Rush Creek Project, FERC Project No. 1389

DEC 1 – Full Decommissioning Study Technical Study Report

January 2025

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List of Acronyms

FERC	Federal Energy Regulatory Commission
SCE	Southern California Edison Company

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1.0 INTRODUCTION

The following provides the results of Phase I and Phase II of the Full Decommissioning Study required by the Federal Energy Regulatory Commission (FERC) in its Study Plan Determination (FERC 2022). The specific activities to be completed as part of the Full Decommissioning Study (Phase I and Phase II) are defined in Southern California Edison Company's (SCE) 2023 Initial Study Report Meeting Summary (November 21, 2023).

Consistent with FERC's Study Plan Determination, this report includes the following information:

- Description of Project Decommissioning Options and Feasibility (Appendix A)
- Estimate of Costs for Each Option (Appendix B)
- Description of Possible Flow and Water Level Changes Under Each Option (Appendix C)
- Characterization of Sediment in Project Lakes (Appendix D)
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APPENDIX A
Project Decommissioning Options and Feasibility

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List of Acronyms

ac-ft	acre-feet
BMP	Best Management Practice
CFR	Code of Federal Regulations
cfs	cubic feet per second
FERC	Federal Energy Regulatory Commission
Forest Service	United States Forest Service
HDPE/PVC	high-density polyethylene/polyvinyl chloride
kW	kilowatt
lbs	pounds
NPS	National Parks Service
PMF	probable maximum flood
Project	Rush Creek Project
RT	roundtrip
SCE	Southern California Edison Company
SR-158	State Route 158
SUP	Special Use Permit
US-395	United States Route 395

1.0 PROJECT DECOMMISSIONING OPTIONS AND FEASIBILITY

1.1 INTRODUCTION

This section describes the decommissioning options for the disposition of facilities at Rush Meadows Dam, Agnew Dam, and Gem Dam evaluated in the relicensing proceeding for Southern California Edison Company's (SCE) Rush Creek Project (Project) (Federal Energy Regulatory Commission [FERC] Project No. 1389). Refer to Map A-1 for the location of the Project and associated land jurisdiction.

Two Project options have been identified to bookend the analysis for disposition of Rush Meadows and Agnew dams, namely:

- Full dam removal
- Partial dam removal (SCE's preferred option)

Under each option, hydroelectric operations at Rush Meadows and Agnew dams would be discontinued, and these facilities would be removed from the FERC license once all license conditions and regulatory requirements of FERC and other resource agencies are met.

Three Project options are being evaluated at Gem Dam, namely:

- Retrofitting the dam to meet seismic restrictions under a probable maximum flood (PMF) event with a new spillway and reduced dam height (SCE's preferred option).
- Full dam removal
- Partial dam removal

Under the retrofitting option, hydroelectric operations at Gem Dam and Rush Creek Powerhouse would continue under FERC jurisdiction consistent with conditions identified in a new FERC license. The Gem Dam retrofitting option was developed at a conceptual engineering level of design including structural modeling.

Under the full and partial dam removal options, hydroelectric operations at Gem Dam and Rush Creek Powerhouse would be discontinued, and these facilities would be removed from the FERC license once all license conditions and regulatory requirements of FERC and other resource agencies are met (i.e., full decommissioning of the Project).

Provided below is a description of each option (based on conceptual engineering level of design) for the disposition of Rush Meadows Dam, Agnew Dam, and Gem Dam. Refer to the LAND 1 – Aesthetics Technical Study Report for visual renderings of partial and full dam removal. Final engineering design would be provided to FERC and the California Division of Safety of Dams for review and approval prior to implementation.

1.2 ACTIVITIES COMMON AMONG OPTIONS

Although the Project options for Rush Meadows, Agnew, and Gem dams vary in their locations, objectives, specific construction activities, timing, and duration, the general activities common among all the options include (1) establishment of June Mountain Ski Area Parking Lot as the Base of Operations; (2) establishment of the construction area; (3) general construction activities; (4) disposition of other Project facilities; and (5) outreach activities. Each of these common activities are described below.

Project-specific information on the construction area, worker housing, transport of personnel, construction activities, and restoration activities is discussed in detail for each option in Sections 1.3 through 1.5.

1.2.1 June Mountain Ski Area Parking Lot (Base of Operations)

Pending issuance of a Special Use Permit (SUP) from the United States Forest Service (Forest Service), the Base of Operations for all options would be established at the June Mountain Ski Area Parking Lot (Map A-1), or other suitable location if identified later. The June Mountain Ski Area Parking Lot was selected as the Base of Operations for the following key reasons: (1) its proximity to the construction sites, (2) it has appropriate access and space available (including for small and large aircraft), (3) it does not require any modification or upgrades, and (4) it has been successfully used by SCE to support previous Project maintenance activities. In addition, use of the site does not require directly crossing over highways or human occupied areas, and flight paths avoid Sierra Nevada Bighorn Sheep critical habitat. Selection of the June Mountain Ski Area Parking Lot as the Base of Operations was made after SCE completed an evaluation of 10 location options. Details of this evaluation are included in the Final License Application, Section 5, Appendix 5-A.

The following activities are associated with the Base of Operations. The Base of Operations would be established at the beginning of each construction season and would include the following:

- Project Management Facilities, including
  - An office trailer powered by a generator (up to 25 kilowatts [kW]) would be installed for SCE project management and construction oversight personnel.
  - An office trailer powered by a generator (up to 25-kW) would be installed for the contractor's construction personnel.
- Helicopter Landing Site
  - K-rail barriers would be used to control access to the helicopter landing site.
  - Helicopter fuel storage tanks and appropriate secondary containment and fire prevention/response equipment would be located adjacent to the landing site.

- Supporting Construction Equipment
  - Table A-1 provides a preliminary list of construction equipment that would be located at the Base of Operations.
- Staging Area
  - The staging area would be used to store construction equipment and materials.
  - Several storage containers would be used to secure smaller construction materials and equipment.
- Stockpile Area
  - The stockpile area would be used to temporarily store material removed from the construction sites prior to transport to an appropriate disposal site.
  - Specific locations within the stockpile area would be designated to temporarily store material based on its characteristics (i.e., hazardous/non-hazardous) and ultimate disposal location.
  - Debris boxes may be used to contain small waste material, as appropriate.
- Designated General Parking Area
  - The general parking area would be used by project managers, construction personnel, subcontractors, and other support personnel. Construction equipment would be parked at a designated location within the staging area.
- Sanitary Facilities
  - Sanitary facilities (i.e., port-a-johns) would be provided commensurate with the number of personnel using the site.
  - A local contractor would clean and maintain the sanitary facilities.
- Security
  - A security kiosk and entrance gate would be installed at the entrance to the Base of Operations.
  - Security personnel would be on-site 24 hours per day to control site access during the construction season.

- Fire Suppression Equipment
  - Fire prevention would be implemented consistent with a Project-specific Fire Prevention/Protection Plan and would include, but is not limited to, staging of the following equipment at the Base of Operations to expeditiously extinguish any fire resulting from Project activities:
    - Fire box with enough tools to outfit the average number of workers on the site;
    - Type 6 fire engines with minimum of 300 gallons of water; and
    - Water tender with at least 50 feet of hose and a nozzle.

1.2.1.1 Transport of Personnel, Equipment, and Material

The Base of Operations would function as the transportation hub for construction activities, including (1) arrival and departure of personnel to the job site; (2) receiving center for arrival and departure of construction equipment and material from the contractors and supply companies; (3) transport of equipment and material to/from the dam construction areas; and (4) receipt and loading of debris/material removed from the dam construction areas for transport to an appropriate disposal site. The following describes these transportation-related activities:

- Personnel, Equipment, and Material Access

The Base of Operations is located directly off State Route 158 (SR-158; also known as the June Lake Loop). Personnel would arrive/depart via SR-158 using either the northern or southern route of the loop road. SR-158 intersects United States Route 395 (US-395), the primary travel route into the region.

- Construction equipment and vehicles hauling material would arrive/depart via SR-158 using the northern route of the loop road to avoid traffic through the community of June Lake.
- Construction Area Access
  - Specific information regarding access to the construction area from the Base of Operations is unique to each option and is provided in Sections 1.3 through 1.5. The following access to/from the construction areas is common to each option.
    - During mobilization and demobilization, heavy equipment would be transported to/from the construction areas using a Skycrane helicopter (lift capacity of approximately 11,000 pounds [lbs.]).

- During the construction season, equipment and material would be transported to/from the construction areas, as needed, using sling loads attached to either A-Star helicopter (lift capacity of approximately 2,500 lbs.), or modified Black Hawk helicopters (lift capacity of approximately 6,000 lbs.).

- Construction debris would be transported from the construction areas using sling loads attached to a helicopter to the Base of Operations for stockpiling prior to transport to an appropriate disposal site.

- Transport of Disposal Material

    - Transport of material (debris) from the Base of Operations to an appropriate disposal site that is common among options consists of the following:

        - Non-hazardous construction debris stockpiled at the Base of Operations would be transported to the Pumice Valley Landfill or another disposal site on a daily/weekly basis. To travel to the Pumice Valley Landfill, haul trucks would leave the Base of Operations and travel east on SR-158 for approximately 12 miles to the northern intersection with US-395. The haul trucks would continue south on US-395 for approximately 0.5 mile, then east on Mono Lake Basin Road for approximately 2 miles, and then turn left onto Dross Road traveling 0.5 mile to the landfill.

        - Hazardous waste would be hauled by truck, consistent with state and federal regulations, for disposal at an appropriate hazardous waste disposal site (i.e., Ridgecrest, California; Los Angeles, California; or Beatty, Nevada).

        - California Department of Transportation and county authorizations would be obtained, as necessary, for road use.

- Transport of Personnel

        - Workers would be transported to/from the construction areas using the Agnew Tram (located near the Rush Creek Powerhouse) and/or using mules originating from the Frontier Pack Station (located near Silver Lake) via the Rush Creek Trail (Map A-1). Following completion of construction, the Rush Creek Trail would be restored to pre-construction conditions.

1.2.1.2 Demobilization/Winterization

Demobilization/winterization of the Base of Operations would be completed at the end of each construction season according to the following procedures:

- All construction equipment and materials, fuel tanks, trailers, sanitation facilities, secondary containment features, kiosks, signage, and K-rails would be removed from the site.

- The site would be restored to conditions that allow for winter ski operations consistent with requirements of the Forest Service SUP.

1.2.2 Construction Area

For each Project option, a construction area would be established at the beginning of each construction season, including the following:

- Medical Kiosk
  - An emergency medical technician(s) and support equipment would be present in the construction area during construction hours.
- Work Area
  - Construction activities associated with the dam removal/retrofitting would occur within designated work areas located upstream and downstream of Project dams. All work, staging, and stockpile areas would be flagged prior to initiation of construction activities.
- Staging Areas
  - SCE would designate the following staging area(s) for each option:
    - A staging area located near the dam that may consist of:
      - One or more wood decks would be erected to provide a flat and stable surface for generators, compressors, fuel, spill prevention kits, and toolboxes. The decks would include secondary containment areas.
      - Diesel fuel tanks would be flown in, as needed, and stored in designated secondary containment areas.
      - Additional areas, as necessary, to store equipment and material.
    - A mule team staging area(s) located near the dam to facilitate transport of personnel, if appropriate.
  - The work area may also be used to stage equipment and material, as needed, during construction activities.
- Stockpile Areas
  - All hazardous material encountered during dam removal/retrofitting would be temporarily stockpiled within the construction/work area prior to transport off-site.

  - If appropriate, material from the disposition of Agnew Dam suitable for use in the retrofitting of Gem Dam would be stockpiled for future use within the construction/work area of Agnew Dam or Gem Dam outside the wilderness boundary.

  - All other material/debris would be temporarily stockpiled in designated areas prior to being transported off-site.

- Sanitation Facilities

  - Port-a-johns would be transported by helicopter to the construction area. The number of sanitation facilities would be commensurate with the number of personnel on-site. The port-a-johns would be replaced once per week. Secondary containment would be placed under the port-a-johns to contain any potential spills.

1.2.2.1 Demobilization/Winterization

Demobilization/winterization of the construction area would be completed at the end of each construction season according to the following general procedures:

- Remove the temporary cofferdam (super sacks/sandbags), dewatering pipes, and pumps (if present) from the active lakebed and transport to a staging area.

  - The super sacks and pipes would be covered, contained, and stored over the winter consistent with Forest Service guidance developed during the relicensing proceeding.

- Install temporary erosion control features in the construction area to stabilize soil, where necessary.

- Consolidate, cover, contain, and store construction and Best Management Practice (BMP) materials for the following year, as needed, at a staging area, consistent with Forest Service guidance to be developed during the relicensing proceeding.

- Winterize the work, staging, and stockpile areas in accordance with requirements of the Project-specific Stormwater Pollution Prevention Plan.

- Use helicopters to remove all construction equipment, fuel tanks, sanitary facilities, and secondary containment features from the construction area and transport to the Base of Operations.

- Use mules to remove personnel equipment, supplies, and trash from the construction area.

1.2.3 General Construction Activities

The following sections describe the general construction activities associated with dam removal/retrofitting that would be implemented for each Project option. A detailed description of site-specific construction activities associated with dam removal at Rush Meadows and Agnew dams is provided for each option in Sections 3.3 and 3.4, respectively. Refer to Section 3.5 for a description of construction activities associated with the Gem Dam options, including dam retrofitting, full dam removal, and partial dam removal.

After establishment of the Base of Operations and construction area, the following construction activities would be implemented:

- Remove any hazardous material identified during on-site investigations completed during pre-construction activities, if applicable.
  - Hazardous material would be removed and contained consistent with federal and state regulations.
  - The material may be temporarily stockpiled on-site in a designated location prior to transport by helicopter to the designated hazardous waste stockpile area at the Base of Operations.
- Install a cofferdam and water bypass system to dewater the work area upstream of the dam, as appropriate.[1]

Excavate sediment to expose the face of the dam, as necessary, to complete dam removal/retrofitting.

- Excavation would be limited to locations with dry soils.
- Clean sediment would be stockpiled on-site for later use during restoration activities, as applicable.
- Remove/trim the geomembrane liner along the upstream face of the dam, as necessary, to complete dam removal/retrofitting.
- Complete Project-specific construction activities associated with dam removal/ retrofitting using modern mechanical equipment.
- Transport material (debris) from the construction area to the Base of Operations.

[1] Currently, the installation of cofferdam(s) is proposed for the Rush Meadows Dam, Agnew Dam, and Gem Dam removal options. Retrofitting of Gem Dam is proposed to be primarily conducted from a barge in a partially filled reservoir (see Section 1.5 for more detail).

1.2.4 Disposition of Other Project Facilities

1.2.4.1 Removal

Concurrent with dam removal/retrofitting construction activities, existing Project facilities deemed unnecessary for continued operation and maintenance of the Project would be demolished and removed as follows:

- Temporary scaffolding may be erected to support demolition of buildings (e.g., removal of roofing).
- If present, concrete foundations/pads would be broken into manageable pieces using either pneumatic hand tools or a hoe ram mounted on a small excavator.
- All debris would be placed into bags and transported by helicopter with a sling load to the Base of Operations stockpile area.
- Debris would be transported to the Pumice Valley Landfill or another appropriate disposal site.

1.2.4.2 Retention

Concurrent with dam removal/retrofitting construction activities, other Project facilities deemed necessary for continued operation and maintenance of the Project would be retained and rehabilitated, as appropriate.

Refer to Table A-2 for a list of existing Project facilities designated for removal or retention associated with each of the Project options.

1.2.5 Outreach Activities

The following outreach activities would be implemented for each Project option:

- Prior to initiation of construction SCE would:
  - Coordinate with the Forest Service and the National Park Service (NPS), as appropriate, regarding procedures for: (1) notifying the public regarding Project activities; (2) issuing future wilderness permits to backcountry recreationists; and (3) evaluating/implementing trail closures and/or camping restrictions during construction.
    - Affected trails may include Rush Creek Trail, Clark Lakes Trail, Spooky Meadows Trail, and Weber Lake Trail (Map A-1). Trails may be closed for the duration of construction (June 1 to October 31).

    - The Rush Creek Trail terminates at its junction with the Pacific Crest Trail/John Muir Trail, which is located approximately 1.2 miles southwest of Rush Meadows Dam (Map A-1); therefore, notifications to hikers along the trail may be required.
    - Following determination of the need for trail or camping restrictions/closures, the Forest Service may issue a future Forest Order pursuant to 16 United States Code 551 and 36 Code of Federal Regulations (CFR) 261.50(a) and (b).

- Prior to initiation of construction SCE would:
  - Conduct a town hall meeting at June Lake to provide an overview of the upcoming Project activities/schedule for residents, business owners, local government officials, sheriff's department, resource agencies, Tribes, and members of the public. The meeting would provide an opportunity for stakeholders to ask questions and voice concerns.
- Prior to initiation of construction/restoration activities, SCE would:
  - Conduct a town hall meeting at June Lake (as described above).
  - Coordinate with the Forest Service and NPS regarding communicating any trail or area closures associated with the Project to the public, including:
    - Preparation of fliers, if necessary, for distribution at Forest Service visitor centers (e.g., Bishop, Mono Lake, Lone Pine, and Mammoth).
    - Posting of fliers, Forest Service Order(s), and associated maps at pertinent trailheads, Forest Service visitor centers (e.g., Bishop, Mono Lake, Lone Pine, and Mammoth), and the Forest Service website.
  - Coordinate with Forest Service air operations regarding helicopter flights and proposed flight paths.

1.2.6 Avoidance/Protection Measures and Best Management Practices

- SCE would implement avoidance/protection measures and BMPs during construction associated with each option. Refer to Section 5, Appendix 5-B for a list of proposed measures and BMPs.
- Following FERC's issuance of a License Order and development of site-specific engineering designs, SCE would review the measures with resource agencies for adequacy in protecting resources. If additional site-specific construction measures are necessary, or existing measures require modification, they would be developed/modified in consultation with resource agencies.

1.2.7 Construction Sequencing

Construction activities would follow a phased approach over several years, as noted below:

- Phase 1: Development of Final Engineering Plans
- Phase 2: Permitting/Agency Coordination and Approval of the Engineering Design by FERC and California Division of Safety of Dams
- Phase 3: Implementation/Construction
- Phase 4: Restoration and Implementation of License Conditions

Construction activities would be completed sequentially (not concurrently). Refer to Subsection 1.3.3.2 (Rush Meadows Dam), 1.4.3.3 (Agnew Dam), 1.5.4.1 (Gem Dam) for the duration of construction under each option. The construction season would extend from approximately June 1 to October 31, depending on weather and snow conditions.

1.3 PROJECT-SPECIFIC APPROACH FOR DISPOSITION OF RUSH MEADOWS DAM

Pursuant to 18 CFR § 5.18(b)(4), this section describes the Project-specific approach for the disposition of Rush Meadows Dam, including the two options:

- Full dam removal involving:
  - Demolition of the entire dam with all concrete and other debris transported via helicopter to the Base of Operations for disposal at an approved site (approximately 3,400 cubic yards).
- Partial dam removal involving:
  - Construction of a notch in the center of the Rush Meadows Dam, sized to pass the PMF (approximately 6,500 cubic feet per second [cfs]), without water impoundment.
    - The notch would be approximately 140 feet wide at an elevation of 9,378 +/-feet.
  - Removal of the top 15 feet of the remaining dam sections.
  - Reuse of the demolished concrete (approximately 2,300 cubic yards) as fill material with preliminary slopes of 1.5H:1V on the upstream and downstream sides of the remaining left and right sections of the dam to provide stabilizing support.
    - Minimal import of new fill materials or export of demolished concrete would be required.

Figure A-1 shows the concept design for partial dam removal, subject to modifications in final design to reflect refined hydraulic calculations, topographic information, and structural engineering.

General construction activities that are common among options are described in Section 1.2. The following section provides a detailed description of the construction area, transport of personnel, and Project-specific construction activities.

1.3.1 Rush Meadows Dam Construction Area

The construction area would encompass areas upstream and downstream of Rush Meadows Dam (Map A-2). The following detailed Project-specific information augments the general discussion of the establishment of the construction area and associated activities provided in Section 1.2. Each of these Project-specific features/activities are described below:

- Construction Area
  - Construction activities associated with full and partial dam removal would occur within a work area located upstream and downstream of Rush Meadows Dam.
  - Temporary bridges would be established adjacent to the dam to facilitate personnel and equipment transport across the Rush Creek channel, as appropriate.
- Staging Areas
  - One staging area would be established in the dry reservoir bed on the right bank near the dam (looking downstream) for construction storage, fuel storage, portable restrooms, construction offices, equipment staging, and laydown area.
  - Mule team staging areas would be located on the granite outcropping near Rush Creek Trail just south of the spillway and at the existing Frontier Pack Station Camp.
- Stockpile Areas
  - Hazardous materials would be stockpiled in the staging area located within the dry reservoir bed.
  - Material used to stabilize the abutments (partial removal option only) would be stockpiled within the work area downstream of the dam.
  - Material to be transported off-site would be stored at the debris stockpile area located within the staging area.

- Worker Housing Area
  - Worker housing would be established approximately 0.25 mile from Rush Meadows Dam at the existing Frontier Pack Station Camp (currently operated by Frontier Pack Station under an existing SUP issued by the Forest Service). The camp would be maintained consistent with all SUP conditions. The camp would provide housing, kitchen facilities, and shower and restroom facilities for the workers.
    - An alternative approach would be to provide worker housing on the right bank of the reservoir just upstream of the dam using pre-manufactured containers. On-site facilities have the advantage of a more contained construction site and more secure cover from severe weather events over the entirety of the construction season.
  - Food, camping, personal supplies, and garbage would be transported primarily by pack mules and, when necessary, by helicopter. Food and garbage would be stored in bear-proof containers.
  - Sanitary facilities (i.e., port-a-johns) would be transported by helicopter to the camp. The number of facilities would be commensurate with the number of personnel at the camp. The port-a-johns would be replaced once per week. Secondary containment would be placed under the port-a-johns to contain any potential spills.
  - Shower stations would be established consistent with the Frontier Pack Station SUP. Showers would have warm water heated by 1- to 5-gallon refillable propane tanks. Similar shower units are currently in use by the Frontier Pack Station in the wilderness area.
  - Following construction, the worker housing area facilities (including temporary housing and sanitation facilities) would be removed, and the site would be restored to pre-construction conditions.

1.3.2 Rush Meadows Dam Transport of Personnel

Transport of personnel to/from the construction area (including the worker housing area) is described below.

- Tram Access
  - Workers would use the Agnew Tram[2] located near Rush Creek Powerhouse for transportation to/from Agnew Dam They would then board a barge/boat to cross Agnew Lake (if reservoir levels allow) or walk the Rush Creek Trail to the Upper

2 Agnew Tram will be repaired prior to dam retrofit/removal activities.

Agnew Lake Boat Dock where they would board the Gem Tram.[3] The Gem Tram terminates at Gem Dam. The workers would then travel on foot or by mule along Rush Creek Trail to/from the construction area/worker housing area.

- Mule Access
  - Workers may also be transported by mule between the Frontier Pack Station (located near Silver Lake) and the construction area via the Rush Creek Trail.

1.3.3 Rush Meadows Dam Project-Specific Construction Activities

After establishment of the work, staging, stockpile, and worker housing areas, the following Project-specific construction activities would be conducted. Refer to Section 1.2.3 for a description of general construction activities. This section also identifies the duration of construction, volume of material, and helicopter and truck trips for each option.

1.3.3.1 Rush Meadows Dam Construction Activities

Common Activities among Options

The following construction activities are common to the Rush Meadows Dam options (full and partial dam removal):

- Remove the geomembrane liner covering the upstream face of the dam and properly dispose of off-site.
- Install and operate the reservoir dewatering and bypass system:
  - In the late fall/winter prior to each construction season, the low-level outlets (one 24-inch circular outlet and one 30-inch square outlet at Rush Meadows Dam) would be fully opened to reduce impoundment of water in Waugh Lake.
  - If inflow during the runoff season exceeds the capacity of the low-level outlets, water would be impounded in the reservoir, potentially up to the bottom of the spillway.
  - Work in the reservoir and on the upstream side of the dam would be initiated only after the reservoir is drained and the entire volume of the inflow can be passed through the low-level outlet, allowing the reservoir bed to dry.
  - Once the water is at minimum pool at the invert elevation of the low-level outlet, high-density polyethylene/polyvinyl chloride (HDPE/PVC) piping would be inserted through the low-level outlet, extending approximately 100 to 200 feet upstream and downstream of the dam.

[3] Gem Tram was damaged during high flows in 2017 and a portion of the tram was washed out. Prior to dam retrofit/removal activities, the tram will be repaired.

  - A small cofferdam consisting of super sacks and/or sandbags would be constructed at the upstream end of the pipe to direct water from the reservoir, past the work area (dam), to Rush Creek.

  - Small portable pumps may be placed between the cofferdam and Rush Meadows Dam to remove any water from low spots or capture leakage water to maintain a dry work area. The water would be pumped to a settling basin located in the dry lakebed. “Clean” water would then be pumped into the low-level outlet pipe.

- Construct temporary bridges over Rush Creek to provide full access upstream and downstream of the dam.

<u>Full Dam Removal Activities</u>

- Using modern equipment, a new opening at the base of the dam near the thalweg would be created to manage inflow and protect against job-site flooding.

- Scaffolding and modern mechanical equipment would be used to cut sections of the concrete dam into small, manageable blocks using self-contained hydraulic wire saws powered by generators.[4]

  - The blocks would be temporarily placed at the base of the dam.

  - A mini-excavator mounted with a hydraulic hoe would collect each felled concrete block and break it into smaller pieces that are of proper size for helicopter transport. Confinement bags would be used, as necessary, to secure the concrete blocks and/or construction debris.

  - Helicopters would transport the concrete blocks and other construction debris to a stockpile area at the Base of Operations.

<u>Partial Dam Removal Activities</u>

- Using modern equipment, a new opening at the base of the dam near the thalweg would be created to manage inflow and protect against job-site flooding.

- Dam demolition would be performed as follows:

  - Scaffolding and modern mechanical equipment would be used to cut sections of the concrete dam into small, manageable blocks using self-contained hydraulic wire saws powered by generators. [4]

4 Slurry water generated by the cutting process would be vacuumed into double contained, sealed barrels and flown off- site for disposal.

  - A medium-sized excavator on the downstream side of the dam would load the debris into dump trucks (3-cubic-yard capacity).
  - The first material would be used to create access along the downstream side of the dam (the access route would be removed after Project completion).
  - The remaining demolished concrete would be used as fill material with preliminary slopes of 1.5H:1V on the upstream and downstream sides of the remaining left and right abutments of the dam to provide stabilizing support.
- Minimal import of new fill materials or export of demolished concrete would be required.

1.3.3.2 Construction Duration

The duration of construction for each Project option is:

- Full dam removal—two construction seasons
- Partial dam removal—one construction season

The duration of construction may change based on final engineering design. The construction season would extend annually from approximately June 1 to October 31, depending on weather and snow conditions. Construction activities would be implemented 10 hours per day, beginning no earlier than 7:00 a.m. (depending on activity and location), Monday through Saturday. A maximum of 8 to 12 workers would be at the construction area on each scheduled workday.

1.3.3.3 Volume of Material, Helicopter Trips, and Truck Trips

Table A-3 provides an overview of construction activities associated with each Rush Meadows Dam option.

Table A-4 provides an estimate of helicopter and truck trips (round trips [RT]) for each Rush Meadows Dam option by construction season and month. The total number of helicopter and truck trips may be modified following completion of engineering design and development of a detailed construction schedule.

1.3.3.4 Construction Equipment

Table A-5 provides a preliminary list of the type and quantity of construction equipment necessary to support full and partial dam removal (including other associated Project facilities) at the Base of Operations and the construction area. The final list of the type and quantity of construction equipment may be modified following completion of engineering design and development of a detailed construction schedule.

1.3.4 Rush Meadows Dam Project-Specific Restoration Activities

Conceptual restoration plans will be developed in collaboration with stakeholders during the relicensing process for inclusion in the Final License Application. The conceptual restoration plans will include:

- Stabilization of areas upstream and downstream of the former dam site, as appropriate, to prevent erosion.
- Restoration of the Rush Meadows Dam work area, staging area, campsite, and areas where Project-support facilities were removed.
- Revegetation and stabilization of sediment in the former lakebed, as necessary.
- Reestablishment/stabilization of Rush Creek with the lakebed, as necessary.

Project-specific restoration activities will be initiated the year following completion of full/partial dam removal construction activities. Restoration activities would occur over a single season and would include implementation of measures to protect environmental and cultural resources potentially present. Following implementation of the restoration plan, a 5-year monitoring period would be implemented to evaluate the success of the restoration effort. If it is determined that the restoration does not meet the established success criteria (included in the restoration plan), SCE will modify and implement additional restoration actions, developed in consultation with resource agencies, to improve restoration success to meet the criteria.

1.4 PROJECT-SPECIFIC APPROACH FOR DISPOSITION OF AGNEW DAM

Pursuant to 18 CFR § 5.18(b)(4), this section describes the Project-specific approach for disposition of Agnew Dam including two options:

- Full dam removal involving:
    - Demolition of the entire dam with all concrete and other debris transported via helicopter to the Base of Operations for disposal at an approved site (approximately 2,200 cubic yards).
- Partial dam removal involving:
    - Demolishing the center three arches of Agnew Dam to pass the PMF (approximately 8,400 cfs) without any water impoundment.
        - The new opening would be approximately 120 feet wide at an estimated water surface elevation of 8,474± feet.
    - Reusing the demolished concrete (approximately 1,500 cubic yards) as fill material with preliminary slopes of 1.5H:1V on the inside of the remaining arches to provide stabilizing support.

Figure A-2 shows the concept design for partial dam removal, subject to modifications in final design to reflect refined hydraulic calculations, topographic information, and structural engineering.

General construction activities that are common among options are described in Sections 1.2. The following section provides a detailed description of the construction area, transport of personnel, and Project-specific construction activities.

1.4.1 Agnew Dam Construction Area

The construction area would encompass areas adjacent to Agnew Dam (Map A-3). The following detailed Project-specific information augments the general discussion for establishment of the construction area and associated activities provided in Section 1.2. Each of these Project-specific features/activities are described below:

- Construction Area
  - Construction activities associated with full and partial dam removal would occur within a work area located upstream and downstream of Agnew Dam.
  - Temporary bridge(s) would be established adjacent to the dam to facilitate personnel and equipment transport across the reservoir and downstream channel, as appropriate. A temporary bridge over Rush Creek downstream of the dam would be installed to provide access along the full length of the dam during the construction period.
- Staging Areas
  - Two staging areas would be established in the dry reservoir bed (elevation 8,474 feet) on the left and right bank near the dam for construction storage, fuel storage, portable restrooms, construction offices, equipment staging, and laydown areas.
- Stockpile Areas
  - Hazardous materials would be stockpiled in the staging areas located within the dry reservoir bed upstream of the dam.
  - Material used to stabilize the remaining abutments (partial removal option only) would be stockpiled within the work area downstream of the dam.
  - Material to be transported off-site would be stored at the debris stockpile area located within the staging areas.

- Worker Housing Area
  - The existing Agnew Cabin downstream of the dam would be used to accommodate up to two people and provide kitchen and bathroom facilities and/or emergency shelter for workers.
  - Primary worker housing would be located at hotels in the vicinity of the Project.
  - Food, personal supplies, and garbage would be transported primarily via the tram and/or pack mules. Food and garbage would be stored in bear-proof containers.
  - Sanitary facilities (i.e., port-a-johns) would be transported by helicopter to the construction site. The number of facilities would be commensurate with the number of personnel on-site. The port-a-johns would be replaced once per week. Secondary containment would be placed under the port-a-johns to contain any potential spills.
  - Following construction, the worker housing area facilities (including temporary housing and sanitation facilities) would be removed, and the site would be restored to pre-construction condition.
- Helicopter Landing Site
  - A temporary helicopter landing site would be established in the staging area upstream of Agnew Dam (Map A-3).

1.4.2 Agnew Dam Transport of Personnel

Workers would be transported to/from the construction area using the Agnew Tram (located near the Rush Creek Powerhouse) and/or using mules originating from the Frontier Pack Station (located near Silver Lake) via the Rush Creek Trail (Map A-3).

1.4.3 Agnew Dam Project-specific Construction Activities

After establishment of the work, staging, stockpile areas, the following Project-specific construction activities would be conducted. Refer to Section 1.2.3 for a description of general construction activities. This section also identifies the duration of construction, volume of material, and helicopter and truck trips for each option.

1.4.3.1 Agnew Dam Construction Activities Common Activities among Options

The following describes construction activities common to the Agnew Dam options (full and partial dam removal):

- Remove the geomembrane liner covering the upstream face of the dam and properly dispose of off-site.
- Reduce water levels in the reservoir to the elevation of the natural lake:
  - In the late fall/winter/spring prior to the construction season, the 30-inch low-level outlet would be fully opened to manage water levels in Agnew Lake.
  - If inflow during the runoff season exceeds the capacity of the low-level outlet, water would be impounded in the reservoir, potentially up to the bottom of the notches in Arches No. 5 and No. 6.
  - Work in the reservoir and on the upstream side of the dam would only be initiated once the reservoir is drained and the entire volume of the inflow can be passed through the low-level outlet, allowing the reservoir bed to dry.
  - Inflow to Agnew Lake would be managed using storage in Gem Lake and controlling outflow from Gem Dam.
- Install cofferdam and water bypass system:
  - Once water is at minimum pool at the invert elevation of the low-level outlet, HDPE/PVC piping would be inserted through the low-level outlet and extend to the upstream cofferdam.
  - A cofferdam consisting of super sacks and/or sandbags would be constructed at the upstream end of the pipe to direct clean water from the reservoir, past the construction area (dam).
  - Small portable pumps may be placed between the cofferdam and Agnew Dam to remove any water from low spots or capture leakage water to maintain a dry work area. The water would be pumped to a settling basin located in the dry lakebed. “Clean” water would then be pumped into the low-level outlet pipe.
- Temporary bridge(s) would be constructed over Rush Creek to provide access to both sides of the dam.

Full Dam Removal Activities

- Scaffolding and mechanical equipment would be used to cut sections of the concrete dam into small, manageable blocks using self-contained hydraulic wire saws powered generators.[5]
  - The blocks would be temporarily placed at the base of the dam.
  - A mini-excavator mounted with a hydraulic hoe would collect each felled concrete block and break it into smaller pieces that are of proper size for helicopter transport. Confinement bags would be used, as necessary, to secure the concrete blocks and/or construction debris.
- Helicopters would transport the concrete blocks and all other construction debris to either:
  - The stockpile area at the Base of Operations for hauling to an approved disposal site, or
  - The stockpile area within the construction area at Agnew Dam or near Gem Dam, outside the wilderness boundary, for future recycling as part of Gem Dam retrofitting (Section 3.5). All stockpiled material designated for future recycling would be contained and stored consistent with Forest Service guidance.
    - Determination of the suitability of material for recycling would be based on historical borings (2010) and examination/testing by the contractor in coordination with a materials testing/geotechnical engineer and structural engineer during dam removal construction activities.

Partial Dam Removal Activities

- Dam demolition would be performed as follows:
  - Scaffolding and modern mechanical equipment would be used to remove Arches No. 4 to No. 6 from the dry reservoir bed. The concrete dam would be cut into small, manageable blocks using self-contained hydraulic wire saws powered by generators.[5]
  - A medium-sized excavator on the downstream side of the dam would load the debris into dump trucks (3-cubic-yard capacity).
  - The first material would be used to create access along the downstream side of the dam (the access route would be removed after Project completion).

5 Slurry water generated by the cutting process would be vacuumed into double contained, sealed barrels and flown off- site for disposal.

  - The remaining demolished concrete would be used as fill material with preliminary slopes of 1.5H:1V on the upstream and downstream sides of the remaining left and right abutments of the dam to provide stabilizing support.

- Minimal import of new fill materials or export of demolished concrete would be required.

1.4.3.2 Flowline Removal Activities

Concurrent with full or partial dam removal construction activities, the Agnew Dam Flowline would be removed from service as follows:

- Aboveground sections of the flowline would be cut into manageable pieces and transported to the Base of Operations using helicopters.

- Underground sections of the flowline would remain in place with any exposed opening capped in concrete.

- Anchor blocks would be demolished similar to a building foundation and the gabion baskets would be disassembled.

- All debris would be placed into bags and flown out by helicopter via sling load to the Base of Operations stockpile area.

- The area would be backfilled, returned to its natural grade, and stabilized to prevent erosion.

1.4.3.3 Construction Duration

The duration of construction for each option is:

- Full dam removal—two construction seasons

- Partial dam removal—one construction season

The duration of construction may change based on final engineering design. The construction season would extend annually from approximately June 1 to October 31, depending on weather and snow conditions. Construction activities would be implemented 10 hours per day, beginning no earlier than 7:00 a.m., Monday through Saturday. A maximum of 8 to 12 workers would be at the construction area on each scheduled workday.

1.4.3.4 Volume of Material, Helicopter Trips, and Truck Trips

Table A-6 provides an overview of construction activities associated with each Agnew Dam option.

Table A-7 provides an estimate of helicopter and truck trips (RT) for each Agnew Dam option by construction season and month. The total number of helicopter and truck trips may be modified following completion of engineering design and development of a detailed construction schedule.

1.4.3.5 Construction Equipment

Table A-8 provides a preliminary list of the type and quantity of construction equipment necessary to support full and partial dam removal (including other associated Project facilities) at the Base of Operations and the construction area. The final list of the type and quantity of construction equipment may be modified following completion of engineering design and development of a detailed construction schedule.

1.4.4 Agnew Dam Project-Specific Restoration Activities

Conceptual restoration plans will be developed in collaboration with stakeholders during the relicensing process for inclusion in the Final License Application. The conceptual restoration plan will include:

- Stabilization of areas upstream and downstream of the former dam site, as appropriate, to prevent erosion.
- Restoration of the Agnew Dam work area, staging area, and areas where Project-support facilities were removed (i.e., flowline).
- Revegetation and stabilization of sediment in the former lakebed, as necessary.
- Reestablishment/stabilization of Rush Creek with the lakebed, as necessary.

Project-specific restoration activities will be initiated the year following completion of full/partial dam removal construction activities. Restoration activities would occur over a single season and would include implementation of measures to protect environmental and cultural resources potentially present. Following implementation of the restoration plan, a 5-year monitoring period would be implemented to evaluate the success of the restoration effort. If it is determined that the restoration does not meet the established success criteria (included in the restoration plan), SCE will modify and implement additional restoration actions, developed in consultation with resource agencies, to improve restoration success to meet the criteria.

1.5 PROJECT-SPECIFIC APPROACH FOR DISPOSITION OF GEM DAM

Pursuant to 18 CFR § 5.18(b)(4), this section describes the Project-specific approach for disposition of Gem Dam including three options:

- Retrofitting of Gem Dam to meet the following goals:
  - Ensure structural performance/integrity—minimal damage during and after a large magnitude earthquake (>5,000-year event), such that no repair is expected to be required.
  - Maintain hydraulic performance—spillway capacity capable of passing the PMF discharge without overtopping the dam.
- Full dam removal involving:
  - Demolition of the entire dam with all concrete and other debris transported via helicopter to the Base of Operations for disposal at an approved site (approximately 22,700 cubic yards).
- Partial dam removal involving:
  - Construction of a notch in Gem Dam, sized to pass the PMF (approximately 8,700 cfs), without water impoundment.
    - The notch would be approximately 240 feet wide at an average elevation of 8,980 feet.
  - Reuse of the demolished concrete (approximately 18,200 cubic yards) as fill material with preliminary slopes of 2H:1V to 1.5H:1V on the upstream and downstream sides of the remaining left and right sections of the dam (abutments) to provide stabilizing support.
    - Minimal import of new fill materials or export of demolished concrete would be required.

Table A-9 compares dam and reservoir characteristics under the original dam specification (existing project/seismic restrictions) and proposed retrofitting project. Reservoir storage under the retrofitting option would be at the seismic restricted capacity of 10,752 acre-feet (ac-ft).

Figure A-3 shows the concept design for dam retrofit, subject to minor modifications in final design to reflect refined hydraulic calculations, topographic information, and more detailed structural modeling and engineering.

Figure A-4 shows the concept design for partial dam removal, subject to modifications in final design to reflect refined hydraulic calculations, topographic information, and structural engineering.

General construction activities that are common among options are described in Section 1.2. The following section provides a detailed description of the construction area, transport of personnel, and Project-specific construction activities for the three options.

1.5.1 Gem Dam Construction Area

The construction area would encompass areas located upstream and downstream of Gem Dam. Map A-4a identifies the work area associated with dam retrofitting. Map A-4b identifies the work area associated with full and partial dam removal. The work areas differ between the options because dam retrofitting is proposed to be completed with the reservoir partially filled while full and partial dam activities are proposed to be completed in a dry lakebed (reservoir drawdown to approximate elevation of 8,970 feet elevation). The following detailed Project-specific information augments the general discussion for establishment of the construction area and associated activities provided in Section 1.2. Each of these Project-specific features/activities are described below:

- Construction Area
  - Construction activities associated with the three options would occur within a work area located adjacent to the dam.
  - Temporary bridge(s) would be established upstream (dam removal options only) and downstream of the dam to facilitate personnel and equipment transport across the stream channel during dam removal activities.
- Staging Areas
  - Staging area would be established in the dry reservoir bed for construction storage, fuel storage, portable restrooms, construction offices, equipment staging, and temporary docking facilities for the barge (Map A-4a and Map A-4b).
- Stockpile Areas
  - Hazardous materials would be stockpiled in the staging area located within the dry reservoir bed upstream of the dam.
  - Material used in retrofitting Gem Dam or stabilizing the remaining dam abutment (partial dam removal option only) would be stockpiled within the work area downstream of the dam.
  - Material to be transported off-site would be stored at the debris stockpile area located in the staging area.
- Worker Housing Area
  - Worker housing would be established at: (1) the existing Gem Bunkhouse (to be renovated prior to construction; capacity 12 to 15 workers); (2) the existing Gem Valve House and Cabin (capacity of 6 workers); and (3) Agnew Cabin, if

necessary (capacity of 2 workers). Additional housing units would be established near the construction area, if necessary.

- The existing Gem Cookhouse would be used to provide meals to the crew (to be renovated prior to construction). The existing kitchen facilities are expected to be adequate, but an additional kitchen container unit may be provided near the construction area, if needed.
- Food, camping, personal supplies, and garbage would be transported primarily by pack mules and/or tram. Food and garbage would be stored in bear-proof containers.
- Additional sanitary facilities (i.e., port-a-johns) would be transported by helicopter to the construction area. The number of facilities would be commensurate with the number of personnel on the job site. The port-a-johns would be replaced once per week. Secondary containment would be placed under the port-a-johns to contain any potential spills.
- A mule staging area would be established near the construction area.
- Following construction, the worker housing area facilities (including temporary housing and sanitation facilities) would be removed, and the site would be restored to pre-construction condition.

1.5.2 Gem Dam Transport of Personnel

Transport of personnel to/from the construction area is described below.

- Tram Access
    - Workers would use the Agnew Tram located near Rush Creek Powerhouse for transportation to/from Agnew Dam.[6] They would then board a barge/boat to cross Agnew Lake (if reservoir levels allow) or walk the Rush Creek Trail to the Upper Agnew Lake Boat Dock where they would board the Gem Tram.[7] The Gem Tram terminates at Gem Dam
- Mule Access
    - Workers may also be transported by mule between the Frontier Pack Station (located near Silver Lake) and the construction area via the Rush Creek Trail.

6 Agnew Tram will be repaired prior to dam retrofit/removal activities.

7 Gem Tram was damaged during high flows in 2017 and a portion of the tram was washed out. Prior to dam retrofit/removal activities, the tram will be repaired.

1.5.3 Gem Dam Project-specific Construction Activities

After establishment of the work, staging, and stockpile areas, the following Project- specific construction activities would be conducted. Refer to Section 1.2.3 for a description of general construction activities. This section also identifies the duration of construction, volume of material, and helicopter and truck trips for each option at Gem Dam.

1.5.3.1 Gem Dam Construction Retrofitting Activities

SCE is not considering fully retrofitting Gem Dam to its original specifications and storage capacity. The preferred retrofitting option for Gem Dam to be evaluated in the Rush Creek relicensing includes the following:

- Removal of the upper portions of Arches No. 10 to No. 14 to develop a new ungated ogee spillway with a crest elevation corresponding to the top of the existing gravity infill section, elevation 9,027.5 feet (consistent with current seismic restrictions).
    - The spill capacity would be equal to or greater than the estimated PMF (8,700 cfs).
    - Removal of approximately the top 22 feet of the remaining dam arches, Arches No. 1 to No. 9 and No. 15, leaving an estimated 1.5 feet of freeboard to prevent overtopping during a PMF event.
- Removal of approximately the downstream 10 feet of the vertical piers between Arches No. 1 to No. 9 to reduce concrete stresses in large seismic events.
- Use of the demolished concrete from construction as fill in Arches No. 1 to No. 7 and No. 9 to No. 14 to support the new spillway and remaining arches (Arch No. 8 is left unfilled due to the presence of the low-level outlet). No demolished concrete would be exported for disposal.

The following describes construction activities for retrofitting Gem Dam.

- Construction/retrofitting activities would occur primarily from upstream of the dam using a floating barge in a drawn-down reservoir with implementation of appropriate BMPs.
- The reservoir would be drawn down to an elevation of approximately 9,000 feet.
    - The reservoir water level during construction would be adjusted by controlling releases from the 36-inch dam low-level outlet, 36-inch bypass valve, and power tunnel intake (48-inch pipe) at Gem Lake Dam and by adjusting Waugh Lake storage and outflow from Rush Meadows Dam.

- A floating barge equipped with a large excavator would be used to access the face of the dam for removal/adjustment of the existing geomembrane liner[8] and for modification/retrofitting of the dam.
  - Construction would be completed using access primarily from the reservoir side to minimize the potential for large pieces of demolished concrete material to fall into the drawn-down reservoir.
  - A catchment system along the upstream edge of the dam would be used to capture material before it enters the reservoir.
- The demolished concrete from construction of the new spillway, lowering of the remaining dam arches, and trimming of the vertical piers (approximately 10,200 cubic yards) would be used as infill to Arches No. 10 to No. 14 to support the downstream chute of the new spillway.[9] Recycled material available from Agnew Dam would also be used as infill to Arches No. 10 to No. 14.[10]
  - The demolished concrete fill in Arches No. 10 to No. 14 would be compacted to a stable slope of approximately 1.5H:1V with a top layer of new reinforced concrete that would protect the fill material from scour and erosion during spill.
  - The concrete layer is expected to be formed into steps to improve energy dissipation of spill flow.

1.5.3.2 Common Activities Among the Gem Dam Removal Activities

The following construction activities are common to the Gem Dam removal options (full and partial dam removal):

- Remove the geomembrane liner covering the upstream face of the dam and properly dispose of off-site.
- Install and operate a reservoir dewatering and bypass system:
  - In the late fall/winter prior to each construction season, the low-level outlet at Arch No. 8 (36-inch-diameter low-level outlet, 36-inch bypass value) and power tunnel intake (48-inch pipe) at Gem Lake Dam would be fully opened to reduce impoundment of water in Gem Lake.

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8 The existing geomembrane liner covering the upstream face of the dam would be modified during construction to accommodate the new dam face shape.

9 A small portion of the demolished material would initially be used as base material for a construction access route along the rough rock surface downstream of the dam. This material would be removed near the end of construction and used as infill to Arches No. 10 to No. 14 to support the downstream chute of the new spillway.

10 Suitable material from the disposition of Agnew Dam (full removal option only) would also be used as fill in Arches No. 10 to No. 14 to support the downstream chute of the new spillway.

  - If inflow during the runoff season exceeds the capacity of the low-level outlet, water would be impounded in the reservoir, potentially up to the bottom of the spillway.

  - Work in the reservoir and on the upstream side of the dam would be initiated only after the reservoir is drained and the entire volume of the inflow can be passed through the low-level outlet, allowing the reservoir bed to dry.

  - Once the water is at minimum pool at the invert elevation of the low-level outlet, HDPE/PVC piping would be inserted through the low-level outlet, extending approximately 100 to 200 feet upstream and downstream of the dam.

  - A small cofferdam consisting of super sacks and/or sandbags would be constructed at the upstream end of the pipe to direct water from the reservoir, past the work area (dam), to Rush Creek.

  - Small portable pumps may be placed between the cofferdam and Gem Dam to remove any water from low spots or capture leakage water to maintain a dry work area. The water would be pumped to a settling basin located in the dry lakebed. “Clean” water would then be pumped into the low-level outlet pipe.

- Construct temporary bridges over Rush Creek upstream and downstream of the dam) to provide full access during construction.

Full Dam Removal Activities

- Using modern equipment, a new opening at the base of the dam near the thalweg would be created to manage inflow and protect against job-site flooding.

- Scaffolding and modern mechanical equipment would be used to cut sections of the concrete dam into small, manageable blocks using self-contained hydraulic wire saws powered by generators.[11]

  - Blocks would be temporarily placed at the base of the dam.

  - A mini-excavator mounted with a hydraulic hoe would collect each felled concrete block and break it into smaller pieces that are of proper size for helicopter transport. Confinement bags would be used, as necessary, to secure the concrete blocks and/or construction debris.

  - Helicopters would transport the concrete blocks and other construction debris to a stockpile area at the Base of Operations.

[11] Slurry water generated by the cutting process would be vacuumed into double contained, sealed barrels and flown off-site for disposal.

Partial Dam Removal Activities

- Using modern equipment, a new opening at the base of the dam near the thalweg would be created to manage inflow and protect against job-site flooding.
- Dam demolition would be performed as follows:
  - Scaffolding and modern mechanical equipment would be used to cut sections of the concrete dam into small, manageable blocks using self-contained hydraulic wire saws powered by generators.[12]
  - A medium-sized excavator on the downstream side of the dam would load the debris into dump trucks (3-cubic-yard capacity).
  - The first material would be used to create an access along the downstream side of the dam (the access route would be removed after Project completion).
  - The remaining demolished concrete would be used as fill material with preliminary slopes of 2H:1V to 1.5H:1V on the upstream and downstream sides of the remaining left and right abutments of the dam to provide stabilizing support.
- Minimal import of new fill materials or export of demolished concrete would be required.

1.5.4 Removal of Ancillary Facilities

Under the full and partial dam removal options, hydroelectric operations at Gem Dam and Rush Creek Powerhouse would be discontinued, and facilities identified for retention under the Gem Dam retrofit option would be removed. Refer to Table A-2 for facilities to be removed under the Gem Dam full and partial dam removal options. A brief description of facility removal is provided below by area—Rush Meadows Dam Area, Gem Dam Area, Agnew Dam Area, and Rush Creek Powerhouse Area.

Rush Meadows Dam Area Facilities:

- Remove Rush Creek stream gage downstream of Rush Meadows Dam.
- Dismantle and salvage suitable equipment and gage components.
  - Demolish and remove gage facilities, bundle and/or include with other demolition debris to be flown out by helicopter.

Gem Dam Area Facilities:

- Remove flowline (Gem Dam to Agnew Junction) consistent with the approach described above in Section 1.4.3.2.
- Remove Rush Creek stream gage downstream of Gem Dam. Dismantle and salvage suitable equipment and gage components.
    - Demolish and remove gage facility, bundle and/or include with other demolition debris to be flown out by helicopter.
- Remove Project communication lines.
    - Lines would be dropped to the ground, cut into sections, and bundled for removal. Material would be flown out by helicopter.
    - Poles and/or towers would be felled, cut into pieces, and flown out by helicopter to the base of operations.
    - Remaining pole and/or tower footings would be removed and placed in debris bags. The holes would be backfilled with native materials on site.
- Remove Gem tram and hoist systems, carts, housing for tram winches, tow cables, and power supply. Bundle all material to be flown out by helicopter.
    - Removal of tram carts, winch cable line, and communication line conduits.
    - Disassemble tram steel rails, rollers, wood ties and ancillary components.
    - Dismantle tram winch, anchors, tow cables, power supply systems, and housing buildings.
- Project access trails would be removed, and the area would be restored to natural conditions.
- Remove Gem Dam/Lake Ancillary and Support facilities including facilities such as bunkhouse, cookhouse, outhouse, storage shed, weather station, lake dock and motor barge, equipment sheds, footbridges, overhead hoist system, communication equipment, and solar facility would be removed consistent with the approach described in Section 1.2.4.1.

Agnew Dam Area facilities:

- Remove flowline (Agnew Dam to Agnew Junction) consistent with approach described above in Section 1.4.3.2.
- Remove Rush Creek flume and stream gage (downstream of Agnew Dam and reservoir gage).

  - Dismantle and salvage suitable equipment and gage components.
  - Demolish and remove gage facility, bundle and/or include with other demolition debris to be flown out by helicopter.
- Remove Project power and communication lines.
  - Removal would be completed consistent with the approach described above.
  - Removal of Agnew tram and hoist systems, carts, and housing would be completed consistent with the approach described above for the Gem tram.
- Project access trails would be removed, and the area would be restored to natural conditions.
- Remove Agnew Dam/Lake Ancillary and Support facilities including facilities such as cabin, boathouses, lake docks and motor barge, weather station, and Agnew flume facility consistent with the approach described above in Section 1.2.4.1.

Rush Creek Powerhouse Area facilities:

- Above ground sections of the penstock would be cut into manageable pieces and transported to the Base of Operations.
- Underground sections of the penstock would remain in place with any exposed opening capped in concrete.
- Anchor blocks would be demolished similar to a building foundation and the gabion baskets would be disassembled.
- Leave Rush Creek Powerhouse in place. Remove any hazardous material such as oils, grease, fuels, and applicable storage containers.

1.5.4.1 Construction Duration

The duration of construction associated with three Gem Dam options are as follows:

- Dam retrofitting—three construction seasons
- Full Dam Removal – six construction seasons
- Partial Dam Removal – five construction seasons

The duration of construction may change based on final engineering design. The construction season would extend annually from approximately June 1 to October 31, depending on weather and snow conditions. Construction activities would be implemented 10 hours per day, beginning no earlier than 7:00 a.m., Monday through

Saturday. A maximum of 12 to 18 workers would be at the construction area on each scheduled workday.

1.5.4.2 Volume of Material, Helicopter Trips, and Truck Trips

Table A-10 provides an overview of construction activities associated with the three Gem Dam options.

Table A-11 provides an estimate of helicopter and truck trips (RT) for the three Gem Dam options by construction season and month. The total number of helicopter and truck trips may be modified following completion of engineering design and development of a detailed construction schedule.

1.5.4.3 Construction Equipment

Table A-12 provides a preliminary list of the type and quantity of construction equipment necessary for three Gem Dam options. The final list of the type and quantity of construction equipment may be modified following completion of engineering design and development of a detailed construction schedule.

1.5.5 Gem Dam Project-Specific Restoration Activities

Conceptual restoration plans will be developed in collaboration with stakeholders during the relicensing process for inclusion in the Final License Application. The conceptual restoration plan will include:

- Restoration of the Gem Dam work area, staging area, and areas where Project-support facilities were removed.
- Revegetation and stabilization of sediment in the former inundation zone, as necessary.
- Reestablishment/stabilization of Rush Creek within the former inundation zone, as necessary.

Project-specific restoration activities will be initiated the year following completion of the retrofitting construction activities. Restoration activities would occur over a single season and would include implementation of measures to protect environmental and cultural resources potentially present. Following implementation of the restoration plan, a 5-year monitoring period would be implemented to evaluate the success of the restoration effort. If it is determined that the restoration does not meet the established success criteria (included in the restoration plan), SCE will modify and implement additional restoration actions, developed in consultation with resource agencies, to improve restoration success to meet the criteria.

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TABLES

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Table A-1. Preliminary List of Construction Equipment at the June Mountain Ski Area Parking Lot

Equipment Description
Skycrane Helicopter, Heavy Lift (11,000-lb. load capacity)
Modified Black Hawk Helicopters, Moderate Lift (6,000-lb. load capacity)
A-Star 350, Light Lift Helicopter (2,500-lb. load capacity)
Helicopter Fuel Storage Tanks (including secondary containment)
K-rail Barriers (control access to landing sites)
20-foot Cargo Van
Office Trailers (one for SCE project management and one for contractor construction personnel)
25-kW Generators (two total—one for each office trailer)
Telehandler Forklift
Concrete Flight Buckets
Storage Containers
Debris Boxes
Concrete Waste Bin
10-wheel Dump Truck
Water Tender (including minimum of 50 feet of hose)
Street Sweeper
Cat 313 Excavator
Cat 950 Loader
Sanitary Facilities (port-a-johns)
Security Kiosk
Fire Suppression Equipment and Fire Box
Type 6 Fire Engine (minimum 300-gallon capacity)

Notes: kW = kilowatt
lb. = pound
SCE = Southern California Edison Company

Table A-2. Disposition of Project Facilities

Project Facility		Retrofitting of Gem Dam, Removal of Rush Meadows and Agnew Dams (partial/full)		Full Decommissioning Removal of Gem, Rush Meadows, and Agnew Dams (partial/full)	
		Remove	Retain	Remove	Retain
Rush Meadows Dam Area					
Dam	Rush Meadows Dam	X		X	
Reservoir	Waugh Lake	X		X	
Valve House	Rush Meadows Dam Valve House	X		X	
Stream Gage	Rush Creek below Rush Meadows (Waugh Lake) (USGS No. 10287262; SCE No. 359r)		X	X	
Reservoir Gage	Waugh Lake (USGS No. 10287260; SCE No. 359)	X		X	
Trail	Rush Meadows Dam Access Trail	X		X	
Rush Meadows Dam/Waugh Lake Ancillary and Support Facilities	Rush Meadows Dam Equipment Shed	X		X	
	Rush Meadows Dam Gage House	X		X	
	Rush Meadows Dam Solar Facility	X		X	
Gem Dam Area					
Dam	Gem Dam		X	X	
Reservoir/Natural Lake(s)	Gem Lake		X		X
Flowline	Gem Dam to Agnew Junction Flowline		X	X	
Valve House	Gem Valve House and Cabin		X	X	
	Gem Dam Arch 8 Valve House		X	X	
	Gem Flowline Valve House		X	X	
Stream Gage	Rush Creek below Gem Lake (USGS No. 10287281; SCE No. 352r)		X	X	
Reservoir Gage	Gem Lake (USGS No. 10287280; SCE No. 352)		X	X	

Project Facility		Retrofitting of Gem Dam, Removal of Rush Meadows and Agnew Dams (partial/full)		Full Decommissioning Removal of Gem, Rush Meadows, and Agnew Dams (partial/full)	
		Remove	Retain	Remove	Retain
Communication Lines	Communication Line from Rush Creek Powerhouse to Gem Lake Dam		X	X	
	Communication Line from Gem Valve House to Arch 8 Valve House		X	X	
	Communication Line from Gem Tram Hoist House to Gem Valve House		X	X	
Trams and Hoist Houses	Gem Tram		X	X	
	Gem Tram Hoist House		X	X	
	Gem Tram Lower/Upper Landing		X	X	
Trails	Lower Gem Dam Access Trail		X	X	
	Gem Dam Arch 8 Access Trail		X	X	
	Upper Gem Dam Access Trail		X	X	
Gem Dam/Lake Ancillary and Support Facilities	Gem Lake Dock		X	X	
	Gem Lake Motor Barge		X	X	
	Gem Bunkhouse		X	X	
	Gem Outhouse		X	X	
	Gem Cookhouse		X	X	
	Gem Dam Compressor Shed		X	X	
	Gem Dam Storage Shed		X	X	
	Gem Dam Overhead Hoist House for Dam Length		X	X	
	Gem Dam Overhead Hoist House		X	X	
	Gem Fish Release Footbridge		X	X	
	Gem Tram Landing Footbridge		X	X	
	Gem Tram Bridge		X	X	
	Gem Weather Station		X	X	
	Gem Satellite Dish		X	X	
	Gem Solar Facility		X	X	
	Gem Valve House Tunnel		X	X	

Project Facility		Retrofitting of Gem Dam, Removal of Rush Meadows and Agnew Dams (partial/full)		Full Decommissioning Removal of Gem, Rush Meadows, and Agnew Dams (partial/full)	
		Remove	Retain	Remove	Retain
Agnew Dam Area					
Dam	Agnew Dam	X		X	
Reservoir/Natural Lake	Agnew Lake		X (natural lake)		X (natural lake)
Flowline	Agnew Dam to Agnew Junction Flowline	X		X	
Valve House	Agnew Junction (Valve House and Stand Pipe)		X	X	
	Agnew Dam Valve House	X		X	
Stream Gage	Rush Creek below Agnew Lake (USGS No. 10287289; SCE No. 357)		X	X	
Reservoir Gage	Agnew Lake (USGS No. 10287285; SCE No. 351)	X		X	
Power Lines	4 kV Agnew Distribution Line		X	X	
	4 kV Agnew Dam Tap Line	X		X	
	4 kV Upper Agnew Boat Dock Tap Line		X	X	
Communication Line	Communication Line from Agnew Hoist House to Agnew Boathouse		X	X	
Trams and Hoist Houses	Agnew Tram		X	X	
	Agnew Tram Hoist House		X	X	
	Agnew Tram Landing		X	X	
Trail	Agnew Stream Gage Access Trail		X	X	
Agnew Dam/Lake Ancillary and Support Facilities	Lower Agnew Lake Boathouse/Dock		X	X	
	Upper Agnew Lake Boathouse/Dock		X	X	
	Agnew Lake Motor Barge		X	X	
	Agnew Cabin		X	X	
	Agnew Weather Station	X		X	
	Agnew Flume (downstream of Agnew Dam)		X	X	

Project Facility		Retrofitting of Gem Dam, Removal of Rush Meadows and Agnew Dams (partial/full)		Full Decommissioning Removal of Gem, Rush Meadows, and Agnew Dams (partial/full)	
		Remove	Retain	Remove	Retain
Rush Creek Powerhouse Area					
Penstocks	Agnew Junction to Rush Creek Powerhouse Penstock (No. 1)		X	X	
	Agnew Junction to Rush Creek Powerhouse Penstock (No. 2)		X	X	
Powerhouse	Rush Creek Powerhouse		X		X
Gage	Rush Creek Powerhouse (USGS No. 10287300; SCE No. 367)		X	X	
Power Line	2.4 kV Switchyard to Powerhouse Distribution Line		X	X	
Powerhouse Ancillary and Support Facilities	Rush Creek Powerhouse Complex Access Road		X	X	
	Cottages (2)		X	X	
	Garages (4)		X	X	
	Warehouse and Dock		X	X	
	Machine Shop		X	X	
	Pump House		X	X	
	Woodsheds (2)		X	X	
	Helicopter Landing Site		X	X	
	Tank (propane)		X	X	
	Bridge over Powerhouse Tailrace		X	X	
	Bridge over Rush Creek		X	X	

Notes: kV= kilovolt
SCE = Southern California Edison
USGS = United States Geological Survey

Table A-3. Overview of Construction Activities Associated with the Rush Meadows Dam Options

Activity	Full Dam Removal	Partial Dam Removal
Number of Construction Seasons	2	1
On-site Use of Demolition Material (cy)	0	2,286
Export of Demolition Material (cy)	3,351	0
Import of Stabilizing Material (cy)	0	55
Helicopter Trips (RT)	1,426	150
• Heavy Lift	1,308	94
• Light Lift	118	56
Truck Trips (RT)	776	261
• Construction	419	245
• Disposal	357	16
Mule Trips (RT)	837	554

Notes: cy = cubic yard
RT = round trip

Table A-4. Estimated Helicopter and Truck Trips Associated with the Rush Meadows Dam Options by Construction Season and Month

Activity	Helicopter Trips[1,2]			Truck Trips[3,4]		
	Total Trips (RT)	Trips/ Construction Season	Trips/ Month	Total Trips (RT)	Trips/ Construction Season	Trips/ Month
Full Dam Removal						
Total	1,426	713	142.6	776	388	77.6
Partial Dam Removal						
Total	150	150	30	261	261	52.2

[1] Helicopter trip calculations include construction operations only. Trips associated with restoration are not included.
[2] Helicopter trip calculations are based on estimated weight (pounds) of material.
[3] Truck trip calculations include construction operations only. Trips associated with restoration are not included.
[4] Truck trip calculations are based on estimated weight (pounds) of material.
Notes: RT = round trip

Table A-5. Preliminary List of Construction Equipment Associated with the Rush Meadows Dam Options

Equipment Type	Example Make/Model	Quantity (No.)
Excavator, Large	CAT 340F	1
Excavator, Medium	CAT 330	1
Excavator, Mini	CAT 306	1
Tracked Dump	Panther T6	2
Mobile Crane	Grove 30 Ton	1
Concrete Batch Plant	EZ 1-1	1
Stabilizing Material Pump	Warrior 500	1
Water Pump	Honda WB2.0XT	1
Fuel Tank Trailer	Lee DT 975	1
Potable Water Tank	Norwesco 44115	1
Welder	Miller Bobcat 200	1
Container	job office	1
Container	tool unit	2
Work Platform	—	4
Temporary Bridge	40-foot shipping length	2

Table A-6. Overview of Construction Activities Associated with the Agnew Dam Options

	Full Dam Removal	Partial Dam Removal
Number of Construction Seasons	2	1
On-site Use of Demolition Material (cy)	0	1,515
Export of Demolition Material (cy)	2,243	0
Import of Stabilizing Material (cy)	0	35
Helicopter Trips (RT)	988	110
Heavy Lift	942	75
Light Lift	46	35
Truck Trips (RT)	334	76
Construction	95	63
Disposal	239	13
Mule Trips (RT)	0	0

Notes: cy = cubic yard
RT = round trip

Table A-7. Estimated Helicopter and Truck Trips Associated with the Agnew Dam Options by Construction Season and Month

Activity	Helicopter Trips[1,2]			Truck Trips[3,4]		
	Total Trips (RT)	Trips/ Construction Season	Trips/ Month	Total Trips (RT)	Trips/ Construction Season	Trips/ Month
Full Dam Removal[5]						
Total	988	494	98.8	334	334	66.8
Partial Dam Removal						
Total	110	110	22	76	76	15.2

[1] Helicopter trip calculations include construction operations only. Trips associated with restoration are not included.
[2] Helicopter trip calculations are based on estimated weight (pounds) of material.
[3] Truck trip calculations include construction operations only. Trips associated with restoration are not included.
[4] Truck trip calculations are based on estimated weight (pounds) of material.
Notes: RT = round trip

Table A-8. Preliminary List of Construction Equipment Associated with the Agnew Dam Options

Equipment Type	Example Make/Model	Quantity (No.)
Excavator, Large	CAT 340F	1
Excavator, Medium	CAT 330	1
Excavator, Mini	CAT 306	1
Tracked Dump	Panther T6	2
Mobile Crane	Grove 30 Ton	1
Concrete Batch Plant	EZ 1-1	1
Stabilizing Material Pump	Warrior 500	1
Water Pump	Honda WB2.0XT	1
Fuel Tank Trailer	Lee DT 975	1
Potable Water Tank	Norwesco 44115	1
Welder	Miller Bobcat 200	1
Container	restroom/shower	1
Container	job office	1
Container	tool unit	2
Work Platform	—	2
Temporary Bridge	40-foot shipping length	2

Table A-9. Gem Dam and Lake Specifications

	Existing (Seismic Restriction)	Post Retrofit
Dam		
Type	multiple arch (16 complete; 2 partial)	No change
Material	concrete	No change
Height (maximum)	84 feet	62 feet
Length	688 feet	No change
Volume	21,612 cubic yards	21,612 cubic yards
Elevation of Dam Crest	9,057.5 feet	9,035 feet
Spillway		
Type	Uncontrolled	No change
Upper Spillway Elevation	9,053.64 feet	9,027.5 feet
• Openings/Dimensions	5 openings / 5 feet wide x 2 feet high	Wide, ungated, free overflow spillway in Arches No. 10 to No. 14
Lower Spillway Elevation	9,051.63 feet	Removed
• Openings/Dimensions	8 openings/5 feet wide x 2 feet high	Removed
Capacity (maximum)	1,100 cubic feet per second	8,700 cubic feet per second
Reservoir		
Elevation at Maximum Operating Water Surface	9,027.5 feet	9,027.5 feet
Gross Storage	10,752 acre-feet	10,752 acre-feet
Area at Maximum Operating Water Surface	256 acres	256 acres

Table A-10. Overview of Construction Activities Associated with the Gem Dam Options

	Retrofitting	Full Dam Removal	Partial Dam Removal
Number of Construction Seasons	3	6	5
On-site Use of Demolition Material (cy)	10,198	0	18,200
Export of Demolition Material (cy)	0	22,700	0
Import of Stabilizing Material (cy)[1]	3,000	0	470
Helicopter Trips (RT)	1,980	9,660	1,200
Heavy Lift	1,380	8,870	750
Light Lift	600	800	450
Truck Trips (RT)	2,000	3,390	2,080
Construction	1,825	970	1,960
Disposal	175	2,420	130
Mule Trips (RT)	3,600	5,670	4,420

[1] The amount of import material does not reflect the import of recycled material from Agnew Dam for retrofitting of Gem Dam. The availability of recycled material from Agnew Dam would be determined pending future material examination/testing by a contractor in coordination with a geotechnical engineer and a structural engineer.

Notes: cy = cubic yard
RT = round trip

Table A-11. Estimated Helicopter and Truck Trips Associated with Gem Dam Options by Construction Season and Month

Activity	Helicopter Trips[1,2]			Truck Trips[3,4]		
	Total Trips (RT)	Trips/ Construction Season	Trips/ Month	Total Trips (RT)	Trips/ Construction Season	Trips/ Month
Retrofitting						
Total	1,980	660	132	2,000	665	133
Full Dam Removal						
Dam Removal	9,660	1,610	322	3,390	565	113
Other Ancillary Facilities[5]	530	89	18	370	62	13
Total	10,190	1,699	340	3,760	627	126
Partial Dam Removal						
Dam Removal	1,200	240	48	2,080	416	84
Other Ancillary Facilities[5]	530	106	22	370	74	15
Total	1,730	346	70	2,450	490	99

[1] Helicopter trip calculations include construction operations only. Trips associated with restoration are not included.

[2] Helicopter trip calculations are based on estimated weight (pounds) of material.

[3] Truck trip calculations include construction operations only. Trips associated with restoration are not included.

[4] Truck trip calculations are based on estimated weight (pounds) of material.

[5] Refer to Table A-10 for an estimate of the total volume of export material.

Notes: RT = round trip

Table A-12. Preliminary List of Construction Equipment Associated with Gem Dam Options

Equipment Type	Example Make/Model	Retrofitting Quantity (No.)	Full/Partial Dam Removal Quantity (No.)
Excavator, Large	CAT 340F	1	1
Excavator, Medium	CAT 330	1	2
Excavator, Mini	CAT 306	1	2
Tracked Dump	Panther T6	2	2
Mobile Crane	Grove 30 Ton	1	1
Track Drill	IR ECM370	1	2
Boom Man Lift	Genie S-65 HF	2	2
Concrete Batch Plant	EZ 1-1	1	1
Water Pump	Honda WB2.0XT	1	1
Fuel Tank Trailer	Lee DT 975	1	1
Potable Water Tank	Norwesco 44115	1	1
Welder	Miller Bobcat 200	1	1
Container	job office	1	1
Container	tool unit	2	2
Work Platform	—	4	4
Barges (Floats)	—	2	0
Skiff	—	1	0
Temporary Bridge	40-foot shipping length	2	2

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FIGURES

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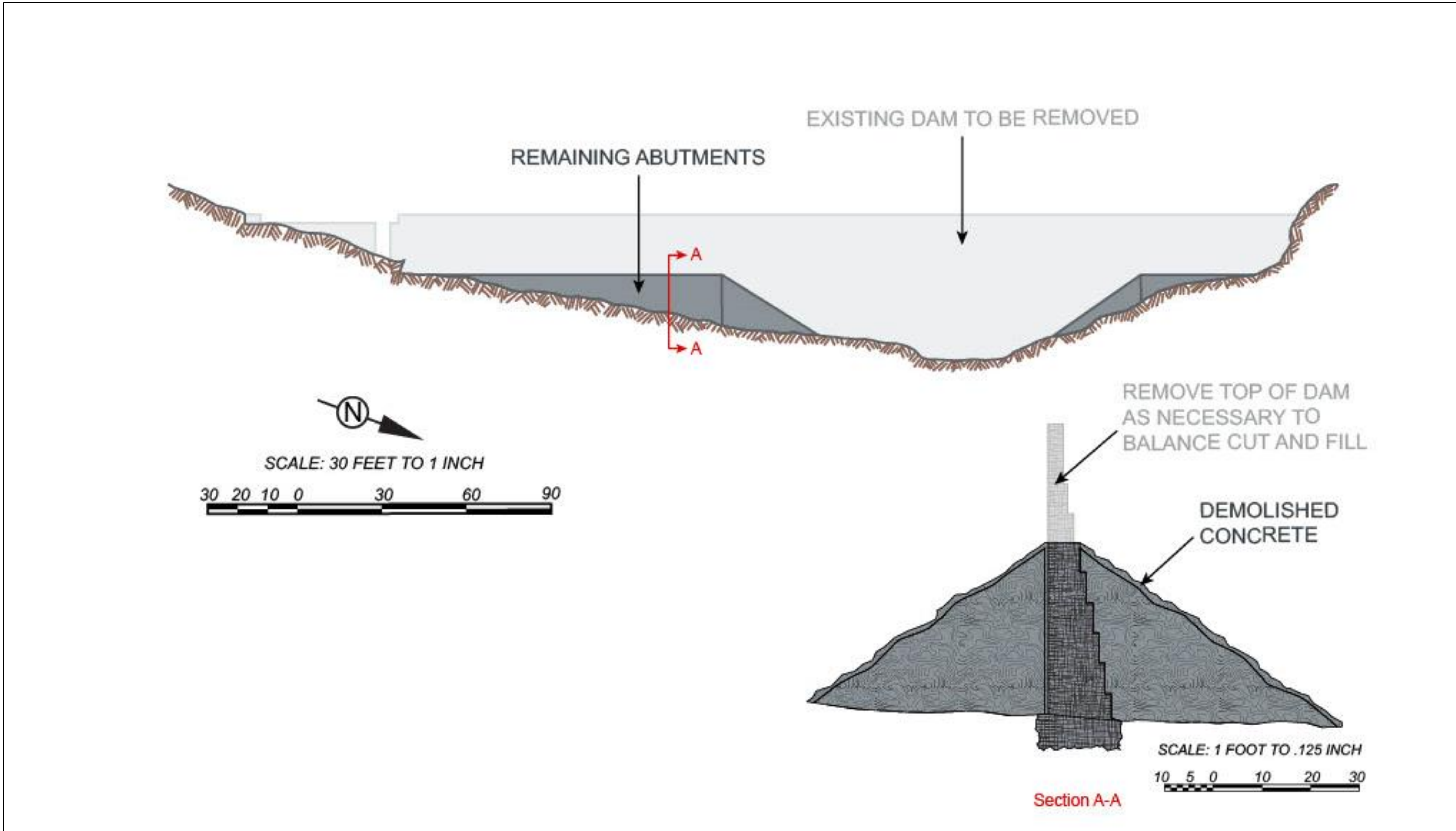

Figure A-1. Cross Section of the Existing Rush Meadows Dam and Remaining Abutments Associated with the Partial Dam Removal Option

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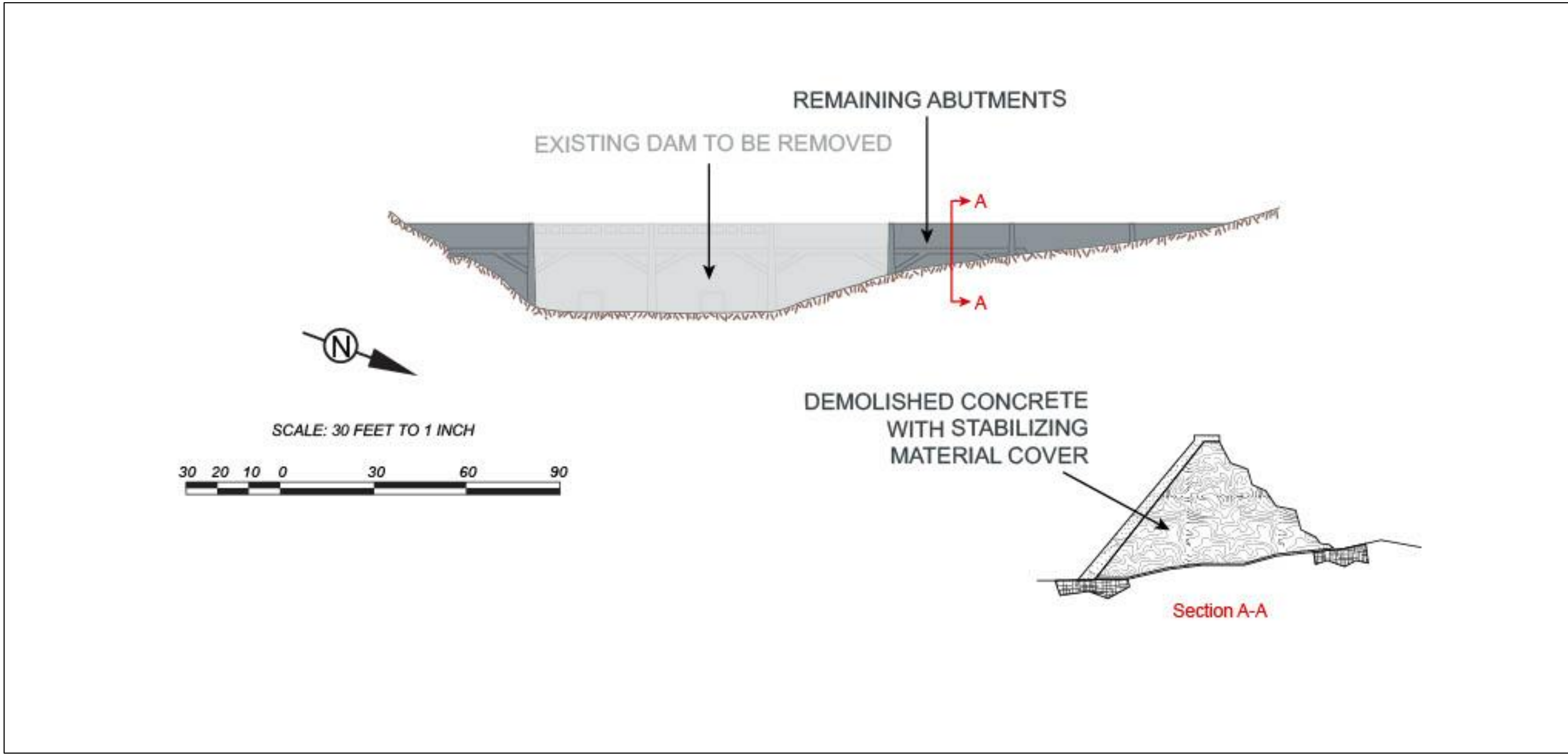

Figure A-2. Cross Section of the Existing Agnew Dam and Remaining Abutments Associated with the Partial Dam Removal Option

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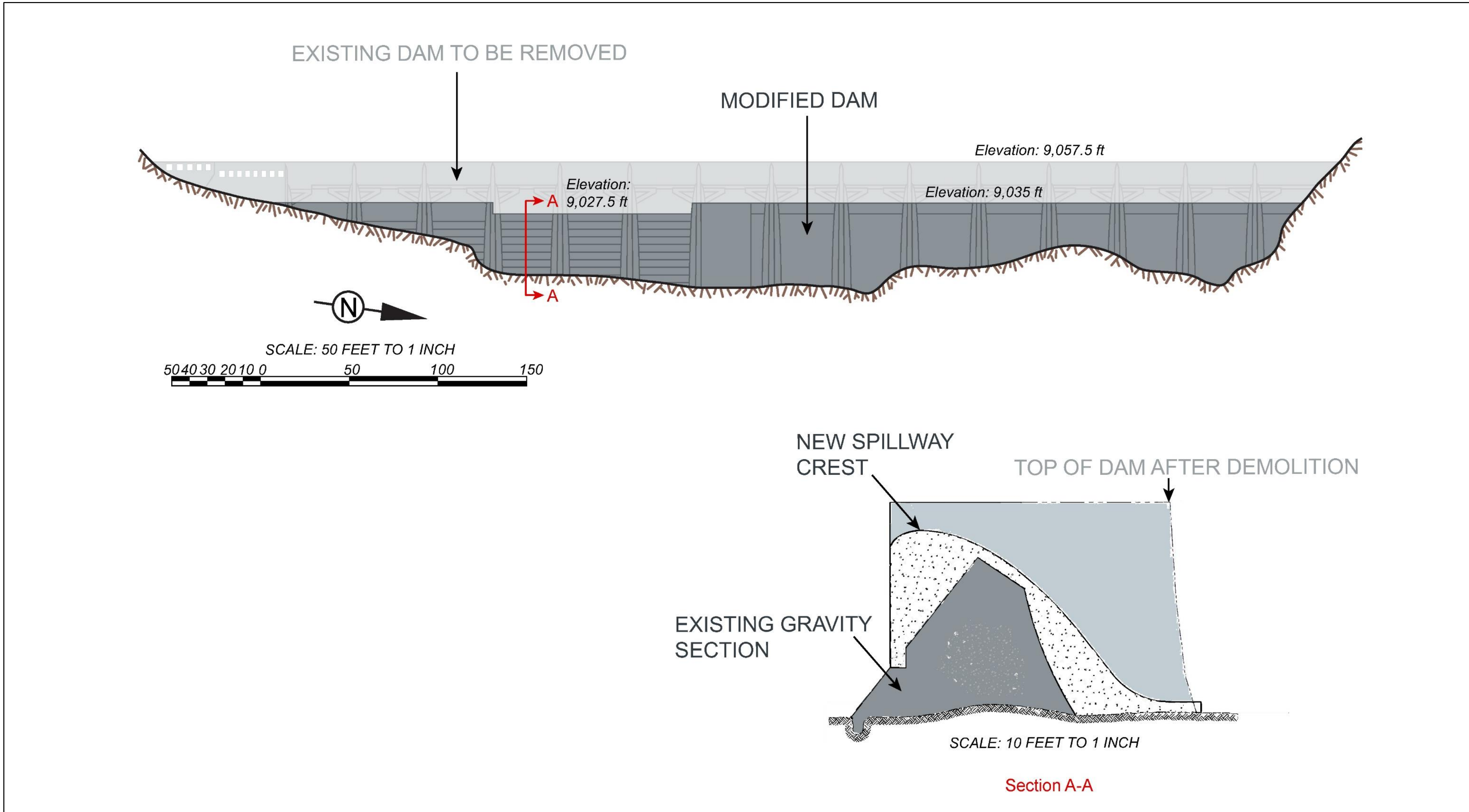

Figure A-3. Cross Section of the Existing Gem Dam and Modified Dam Associated with the Gem Dam Retrofitting Option

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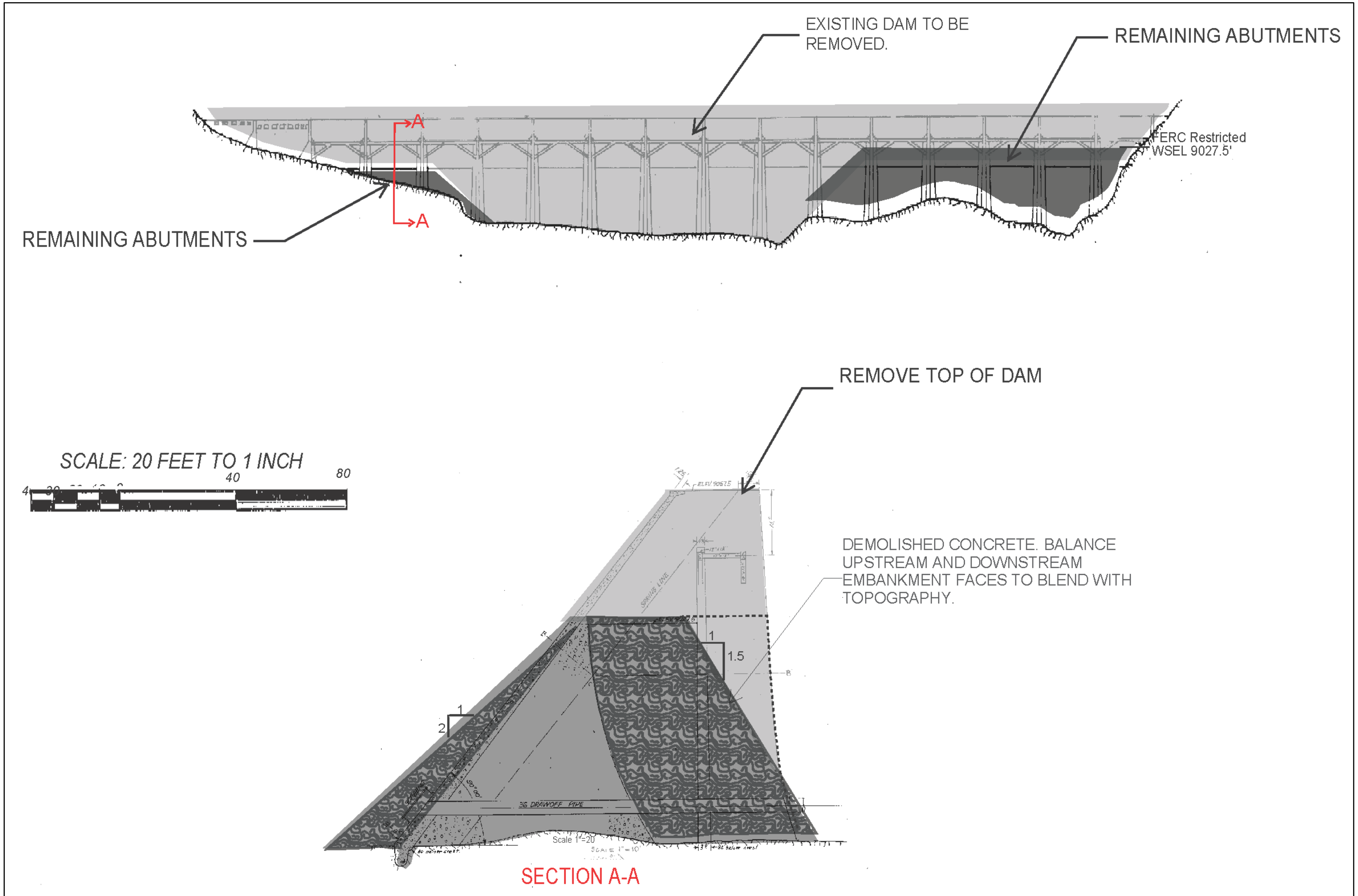

Figure A-4. Cross Section of the Existing Gem Dam and Remaining Abutments Associated with the Gem Dam Partial Removal Option

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MAPS

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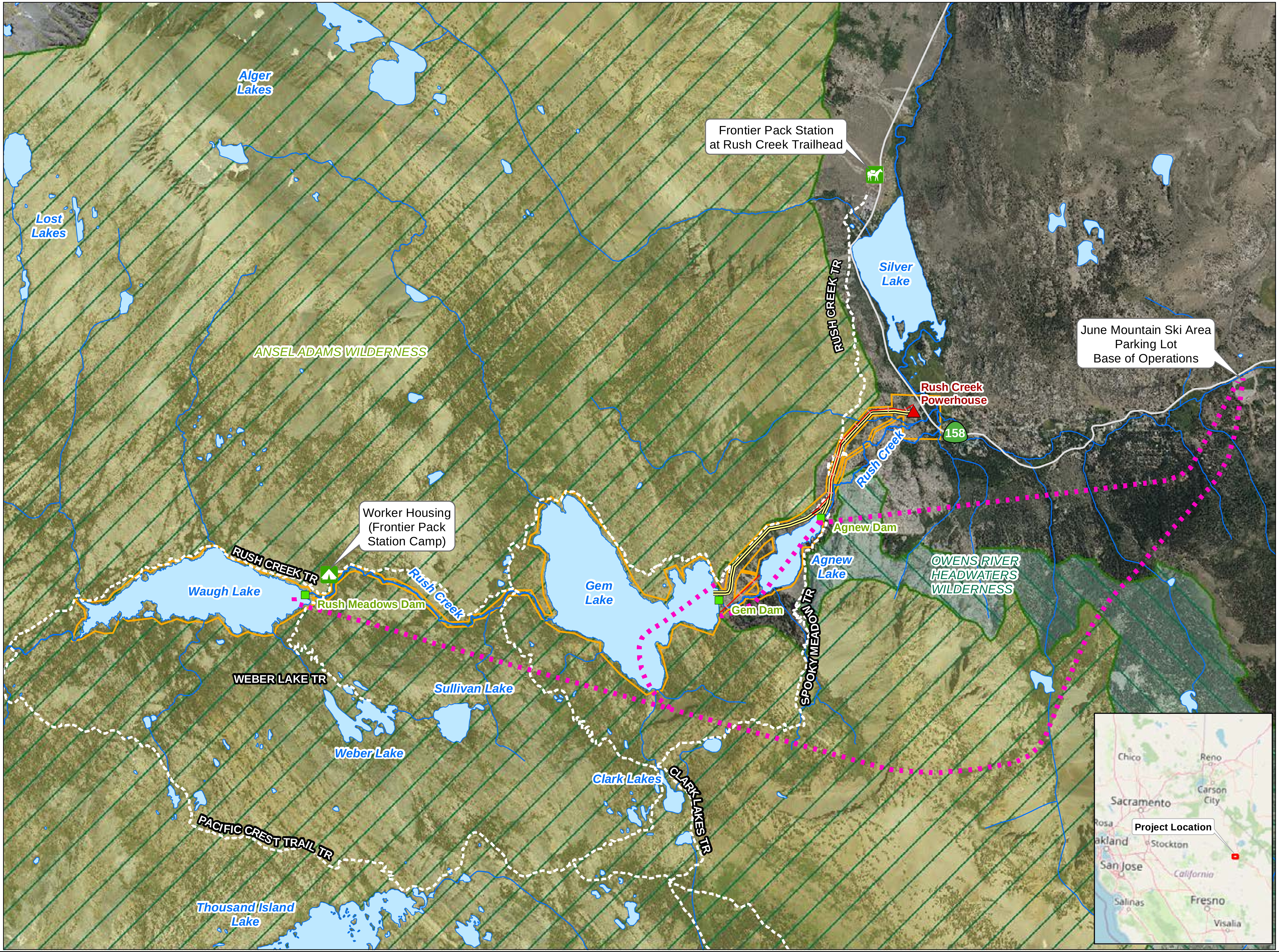

SCE Facilities

- Dam
- Powerhouse
- Flowline / Penstock
- Tramway
- FERC Boundary

Other Features

- Approximate Helicopter Flight Path
- Highway
- County Boundary
- Watercourse
- Lake
- Non-Project Trail

Land Management

National Wilderness Area*

- Ansel Adams Wilderness
- Owens River Headwaters Wilderness

*NOTE: Ansel Adams Wilderness and Owens River Headwaters Wildernes are located on USFS Lands

SOUTHERN CALIFORNIA EDISON
Energy for What's Ahead℠

Rush Creek Project (FERC 1389)

Map A-1

Location of Base of Operations, Flight Paths, and Recreation Trails

Date: 7/2/2024

0 1,250 2,500 Feet

Projection: UTM Zone 11
Datum: NAD 83

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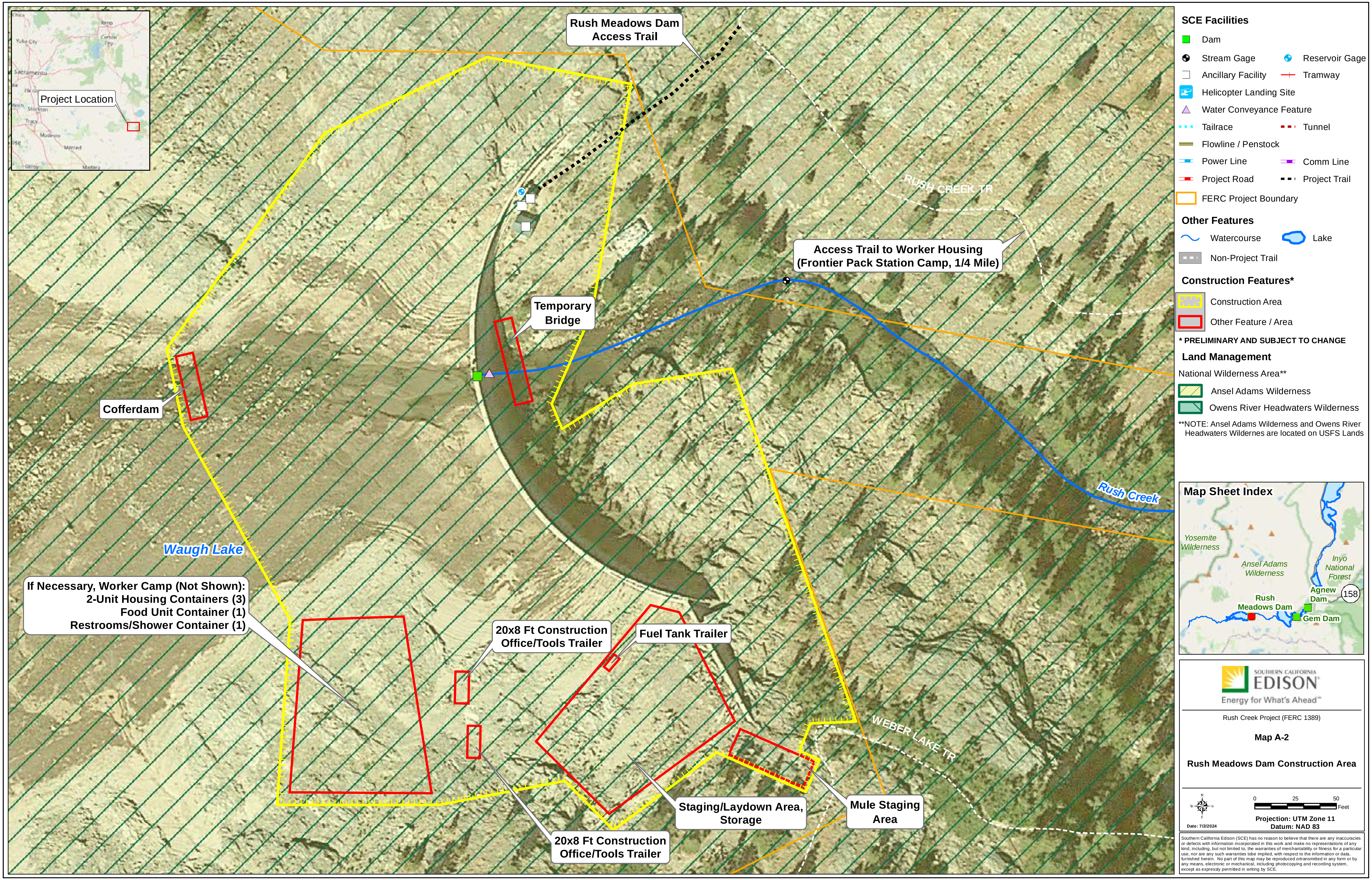

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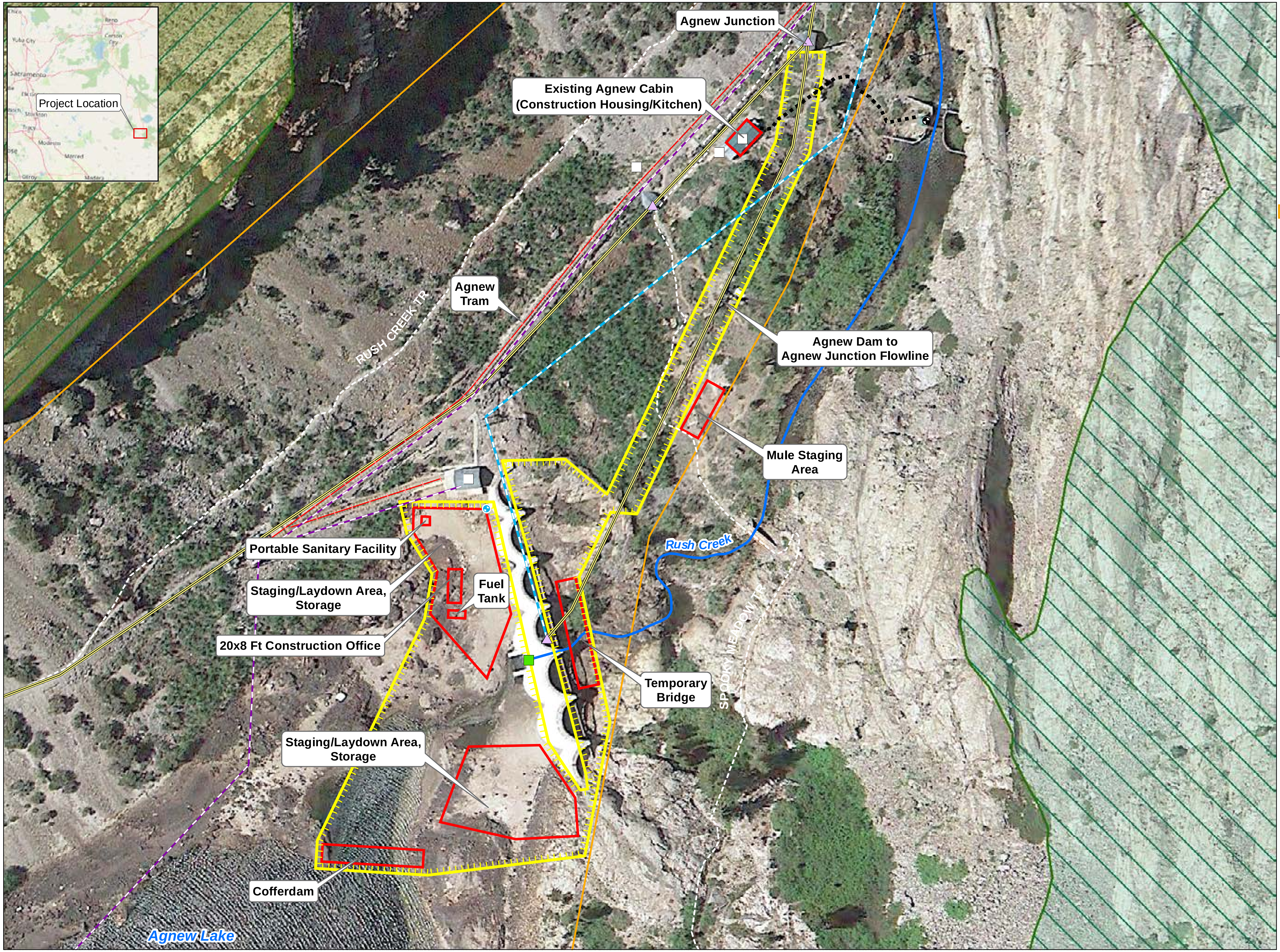

SCE Facilities

- Dam
- Stream Gage
- Reservoir Gage
- Ancillary Facility
- Tramway
- Helicopter Landing Site
- Water Conveyance Feature
- Tailrace
- Tunnel
- Flowline / Penstock
- Power Line
- Comm Line
- Project Road
- Project Trail
- FERC Project Boundary

Other Features

- Watercourse
- Lake
- Non-Project Trail

Construction Features*

- Construction Area
- Other Feature / Area

*** PRELIMINARY AND SUBJECT TO CHANGE**

Land Management

National Wilderness Area**

- Ansel Adams Wilderness
- Owens River Headwaters Wilderness

**NOTE: Ansel Adams Wilderness and Owens River Headwaters Wildernes are located on USFS Lands

Map Sheet Index

Yosemite Wilderness
Ansel Adams Wilderness
Inyo National Forest
Agnew Dam
158
Rush Meadows Dam
Gem Dam

SOUTHERN CALIFORNIA EDISON
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Rush Creek Project (FERC 1389)

Map A-3

Agnew Dam Construction Area

N W E S

0 25 50 Feet

Projection: UTM Zone 11
Datum: NAD 83

Date: 7/2/2024

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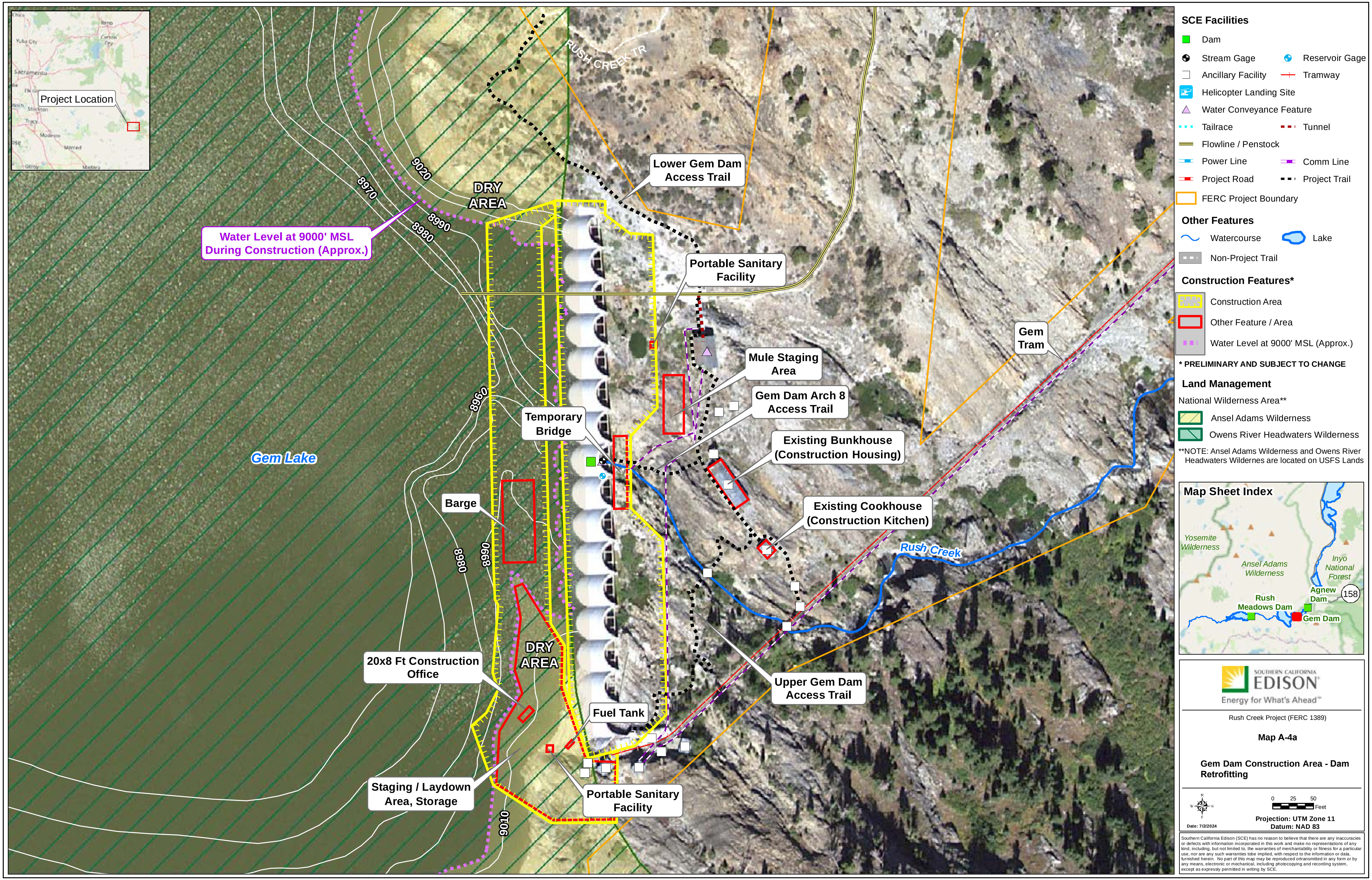

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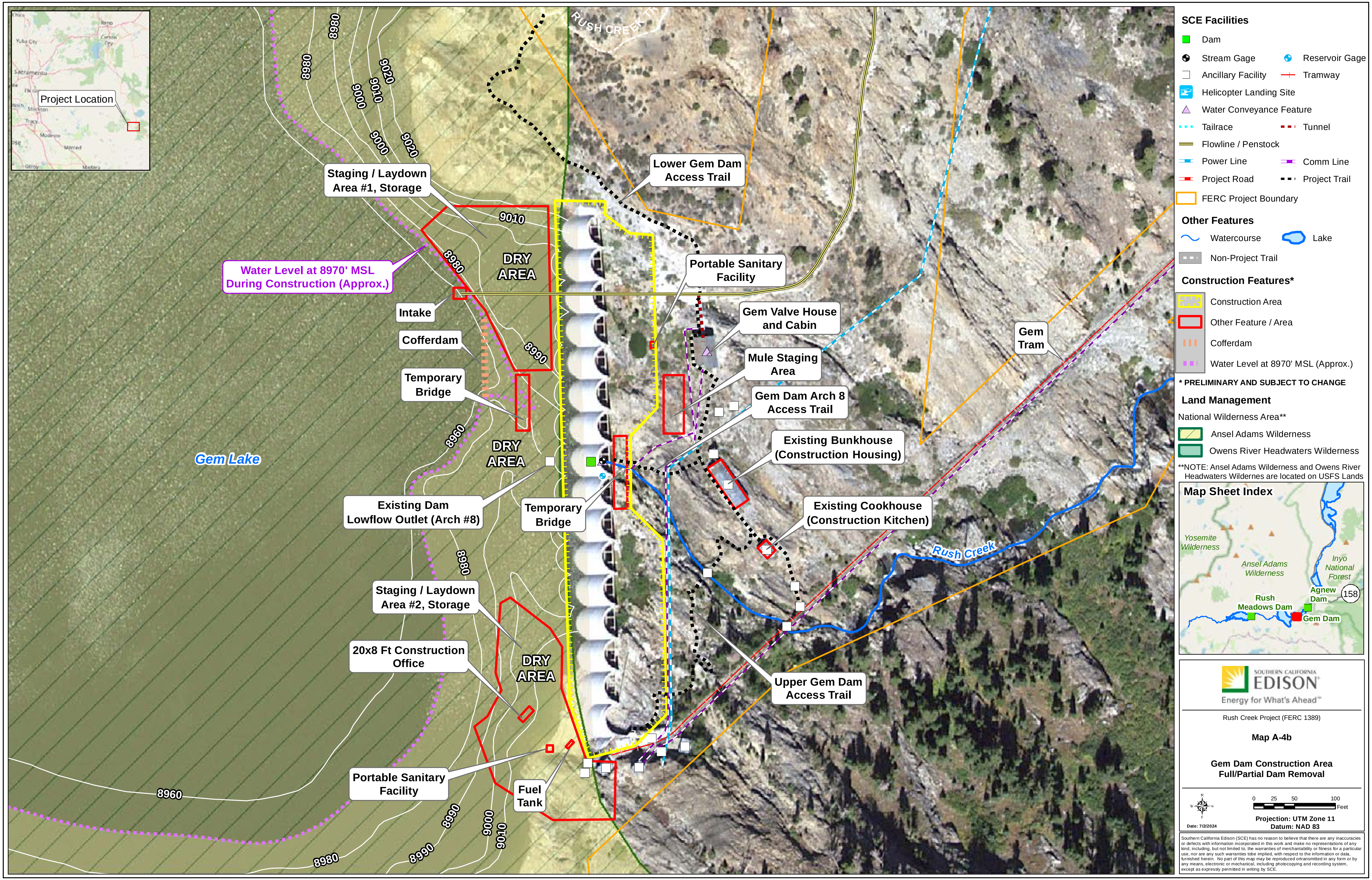

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APPENDIX B
Estimate of Costs for Each Option

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List of Acronyms

ac-ft	acre-feet
FERC	Federal Energy Regulatory Commission
Project	Rush Creek Project
SCE	Southern California Edison Company

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1 ESTIMATE OF COSTS FOR EACH DECOMMISSIONING OPTION

1.1 INTRODUCTION

The Federal Energy Regulatory Commission (FERC) Study Plan Determination (FERC 2022) requested Southern California Edison (SCE) to conduct a study to evaluate the effects of decommissioning the Rush Creek Project (Project). For each decommissioning option, FERC requested that SCE provide estimates of the associated capital, operational (including lost power production), and maintenance costs. This attachment summarizes current Project operations for context and identifies the decommissioning options and their associated costs (Table B-1). Methods for determining costs are provided below the table.

1.2 CURRENT PROJECT OPERATIONS

Current Project operations at each reservoir are summarized below:

- Waugh Lake – Waugh Lake storage is maintained below the seismic restriction (9,321.1 feet elevation) reducing storage in Waugh Lake to 1,555 acre-feet (ac-ft). During the winter and early spring, the reservoir is completely drained (the low-level outlets are left open). Since approximately 2017, the low-level outlets have generally been left open year-round. The notching of the spillway in 2018 facilitates compliance with the FERC-mandated reservoir elevation restrictions.

- Agnew Lake – Agnew Lake is no longer used for storing water or power generation. A pre-Project natural lake is present with a maximum elevation of 8,470 feet and gross storage of 569 ac-ft. Currently, the 30-inch low-level outlet is fully opened to manage water levels in Agnew Lake and pass water downstream. If inflow during the runoff season exceeds the capacity of the low-level outlet, water will be impounded in the reservoir, potentially up to the bottom of the notches in Arches No. 5 and No. 6.

- Gem Lake – Gem Lake fills up to the maximum seismic restriction capacity of 10,752 ac-ft (9,027.5 feet elevation) and maintains storage through the summer. Most of the storage is released in the fall and the reservoir remains low until spring high flows refill it the following year.

1.3 DECOMMISSIONING OPTIONS AND ASSOCIATED COSTS AND POWER PRODUCTION

The following dam decommissioning options at Rush Meadows Dam (Waugh Lake), Agnew Dam, and Gem Dam are being evaluated.

- Rush Meadows Dam
  - Full dam removal
  - Partial dam removal (abutments remain)

- Agnew Dam
  - Full dam removal
  - Partial dam removal (abutments remain)
- Gem Dam
  - Dam retrofit / continued operation of Rush Creek Powerhouse
  - Full dam removal
- Partial dam removal (abutments remain)

Table B-1 provides information requested by FERC to facilitate evaluation of decommissioning options for the Project. A description of the approach to determine costs is provided below.

Table B-1. Decommissioning Options and Associated Costs and Power Production

Project Decommissioning Option	Capital Costs of Decommissioning/ Retrofitting	Annual Operating Costs	Annual Maintenance Costs	Annual Power Production (MWh)
Rush Meadows Dam Decommissioning				
Full Dam Removal	$45,980,000	-	-	-
Partial Dam Removal	$13,800,000	-	$10,000	-
Agnew Dam Decommissioning				
Full Dam Removal	$20,570,000	-	-	-
Partial Dam Removal	$9,200,000	-	$10,000	-
Gem Dam Retrofitting/Decommissioning				
Dam Retrofit / Continued Operations of Rush Creek Powerhouse	$71,300,000	$910,738	$278,259	35,709 MWh
Full Dam Removal	$235,950,000	-	-	-35,709 MWh
Partial Dam Removal	116,160,000	-	$10,000	-35,709 MWh

Notes: MWh = megawatt hours

1.3.1 Approach to Determine Costs

1.3.1.1 Capital Costs of Decommissioning / Retrofitting

- Capital costs of decommissioning/retrofitting are Class 4 cost estimates.
- Capital costs associated with decommissioning of Rush Meadows and Agnew dams and retrofitting, or removal of Gem Dam represent the total construction costs.
- Costs associated with permitting, restoration, monitoring, and mitigation measures of dam decommissioning options and enhancement of the lower Rush Creek channel are not included as these items are either unknown at this time or have not been developed.

1.3.1.2 Annual Operating Costs

- There are no operating costs associated with Rush Meadows or Agnew dams.
- Based on SCE's FERC Form 1 submittals for the previous five years (2019–2023), annual operating costs for the Rush Creek Project (total costs for all developments) were tallied and the annual average operating costs determined ($1,138,422). SCE estimates that continued operation of Gem Dam, Rush Creek Powerhouse, and above-ground flowlines/penstocks represents 80% of total Project operating costs ($910,738).

1.3.1.3 Annual Maintenance Cost

- No annual maintenance costs are assumed for full removal of Rush Meadows, Agnew, and Gem dams.
- Annual maintenance costs associated with partial removal of Rush Meadows, Agnew, and Gem dams include periodic inspection and maintenance of remaining abutments for the first five years following removal activities. It is assumed that once the abutments are considered stable that annual maintenance will no longer be required.
- Based on SCE's FERC Form 1 submittals for the previous five years (2019–-2023), annual maintenance costs for the Rush Creek Project (total costs for all developments) were tallied and the annual average maintenance costs determined ($347,824). SCE estimates that continued maintenance of Gem Dam, Rush Creek Powerhouse, and above-ground flowlines/penstocks represents 80% of total Project maintenance costs ($278,259).

1.3.1.4 Annual Power Production

- Since approximately 2017, the low-level outlets at Rush Meadows Dam have been left open year-round; therefore, over the last five-year period (2019–2023) Rush Meadows Dam has not contributed to annual power production.
- In 2017, Agnew Dam and Flowline were modified such that no water is impounded or diverted into the powerhouse; therefore, over the last five-year period (2019–2023) Agnew Dam has not contributed to annual power production.
- Annual power production for Gem Dam represents average annual power generation over the last five-year period (2019–2023). Annual power production associated with Gem Dam retrofitting is positive representing the amount of generation that would be possible with Gem Lake having 10,752 ac-ft of storage and direct diversion capabilities following the retrofit.
- Annual power production associated Gem Dam decommissioning (full and partial) is negative representing lost generation from the absence of the dam and associated loss of storage (below the seismic restriction) in Gem Lake (10,752 ac-ft) and loss of direct diversion capability.

1.4 REFERENCES

FERC (Federal Energy Regulatory Commission). 2022. Rush Creek Hydroelectric Project (FERC Project No. 1389). Study Plan Determination. October.

APPENDIX C
Flow and Water Level Changes Under Each Option

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List of Maps

List of Acronyms

cfs	cubic feet per second
FERC	Federal Energy Regulatory Commission
POR	period of record
Project	Rush Creek Project
SCE	Southern California Edison

1.0 INTRODUCTION

The Federal Energy Regulatory Commission (FERC) Study Plan Determination (FERC 2022) required Southern California Edison (SCE) to conduct a study to evaluate the effects of decommissioning the Rush Creek Project (Project). Appendix C provides results from the hydrology analysis of the potential for localized flooding to occur in the vicinity of State Route 158 (refer to Map C-1 for the area of interest) and provides a description of the Rush Creek Project reservoir levels and stream flow conditions under each decommissioning option as modeled in the AQ 2 – Hydrology Technical Study. Modeling includes the 1990–2022 period of record (POR) for Unimpaired Flow (Full Dam Decommissioning), Proposed Project (Gem Dam retrofitting and removal of Agnew and Rush Meadows dams), and the Existing Condition (operations of the Project under the current seismic restrictions). Reservoir storage is provided for Waugh (Rush Meadows Dam), Gem, and Agnew lakes. Flow is provided at five locations, Rush Creek below Rush Meadows Dam, Rush Creek below Gem Dam, Rush Creek below Agnew Dam, and Rush Creek below Silver Lake.

2.0 RESULTS

2.1 POTENTIAL FLOODING

Based on recent hydrology and site observations, potential localized flooding may occur near State Route 158 in the vicinity of Dream Mountain Estates and Lockhart properties when total flows through Silver Lake are in the range of approximately 600 cubic feet per second (cfs) as occurred spring of 2017, 2019, and 2023. Map C-2 shows the standing water conditions near the Dream Mountain Estates and Lockhart properties on July 13, 2023, when flows through Silver Lake were 566 cfs. Localized flooding was more extensive in 2017, however, aerial photograph was unavailable. Table C-1 shows the frequency (days and years) that flows exceed 500 cfs and 600 cfs under each of the flow scenarios (Unimpaired Flow, Proposed Project, Existing Condition) for the 1990–2022 POR.

Flows exceeded the 600 cfs threshold for potential flooding in 13 of the 33 years for both the Unimpaired Flow and Proposed Project (36 percent) during the POR (Table C-1). For the Unimpaired Flow, the total number of days >600 cfs was 135 days compared to 102 days for the Proposed Action. For the Existing Condition, flows exceeded 600 cfs in 8 of 33 years (24 percent) and the total number of days flow was >600 cfs for the POR was 67 days.

2.2 RESERVOIR STORAGE AND FLOWS

Figures C-1 through C-3 show Waugh, Gem, and Agnew Lake storage levels, respectively, for the POR. Waugh Lake only stores a small amount of water under the Existing Condition when spring inflows exceed the capacity of the low-level outlets. Agnew Lake has no storage under any of the scenarios.

Figures C-4 through C-7 show flows in Rush Creek below Rush Meadows Dam, Rush Creek below Gem Dam, Rush Creek below Agnew Dam, and Rush Creek below Silver Lake, respectively. Figure C-7, Rush Creek below Silver Lake flows, includes inflows to Silver Lake from the Project and additional local tributaries unaffected by the Rush Creek Project (Reversed Creek, Alger's Creek, and unnamed tributaries). These local tributaries affect the potential flooding conditions (discussed above), by either increasing the elevation of Silver Lake (creating backwater effects at State Route 158) and/or contributing to overbank flows in the potential flooding areas (Reversed Creek, unnamed tributary).

TABLES

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Table C-1. Modeled Rush Creek Flows below Silver Lake (Days above 500 cfs and 600 cfs)

Year	Scenarios					
	Days above 500 cfs			Days above 600 cfs		
	Unimpaired Flow (Full Dam Decommissioning)	Proposed Project	Existing Condition	Unimpaired Flow (Full Dam Decommissioning)	Proposed Project	Existing Condition
1990	0	0	0	0	0	0
1991	2	0	0	0	0	0
1992	0	0	0	0	0	0
1993	7	7	3	1	1	0
1994	0	0	0	0	0	0
1995	38	31	33	23	23	18
1996	9	4	1	2	2	0
1997	7	2	1	2	2	1
1998	32	23	21	10	5	3
1999	5	3	0	0	0	0
2000	8	3	0	0	0	0
2001	5	0	0	1	0	0
2002	0	0	0	0	0	0
2003	10	5	0	7	1	0
2004	0	0	0	0	0	0
2005	30	14	8	10	6	0
2006	35	23	25	9	6	2
2007	0	0	0	0	0	0
2008	0	0	0	0	0	0
2009	1	0	0	0	0	0
2010	16	15	12	11	10	3
2011	26	25	25	17	15	9
2012	0	0	0	0	0	0
2013	0	0	0	0	0	0
2014	0	0	0	0	0	0
2015	0	0	0	0	0	0
2016	1	0	0	0	0	0
2017	52	39	36	31	21	23
2018	2	3	1	0	1	0

Year	Scenarios					
	Days above 500 cfs			Days above 600 cfs		
	Unimpaired Flow (Full Dam Decommissioning)	Proposed Project	Existing Condition	Unimpaired Flow (Full Dam Decommissioning)	Proposed Project	Existing Condition
2019	16	11	15	11	9	8
2020	0	0	0	0	0	0
2021	0	0	0	0	0	0
2022	0	0	0	0	0	0
Total Days	**302**	**208**	**181**	**135**	**102**	**67**
Total Years	**19**	**15**	**12**	**13**	**13**	**8**

FIGURES

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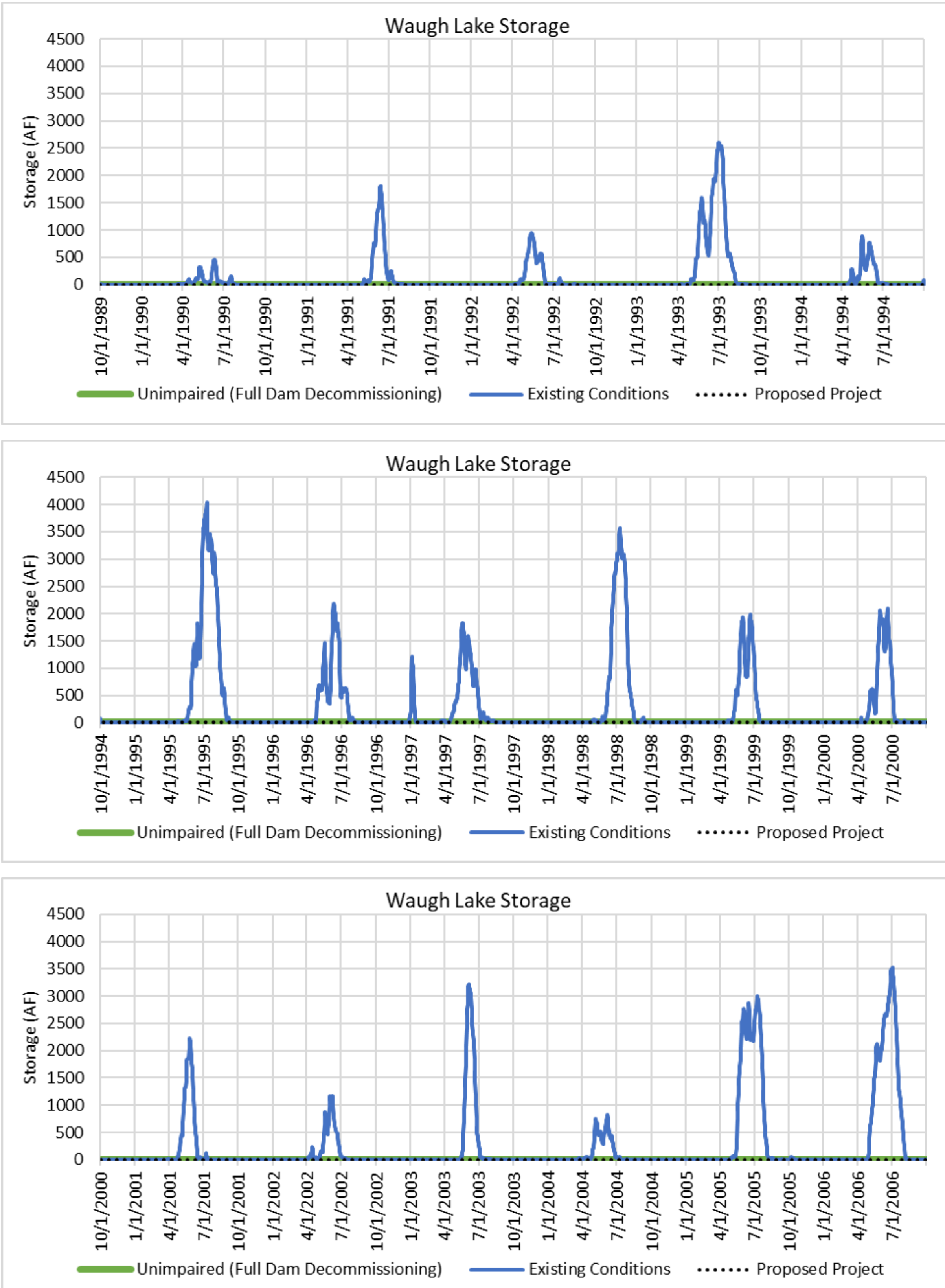
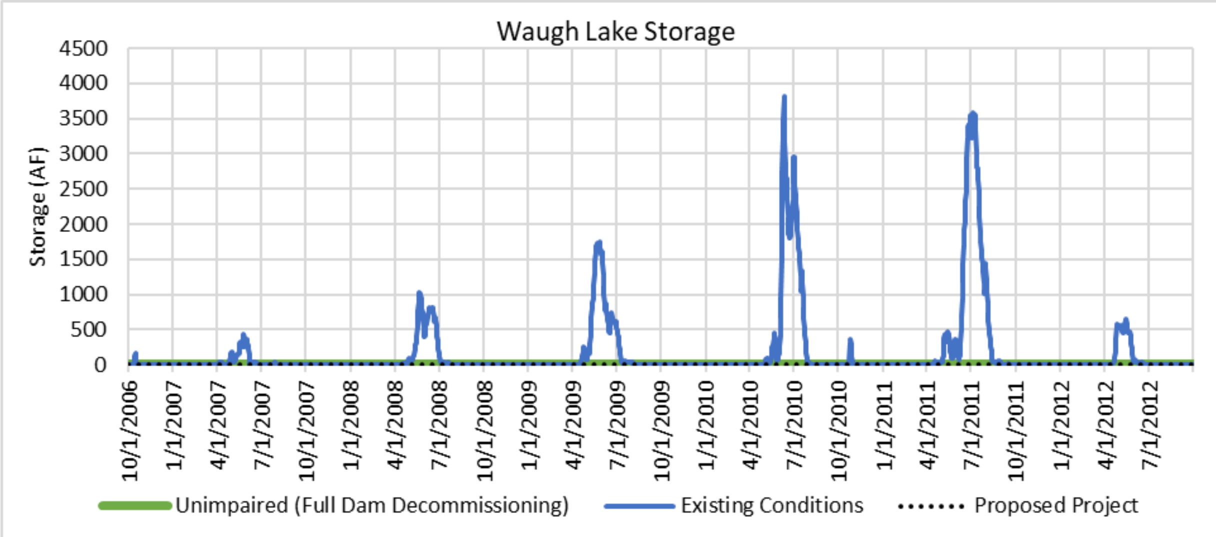
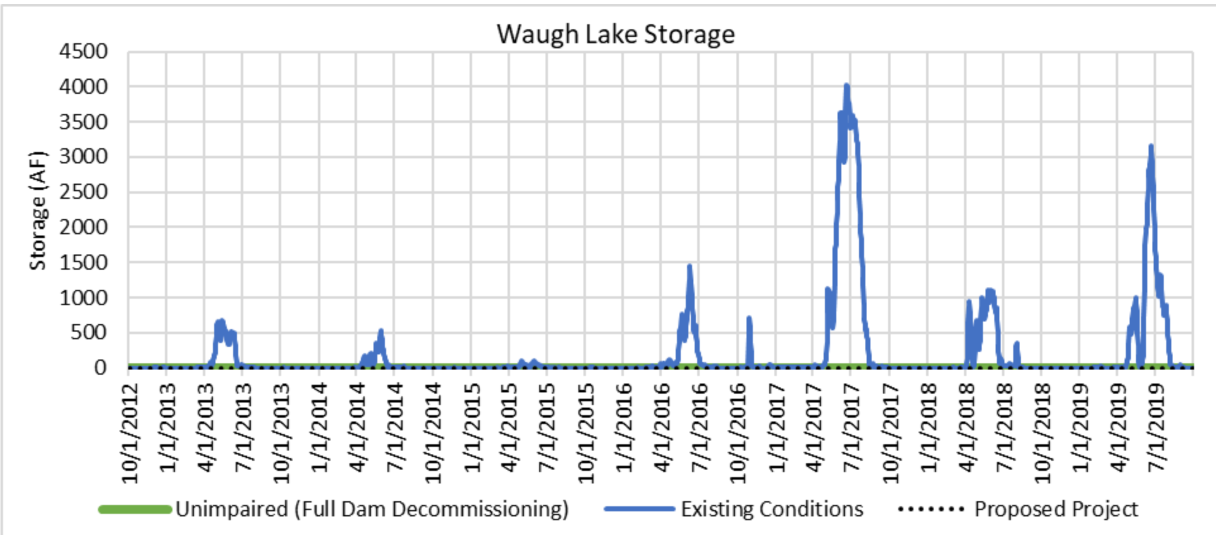


Figure C-1. Modeled Waugh Lake Storage





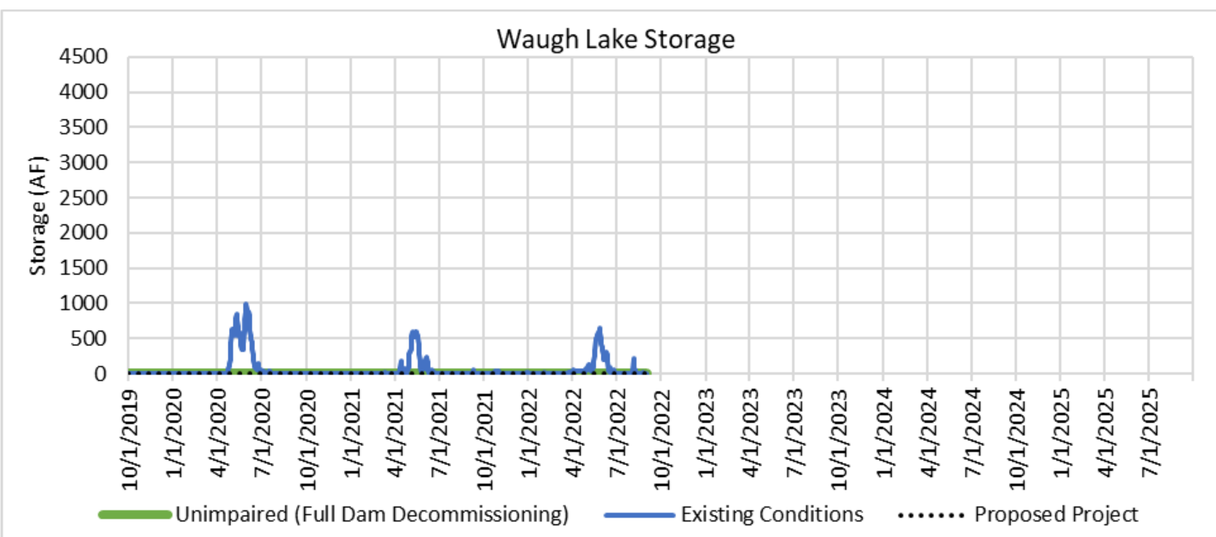


Figure C-1 (continued). Modeled Waugh Lake Storage

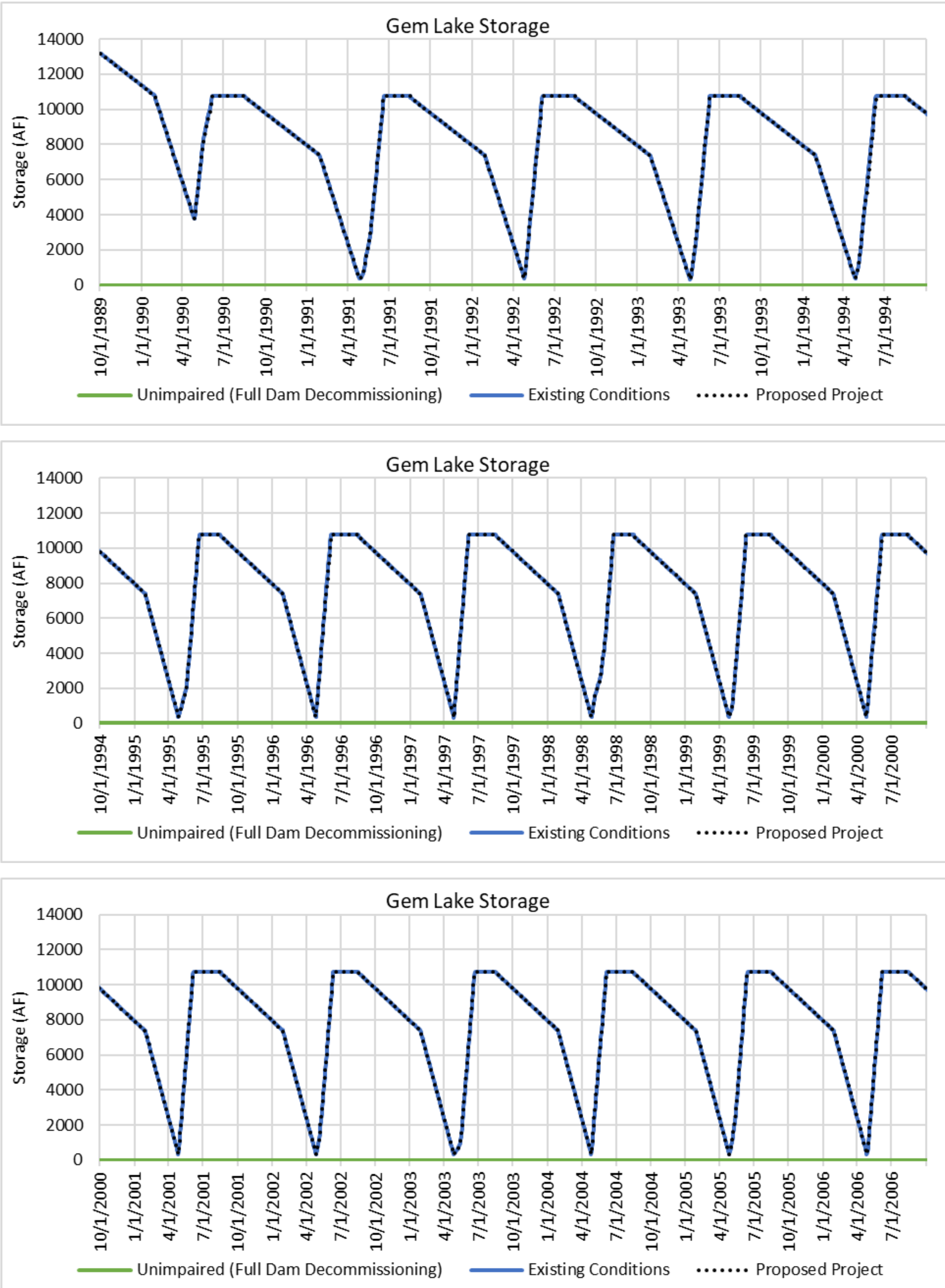
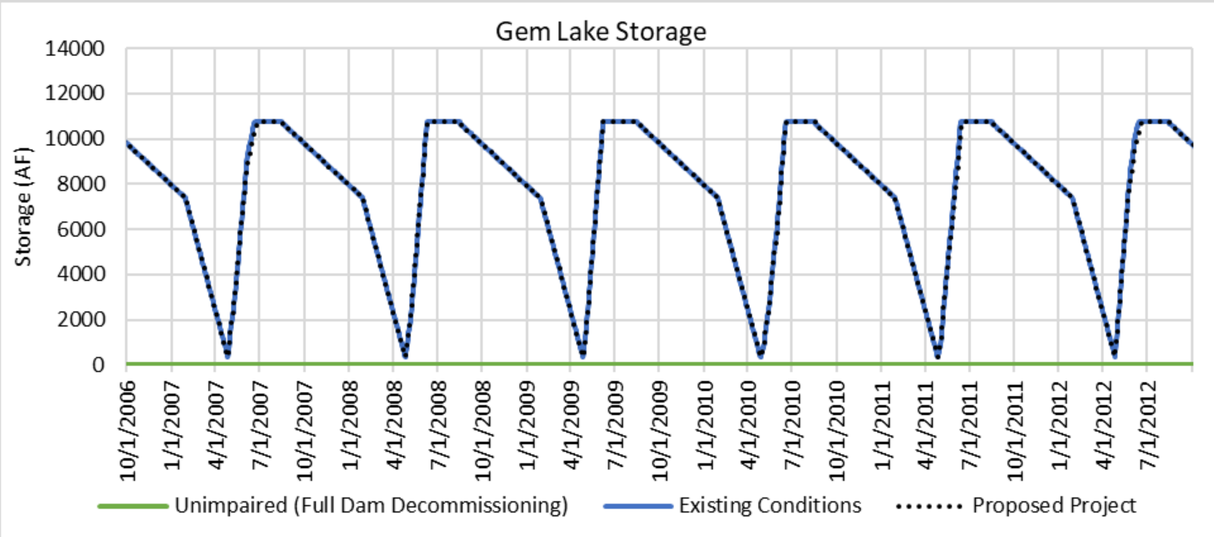
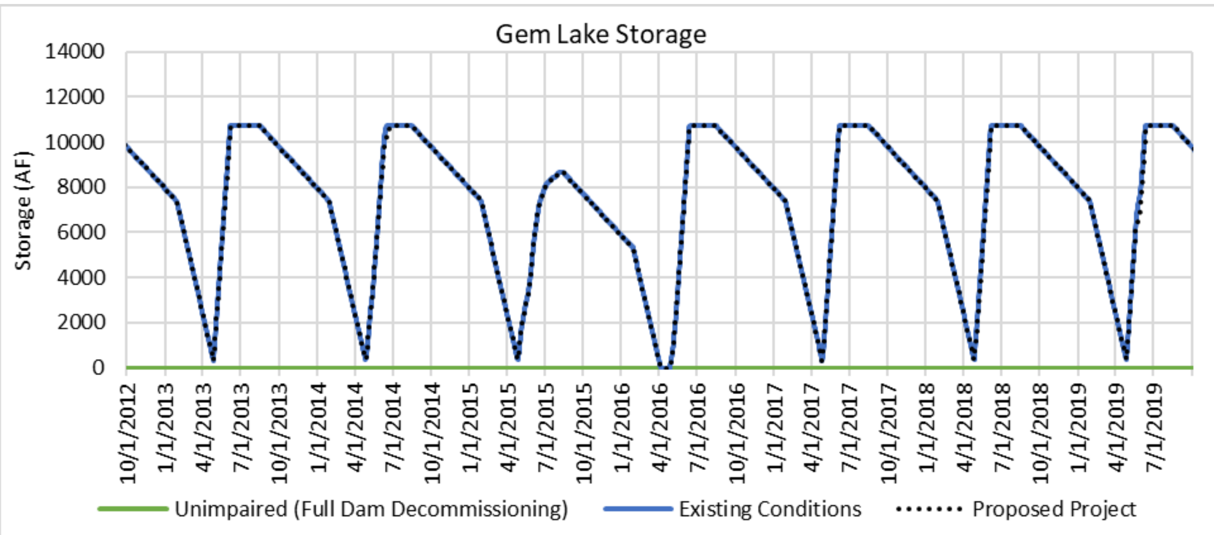


Figure C-2. Modeled Gem Lake Storage





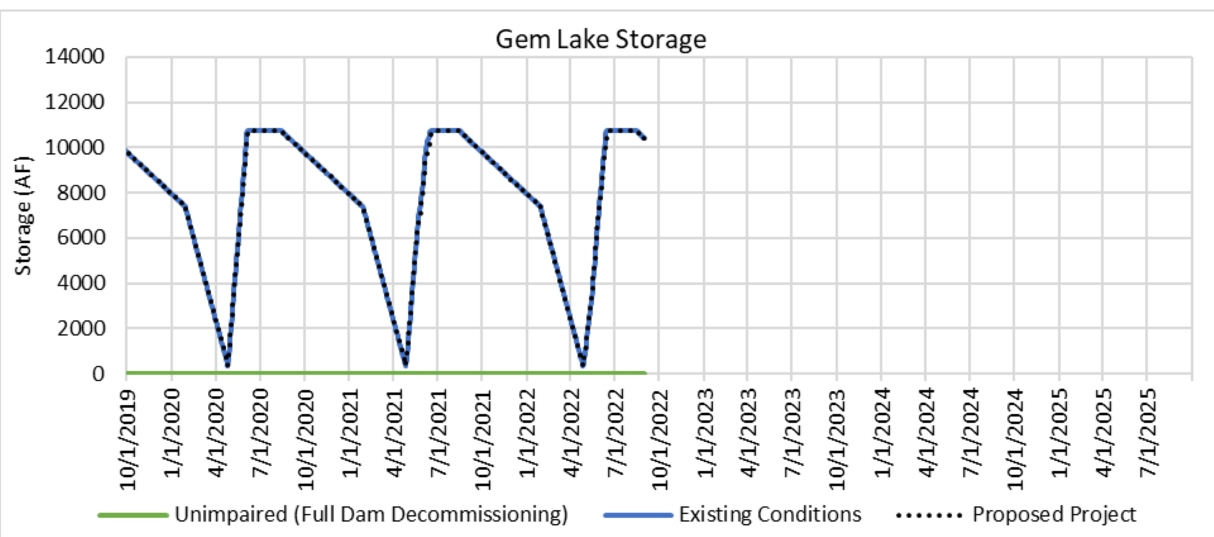
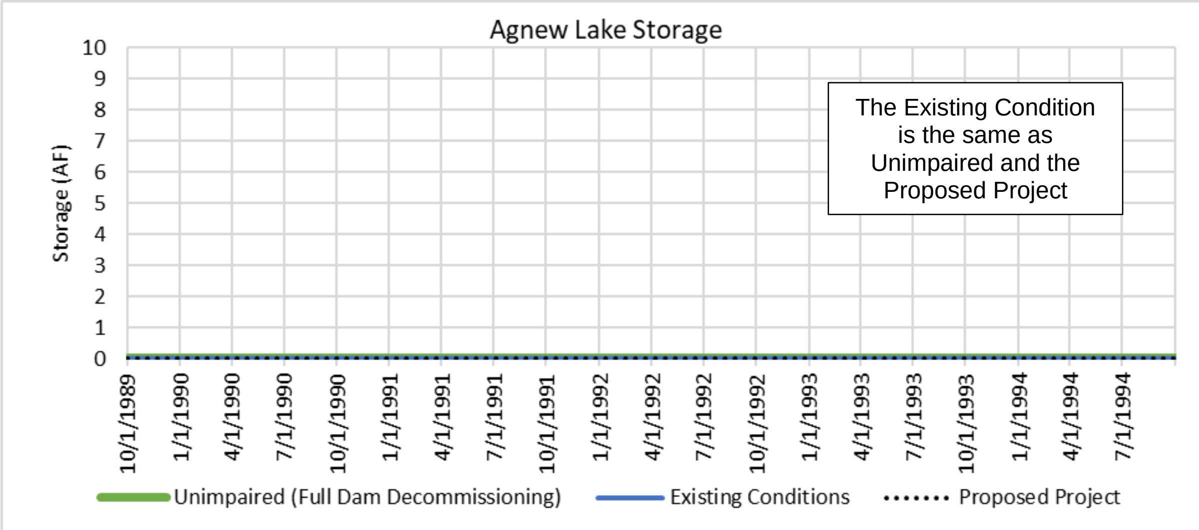
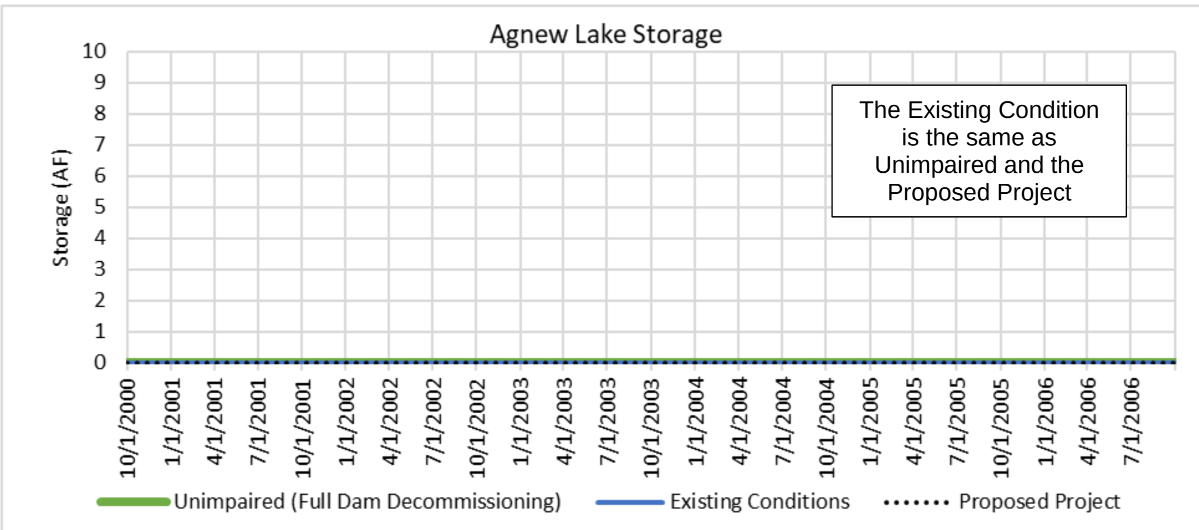


Figure C-2 (continued). Modeled Gem Lake Storage





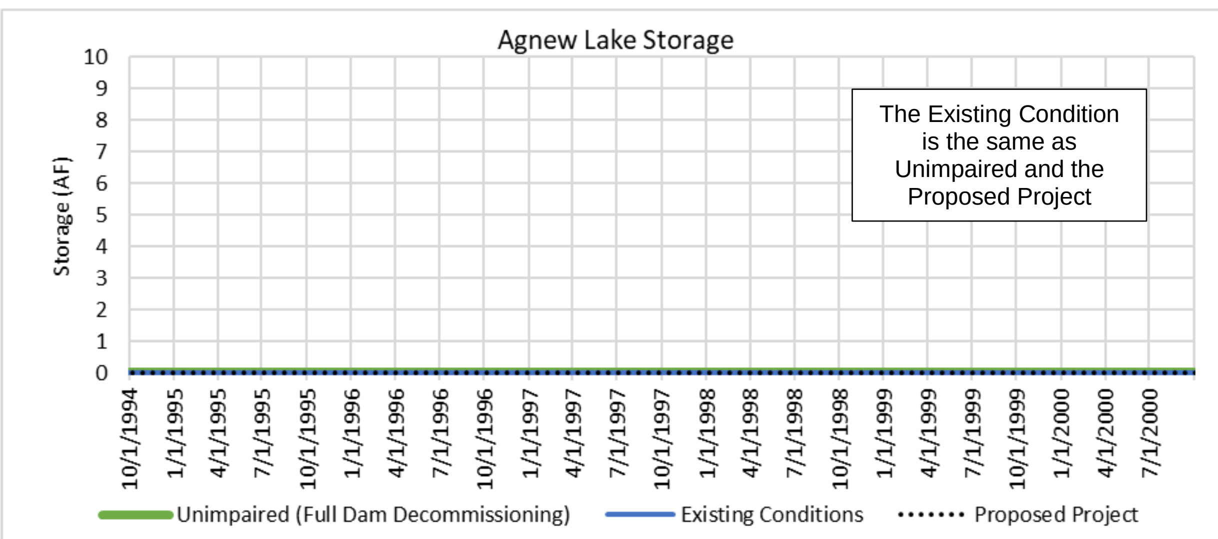
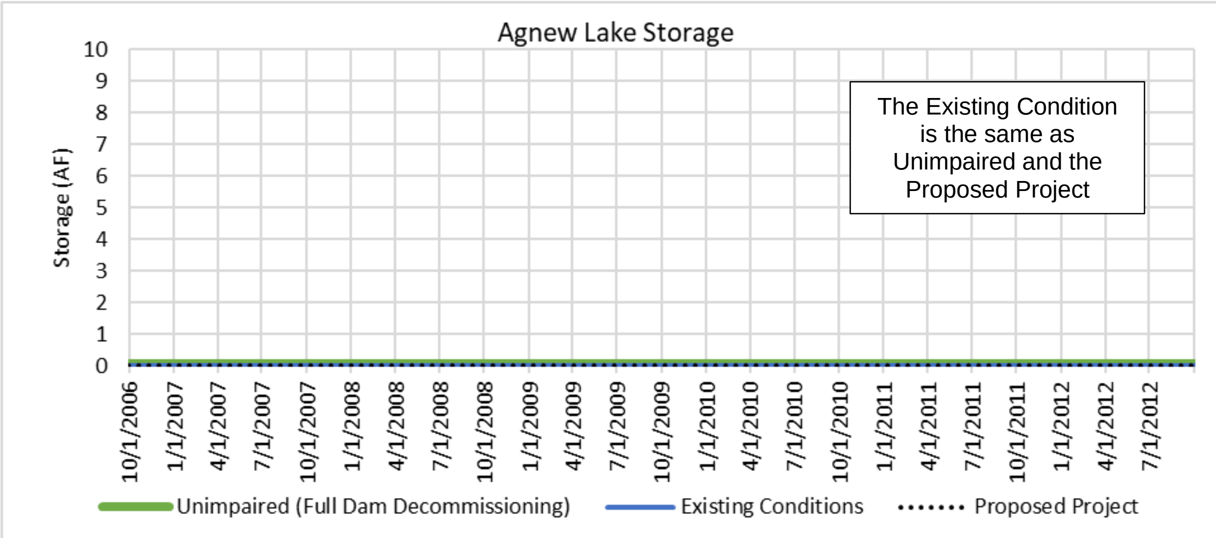
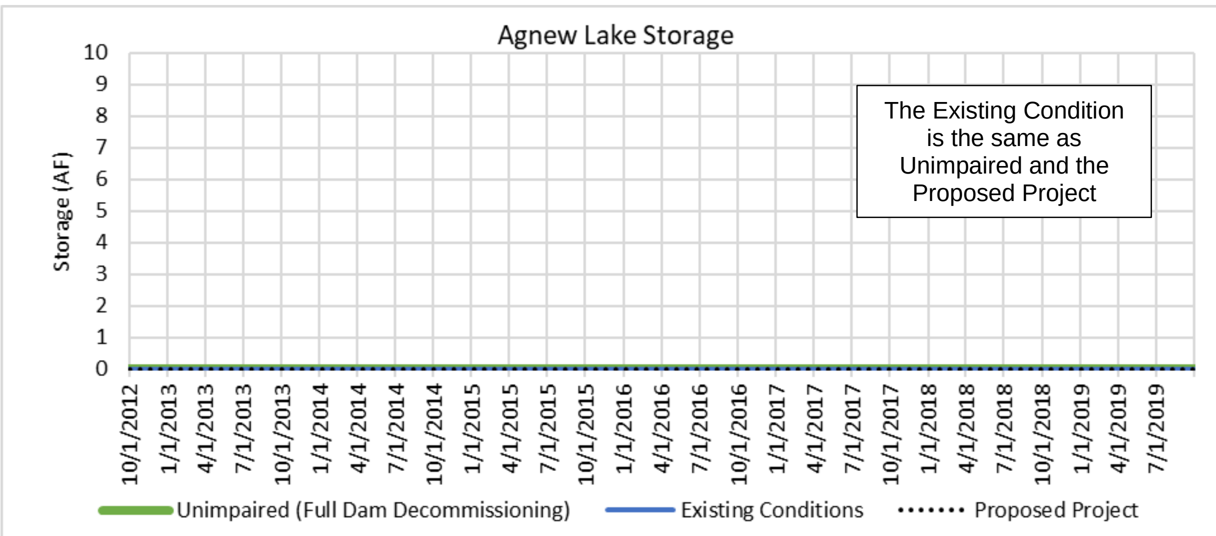


Figure C-3. Modeled Agnew Lake Storage





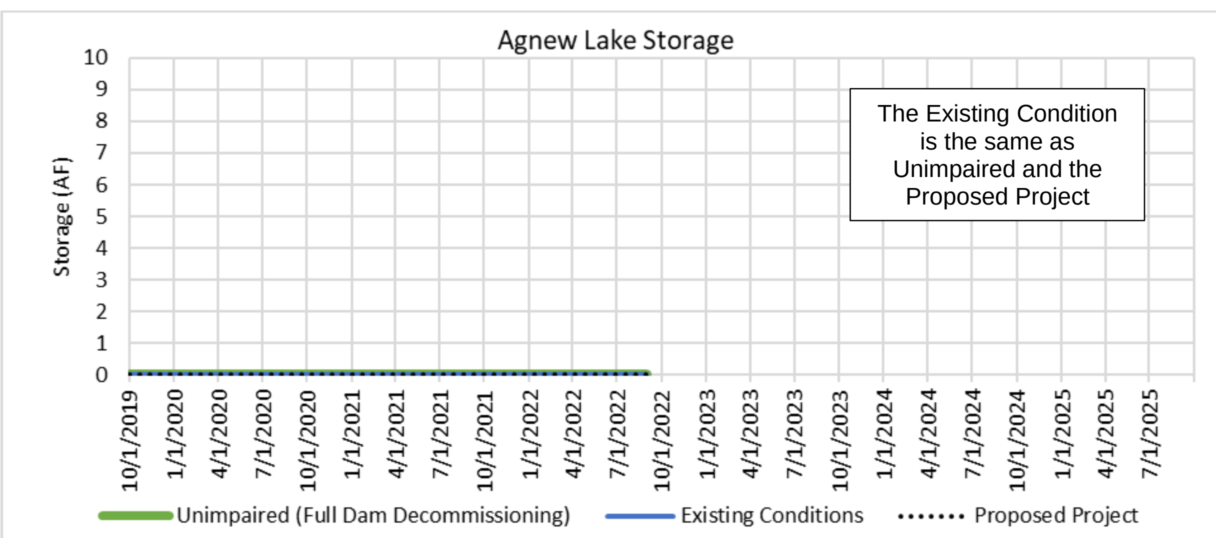


Figure C-3 (continued). Modeled Agnew Lake Storage

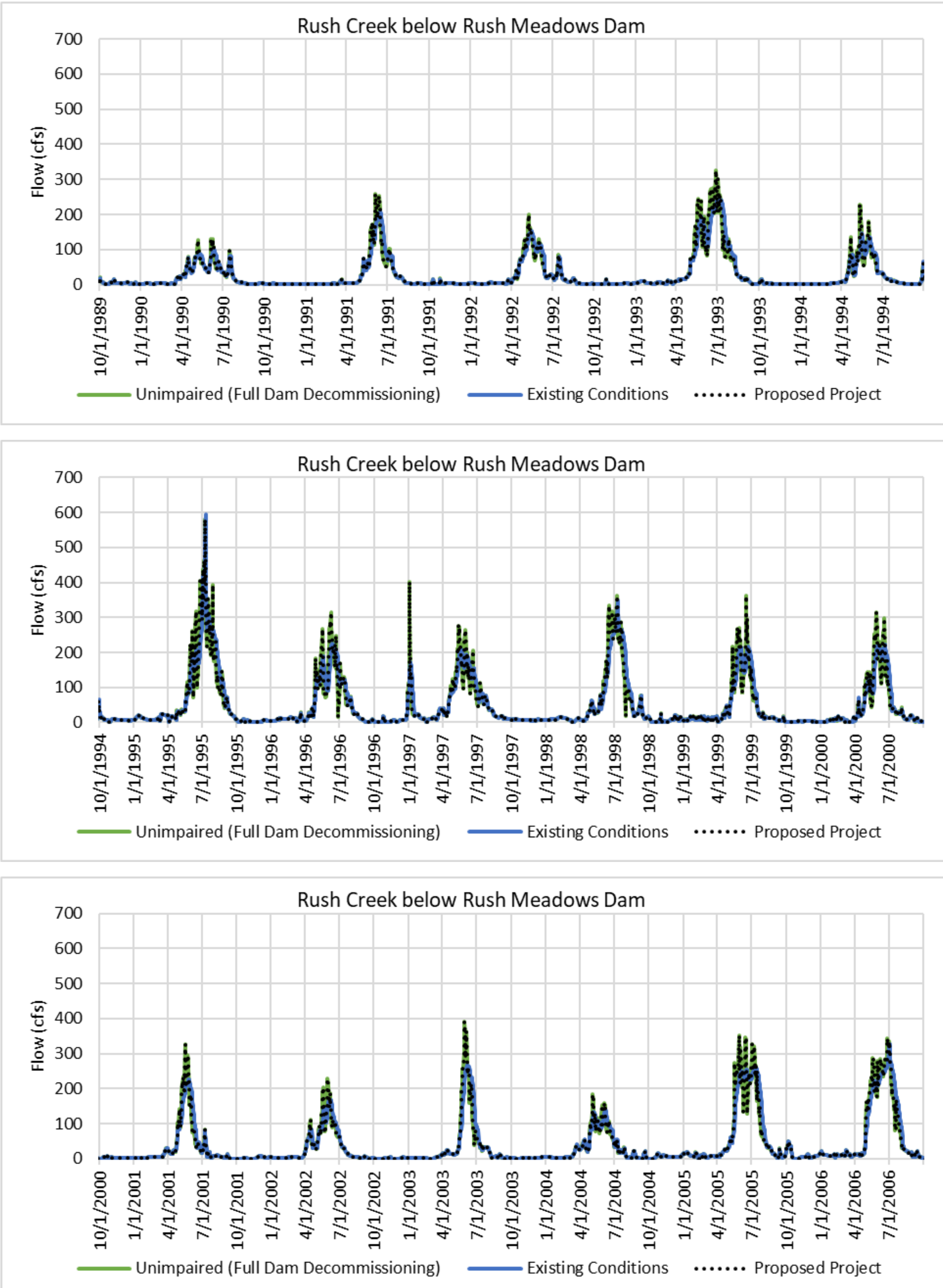


Figure C-4. Modeled Rush Creek Flow Below Rush Meadows Dam

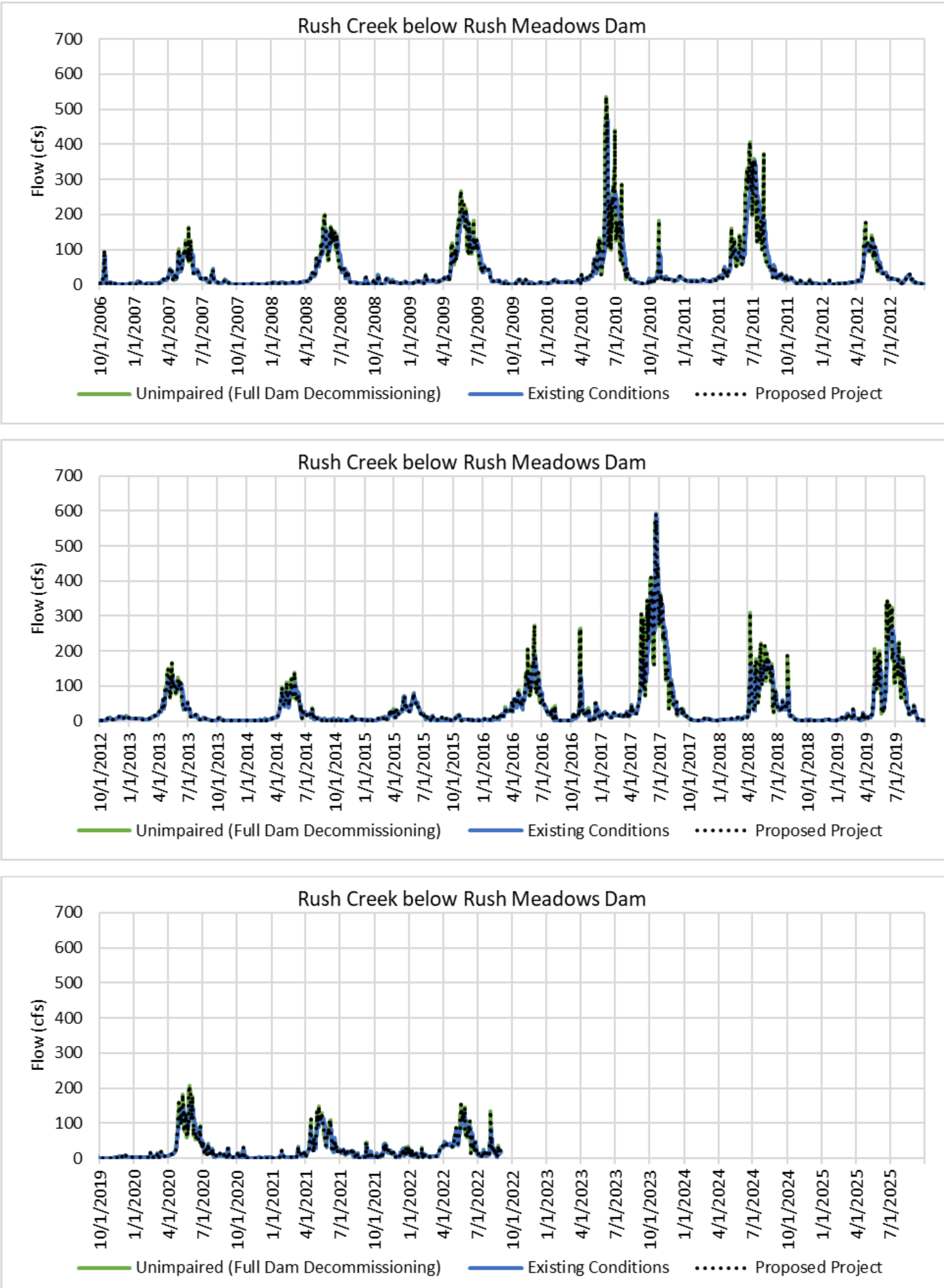


Figure C-4 (continued). Modeled Rush Creek Flow Below Rush Meadows Dam

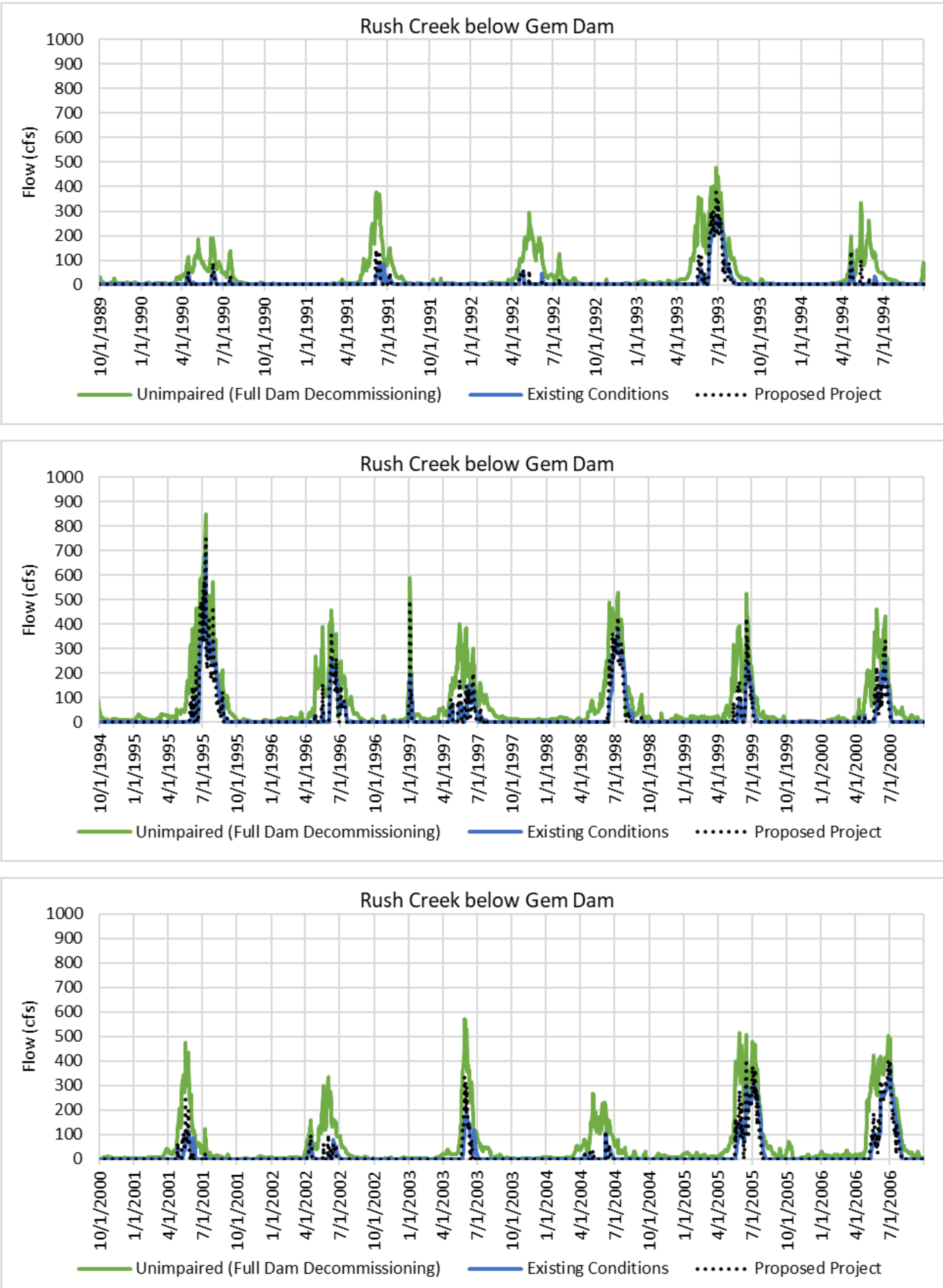
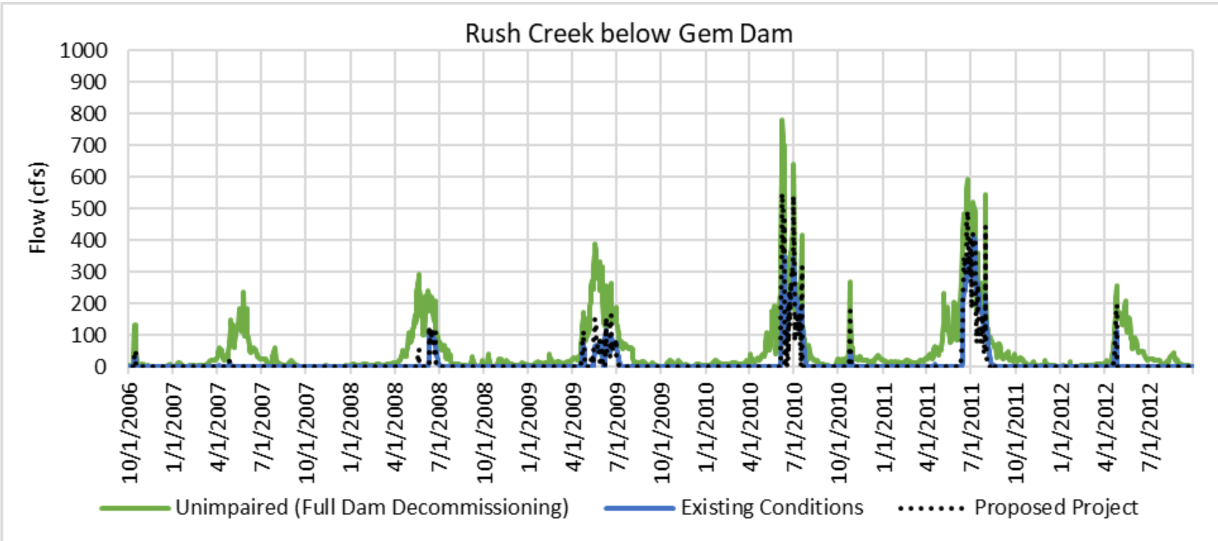
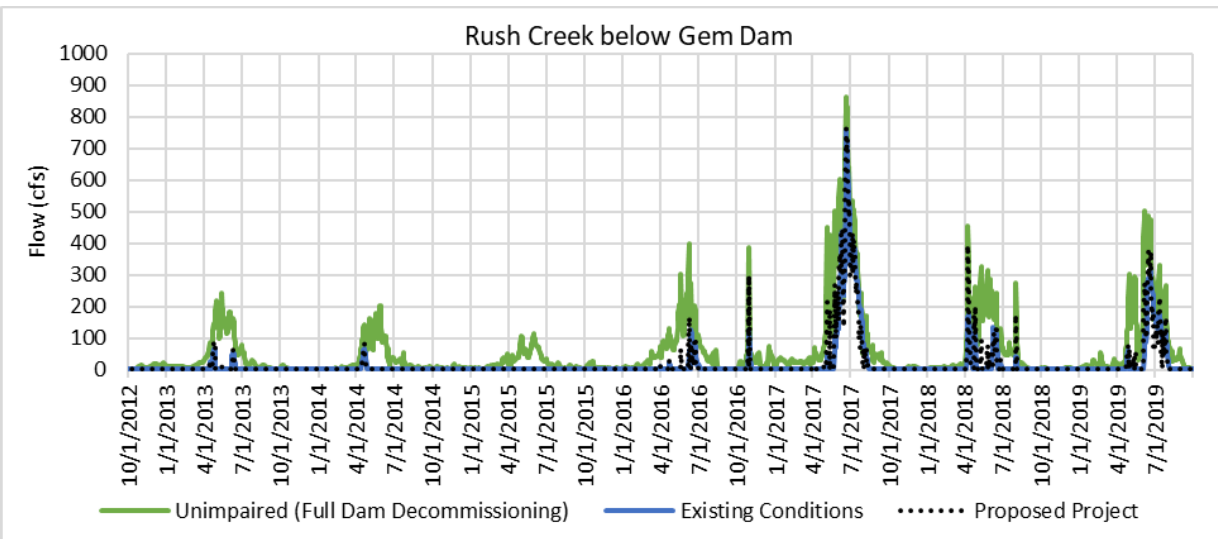


Figure C-5. Modeled Rush Creek Flow Below Gem Dam





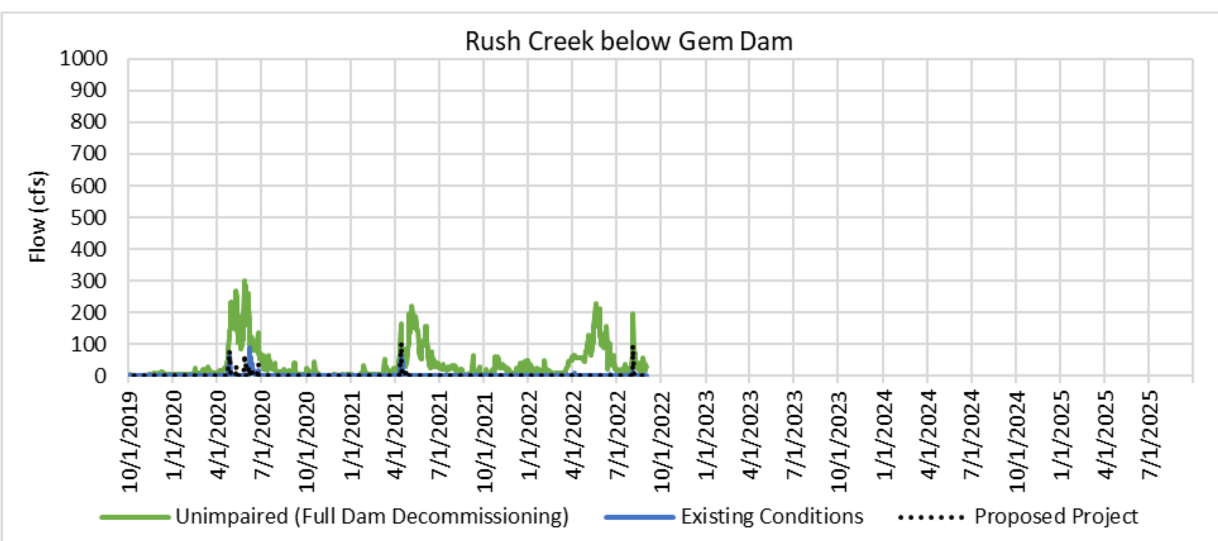


Figure C-5 (continued). Modeled Rush Creek Flow Below Gem Dam

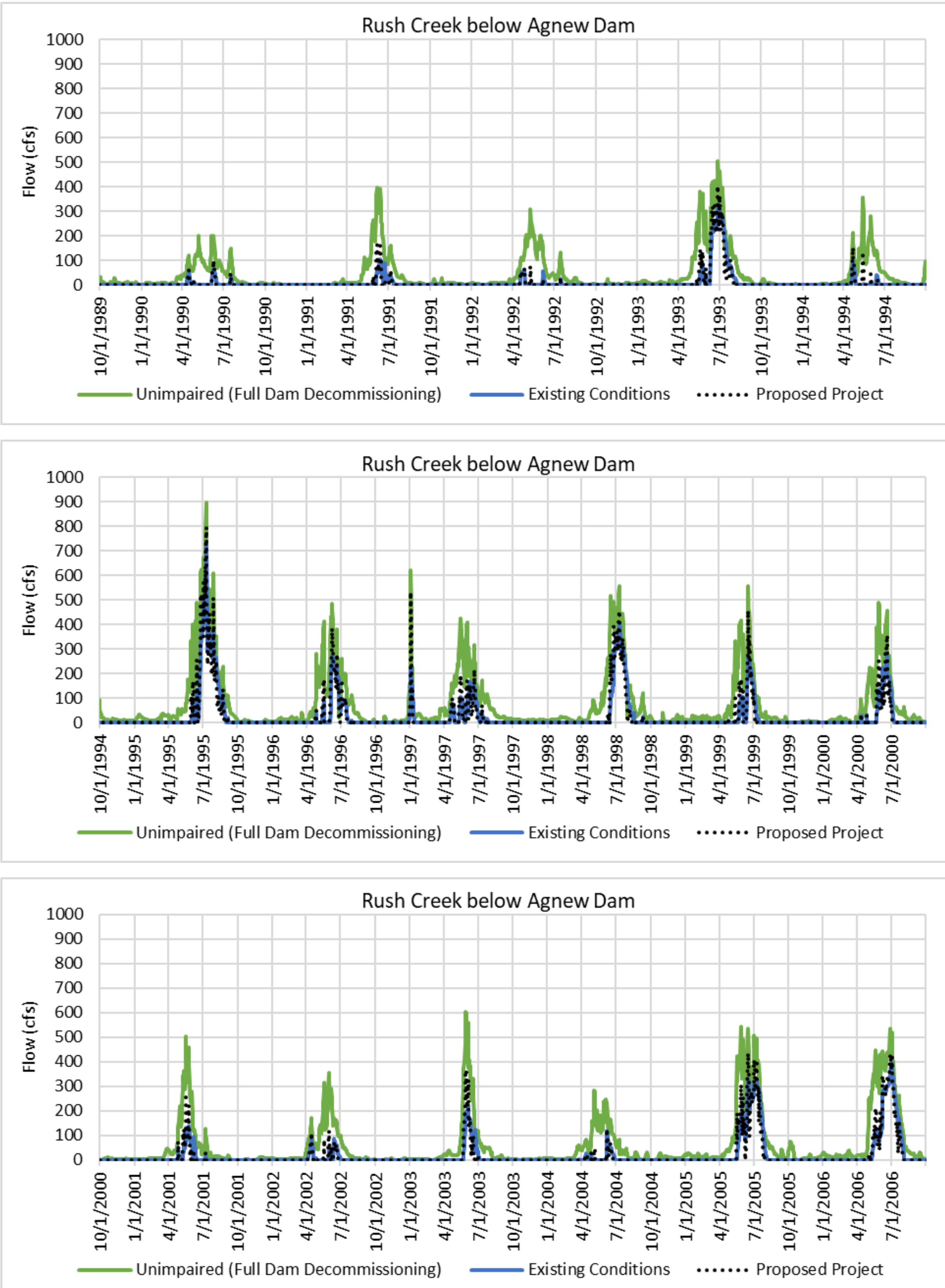
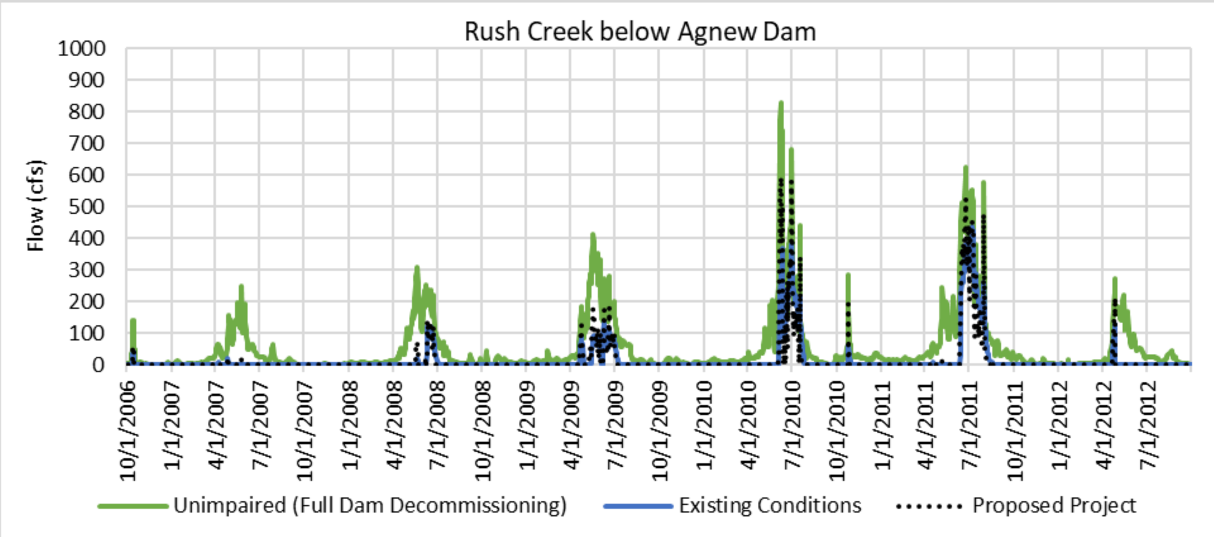
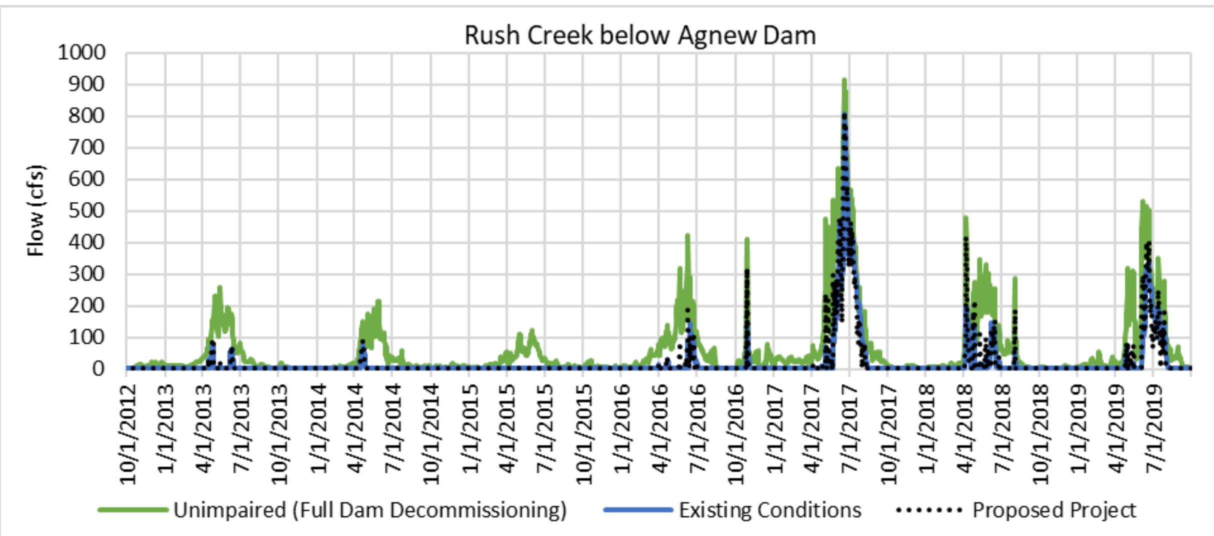


Figure C-6. Modeled Rush Creek Flow Below Agnew Dam





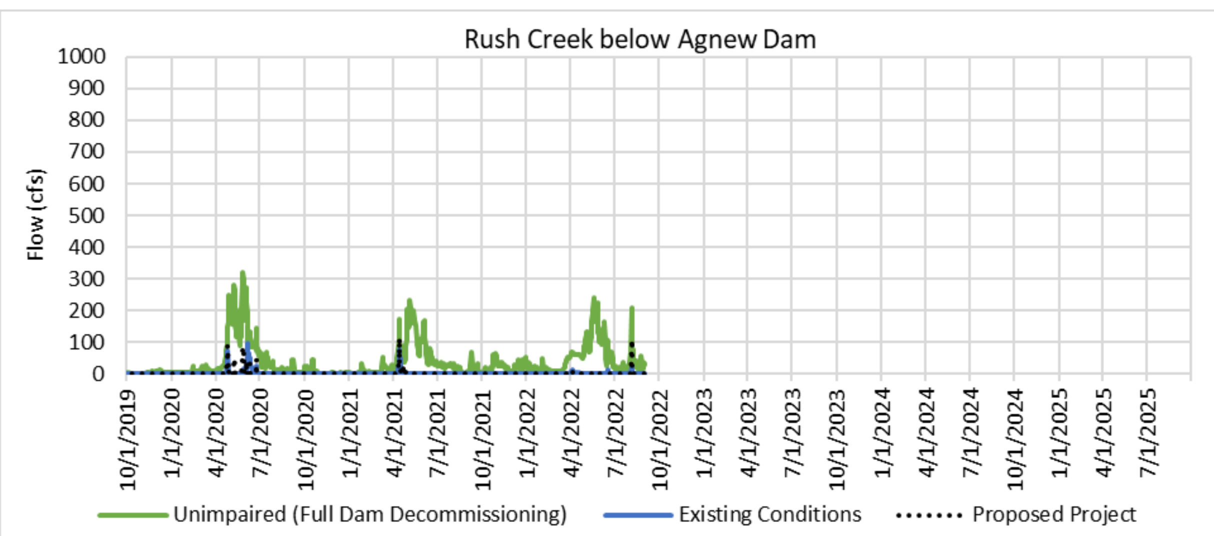


Figure C-6 (continued). Modeled Rush Creek Flow Below Agnew Dam

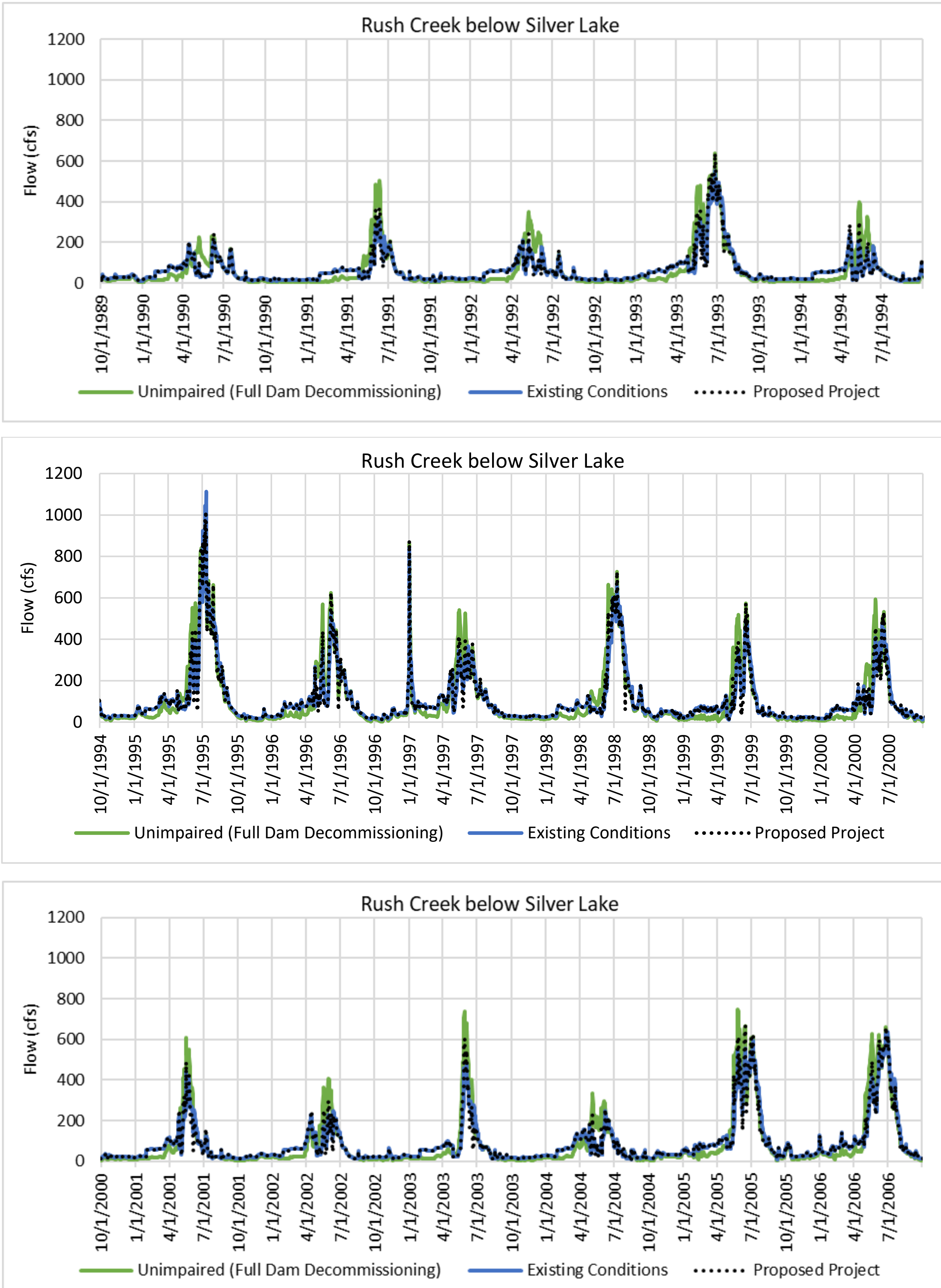


Figure C-7. Modeled Rush Creek Flow Below Silver Lake

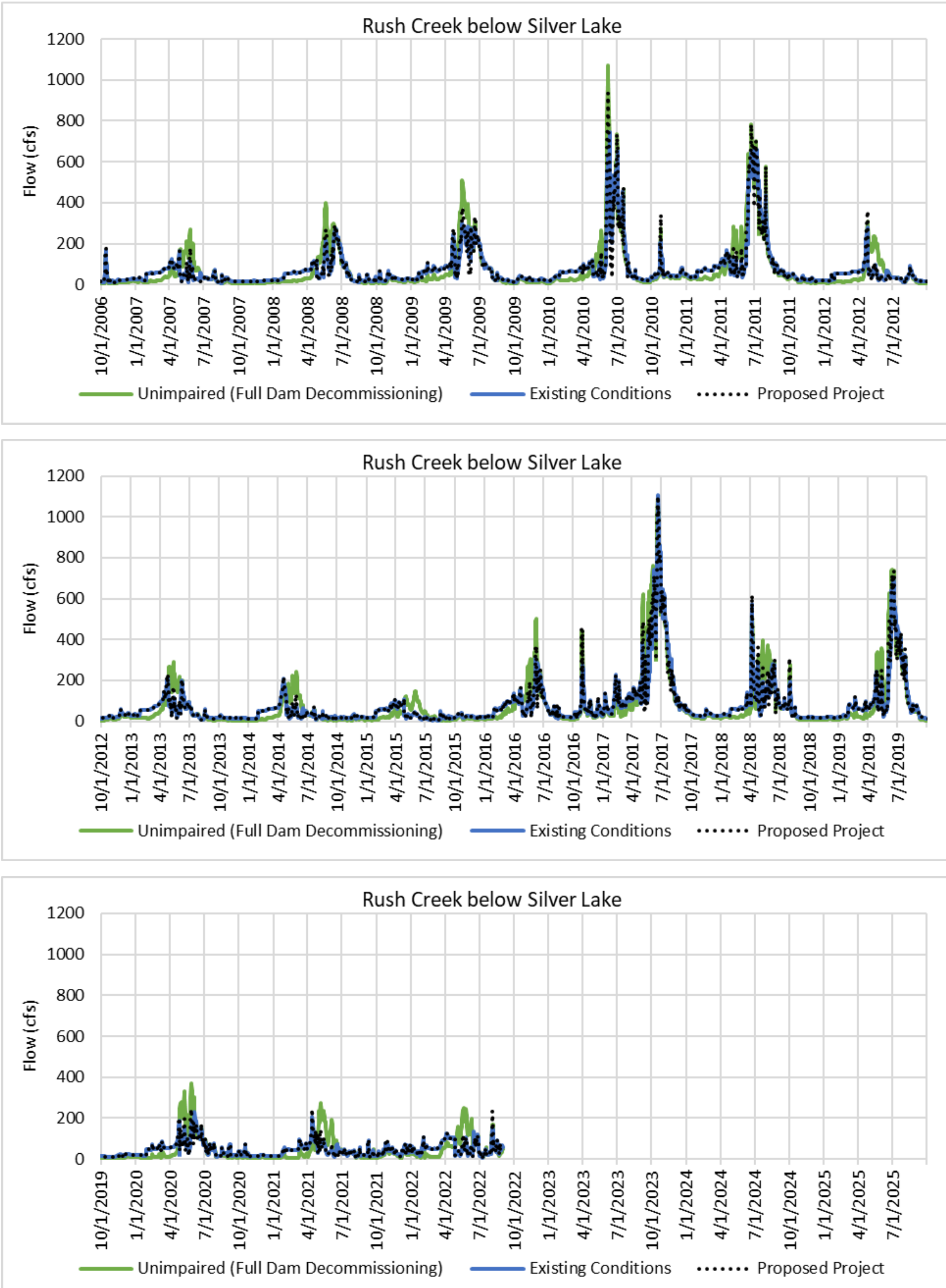


Figure C-7 (continued). Modeled Rush Creek Flow Below Silver Lake

MAPS

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Map C-1. Silver Lake and the Area of Interest for Potential Flooding (July 2023; Standing Water in Upper Silver Lake Area [Left])

Map C-2. Aerial Map of Potential Flooding Area (Lockhart and Dream Mountain Estates Properties) in July 2023 (Standing Water in Property Areas [Top]) and June 2022 (No Standing Water in Property Areas [Bottom])

APPENDIX D
Characterization of Sediment in Project Lakes

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APPENDIX D
Characterization of Sediment in Project Lakes

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Rush Creek Project, FERC Project No. 1389

DEC 1 – Full Decommissioning Study (Phase II)
Draft Technical Study Report

January 2025

Southern California Edison Company
Regulatory Support Services
2244 Walnut Grove Ave. Rosemead, CA 91770

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List of Acronyms

ASTM	American Society of Testing Materials
BOD	Biochemeical Oxygen Demand
CCR	California Code of Regulations
D_{16}	16^{th} Percentile Particle Size
D_{50}	50^{th} Percentile (Median) Particle Size
D_{84}	84^{th} Percentile Particle Size
DRI	Desert Research Institute
DTM	Digital Terrain Model
GIS	Geographic Information System
GPS	Global Positioning System
HDPE	High Density Poly Ethylene
LiDAR	Light Detection and Ranging
mg/kg	milligrams/kilogram
ml	milliliter
mm	millimeter
MSL	Mean Sea Level
PEC	Probable Effect Concentration
Project	Rush Creek Project
RM	River Mile
RTK	Real-Time Kinematic positioning
SCE	Southern California Edison Company
TEC	Threshold Effect Concentration
TIN	Triangular Irregular Network
TOC	Total Organic Carbon
TSP	Technical Study Plan
TSR	Technical Study Report
TTLC	Total Threshold Limit Concentration

1 INTRODUCTION

The following describes the methods and results associated with characterization of sediment in Project lakes (Waugh, Gem, Agnew) as part of implementation of the DEC 1 – Full Decommissioning Technical Study Plan (TSP) (Phase I) for Southern California Edison Company's Rush Creek Project (Project). The study plan was included as Appendix D of the Draft DEC 1 – Full Decommissioning Technical Study Report included in SCE's Draft License Application (August 2024). Here we refer to it as the DEC 1 – Lake Sediment TSP.

2 STUDY OBJECTIVES

- Characterize the current bathymetry in each Project reservoir (Waugh, Gem, and Agnew lakes) and compare to historical bathymetry to quantify accumulated sediment behind the dams.
- Characterize the sediment type in the Project reservoirs.
- Characterize potential sediment contaminates in the Project reservoirs.
- Characterize sediment contaminates at reference sites.
- Assess the sediment quantity, type, and contaminants that could potentially be released from behind Project dams under full decommissioning.
- Characterize the movement (transport and deposition) of sediment released from each dam into Rush Creek post-removal of the dams.

3 STUDY IMPLEMENTATION

Study elements described in the DEC 1 – Lake Sediment TSP were initiated in 2024. A summary of the study elements that have been completed and any deviations or proposed modifications to the DEC 1 – Lake Sediment TSP are discussed in the following subsections.

3.1 STUDY ELEMENTS COMPLETED

All study elements were completed in 2024 and are reported here in the DEC 1 – Lake Sediment Technical Study Report (TSR).

3.2 STUDY VARIANCES

There have been no variances from the DEC 1 – Lake Sediment TSP.

4 STUDY AREA AND STUDY SITES

The study area includes Waugh Lake, Gem Lake, Agnew Lake, downstream Rush Creek stream reaches, and Silver Lake. The study area also includes reference sampling locations in three unnamed tributary streams to Waugh Lake and in Rush Creek upstream of Silver Lake (downstream of the Reversed Creek confluence).

5 STUDY APPROACH

The following describes the study approach, which includes data collection and analyses for: (1) quantity of reservoir accumulated sediment; (2) potential reservoir sediment mobilization; (3) reservoir sediment type; and (4) reservoir and reference site sediment contaminates.

5.1 QUANTITY OF RESERVOIR ACCUMULATED SEDIMENT

The quantity of sediment accumulated in the reservoirs that has the potential to be released following dam removal was estimated though a comparative analysis of the current (2024) topographic surface derived from a combination of LiDAR (out of water topography) and RTK-GPS coupled sonar (underwater bathymetry) and the historical topographic surface derived from historical contour maps.

- In Waugh, Gem, and Agnew lakes, LiDAR data of the exposed reservoir bed was collected at the lowest water surface elevation available during the 2024 summer field season. Waugh Reservoir was completely exposed with limited residual water in the reservoir. Gem Lake was relatively full and only the exposed banks were visible. Agnew Lake was at its natural lake level and the historical reservoir bed above the natural lake level was exposed.
- In Gem and Agnew reservoirs detailed sonar data were collected in the inundated portions of the lakes using RTK-GPS coupled multi-beam sonar at the highest water surface elevation available during the 2024 field season. At Agnew Lake, wind precluded collection of the entire lake during the scheduled field work but data from a previous survey, 2017, were combined with the 2024 data set.
- The sonar and LiDAR data were merged to create a full bathymetry/topography data set for each reservoir.
- The 2024 bathymetry data were compared to historical contour data to determine the amount of accumulated sediment in the reservoirs (Waugh, Gem, and Agnew).
    - In Waugh Lake, sediment accumulation was estimated for the entire lake area.
    - At Gem and Agnew Lakes, the accumulated sediment analysis was only conducted within the vicinity of the dams where sediment would have the potential to be mobilized downstream following dam removal. Any sediment upstream of this area would remain within the residual natural lakes.
- Sediment facies depths (detailed below) was also used to help identify sediment quantity.
- Historical topography DTM surfaces were derived from images of mid 1900s era historical contour maps (historical FERC Exhibits G, F, or J). The contour map images were georeferenced in ArcGIS Pro[1] and contour interval lines on the exhibits were digitized.

[1] Exhibits G, F, and J images were georeferenced based on bearings and distances indicated between survey control points on Exhibit G that were common amongst the other two exhibits.

5.2 POTENTIAL RESERVOIR SEDIMENT MOBILIZATION

Reservoir sediment was analyzed for potential downstream movement post-dam removal. Each of the Project reservoirs and dams have unique bathymetry and sediment release potential. Typically, only sediment upstream of the dams at an elevation equal or higher than the base of the dams has the potential to be mobilized downstream post-dam removal. With removal of the dams, that sediment could erode and be transport downstream.

Waugh Lake was historically a low gradient meadow. Fieldwork indicates there is a coarse sediment control approximately 400 feet upstream of the Rush Meadows Dam (AQ 1 – Instream Flow TSR) that resists channel downcutting and maintains the sediment upstream in the low gradient "meadow" reach (Figure D-1). In the case of Gem and Agnew Lakes, which were historically natural lakes, they would be returned to their near historic elevation following full decommissioning of the dams. Both lakes are comprised of two deeper portions of the lake separated by an underwater ridge (Figure D-2 and Figure D-3). With dam decommissioning, sediment in the lakes or entering the lakes would largely deposit within the natural lake body. For the sediment analysis in Waugh Lake, the entire former inundation area was evaluated in the analysis. For Gem and Agnew lakes, only areas within the immediate vicinity of the dam, which could release sediment downstream, were considered in the analysis. The approach for estimating the potential volume of sediment that could be mobilized is described below for each reservoir.

Waugh Lake

- The 2024 topographic surface and aerial image was used to draw the dominate flowlines for Rush Creek and the small tributaries within the lakebed that have potential to erode and carry sediment downstream.
- Profiles derived from the 2024 DTM surface were evaluated alongside aerial imagery, facies mapping, and knowledge of the site to determine the upper extent at which each channel could potentially erode and identify any bedrock controls that would inhibit channel incision. An equilibrium gradient profile was drafted along the length of Rush Creek from the anticipated elevation where the dam would be removed (9,368.6 feet MSL) to the upstream extent of the reservoir. Stable grade control features were included in the design (Figure D-4). In addition to the grade control just upstream of the current dam, four bedrock controls were identified along Rush Creek within the 0.4-mile extent of the reservoir.
- The same approach was used to design equilibrium gradients for each tributary within the Waugh Lake lakebed. An example comparative profile is shown in Figure D-5.
- Results of a hydrodynamic and sediment transport models developed for Rush Creek in the lakebed as apart of AQ 1 – Instream Flow TSR were reviewed to help estimate the depth of potential channel erosion.

- Bank erosion from channel widening was assumed to be the largest potential source of sediment after dam removal due to lack of vegetative bank cover. To estimate maximum erosional loss, the meander belt-width (lateral erosional extent) that could be significantly impacted by fluvial processes was estimated and drawn as a polygon around each flowline.
- The erosional surface was developed by building triangular irregular network (TIN) with lines projected at a constant slope perpendicular to the channel alignment and to points along the erosional boundary in AutoCAD Civil3D (Figure D-5). The constant slope from the profile alignment to the erosional boundary was an oversimplification of how a channel might laterally erode; however, it provided an order magnitude estimate of potential erosion. Figure D-5 provides a hypothetical example cross section showing how the grading model would indicate cut fill areas depending on the profile, erosional boundary extent elevations, and undulating terrain.

<u>Gem Lake</u>

- To analyze potential sediment transport downstream from the Gem Dam site, the surface used in calculating sediment accumulation (Section 5.1) was edited to eliminate any sediment accumulation below the base elevation at which the dam would be removed (8,977 feet MSL as indicated in Exhibit F – Figure D-6).
- The analysis area was then refined by removing areas from the 2024 surface where the aspect slope would result in eroded material entering and settling in the natural lake rather than towards the outlet channel where it would be transported downstream. The resultant net volume generated by subtraction of the 2024 surface from the historical surface contours represented the estimated volume of sediment that could be eroded downstream following dam removal.

<u>Agnew Lake</u>

- Similar to the Gem Lake analysis above, the Agnew Lake analysis area was trimmed to only include topography above the anticipated elevation the dam would be removed (i.e., 8,470 feet MSL - the base elevation of the dam as indicated in Exhibit F - Figure D-7). The analysis area was further refined by removing areas where the slope aspect would result in eroded material entering and settling in the natural lake. The resultant net volume generated by subtraction of the 2024 surface from the historical surface contours represented the estimated volume of sediment that could be eroded downstream following dam removal.

5.3 RESERVOIR SEDIMENT TYPE

The type of sediment accumulated in the Project reservoirs (Waugh, Gem, and Agnew) was sampled and evaluated differently for the exposed and underwater portions of the lakebeds.

5.3.1 <u>Exposed Sediment</u>

Facies

- Substrate facies polygons were mapped within the entire inundation extent of Waugh Lake. At Gem and Agnew Lakes, fine sediment facies polygons were mapped along the exposed shoreline. Fine sediment facies were considered those dominated by particles smaller than gravel sized (<64mm) particles. These facies are susceptible to surface erosion (i.e., raindrop slash, sheet flow, and shallow concentrated flow) and potential contributors of sediment.
- Facies were classified according to Buffington and Montgomery (1999) whereby the relative abundance of the three primary grain-size classes (silt, sand, gravel, cobble, and boulder) visible at the surface were recorded in order from least to most dominate (e.g., an area comprised of 10% cobble, 25% gravel, and 65% sand would be classified as a cobbley and gravelly sand). Due to the abundance of bedrock, bedrock was added as an additional size class. Bedrock is not a part of the Buffington and Montgomery (1999) classification scheme.
- Facies polygons were initially digitized and estimated based on aerial imagery analysis. The initial maps were then field verified and adjusted as necessary by hand, using a submeter Trimble GPS or ArcGIS Field Maps to map / digitize the extent in the field.
- Additionally, where sediment gradation samples were taken (described below), field mapped facies polygons classifications were updated according to the lab gradation results.

Sediment Thickness

- Within the Waugh Lake lakebed, a representative sampling of sediment facies depths was recorded with a probe to characterize the geologic and reservoir sediment accumulation and facilitate hydraulic modeling efforts in the AQ 1 - Instream Flow TSR (Map D-1a).
- For fine sediment facies mapped in proximity of Gem and Agnew dams, where there was a possibility of sediment mobilization following potential dam removal, an estimate of the sediment depth was made based on probe measurements or, in limited cases, it was estimated by eye (Map D-1b and Map D-1c).

Particle Size Gradation

- In Waugh Lake, sediment samples were collected within the major facies types to measure particle size gradation (Map D-2a).
  - Samples were generally collected from a hand dug hole with a shovel or a 12-inch AMS, Inc. hand auger to depth ranging from 1 to 4 feet. A high-water table in most instances prevented sampling greater than 2 feet as the hole would collapse into itself.
  - The sediment samples were collected in 1 – 2-gallon Ziplock bags. If notable strata of differing particle sizes were observed, a subsample was collected and analyzed separately. Otherwise, the entire depth of the sample was composited into one sampling bag.
  - Samples were sent to the Desert Research Institute (DRI) lab (Reno, NV) for analysis.
  - DRI conducted a stacked sieve analysis on particles >2 mm according to American Society of Testing Materials (ASTM) Method D422 with the modification of conducting a laser particle size analysis (Malvern Mastersizer 2011) on particles <2 mm rather than a hydrometer analysis of particles <0.075 mm. Cumulative particle size distribution curves and size class histograms were produced to graphically represent the data. Additionally, the D_{50}, D_{16}, and D_{84} index particle sizes were calculated (i.e., the median, 16th, and 84th percentile size for a given sample).

5.3.2 <u>Underwater Sediment</u>

Underwater sediment gradation samples were collected at Gem and Agnew lakes from the areas adjacent to the dam that were most likely to be mobilized with dam removal (Map D-2b and Map D-2c).

- Within Gem Lake, a vibratory corer (Specialty Devices, Inc. Vibecore-D) with a 3-inch diameter, 5-foot-long core tube was used to sample sediment in deep water. Where the corer was unsuccessful at retrieving sediment, a Wildco standard Ponar grab sampler was used to sample sediment. Both devices were deployed from a cable hoist attached to a frame on a 16-foot cataraft.
- Within Agnew Lake, shallow water allowed the use of a 12-inch AMS hand auger, 12-inch AMS slide-hammer corer, or shovel to collect samples.
- All gradation samples were analyzed at the DRI lab by sieve and laser particle size analysis and reported as was done for the exposed sediment (described above).

5.4 RESERVOIR AND REFERENCE SITE SEDIMENT CONTAMINATES

Sediment was tested for contaminates in each of the Project reservoirs (Waugh, Gem, Agnew lakes) and at six reference sites.

- Sediment was sampled for contaminates at each of the locations identified in Table D-1 and Maps D-2a through D-2e. There were five contaminate sampling locations in Waugh Lake, five locations in Gem Lake, and four in Agnew Lake. Contaminates were sampled at three reference sediment locations in tributaries into Waugh Lake upstream of the lake and three sediment samples were collected in Rush Creek upstream of Silver Lake.
- Sediment samples were collected with the same methods described above for particle size sampling (Section 5.3). To minimize sample contamination, stainless steel sampling and handling equipment was used where possible. If not possible, samples were extracted from a portion of the sampling device or hole that was not in contact with the sampling device (e.g., shovel). At Gem Lake a 3-inch polycarbonate core tube and stainless steel or plastic handling tools were used for metals sampling to avoid any metals contamination from the aluminum core tube. A 3-inch aluminum core tube was used specifically for total organic carbon (TOC) samples along with stainless steel sampling tools to avoid any organics contamination from plastic.
- Sediment samples were a composite of the core samples (or shovel sample), except where visual observation of the core samples indicated a unique stratification in the sediment. Where stratification occurred, samples were acquired from the different strata.
- All contaminate samples were collected in appropriate lab-provided containers (i.e., 8 oz. amber glass jars for general chemistry and metals testing, 4 oz. amber glass for TOC testing, and 1000 ml HDPE bottles for biochemical oxygen demand [BOD] testing). Samples were immediately put on ice in a cooler and taken to the lab within the specified hold times (48 hours for BOD testing). Initially, at Gem Lake, BOD samples consisted entirely of sediment with the intention that sufficient soil / sediment pore water would be available to conduct the testing without need for conducting a distilled water extraction. Initial lab testing indicated insufficient pore water was available to conduct the testing after the sample was centrifuged. As a result, a 10:1 distilled water extraction was necessary to conduct the test. Per the labs request, at least 60 ml of water from the sample core tube or hole was added to subsequent sample bottles. All BOD bottles were filled to the brim with no head (air) space to minimize biochemical oxygen consumption prior to lab testing.
- WETLAB (Sparks, Nevada) conducted general chemistry, metals, and biochemical oxygen demand testing and analysis. WETLAB sent separate total organic carbon samples to Eurofins (Arvada, CO) for analysis.
- Table D-2 lists the analyzed constituents and testing methods. Table D-2 also lists analyte threshold or screening level concentrations by which results can be compared as described below:

  - Consensus-based sediment quality guidelines by MacDonald et al. (2000) developed from various published sources:
    - The threshold effect concentration (TEC) is the concentration below which adverse effects on aquatic biota are not expected to occur.
    - The probable effect threshold (PEC) is the concentration above which adverse effects to aquatic biota are expected to occur more often than not.
    - Title 22 of the California Code of Regulations (CCR) § 66261.24 specifies total threshold limit concentration (TTLC) values for analytes above which a sample is considered hazardous waste.
    - Background screening levels for aluminum and barium, based on literature references (USEPA 1996, Los Alamos National Laboratory - No Date).
- Sampling and sample handling complied with the Regional Water Quality Control Board's chain of custody procedures.

6 STUDY RESULTS

6.1 QUANTITY OF RESERVOIR ACCUMULATED SEDIMENT

6.1.1 Waugh Lake

Historical Topography Surface

- Historical Exhibit G (Figure D-8) 10-foot contours were digitized and then compared to the 2024 LiDAR surface. This revealed significant bedrock areas missing from the Exhibit G contours for unknown reasons (perhaps vegetation or inundation obscuring the view at the time of the historical survey). Therefore, 10-foot contours of the bedrock areas from the 2024 LiDAR data were added to the historical surface to fill in gaps and more accurately create a historical surface. Additional detail in the flat areas was incorporated by adding the 9,376-foot MSL contour from the Exhibit G contour map and 1-foot contours at 9,377 and 9,378 feet MSL from a 1924 Exhibit J (Figure D-9 topographic map. Significant areas of the lakebed that were very coarse (bedrock, cobble-boulder) with no sediment in the 2024 photogrammetry/LiDAR were excluded from the sediment analysis to accurately estimate just accumulated fine sediment volumes (Figure D-10).

Lakebed Geology

- The valley geology within Waugh Lake consists of undulating, granitic bedrock with valleys and ridges. In the upper portion of the lakebed (0.5 mile downstream of the former inundation extent or RM 23.2 to 23.7) the gradient is steeper and Rush Creek has incised into the bedrock. In the mid-section of the lakebed the valley widens and the valley slope decreases. Coarse alluvium has deposited in this area and the channel meanders around bedrock outcroppings that extend above the fine sediment. In the downstream portion of the lakebed, just upstream of the dam, there is a subsurface bedrock ridge / ribs that extend across the valley floor and a coarse sediment portion of the channel that has prevented the downcutting from occurring. This vertical grade control maintains / preserves the upstream sediment that formed the historical meadow from being eroded downstream. Downstream of the coarse sediment control is a steeper gradient riffle down to the low water outlet in the dam (Figure D-4). The dam is built on bedrock (Figure D-11). Because of the underlying topography of the bedrock geology, it appears that most of the fine sediment within the valley upstream of Rush Meadows Dam predates the reservoir.

Comparative Surface Analysis

- Comparative analysis of the 2024 topographic surface to the mid-1900s historical contour surface is shown in Figure D-12. Figure D-12 shows historical areas of erosion and deposition in one-foot color increments. Erosional areas occur around the periphery of the reservoir where littoral shoreline erosion occurred. A long erosional area in the upper Rush Creek channel (within the reservoir extent) appears to be degradation of Holocene alluvial fan deposits that helped form the historical Rush Meadows. The existing versus historical surface analysis indicates 99,225 cubic yards of erosion and 194,390 cubic yards of deposition for a combined net reservoir sediment accumulation of 95,165 cubic yards (see table in Figure D-12).

6.1.2 Gem Lake

Historical Topography

- 10-foot historical contours available for Gem Lake from the mid-1900s era georeferenced Exhibit G drawing are shown in Figure D-13 and higher resolution contour information available in the immediate vicinity of the dam from a mid-1900s era georeferenced Exhibit F engineering drawing is shown in Figure D-6. The historical contours were clipped at 9,027.5’ MSL to the seismic maximum water surface elevation for the impoundment. A DTM surface was created from the contours.

Lakebed Geology

- The lakebed geology includes a submerged bedrock ridge that partially separates the natural lake into two deep lake basins (Figure D-2, D-13). The dam is built on a bedrock ridge that forms the downstream boundary of the natural lake (Figure D-14).

Comparative Surface Analysis

- Comparative surface analysis of the 2024 topographic surface to the mid-1900s Exhibit F historical contour surface near the dam (where sediment is vulnerable to downstream transport) is shown in Figure D-15. The analysis indicates 1,230 cubic yards were eroded, 41,320 cubic yards were deposited, and the net accumulation is 40,090 cubic yards of sediment.

6.1.3 Agnew Lake

Historical Topography

- At Agnew Dam, the detailed historical Exhibit F contours (Figure D-7) did not cover enough area at the dam for analysis so historical Exhibit G (Figure D-16) contours were used. Contours within the vicinity of the dam were digitized within the extent of the original reservoir inundation elevation (8,496 feet MSL).

Lakebed Geology

- The geology of the lake includes bedrock and talus shores and the dam is built on a bedrock ridge that forms the downstream boundary of the natural lake (Figure D-17).

Comparative Surface Analysis

- Comparative surface analysis of the 2024 topographic surface to the mid-1900s Exhibit G historical surface near the dam (where sediment is vulnerable to downstream transport) is shown in Figure D-18. The results indicate erosional areas along the shoreline, particularly the south shoreline (up to 20 feet) and moderate deposition of 5 – 10 feet within the shallow secondary lake basin adjacent to the dam. The analysis of sediment that has an elevation above the base of the dam (8,470 feet MSL) indicates 7,929 cubic yards of erosion, 42,322 cubic yards of deposition or fill for a net amount of 34,393 cubic yards of sediment accumulation (Figure D-18).

6.2 POTENTIAL RESERVOIR SEDIMENT MOBILIZATION

6.2.1 Construction and Restoration Measures

- The potential sediment/erosion analysis does not account for construction and restoration measures (revegetation, grade control structures, recontouring of sediment) that would be implemented to contain reservoir sediment during and following of dam removals. In addition, any sediment leaving Waugh Lake would be captured in Gem Lake and sediment leaving Gem Lake would be captured in Agnew Lake. At Agnew Lake there is a limited amount of sediment near the dam and construction/restoration measures would be implemented to prevent the release of sediment from Agnew Dam removal. The analysis below identifies the potential amount of sediment that could be released if construction / restoration measures were not implemented.

6.2.2 Waugh Lake

- Results of the potential erosional analysis for Rush Meadows Dam removal indicate a total of 32,650 cubic yards of potential erosion (cut), 21,815 cubic yards of deposition (fill) or a net potential downstream mobilization of 10,835 cubic yards (Figure D-19). Figure D-19 shows locations and relative depths where the grading model indicates erosion or deposition. The predominate source of potential sediment results from lateral bank erosion in the flatter valley bottom.

6.2.3 Gem Lake

- Gem Lake areas where sediment could potentially be mobilized with full dam removal are shown in Figure D-20. The volume of potentially erodible sediment that has either been placed as fill against the dam or accumulated since the mid-1900s is 15,447 cubic yards. Erodible areas defined as fill in Figure D-20 are located within a narrow strip upstream of the dam where the aspect slope faces the former outlet channel and fluvial or surface erosional processes could mobilize sediment downstream. The maximum depth of the material above the base elevation of the dam is up to 35 feet deep in the former outlet channel, however most of the area ranges between 5 and 20 feet deep. Review of a ground photograph taken when the reservoir level was low for maintenance operations (Photo D-1) suggest that much of the volume indicated above may be fill material on the upstream side of the dam that would likely be partially removed, recontoured, and stabilized to reduce the potential for erosion at the time of dam removal.

6.2.4 Agnew Lake

- Areas in Agnew Lake where sediment could potentially be mobilized downstream with full dam removal are indicated as fill in Figure D-21. Cut areas in Figure D-21 represent locations where the historical surface was higher in elevation than the existing surface. Presumably these areas have already eroded and deposited lower in the lakebed (represented by the 2024 topography used in the analysis) or mobilized downstream. The estimated volume of sediment either placed as fill against the dam or accumulated since the mid-1900s that may be mobilized downstream with dam removal is 6,697 cubic yards gross fill. In this case net fill, see Figure D-21, is likely not the best measure of potentially erodible sediment.

6.3 RESERVOIR SEDIMENT TYPE

The bulk sediment sample classifications for each of the Project reservoirs are presented in Table D-3. Table D-3 summarizes the geometric mean, D_{16}, D_{50}, D_{84} size class indices, and percent composition of clay, silt, sand, and gravel for each sample location. Histogram and cumulative particle size distribution curves from each bulk sample along with site and/or sample photos are available in Attachment A.

6.3.1 Waugh Lake

Exposed Sediment

Bulk sample particle size analysis for the 12 locations within the Waugh Lakebed (Map D-1a, Attachment B, Photos B-1 to B-12) are shown in histograms and cumulative particle size distribution curves (Attachment A). Attachment A also includes representative site photos. Sample locations (with exception to four described below) were located in various facies to characterize the range of sediment in the lakebed. Four of the twelve locations sampled were collected within the low-flow, active Rush Creek channel to characterize particle size for a sediment transport model (AQ 1 - instream flow TSR). Of the four locations, three sites were coarser than adjacent sample points outside the channel, indicating sorting of substrate in the channel. The fourth sample was collected within a recent depositional area at the upstream end of a mid-channel bar in finer material accumulation.

Most surface samples consisted of coarse silt to medium sand (averaged D_{50} of medium sand or 0.16 mm). The geometric mean grain size for the sediment samples ranged between 0.03 mm (coarse silt) and 0.9 mm (fine sand) at all locations except the geometric mean for the Waugh 1 sample was 13.1 mm (medium gravel) (Table D-3). A summary of the particle size analysis is presented in Figure D-22.

Map D-1a shows the classification of sediment facies mapped in the Waugh Lakebed along with sediment depth measurements recorded throughout the lakebed. The variability in sediment thickness measurements is a testament to the undulating bedrock topography described in Section 6.1.1. Sediment thickness measurements in the lakebed exceeded the 12-foot length of the probe in some areas and was much shallower in other areas where bedrock refusal of the probe occurred.

Facies mapping, similar to the sediment samples, show that the lakebed was dominated by silty sand (Photo D-2). There are three discrete areas of bouldery cobbley sand in the main channel that appear to coincide with breaks in slope that may serve as grade controls and could inhibit upstream channel incision / headcutting propagation with dam removal. Along Rush Creek, there is a progression of coarse to finer substrate from the inlet towards the outlet of the reservoir as the channel slope decreases.

6.3.2 Gem Lake

Exposed Sediment

Results of fine sediment facies mapping around the shoreline of Gem Lake is provided in Map D-1b. Most of the fine sediment facies are scattered along the shoreline with most of the deeper, large patches found in coves or drainages protected from wind driven wave erosion (Photo D-3). Average facies depths recorded within the second subbasin of Gem Lake closest to the dam ranged from 0.5 to 5 feet deep. Only one fine facies patch (sandy and cobbley gravel) was mapped within the area with potential to be mobilized downstream following dam removal (estimated volume of 142 cubic yards). All other facies near the dam are coarse and flushed of fine sediment due frequent wind driven wave action. Mobilization of almost all other facies along the shoreline would be into deeper depths in the lake. Most of the silts in the facies have been cleaned from the shoreline areas.

Underwater Sediment

Underwater bulk samples for particle size analysis (Map D-2b) near the dam results are presented in Table D-3 and Figure D-23. Field photos of the samples are shown in Attachment B, Photos B-14 to B-21. Histogram and cumulative particle size distribution curves from each bulk sample are available in Attachment A. Four sample locations (Gem 2, 3, 4, and 5) were core samples, which sampled up to 4.5 feet deep. Three of the samples (Gem 1, 6, and 7) were standard Ponar grab samples which likely sampled no deeper than 0.5-foot. Mooring of the cataraft with three anchors in targeted locations proved difficult due to winds dragging the cataraft and anchors until one or more dug into the sediment or latched onto rocks or woody debris. As a result, spacing of sample points at desired locations proved difficult.

Sampling results indicate deposition of predominately coarse silt to fine sand present to a depth greater than 4.5 feet deep in certain locations within 110 and 290 feet of the upstream face of the dam. All samples except Gem 1, 2A, and 2B predominately consisted of silt with composition greater than 60 percent (Figure D-23). The D_{50} of the surface layers of all samples averaged 0.04 mm (coarse silt), which was finer than the D_{50} of all sampled layers at combined, 0.22 mm (fine sand). Dense compacted strata likely prevented the Vibecore coring device from penetrating the full length of the 5-foot core tube with the attached sampler weight ring. Depositional depth varied based on the topographic location, typically with more deposition further from the dam. Residual or disturbed soil (likely from construction and maintenance of the dam) with angular gravel was retrieved from Ponar samples closer to the dam face and the middle-right side of the dam where a ridge of bedrock runs down into the reservoir (Photo D-1). Little deposition was observed in grab samples closer to the dam where core sampling could not be achieved.

Three of the four core samples (Gem 2, 3, and 4) had notable stratification layers at a maximum core depth of 2.4 to 4.5. All the samples had a light gray colored layer presumed to be tephra (volcanic ash and pumice) from eruption of the Mono Craters (Attachment B, Photos B-15, B-16, and B-17). Tephra layers were documented in archeological digs in Waugh Lake (Jackson 1997, Jackson and Morgan 1999) and sedimentological studies conducted by Yang et al (2019) throughout the Wilson Creek Formation in the Mono Basin. The presence of tephra in the core samples is an indication that the cores retrieved contained the full record of reservoir sedimentation that has occurred since construction of the dam. Silt below the tephra layer is indicative of natural lacustrine sediment deposition prior to the Mono Crater eruption(s) dating circa 1,800 to 2,100 years before present (Jackson and Morgan 1999). Also present in the Gem 2 sample was a charcoal layer deposited above the tephra layer (Attachment B, Photo B-16) likely from burning of trees and stumps within the reservoir inundation area which was common practice and was noted in Waugh Lake (Jackson 1997). However, Jackson and Morgan (1999) notes that carbon dating of charcoal demonstrates that extensive forest fires burned across that area dating circa 2,400–1,700 years ago.

6.3.3 Agnew Lake

Exposed Sediment

Results of fine sediment facies mapping around the shoreline of Agnew Lake are provided in Map D-1c. A total of 0.6 acre of sand dominated facies (approximately 752 cubic yards) was mapped adjacent to the dam in areas with potential to mobilize downstream with dam removal (Photo D-4). Within the secondary/smaller lake basin (Sections 6.2.3), 6.3 acres of sand dominated facies were mapped (approximately 3,988 cubic yards). Fine sediment facies mapped within the primary subbasin of the lake (predominately gravely sand and cobbley gravel) totaled 10.7 acres and consisted mostly of alluvial fan deposits from the Spooky Meadow drainage (to the south) and Rush Creek. A large quantity of sediment resides in these two fans that have merged; however, erosion and mobilization of material would be trapped within the deep primary subbasin of the lake.

Underwater Sediment

Underwater bulk samples for particle size analysis of reservoir sediment is presented in Table D-3 and Figure D-24. Field photos of the samples are shown in Attachment B, Photos B-22 to B-31.Histogram and cumulative particle size distribution curves from each bulk sample are presented in Attachment A. Sample locations were distributed across the upstream face of the dam where sediment appeared most vulnerable to downstream erosion with dam removal. Samples were extracted using an AMS soil core sampler, which captured one foot of material per extraction. The fine non-cohesive bed material typically collapsed underwater during sample extraction limiting core sample depths to one foot. A tempered steel shovel was used to extract larger quantities of sediment at a greater depth, if possible, but stratigraphy was not preserved.

The median particle size (D_{50}) varied among the four sample sites but the samples were all finer than very fine gravel (3.7 mm). All samples had a presence of organic soils, and some were very root bound and fibrous. Three of four samples (Agnew 1, 2, and 3) were comprised of at least 51% sand. The dominant particle size for Agnew 4 was very fine gravel. Layer stratification was observed to varying degrees at three of the sampling locations. A coarse bright sand layer overlayed organics at Agnew 1 that was deposition from wave action that slowly transports sediment along the south shore to the outlet. A 0.5-foot dense mat of peat overlayed organics and coarse sands and gravels at Agnew 2. Coarse and fine gravels overlayed organic materials at Agnew 3. Agnew 4 appeared to be a homogenous sandy gravel to the depths sampled.

6.4 RESERVOIR AND REFERENCE SITE SEDIMENT CONTAMINATES

Sediment samples were collected for contaminate analysis in Waugh, Gem, and Agnew Lakes as well as three reference tributary streams to Waugh Lake and three locations within Rush Creek upstream of Silver Lake (Maps D-1a to D-1e, Table D-1). Attachment B provides field photographs of the sediment sampling. Table D-2 summarizes sediment contaminant analytes and sediment quality guidelines for freshwater ecosystems, State hazardous waste criteria, and separate screening levels for aluminum and barium. Contaminate concentration summaries for each bulk sediment sample are provided in Tables D-4 to D-7.

6.4.1 Waugh Lake

- Four of the five sites (Waugh 2, Waugh 7, Waugh 9, and Waugh 12) (Table D-4. Map D-2a) exceeded the 0.18 mg/kg TEC (threshold effects concentration) for mercury. Mercury concentrations ranged from 0.29 – 0.47 mg/kg with the highest detected concentration at Waugh 7. At these concentrations there is a potential for adverse effects on aquatic biota; however, the concentration is not above a level at which adverse effects would be expected to occur, as defined by the PEC (probable effects concentration) (MacDonald et al. 2000).

6.4.2 Gem Lake

- Three of the five sample sites (Gem 2, Gem 3, and Gem 4) (Table D-5, Map D-2b) had arsenic concentrations above the 9.79 mg/kg TEC with the lower-most strata of Gem 4C exceeding the 33 mg/kg PEC.
- Two of the five sample sites (Gem 1 and Gem 3C) had mercury concentrations that exceeded the 0.18 mg/kg TEC. Gem 1 had a mercury concentration of 0.19 mg/kg and Gem 3C (third strata from the surface) had a 0.56 mg/kg concentration of mercury.

6.4.3 Agnew Lake

- Two of the four sample sites (Agnew 2 and Agnew 4) (Table D-6, Map D-2c).had arsenic concentrations above the 9.79 mg/kg TEC. Arsenic concentrations ranged from 12 – 18 mg/kg.
- One of the four sample sites (Agnew 4) had a zinc concentration (190 mg/kg) that exceeded the 121 mg/kg TEC.

6.4.4 Reference Sites

- Sediment contaminate analysis results for samples collected in reference areas (Map D-2d Map D-2e) are provided in Table D-7. None of the reference site samples exceeded the TEC, PEC, TTLC, or other screening levels. The reference site contaminate concentrations were very similar to the concentrations in the Waugh, Gem, and Agnew lake samples. The primary difference was that arsenic and mercury levels were slightly higher in some of the lake samples (some TEC exceedances). These differences may be related to the reference locations being within stream channels subject to frequent flushing flows whereas the lake environments accumulate sediment over time with little to no ability for flushing or removal of fine sediment. In the lakes, the source of arsenic could be historical volcanic activity (tephra layer in the lake) or human activities (e.g., atmospheric deposition). Similarly, the mercury sources could be natural or anthropogenic (e.g., atmospheric deposition).

7 SUMMARY

- Accumulated reservoir sediment within the Waugh Lake lakebed was estimated to be 95,165 cubic yards and the estimated accumulated sediment near Gem Dam and near Agnew Dam was 40,090 cubic yards and 34,393 cubic yards, respectively.
- Potential reservoir sediment mobilization at Waugh Lake with dam removal was estimated at 10,835 cubic yards and the potential for sediment mobilization at Gem Lake and Agnew Lake with dam removal was estimated at 15,447 and 6,697 cubic yards, respectively. The potential sediment / erosion analysis did not account for construction and restoration measures (revegetation, grade control structures, recontouring of sediment) that would be implemented to contain reservoir sediment with dam removals. In addition, sediment leaving Waugh Lake would be captured in Gem Lake and sediment leaving Gem Lake would be captured in Agnew Lake. At Agnew Lake there is limited sediment and measures would be implemented to prevent the release of sediment from the Agnew Dam removal. It is estimated that sediment would not be released downstream of Agnew Dam with full decommissioning (all dams removed).
- Sediment in the reservoirs were primarily silt and sand.
- The Project and reference site sediment contaminate levels were generally low. None of the reference sites samples exceed screening levels (TEC, PEC, TLC or other). The reference site and lake sample contaminate levels were similar except for the following:
    - In Waugh Lake four of the six samples were at an intermediate level of mercury contamination. They exceeded the TEC threshold for mercury (level above which effects may occur) but were below the PEC threshold (level which adverse effects on aquatic biota are expected to occur) (MacDonald et al. 2000).
    - In Gem Lake two of the five samples exceeded the TEC threshold for mercury, (but were below the PEC level) and four of the five samples exceeded the TEC for arsenic. One of the subsamples of a core, in an older pre-dam deposit below the historical volcanic tephra layer, exceeded the PEC concentration.
    - In Agnew Lake two of the four samples exceeded the TEC level for arsenic and one of the four samples exceeded the TEC level for zinc.

  Overall, sediment contaminate levels in the lakes were low and representative of background conditions with some limited accumulation of arsenic and mercury potentially related to atmospheric deposition (or some other unknown source).

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TABLES

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Table D-1. Sediment Sampling Locations.

Sediment Sample Locations			
Location	**Site ID**	**Sample Type**	**GPS Coordinates**
Waugh Lake	Waugh 1	Particle Size	37.74952935, -119.20171339
	Waugh 2	Contaminant & Particle Size	37.75223038, -119.19419985
	Waugh 3	Particle Size	37.75072467, -119.19401371
	Waugh 4	Particle Size	37.75098439, -119.19137913
	Waugh 5	Particle Size	37.7514933, -119.19101703
	Waugh 6	Particle Size	37.74980681, -119.18709454
	Waugh 7	Contaminant & Particle Size	37.74932378, -119.18606702
	Waugh 8	Particle Size	37.74842701, -119.185201
	Waugh 9	Contaminant & Particle Size	37.75068187, -119.18537251
	Waugh 10	Particle Size	37.75065121, -119.18270371
	Waugh 11	Contaminant & Particle Size	37.75120353, -119.18229514
	Waugh 12	Contaminant & Particle Size	37.75102409, -119.18189614
Gem Lake	Gem 1	Contaminant & Particle Size	37.75103167, -119.14241716
	Gem 2	Contaminant & Particle Size	37.75110897, -119.14248246
	Gem 3	Contaminant & Particle Size	37.75168448, -119.14244031
	Gem 4	Contaminant & Particle Size	37.75174304, -119.1424636
	Gem 5	Contaminant & Particle Size	37.7520756, -119.1421749
	Gem 6	Particle Size	37.75182977, -119.14219431
	Gem 7	Particle Size	37.75182477, -119.14205731
Agnew Lake	Agnew 1	Contaminant & Particle Size	37.75771205, -119.13217331
	Agnew 2	Contaminant & Particle Size	37.75787316, -119.13203764
	Agnew 3	Contaminant & Particle Size	37.75776602, -119.13194392
	Agnew 4	Contaminant & Particle Size	37.75783932, -119.13187008
Waugh Lake Tributaries	Reference 1	Contaminant & Particle Size	37.75281757, -119.22168388
	Reference 2	Contaminant & Particle Size	37.76523996, -119.20459639
	Reference 3	Contaminant & Particle Size	37.7627228, -119.19388009
Rush Creek Above Silver Lake	Reference 4	Contaminant & Particle Size	37.76789814, -119.12301475
	Reference 5	Contaminant & Particle Size	37.76983414, -119.12379405
	Reference 6	Contaminant & Particle Size	37.77181903, -119.12117212

Table D-2. Tested Sediment Contaminate Analytes, Analysis Methods, and Published Sediment Quality Threshold Levels

Analyte	Units	Analysis Method	Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems[1]		Total Threshold Limit Concentration (TTLC) for Hazardous Waste[4]	Other Screening Levels[5,6]
			Threshold Effect Concentration (TEC)[2]	Probable Effect Concentration (PEC)[3]		
Trace Metals (Sediment) by Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES)[7]						
Aluminum	mg/kg	SW846 6010B	-	-	-	25500
Antimony	mg/kg	SW846 6010B	-	-	500	-
Arsenic	mg/kg	SW846 6010B	9.79	33	500	-
Barium	mg/kg	SW846 6010B	-	-	10000	300
Beryllium	mg/kg	SW846 6010B	-	-	75	-
Bismuth	mg/kg	SW846 6010B	-	-	-	-
Boron	mg/kg	SW846 6010B	-	-	-	-
Cadmium	mg/kg	SW846 6010B	0.99	4.98	100	-
Calcium	mg/kg	SW846 6010B	-	-	-	-
Chromium	mg/kg	SW846 6010B	43.4	111	500	-
Cobalt	mg/kg	SW846 6010B	-	-	8000	-
Copper	mg/kg	SW846 6010B	31.6	149	2500	-
Gallium	mg/kg	SW846 6010B	-	-	-	-
Iron	mg/kg	SW846 6010B	-	-	-	-
Lead	mg/kg	SW846 6010B	35.8	128	1000	-
Lithium	mg/kg	SW846 6010B	-	-	-	-
Magnesium	mg/kg	SW846 6010B	-	-	-	-
Manganese	mg/kg	SW846 6010B	-	-	-	-
Molybdenum	mg/kg	SW846 6010B	-	-	3500	-
Nickel	mg/kg	SW846 6010B	22.7	48.6	2000	-
Phosphorus	mg/kg	SW846 6010B	-	-	-	-
Potassium	mg/kg	SW846 6010B	-	-	-	-
Scandium	mg/kg	SW846 6010B	-	-	-	-
Selenium	mg/kg	SW846 6010B	-	-	100	-
Silver	mg/kg	SW846 6010B	-	-	500	-
Sodium	mg/kg	SW846 6010B	-	-	-	-
Strontium	mg/kg	SW846 6010B	-	-	-	-
Thallium	mg/kg	SW846 6010B	-	-	700	-
Tin	mg/kg	SW846 6010B	-	-	-	-
Titanium	mg/kg	SW846 6010B	-	-	-	-
Vanadium	mg/kg	SW846 6010B	-	-	2400	-
Zinc	mg/kg	SW846 6010B	121	459	5000	-
General Chemistry						
Ammonia, as Nitrogen	mg/kg	Timberline Ammonia-001[8]	-	-	-	-
Total Solids	%	SM 2540 G	-	-	-	-
Total Volatile Solids	%	SM 2540 G	-	-	-	-
Biochemical Oxygen Demand	mg/L	SM 5210B[7]	-	-	-	-
Total Organic Carbon	mg/kg	SW846 9060A	-	-	-	-
Anions by Ion Chromatography[8]						
Nitrate Nitrogen	mg/kg	EPA 300.0	-	-	-	-
Nitrite Nitrogen	mg/kg	EPA 300.0	-	-	-	-
Flow Injection Analyses						
Total Kjeldahl Nitrogen	mg/kg	EPA 351.2	-	-	-	-
Mercury by Cold Vapor Atomic Absorption (CVAA)						
Mercury	mg/kg	SW846 7471B	0.18	1.06	20	-

1. MacDonald, D.D., Ingersoll, C.G. and Berger, T.A. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of environmental contamination and toxicology, 39(1), pp.20-31.
2. The threshold effect concentration (TEC) is the concentration below which adverse effects on aquatic biota are not expected to occur.
3. The probable effect threshold (PEC) is the concentration above which adverse effects to aquatic biota are expected to occur more often than not.
4. Under 22 California Code of Regulations § 66261.24 when any target analyte exceeds the TTLC limits the waste is classified as hazardous.
5. For Aluminum: USEPA. 1996. Assessment and Remediation of Contaminated Sediments (ARCS) Program. Calculation and evaluation of sediment effect concentrations for the amphipod Hyalella Azteca and the midge Chironomus riparius. Great Lakes National Program Office. EPA 905-R96-008. September.
6. For Barium: Los Alamos National Laboratory, Minimum "Lowest Effect Ecological Screening Level" for sediment (multiple ecological receptors), ECORISK Database V4.1. http://www.lanl.gov/environment/protection/eco-risk-assessment.php.
7. Biochemical Oxygen Demand (BOD) samples did not meet method criteria based on sample aliquots used to perform the test. A 10:1 distilled water extraction was necessary to conduct the test to derive an estimate of the BOD.
8. The analysis for anions by ion chromatography were performed after a 10:1 DI water extraction.

Key: - = No threshold or screening level available

Table D-3. Reservoir Sediment Gradation Summary Table

Sample Location ID	Strata Depth (ft bgs)	Geometric Mean (mm)	Size (mm)			Percentage by Type				Total %	Dominate Substrate (%)	Stratification
			D16	D50	D84	Clay	Silt	Sand	Gravel			
Waugh Lake												
Waugh 1	0 - 0.3	13.08	5.73	21.26	30.21	0%	1%	6%	94%	100%	Coarse gravel (61)	<0.3 foot below surface: gravel
Waugh 2A	0 - 2.8	0.19	0.05	0.20	0.69	1%	16%	78%	4%	100%	Medium Sand (19)	<2.8 foot below surface: silty sand, presence of redox hydric soil 1.8 foot below surface, assumed pre-dam elevation of Rush Meadow. 2.8 - 4.8 foot below surface: sandy silt
Waugh 2B	2.8 - 4.8	0.04	0.01	0.06	0.17	3%	49%	48%	0%	100%		
Waugh 3	0 - 0.6	0.34	0.06	0.29	1.84	1%	15%	69%	16%	100%	Medium sand (24)	<0.6 foot below surface: silty gravely sand
Waugh 4	0 - 0.4	0.04	0.01	0.06	0.17	3%	47%	50%	0%	100%	Very fine sand (10)	<0.4 foot below surface: silty sand
Waugh 5	0 - 0.9	0.12	0.07	0.13	0.21	0%	13%	87%	0%	100%	Fine sand (19)	<0.9 foot below surface: silty sand
Waugh 6	0 - 0.5	0.10	0.03	0.12	0.35	1%	29%	70%	0%	100%	Medium sand (17)	<0.5 foot below surface: silty sand
Waugh 7A	0 - 1.0	0.05	0.01	0.05	0.18	1%	53%	45%	0%	100%	Coarse silt (12)	<1 foot below surface: sandy silt, 1-2.3 sandy silt
Waugh 7B	1.0 - 2.3	0.03	0.01	0.03	0.09	4%	69%	27%	0%	100%		
Waugh 8	0 - 0.6	0.24	0.09	0.23	0.66	0%	8%	83%	8%	100%	Medium sand (26)	< 0.6 foot below surface: sand
Waugh 9	0 - 0.5	0.16	0.07	0.16	0.37	1%	14%	85%	0%	100%	Medium sand (21)	<0.5 foot below surface: silty sand
Waugh 10	0 - 0.7	0.08	0.02	0.09	0.30	1%	38%	60%	0%	100%	Medium sand (12)	<0.7 foot below surface: silty sand
Waugh 11A	0 - 0.9	0.22	0.09	0.23	0.52	0%	9%	90%	0%	100%	Very fine gravel (76)	<0.9 foot below surface: sand, 0.9 - 1.9 foot below surface: sandy gravel
Waugh 11B	0.9 - 1.9	0.91	0.20	2.77	4.09	0%	7%	14%	79%	100%		
Waugh 12	0 - 1.3	0.24	0.03	0.17	1.79	1%	25%	59%	15%	100%	Medium sand (11)	<1.3 foot below surface: gravely silty sand
Gem Lake												
Gem 1	0 - 0.5	0.21	0.02	0.09	2.47	1%	39%	42%	18%	100%	Fine gravel (11)	<0.5 foot below surface: silty sand
Gem 2A	0 - 1.2	0.05	0.01	0.07	0.24	2%	47%	51%	0%	100%	Medium sand (14) Coarse gravel (32) [1]	<1.2 foot below surface: coarse silt and medium sands, 1.2 - 2.1-foot sandy gravel, 2.1 - 2.4 grayish silt assumed tephra layer
Gem 2B	1.2 - 2.1	0.96	0.03	2.46	27.82	1%	21%	23%	55%	100%		
Gem 2C	2.1 - 2.4	0.01	0.00	0.01	0.03	10%	85%	5%	0%	100%		
Gem 3A	0 - 1.0	0.02	0.01	0.02	0.07	4%	79%	18%	0%	100%	Coarse silt (14)	0 - 1 foot below surface: sandy silt, 1 - 2.4-foot grayish silt and sand assumed tephra layer less defined, 2.4 - 3.9-foot sandy silt
Gem 3B	1.0 - 2.4	0.03	0.01	0.04	0.16	3%	61%	36%	0%	100%		
Gem 3C	2.4 - 3.9	0.02	0.01	0.02	0.07	3%	78%	19%	0%	100%		
Gem 4A	0 - 1.6	0.03	0.01	0.03	0.09	3%	73%	25%	0%	100%	Coarse silt (14)	<1.6 foot below surface: sandy silt, 1.6 - 2.3-foot greyish sandy silt assumed tephra layer, 2.3 - 4.5-foot sandy silt
Gem 4B	1.6 - 2.3	0.03	0.01	0.03	0.12	3%	67%	30%	0%	100%		
Gem 4C	2.3 - 4.5	0.02	0.01	0.02	0.06	3%	81%	16%	0%	100%		
Gem 5	0 -1.4	0.03	0.01	0.03	0.16	4%	66%	30%	0%	100%	Coarse silt (15)	<1.4 foot below ground: sandy silt
Gem 6	0 - 0.5	0.03	0.01	0.03	0.10	2%	70%	27%	0%	100%	Coarse silt (13)	<0.5 foot below surface: sandy silt
Gem 7	0 - 0.5	0.04	0.01	0.04	0.16	2%	62%	36%	0%	100%	Coarse silt (11)	<0.5 foot below surface: sandy silt

Sample Location ID	Strata Depth (ft bgs)	Geometric Mean (mm)	Size (mm)			Percentage by Type				Total %	Dominate Substrate (%)	Stratification
			D16	D50	D84	Clay	Silt	Sand	Gravel			
Agnew Lake												
Agnew 1	0 - 1.1	0.21	0.06	0.23	0.81	1%	16%	83%	0%	100%	Coarse sand (20)	<0.77 foot below surface: silty sand, 0.77 - 1.15-foot peaty organic material
Agnew 2	0 - 1	0.07	0.02	0.07	0.24	1%	45%	54%	0%	100%	Medium and very fine sand (10)	<0.6 foot below surface: Peat and organic material, 0.6 - 0.8-foot silty sand
Agnew 3	0 - 1.6	2.68	0.40	3.73	18.18	0%	5%	51%	44%	100%	Very fine gravel (16)	<0.68 foot below surface: coarse sand and fine gravels, 0.68 - 0.98-foot organic material, 0.98 - 1.64-foot coarse sand and organic material
Agnew 4	0 - 0.8	1.41	0.11	2.83	17.73	1%	11%	31%	57%	100%	Very fine gravel (19)	<0.8 depth below surface: sandy gravel

[1] Suspected error in laboratory analysis. Field observations contradict lab results indicting presence of coarse gravel.

Table D-4. Contaminant Concentrations for Sediment Samples Collected in Waugh Lake

Analyte, Units, Analysis Method			Sample Location[1], Collection Date, and Analyte Concentration						Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems[2]		Total Threshold Limit Concentration (TTLC) for Hazardous Waste[5]	Other Screening Levels[6,7]
			Waugh 2 8/28/2024	Waugh 7 8/28/2024	Waugh 9 8/28/2024	Waugh 11A 8/27/2024	Waugh 11B 8/27/2024	Waugh 12 8/28/2024	Threshold Effect Concentration (TEC)[3]	Probable Effect Concentration (PEC)[4]		
Trace Metals (Sediment) by Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES)[8]												
Aluminum	mg/kg	SW846 6010B	5000	7700	3400	5500	6000	6000	-	-	-	25500
Antimony	mg/kg	SW846 6010B	ND	0.72	ND	ND, D	ND, D	ND	-	-	500	-
Arsenic	mg/kg	SW846 6010B	3.4	7.4	3.5	ND, D	ND, D	5.6	9.79	33	500	-
Barium	mg/kg	SW846 6010B	3.7	44	28	29	17	34	-	-	10000	300
Beryllium	mg/kg	SW846 6010B	0.12	0.32	0.13	ND, D	ND, D	ND	-	-	75	-
Bismuth	mg/kg	SW846 6010B	ND	ND	ND	ND, D	ND, D	ND	-	-	-	-
Boron	mg/kg	SW846 6010B	ND	ND	ND	ND, D	ND, D	ND	-	-	-	-
Cadmium	mg/kg	SW846 6010B	ND	ND	ND	ND, D	ND, D	ND	0.99	4.98	100	-
Calcium	mg/kg	SW846 6010B	420	1300	510	ND, D	ND, D	5300	-	-	-	-
Chromium	mg/kg	SW846 6010B	2.7	4.1	1.5	3.1	2.9	4	43.4	111	500	-
Cobalt	mg/kg	SW846 6010B	ND	ND	ND	ND, D	ND, D	ND	-	-	8000	-
Copper	mg/kg	SW846 6010B	7.1	6.1	3.5	ND, D	ND, D	7.2	31.6	149	2500	-
Gallium	mg/kg	SW846 6010B	ND	3	ND	ND, D	ND, D	ND	-	-	-	-
Iron	mg/kg	SW846 6010B	8000	8300	5900	5700	4300	7000	-	-	-	-
Lead	mg/kg	SW846 6010B	1.9	3.4	2.1	ND, D	ND, D	4.4	35.8	128	1000	-
Lithium	mg/kg	SW846 6010B	6.8	8.7	5	ND, D	ND, D	8.4	-	-	-	-
Magnesium	mg/kg	SW846 6010B	2300	1800	1300	2100	1800	1800	-	-	-	-
Manganese	mg/kg	SW846 6010B	77	66	51	120	84	96	-	-	-	-
Molybdenum	mg/kg	SW846 6010B	ND	ND	ND	ND, D	ND, D	ND	-	-	3500	-
Nickel	mg/kg	SW846 6010B	3.1	2.9	1.8	ND, D	ND	3.1	22.7	48.6	2000	-
Phosphorus	mg/kg	SW846 6010B	150	140	120	230	ND	250	-	-	-	-
Potassium	mg/kg	SW846 6010B	1000	310	500	1200	460	640	-	-	-	-
Scandium	mg/kg	SW846 6010B	ND	ND	ND	ND, D	ND, D	ND	-	-	-	-
Selenium	mg/kg	SW846 6010B	ND	ND	ND	ND, D	ND, D	ND	-	-	100	-
Silver	mg/kg	SW846 6010B	ND	ND	ND	ND, D	ND, D	ND	-	-	500	-
Sodium	mg/kg	SW846 6010B	80	160	59	ND, D	ND, D	99	-	-	-	-
Strontium	mg/kg	SW846 6010B	ND	11	3.7	ND, D	ND, D	9.6	-	-	-	-
Thallium	mg/kg	SW846 6010B	ND	ND	ND	ND, D	ND, D	ND	-	-	700	-
Tin	mg/kg	SW846 6010B	ND	ND	ND	ND, D	ND, D	ND	-	-	-	-
Titanium	mg/kg	SW846 6010B	560	330	300	4601	370	370	-	-	-	-
Vanadium	mg/kg	SW846 6010B	18	13	11	15	12	15	-	-	2400	-
Zinc	mg/kg	SW846 6010B	17	15	11	28	21	19	121	459	5000	-
General Chemistry												
Ammonia, as Nitrogen	mg/kg	Timberline Ammonia-001[9]	23	27	43	59,M	18	70	-	-	-	-
Total Solids	%	SM 2540 G	60.44	45.23	60.02	66.53	68.55	61.69	-	-	-	-
Total Volatile Solids	%	SM 2540 G	1.542	3.621	0.7203	1.563	1.066	2.391	-	-	-	-
Biochemical Oxygen Demand	mg/L	SM 5210B[10]	ND	ND	ND	ND, HT	ND, HT	ND	-	-	-	-
Total Organic Carbon	mg/kg	SW846 9060A	15000	21000	13000	10000	14000	29000	-	-	-	-
Anions by Ion Chromatography[11]												
Nitrate Nitrogen	mg/kg	EPA 300.0	ND	ND	ND	ND	ND	ND	-	-	-	-
Nitrite Nitrogen	mg/kg	EPA 300.0	ND	ND	ND	ND	ND	ND	-	-	-	-
Flow Injection Analyses												
Total Kjeldahl Nitrogen	mg/kg	EPA 351.2	6.5	9.9	6.2	8.9	6.8	7	-	-	-	-
Mercury by Cold Vapor Atomic Absorption (CVAA)												
Mercury	mg/kg	SW846 7471B	0.29	0.47	0.30	ND	ND	0.31	0.18	1.06	20	-

1. Sample locations Waugh 1, 3 - 6, 8, and 10 did not include contaminant analysis (only sample locations 2, 7, 9, 11, and 12). See **Map D-1a** for sediment sample locations.
2. MacDonald, D.D., Ingersoll, C.G. and Berger, T.A. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of environmental contamination and toxicology, 39(1), pp.20-31.
3. The threshold effect concentration (TEC) is the concentration below which adverse effects on aquatic biota are not expected to occur.
4. The probable effect threshold (PEC) is the concentration above which adverse effects to aquatic biota are expected to occur more often than not.
5. Under 22 California Code of Regulations § 66261.24 when any target analyte exceeds the TTLC limits the waste is classified as hazardous.
6. For Aluminum: USEPA. 1996. Assessment and Remediation of Contaminated Sediments (ARCS) Program. Calculation and evaluation of sediment effect concentrations for the amphipod Hyalella Azteca and the midge Chironomus riparius. Great Lakes National Program Office. EPA 905-R96-008. September.
7. For Barium: Los Alamos National Laboratory, Minimum "Lowest Effect Ecological Screening Level" for sediment (multiple ecological receptors), ECORISK Database V4.1. http://www.lanl.gov/environment/protection/eco-risk-assessment.php.
8. Trace metals digestion method: EPA 3050B
9. Ammonia distillation method: SM 4500 NH3 B
10. Biochemical Oxygen Demand (BOD) samples did not meet method criteria based on sample aliquots used to perform the test. A 10:1 distilled water extraction was necessary to conduct the test to derive an estimate of the BOD.
11. The analysis for anions by ion chromatography were performed after a 10:1 DI water extraction.

Key:
- \- = Analyte not sampled/no threshold or screening level
- B = The analysis of the method blank revealed concentrations of the target analyte above the reporting limit. The results were greater than ten times the blank amount or non-detect; therefore, the data was not impacted.
- D = Due to the sample matrix, dilution was required in order to properly detect and report the analyte. The reporting limit was adjusted accordingly.
- HT = Sample analyzed beyond the accepted holding time
- J = Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
- M = The matrix spike value for the analysis of this parameter was outside acceptance criteria due to sample concentration or possible matrix inference. The reported result should be considered an estimate.
- ND = Non-detection (ND) is reported for values that do not fall in the reporting limits or were not detected based on dilution.

Table D-5. Contaminant Concentrations for Sediment Samples Collected in Gem Lake

Analyte, Units, Analysis Method			Sample Location, Collection Date, and Analyte Concentration											Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems[1]		Total Threshold Limit Concentration (TTLC) for Hazardous Waste[4]	Other Screening Levels[5,6]
			Gem 1 8/8/2024	Gem 2A 8/8/2024	Gem 2B 8/8/2024	Gem 2C 8/8/2024	Gem 3A 8/7/2024	Gem 3B 8/7/2024	Gem 3C 8/7/2024	Gem 4A 8/6/2024	Gem 4B 8/6/2024	Gem 4C 8/6/2024	Gem 5 8/6/2024	Threshold Effect Concentration (TEC)[2]	Probable Effect Concentration (PEC)[3]		
Trace Metals (Sediment) by Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES)[7]																	
Aluminum	mg/kg	SW846 6010B	2100	1400	1200	14000	5400	2800	5400	5400	3300	7000	4600	-	-	-	25500
Antimony	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	500	-
Arsenic	mg/kg	SW846 6010B	ND, D	12	6.5	13	31	24	39	30	24	61	ND, D	9.79	33	500	-
Barium	mg/kg	SW846 6010B	10	10	9.7	150	36	18	36	49	31	68	38	-	-	10000	300
Beryllium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	75	-
Bismuth	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Boron	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Cadmium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	0.99	4.98	100	-
Calcium	mg/kg	SW846 6010B	440	450	450	4200	700	ND, D	790	770	530	980	1100	-	-	-	-
Chromium	mg/kg	SW846 6010B	1.7	0.82	0.71	6.5	3.1	1.4	2.9	2.4	1.4	3.2	3.5	43.4	111	500	-
Cobalt	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	5.1	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	8000	-
Copper	mg/kg	SW846 6010B	6.3	ND, D	ND, D	27	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	31.6	149	2500	-
Gallium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Iron	mg/kg	SW846 6010B	2000	1800	1300	20000	7300	4000	6500	7000	4400	8300	4300	-	-	-	-
Lead	mg/kg	SW846 6010B	24	3.2	ND, D	12	17	ND, D	9.4	8.1	ND, D	12	22	35.8	128	1000	-
Lithium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	40	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Magnesium	mg/kg	SW846 6010B	790	470	380	6600	1600	650	1400	1500	840	1800	1700	-	-	-	-
Manganese	mg/kg	SW846 6010B	66	64	46	370	290	130	170	290	190	420	110	-	-	-	-
Molybdenum	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	3500	-
Nickel	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	22.7	48.6	2000	-
Phosphorus	mg/kg	SW846 6010B	83	ND, D	ND, D	580	270	150	370	300	210	510	260	-	-	-	-
Potassium	mg/kg	SW846 6010B	180	180	190	4500	610	350	540	710	510	720	560	-	-	-	-
Scandium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Selenium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	100	-
Silver	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	500	-
Sodium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	370	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Strontium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	38	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Thallium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	700	-
Tin	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Titanium	mg/kg	SW846 6010B	100	76	77	1600	260	130	240	280	170	270	260	-	-	-	-
Vanadium	mg/kg	SW846 6010B	6.6	4.3	4.1	51	16	8.8	18	14	8.9	18	15	-	-	2400	-
Zinc	mg/kg	SW846 6010B	42	17	12	120	65	30	59	52	29	85	76	121	459	5000	-
General Chemistry																	
Ammonia, as Nitrogen	mg/kg	Timberline Ammonia-001[8]	160	ND	ND	ND, M	74	ND	130	84, M	87	120	63	-	-	-	-
Total Solids	%	SM 2540 G	31.1	48.4	49.4	68.7	29.2	59.1	26.6	30.4	50.5	28.3	54.5	-	-	-	-
Total Volatile Solids	%	SM 2540 G	1.3	0.3	0.3	0.3	72.4	42.2	76.1	1.7	1.1	2.6	1.7	-	-	-	-
Biochemical Oxygen Demand	mg/L	SM 5210B[9]	-	-	-	-	ND, B	ND, B	ND, B, D	ND, D	ND	ND, D	ND, HT	-	-	-	-
Total Organic Carbon	mg/kg	SW846 9060A	-	-	-	-	48000, D	3200, J	27000, D	37000	4900	49000	65000, D	-	-	-	-
Anions by Ion Chromatography[10]																	
Nitrate Nitrogen	mg/kg	EPA 300.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-
Nitrite Nitrogen	mg/kg	EPA 300.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-
Flow Injection Analyses																	
Total Kjeldahl Nitrogen	mg/kg	EPA 351.2	990	290	110	51	620	610	1100	780	380	860	490	-	-	-	-
Mercury by Cold Vapor Atomic Absorption (CVAA)																	
Mercury	mg/kg	SW846 7471B	0.19	0.05	0.04	ND	0.08	0.06	0.56	0.05	0.12	0.07	0.06	0.18	1.06	20	-

1. MacDonald, D.D., Ingersoll, C.G. and Berger, T.A. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of environmental contamination and toxicology, 39(1), pp.20-31.
2. The threshold effect concentration (TEC) is the concentration below which adverse effects on aquatic biota are not expected to occur.
3. The probable effect threshold (PEC) is the concentration above which adverse effects to aquatic biota are expected to occur more often than not.
4. Under 22 California Code of Regulations § 66261.24 when any target analyte exceeds the TTLC limits the waste is classified as hazardous.
5. For Aluminum: USEPA. 1996. Assessment and Remediation of Contaminated Sediments (ARCS) Program. Calculation and evaluation of sediment effect concentrations for the amphipod Hyalella Azteca and the midge Chironomus riparius. Great Lakes National Program Office. EPA 905-R96-008. September.
6. For Barium: Los Alamos National Laboratory, Minimum "Lowest Effect Ecological Screening Level" for sediment (multiple ecological receptors), ECORISK Database V4.1. http://www.lanl.gov/environment/protection/eco-risk-assessment.php.
7. Trace metals digestion method: EPA 3050B
8. Ammonia distillation method: SM 4500 NH3 B
9. Biochemical Oxygen Demand (BOD) samples did not meet method criteria based on sample aliquots used to perform the test. A 10:1 distilled water extraction was necessary to conduct the test to derive an estimate of the BOD.
10. The analysis for anions by ion chromatography were performed after a 10:1 DI water extraction.

Key:
- = Analyte not sampled/no threshold or screening level
B = The analysis of the method blank revealed concentrations of the target analyte above the reporting limit. The results were greater than ten times the blank amount or non-detect; therefore, the data was not impacted.
D = Due to the sample matrix, dilution was required in order to properly detect and report the analyte. The reporting limit was adjusted accordingly.
HT = Sample analyzed beyond the accepted holding time
J = Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
M = The matrix spike value for the analysis of this parameter was outside acceptance criteria due to sample concentration or possible matrix inference. The reported result should be considered an estimate.
ND = Non-detection (ND) is reported for values that do not fall in the reporting limits or were not detected based on dilution.

Table D-6. Contaminant Concentrations for Sediment Samples Collected in Agnew Lake

Analyte, Units, Analysis Method			Sample Location, Collection Date, and Analyte Concentration				Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems[1]		Total Threshold Limit Concentration (TTLC) for Hazardous Waste[4]	Other Screening Levels[5,6]
			Agnew 1	Agnew 2	Agnew 3	Agnew 4	Threshold Effect Concentration (TEC)[2]	Probable Effect Concentration (PEC)[3]		
			8/21/2024	8/21/2024	8/21/2024	8/21/2024				
Trace Metals (Sediment) by Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES)[7]										
Aluminum	mg/kg	SW846 6010B	1700	2500, M	6500	6800	-	-	-	25500
Antimony	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	-	-	500	-
Arsenic	mg/kg	SW846 6010B	ND, D	18	ND, D	12	9.79	33	500	-
Barium	mg/kg	SW846 6010B	24	33, M	53	71	-	-	10000	300
Beryllium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	-	-	75	-
Bismuth	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Boron	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Cadmium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	0.99	4.98	100	-
Calcium	mg/kg	SW846 6010B	1300	1700, M	4500	18000	-	-	-	-
Chromium	mg/kg	SW846 6010B	ND, D	3.2	4.7	7	43.4	111	500	-
Cobalt	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	-	-	8000	-
Copper	mg/kg	SW846 6010B	ND, D	14	ND, D	22	31.6	149	2500	-
Gallium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Iron	mg/kg	SW846 6010B	2800	3900, M	6500	11000	-	-	-	-
Lead	mg/kg	SW846 6010B	6.2	19	8.7	19	35.8	128	1000	-
Lithium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Magnesium	mg/kg	SW846 6010B	ND, D	680, M	2100	3500	-	-	-	-
Manganese	mg/kg	SW846 6010B	260	130, M	390	560	-	-	-	-
Molybdenum	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	-	-	3500	-
Nickel	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	22.7	48.6	2000	-
Phosphorus	mg/kg	SW846 6010B	ND, D	140	240	290	-	-	-	-
Potassium	mg/kg	SW846 6010B	ND, D	260, M	460	1500	-	-	-	-
Scandium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Selenium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	-	-	100	-
Silver	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	-	-	500	-
Sodium	mg/kg	SW846 6010B	ND, D	ND, M, D	ND, D	ND, D	-	-	-	-
Strontium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	27	-	-	-	-
Thallium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	-	-	700	-
Tin	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Titanium	mg/kg	SW846 6010B	110	130, M	420	400	-	-	-	-
Vanadium	mg/kg	SW846 6010B	5.5	17	19	28	-	-	2400	-
Zinc	mg/kg	SW846 6010B	29	100, M	66	190	121	459	5000	-
General Chemistry										
Ammonia, as Nitrogen	mg/kg	Timberline Ammonia-001[8]	ND	86	ND	ND	-	-	-	-
Total Solids	%	SM 2540 G	54.54	33.52	71.51	72.01	-	-	-	-
Total Volatile Solids	%	SM 2540 G	2.175	1.891	0.2808	0.213	-	-	-	-
Biochemical Oxygen Demand	mg/L	SM 5210B[9]	ND	34	ND	ND	-	-	-	-
Total Organic Carbon	mg/kg	SW846 9060A	12000	71000	35000	11000	-	-	-	-
Anions by Ion Chromatography[10]										
Nitrate Nitrogen	mg/kg	EPA 300.0	ND	ND	ND	ND	-	-	-	-
Nitrite Nitrogen	mg/kg	EPA 300.0	ND	ND	ND	ND	-	-	-	-
Flow Injection Analyses										
Total Kjeldahl Nitrogen	mg/kg	EPA 351.2	560	930	ND	380	-	-	-	-
Mercury by Cold Vapor Atomic Absorption (CVAA)										
Mercury	mg/kg	SW846 7471B	ND	0.06	ND	ND	0.18	1.06	20	-

1. MacDonald, D.D., Ingersoll, C.G. and Berger, T.A. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of environmental contamination and toxicology, 39(1), pp.20-31.
2. The threshold effect concentration (TEC) is the concentration below which adverse effects on aquatic biota are not expected to occur.
3. The probable effect threshold (PEC) is the concentration above which adverse effects to aquatic biota are expected to occur more often than not.
4. Under 22 California Code of Regulations § 66261.24 when any target analyte exceeds the TTLC limits the waste is classified as hazardous.
5. For Aluminum: USEPA. 1996. Assessment and Remediation of Contaminated Sediments (ARCS) Program. Calculation and evaluation of sediment effect concentrations for the amphipod Hyalella Azteca and the midge Chironomus riparius. Great Lakes National Program Office. EPA 905-R96-008. September.
6. For Barium: Los Alamos National Laboratory, Minimum "Lowest Effect Ecological Screening Level" for sediment (multiple ecological receptors), ECORISK Database V4.1. http://www.lanl.gov/environment/protection/eco-risk-assessment.php.
7. Trace metals digestion method: EPA 3050B
8. Ammonia distillation method: SM 4500 NH3 B
9. Biochemical Oxygen Demand (BOD) samples did not meet method criteria based on sample aliquots used to perform the test. A 10:1 distilled water extraction was necessary to conduct the test to derive an estimate of the BOD.
10. The analysis for anions by ion chromatography were performed after a 10:1 DI water extraction.

Key:
- \- = Analyte not sampled/no threshold or screening level
- B = The analysis of the method blank revealed concentrations of the target analyte above the reporting limit. The results were greater than ten times the blank amount or non-detect; therefore, the data was not impacted.
- D = Due to the sample matrix, dilution was required in order to properly detect and report the analyte. The reporting limit was adjusted accordingly.
- HT = Sample analyzed beyond the accepted holding time
- J = Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
- M = The matrix spike value for the analysis of this parameter was outside acceptance criteria due to sample concentration or possible matrix inference. The reported result should be considered an estimate.
- ND = Non-detection (ND) is reported for values that do not fall in the reporting limits or were not detected based on dilution.

Table D-7. Contaminant Concentrations for Sediment Samples Collected in Reference Locations

Analyte, Units, Analysis Method			Sample Location, Collection Date, and Analyte Concentration						Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems[1]		Total Threshold Limit Concentration (TTLC) for Hazardous Waste[4]	Other Screening Levels[5,6]
			Reference 1 8/27/2024	Reference 2 8/27/2024	Reference 3 8/27/2024	Reference 4 8/22/2024	Reference 5 8/22/2024	Reference 6 8/22/2024	Threshold Effect Concentration (TEC)[2]	Probable Effect Concentration (PEC)[3]		
Trace Metals (Sediment) by Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES)[7]												
Aluminum	mg/kg	SW846 6010B	5200	5300	8700	640	640	430	-	-	-	25500
Antimony	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	500	-
Arsenic	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	9.79	33	500	-
Barium	mg/kg	SW846 6010B	32	21	43	5.7	5.1	3.4	-	-	10000	300
Beryllium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	75	-
Bismuth	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Boron	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Cadmium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	0.99	4.98	100	-
Calcium	mg/kg	SW846 6010B	590	1500	1000	260	ND, D	ND, D	-	-	-	-
Chromium	mg/kg	SW846 6010B	2	1.8	3.2	0.65	ND, D	ND, D	43.4	111	500	-
Cobalt	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	8000	-
Copper	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	31.6	149	2500	-
Gallium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Iron	mg/kg	SW846 6010B	7100	8500	12000	770	620	440	-	-	-	-
Lead	mg/kg	SW846 6010B	ND, D	ND, D	4.9	ND, D	ND, D	ND, D	35.8	128	1000	-
Lithium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Magnesium	mg/kg	SW846 6010B	2500	2200	3600	190	210	ND, D	-	-	-	-
Manganese	mg/kg	SW846 6010B	95	120	120	27	18	13	-	-	-	-
Molybdenum	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	3500	-
Nickel	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	22.7	48.6	2000	-
Phosphorus	mg/kg	SW846 6010B	190	430	290	ND, D	ND, D	ND, D	-	-	-	-
Potassium	mg/kg	SW846 6010B	1400	1000	1800	ND, D	ND, D	ND, D	-	-	-	-
Scandium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Selenium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	100	-
Silver	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	500	-
Sodium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Strontium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Thallium	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	700	-
Tin	mg/kg	SW846 6010B	ND, D	ND, D	ND, D	ND, D	ND, D	ND, D	-	-	-	-
Titanium	mg/kg	SW846 6010B	670	470	900	46	50	35	-	-	-	-
Vanadium	mg/kg	SW846 6010B	19	27	33	1.8	1.6	ND, D	-	-	2400	-
Zinc	mg/kg	SW846 6010B	21	18	27	ND, D	ND, D	ND, D	121	459	5000	-
General Chemistry												
Ammonia, as Nitrogen	mg/kg	Timberline Ammonia-001[8]	57	31	36	ND, D	62	ND	-	-	-	-
Total Solids	%	SM 2540 G	61.26	66.14	62.94	66.54	64.84	60.18	-	-	-	-
Total Volatile Solids	%	SM 2540 G	1.454	0.6923	0.7262	0.1421	0.1312	ND	-	-	-	-
Biochemical Oxygen Demand	mg/L	SM 5210B[9]	ND	ND	ND	ND, B	ND, B	ND, B	-	-	-	-
Total Organic Carbon	mg/kg	SW846 9060A	28000	11000	12000	3100	4500	130	-	-	-	-
Anions by Ion Chromatography[10]												
Nitrate Nitrogen	mg/kg	EPA 300.0	ND	ND	ND	ND	ND	ND	-	-	-	-
Nitrite Nitrogen	mg/kg	EPA 300.0	ND	ND	ND	ND	ND	ND	-	-	-	-
Flow Injection Analyses												
Total Kjeldahl Nitrogen	mg/kg	EPA 351.2	8.6	5.5	7.4	210	180	38	-	-	-	-
Mercury by Cold Vapor Atomic Absorption (CVAA)												
Mercury	mg/kg	SW846 7471B	ND	ND	ND	ND	0.11	ND	0.18	1.06	20	-

1. MacDonald, D.D., Ingersoll, C.G. and Berger, T.A. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of environmental contamination and toxicology, 39(1), pp.20-31.
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6. For Barium: Los Alamos National Laboratory, Minimum "Lowest Effect Ecological Screening Level" for sediment (multiple ecological receptors), ECORISK Database V4.1. http://www.lanl.gov/environment/protection/eco-risk-assessment.php.
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10. The analysis for anions by ion chromatography were performed after a 10:1 DI water extraction.

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- D = Due to the sample matrix, dilution was required in order to properly detect and report the analyte. The reporting limit was adjusted accordingly.
- HT = Sample analyzed beyond the accepted holding time
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- M = The matrix spike value for the analysis of this parameter was outside acceptance criteria due to sample concentration or possible matrix inference. The reported result should be considered an estimate.
- ND = Non-detection (ND) is reported for values that do not fall in the reporting limits or were not detected based on dilution.

PHOTOS

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Photo D-1. Photograph taken looking north from the right upstream abutment side of Gem Dam showing what appears to be fill material placed against the dam and within the former outlet channel of the lake.

Photo D-2. Typical bouldery and cobbley gravel facies in the foreground with silty sand facies found throughout much of the stream channel and backwater areas within the Waugh lakebed.

Photo D-3. Cobbley and gravely sand facies mapped along a northern shoreline cove within the secondary basin of Gem Lake indicating a 4-foot depth on the tile probe.

Photo D-4. Bouldery sand facies mapped on the right abutment side of Agnew Dam with a 2.5-foot sediment depth measured with the tile probe.

FIGURES

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Figure D-1. Boulder and cobble grade break and control located approximately 400 feet upstream of Rush Meadows Dam that along with the presence of shallow bedrock ridges would likely inhibit downcutting of Rush Creek due to dam removal.

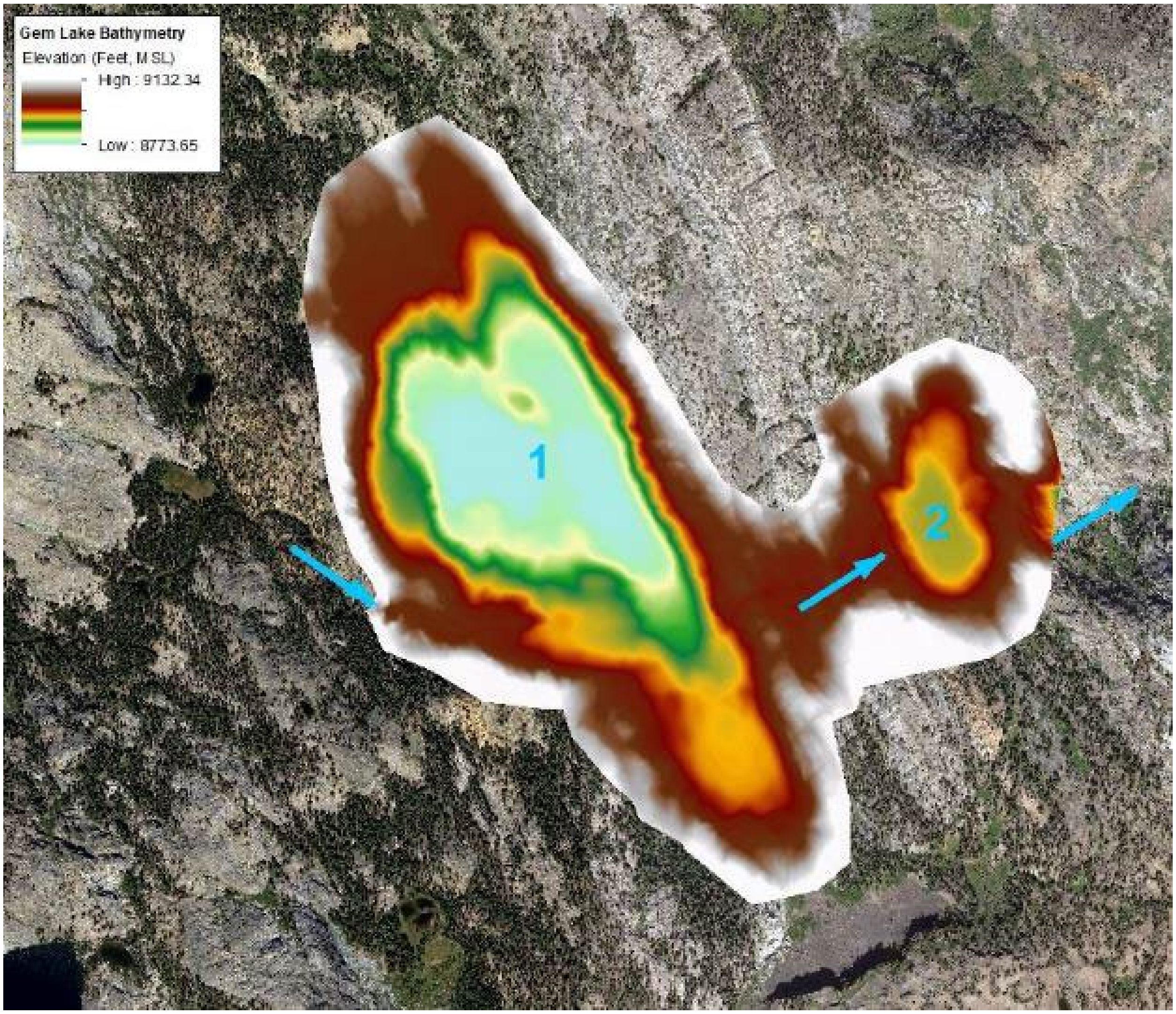


Figure D-2. Bathymetric surface of Gem Lake showing the two deeper portions the natural lake. Both the upstream lake basin (1) and the downstream lake basin (2) would act as a retention basin for incoming sediment from Rush Creek.

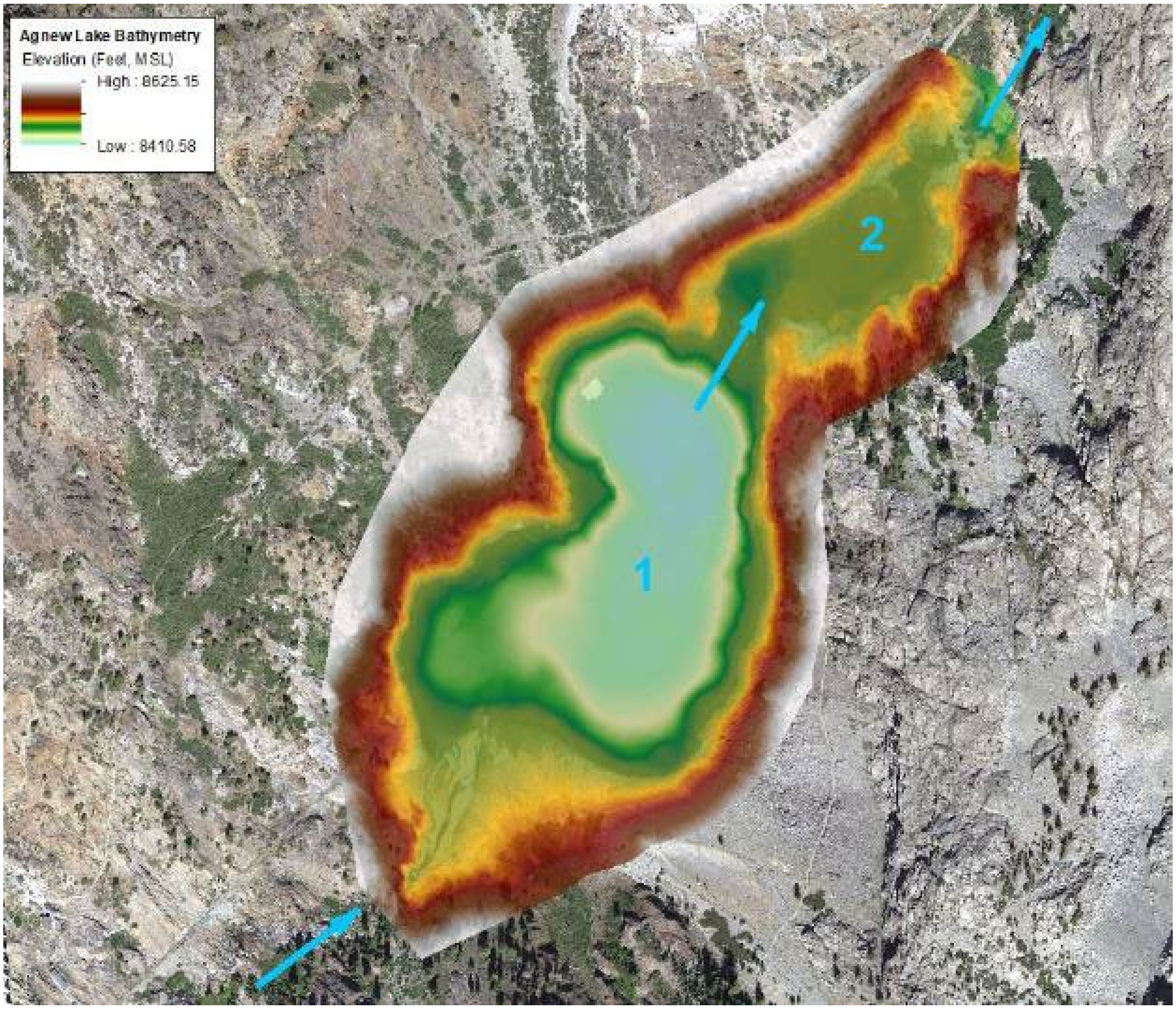


Figure D-3. Bathymetric surface of Agnew Lake showing the two deeper portions of the natural lake. Both the upstream lake basin (1) and the downstream lake basin (2) would act as a retention basin for incoming sediment from Rush Creek.

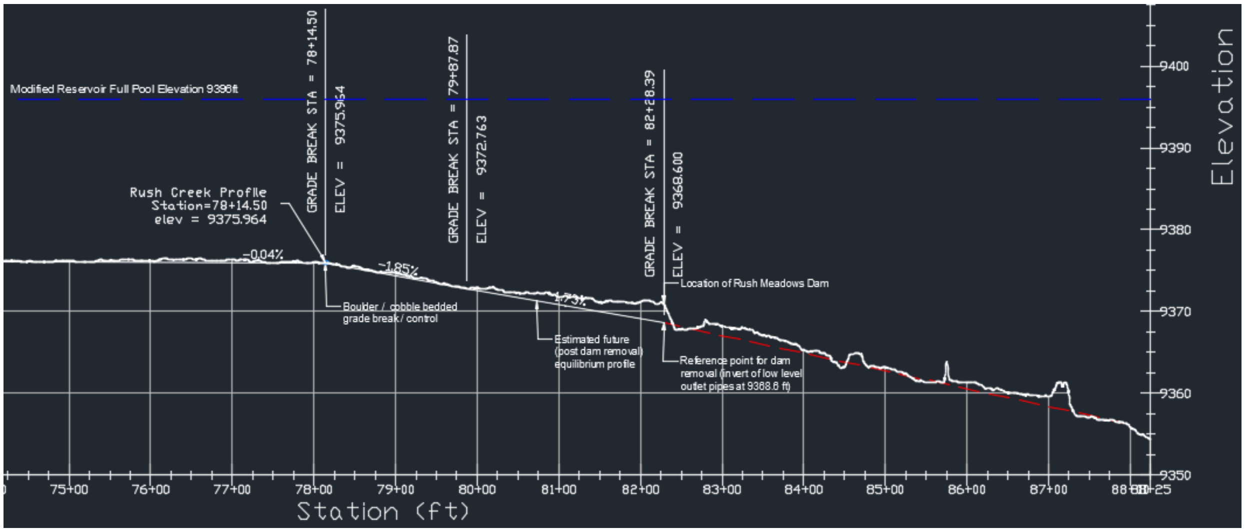


Figure D-4. Profile view of Rush Creek near the dam showing the existing and estimated future channel gradient being held stable at the current elevation of the boulder / cobble grade break.

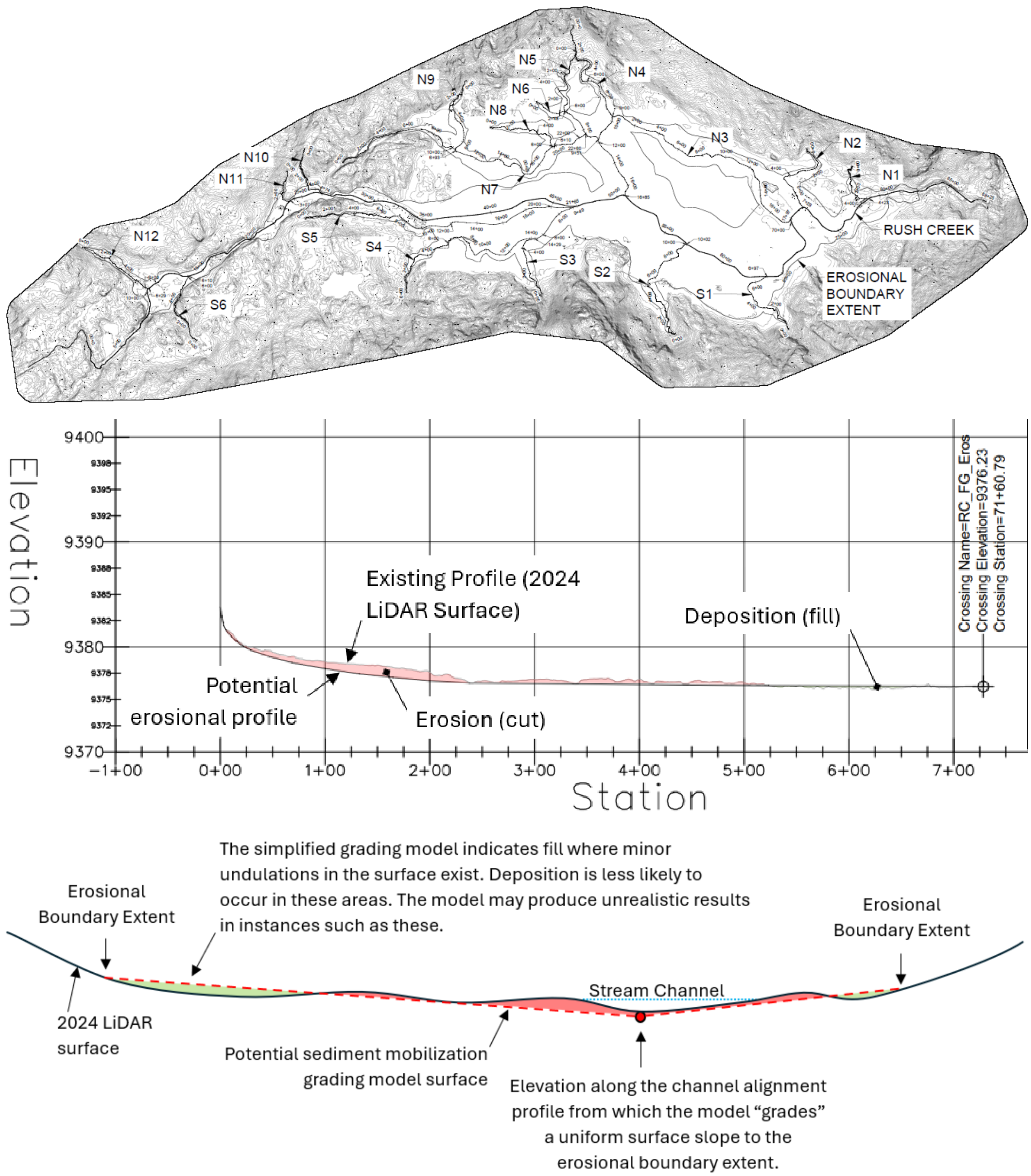


Figure D-5. Channel alignments used in the grading analysis (top), example channel profile showing cut and fill areas determined by the difference between existing and potential erosional surfaces (middle), and a hypothetical cross section showing how the grading model used in the erosion analysis grades a surface from the profile to the erosional boundary extent (bottom).

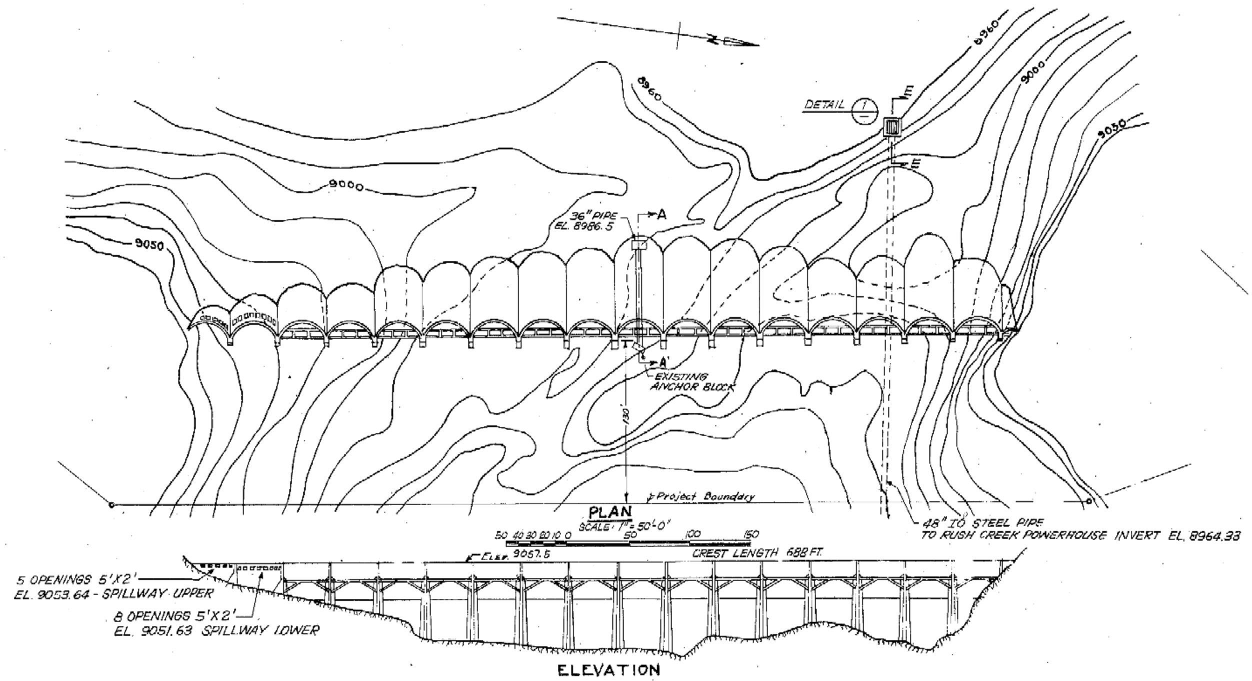


Figure D-6. Exhibit F engineering drawing showing Gem Dam elevations and 10-foot contours in the vicinity of the dam.

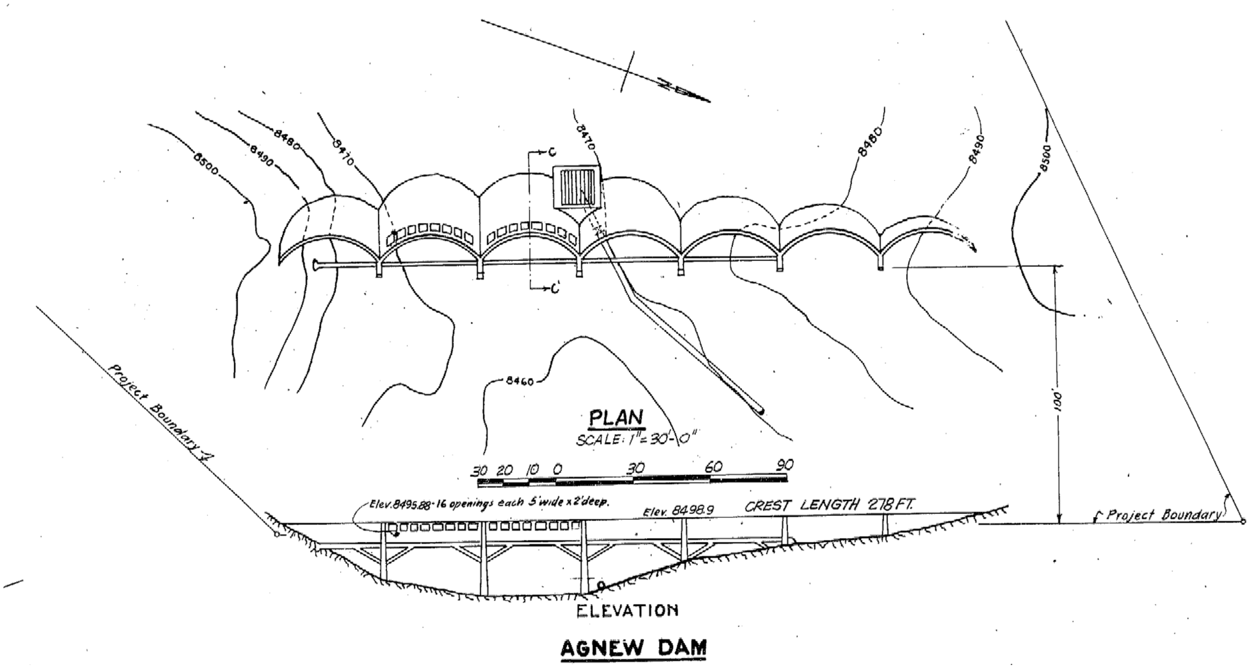


Figure D-7. Exhibit F engineering drawing showing Agnew Dam elevations and 10-foot contours in the vicinity of the dam.

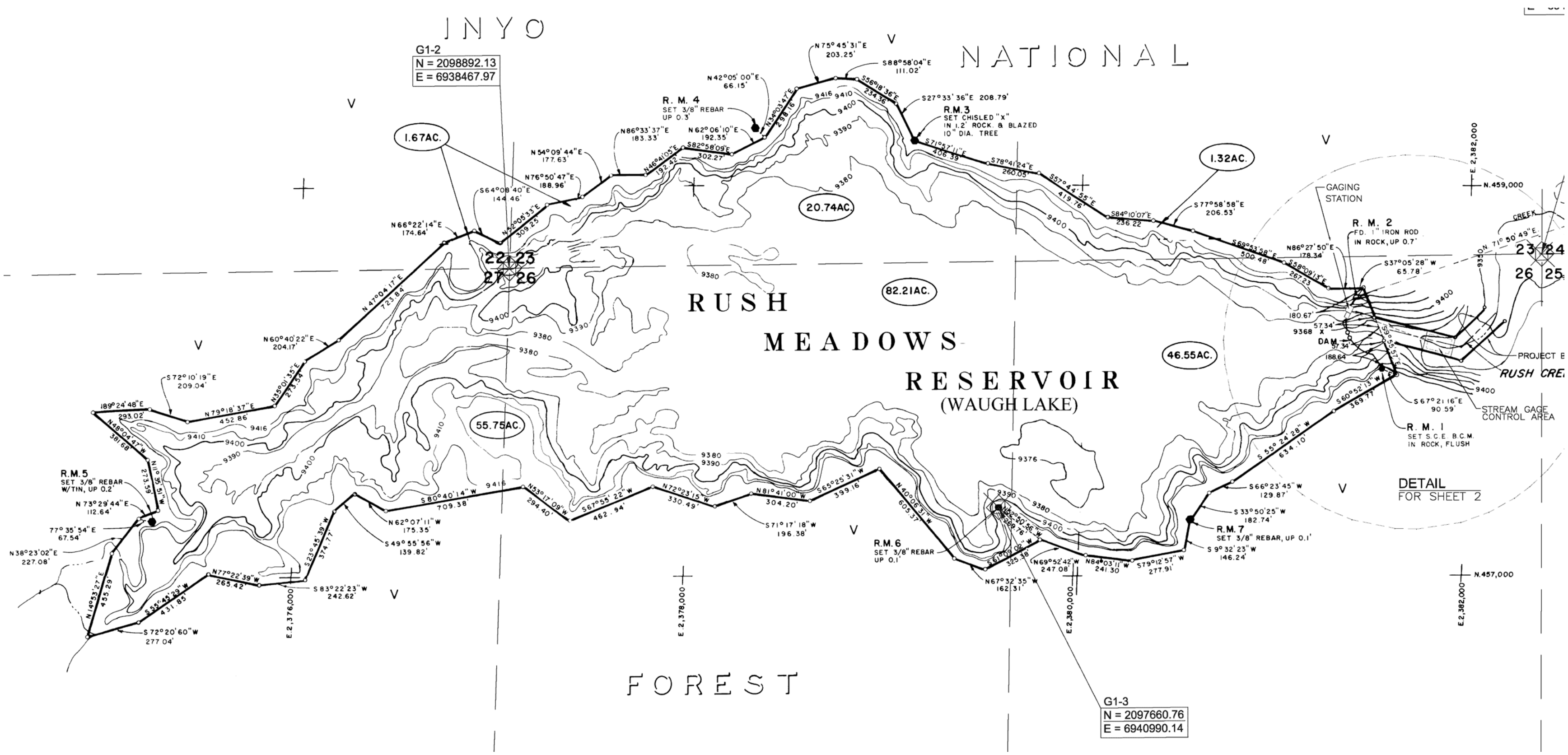


Figure D-8. Exhibit G historical topographic contour map of Rush Meadows digitized and used in the analysis to quantify reservoir sediment accumulation.

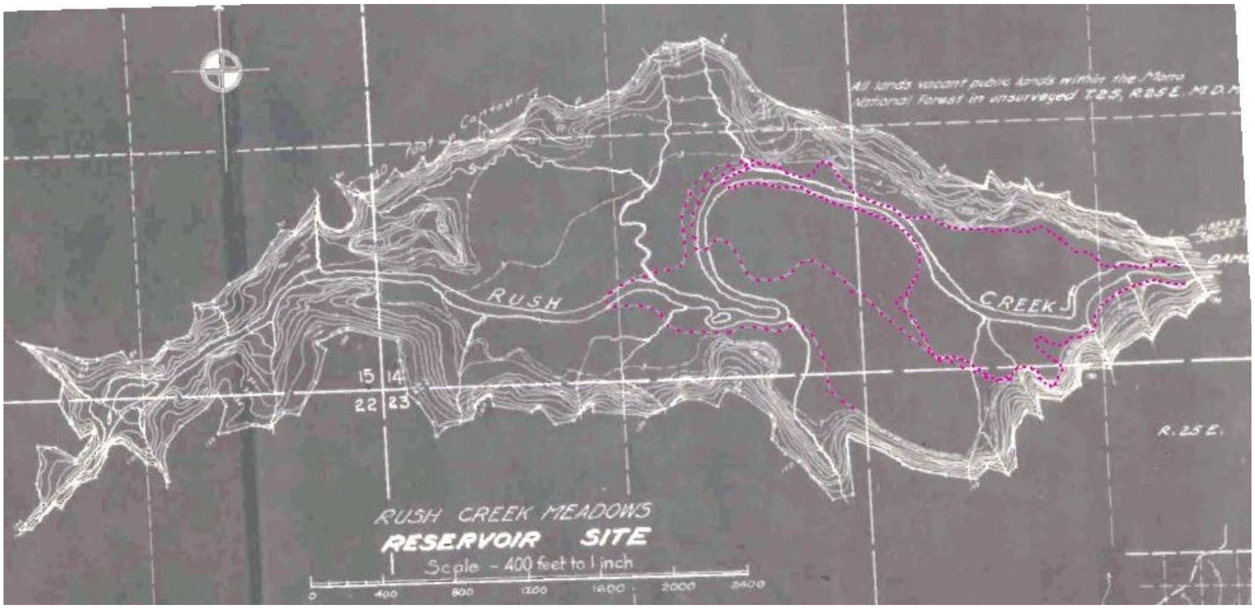


Figure D-9. Image of the 1924 Exhibit J topographic contour Rush Meadows showing contours (magenta) added to the historical DTM surface (based on Exhibit G) and used in the analysis to estimate sediment accumulation in Waugh Lake.

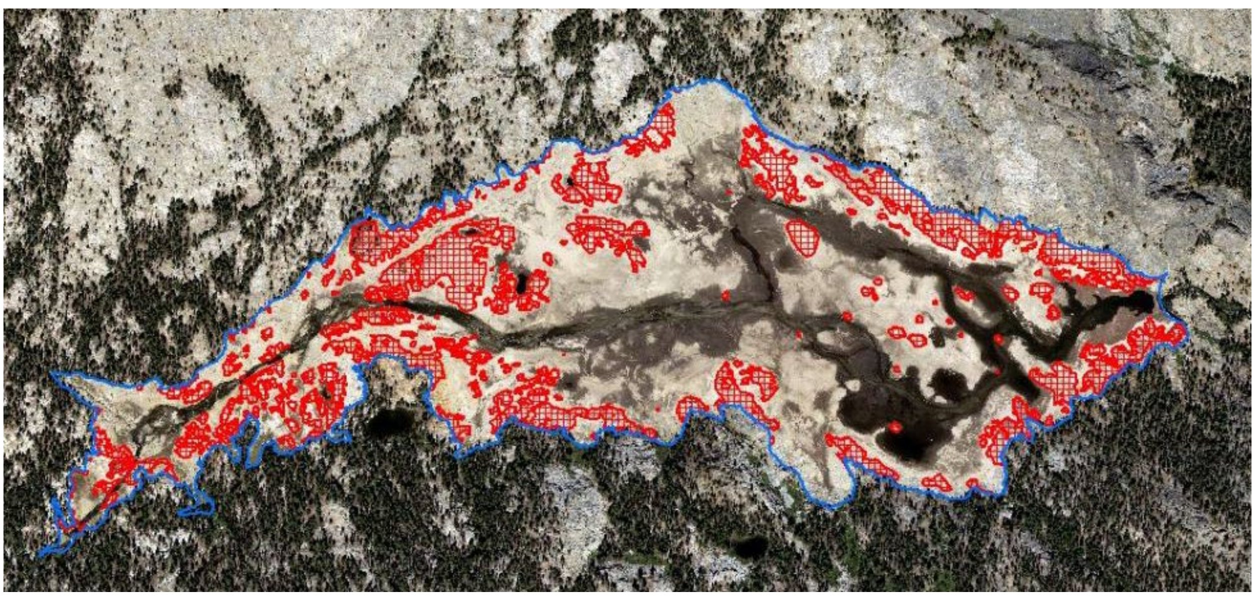
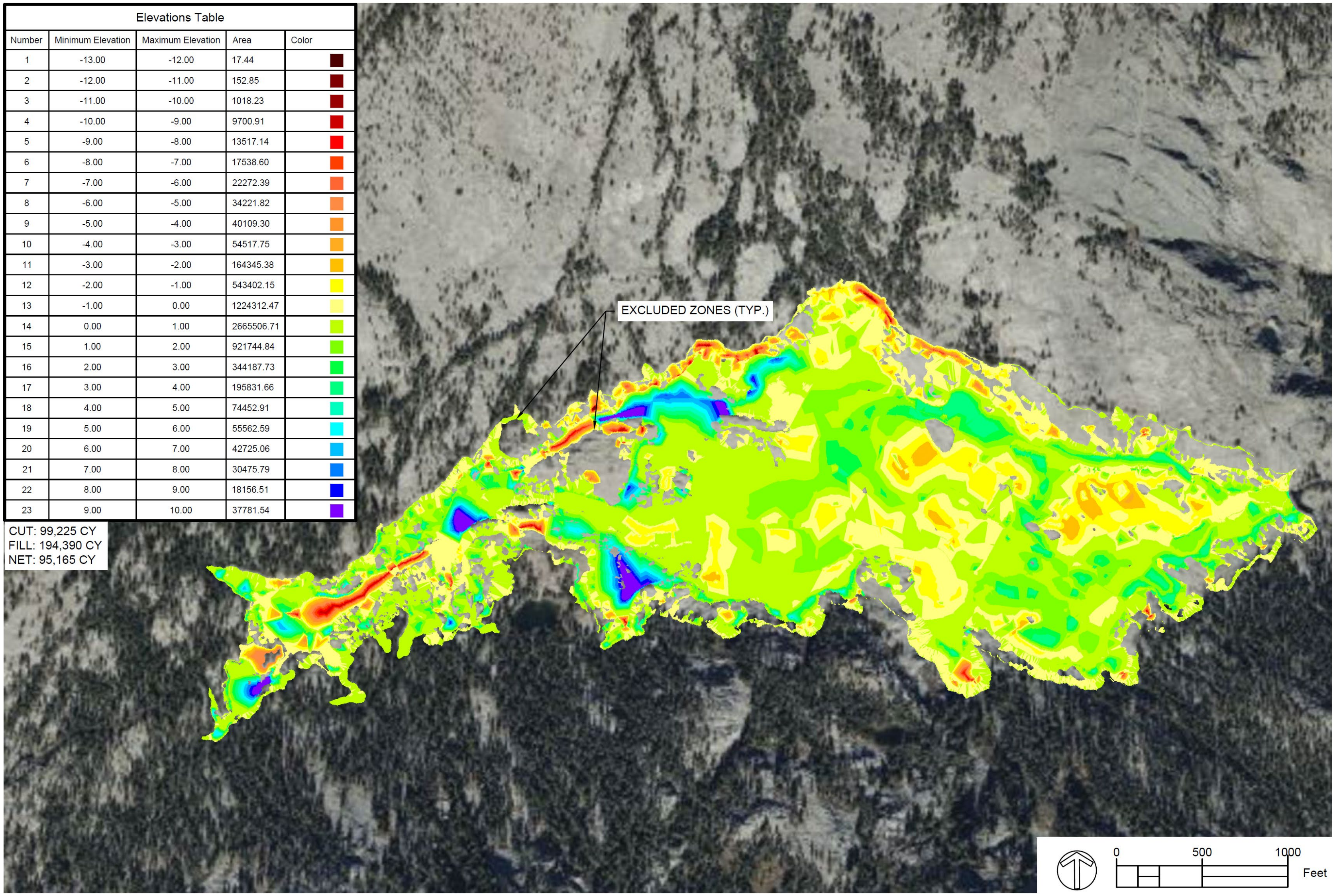


Figure D-10. Cobble-boulder and bedrock areas mapped in 2024 where little to no sediment accumulation was noted. These areas were subsequently removed from the historical comparative analysis to determine fine sediment accumulation.

Figure D-11. Rush Meadows Dam photographs showing the bedrock underlying the dam (top = upstream side of the dam, bottom = downstream side of the dam).



Elevations Table

Number	Minimum Elevation	Maximum Elevation	Area	Color
1	-13.00	-12.00	17.44	
2	-12.00	-11.00	152.85	
3	-11.00	-10.00	1018.23	
4	-10.00	-9.00	9700.91	
5	-9.00	-8.00	13517.14	
6	-8.00	-7.00	17538.60	
7	-7.00	-6.00	22272.39	
8	-6.00	-5.00	34221.82	
9	-5.00	-4.00	40109.30	
10	-4.00	-3.00	54517.75	
11	-3.00	-2.00	164345.38	
12	-2.00	-1.00	543402.15	
13	-1.00	0.00	1224312.47	
14	0.00	1.00	2665506.71	
15	1.00	2.00	921744.84	
16	2.00	3.00	344187.73	
17	3.00	4.00	195831.66	
18	4.00	5.00	74452.91	
19	5.00	6.00	55562.59	
20	6.00	7.00	42725.06	
21	7.00	8.00	30475.79	
22	8.00	9.00	18156.51	
23	9.00	10.00	37781.54	

Figure D-12. Sediment accumulation in Waugh Lake calculated by subtracting the 2024 LiDAR surface from a historical surface based on mid-1900s Exhibits G and J contours and removing exposed bedrock areas (red/yellow = erosion; green/blue = accumulation).

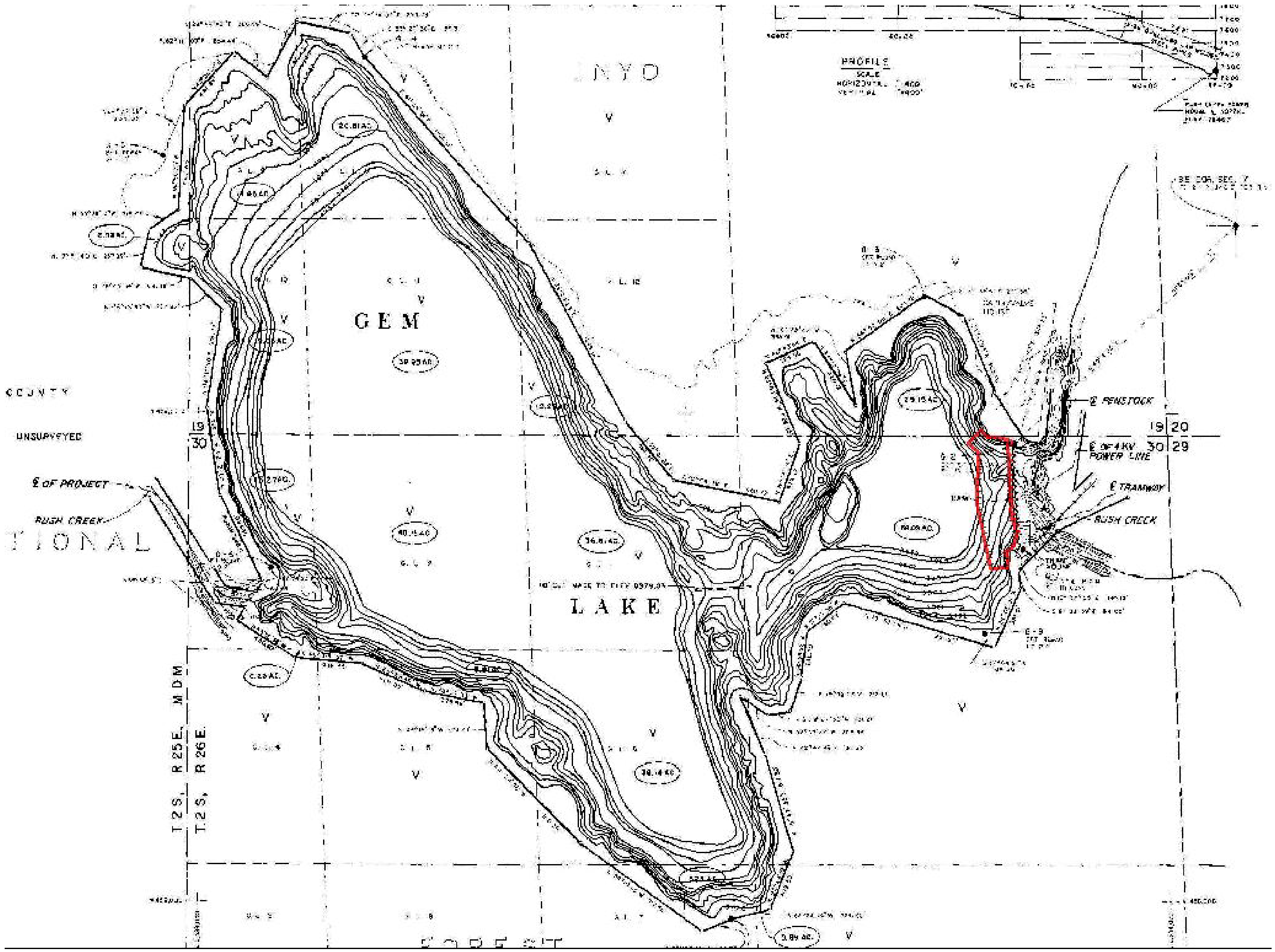


Figure D-13. **Exhibit G historical topographic map of Gem Lake. The contours are less detailed in the vicinity of the dam (red outline) compared to the Exhibit F engineering drawing (Figure D-5) used in the analysis to quantify reservoir sediment accumulation.**

Figure D-14. Gem Dam photographs showing the bedrock ridge underlying the dam (top = upstream side of the dam, bottom = downstream side of the dam).

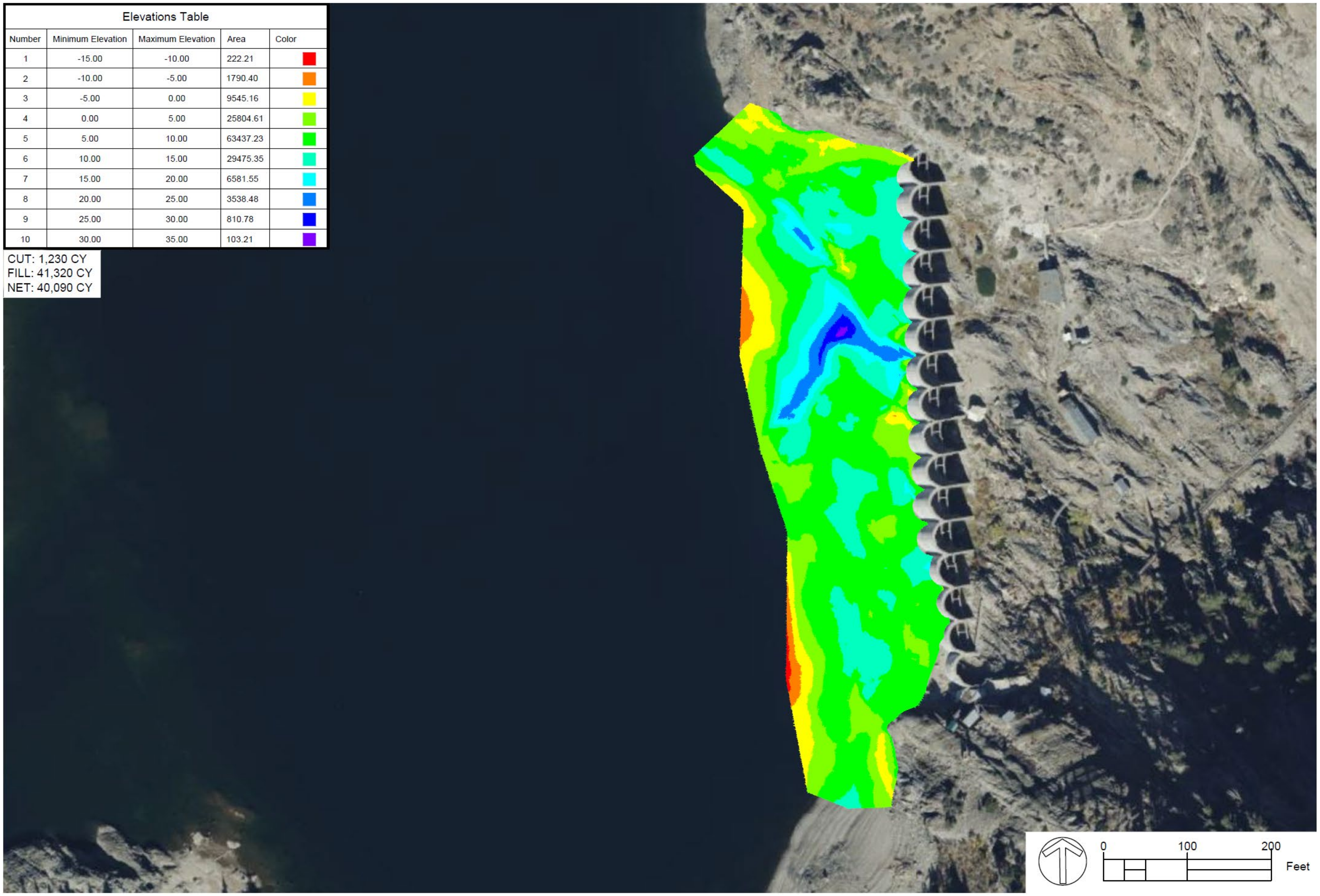


Figure D-15. Sediment accumulation near Gem Dam calculated by subtracting the 2024 surface from a mid-1900s Exhibit F historical contour based surface clipped to the re-regulated reservoir elavation of 9,027.5 feet MSL.

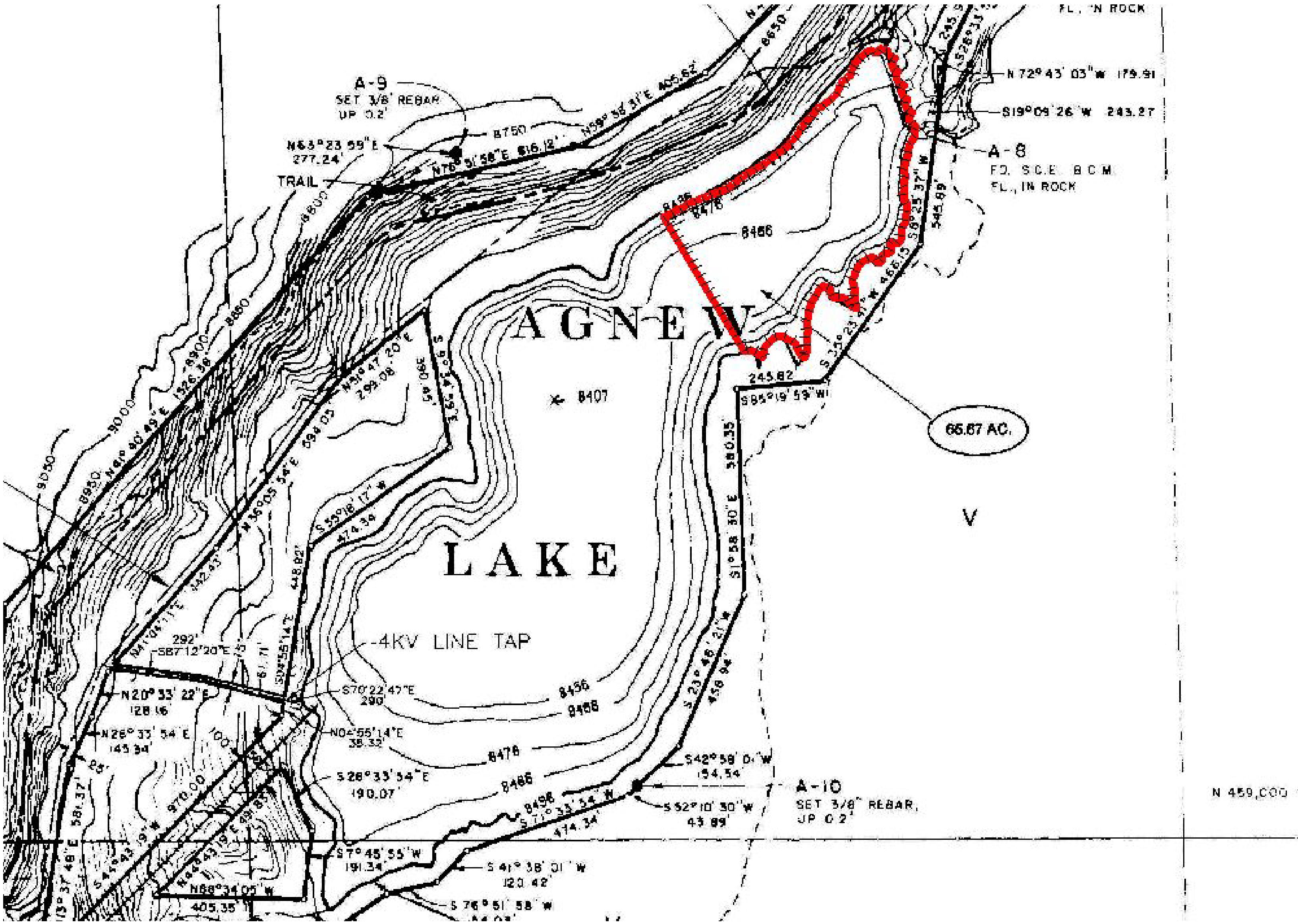


Figure D-16. Exhibit G historical topographic map of Agnew Lake digitized and used in the analysis to quantify reservoir sediment accumulation. Area of analysis is shown in red.

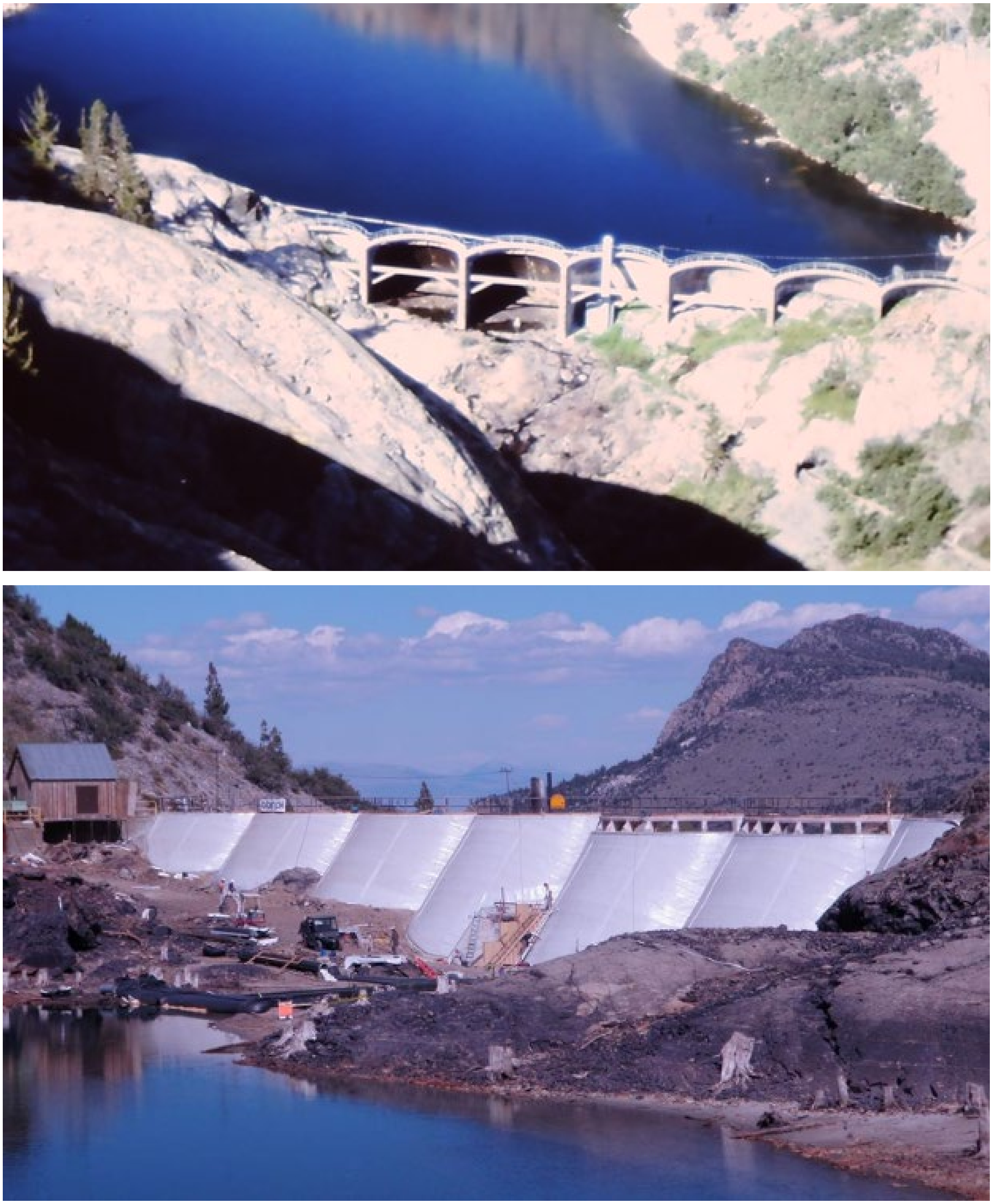


Figure D-17. Agnew Dam photographs showing the bedrock underlying the dam (top = upstream side of the dam, bottom = downstream side of the dam).

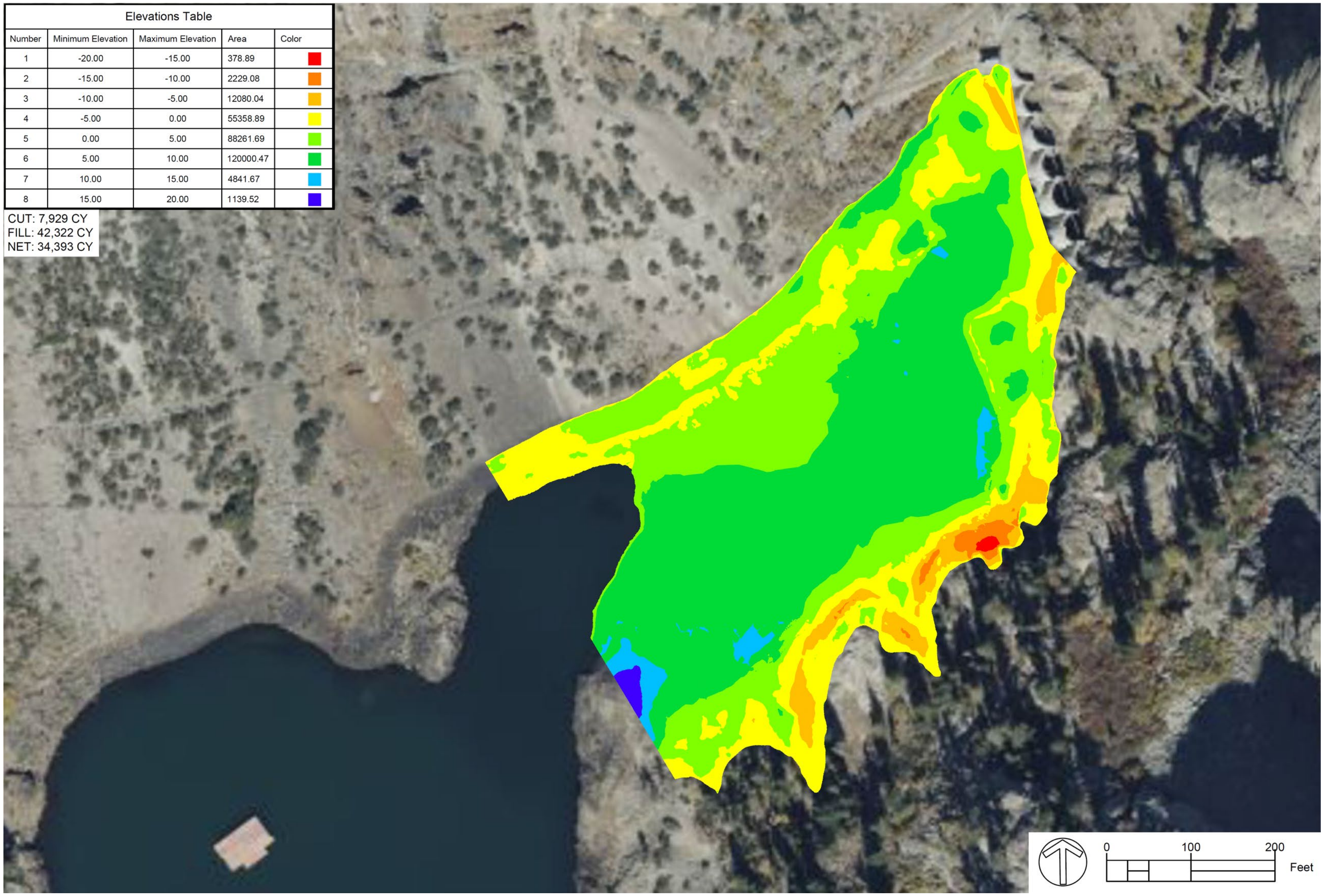


Figure D-18. **Sediment accumulation near Agnew Dam calculated by subtracting the 2024 LiDAR and 2017 bathymetric surface from a mid-1900s Exhibit G historical coontour based surface clipped to the 8,470 feet MSL.**

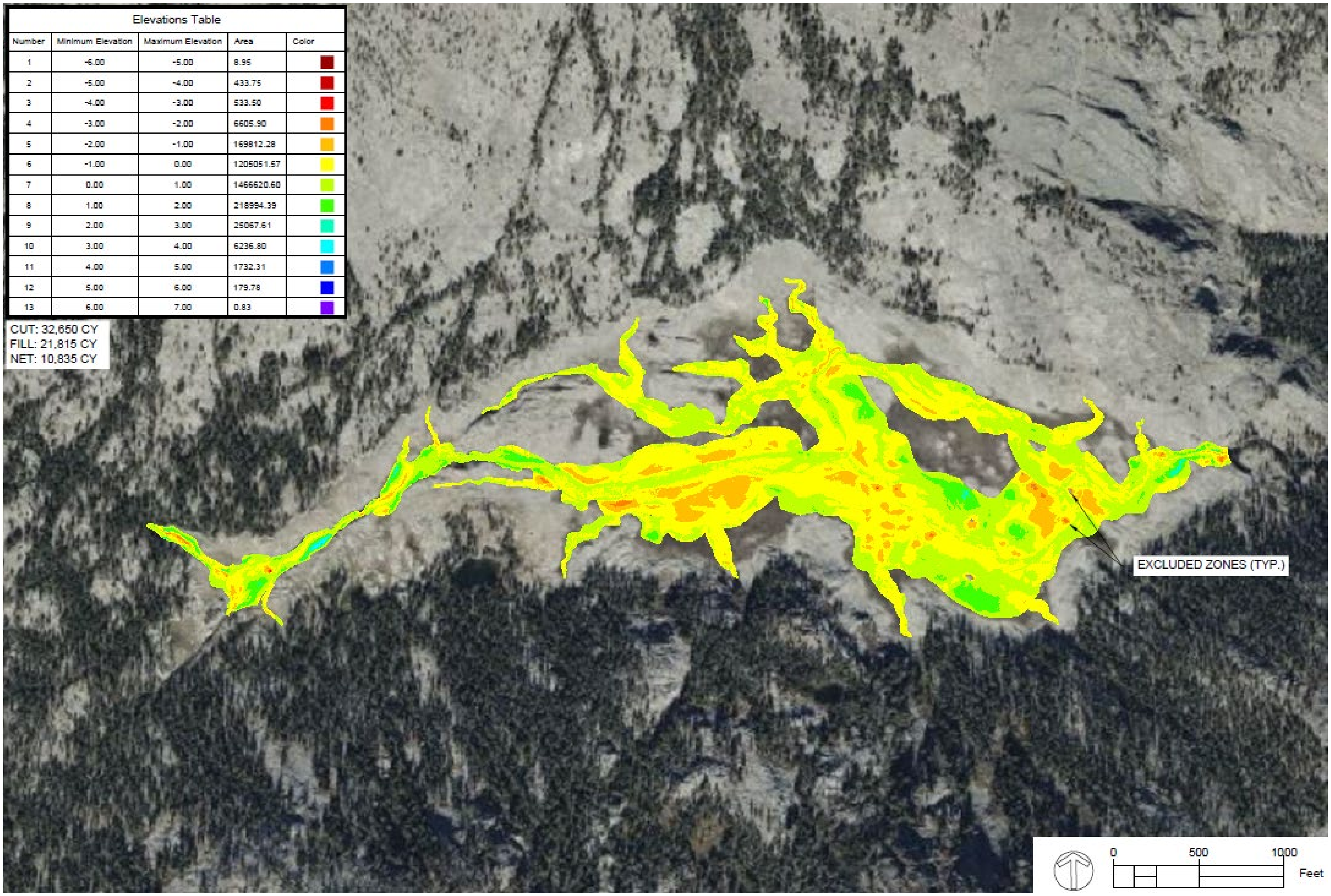
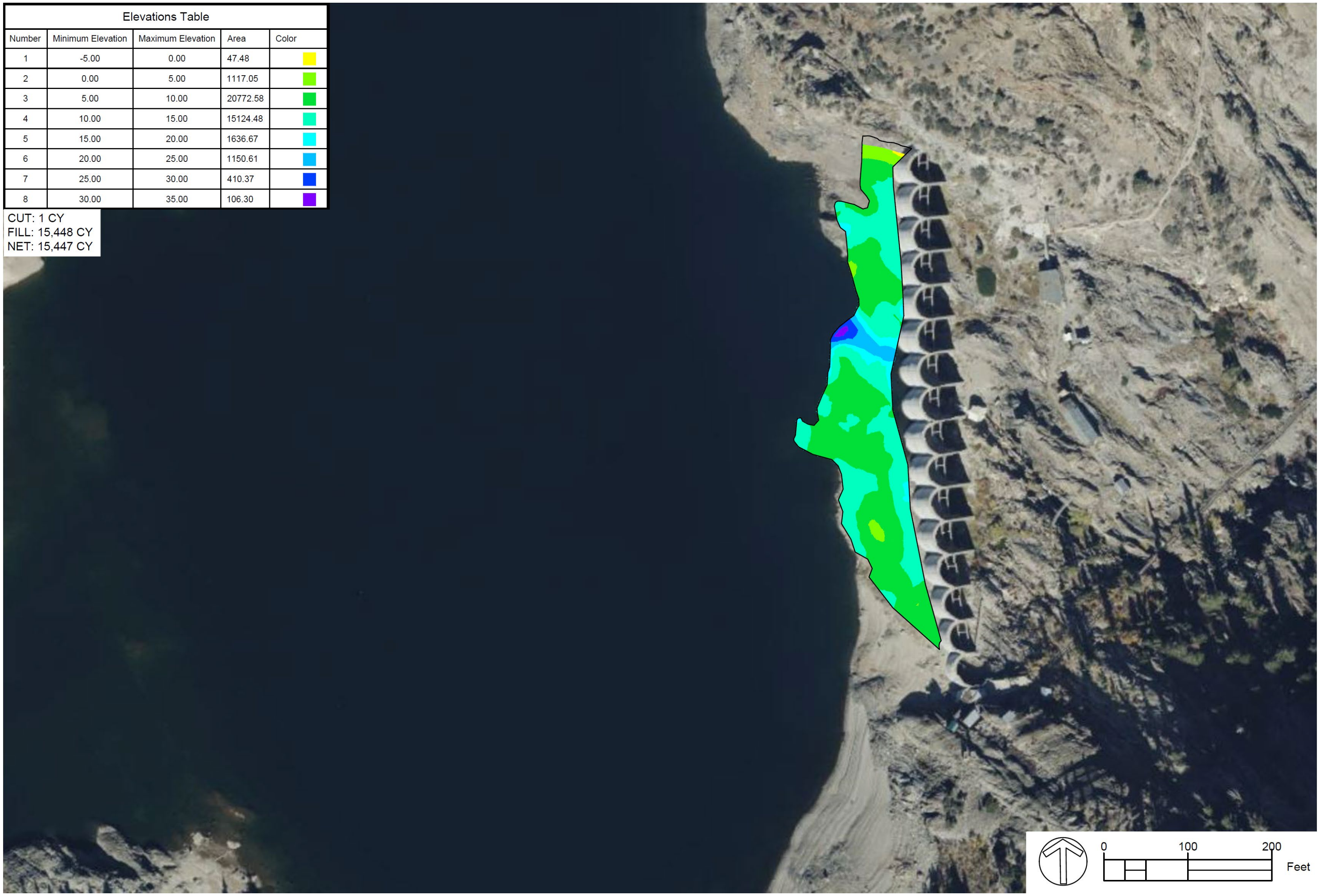


Figure D-19. The Waugh Lake sediment that could potentially be mobilized downstream with removal of Rush Meadows Dam (based on analysis of historic sediment accumulation).



Number	Minimum Elevation	Maximum Elevation	Area	Color
1	-5.00	0.00	47.48	
2	0.00	5.00	1117.05	
3	5.00	10.00	20772.58	
4	10.00	15.00	15124.48	
5	15.00	20.00	1636.67	
6	20.00	25.00	1150.61	
7	25.00	30.00	410.37	
8	30.00	35.00	106.30	

Figure D-20. Gem Lake sediment that could potentially be mobilized downstream with removal of Gem Dam (based on analysis of historic sediment accumulation).

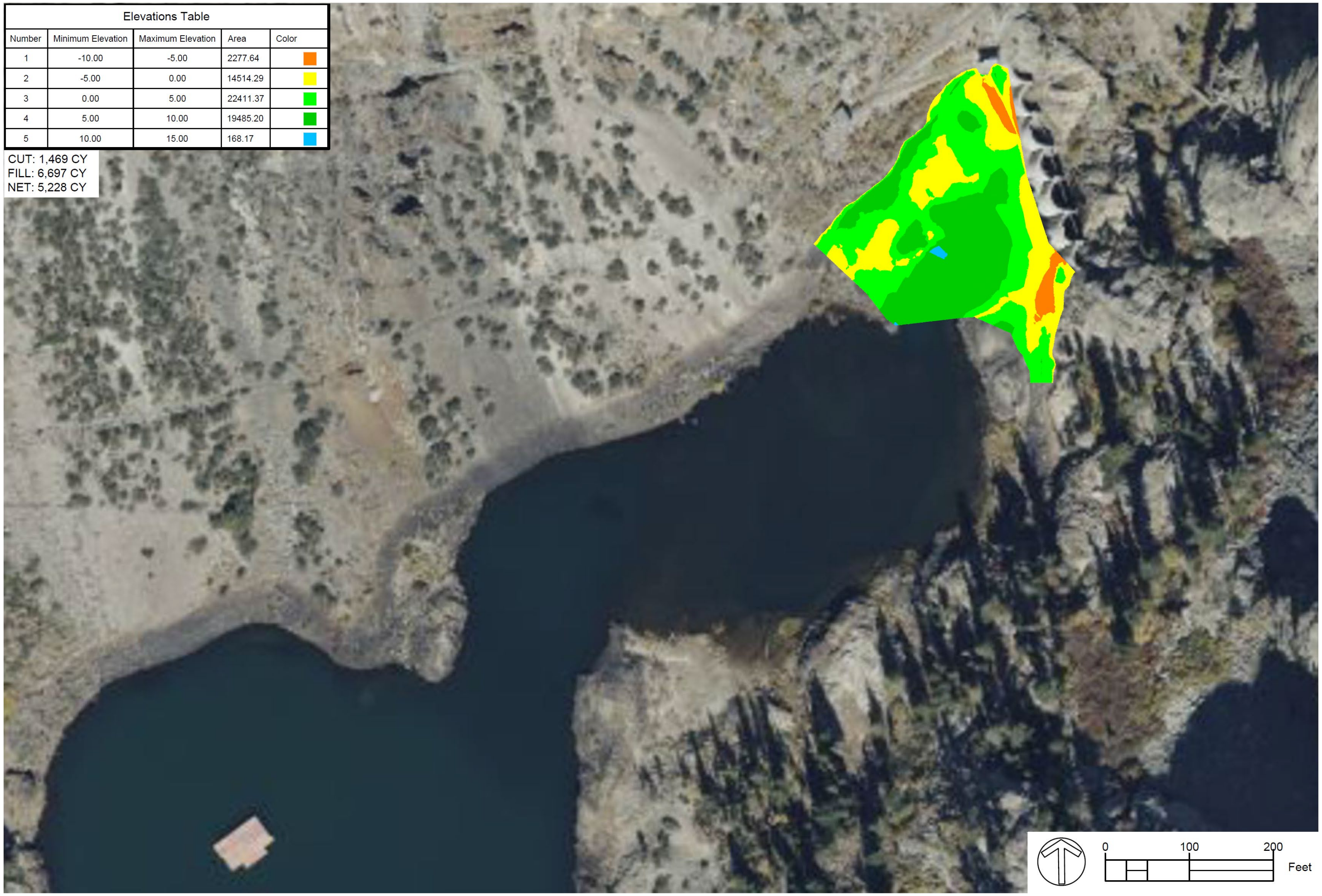
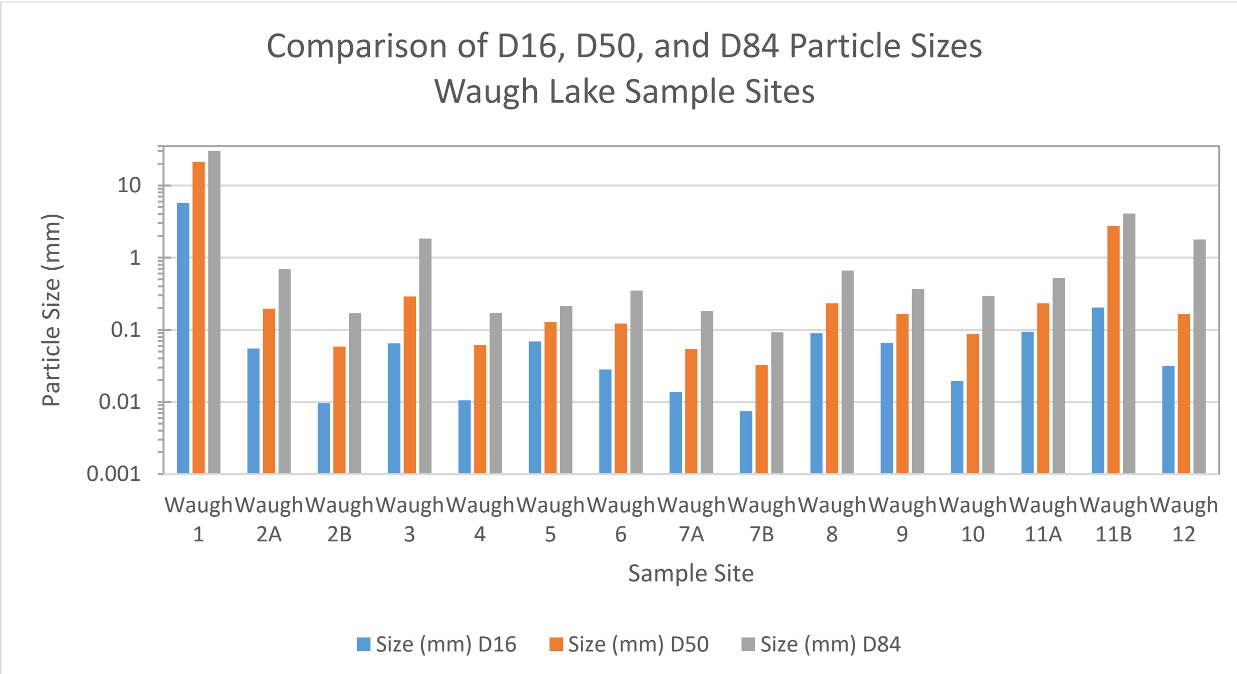


Figure D-21. Agnew Lake sediment that could potentially be mobilized downstream with removal of Agnew Dam (based on analysis of historic sediment accumulation).



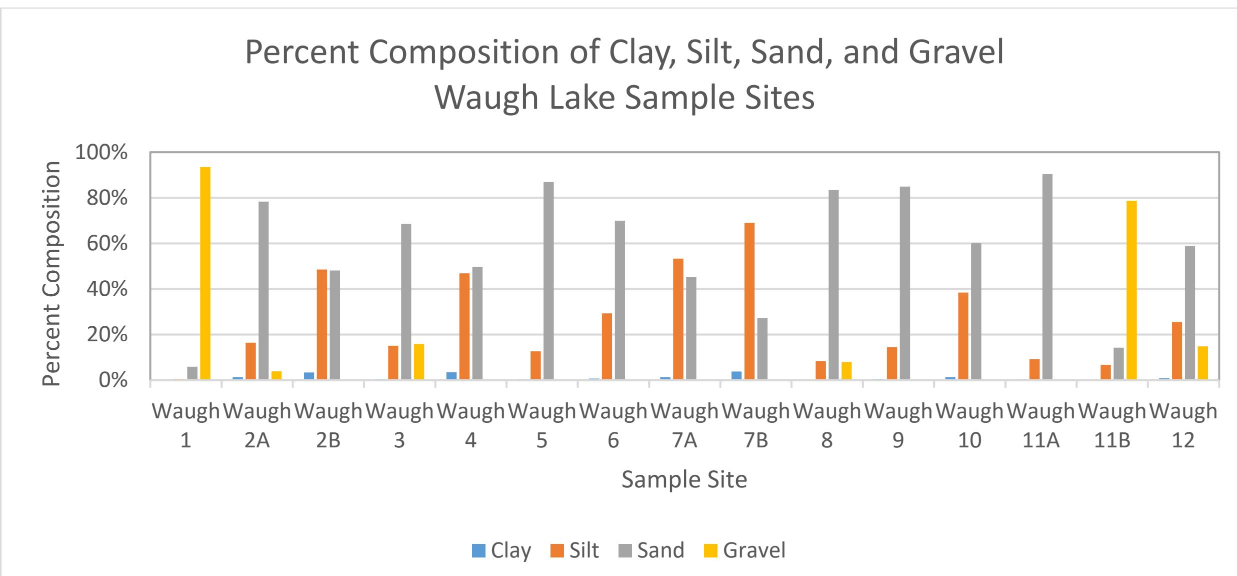
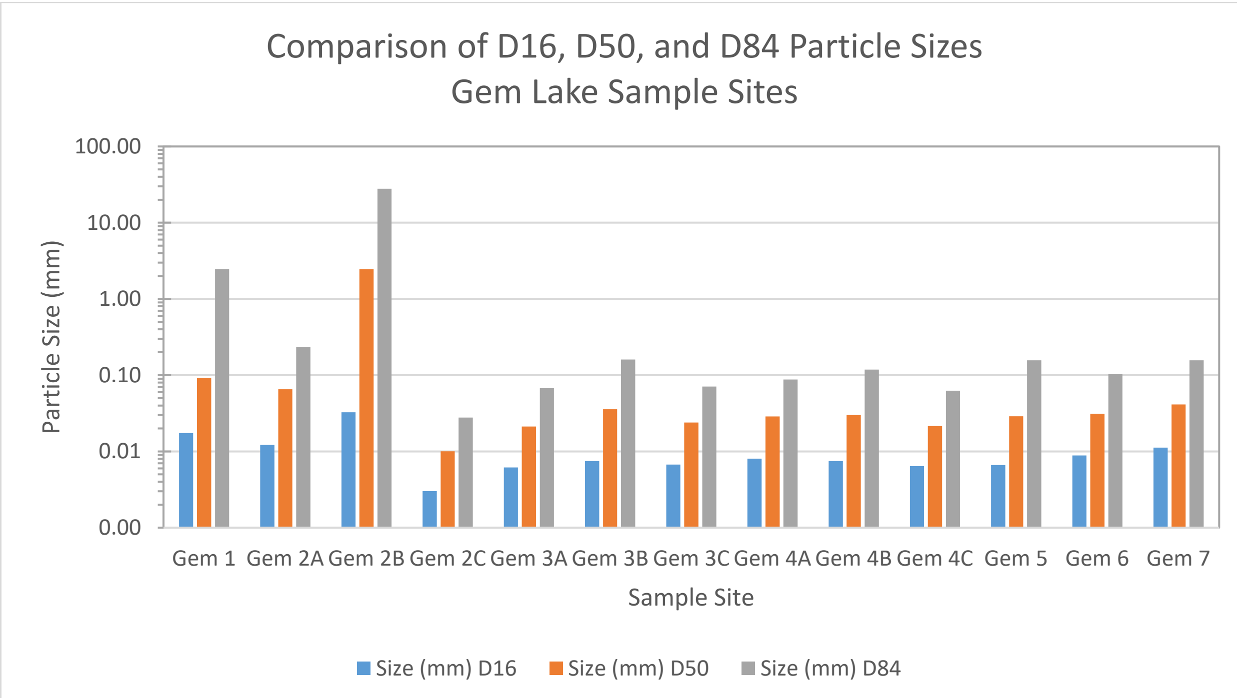


Figure D-22. Waugh Lake particle size analysis.



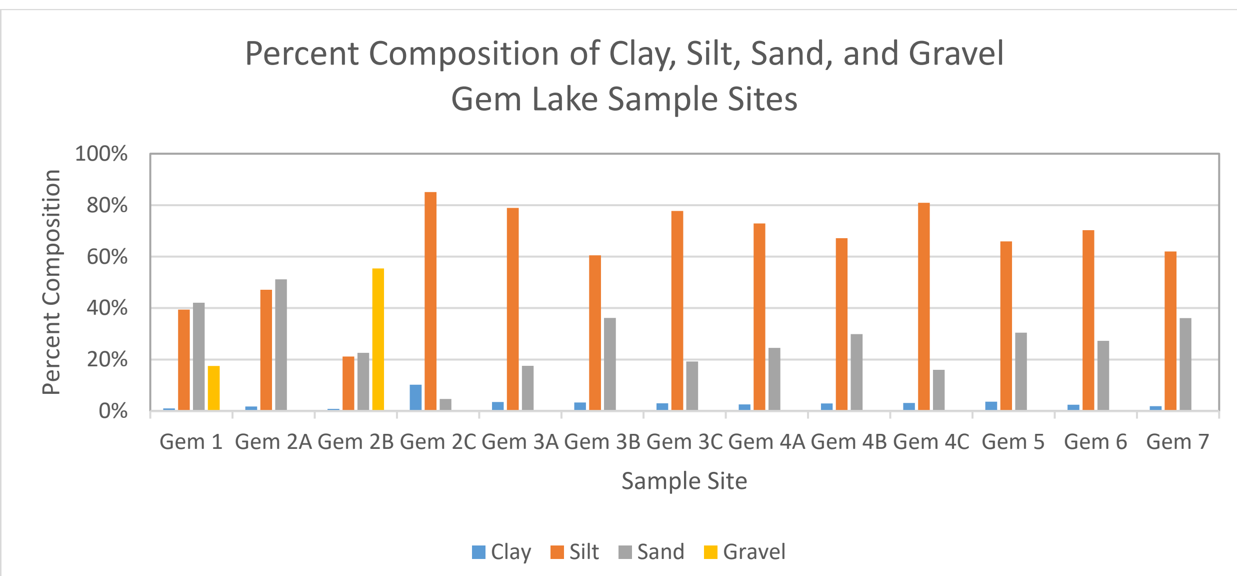
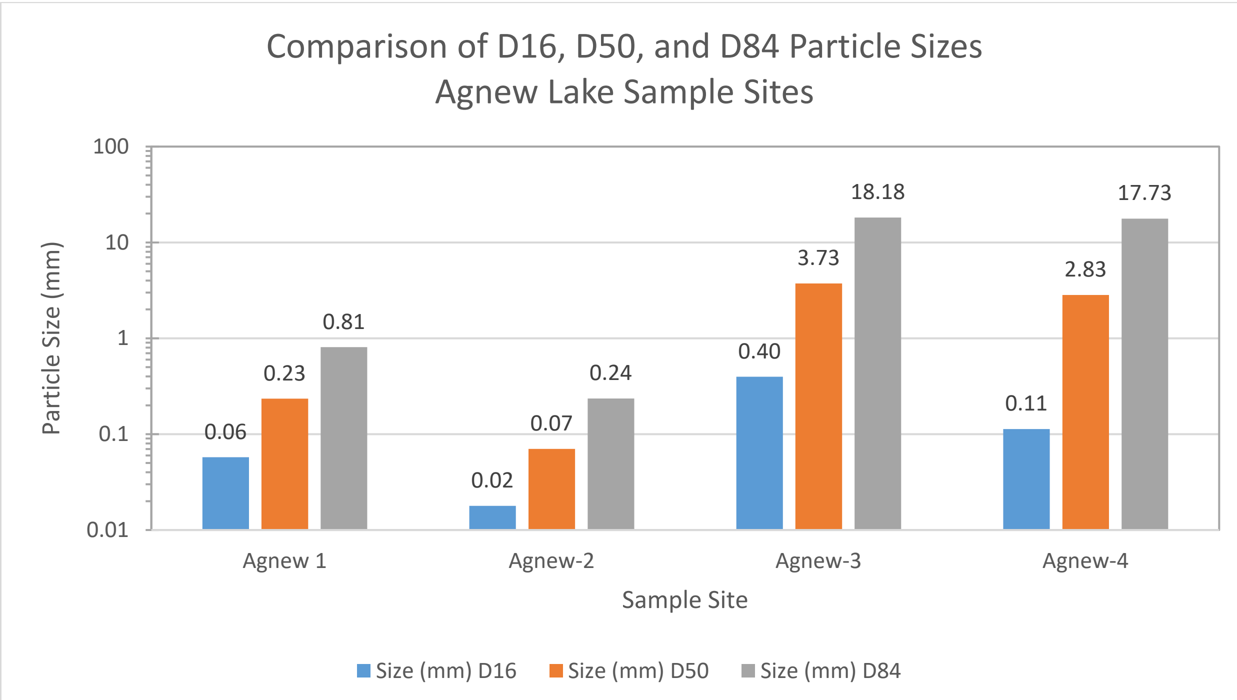


Figure D-23. Gem Lake particle size analysis.



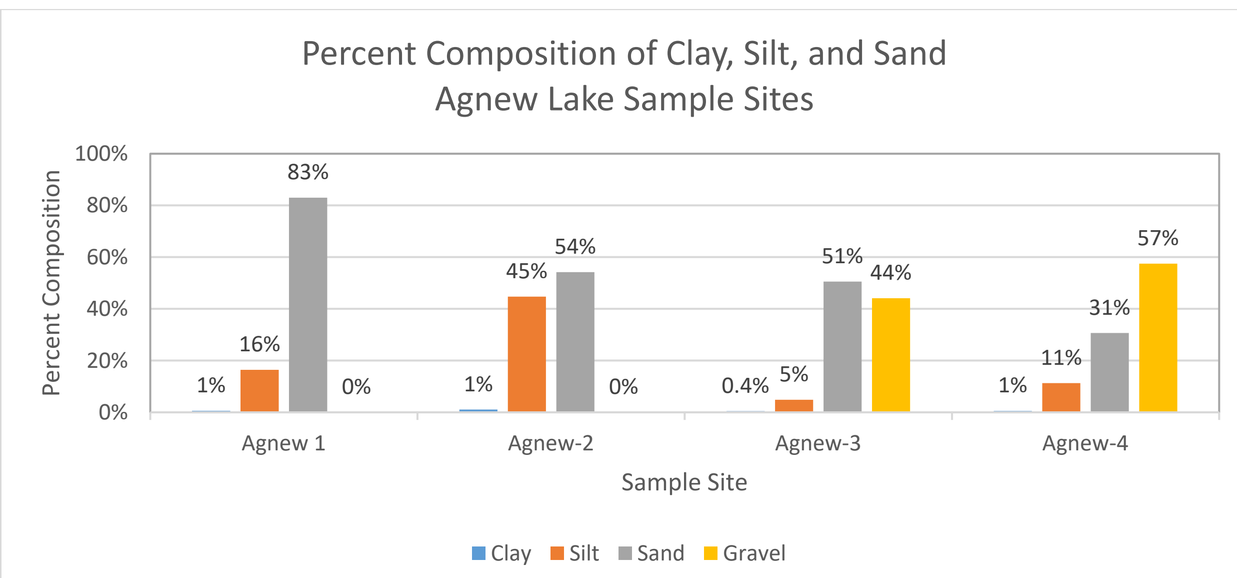


Figure D-24. Agnew Lake particle size analysis.

MAPS

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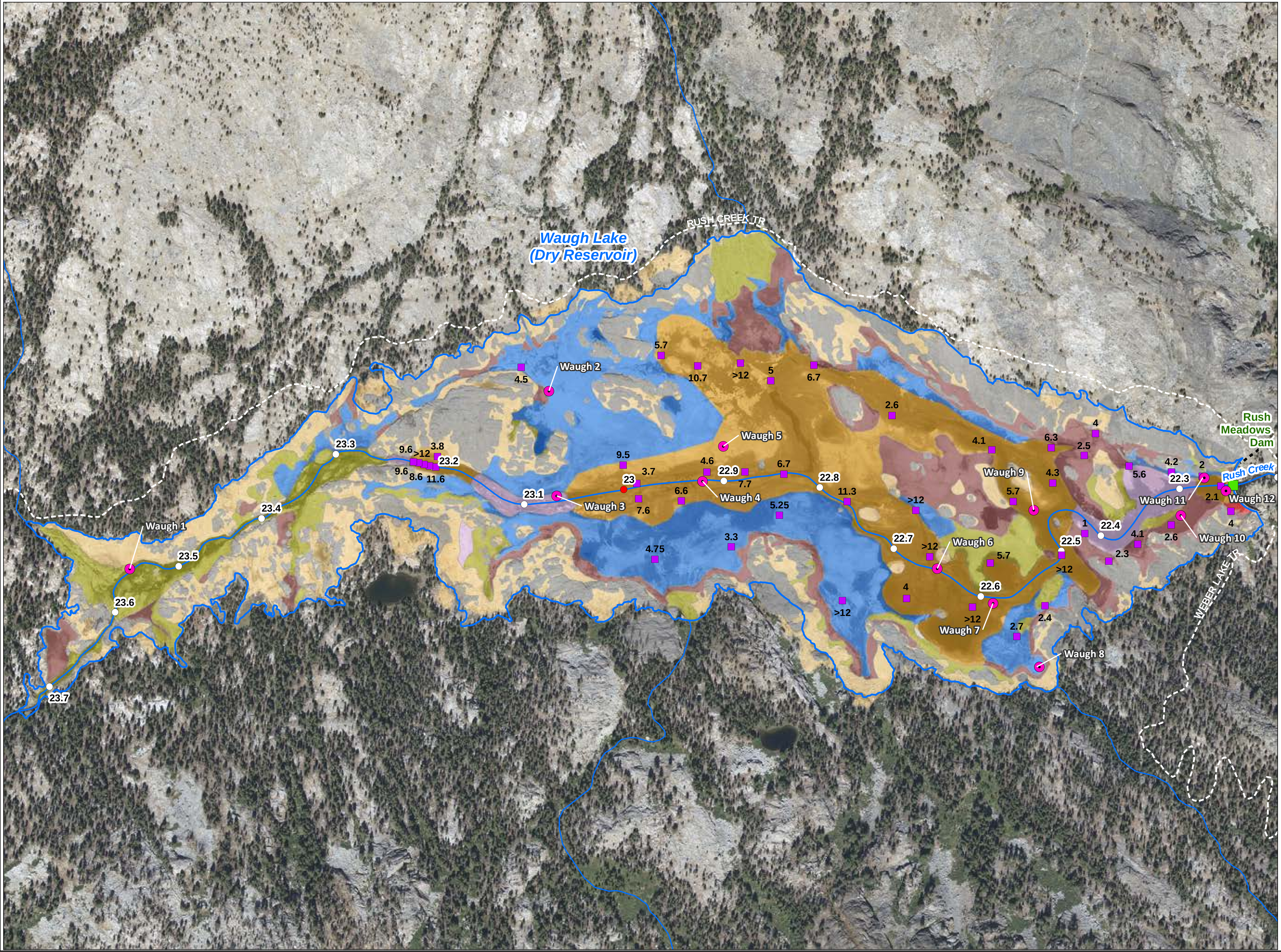


SCE Facilities

Powerhouse
Dam

Other Features

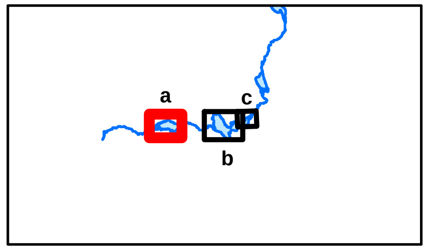
Watercourse
Water Body
Non-Project Trail
River Mile / 10th Mile

Study Sites and Types

Sediment Sampling Location
Sediment Thickness (ft)

Facies

bedrock
cobbley and bouldery bedrock
bouldery and cobbley gravel
bouldery and cobbley sand
gravelly and silty sand
silty and gravelly sand
silty sand
woody debris



SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

Rush Creek Project (FERC 1389)

Map D - 1A
Particle Size Gradation and Facies Map

0 125 250 Feet

Date: 1/20/2025

Projection: UTM Zone 11
Datum: NAD 83

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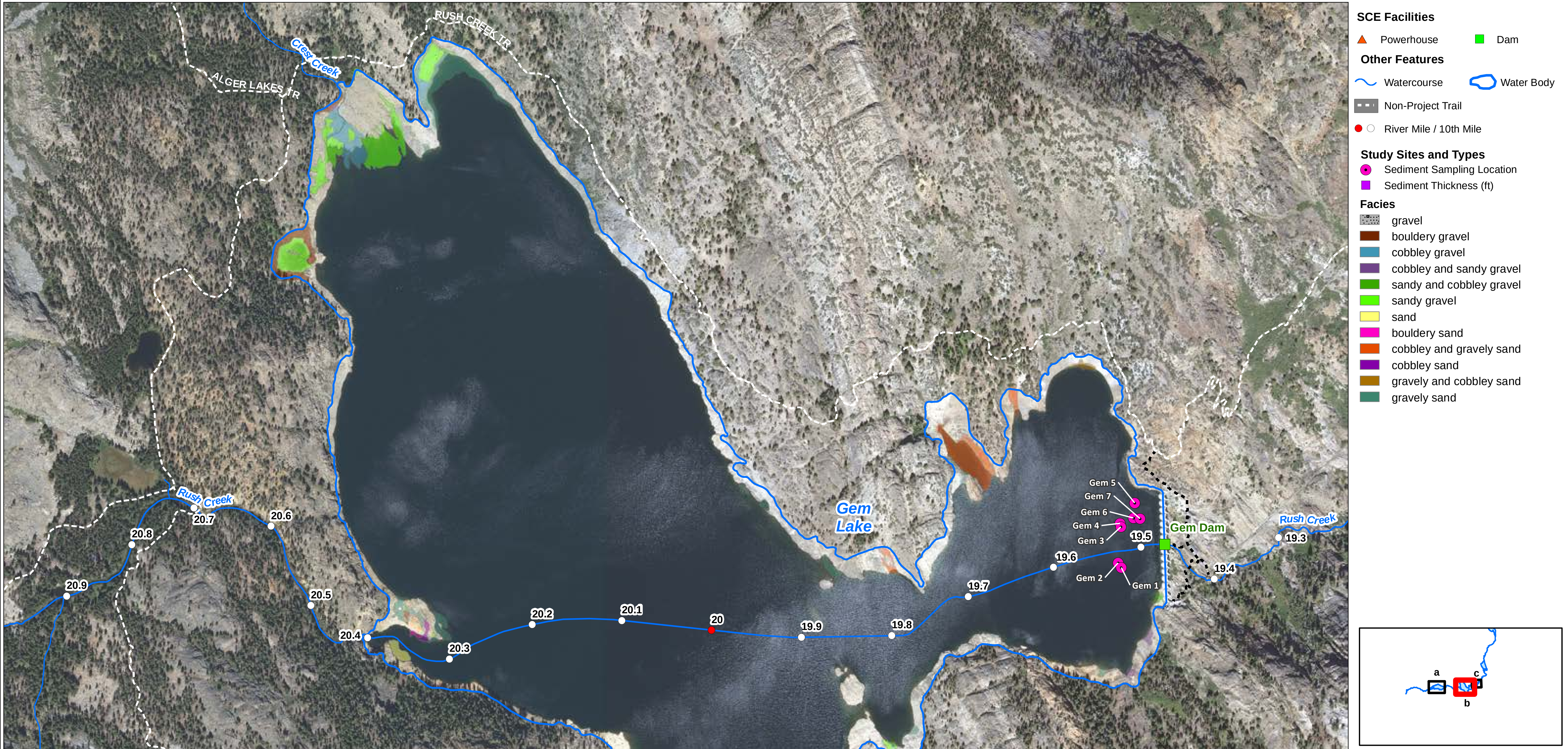

Rush Creek Project (FERC 1389)

Map D - 1B
Particle Size Gradation and Facies Map

0 125 250 Feet

Date: 1/17/2025

Projection: UTM Zone 11
Datum: NAD 83

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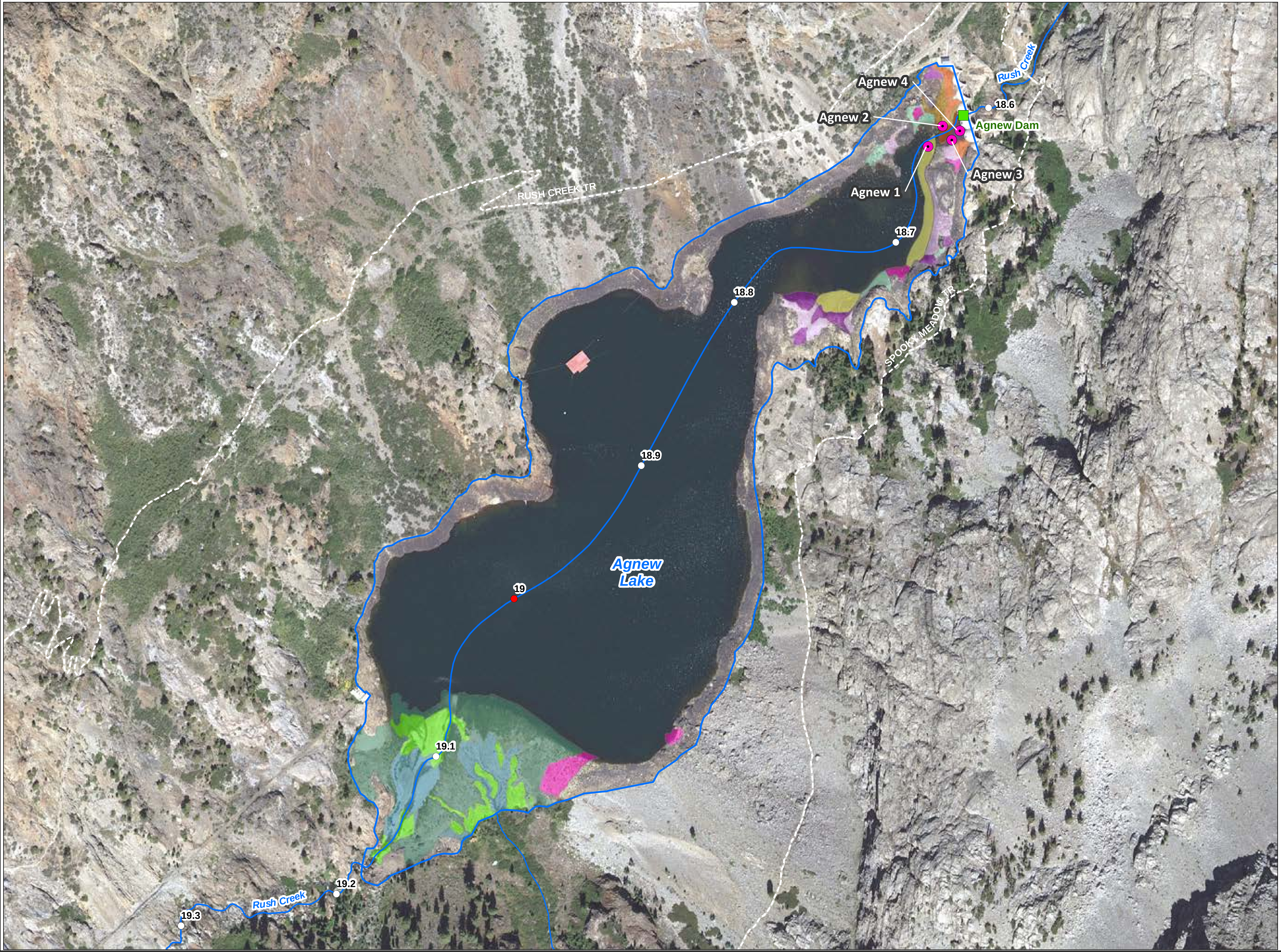


SCE Facilities

- Powerhouse
- Dam

Other Features

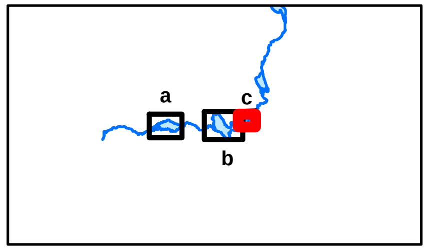
- Watercourse
- Water Body
- Non-Project Trail
- River Mile / 10th Mile

Study Sites and Types

- Sediment Sampling Location
- Sediment Thickness (ft)

Facies

- cobbley gravel
- cobbley and sandy gravel
- sandy gravel
- sand
- bouldery and cobbley sand
- bouldery and gravely sand
- bouldery sand
- cobbley and bouldery sand
- cobbley and gravely sand
- cobbley sand
- gravely and cobbley sand
- gravely sand



SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL Company

Rush Creek Project (FERC 1389)

Map D - 1C
Particle Size Gradation and Facies Map

0 125 250 Feet

Date: 1/17/2025

Projection: UTM Zone 11
Datum: NAD 83

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SCE Facilities

Powerhouse

Dam

Other Features

Watercourse

Water Body

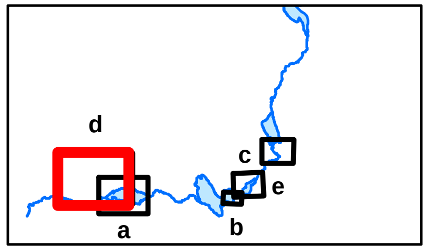
Non-Project Trail

River Mile / 10th Mile

Study Sites and Types

Contaminant & Particle Size

Particle Size



SOUTHERN CALIFORNIA EDISON
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Rush Creek Project (FERC 1389)

Map D - 2A
Sediment Sampling Locations

0 125 250 500 750 Feet

Date: 1/17/2025

Projection: UTM Zone 11
Datum: NAD 83

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SOUTHERN CALIFORNIA EDISON
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Rush Creek Project (FERC 1389)

Map D - 2B
Sediment Sampling Locations

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SCE Facilities

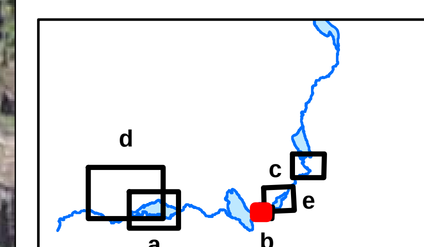
Powerhouse
Dam

Other Features

Watercourse
Water Body
Non-Project Trail
River Mile / 10th Mile

Study Sites and Types

Contaminant & Particle Size
Particle Size



SOUTHERN CALIFORNIA EDISON
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Rush Creek Project (FERC 1389)

Map D - 2C
Sediment Sampling Locations

0 25 50 100 Feet

Date: 1/17/2025

Projection: UTM Zone 11
Datum: NAD 83

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SCE Facilities

Powerhouse   Dam

Other Features

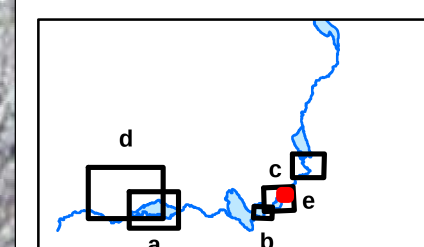
Watercourse   Water Body

Non-Project Trail

River Mile / 10th Mile

Study Sites and Types

Contaminant & Particle Size



SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL Company

Rush Creek Project (FERC 1389)

Map D - 2D
Sediment Sampling Locations

0 25 50 Feet

Date: 1/17/2025

Projection: UTM Zone 11
Datum: NAD 83

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SCE Facilities

Powerhouse　Dam

Other Features

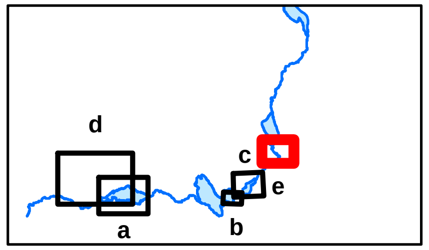
Watercourse　Water Body

Non-Project Trail

River Mile / 10th Mile

Study Sites and Types

Contaminant & Particle Size



SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL® Company

Rush Creek Project (FERC 1389)

Map D - 2E
Sediment Sampling Locations

Date: 1/17/2025

0 50 100 200 300 Feet

Projection: UTM Zone 11
Datum: NAD 83

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ATTACHMENT A

Reservoir Sediment Sampling Particle Size Distribution Curves and Size Class Histograms

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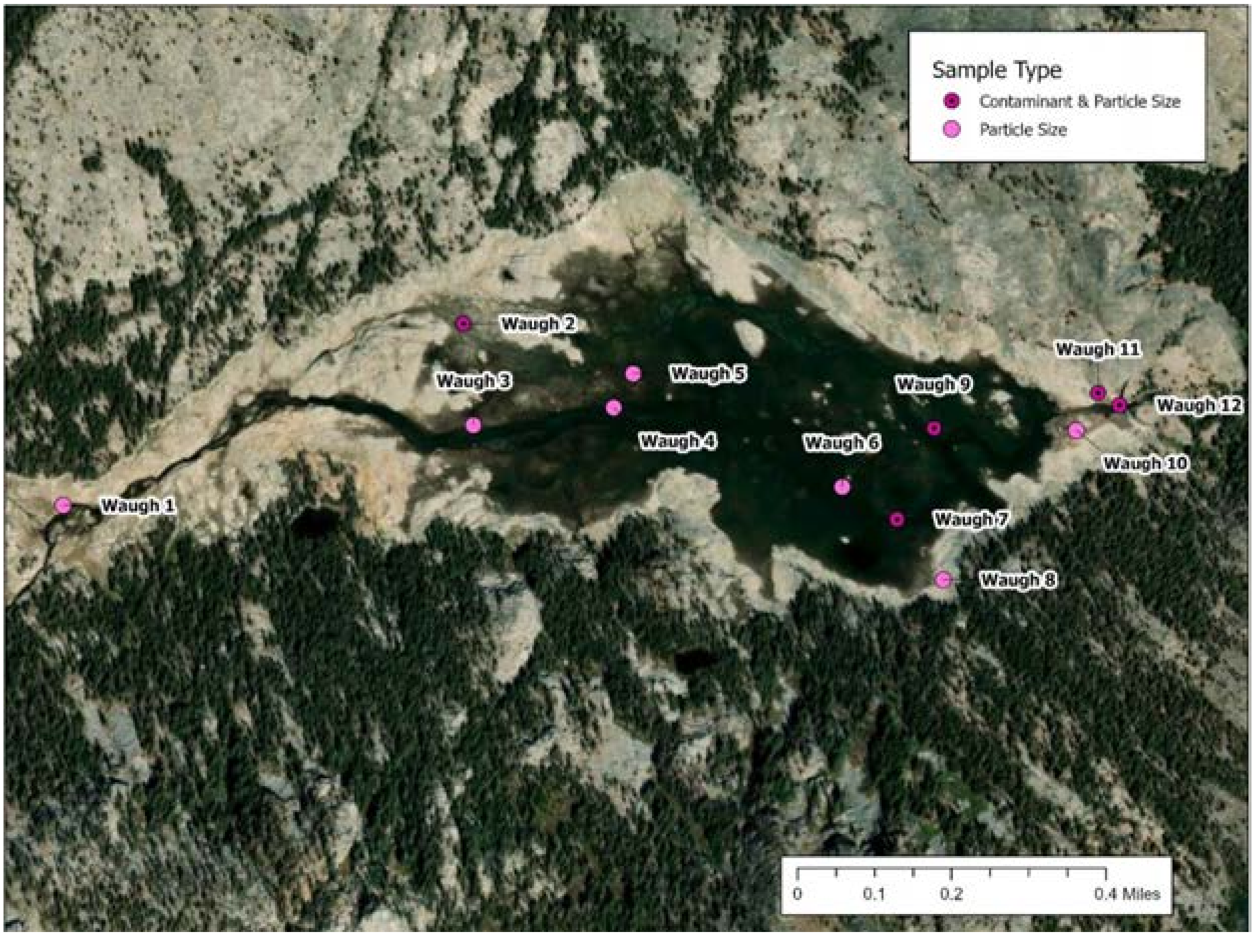


Map A-1. Waugh Lake Sediment Particle Size Sample Locations (Sites)

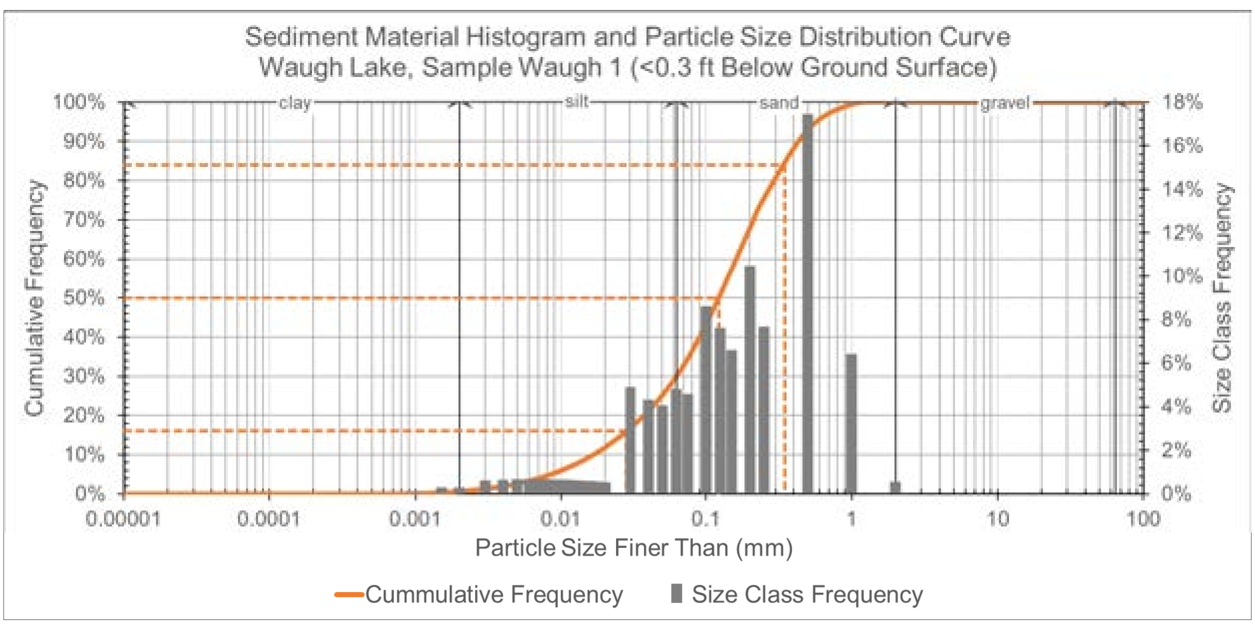


Figure A-1. Waugh 1 Sediment Sample Histogram and Particle Size Distribution Curve for Waugh Lake

Photo A-1. Waugh 1 Sediment Sample Collected in the upstream, higher gradient, portion of channel with a stainless-steel shovel

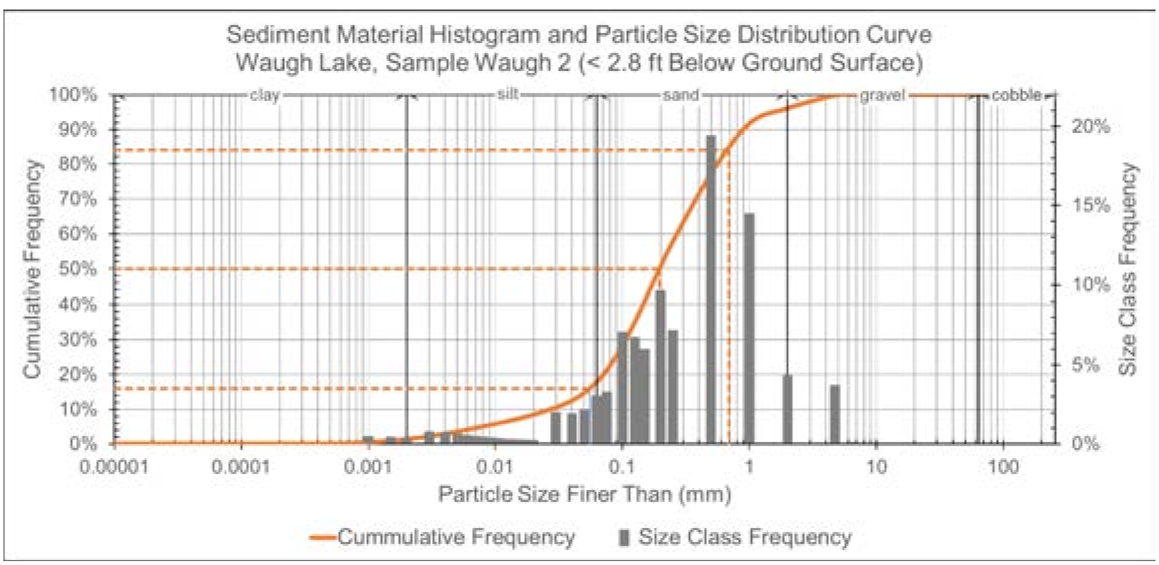


Figure A-2. Waugh 2A Sediment Sample Histogram and Particle Size Distribution Curve for Waugh Lake

Photo A-2. Waugh 2 Sediment Sample Collected in Waugh Lake Bed with a shovel, photo looking towards Waugh Dam

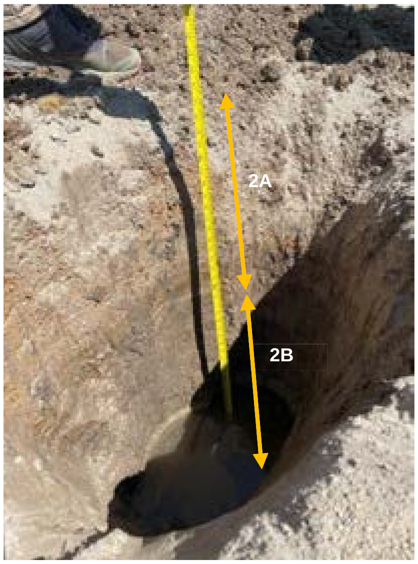


Photo A-3. Waugh 2 Sediment Sample

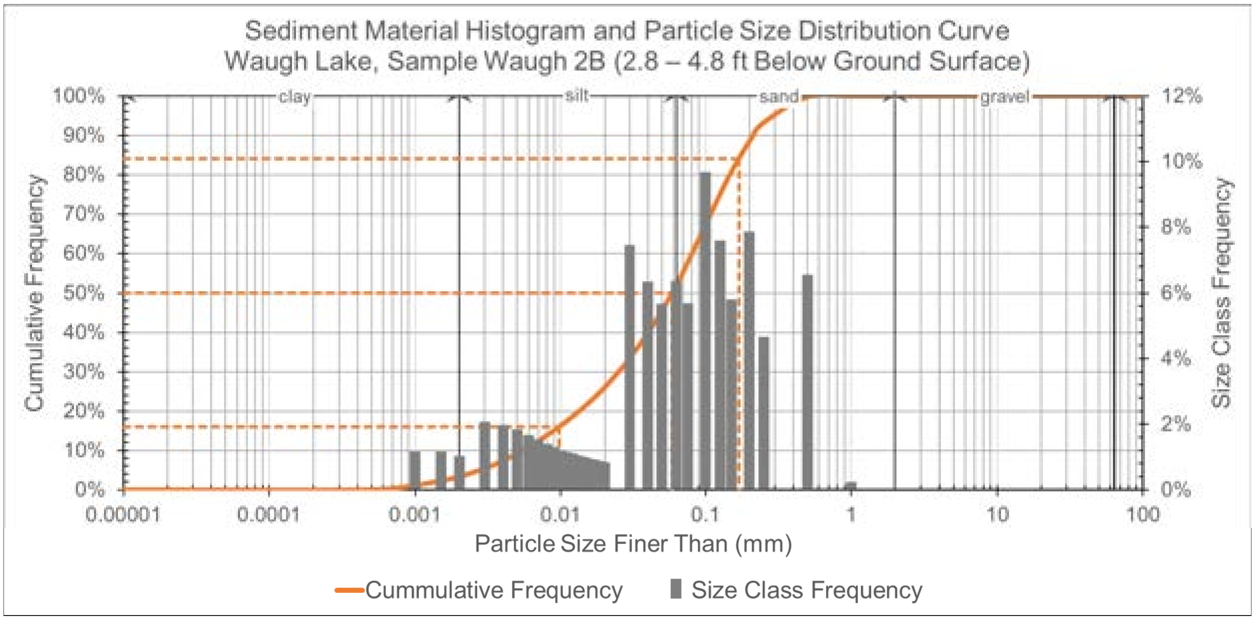


Figure A-3. Waugh 2B Sediment Sample Histogram and Particle Size Distribution Curve for Waugh Lake

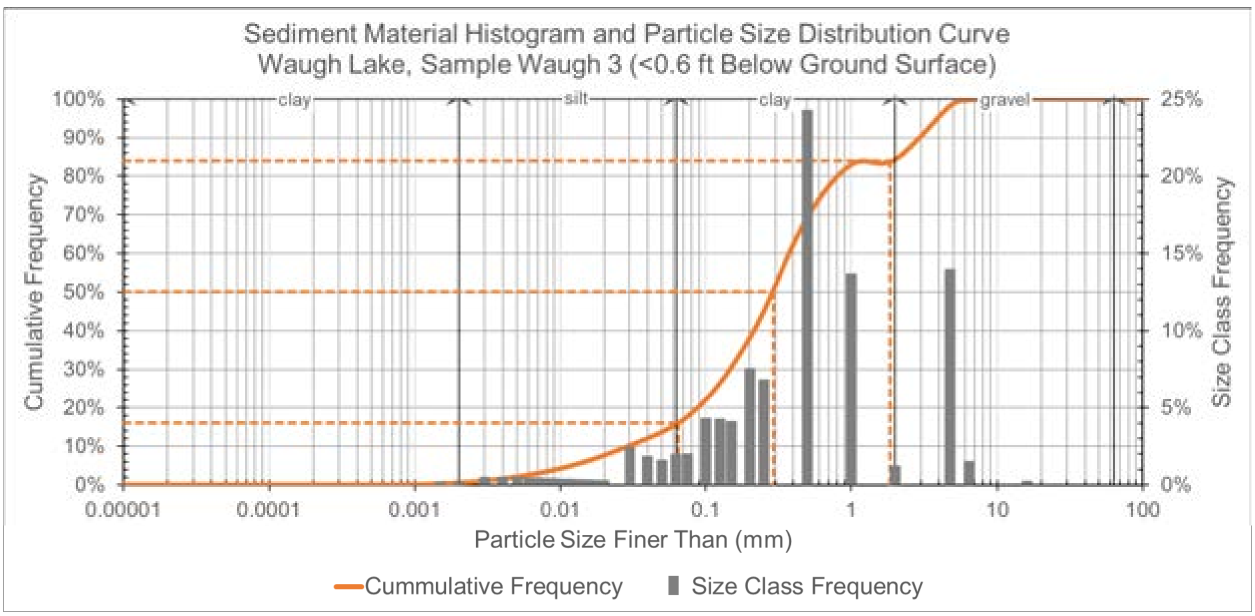


Figure A-4. Waugh 3 Sediment Sample Histogram and Particle Size Distribution Curve for Waugh Lake

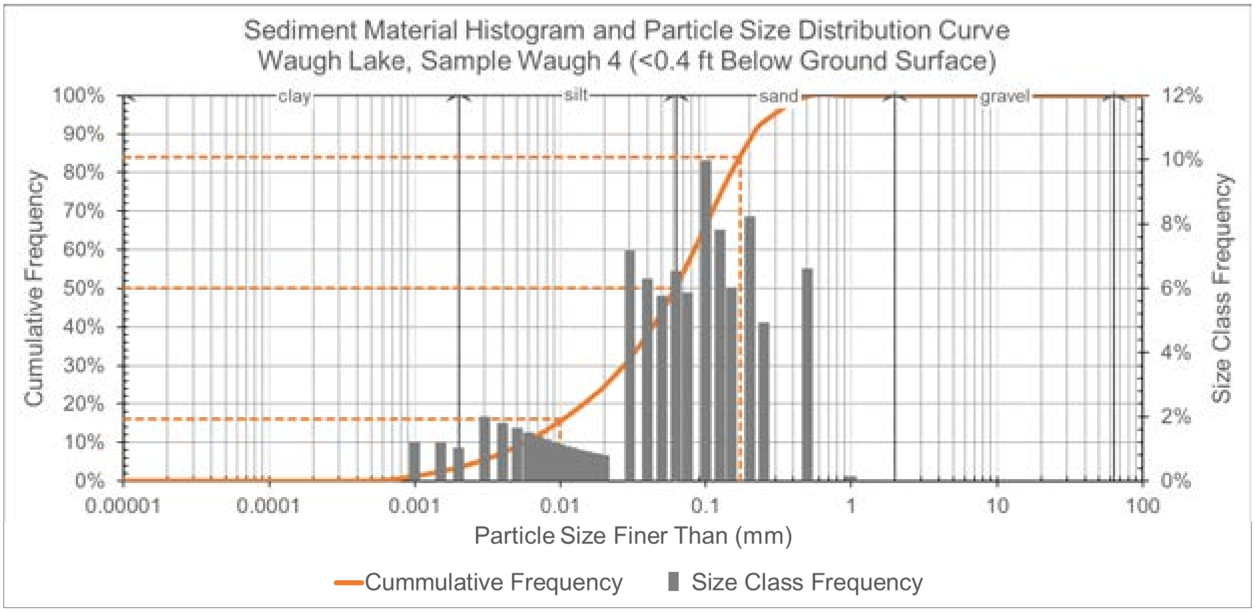


Figure A-5. Waugh 4 Sediment Sample Histogram and Particle Size Distribution Curve for Waugh Lake

Photo A-4. Waugh 4 Sediment Sample Location

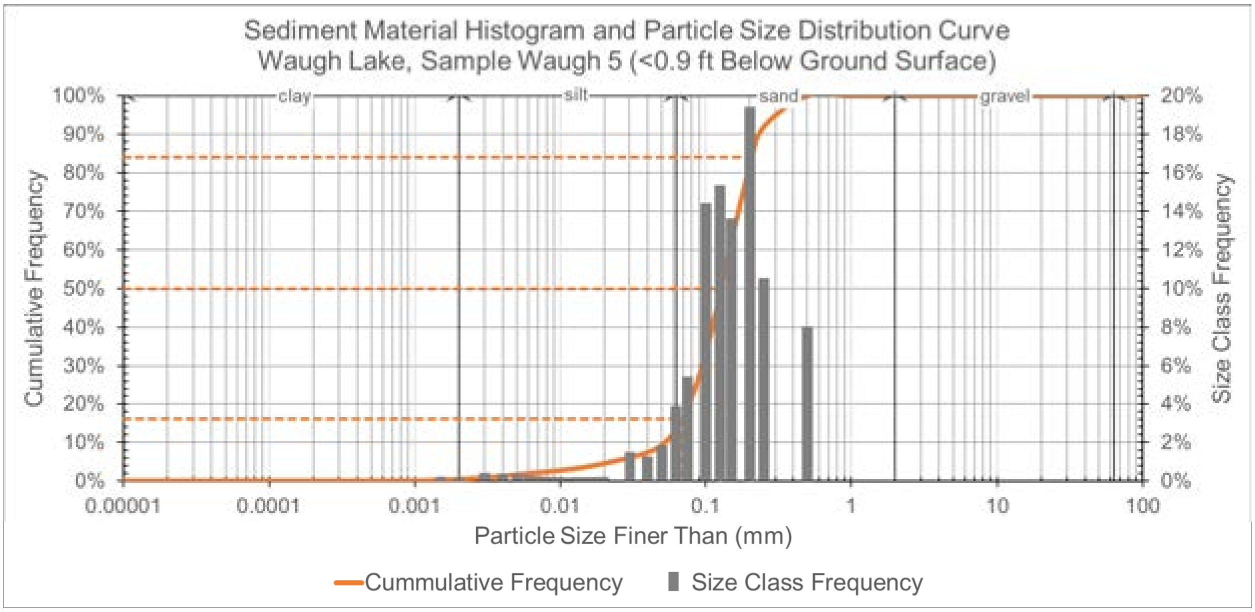


Figure A-6. Waugh 5 Sediment Sample Histogram and Particle Size Distribution Curve for Waugh Lake

Photo A-7. Waugh 5 Sediment Sample Collected with an AMS Core Sampler

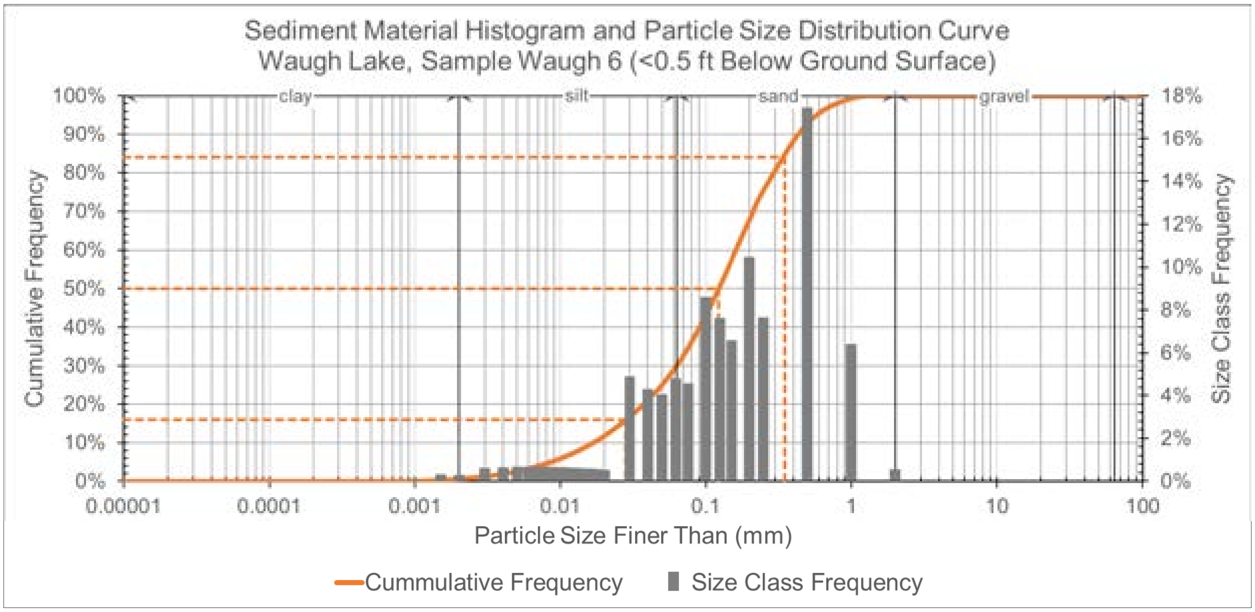


Figure A-7. Waugh 6 Sediment Sample Histogram and Particle Size Distribution Curve for Waugh Lake

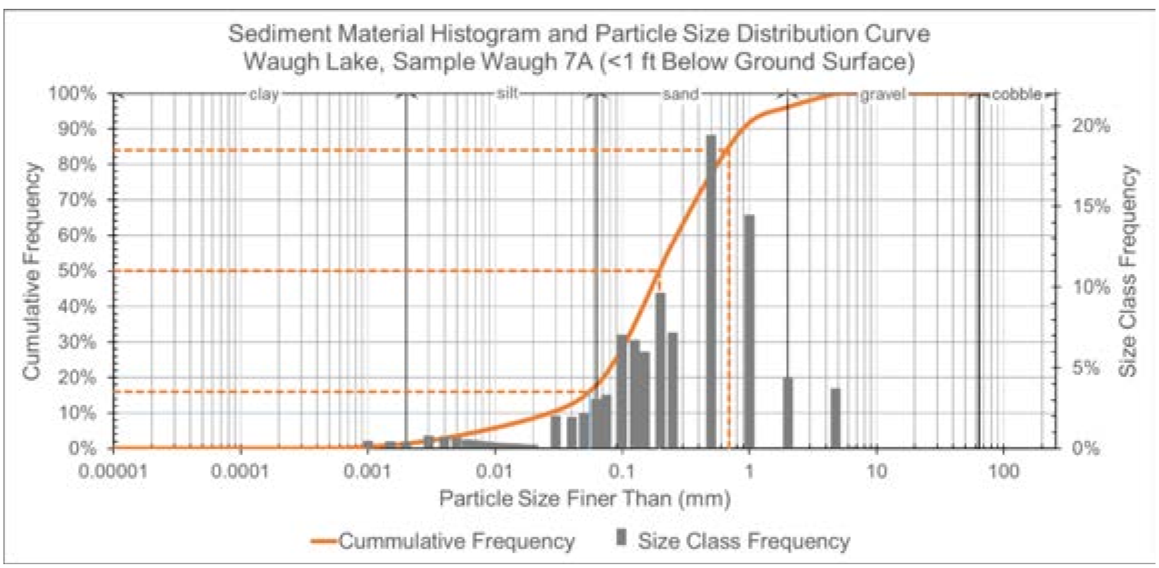


Figure A-8. Waugh 7A Sediment Sample Histogram and Particle Size Distribution Curve for Waugh Lake

Photo A-8. Waugh 7 Sediment Sample Collected on a low flow bar

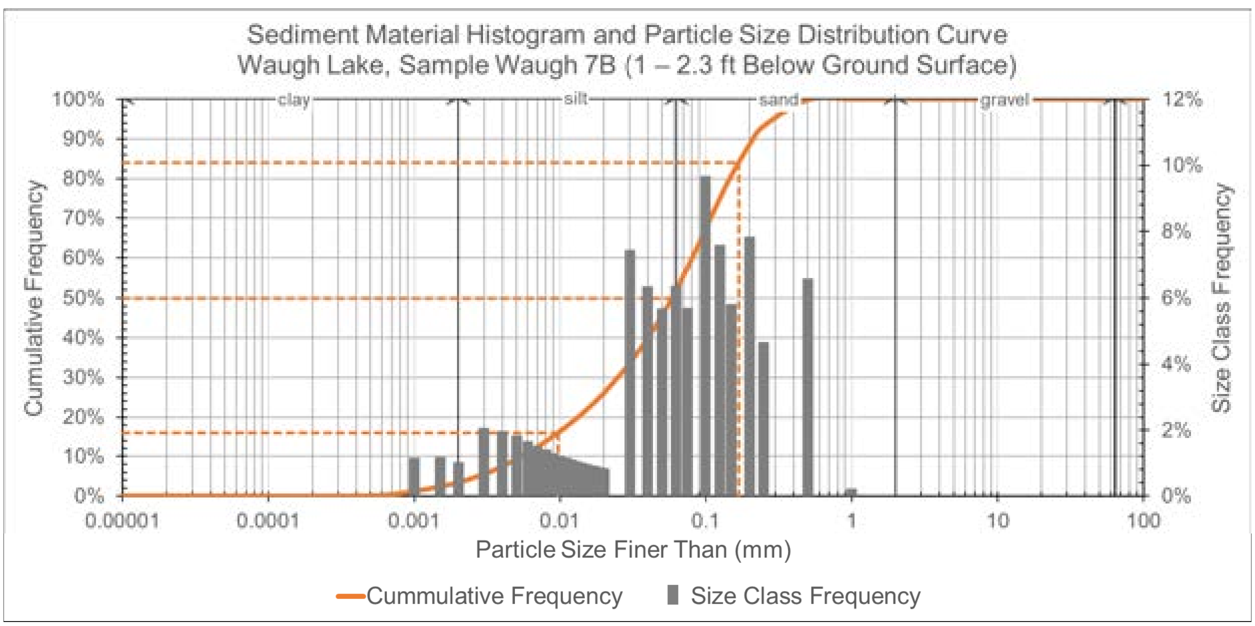


Figure A-9. Waugh 7B Sediment Sample Histogram and Particle Size Distribution Curve for Waugh Lake

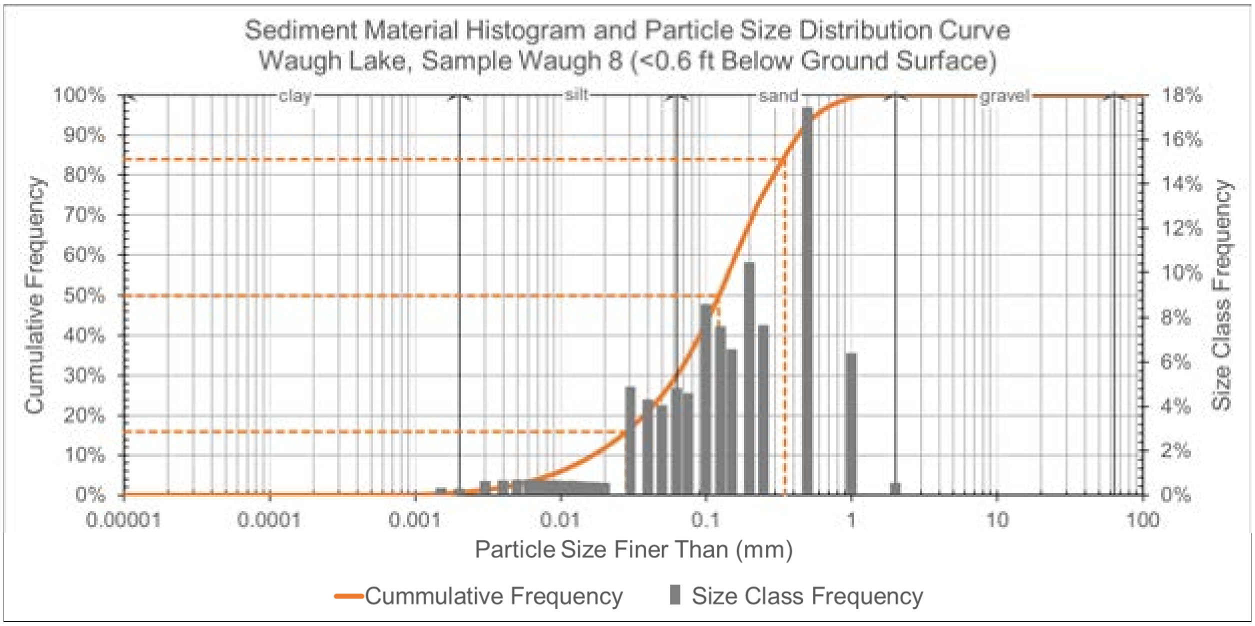


Figure A-10. Waugh 8 Sediment Sample Histogram and Particle Size Distribution Curve for Waugh Lake

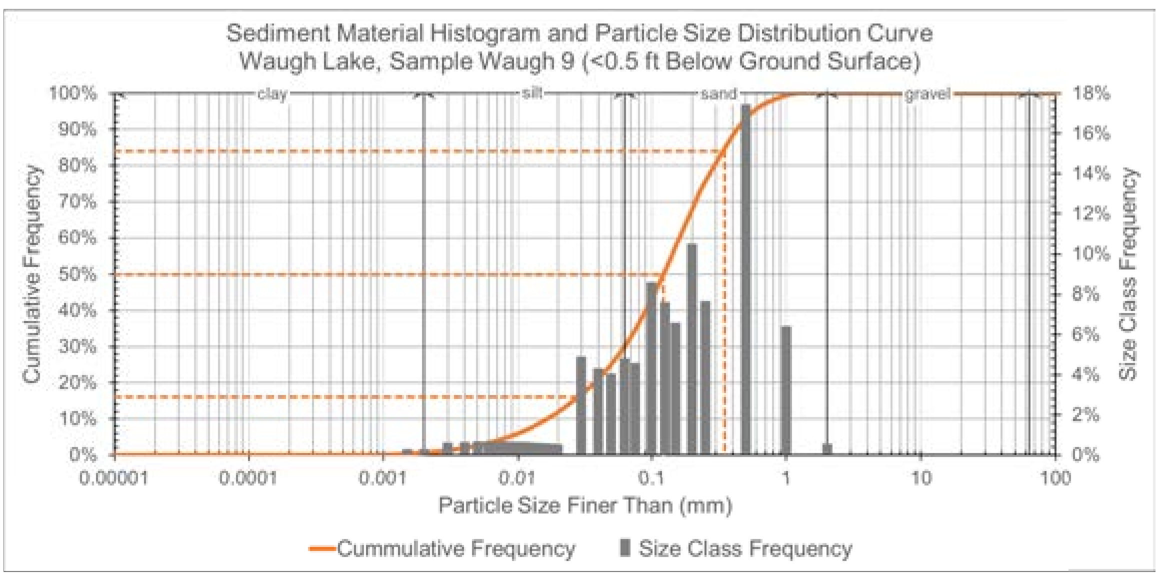


Figure A-11. Waugh 9 Sediment Sample Histogram and Particle Size Distribution Curve for Waugh Lake

Photo A-10. Waugh 9 Sediment Sample Collected along the low flow channel left bank

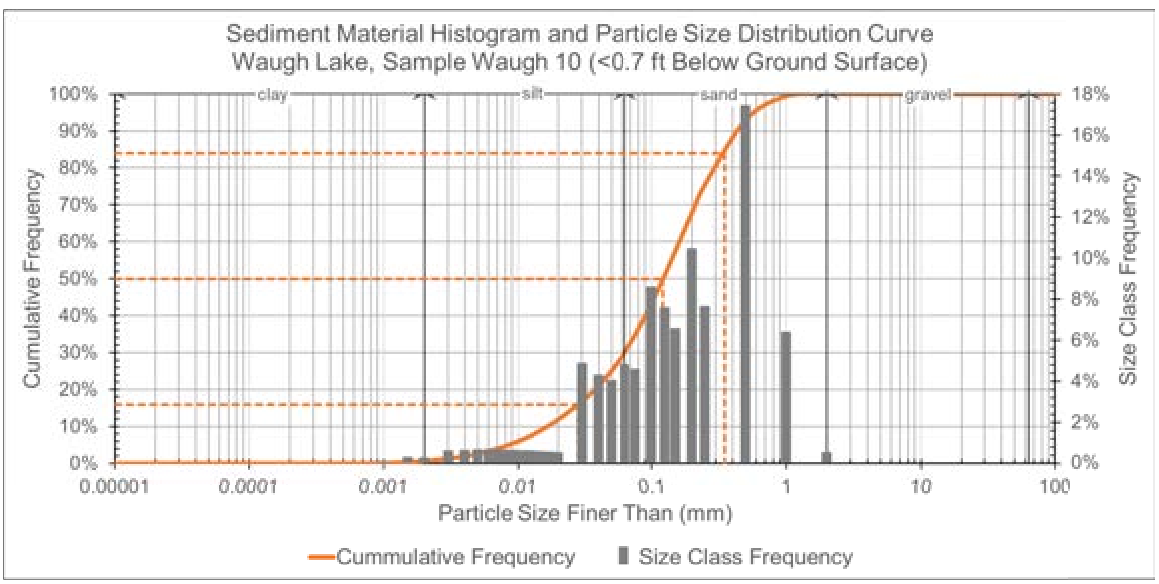


Figure A-12. Waugh 10 Sediment Sample Histogram and Particle Size Distribution Curve for Waugh Lake

Photo A-11. Waugh 10 Sediment Sample Collected in reservoir accumulation zone upstream of dam.

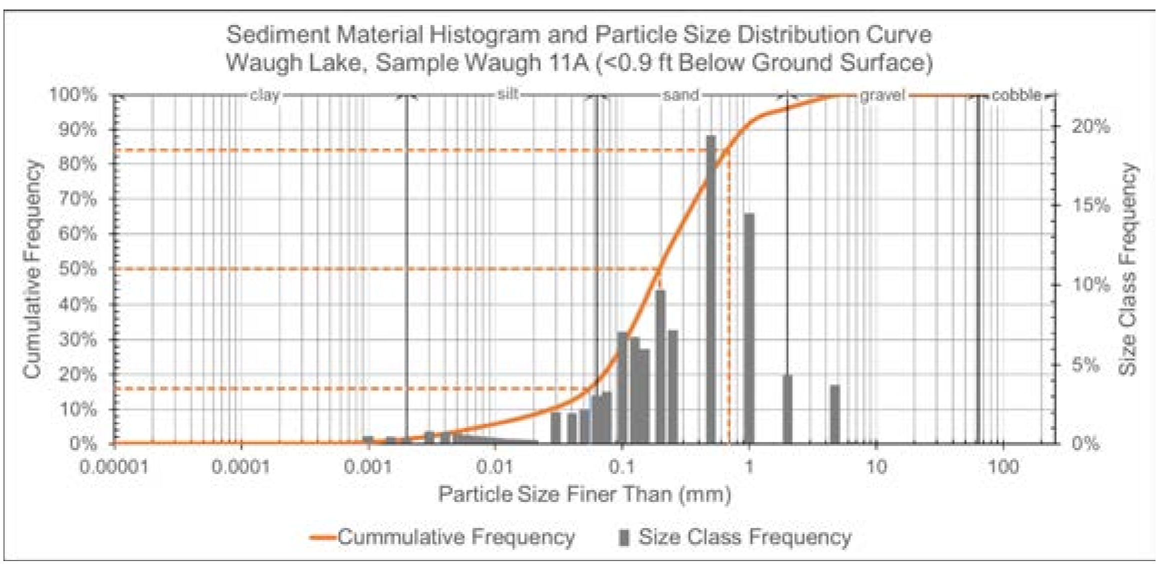


Figure A-13. Waugh 11A Sediment Sample Histogram and Particle Size Distribution Curve for Waugh Lake

Photo A-12. Waugh 11 Sediment Sample Collected with an AMS Core Sampler Upstream of Dam

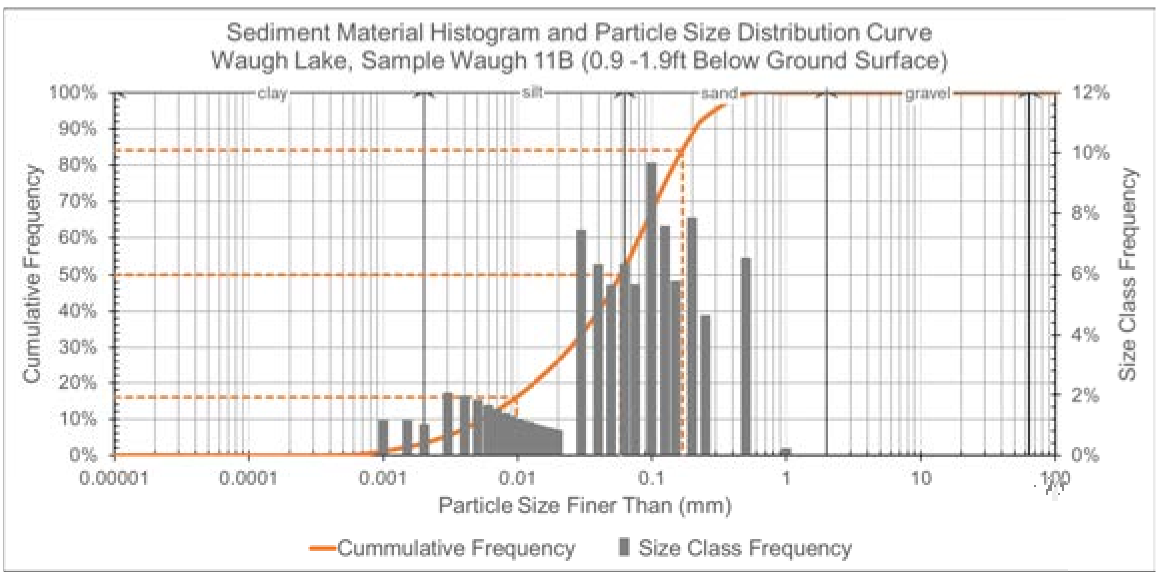


Figure A-13. Waugh 11B Sediment Sample Histogram and Particle Size Distribution Curve for Waugh Lake

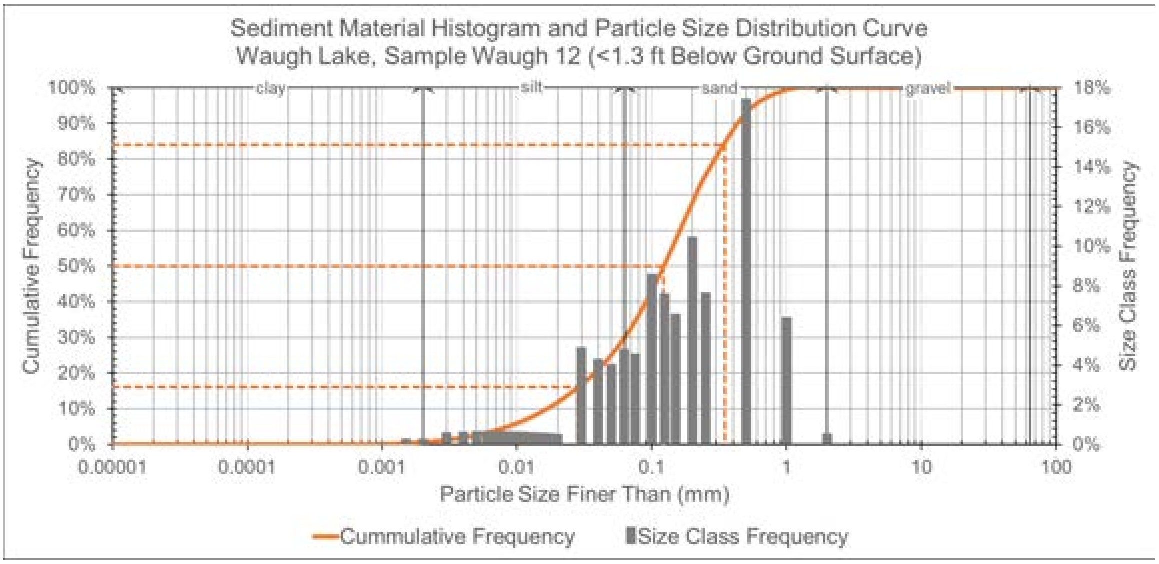
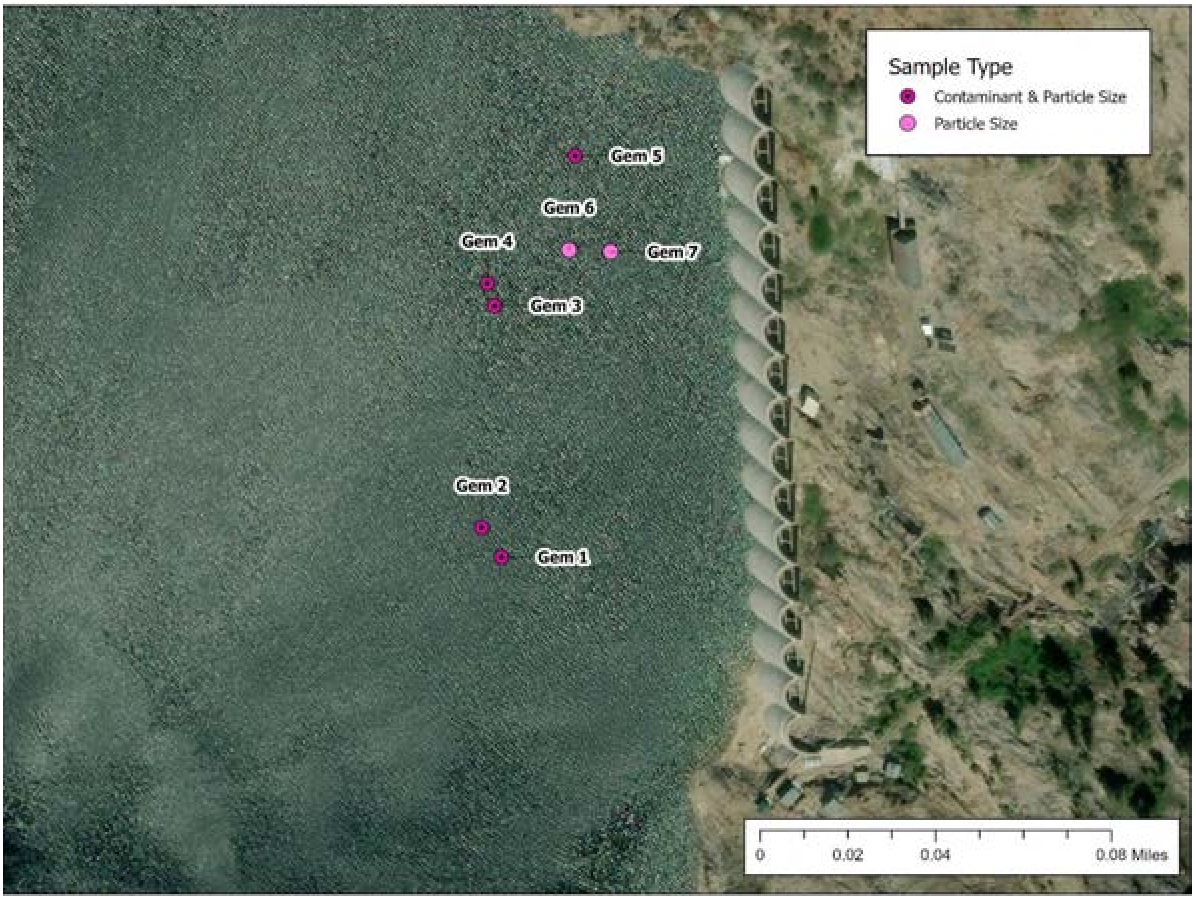


Figure A-14. Waugh 12 Sediment Sample Histogram and Particle Size Distribution Curve for Waugh Lake

Photo A-13. Waugh 12 Sediment Sample Collected Upstream of Dam in Reservoir Accumulated Debris and Sediment



Map A-2. Gem Lake Sediment Particle Size Sample Locations (Sites)

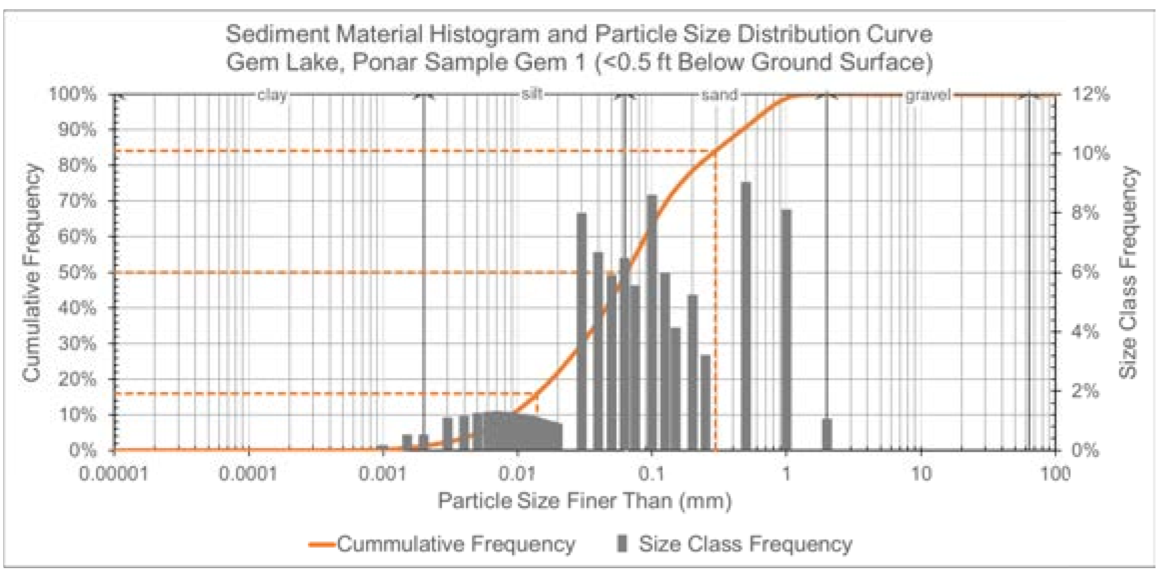


Figure A-15. Gem 1 Sediment Sample Histogram and Particle Size Distribution Curve for Gem Lake

Photo A-14. Gem 1 Sediment Sample Collected with a Standard Ponar

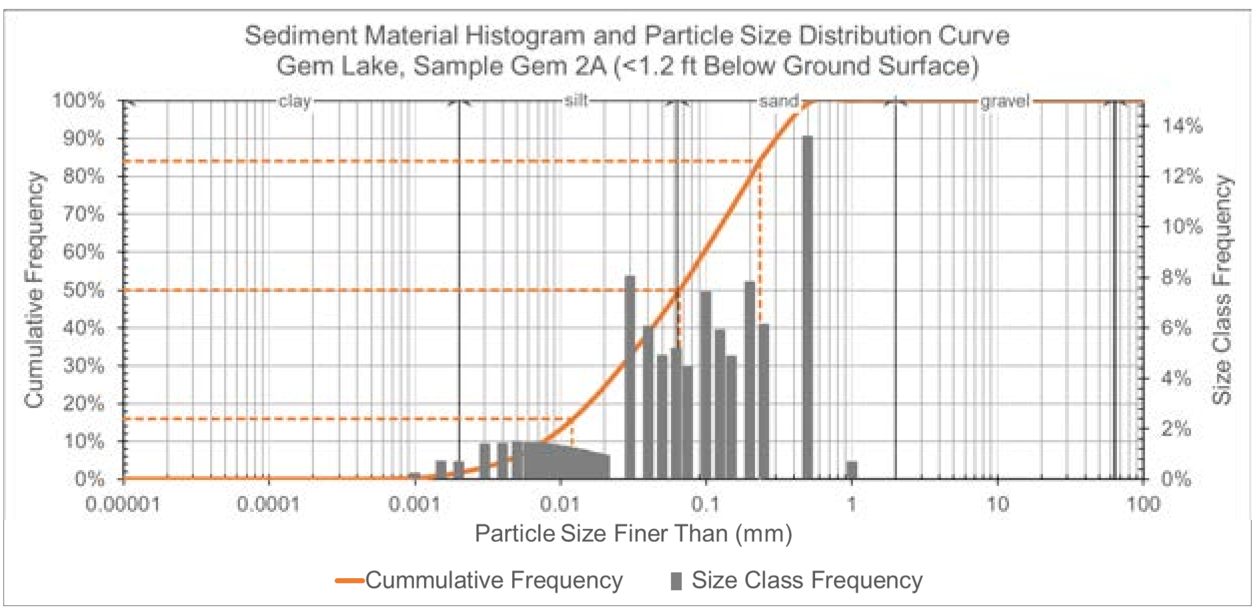


Figure A-16. Gem 2A Sediment Sample Histogram and Particle Size Distribution Curve for Gem Lake

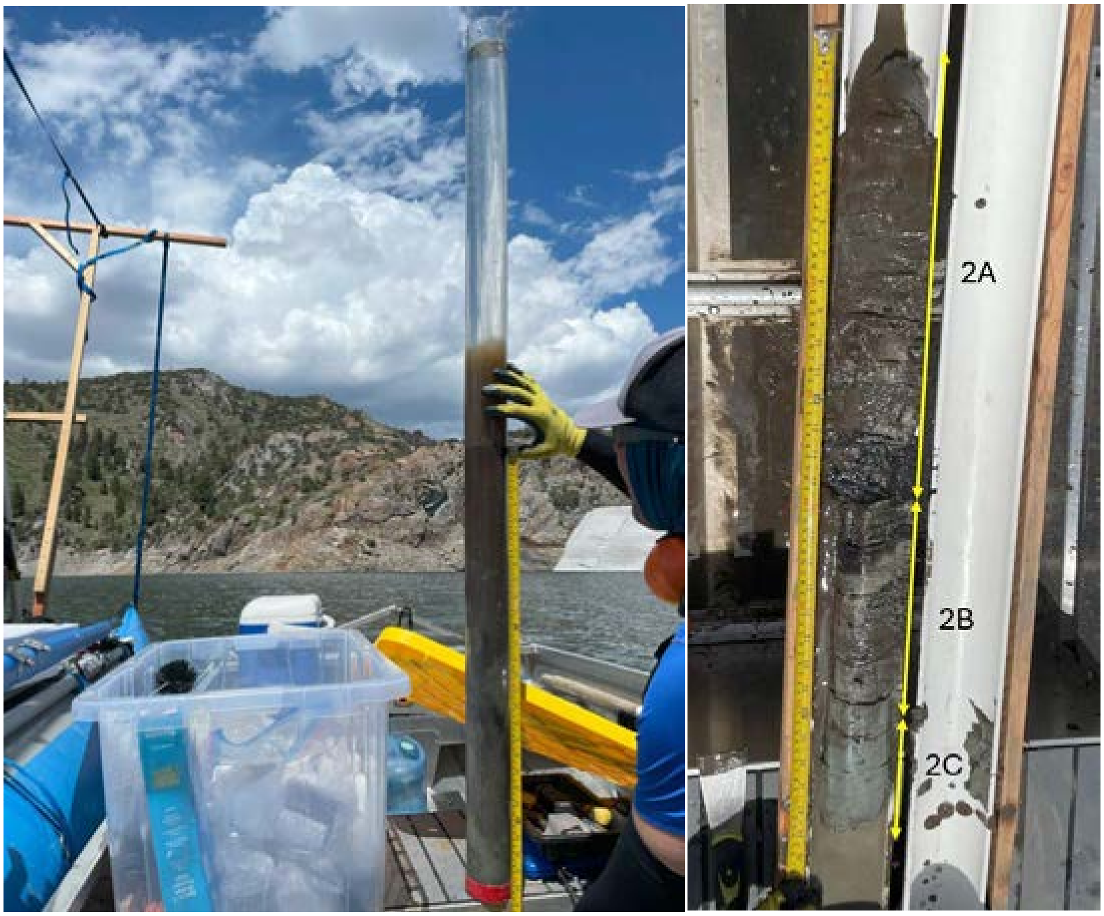


Photo A-15. Gem 2 Sample Site and Sediment Core

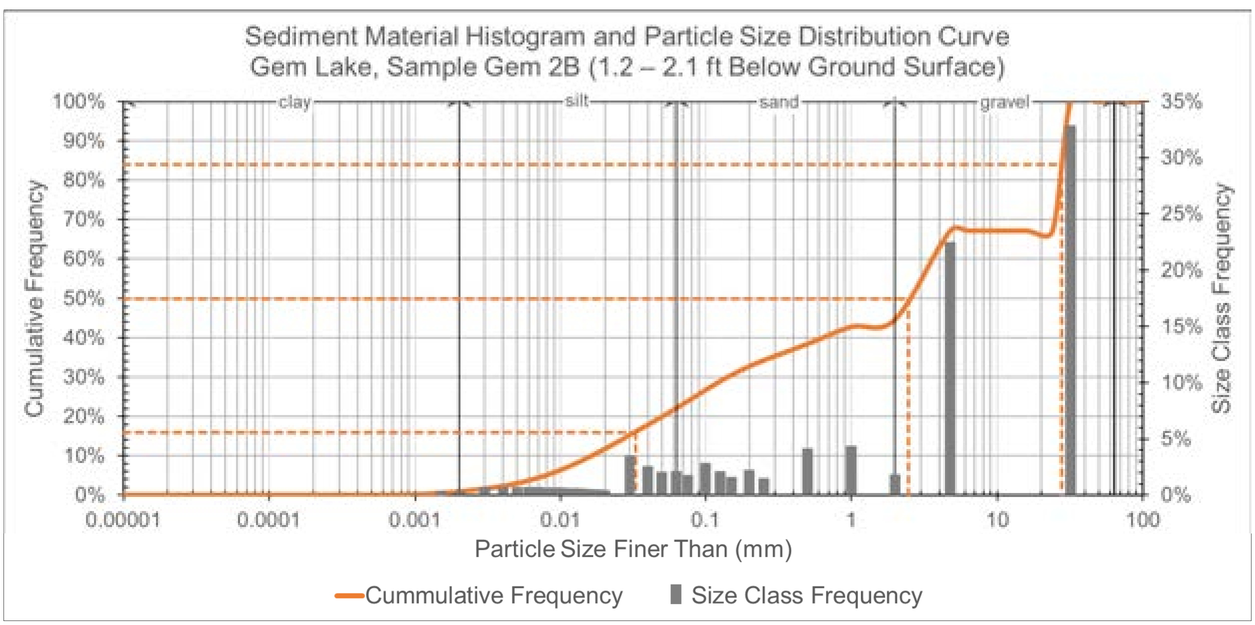


Figure A-17. Gem 2B Sediment Sample Histogram and Particle Size Distribution Curve for Gem Lake

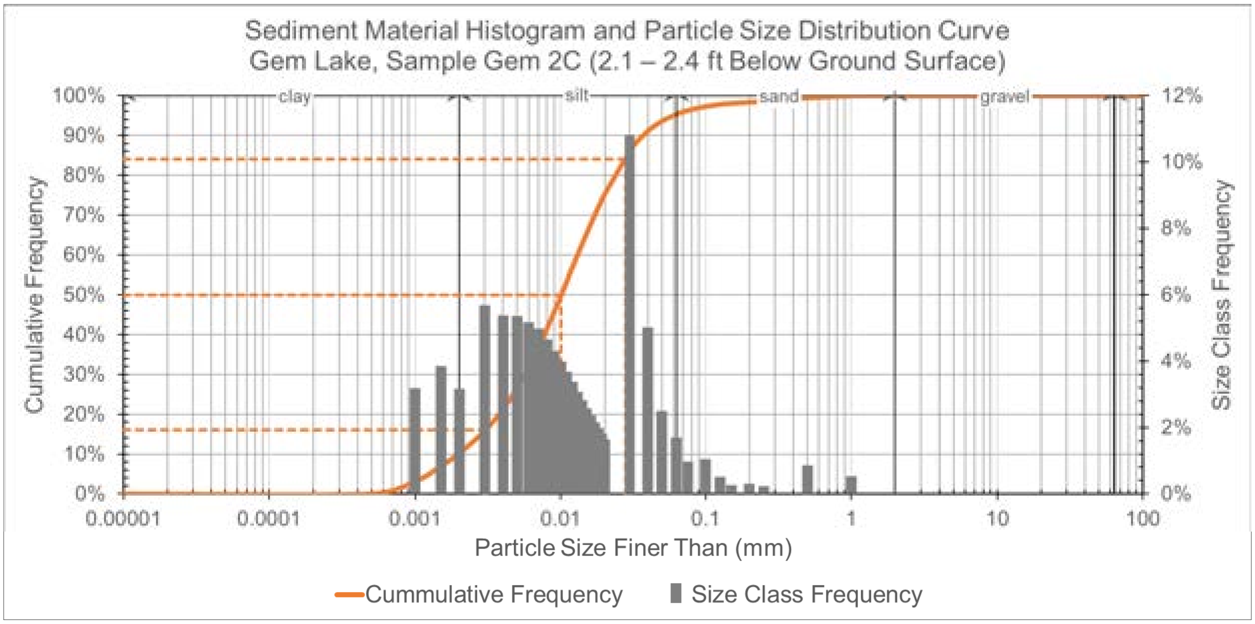


Figure A-18. Gem 2C Sediment Sample Histogram and Particle Size Distribution Curve for Gem Lake

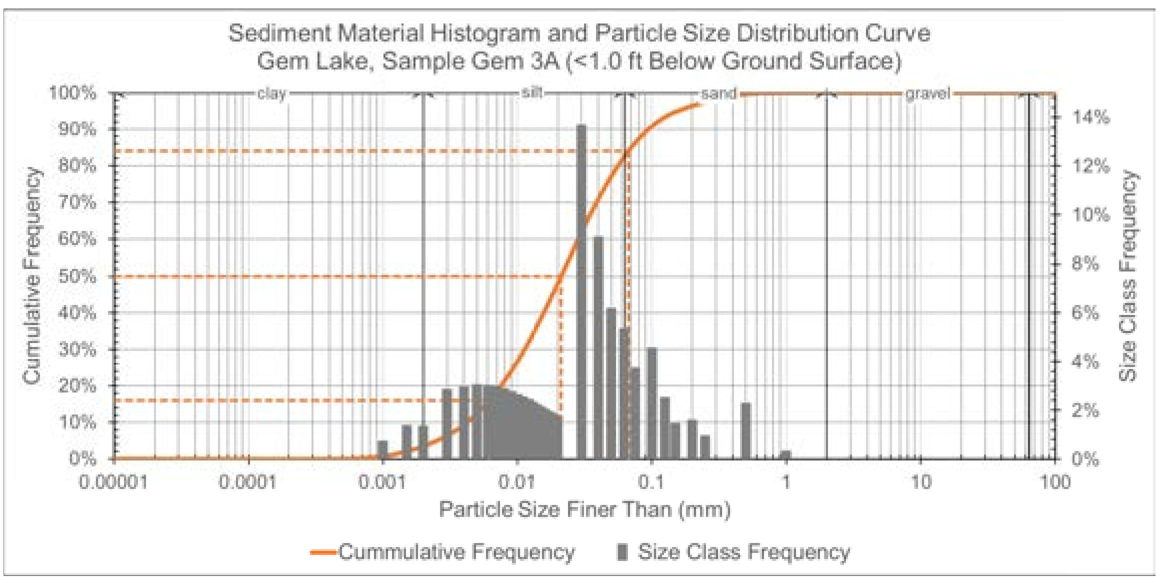


Figure A-19. Gem 3A Sediment Sample Histogram and Particle Size Distribution Curve for Gem Lake

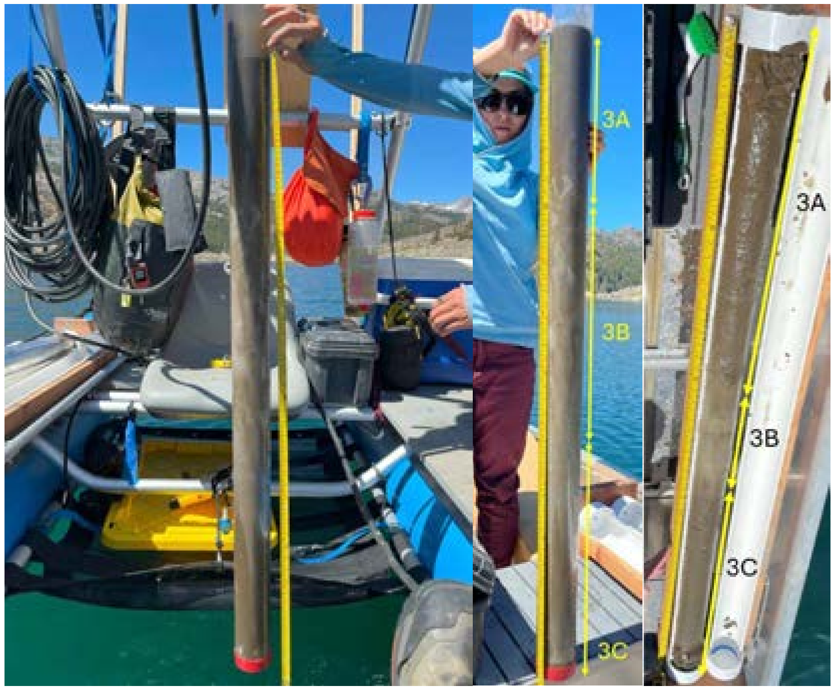


Photo A-16. Gem 3 Sample Site and Sediment Core from Polycarbonate (Left) and Aluminum (Right) Core Tubes

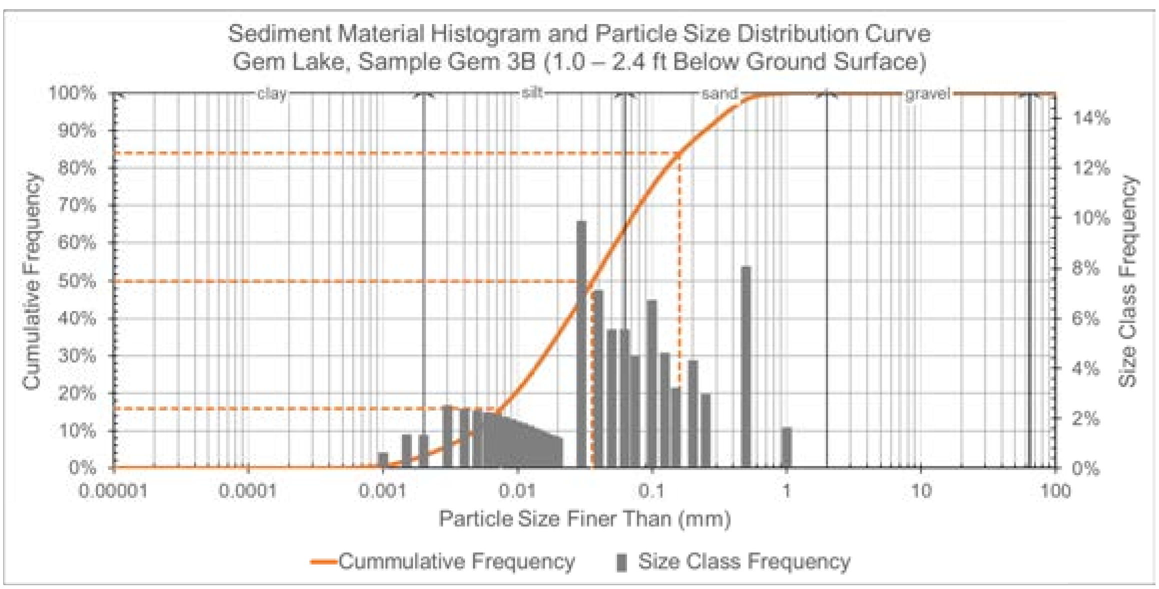


Figure A–20. Gem 3B Sediment Sample Histogram and Particle Size Distribution Curve for Gem Lake

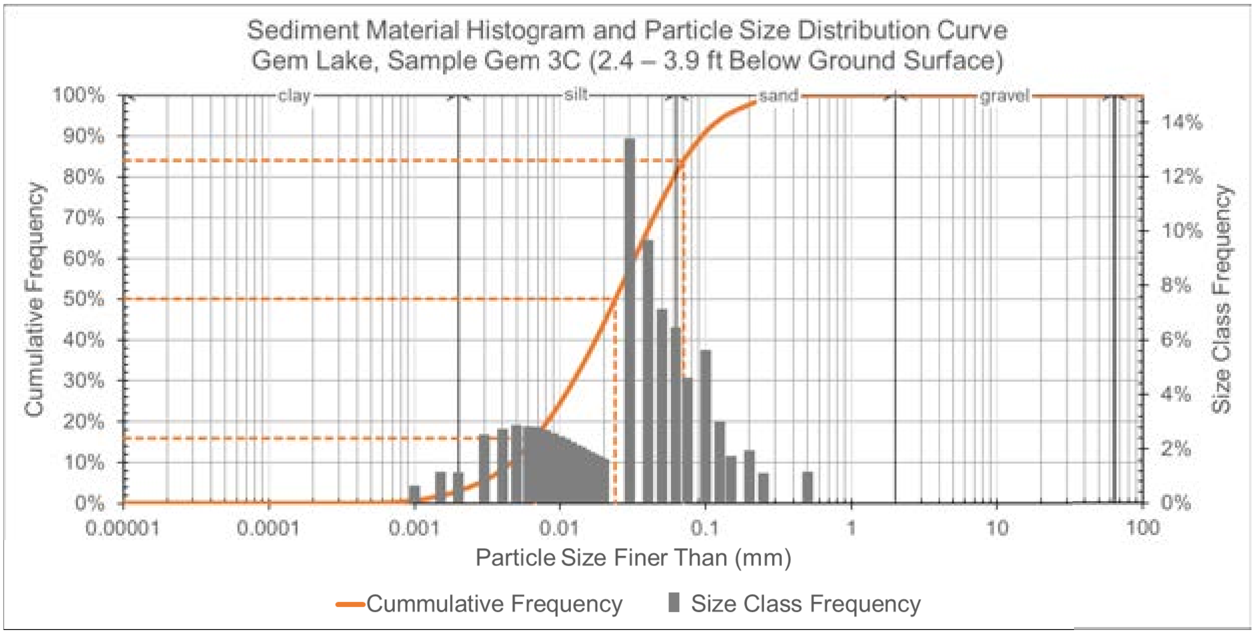


Figure A–21. Gem 3C Sediment Sample Histogram and Particle Size Distribution Curve for Gem Lake

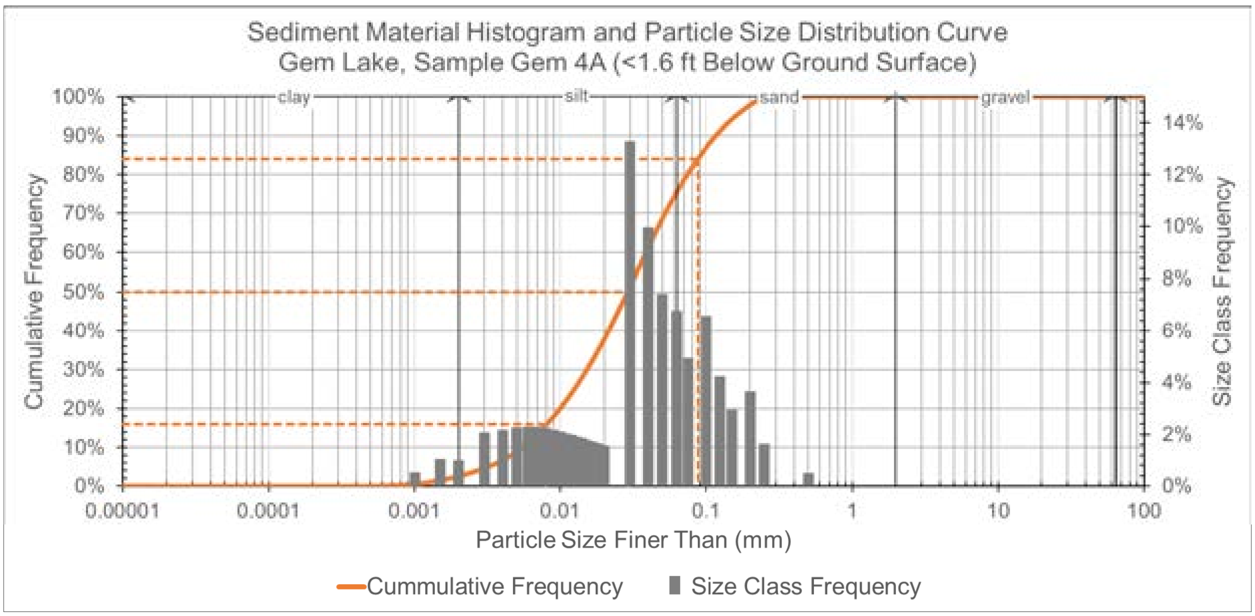


Figure A–22. Gem 4A Sediment Sample Histogram and Particle Size Distribution Curve for Gem Lake

Photo A-17. Gem 4 Sample Site (Looking Towards the Dam) and Sediment Core

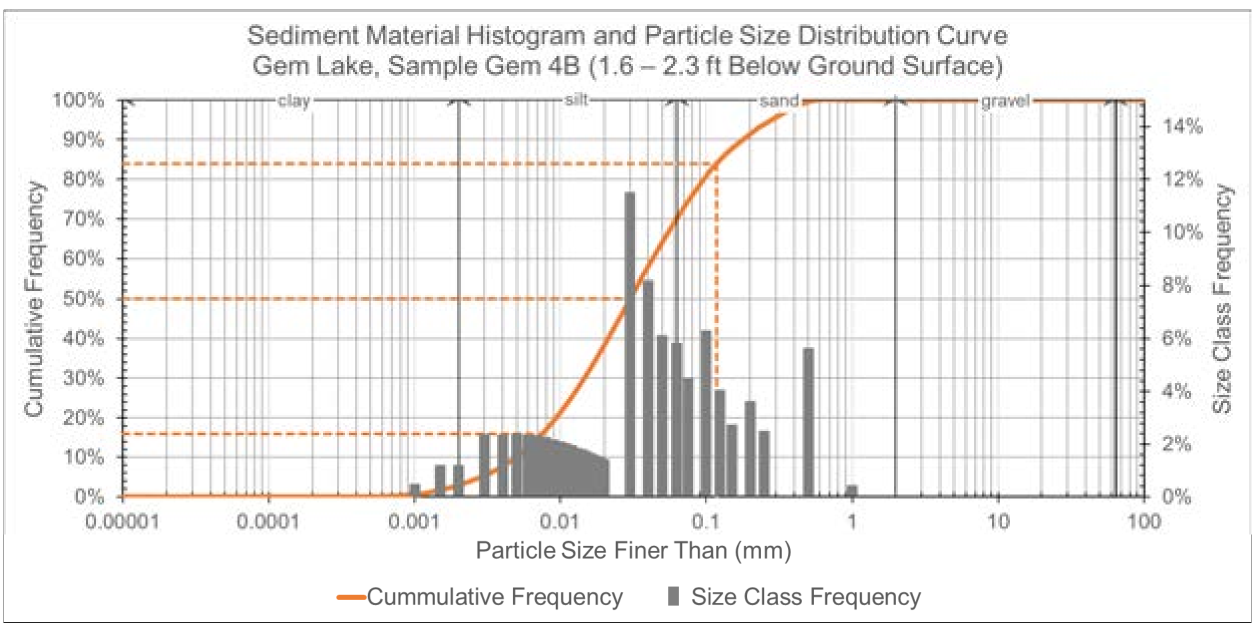


Figure A–23. Gem 4B Sediment Sample Histogram and Particle Size Distribution Curve for Gem Lake

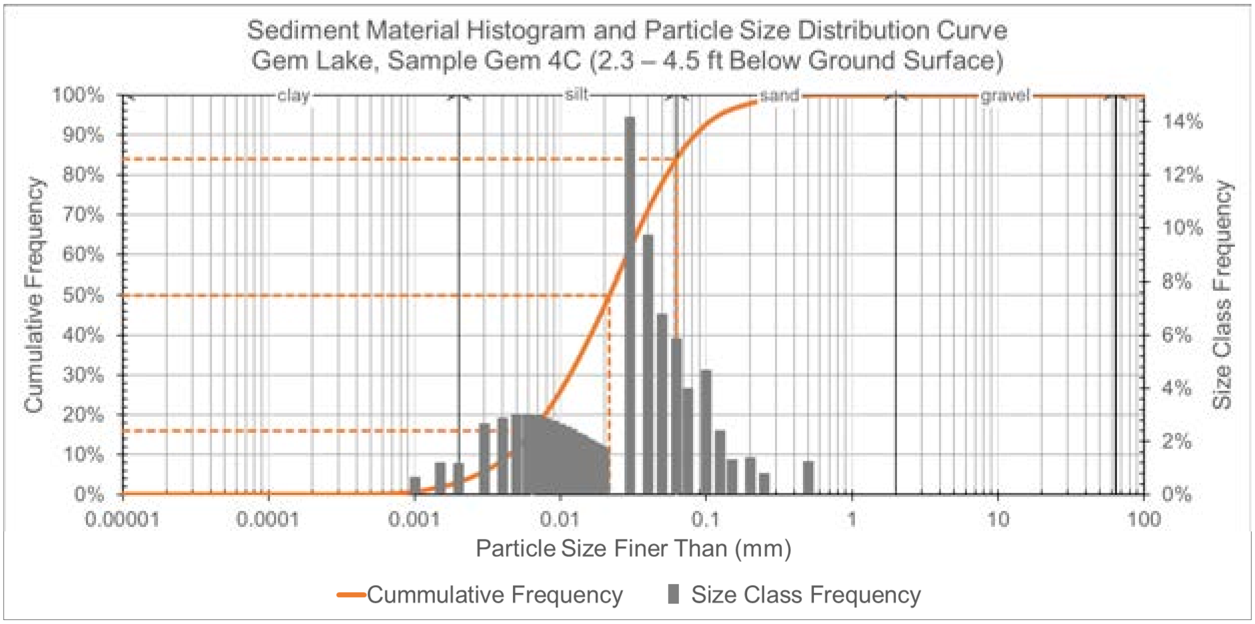


Figure A–24. Gem 4C Sediment Sample Histogram and Particle Size Distribution Curve for Gem Lake

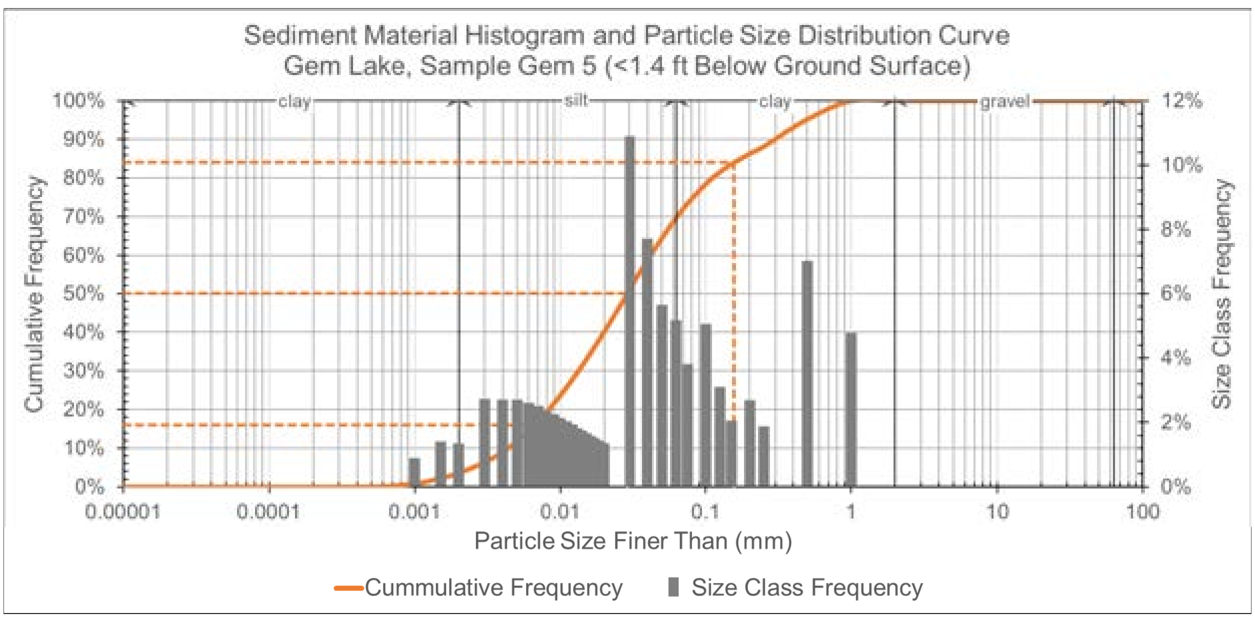


Figure A–25. Gem 5 Sediment Sample Histogram and Particle Size Distribution Curve for Gem Lake

Photo A-18. Gem 5 Sample Site (Looking Towards the Dam) and Sediment Core

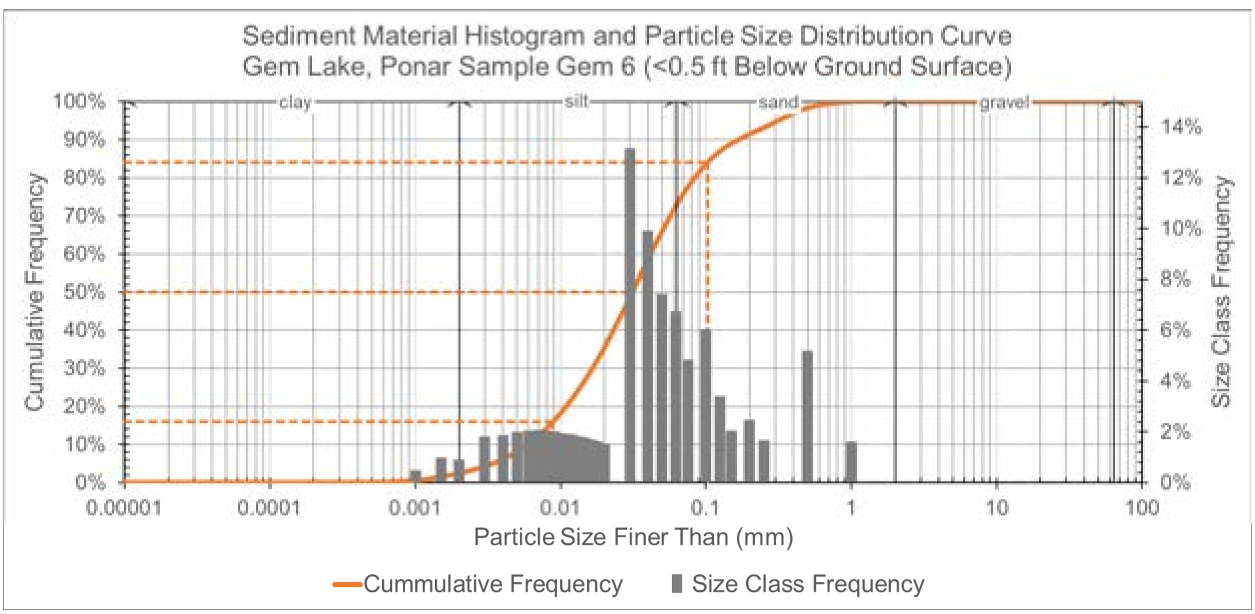


Figure A-26. Gem 6 Sediment Sample Histogram and Particle Size Distribution Curve for Gem Lake

Photo A-19. Gem 6 Sediment Sample Collected with a Standard Ponar

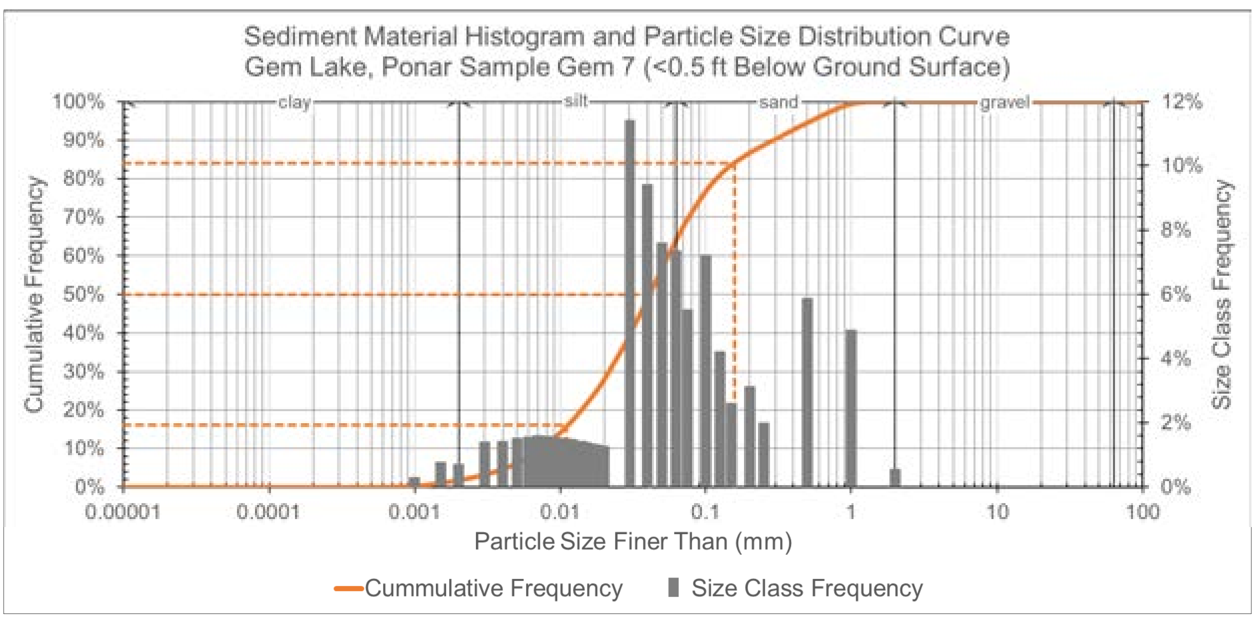


Figure A–27. Gem 7 Sediment Sample Histogram and Particle Size Distribution Curve for Gem Lake

Photo A-20. Gem 7 Sediment Sample Collected with a Standard Ponar

Map A-3. Agnew Lake Sediment Particle Size Sample Locations (Sites)

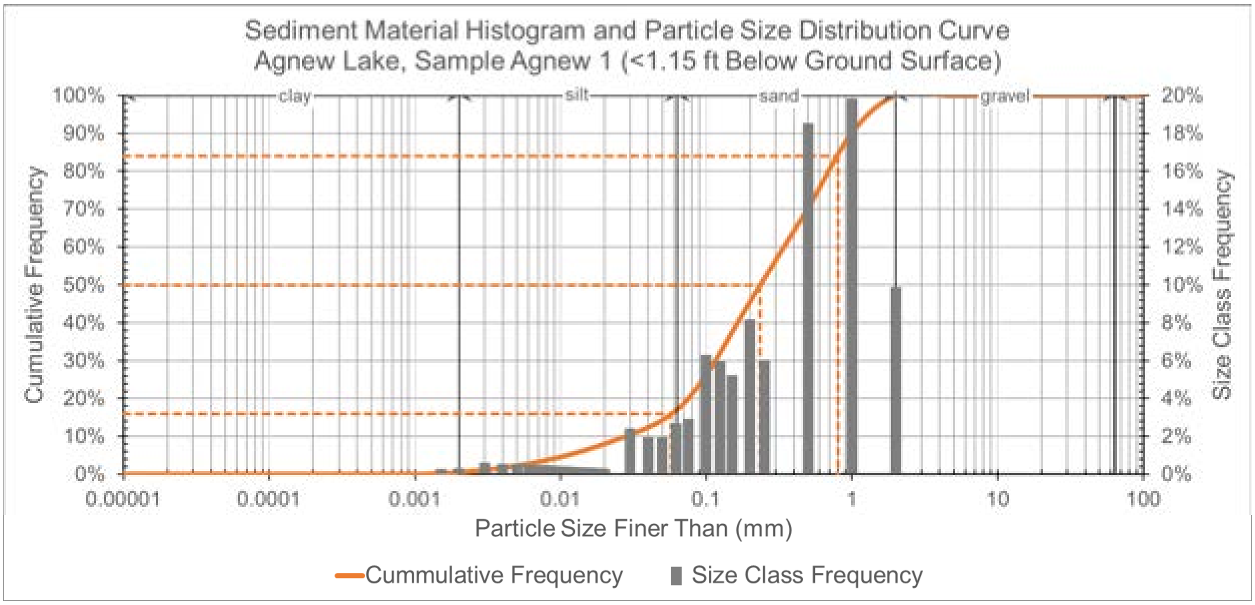


Figure A-28. Agnew 1 Sediment Sample Histogram and Particle Size Distribution Curve for Agnew Lake

Photo A-21. Agnew 1 Sediment Sample Collected with an AMS Core Sampler

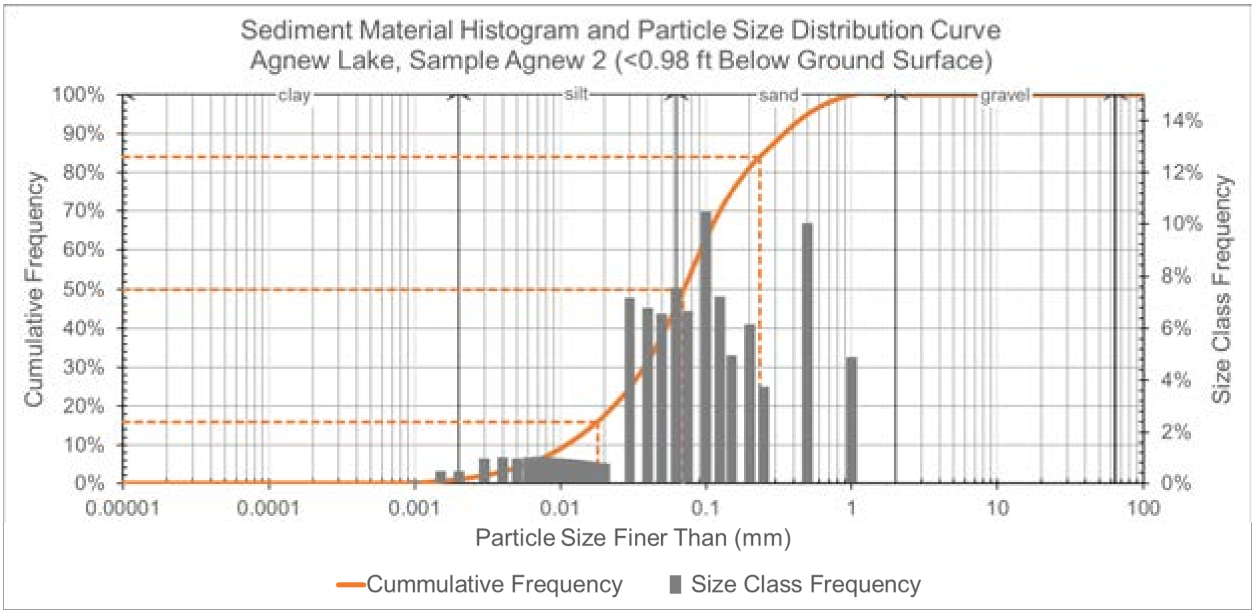


Figure A-29. Agnew 2 Sediment Sample Histogram and Particle Size Distribution Curve for Agnew Lake

Photo A-21. Agnew 2 Sediment Sample Collected with an AMS Core Sampler and stainless-steel shovel.

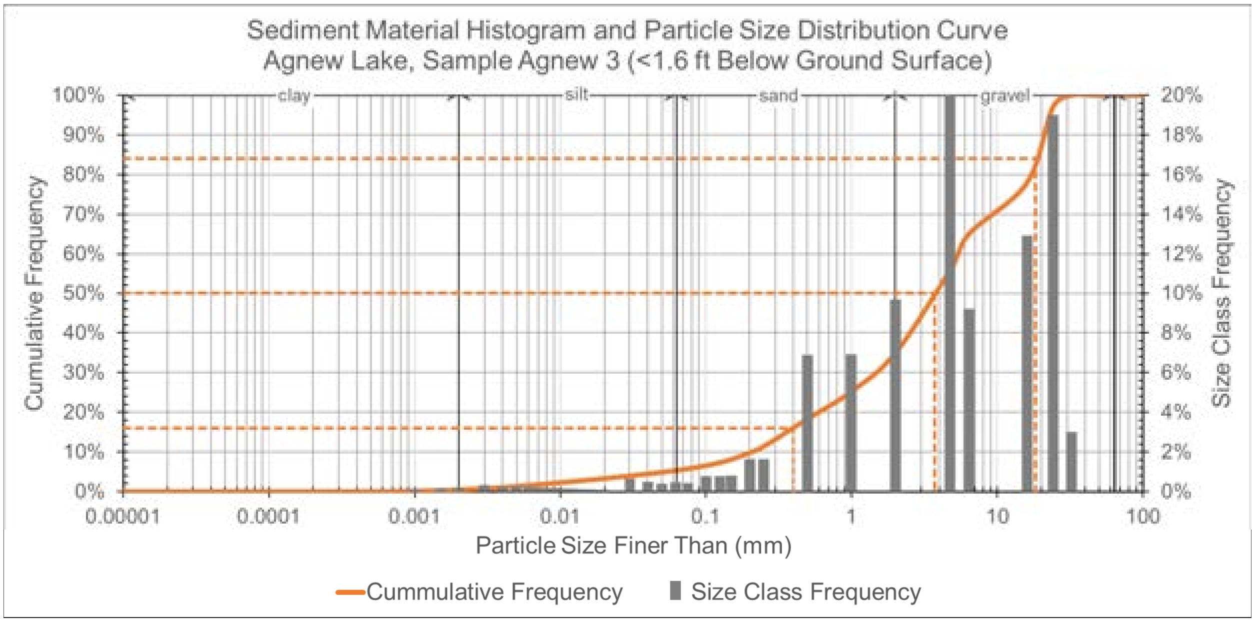


Figure A-30. Agnew 3 Sediment Sample Histogram and Particle Size Distribution Curve for Agnew Lake

Photo A-22. Agnew 3 Sediment Sample Collected with an AMS Core Sampler.

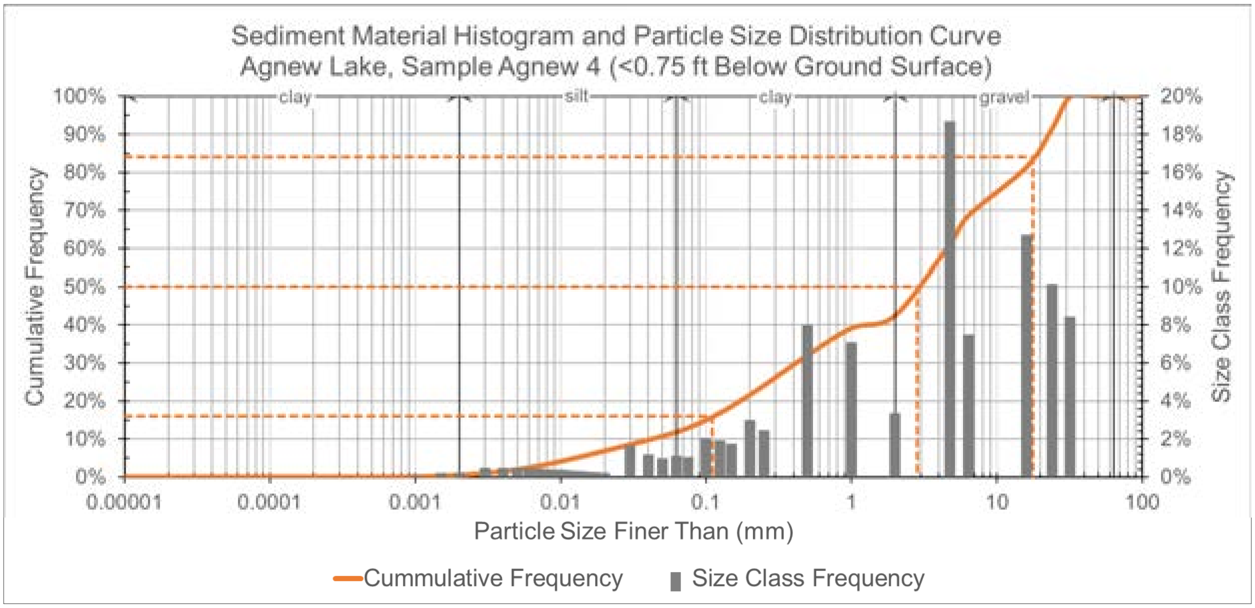


Figure A-31. Agnew 4 Sediment Sample Histogram and Particle Size Distribution Curve for Agnew Lake

Photo A-23. Agnew 4 Sediment Sample Collected with an AMS Core Sampler and stainless-steel shovel

ATTACHMENT B

Sediment Sampling Photos

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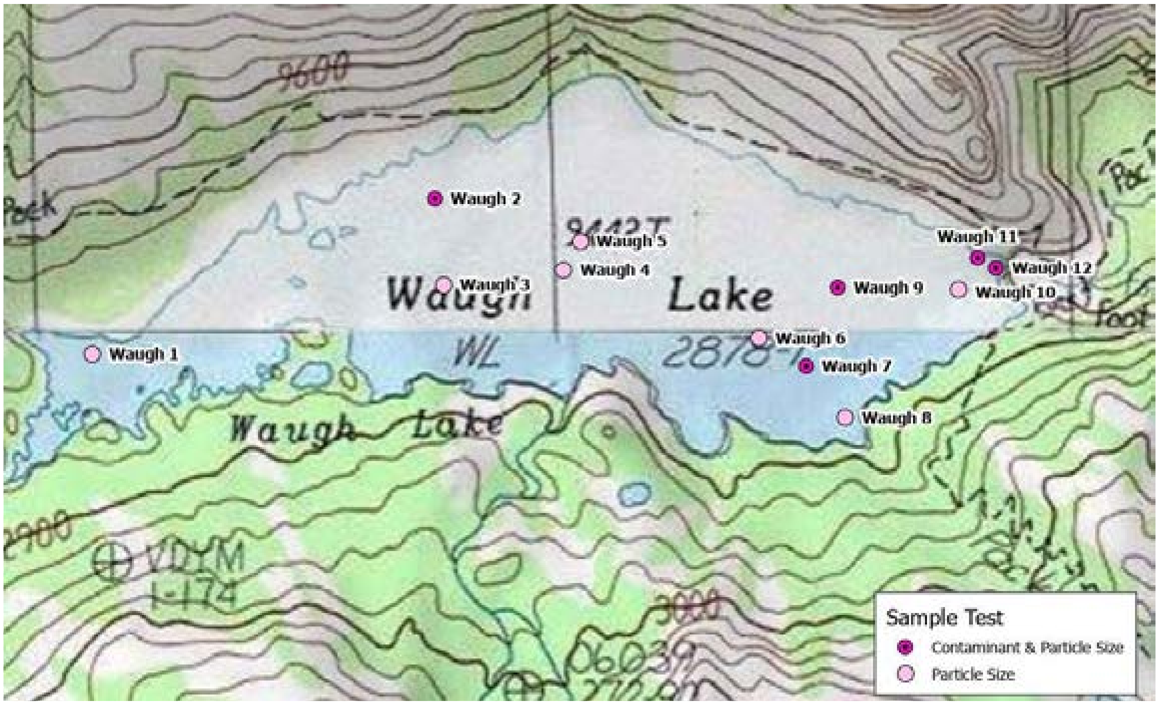

Photo B-1. Waugh Lake sediment sample locations.

Photo B-2. Waugh 1 gradation sample location within the Rush Creek streambed.

Photo B-3. Waugh 2 contaminant and gradation sample location.

Photo B-4. Waugh 2 contaminant and gradation sample pit. Sample set was broken into two strata.

Photo B-5. Waugh 3 gradation sample location within the Rush Creek streambed.

Photo B-6. Waugh 4 gradation sample location indicated by the orange arrow.

Photo B-7. Waugh 5 gradation sample location.

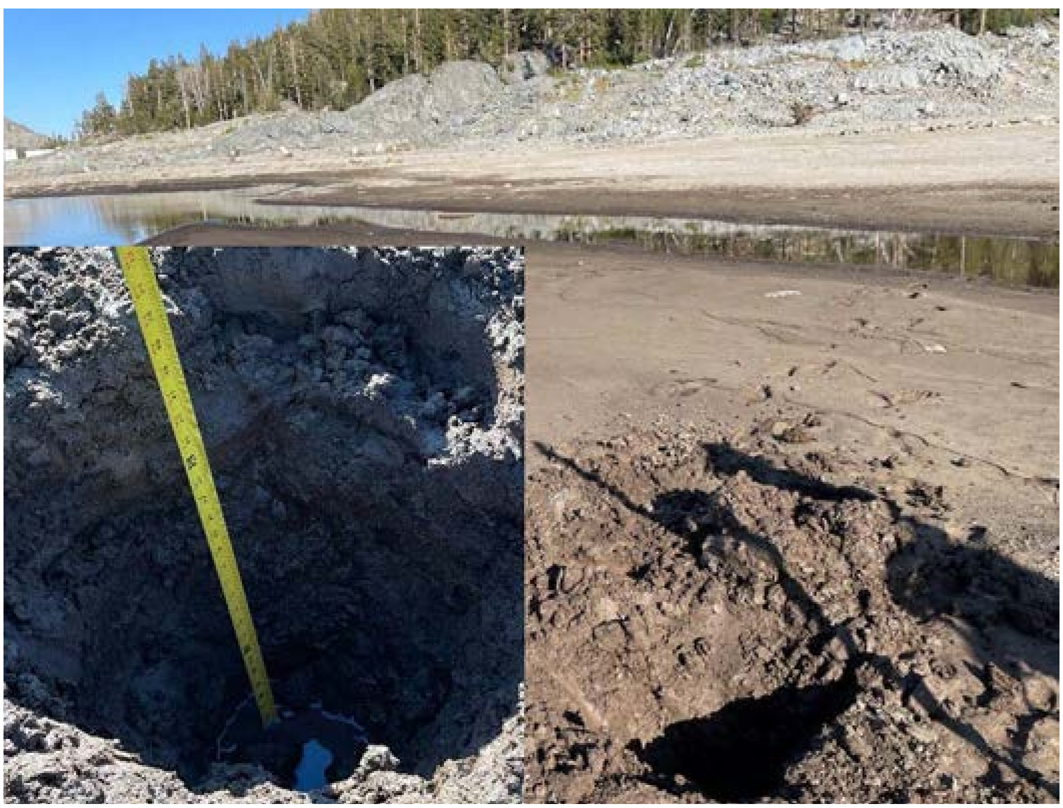

Photo B-8. Waugh 7 contaminant and gradation sample location.

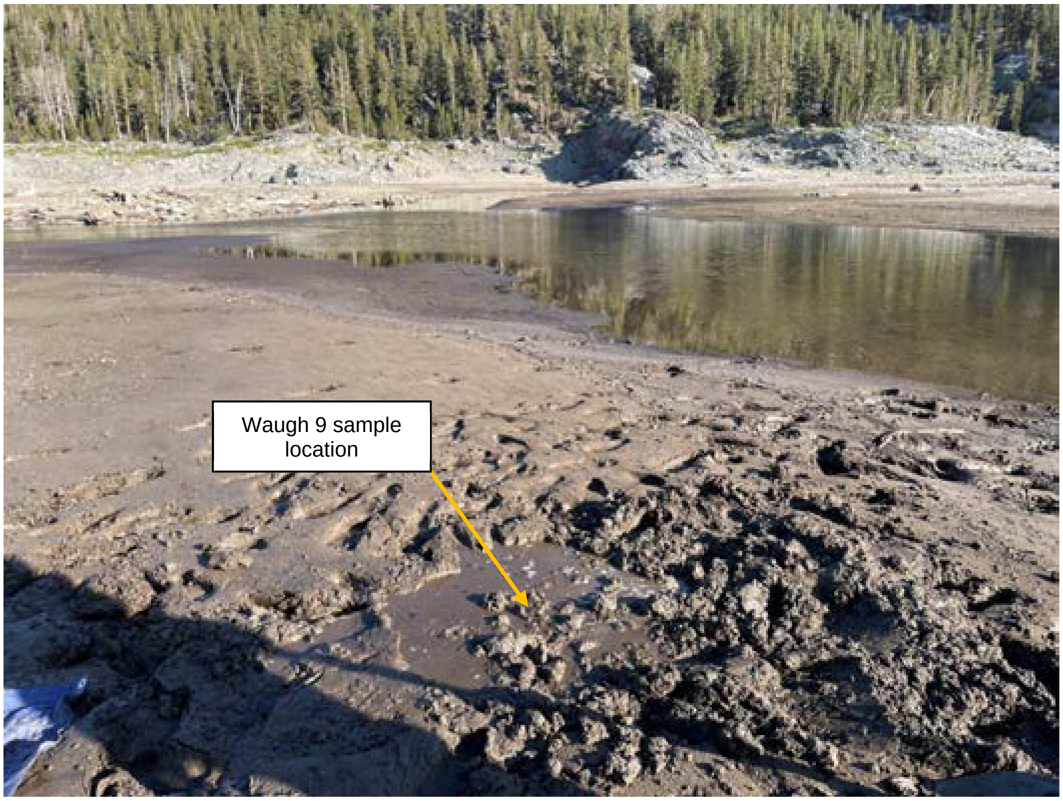

Photo B-9. Waugh 9 contaminant and gradation sample location.

Photo B-10. Waugh 10 gradation sample location.

Photo B-11. Waugh 11 contaminant and gradation sample location. Sample pit shows the two visible strata.

Photo B-12. Waugh 12 contaminant and gradation sample location and pit.

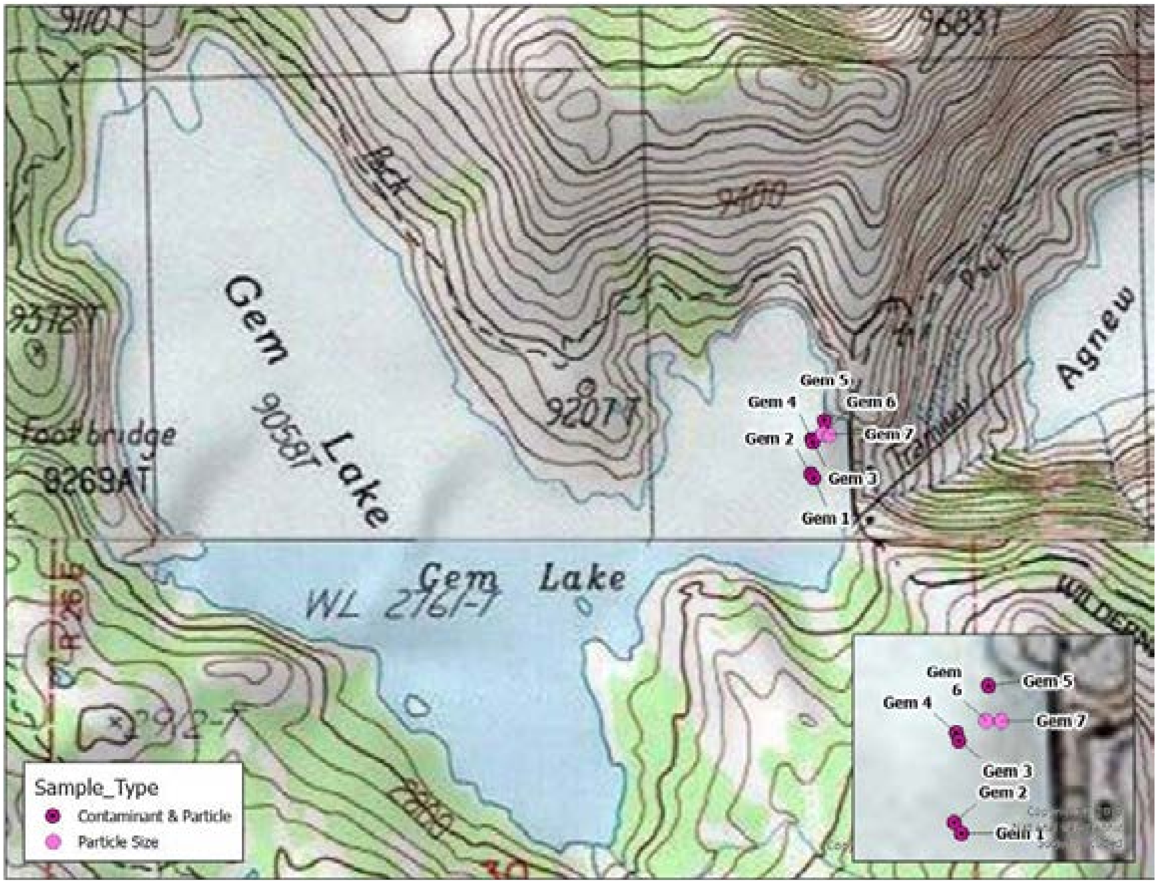

Photo B-13. Gem Lake sediment sampling locations.

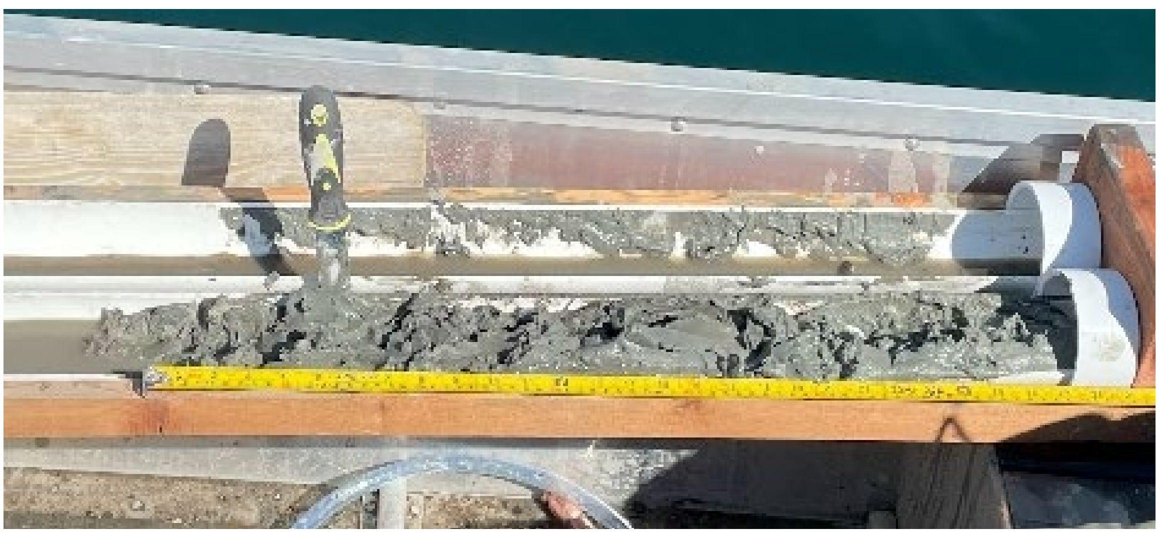

Photo B-14. Gem 1 contaminant and gradation core sample extracted with aluminum core sleeve.

Photo B-15. Gem 1 contaminant and gradation sample extracted with standard Ponar grab sampler.

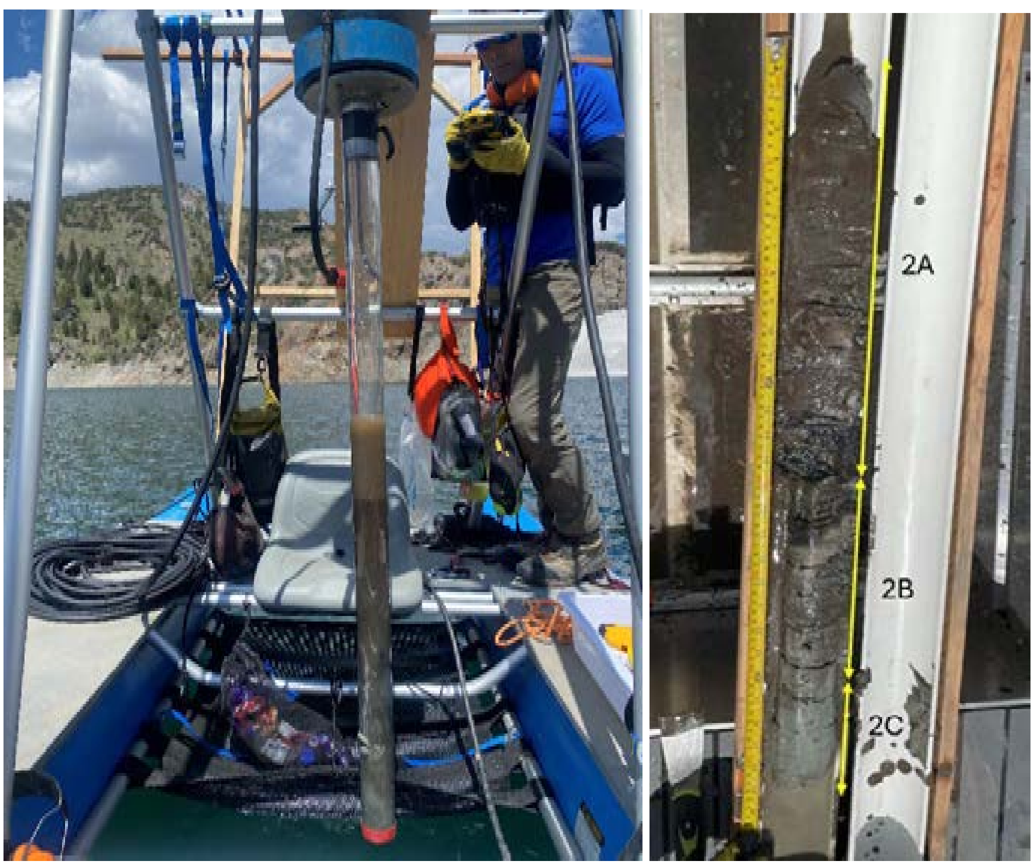

Photo B-16. Gem 2 contaminant and gradation core sample extracted with plastic core sleeve.

Photo B-17. Gem 3 contaminant and gradation core sample extracted with plastic core sleeve (left and middle) and aluminum sleeve (right).

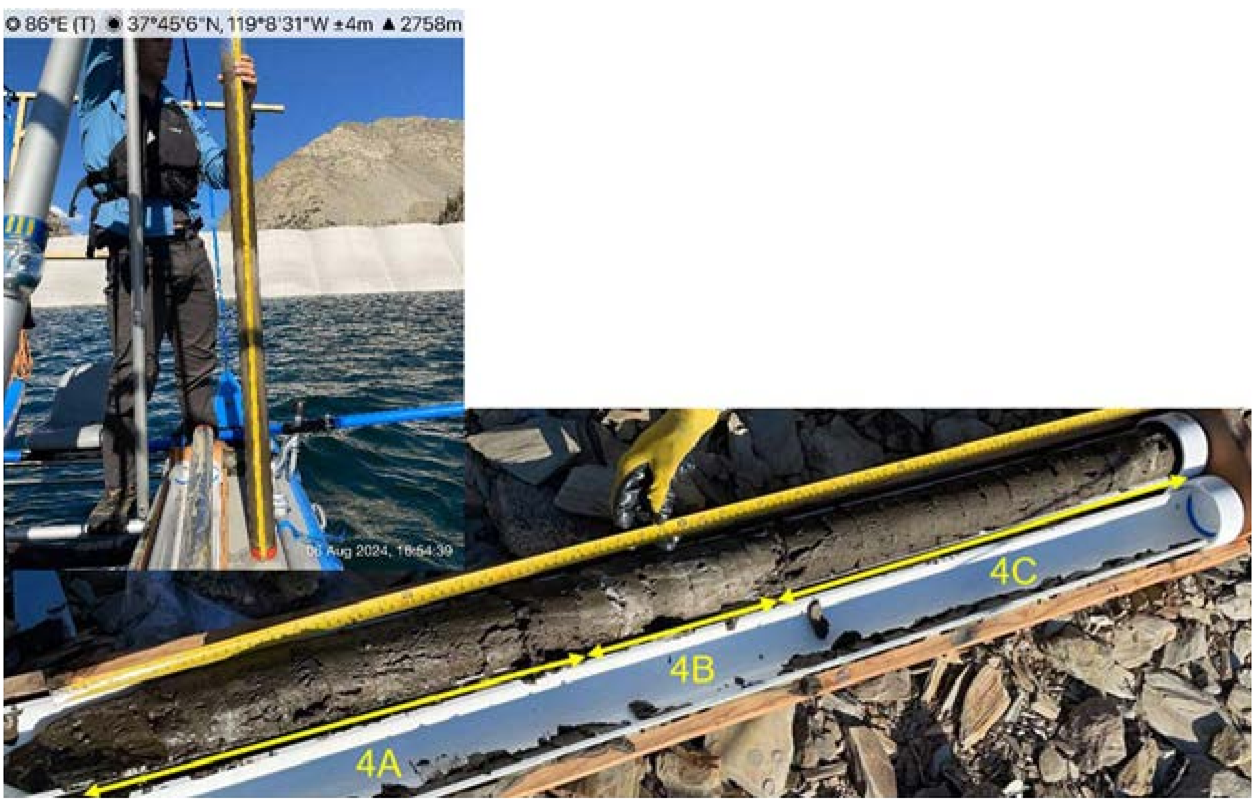

Photo B-18. Gem 4 contaminant and gradation sample location.

Photo B-19. Gem 5 contaminant and gradation sample extracted with plastic core sleeve.

Photo B-20. Gem 6 gradation sample extracted with Ponar grab sampler.

Photo B-21. Gem 7 gradation sample extracted with Ponar grab sampler.

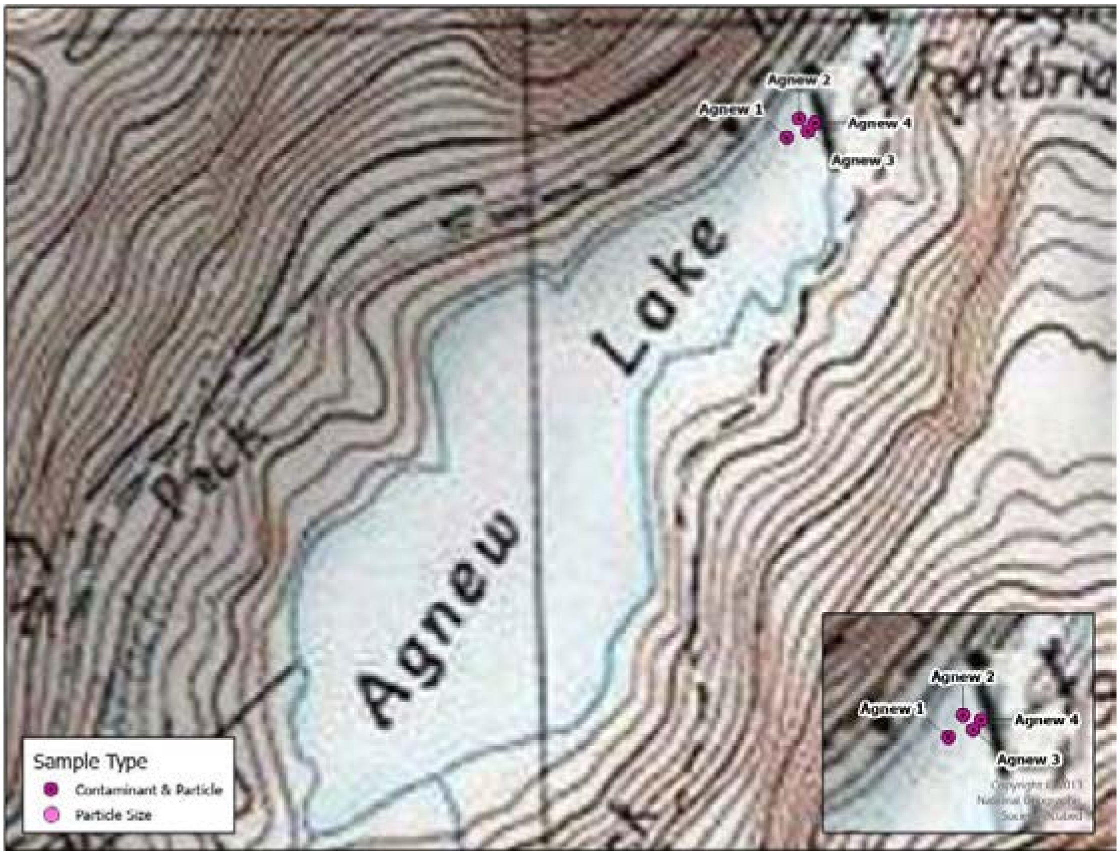

Photo B-22. Agnew Lake sediment sample locations.

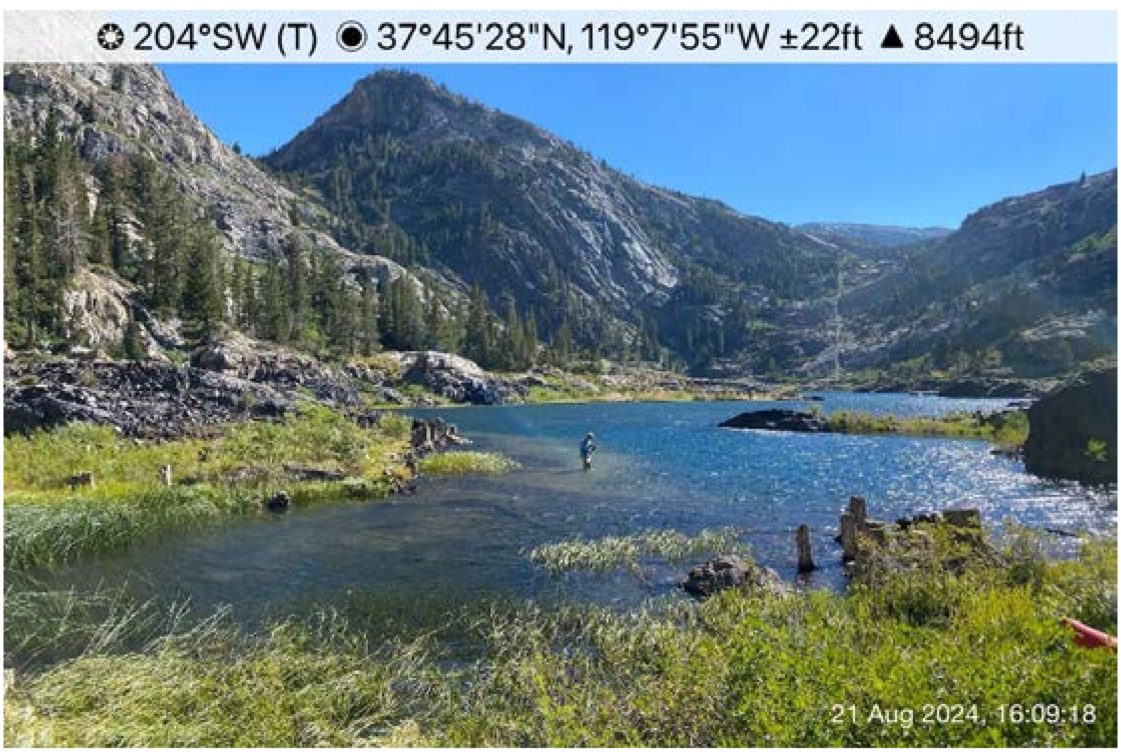

Photo B-23. Agnew 1 sediment sample location within sand facies deposit.

Photo B-24. Agnew 1 contaminant and gradation core sample extracted with plastic sleeve.

Photo B-25. Agnew 2 sediment sample location.

Photo B-26. Agnew 2 contaminant and gradation core sample extracted with plastic sleeve. The top 6 inches of the sample was composed of organic matter.

Photo B-27. Agnew 2 remaining contaminant and gradation sample extracted with a shovel below surface organic matter.

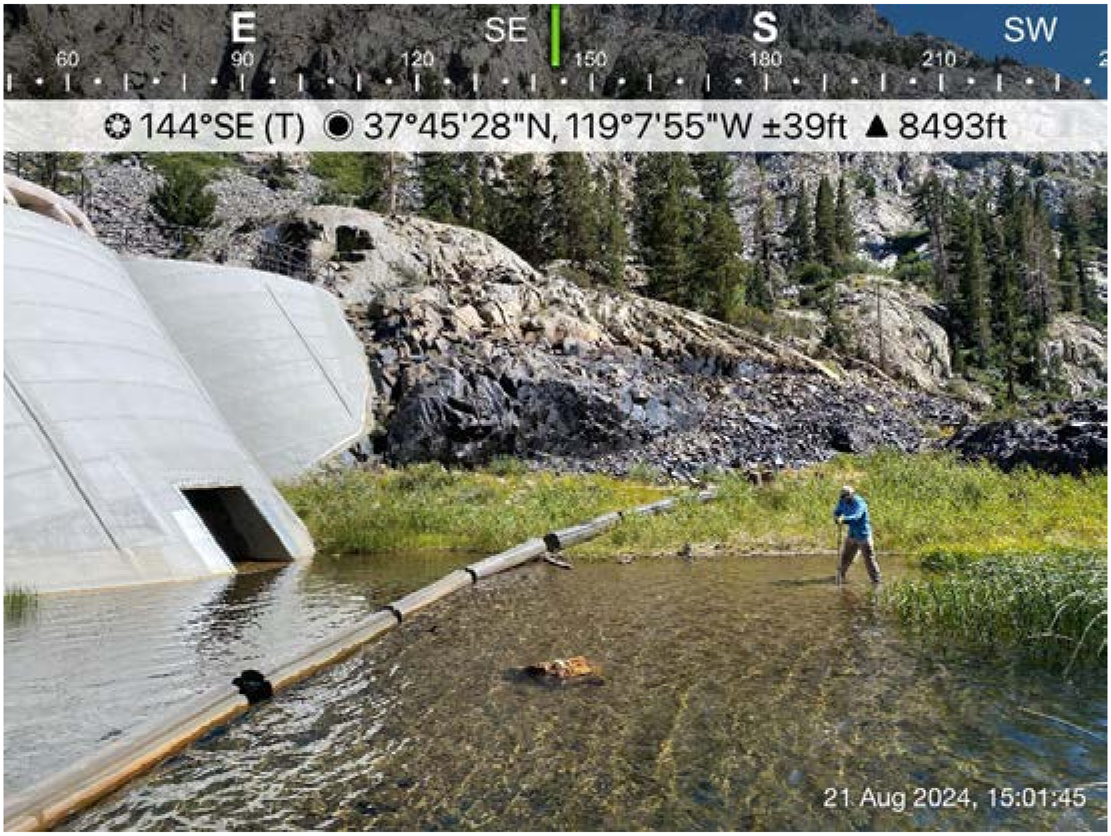

Photo B-28. Agnew 3 sediment sampling location.

Photo B-29. Agnew 3 contaminant and gradation sample extracted using plastic core sleeve.

Photo B-30. Agnew 4 sediment sample location.

Photo B-31. Agnew 4 contaminant and gradation sample extracted using plastic core sleeve.

Photo B-32. Reference sediment sample locations. Waugh Lake tributaries.

Photo B-33. Reference 1 contaminant and gradation sample collected on low gradient stream channel point bar.

Photo B-34. **Reference 2 sample collected downstream of Lost Lakes on the right bank of a high gradient channel. A small area of sediment deposition was found behind a large boulder.**

Photo B-35. **Reference 3 sediment sample collected on low gradient meadow channel.**

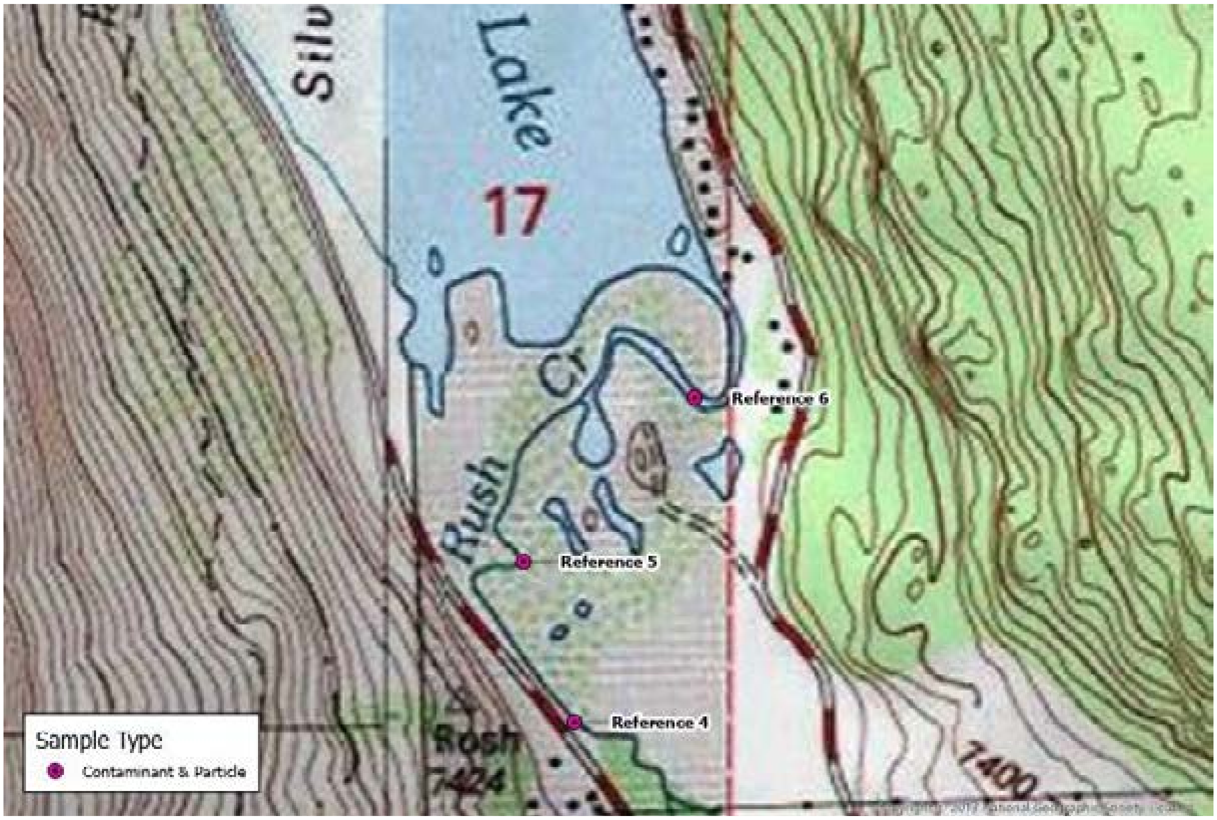

Photo B-36. Reference sediment sample locations upstream of Silver Lake.

Photo B-37. Reference 4 sediment sample location.

Photo B-38. Reference 4 contaminant and gradation sample.

Photo B-39. Reference 5 contaminant and gradation sample collected on left bank low gradient bend where finer sediment deposition was apparent.

Photo B-40. Reference 5 contaminant and gradation sample.

Photo B-41. Reference 6 sediment sample location.

Photo B-42. Reference 6 contaminant and gradation sample.

APPENDIX E
Environmental Effects of the Decommissioning Options

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List of Tables

List of Acronyms

CDFW	California Department of Fish and Wildlife
FERC	Federal Energy Regulatory Commission
Forest Service	United States Forest Service
NRHP	National Register of Historic Places
Project	Rush Creek Project
SIO	Scenic Integrity Objectives

1 ENVIRONMENTAL EFFECTS OF THE DECOMMISSIONING OPTIONS

1.1 INTRODUCTION

This section includes a description (by resource area) of the potential environmental effects associated with the following Rush Creek Project (Project) decommissioning options:

- Full Dam Removal Option (dam and abutments removed for all dams)
- Partial Dam Removal Option (dam removed and abutments remain for all dams)

An analysis of the environmental effects of implementing the Proposed Action is included in Southern California Edison Company's Final License Application (Exhibit E, Section 9.2, Construction Effects (including restoration activities) and Section 9.3, Continued Operation and Maintenance Effects). Potential environmental effects of decommissioning the Project were determined by comparing each decommissioning option to the Proposed Action described in Exhibit E, Section 5 of the Final License Application. Key differences between the Proposed Action and the decommissioning options are the period of disturbance and the area of disturbance. Refer to Table E-1 for a summary of key differences between the Proposed Action and decommissioning options. Table E-2 includes a comparison of construction-related activities for the Proposed Action, Partial Dam Removal Option, and Full Dam Removal Option

Table E-1. Key Differences Between the Proposed Action and Decommissioning Options

Project Feature	Proposed Action	Partial Dam Removal Option	Full Dam Removal Option
Construction Seasons	5	7	10
Dams to be Removed	• Agnew Dam • Rush Meadows Dam	• Agnew Dam • Gem Dam • Rush Meadows Dam	• Agnew Dam • Gem Dam • Rush Meadows Dam
Dam Abutments	Remain in Place	Remain in Place	Removed
Dam Retrofit	Gem Dam	N/A	N/A
Restoration Areas	• Agnew Dam Construction Area and Historical Shoreline Inundation Area • Rush Meadows Dam Construction Area and Former Waugh Lakebed	• Agnew Dam Construction Area and Historical Shoreline Inundation Area • Gem Dam Construction Area and Former Gem Lake Shoreline • Rush Meadows Dam Construction Area and Former Waugh Lakebed	• Agnew Dam Construction Area and Historical Shoreline Inundation Area • Gem Dam Construction Area and Former Gem Lake Shoreline • Rush Meadows Dam Construction Area and Former Waugh Lakebed

Under both decommissioning options, it is assumed that upon the Federal Energy Regulatory Commission's (FERC) termination of the license following the completion of license surrender requirements, the United States Forest Service (Forest Service) would assume full managerial responsibility for the areas formerly within the FERC Project boundary and land management within this area would be provided by the Inyo National Forest Land in accordance with its Resource Management Plan and/or other applicable Forest Service policy or regulation.

Table E-2. Comparison of Construction Activities by Decommissioning Option

	Proposed Action	Partial Dam Removal	Full Dam Removal
Number of Construction Seasons			
Rush Meadows	1	1	2
Agnew	1	1	2
Gem	3	5	6
Total	**5**	**7**	**10**
Cost[1]			
Rush Meadows	$13,800,000	$13,800,000	$45,980,000
Agnew	$9,200,000	$9,200,000	$20,570,000
Gem	$71,300,000	$116,160,000	$235,950,000
Total	**$94,300,000**	**$139,160,000**	**$302,500,000**
On-site Use of Demolition Material (cy)			
Rush Meadows	2,286	2,286	0
Agnew	1,515	1,515	0
Gem	10,198	18,200	0
Total	**13,999**	**22,001**	**0**
Export of Demolition Material (cy)			
Rush Meadows	0	0	3,351
Agnew	0	0	2,243
Gem	0	0	22,700
Total	**0**	**0**	**28,294**
Import of Concrete/Shotcrete (cy)			
Rush Meadows	55	55	0
Agnew	35	35	0
Gem	2,362	470	0
Total	**2,452**	**560**	**0**
Helicopter Trips - Heavy Lift (RT)			
Rush Meadows	94	94	1,308
Agnew	75	75	942
Gem	1,140	750	8,870
Total	**1,309**	**919**	**11,120**

	Proposed Action	Partial Dam Removal	Full Dam Removal
Helicopter Trips - Light Lift (RT)			
Rush Meadows	56	56	118
Agnew	35	35	46
Gem	612	450	800
Total	**703**	**541**	**964**
Truck Trips - Construction (RT)			
Rush Meadows	245	245	419
Agnew	63	63	95
Gem	1,664	1,960	970
Total	**1,972**	**2,268**	**1,484**
Truck Trips - Disposal (RT)			
Rush Meadows	16	16	357
Agnew	13	13	239
Gem	175	130	2,420
Total	**204**	**159**	**3,016**
Mule Trips (RT)			
Rush Meadows	554	554	837
Agnew	0	0	0
Gem	3,555	4,420	5,670
Total	**4,109**	**4,974**	**6,507**

Notes:

[1] Refer to the DEC 1 TSR, Appendix B for additional cost information.

Key: cy = cubic yards
Full Dam Removal = full dam removal (all sites)
Partial Dam Removal = partial dam removal (all sites; abutments remain)
Proposed Action = partial removal of Rush Meadows and Agnew dams (abutments remain), retrofitting of Gem Dam
RT = round trip

The discussion below identifies the incremental construction effects (short-term) and the resulting condition effects (long-term) under each option when compared to the Proposed Action. Short-term construction effects are temporary effects that may occur during full/partial dam removal. These effects would result from ground disturbance, use of heavy equipment, and transport of material to and from the construction sites. Under both options (full and partial dam removal), the long-term resulting condition is that hydroelectric operations would be discontinued, and the Project would be removed from FERC jurisdiction (surrender of the license and decommissioning of the Project). There would be no future operation and maintenance activities. The Project area would be restored and natural processes allowed to re-establish.

1.2 Resource Analysis

1.2.1 Water Use and Hydrology

1.2.1.1 Construction

Construction and restoration activities have the potential to temporarily affect the ability to maintain minimum instream flows and manage high flows during construction and restoration.

Under the Full and Partial Dam Removal options, impacts associated with water use and hydrology and measures to avoid or reduce those impacts during construction and restoration activities would generally be the same as under the Proposed Action. However, the decommissioning options introduce a third dam removal location (Gem Dam would be removed instead of retrofitted) that would require dewatering and installation of a bypass system, and there is a slightly greater chance of hydrology issues arising during construction (high flows, disruption of minimum flows). Therefore, the Full and Partial Dam Removal options would have a ***greater*** potential to adversely affect water use and hydrology as compared to the Proposed Action.

1.2.1.2 Resulting Condition

Under the Full and Partial Dam Removal options, Rush Creek would be returned to unimpaired conditions in all Project reaches (below Waugh Dam, below Gem Dam, below the Rush Creek Powerhouse). Removal of all Project dams/reservoirs would result in the following compared to the Proposed Action:

- Below Waugh Dam Reach – Same hydrology.
- Below Gem Dam Reach – Higher, more frequent high-flow events and similar low-flow events. More potential overbanking in the vicinity of the State Route 158 (SR-158).
- Below Rush Creek Powerhouse Reach – Higher high-flow events (May through July) and much lower low flow events (September through April).
- Loss of power generation (18,047 megawatt hours of dependable power generation capacity in a dry year, 2015).

Overall, removal of Project dams and associated facilities would result in unimpaired hydrology and a loss of power generation, which is considered a ***long-term adverse impact*** on water use compared to the Proposed Action.

1.2.2 Water Quality

1.2.2.1 Construction

The existing water quality in the vicinity of the Project is currently high quality (e.g., cold temperatures, high dissolved oxygen, no contaminants). Construction and restoration activities could temporarily affect water quality, including increases in turbidity and suspended solids due to sediment disturbance, introduction of pollutants as a result of accidental spill, contamination associated with stormwater runoff from construction staging and stockpile areas, and contamination associated with mule and human waste.

Under the Full and Partial Dam Removal options, impacts to water quality and measures to avoid or reduce those impacts during construction and restoration activities would generally be the same as under the Proposed Action. However, the decommissioning options introduce a third dam removal location (Gem Dam would be removed instead of retrofitted) and there is a longer construction duration increasing the opportunity for water quality impacts to occur. Therefore, the Full and Partial Dam Removal options would have a ***greater*** potential to adversely affect water quality as compared to the Proposed Action.

1.2.2.2 Resulting Condition

Under the Proposed Action, Gem Dam would be retrofitted and retained as a storage reservoir. Under the Full and Partial Removal options, Gem Dam would be removed. The remaining natural lake would be smaller, similar to Gem Lake at low pool. With Gem Dam removed, high-flow events associated with the unimpaired hydrograph would not be captured by the reservoir and would flow through the project reaches more frequently with increased magnitude and duration. This would potentially allow slightly more or similar sediment to be released from Gem Lake into Rush Creek compared to the Proposed Action. The high-flow events could cause slightly more erosion in Rush Creek downstream, resulting short periods of lower water clarity in Agnew Lake and Silver Lake during spring runoff (unimpaired conditions).

Water temperature released from the surface of natural Gem Lake would be warmer during the summer than water temperature released from the bottom of Gem Lake under the Proposed Action. This change in water temperature is expected to be small and offset by higher summer flows that would warm slower as they flow downstream. Water temperature downstream would remain cold. No other changes to water quality (dissolved oxygen, pH, alkalinity, conductivity, salinity, contaminates) are expected. Water quality would be high quality (e.g., cold temperatures, high dissolved oxygen, no contaminants) under the Full or Partial Dam Removal options similar to the Proposed Action. Therefore, removal of Project dams and associated facilities would have a ***neutral*** effect on water quality in Rush Creek compared to the Proposed Action.

1.2.3 Fish and Aquatics

1.2.3.1 Construction

Construction activities could temporarily affect fish and aquatic species physical habitat by affecting water quality, including increasing water temperature, increasing turbidity and suspended solids from sediment disturbance, introducing pollutants because of accidental spill or contamination associated with stormwater runoff from construction staging and stockpile areas, and contamination associated with human/mule waste. Construction has the potential to temporarily affect physical habitat by modifying channel geomorphology/sediment and hydrology, including minimum instream flows and channel dewatering, creating barriers to fish movement, and introduction of invasive species and disease. It could also result in direct loss of fish and aquatic species.

Under the Full and Partial Dam Removal options, impacts to fish and aquatic resources and their habitat and measures to avoid or reduce those impacts during construction and restoration activities would generally be the same as under the Proposed Action. However, the decommissioning options introduce a third dam removal location (Gem Dam would be removed instead of retrofitted) and there is a longer construction duration increasing the opportunity for impacts to fish and aquatic resources to occur. Therefore, the Full and Partial Dam Removal options would have a ***greater*** potential to adversely affect fish and aquatic resources as compared to the Proposed Action.

1.2.3.2 Resulting Condition

Under the Proposed Action, Gem Dam would be retrofitted and retained as a storage reservoir. Under the Full and Partial Removal options, Gem Dam would be removed, and Gem Lake would return to a natural lake (similar in size to Gem Lake at low pool). Under the Full and Partial Dam Removal options, there would be a change to aquatic habitat (reservoir to natural lake), however, it is not expected that productivity of the lake would change significantly. With removal of Gem Dam and associated facilities, the relatively low amount of fish entrainment that would exist under the Proposed Action would no longer occur and the mitigation (1,000 catchable-sized rainbow trout every five years) would no longer occur. Flows and fish populations in the Project reaches (below Waugh Dam, below Gem Dam, below the Rush Creek Powerhouse) would change compared to the Proposed Action as follows:

- Below Waugh Dam Reach
  - Hydrology – Same hydrology.
  - Fish Population – Same brook and rainbow trout populations.
- Below Gem Dam Reach
  - Hydrology – Higher more frequent high-flow events and similar low-flow events.

  - Fish Population – Fish populations (brook and rainbow trout) are currently high (density and biomass). Populations would likely decline due to high flow events in the steep, plunge pool habitat.

- Below Rush Creek Powerhouse Reach to Grant Lake

  - Hydrology – Higher high-flow events and much lower low-flow events, September through April.

  - Fish Population – Fish populations (primarily rainbow and brown trout) are currently healthy, but heavily fished and supported by California Department of Fish and Wildlife (CDFW) stocking. Populations would remain heavily fished and supported by CDFW stocking. Physical habitat would decline with higher high flows and lower low flow events.

The Full and Partial Removal options would result in a smaller natural Gem Lake, no diversions and fish entrainment, and modified hydrology. Compared to the Proposed Action, fish productivity in Gem Lake would be similar and, in the stream reaches, fish productivity would be less. The overall effect to fish and aquatics is considered to be a small, ***long-term adverse effect*** when compared to the Proposed Action.

1.2.4 Botanical and Wildlife

1.2.4.1 Construction

Construction and restoration activities could directly and indirectly affect special-status botanical and wildlife species and result in the introduction or spread of non-native invasive plants.

Under the Full and Partial Dam Removal options, impacts to botanical and wildlife resources and measures to avoid or reduce those impacts and prevent the introduction or spread of non-native invasive plants during construction and restoration activities would generally be the same as under the Proposed Action. However, under both decommissioning options wildlife resources would be disturbed for a longer period as compared to the Proposed Action. In particular, under the Full Dam Removal option, there would be a significant increase in the number of helicopter and truck trips to support export of demolished material from the construction site to the Base of Operations and transport to a disposal facility as compared to the Proposed Action (refer to Table E-2). In addition, under the Full and Partial Dam Removal options there would be an increase in ground disturbance (including decommissioning of a third dam—Gem Dam would be removed instead of retrofitted) that could result in loss of individual special-status botanical and wildlife resources or their habitat and increase the opportunity to introduce or spread non-native invasive plants. Therefore, the Full and Partial Dam Removal options would have a ***greater*** potential to adversely affect botanical and wildlife resources compared to the Proposed Action.

1.2.4.2 Resulting Condition

Under the Full and Partial Dam Removal options, the Project would no longer be present. The decommissioning options would remove all Project dams, re-establish unimpaired conditions in Rush Creek, restore the former dam and support facility sites, restore the former Waugh Lakebed, Gem and Agnew lake shorelines, and eliminate operation and maintenance activities that could potentially disturb botanical and wildlife resources. Removal of Gem Dam would result in re-establishment of the natural lake (Gem Lake). The natural lake would continue to provide potential foraging habitat for bald eagle, osprey, and special-status bat species under Full and Partial Dam Removal options. At Gem Dam/Lake operation and maintenance activities consist of dam inspections, testing, and maintenance, and large woody debris removal. Under the Proposed Action, these activities are minimal and only require a small crew to occasionally visit the site. While operation and maintenance activities would no longer occur under the Full and Partial Dam Removal options this reduction of potential disturbance to botanical and wildlife resources would be minimal and is considered ***neutral*** when compared to the Proposed Action.

1.2.5 Geology and Soils

1.2.5.1 Construction

Grading, vegetation removal, and other ground-disturbing activities could temporarily increase the susceptibility of soils to water and wind erosion during construction and restoration activities. In addition, construction activities could impact soils from the accidental spill of fuels or other toxic materials that are used for construction activities or from use of heavy equipment.

Under the Full and Partial Dam Removal options, impacts to geology and soils and measures to avoid or reduce those impacts during construction and restoration activities would generally be the same as under the Proposed Action. However, the decommissioning options introduce a third dam removal location (Gem Dam would be removed instead of retrofitted) and there is a longer construction duration increasing the opportunity for construction-related erosion or contamination from an accidental spill to occur. Therefore, the Full and Partial Dam Removal options would have a ***greater*** potential to adversely affect geology and soils as compared to the Proposed Action.

1.2.5.2 Resulting Condition

Under the Proposed Action, Gem Dam would be retrofitted and retained as a storage reservoir. Under the Full and Partial Removal options, Gem Dam would be removed, however a natural Gem Lake would still be present following removal. The potential for erosion and sedimentation to occur under the Proposed Action, and Full and Partial Dam Removal options is not significantly different; therefore, effects to geology and soils are considered ***neutral***.

1.2.6 Geomorphology

1.2.6.1 Construction

Construction and restoration activities could temporarily affect erosion and sedimentation in Rush Creek. Specifically, the establishment of construction staging and storage areas, such as grading, stockpiling materials, etc., have the potential to temporarily convey sediments into the channel and flood prone areas. Excavation and fill activities have the potential to temporarily erode and deliver sediment to the channel as a result of unstable slopes, toppling of unstable material, and from storm event runoff. Installation of dewatering infrastructure has the potential to cause temporary sedimentation through the installation of cofferdams and by placement of the discharge pipe. Temporary access routes for foot and vehicle traffic, over time, can destabilize slopes and deliver sediment into waterways or flood prone areas. Significant erosion could lead to channel diversion or channel blockages, altering the direction of flow and accelerating erosion and deposition of sediment. Ground disturbance as a result of installation of temporary structures to support construction activities has the potential to result in erosion.

Under the Full and Partial Dam Removal options, impacts to geomorphology and measures to avoid or reduce those impacts during construction and restoration activities would generally be the same as under the Proposed Action. However, the decommissioning options introduce a third dam removal location (Gem Dam would be removed instead of retrofitted) and there is a longer construction duration increasing the opportunity for erosion and sedimentation in Rush Creek to occur. Therefore, the Full and Partial Dam Removal options would have a ***greater*** potential to adversely affect geomorphology as compared to the Proposed Action.

1.2.6.2 Resulting Condition

Under the Proposed Action, Gem Dam would be retrofitted and retained as a storage reservoir. Under the Full and Partial Dam Removal options, Project facilities (buildings, flowlines) and Gem Dam would be removed. Erosion at Project facilities was not identified as an issue under existing conditions and would not change under the Full and Partial Dam Removal options. The natural Gem Lake would be smaller, similar to the current Gem Lake at low pool. With Gem Dam removed, high-flow events associated with the unimpaired hydrograph would not be captured by the reservoir and would flow through the Project reaches more frequently with increased magnitude and duration. Removal of all Project dams/reservoirs would result in the following hydrology, sediment supply, and channel erosion potential compared to the Proposed Action:

- Below Waugh Dam Reach
    - Hydrology – Same hydrology.
    - Sediment Supply – Same sediment supply.
    - Channel Erosion Potential – Same erosion potential.

- Below Gem Dam Reach
  - Hydrology – Higher high-flow events with longer duration.
  - Sediment Supply – Same sediment supply.
  - Channel Erosion Potential – Higher erosion potential. Primarily bedrock reach, limited channel change potential.
- Below Rush Creek Powerhouse Reach to Grant Lake
  - Hydrology – Higher high-flow events with longer duration.
  - Sediment Supply – Same sediment supply.
  - Channel Erosion Potential – Higher erosion potential. Adjustable channel. A small amount of channel widening and coarsening would occur.

Under the Full and Partial Removal options, Gem Dam removal would increase the frequency, magnitude and duration of unimpaired high-flow conditions downstream of Gem Lake, but sediment supply would stay essentially the same. The only adjustable channel is downstream of the Rush Creek Powerhouse. Higher flows associated with the unimpaired hydrology would slightly widen and coarsen the channel. The change would be small. The Full and Partial Dam Removal options would have a ***neutral*** effect on geomorphology compared to the Proposed Action.

1.2.7 Wetland, Riparian, and Littoral Habitats

1.2.7.1 Construction

Construction and restoration activities could directly and indirectly affect wetland, riparian, and littoral habitats. Under the Full and Partial Dam Removal options, impacts to wetland, riparian, and littoral habitats and measures to avoid or reduce those impacts during construction and restoration activities would generally be the same as under the Proposed Action. However, the decommissioning options introduce a third dam removal location (Gem Dam would be removed instead of retrofitted) and restoration of the Gem Lake shoreline. Removal of Gem Lake would result in loss of additional lacustrine habitat as compared to the Proposed Action. Therefore, the Full and Partial Dam Removal options would have a ***greater*** potential to adversely affect wetland, riparian, and littoral habitats as compared to the Proposed Action.

1.2.7.2 Resulting Condition

The Full and Partial Dam Removal options would remove all Project dams (return Rush Creek to unimpaired conditions), restore the former dam and support facility sites, and eliminate operation and maintenance activities that could potentially remove or disturb wetland, riparian, or littoral habitats. Removal of Project dams/reservoirs would result in higher and/or more frequent natural unimpaired high-flow events and lower low-flow events in Rush Creek.

Rush Creek below Gem Dam is a steep mountain stream which is confined in bedrock and with a very narrow floodplain. Riparian vegetation along this reach is distributed discontinuously in patches along the stream and rocky granitic sections which lack riparian vegetation. Although removal of Gem Dam would result in re-establishment of unimpaired flows, riparian vegetation is limited and is not expected to substantially change over the long-term.

Under existing conditions, the littoral zone of Gem Lake (defined to include habitats that fall within the historical inundation zone of the lake) currently experiences periodic inundation depending on the water year type. As a result, habitats in some portions of the reservoir bed are gradually transitioning from littoral to either riparian (along tributary drainages within the historical streambed) or upland habitats (in more open areas), but in an early successional state, bare substrates still predominate the landscape. Removal of Gem Dam will allow re-establishment of the natural lake (Gem Lake) that will continue to support littoral habitats. Although flow conditions would return to an unimpaired hydrograph under the Full and Partial Dam Removal options, removal of Project dams and associated facilities would have a ***neutral*** effect on wetland, riparian, or littoral habitats as compared to the Proposed Action.

1.2.8 Land Use

1.2.8.1 Construction

Construction and restoration activities could temporarily affect land use, including potential effects associated with undertaking construction activities in the Ansel Adams Wilderness, using June Mountain Ski Area Parking Lot as a Base of Operations, and removal of Project facilities.

Under the Full and Partial Dam Removal options, all dams and Project support facilities would be removed. Impacts to land use and measures to avoid or reduce those impacts during construction and restoration activities would generally be the same as compared to the Proposed Action. In addition, the land jurisdiction where ground disturbance would occur is similar between the decommissioning options and the Proposed Action. However, impacts to land use would occur over a longer period; therefore, the Full and Partial Dam Removal options would have ***greater*** potential to adversely affect land use as compared to the Proposed Action.

1.2.8.2 Resulting Condition

Under the Full and Partial Dam Removal options, all dams and Project support facilities would be physically removed from the landscape, the Project area would be restored, and operation and maintenance activities would cease. Under the Proposed Action, removal of Project facilities would have no effect or a beneficial effect on land use because SCE would adhere to Forest Service policies and regulations related to activities occurring within wilderness and Inyo National Forest, and because access to these areas for purposes of land management and project maintenance would occur only periodically. Under the Full and Partial Dam Removal options, the additional removal of Gem Dam and associated facilities would also result in the cessation of any operation and maintenance activities at the former Gem Dam site, however, this change would not differ substantially from the effects of the Proposed Action, given the frequency and effects associated with access to these areas under the Proposed Action. Thus, any land use benefits associated with the Full and Partial Dam Removal options are considered ***neutral*** when compared to the Proposed Action.

1.2.9 Recreation

1.2.9.1 Construction

Construction and restoration activities could temporarily affect recreation resources, including use of developed day-use and camping facilities in the vicinity of construction activities and dispersed recreation areas in the backcountry. The specific construction activities that could potentially affect day-use and camping facilities are vehicle traffic and helicopter flights to and from the Base of Operations and to and from the Rush Creek Powerhouse, and increased pack animal activity at the Frontier Pack Station. The Project does not include any developed recreation facilities that would support recreation use. However, dispersed recreation use does occur in the vicinity of the Project. Dispersed recreation could be affected by trail closures limiting access to backcountry areas, fugitive dust emissions, construction noise, increased mule usage along the Rush Creek Trail, and reduced opportunities for fishing and water recreation in the backcountry.

Under the Full and Partial Dam Removal options, all dams and Project support facilities would be removed. While impacts to recreation resources and measures to avoid or reduce impacts during construction and restoration activities would generally be the same as compared to the Proposed Action, the extended construction timeframes for both decommissioning options means that developed and dispersed recreation use and opportunities would be impacted for a longer period of time (up to 10 years for full decommissioning as compared to five years for the Proposed Action). Therefore, the Full and Partial Dam Removal options would have a ***greater*** potential to adversely affect recreation resources as compared to the Proposed Action.

1.2.9.2 Resulting Condition

Under the Full and Partial Dam Removal options, all dams, reservoirs, and Project support facilities would be removed; the Project area restored; and operation and maintenance activities would cease. The decommissioning options would not result in a modification to developed recreation opportunities; however, they would result in a modification to dispersed reservoir-based recreation at Gem Lake. Hiking/camping around Gem Lake would still occur however, recreationists would experience a natural water body at Gem Lake rather than a reservoir. While the quality of the recreation experience and opportunities would be slightly modified under the Full and Partial Dam Removal options, effects are considered ***neutral*** when compared to the Proposed Action.

1.2.10 Aesthetics

1.2.10.1 Construction

Construction and restoration activities could temporarily affect aesthetic resources due to the presence of construction work and staging areas. Staging and work areas in the backcountry would introduce temporary structures, heavy equipment, fencing, and other materials that would contrast with the natural environment at each dam site. While the June Mountain Ski Area Parking Lot Base of Operations is an existing disturbed area that already includes industrial elements, the addition of equipment and materials associated with construction and restoration activities would introduce more visually intrusive elements to the setting, which may be intermittently visible to people traveling on State Route 158 or from other public vantage points with views of the parking lot.

While impacts to aesthetic resources and measures to avoid or reduce those impacts during construction and restoration activities would generally be the same as compared to the Proposed Action, the extended construction timeframes for both decommissioning options means that construction work and staging areas would impact the visual environment longer (up to 10 years for full decommissioning as compared to five years for the Proposed Action). Therefore, the Full and Partial Dam Removal options would have a ***greater*** potential to adversely affect aesthetic resources during construction and restoration activities as compared to the Proposed Action.

1.2.10.2 Resulting Condition

Under the Full and Partial Dam Removal options, Gem Dam would be removed and the visual character of the area where the dam is currently located would be expected to be more consistent with the Forest Service Scenic Integrity Objectives (SIO) designations assigned to the landscape within which it is located. Under both decommissioning options (full or partial removal) the visual character of the immediate area around Gem Dam/Lake would be more consistent with the SIO designations; this would result in a ***long-term benefit*** to the visual quality and character of the area when compared to the Proposed Action.

Under the Full and Partial Dam Removal options, the Waugh Lakebed and Agnew Lake shoreline would be restored the same as under the Proposed Action. Gem Lake would have a natural lake shoreline varial zone (small) compared to the larger shoreline varial zone under the Proposed Action. Removal of all Project dams/reservoirs would result in unimpaired flow conditions in all Project reaches (below Waugh Dam, below Gem Dam, below the Rush Creek Powerhouse). Hydrology would change compared to the Proposed Action as follows:

- Below Waugh Dam Reach
  - Hydrology – Same hydrology.

- Below Gem Dam Reach
  - Hydrology – Higher more frequent high-flow events, higher more frequent intermediate flow events, and similar low-flow events.
- Below Rush Creek Powerhouse Reach to Grant Lake
  - Hydrology – Higher high-flow events and much lower low flow events, September through April.

Under the Full and Partial Dam Removal options, there would be higher flows and more frequent flows over Horsetail Falls. This is considered a ***long-term benefit*** to aesthetic resources when compared to the Proposed Action.

1.2.11 Cultural

1.2.11.1 Construction

Construction and restoration activities could temporarily affect archaeological sites eligible for listing on the National Register of Historic Places (NRHP), contributing to the NRHP eligible Rush Meadows Archaeological District, or unevaluated sites through direct and indirect effects. In addition, there is the potential to affect cultural resources through ground disturbance related to construction activities, staging areas, helicopter landing zones, construction camps, and mule access and holding areas.

Under the Full and Partial Dam Removal options, all dams and Project support facilities would be removed. While impacts to cultural resources and measures to avoid or reduce impacts to cultural resources during construction and restoration activities would generally be the same as compared to the Proposed Action, the decommissioning options introduce new areas of disturbance (e.g., Gem Dam, support facilities that would have been retained under the Proposed Action, Rush Powerhouse, etc.). Therefore, the Full and Partial Dam Removal options would have a ***greater*** potential to adversely affect cultural resources as compared to the Proposed Action.

1.2.11.2 Resulting Condition

Under the Full and Partial Dam Removal options, all dams and Project support facilities would be removed, the Project area restored, and operation and maintenance activities that could disturb cultural resources would cease. Under the Proposed Action, operation and maintenance activities that could affect cultural resources are limited to areas around Project facilities. While operation and maintenance activities would no longer occur under the decommissioning options, this reduction of potential disturbance to cultural resources would be minimal and is considered ***neutral*** when compared to the Proposed Action.

In addition, decommissioning the Project would result in the removal of the Rush Creek Hydroelectric System Historic District and this is considered a permanent ***long-term adverse impact***.

1.2.12 Tribal

1.2.12.1 Construction

Construction and restoration activities could temporarily affect Tribal resources through ground disturbance related to construction activities, staging areas, helicopter landing zones, construction camps, and mule access and holding areas.

Under the Full and Partial Dam Removal options, all dams and Project support facilities would be removed. While impacts to Tribal resources and measures to avoid or reduce impacts to Tribal resources during construction and restoration activities would generally be the same as compared to the Proposed Action, the decommissioning options introduce new areas of disturbance (e.g., Gem Dam, support facilities that would have been retained under the Proposed Action, Rush Powerhouse, etc.). Therefore, the Full and Partial Dam Removal options would have a ***greater*** potential to adversely affect Tribal resources as compared to the Proposed Action.

1.2.12.2 Resulting Condition

Under the Full and Partial Dam Removal options, all dams and Project support facilities would be removed, the Project area restored, and operation and maintenance activities that could disturb Tribal resources would cease. Under the Proposed Action, operation and maintenance activities that could affect Tribal resources are limited to areas around Project facilities. While operation and maintenance activities would no longer occur under the decommissioning options, this reduction of potential disturbance to Tribal resources would be minimal and is considered ***neutral*** when compared to the Proposed Action.

1.2.13 Socioeconomics

1.2.13.1 Construction

Construction and restoration activities could temporarily affect socioeconomics through changes to the local and regional economy because of reduced tourism during construction and restoration activities.

Under the Full and Partial Dam Removal options, all dams and Project support facilities would be removed. While impacts to socioeconomics and measures to avoid or reduce those impacts during construction and restoration activities would generally be the same as compared to the Proposed Action, the extended construction timeframes for both decommissioning options would exacerbate the negative effect on tourism in the June Lake region by potentially deterring visitors to the area that would otherwise contribute to the local economy, for a longer period of time. Therefore, the Full and Partial Dam Removal options would have a ***greater*** potential to adversely affect socioeconomics (i.e., income generation from tourism) as compared to the Proposed Action.

1.2.13.2 Resulting Condition

Under the Full and Partial Dam Removal options, the Project would no longer be present. The employment opportunity that the Project represents would no longer be available and revenue from hydropower generation would no longer contribute to the economy. In addition, the Rush Creek Powerhouse is used to respond to California Public Utility Commission and California Independent System Operator (CAISO) demands for power. Demands can be market driven (i.e., energy needs and renewable load), or used to stabilize the grid. Absent the Rush Creek Powerhouse to serve as backup power to local communities, there would be significant impacts to customers. The region has a need for power over the near term, and power from the Project would continue to help meet demands in the future. If the Project were to shut down or significantly change operations, SCE would need to build new, incremental resources to fill the energy, capacity, and clean-attribute gaps. This would likely involve the development of new renewable projects and associated infrastructure, which would be time-consuming, costly, and require significant resources (refer to Exhibit E, Section 3, Purpose of Action and Need for Power). Therefore, the Full and Partial Dam Removal options would result in a ***long-term adverse impact*** on socioeconomics as compared to the Proposed Action.

1.2.14 Air Quality

1.2.14.1 Construction

Construction and restoration activities could temporarily affect air quality through the operation of off-road construction equipment and on-road vehicles; increased fugitive dust emissions because of demolition and construction activities; toxic air contaminant emissions; and greenhouse gas impacts caused by operation of off-road construction equipment and on-road vehicles.

Under the Full and Partial Dam Removal options, all dams and Project support facilities would be removed. While impacts to air quality and measures to avoid or reduce those impacts during construction and restoration activities would generally be the same as compared to the Proposed Action, the use of construction vehicles and equipment, helicopters, and truck trips under both decommissioning options would occur over a longer duration, increasing the amount time that emission-generating activities would occur. Therefore, the Full and Partial Dam Removal options would have a ***greater*** potential to adversely affect air quality as compared to the Proposed Action.

1.2.14.2 Resulting Condition

Under the Full and Partial Dam Removal options, the Project would no longer be present, and emissions-generating activities associated with operation and maintenance of the Project would no longer occur. Emissions-generating activities under the Proposed Action do not significantly contribute to regional air quality. While operation and maintenance activities would no longer occur under the Full and Partial Dam Removal options, this reduction in emissions-generating activities is minor and effects are considered ***neutral*** when compared to the Proposed Action.

However, decommissioning of the Project would eliminate hydropower generation at this facility. Energy generated by the Project reduces greenhouse gas emissions in California by displacing energy and other services that would otherwise be provided by gas-fired units. If the Project is decommissioned, Southern California Edison would need to obtain replacement from zero-emitting, firm (i.e., can generate power 24 hours per day / 7 days per week, when needed), Renewable Portfolio Standard eligible energy sources, which would require new facilities (refer to Exhibit E, Section 3, Purpose of Action and Need for Power). Since the Project provides low-cost power that displaces nonrenewable, fossil-fired generation, and contributes to a diversified generation mix, its decommissioning would result in a permanent ***long-term adverse impact*** to air quality.

1.2.15 Noise

1.2.15.1 Construction

Construction and restoration activities could temporarily affect ambient noise levels from ground operated construction equipment, truck hauling of materials and equipment, and helicopter use for movement of equipment and materials.

Under the Full and Partial Dam Removal options, all dams and Project support facilities would be removed. While impacts to ambient noise levels and measures to avoid or reduce those impacts during construction and restoration activities would generally be the same as compared to the Proposed Action, the use of construction vehicles and equipment, helicopters, and truck trips under both decommissioning options would occur over a longer duration, increasing the amount of time that noise-generating activities would occur. In particular, there is a significant increase in helicopter and truck trips under the decommissioning options (refer to Table E-2). Therefore, the Full and Partial Dam Removal options would have a ***greater*** potential to adversely affect the ambient noise levels as compared to the Proposed Action.

1.2.15.2 Resulting Condition

Under the Full and Partial Dam Removal options, the Project would no longer be present, and operation and maintenance activities would cease. Rush Creek Powerhouse would no longer be operating, and worker trips to the Project and helicopter use to conduct operation and maintenance activities would no longer occur. As such, the Project would no longer contribute noise to the existing ambient noise environment. However, the Project is not the only, nor necessarily the primary, source of noise in the area. In addition to sources of noise associated with Project facility operation at the Rush Creek Powerhouse, nearby sensitive receptors experience noise from vehicular traffic along State Route 158 and natural sources (wind and water). Any reduction in ambient noise levels as a result of full and partial dam removal would be minimal and is considered ***neutral*** when compared to the Proposed Action.

1.2.16 Traffic

1.2.16.1 Construction

Construction and restoration activities could temporarily affect traffic because of increased truck trips, increased worker transportation, and road damage from construction truck trips.

Under the Full and Partial Dam Removal options, all dams and Project support facilities would be removed. While impacts to traffic and measures to avoid or reduce those impacts during construction and restoration activities would generally be the same as compared to the Proposed Action, the increased truck/worker trips and road damage from construction truck trips under both decommissioning options would occur over a longer duration, increasing the amount of time that traffic would be impacted. Therefore, the Full and Partial Dam Removal options would have a ***greater*** potential to adversely affect traffic as compared to the Proposed Action.

1.2.16.2 Resulting Condition

Under the Full and Partial Dam Removal options, the Project would no longer be present, and operation and maintenance activities would cease. Worker trips to the Project to conduct operation and maintenance activities are minimal under the Proposed Action. While operation and maintenance activities would no longer occur under the Full and Partial Dam Removal options this reduction on traffic is minor and effects are considered ***neutral*** when compared to the Proposed Action.