BISHOP CREEK PROJECT
INSTREAM FLOW NEEDS

TO: Bishop Relicensing TWG

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SUBJECT: PHABSIM transect selection - Summary of conference call

DATE: October 25, 2019

Southern California Edison (SCE) is currently undergoing relicensing for the Bishop Creek Hydroelectric Project (FERC Project No. 1394) (Project), utilizing the Integrated Licensing Process (ILP) pursuant to 18 CFR § 5.6, with additional consultation conducted early in the process to allow certain field studies to be implemented without delay. During consultation the Fisheries Technical Working Group (TWG) identified the need for an Instream Flow Incremental Methodology (IFIM) study to assess and potentially refine the existing minimum flow requirements below the Project's spillways. Existing minimum flows are based on the results of an IFIM study conducted during the prior relicensing (EA, 1986). The IFIM study will be supported by a Physical Habitat Simulation (PHABSIM) model, and as such, SCE subsequently developed a study plan in consultation with the TWG to address the issue which calls for a mesohabitat survey the Bishop Creek study area as a precursor for selecting study sites for further PHABSIM modeling. During September 2019, SCE conducted a mesohabitat survey (See memo of October 4, 2019) that informed the TWG 's initial selection of reach-specific study sites. This memo summarizes transect selection decisions completed by the TWG on the conference call of October 24, 2019.

The TWG convened a webinar-format conference call on October 24 to scrutinize detailed aerial drone photography and high-resolution video flyovers of each reach. Each flyover was reviewed and discussed. Movie clips were rerun and paused at candidate transect locations and boundaries. An image was harvested from each video so that specific collectively selected transects could be marked to document decisions.

Reaches are numbered sequentially from downstream to upstream following the pattern established in the prior IFIM Study (*EA Engineering, Science and Technology, Inc. 1988*). Reach boundaries occur at key hydrologic influences such as spillways and confluences of major tributaries including Coyote Creek, and the Middle and South forks of Bishop Creek, for a total of 10 reach segments. For purposes of this memo, transects have been provisionally numbered sequentially from downstream to upstream, following standard PHABSIM protocol.

A study site was located in each reach. The TWG agreed that the focus should be on **critical** habitat rather than **representative** habitat. Critical habitat refers to those mesohabitats that are strategic to the targeted species and life stages regardless of whether it is a commonly-occurring mesohabitat or not. For example, the mesohabitat mapping survey demonstrated that cascades, high gradient riffles and plunge pools are dominant mesohabitats in most of the reaches. However, it was agreed that the target species (*Brown trout, Owens sucker and speckled dace*) all prefer the less commonly-occurring lower gradient mesohabitat such as pools, runs and lower gradient riffles. The TWG further targeted a minimum of three transects per study site to ensure that natural variability of stream morphology, cover and hydraulics was adequately captured. The exact number of transects per reach would, however, be governed by local site-specific stream channel complexity.

It was also recognized that the high gradient of reaches 4 and 6 resulted in such a high degree of cascade and plunge pool hydraulics that modeling was infeasible. Instead the group agreed that Habitat Criteria Modeling (HCM) approach suggested by Tristan Leong (USFS) would be substituted[1].

The subject reaches are shown in Figure 1.

Bishop Creek. This portion of the study area was divided into a total of six hydrologic reaches on Bishop Creek, numbered from downstream to upstream. Flows in Reaches 1 and 2 are influenced by releases from the Intake 6 and Intake 5 spillways, respectively. Reach 3 flow is influenced by releases from Intake 4 and Coyote Creek discharge; Reach 4 is solely influenced by releases from Intake 4. Reach 5 is influenced by releases from Intake 3. Reach 6 receives flow from both the Middle Fork and the South Fork of Bishop Creek.

Middle Fork Bishop Creek. Reach 7 is influenced by releases from Intake 2; Reach 8 is influenced by releases from Sabrina Lake.

South Fork Bishop Creek. Reach 9 is influenced by releases from the Intake 2 diversion; Reach 10 is influenced by releases from South Lake.

[1] The HCM relies on obtaining empirical measurements at specific flow "snapshots" with no simulation or extrapolation to other flows.

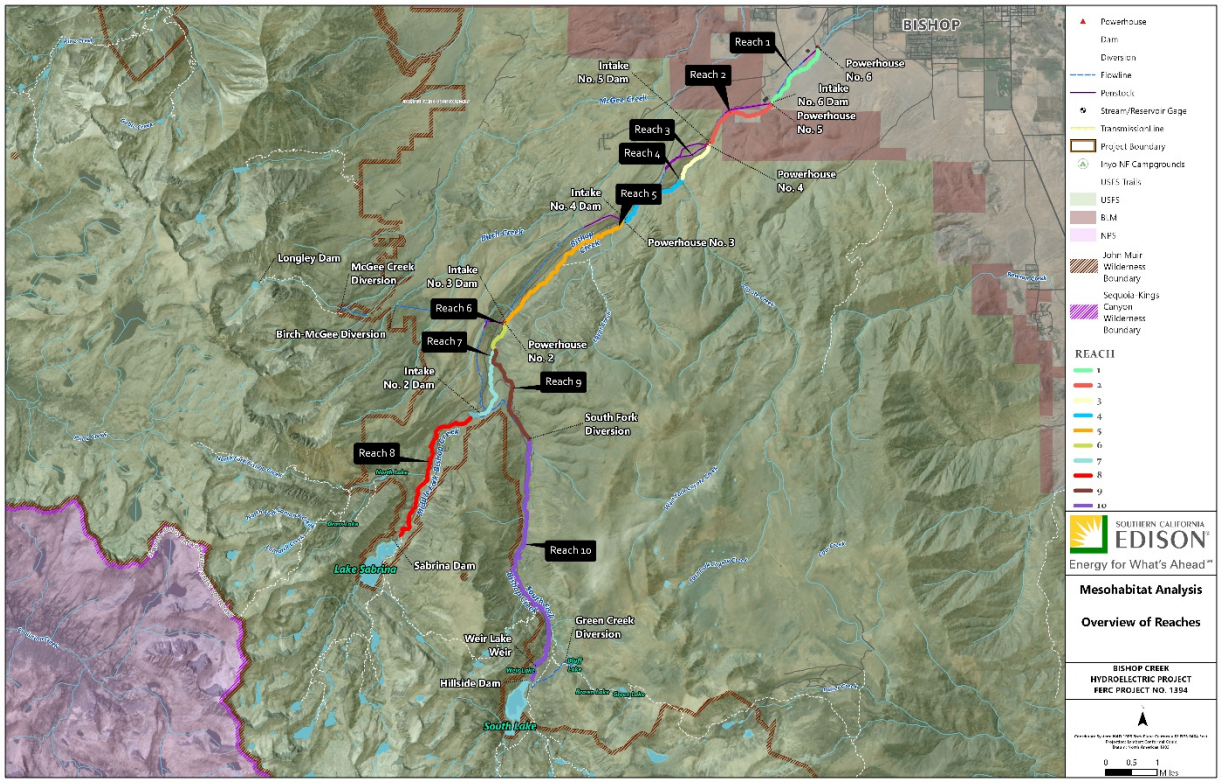

FIGURE 1 BISHOP CREEK IFIM STUDY AREA.

SUMMARY

Reach 1

Critical mesohabitat in this reach was identified as the repeating pattern of low gradient riffle/shallow pool complexes. The overall pattern repeats, but there are variations in microhabitat features such as channel geometry, substrate, and presence/absence of point bars.

PHOTO PLATE 1 REACH 1, BISHOP CREEK.

Reach 2

Mesohabitat in this reach is dominated by riffles separated by steeper cascades. The IFIM study site was located in a section of riffle, mixed with shallow pools that likely transition to runs at higher flows. A total of four transects were selected to characterize both riffles and pool/runs

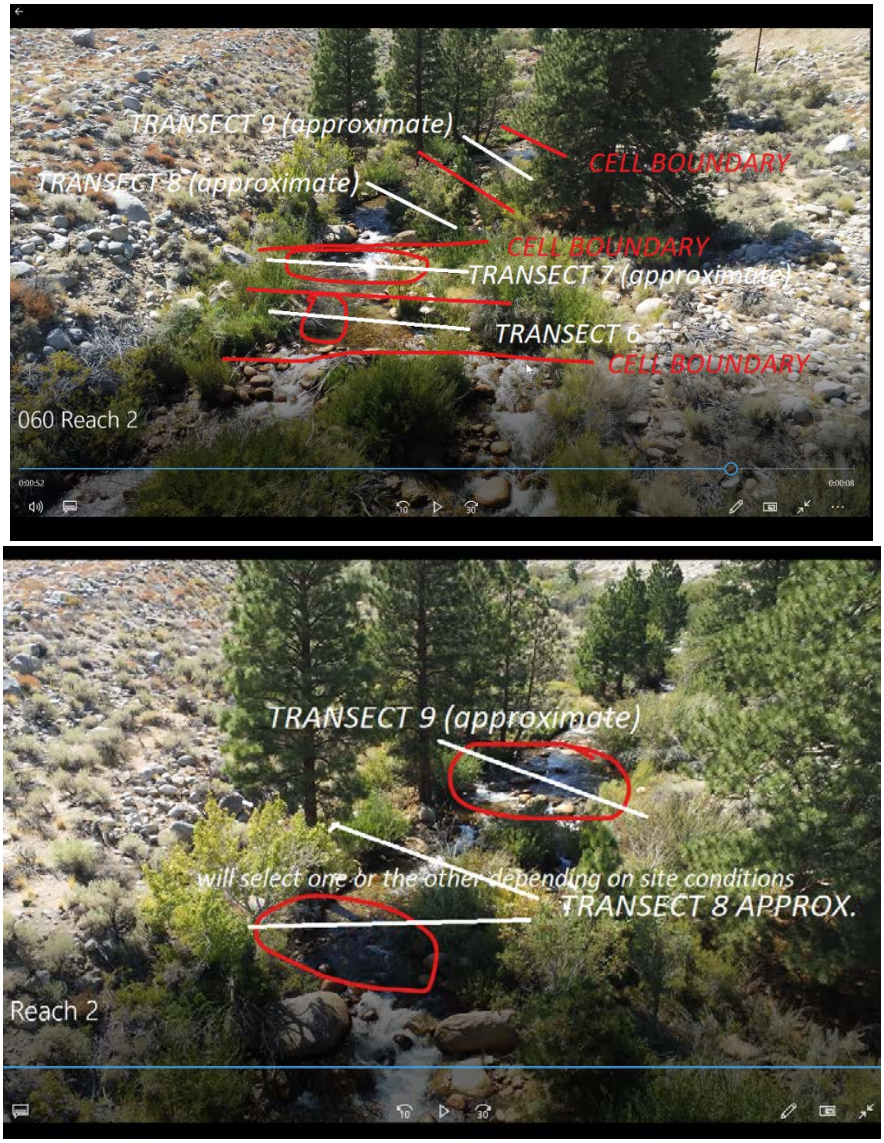

PHOTO PLATE 2. STUDY SITE 2, BISHOP CREEK. (*SECOND PHOTO SHOWS TRANSECTS 8 AND 9 MORE CLEARLY*)

Reach 3

Critical habitat in Reach 3 is dominated by riffle mesohabitat with scattered small pools. A total of four transects were selected to depict both pool and riffle habitat variations.

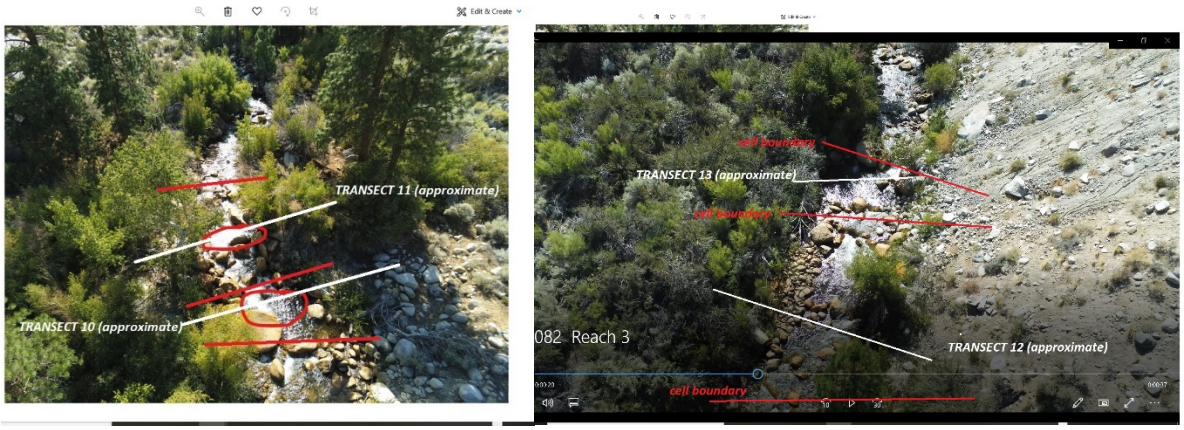

PHOTO PLATE 3 REACH 3 IFIM STUDY SITE

Reach 4

Reach 4 is dominated by very high gradient riffles (i.e., approximately 5% or greater slopes); cascades (25%) and step pools (23%) . The TWG concluded that this site would be best documented using the HCM methodology. It was agreed that the field team could select two pools to survey. Each pool should depict a balance of different cover quality and volume conditions to the extent possible.

PHOTO PLATE 4. CASCADE/STEP POOL MESOHABITAT IN REACH 4, BISHOP CREEK.

Reach 5

Reach 5 is dominated by cascade mesohabitat (58%); riffle (21%) and cascade/riffle complexes. The TWG determined that the lower gradient riffle habitat was the most critical in this reach. Three transects were selected to account for natural channel variability.

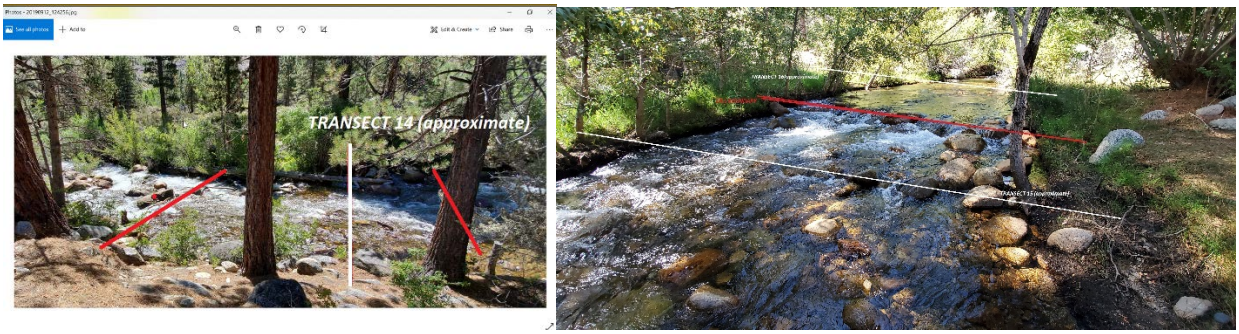

PHOTO PLATE 5. STUDY SITE 5, BISHOP CREEK.

Reach 6

Reach 6 is dominated by cascade mesohabitat. It will receive the same treatment as Reach 4.

Reach 7

Reach 7 is dominated by high gradient riffle (53%) and cascade (30%) mesohabitat; riffle (15%) and occasional riffle-pool (2%) mesohabitats are also present. Pools are extremely small. The TWG determined that the lower gradient riffle habitat was the most critical in this reach. Three transects were selected to account for natural channel variability and to capture both riffle and pool mesohabitats.

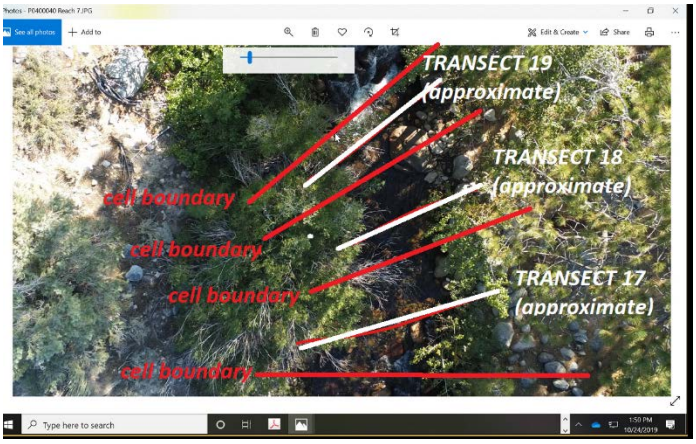

PHOTO PLATE 6. STUDY SITE 7, BISHOP CREEK.

Reach 8

Reach 8 contains significant low gradient habitats, including consecutive run, run-pool, and pool habitat in the Aspendell vicinity, collectively contributing approximately 19% of the mesohabitat in this reach. This area has numerous braided channels, woody debris and varied substrates. Such expansive complexes are relatively unique in this watershed and are rich in woody debris cover, including scour holes, undercut banks, and overhead cover. The TWG concluded that this was the most critical habitat to model in this reach. However, after review of video and photos, it was concluded that a site visit would be required to adequately select transects[2]. It is anticipated that 3 or 4 transects may be required to characterize the critical mesohabitat in this reach.

PHOTO PLATE 7. REPRESENTATIVE RUN-POOL, RIFFLE, MESOHABITAT IN REACH 8, MIDDLE FORK BISHOP CREEK.

Reach 9

Reach 9 is dominated by cascades and riffles. The TWG determined that low gradient riffles were the critical habitat in this reach, located a study site in the low gradient riffle near the U.S. Forest Service's Four Jeffreys Campground, and selected three transects to portray natural stream channel variability. The study site boundary will be established to avoid any hydraulic influence of the road bridge.

[2] A site visit has been tentatively scheduled for November 4, 2019.

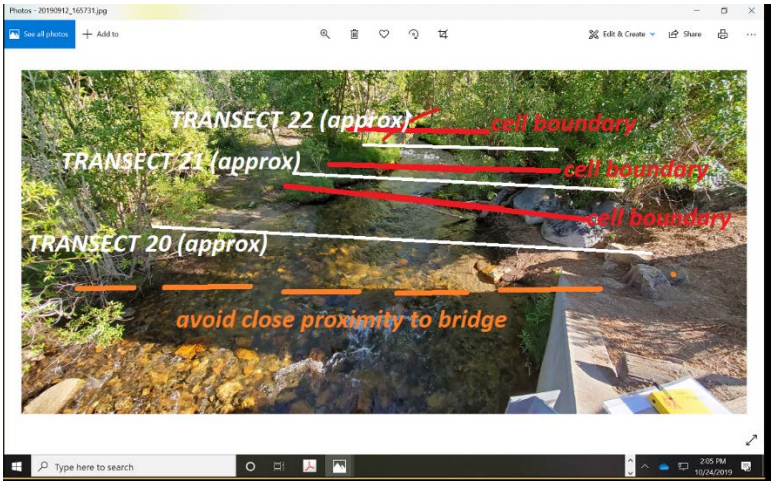

PHOTO PLATE 8 STUDY SITE 9, SOUTH FORK BISHOP CREEK.

Reach 10

Reach 10 is generally high gradient, but also is comprised of meandering run habitat, with sand and gravel substrates, and extensive meadow surrounding with riparian brush. The runs feature excellent undercut banks as well as large boulder object cover. The TWG concluded that this was the most critical habitat to model in this reach. Two study sites were selected. Although channel conditions are relatively uniform, Site 10 A (at the lower end of this mesohabitat unit) includes run-pool characteristics with gravel dominated substrate, along with undercut banks and large object cover; Site 10A (at the upper end of this unit) is a riffle/run transition area with cobble and small boulder substrate. A total of four transects will be deployed. It was concluded that the field team could select transect locations at the time of the field study. Photo Plate 9 proposes a conceptual layout of the two sites.

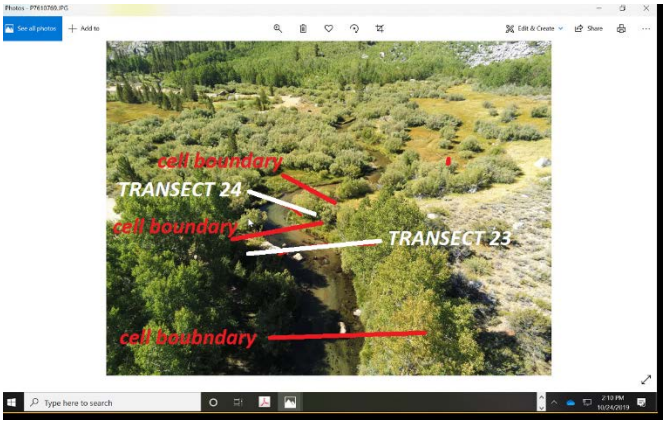

PHOTO PLATE 9. REACH 10 IFIM STUDY SITE, AND PROPOSED TRANSECT LOCATIONS.

SUMMARY

REACH	TRANSECTS	NOTES
Reach 1	5	
Reach 2	4	
Reach 3	3	
Reach 4	2	Pocket pools will be survey using HCM methodology
Reach 5	3	
Reach 6	2	Pocket pools will be survey using HCM methodology
Reach 7	3	
Reach 8	Approximately 4	To be determined by TWG site visit
Reach 9	3	
Reach 10	4	To be located by field crew at time of survey

LITERATURE CITED

EA Engineering, Science and Technology, Inc. (EA). 1988. Instream flow and fisheries report for the Bishop Creek Hydroelectric Project. EA, Lafayette, CA. January 1986. 23 p. plus attachments.