OPS-1 WATER CONVEYANCE ASSESSMENT STUDY PLAN

KERN RIVER NO. 3 HYDROELECTRIC PROJECT
FERC PROJECT NO. 2290

PREPARED FOR:

SOUTHERN CALIFORNIA EDISON®

Energy for What's Ahead®

KERNVILLE, CALIFORNIA

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1.0 POTENTIAL RESOURCE ISSUE

The Kern River No. 3 (KR3) Hydroelectric Project (Federal Energy Regulatory Commission [FERC] Project No. 2290) water conveyance system may be affected by rapid flow cycling (i.e., decreases or increases in flow rates and corresponding decreases or increase in water levels in the conveyance).

2.0 PROJECT NEXUS AND HOW THE RESULTS WILL BE USED

Results from this study will aid in the identification of guidelines to consider when discussing water conveyance system operations.

3.0 STUDY GOALS AND OBJECTIVES

- Conduct an engineering review and evaluation of current water conveyance conditions (i.e., hydrostatic pressure, flow depth, etc.) under varying flow conditions.

- Identify guidelines for future operational conditions using current Project information and industry best practices to maintain water conveyance system integrity.

4.0 STUDY AREA AND STUDY SITES

The study area includes the approximately 13 miles of water conveyance infrastructure that runs along the eastern hillslope above the North Fork Kern River (NFKR) between Fairview Dam and the KR3 Forebay. The water conveyance infrastructure includes tunnels, open and covered above-ground flumes, steel siphon, regulating pressure flume, forebay and penstock.

5.0 EXISTING INFORMATION

Project operations divert water in the NFKR towards the intake at Fairview Dam where flow is directed through a sediment settling basin (sandbox), and then into a series of tunnels, open and covered aboveground flumes, and a steel siphon before connecting to a regulating pressure flume, forebay, and penstocks leading to the KR3 Powerhouse. The Project water conveyance system conveys up to approximately 600 cubic feet per second (cfs) and descends between 1.5 and 2 vertical feet for every 1,000 horizontal feet.

Key components of the water conveyance system include:

- Twenty-four tunnel segments totaling approximately 60,270 feet and varying in length from several hundred feet to over 1 mile. The tunnel segments range in size from 8.5 feet wide by 8 feet high to 9.5 feet wide by 8 feet high. Tunnel portal access points, or adits, are situated at various tunnel or tunnel/flume junctions along the flowline.

- Aboveground sections of the conveyance system, or flumes, are located between tunnel segments. The flumes are constructed of reinforced concrete and are 8.5 feet wide and 8.25 feet high. The majority of the 4,600 feet of flumes are enclosed;

however, there is approximately 1,000 feet of uncovered, or open-topped flume segments.

- Two smaller diversions, Salmon Creek Diversion and Corral Creek Diversion, were built to divert seasonal runoff from the creeks, and diverted flow is directed into the main water conveyance system via aboveground pipes. Both diversions were constructed after the main water conveyance system.

- The Cannell Creek Siphon (historically called Brush Creek Siphon) is situated approximately 1 mile upstream from the KR3 Forebay. The siphon is made of riveted steel pipe and is supported on concrete piers that are anchored to bedrock as it crosses above Cannell Creek. The total length of the siphon is 1,146 feet with a diameter of 9.5 feet at the upstream tunnel connection narrowing to 8 feet at the lowest point.

- The end of the water conveyance system consists of a 9.5-foot diameter, 1,100-foot reinforced concrete pipe, referred to as the pressure flume, and a 61-foot-long, 20-foot-wide, and 30-foot-high concrete forebay box structure.

The Project is operated as a run-of-river facility in accordance with the FERC license that was issued on December 24, 1996 (77 FERC ¶ 61,313) and subsequently amended in 1997 (81 FERC ¶ 61,162), 2004 (107 FERC ¶ 62,136), and 2019 (166 FERC ¶ 62,049).The amount and timing of flow diverted for power at Fairview Dam is a function of inflow from the NFKR upstream of the Project, FERC License requirements for minimum instream flow (refer to License Article 406), seasonal whitewater flow releases (refer to License Article 422), flowline capacities, and other operational agreements. Furthermore, License Article 407 states that the “the Licensee shall operate the project such that flow reductions [below Fairview Dam in the NFKR] do not exceed 30 percent of the existing flow per half hour.”

6.0 STUDY APPROACH

A two-phased approach will be utilized to complete a desktop engineering review and evaluation of current conveyance flowline conditions.

Phase 1 includes an assessment to summarize existing and available information on the Project conveyance. Additionally, any readily available industry guidance on flow cycling and effects to tunnel integrity will be reviewed and summarized, as applicable.

Information sources may include, but are not limited to:

- Project documents including as-built drawings, hydraulic information, descriptions of recent refurbishment work conducted on the tunnels, and any recent inspection reports;

- Interviews with Southern California Edison (SCE) Company’s Project Operators and review of Station Orders or other documents describing SCE’s current operational

practices when cycling conveyance flows in accordance with license requirements, or during tunnel dewatering events for maintenance outages;

- Geologic maps and other published information; and
- Literature review of studies on tunnel structural integrity and long-term effects of cycling tunnel flows and industry best practices.

Phase 2 will utilize the information obtained during Phase 1 to further describe the existing conditions within the Project conveyance flowline during operations and includes:

- An initial hydraulic assessment (e.g., conveyance flow depth, internal flowline pressure, flow velocities, etc.) for various flows up to approximately 600 cfs. This information will further be used to describe, for example, potential conveyance lining abrasion and to inform lining stability assessments along the various segments of the conveyance flowline.
- A preliminary structural integrity assessment, including uplift and unbalanced hydraulic pressure loading of lined/unlined tunnel sections during flow increases and decreases as well as changes in conveyance flowline conditions at transition points (i.e., tunnel-flume junctions).

The results of the Phase 1 and Phase 2 analyses will be used to compile a list of guidelines and/or considerations for use when evaluating long-term Project operations.

The conveyance flowline analysis will be supported by SCE engineering staff and work will be conducted by independent contractors knowledgeable about hydropower engineering principles and with expertise in tunnels and underground structures.

7.0 REPORTING

SCE will file an Initial Study Report (ISR) within 1 year following FERC's Study Plan Determination (estimated August 3, 2023) and an Updated Study Report (USR) no later than 2 years after FERC's Study Plan Determination. The ISR and USR will provide an update on SCE's overall progress in implementing the Study Plan and schedule and the data collected, including an explanation of any variance from the Study Plan and schedule. A Technical Memo will be appended to either the ISR or USR filing, as applicable. The information provided in the Technical Memo will be summarized in, and appended to, the Application for New License.

In addition, SCE may prepare interim reports during the study year to apprise Stakeholders on study implementation progress and to support consultation with Stakeholders.

8.0 SCHEDULE

SCE is proposing to conduct this study during the course of one study year as outlined below.

Date	Activity
Winter 2022/2023	Conduct desktop analysis and prepare Technical Memo
August 2023	Provide Technical Memo with ISR

ISR = Initial Study Report

9.0 LEVEL OF EFFORT AND COST

The estimated cost (2022 dollars) for the study is approximately $60,000 to $75,000, which includes study-specific consultation, data compilation and analysis, and reporting.

10.0 REFERENCES

None.