Wayne P. Allen
Principal Manager
Regulatory Support Services

Filed Electronically

December 3, 2021

Kimberly D. Bose, Secretary
Nathaniel J. Davis, Sr., Deputy Secretary
Federal Energy Regulatory Commission
825 First Street, N.E.
Washington, D.C. 20426

Subject: Bishop Creek Hydroelectric Project, FERC Project No. 1394
Updated Study Report Meeting Summary

Dear Secretary Bose:

Southern California Edison Company (SCE) hereby files with the Federal Energy Regulatory Commission (FERC) its Updated Study Report Meeting Summary for the Bishop Creek Project (Project No. 1394).

Pursuant to 18 Code of Federal Regulation (CFR) 5.15(f) an Updated Study Report (USR) and USR meeting marks the 2-year anniversary of the Study Plan Determination. SCE held a virtual USR Meeting via Microsoft Teams on November 18, 2021 from 9am – 12:30pm PST.

SCE has successfully completed the second year of relicensing studies consistent with the Revised Study Plans filed with FERC on August 29, 2019. Minor variances to study methodologies were necessary to accommodate circumstances encountered during study implementation including responding to the COVID-19 pandemic and the wildfires surrounding the Project Area. These variances were discussed with the technical working group (TWG) members and documented in the individual study sections of the USR. SCE is not proposing any additional studies for the Project. Following up on comments received during the USR meeting, SCE is including the following attachments to this meeting summary filing:

- USR Meeting PowerPoint Presentation
- Tracer Rock Study Report

Pursuant to 18 CFR 5.15(c)(3), if there is any disagreement with this meeting summary, and/or any proposed modifications to ongoing studies or new studies, any stakeholder may provide comments to FERC within 30-days of this filing.

Following the acceptance of this filing, SCE will forward the “Acceptance for Filing” e-mail generated by FERC's e-filing service to all contacts on the distribution list via e-mail. This filing, along with attachments, will also be placed on SCE's Bishop Creek Relicensing Website (www.sce.com/bishopcreek) where it will be available for download, and available for review by appointment at the Bishop Creek Hydro Headquarters Office – 4000 E. Bishop Creek Road, Bishop, CA 93514.

SCE looks forward to continuing to work with FERC and other interested parties on the Bishop Creek relicensing. Should there be any questions or concerns regarding this filing please contact

1515 Walnut Grove Avenue
Rosemead, CA 91770
626.302.9741
wayne.allen@sce.com

Matthew Woodhall, Senior Regulatory Advisor, by phone at (626) 302-9596 or via e-mail at matthew.woodhall@sce.com.

Sincerely,

DocuSigned by:
Wayne Allen
106CF18A73D445F...

Wayne P. Allen
Principal Manager

Enclosures: Meeting Summary
USR Meeting PowerPoint Presentation
Bishop Creek Tracer Rock Study Report

MEETING SUMMARY*
BISHOP CREEK HYDROELECTRIC PROJECT
TECHNICAL WORKING GROUP UPDATES
FERC PROJECT NO. 1394

DATE: November 18, 2021, 9:00 a.m. - 12:00 p.m.
LOCATION: Conference Call/Webinar
TOPIC: *Updated Study Report (USR)*

**These meeting notes are documentation of general discussions from the meeting held on the above-noted date. These notes are not a verbatim account of proceedings, are not meeting minutes, and do not represent any final decisions or official documentation for the Project or participating agencies.*

1.0 OBJECTIVES

- Outline upcoming milestones in the relicensing process
- Review and Discuss Status of Studies
  - Newly complete
  - Ongoing
- Confirm schedule and outstanding tasks that are necessary for finalizing measures.

2.0 ATTENDEES

Relicensing Team Members
Seth Carr, Southern California Edison (SCE)
Martin Ostendorf, SCE
Calvin Rossi, SCE
Vince White, SCE
Audry Williams, SCE
Matthew Woodhall, SCE
Finlay Anderson, Kleinschmidt
Matt Harper, Kleinschmidt
Tyler Kreider, Kleinschmidt
Brandon Kulik, Kleinschmidt
Bret Hoffman, Kleinschmidt
Shannon Luoma, Kleinschmidt

Technical Working Group Members & Interested Parties
Dannon Dirgo, US Forest Service (USFS)
Todd Ellsworth, USFS
Sheila Irons, USFS
Tristan Leong, USFS
Richard McNeill, USFS
Kary Schlick, USFS
Nathan Sill, USFS
Brandy Wood, CA Department of Fish & Wildlife (CDFW)
Jill North, State Water Resources Control Board (SWRCB)

Lynn Compas, Historical Research Associates, Inc.
Ian Pryor, Stillwater Sciences
Michael Donovan, Psomas
Brad Blood, Psomas
Jim Sandlin, MacKay Sposito
Joey Verdian, Stillwater Sciences
Parker Thaler, SWRCB
James Hastreiter, Federal Energy Regulatory Commission (FERC)
Frank Winchell, FERC
Kyle Olcott, FERC

Facilitation Team
Mike Harty, Kearns & West
Lindsay Tryba, Kearns & West

3.0 COMPILED ACTION ITEMS

- **Relicensing Team** will recirculate a previous FERC letter that shows the USR process timeline.
- **Relicensing Team** will distribute the slide outlining the status of the studies to TWG members.
- **Relicensing Team** will follow up with Beth Lawson, CDFW, on the Operations Model because she missed this meeting.
- **Relicensing Team (Matt Harper)** will work with USFS to identify roads that are frequently used by off-highway vehicles (OHV) when analyzing Project roads under the Project Boundary and Lands (LAND 1) study. This information will be included in the DLA.
- **Relicensing Team** (Matt Woodhall) will follow up with the USFS regarding the timeline for placing the Green Creek Diversion back in service.

4.0 INTRODUCTION & GENERAL QUESTIONS

The Kearns & West facilitator welcomed participants and introduced the Kleinschmidt Relicensing Team ("Team"). Today's meeting fulfills a Federal Energy Regulatory Commission (FERC) requirement to review the studies conducted in 2021. The goal of the meeting is to examine those studies and build consensus that they were conducted in their intended manner so that FERC can continue with an environmental review. Each Relicensing Team Resource Area Lead will review the complete and ongoing studies for their resource area and answer any questions from participants.

Finlay Anderson, the Team Lead, outlined the Updated Study Report (USR) process and next steps. The USR timeline includes the following: the USR was filed on November 4, 2021; the USR meeting is on November 18 (today); the USR meeting summary will be filed with FERC on December 3; stakeholder comments or disagreements on the Meeting Summary are due on January 3, 2022; SCE will respond to comments by February 2; and the FERC Director will resolve any unresolved study disputes.

Questions and comments from participants included:

- Question (Q) (USFS): Can you contextualize the meeting dates and how these fit into the FERC timeline?
    - Response (R) (Relicensing Team): We will try to be as clear as possible about which meetings are FERC-required and which are additional; you can reference Slide 7 for the process timeline. The FERC deadline for the Draft License Agreement (DLA) is the end of

January 2022, and this is a hard FERC-required deadline. SCE will continue conversations with resource agencies and interested parties after the DLA is filed. FERC requires SCE to file a USR meeting summary within two weeks of today.
    - **Action**: Relicensing Team will recirculate FERC's letter from October 2019 approving the waiver request that shows the Project timeline.
- Comment (C) (USFS): There is a lot going on, and it is difficult to complete all the work with overlapping deadlines for multiple relicensings.
    - R (Relicensing Team): Yes, we're aware of the overlap. These deadlines are set by FERC requirements, but we will work with agencies to accommodate schedules whenever possible.

Finlay provided an overview of the status of Relicensing Studies (see slide 10). Questions and comments from participants included:

- Q (USFS): Can you please redistribute the status of studies?
    - R (Relicensing Team): Yes, we will share this slide, and you can also reference this information in the USR.
    - **Action**: The Relicensing Team will send out the status of the studies slide to this group.
- C (USFS): Please minimize the use of acronyms for this meeting.
- Q (USFS): Since this project is using the Integrated Licensing Process (ILP), is there a reason why it was decided that a Draft License Application (DLA) was required by January versus a Preliminary License Proposal (PLP). I would suggest that we differentiate the post-application phase vs. pre-application.
    - R (Relicensing Team): The decision for the DLA was made early in the process and reflects the Team's decision to pursue early outreach and ongoing efforts to work collaboratively with the resource agencies. Given all that early collaboration, the expectation was that, during this stage of the process, more studies would be completed. COVID-19, and wildfire smoke delayed many of the studies.
    - Q (USFS): Is it a good gut check to reassess the process at this time?
        - R (Relicensing Team): We will proceed with the DLA at this point. We will need to continue to work between the DLA and Final License Application (FLA). As well, the functional differences between a PLP vs the DLA are not significant – content requirements the DLA's environmental analysis matches that of the PLP. Most licensees file a DLA because helps them keep on track with other exhibits. A PLP would also be subject to the same schedule and be due to FERC at the end of January.

5.0 CULTURAL RESOURCES

5.1 STUDY SUMMARY

Below are the goals and objectives for the Cultural Resource studies; these were reviewed and followed by the Team's high-level summary of the study results. The field schedule was delayed due to COVID-19 and California wildfires; thus, SCE is proposing to defer some analyses to the Historic Properties Management Plan (HPMP). Reference the meeting slides for more detail.

Goals and objectives included:

- Identify Cultural Resources and Potential Project Effects to those Resources
- Provide a description of the known cultural resources of the proposed project and surrounding area

5.2 QUESTIONS & COMMENTS

Audry Williams, Relicensing Team Cultural Lead, presented the cultural resources study timeline and results. Questions and comments from the participants included:

- Q (USFS): Will the Cultural Resources studies be completed and included in the DLA?
    - R (Relicensing Team): Yes, that is the goal.

5.3 ACTION ITEMS

- N/A

6.0 TRIBAL RESOURCES

6.1 STUDY SUMMARY

Below are the goals and objectives for the Tribal Resource studies; these were reviewed and followed by the Team's high-level summary of the study results to date. The interview schedule was delayed due to COVID-19 tribal office closures, and effects from California wildfires; thus, SCE is proposing to defer some evaluations to the HPMP. Reference the meeting slides for more detail.

Goals and Objectives

- Identify Tribal Resources and Potential Project Effects to those Resources
- Provide a description of Indian Tribes, Tribal lands, and associated interests that may be affected by the project

6.2 QUESTIONS & COMMENTS

Audry Williams, Relicensing Team Tribal Lead, presented the Tribal Resource study timeline and results. Questions and comments from the participants included:

- Q (FERC): For Tribal resources, it looks like there are some interviews that still need to be conducted. Will we see a Tribal resources report with the DLA?
    - R (Relicensing Team): Yes, we will submit the known information in the DLA. That said, we may not have comments from USFS, which means that we will still need to update information after the DLA.
        - C (FERC): Please reference in the DLA which reviews are still needed.
- Q (FERC): Will you submit a draft HPMP with the DLA?
    - R (Relicensing Team): No, there will not be a draft HPMP with the DLA, but an overview of the intent and purpose of the HPMP will be described.
    - C (FERC): Please include in the DLA that the draft HPMP is outstanding and needs review. The HPMP should be completed when you file the FLA.

        - C (Relicensing Team): We will begin drafting the HPMP in December and will add to it as agency and Tribal review occur.
            - C (FERC): Good, I like that timeline and understand the serious delays due to COVID-19 and the wildfires.
- Q (FERC): Are you planning more excavations?
    - R (Relicensing Team): Yes, there are some cultural sites that will likely need to be evaluated through excavation, but which sites and the logistics still need to be run past USFS. USFS may say that we do not need to test the sites. We will include language in the DLA that shows the sites that are not impacted by Project activities and may not need to be tested.
- Q (FERC): When would those excavations be completed?
    - R (Relicensing Team): Ideally, these will be completed in time to be included in the HPMP.
- Q (SWRCB): Are the Tribes aware of this timeline, and what are their thoughts?
    - R (Relicensing Team): Yes, the Tribes have been informed, but we have not received recent comments on the timeline.
- Q (USFS): Were there any ditches on the "Buttermilk" side of the Project by McGee and Birch Creek? When you talk to the Tribe's elders, you should ask if the ditches are used by the range permittees.
    - R (Relicensing Team): There are ditches everywhere, but I do not know which ditches are used by range permittees.
    - **Action**: .If the Tribal Resources study identifies that these ditches are used by the tribes, this information included in both the cultural and Tribal resources technical reports.
- Q (FERC): When you file the HPMP and receive review comments, will you revise the HPMP according to those comments?
    - R (Relicensing Team): Yes, we will revise the HPMP accordingly following the comments.

7.0 WATER QUALITY

7.1 STUDY SUMMARY

Below are the goals and objectives for the Water Quality studies; these were reviewed and followed by the Team's high-level summary of the study results. Reference the meeting slides for more detail.

Goals and Objectives:

- Monitor WQ (Turb., Cond., TDS, PO_4^{-3}, NO_3, N-tot) on a regular basis at Bishop Creek, South Lake, and Lake Sabrina
- Monitor water temperature & DO for 2 years at Bishop Creek, South Lake, and Lake Sabrina
- Monitor *E. coli* at recreation areas in July-Aug.
- Ensure future Project facilities & operations are:
    - Consistent with WQ goals and objectives for Bishop Creek in the Basin Plan
    - Consistent with desired conditions in the 2018 Inyo National Forest Management Plan

7.2 QUESTIONS AND COMMENTS

Michael Donovan, Relicensing Team Water Quality Lead, presented the Water Quality study timeline and results. Questions and comments from the participants included:

- N/A

7.3 ACTION ITEMS

- N/A

8.0 SEDIMENT AND GEOMORPHOLOGY

8.1 STUDY SUMMARY

Below are the goals and objectives for the Sediment and Geomorphology studies; these were reviewed and followed by the Team's high-level summary of the study results. Reference the meeting slides for more detail.

Goals and Objectives:

- Determine flow conditions in which sediment is mobilized in the stream channel
- Understand if and how LWM is mobilized
- Evaluate flows that could mobilize sediments and LWM from forebays
- Evaluate how operations (flow release timing, magnitude, and duration) could be modified to provide sediment transport flows
- Understand potential sediment inputs and impacts from higher flows to reaches below Plant 6 from
  proposed changes in flow/operations

8.2 QUESTIONS AND COMMENTS

Tyler Kreider, Kleinschmidt, and Ian Pryor, Stillwater Sciences, presented the Sediment and Geomorphology study results, including an update on the Tracer Rock study. Questions and comments from the participants included:

- Q (USFS): Are the sites referred to as Sites 4.1 and 4.2 in your results the same as the Riparian study sites with the same names?
  - R (Relicensing Team): Yes, they align with the Riparian study sites. The sites were established in approximately 1990 as part of monitoring required through the existing license.
- C (Relicensing Team): A preliminary Tracer Rock Study Report will be included as part of the USR Meeting Summary filing on December 3. The final report will be incorporated into the final Sediment and Geomorphology Technical Report with the DLA.

8.3 ACTION ITEMS

- N/A

9.0 BISHOP CREEK OPERATIONS MODEL

9.1 STUDY SUMMARY

Below are the goals and objectives for the Bishop Creek Operations Model study; these were reviewed and followed by the Team's high-level summary of the study results. Reference the meeting slides for more detail.

Goals and Objectives:

- Calculation of System Inflows
- Based upon hydrologic data, not subject to changing allocation rules
    - Calculated increase of storage plus flow release from reservoirs
    - Ungauged areas synthesized based on gauged areas
    - Changes in flow release requirements do not affect inflow calculations, only allocations; model rules set according to current requirements
    - Mass balance for calibration: net calculated inflow vs. outflow gauged
- Align model with needs of other relicensing studies and information needs
- Develop procedures to configure the model for alternative operational scenarios and document results

9.2 QUESTIONS AND COMMENTS

Bret Hoffman presented the operations model progress. Questions and comments from the participants included:

- N/A

9.3 ACTION ITEMS

- **Action**: Relicensing Team will follow up with Beth Lawson, CDFW, on the Operations Model as she was unable to attend this meeting.

10.0 RECREATION USE & NEEDS (REC 1)

10.1 STUDY SUMMARY

Below are the goals and objectives for the Recreation Use & Needs (REC 1) study; these were reviewed and followed by the Team's high-level summary of existing and outstanding study results, as well as immediate next steps for finalizing the data. Reference the meeting slides for more detail.

Goals and Objectives:

- Characterize existing use and needs
- Evaluate adequacy of existing recreation opportunities to meet current needs
- Estimate future Project-related recreational demand and needs
- Methods
    - Web-based Recreation Use Survey
    - Creel Survey

- Spot Counts
- Traffic Counters
- Trail Counters

Recreation Next Steps and Timeline:

- **November 2021 – January 2022**: Compile and analyze data. Prepare Technical Report.
- **January 2022**: Submit Technical Report as part of the Draft License Application (DLA).
  - Report will be sent out separately for TWG comment
- **March 23, 2022**: Comments due on Technical Report.
- **Late Q1, 2022**: Recreation & Land Use TWG Meeting to discuss comments and results.

10.2 QUESTIONS AND COMMENTS

Matthew Harper, Relicensing Team Recreation and Land Use Lead, presented the Relicensing Team's study results. Questions and comments from the participants included:

- Q (SWRCB): I know climbing is one of the recreation uses; are there other climbing areas within the Project area besides Little Egypt?
  - R (Relicensing Team): There are no climbing areas within the Project boundary, as most of the climbing near the Project is at higher elevations and within the John Muir Wilderness. Access to Little Egypt climbing area was included in recreation studies because SCE's Plant 3 parking facilities have been used by climbers to informally access the area. Data collected will be used to determine how to potentially manage or preclude this use.
- Q (SWRCB): Why didn't you break out climbing specifically in your recreation analysis?
  - R (Relicensing Team): A summary of climbing activity in the Project area was included in the PAD, though there were no data gaps identified that warranted a more detailed study of climbing use in the area.
- Q (USFS): Was there a decision to not include off-highway vehicles (OHVs) as part of the study?
  - R (Relicensing Team): No data gaps related to OHV use were identified in the development of study plans. This is good information to know and consider in our discussion and desktop analysis as part of the LAND 1 study. Once we have provided our initial inventory for discussion, we would appreciate your feedback on which of those roads have issues with OHV use.
  - R (Relicensing Team): We likely don't need a field study for this; This could be part of the conversation when we study the roads that are associated with the Project (Lands and Roads study). Perhaps you can help point out which trails are most heavily used by OHVs.
    - C (USFS): USFS considers all Level 2 roads for OHV use. Sand Canyon and Coyote Road receive a lot of OHV use.

10.3 ACTION ITEMS

- **Relicensing Team (Matt Harper)** will work with USFS to identify roads that are frequently used by OHVs when analyzing Project roads under the Project Boundary and Lands (LAND 1) study. USFS suggests addressing this in the DLA.

11.0 RECREATION FACILITIES CONDITION & PUBLIC ACCESSIBILITY (REC 2)

11.1 STUDY SUMMARY

Below are the goals and objectives for the Recreation Facilities Condition and Public Accessibility (REC 2) study; these were reviewed and followed by the Team's high-level summary based on the study results. Reference the meeting slides for more detail.

Goals and Objectives:

- For Project-related recreation areas, assess the condition of existing recreation facilities
    - Full Facilities Condition Assessment and Inventory
- Assess the need to formalize or reclaim (due to environmental concerns) dispersed or informal use areas
    - Dispersed Use Assessment
- Analyze economics of current and future Project-related O&M of recreation facilities
    - Operations and Maintenance Economics Assessment

11.2 QUESTIONS AND COMMENTS

Matthew Harper, Relicensing Team Recreation Lead, presented the Relicensing Team's study results. Questions and comments from the participants included:

- Q (Relicensing Team): The Relicensing Team noted that to fully meet study objectives, an analysis of past operations and maintenance activity at the studied facilities would be performed. To date, no costing information from the US Forest Service had been received. The Relicensing Team asked whether this analysis was still desired, and if so, what information might be provided.
    - R (USFS): We do have some O&M information that we can provide, understanding that we will be discussing these sites in greater detail as we move forward.
- Q (USFS): Did you say that Green Creek Diversion is not currently being used?
    - R (Relicensing Team): The diversion is not currently in service; we will follow up on the timeline for placing Green Creek Diversion back in service.

11.3 ACTION ITEMS

- **Relicensing Team (Matt Woodhall)** will follow up with the USFS regarding the timeline for placing the Green Creek Diversion back in service.

12.0 PROJECT BOUNDARY & LANDS (LAND 1)

12.1 STUDY SUMMARY

Below are the goals and objectives for the Project Boundary and Lands (LAND 1) study; these were reviewed and followed by the Team's high-level summary of the study results. Reference the meeting slides for more detail.

Goals and Objectives:

- Assess Project boundary for accuracy
- Determine Project lands needed for operation (including roads, trails, and spoil areas)
- Assess Project boundary for potential modifications
- Confirm ownership of Project lands

12.2 QUESTIONS AND COMMENTS

Matthew Harper, Relicensing Team Recreation and Land Use Lead, presented Relicensing Team's study results. Questions and comments from the participants included:

- C (USFS): For the areas that SCE wants to add, we're wondering what (if any) mitigation would be associated with the impacts from the beginning since these were not part of the original license. We talked about addressing OHV in the LAND 1 analysis. So, perhaps a mitigation conversation can be addressed somewhere, but these discussions could bleed into other discussions.
    - R (Relicensing Team): We agree that there's a lot of overlap in these discussions, which has been our goal to combine discussions for both recreation and land use into one TWG, the Recreation and Land Use TWG, in order to facilitate those cross-over conversations.
- Q (SWRCB): Since I am just joining this project, I would like to make sure that I have the upcoming requested comment deadlines for Rec. I know the REC 2 study comments are due by December 5. Is there another request due December 14? Is that REC 1?
    - R (Relicensing Team): On December 5, comments on the LAND 1 memo are due. On December 14, comments are due on the REC 2 Technical Report. A progress report technical memo for REC 1 was filed with FERC as part of the USR, no comments are due at this time. The REC 1 Final Technical Report will be submitted with the DLA end of January, with comments welcomed through March. The main goal is to have all of the information available for review before we have a Recreation & Land Use TWG meeting late in Q1.

12.3 ACTION ITEMS

- N/A

13.0 SCHEDULE AND NEXT STEPS

The Relicensing team reviewed the upcoming schedule and next steps:

- By December 3, 2021, SCE will file a meeting summary with FERC, which will identify:
    - Any additional/supplemental information available at that time
    - Any proposed study modification to ongoing studies, new studies
- Within 30 days of the USR Meeting Summary filing (tentatively January 3, 2022), participants or the Commission staff may file:

    - A disagreement concerning information in the applicant's meeting summary.
    - Any proposed modifications to ongoing studies or new studies.
- Draft License Application due January 31, 2022.

The following table includes the FERC-related deadlines through the rest of the relicensing:
**Italicized meetings in table are additional meetings being proposed by SCE and are not required by FERC*

Task	**Date**
USR Meeting	November 18, 2021
USR Meeting Summary filed with FERC	December 3, 2021
Comments due on LAND 1 memo	*December 5, 2021*
Optional Preliminary License Conditions Meetings	*December 7 & 9, 2021*
Comments due on REC 2 Technical Report	*December 14, 2021*
Comments/Modification Requests on USR Meeting Summary due to FERC	January 3, 2022
DLA due to FERC	**January 31, 2022**
SCE Response to USR Meeting Summary Comments due	February 2, 2022
Continue discussions on License Terms and Conditions	*February-March 2022*
Comments due to FERC on DLA	May 2, 2022
FLA due to FERC	**June 30, 2022**
FERC issues Tendering Notice	14 days after FLA filed
FERC decision on outstanding Additional Information Requests (AIRs)	30 days after FLA filed

The Relicensing Team thanked attendees and adjourned the meeting.

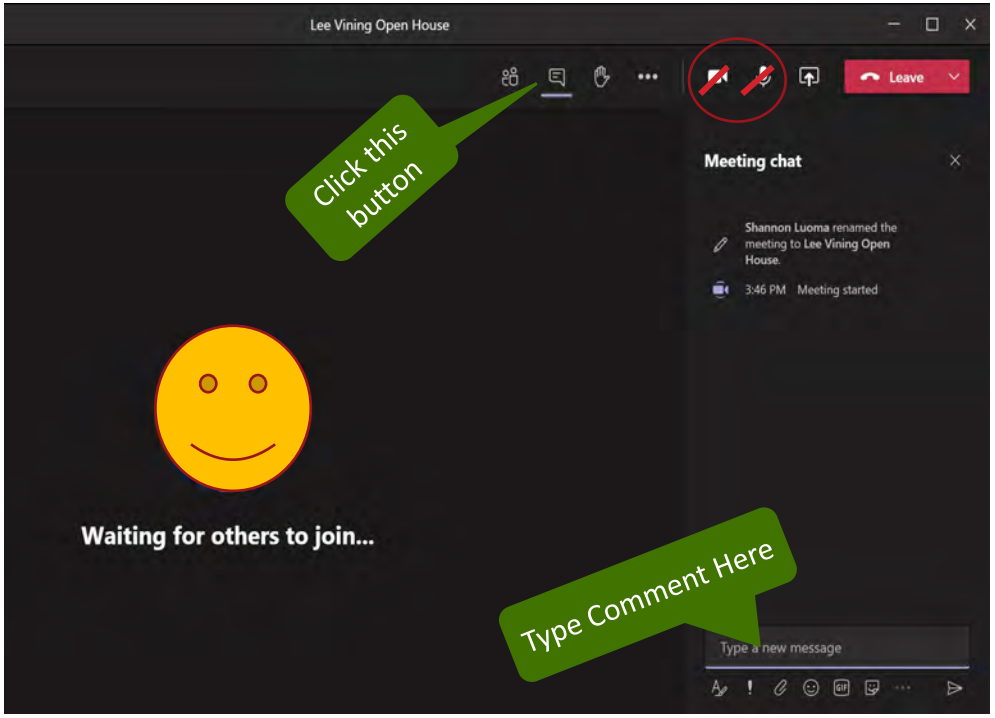
Bishop Creek Project (P-1394) Relicensing USR Meeting November 18, 2021

The meeting will begin at **9:05am**. We appreciate your patience and muting your microphone while we wait.


Stay Safe
Nutrition
Fitness
Positivity
You
Mind
Virtual
Balance
Wellness
Stay Connected
Focus
Health
Prioritize
Body

How to Ask a Question

- Please use the Chat Box
- Use the "Raise Hand" Feature to Indicate You Would Like to Ask Your Question Verbally
- Please Wait to be Called on and then Unmute Your Line
  - Introduce yourself (name and affiliation) prior to speaking
- Please Listen and Respect Each Other
- Please Stay on Topic



Bishop Relicensing Team

SCE Team

Matthew Woodhall
Project Manager

Martin Ostendorf
Senior Manager

Audry Williams
Senior Archeologist, Cultural/Tribal Study Lead

Lyle Laven

Seth Carr
Operations Manager

Vince White
Hydrographer

Consultant Team

Finlay Anderson
Project Manager

Shannon Luoma
Deputy PM

Kelly Larimer
Project Director

Michael Donovan
Water Quality

Ken Jarrett
Fisheries Study Lead

Edith Read
Botanical Study Lead

Bret Hoffman
Operations Study Lead

Tyler Kreider
Sediment and Geomorphology Study Lead

Matt Harper
Recreation/ Land Use Study Lead

Brandon Kulik
IFIM Study Lead

Brad Blood
Wildlife Study Lead

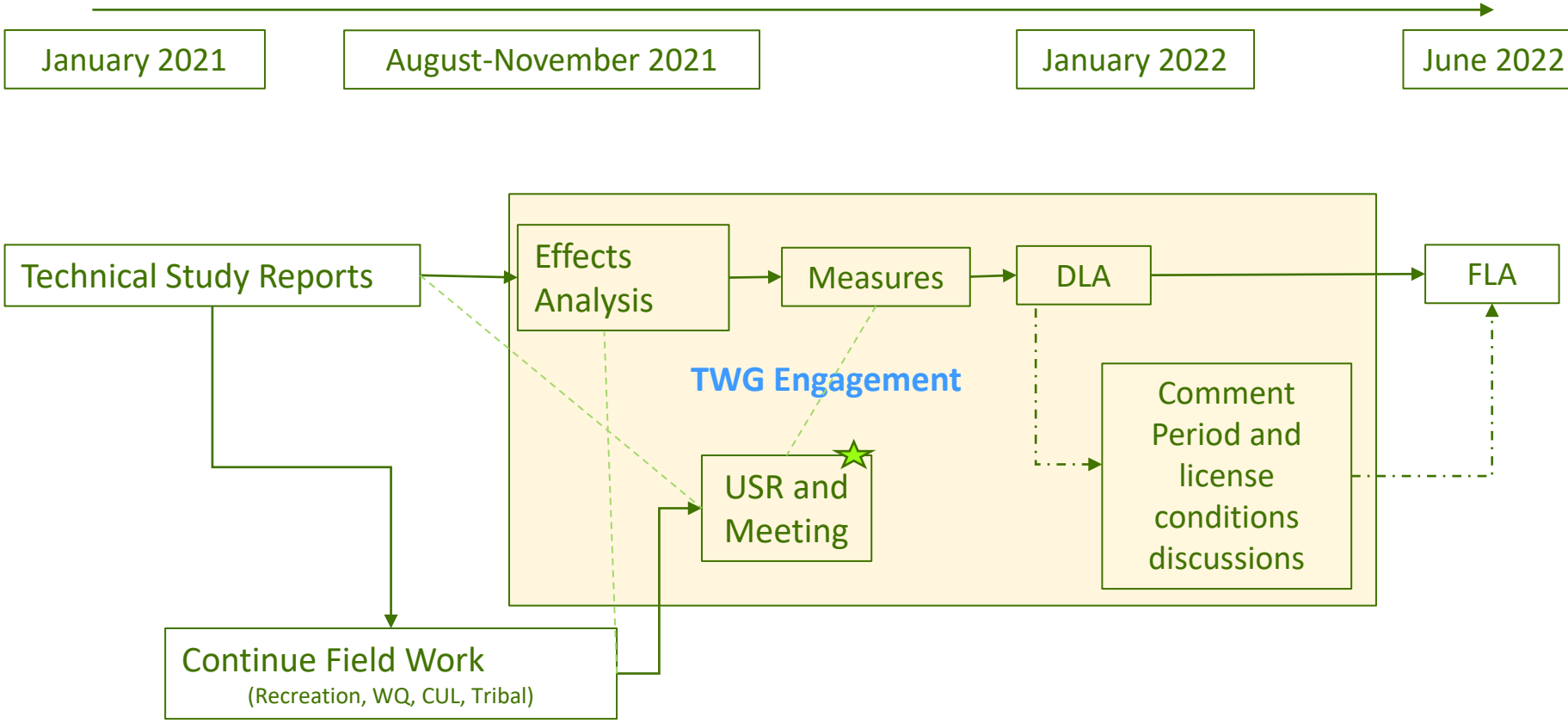
Lynn Compas
Cultural Study Lead

Shelly Davis-King
Tribal Study Lead

Meeting Objectives

- Outline upcoming milestones in relicensing process
- Review and Discuss Status of Studies
  - Newly complete
  - Ongoing
- Confirm schedule and outstanding tasks that are necessary for finalizing measures.

Process Overview



Updated Study Report Process Steps

- SCE Filed USR on November 4
  - Status of studies
  - Technical reports for studies that had substantive field work and data collection since Initial Study Report
  - Summary of variances, challenges, modifications
- USR Meeting **November 18**
- USR Meeting Summary within 15 days (**Dec 3**)
- Comments or disagreements on Meeting Summary within 30 days (**Jan 3**)
- SCE Responses within 30 days (**Feb 2**)
- FERC Director to resolve any disputes

18 CFR 5.15(d) - Criteria for Modification of Approved Study

Requestors must provide a showing of good cause that:

1) Approved studies were not conducted as provided for in the approved study plan; or
2) The study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.

18 CFR 5.15(e) - Criteria for new study

Requestors must provide a showing of good cause that:

1) Any material changes in the law or regulations applicable to the information request;
2) Why the goals and objectives of any approved study could not be met with the approved study methodology;
3) Why the request was not made earlier;
4) Significant changes in the project proposal or that significant new information material to the study objectives has become available; and
5) Why the new study request satisfies the study criteria in § 5.9(b).

Status of Studies (See USR)

Studies Completed in 2021			
Study	**Request for Mods?**	**Reporting**	**Comments**
Operations Model	PENDING	Tech Report (8/16)	File with USR Meeting Summary
Water Quality	NO	Data Summary (11/4)	As needed, address in DLA
Sediment and Geomorphology	NO	Forthcoming with USR Summary	As needed, address in DLA
Tribal Resources	Schedule	Forthcoming	As needed, address in DLA
Cultural Resources	Schedule	Forthcoming	As needed, address in DLA
Lands and Boundaries	NO	Tech Report (10/8)	As needed, address in DLA
Recreation Use and Needs	Schedule, Methods	Data Summary (11/4)	As needed, address in DLA
Facilities Condition Assessment	NO, discuss	Tech Report (10/14)	As needed, address in DLA

Studies Complete as of Initial Study Report (ISR)			
Study	**Modifications?**	**Reporting**	**Comments**
Creek Fish Distribution	NO	Technical Report (5/14)	Yes, will be reflected in DLA
Reservoir Fish Distribution	NO	Technical Report (5/14)	Yes, will be reflected in DLA
Riparian Community Assessment	NO	Technical Report (8/26)	To be addressed in DLA
Invasive Plants	NO	Technical Report (8/26)	To be addressed in DLA
RTE Plants	NO	Technical Report (8/26)	To be addressed in DLA
Wildlife	NO	Technical Report (8/26)	Pending
Instream Flow Assessment	NO	Technical Report (5/14)	Yes, will be reflected in DLA


Resource Areas

Cultural Resources – CUL 1

Cultural Resources – CUL 1 Goals and Objectives

Identify Cultural Resources and Potential Project Effects to those Resources

Provide a description of the known **cultural or historical resources** of the proposed project and surrounding area. Components of this description include:

- Consult Previous Studies
- Identify New Cultural Resources in the Area of Potential Effect via Pedestrian Survey and Research
- Identify Cultural Recourses Eligible for Listing on the National Register of Historic Places
- Identify Potential Effects to Cultural Resources

Cultural Resources – CUL 1

Study Name	Status	Modifications and/or Consultation Needed
CUL 1 – Cultural Resources	Data collection complete as of November 2021.	The field schedule was delayed due to COVID-19 and air quality related to the wildfires. As a result of the delays SCE is proposing to defer some evaluations to the Historic Properties Management Plan (HPMP).

Cultural Resources – CUL 1 Data Summary

Archaeological Sites to Date

- 24 Precontact
- 9 Multi-component (Pre- and Post-contact)
- 52 Historic-Period (Nonnative and Native)
- 85 Total

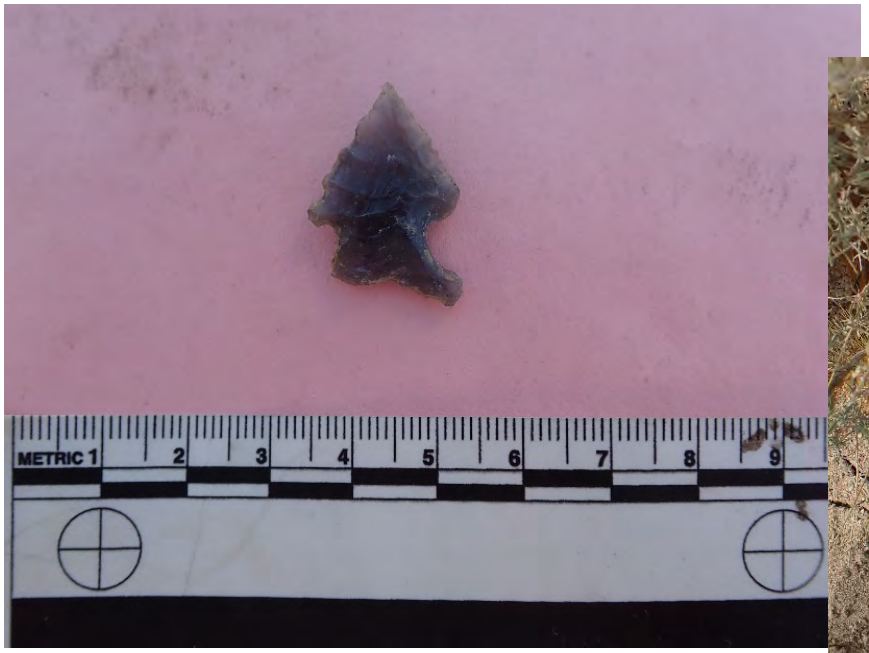
- Archaeological sites are related to habitation, mining, hydroelectric development, Basque sheep herding, roads, recreation, and irrigation.
  - Some of the archaeological sites are also Tribal Resources

Built Environment Resources

- 200 resources recorded to date
- Built environment resources are related to the Bishop Creek Hydroelectric Project, mining, and recreation.

Cultural Resources – CUL 1
Data Summary

Precontact Archaeological Sites



Obsidian Projectile Point

Milling Slick

Cultural Resources – CUL 1 Data Summary

Multi-Component Archaeological Sites

Toy Wagon Wheel, Shell Button, Prosser Button, and Milk Can

Basketry Sizing Lid

Cultural Resources – CUL 1 Data Summary

Historic-Period Archaeological Sites

Structural remains

Basque Arborglyph

Tobacco Tin

Cultural Resources – CUL 1
Data Summary

Native American Monitor Harry Williams Standing By Paiute Ditch System In Background, Milling Slick in Foreground

Cultural Resources – CUL 1
Data Summary

Built Environment Resources

Bishop Creek Powerhouse No. 2
Constructed in 1908

Colden Trout Cabin at Cardinal Mine
Constructed in 1906

Cultural Resources – CUL 1 Status

- Surveys and recording of resources complete
- Archaeological and Built Environment Reports are in progress and due to SCE in December
- Preparation of the Historic Properties Management Plan (HPMP) be prepared in 2022

Tribal Resources – CUL 2

Tribal Resources – CUL 2 Goals and Objectives

Identify Tribal Resources and Potential Project Effects to those Resources

Provide a description of **Indian tribes, tribal lands, and interests** that may be affected by the project. Components of this description include:

- Previous Studies
- Identify New Tribal Resources in the Area of Potential Effect via Pedestrian Survey , Research and Tribal Outreach
- Identify Tribal Recourses Eligible for Listing on the National Register of Historic Places
- Identify Potential Effects to Tribal Resources

Tribal Resources – CUL 2 Status

Study Name	Status	Modifications and/or Consultation Needed
CUL 2 – Tribal Resources	This study is being implemented in 2021.	Descriptions of Tribal Resources identified to date are based on incomplete tribal as consultation and interviews have not been completed due to COVID restrictions and wildfires. Draft report is expected to be completed in Q1, 2022. **Modification Request:** As a result of the delays, SCE is proposing to defer evaluations to the HPMP

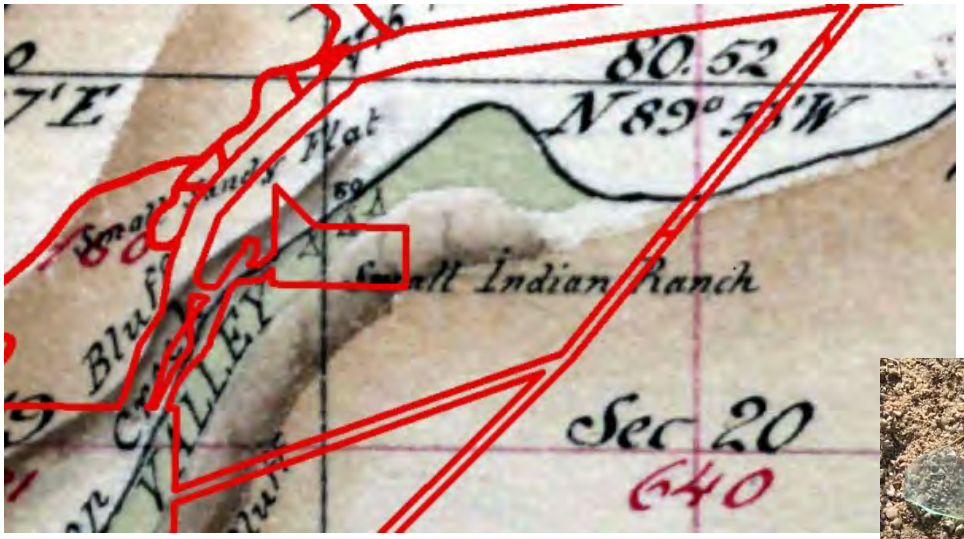
Tribal Resources – CUL 2 Data Summary

Results to date identified 5 Tribal Resource types:

- Native American sites related to the post-contact American Period
- Ethnobotanical areas of gathering and plant tending
- Irrigation system
- Bishop Creek Battleground
- Areas related to transportation (trails)

Tribal Resources – CUL 2 Data Summary

Ethnohistoric Areas

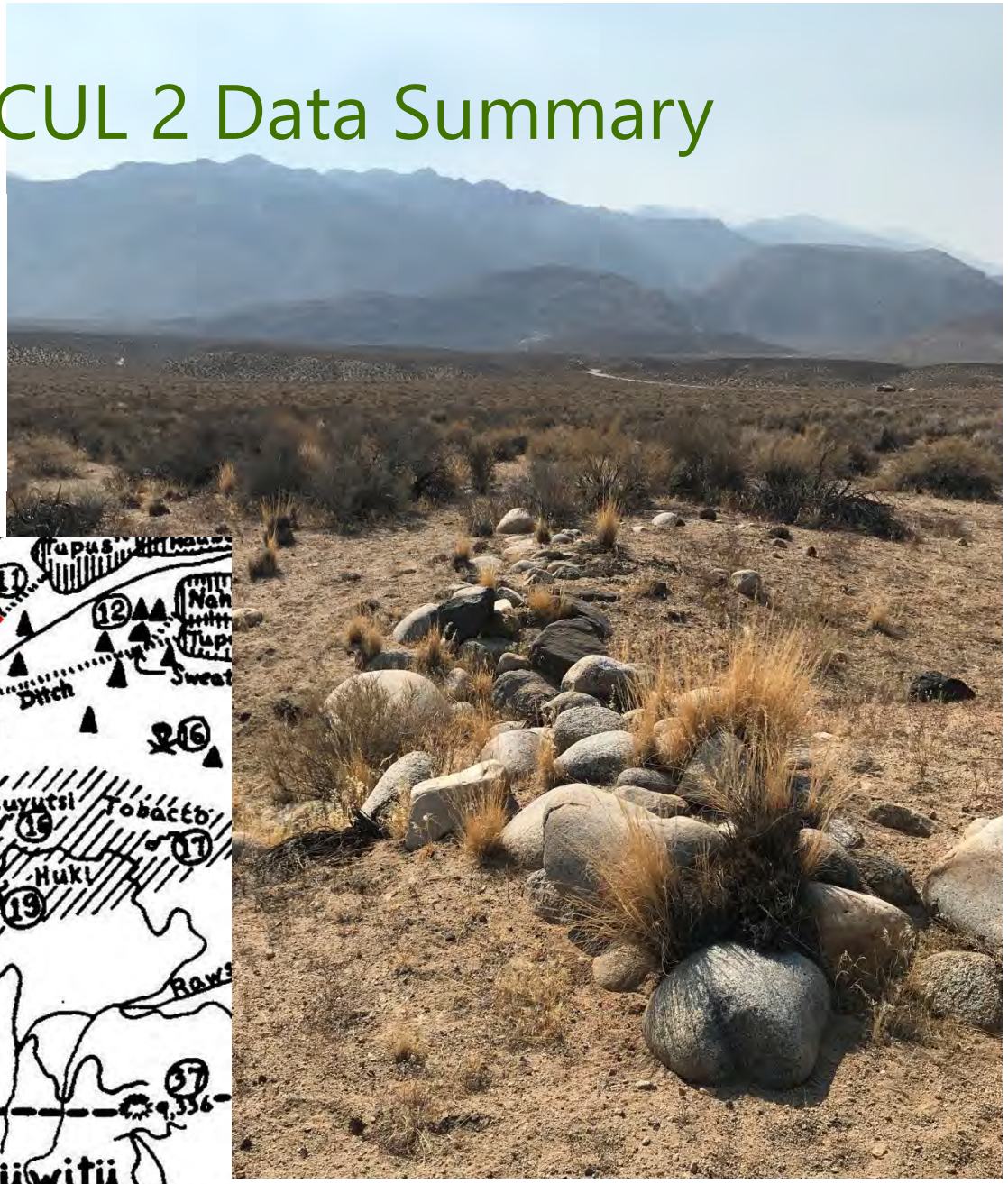


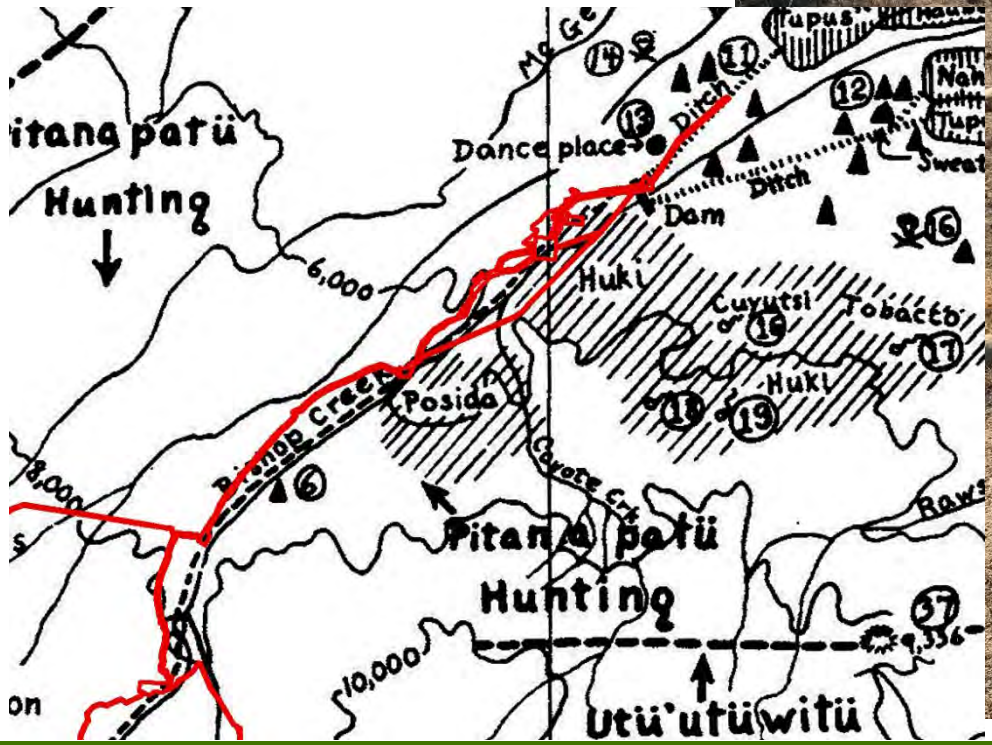
1880 General Land Office Plat with FERC Boundary Overlain (in red) depicting "Small Indian Ranch"

Artifacts found at Indian Ranch

Tribal Resources – CUL 2 Data Summary

Paiute Ditch System - Used Water from Bishop Creek, documented by Julian Steward 1933





Tribal Resources – CUL 2 Data Summary

Bishop Creek Battleground

California Registered Historic
Landmark No. 811

Tribal Resources – CUL 2 Data Summary

Ethnobotanical Areas

Tribal Resources – CUL 2 Data Summary

Transportation Corridors (Trails)

Dashed line adjacent to Bishop Creek indicates trail from Bishop to Piute Pass (Steward 1933)

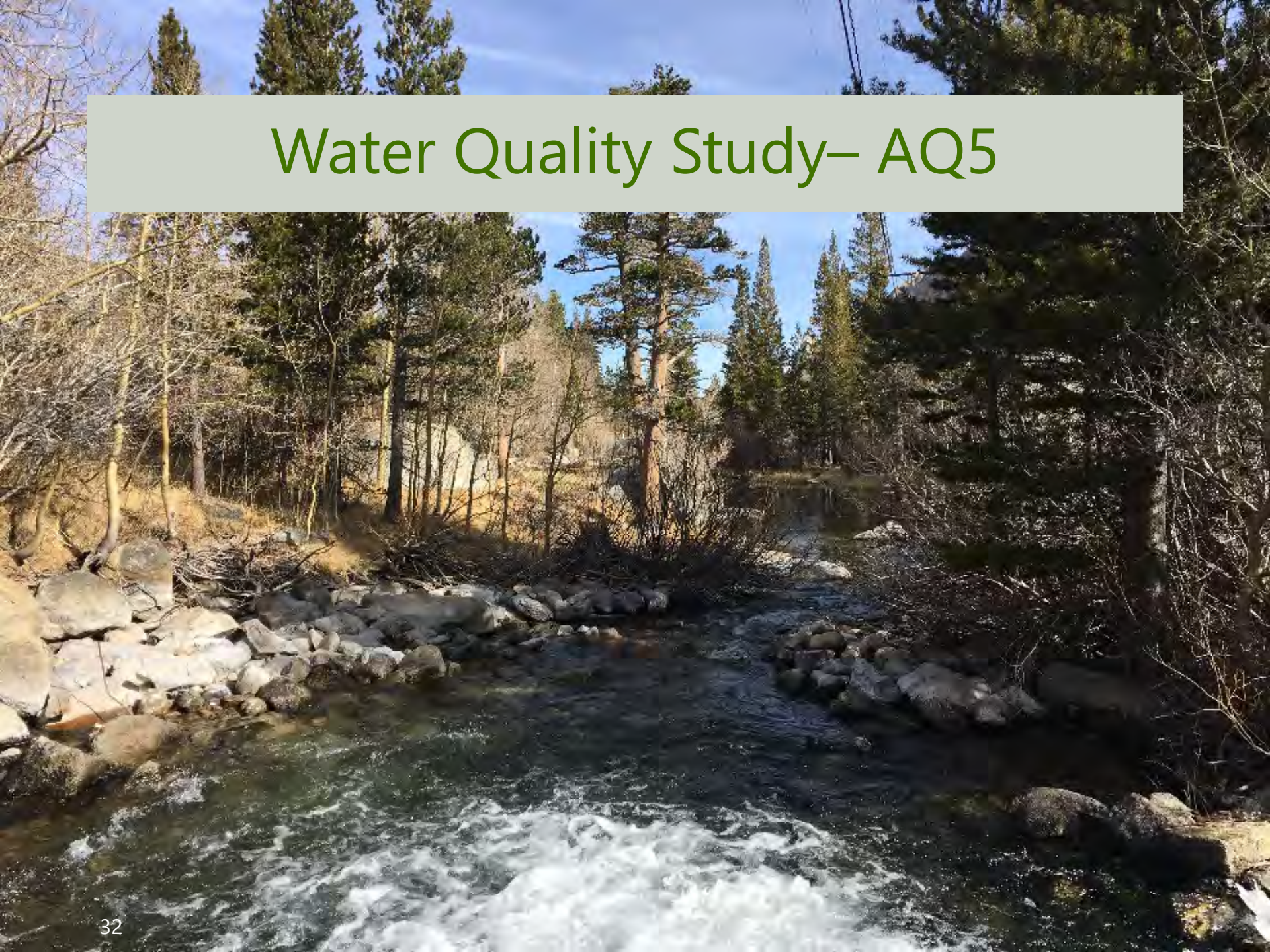
Tribal Resources – CUL 2
Upcoming Research

- Conduct additional background research
- Interview tribes and tribal elders about their knowledge of project, as conditions allow

Interviews and additional research may identify additional tribal resources:

- Ethnozoological connection with hunting, fishing, and gathering in project area
- Connections with the Hydro Project (e.g. employment during construction or operations)
- Identify any tribal council positions on access to resources

Water Quality Study– AQ5



Water Quality Study Plan Review – AQ 5 Goals and Objectives

- Monitor WQ (Turb., Cond., TDS, PO_4^{-3}, NO_3, N-tot) on a regular basis at multiple sites:
  - Bishop Creek, South Lake, Lake Sabrina
- Monitor water temperature & DO for 2 years at:
  - Bishop Creek, South Lake, Lake Sabrina
- Monitor E. coli at recreation areas in July-Aug.
  - Intake No. 2 reservoir, South Lake, Lake Sabrina
- Ensure future Project facilities & operations are:
  - Consistent with WQ goals and objectives for Bishop Creek in the Basin Plan
  - Consistent with desired conditions in the 2018 Inyo National Forest Management Plan

Water Quality

Study Name	Status	Modifications and/or Consultation Needed
AQ 5 – Water Quality (Attachment 3)	**Status of Field Surveys:** This survey effort is complete with final data collection in October of 2021. **Technical Reports:** A summary of data collected to date and since the 2020 Annual Report will be presented at the USR meeting, scheduled for November 18, 2021. **Status and Resolution of TWG Comments:** No comments from on the 2020 Annual Report were received.	• Change in labratories due to unavailble resources • Greater depth of lakes than expected led to incomplete data collection initially and necessitated change in methods to achieve appropriate sampling

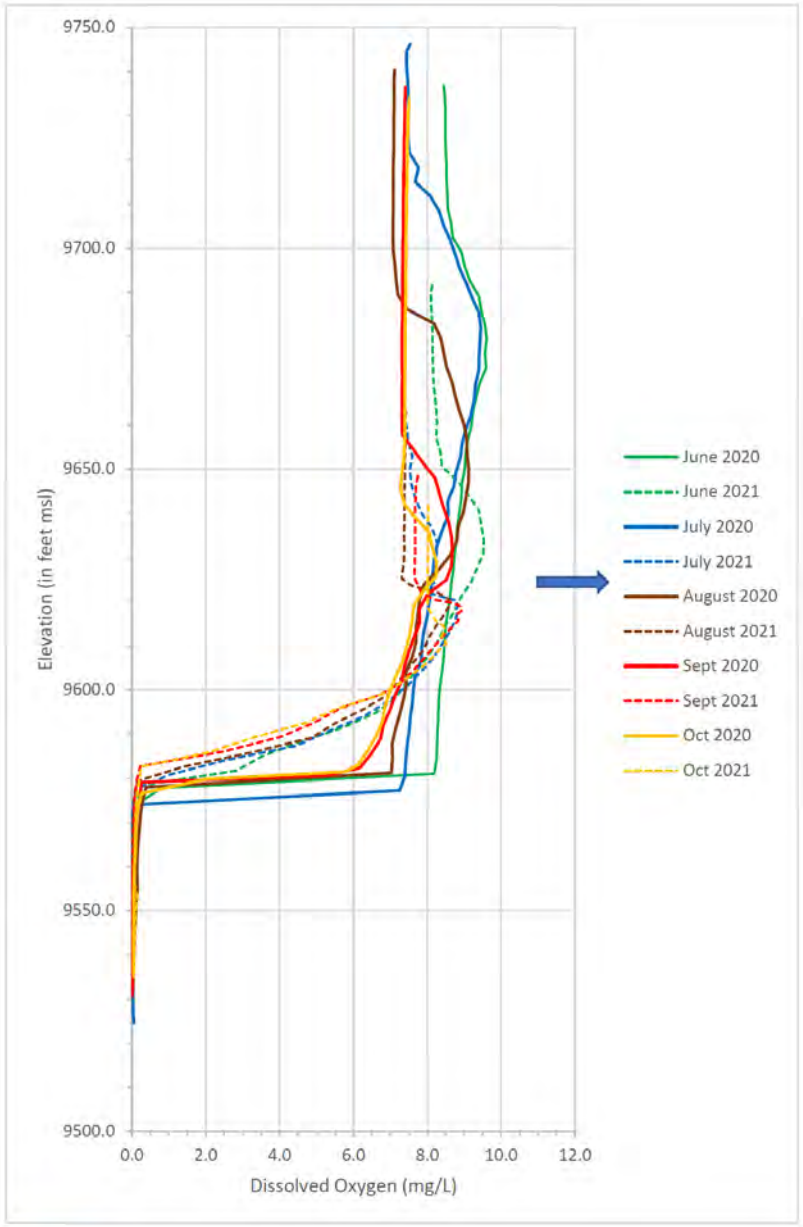
WQ Summary of 2021 Data

- South Lake
  - DO and Water Temperature
    - The DO and water temperature profiles for South Lake were similar for each monitoring period throughout the summer and early fall.
    - Elevated DO readings in the upper two thirds of the lake and extremely low DO readings in the bottom portion of the lake (approximately 12 meters below the outlet).
    - Findings consistent with 2020 data

Year	Lake Surface Elevation Range (ft msl)	Range of Dissolved Oxygen above and below Outlet (b)		
		Position (c)	Maximum	Minimum
2020	9747.82 – 9734.02	Above	9.61	7.07
		Below	8.55	0.00
2021	9693.20 – 9641.70	Above	9.53	7.30
		Below	8.94	0.00

Notes:
a – Five transects were conducted in each calendar year.
b – From instantaneous measurements at 1-meter intervals from lake surface to bottom of survey/lake.
c – Position above or below lake outlet.

South Lake DO Vertical Profiles



WQ Summary of 2021 Data

- South Lake – General Water Quality

Year	Parameter	Total Dissolved Solids (mg/L)	Nitrate as N (mg/L)	Total Nitrogen (mg/L)	Ortho phosphate as P (mg/L)
2020	Maximum	1,100*	ND<0.110	5.2*	0.17*
	Minimum	ND<10	ND<0.110	ND<0.30	ND<0.010
	Average**	18	ND<0.110	ND<0.30	0.011
2021	Maximum	1,300*	ND<0.230	5.5*	0.12*
	Minimum	ND<10	ND<0.110	ND<0.10	ND<0.010
	Average**	21.5	ND<0.110	0.108	ND<0.010
Basin Objective (annual average/90th percentile)		12/20	0.1/0.1	0.2/0.4	0.03/0.04

Notes:
* Maximum values for these constituents were collected below the outlet.
** Arithmetic average is for samples collected above the outlet. For samples with ND values, 1/2 of the ND value was used to calculate average when more than one sample had detectable values, otherwise the ND value was used.

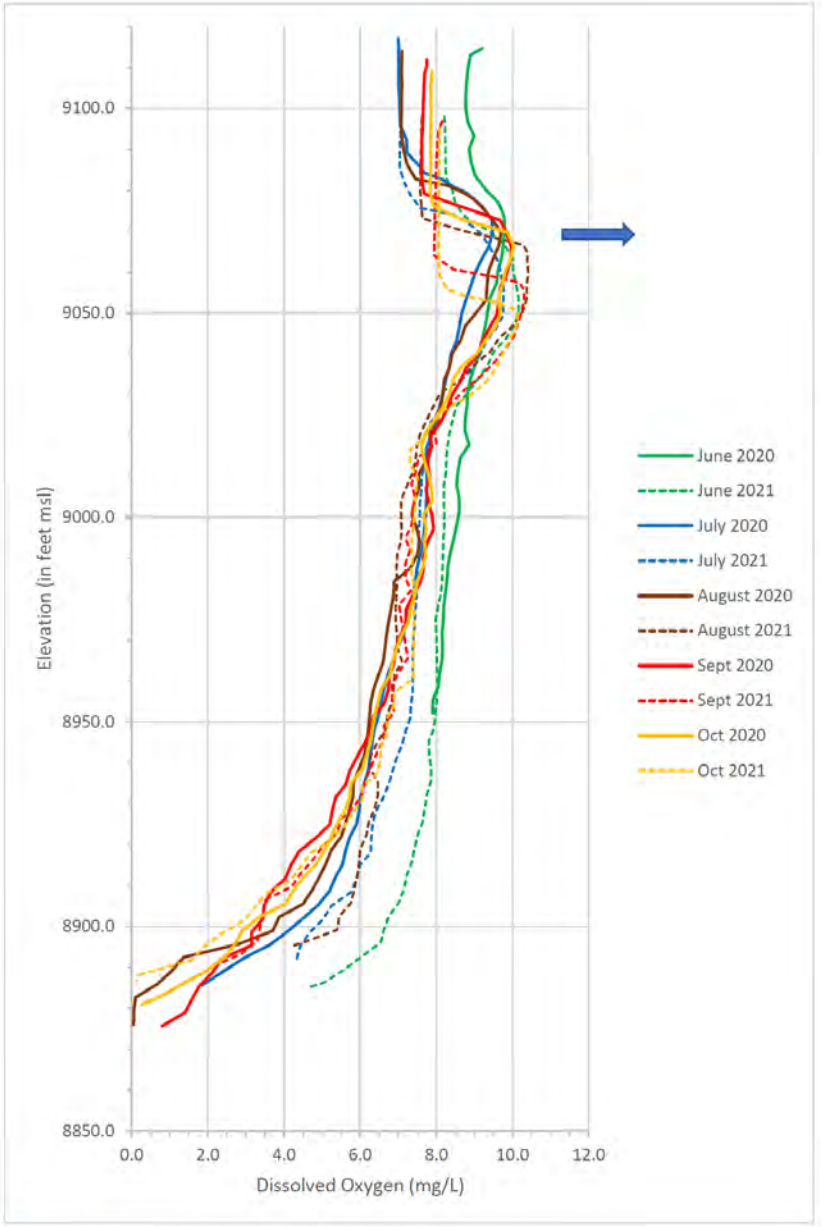
WQ Summary of 2021 Data

- Sabrina - DO and Water Temperature
  - The DO and water temperature profiles for South Lake were similar for each monitoring period throughout the summer and early fall.
  - Elevated DO readings in the upper two thirds of the lake and extremely low DO readings in the bottom portion of the lake (approximately 18-20 meters below the outlet).
  - Findings consistent with 2020 data

YEAR	LAKE SURFACE ELEVATION RANGE (ft msl)	RANGE OF DISSOLVED OXYGEN ABOVE AND BELOW OUTLET (b)		
		Position (c)	Maximum	Minimum
2020	9118.62 – 9108.97	Above	9.87	7.00
		Below	10.03	0.05
2021	9099.50 – 9095.09	Above	9.78	7.04
		Below	10.41	0.11

Notes:
a – Five transects were conducted in each calendar year.
b – From instantaneous measurements at 1-meter intervals from lake surface to bottom of survey/lake.
c – Position above or below lake outlet.

Lake Sabrina DO Vertical Profiles



WQ Summary of 2021 Data

- Sabrina– General Water Quality

Year	Parameter	Total Dissolved Solids (mg/L)	Nitrate as N (mg/L)	Total Nitrogen (mg/L)	Ortho phosphate as P (mg/L)
2020	Maximum	39	ND<0.110	0.52	0.022
	Minimum	11	ND<0.110	ND<0.30	ND<0.010
	Average*	21	ND<0.110	ND<0.30	ND<0.010
2021	Maximum	24	ND<0.230	0.11	ND<0.010
	Minimum	12	ND<0.110	ND<0.10	ND<0.010
	Average*	16	ND<0.110	ND<0.10	ND<0.010
Basin Objective (annual average/90th percentile)		10/17	0.2/0.3	0.3/0.6	0.03/0.05

Notes:
* Arithmetic average is for samples collected above the outlet. For samples with ND values, 1/2 of the ND value was used to calculate average when more than one sample had detectable values Otherwise the ND value was used..

WQ Summary of 2021 Data

- Bacteriological data for Project Reservoirs

Parameter	Range of E. Coli (MPN/100 ml)		
	South Lake	Lake Sabrina	Intake No. 2 Reservoir
2020 Maximum	1.0	3.1	24.0
2020 Minimum	ND<1.0	ND<1.0	ND<1.0
2020 Geometric Mean	1.0	1.21	4.73
2021 Maximum	ND<1.0	310	210
2021 Minimum	ND<1.0	ND<1.0	2.0
2021 Geometric Mean	ND<1.0	17.0	8.90
Inland Surface Water Objectives for E.coli			
Geometric Mean	100		
90th Percentile	320		

WQ Summary of 2021 Data

- Bishop Creek – DO and Temperature

Year	Parameter	Water Temperature (deg C)	Dissolved Oxygen (mg/L)	Barometric Pressure (in Hg)	Calculated DO Saturation (%)
2020	Maximum	17.8	9.68	25.53	124.9%
	Minimum	6.9	7.12	21.15	98.0%
	Average*	12.7	8.62	23.36	104.3%
2021	Maximum	18.4	9.74	25.60	116.6%
	Minimum	8.4	7.08	21.10	98.9%
	Average*	14.1	8.33	23.36	104.0%

Notes:
* Arithmetic average is for all samples collected.

WQ Summary of 2021 Data

- Bishop Creek – General Water Quality

Year	Parameter	Total Dissolved Solids (mg/L)	Nitrate as N (mg/L)	Total Nitrogen (mg/L)	Ortho phosphate as P (mg/L)
2020	Maximum	41	ND<0.110	1.1	0.044
	Minimum	ND<10	ND<0.110	ND<0.30	ND<0.010
	Average*	26	ND<0.110	0.19	ND<0.010
2021	Maximum	46	ND<0.230	0.37	0.018
	Minimum	14	ND<0.110	ND<0.10	ND<0.010
	Average*	32	ND<0.110	0.12	ND<0.010
Basin Objective (annual average/90th percentile)		27/29	0.1/0.2	0.1/0.4	0.05/0.09

Notes:
* Arithmetic average is for all samples collected. For samples with ND values, 1/2 of the ND value was used to calculate average when more than one sample had detectable values, otherwise the ND value was used.

WQ Summary of 2021 Data

- Powerhouse Tailwater

Year	Parameter	Water Temperature (deg C)	Dissolved Oxygen (mg/L)	Barometric Pressure (in Hg)	Calculated DO Saturation (%)
2020	Maximum	15.4	9.64	25.54	114.1%
	Minimum	10.5	8.17	23.11	95.6%
	Average*	12.9	8.82	24.53	102.9%
2021	Maximum	16.8	9.72	25.60	112.9%
	Minimum	9.1	7.77	23.05	96.5%
	Average*	13.8	8.61	24.49	101.6%

Notes:
* Arithmetic average is for all samples collected.

Water Quality Study Plan Review – AQ 5

- Outstanding tasks
  - Additional analysis of E. coli samples with values over 50MPN/100 ml
  - Next annual report to include all data collected in 2021

Questions?

Sediment and Geomorphology- AQ 6

Sediment and Geomorphology – AQ 6 Goals and Objectives

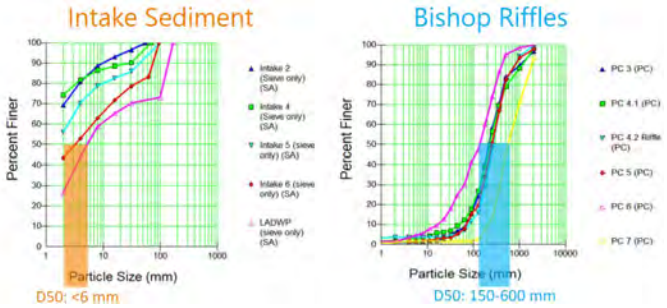
- Determine flow conditions in which sediment is mobilized in the stream channel
- Understand if and how LWM is mobilized
- Evaluate flows that could mobilize sediments and LWM from forebays
- Evaluate how operations (flow release timing, magnitude, and duration) could be modified to provide sediment transport flows

- Understand potential sediment inputs and impacts from higher flows to reaches below Plant 6 from proposed changes in flow/operations

Sediment and Geomorphology

Study Name	Status	Modifications and/or Consultation Needed
AQ 6 – Sediment and Geo-morphology	**Status of Field Surveys:** This survey effort is complete with final data collected in July of 2021. **Technical Reports:** An updated Technical Report, including the results of the 2021 tracer rock study, will be included with the DLA. **Status and Resolution of TWG Comments:** SCE anticipates that comments on presented tracer rock data will be discussed in the final version filed with the DLA.	Addition of Tracer Rock Study in 2021 to address limitation of bed-load sampling, as previously presented at the ISR meeting; no comments were raised at this meeting.

Sediment and Geomorphology - History

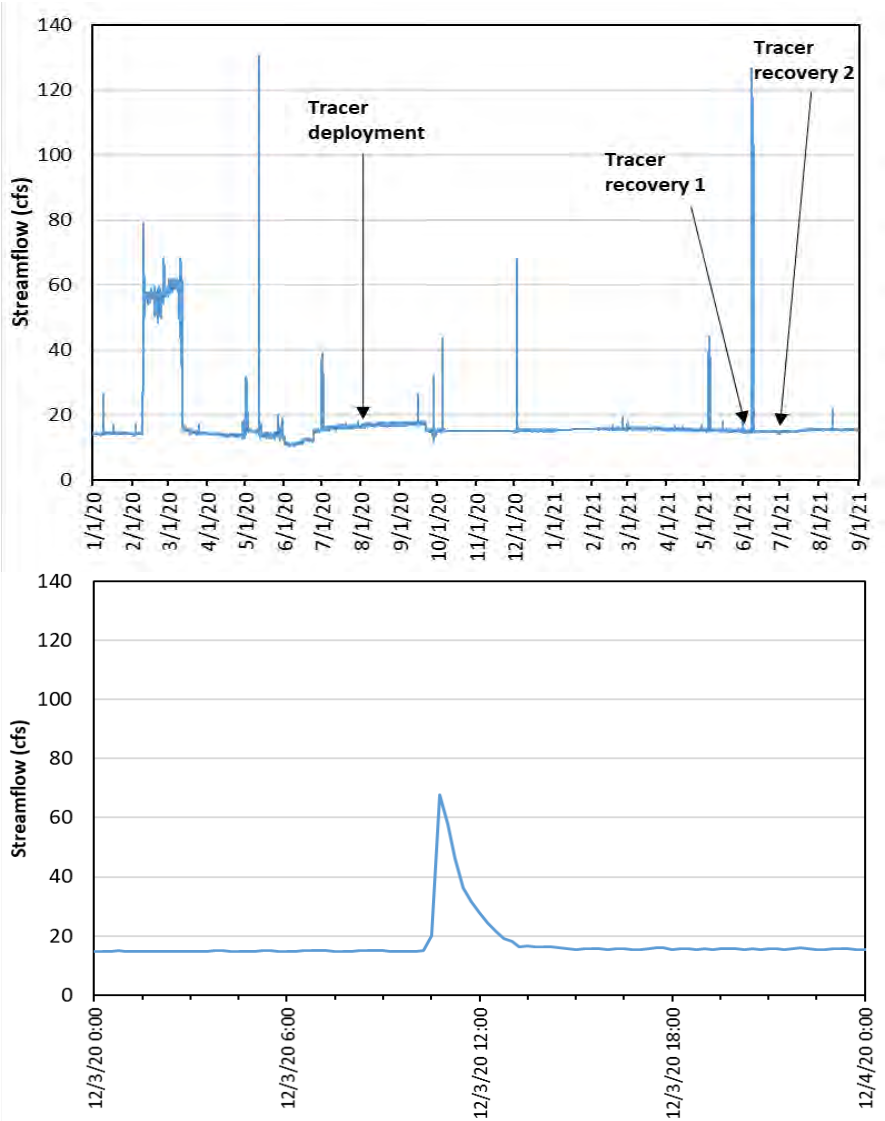


- 2019:
  - Cross Section and Profile Surveys
  - LWM Survey
  - Riffle Pebble Counts (>150mm D_{50})
  - Intake 2, 4, 5, 6, and LADWP sediment eval. (<6mm D_{50})
- May 2020 TWG Meeting:
  - Approved removal of Site 2, dropping bedload sampling, and tracer rock study concept
- Nov. 2020 ISR Meeting: shared details of tracer study:
  - Objectives to assess:
    - Channel stability after pulse flow (re-survey cross sections/profile)
    - Substrate mobility during pulse flow
  - 60+tracers per site, tracers 32-350mm in size
  - Plan to recover tracers after one high flow*
  - No substantial comments received

Tracer Rocks

- 116 PIT-tagged tracer rocks deployed at Site 4 in early August 2020
- 67 PIT-tagged tracer rocks deployed at Site 6 in early August 2020
- Tracers surveyed with RTK-GNSS and total station equipment

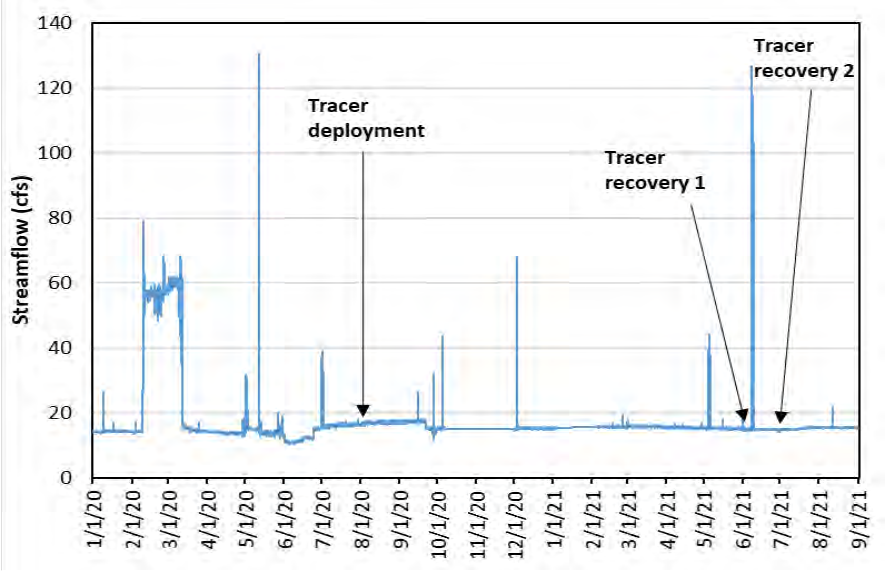
Site 4, Recovery Effort #1 (May 2021)
Peak flow ~70 cfs

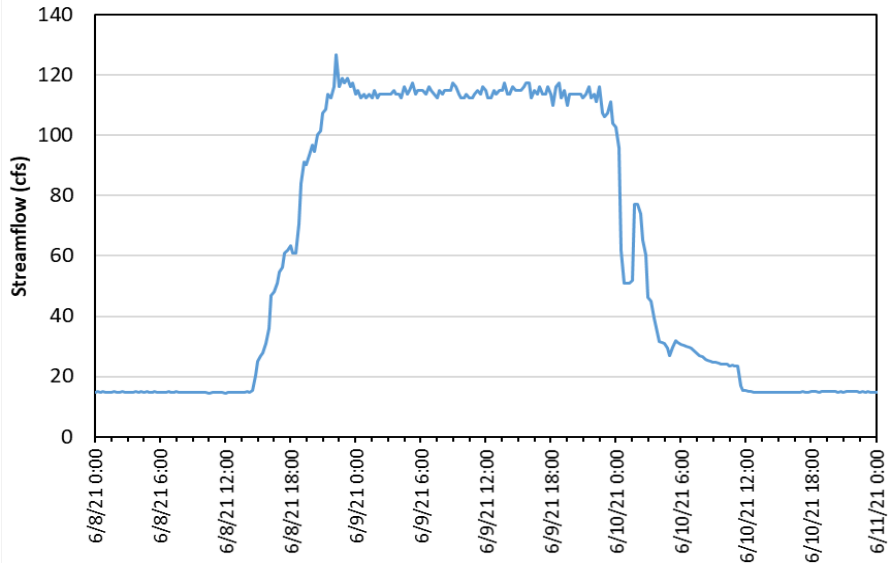


- 116/116 tracers recovered (100% recovery rate)
- 2/116 tracers displaced > 1 ft (1.7% mobilization rate)
- we interpret particles that displaced less than 1 foot as in-place, no mobilization

Size Class	Recovered	Mobilized
A (32-45 mm)	18	1
B (45-64 mm)	18	1
C (64-90 mm)	22	0
D (90-128 mm)	19	0
E (128-180 mm)	19	0
F (180-256 mm)	14	0
G (> 256 mm)	6	0
Total	116	2

Site 4, Recovery Effort #2 (July 2021)
Peak flow ~120 cfs

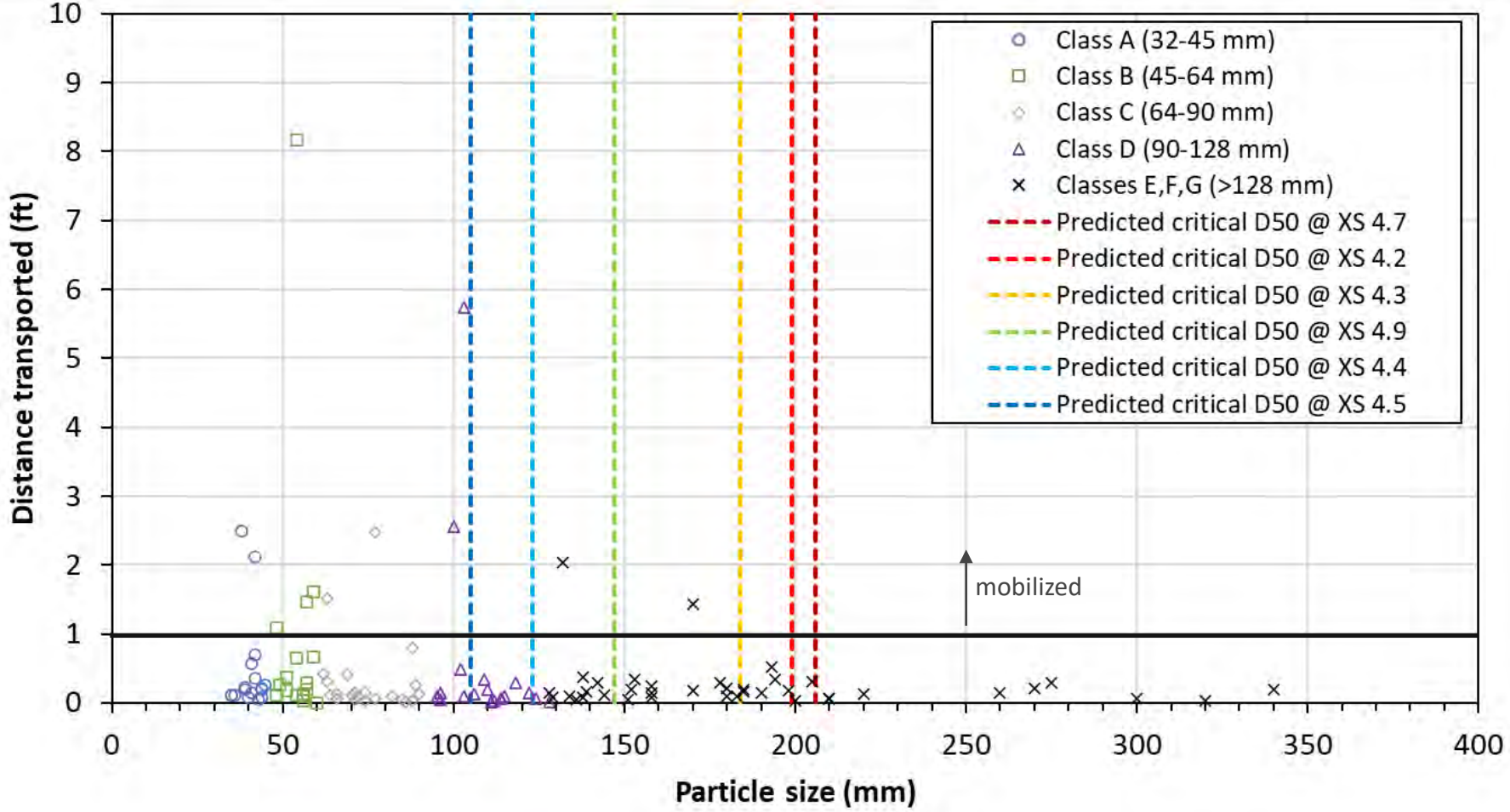




- 114/116 tracers recovered (98% recovery rate)
- 12/114 tracers displaced > 1 ft (11% mobilization rate)

Size Class	Recovered	Mobilized
A (32-45 mm)	17 (-1)	2
B (45-64 mm)	17 (-1)	4
C (64-90 mm)	22	2
D (90-128 mm)	19	2
E (128-180 mm)	19	2
F (180-256 mm)	14	0
G (> 256 mm)	6	0
Total	114	12

Site 4, Recovery Effort #2 (July 2021)
Peak flow ~120 cfs

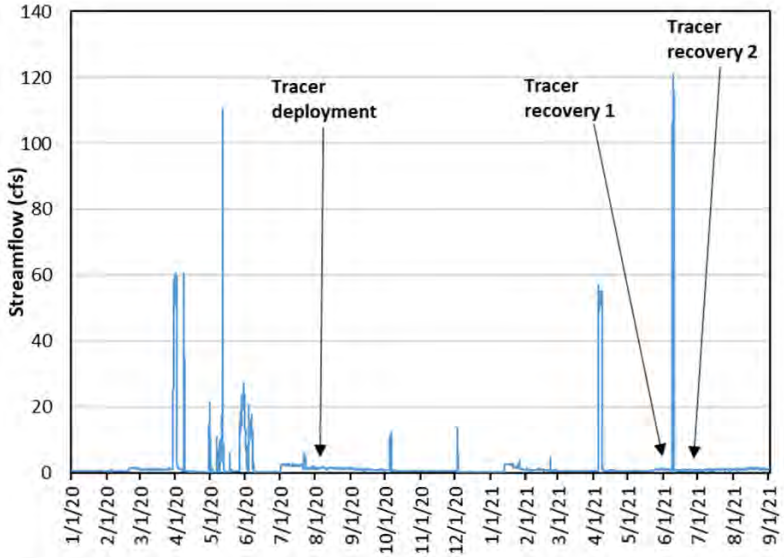


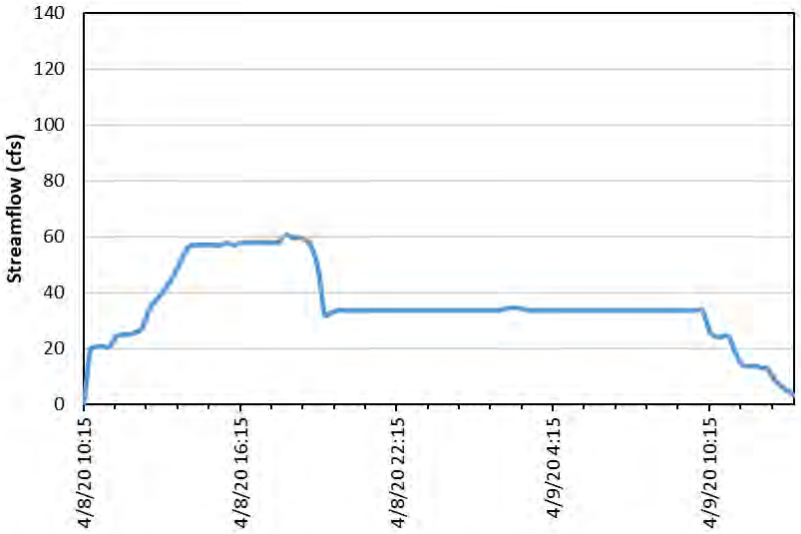
Site 4

~18 cfs

~175 cfs

Site 6, Recovery Effort #1 (May 2021)
Peak flow ~60 cfs

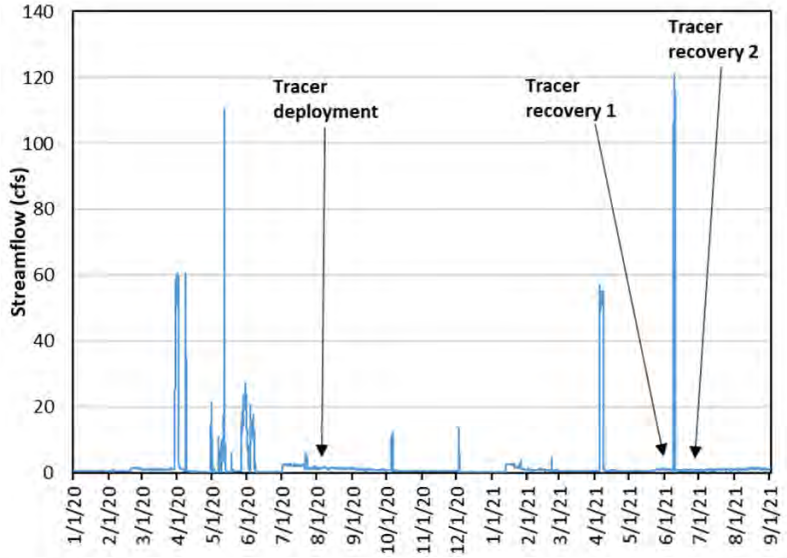


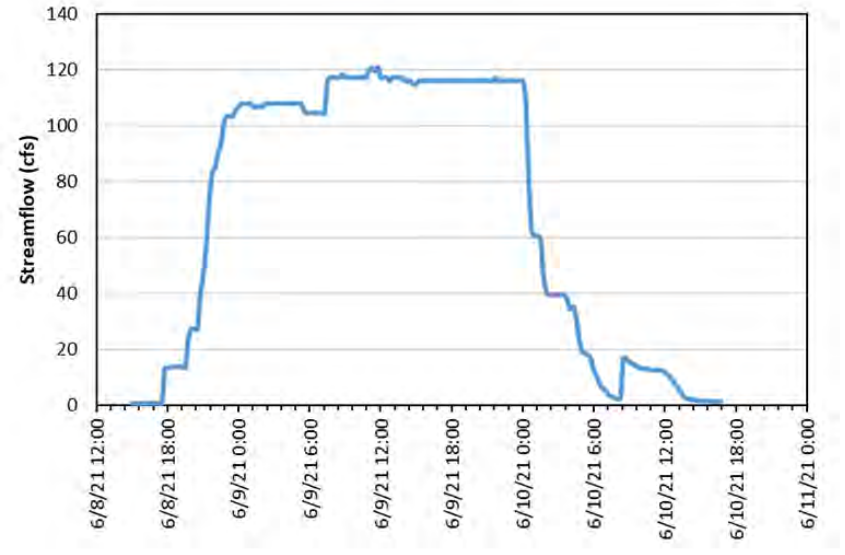


- 62/67 tracers recovered (93% recovery rate)
- 31/62 tracers disturbed (vandalism)
- 0/31 undisturbed tracers mobilized

Size Class	Recovered	Disturbed
A (32-45 mm)	11 (-1)	4
B (45-64 mm)	9 (-3)	6
C (64-90 mm)	11	4
D (90-128 mm)	12	7
E (128-180 mm)	11 (-1)	7
F (180-256 mm)	5	3
G (> 256 mm)	3	0
Total	62	31

Site 6, Recovery Effort #2 (July 2021)
Peak flow ~120 cfs

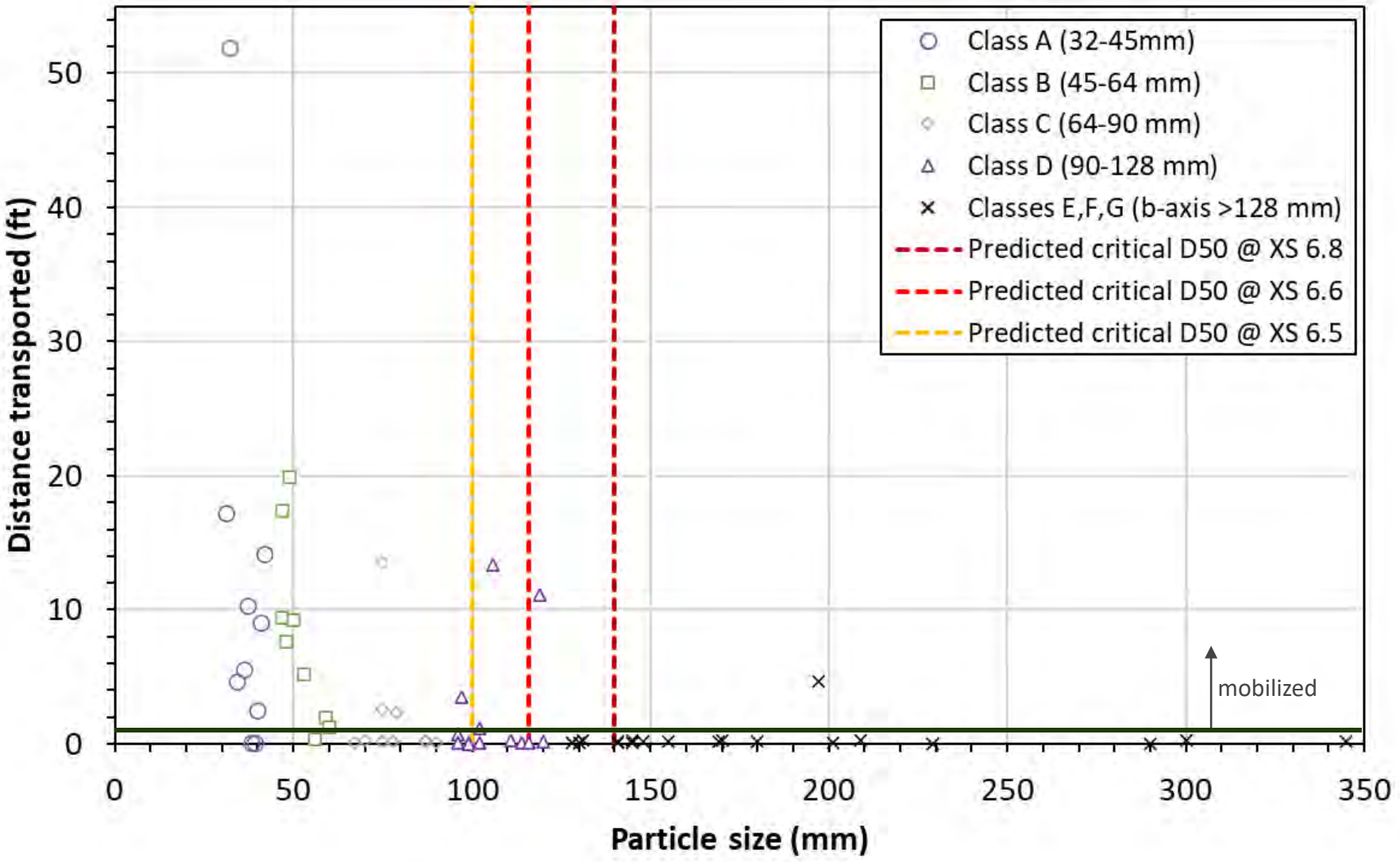




- 61/62 tracers recovered (98% recovery rate)
- 24/61 tracers displaced > 1 ft (39% mobilization rate)

Size Class	Recovered	Mobilized
A (32-45 mm)	10	8
B (45-64 mm)	9	8
C (64-90 mm)	10	3
D (90-128 mm)	13	4
E (128-180 mm)	11	0
F (180-256 mm)	5	1
G (> 256 mm)	3	0
Total	61	24

Site 6, Recovery Effort #1 (July 2021)
Peak flow ~120 cfs



Site 6

~8 cfs

~146 cfs

Questions?

Meeting will resume at 10:50 PST

Bishop Creek Operations Model – AQ2

Bishop Creek Operations Model – AQ2 Objectives

- Calculation of System Inflows
  - Based upon hydrologic data, not subject to changing allocation rules
    - Calculated increase of storage plus flow release from reservoirs
    - Ungauged areas synthesized based on gauged areas
    - Changes in flow release requirements do not affect inflow calculations, only allocations; model rules set according to current requirements
    - Mass balance for calibration: net calculated inflow vs. outflow gauged
- Align model with needs of other relicensing studies and information needs.
- Develop procedures to configure model for alternative operational scenarios and document results.

Operations Model

Study Name	Status	Modifications and/or Consultation Needed
AQ 2 – Operations Model	**ISR:** Model Structure Configured and populated with historic data; calibration identified as key 2021 **Technical Reports:** Technical report was distributed to the TWG on August 16, 2021; comments were requested by October 15, 2021. Modeling workshops were held on September 3, October 13, and November 4 2021. **Status and Resolution of TWG Comments:** SCE will propose resolution of outstanding comments at the USR.	No variances proposed by SCE or requested by stakeholders at ISR Resolving requests by CDFW.

Summary of Conversations to Date on Operations Model

- Prior to ISR
  - Reviewed operational and generational nodes
  - Reviewed hydrology basis
  - Reviewed constraints
  - Discussed calibration approach
- Technical Report in August 2021
- Multiple workshops since September 2021; CDFW comments on October 15
  - Of 11 comments, all but three resolved by November 4, 2021
  - Comment/Response matrix to be filed with USR meeting summary along with today's discussion.
  - Outstanding questions/requests
    1. Output and display of reach information
    2. Ability to add Birch-McGee Node
    3. Incorporation of water-year inputs into multiple locations

Operations Model Overview

- Measures the ability of the Bishop Creek system to meet flow targets
- Flows that enhance reaches can be entered as alternative scenarios to baseline conditions
- Calculate the percent of days when target flow is missed
- Impacts to all other reaches' target flows are calculated
- Displays missed target flows due to dry years
- Checks for success in meeting the "or inflow" alternative minimum flow requirement

Ops Model Use Considerations

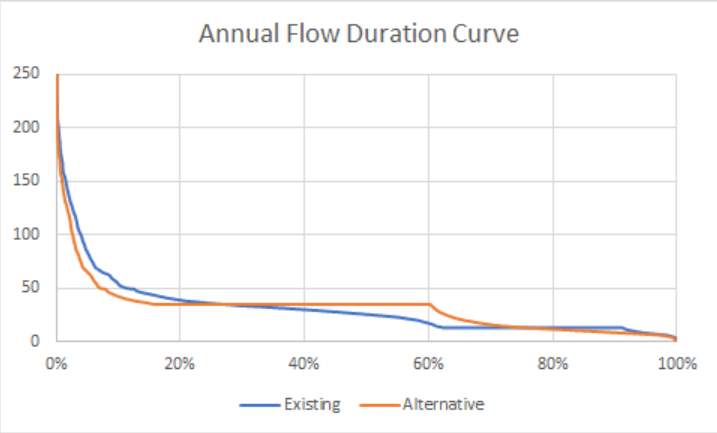
- Un-gaged areas and synthesized flows limit calibration accuracy
  - Random localized precipitation runoff
- Prioritization in model is meeting daily flow targets/requirements
  - Near-term planning sometimes supersedes this practice when storage is forecasted to deplete; adjustments made in consultation
  - Emergencies, construction may affect targets

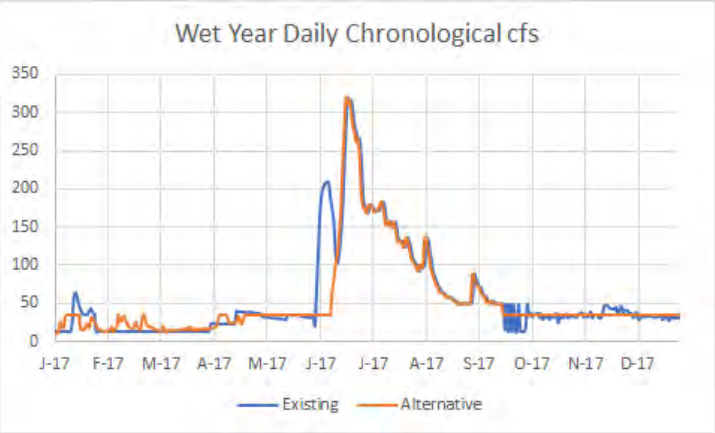
Request to add output/display of hydrograph

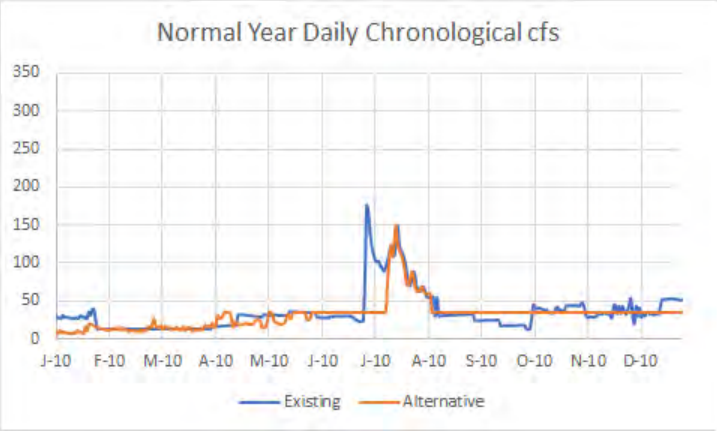
- Added chronological hydrographs for select locations
  - Total period of model record, most recent decade
  - Wet, dry and normal year hydrographs
- Added exceedance graphs
- Need input on locations of interest
  - Similar reaches have nearly identical graphs
  - Graphs below reservoirs, S. Lake diversion, and specific Bishop Creek reach of interest?

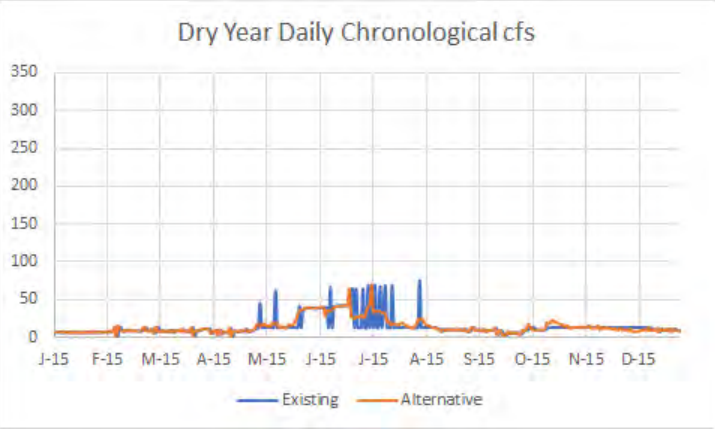
Hydrograph Example

- Middle Fork Bishop Creek below Lake Sabrina









Request to add visibility on flow changes at Birch-McGee

- Not scoped in original study plan as no needs were identified
- Ops Model approach and scope reviewed at ISR, no changes were requested for the Birch-McGee Creeks
- Propose a deduct approach to quantify ability to meet existing or modified flow targets in creeks
  - Have ~94% daily flow data for total diversion into Bishop Creek system for modeled period of record
  - No gage on Longley Reservoir, sparse creek data records downstream of diversions (1% of daily flow data on McGee, 12% on Birch)
  - Data availability directly impacts viability of mass balance approach for modeling (such as used on Bishop Creek)
- Can quantify ability to meet flow allocations based on deduct, but cannot accurately describe effects on reaches below Birch and McGee diversions
    - Model resolution could not address IFIM-level of responsiveness

Request to add water-year scenarios at key locations

- Not scoped in original study plan as no needs were identified; nor was need identified at ISR.
- Only exists currently below reservoir 2 intake
- Can simulate effect by running two flows at location of interest
  - For higher flow, results of missed days summarized in table on "Input and Summary" tab
  - For dry year flow results, input reduced flow for location of interest, divide by 0.3 (30% of years in record are dry)
  - Tested at existing location below reservoir 2 intake at multiple flows, results within 0.5%

Questions?

Recreation Use and Needs - REC 1

Recreation Use and Needs (REC 1) Goals and Objectives

- Characterize existing use and needs
- Evaluate adequacy of existing recreation opportunities to meet current needs
- Estimate future Project-related recreational demand and needs
- Methods
  - Web-based Recreation Use Survey
  - Creel Survey
  - Spot Counts
  - Traffic Counters
  - Trail Counters

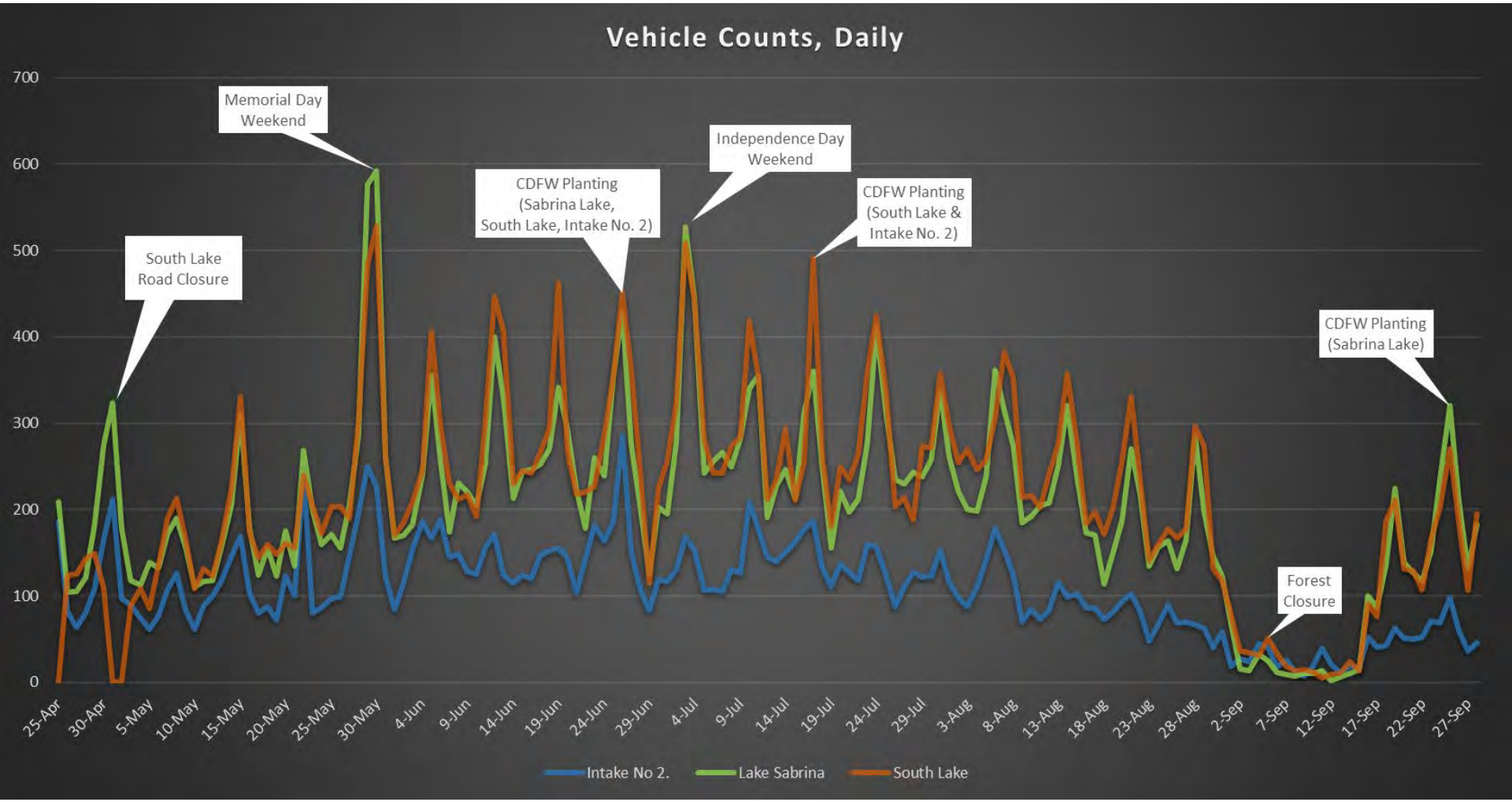
Recreation Use and Needs (REC 1)

Study Name	Status	Modifications and/or Consultation Needed
REC 1 – Recreation Use and Needs	**Technical Reports:** A Technical Report will be included with the DLA in January 2022. A memo was submitted with the USR on November 4 summarizing preliminary results of 2021 surveys and data collection. **Status and Resolution of TWG Comments:** SCE anticipates that comments on the Recreation Use and Needs study will run concurrent to the comment period for the DLA.	**Previous Variances:** Schedule modifications due to South Lake Road and travel restrictions relating to COVID-19 **2021 Variances:** • Alternative methods to address COVID -19 Concerns

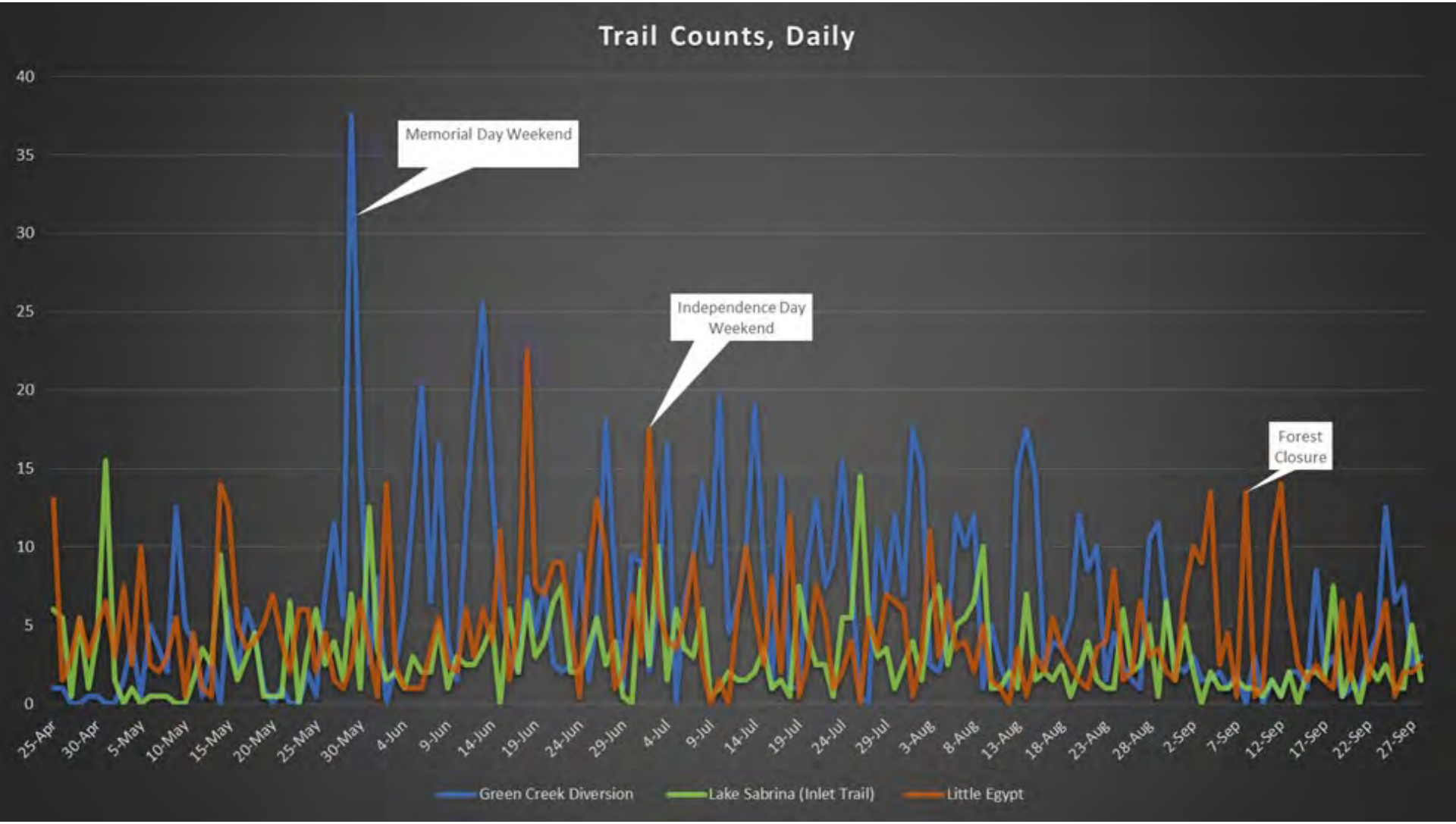
REC 1 - Preliminary Findings and Observations: Challenges

- South Lake Road closed due to road damage and repairs. (Beginning of Rec season – May 4)
- Inyo National Forest temporary closure due to wildfire response (August 31 – September 15, including Labor Day Weekend)
- Drought conditions in the watershed leading to extremely low lake levels at Lake Sabrina and South Lake.
- Collection of survey data through web-based survey rather than in the field.

REC 1 - Preliminary Findings and Observations: Vehicle Counters (Total Vehicle Counts, Daily)

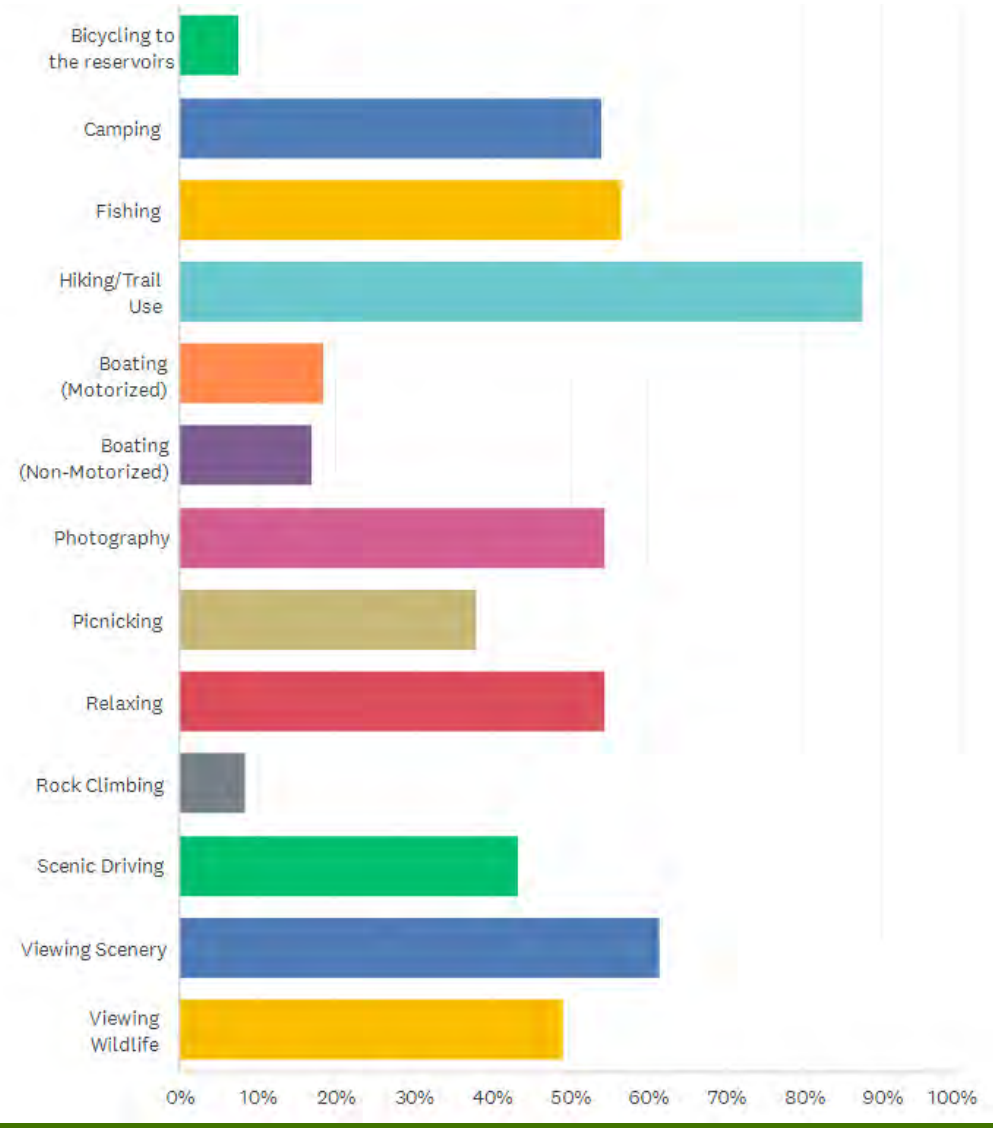


REC 1 - Preliminary Findings and Observations: Trail Counters (Total Counts, Daily)



REC 1 - Preliminary Findings and Observations: Web-based Recreation Surveys (Activities)

- Top activities: hiking, scenery, camping, photography, fishing, relaxing



REC 1 Next Steps

- **November 2021 – January 2022**: Compile and analyze data. Prepare Technical Report.
- **January 2022**: Submit Technical Report as part of the Draft License Application (DLA).
- **Late Q1, 2022**: Recreation & Land Use TWG Meeting to discuss comments and results.
- **May 1, 2022**: DLA comments due.

Questions?

Recreation Facilities Condition & Public Accessibility - REC 2

Recreation Facilities Condition & Public Accessibility (REC 2) Goals and Objectives

- For Project-related recreation areas, assess the condition of existing recreation facilities
  - Full Facilities Condition Assessment and Inventory
- Assess the need to formalize or reclaim (due to environmental concerns) dispersed or informal use areas
  - Dispersed Use Assessment
- Analyze economics of current and future Project-related O&M of recreation facilities
  - Operations and Maintenance Economics Assessment

Recreation Facilities Condition and Public Accessibility (REC 2)

Study Name	Status	Modifications and/or Consultation Needed
REC 2 – Recreation Facilities Condition and Public Accessibility	**Technical Reports:** A Technical Report was provided on October 14. **Status and Resolution of TWG Comments:** Results will be generally discussed at the USR meeting; comments on the Technical Report were requested by December 14.	No changes or modifications to methodology and no additional field work is anticipated for the duration of this relicensing process, barring any identification of new data collection / analysis as permitted by 18 CFR 5.15(d). To fully meet study objectives, SCE has requested Operations and Maintenance costing information from the US Forest Service but has yet to receive this information. At the USR meeting, SCE will review this objective, and whether this information is still needed. As appropriate, a study plan variance will be requested.

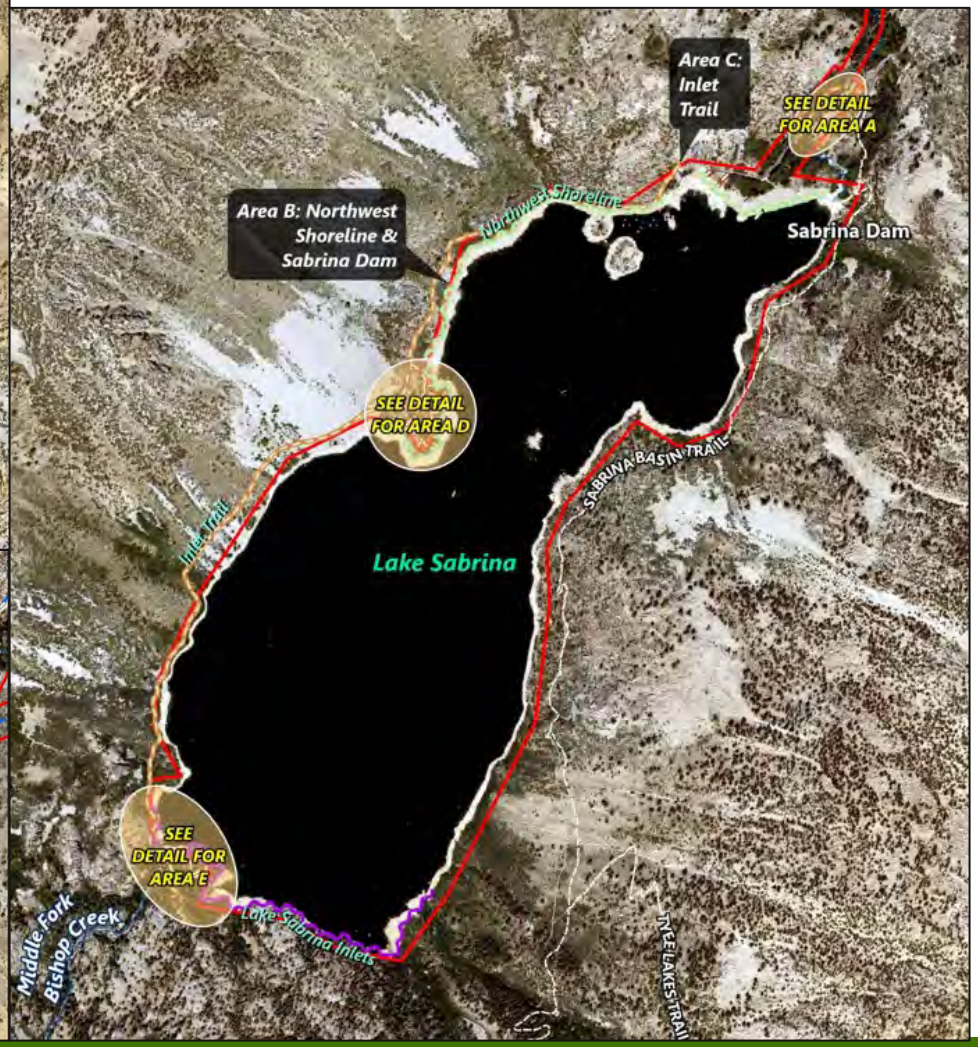
REC 2 - Preliminary Findings and Observations

- Roads and Parking: Appears to be an issue at both Lake Sabrina and Intake No. 2. South Lake's access road and parking facilities were recently re-paved.
- Site Elements & Buildings: Many site elements (docks, picnic tables, stairs, gates, fish cleaning stations, trash receptacles, water hydrants, etc.) and buildings need maintenance or repair.
- Signage and Wayfinding: Would benefit from upgrades and consistent graphics, mounting structures, and general placement and organization.
- Universal Accessibility: Lack of universally accessible parking and routes to amenities.
- Public Safety Measures: Lake Sabrina and Intake No. 2 have potential pedestrian and vehicular conflicts from parking lots to amenities. Tripping hazards and potential for vehicle damage due to eroded edges and sections of pathways and paved surfaces.

REC 2 - Preliminary Findings and Observations: Dispersed/Informal Use

- Potential campsites, fire pits, and user-created trails were noted at all three reservoirs.
- Observances are noted related to the FERC Project boundary, high-water mark, and John Muir Wilderness.
- Inlet Trail: User-created trail that extends from the marina to the Middle Fork Bishop Creek Inlet.
  - Trail counter installed as part of REC 1.
- Green Creek Diversion Pipeline: Use of Pipeline as a hiking trail, potentially as a shortcut to USFS' Baker Summit Trail.
  - Trail counter installed as part of REC 1.

REC 2 - Preliminary Findings and Observations: Dispersed/Informal Use



Recreation Facilities Condition and Public Accessibility (REC 2)

Next Steps

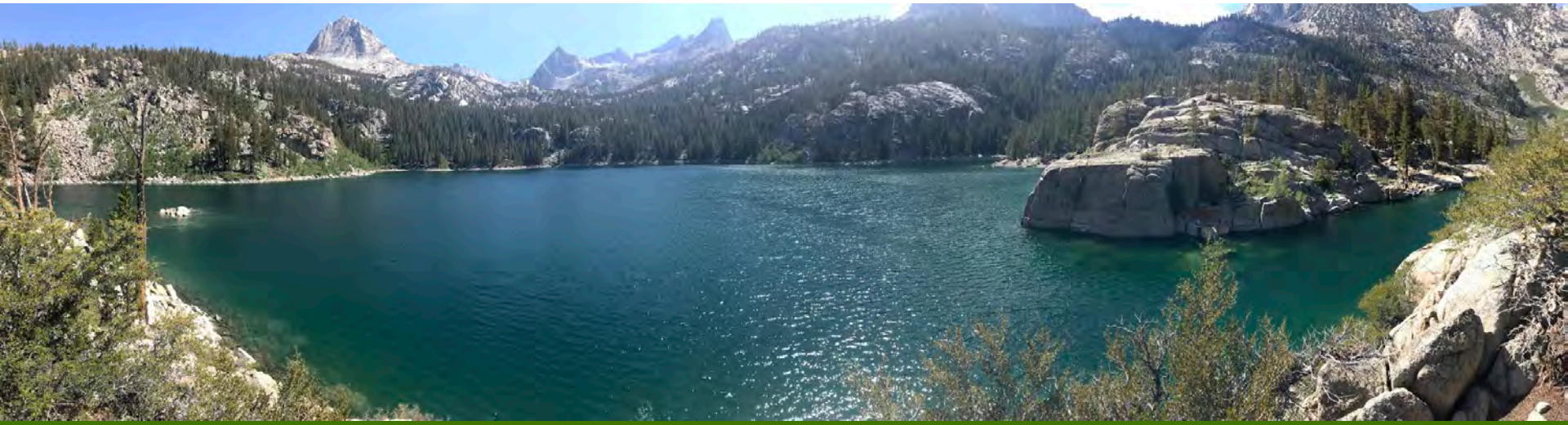
- **December 14, 2021**: Comments due on Technical Report provided October 14, 2021.
- **Late Q1, 2022**: Recreation & Land Use TWG Meeting

Questions?

Project Boundary and Lands – LAND 1

Project Boundary and Lands (LAND 1) Goals and Objectives

- Assess Project boundary for accuracy
- Determine Project lands needed for operation (including roads, trails, and spoil areas)
- Assess Project boundary for potential modifications
- Confirm ownership of Project lands



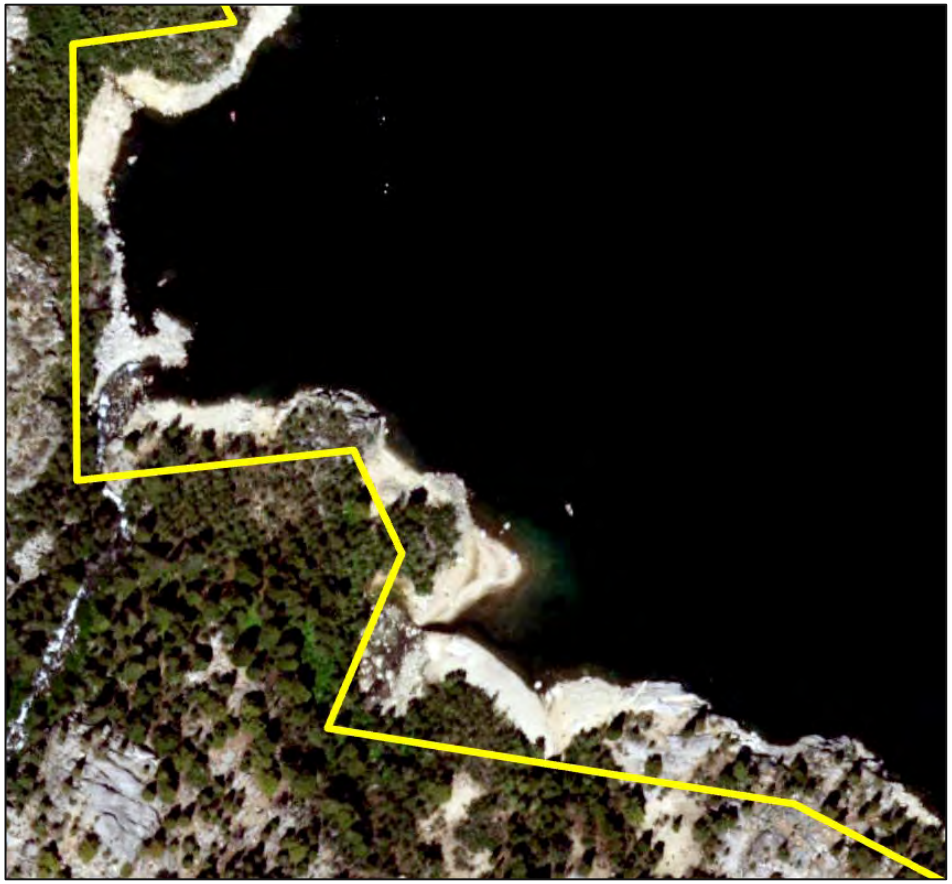
Project Boundary and Lands (LAND 1)

Study Name	Status	Modifications and/or Consultation Needed
LAND 1 – Project Boundary and Lands	**Technical Reports:** A Technical Memo was provided on October 6. **Status and Resolution of TWG Comments:** Preliminary results/proposals from the memo will be generally discussed at the USR meeting; comments on the Technical Memo were requested by December 5. SCE anticipates that comments and discussion related to this study will continue through filing of a Final License Application.	Ongoing consultation needed regarding proposed additions to Project lands, specifically those on USFS or BLM lands, and inventory of Project roads and trails.

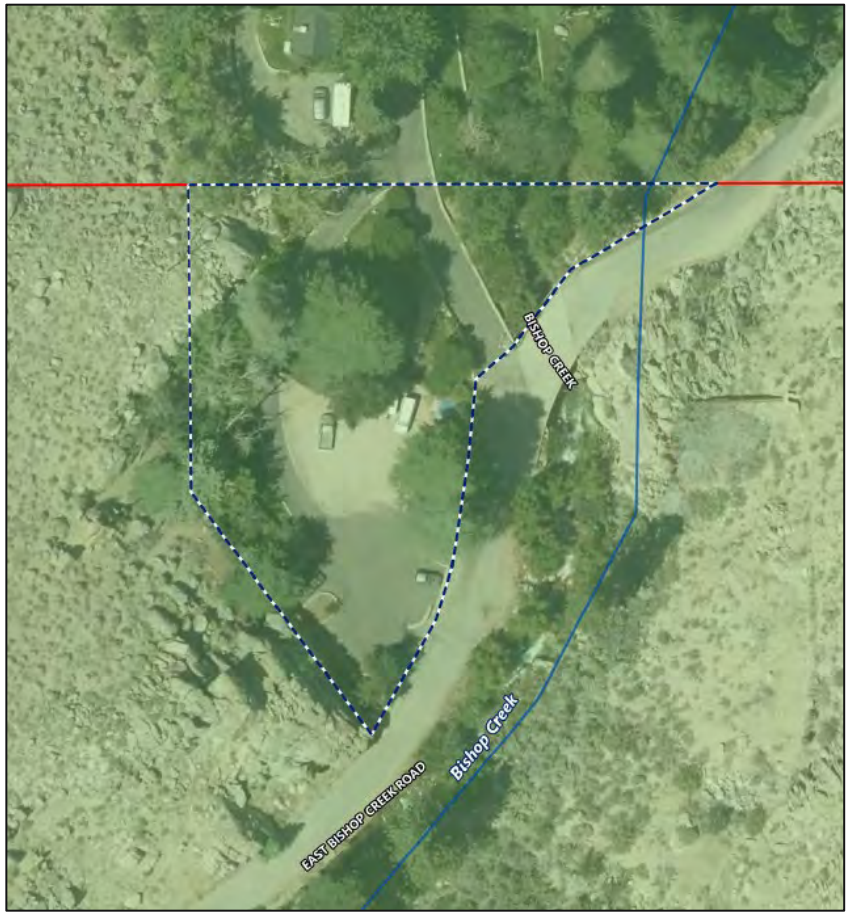
LAND 1 - Preliminary Findings and Observations

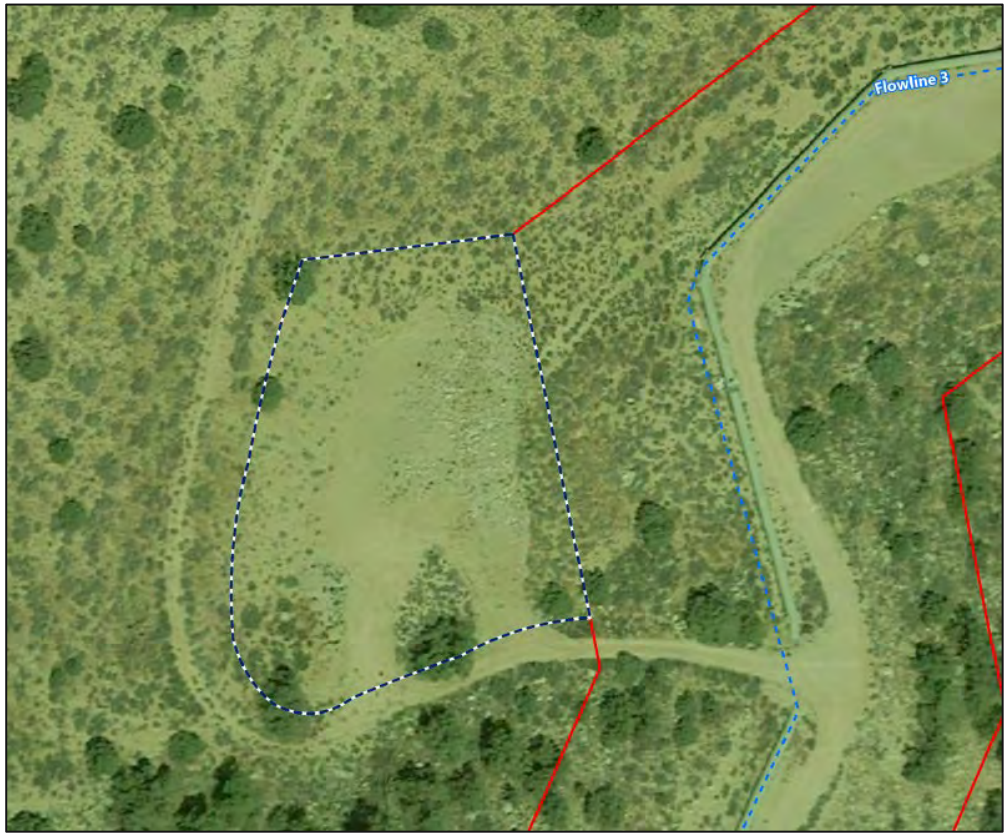
- Proposed changes are primarily related to ensuring that all current Project operations and facilities are adequately encompassed, including current and proposed Project roads and trails.
- Mapping corrections include improved centerlines and buffers for roads, flowlines, creeks, or transmission lines that are contemplated in the Project boundary but not accurately represented in the GIS data.
- Memo identifies additions related to Operations/Facilities (4); Roads (17); and Trails (1).

LAND 1 - Preliminary Findings and Observations (Mapping Corrections)

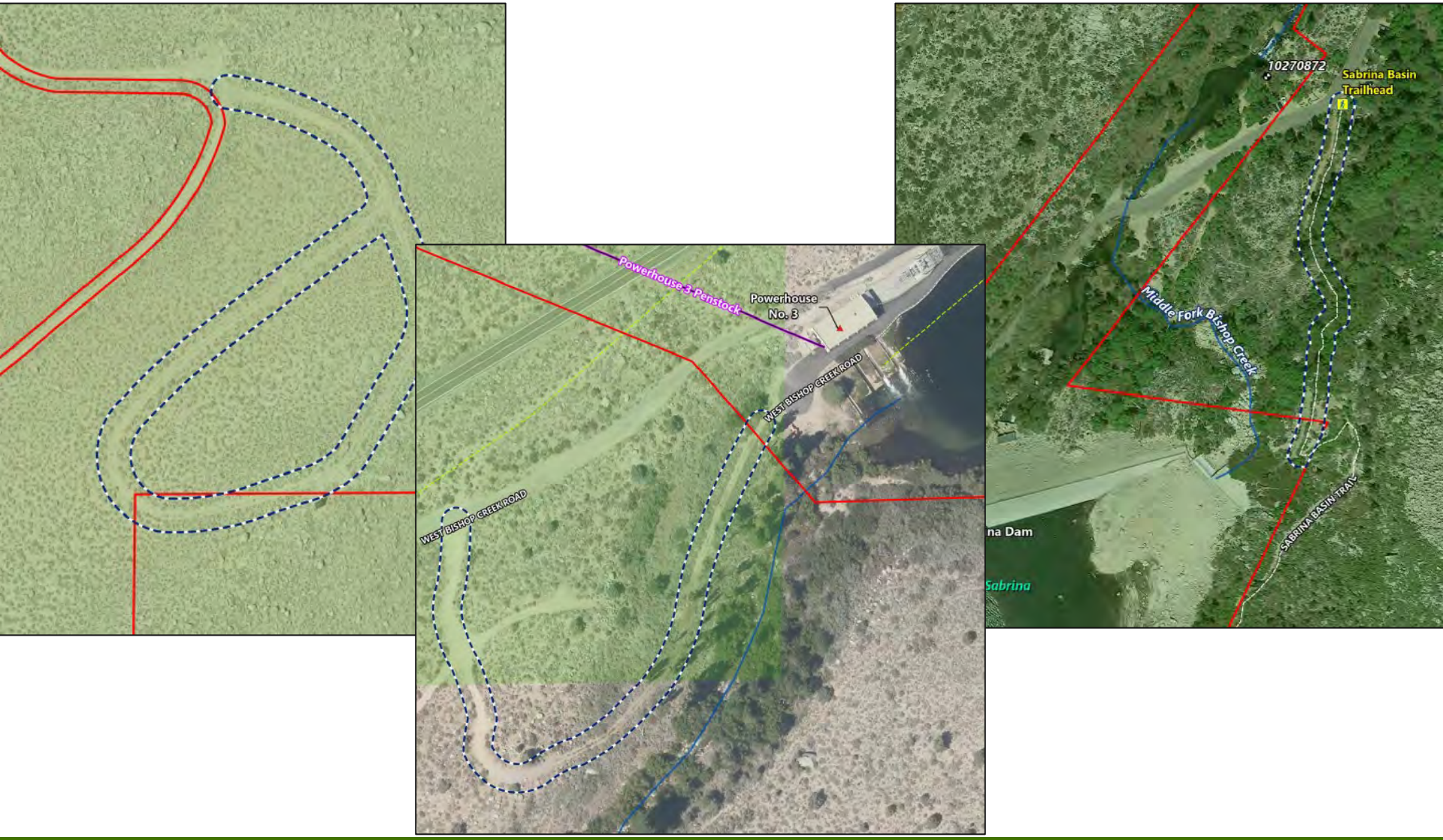


LAND 1 - Preliminary Findings and Observations (Operations/Facilities)





LAND 1 - Preliminary Findings and Observations (Roads/Trails)



Questions?

Next Steps and Action Items

Schedule

- By December 3, 2021 SCE will file meeting summary
  - any additional/supplemental information
  - Any proposed study modification to ongoing studies, new studies
- Within 30 days (January 3, 2022) –
  - participant or the Commission staff may file a disagreement concerning the applicant's meeting summary
  - filing must also include any modifications to ongoing studies or new studies proposed by the Commission staff or other participant.
- Draft License Application Due January 31, 2022

Task	Date
USR Meeting	November 18, 2021
USR Meeting Summary filed with FERC	December 3, 2021
Optional Preliminary License Conditions Meetings	*December 7 & 9, 2021*
Comments due on REC Reports	*December 5 &14 2021*
Comments/Modification Requests on USR Meeting Summary due to FERC	January 3, 2022
DLA due to FERC	**January 31, 2022**
SCE Response to USR Meeting Summary Comments due	February 2, 2022
Continue discussions on License Terms and Conditions	*February-March 2022*
Comments due to FERC on DLA	May 2, 2022
FLA due to FERC	**June 30, 2022**
FERC issues Tendering Notice	14 days after FLA filed
FERC decision on outstanding Additional Information Requests (AIRs)	30 days after FLA filed

Transitioning to License Application - pulling the pieces together

- Draft license application will provide opportunity for first comprehensive look at environmental analysis, proposed measures
- TWG meetings as needed to discuss analysis, resolve issue, refine proposals
- Formal comments due in early May
- Final license application June 30, 2022

Thank You!

SOUTHERN CALIFORNIA EDISON

Bishop Creek Hydroelectric Project

(FERC Project No. 1394)

TECHNICAL MEMORANDUM
BISHOP CREEK SUBSTRATE MOBILITY EVALUATION

SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL Company

December 2021

SOUTHERN CALIFORNIA EDISON

Bishop Creek Hydroelectric Project

(FERC Project No. 1394)

TECHNICAL MEMORANDUM
BISHOP CREEK SUBSTRATE MOBILITY EVALUATION

Southern California Edison
1515 Walnut Grove Ave
Rosemead, CA 91770

December 2021

Support from:

Stillwater Sciences

and

Kleinschmidt

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1.0 INTRODUCTION

This Technical Memorandum summarizes results from supplemental field investigations conducted as part of Task 4 – Substrate Mobility Evaluation from the Sediment and Geomorphology Study, as described in the Modification to Methods of the Initial Study Report (section 12.5). The primary goals of Task 4 are to (1) characterize the particle size distribution of sediments mobilized at or near bankfull flow condition, and (2) evaluate hydraulic conditions required to mobilize D_{65} and D_{84} particle sizes. This tracer study primarily looks at the first goal, as based on estimated bankfull conditions for these sites.

2.0 STUDY AREA AND BACKGROUND

The Study Area included two study sites in the Bishop Creek watershed, Site 4 and Site 6. Site 4 is comprised of two contiguous sub-sites, 4.1 and 4.2, which are treated as one site for this Technical Memorandum. Both sites are downstream of Project reservoirs (i.e., South Lake and Lake Sabrina) (Figure 1) and located on natural stream reaches between a powerhouse intake impoundment and the associated powerhouse (a penstock carries flow parallel to the creek).

Bishop Creek is approximately 10 miles long and has a drainage area of approximately 70 square miles from its headwaters to its confluence with the Owens River. The Bishop Creek watershed drains the eastern side of the Sierra Nevada Range and joins Owens River near Bishop, California. This section of the watershed ranges in elevation from approximately 4,900 feet (ft) to 8,500 ft. Bishop Creek is separated into multiple segments by a series of powerhouses and intakes (Figure 1). The channel form is characterized by high gradient, coarse-grained, cascade and step-pool morphology.

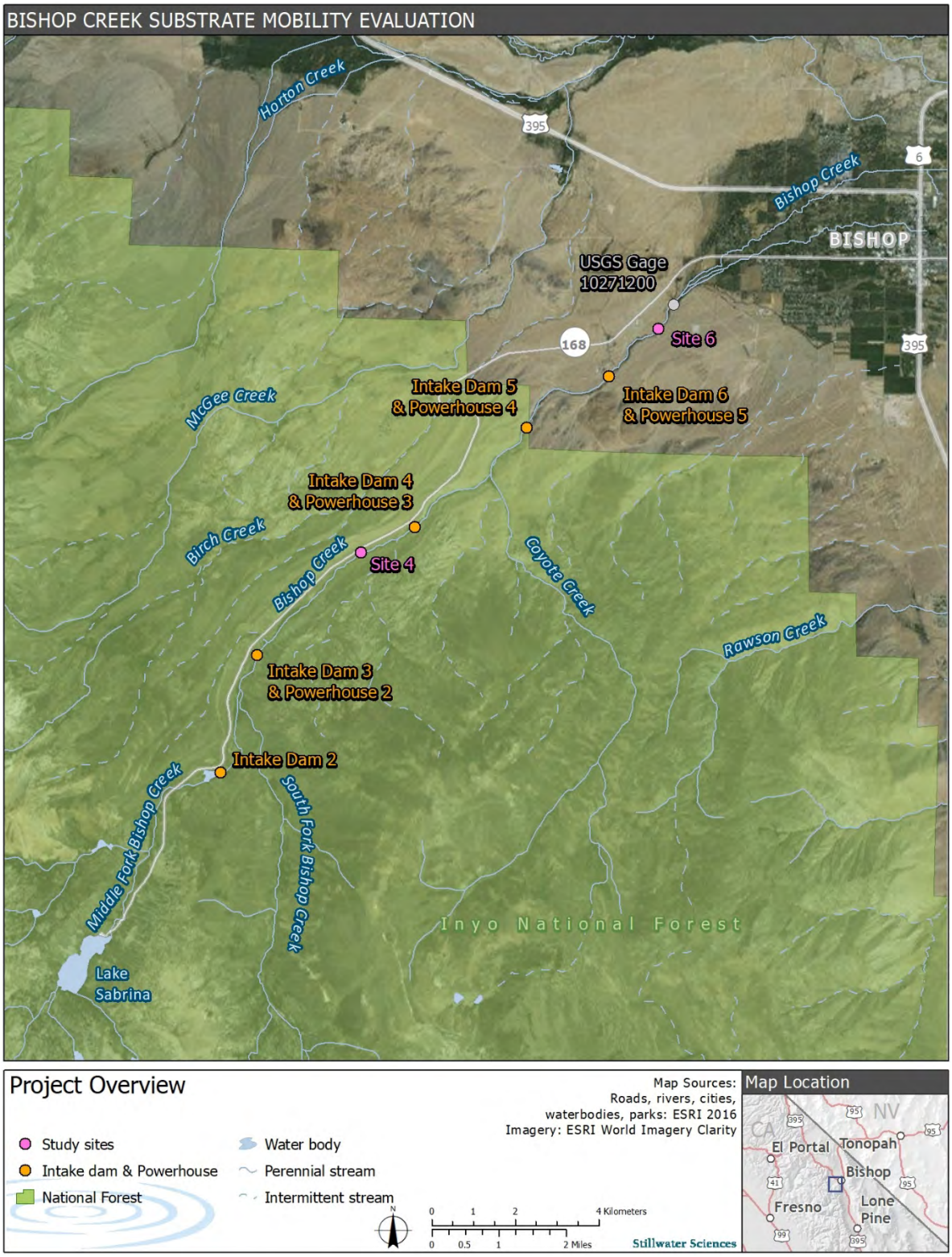

Figure 1. Bishop Creek Tracer Rock Study Site Overview

2.1 HYDROLOGY

Annual peak and 15-minute flow data were used to evaluate hydrology driving sediment transport at Sites 4 and 6. Daily flow data were obtained from Southern California Edison (SCE) for Bishop Creek below Intake 6 and Intake 3, which correspond to the flow in Bishop Creek at Sites 6 and 4, respectively. Fifteen-minute flow data were evaluated for the period of March 2020 to September 2021 to determine the magnitude and duration of high flow events that occurred over the duration of the tracer rock study. Annual peak flow data were obtained from U.S. Geological Survey (USGS) Gage ID 10271200, which is approximately 0.3 miles downstream of Site 6 (on Bishop Creek above Plant 6) and has a total record of 27 years under current in-stream flow requirements. Annual peak flow data are not available for Site 4. Because of this, Site 6 peak flow data were prorated using a standard flow transference formula based on drainage area ratios (Waananen and Crippen 1977):

$$Q_u = Q_g(A_u/A_g) \quad (1)$$

Q_u = Ungaged discharge

Q_g = Gaged discharge

A_u = Ungaged drainage area

A_g = Gaged drainage area.

A flood frequency analysis was performed in accordance with Bulletin 17C (USGS 2019) for USGS Gage ID 10271200 using the Hydrologic Engineering Center's statistical software package (HEC-SSP) (USACE 2019). Table 1 presents peak discharges up to the 20-year recurrence interval (5% annual exceedance probability). Annual peak flows in Bishop Creek ranged from 15 cubic feet per second (cfs) to 453 cfs over the last 27 years (water years 1994 to 2020) (Figure 2). The largest flow on record (453 cfs) had a return period of approximately 20 years (Figure 3).

Table 1. Flood frequency flows for USGS Gage ID 10271200

Annual Exceedance Probability (%)	Site 6 Instantaneous Peak Flow (cfs)	Site 4 Instantaneous Peak Flow (cfs)[1]
5	487	342
10	403	283
20	313	220
50	176	124

[1] Discharge values were prorated by drainage area using equation 1. A_g =104 mi^2, A_u =73 mi^2.

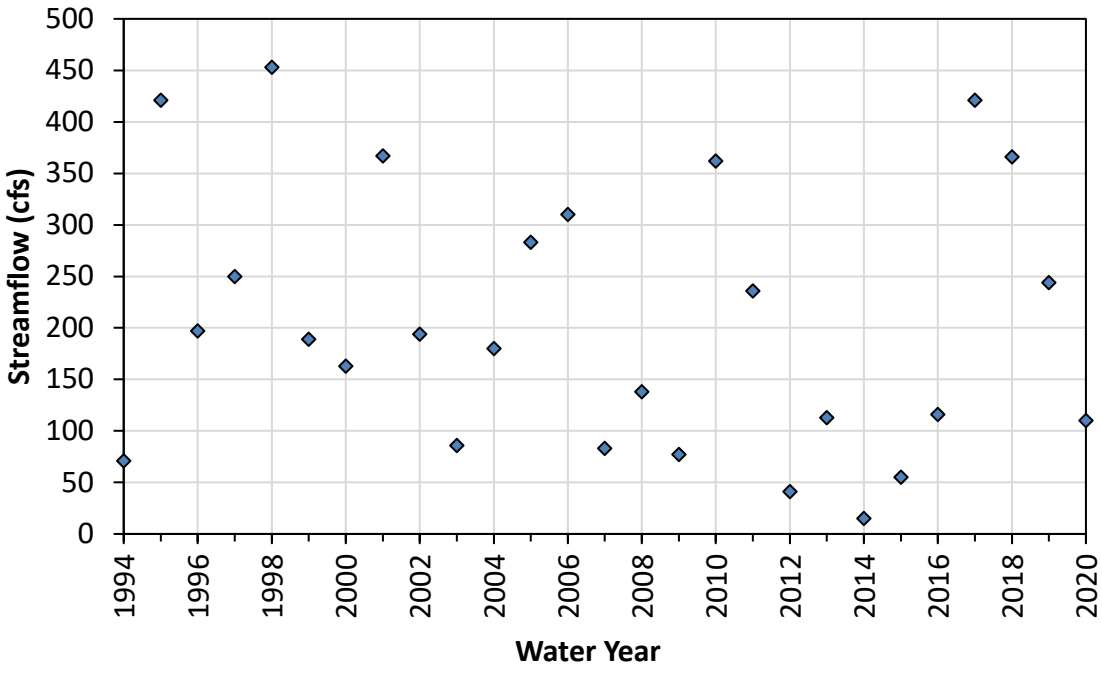

Figure 2. Instantaneous maximum annual peak flow record for water years 1994–2020 at USGS Gage ID 10271200 (Site 6)

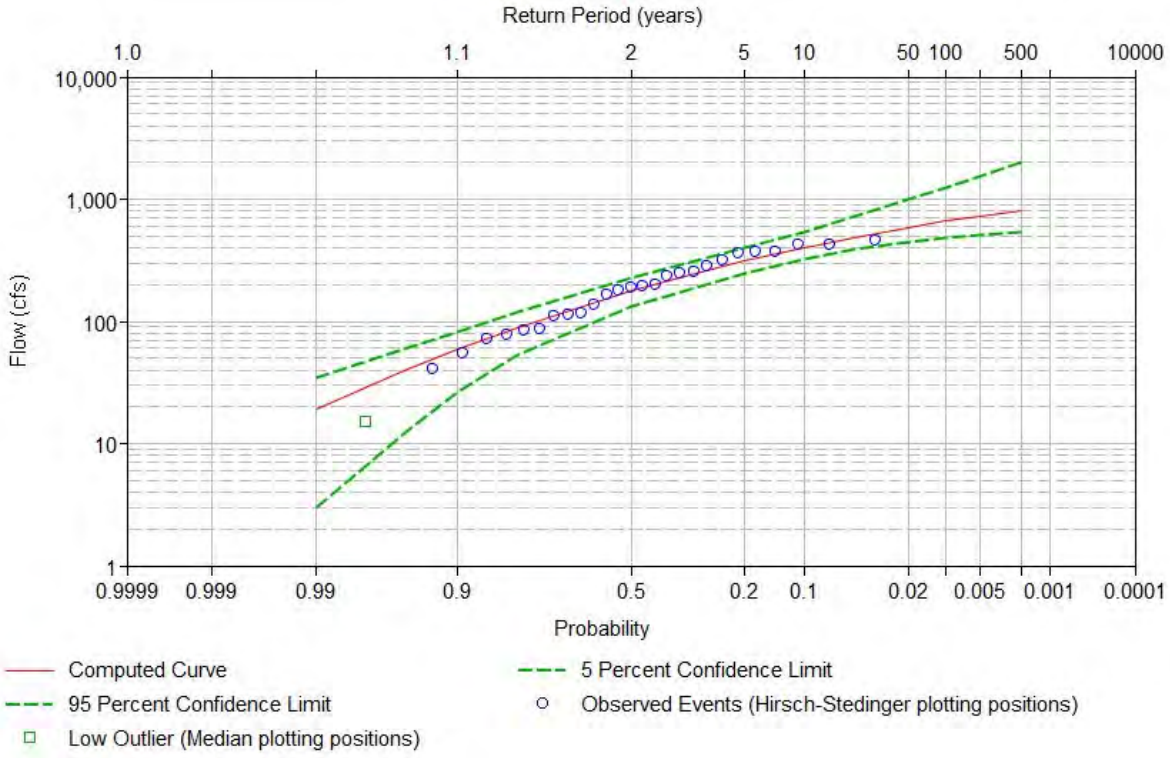

Figure 3. Flood frequency analysis for USGS Gage ID 10271200 (Site 6)

The Project utilizes water from Bishop Creek to generate electricity. Instream flow releases are made within bypass reaches as described in Section 12.2.3 of the PAD (Southern California Edison 2019). Other sources of water input between the junction of South Fork Bishop Creek and Middle Fork Bishop Creek and Powerhouse No. 6 include limited inter-basin transfers from Birch and McGee Creeks (directly into the penstocks) and three tributaries. The largest tributary, Coyote Creek, is unregulated and enters Bishop Creek upstream of Powerhouse No. 4, between Sites 4 and 6.

As described in the Operations Model Study Plan, flow at the site varies depending on the amount of runoff, instream minimum flow requirements, and SCE's release schedule, which is dictated by snowpack, snow melt, spring rain events, drought, power demand, and irrigation. In Bishop Creek, peak runoff generally occurs from June to August, as the snow melts in the higher mountain elevations. A discussion of general project hydrology and operations is available in SCE (2019).

3.0 METHODS

3.1 FIELD MEASUREMENTS

Field measurements at Study Sites 4 and 6 included cross section surveys, longitudinal profile surveys of the channel bed and water surface, surface measurements of bed particle size distribution, deployment, and recovery of Passive Integrated Transponder (PIT) tagged tracer rocks, and photo documentation.

Tracer rock deployments were conducted at Sites 4 and 6 between August 2 and August 6, 2020. Tracer rock recovery efforts 1 and 2 were conducted on May 26 and July 20, 2021, respectively.

3.1.1 LONGITUDINAL PROFILES AND CROSS SECTIONS

Cross section and longitudinal profile surveys were conducted at the study sites utilizing Trimble S7 robotic total station (RTS) and Trimble R10-2 Real-time kinematic Global Navigation Satellite System (RTK GNSS) survey equipment. Temporary control points were installed near each study site, and coordinates were established by submitting static GNSS observations to the National Geodetic Survey Online Positioning User Service (NGS OPUS).

Cross section surveys were conducted in sufficient detail to capture significant changes in grade and characterize channel geometry generally following standard survey procedures as described by the U.S. Dept. of Agriculture, Forest Service (Forest Service) (Harrelson et al. 1994). The cross section surveys extended above bankfull on both banks and included measurements of the edge of water and thalweg. Indicators of bankfull flow elevation, including water stain lines, vegetation transitions, and channel bank slope breaks were noted, and the approximate bankfull locations were recorded. Photos of each cross section were taken facing upstream, downstream, towards left bank, and towards the right bank to document site conditions during the time of survey.

A longitudinal profile of the channel thalweg was surveyed through the length of the site and extended upstream and downstream of the cross sections for a minimum total length of 20 times the bankfull width. Survey point spacing averaged 3 ft, with denser spacing in topographically complex areas. The longitudinal profile survey followed procedures described by the Forest Service (Harrelson et al.1994), including surveying enough points to capture the topography of pools, riffles, and other habitat features, as well as other significant breaks in channel gradient.

3.1.2 SUBSTRATE CHARACTERIZATION

Wolman pebble counts (Wolman 1954) were conducted to characterize channel bed particle size distribution along cross sections and representative channel locations. Pebble counts were conducted in 2020 and 2021 at Site 6 and 2020 at Site 4. Pebble counts entailed measuring the intermediate axis (b-axis) of 100 particles in the immediate vicinity of a cross section transect. All silt- and sand-sized particles were classified as <2 millimeters (mm).

3.1.3 TRACER ROCKS

Passive Integrated Transponder (PIT)-tagged tracer rocks were deployed to inform sediment transport dynamics at sites 4 (consisting of sites 4.1 4.2) and 6. Tracer rocks bracketed the average range of D10 to D84 particle sizes (32 to 350 mm) based on 2019 pebble counts for these sites (Kleinschmidt 2020). Table 2 describes the particle size classes and total quantity of tracer rocks installed in 2020.

Table 2. Tracer rock size classes and quantities by site

Size Class	B-axis Range (mm)	Site[1]	Quantity
A	32–45	4	18
		6	12
B	45–64	4	18
		6	12
C	64–90	4	22
		6	11
D	90–128	4	19
		6	12
E	128–180	4	19
		6	12
F	180–256	4	14
		6	5
G	256–350	4	6
		6	3
Total		4	116
		6	67

[1] Sites 4.1 and 4.2 were treated as a single site (Site 4) for the tracer rock study because the sites are contiguous and tracer rocks were deployed between the two sites as well as at the cross sections.

Tracer rock size classes A–F were obtained from an out-of-area aggregate source prior to the start of fieldwork. The out-of-area tracer rocks had similar lithology (igneous) and physical properties (e.g., specific gravity, sphericity, hardness, mineralogy) to native particles found at the Bishop Creek study sites. Tracer rocks in size class G were obtained on site. The out-of-area tracer rocks were decontaminated with Virkon® aquatic disinfectant prior to deployment in Bishop Creek. The intermediate axis (B-axis) and mass were recorded for each particle in size classes A-F, but only the B-axis parameter was recorded for size class G particles. PIT tags were inserted into the tracers by drilling a 3/16-inch hole into each particle and sealing the PIT tag in place with a quick cure, high strength concrete and masonry anchoring adhesive. The adhesive was smoothed over to mimic natural particle surface texture. The tracer particles were painted a bright, high-contrast color with concrete marking paint once the adhesive was dry.

Tracer rocks were deployed along cross sections and at other representative geomorphic units between the cross sections at each study site. Various geomorphic units were chosen for tracer rock placement to test rock particle mobility in a range of environments. Geomorphic units included riffles, cascades, flat-water sections (runs and glides), and plunge pools. Prior to placement of individual tracer rocks, a rock of similar shape and size was removed from the streambed to create a void space and a similarly sized tracer rock was gently pressed down and worked into the void space to simulate natural streambed particle emplacement. The location of each tracer rock was surveyed with RTS or RTK GNSS equipment, and representative photographs were taken of the tracer locations.

3.2 ANALYSIS

3.2.1 LONGITUDINAL PROFILES AND CROSS SECTIONS

Results from the 2021 cross section and longitudinal profile surveys during tracer recovery were compared with surveys from 2019 and 2020 to assess geomorphic change (e.g., aggradation or incision). The 2019 profiles and cross sections were completed as part of the larger Sediment & Geomorphology Study using local benchmarks and laser level surveying, so there may be some differences in precision between the 2019 and 2020/2021 surveys. Because the longitudinal profiles do not start and stop at endpins, there is likely some uncertainty in aligning the 2019, 2020, and 2021 surveys. Despite differences in longitudinal profile alignments, changes were quantified by comparing reach-average slope between monitoring years. Cross sections were evaluated for instances of aggradation or incision.

3.2.2 BED PARTICLE SIZE DISTRIBUTIONS

Bed particle size distribution data were used to calculate commonly used bed particle size metrics: the particle size for which 16% of the distribution is finer (D_{16}), the particle size for which 50% of the distribution is finer (D_{50}, or the median size), and the particle size for which 84% of the distribution is finer (D_{84}). Particle sizes were binned by size class using half-phi intervals and plotted using cumulative distribution functions (Bunte and Abt 2001).

3.2.3 SEDIMENT MOBILITY

Tracer rock displacement lengths were quantified between deployment and recovery effort 1, and recovery effort 1 and recovery effort 2. Tracer rocks with a displacement greater than 1 ft were considered mobilized. Sediment mobility was assessed at each study site using the channel shear stresses estimated from a Hydrologic Engineering Center's River Analysis System (HEC-RAS) hydraulic model for the largest pulse flow during tracer deployment, particle size data from the pebble counts, and the Shields relationship (equation 2) to compute the critical shear stresses acting on the channel bed during specific flows.

$$\tau^*_{crit} = \frac{\tau_b}{(\rho_s - \rho) g D_{50}} \quad (2)$$

Where:

τ^*_{crit} is the critical Shields number (unitless)

τ_b is basal shear stress (pascals)

ρ is the density of water (kilograms per square meter [kg/m^3])

ρ_s is the particle density, (assumed 2,650 [kg/m^3])

g is acceleration due to gravity (meters per second squared [m/s^2])

D_{50} is the median particle size (mm)

Equation 2 can then be rearranged to solve for critical D_{50} (i.e., the median particle size likely to be mobilized for a given shear stress) under a given flow at each cross section.

$$D_{50_{crit}} = \frac{\tau_b}{(\rho_s - \rho) g \tau^*_{crit}} \quad (3)$$

To estimate shear stresses (τ_b) acting on the channel bed at each study site, flow hydraulics were modeled using the U.S. Army Corps of Engineers' (USACE) HEC-RAS. HEC-RAS is a one-dimensional hydraulic model that is widely used for estimating general flow characteristics. This was a simple HEC-RAS model, constructed for the purpose of estimating shear stress. This one-dimensional model assumes a uniform velocity across the channel but can partition flow into channel and overbank sections. Flow is modeled based on cross sections and topography between the cross sections is assumed to be uniform. The geometry used in the HEC-RAS model was derived from the channel cross section surveys and the discharge was set equal to the largest pulse flows released by SCE during each tracer deployment. Manning's n roughness values ranging between 0.05 and 0.055 were applied in the main channel and overbanks, respectively. The roughness values were estimated based on dominant substrate cover in the channel and vegetation density in overbank areas, using a combination of field observations and professional judgement.

4.0 RESULTS

4.1 SITE 4

The following sections provide results from the 2020 surveys (during tracer installation) at Site 4 and a comparison with data collected in 2019 during separate study elements. Due to the limited mobility of the tracers observed during the tracer recovery efforts in 2021 at this site, the profile and cross section were not resurveyed. An overview of Site 4 and the survey extents are provided in Figure 4.

Figure 4. Site 4 overview

4.1.1 LONGITUDINAL PROFILE AND CROSS SECTIONS

The 2020 longitudinal profile was 550 ft long and extended 75 ft upstream of cross section 4.9 and 110 ft downstream of cross section 4.2 (Figure 4 and Figure 5). The reach average slope, calculated as a best-fit line to the long profile, was 0.04 (4%) in 2019 and 2020. No significant changes were apparent between the 2019 and 2020 longitudinal profiles, and minor variability in elevations between the two profiles is likely a result of profile alignment and/or survey point density.

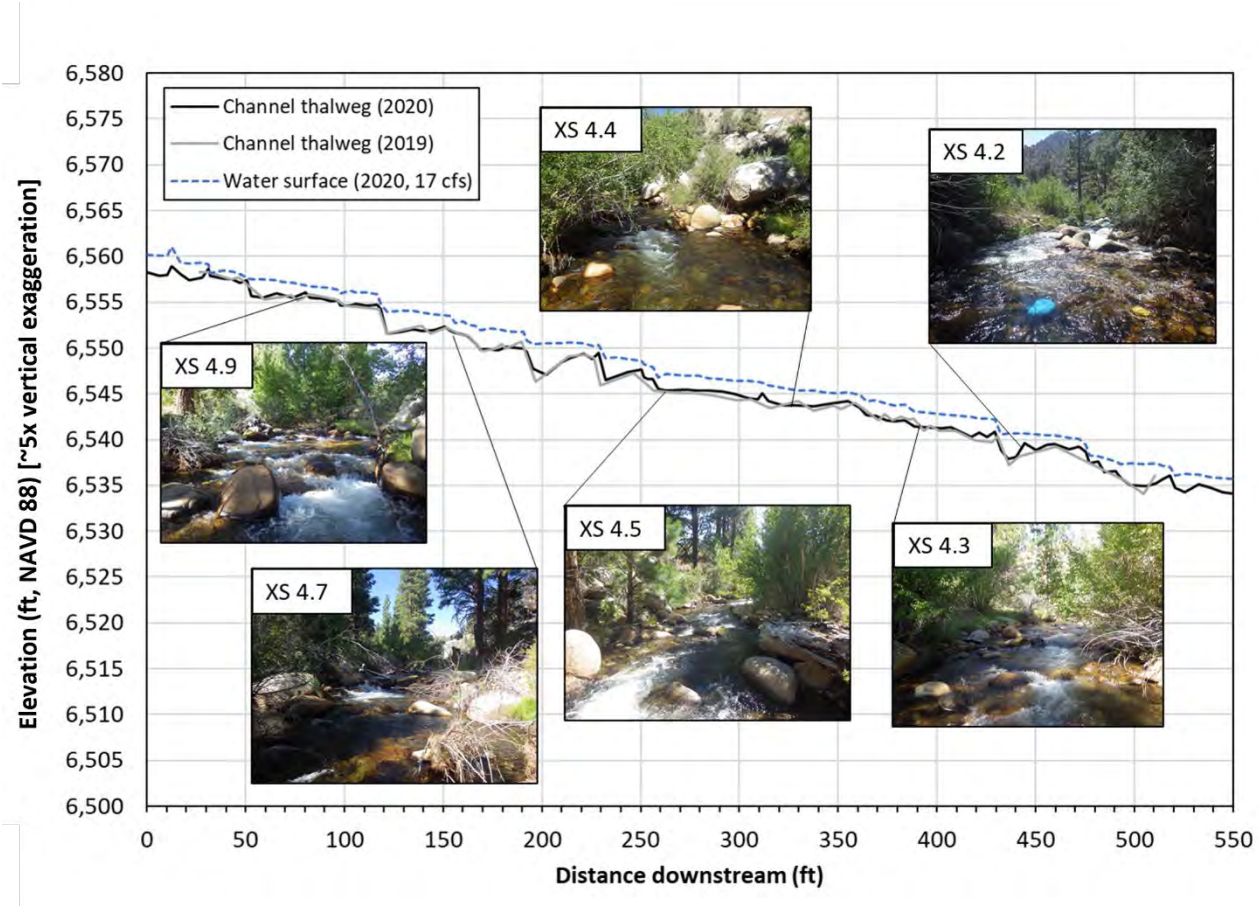

Figure 5. Longitudinal profile for Site 4. Leader lines indicate cross section locations along longitudinal profile. Inset photos show representative conditions of each cross section during 2020 surveys.

Cross sections from 2019 and 2020 are provided in Figure 6 through Figure 8. The cross section geometry was generally similar between the two monitoring years. Differences in bed elevation (e.g., cross section 4.4 between stations 35 and 45) between the monitoring years likely reflect variation in survey point locations rather than topographic changes. Apparent differences in cross section 4.5 are due to the 2019 cross section including survey points on large wood, where the 2020 cross section did not.

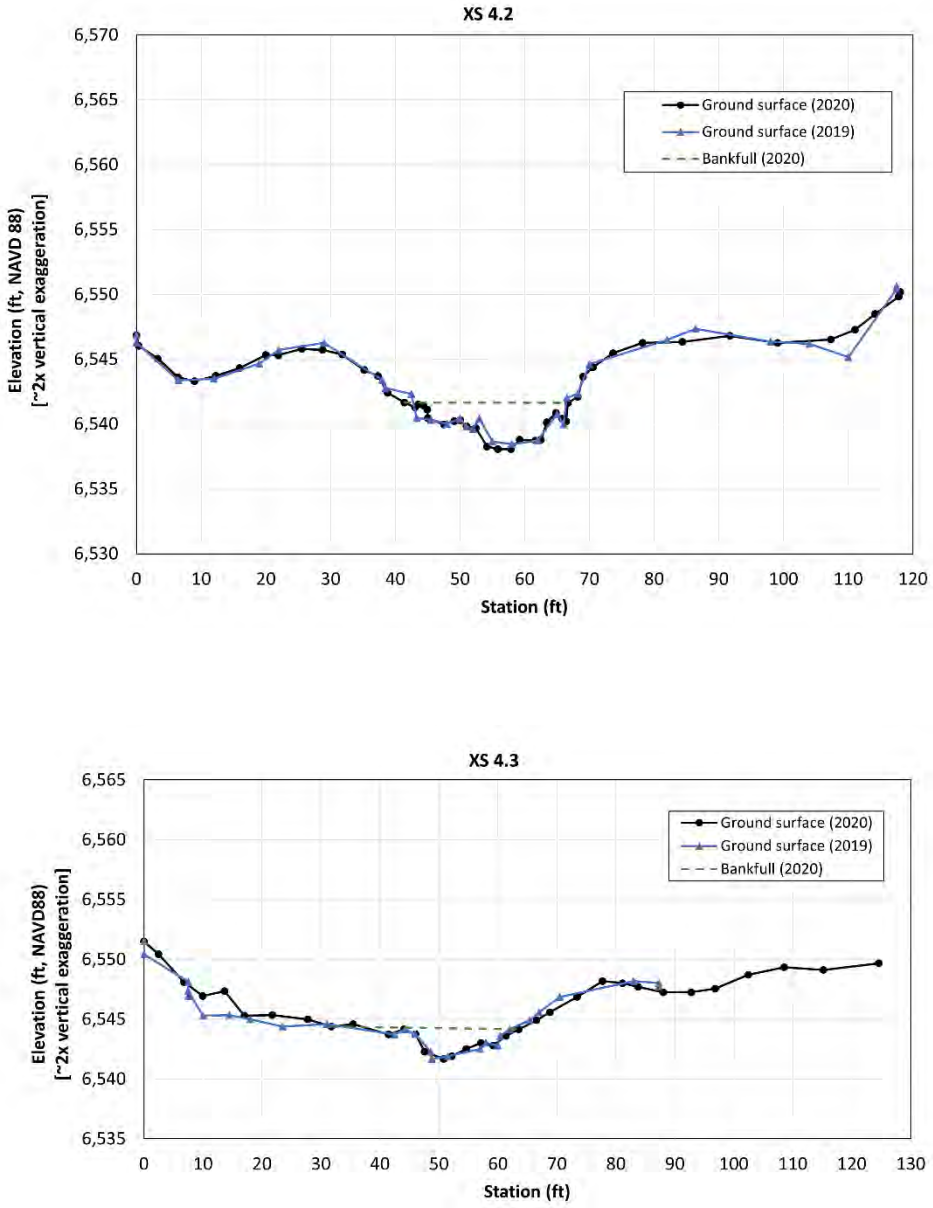

Figure 6. Cross sections 4.2 and 4.3. Stationing is from left to right bank looking downstream.

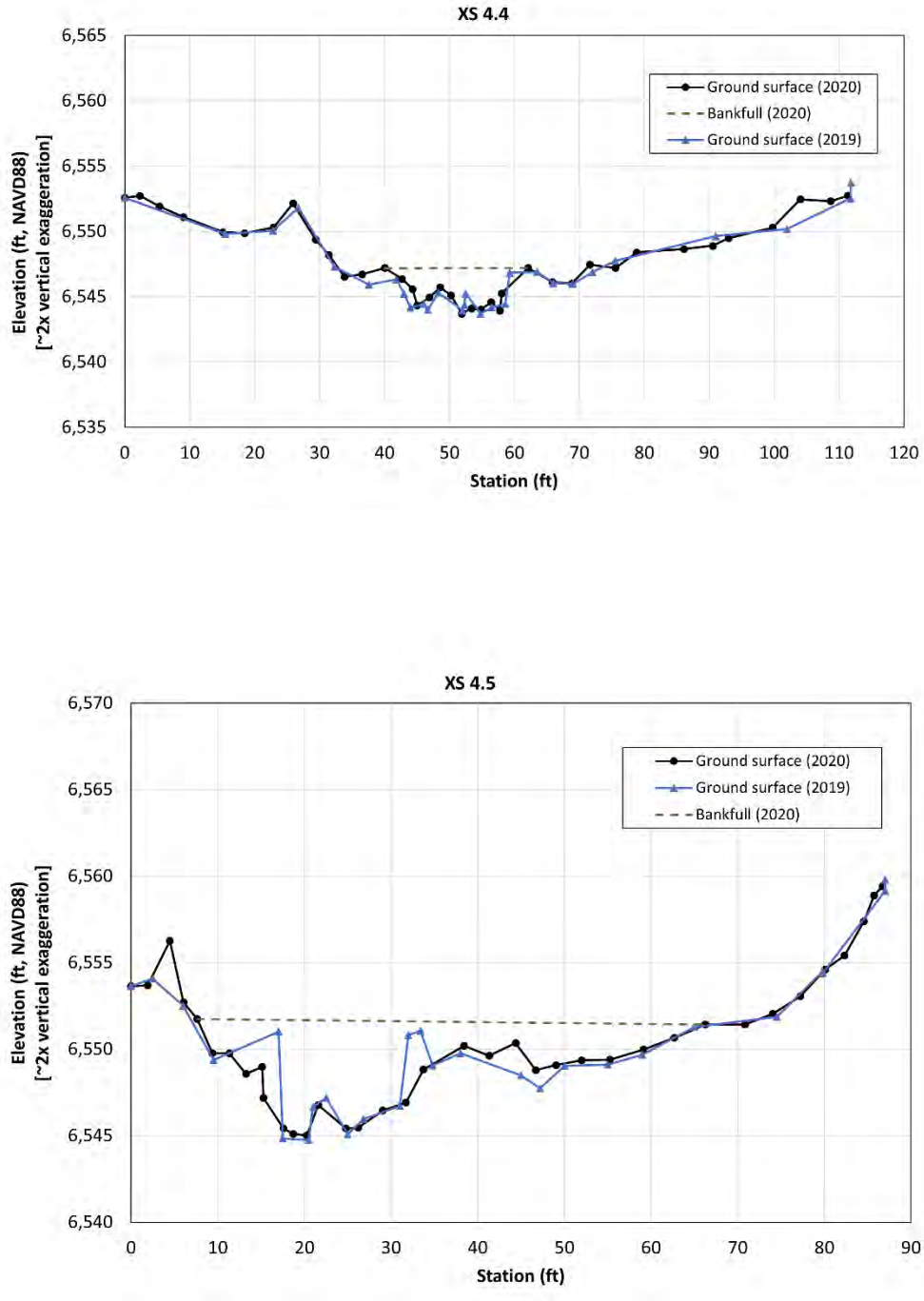

Figure 7. Cross sections 4.4 and 4.5. Stationing is from left to right bank looking downstream.

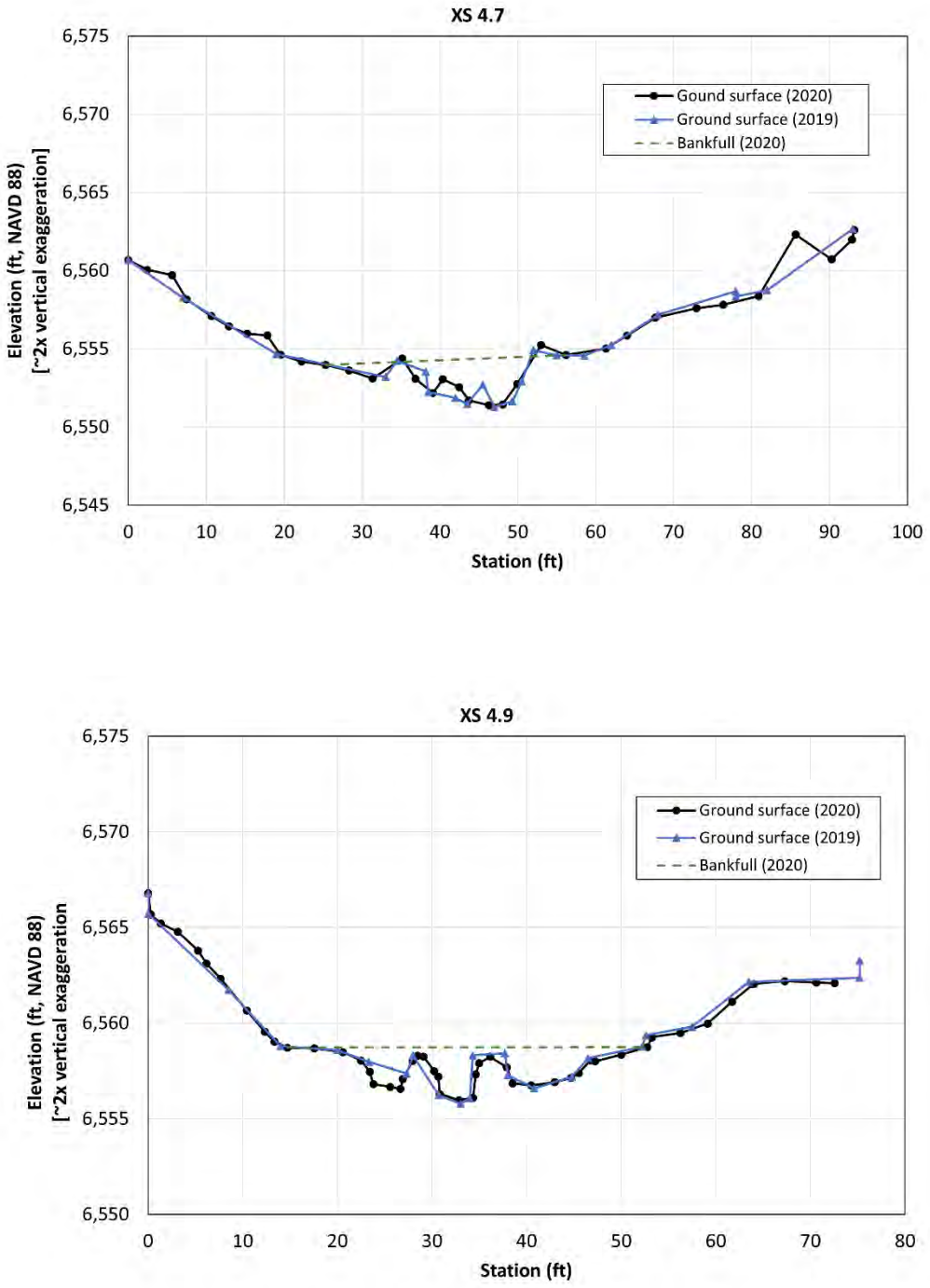

Figure 8. Cross sections 4.7 and 4.9. Stationing is from left to right bank looking downstream.

4.1.2 BED PARTICLE SIZE DISTRIBUTIONS

Pebble counts were conducted at three cross section locations selected to best represent the variety of channel geometry and bed sediment conditions at Site 4. The bed at all three cross sections was predominantly made up of cobbles, with gravel comprising less than 37% and boulders comprising less than 21% of the grain size distribution at each cross section. Sand content (<2 mm) from the 2020 pebble counts was 4, 16, and 1% of the measured particles at cross sections 4.9, 4.7, and 4.2, respectively. A summary of the pebble count data is provided in Table 3 and a plot of the particle size distributions at each cross section is provided in Figure 9.

Pebble counts conducted during 2019 pooled multiple locations within Sites 4.1 and 4.2 as one count and therefore are not directly comparable to the cross section-specific pebble counts conducted in 2020. Although there was spatial variability in the pebble count locations between monitoring years, the 2019 and 2020 particle size distributions were plotted together to evaluate changes. The 2019 particle size distributions were coarser than the 2020 distributions (Figure 9). Differences between the 2019 and 2020 particle size distributions suggest that the bed fined between monitoring years. These differences may be due to measurement bias, variability in collection methods, and pebble count locations.

Table 3.Summary of pebble count data from 2020 for Site 4

Cross Section (XS) ID	Year[1]	D16 (mm)	D50 (mm)	D84 (mm)
4.9	2020	25	78	239
4.7	2020	3	91	323
4.2	2020	43	117	226

[1] Pebble counts were not conducted at Site 4 in 2021 due to limited tracer mobility after flushing flows.

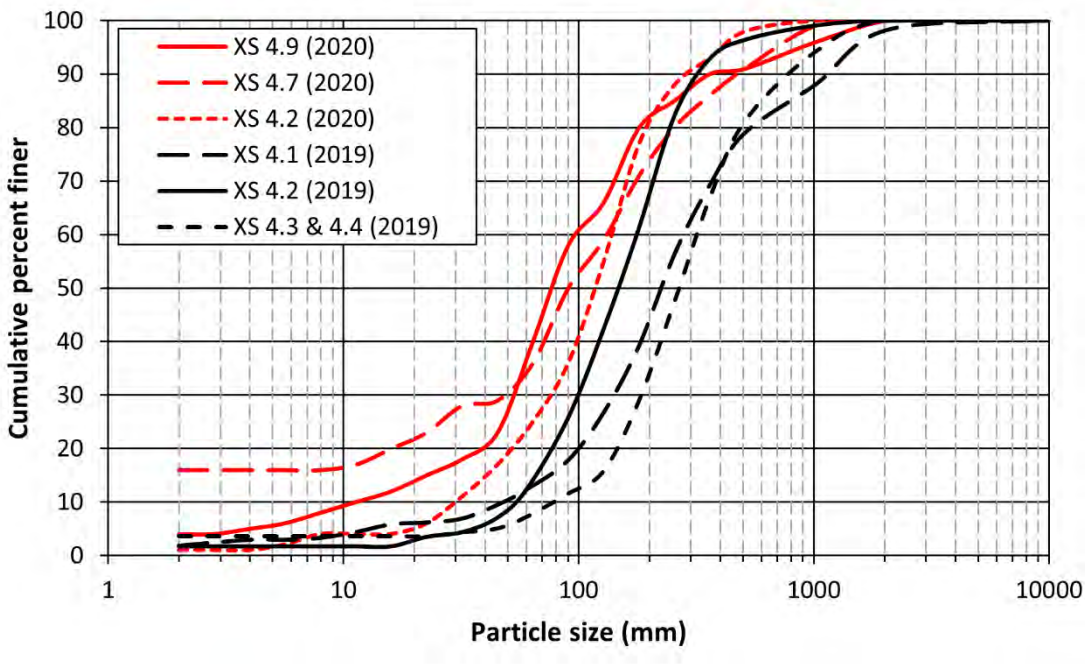

Figure 9. 2020 and 2019 particle size distributions at Site 4. 2020 pebble counts were conducted along cross sections. 2019 pebble counts were conducted at multiple riffles throughout the site.

4.1.3 TRACER ROCKS

One hundred and seventeen tracer rocks were deployed at Site 4 between August 2 and August 6, 2020. Tracer rock recovery surveys were conducted on May 26 and July 20, 2021. Pulse flows of approximately 70 cfs (recurrence interval of ~1.2 years) and 120 cfs (recurrence interval of ~1.6 years) were released to the study reach before recovery effort 1 and recovery effort 2, respectively (Figure 10).

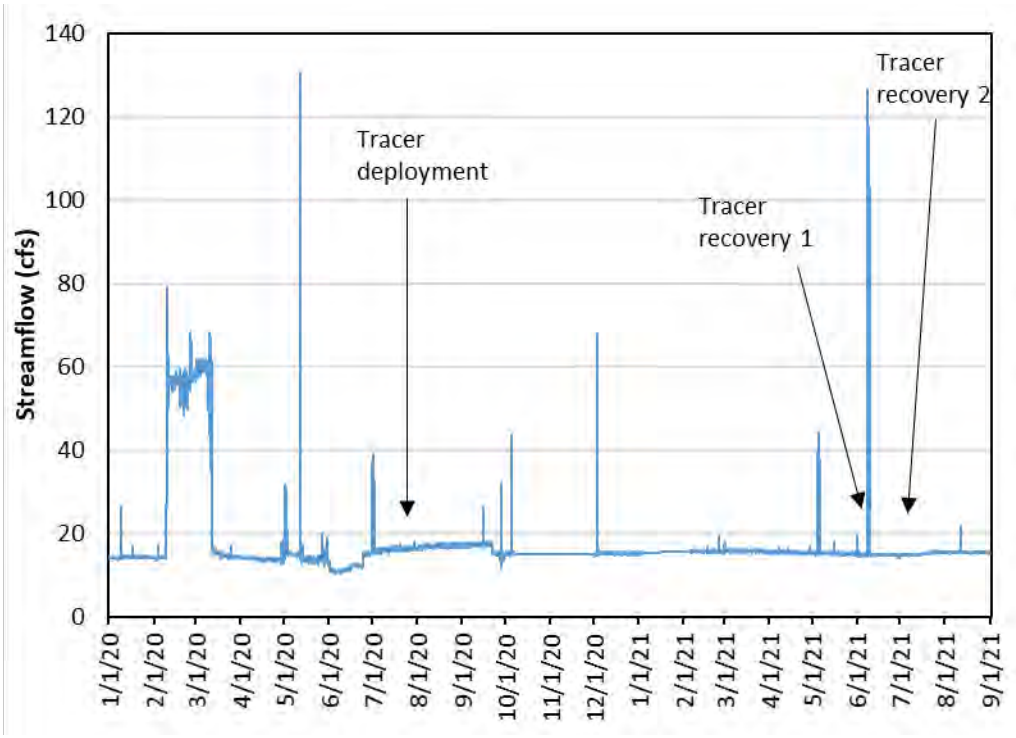

Figure 10. Hydrograph for Bishop Creek below Intake 3 (Site 4). Tracer deployment and recovery survey dates are annotated with arrows.

One hundred and seventeen (100%) of the tracer rocks deployed on August 2, 2020, were recovered on May 26, 2021 after a pulse flow of approximately 70 cfs for a period of approximately 1 hour. Tracer rocks displacement calculations between the deployment and first recovery effort showed that 114 (98%) of the recovered tracer rocks at Site 4 had not mobilized. The remaining 2% of mobile tracers showed negligible transport distances, with a maximum displacement of 1.75 ft. A pulse flow of approximately 120 cfs was released to the study reach shortly after the first recovery effort (Figure 11).

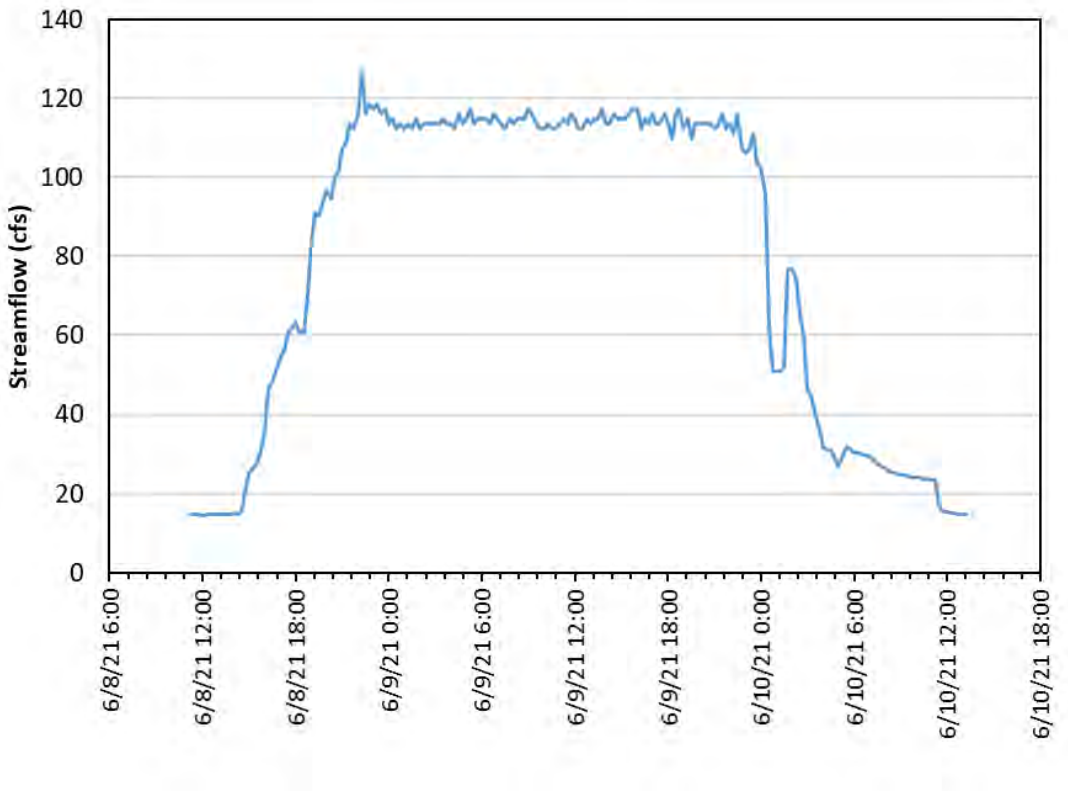

Figure 11. Hydrograph of pulse flow at Site 4 that occurred prior to the second tracer recovery effort.

One hundred and fifteen (98%) of the deployed tracer rocks were recovered during the second recovery effort on July 21, 2021. The pulse flow shown in Figure 11 had a magnitude of approximately 120 cfs and a duration of approximately 24 hours. This flow resulted in mobilization of twelve tracers (11%) and 17% of tracers with diameters <60 mm. Ninety-three percent of tracers with diameters >60 mm showed no mobilization. The largest mobilized particle had a diameter 170 mm, although it was only transported 1.5 ft. There were no mobile particles larger than highest predicted critical D50 at the site ($D50_{crit}$ = 206 mm at XS 4.7). Table 4 provides the channel shear stresses from HEC-RAS and the critical D50 at each cross section location. Tracer movement by particle size is summarized in Figure 12.

Table 4. Predicted critical D50 and modeled channel shear stress at Site 4 cross sections during a discharge of 120 cfs

Cross section	Channel shear stress (pascals)	Predicted critical D50 (mm)
4.9	105	147
4.7	148	206
4.5	77	105
4.4	91	123
4.3	134	184
4.2	144	199

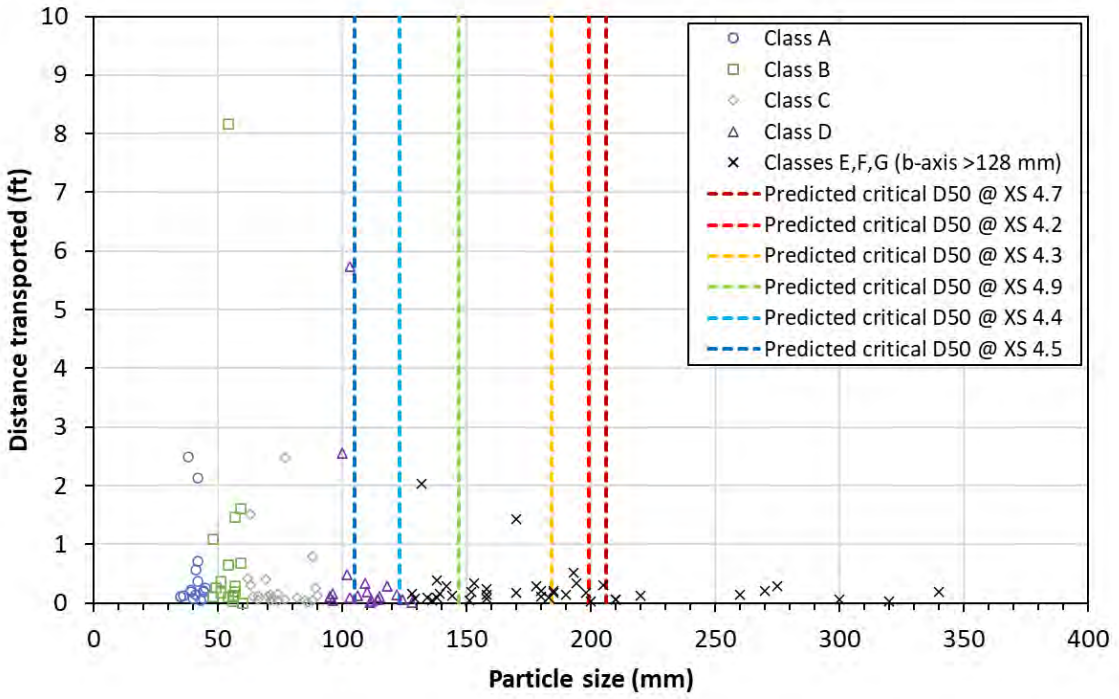

Figure 12. Transport distance of tracer rocks by particle size at Site 4 between recovery effort 1 and recovery effort 2 (after 120 cfs flushing flow). Grain size classes follow conventions used in Table 2.

4.2 SITE 6

The following sections provide results from the 2020 (tracer deployment) and 2021 (tracer recovery 1 and 2) surveys at Site 6, and a comparison with data collected in 2019 during a separate study element. An overview of Site 6 and the survey extents are provided in Figure 13. Cross sections are numbered sequentially from downstream to upstream.

Figure 13. Site 6 overview.

4.2.1 LONGITUDINAL PROFILE AND CROSS SECTIONS

The 2020 and 2021 longitudinal profiles were approximately 420 ft long and extended 100 ft upstream of cross section 6.8 and 160 ft downstream of cross section 6.5 (Figure 14). The 2019 long profile was 250 ft long and extended 35 ft upstream of cross section 6.8 and 60 ft downstream of cross section 6.5. The reach average slope, calculated as a

best-fit line to the long profile, was 0.02 (2%) during all three monitoring years. The 2020 and 2021 longitudinal profiles are generally similar, and apparent differences in the two profiles are likely a result of slight misalignment or variability in survey point locations rather than changes in channel morphology. Apparent changes between the 2019 and the 2020 long profiles, particularly between stations 75 and 125, suggest channel aggradation but may be a result of misalignment and/or different survey point spacing.

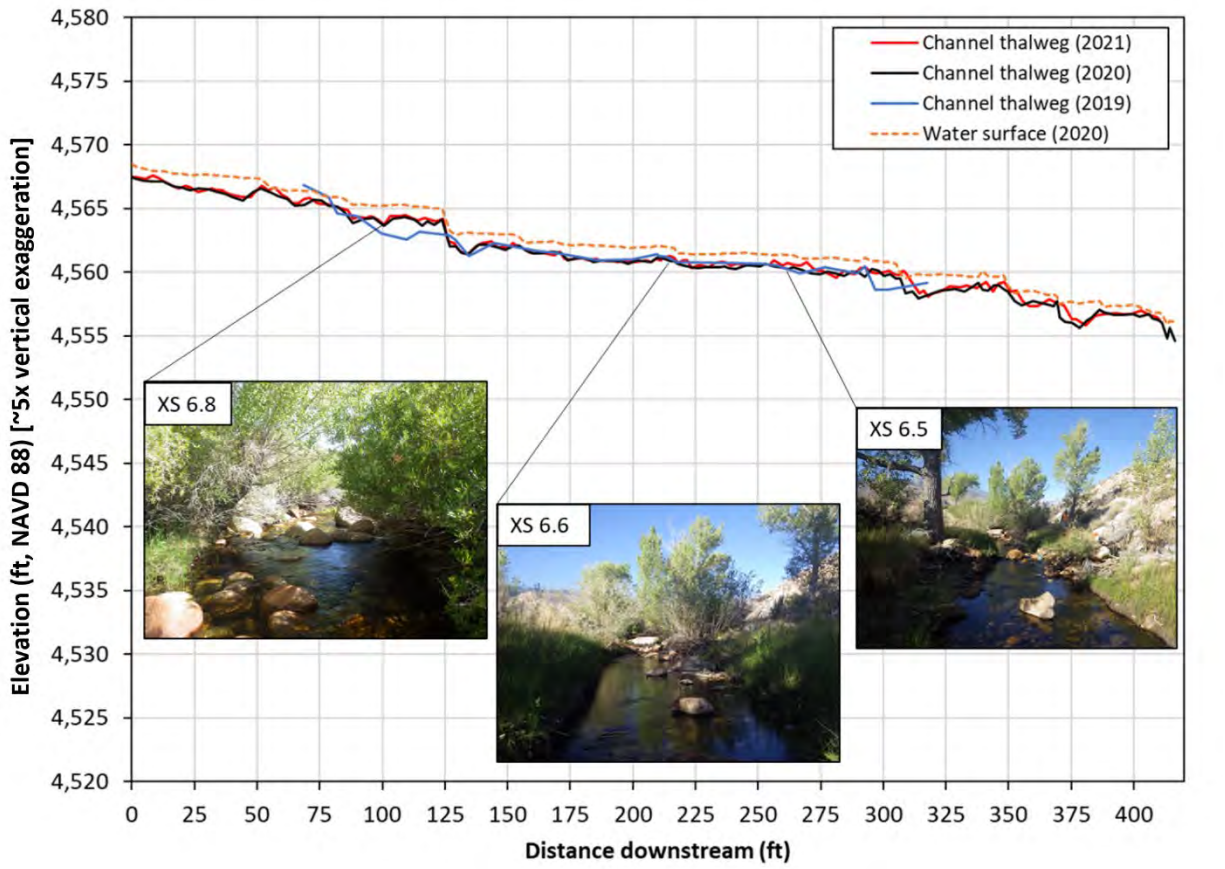

Figure 14. Site 6 longitudinal profiles from 2019, 2020, and 2021. Leader lines indicate cross section locations along longitudinal profile. Inset photos show representative conditions of each cross section during 2020 surveys.

Cross sections from 2019 through 2021 are provided in Figure 15 through Figure 17. The cross section geometry was generally similar between the three monitoring years. Minor differences in bed elevation (e.g., cross section 6.5 at station 35) between the monitoring years likely reflect variation in survey point locations rather than topographic changes.

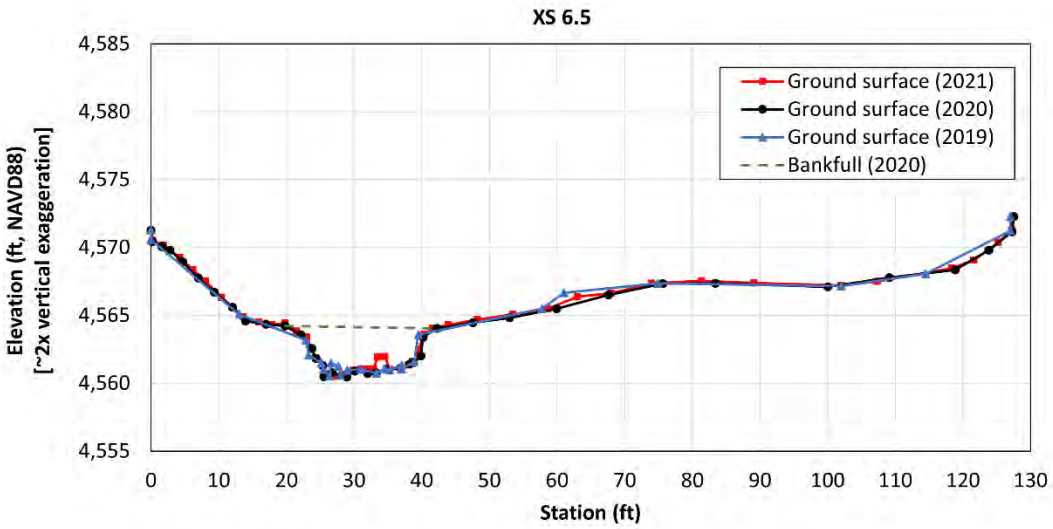

Figure 15. Cross section 6.5 during 2019, 2020, and 2021. Stationing is from left to right bank looking downstream

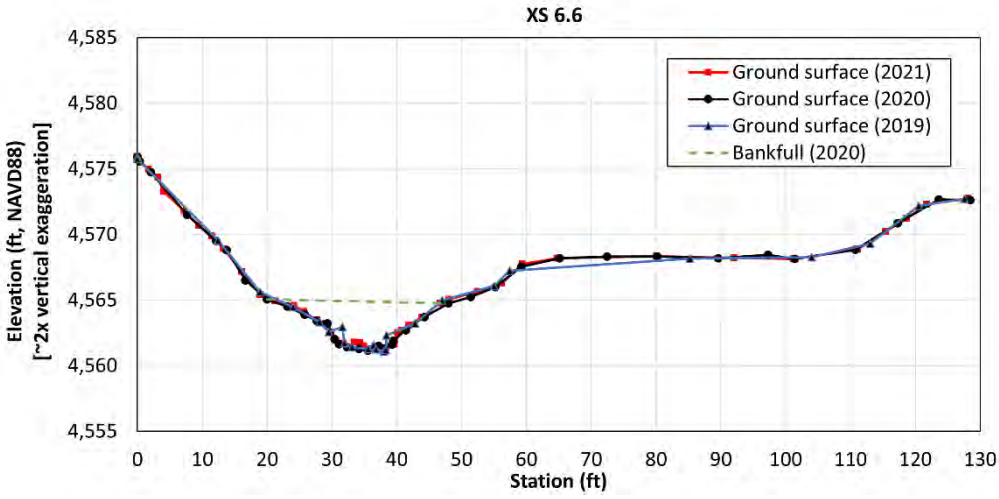

Figure 16. Cross section 6.6 during 2019, 2020, and 2021. Stationing is from left to right bank looking downstream.

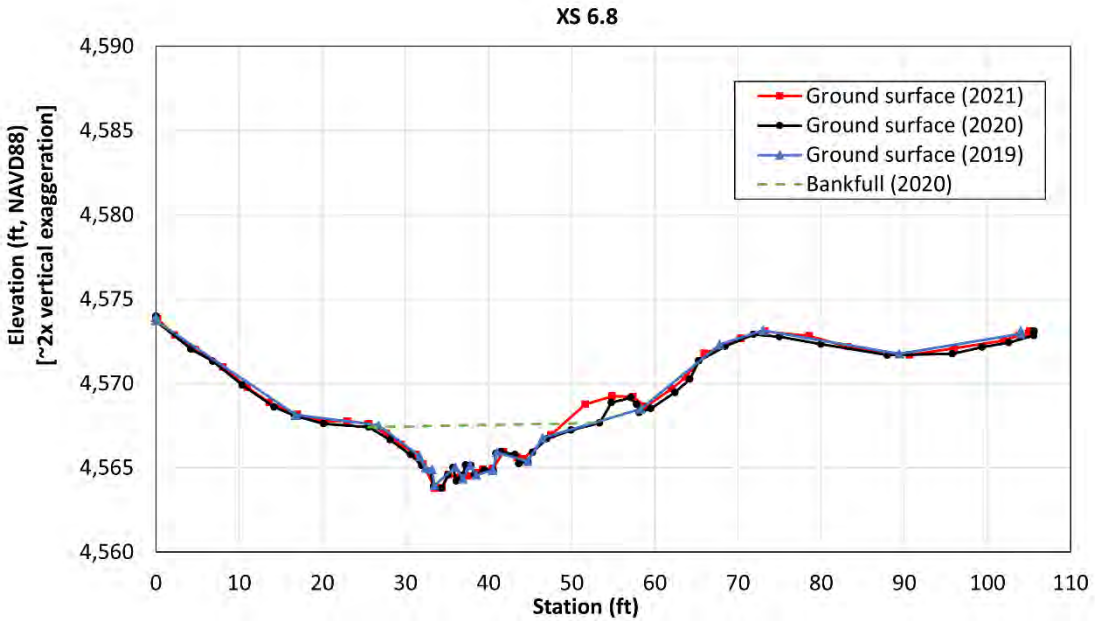

Figure 17. Cross section 6.8 during 2019, 2020, and 2021. Stationing is from left to right bank looking downstream.

4.2.2 BED PARTICLE SIZE DISTRIBUTIONS

The bed at all three cross sections at this site was primarily made up of cobbles and gravel, with boulders comprising less than 21% of the pebble counts at each cross section in 2020 and 2021. Relative to the 2020 measurements, the bed coarsened at cross sections 6.6 and 6.5 (Figure 18 and Figure 19), with increases of cobble-sized material. The bed at cross section 6.8 remained mostly stable between 2020 and 2021 but showed a slight decrease in the coarse fraction of the particle size distribution (Figure 20). The amount of gravel decreased by 15% between 2020 and 2021 at cross sections 6.8 and 6.5 and decreased by 26% at cross section 6.6. A summary of the pebble count data from 2020 and 2021 is provided in Table 5 and plots of the particle size distributions at each cross section are provided in Figure 18 through Figure 20.

Pebble counts conducted during 2019 grouped the entire site as one count and therefore are not directly comparable to the cross section-specific pebble counts conducted in 2020. To compare the 2019 and 2020 particle size distributions, all three cross sectional pebble counts conducted during 2020 were grouped into a single distribution and plotted with the 2019 data. The 2019 distribution was coarser overall (Figure 21). Differences in the particle size distributions may be due to measurement bias and variability in collection methods.

Table 5. Summary of pebble count data from 2020 and 2021 for Site 6

Cross Section	6.8		6.6		6.5	
Year	2020	2021	2020	2021	2020	2021
D16 (mm)	17	18	23	60	4	23
D50 (mm)	76	74	69	130	58	137
D84 (mm)	283	177	58	137	199	256

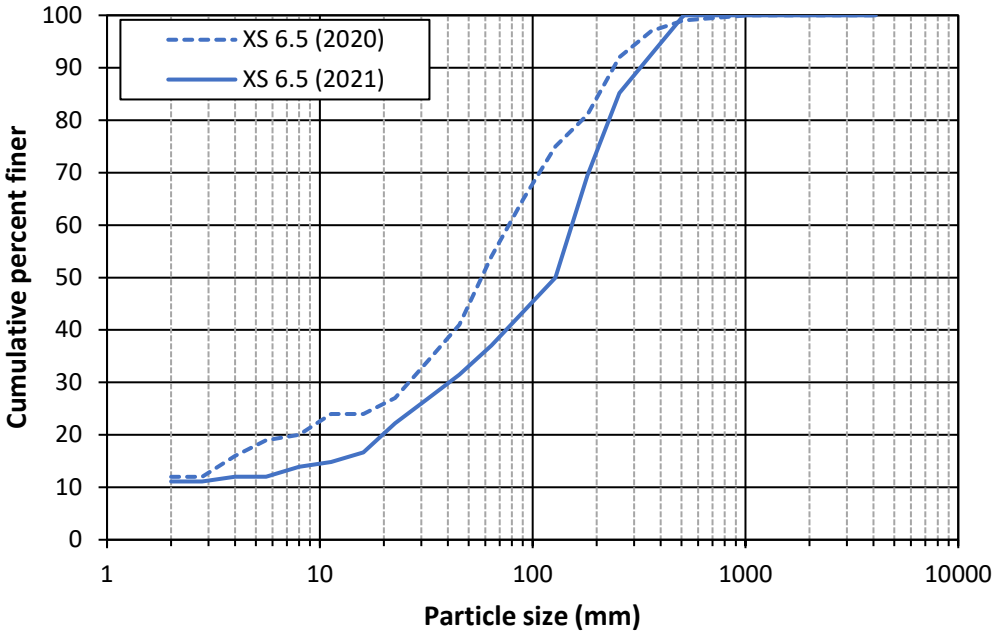

Figure 18. Particle size distributions at cross section 6.5 during 2020 and 2021

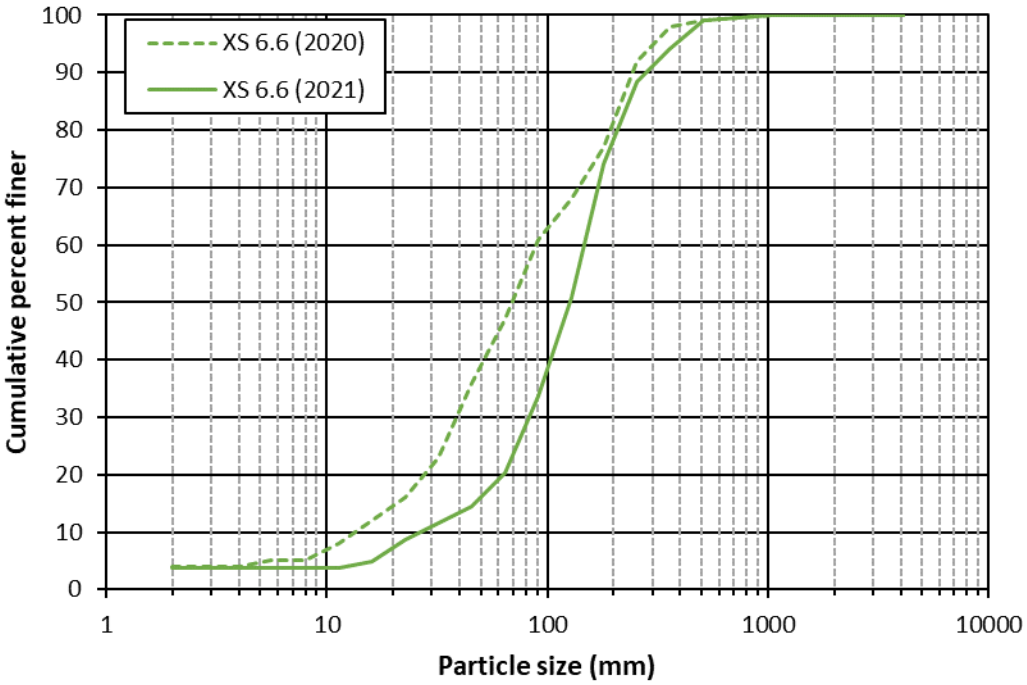

Figure 19. Particle size distributions at cross section 6.6 during 2020 and 2021

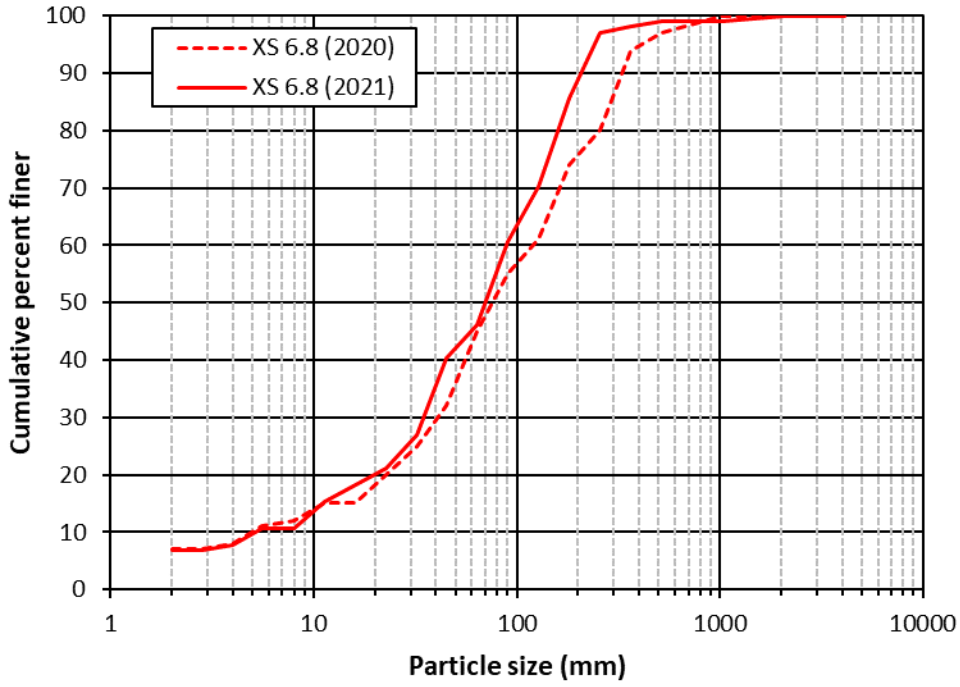

Figure 20. Particle size distributions at cross section 6.8 during 2020 and 2021

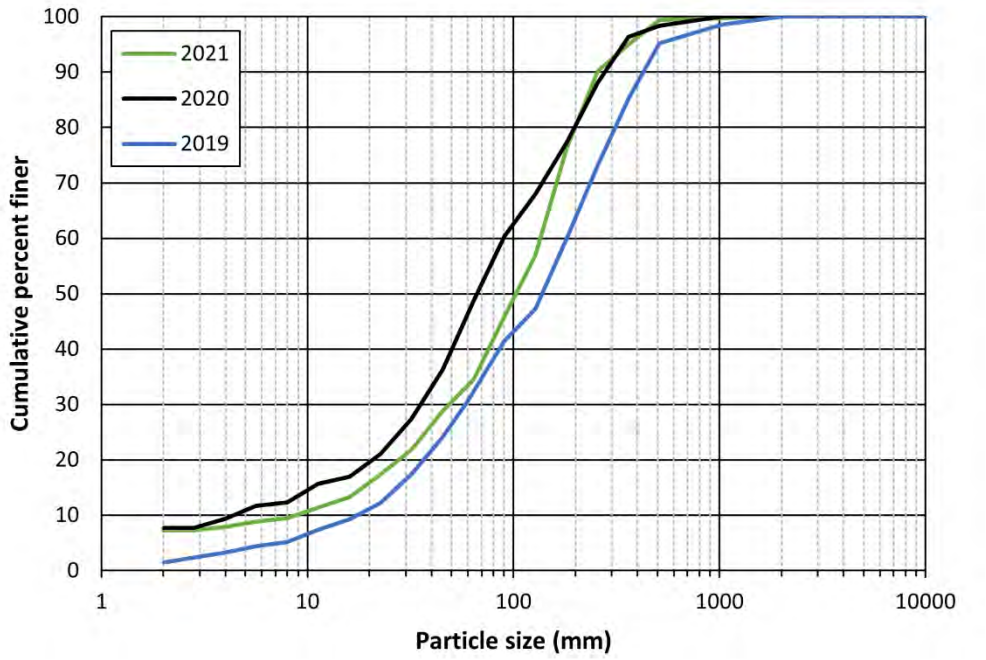

Figure 21. Particle size distributions at Site 6 during 2019 and 2020. Particle size data from 2019 was conducted throughout Site 6 riffles. Particle size data from 2020 was conducted at cross sections and grouped into a single distribution.

4.2.3 TRACER ROCKS

Sixty-seven tracer rocks were deployed at Site 6 between July 29 and August 1, 2020. Tracer rock recovery surveys were conducted on May 26 and July 20, 2021. Pulse flows of approximately 60 cfs and 120 cfs were released to the Project reach before recovery effort 1 and recovery effort 2, respectively (Figure 22).

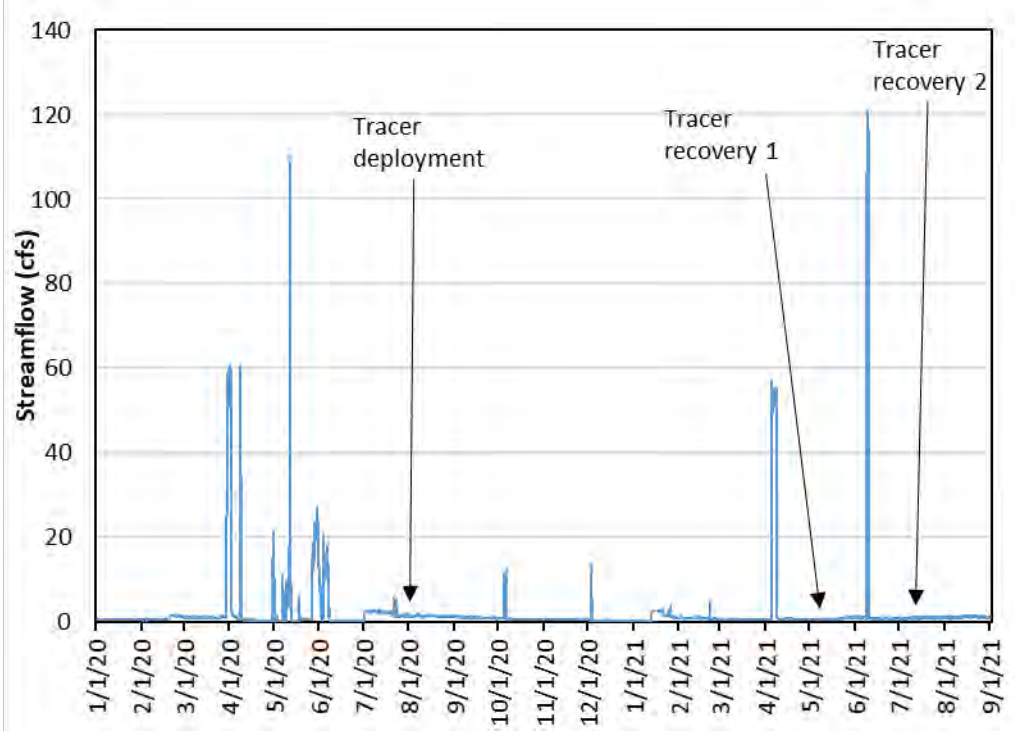

Figure 22. Hydrograph for Bishop Creek below Intake 6 (Site 6). Tracer deployment and recovery survey dates are annotated with arrows.

Sixty-two (93%) of the deployed tracer rocks were recovered during the first recovery effort on May 26, 2021. However, 31 (46%) of the total tracer rocks deployed at Site 6 had been heavily disturbed by non-fluvial processes prior to the recovery effort. The remaining 36 (54%) tracers that were recovered in the stream channel were undisturbed and showed no movement from their initial placement locations. Non-fluvial disturbance was determined by observations of lateral and upstream movement of tracer rocks, presumably from anglers or other recreating individuals. This necessitated resetting approximately half of the tracers at Site 6 in May 2021, which resulted in shorter residence times for approximately half of the tracers at Site 6 prior to the second, larger pulse flow. The pulse flow on June 9, 2021 had a peak discharge of 120 cfs and a duration of approximately 24 hours (Figure 23).

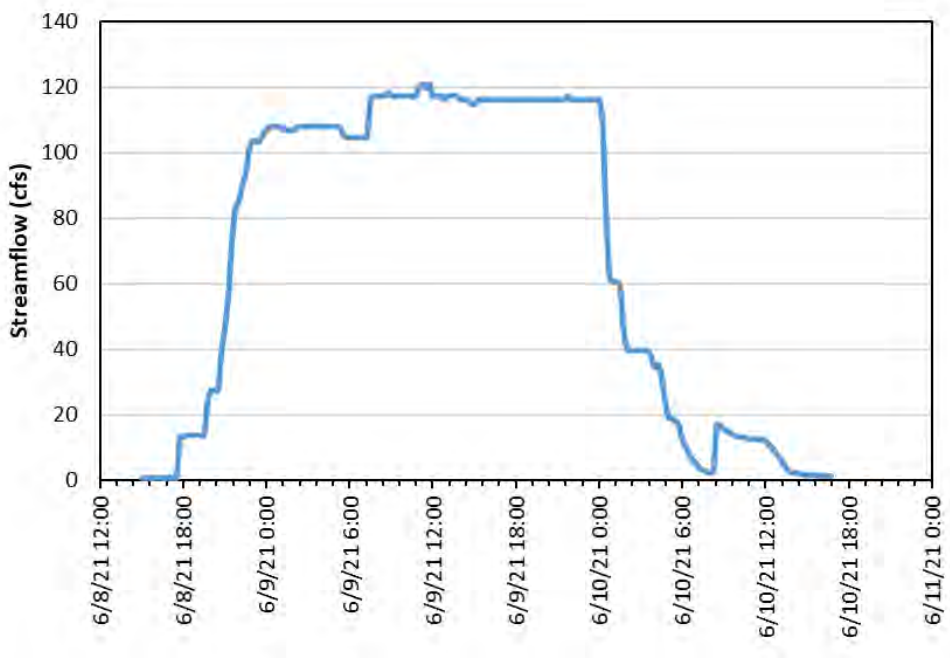

Figure 23. Magnitude and duration of pulse flow that occurred prior to the second tracer recovery effort

Sixty (90%) of the deployed tracer rocks were recovered during the second recovery effort on July 21, 2021. The pulse flow shown in Figure 23 resulted in mobilization of 40% (n = 24) of all recovered tracer rocks and 84% (n = 16) of tracers <60 mm. Eighty percent (n = 34) of tracers >60 mm showed no mobilization. The largest mobilized particle was 197 mm and was transported 4.5 ft. This was the only mobile particle larger than the highest predicted critical D_{50} at the site. Table 4 provides the channel shear stresses from HEC-RAS and associated critical D_{50} at each cross section location based on the pulse flow of 120 cfs. Tracer movement by particle size is summarized in Figure 24.

Table 6. Predicted critical D50 and modeled channel shear stress at Site 6 cross sections during a discharge of 120 cfs.

Cross section	Channel shear stress (pascals)	Predicted critical D50 (mm)
6.8	101	141
6.6	81	116
6.5	72	100

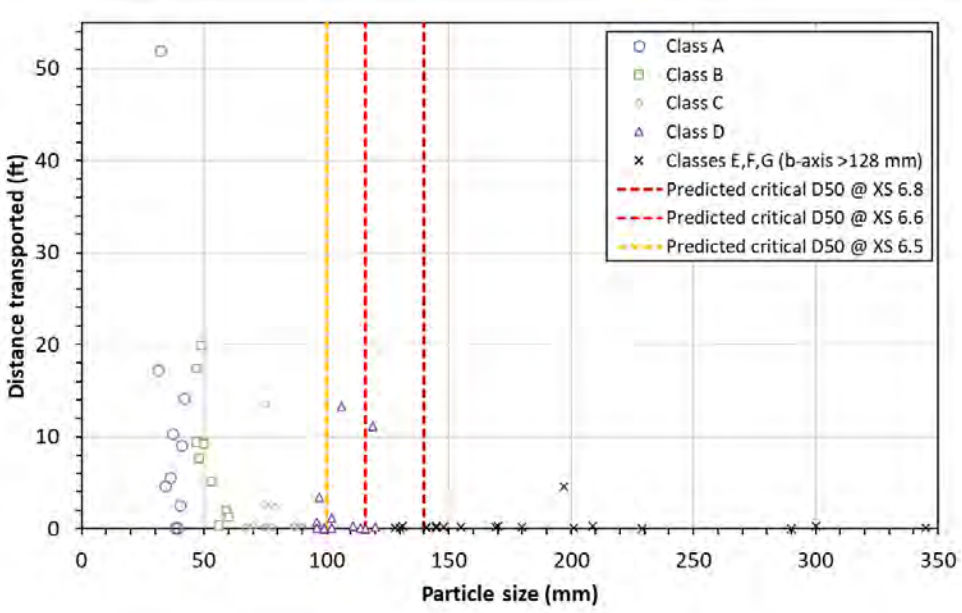

Figure 24. Transport distance of tracer rocks by particle size at Site 6 between recovery effort 1 and recovery effort 2. Grain size classes follow conventions used in Table 2.

5.0 DISCUSSION

Tracer rock disturbance by non-fluvial processes and associated lower particle residence time in the streambed prior to the larger pulse flow may partially explain higher transport distances observed at Site 6. Resetting the tracers at Site 6 on May 26, 2021 resulted in the tracer rocks having less than two weeks in the streambed prior to the larger pulse flow, where the tracer rocks at Site 4 had approximately 10 months in the streambed prior to the larger pulse flow. Shorter residence times of tracers in the streambed are likely associated with smaller degrees of embeddedness, which can affect the mobility of streambed particles (Parker 2008).

The smaller transport distances observed at Site 4 are likely a more accurate depiction of sediment mobility in these reaches because the tracer rocks had longer residence times in the streambed, which is a more accurate representation of native particles.

6.0 REFERENCES

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SOUTHERN CALIFORNIA EDISON

Bishop Creek Hydroelectric Project

(FERC Project No. 1394)

APPENDIX A
Photo Log

Figure A-1. Cross section 4.9 in August 2020, view upstream from mid channel.

Figure A-2. Cross section 4.9 in August 2020, view downstream from mid channel.

Figure A-3. Cross section 4.9 in August 2020, view of left bank from right bank.

Figure A-4. Cross section 4.9 in August 2020, view of right bank from left bank.

Figure A-5. Cross section 4.9 in August 2020, view of tracers from right bank.

Figure A-6. Cross section 4.9 in August 2020, view of tracers from left bank.

Figure A-7. Cross section 4.9 in August 2020, close up view of right bank pin.

Figure A-8. Cross section 4.9 in August 2020, landscape view of right bank pin.

Figure A-9. Cross section 4.9 in August 2020, close up view of left bank pin.

Figure A-10. Cross section 4.9 in August 2020, landscape view of left bank pin.

Figure A-11. Cross section 4.7 in August 2020, view upstream from mid channel.

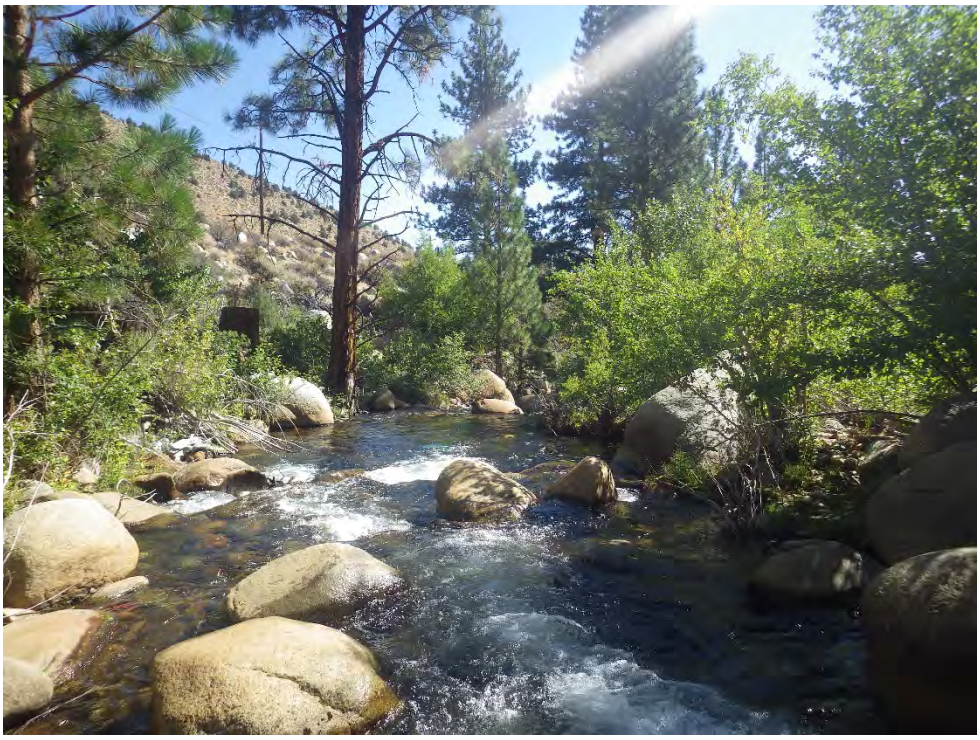

Figure A-12. Cross section 4.7 in August 2020, view downstream from mid channel.

Figure A-13. Cross section 4.7 in August 2020, view of left bank from right bank.

Figure A-14. Cross section 4.7 in August 2020, view of right bank from left bank.

Figure A-15. Cross section 4.7 in August 2020, view of tracers from right bank.

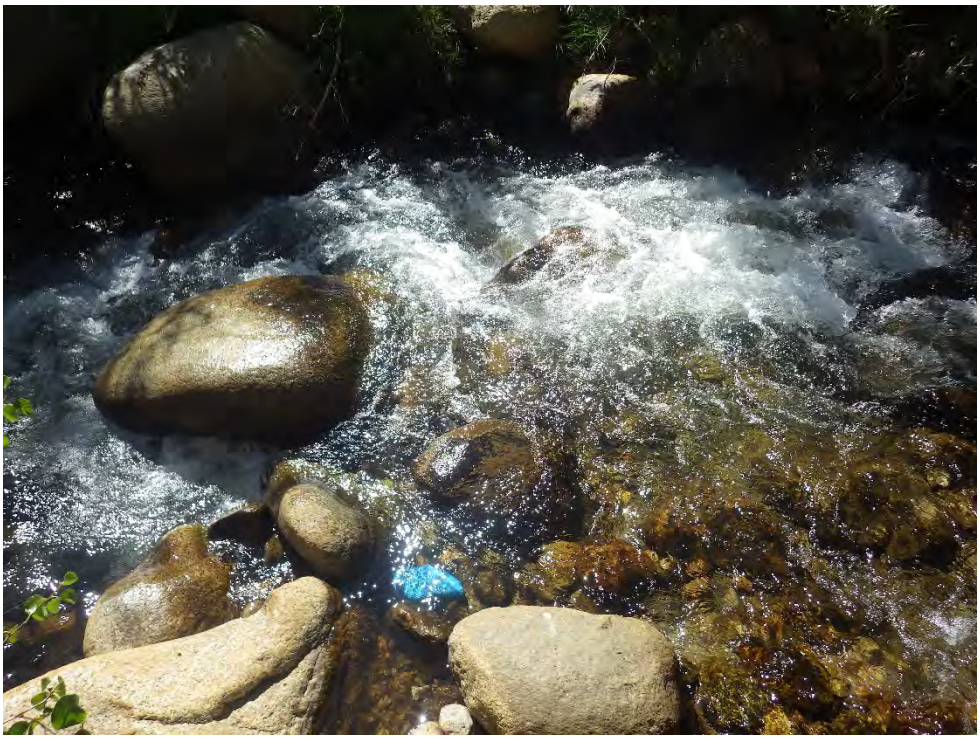

Figure A-16. Cross section 4.7 in August 2020, view of tracers from left bank.

Figure A-17. Cross section 4.7 in August 2020, close up view of right bank pin.

Figure A-18. Cross section 4.7 in August 2020, landscape view of right bank pin.

Figure A-19. Cross section 4.7 in August 2020, close up view of left bank pin.

Figure A-20. Cross section 4.7 in August 2020, landscape view of left bank pin.

Figure A-21. Cross section 4.5 in August 2020, view upstream from mid channel.

Figure A-22. Cross section 4.5 in August 2020, view downstream from mid channel.

Figure A-23. Cross section 4.5 in August 2020, view of left bank from right bank.

Figure A-24. Cross section 4.5 in August 2020, view of right bank from left bank.

Figure A-25. Cross section 4.5 in August 2020, view of tracers from left bank.

Figure A-26. Cross section 4.5 in August 2020, landscape view of right bank pin.

Figure A-27. Cross section 4.5 in August 2020, close up view of left bank pin.

Figure A-28. Cross section 4.5 in August 2020, landscape view of left bank pin.

Figure A-29. Cross section 4.4 in August 2020, view upstream from mid channel.

Figure A-30. Cross section 4.4 in August 2020, view downstream from mid channel.

Figure A-31. Cross section 4.4 in August 2020, view of left bank from right bank.

Figure A-32. Cross section 4.4 in August 2020, view of right bank from left bank.

Figure A-33. Cross section 4.4 in August 2020, view of tracers from right bank.

Figure A-34. Cross section 4.4 in August 2020, view of tracers from left bank.

Figure A-35. Cross section 4.4 in August 2020, close up view of right bank pin.

Figure A-36. Cross section 4.4 in August 2020, landscape view of right bank pin.

Figure A-37. Cross section 4.4 in August 2020, close up view of left bank pin.

Figure A-38. Cross section 4.4 in August 2020, landscape view of left bank pin.

Figure A-39. Cross section 4.3 in August 2020, view upstream from mid channel.

Figure A-40. Cross section 4.3 in August 2020, view downstream from mid channel.

Figure A-41. Cross section 4.3 in August 2020, view of left bank from right bank.

Figure A-42. Cross section 4.3 in August 2020, view of right bank from left bank.

Figure A-43. Cross section 4.3 in August 2020, view of tracers from right bank.

Figure A-44. Cross section 4.3 in August 2020, view of tracers from left bank.

Figure A-45. Cross section 4.3 in August 2020, close up view of right bank pin.

Figure A-46. Cross section 4.3 in August 2020, landscape view of right bank pin.

Figure A-47. Cross section 4.3 in August 2020, close up view of left bank pin.

Figure A-48. Cross section 4.3 in August 2020, landscape view of left bank pin.

Figure A-49. Cross section 4.2 in August 2020, view upstream from mid channel.

Figure A-50. Cross section 4.2 in August 2020, view downstream from mid channel.

Figure A-51. Cross section 4.2 in August 2020, view of left bank from right bank.

Figure A-52. Cross section 4.2 in August 2020, view of right bank from left bank.

Figure A-53. Cross section 4.2 in August 2020, view of tracers from right bank.

Figure A-54. Cross section 4.2 in August 2020, view of tracers from left bank.

Figure A-55. Cross section 4.2 in August 2020, close up view of right bank pin.

Figure A-56. Cross section 4.2 in August 2020, landscape view of right bank pin.

Figure A-57. Cross section 4.2 in August 2020, close up view of left bank pin.

Figure A-58. Cross section 4.2 in August 2020, landscape view of left bank pin.

Figure A-61. Cross section 6.8 in August 2020, view upstream from mid channel.

Figure A-62. Cross section 6.8 in August 2020, view downstream from mid channel.

Figure A-63. Cross section 6.8 in August 2020, view of left bank from right bank.

Figure A-64. Cross section 6.8 in August 2020, view of right bank from left bank.

Figure A-65. Cross section 6.8 in August 2020, view of tracers from right bank.

Figure A-66. Cross section 6.8 in August 2020, view of tracers from left bank.

Figure A-67. Cross section 6.8 in August 2020, close up view of right bank pin.

Figure A-68. Cross section 6.8 in August 2020, landscape view of right bank pin.

Figure A-69. Cross section 6.8 in August 2020, close up view of left bank pin.

Figure A-70. Cross section 6.8 in August 2020, landscape view of left bank pin.

Figure A-71. Cross section 6.6 in August 2020, view upstream from mid channel.

Figure A-72. Cross section 6.6 in August 2020, view downstream from mid channel.

Figure A-73. Cross section 6.6 in August 2020, view of left bank from right bank.

Figure A-74. Cross section 6.6 in August 2020, view of right bank from left bank.

Figure A-75. Cross section 6.6 in August 2020, view of tracers from right bank.

Figure A-76. Cross section 6.6 in August 2020, view of tracers from left bank.

Figure A-77. Cross section 6.6 in August 2020, close up view of right bank pin.

Figure A-78. Cross section 6.6 in August 2020, landscape view of right bank pin.

Figure A-79. Cross section 6.6 in August 2020, close up view of left bank pin.

Figure A-80. Cross section 6.6 in August 2020, landscape view of left bank pin.

Figure A-81. Cross section 6.5 in August 2020, view upstream from mid channel.

Figure A-82. Cross section 6.5 in August 2020, view downstream from mid channel.

Figure A-83. Cross section 6.5 in August 2020, view of left bank from right bank.

Figure A-84. Cross section 6.5 in August 2020, view of right bank from left bank.

Figure A-87. Cross section 6.5 in August 2020, view of tracers from right bank.

Figure A-88. Cross section 6.5 in August 2020, view of tracers from left bank.

Figure A-89. Cross section 6.5 in August 2020, close up view of right bank pin.

Figure A-90. Cross section 6.5 in August 2020, landscape view of right bank pin.

Figure A-91. Cross section 6.5 in August 2020, close up view of left bank pin.

Figure A-92. Cross section 6.5 in August 2020, landscape view of left bank pin.

SOUTHERN CALIFORNIA EDISON

Bishop Creek Hydroelectric Project

(FERC Project No. 1394)

APPENDIX B
Tracer Coordinates

Site 4 Tracers

Tracer ID	Paint Color	B-AXIS (mm)	PIT Tag Code	Original Placement			Last Found Location (July 2021)		
				Northing (ft)	Easting (ft)	Elevation (ft)	Northing (ft)	Easting (ft)	Elevation (ft)
A-3	yellow	45	986112100280859	2,355,331.20	6,693,999.28	6,544.42	2,355,331.47	6,694,001.72	6,543.96
A-5	yellow	42	986112100298737	2,355,301.92	6,693,897.15	6,549.29	2,355,301.54	6,693,897.11	6,549.22
A-11	yellow	41	986112100298043	2,355,192.31	6,693,812.88	6,558.04	2,355,190.66	6,693,813.05	6,558.20
A-12	yellow	42	986112100283940	2,355,301.85	6,694,049.66	6,542.99	2,355,302.73	6,694,049.79	6,542.95
A-13	yellow	43	986112100279682	2,355,299.53	6,693,906.35	6,549.52	2,355,299.62	6,693,906.27	6,549.67
A-14	yellow	36	986112100288814	2,355,296.31	6,693,908.50	6,549.94	2,355,296.31	6,693,908.41	6,549.85
A-16	yellow	40	986112100290299	2,355,197.07	6,693,805.23	6,556.86	2,355,197.13	6,693,805.17	6,556.86
A-18	yellow	35	986112100288773	2,355,263.34	6,693,865.94	6,551.82	not recovered		
A-19	yellow	39	986112100290596	2,355,313.83	6,693,942.48	6,546.95	2,355,313.26	6,693,942.40	6,547.09
A-21	yellow	39	986112100280202	2,355,203.79	6,693,811.34	6,556.37	2,355,203.58	6,693,811.37	6,556.26
A-22	yellow	35	986112100279748	2,355,297.36	6,694,102.79	6,539.92	2,355,297.33	6,694,102.62	6,539.89
A-23	yellow	45	986112100298437	2,355,214.02	6,693,835.94	6,557.01	2,355,213.97	6,693,835.85	6,557.12
A-24	yellow	42	986112100279994	2,355,300.82	6,694,102.39	6,540.08	2,355,300.57	6,694,102.24	6,539.94
A-25	yellow	41	986112100284194	2,355,300.36	6,694,102.62	6,540.22	2,355,244.34	6,693,849.13	6,552.91
A-26	yellow	44	986112100291935	2,355,242.32	6,693,848.82	6,552.92	2,355,299.51	6,693,897.88	6,548.98
A-27	yellow	44	986112100280372	2,355,299.44	6,693,898.34	6,549.01	2,355,285.12	6,694,102.73	6,540.10
A-28	yellow	44	986112100280072	2,355,285.24	6,694,102.96	6,540.05	2,355,243.58	6,694,137.92	6,537.23
A-29	yellow	38	986112100278894	2,355,243.83	6,694,137.01	6,537.25	2,355,316.68	6,694,006.05	6,544.67
B-2	blue	60	986112100289313	2,355,295.99	6,693,900.87	6,549.06	not recovered		
B-4	blue	48	986112100294959	2,355,301.98	6,694,103.17	6,540.31	2,355,301.73	6,694,104.29	6,540.29
B-5	blue	54	986112100283978	2,355,297.92	6,694,102.83	6,540.01	2,355,297.78	6,694,101.99	6,540.14
B-6	blue	51	986112100279932	2,355,297.49	6,693,906.96	6,549.93	2,355,298.41	6,693,907.47	6,549.99
B-8	blue	59	986112100290868	2,355,308.29	6,694,051.52	6,541.96	2,355,308.71	6,694,053.66	6,541.52
B-9	blue	57	986112100280365	2,355,306.32	6,693,900.79	6,549.77	2,355,306.12	6,693,900.53	6,549.71
B-15	blue	54	986112100296419	2,355,284.27	6,694,101.95	6,540.05	2,355,279.79	6,694,108.73	6,539.89
B-16	blue	51	986112100295944	2,355,219.95	6,693,810.55	6,556.43	2,355,219.88	6,693,810.44	6,556.24

Tracer ID	Paint Color	B-AXIS (mm)	PIT Tag Code	Original Placement			Last Found Location (July 2021)		
				Northing (ft)	Easting (ft)	Elevation (ft)	Northing (ft)	Easting (ft)	Elevation (ft)
B-17	blue	56	986112100281350	2,355,195.06	6,693,809.64	6,556.80	2,355,195.15	6,693,809.61	6,556.84
B-18	blue	56	986112100293290	2,355,244.54	6,694,137.75	6,537.02	2,355,244.42	6,694,137.75	6,536.87
B-22	blue	57	986112100291392	2,355,321.24	6,694,009.29	6,543.80	2,355,321.48	6,694,009.46	6,543.71
B-23	blue	54	986112100297929	2,355,246.64	6,694,140.04	6,536.77	2,355,246.37	6,694,139.85	6,536.75
B-24	blue	56	986112100293303	2,355,200.85	6,693,800.92	6,555.80	2,355,200.63	6,693,800.85	6,556.07
B-26	blue	57	986112100281625	2,355,333.41	6,693,999.98	6,544.89	2,355,332.37	6,694,000.53	6,544.75
B-27	blue	49	986112100282879	2,355,259.29	6,693,871.60	6,551.39	2,355,259.37	6,693,871.67	6,551.40
B-28	blue	56	986112100282939	2,355,304.82	6,693,894.97	6,549.56	2,355,304.85	6,693,895.13	6,549.64
B-29	blue	59	986112100297430	2,355,219.12	6,693,830.77	6,554.55	2,355,220.22	6,693,829.63	6,554.67
B-30	blue	48	986112100279077	2,355,316.12	6,693,941.63	6,546.27	2,355,315.71	6,693,941.58	6,546.41
C-1	orange	69	986112100258401	2,355,284.25	6,694,100.29	6,540.04	2,355,284.66	6,694,100.11	6,539.94
C-2	orange	62	986112100258387	2,355,337.21	6,694,000.76	6,544.53	2,355,337.07	6,694,001.11	6,544.54
C-3	orange	71	986112100281585	2,355,178.02	6,693,787.55	6,557.77	2,355,178.18	6,693,787.50	6,557.81
C-5	orange	85	986112100258432	2,355,297.83	6,693,899.64	6,548.83	2,355,297.78	6,693,899.60	6,548.92
C-7	orange	74	986112100258541	2,355,289.93	6,694,106.21	6,539.29	2,355,289.87	6,694,106.17	6,539.27
C-8	orange	86	986112100258525	2,355,304.49	6,693,902.21	6,549.48	2,355,304.47	6,693,902.19	6,549.51
C-9	orange	72	986112100258443	2,355,207.00	6,693,805.74	6,555.93	2,355,207.04	6,693,805.91	6,556.11
C-10	orange	74	986112100258416	2,355,303.77	6,693,895.82	6,549.36	2,355,303.73	6,693,895.91	6,549.46
C-11	orange	82	986112100258478	2,355,280.56	6,694,105.73	6,539.97	2,355,280.46	6,694,105.47	6,540.04
C-12	orange	77	986112100258459	2,355,283.38	6,694,105.62	6,540.26	2,355,283.63	6,694,108.03	6,540.05
C-13	orange	66	986112100258435	2,355,304.13	6,694,049.92	6,542.94	2,355,304.40	6,694,049.82	6,542.94
C-15	orange	71	986112100258499	2,355,299.05	6,693,906.64	6,549.99	2,355,298.99	6,693,906.66	6,550.00
C-16	orange	88	986112100258394	2,355,258.25	6,693,873.39	6,552.81	2,355,258.11	6,693,872.64	6,552.81
C-17	orange	63	986112100258377	2,355,197.81	6,693,802.35	6,556.41	2,355,199.47	6,693,801.30	6,556.17
C-18	orange	63	986112100258479	2,355,332.03	6,694,000.57	6,544.68	2,355,332.42	6,694,000.28	6,544.56
C-19	orange	77	986112100258487	2,355,191.17	6,693,802.11	6,556.76	2,355,191.06	6,693,802.18	6,556.79
C-21	orange	89	986112100258452	2,355,229.75	6,693,820.75	6,555.19	2,355,229.84	6,693,820.86	6,555.07
C-22	orange	64	986112100258393	2,355,289.66	6,694,102.33	6,539.64	2,355,289.96	6,694,102.38	6,539.59

Tracer ID	Paint Color	B-AXIS (mm)	PIT Tag Code	Original Placement			Last Found Location (July 2021)		
				Northing (ft)	Easting (ft)	Elevation (ft)	Northing (ft)	Easting (ft)	Elevation (ft)
C-23	orange	90	986112100258528	2,355,327.84	6,694,015.55	6,543.68	2,355,327.91	6,694,015.28	6,543.65
C-24	orange	88	986112100290195	2,355,211.02	6,693,791.88	6,558.86	2,355,211.12	6,693,791.67	6,558.86
C-25	orange	66	986112100289218	2,355,314.17	6,693,941.67	6,547.06	2,355,313.86	6,693,941.88	6,547.15
C-26	orange	70	986112100283594	2,355,244.96	6,694,138.10	6,536.93	2,355,244.76	6,694,137.93	6,537.03
D-2	yellow	100	986112100258379	2,355,249.80	6,694,143.49	6,535.17	2,355,247.18	6,694,144.47	6,535.85
D-3	yellow	115	986112100258371	2,355,310.07	6,694,051.74	6,542.11	2,355,310.28	6,694,051.27	6,542.04
D-5	yellow	109	986112100258509	2,355,278.70	6,694,100.14	6,541.76	2,355,278.11	6,694,100.04	6,541.64
D-7	yellow	102	986112100258560	2,355,262.17	6,693,867.50	6,551.92	2,355,261.86	6,693,867.73	6,551.81
D-13	yellow	111	986112100258472	2,355,288.14	6,694,101.28	6,539.85	2,355,288.28	6,694,101.33	6,540.00
D-14	yellow	103	986112100258425	2,355,320.14	6,693,938.64	6,545.72	2,355,321.83	6,693,944.36	6,545.67
D-18	yellow	106	986112100258493	2,355,292.18	6,694,104.57	6,539.24	2,355,292.01	6,694,104.52	6,539.30
D-19	yellow	112	986112100283712	2,355,177.06	6,693,781.66	6,557.76	2,355,177.02	6,693,781.64	6,557.81
D-20	yellow	95	986112100258500	2,355,306.86	6,693,899.55	6,550.16	2,355,306.94	6,693,899.47	6,550.15
D-21	yellow	96	986112100258442	2,355,302.73	6,693,903.47	6,549.56	2,355,302.85	6,693,903.45	6,549.54
D-22	yellow	124	986112100258533	2,355,206.33	6,693,795.71	6,556.96	2,355,205.76	6,693,795.79	6,557.04
D-24	yellow	128	986112100258410	2,355,212.23	6,693,838.52	6,557.13	2,355,212.23	6,693,838.40	6,557.33
D-25	yellow	96	986112100298504	2,355,245.34	6,694,139.27	6,536.78	2,355,245.10	6,694,139.18	6,536.79
D-26	yellow	122	986112100298555	2,355,281.87	6,694,104.23	6,540.32	2,355,281.68	6,694,104.04	6,540.18
D-27	yellow	110	986112100258399	2,355,293.26	6,693,903.58	6,549.88	2,355,293.14	6,693,903.26	6,549.86
D-28	yellow	103	986112100258458	2,355,201.51	6,693,799.38	6,555.97	2,355,201.27	6,693,799.65	6,556.19
D-29	yellow	114	986112100258388	2,355,296.77	6,693,900.20	6,548.96	2,355,296.62	6,693,900.22	6,548.93
D-30	yellow	114	986112100258513	2,355,318.66	6,694,007.89	6,544.50	2,355,318.76	6,694,007.39	6,544.57
D-31	yellow	118	986112199258409	2,355,327.83	6,693,996.64	6,544.07	2,355,328.15	6,693,996.21	6,544.11
E-4	blue	138	986112100258414	2,355,247.53	6,694,142.21	6,535.64	2,355,247.39	6,694,142.17	6,535.62
E-5	blue	134	986112100280016	2,355,180.52	6,693,790.31	6,557.93	2,355,180.50	6,693,790.09	6,557.89
E-6	blue	138	986112100258422	2,355,324.37	6,694,011.57	6,544.17	2,355,324.33	6,694,011.34	6,544.20
E-7	blue	158	986112100258543	2,355,294.82	6,693,901.02	6,549.28	2,355,294.88	6,693,900.83	6,549.29
E-9	blue	142	986112100258440	2,355,321.54	6,693,944.72	6,545.56	2,355,321.82	6,693,944.68	6,545.57

Tracer ID	Paint Color	B-AXIS (mm)	PIT Tag Code	Original Placement			Last Found Location (July 2021)		
				Northing (ft)	Easting (ft)	Elevation (ft)	Northing (ft)	Easting (ft)	Elevation (ft)
E-11	blue	170	986112100258538	2,355,291.67	6,694,094.97	6,538.93	2,355,290.45	6,694,096.05	6,538.82
E-12	blue	139	986112100258392	2,355,265.84	6,693,865.73	6,552.56	2,355,265.67	6,693,865.72	6,552.53
E-13	blue	132	986112100258531	2,355,280.46	6,694,103.45	6,540.45	2,355,278.90	6,694,104.95	6,540.15
E-14	blue	128	986112100258521	2,355,301.22	6,693,897.29	6,549.24	2,355,301.27	6,693,897.28	6,549.32
E-16	blue	136	986112100258390	2,355,205.68	6,693,796.03	6,556.94	2,355,205.88	6,693,796.19	6,556.98
E-19	blue	158	986112100258455	2,355,222.63	6,693,827.04	6,555.29	2,355,222.60	6,693,826.95	6,555.20
E-20	blue	178	986112100258434	2,355,188.19	6,693,806.99	6,558.06	2,355,188.48	6,693,806.96	6,558.22
E-21	blue	170	986112100258398	2,355,325.11	6,693,995.29	6,544.77	2,355,325.32	6,693,995.20	6,544.80
E-22	blue	151	986112100291983	2,355,172.91	6,693,782.79	6,558.10	2,355,172.95	6,693,782.56	6,558.16
E-25	blue	152	986112100258363	2,355,298.73	6,693,908.02	6,550.23	2,355,298.89	6,693,908.02	6,550.22
E-27	blue	158	986112100258431	2,355,313.70	6,694,053.51	6,542.48	2,355,313.98	6,694,053.52	6,542.17
E-28	blue	144	986112100258381	2,355,197.09	6,693,803.84	6,557.15	2,355,197.00	6,693,803.54	6,557.07
E-29	blue	129	986112100258474	2,355,300.82	6,693,905.16	6,549.97	2,355,300.90	6,693,905.08	6,549.97
E-31	blue	153	986112100258524	2,355,253.45	6,694,147.19	6,536.55	2,355,253.72	6,694,147.11	6,536.61
F-1	orange	198	986112100258476	2,355,299.34	6,694,100.48	6,540.90	2,355,299.27	6,694,100.16	6,540.88
F-3	orange	181	986112100258556	2,355,223.32	6,693,832.37	6,555.46	2,355,223.12	6,693,832.00	6,555.44
F-9	orange	180	986112100258482	2,355,306.51	6,693,894.05	6,549.96	2,355,306.57	6,693,893.90	6,550.09
F-10	orange	193	986112100258445	2,355,294.57	6,694,096.98	6,538.16	2,355,294.43	6,694,096.57	6,538.19
F-11	orange	180	986112100258549	2,355,315.43	6,694,052.79	6,543.68	2,355,315.51	6,694,052.77	6,543.79
F-12	orange	200	986112100258546	2,355,329.61	6,693,998.84	6,544.36	2,355,330.07	6,693,998.89	6,544.31
F-13	orange	220	986112100258429	2,355,219.71	6,693,816.68	6,556.26	2,355,219.87	6,693,816.71	6,556.09
F-14	orange	185	986112100258413	2,355,194.37	6,693,808.43	6,557.32	2,355,194.42	6,693,808.18	6,557.43
F-15	orange	210	986112100258536	2,355,286.62	6,694,107.00	6,540.07	2,355,286.50	6,694,106.71	6,539.98
F-16	orange	205	986112100258375	2,355,335.93	6,693,999.81	6,544.72	2,355,336.30	6,694,000.21	6,544.74
F-17	orange	210	896112100258427	2,355,260.53	6,693,870.22	6,552.16	2,355,260.45	6,693,870.12	6,552.05
F-18	orange	190	986112100258514	2,355,260.53	6,693,870.22	6,552.16	2,355,248.70	6,693,845.68	6,554.50
F-19	orange	194	986112100258447	2,355,293.43	6,693,901.66	6,549.80	2,355,293.40	6,693,901.46	6,549.79
F-20	orange	183	986112100258522	2,355,321.76	6,693,937.51	6,545.69	2,355,321.24	6,693,938.83	6,545.58

Tracer ID	Paint Color	B-AXIS (mm)	PIT Tag Code	Original Placement			Last Found Location (July 2021)		
				Northing (ft)	Easting (ft)	Elevation (ft)	Northing (ft)	Easting (ft)	Elevation (ft)
F-21	orange	185	986112100258436	2,355,199.98	6,693,798.93	6,556.14	2,355,199.73	6,693,798.74	6,556.18
G-4	blue	320	986112100283920	2,355,198.99	6,693,800.59	6,556.63	2,355,198.71	6,693,800.64	6,556.66
G-5	blue	260	986112100289274	2,355,195.11	6,693,806.59	6,557.33	2,355,194.96	6,693,806.61	6,557.26
G-6	blue	270	986112100280431	2,355,175.59	6,693,789.00	6,558.55	2,355,175.49	6,693,789.07	6,558.51
G-8	blue	275	986112100289864	2,355,294.92	6,693,895.98	6,549.06	2,355,294.81	6,693,895.85	6,548.85
G-9	blue	258	986112100283565	2,355,298.96	6,694,049.76	6,544.59	2,355,299.00	6,694,049.49	6,544.67
G-10	blue	300	98611210093614	2,355,289.34	6,694,110.11	6,539.88	2,355,289.26	6,694,109.83	6,539.96

Site 6 Tracers

Tracer ID	Paint Color	B-AXIS (mm)	PIT Tag Code	Original Placement			Last Found Location (July 2021)		
				Northing (ft)	Easting (ft)	Elevation (ft)	Northing (ft)	Easting (ft)	Elevation (ft)
A-1	yellow	34	986112100283912	2,373,427.60	6,717,006.99	4,560.89	2,373,431.69	6,717,009.46	4,560.01
A-2	yellow	36	986112100298399	2,373,412.15	6,716,989.45	4,560.77	2,373,413.79	6,716,994.19	4,561.16
A-4	yellow	37	986112100280396	2,373,447.03	6,717,035.78	4,559.82	not recovered		
A-6	yellow	38	986112100278885	2,373,348.72	6,716,948.58	4,563.24	2,373,348.70	6,716,948.58	4,563.16
A-7	yellow	42	986112100295408	2,373,292.76	6,716,914.35	4,565.44	2,373,305.37	6,716,920.89	4,564.30
A-8	yellow	40	986112100280516	2,373,309.42	6,716,923.37	4,564.38	2,373,310.97	6,716,921.15	4,564.12
A-9	yellow	32	986112100278928	2,373,329.86	6,716,926.41	4,564.42	2,373,381.89	6,716,959.64	4,562.13
A-10	yellow	31	986112100278987	2,373,431.26	6,717,004.19	4,560.70	2,373,432.76	6,717,013.11	4,560.08
A-15	yellow	39	986112100294813	2,373,353.51	6,716,940.65	4,561.96	2,373,352.51	6,716,940.72	4,561.99
A-17	yellow	40	986112100278966	2,373,306.88	6,716,925.66	4,564.80	not recovered		
A-20	yellow	39	986112100283422	2,373,398.60	6,716,973.12	4,561.76	not recovered		
A-30	yellow	41	986112100283400	2,373,395.89	6,716,977.14	4,561.27	2,373,401.86	6,716,983.90	4,560.44
B-1	blue	53	986112100284748	2,373,426.24	6,717,008.05	4,561.29	2,373,434.95	6,717,011.59	4,560.12
B-3	blue	47	986112100298328	2,373,393.74	6,716,977.81	4,561.48	2,373,409.26	6,716,986.82	4,561.05
B-7	blue	49	986112100289497	2,373,352.04	6,716,940.84	4,561.99	2,373,369.21	6,716,950.74	4,562.04
B-10	blue	56	986112100298316	2,373,398.17	6,716,975.97	4,561.32	not recovered		
B-11	blue	56	986112100298135	2,373,307.09	6,716,929.47	4,565.53	2,373,307.14	6,716,925.97	4,564.72
B-12	blue	47	986112100298759	2,373,325.45	6,716,927.22	4,564.49	2,373,339.16	6,716,929.85	4,561.98
B-13	blue	56	986112100297656	2,373,442.49	6,717,040.25	4,560.57	not recovered		
B-14	blue	50	986112100279549	2,373,285.64	6,716,914.12	4,566.08	2,373,294.85	6,716,912.58	4,565.42
B-19	blue	54	986112100278832	2,373,292.74	6,716,913.96	4,565.43	not recovered		
B-20	blue	60	986112100279159	2,373,433.69	6,717,002.75	4,560.27	2,373,430.22	6,717,011.22	4,560.68
B-21	blue	59	986112100291205	2,373,371.38	6,716,959.89	4,561.35	2,373,371.03	6,716,961.78	4,561.38
B-25	blue	48	986112100284474	2,373,309.95	6,716,922.70	4,564.35	2,373,317.08	6,716,924.74	4,564.42
C-4	orange	70	986112100258557	2,373,311.21	6,716,920.72	4,564.11	2,373,311.75	6,716,920.87	4,563.98
C-6	orange	67	986112100258527	2,373,349.98	6,716,938.37	4,561.97	2,373,349.97	6,716,938.37	4,561.95

Tracer ID	Paint Color	B-AXIS (mm)	PIT Tag Code	Original Placement			Last Found Location (July 2021)		
				Northing (ft)	Easting (ft)	Elevation (ft)	Northing (ft)	Easting (ft)	Elevation (ft)
C-14	orange	75	986112100258418	2,373,293.21	6,716,914.46	4,565.55	2,373,304.60	6,716,922.45	4,564.42
C-20	orange	75	986112100258373	2,373,425.75	6,717,009.17	4,561.43	2,373,425.31	6,717,007.91	4,561.24
C-27	orange	87	986112100279350	2,373,373.46	6,716,960.67	4,561.19	2,373,373.53	6,716,960.68	4,561.27
C-28	orange	87	986112100289366	2,373,395.27	6,716,975.45	4,561.41	2,373,395.28	6,716,975.21	4,561.31
C-29	orange	99	986112100281375	2,373,414.69	6,716,987.67	4,560.58	2,373,414.68	6,716,991.08	4,560.87
C-30	orange	90	986112100279987	2,373,309.16	6,716,923.91	4,564.63	2,373,309.06	6,716,924.16	4,564.80
C-31	orange	79	986112100289071	2,373,402.32	6,716,974.18	4,561.82	2,373,398.14	6,716,973.45	4,561.68
C-32	orange	78	986112100295473	2,373,301.80	6,716,920.95	4,564.38	2,373,301.99	6,716,920.77	4,564.42
C-33	orange	75	986112100289760	2,373,427.86	6,717,007.40	4,561.01	2,373,429.64	6,717,009.35	4,560.85
D-1	yellow	106	986112100258481	2,373,282.83	6,716,923.46	4,566.62	2,373,282.85	6,716,923.38	4,566.67
D-4	yellow	120	986112100258469	2,373,310.98	6,716,923.17	4,564.57	2,373,310.69	6,716,923.46	4,564.53
D-6	yellow	102	986112100258491	2,373,433.68	6,717,004.09	4,560.28	2,373,429.89	6,717,001.58	4,560.76
D-8	yellow	114	986112100258384	2,373,412.34	6,716,987.58	4,560.66	2,373,420.92	6,716,990.59	4,561.01
D-9	yellow	96	986112100258480	2,373,424.98	6,717,009.42	4,561.57	2,373,426.69	6,717,010.16	4,561.47
D-10	yellow	119	986112100258380	2,373,397.70	6,716,974.68	4,561.48	2,373,397.01	6,716,976.26	4,561.67
D-11	yellow	96	986112100281712	2,373,326.23	6,716,927.26	4,564.56	2,373,325.83	6,716,927.76	4,564.28
D-12	yellow	102	986112100258370	2,373,360.00	6,716,950.72	4,561.58	2,373,359.99	6,716,950.83	4,561.59
D-15	yellow	97	986112100258488	2,373,351.30	6,716,943.79	4,562.73	2,373,350.49	6,716,947.39	4,563.16
D-16	yellow	111	986112100258554	2,373,394.61	6,716,976.23	4,561.37	2,373,394.71	6,716,976.27	4,561.52
D-17	yellow	116	986112100258451	2,373,309.18	6,716,926.33	4,564.94	2,373,309.46	6,716,926.53	4,564.92
D-23	yellow	99	986112100258376	2,373,439.49	6,717,040.52	4,561.00	2,373,441.69	6,717,041.99	4,560.58
E-1	blue	128	986112100258510	2,373,319.64	6,716,931.65	4,564.63	2,373,320.89	6,716,931.63	4,564.48
E-2	blue	145	986112100258364	2,373,428.04	6,717,006.12	4,561.11	2,373,428.06	6,716,998.84	4,560.88
E-3	blue	155	986112100258534	2,373,430.18	6,717,006.34	4,560.62	2,373,431.02	6,717,001.40	4,560.76
E-8	blue	142	986112100258420	2,373,292.40	6,716,913.14	4,565.86	not recovered		
E-10	blue	130	986112100258504	2,373,374.51	6,716,961.71	4,561.41	2,373,374.39	6,716,961.69	4,561.49
E-15	blue	148	986112100258365	2,373,444.23	6,717,034.15	4,560.29	2,373,444.62	6,717,034.41	4,560.13
E-17	blue	141	986112100258403	2,373,347.03	6,716,952.46	4,564.03	2,373,347.06	6,716,952.41	4,563.89

Tracer ID	Paint Color	B-AXIS (mm)	PIT Tag Code	Original Placement			Last Found Location (July 2021)		
				Northing (ft)	Easting (ft)	Elevation (ft)	Northing (ft)	Easting (ft)	Elevation (ft)
E-18	blue	141	pit tag stopped	2,373,308.00	6,716,922.00	4,564.00	2,373,310.15	6,716,922.86	4,564.90
E-23	blue	141	986112100258502	2,373,397.37	6,716,978.82	4,560.97	2,373,395.86	6,716,978.97	4,561.61
E-24	blue	169	986112100258378	2,373,287.45	6,716,911.74	4,565.95	2,373,287.53	6,716,911.99	4,565.97
E-26	blue	170	986112100298383	2,373,309.62	6,716,928.96	4,564.77	2,373,309.79	6,716,928.70	4,564.77
E-30	blue	131	986112100258453	2,373,400.26	6,716,975.17	4,561.48	2,373,391.13	6,716,971.67	4,561.37
F-2	orange	201	986112100258415	2,373,432.68	6,717,004.34	4,560.54	2,373,432.71	6,717,004.17	4,560.81
F-5	orange	209	986112100258419	2,373,327.39	6,716,930.18	4,564.57	2,373,326.92	6,716,929.93	4,564.54
F-6	orange	229	986112100258558	2,373,309.75	6,716,925.60	4,565.25	2,373,309.82	6,716,925.36	4,565.30
F-7	orange	197	986112100258426	2,373,397.21	6,716,975.99	4,561.80	2,373,405.01	6,716,978.86	4,561.21
F-8	orange	180	986112100258503	2,373,404.40	6,716,973.75	4,562.88	2,373,397.24	6,716,974.72	4,561.75
G-1	blue	290	986112100258477	2,373,402.44	6,716,975.70	4,562.30	2,373,402.47	6,716,975.73	4,562.31
G-2	blue	300	986112100258382	2,373,424.97	6,717,008.58	4,561.66	2,373,425.16	6,717,008.75	4,561.74
G-3	blue	345	986112100258395	2,373,308.69	6,716,924.90	4,565.63	2,373,308.67	6,716,924.90	4,565.69