Document Accession #: 20230523-5020 Filed Date: 05/23/2023

Pacific Gas and Electric Company

Power Generation

300 Lakeside Drive
Oakland, CA 94612

Mailing Address:
Mail Code N11D
P.O. Box 770000
San Francisco, CA 94177

May 22, 2023

Via Electronic Submittal (E-File)

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
Office of Energy Projects
888 First Street, N.E.
Washington, DC 20426

RE: Potter Valley Hydroelectric Project, FERC No. 77-CA
2023 Flow Variance Request Due to Limited Storage Capacity

Dear Secretary Bose:

Please consider this letter a request for a 2023 flow variance for Pacific Gas and Electric Company's (PG&E) Potter Valley Project (Project), Federal Energy Regulatory Commission (FERC) No. 77. Article 52 of the Project license requires PG&E to comply with the National Marine Fisheries Service (NMFS) Reasonable and Prudent Alternative (RPA) that was made part of the license by FERC's "Order Amending License, issued January 28, 2004." The RPA includes requirements for the minimum instream flows of the Project.

PG&E is engaged in studies to evaluate the seismic risk at Scott Dam as part of its dam safety program. Recently, PG&E dam safety engineers determined that the seismic risk is greater than previously understood. To reduce the potential seismic risk, PG&E has determined that the gates at Scott Dam will not be closed indefinitely to impound water above spillway elevation, reducing the water storage capacity by approximately 20,000 acre-feet (AF). With the dam's spillway gates remaining open, water availability is expected to be similar to dry conditions experienced in 2020 and 2021, when Lake Pillsbury's spring top-off did not reach the spillway crest elevation and the Project operated under FERC-approved flow variances.

Accordingly, PG&E is requesting a variance for 2023 from the current requirements to reduce East Branch Russian River (EBRR) flows to proactively manage reservoir storage in a manner that is protective of Project facilities and minimize potential impacts to fish species residing in the Eel River protected under the federal Endangered Species Act (ESA). PG&E is requesting expedited review of the variance. In addition, pursuant to FERC's letters dated March 28, 2023, and April 28, 2023, PG&E is beginning discussions

to develop the longer-term flow regime to assure compliance of environmental requirements with the spillway gates remaining open.

Lake Pillsbury Minimum Pool

As a condition of a prior flow variance for the Project issued on July 15, 2016, FERC required PG&E to "determine the current low level operation constraints at Lake Pillsbury (beyond operator recommendations) that support a low reservoir elevation level." To address this requirement, PG&E submitted to FERC on April 3, 2017, a Technical Memo (TM) that identified and evaluated potential dam safety and operational constraints on lowering the operating level. The TM found a high potential of bank sloughing exists at pool levels between 5,000 and 12,000 AF; the degree of bank sloughing is partially dependent on the drawdown rate of the reservoir. Since this analysis was performed, PG&E has used 12,000 AF as the Lake Pillsbury planning minimum for water management (see Figure 1).

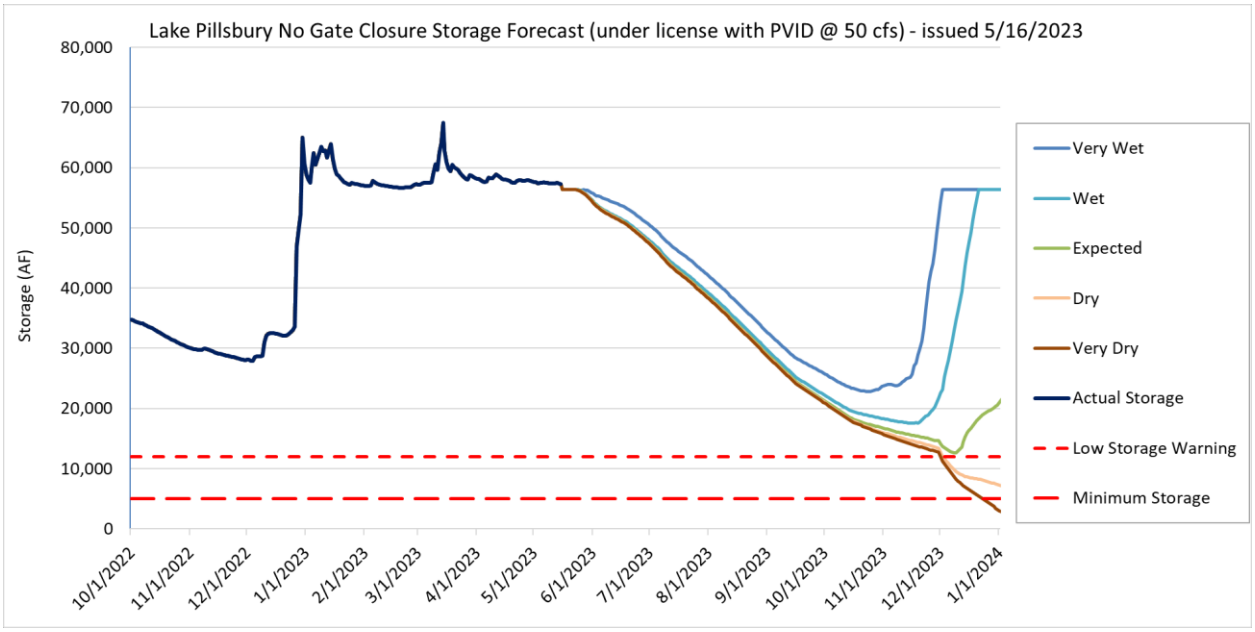


***Figure 1**. Lake Pillsbury daily storage forecast without flow variance under RPA flows and a range of inflow forecasts from the California-Nevada River Forecast Center (CNRFC). These storages forecast curves assume 2023 block water releases of 2,500 AF on 6/15 and Water Year 2024 block water release of 2,500 AF on 12/1.*

Current Minimum Instream Flows

Below is a summary of the license-required flows for Spring/Summer 2023 (Table 1).

Table 1: Expected Spring/Summer 2023 flows under RPA

Compliance Point	5/1 Requirement (cfs)	5/15 Requirement (cfs)	6/1 Requirement (cfs) with classification	8/1-9/30 Requirement (cfs) with classification
Eel River below Scott Dam (E-2)	100 cfs	100 cfs	Normal - 60 cfs	Normal - 60 cfs
Eel River below Cape Horn Dam (E-11)	Value depends on Eel Index Flow.	Value depends on Eel Index Flow.	Value depends on Eel Index Flow.	Wet –15 cfs
East Branch Russian River (E-16)	Normal - 35 cfs	Normal - 75 cfs	Normal - 75 cfs	Normal - 75 cfs, then 35 cfs after 9/15

The EBRR Project compliance point gaging station (E-16) is currently in the 'Normal' Water Year Type (WYT) classification and will remain there based on the current cumulative inflow to Lake Pillsbury to date. The required flows at E-16 are 75 cfs for the summer. This required flow is a significant drain on the limited storage in the reservoir and could make it impossible to maintain adequate storage in the reservoir under drier scenarios (see Figure 1).

The upper Eel River contains habitat for Chinook salmon (*Onchorhynchus tshawytscha*) and steelhead trout (*O. mykiss*), both of which are listed as threatened under the Endangered Species Act (ESA). Under this variance, modifications to the minimum flows on the Eel River below Cape Horn Dam are not proposed and modifications to minimum flows below Scott Dam are within thresholds previously evaluated under the RPA.

The RPA does not set a minimum for Potter Valley Irrigation District (PVID) contract water deliveries (only sets a maximum), outside of winter frost protection and post-harvest irrigation periods, tied to FERCs October 14, 2009, license article 52 amendment. Accordingly, reductions to PVID contract water deliveries are at PG&E's discretion and outside the scope of this flow variance request. Therefore, the variance reductions will address EBRR flows, the minimum and maximum of which are dictated by the RPA.

Proposed Variance

To preserve Lake Pillsbury storage and maintain cooler release water temperatures, the proposed variance will focus on meeting Eel River RPA flow requirements at E-11, and reducing flows to the EBRR at E-16 in response to Lake Pillsbury release temperatures as measured at E-2.

The following flow variance conditions will be in effect for 2023:

- Gaging Station E-2 will be reclassified as a Critical WYT. In practice, the E-2 flows will be the combined releases for E-11, E-16, and PVID, with a floor set by the minimum opening of the low-level outlet (approximately 35 cfs) (see Table 2).
- Gaging Station E-16 flows will be reclassified initially as Dry (25 cfs), as soon as FERC grants the variance request, and then will be adjusted between 5 cfs and 25 cfs based on PG&E and agency determination when daily average reservoir release water temperatures at E-2 exceeds 16 degrees Celsius. Additionally, E-16 will be adjusted between 5 cfs and 25 cfs if Lake Pillsbury storage forecast shows a reduction in flow releases is needed to maintain reservoir storage above concerning levels for facility safety through during this variance.
- The Drought Working Group (DWG) will meet once monthly during the variance period to discuss storage levels, release flow rates, water temperature profiles, release temperatures, and estimated temperature projections at E-2.
- PG&E will submit monthly storage reports to FERC.
- The drought variance will end when Lake Pillsbury storage exceeds 36,000 AF following October 1, 2023, or is superseded by another variance or long-term variance. This 36,000 AF storage threshold would allow the reservoir to meet minimum flow obligations, including a possible block water release, through January 2024 in the event of extremely low inflow in early winter.
- Flows will be calculated at a 48-hour average measured at E-11 rather than instantaneous. This will allow for a tighter compliance buffer on minimum E-11 flows.

Table 2: Proposed flows under 2023 variance for the summer baseflow period (Date of variance approval to September 30).

Compliance Point	Allowed Range: Min / Max	WY Classification	Notes
Eel River below Scott Dam (E-2)	20 cfs / No max.	Critical	Adjusted from Normal classification
Eel River below Cape Horn Dam (E-11)	15 cfs (Wet) / No max.	Wet	No change
East Branch Russian River (E-16)	5 cfs / 25 cfs	Critical / Dry	Adjusted from Normal classification
Potter Valley Irrigation District	No min. / 50 cfs	N/A	PG&E's discretion

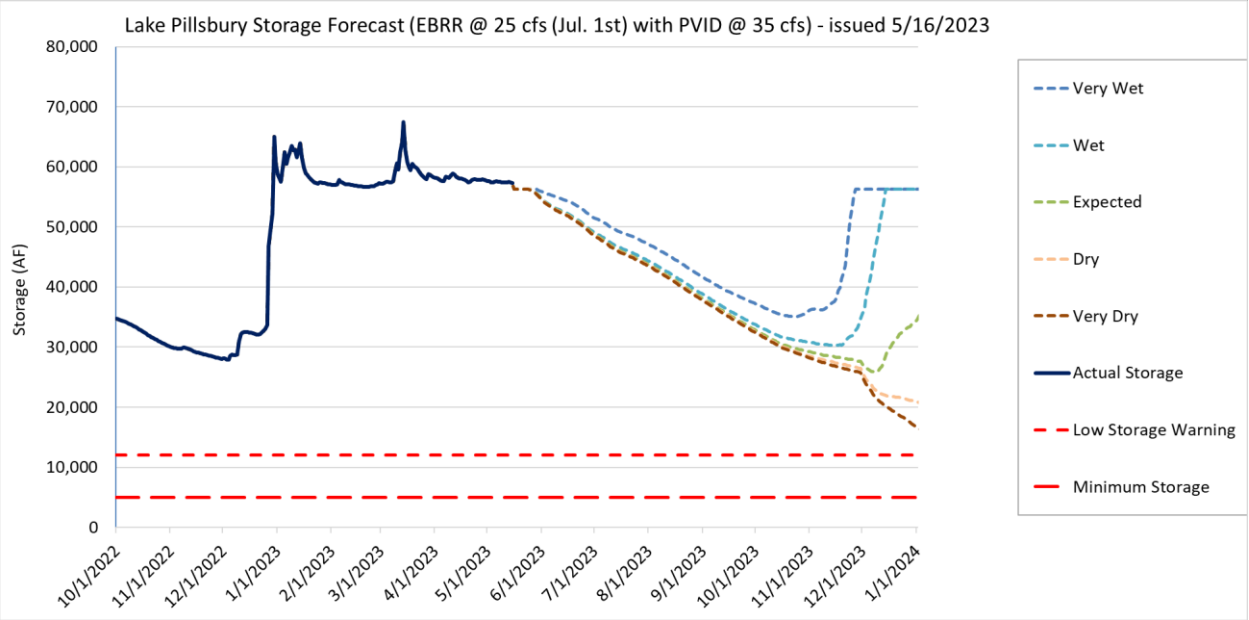


Figure 2. *Lake Pillsbury daily storage forecast with variance conditions in effect (assuming July 1st start date). Storage forecast curves assume 2023 block water releases of 2,500 AF on 6/15 and Water Year 2024 block water release of 2,500 AF on 12/1.*

Additional measures to monitor conditions in Lake Pillsbury and the Eel River below Scott Dam where ESA listed species may occur will include:

- PG&E will finalize the Lake Pillsbury CE-QUAL water temperature model in preparation of developing 5 potential reservoir management scenarios for future

reservoir operations, with agency input, that may be used to help inform 2023 variance flow management.

- PG&E will collect bi-weekly Lake Pillsbury vertical water temperature profiles immediately upstream of Scott Dam, starting after the reservoir ceases spilling through September 30, 2023. Reservoir water temperature data will be compared with historical temperature profiles and lake elevation data, used for the CE-QUAL water temperature model scenarios, and used to inform flow adjustments to EBRR. This information will be distributed to the DWG prior to monthly meetings.
- PG&E will collect bi-weekly spot temperature measurements at two accessible locations on the Eel River between Scott Dam and Cape Horn Dam (Eel River at/near Benmore Creek and Eel River at/near Trout Creek) to determine downstream water temperature changes, and associated water temperature suitability for salmonids. River temperature measurements will be collected beginning after May 15 in coordination with Lake Pillsbury vertical water temperature profiles.
- PG&E will provide funding consistent with the 2022 variance for CDFW and RVIT adult salmonid DIDSON monitoring effort on the mainstem Eel River above South Fork Eel and Middle Fork Eel River for the period of October 1 - January 31, 2024, as part of this variance.

Water Temperature Analysis and Conditions Under the Variance

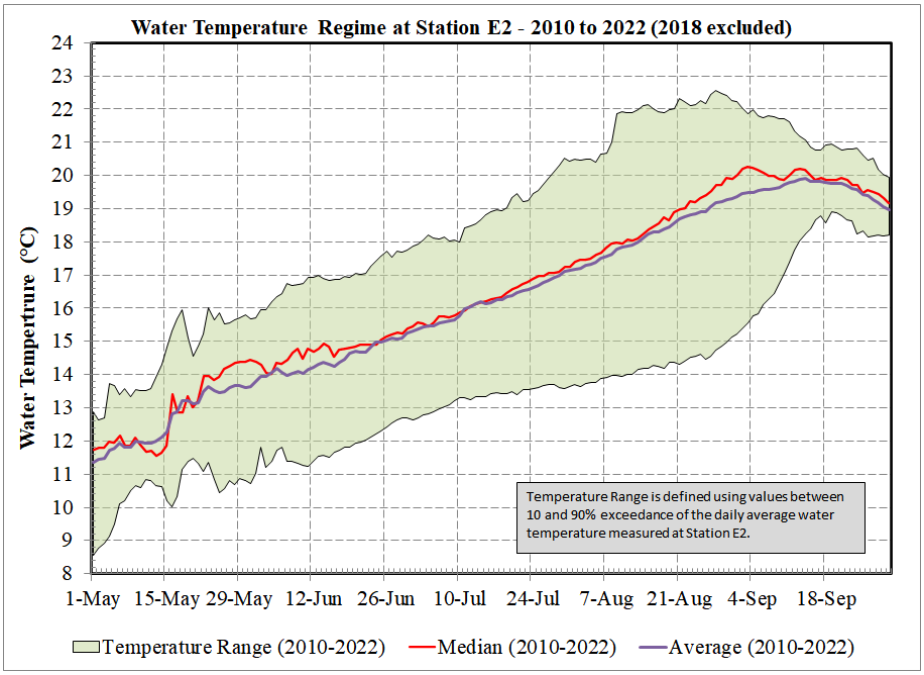


***Figure 3**. Summary of median, average, and 10%-90% exceedance range of water temperatures at E-2 between May and September, using 2010-2022 data (excluding 2018 due to Mendocino Complex Fire).*

In response to PG&Es *2022 Flow Variance Request Due to Limited Water Availability,* submitted May 13, 2022, FERC ordered PG&E to continue to conduct Lake Pillsbury water quality monitoring and develop water temperature modeling scenarios for the purpose of evaluating the potential benefits to cooler reservoir temperatures and water storage that support ESA-listed salmonids during the dry season (Enclosure 2). PG&E evaluated 12 years of historical water temperature data collected under the RPA to develop a regression model to satisfy the July 27, 2022, FERC Order. The water temperature analysis concluded that there are limited tools for mitigating high water temperature in the release from Lake Pillsbury. The small storage volume present in the deeper portions of the reservoir means that there is a limited supply of cooler water that is continuously being mixed with warmer surface water via discharges from the low-level outlet. This results in gradually warming discharges (as measured at gage E-2), especially during periods of high-volume releases.

The conclusion of the PG&E water temperature analysis was that managing releases was the only tool available to moderate water temperature releases from the reservoir. This method of storage control meters the volume of cooler water, reducing the mixing of warmer upper water layers down through the water column, and possibly allowing the natural cooling influences of later September ambient meteorological conditions to mitigate temperatures in the remaining reservoir volume. The results of this analysis are included in enclosure 2.

Based on the findings of the water temperature analysis, PG&E, in coordination with NMFS, California Department of Fish and Wildlife (CDFW), Round Valley Indian Tribes (RVIT) and United States Fish and Wildlife Service (USFWS) (hereafter Agencies) determined that a flexible management approach to reservoir releases in 2023 during the mid-July to late-September period could support cooler temperatures for ESA listed salmonids rearing in the Eel River downstream of Scott Dam.

Under the flexible management approach, PG&E will monitor release water temperatures as measured at E-2 during the summer. When daily average water temperatures exceed 16 degrees Celsius (which could occur beginning June assuming median and average values – see Figure 2), PG&E will notify Agencies and begin meeting on a weekly basis to determine if diversions to the EBRR, as measured at E-16, should be reduced in support of minimizing withdrawals from the reservoir in order to better manage release temperatures.

In coordination with Agencies, PG&E will adjust flows in EBRR between the range of 25 and 5 cfs for the period of mid-July through September 30, informed by observed release water temperatures as measured at E-2, as needed to preserve cooler temperatures releases from the reservoir in support of ESA listed species in the Eel River downstream of Scott Dam. After September 30, E-16 (EBRR) will be classified as Dry and remain at 25 cfs, barring the reservoir storage forecast indicating a lower release is necessary to avoid the reservoir reaching concerning levels later in the year.

Biological Impacts

PG&E biologists have reviewed this variance proposal and believe that the proposed flow variance is necessary to conserve water in Lake Pillsbury and provide adequate flow releases and suitable water quality conditions for the long-term protection of Chinook salmon and steelhead trout in the watershed. Below is their biological analysis.

Eel River below Lake Pillsbury and Van Arsdale Reservoir

The primary ESA-listed fish species impacted by the Potter Valley Project are Chinook salmon (*Onchorhynchus tshawytscha*) and steelhead trout (*O. mykiss*). Life stages of these species that could potentially be in the river and whose habitat conditions are influenced by project operations during the flow variance period are adult steelhead trout (pre- and post-spawn), and juvenile Chinook salmon and steelhead trout. If the variance extends beyond October, adult Chinook salmon will likely be present in the mainstem Eel River as well.

Adult steelhead trout migrate into the upper Eel River watershed to spawn primarily from January through April. Through May 14, 2023, of the current spawning season, 145 adult steelhead trout have been counted at Van Arsdale Fisheries Station at Cape Horn Dam. Under the proposed variance, flows in the Eel River for adult steelhead trout migration and spawning would not be reduced below the RPA-prescribed flows. Juvenile Chinook salmon remain in the river for several weeks after hatching and then migrate to the ocean during spring (typically April-June), as flows decline, and water temperatures increase. Juvenile steelhead trout, which typically spend one or more years in the river before migrating to the ocean during late winter and spring (typically February-June), require suitable habitat conditions throughout the summer. Under the variance proposal, available spring rearing habitat in the Eel River would not be affected by the variance. An increase in spring flows followed by a decrease to summer levels, as prescribed by the RPA, would still occur under the variance proposal, thus providing important migration cues for downstream migrating fish. The variance will also support cooler water temperatures in late summer for rearing juvenile steelhead trout. PG&E, in coordination with Agencies, will use the water temperature regression model, the updated CE-QUAL reservoir temperature model (note – model must be calibrated in coordination with Agencies prior to selecting/running scenarios), and other tools to inform reservoir release management from mid-July (assumed start of variance) through September 30 in support of maintaining release temperatures below 20 degrees Celsius at E-2.

Once approved by FERC, the proposed variance would reduce minimum flows in the reach between Scott Dam and Cape Horn Dam to preserve storage in Lake Pillsbury. While this will reduce the available summer rearing habitat for steelhead trout, minimum flows would remain above the E-2 “Critical” classification prescribed by the RPA. Summertime flow requirements in the Eel River below Cape Horn Dam under the proposed variance would remain unchanged from the RPA-prescribed “Wet” classification summer flow of 15 cfs, plus a buffer release.

Transitioning into fall and winter, the proposed flow variance is the prudent action, given reduced storage capacity in Lake Pillsbury and the unpredictability of storm activity and inflow conditions. Implementation of the proposed flow variance will conserve water in Lake Pillsbury and support suitable water quality conditions for aquatic resources below Scott Dam. It will also reduce the risk of reservoir bank erosion and sloughing at low reservoir storage levels that could limit PG&E's ability to make releases at Scott Dam, which could in turn impact downstream aquatic resources (including Chinook salmon and steelhead trout) due to changes in flow, high levels of turbidity, and sedimentation. Under the proposed flow variance, Agencies' WY2023 block water allotment under the RPA will be for use at their discretion, including during the fall/winter Chinook salmon spawning season to supplement flows if needed, given hydrologic conditions in the Eel River watershed.

East Branch Russian River (EBRR)

The primary fish species of interest in the EBRR downstream of the Potter Valley Powerhouse is non-federally ESA listed resident rainbow trout (*O. mykiss*). Both natural origin and hatchery rainbow trout inhabit this stream reach. CDFW historically planted catchable resident rainbow trout to support the local sport fishery; however, planting activities have been reduced in recent years due to persisting drought conditions and lower flows. Under the variance, flows in the EBRR would be reduced from Normal to between Dry and Critical classifications (75 cfs to 25-5 cfs), resulting in a reduction in habitat for rainbow trout and other aquatic species. In turn, this would likely result in the continuation of reduced sport fishing opportunities for the duration of the variance.

Agency Consultation and Conclusion

Given the risk that providing Project License-required flows with the reduced reservoir levels will lead to destabilizing drawdown rates and, in the worst case, reaching critical minimum pool at Lake Pillsbury, PG&E consulted with Agencies and the DWG during the development of the following variance proposal, and Agencies provided input to PG&E. PG&E requests that the variance proposal take effect as soon as FERC approves the request.

PG&E and Agencies met to discuss potential variance on May 2, 2023, and May 10, 2023. PG&E provided Agencies a draft variance proposal on May 11, 2023. Agencies provided comments on May 18, 2023, PG&E provided response to comments in enclosure 1 on May 18, 2023 (enclosure 1, consultation record). Additionally, the DWG was provided the draft variance prior to meeting on May 16, 2023.

If you have any questions, concerns, or comments, please do not hesitate to contact Jackie Pope, license coordinator at (530) 254-4007.

Sincerely,

Janet Walther,
Senior Manager, Hydro Licensing

Enclosures:
1.Agency Consultation Record
2. Lake Pillsbury water temperature modeling scenarios

ENCLOSURE 1

From: Wyatt Smith
To: Pope, Jackie
Cc: Scott McBain; Boyce, Josh; Joshua Fuller - NOAA Federal; Myers, Matt@Wildlife; Matt Goldsworthy - NOAA Federal; Allan.Renger@wildlife.ca.gov
Subject: Potter Valley Variance 2023
Date: Saturday, May 20, 2023 6:42:37 PM

Good evening Ms Pope,

Thank you for addressing our comments on the draft variance request, we appreciate the improved clarity and commitments. At this time, we have no further comments, and the Round Valley Indian Tribes support submittal to FERC as soon as possible in order to begin implementing the variance actions to help maintain desirable release temperatures from Scott Dam that should help salmonid habitat conditions downstream of the PVP.

Please feel free to call me if you have any questions.

Sincerely,
Wyatt

Wyatt Smith
Fisheries Program Coordinator & Biologist
Round Valley Indian Tribes
707-354-4423

From: Myers, Matt@Wildlife
To: Pope, Jackie; Joshua Fuller - NOAA Federal; Scott McBain; Wyatt Smith; Renger, Allan@Wildlife; josh_boyce@fws.gov; Bob Coey - NMFS
Cc: Anderson, Andrew; Lent, Michelle; Evans, Mike; Gigliotti, Tony; McCready, Chadwick; Joseph, Matthew
Subject: RE: Request to review Potter Valley Variance
Date: Monday, May 22, 2023 8:48:01 AM
Attachments: image002.png

CAUTION: EXTERNAL SENDER!

This email was sent from an EXTERNAL source. Do you know this person? Are you expecting this email? Are you expecting any links or attachments? If suspicious, do not click links, open attachments, or provide credentials. Don't delete it. **Report it by using the "Report Phish" button.**

Jackie,
The California Department of Fish and Wildlife has reviewed the proposed Potter Valley Variance, we have no further comments and support sending it to FERC as soon as possible. If you have any questions, please let me know.

Matt Myers
Senior Environmental Scientist
R1 FERC Coordinator

From: Pope, Jackie <JHPL@pge.com>
Sent: Friday, May 19, 2023 4:05 PM
To: Joshua Fuller - NOAA Federal <joshua.fuller@noaa.gov>; Scott McBain <scott@mcbainassociates.com>; Wyatt Smith <Wsmith@rvit.org>; Myers, Matt@Wildlife <Matt.Myers@wildlife.ca.gov>; Renger, Allan@Wildlife <Allan.Renger@wildlife.ca.gov>; josh_boyce@fws.gov; Bob Coey - NMFS <bob.coey@noaa.gov>
Cc: Anderson, Andrew <A5AK@pge.com>; Lent, Michelle <M4LQ@pge.com>; Evans, Mike <MDE3@pge.com>; Gigliotti, Tony <T1GF@pge.com>; McCready, Chadwick <COMM@pge.com>; Joseph, Matthew <MWJA@pge.com>
Subject: RE: Request to review Potter Valley Variance
Importance: High

WARNING: This message is from an external source. Verify the sender and exercise caution when clicking links or opening attachments.

Classification: Internal

Greetings agencies,

Thank you for taking the time to review PG&Es draft variance request. Please see the attached updated variance that includes incorporated edits and PG&Es comment matrix, please note comments that were editorial in nature were not included in the comment matrix. Please respond to this email as soon as you can with your comments or concurrence on the attached variance.

I am available if you have any questions or concerns by phone or email as well.

Thank you,

Jackie Pope | Hydro License Coordinator | Power Generation

Pacific Gas and Electric Company
Phone: (530) 254-4007
Email: jhpl@pge.com

From: Joshua Fuller - NOAA Federal <joshua.fuller@noaa.gov>
Sent: Monday, May 15, 2023 6:02 PM
To: Scott McBain <scott@mcbainassociates.com>
Cc: Pope, Jackie <JHPL@pge.com>; Wyatt Smith <Wsmith@rvit.org>; Myers, Matt@Wildlife <Matt.Myers@wildlife.ca.gov>; Renger, Allan@Wildlife <Allan.Renger@wildlife.ca.gov>; josh_boyce@fws.gov; Bob Coey - NMFS <bob.coey@noaa.gov>; Anderson, Andrew <A5AK@pge.com>; Lent, Michelle <M4LQ@pge.com>; Evans, Mike <MDE3@pge.com>; Gigliotti, Tony <T1GF@pge.com>; McCready, Chadwick <COMM@pge.com>
Subject: Re: Request to review Potter Valley Variance

CAUTION: EXTERNAL SENDER!

This email was sent from an EXTERNAL source. Do you know this person? Are you expecting this email? Are you expecting any links or attachments? If suspicious, do not click links, open attachments, or provide credentials. Don't delete it. **Report it by using the "Report Phish" button.**

Hi All -

I added a few comments to Scott's provided comments.

Thanks for the opportunity to review.

Cheers,
JF

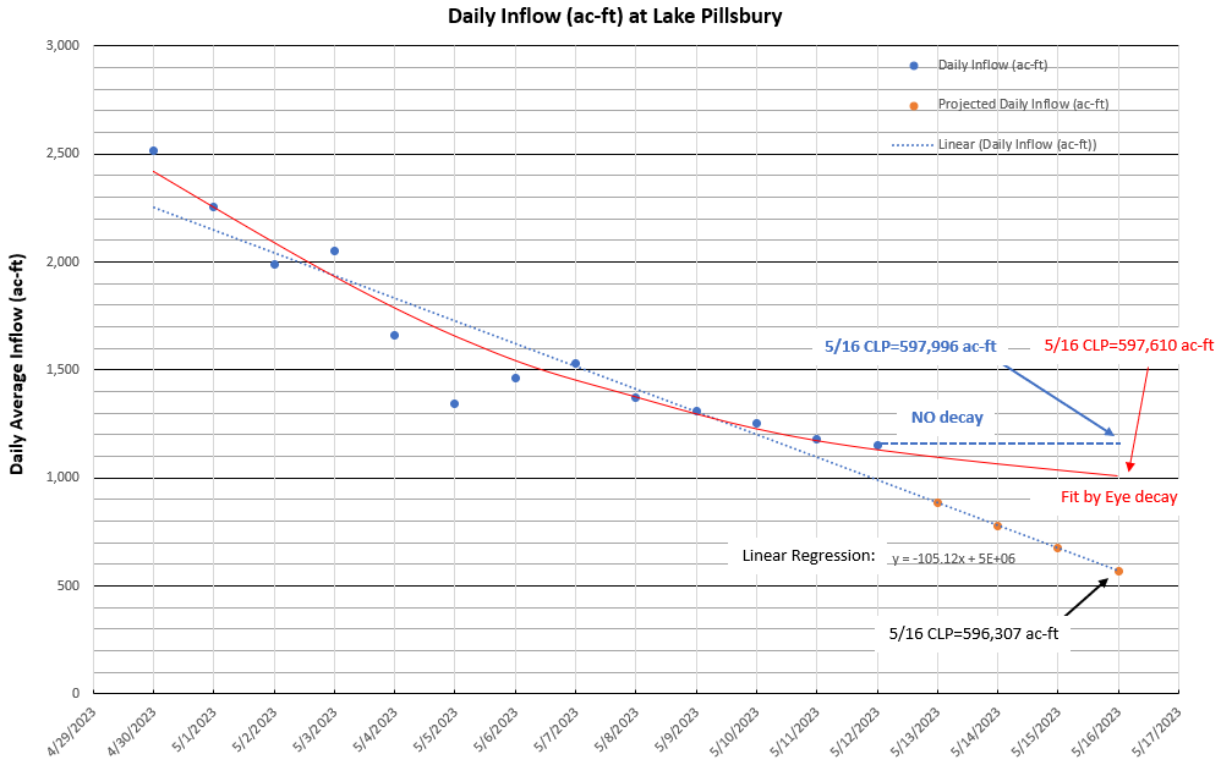
On Fri, May 12, 2023 at 12:11 PM Scott McBain <scott@mcbainassociates.com> wrote:

> Thanks Jackie and Team PG&E,

Attached are comments/suggested edits to the variance proposal for your consideration. It is a lot, sorry about that, but wanted to clarify some things that were still a bit vague in the document. Feel free to call if you have any questions.

Also, I plotted inflows over the last two weeks to predict whether we'd get over the 598,400 ac-ft CLP hump, and it's looking impossible based on the chart below unless inflows increase substantially with the hot weather coming this weekend. Sooooo close!

Scott



From: Pope, Jackie <JHPL@pge.com>
Sent: Thursday, May 11, 2023 12:22 PM
To: Scott McBain <scott@mcbainassociates.com>; Wyatt Smith <Wsmith@rvit.org>; Joshua Fuller - NOAA Federal <joshua.fuller@noaa.gov>; Myers, Matt@Wildlife <Matt.Myers@wildlife.ca.gov>; Renger, Allan@Wildlife <Allan.Renger@wildlife.ca.gov>; josh_boyce@fws.gov; 'Bob Coey - NMFS' <bob.coey@noaa.gov>
Cc: Anderson, Andrew <A5AK@pge.com>; Lent, Michelle <M4LQ@pge.com>; Evans, Mike <MDE3@pge.com>; Gigliotti, Tony <T1GF@pge.com>; McCready, Chadwick <COMM@pge.com>
Subject: Request to review Potter Valley Variance

Classification: Internal

Greetings,
Thank you for taking the time to speak with me yesterday. As promised, please see the attached draft variance. Please provide your comments by **noon, May 18, 2023**.

Thank you,

Jackie Pope | Hydro License Coordinator | Power Generation

Pacific Gas and Electric Company
Phone: (530) 254-4007
Email: jhpl@pge.com

--
~~~~~~~~~~~~~~~~

Joshua Fuller
Fish Biologist
North Coast Branch
~~~~~~~~~~~~~~~~

California Coastal Office
NOAA Fisheries West Coast Region
U.S. Department of Commerce
777 Sonoma Ave., Rm. 325
Santa Rosa, CA 95404
Office: 707-575-6096
Cell: 707-531-0711
Joshua.Fuller@noaa.gov

From: Joshua Fuller - NOAA Federal
To: Pope, Jackie
Cc: Scott McBain; Wyatt Smith; Myers, Matt@Wildlife; Renger, Allan@Wildlife; josh_boyce@fws.gov; Bob Coey - NMFS; Anderson, Andrew; Lent, Michelle; Evans, Mike; Gigliotti, Tony; McCready, Chadwick; Joseph, Matthew
Subject: Re: Request to review Potter Valley Variance
Date: Monday, May 22, 2023 1:25:53 PM
Attachments: image002.png

Hello Jackie -

Thank you for the opportunity to review and comment on PG&E's Potter Valley Project (PVP; FERC No. 77), *2023 Flow Variance Request Due to Limited Water Storage Capacity*, received via email, dated May 19, 2023. The National Marine Fisheries Service (NMFS) supports the need for a variance to conserve water storage within Lake Pillsbury that ensures suitable flow and water temperature conditions for federally ESA-listed salmonids that inhabit the Eel River downstream of Scott Dam. NMFS believes that the flow components of this variance associated with the Eel River are consistent with the *intent* of NMFS' 2002 Biological Opinion and some components of the *Interim Protective Measures* (IPMs), as outlined in NMFS' March 16, 2022 letter addressed to FERC. However, NMFS strongly urges full implementation of the IPMs to further minimize negative impacts to ESA-listed salmonids until the longer-term PVP decommissioning process has been completed. NMFS remains available to provide technical assistance and support to PG&E and FERC on implementation of this variance and subsequent development and implementation of a more robust IPM(s) variance.

Please let me know if you have any questions or comments regarding NMFS technical assistance and support for this proposed variance.

Best regards,
Josh Fuller

On Fri, May 19, 2023 at 4:08 PM Pope, Jackie <JHPL@pge.com> wrote:

> Classification: Internal
>
> Greetings agencies,
>
> Thank you for taking the time to review PG&Es draft variance request. Please see the attached updated variance that includes incorporated edits and PG&Es comment matrix, please note comments that were editorial in nature were not included in the comment matrix. Please respond to this email as soon as you can with your comments or concurrence on the attached variance.
>
> I am available if you have any questions or concerns by phone or email as well.
>
> Thank you,
>
> **Jackie Pope** | Hydro License Coordinator | Power Generation
>
> ==========
>
> **Pacific Gas and Electric Company**
>
> Phone: (530) 254-4007
>
> Email: jhpl@pge.com
>
> ---
>
> **From:** Joshua Fuller - NOAA Federal <joshua.fuller@noaa.gov>
> **Sent:** Monday, May 15, 2023 6:02 PM
> **To:** Scott McBain <scott@mcbainassociates.com>
> **Cc:** Pope, Jackie <JHPL@pge.com>; Wyatt Smith <Wsmith@rvit.org>; Myers, Matt@Wildlife <Matt.Myers@wildlife.ca.gov>; Renger, Allan@Wildlife <Allan.Renger@wildlife.ca.gov>; josh_boyce@fws.gov; Bob Coey - NMFS <bob.coey@noaa.gov>; Anderson, Andrew <A5AK@pge.com>; Lent, Michelle <M4LQ@pge.com>; Evans, Mike <MDE3@pge.com>; Gigliotti, Tony <T1GF@pge.com>; McCready, Chadwick <COMM@pge.com>
> **Subject:** Re: Request to review Potter Valley Variance
>
>

Hi All -

I added a few comments to Scott's provided comments.

Thanks for the opportunity to review.

Cheers,

JF

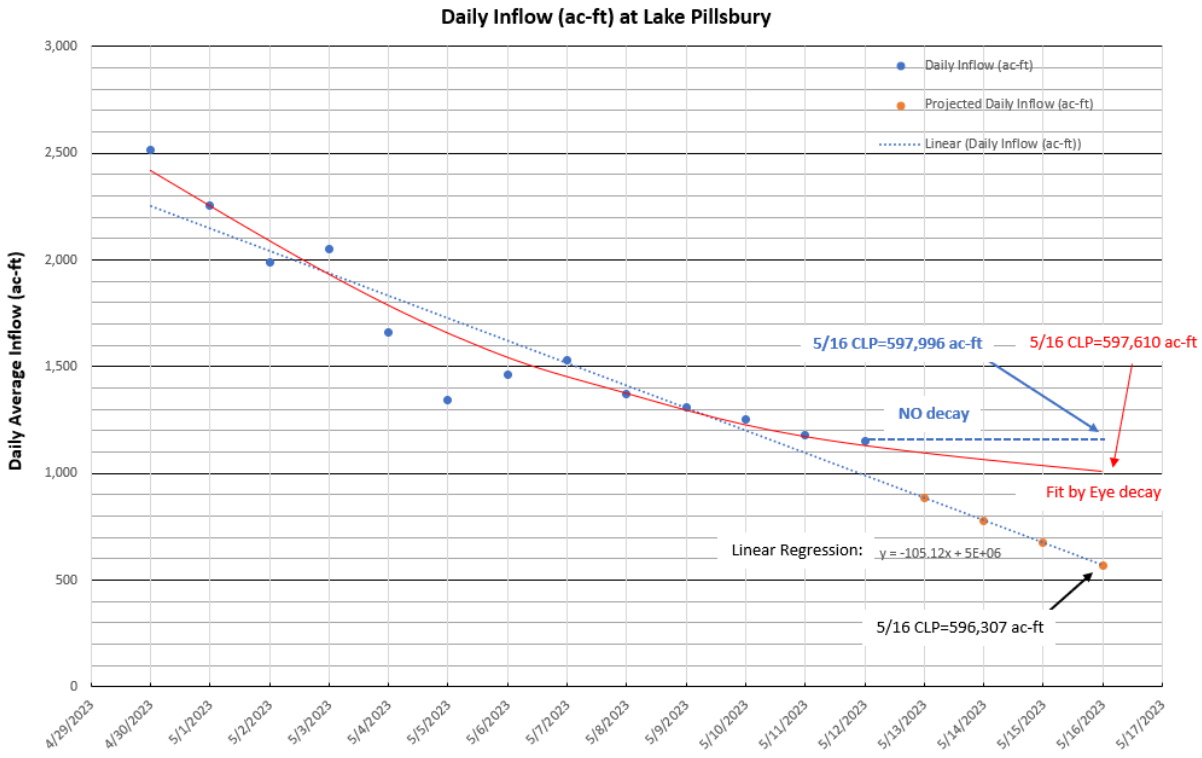
On Fri, May 12, 2023 at 12:11 PM Scott McBain <scott@mcbainassociates.com> wrote:

Thanks Jackie and Team PG&E,

Attached are comments/suggested edits to the variance proposal for your consideration. It is a lot, sorry about that, but wanted to clarify some things that were still a bit vague in the document. Feel free to call if you have any questions.

Also, I plotted inflows over the last two weeks to predict whether we'd get over the 598,400 ac-ft CLP hump, and it's looking impossible based on the chart below unless inflows increase substantially with the hot weather coming this weekend. Sooooo close!

Scott



From: Pope, Jackie <JHPL@pge.com>
Sent: Thursday, May 11, 2023 12:22 PM
To: Scott McBain <scott@mcbainassociates.com>; Wyatt Smith <Wsmith@rvit.org>; Joshua Fuller - NOAA Federal <joshua.fuller@noaa.gov>; Myers, Matt@Wildlife <Matt.Myers@wildlife.ca.gov>; Renger, Allan@Wildlife <Allan.Renger@wildlife.ca.gov>; josh_boyce@fws.gov; 'Bob Coey - NMFS' <bob.coey@noaa.gov>
Cc: Anderson, Andrew <A5AK@pge.com>; Lent, Michelle <M4LQ@pge.com>; Evans, Mike <MDE3@pge.com>; Gigliotti, Tony <T1GF@pge.com>; McCready, Chadwick <COMM@pge.com>
Subject: Request to review Potter Valley Variance

Classification: Internal

Greetings,
Thank you for taking the time to speak with me yesterday. As promised, please see the attached draft variance. Please provide your comments by **noon, May 18, 2023**.

Thank you,

Jackie Pope | Hydro License Coordinator | Power Generation

Pacific Gas and Electric Company

Phone: (530) 254-4007

Email: jhpl@pge.com

--

~~~~~~~~~~~~~~~~

Joshua Fuller

Fish Biologist

North Coast Branch

California Coastal Office

NOAA Fisheries West Coast Region

U.S. Department of Commerce

777 Sonoma Ave., Rm. 325

Santa Rosa, CA 95404

Office: 707-575-6096

Cell: 707-531-0711

Joshua.Fuller@noaa.gov

--
~~~~~~~~~~~~~~~~
Joshua Fuller
Fish Biologist
North Coast Branch
California Coastal Office
NOAA Fisheries West Coast Region
U.S. Department of Commerce
777 Sonoma Ave., Rm. 325
Santa Rosa, CA 95404
Office: 707-575-6096
Cell: 707-531-0711
Joshua.Fuller@noaa.gov

2023 Flow Variance Request Due to Limited Storage Capacity
Comment Response Matrix

May 2023

#	Location		Comment	Reviewer	Response
	Page	Section			
1	2	Current Minimum Instream Flows	Below is a summary of the license-required flows for Spring/Summer 2023 (Table 1). Table 1: Expected Spring/Summer 2023 flows under RPA NMFS Comment: Might be best to say under the FERC license vs. the RPA, as the BiOp has expired. Change through the document.	NMFS	The terms of the RPA and RPMs from the BiOp were incorporated into the license by FERC, and did not include any expiration date or other time limitation. If NMFS did not agree with the RPA and RPMs as incorporated into the license, or wanted to add or clarify that the RPA and RPMs were for a specific time period, NMFS could have requested rehearing of the 2004 amendment order to add it. While NMFS filed for rehearing on other issues, its rehearing request did not seek to limit the term of the BiOp. Thus, there is no expiration date for the RPA and RPM conditions incorporated into the license, or for the BiOp. They continue throughout the term of the license, including any annual licenses. See PG&Es *Response to FERC's May 11, 2022 Letter,* submitted Jully 11, 2022; see FERC *notice of an annual license for the Project* issued April 21, 2022; NMFS comments on RPA/BiOp not accepted throughout document
2	3	Current Minimum Instream Flows	RVIT added forth column to Table 1, includes the following: Expected 8/1-9/30 Requirement (cfs) with classification* Normal - 60 cfs Wet –15 cfs Very Wet – 30 cfs Normal - 75 cfs, then 35 cfs after 9/15	RVIT	Edits accepted with the exception of including Very Wet at E-11, cumulative inflow did not meet very wet threshold on May 15. References to very wet removed in proposal as appropriate
3	3	Current Minimum	There is no mention of "sharpening the pencil" of the buffer flows in the document, I assume that is	RVIT	Comment accepted; bullet added under proposed variance: *Flows will be calculated at a 48-hour*

2023 Flow Variance Request Due to Limited Storage Capacity
Comment Response Matrix

May 2023

#	Location		Comment	Reviewer	Response
	Page	**Section**			
		Instream Flows	intentional. If not, this could be a good place to introduce it.		*average measured at E-11 rather than instantaneous.*
4	3	Proposed Variance	Language added: To preserve Lake Pillsbury storage and reduce summer release maintain cooler release water temperatures, the proposed variance will focus on meeting Eel River RPA flow requirements at E-11, and reducing flows to the EBRR at E-16 in response to Lake Pillsbury release temperatures as measured at E-2. The following flow variance conditions will be in effect for 2023:	RVIT	Edits/additional language accepted
5	3	Proposed Variance	Gaging Station E-16 flows will be reclassified initially as Dry (25 cfs), RVIT comment: *Consistent with comments in Table 2, when will this occur? 8/1? Or as soon as FERC grants variance request?*	RVIT	Language updated to: *Gaging Station E-16 flows will be reclassified initially as Dry (25 cfs), as soon as FERC grants the variance request,*
6	3	Proposed Variance	Gaging Station E-16 flows will be reclassified initially as Dry (25 cfs), and then will be adjusted between 5 cfs and 25 cfs based on PG&E and agency determination when daily average reservoir release water temperatures at E-2 exceeds 16 degrees Celsius averaged daily temperature. Additionally, E-16 will be adjusted between 5 cfs and 25 cfs if Lake Pillsbury storage forecast shows a reduction in flow releases is needed to preserve adequate reservoir storage to maintain cooler release water temperatures.	RVIT	Edits accepted

2023 Flow Variance Request Due to Limited Storage Capacity
Comment Response Matrix

May 2023

#	Location		Comment	Reviewer	Response
	Page	Section			
7	4	Proposed Variance	Should add a project variance storage figure based on max release under variance flow prescriptions, etc..	NMFS	Agreed, figure 2 added to page 5
8	4	Proposed Variance	So if the variance starts earlier than August 1, then we should modify the E-16 flows to indicate an earlier date than 8/1. Could do this in the title, or as another footnote. I think the "summer baseflow period (8/1-9/30) should be in the title due to the E-11 flow requirements, as before 8/1 is the ramp down period, and would require another column to the table for the period prior to 8/1 (again assuming the variance would start before 8/1). Text further down mentions mid-July…	RVIT; NMFS	Agreed, changed text in title of Table 2 from "August 1 – September 30", to "beginning of variance to September 30"
9	4	Proposed Variance	I guess no need to provide an estimated average? Currently 30 cfs in the spreadsheet	RVIT	The RPA does not set a minimum for Potter Valley Irrigation District (PVID) contract water deliveries (only sets a maximum), outside of winter frost protection and post-harvest irrigation periods, tied to FERC's October 14, 2009, license article 52 amendment. Accordingly, reductions to PVID contract water deliveries are at PG&E's discretion and outside the scope of this flow variance request. Therefore, the variance reductions will address EBRR flows, the minimum and maximum of which are dictated by the RPA.
10	4	Proposed Variance	So no adjustments to PVID under any circumstances?	NMFS	See comment response 9
11	5	Proposed Variance	Not sure we're really going to assess flow or habitat, just temperature preferences. Maybe I'm wrong?	RVIT	Although this measure will assess habitat conditions with respect to temperature, we have accepted the proposed edits.

2023 Flow Variance Request Due to Limited Storage Capacity
Comment Response Matrix

May 2023

#	Location		Comment	Reviewer	Response
	Page	Section			
12	6	Proposed Variance	PG&E will continue to monitor adult salmonid passage at Van Arsdale Fisheries Station at Cape Horn Dam throughout the variance. RVIT Comment: *I deleted because I think this is a license requirement, and not an "Additional Measure" associated with the variance*	RVIT	Agreed, this measure has been removed from document
13	6	Proposed Variance	PG&E will provide funding consistent with the 2022 variance for CDFW and RVIT adult salmonid DIDSON monitoring effort on the mainstem Eel River above South Fork Eel and Middle Fork Eel River for the period of October 1 - January 31, 2024, as part of this variance. RVIT: *There was discussion on our call to extend through January 2024 to support monitoring for late Chinook salmon, as well as if we need to extend the variance into January if we don't get any significant precipitation in October-January*	RVIT	PG&E will provide an additional $15,000 total for an additional month of DIDSON monitoring at the mainstem Eel River above South Fork Eel and Middle Fork Eel River.
14	6	Proposed Variance	PG&E will provide funding consistent with the 2022 variance for CDFW and RVIT adult salmonid DIDSON monitoring effort on the mainstem Eel River above South Fork Eel and Middle Fork Eel River for the period of October 1 - January 31, 2024, as part of this variance. NMFS: *Yes, at minimum through January (data shows). Also, maintenance funding should also be provided to CDFW 0 major concern with aging equipment, etc.*	NMFS	PG&E will provide an additional $15,000 total for an additional month of DIDSON monitoring at the mainstem Eel River above South Fork Eel and Middle Fork Eel River. PG&E and NMFS are engaged in discussions regarding additional monitoring efforts associated with a long-term variance, including a cost share agreement for equipment upgrades to the DIDSON/sonar monitoring network.

2023 Flow Variance Request Due to Limited Storage Capacity
Comment Response Matrix

May 2023

#	Location		Comment	Reviewer	Response
	Page	Section			
15	6	WT analysis and conditions under the variance	The small storage volume present in the deeper portions of the reservoir means that there is a limited supply of cooler water, and that this cooler water is continuously being mixed with warmer surface water pulled along the face of Scott Dam via discharges from the low-level outlet. This results in gradually warming release water temperatures at E-2discharges, especially during periods of high-volume needle valve releases from Scott Dam. RVIT Comment: Suggest a different term than "high volume" as it is not defined. Maybe "higher releases" but that is still undefined. Also, I added needle valve to distinguish between spill releases	RVIT	Edits not accepted, language taken from Water Temperature Analysis provided to agencies on April 3, 2023. Enclosure 1
16	7	Proposed Variance WT analysis and conditions under the variance	In coordination with Agencies, PG&E will adjust flows in EBRR between the range of 25 and 5 cfs for the period of mid-July through September 30 , when informed by observed release water temperatures exceed 16 degrees Celsius averaged daily temperature, as measured at E-2, as needed, to preserve cooler temperatures releases from the reservoir in support of ESA listed species in the Eel River downstream of Scott Dam. *RVIT: What happens after September 30? Seems like we'd want to extend this through January or until the variance ends, per the January 2024 text above.*	RVIT	Text added: After September 30, E-16 (EBRR) will be classified as Dry and remain at 25 cfs, barring the reservoir storage forecast indicating a lower release is necessary to avoid the reservoir reaching concerning levels later in the year.
17	9	Biological Impacts	PG&E, in coordination with Agencies, will use the water temperature regression model, the updated CE-QUAL reservoir temperature model, and other tools to inform to manage reservoir releases from the	RVIT	After September 30, 2023, E-16 will remain at reduced flow releases of 25 cfs. PG&E storage projections in Figure 2 show EBRR release at 25 cfs

2023 Flow Variance Request Due to Limited Storage Capacity
Comment Response Matrix

May 2023

#	Location		Comment	Reviewer	Response
	Page	Section			
			reservoir management from mid-July (assumed start of variance) through September 30 in support of maintaining release temperatures below 20 degrees Celsius at E-2. RVIT: *Text above implies this could extend into January 2024. I'm worried that September 30 is too early to "end" reservoir release management. I guess there are two objectives: water temperature and reservoir storage>12,000 ac-ft. Perhaps reservoir release management could end on Sept 30 (still a bit worried), but probably don't want to commit to this date for reservoir storage management?* NMFS: *Temperature management should end by sept/oct, but agreed, storage management need to continue until 36K plus…*		are sufficient to maintain reservoir storage above 12,000 ac-ft into January 2024.
18	9	Proposed Variance	Agency Consultation and Conclusion	NMFS	PG&E is not requesting ESA consultation in this variance. FERC requires that PG&E consult on the terms of the variance with NMFS prior to submitting this request. FERC guidance states (How to Apply for a Temporary Variance | Federal Energy Regulatory Commission (ferc.gov)): (5) documentation of consultation with resource agencies, tribes, and other appropriate stakeholders, so that DHAC staff are able to analyze any potential effects on dam safety, project operation, environmental resources, adjacent landowners, and public recreators.

To add additional rows, place cursor in the bottom right cell and hit << Tab>>.

Pacific Gas and Electric Company

Power Generation

245 Market Street
San Francisco, CA 94105

Mailing Address:
Mail Code N11D
P.O. Box 770000
San Francisco, CA 94177

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
Office of Energy Projects
888 First Street, N.E.
Washington, DC 20426

Re: Potter Valley Project (FERC No. 77)
2023 Flow Variance Request Due to Limited Storage Capacity

Dear Secretary Bose:

Please consider this letter a request for a 2023 flow variance for Pacific Gas and Electric Company's (PG&E) Potter Valley Project (Project), Federal Energy Regulatory Commission (FERC) No. 77. Article 52 of the Project license requires PG&E to comply with the National Marine Fisheries Service (NMFS) Reasonable and Prudent Alternative (RPA) that was made part of the license by FERC's "Order Amending License, issued January 28, 2004." The RPA includes requirements for the minimum instream flows of the Project.

PG&E is engaged in studies to evaluate the seismic risk at Scott Dam as part of its dam safety program. Recently, PG&E dam safety engineers determined that the seismic risk is greater than previously understood. To reduce the potential seismic risk, PG&E has determined that the gates at Scott Dam will not be closed in 2023 to impound water above spillway elevation, reducing the water storage capacity by approximately 20,000 acre-feet (AF). With the dam's spillway gates remaining open, water availability is expected to be similar to dry conditions experienced in 2020 and 2021, when Lake Pillsbury's spring top-off did not reach the spillway crest elevation and the Project operated under FERC-approved flow variances.

Formatted: Line spacing: single

Commented [SM1]: I added this to be specific to 2023, but I guess you could also add "indefinitely" if desired. Main thing is to clarify the duration of the gates remaining open

Accordingly, PG&E is requesting a variance from the current requirements to reduce East Branch Russian River (EBRR) flows to proactively manage reservoir storage in a manner that is protective of Project facilities and minimize potential impacts to fish species residing in the Eel River protected under the federal Endangered Species Act (ESA). PG&E is requesting expedited review of the variance.

Lake Pillsbury Minimum Pool

As a condition of a prior flow variance for the Project issued on July 15, 2016, FERC required PG&E to "determine the current low level operation constraints at Lake Pillsbury (beyond operator recommendations) that support a low reservoir elevation level." To address this requirement, PG&E submitted to FERC on April 3, 2017, a

Technical Memo (TM) that identified and evaluated potential dam safety and operational constraints on lowering the operating level. The TM found a high potential of bank sloughing exists at pool levels between 5,000 and 12,000 AF; the degree of bank sloughing is partially dependent on the drawdown rate of the reservoir. Since this analysis was performed, PG&E has used 12,000 AF as the Lake Pillsbury planning minimum for water management (see Figure 1).

Commented [SM2]: This term should line up with the legend text below to avoid confusion, and to be consistent throughout document

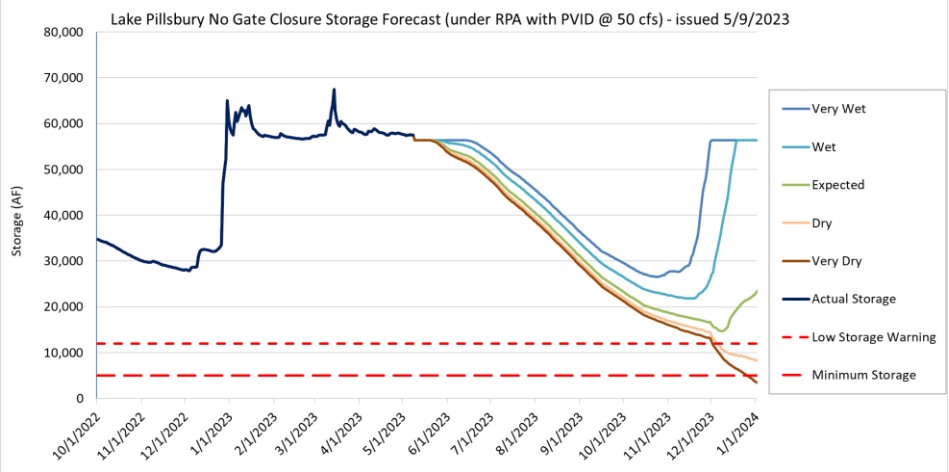


Figure 1. Lake Pillsbury daily s~~S~~torage forecast without flow variance under RPA flows and a range of inflow forecasts from the California-Nevada River Forecast Center (CNRFC). These storage forecast curves~~,~~ assume 2023~~s~~ block water releases of 2,500 AF on 6/15 and 2024 block water release of 2,500 AF on 12/1.

Current Minimum Instream Flows

Below is a summary of the license-required flows for Spring/Summer 2023 (Table 1).

Table 1: Expected Spring/Summer 2023 flows under RPA

Commented [JAF3]: Might be best to say under the FERC license vs. the RPA, as the BiOp has expired. Change through the document.

Compliance Point	5/1 Requirement (cfs)	5/15 Requirement (cfs)	Expected 6/1 Requirement (cfs) with classification*	Expected 8/1-9/30 Requirement (cfs) with classification*
Eel River below Scott Dam (E-2)	100 cfs	100 cfs	Normal - 60 cfs	Normal - 60 cfs
Eel River below Cape Horn Dam (E-11)	Value depends on Eel Index Flow.	Value depends on Eel Index Flow.	Value depends on Eel Index Flow. ~~Wet – Summer base flow is 15 cfs~~	Wet –15 cfs Very Wet – 30 cfs

Formatted: Font: 10 pt

Formatted Table

Formatted: Font: 10 pt

Formatted: Font: 10 pt

			~~Very Wet – 30 cfs~~	
East Branch Russian River (E-16)	Normal - 35 cfs	Normal - 75 cfs	Normal - 75 cfs	Normal - 75 cfs, then 35 cfs after 9/15

*Classifications are not finalized until May 15th for E-11 and June 1st for E-2/E-16. Range of expected classifications shown.

The EBRR Project compliance point gaging station (E-16) is currently in the 'Normal' Water Year Type (WYT) classification and will remain there based on the current cumulative inflow to Lake Pillsbury to date. Without a variance, the required flows at E-16 are anticipated to increase from 35 cfs to 75 cfs on May 15th. This flow change will significantly increase the reservoir drawdown rate, and as a result, more severe flow reductions could be needed later in the summer to maintain adequate storage in the reservoir (see Figure 1).

The upper Eel River contains habitat for Chinook salmon (*Onchorhynchus tshawytscha*) and steelhead trout (*O. mykiss*), both of which are listed as threatened under the Endangered Species Act (ESA). Under this variance, modifications to the minimum flows on the Eel River below Cape Horn Dam are not proposed and modifications to minimum flows below Scott Dam are within thresholds previously evaluated under the RPA. ~~The variance reductions will address EBRR flows, the minimum and maximum of which are dictated by the RPA.~~

The RPA does not set a minimum for Potter Valley Irrigation District (PVID) contract water deliveries (only sets a maximum), outside of winter frost protection and post-harvest irrigation periods, tied to FERCs October 14, 2009, license article 52 amendment. ~~Therefore~~Accordingly, reductions to PVID contract water deliveries are at PG&E's discretion and outside the scope of this flow variance request. Therefore, the variance reductions will address EBRR flows, the minimum and maximum of which are dictated by the RPA.

Proposed Variance

To preserve Lake Pillsbury storage and ~~reduce summer release~~maintain cooler release water temperatures, the proposed variance will focus on meeting Eel River RPA flow requirements at E-11, and reducing flows to the EBRR at E-16 in response to Lake Pillsbury release temperatures as measured at E-2. The following flow variance conditions will be in effect for 2023:

- Gaging Station E-2 will be reclassified as a Critical WYT. In practice, the E-2 flows will be the combined releases for E-11, E-16, and PVID, with a floor set by the minimum opening of the low-level outlet (approximately 35 cfs) (see T~~t~~able 2).
- Gaging Station E-16 flows will be reclassified initially as Dry (25 cfs), and then will be adjusted between 5 cfs and 25 cfs based on PG&E and agency determination when daily average reservoir release water temperatures at E-2 exceeds 16 degrees

Formatted: Font: 10 pt

Commented [SM4]: There is no mention of "sharpening the pencil" of the buffer flows in the document, I assume that is intentional. If not, this could be a good place to introduce it.

Commented [JAF5]: FERC license?

Commented [JAF6]: FERC license to mainten

Commented [SM7]: Consistent with comments in Table 2, when will this occur? 8/1? Or as soon as FERC grants variance request?

Celsius ~~averaged daily temperature~~. Additionally, E-16 ~~can~~will be adjusted between 5 cfs and 25 cfs if Lake Pillsbury storage forecast shows a reduction in flow releases is needed to preserve adequate reservoir storage ~~through the end of the year~~ to maintain cooler release water temperatures. ~~;~~

- The Drought Working Group (DWG) will meet once monthly~~,~~ during the variance period to discuss storage levels, release flow rates, water temperature profiles, release temperatures, and estimated temperature projections at E-2.
- PG&E will submit monthly storage reports to FERC.
- The drought variance will end when Lake Pillsbury storage exceeds 36,000 AF following October 1, 2023, or is superseded by another variance or license amendment. This 36,000 AF storage threshold would allow the reservoir to meet minimum flow obligations, including a possible block water release, through January 2024 in the event of extremely low inflow in early winter.
- Buffer flows?

Table 2: Proposed f~~F~~lows ~~requested~~ under 2023 variance for the summer baseflow period (August 1-September 30).

Compliance Point	Allowed Range: Min / Max	WY Classification	Notes
Eel River below Scott Dam (E-2)	20 cfs / No max.	Critical	Adjusted from Normal classification
Eel River below Cape Horn Dam (E-11)	15 cfs (Wet) or 30 cfs (Very Wet) / 15 cfs (Wet) or 30 cfs (Very Wet)~~No max.~~	Wet or Very Wet*	No change
East Branch Russian River (E-16)	5 cfs / 25 cfs	Critical / Dry	Adjusted from Normal classification
Potter Valley Irrigation District	No min. / 50 cfs	N/A	PG&E's discretion

*Expected E-11 classification for WY2023 is Wet, however, the final classification won't be determined until May 15th.

Additional measures to monitor conditions in Lake Pillsbury and the Eel River below Scott Dam where ESA listed species may occur will include:

- PG&E will finalize the Lake Pillsbury CE-QUAL water temperature model in preparation of developing 5 potential reservoir management scenarios for 2023 operations, with agency input, that may be used to help inform 2023 variance flow management.

Commented [SM8]: Deleted because text below extends to January 2024

Commented [JAF9]: Should add a project variance storage figure based on max release under variance flow prescriptions, etc..

Commented [SM10]: So if the variance starts earlier than August 1, then we should modify the E-16 flows to indicate an earlier date than 8/1. Could do this in the title, or as another footnote. I think the "summer baseflow period (8/1-9/30) should be in the title due to the E-11 flow requirements, as before 8/1 is the rampdown period, and would require another column to the table for the period prior to 8/1 (again assuming the variance would start before 8/1). Text further down mentions mid-July...

Commented [JAF11R10]: Agreed.

Formatted: Centered

Formatted Table

Commented [SM12]: Mention buffer flows? Or just ignore that in the document?

Commented [SM13]: I guess no need to provide an estimated average? Currently 30 cfs in the spreadsheet

Commented [JAF14]: So no adjustments to PVID under any circumstances?

- PG&E will collect bi-weekly Lake Pillsbury vertical water temperature profiles ~~at~~immediately upstream of Scott Dam, starting after May 15 through September 30, 2023. Reservoir water t~~T~~emperature data will be compared with historical temperature profiles and lake elevation data, used for the CE-QUAL water temperature model scenarios, and used to inform flow adjustments to EBRR. This information will be distributed to the DWG prior to monthly meetings.
- PG&E will collect bi-weekly spot temperature measurements ~~in coordination with vertical temperature profiles~~ at two accessible locations on the Eel River between Scott Dam and Cape Horn Dam (Eel River at/near Benmore Creek and Eel River at/near Trout Creek) ~~between Scott Dam and Cape Horn Dam~~ to determine downstream water temperature changes, and associated ~~flow and habitat~~water temperature suitability for salmonids.
- ~~PG&E will continue to monitor adult salmonid passage at Van Arsdale Fisheries Station at Cape Horn Dam throughout the variance.~~
- PG&E will provide funding consistent with the 2022 variance for CDFW and RVIT adult salmonid DIDSON monitoring effort on the mainstem Eel River above South Fork Eel and Middle Fork Eel River for the period of October 1 - ~~December~~January 31, 2023~~4~~, as part of this variance.

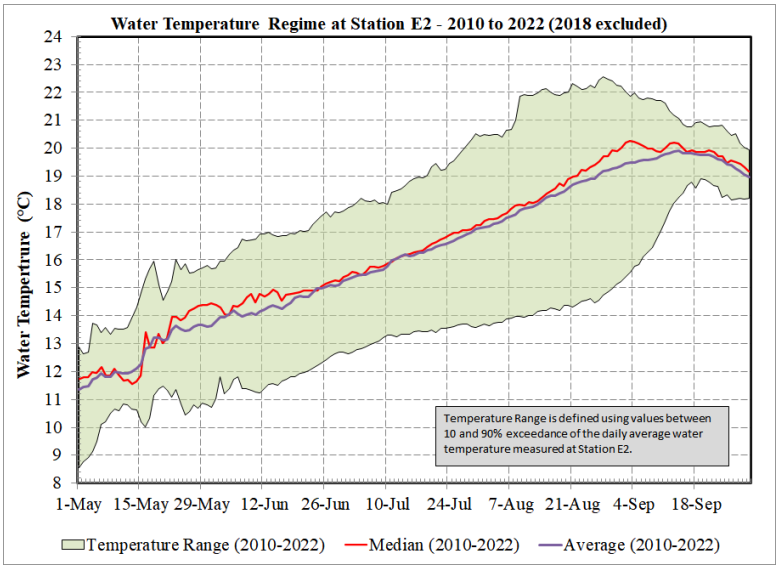
Commented [SM15]: Not sure we're really going to assess flow or habitat, just temperature preferences. Maybe I'm wrong?

Commented [SM16]: I deleted because I think this is a license requirement, and not an "Additional Measure" associated with the variance

Commented [SM17]: There was discussion on our call to extend through January 2024 to support monitoring for late Chinook salmon, as well as if we need to extend the variance into January if we don't get any significant precipitation in October-January

Commented [JAF18R17]: Yes, at minimum through January (data shows). Also, maintenance funding should also be provided to CDFW 0 major concern with aging equipment, etc.

Water temperature analysis and conditions under the variance



~~Figure 2.1 Water temperature regime at E2 May through Sept (2010 to 2022)~~

Figure 2. Summary of median, average, and 10%-90% exceedance range of water temperatures at E-2 between May and September, using 2010-2022 data (excluding 2018 due to XXXX).

In response to PG&Es *2022 Flow Variance Request Due to Limited Water Availability,* submitted May 13, 2022, FERC ordered PG&E to continue to conduct Lake Pillsbury water quality monitoring and develop water temperature modeling scenarios for the purpose of evaluating the potential benefits to cooler reservoir temperatures and water storage that support ESA-listed salmonids during the dry season. PG&E evaluated 12 years of historical water temperature data collected under the RPA to develop a regression model to satisfy the May 13, 2022 FERC Order. The water temperature analysis concluded that there are limited tools for mitigating high water temperature in the release from Lake Pillsbury. The small storage volume present in the deeper portions of the reservoir means that there is a limited supply of cooler water, and that this cooler water is continuously being mixed with warmer surface water pulled along the face of Scott Dam via discharges from the low-level outlet. This results in gradually warming release water temperatures at E-2~~discharges~~, especially during periods of high-volume needle valve releases from Scott Dam.

The conclusion of the PG&E water temperature analysis was that managing releases was the ~~only~~ primary tool available to moderate water temperature releases from the reservoir. This method of minimizing releases ~~storage control~~ meters the volume of cooler water, reducing the mixing of warmer upper water layers down through the water column, and possibly allowing the natural cooling influences of later September ambient meteorological conditions to mitigate temperatures in the remaining reservoir volume. The results of this analysis are included in enclosure 2.

Based on the findings of the water temperature analysis, PG&E, in coordination with NMFS, California Department of Fish and Wildlife (CDFW), Round Valley Indian Tribes (RVIT) and United States Fish and Wildlife Service (USFWS) (hereafter Agencies) determined that an ~~adaptive~~ flexible management approach to reservoir releases in 2023 during the ~~M~~mid -July –to late-September period could support cooler temperatures for ESA listed salmonids rearing in the ~~reach of~~ Eel River ~~between~~ downstream of Scott ~~and Cape Horn~~ Dam.

Under the ~~adaptive~~ flexible management approach, PG&E will monitor release water temperatures as measured at E-2 during the summer. When daily average water temperatures exceed 16 degrees Celsius ~~averaged daily temperature~~ (which is could occur around mid-July assuming median and average values – see Figure ~~X~~2)-, PG&E will notify Agencies and begin meeting on a weekly basis to determine if diversions to the EBRR, as measured at E-16, should be reduced in support of minimizing withdrawals from the reservoir in order to ~~stabilize~~ better manage release temperatures.

In coordination with Agencies, PG&E will adjust flows in EBRR between the range of 25 and 5 cfs for the period of mid-July through September 30, ~~when~~ informed by observed release water temperatures ~~exceed 16 degrees Celsius averaged daily temperature,~~ as

Formatted: Highlight

Formatted: Font: Italic

Formatted: Line spacing: single

Formatted: Left, Line spacing: single

Commented [SM19]: Suggest a different term than "high volume" as it is not defined. Maybe "higher releases" but that is still undefined. Also, I added needle valve to distinguish between spill releases

Formatted: Line spacing: single

Commented [SM20]: Not sure this is the best term, as it has regulatory baggage associated with it, but "curb", "limit", "temper" didn't seem all that much better

Commented [SM21]: We're not doing actual Adaptive Management, so didn't want to imply that we were

Commented [SM22]: As I mentioned yesterday, this could happen in early June based on the range shown on Figure 2. Added text to clarify

Commented [SM23]: What happens after September 30? Seems like we'd want to extend this through January or until the variance ends, per the January 2024 text above.

measured at E-2, as needed, to preserve cooler temperatures releases from the reservoir in support of ESA listed species in the Eel River downstream of Scott Dam.

Minimum Instream Flows Under Variance

The EBRR Project compliance point gaging station (E-16) is currently in the 'Normal' Water Year Type (WYT) classification and will remain there based on the current cumulative inflow to Lake Pillsbury to date. Without a variance, the required flows at E-16 are anticipated to increase from 35 cfs to 75 cfs on May 15th. This flow change will significantly increase the reservoir drawdown rate, and as a result, more severe flow reductions could be needed later in the summer to maintain adequate storage in the reservoir (see Figure 1).

The following variance conditions will be in effect:

- Gaging Station E-2 will be reclassified as Critical. In practice, the E-2 flows will be the combined releases for E-11, E-16, and PVID, with a floor set by the minimum opening of the low-level outlet (approximately 35 cfs) (see table 2).
- Gaging Station E-16 flows will be reclassified initially as Dry (25 cfs), and then will be adjusted between 5 cfs and 25 cfs based on PG&E and agency determination when temperatures at E-2 exceeds 16 degrees Celsius averaged daily temperature. Additionally, E-16 can be adjusted if Pillsbury storage forecast shows a reduction is needed to preserve adequate storage through the end of the year.
- The Drought Working Group (DWG) will meet once monthly, during the variance period to discuss storage levels, release flow rates, water temperature profiles, release temperatures, and estimated temperature projections at E-2.
- PG&E will submit monthly storage reports to FERC.
- The drought variance will end when Lake Pillsbury storage exceeds 36,000 AF following October 1, 2023, or is superseded by another variance or license amendment. This storage threshold would allow the reservoir to meet minimum flow obligations, including a possible block water release, through January 2024 in the event of extremely low inflow in early winter.

Table 2: Range of flow values allowed by variance

Compliance Point	Allowed Range: Min / Max	WY Classification	Notes
Eel River below Scott Dam (E-2)	20 cfs / No max.	Critical	Adjusted from Normal classification
Eel River below Cape Horn Dam (E-11)	15 cfs (Wet) or 30 cfs (Very Wet) / No max.	Wet or Very Wet*	No change

Formatted: Indent: First line: 0", Line spacing: single

Formatted: Indent: Left: 0", First line: 0", Add space between paragraphs of the same style, Line spacing: single

East Branch Russian River (E-16)	5 cfs / 25 cfs	Critical / Dry	Adjusted from Normal classification
Potter Valley Irrigation District	No min. / 50 cfs	N/A	PG&E's discretion

*Expected E-11 classification for WY2023 is Wet, however, the final classification won't be determined until May 15th.

Commented [SM24]: This table is redundant with the prior Table 2

Additional measures to monitor conditions in Lake Pillsbury and the Eel River below Scott Dam where ESA listed species may occur

- PG&E will finalize the Lake Pillsbury CE-QUAL water temperature model in preparation of developing 5 scenarios with agency input.
- PG&E will collect bi-weekly Lake Pillsbury vertical temperature profiles at Scott Dam, starting after May 15 through September 30, 2023. Temperature data will be compared with historical temperature profiles and lake elevation data and used to inform flow adjustments to EBRR. This information will be distributed to the DWG prior to monthly meetings.
- PG&E will collect bi-weekly spot temperature measurements in coordination with vertical temperature profiles at two accessible locations on the Eel River (Eel River at/near Bonmore Creek and Eel River at/near Trout Creek) between Scott Dam and Cape Horn Dam to determine flow and habitat suitability for salmonids.
- PG&E will continue to monitor adult salmonid passage at Van Arsdale Fisheries Station at Cape Horn Dam throughout the variance.
- PG&E will provide funding consistent with 2022 variance for CDFW and RVIT adult salmonid DIDSON monitoring effort on the mainstem Eel River above South Fork Eel and Middle Fork Eel River for the period of October 1 – December 31, 2023, as part of this variance.

Biological Impacts

PG&E biologists have reviewed this variance proposal and believe that the proposed flow variance is necessary to conserve water in Lake Pillsbury and provide adequate flow releases and suitable water quality conditions for the long-term protection of Chinook salmon and steelhead trout in the watershed. Below is their biological analysis.

Eel River below Lake Pillsbury and Van Arsdale Reservoir

The primary ESA-listed fish species impacted by the Potter Valley Project are Chinook salmon (*Onchorhynchus tshawytscha*) and steelhead trout (*O. mykiss*). Life stages of these species that could potentially be in the river and whose habitat conditions are influenced by project operations during the flow variance period are adult steelhead

trout (pre- and post-spawn), and juvenile Chinook salmon and steelhead trout. If the variance extends beyond October, adult Chinook salmon will likely be present in the mainstem Eel River as well.

Adult steelhead trout migrate into the upper Eel River watershed to spawn primarily from January through April. Through May 1, 2023, of the current spawning season, 145 adult steelhead trout have been counted at Van Arsdale Fisheries Station at Cape Horn Dam. Under the proposed variance, flows in the Eel River for adult steelhead trout migration and spawning would not be reduced below the RPA-prescribed flows. Juvenile Chinook salmon remain in the river for several weeks after hatching and then migrate to the ocean during spring (typically April-June), as flows decline, and water temperatures increase. Juvenile steelhead trout, which typically spend one or more years in the river before migrating to the ocean during late winter and spring (typically February-June), require suitable habitat conditions throughout the summer. Under the variance proposal, available spring rearing habitat in the Eel River would not be affected by the variance. An increase in spring flows followed by a decrease to summer levels, as prescribed by the RPA, would still occur under the variance proposal, thus providing important migration cues for downstream migrating fish. The variance will also support cooler water temperatures in late summer for rearing juvenile steelhead trout. PG&E, in coordination with Agencies, will use the water temperature regression model, ~~,~~ the updated CE-QUAL reservoir temperature model, and other tools to inform ~~to manage~~ reservoir release~~s from the reservoir~~ management from mid-July (assumed start of variance) through September 30 in support of maintaining release temperatures below 20 degrees ~~C~~Celsius at E-2.

Once approved by FERC, the proposed variance would reduce minimum flows in the reach between Scott Dam and Cape Horn Dam~~s~~ to preserve storage in Lake Pillsbury. While this will reduce the available summer rearing habitat for steelhead trout, minimum flows would remain above the E-2 "Critical" classification prescribed by the RPA. Summertime flow requirements in the Eel River below Cape Horn Dam under the proposed variance would remain unchanged from the RPA-prescribed "Wet" or "Very Wet" classification summer flow of 15 cfs or 30 cfs, plus a buffer release.

Transitioning into fall and winter, the proposed flow variance is the prudent action, given reduced storage capacity in Lake Pillsbury and the unpredictability of storm activity and inflow conditions. Implementation of the proposed flow variance will conserve water in Lake Pillsbury and support suitable water quality conditions for aquatic resources below Scott Dam. It will also reduce the risk of reservoir bank erosion and sloughing at low reservoir storage levels that could limit PG&E's ability to make releases at Scott Dam, which could in turn impact downstream aquatic resources (including Chinook salmon and steelhead trout) due to changes in flow, high levels of turbidity, and sedimentation. Under the proposed flow variance, Agencies' WY2023 block water allotment under the RPA will be for use at their discretion, including during the fall/winter Chinook salmon spawning season to supplement flows if needed, given hydrologic conditions in the Eel River watershed.

Commented [SM25]: Text above implies this could extend into January 2024. I'm worried that September 30 is too early to "end" reservoir release management. I guess there are two objectives: water temperature and reservoir storage>12,000 ac-ft. Perhaps reservoir release management could end on Sept 30 (still a bit worried), but probably don't want to commit to this date for reservoir storage management?

Commented [JAF26R25]: Temperature management should end by sept/oct, but agreed, storage management need to continue until 36K plus…

Commented [SM27]: Again, if we're ending on September 30, this will need to be revised.

East Branch Russian River (EBRR)

The primary fish species of interest in the EBRR downstream of the Potter Valley Ppowerhouse is non-federally ESA listed resident rainbow trout (*O. mykiss*). Both natural origin and hatchery rainbow trout inhabit this stream reach. CDFW historically planted catchable resident rainbow trout to support the local sport fishery; however, planting activities have been reduced in recent years due to persisting drought conditions and lower flows. Under the variance, flows in the EBRR would be reduced from Normal to between Dry and Critical classifications (75 cfs to 25-5 cfs), resulting in a reduction in habitat for rainbow trout and other aquatic species. In turn, this would likely result in the continuation of reduced sport fishing opportunities for the duration of the variance.

Agency Consultation and Conclusion

Given the risk that providing Project License-required flows with the reduced reservoir levels will lead to destabilizing drawdown rates and, in the worst case, reaching critical minimum pool at Lake Pillsbury, PG&E consulted with- Agencies and the DWG during the development of the following variance proposal, and ~~resource~~ Agencies provided input to PG&E. PG&E requests that the variance proposal take effect as soon as FERC approves the request.

PG&E and Agencies met to discuss potential variance on May 2, 2023, and May 10, 2023. PG&E provided Agencies a draft variance proposal on May 11, 2023. Agencies provided comments on May 18, 2023, PG&E provided response to comments in enclosure 1 (enclosure 1, consultation record).

~~**Conclusion**~~

~~Enclosed with this request is the consultation record. Responses were received from CDFW, NMFS, USFWS, and RVIT, which are also attached.~~

If you have any questions, concerns, or comments, please do not hesitate to contact Jackie Pope, license coordinator at (530) 254-4007.

Sincerely,

Janet Walther,
Senior Manager, Hydro Licensing

Formatted: Font: Bold

Commented [JAF28]: Coordination… NMFS isn't consulting…

Commented [SM29]: This isn't true yet, so make sure this happens before submitting or else you'll likely get a lot more backlash from the DWG members

Commented [SM30]: I think this is covered in the prior paragraph, so could just delete this

JHPL (530) 254-4007 : \\SFShare01-NAS\PG\PG Safety Env & LM\A. NEW SELM\DeSabla Area Projects\Potter Valley (FERC No. 77)\Deviations, Incidents and Variances\Variances\2022-04 PGE to FERC Drought Variance

BCC:
With Enclosures
PGenRegulatoryCorrespondence@pge.com
Jackie Pope
Chadwick McCready
Rob Riedlinger
Mike Evans
Robert Ellis
Janet Walther
Tony Gigliotti
Chadwick McCready

SAP: XXXXXX
Notification:
- LC to attach letter and enclosure
- If all tasks are complete, close the notification

LC Task 1:
- LC update long-text with date of filing
- Close Task

Outgoing Commitments for LC: **No**

Commented [SM31]: Clean up or delete as needed, looks like its for internal use

ENCLOSURE 2

Document Accession #: 20230523-5020 Filed Date: 05/23/2023

Pacific Gas and Electric Company

Power Generation

300 Lakeside Drive
Oakland, CA 94612
Mailing Address:
Mail Code N11D
P.O. Box 770000
San Francisco, CA 94177

April 3, 2023

Via Electronic Mail (E-Mail)

Joshua Fuller
National Marine Fisheries Service
777 Sonoma Avenue, Room 325
Santa Rosa, CA 95404
joshua.fuller@noaa.gov

Matt Myers
California Department of Fish and Wildlife
601 Locust Street
Redding, CA 96001
Matt.Myers@wildlife.ca.gov

Josh Boyce, Ph.D.
United States Fish and Wildlife Service
655 Heindon Road
Arcata, CA 95521
josh_boyce@fws.gov

Wyatt Smith
Fisheries Program Manager & Biologist
Round Valley Indian Tribes
wsmith@rvit.org

RE: Potter Valley Hydroelectric Project, FERC No. 77-CA
Lake Pillsbury water temperature modeling scenarios

Dear Addresses:

On July 27, 2022, the Federal Energy Regulatory Commission (FERC) issued an Order Modifying and Approving the Potter Valley Temporary Variance of Flow Requirements under Article 52 for Pacific Gas and Electric Company's (PG&E) Potter Valley Project (Project), FERC No. 77. The Order requires PG&E to submit Lake Pillsbury water temperature modeling scenarios, found in Enclosure 1, to the National Marine Fisheries Service, California Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, and the Round Valley Indian Tribes, by April 1, 2023.

If you have any technical questions regarding this matter, please contact aquatic biologist, Andrew Anderson, at (530) 896-4285. For general questions, please contact license coordinator, Jackie Pope, at (530) 254-4007.

Sincerely,

Matthew Joseph, Supervisor
Hydro Licensing

Enclosure:
1. *Potter Valley Project – Water Temperature Evaluation, Summary of Approach and Conclusions,* prepared by Sagraves Consulting and dated March 31, 2023

cc: With Enclosure via E-Mail
Allen Renger, CDFW (Allan.Renger@wildlife.ca.gov)
Scott McBain, RVIT (scott@mcbainassociates.com)
Bob Coey, NMFS (bob.coey@noaa.gov)

Potter Valley Project – Water Temperature Evaluation

Summary of Approach and Conclusions

1. Introduction

Federal Energy Regulatory Commission (FERC) July 27, 2022, Temporary Flow Variance order:

Develop water temperature modeling scenarios, including timely wet-season gate closures utilizing current weather forecasting skill with properly adjusted flow schedules for the purpose of evaluating the potential benefits to cooler reservoir temperatures and water storage that support ESA-listed salmonids during the dry season, to be provided to NMFS, the Round Valley Indian Tribes, California DFW, and FWS prior to April 1, 2023.

Objective

Per filings with FERC, National Marine Fisheries Service (NMFS) objective is to develop an operational strategy, primarily focused on storage management, in an attempt to generate water temperatures below Scott Dam that are similar to the Eel River watershed upstream of Lake Pillsbury (above Bloody Roughs). (NMFS letter dated 10-12-2022).

The suggested method for achieving the desired operational strategy was to develop a numerical model (CE-QUAL or similar), which would then be used to simulate various scenarios associated with water year type, meteorology, and storage/release condition and predict resulting release temperatures. The model would ultimately be used to inform real-time water resource management decisions.

2. Proposed Empirical Approach

Pacific Gas and Electric Company (PG&E) contends that the water resource data collected as part of compliance with the requirements of the existing FERC License (water temperature, IFR release, stage-storage) represents a de facto physical model. The available dataset from recent history (2010 to 2022), combined with readily available regional meteorological data is sufficient to develop management tools.

Subsequently, PG&E compiled the available data into a comprehensive evaluation of conditions in Lake Pillsbury and used these data to develop potential empirical tools to aid in water resource management. The results of this evaluation, included the following evaluations:

- Water temperature data for May through September from Station E2 for the period 2010 to 2022.
- Water temperature data for May through September from select Eel River stations for the period 2010 to 2022.

- Water temperature data from seasonal profiles and deployed sensor arrays collected in Lake Pillsbury (2014 to 2022).
- Reservoir storage data for May through September from Station E1 for the period 2010 to 2022.
- Summary evaluation of air temperature data from the National Weather Service (NWS) site at Potter Valley Powerhouse (period of record).

3. Data Evaluation Summary

PG&E presented the results of this evaluation as a PowerPoint discussion on March 20, 2023 to various agency representatives, the presentation materials were subsequently provided to interested parties following the meeting. The PowerPoint slide deck is provided as Appendix A.

All data used as part of this evaluation are readily available through PG&E and will not be provided as part of this document. However, Table 1 is a summary of the results as they pertain to each of the years evaluated.

The water temperature evaluation supported the narrative that the water temperature goals as outlined in the NMFS letter are not achievable in most years given that the inflowing temperatures to the reservoir (as measured at Bloody Rock) are warmer than those released from the dam (Slide 4 Appendix A) during the June-August period. Figure 1 compares the frequency distribution of water temperatures entering the reservoir with those from the E2 station. For the period June-September 2010 to 2022, 71% of the daily average water temperatures (DAWT) entering the reservoir were above 18°C, with 54% being over 20°C. In comparison, 45% of DAWT at E2 were over 18°C, and 21% were over 20°C. Figure 2 focuses this analysis to just the August-September period. As illustrated in Figure 2, 71% of the DAWT entering the reservoir were above 18°C, with 52% being over 20°C. For the E2 releases, 73% of DAWT were over 18°C, and 39% were over 20°C.

As shown in Slide 4 (Appendix A), the peak water temperature releases from Lake Pillsbury are shifted from mid-July (as occurs in natural stream systems) to mid to early September. This shifting is a result of stored water being released in a metered fashion throughout the period. The initial release of cooler water during the June-July period is related to the transient isolation of waters in the deeper layers of the reservoir. While classically defined stratification (i.e., an epilimnion, metalimnion, and hypolimnion) does not develop, a thermal gradient is present due to warming in the upper reservoir layers and mixing with deeper, cooler waters due to the bottom withdrawal. This warming follows the pattern of normal solar input, and as water is withdrawn through the low-level outlet these warm layers are pulled down and mixed with the entire water column (water level is dropping through time). Typically, this transition to a warm, isothermal water column occurs by late August. It is at this point that the peak release temperature occurs and a seasonally induced decline in water temperature begins (as surface waters cool). Based on this evidence, the reservoir is providing much cooler summer period temperatures compared to upstream inflow, with peak release temperatures occurring over a short duration in the late summer early fall. These data show that the reservoir is acting as a heat-sink during the summer period, providing cooler water to the downstream reach during most of the June-early August period.

The water temperature analysis concluded that there are limited tools for mitigating high water temperature in the release from Lake Pillsbury. The small storage volume present in the deeper portions of the reservoir (Slide 20-Appendix A), means that there is a limited supply of cooler water that is continuously being mixed with warmer surface water via discharges from the low-level outlet. This results in gradually warming discharges, especially during periods of high-volume releases.

The conclusion of the PG&E water temperature analysis was that managing releases was the only tool available to moderate water temperature releases from the reservoir. This method of storage control meters the volume of cooler water, reducing the mixing of warmer upper water layers down through the water column, and possibly allowing the natural cooling influences of later September ambient conditions to mitigate temperatures in the remaining reservoir volume.

PG&E contends that the existing 12 years of data represent a de facto physical model and explored this concept by using median daily average water temperatures at E2 from the 2010 to 2022 period at E2 to developing a simple regression tool to evaluate water temperature trends.

4. Regression Model

As discussed, in an effort to define/predict water temperatures, a regression analysis of existing water temperature data was performed. This analysis indicated a very predictable pattern based solely on date. It is suggested that this analysis, could be used as a guidance-curve to adjust release volumes based on how conditions in a particular water year plot to the curve.

Two guidance curves were developed, one based on all water-year types with the second based only on dry water-year types. Daily average water temperatures from each of the monitoring years were then compared with the guidance curves to evaluate actual relationship to the curves. The results of this comparison for all years are provided in Appendix B.

The figures presented in Appendix B illustrate how release patterns during individual water-years effect late summer water temperatures. Early season spill combined with increased agency “block water” or associated demand-based releases invariably cause the small volume of cooler water to be mixed with warm surface water sooner than years when resources are used more conservatively. Extreme ambient conditions (meteorology, drought, wildfire smoke) influence water temperatures in that they are directly affecting surface layer conditions. However, these influences are secondary to the rate of withdrawal, as this rate defines the degree to which the upper layers are drawn down and mixed throughout the water column.

The guidance-curves are provided as a suggested method to track current year trends and facilitate resource decisions with regard to timing and magnitude of changes made to release settings.

5. Conclusion and Recommendations

PG&E contends that the physical configuration and facility infrastructure of Lake Pillsbury limits the ability of operational changes to mitigate water temperatures. These limiting

physical attributes include but, are not limited to, the following: a relatively shallow reservoir (small deep-water volume), minimal seasonal inflow that is warm, and summer period withdrawals made from a low-level outlet that mixes the water column. Under these constraints there are limited operational tools that will mitigate water temperature in releases during the late summer period. Based on the results of the water temperature analysis, it is suggested that reservoir release management is the most practical tool to mitigate late-summer water temperatures. The use of guidance-curves to determine current water year relationship to previous behaviors is suggested as a method to facilitate decisions regarding increasing or decreasing release volumes.

Table 1. Summary of Water Temperature Evaluation.

	Aug-Sept			WT[1] > 18°C		WT > 20°C		Storage[2]	May-Aug Median AT[3]	
	Median	Maximum	WY Type (E11)	No. Days	%	No. Days	%	on Aug 1	Rank	Class
2022	**18.9**	20.1	Dry	61	100%	5	8%	43661	87%	Abv Norm
2021	21.4	22.6	Very Dry	61	100%	53	87%	28983	99%	Hot
2020	20.0	21.3	Very Dry	61	100%	28	46%	42078	95%	Hot
2019	18.2	21.0	Very Wet	33	54%	17	28%	67189	93%	Hot
2018	14.9	19.1	Very Dry	12	20%	0	0%	54228	84%	Abv Norm
2017	**19.5**	22.9	Very Wet	48	79%	26	43%	51252	100%	Hot
2016	**21.2**	22.6	Wet	61	100%	53	87%	35249	59%	Norm
2015	**21.4**	22.5	Dry	61	100%	46	75%	24105	97%	Hot
2014	16.9	20.9	Very Dry	21	34%	14	23%	50014	92%	Hot
2013	19.8	20.7	Dry	54	89%	26	43%	35988	76%	Abv Norm
2012	18.7	20.0	Dry	42	69%	3	5%	44936	24%	Blw Norm
2011	14.9	19.7	Wet	17	28%	0	0%	67150	43%	Norm
2010	14.5	18.2	Wet	5	8%	0	0%	65950	48%	Norm

[1] *WT = Water Temperature*

[2] *as Acre-feet*

[3] *AT = Air Temperature*

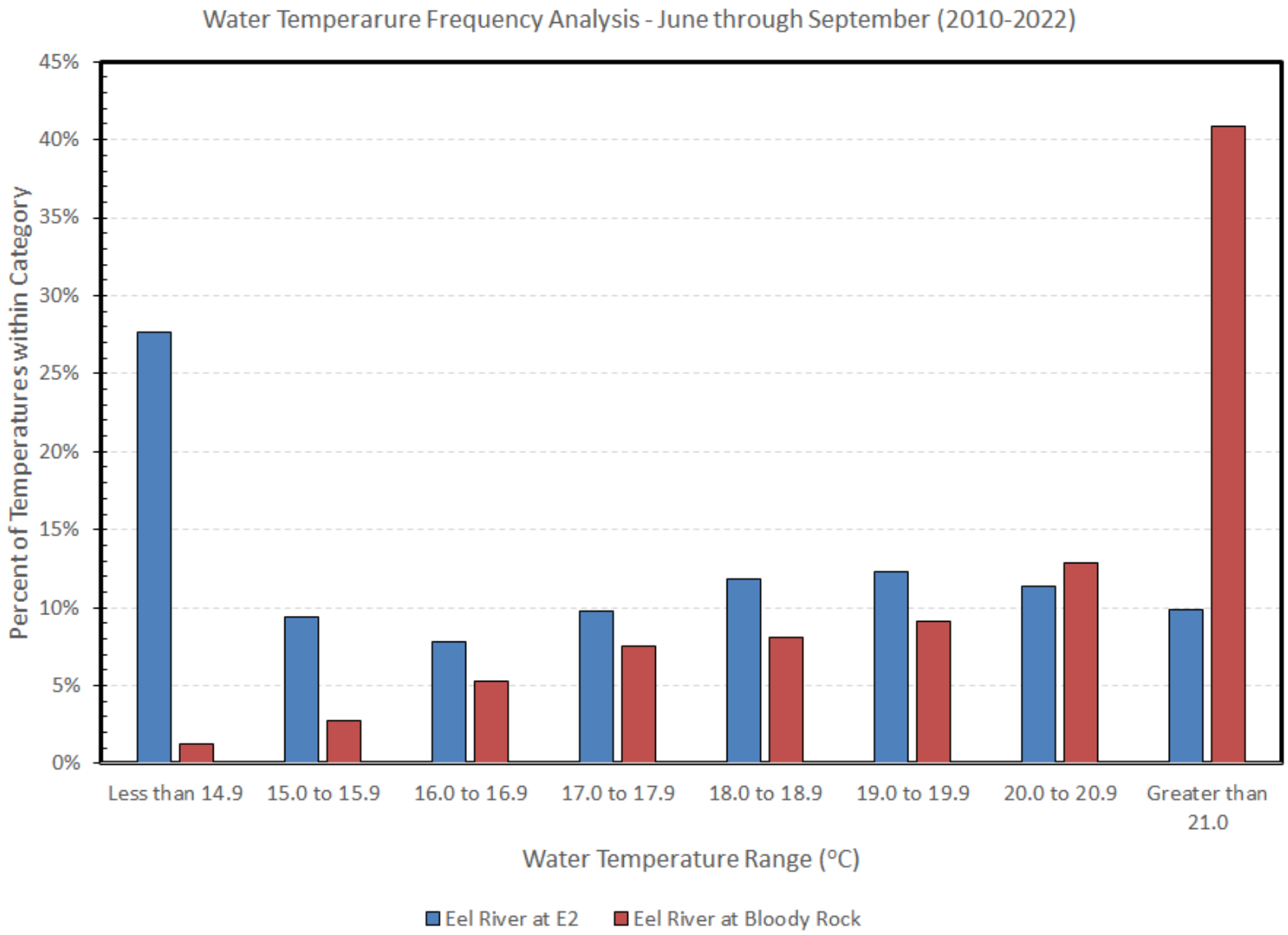


Figure 1. Frequency Distribution of Daily Average Water Temperature for June-September 2010 to 2022 at Two Eel River Stations.

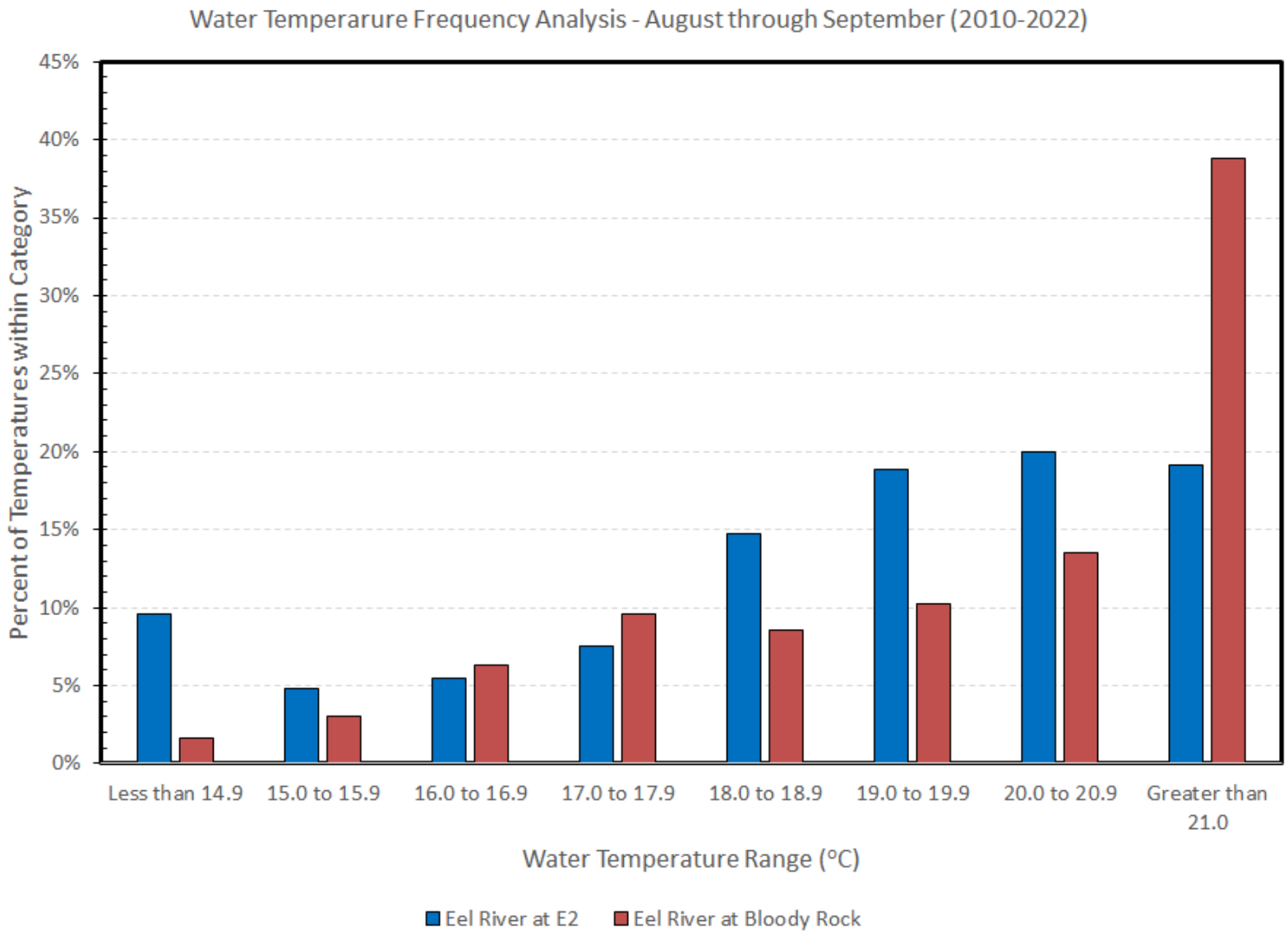


Figure 2. Frequency Distribution of Daily Average Water Temperature for June-September 2010 to 2022 at Two Eel River Stations.

Appendix A

Water Temperature Evaluation Power Point Slide Deck

Presented on March 20, 2023

Potter Valley Hydroelectric Project
FERC Project No. 77

Lake Pillsbury Water Temperature Evaluation

- Overview of 2010-2022 Water Temperature Monitoring from Stations E2 and E1 (Lake Pillsbury - release and storage/elevation)
- Assess impact of storage on late summer (August -September) water temperatures.
  - Impact of RPA and variance flows on water temperature in the late summer.
  - Impact of gate closure date on water temperature in the late summer.
- Explore operational changes that may mitigate late summer water temperatures.

Lake Pillsbury Water Temperature Evaluation

- **Concept**
  - Use modeling to develop operational tool to manage later summer water temperatures (WT).
  - Stated water temperature goals
    - Minimize days over 20°C as daily average
    - Ideally, minimize days over 18°C as daily average
  - Maximize reservoir storage to facilitate WT goals

- **PG&E Proposal**
  - Utilize existing data as de facto physical model
  - Evaluate the existing data to study reservoir behavior under various water year-meteorological-operational scenarios already measured.
  - Develop a simple empirical tool to facilitate operational decisions.

Lake Pillsbury Water Temperature Data Set

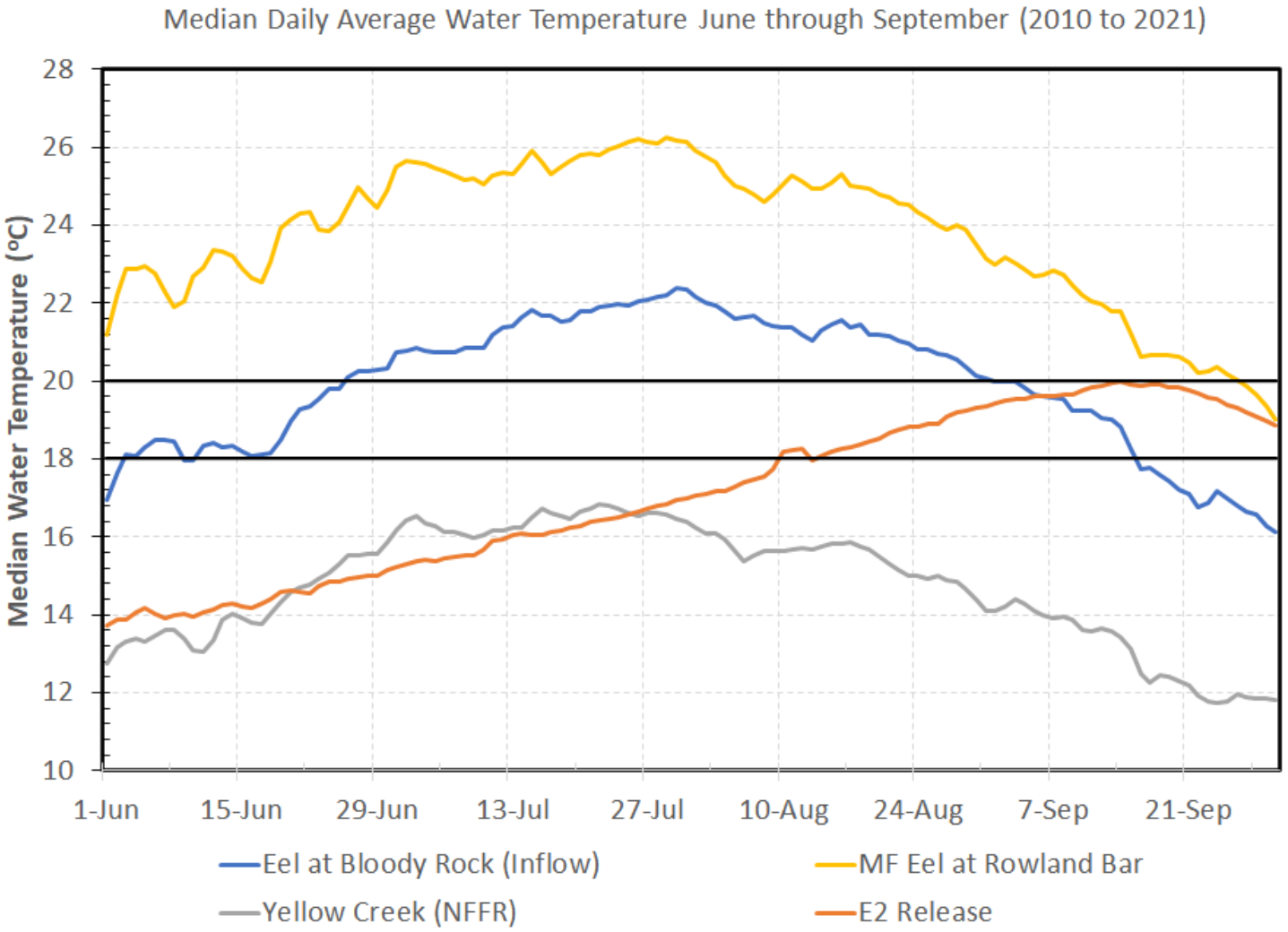
- Evaluation Period is 2010 to 2022 (as data was available)
  - E2 - Release Water Temperatures
  - E1 – Storage and Elevation
  - Lake Pillsbury Water Temperature
    - Seasonal Synoptic Profiles
    - Seasonal logger array (continuous data collection at multiple depths)

- Water Year Type Definition (Project Specific Definitions)
  - Very Wet = (2017, 2019)
  - Wet = (2010, 2011,2016)
  - Dry = (2012,2013,2015,2022)
  - Very Dry = (2014,2018,2020,2021)

- Ambient Meteorological Conditions
  - Potter Valley Powerhouse (NWS COOP Network)

Regional Setting: Stream sites versus reservoir release.

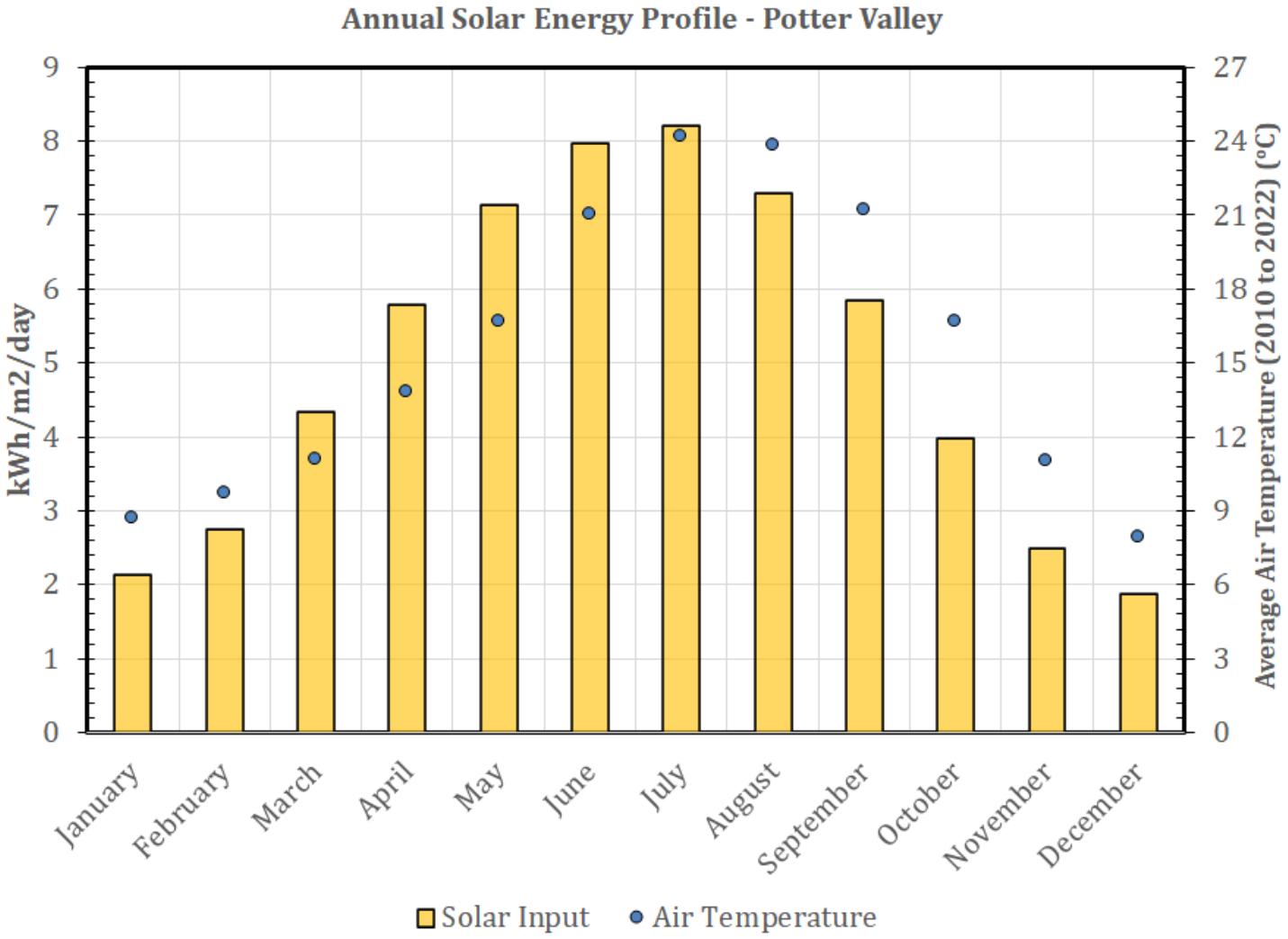
Comparison of water temperature regimes.



Document Accession #: 20230523-5020 Filed Date: 05/23/2023

Monthly Average Solar Input – Potter Valley

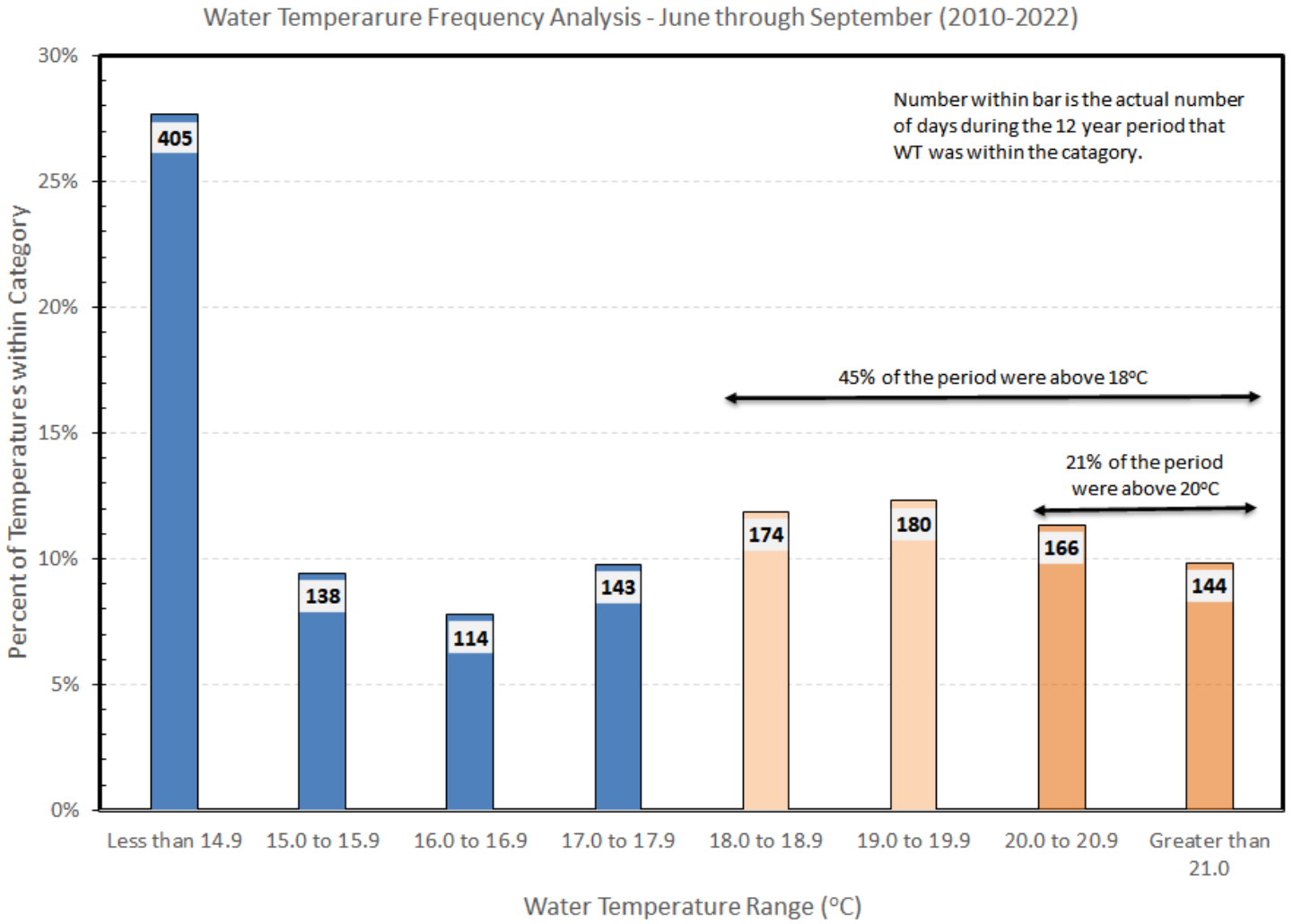
Illustrates pattern of solar input and air temperature



Document Accession #: 20230523-5020 Filed Date: 05/23/2023

Frequency distribution of water temperatures.

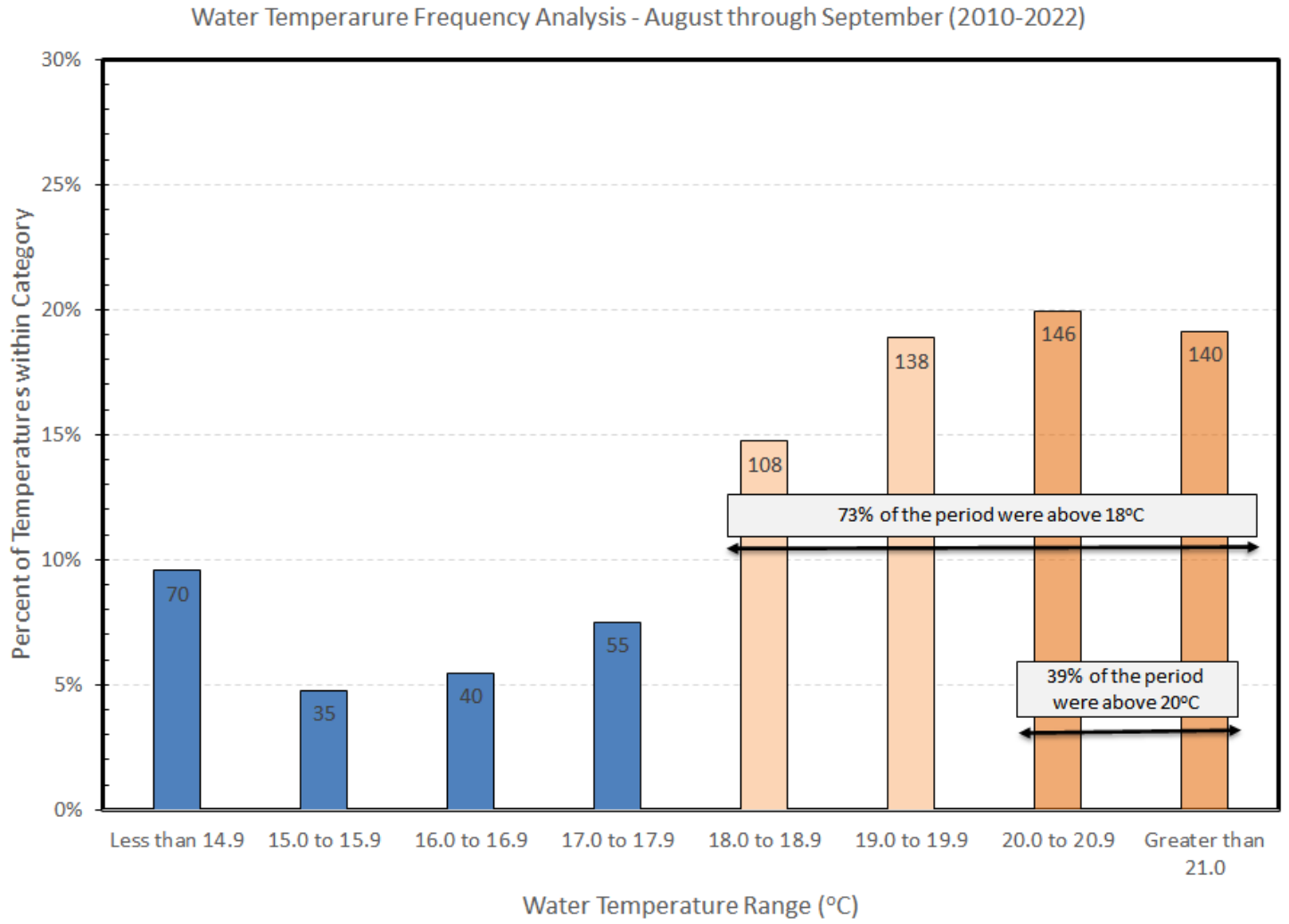
Pillsbury Reservoir release (at E2) daily average WT 2010-2022.



Document Accession #: 20230523-5020 Filed Date: 05/23/2023

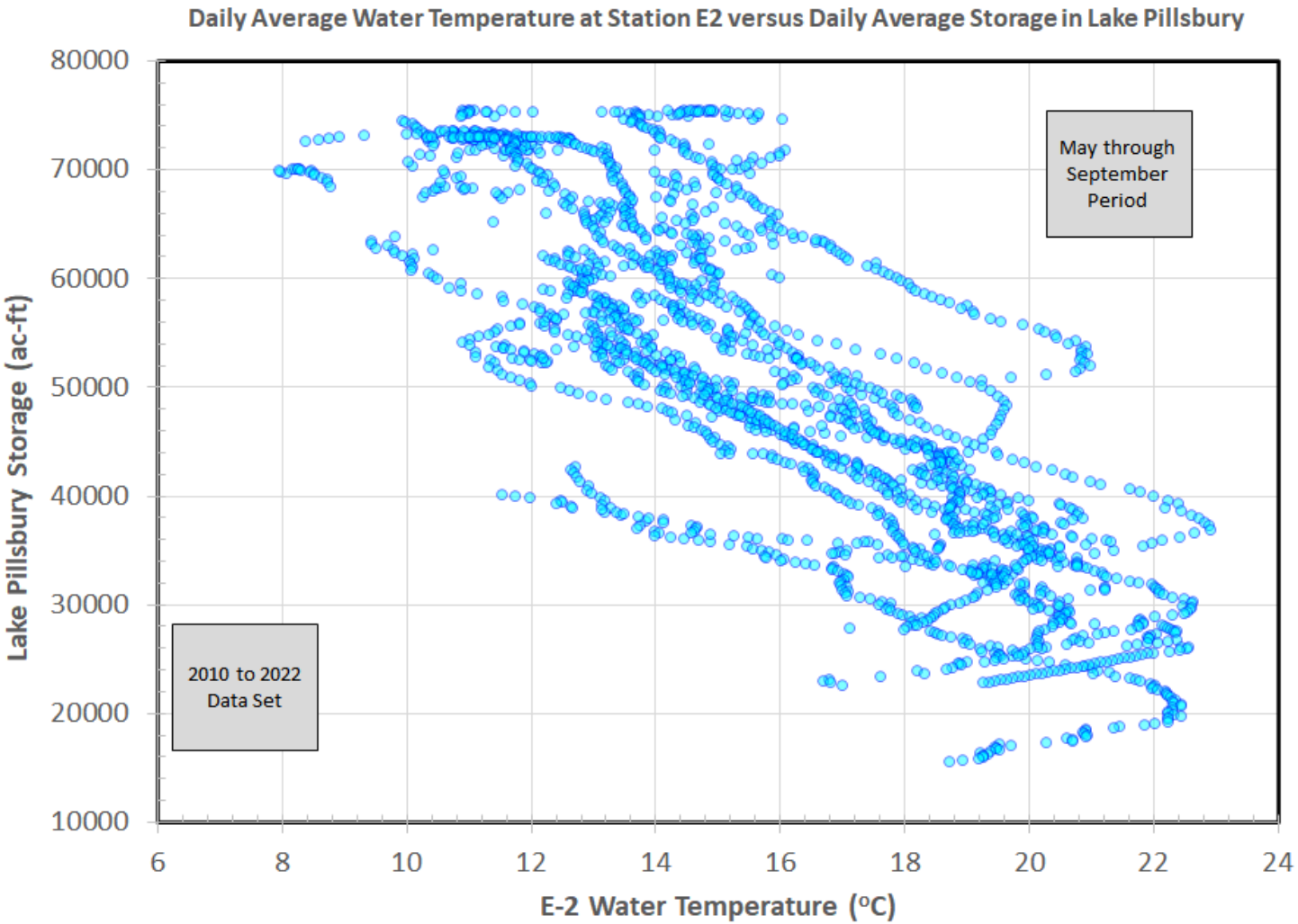
Frequency distribution of Aug-Sept water temperatures.

Pillsbury Reservoir release (at E2) daily average WT 2010-2022.

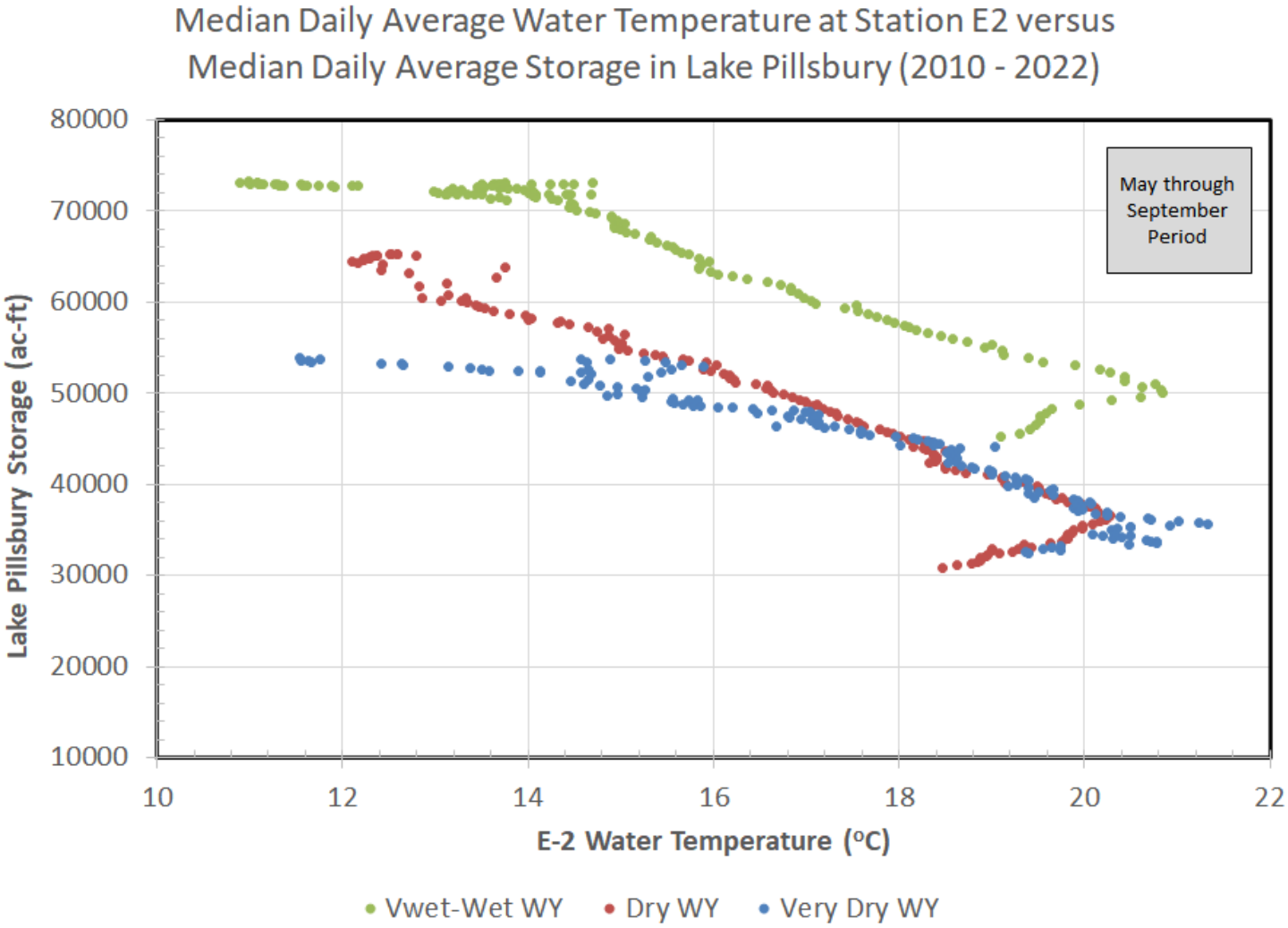


Document Accession #: 20230523-5020 Filed Date: 05/23/2023

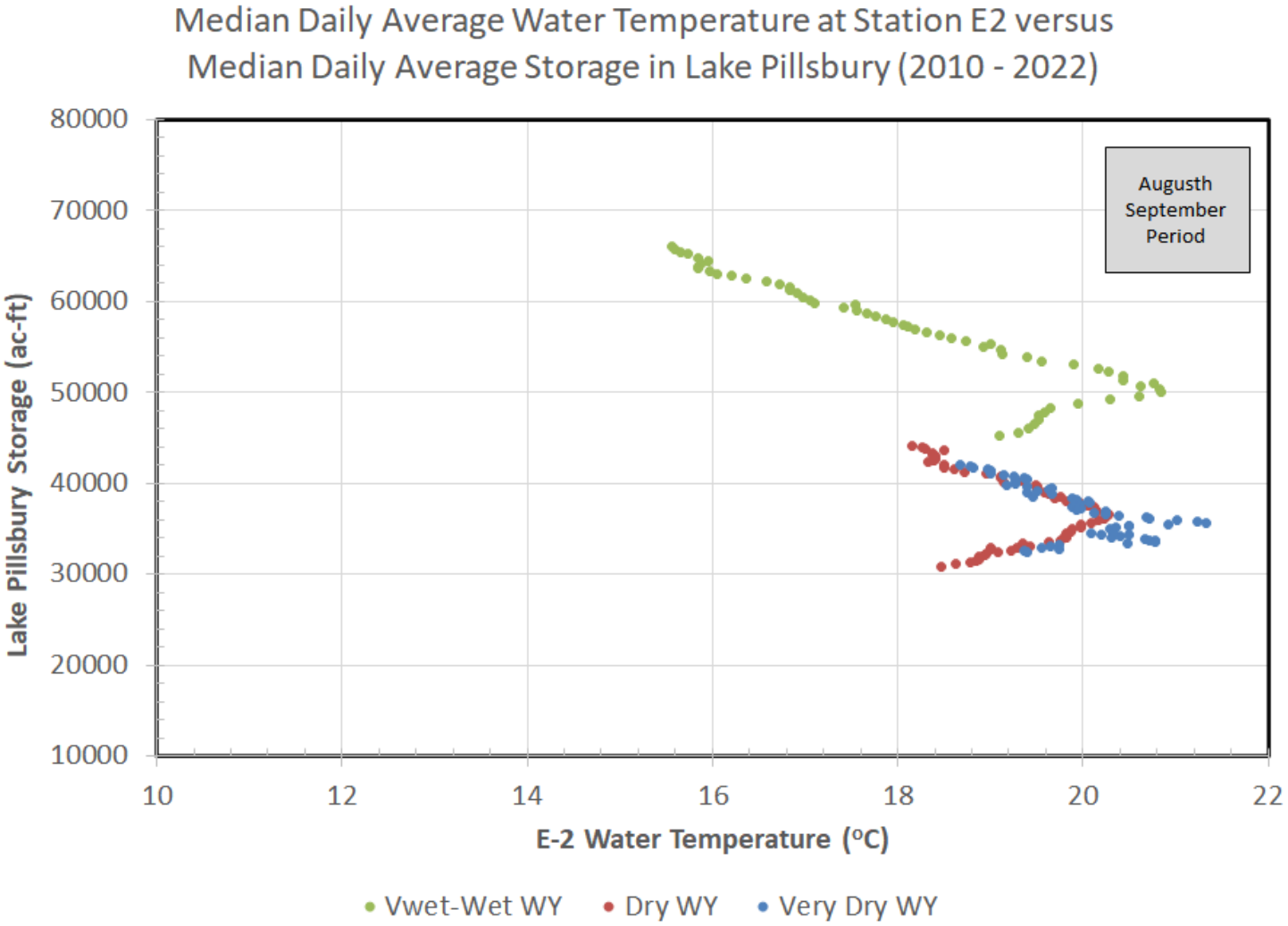
Daily average water temperature compared with daily average storage (2010-2022)



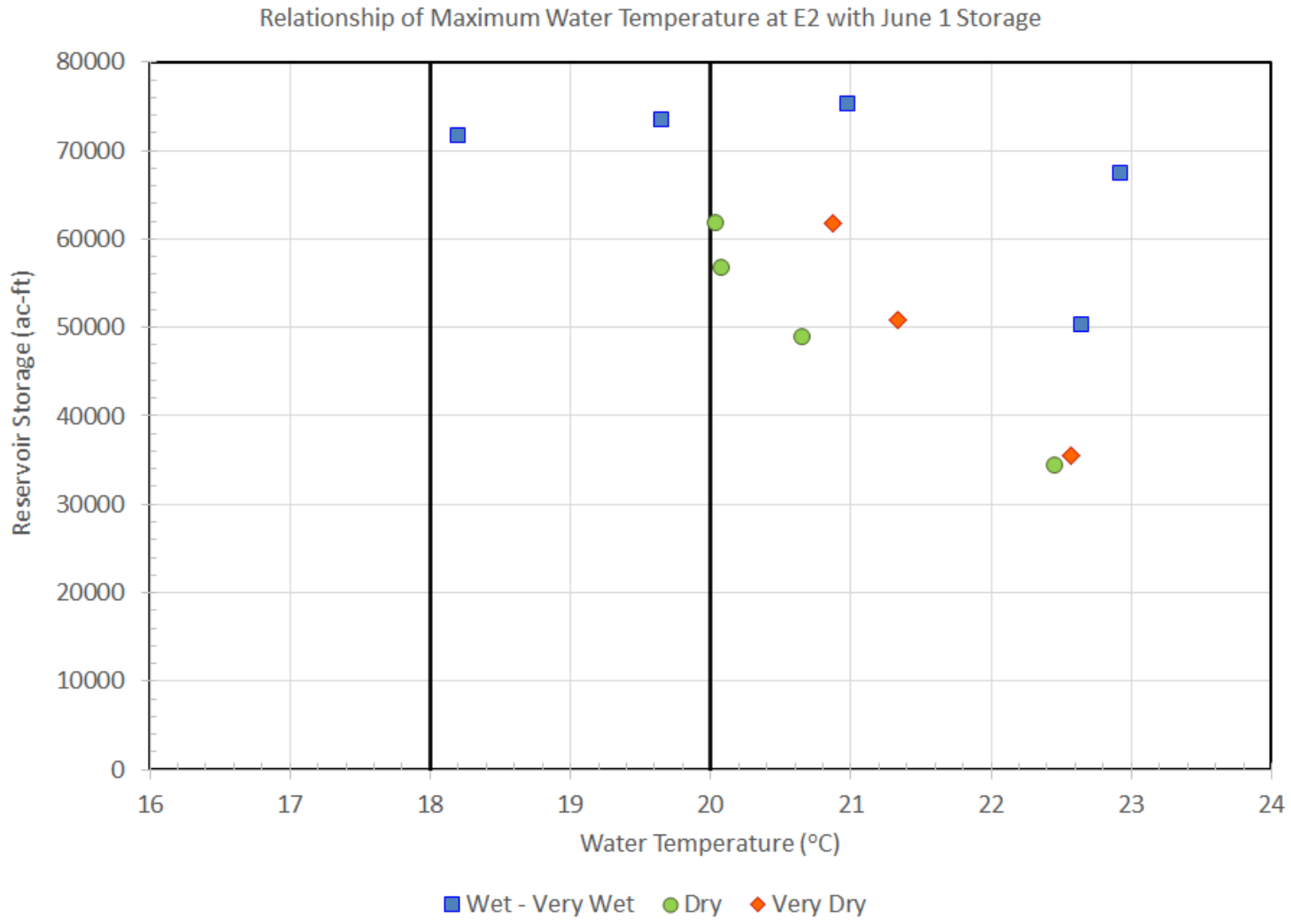
Comparison of median daily average WT with median daily average storage (by water year type)



Comparison of median daily average WT with median daily average storage August and September (by water year type)



Comparison of maximum daily average WT with reservoir storage on June 1 (by water year type)

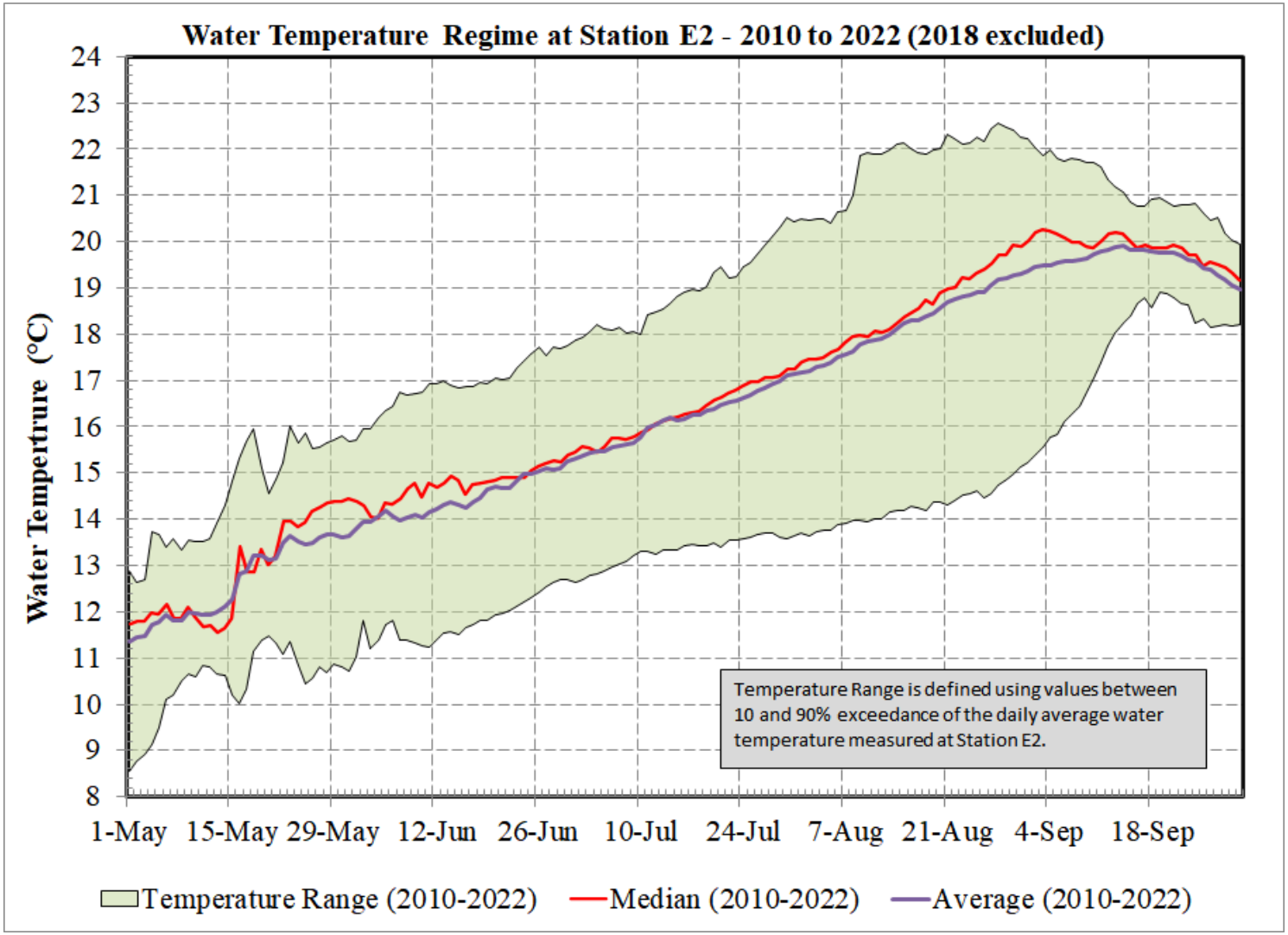


Summary: Water temperature vs Storage

- Storage is not predictive of later summer water temperatures.
  - More storage does not equal cooler release water in late summer
- Distinct seasonal pattern.
  - Temperatures warm through late August
  - After a “hinge point” temperatures become cooler as storage continues to decline.

Water temperature regime at E2 May through Sept (2010 to 2022)

Highlights WT range narrowing in mid-Sept and hinge point.



Summary: Thermal Regime of Release

Observations:

- Predicable pattern of increasing WT through early September.
- After mid-September WT begins to decline
- Typical of shallow reservoirs with primary release from a Low-level outlet (LLO).

Drivers of the water temperature in the release:

1. Physical characteristic of the reservoir.
2. Release logistics (Compliance rules/demand).

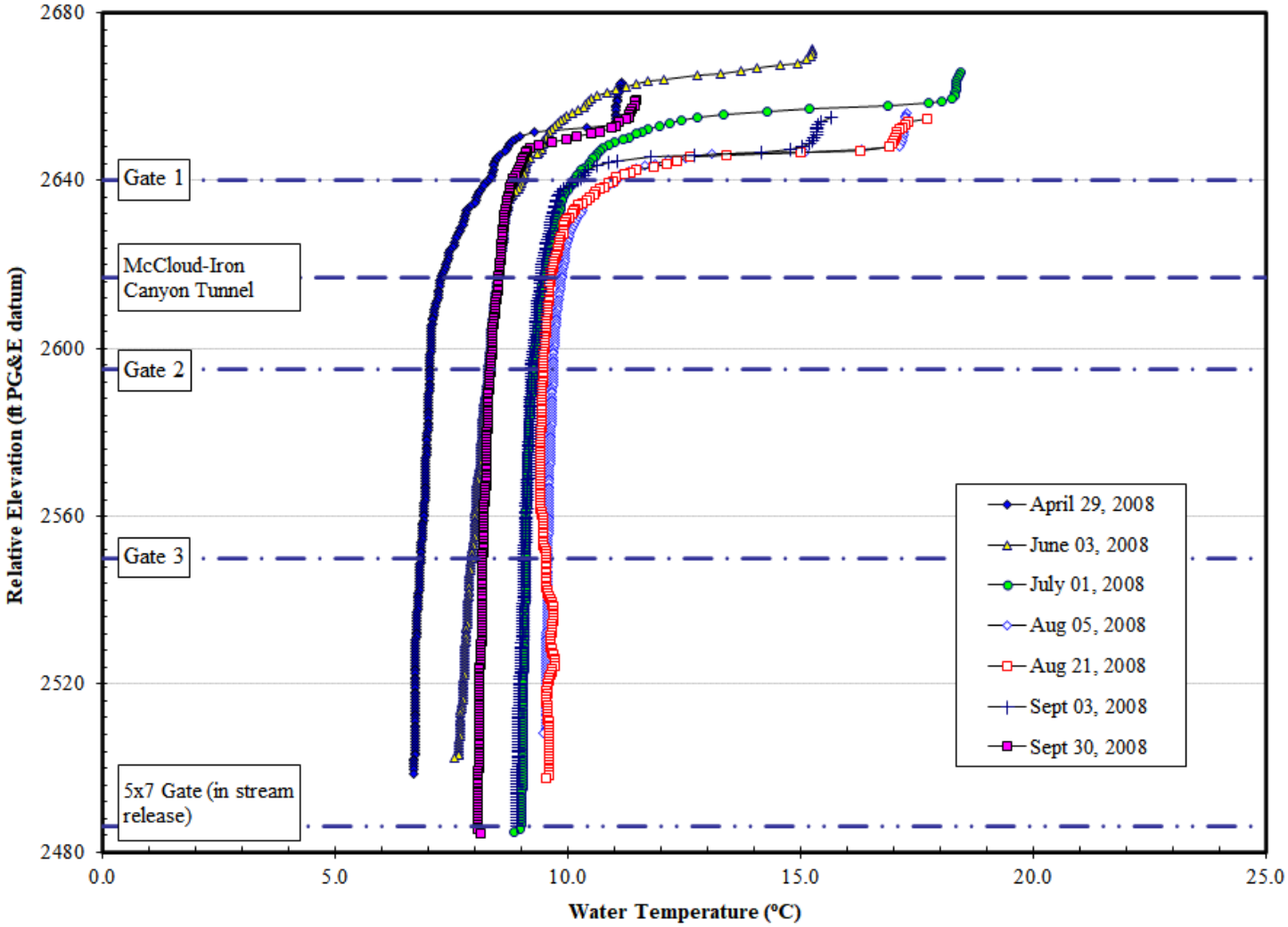
Physical Attributes of Lake Pillsbury.

- **Maximum reservoir storage of ~76,000 ac-ft (all gates closed).**
- **Maximum reservoir elevation is 1910 ft (all gates closed).**
- **Maximum release from the LLO 1900 ft (spill elevation) is 378 cfs (750 ac-ft/day)**
- **Lake Pillsbury LLO is at ~1832 ft elevation.**
- **Maximum depth near the dam is 85 ft (Spill Gates closed - max. full) [*based on profile data from near the dam which established a bottom elevation of 1824 to 1825 ft*].**

Document Accession #: 20230523-5020 Filed Date: 05/23/2023

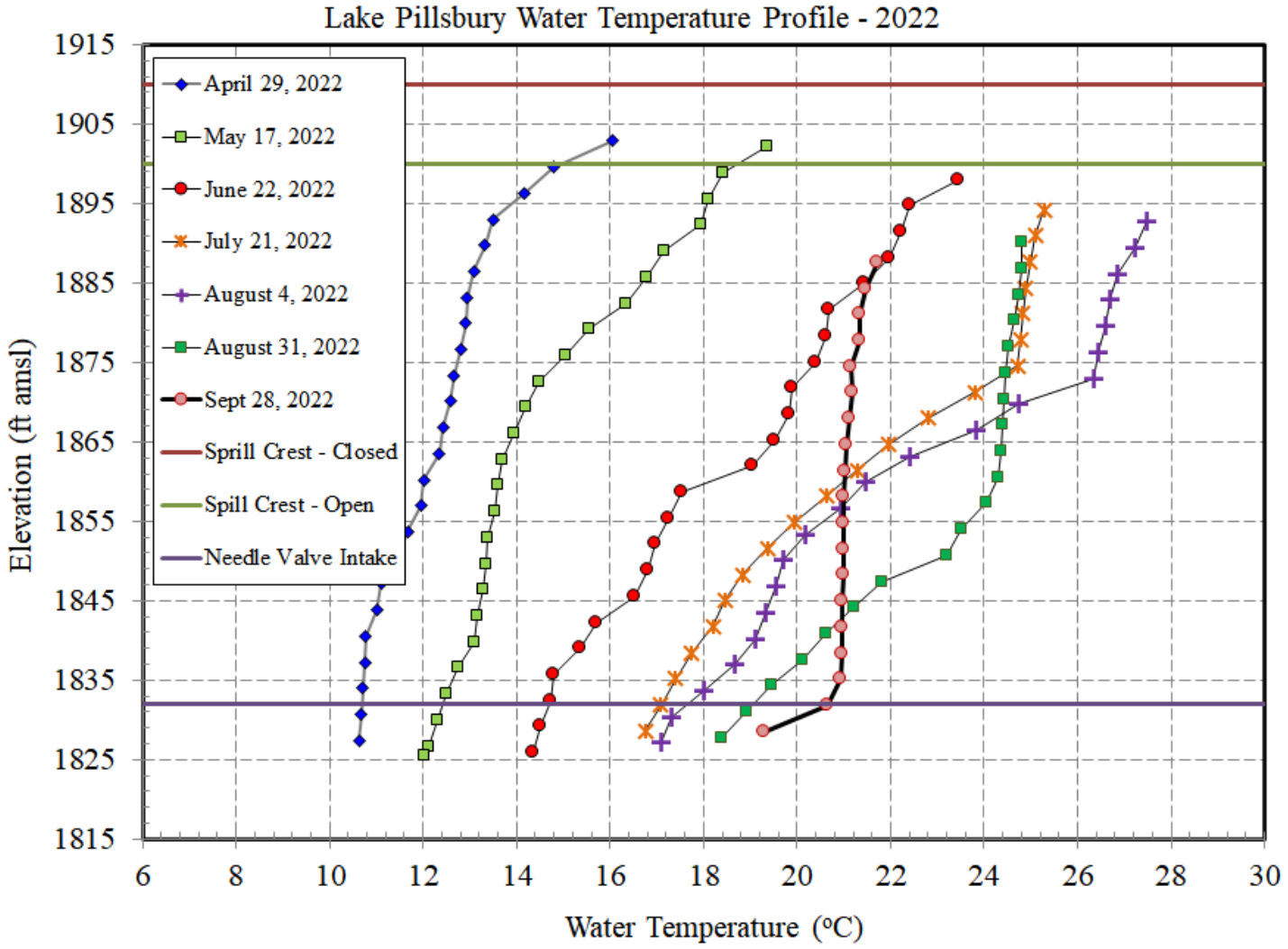
McCloud Reservoir Thermal Structure – 2008 Profile Data

Example of classic stratification



Lake Pillsbury Thermal Structure – 2022 Profile Data

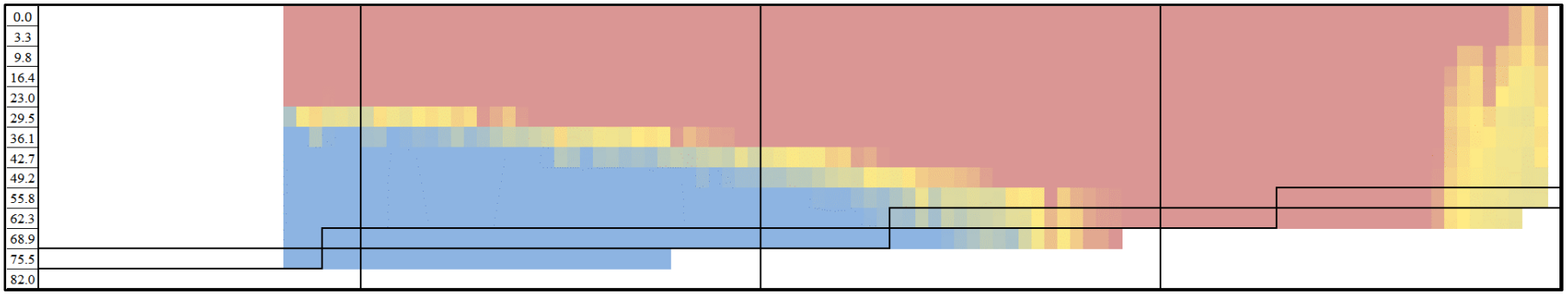
No stratification – withdrawal driven thermal gradient



Lake Pillsbury Thermal Progression Images (2017)

Illustrates deletion of "cool" resources and warming of deeper layers

2017 daily average WT data from continuous array – (June-September) [Hot and Very Wet]



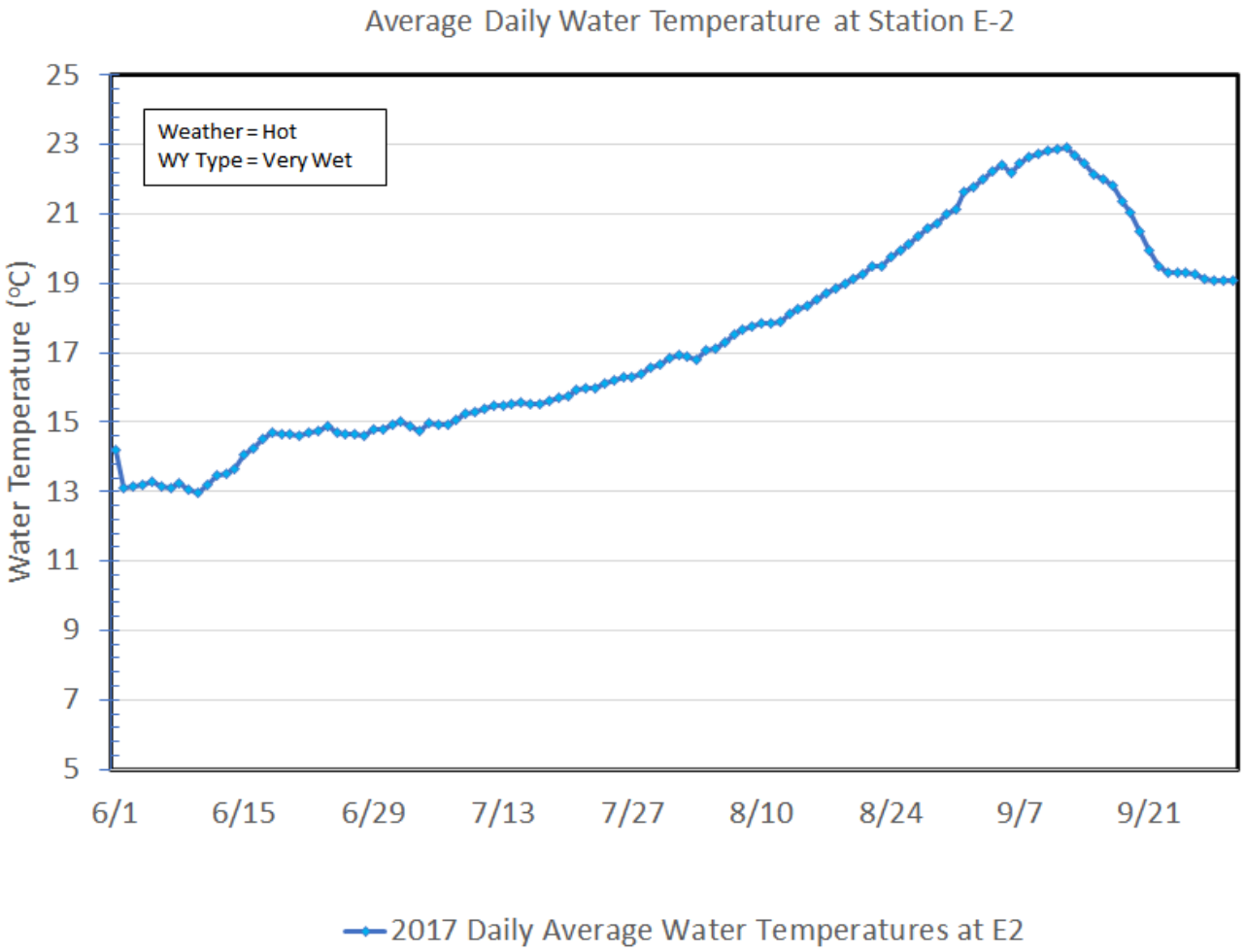
Legend

Red = 22°C or greater, Yellow = 20°C, Blue = 18°C or less

Gradations between the colors represents transitional temperatures.

Daily Average Water Temperature at E2 – 2017 (Hot/Very Wet)

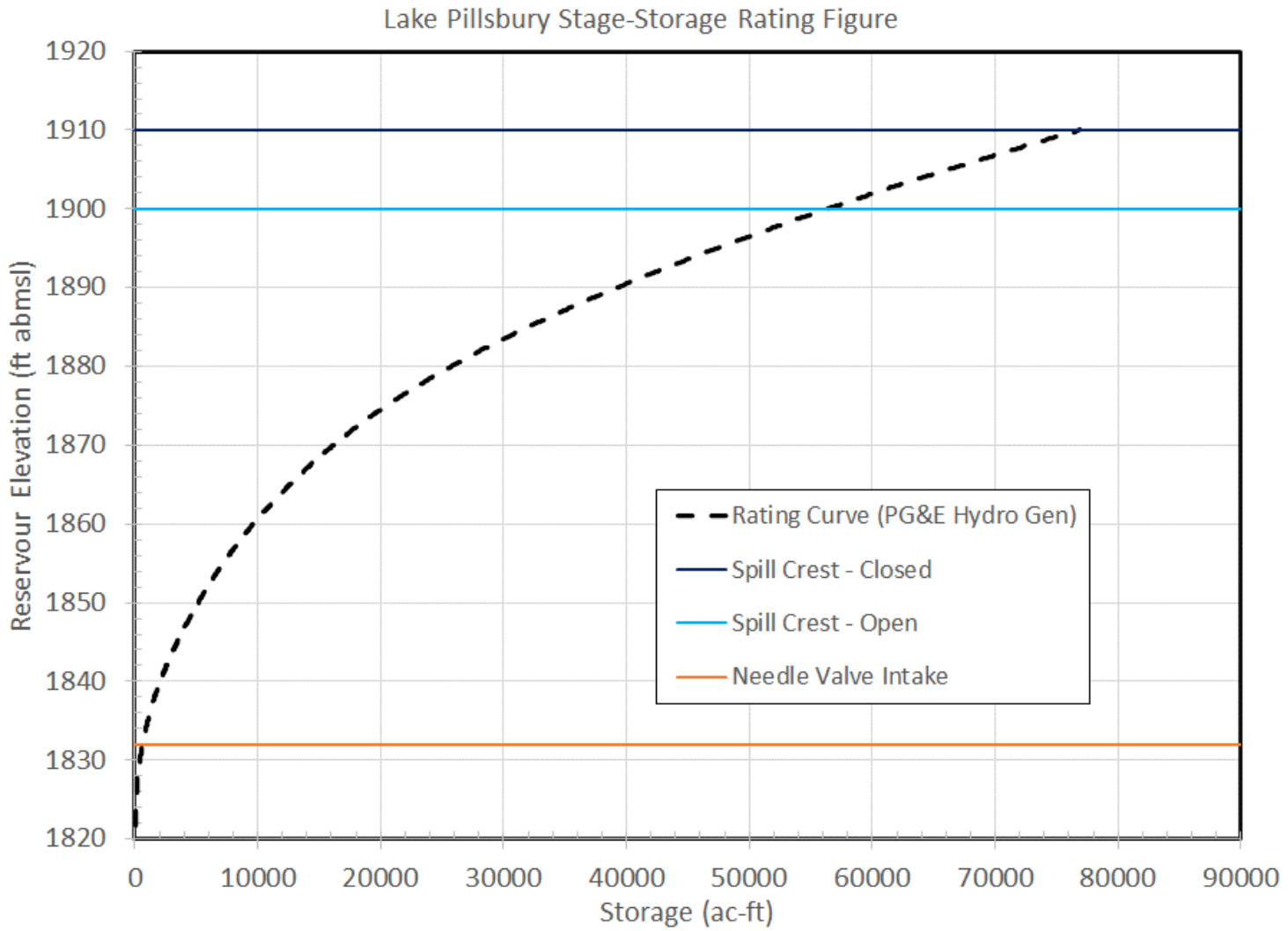
Support figure for 2017 Isopleth – Peak WT of 23°C.



Document Accession #: 20230523-5020 Filed Date: 05/23/2023

Lake Pillsbury elevation-storage rating curve

Illustrates small volume at elevations close to LLO (needle valve)



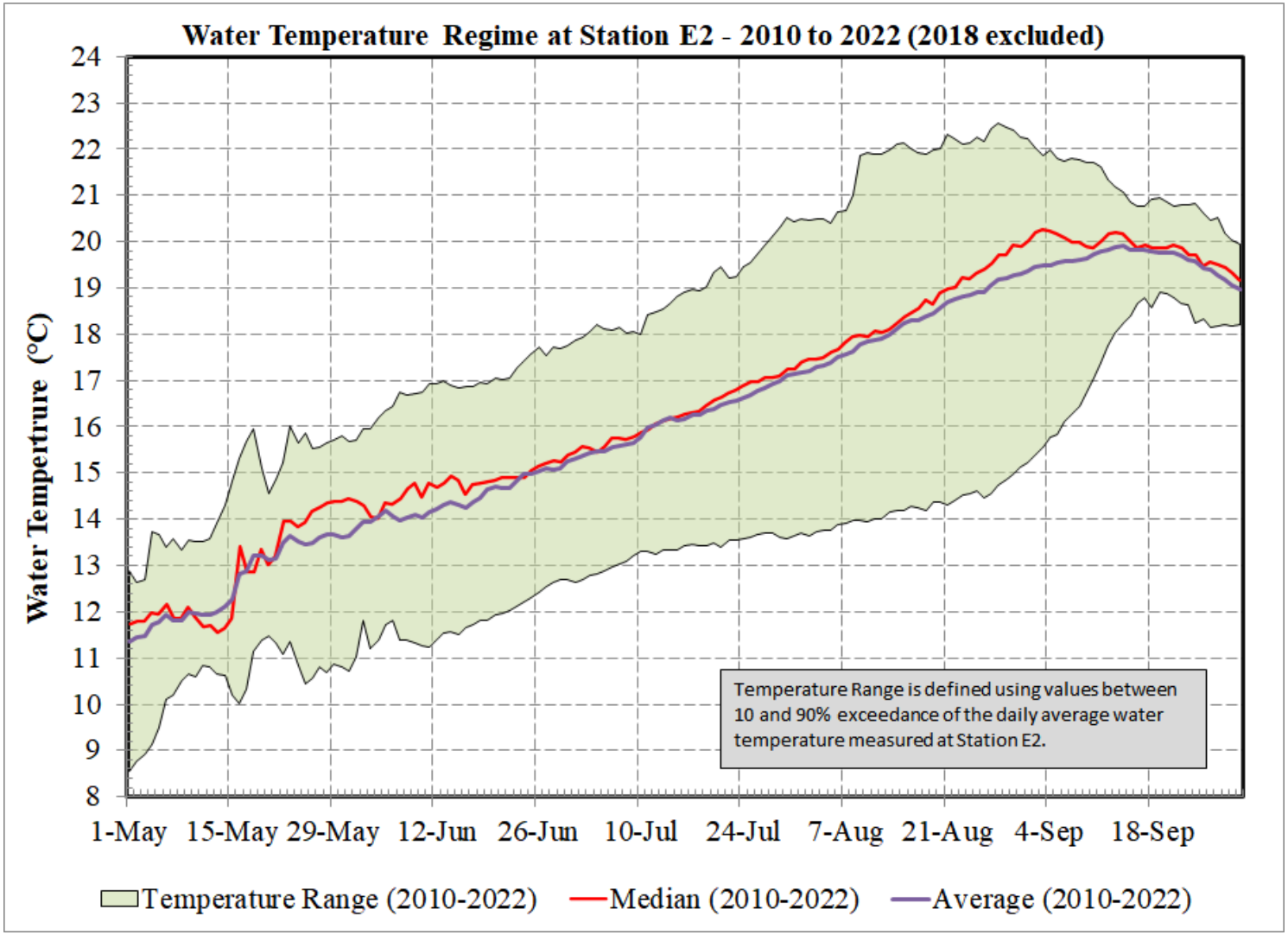
Release Thermal Regime: Part 1

Physical Limnology

- Reservoir is not stratified (*thermal boundaries are not separated by a defined layer [thermocline] that prevents mixing due to density differentials related to temperature*).
  - No protected pool of cool water
  - Structure is defined by a thermal gradient with a late developing warm/hot upper layer.
  - As water is withdraw via the LLO the upper layers are pulled downward through the water column.
- Bottom release is the primary reason for the weak thermal structure.
  - Due to small volume at depth, any cool water is rapidly depleted and replaced by warm upper layers.

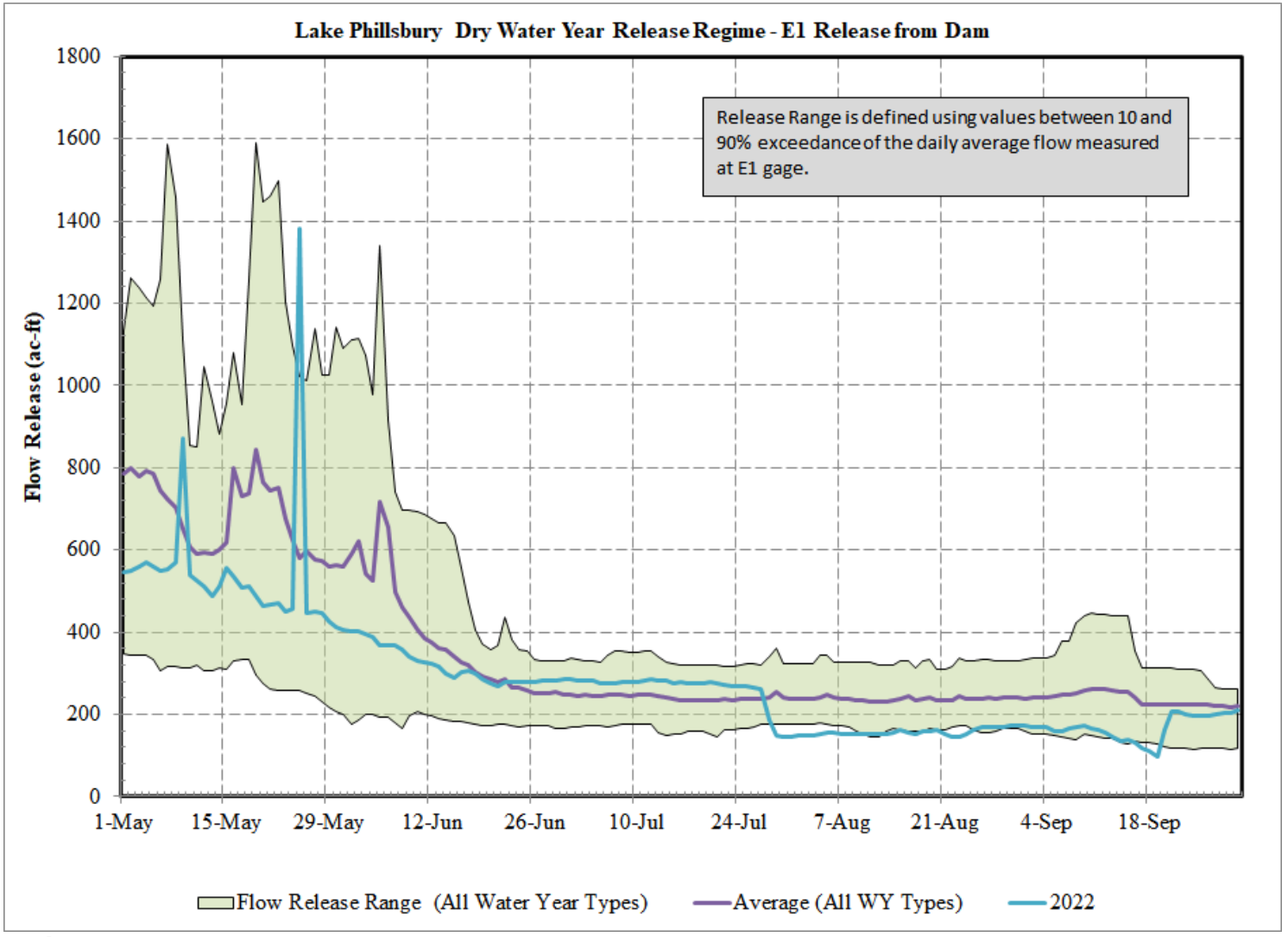
Water temperature regime at E2 May through Sept (2010 to 2022)

Highlights WT range narrowing in mid-Sept and cooling hinge



Release regime at E1 May through Sept (2010 to 2022)

Illustrates heavy use in May- early June



Release Thermal Regime: Part 2

Key Reservoir Characteristics

- Relatively shallow reservoir.
- Low summer inflow volume.
- IFR is made from LLO.
- Rule/demand-based release schedule

Results

- Results in a predicable pattern of WT in IFR
- Reservoir acts as summer period heat sink.
  - Temperatures are out of sync with natural pattern (phase shifting of peak WT to late August early September)

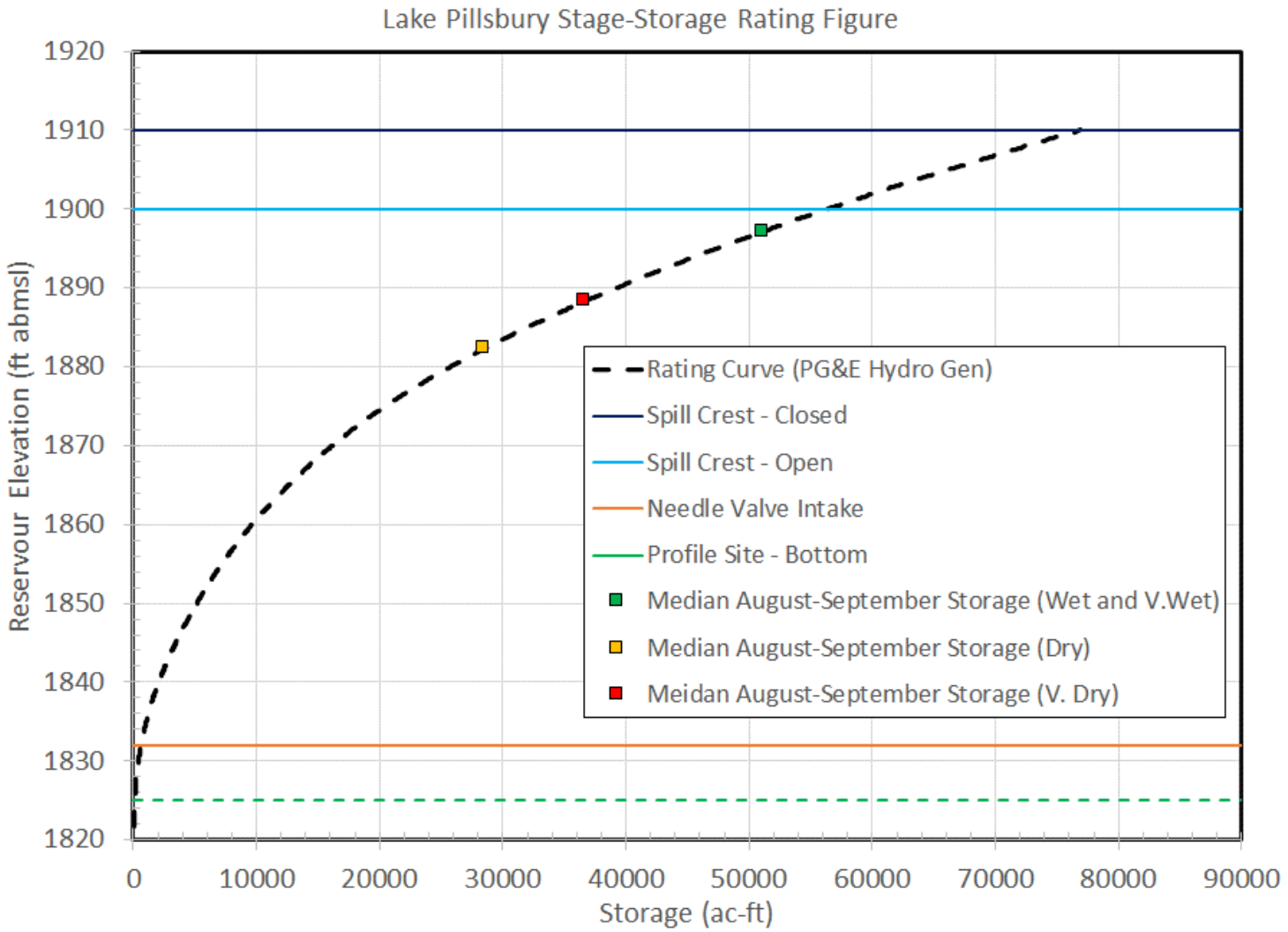
Possible Management Tool

- Flexible release schedule

Document Accession #: 20230523-5020 Filed Date: 05/23/2023

Lake Pillsbury elevation-storage rating curve

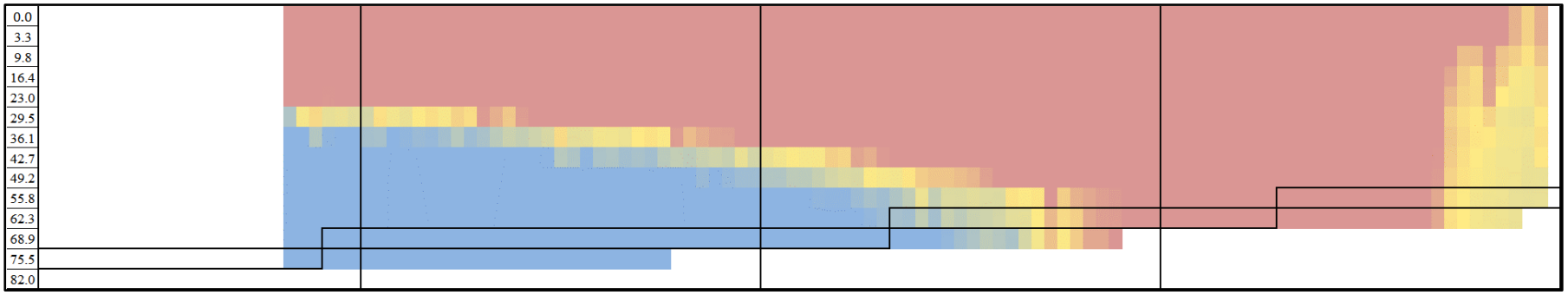
Illustrates the effect of water-year type on storage use decisions



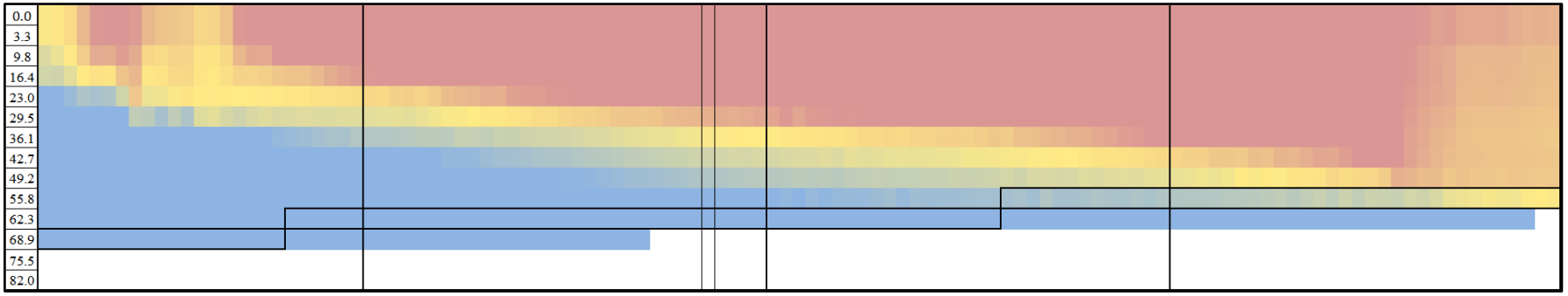
Lake Pillsbury Thermal Progression Images (2017 and 2022)

Illustrate the concept of rapid utilization in wet year vs dry year

2017 daily average WT data from continuous array – (June-September) [Hot and Very Wet]



2022 daily average WT data from continuous array – (June-September) [Abv Norm and Very Dry]



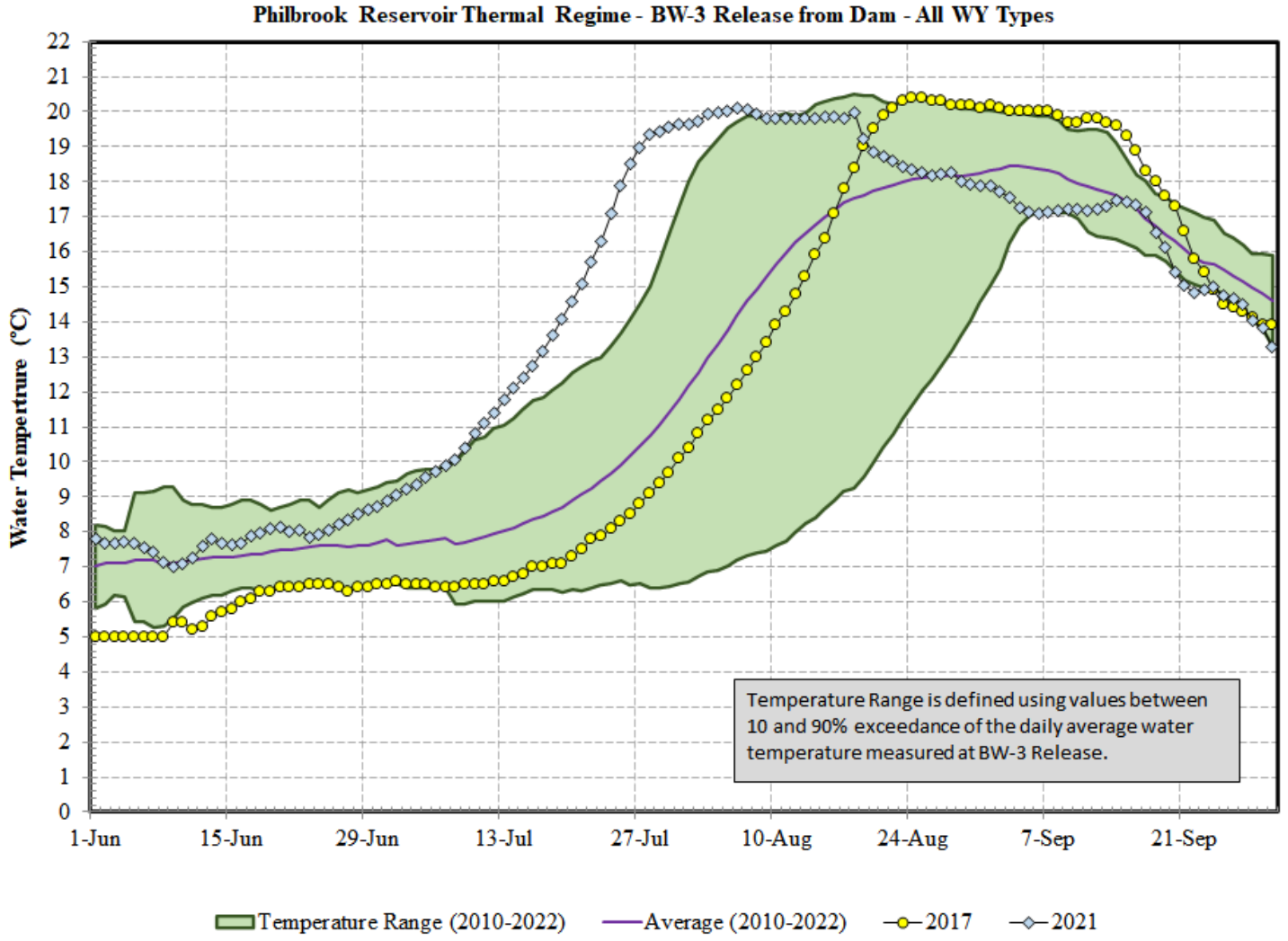
Legend

Red = 22°C or greater, Yellow = 20°C, Blue = 18°C or less

Gradations between the colors represents transitional temperatures.

Philbrook Reservoir Release Regime (DeSabla)

Using 2017 and 2021 to illustrate how demand affects WT of release



Summary

The project has collected data over multiple years to effectively be considered a physical modeling exercise.

- The examination of the water temperature data indicates that there are limited opportunities to reduced water temperatures at E2 during the late summer early fall period (August - September).
- Ambient conditions are driving surface water temperatures to an equilibrium condition.
- By late summer, the IFR from the LLO has drawn the warm epilimnion layers down through the entire water column.

The following conclusions are drawn from the analysis.

- **IFR variance can be used to manipulated water temperatures within a narrow range to facilitate cooler late summer temperatures.**
- **Timing of gate closures will influence late summer water temperatures only if any resultant increase in storage is managed to minimize releases from the LLO during the May-June period.**

Proposed Management Tool

Regression model development

Developed two regression models based on daily average water temperature at E2.

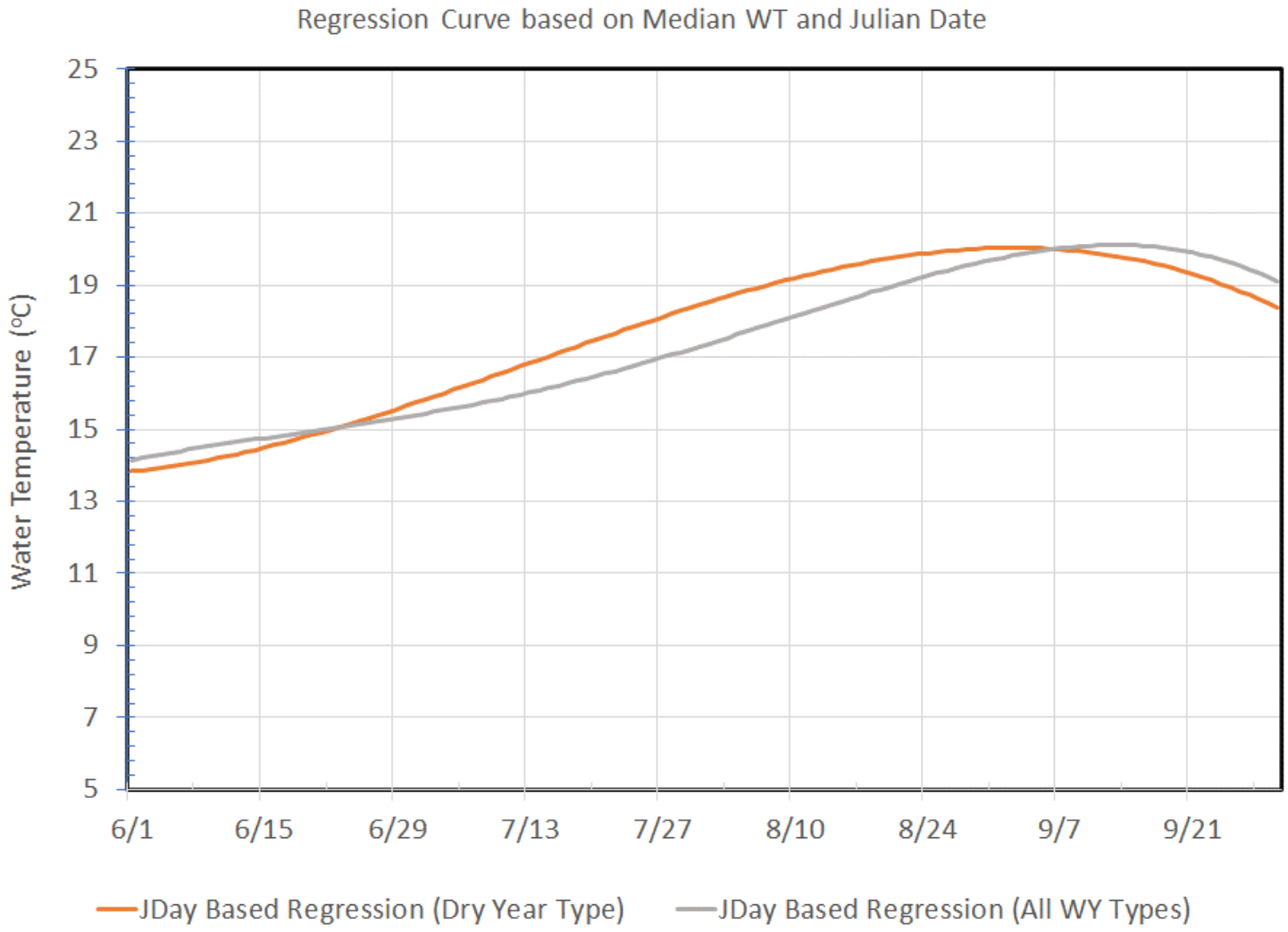
- Dry Water Year Type Regression
- All Water Year Type Regression

Model(s) do not use real-time input of ambient conditions to estimate WT.

Model is based on date (Julian Date) due to the predictable nature of release temperature.

- Focused on the June-September period to minimizes “noise” from spill events which generate warmer temperatures at E2.
- Intended to provide a template to facilitate release management decisions based on water temperature trends at E2.

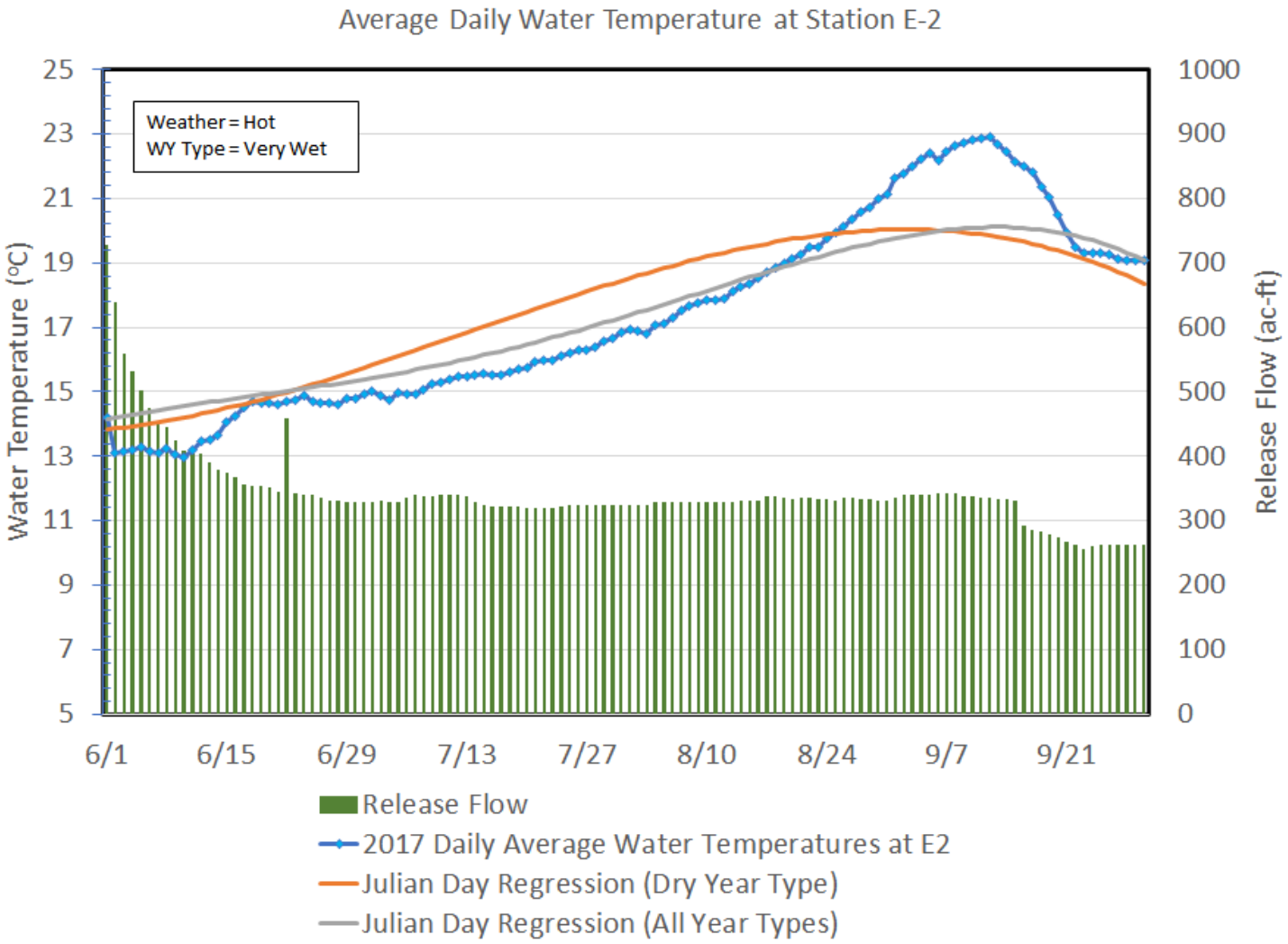
Predictive Regression Analysis – Date vs WT



Document Accession #: 20230523-5020 Filed Date: 05/23/2023

Regression Analysis – 2017 Data (Hot/Very Wet)

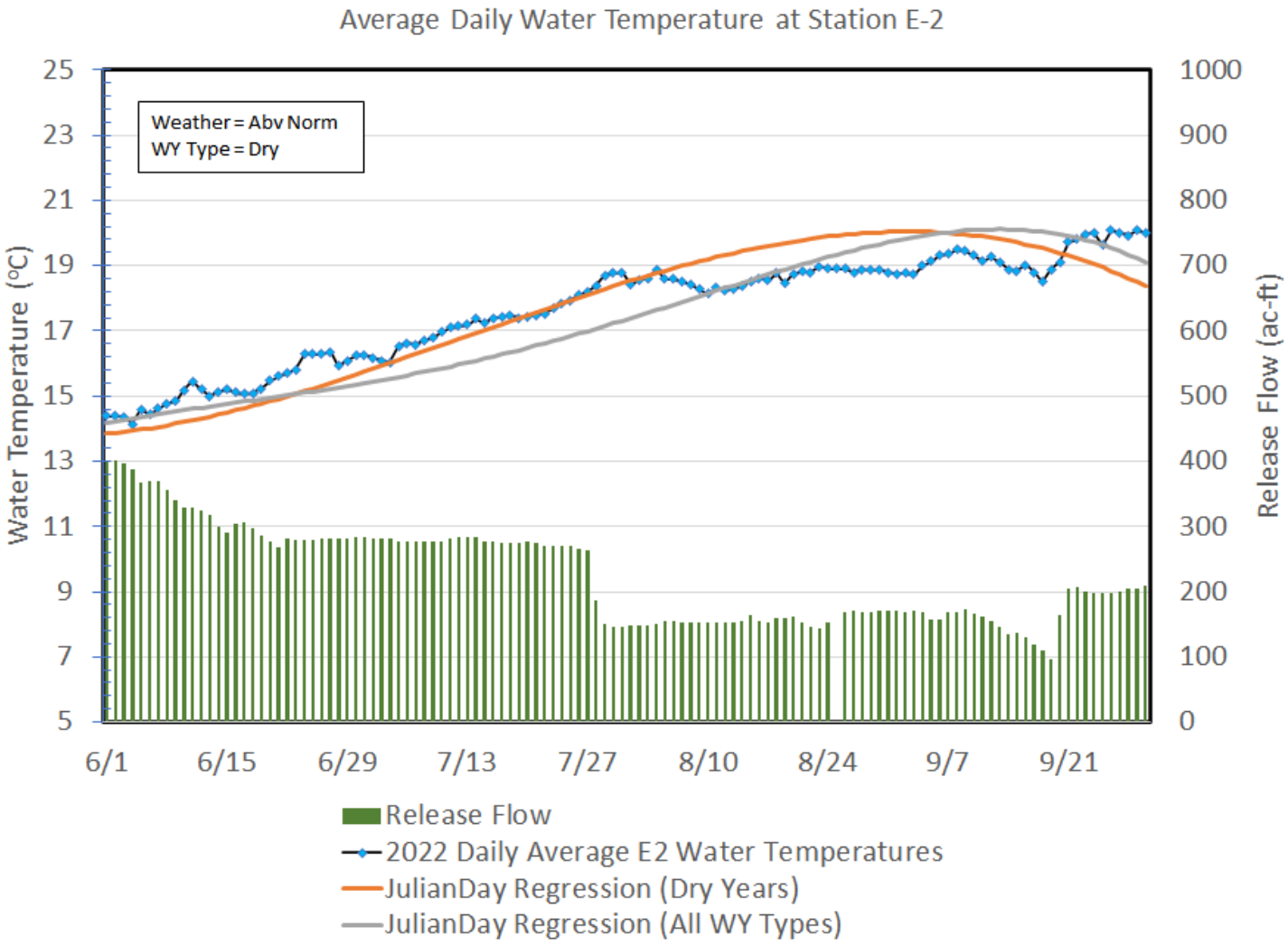
Compares E2 WT with regression curves and release flow



Document Accession #: 20230523-5020 Filed Date: 05/23/2023

Regression Analysis – 2022 Data (Abv Norm/Dry)

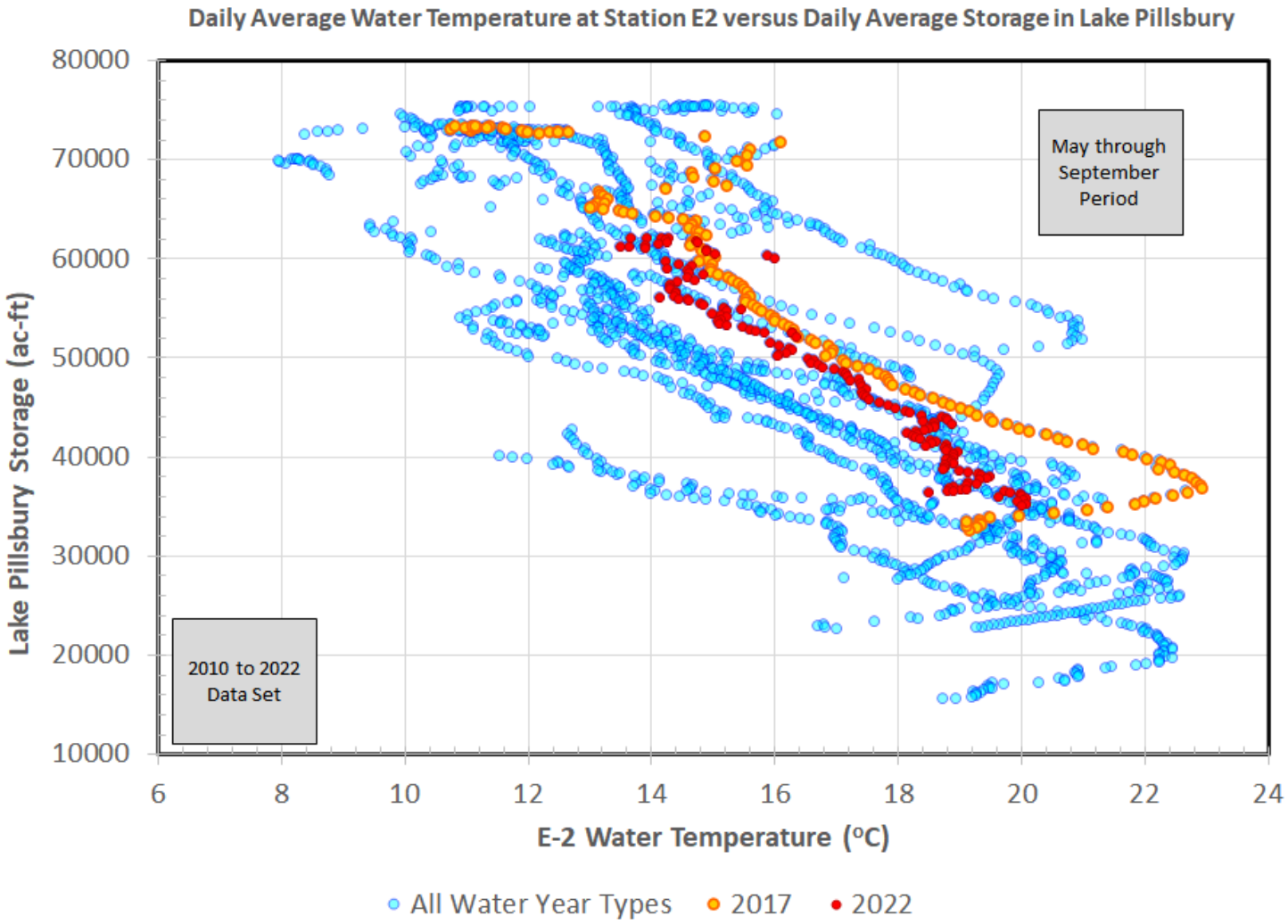
Compares E2 WT with regression curves and release flow (variance)



Document Accession #: 20230523-5020 Filed Date: 05/23/2023

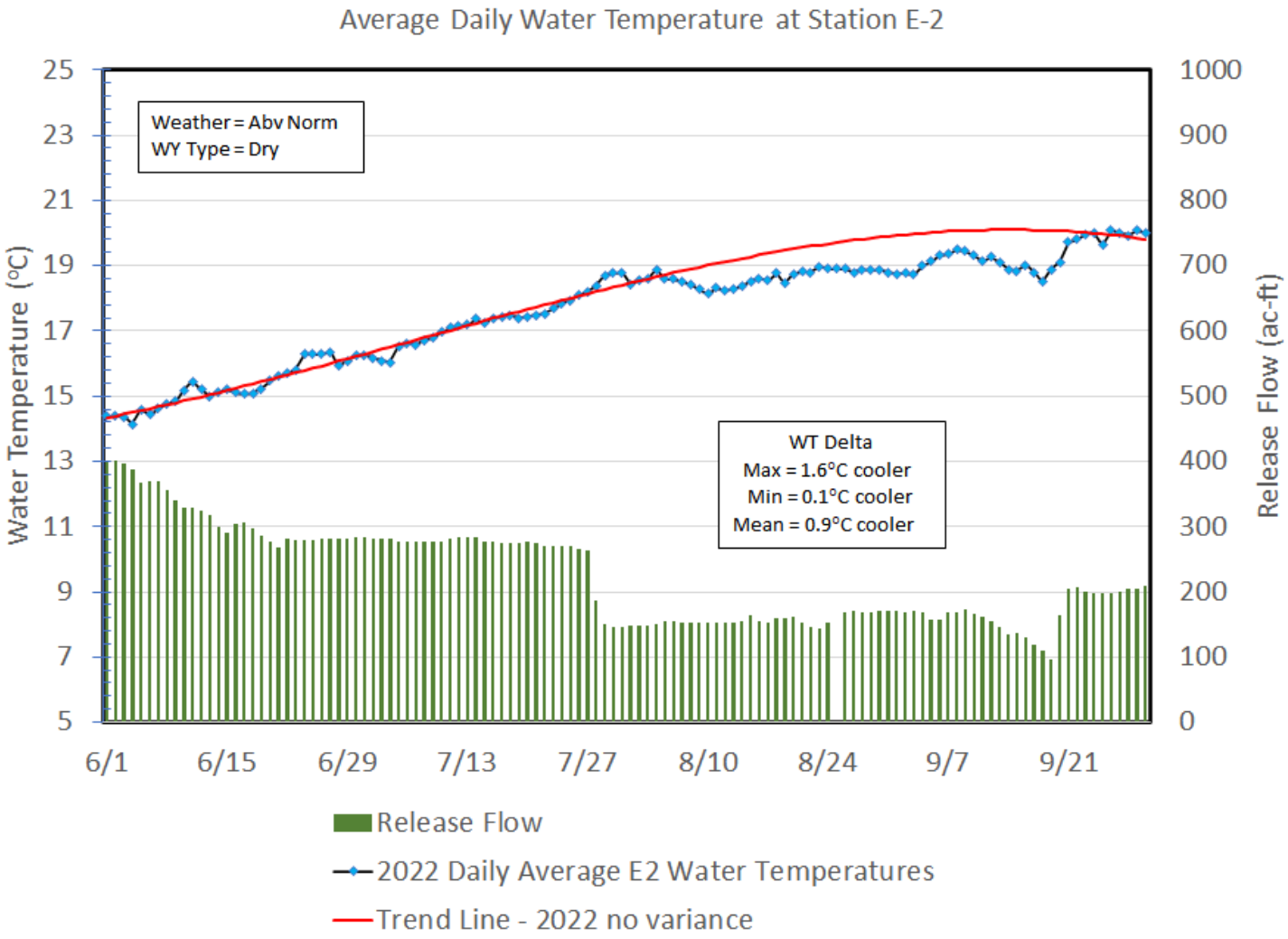
Daily average WT versus daily average storage (2010-2022).

Highlights difference between 2017 and 2022 (summer flow variance).



Comparison of projected trend without flow variance vs 2022 WT.

Estimates result of flow variance on WT – July 2022.



Management Suggestions

Warm water in the reservoir will eventually be released.

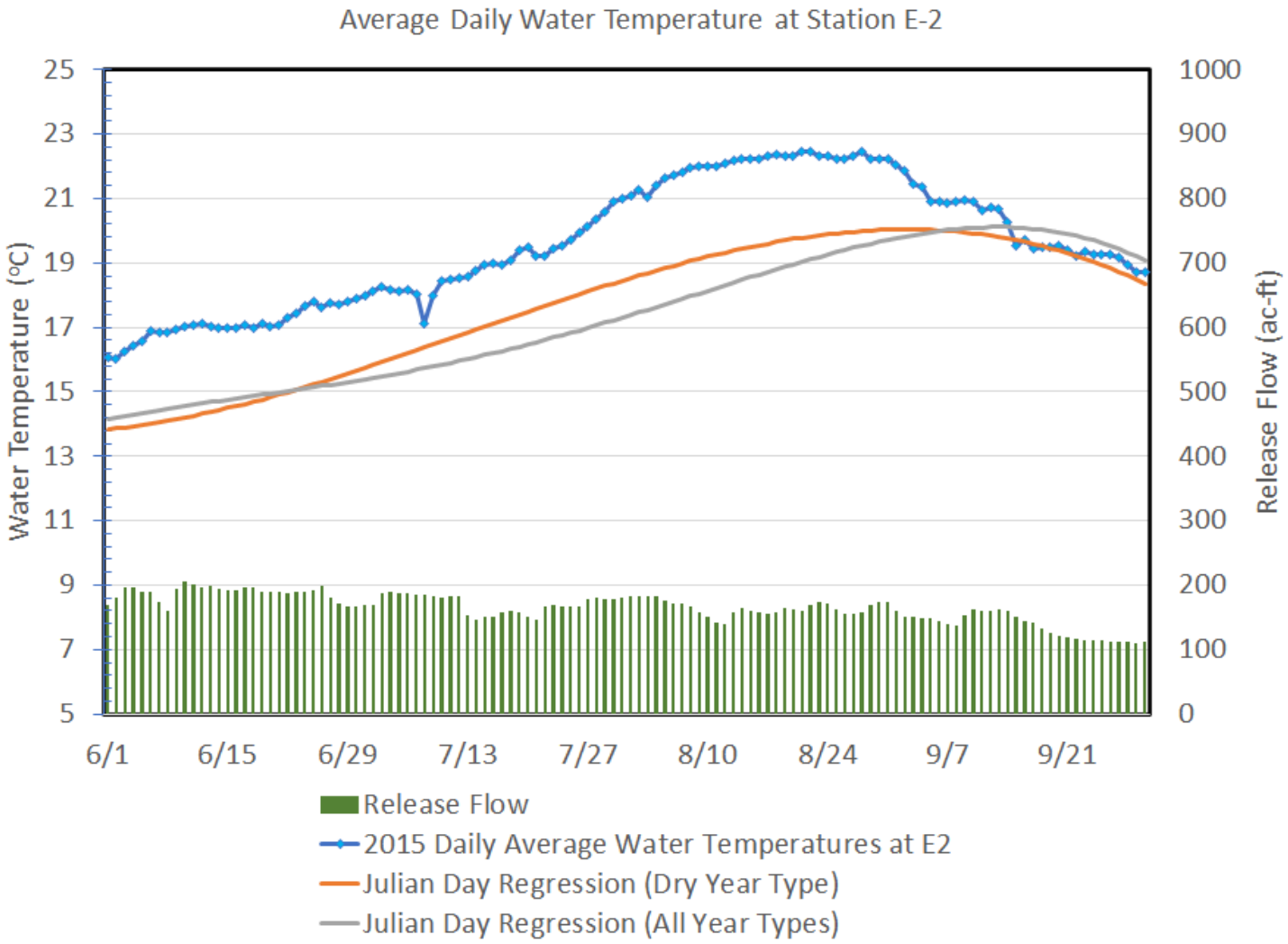
Data indicates that how the storage is used is the primary driver.

- Release logistics becomes the management tool
- 2022 data showed that manipulating the IFR alters the behavior of release temperatures

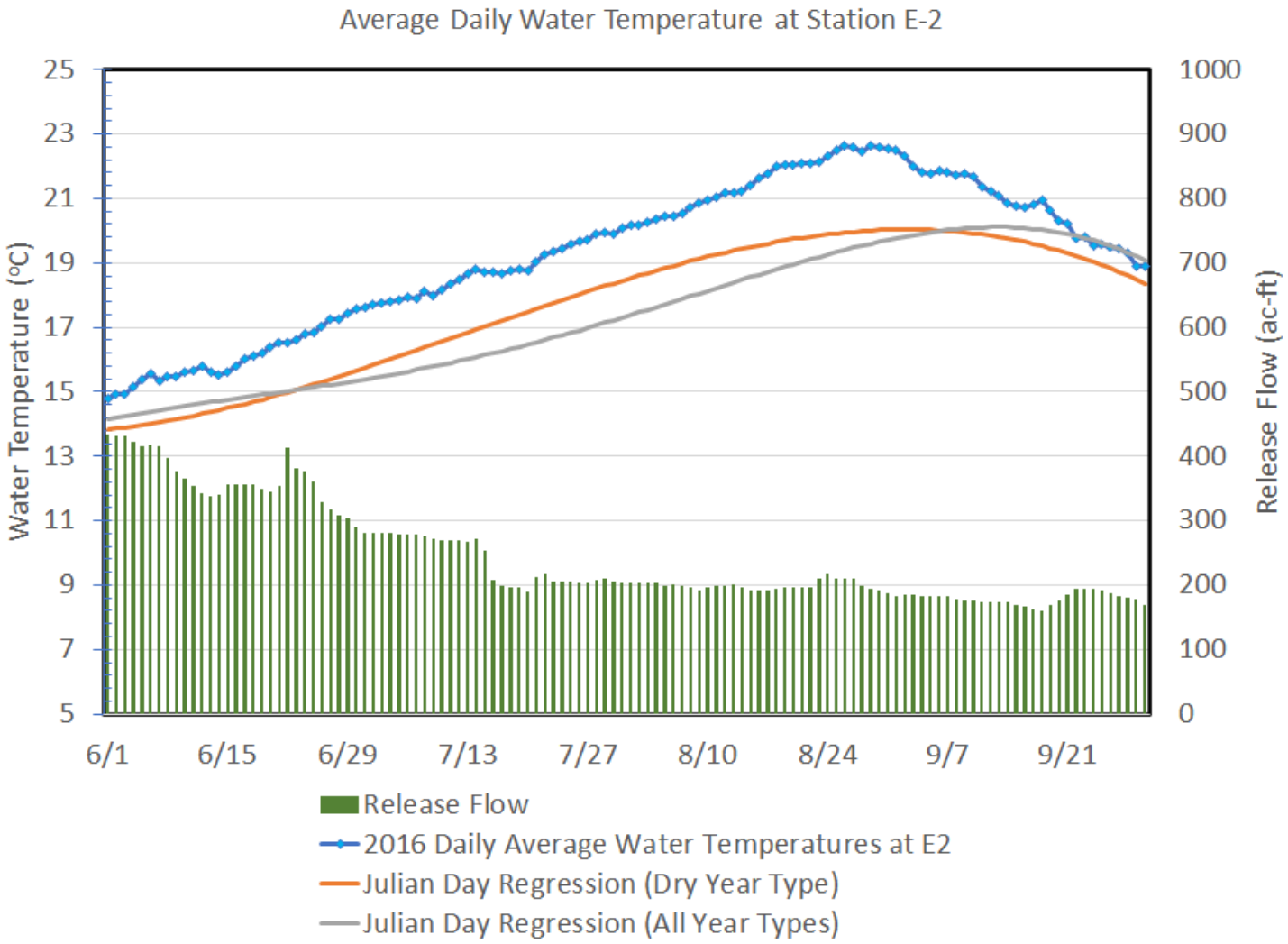
Develop a Decision Tree:

- Minimize releases in May-June
  - Retain/delay depletion of cooler water (small stored volume)
  - Provide block or demand-based deliveries early or later
  - Treat all years like a very dry year.
- Spill as long as possible (when possible)
  - Spill removes warm water from the surface layer (1982)
  - Avoid using LLO if possible (*probably not feasible under current license*)
- Track E2 WT using Date-based regressions to aid in decision making process;
  - Choose to delay or accelerate peak temperature period based on what side of the curve the WT is trending on.

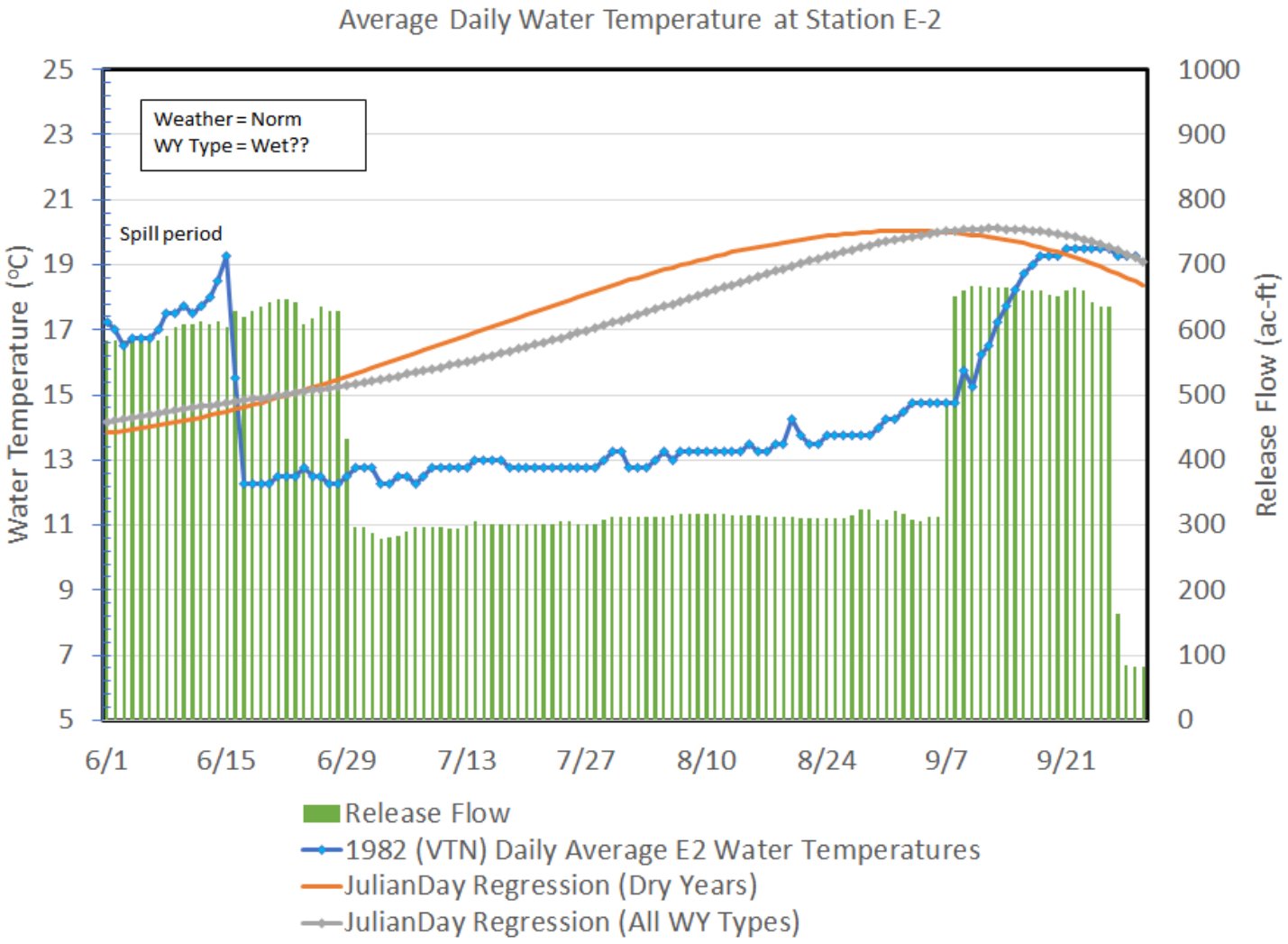
Predictive Regression Analysis – 2015 (Hot/Dry)



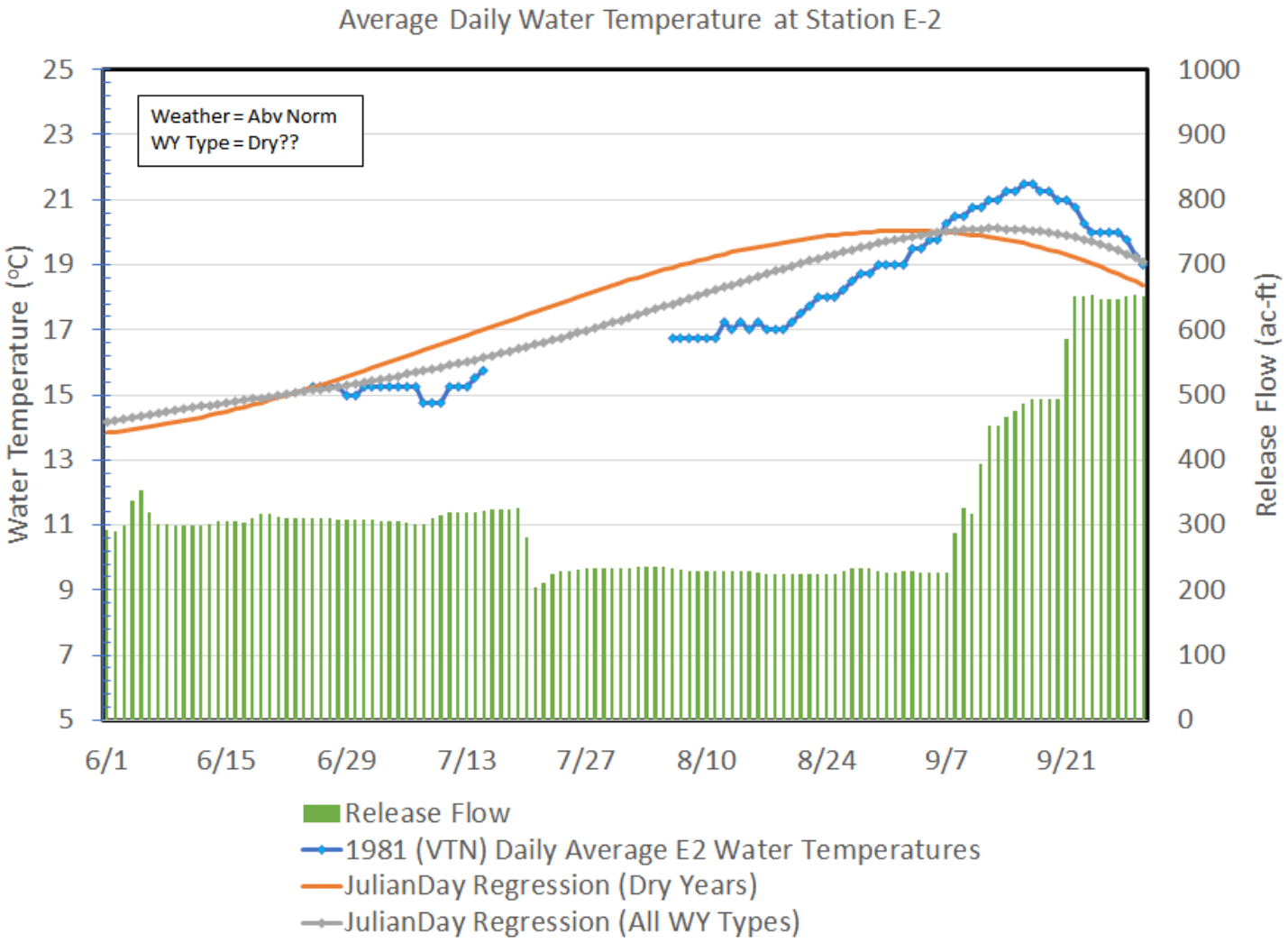
Predictive Regression Analysis – 2016 (Normal/Wet)



Predictive Regression Analysis – 1982 (Normal/Wet?)



Predictive Regression Analysis – 1981 (Abv N/Dry?)



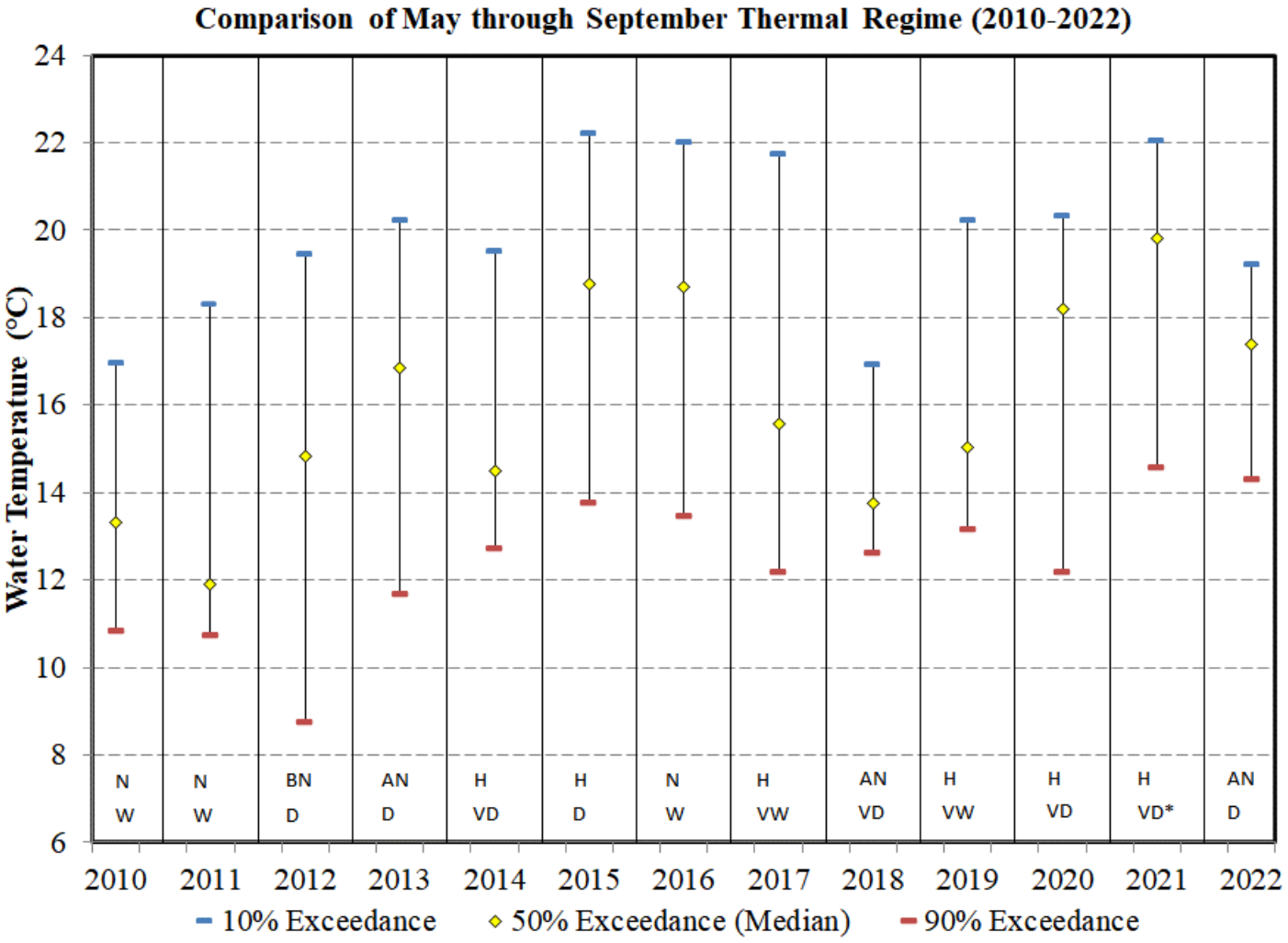
Summary of August-September Conditions.

	Aug-Sept			WT > 18		WT > 20		Storage	May-Aug Median AT	
	Median	Maximum	WY Type	No. Days	%	No. Days	%	on Aug 1	Rank	Class
2022	**18.9**	20.1	Dry	61	100%	5	8%	43661	87%	Abv Norm
2021	21.4	22.6	Very Dry	61	100%	53	87%	28983	99%	Hot
2020	20.0	21.3	Very Dry	61	100%	28	46%	42078	95%	Hot
2019	18.2	21.0	Very Wet	33	54%	17	28%	67189	93%	Hot
2018	14.9	19.1	Very Dry	12	20%	0	0%	54228	84%	Abv Norm
2017	**19.5**	22.9	Very Wet	48	79%	26	43%	51252	100%	Hot
2016	**21.2**	22.6	Wet	61	100%	53	87%	35249	59%	Norm
2015	**21.4**	22.5	Dry	61	100%	46	75%	24105	97%	Hot
2014	16.9	20.9	Very Dry	21	34%	14	23%	50014	92%	Hot
2013	19.8	20.7	Dry	54	89%	26	43%	35988	76%	Abv Norm
2012	18.7	20.0	Dry	42	69%	3	5%	44936	24%	Blw Norm
2011	14.9	19.7	Wet	17	28%	0	0%	67150	43%	Norm
2010	14.5	18.2	Wet	5	8%	0	0%	65950	48%	Norm

Questions

Supplemental Slides

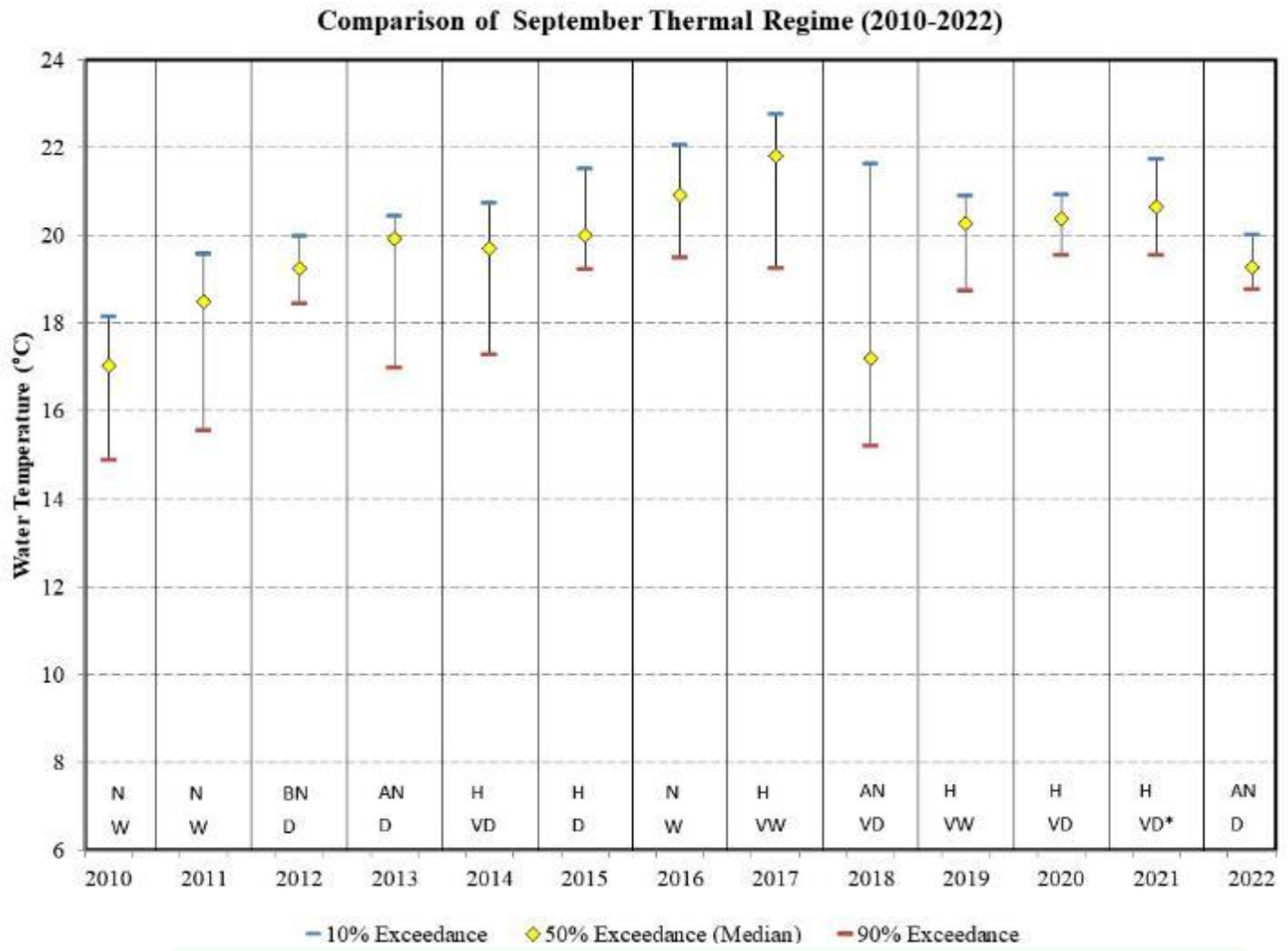
Comparison of May through September water temperature regime at E2 (2010 to 2022)



N=Normal, BN=Below Normal, AB=Above Normal, H=Hot

VW=Very Wet, W=Wet, D=Dry, VD=Very Dry

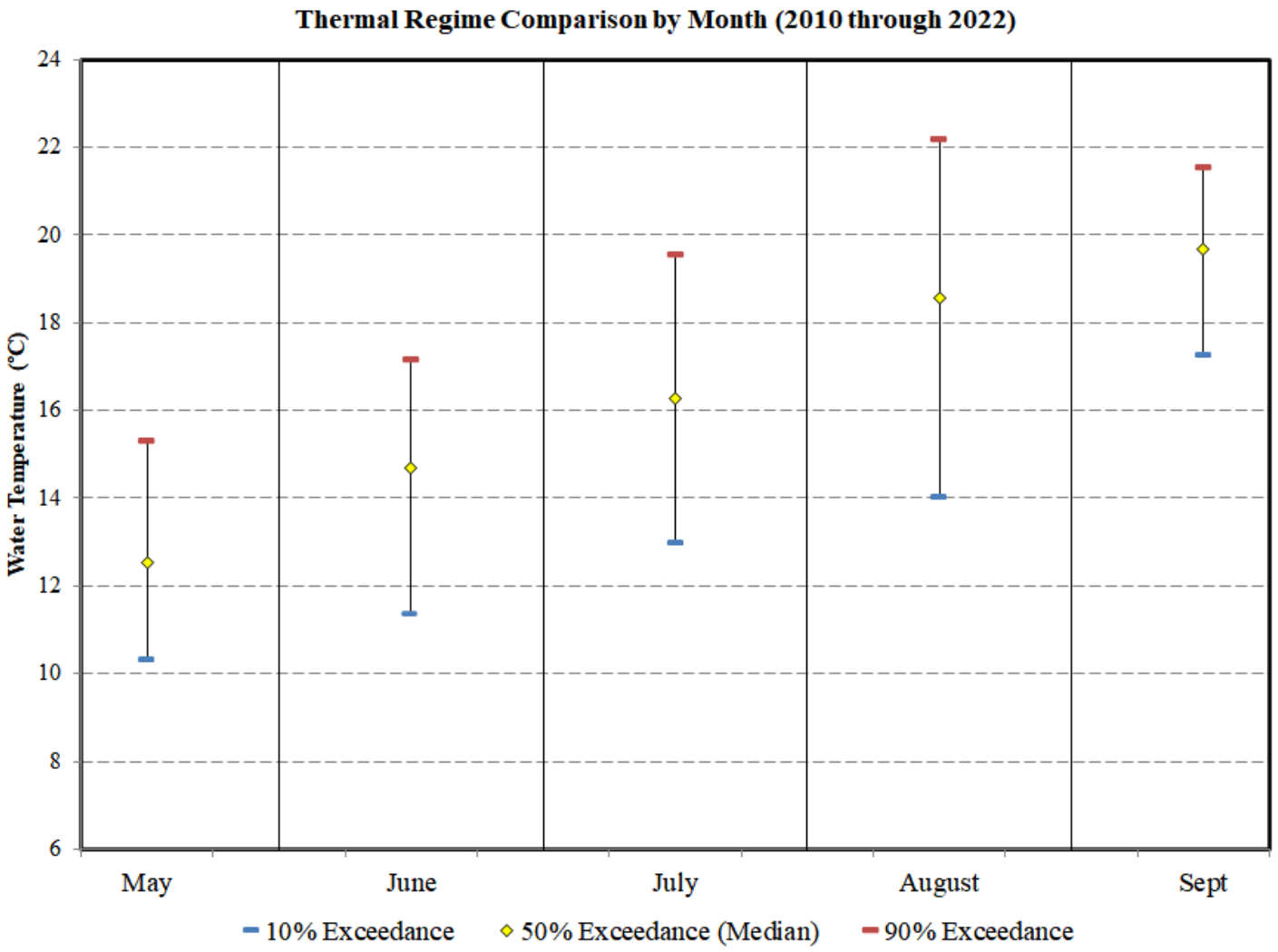
Comparison of thermal regime at E2 September (2010 to 2022)



N=Normal, BN=Below Normal, AB=Above Normal, H=Hot

VW=Very Wet, W=Wet, D=Dry, VD=Very Dry

Comparison of monthly thermal regime at E2 June through Sept (2010 to 2022)



Lake Pillsbury Block Water Release Dates

Year	Start date	End date	Notes
2022	9/27/2022	12/3/2022	
2021	--	--	No block-water due to drought
2020	5/16/2020	6/15/2020	
2019	6/15/2019	8/31/2019	
2018	5/15/2018	6/12/2018	Pulse flows occurred on 5/15/18 and 5/29/18
2017	5/22/2017	6/2/2017	
2016	5/3/2016	5/15/2016	
2015	4/21/2015	5/14/2015	There were three pulse flows that occurred on 4/21/15, 5/5/15, and 5/14/15; each flow lasted 2 days

Appendix B

Water Temperature Evaluation – Regression Curve Analysis

Compares Daily Average Water Temperature with Regression Curves and Flow Releases from the 2010 through 2022 period.

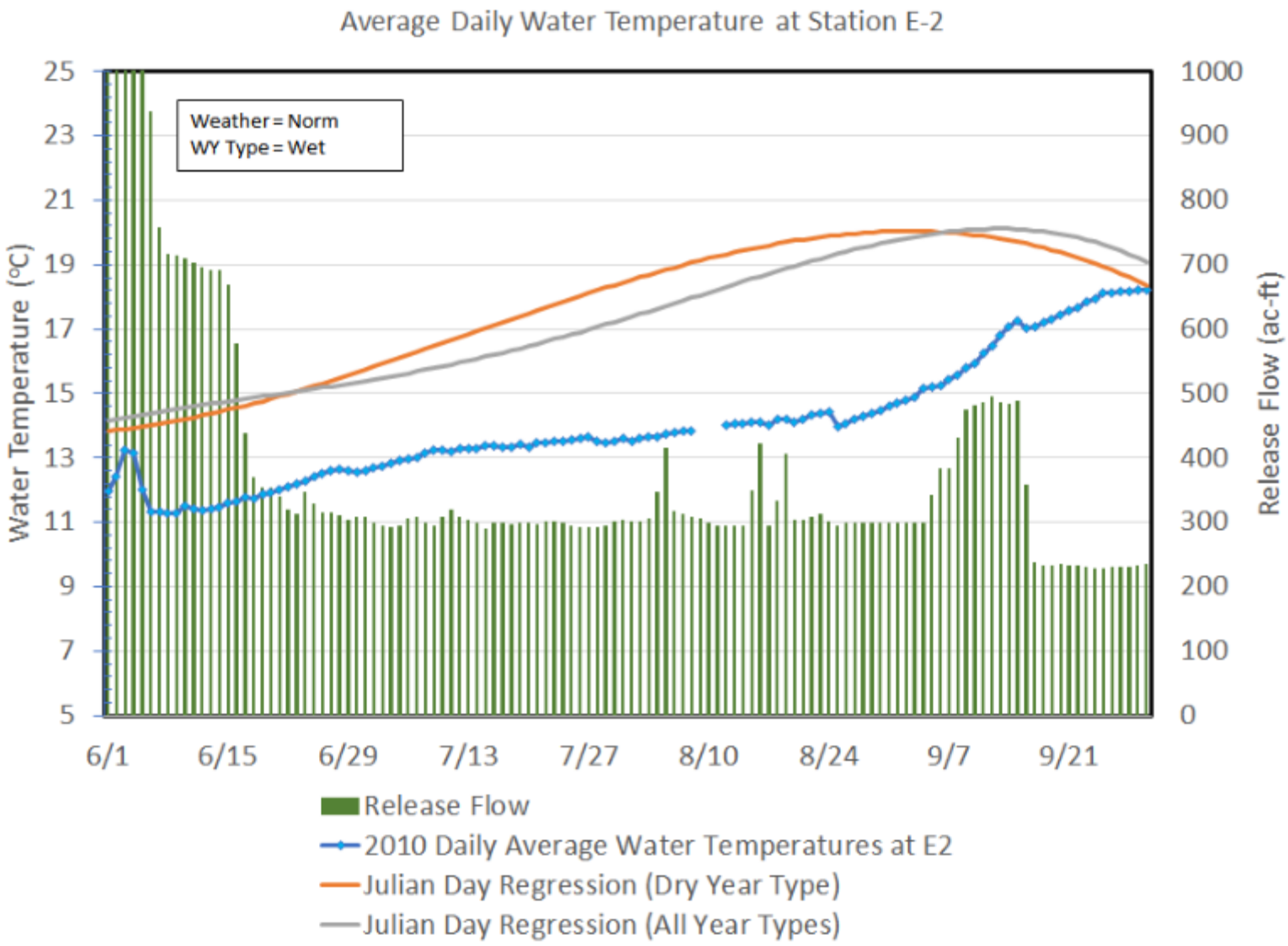


Figure B1: Comparison of 2010 water temperature and release flow to regression curves.

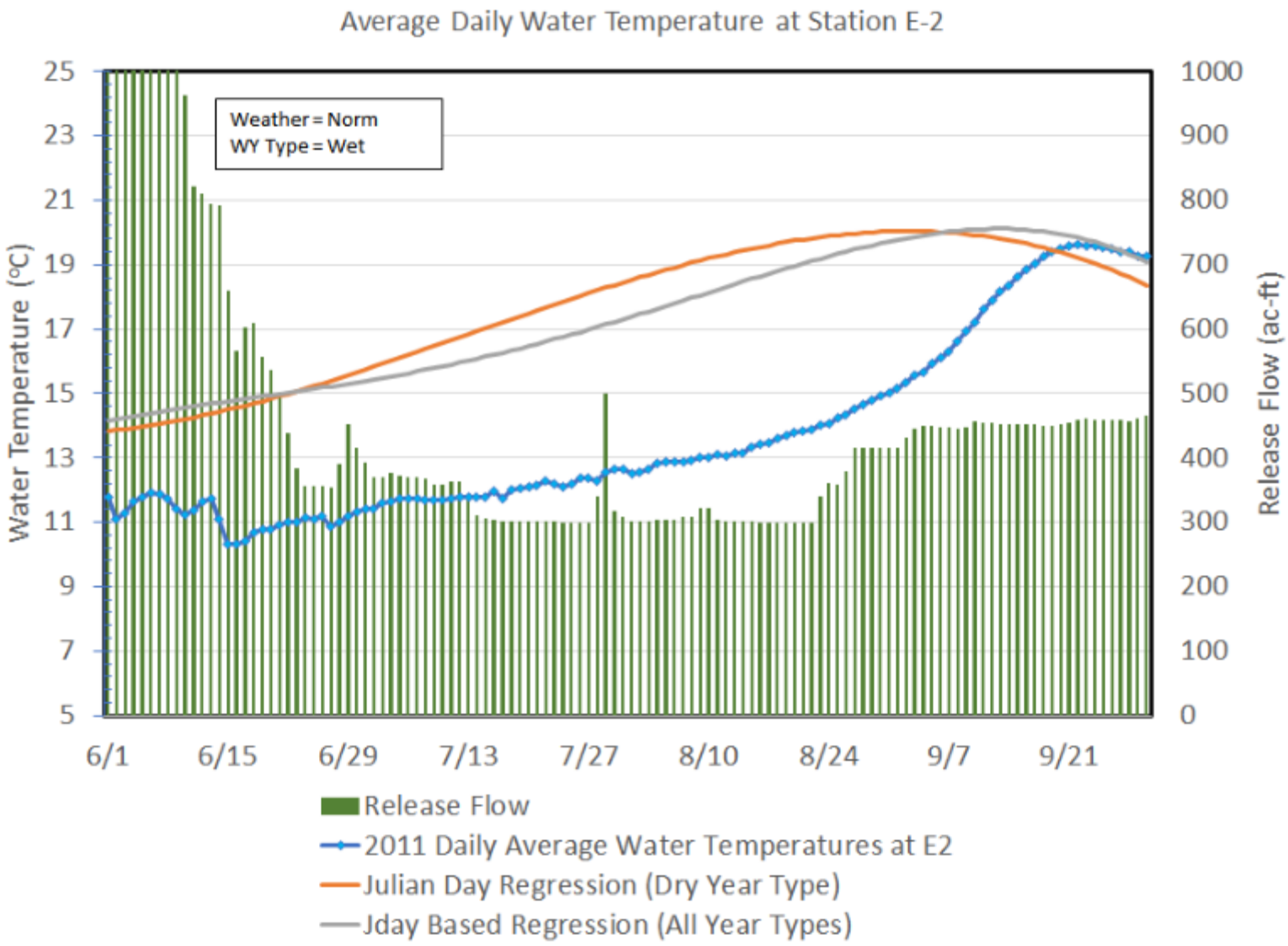


Figure B2: Comparison of 2011 water temperature and release flow to regression curves.

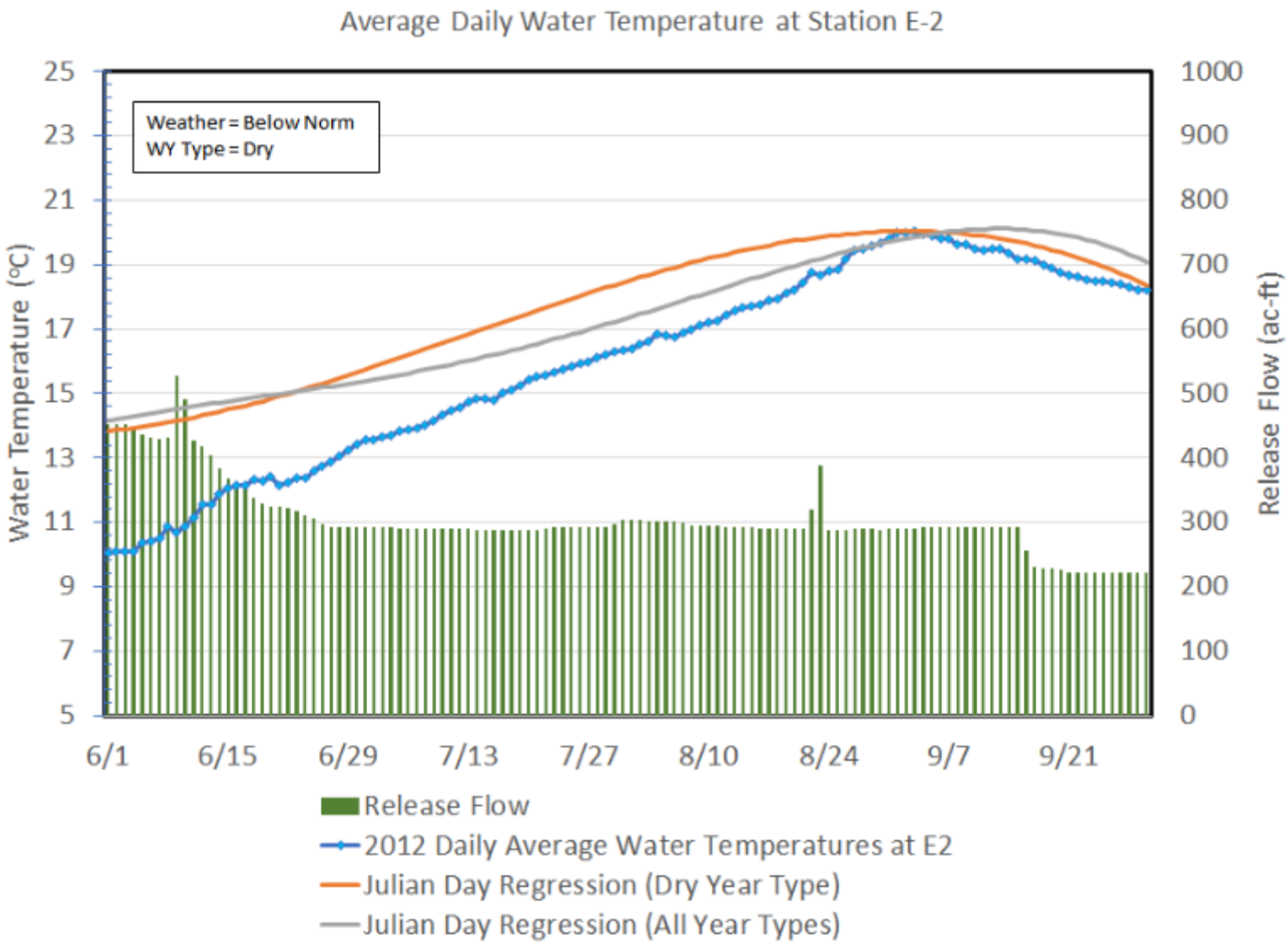


Figure B3: Comparison of 2012 water temperature and release flow to regression curves.

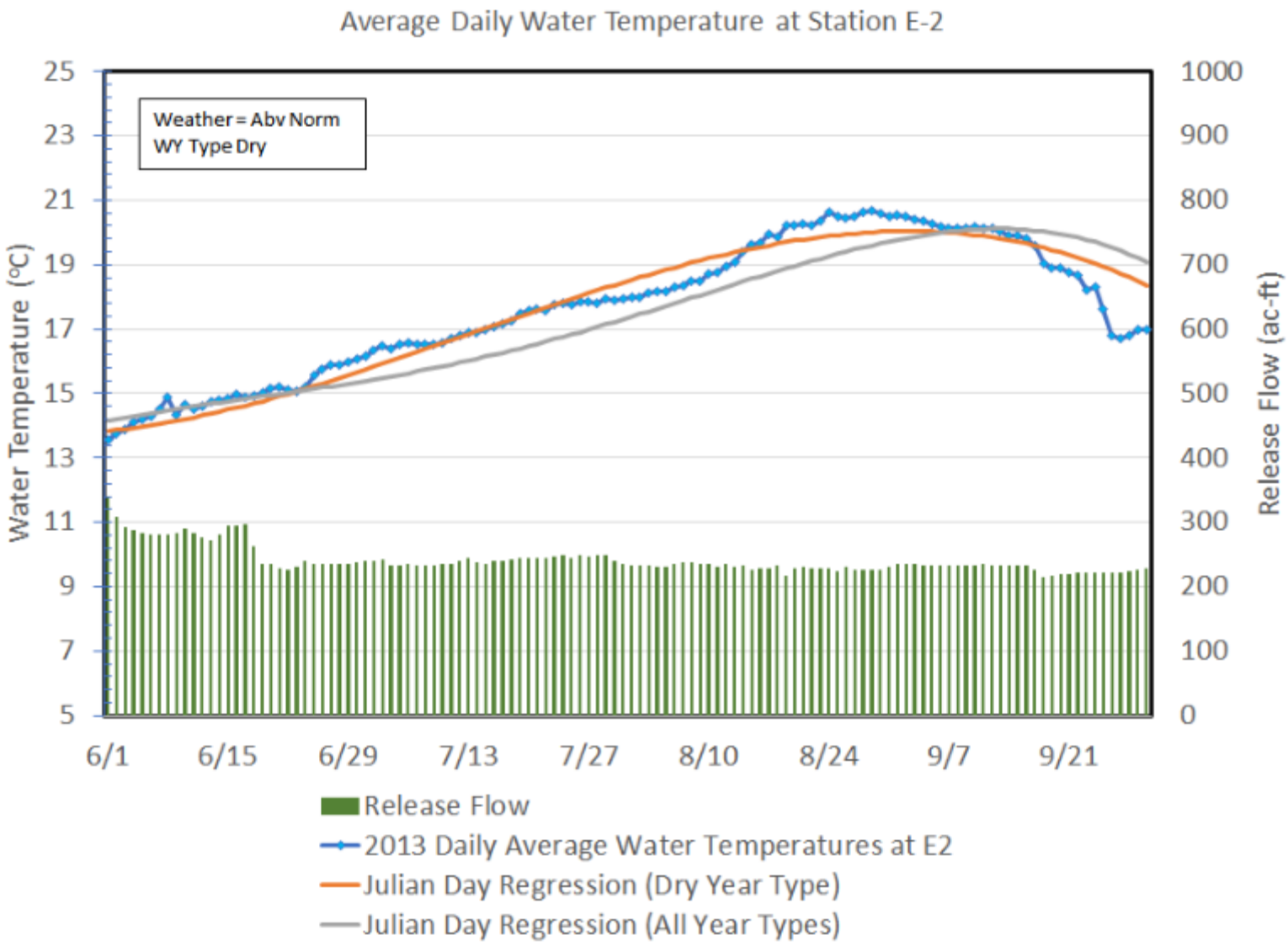


Figure B4: Comparison of 2013 water temperature and release flow to regression curves.

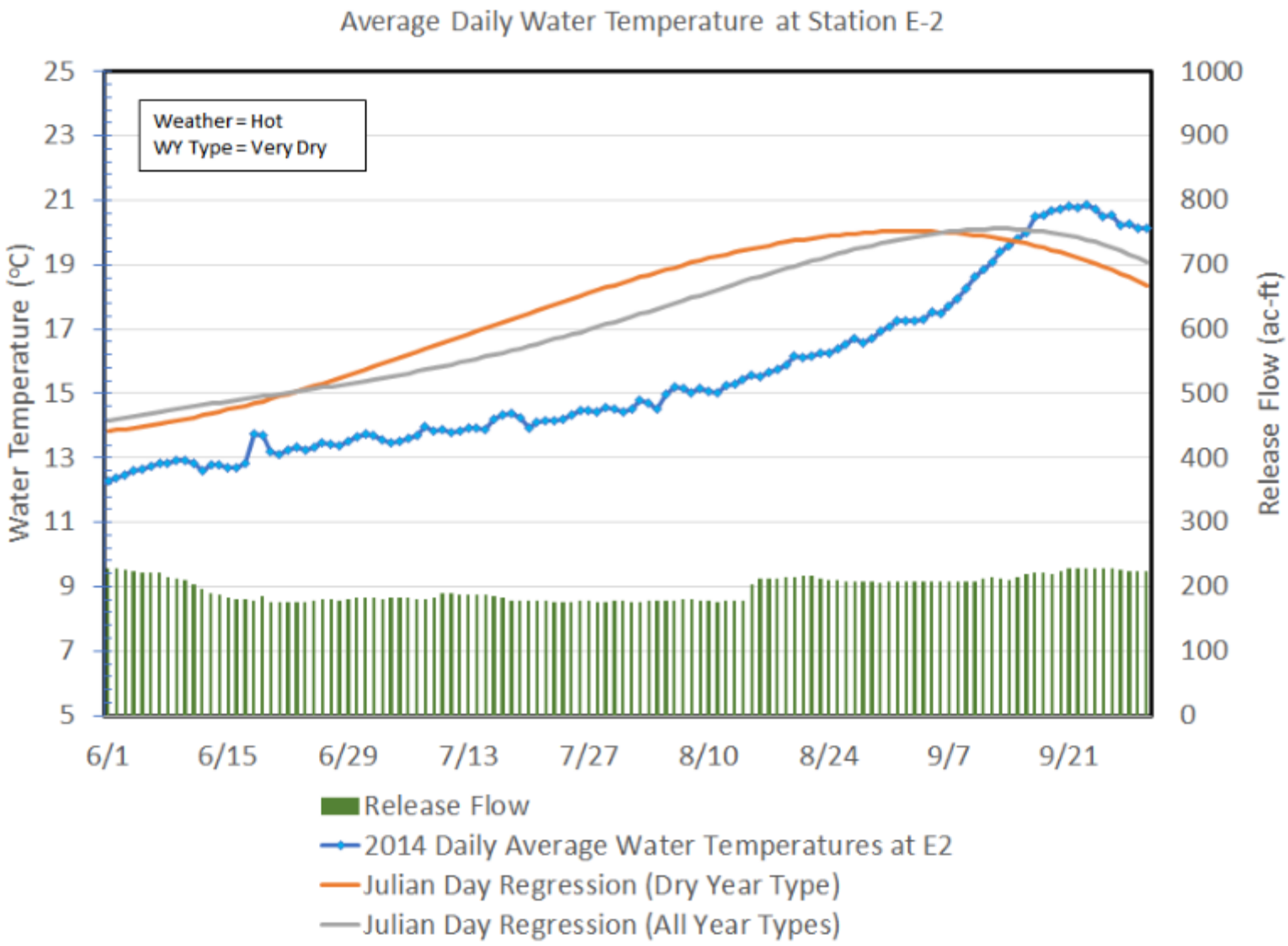


Figure B5: Comparison of 2014 water temperature and release flow to regression curves.

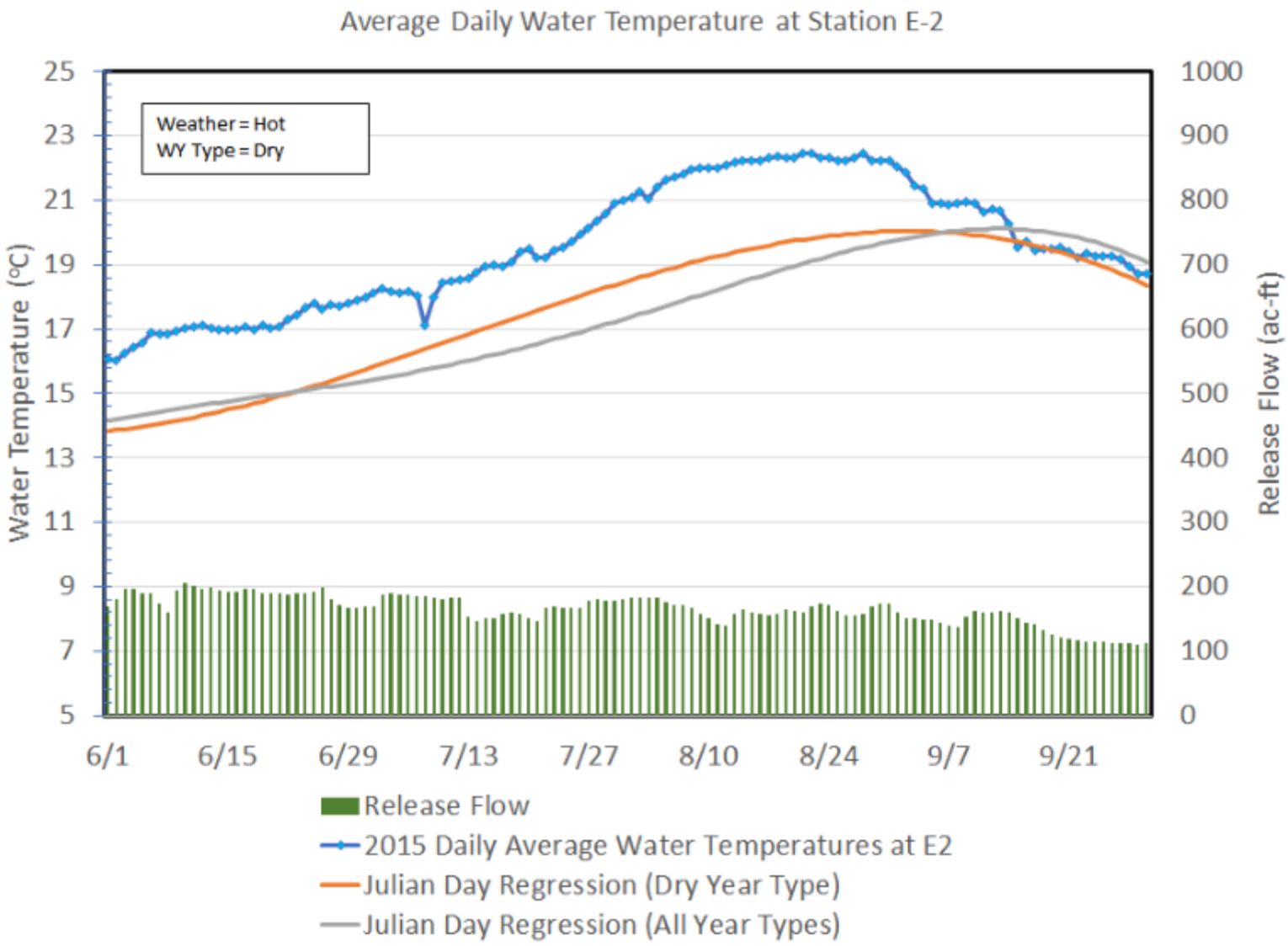


Figure B6: Comparison of 2015 water temperature and release flow to regression curves.

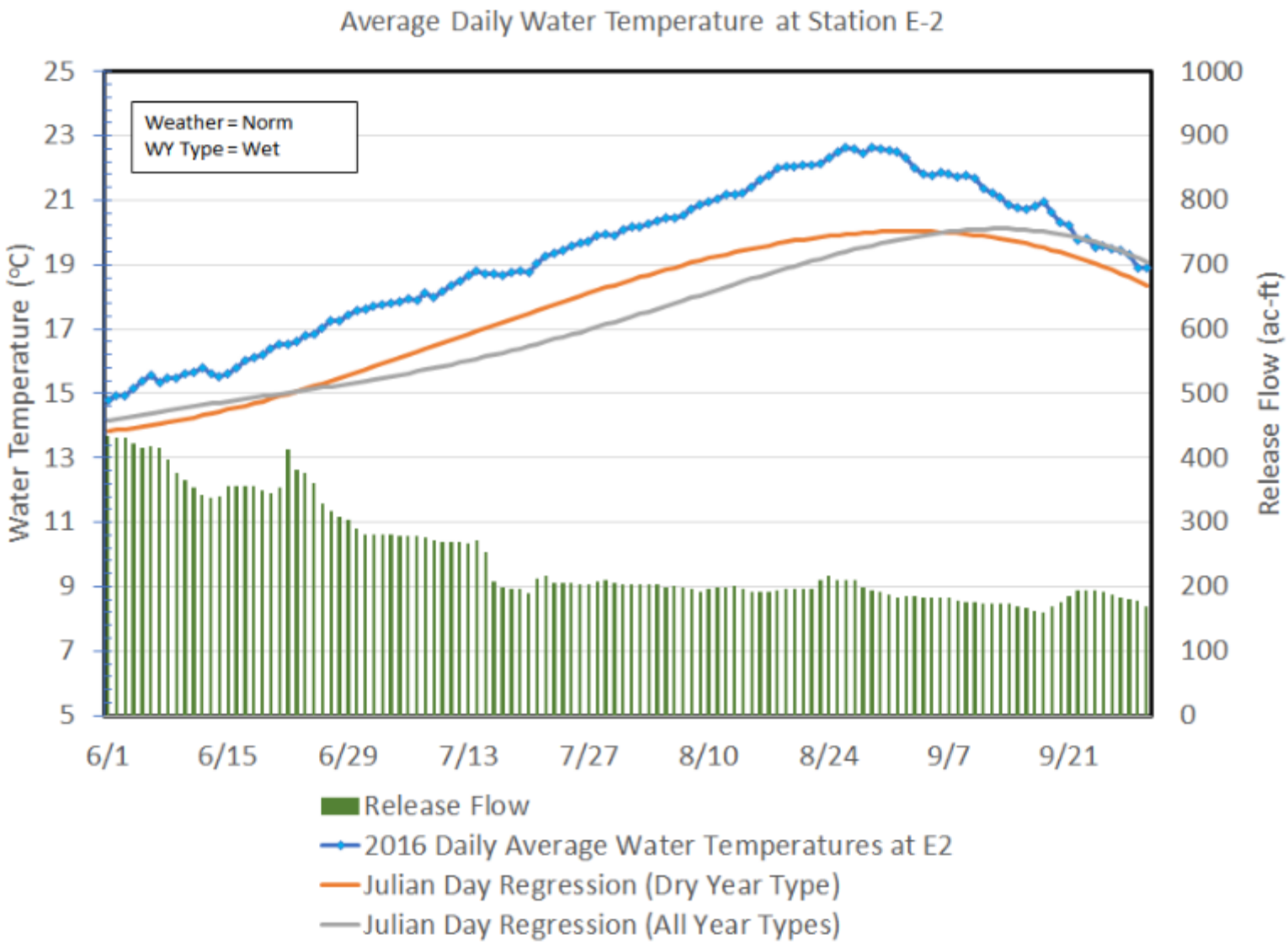


Figure B7: Comparison of 2016 water temperature and release flow to regression curves.

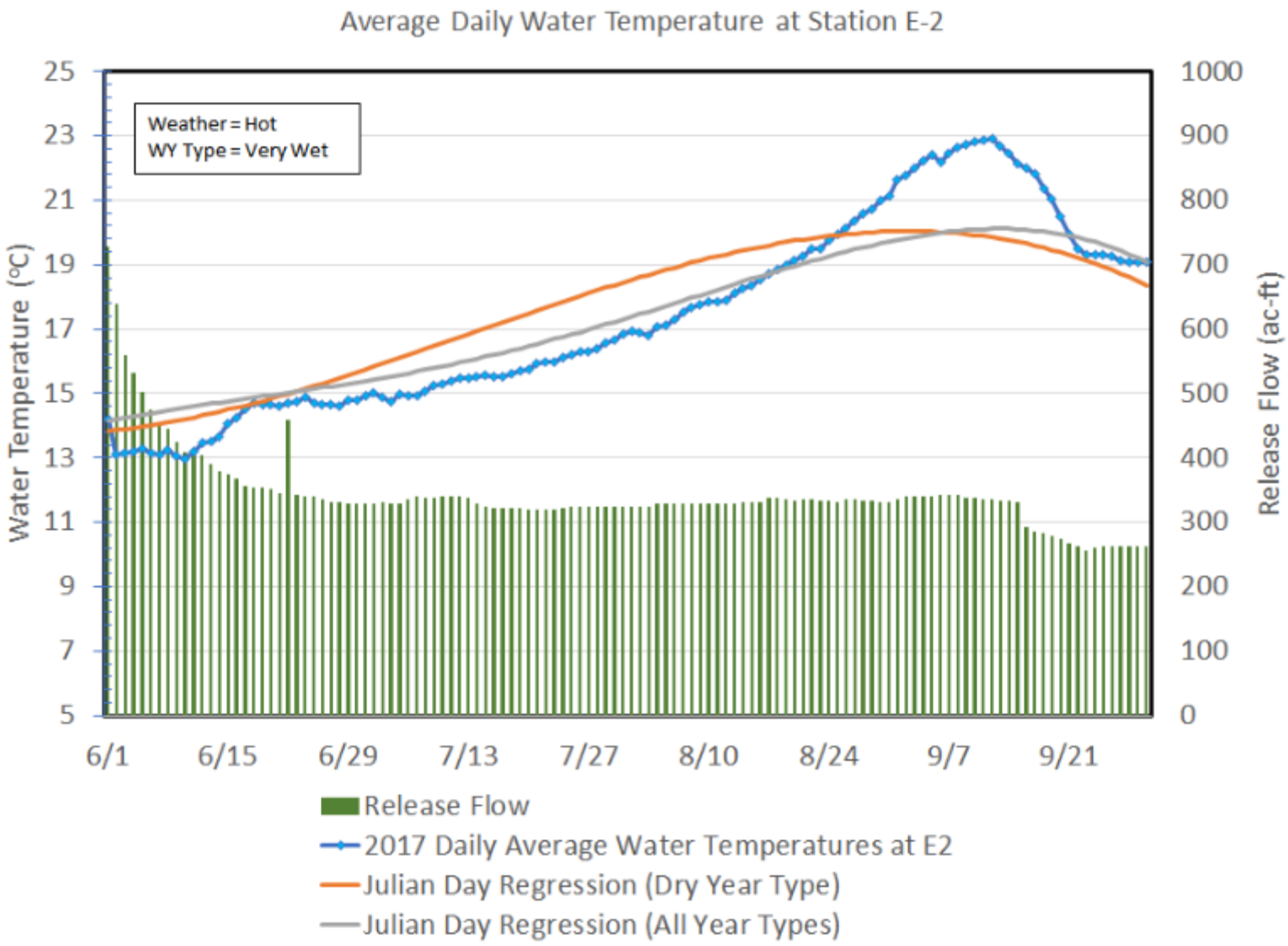


Figure B8: Comparison of 2017 water temperature and release flow to regression curves.

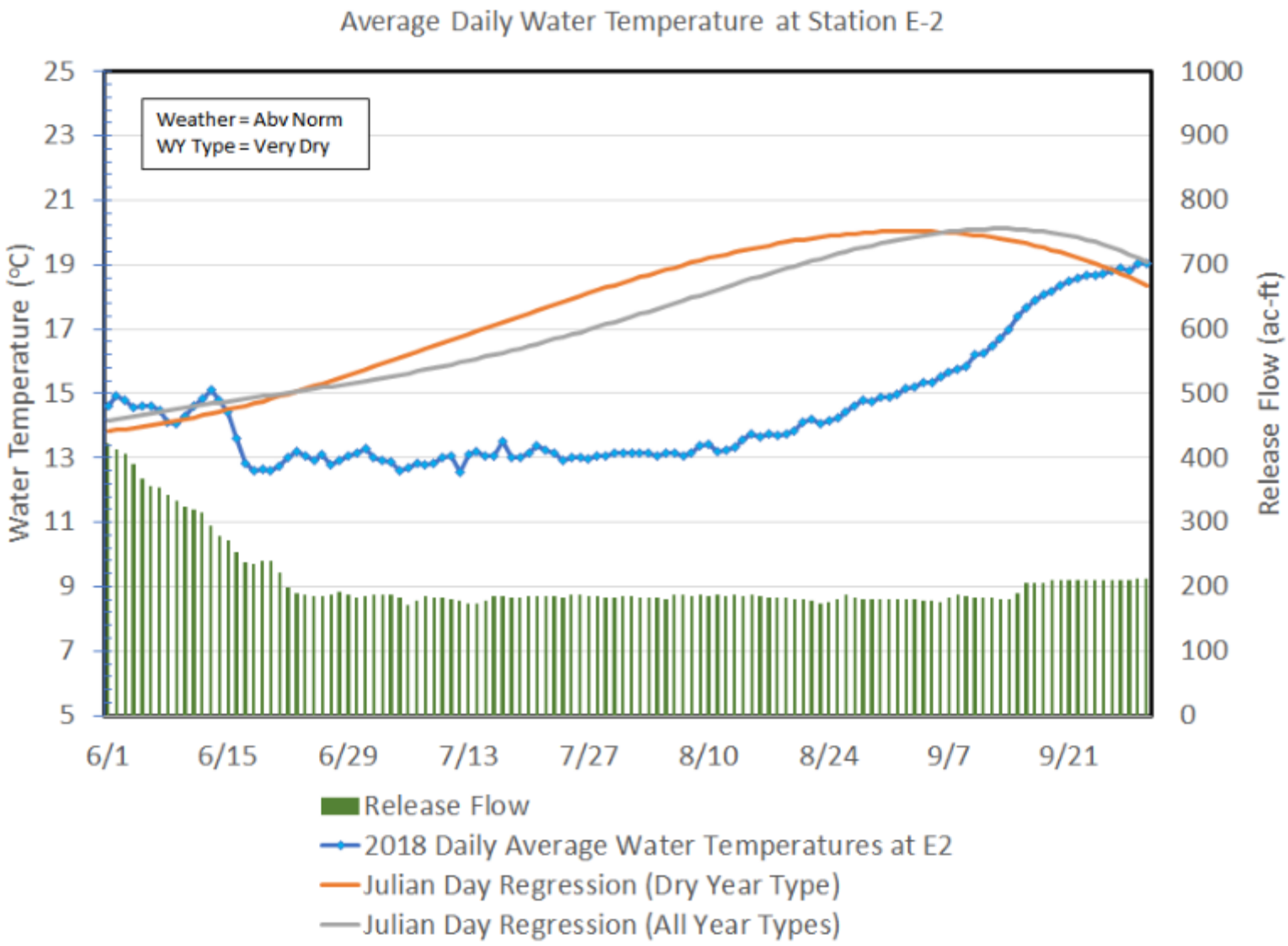


Figure B9: Comparison of 2018 water temperature and release flow to regression curves.

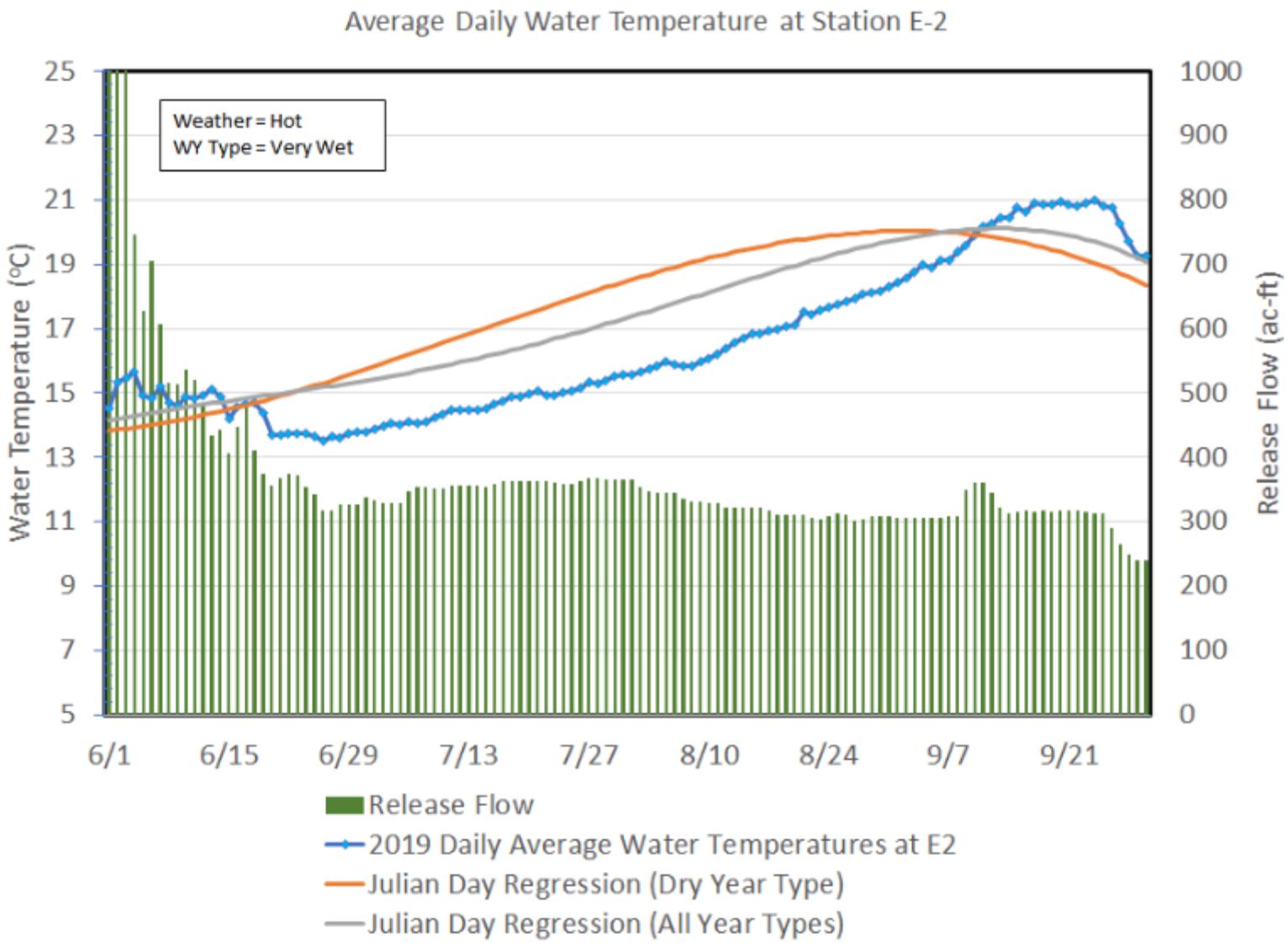


Figure B10: Comparison of 2019 water temperature and release flow to regression curves.

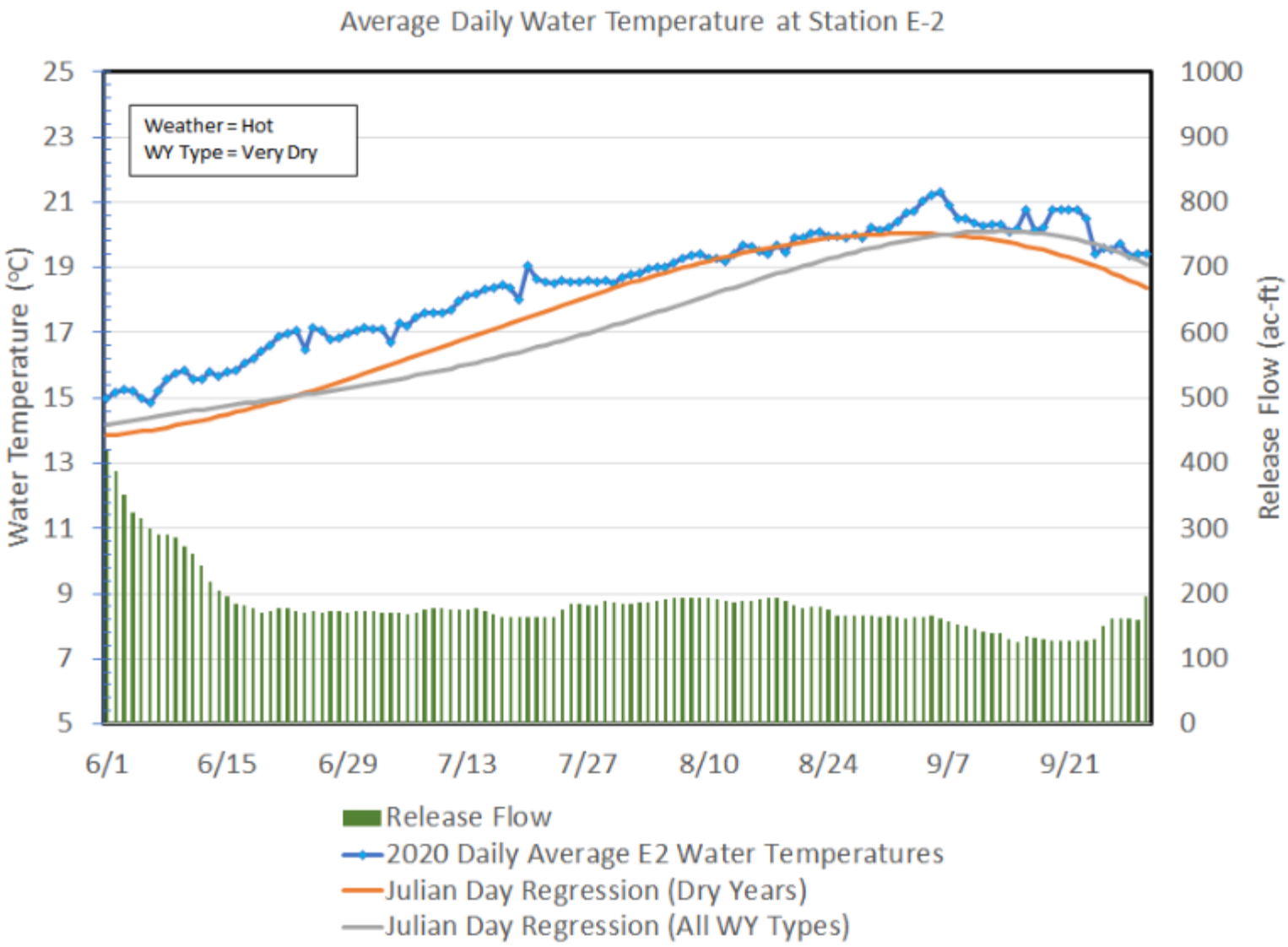


Figure B11: Comparison of 2020 water temperature and release flow to regression curves.

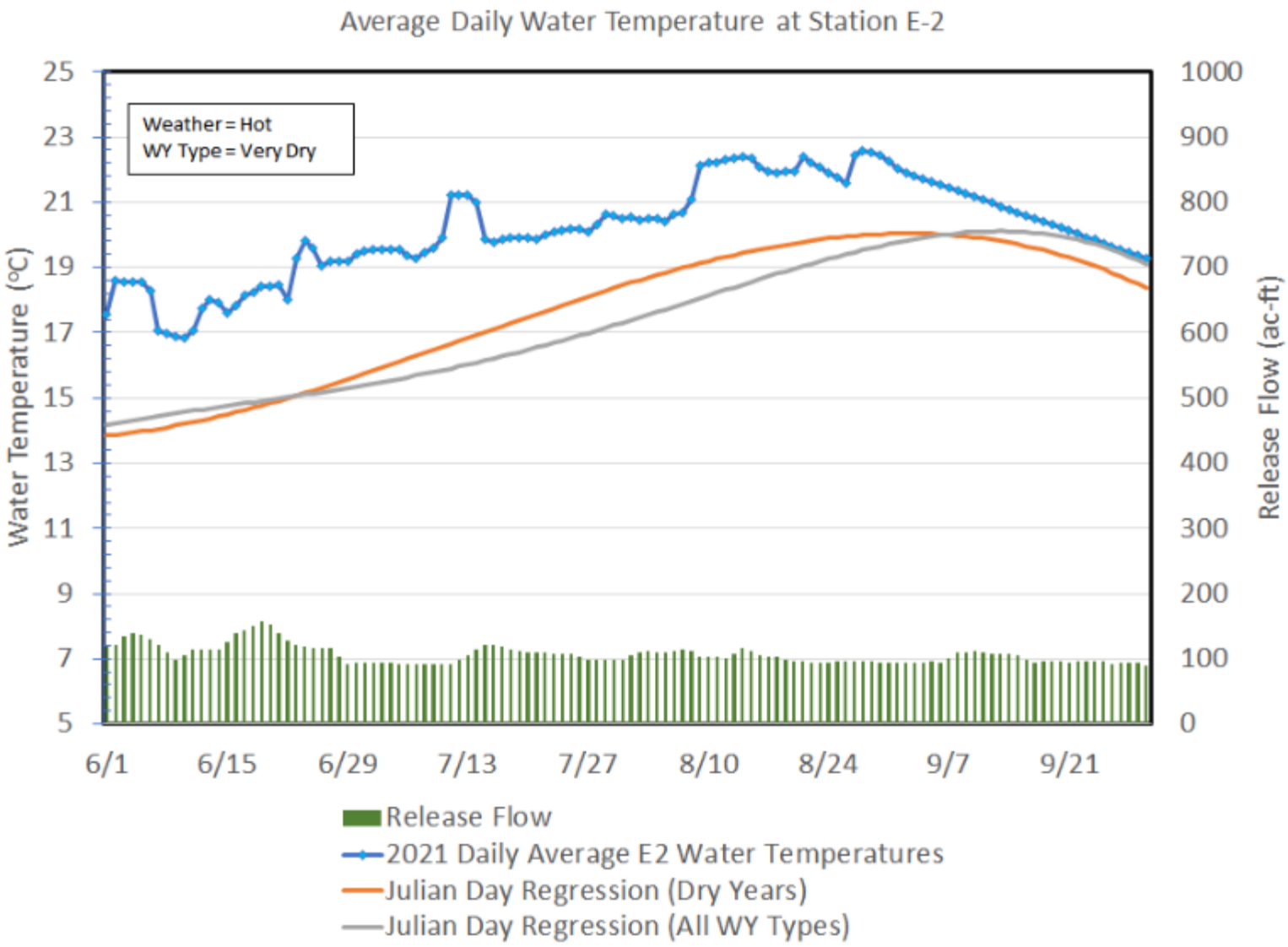


Figure B12: Comparison of 2021 water temperature and release flow to regression curves.

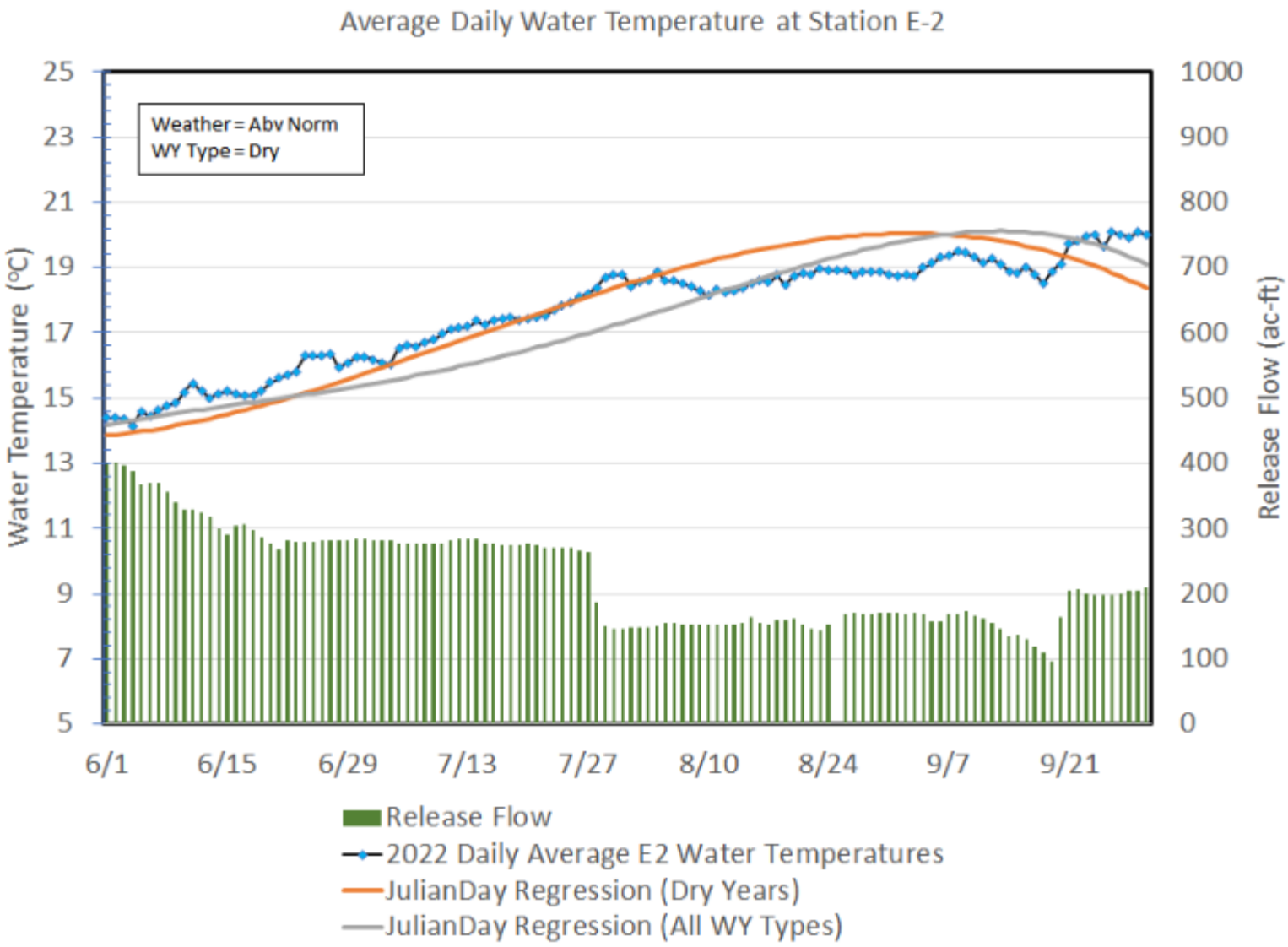


Figure B13: Comparison of 2022 water temperature and release flow to regression curves.

Document Content(s)