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3.0 NO-ACTION ALTERNATIVE

The following section summarizes the No-Action Alternative for the Middle Fork American River Project (MFP or Project). Under the No-Action Alternative, the MFP will continue to operate and be maintained under the terms and conditions of the current Federal Energy Regulatory Commission (FERC or Commission) license. Table 3-1 provides a brief overview of the development history of the MFP and its operations.

This section was developed to meet the requirements for the description of the existing project as specified in Title 18 of the Code of Federal Regulations (CFR) § 5.18(b)(4). The description of the No-Action Alternative has been organized into the following major subsections.

- 3.1 Existing Project Components
- 3.2 Project Boundary
- 3.3 Routine Facility Inspections, Testing, and Maintenance
- 3.4 Project Safety
- 3.5 Project Operations
- 3.6 Existing Environmental Programs, Measures, or Facilities

Throughout this section references are included to direct the reader to applicable Technical Study Reports (TSR) that provide additional information. It should be noted that descriptions of operations and maintenance activities and Project facilities included in the TSRs have been updated, during the relicensing process, following implementation of Technical Study Plans (TSP) and development of TSRs. The information presented in this section represents the most current Project information.

3.1 EXISTING PROJECT COMPONENTS

This section details existing MFP components including dams, reservoirs, diversion pools, water conveyance systems, powerhouses, gaging stations and weirs, communication lines and powerlines, support facilities, roads, trails, and recreation facilities. A list of these Project components is provided in Tables 3-2 and 3-3. A summary of the Project facility specifications is provided in Table 3-4. Map 3-1 provides a geographic overview of the MFP. Maps 3-2a through 3-2e show the location of each Project facility and recreation facility. The general elevation profile of the MFP is shown on Figure 3-1.

3.1.1 Large Dams and Reservoirs

The MFP includes two large dams and reservoirs as described below. The reservoirs have a combined gross storage of 342,583 acre-feet (ac-ft) and combined active storage of 332,415 ac-ft.

- French Meadows Dam and French Meadows Reservoir

French Meadows Dam (also referred to as L L Anderson Dam) is a 231-foot-high, 2,700-foot-long rock and gravel filled structure with a crest elevation of 5,273 feet above mean sea level (msl). French Meadows Dam impounds the Middle Fork American River forming French Meadows Reservoir. The reservoir has a gross storage capacity of 134,993 ac-ft and an active storage capacity of 127,358 ac-ft. The dam has an existing approximately 40-foot-wide spillway channel that is controlled by two 20-foot-wide radial spillway gates. Placer County Water Agency (PCWA) is currently engaged in widening the existing spillway to conform to a revised Probable Maximum Flood (PMF) calculation. The existing spillway is being widened and new larger gates are being installed; work is anticipated to be completed in 2012. The new spillway will be 82 feet wide and controlled by two 36.5-foot-wide spillway gates. The new spillway structure will have a capacity of 39,957 cubic feet per second (cfs). The spillway channel joins the Middle Fork American River approximately 1,000 feet downstream of the dam.

The dam is equipped with outlet works consisting of one 8-inch-diameter pipe for instream flows and a second 72-inch-diameter pipe, upstream slide gate, and a 60-inch ring-jet valve for low-level discharge. The 8-inch pipe has an estimated maximum discharge capacity of 8 cfs. The 72-inch-diameter pipe for low-level discharge has a maximum calculated release capacity of 1,430 cfs at full reservoir.

- Hell Hole Dam and Hell Hole Reservoir

Hell Hole Dam is a 410-foot-high, 1,570-foot-long rock fill structure with a crest elevation of 4,650 feet msl. Hell Hole Dam impounds the Rubicon River and Five Lakes Creek to form Hell Hole Reservoir. The reservoir has 207,590 ac-ft of gross storage and an active storage capacity of 205,057 ac-ft. The dam includes a 350-foot-wide uncontrolled spillway with a maximum capacity of 89,500 cfs. An outlet tunnel with control and energy dissipating valves (outlet works) and a weir for measurement of dam leakage are located adjacent to the downstream face of the dam.

The outlet works consist of a 16-inch-diameter pipe with a 12-inch hollow-cone valve for instream flows and a 48-inch-diameter pipe and hollow-cone valve for low-level discharge. A 20-inch-diameter pipe that supplies water to the Hell Hole Powerhouse is connected to the 48-inch pipe. The 48-inch-diameter Howell-Bunger (HB) valve has a maximum calculated discharge capacity of 852 cfs at full reservoir. However, non-emergency flow through the dam outlet works is

limited to approximately 200 cfs to protect structural integrity of the upstream butterfly valve. In addition, releases from the 48-inch HB valve have the potential to flood the powerhouse and erode the powerhouse access road.

3.1.2 Medium Dams and Reservoirs

The MFP includes two medium dams and reservoirs as described below.

- Middle Fork Interbay Dam and Middle Fork Interbay

Middle Fork Interbay Dam is a 70.5-foot-high, 233-foot-long concrete gravity structure with a crest elevation of 2,536 feet msl. The dam impounds the Middle Fork American River forming Middle Fork Interbay. The reservoir has a maximum operating surface area of about 7 acres, contains 175 ac-ft of gross storage, and 173 ac-ft of active storage capacity. The dam includes a 140-foot-wide spillway, 80 feet of which are controlled by four 20-foot-wide radial spillway gates. The spillway and spillway gates have a maximum capacity of 36,506 cfs.

The dam outlet works consist of a 60-inch-diameter pipe with a slide gate and a 23-inch stream maintenance pipe and slide gate. The 60-inch pipe has a maximum calculated capacity of 890 cfs and the instream flow pipe has a capacity of 23 cfs at full reservoir.

- Ralston Afterbay Dam and Ralston Afterbay

Ralston Afterbay Dam is an 89-foot-high, 560-foot-long concrete gravity structure with a crest elevation of 1,189 feet msl. The dam is located just below the confluence of the Middle Fork American and the Rubicon rivers. The dam impounds the Middle Fork American and Rubicon rivers and forms the Ralston Afterbay. Ralston Afterbay has 2,782 ac-ft of gross storage capacity and an active storage capacity of 1,804 ac-ft (at 1,179 feet msl water surface elevation). The amount of Ralston Afterbay storage available for use by the Oxbow Powerhouse is 756 ac-ft. The dam has a 232-foot-wide controlled spillway. The spillway includes five 40-foot-wide radial spillway gates and has a capacity of 171,200 cfs. The dam includes a 30-inch pipe controlled by a slide gate and ring-jet valve that is used for release of instream flows. The instream flow pipe has a maximum capacity of 155 cfs at full reservoir. The dam also includes a 72-inch-diameter low-level discharge pipe controlled by a slide gate. This pipe has a maximum calculated capacity of 1,132 cfs at full reservoir.

3.1.3 Small Dams and Diversion Pools

The MFP includes three small dams and associated diversion pools as described below.

- Duncan Creek Diversion Dam and Diversion Pool

The Duncan Creek Diversion Dam is a 32-foot-high, 165-foot-long concrete gravity structure with a crest elevation of 5,275 feet msl. The dam forms the Duncan Creek Diversion Pool, with approximately 20 ac-ft of gross storage. The dam incorporates a 100-foot-wide uncontrolled spillway that has a capacity of 7,200 cfs and includes a 10-inch outlet pipe controlled by an angle valve. This pipe provides instream flows and has a release capacity of up to 8 cfs. The dam also includes a 60-inch-diameter outlet pipe controlled by a 60-inch gate valve.

- North Fork Long Canyon Diversion Dam and Diversion Pool

The North Fork Long Canyon Diversion Dam is a 10-foot-high, 120-foot-long concrete gravity structure with a crest elevation of 4,720 feet msl. The dam forms a small diversion pool with less than 1 ac-ft of storage on North Fork Long Canyon Creek. The width of the dam crest acts as an uncontrolled spillway with a 3,000 cfs discharge capacity. The diversion dam includes a 12-inch-diameter pipe to provide instream flows and a 36-inch-diameter outlet pipe controlled with a slide gate.

- South Fork Long Canyon Diversion Dam and Diversion Pool

The South Fork Long Canyon Diversion Dam is a 27-foot-high, 145-foot-long concrete gravity structure with a crest elevation of 4,650 feet msl. The dam forms a small diversion pool with less than 1 ac-ft of storage on South Fork Long Canyon Creek. The dam includes a 60-foot-wide uncontrolled spillway, which has a capacity of 4,000 cfs. The diversion includes a 12-inch-diameter pipe to provide instream flows and a 36-inch-diameter outlet pipe controlled with a slide gate.

Historically, diversions have been reduced at the small diversion (Duncan Creek, North Fork Long Canyon, and South Fork Long Canyon), under existing license conditions, due to debris build-up at the intakes and/or concerns regarding large rocks entering the Hell Hole – Middle Fork Tunnel during high-flow events causing damage to the Middle Fork Powerhouse turbine. In the future, PCWA will modify the trash rack/intake associated with each small diversion, as part of ongoing operations and maintenance of the MFP to address these issues. Once these modifications are completed, PCWA will be able to take their full diversion of water at these diversions, consistent with existing license conditions.

3.1.4 Water Conveyance Systems

The MFP includes seven water conveyance systems to transport water from diversions to reservoirs and powerhouses. The water conveyance systems include features such as intakes, tunnels, diversion pipes, drop inlets, surge shafts and tanks, adits, removable sections, portals, gatehouses, valve houses, and penstocks. These water conveyances are described as follows:

- Duncan Creek – Middle Fork Tunnel

Water is routed from Duncan Creek Diversion to the French Meadows Reservoir via the Duncan Creek – Middle Fork Tunnel. This tunnel is approximately 9-feet wide by 10-feet high and is 7,864-feet long. The tunnel is lined with concrete along approximately 300 feet of its length; the remainder is unlined. The maximum discharge capacity of the tunnel is 400 cfs.

The tunnel intake is located at the south side of the diversion pool. A trash rack is fitted over the intake structure to prevent debris from entering the tunnel. The tunnel ends at an open portal, located near the north end of the French Meadows Dam. Water discharges from the tunnel into French Meadows Reservoir.

- French Meadows – Hell Hole Tunnel

The French Meadows – Hell Hole Tunnel routes water from French Meadows Reservoir through French Meadows Powerhouse to Hell Hole Reservoir. The tunnel consists of a 12.3-foot-wide horseshoe cross-section that is 13,694 feet long. The first approximately 1,617 feet is concrete lined and the last approximately 317 feet, at the end of the tunnel, is steel-lined. The remaining 11,760 feet of the tunnel is unlined. Water enters the tunnel through an inlet structure located on the reservoir bottom approximately 1,000 feet from the southern shoreline. Flow into the tunnel is controlled by a slide gate at the French Meadows – Hell Hole Gatehouse. The current maximum discharge capacity of the tunnel is approximately 400 cfs.

The tunnel terminates at the French Meadows Powerhouse Penstock and Butterfly Valve House. The French Meadows – Hell Hole Tunnel Removable Section is located between the tunnel portal and butterfly valve house. This removable section provides access to the tunnel for inspection and maintenance. At the valve house, water flows into a 6.25-foot-diameter, 691-foot-long penstock, which terminates at the powerhouse. After flowing through the turbine, water is discharged from the powerhouse to Hell Hole Reservoir.

- Hell Hole – Middle Fork Tunnel

The Hell Hole – Middle Fork Tunnel routes water from Hell Hole Reservoir to the Middle Fork Powerhouse. The tunnel consists of a 13.4-foot-wide horseshoe cross-section that is 55,006-feet long. The first approximately 6,780 feet is lined

with concrete and the last approximately 5,180 feet is steel-lined. The remaining 43,046 feet of its length is unlined. Water enters the tunnel through an inlet located on the reservoir bottom, approximately 400 feet offshore. Water flow is controlled by the Hell Hole – Middle Fork Tunnel Gatehouse, located on the north shore of Hell Hole Reservoir approximately 0.5 mile from the dam. The maximum discharge capacity of the tunnel is approximately 920 cfs.

Intersecting this tunnel are drop inlets (vertical shafts) from the North Fork and South Fork Long Canyon Creek diversions. The tunnel also includes the Hell Hole – Middle Fork Tunnel Surge Shaft and Tank, located approximately 1,800 feet from the tunnel outlet. The 8-foot-diameter surge shaft and 60-foot-diameter by 22-foot-high aboveground tank provides surge capacity for the tunnel during powerhouse operations.

At North Fork Long Canyon Creek, the tunnel is aboveground for a short distance. At this point, a concrete-encased steel pipe crosses North Fork Long Canyon Creek and joins a removable pipe section. The North Fork Long Canyon Crossing Removable Section provides access into the tunnel for inspection and maintenance. After the removable section, the tunnel continues underground.

The tunnel terminates at the Middle Fork Powerhouse Penstock and Butterfly Valve House. The penstock and butterfly valve house are located approximately 1,479 feet above the Middle Fork Powerhouse. The Hell Hole – Middle Fork Tunnel Removable Section is located between the tunnel portal and the butterfly valve house. This removable section provides a second access to the tunnel for inspection and maintenance. From the valve house, water flows to the powerhouse through a 3,653-foot-long (7.5 to 9 feet in diameter) penstock.

- North Fork Long Canyon Diversion Pipe and Drop Inlet

The North Fork Long Canyon Diversion Dam acts as a diversion structure, which routes water through a slide gate into North Fork Long Canyon Diversion Pipe and Drop Inlet. The diversion pipe is a 36-inch-diameter buried steel pipe, which is 3,530-feet long. From the pipe, water falls down a 403-foot-deep, 6-foot-diameter vertical drop inlet shaft to a 54-foot-long tunnel that intersects the Hell Hole – Middle Fork Tunnel. The drop inlet has a vent pipe that extends 20 feet above the surface to provide air to the shaft. The pipe and shaft have a maximum flow capacity of 100 cfs.

- South Fork Long Canyon Diversion Pipe and Drop Inlet

The South Fork Long Canyon Creek Diversion Dam acts as a diversion structure by routing water through a slide gate into the South Fork Long Canyon Diversion Pipe and Drop Inlet. The diversion pipe is a 50-foot-long, 42-inch-diameter buried steel pipe. From the pipe, water drops down a 387-foot-long vertical shaft to a 27-foot-long tunnel that intercepts the Hell Hole – Middle Fork Tunnel. The

drop inlet has a vent pipe that extends 20 feet above the surface to provide air to the shaft. The pipe and shaft have a maximum flow capacity of 200 cfs.

- Middle Fork – Ralston Tunnel

The Middle Fork – Ralston Tunnel routes water from Middle Fork Interbay to Ralston Powerhouse. The tunnel consists of a 13.4-foot-wide horseshoe cross-section that is 35,397-feet long. The first 8,245 feet of the tunnel is concrete-lined and the last 245 feet is steel-lined. The remaining 26,907 feet is unlined. Water enters the tunnel through the Middle Fork – Ralston Tunnel Intake and Gatehouse located in the Middle Fork Interbay adjacent to the Middle Fork Interbay Dam. The maximum discharge capacity of the tunnel is approximately 836 cfs.

The tunnel terminates at the Ralston Powerhouse Penstock and Butterfly Valve House. The butterfly valve house and entrance to the penstock are located about 1,105 feet above the Ralston Powerhouse. The Middle Fork – Ralston Tunnel Removable Section is located between the tunnel portal and butterfly valve house. This removable section provides access to the tunnel for inspection and maintenance. From the butterfly valve house, water flows to the powerhouse through the 1,670-foot-long Ralston Powerhouse Penstock. This penstock ranges from 8 to 9.5 feet in diameter. Water is discharged from the powerhouse into Ralston Afterbay.

The Middle Fork – Ralston Tunnel Surge Shaft and Tank is located approximately 500 feet from the tunnel portal and consists of a 10-foot-diameter surge shaft and a 60-foot-diameter by 22-foot-high aboveground tank. The shaft and pipe provide surge capacity for the tunnel during powerhouse operations.

- Ralston – Oxbow Tunnel

The Ralston – Oxbow Tunnel routes water from Ralston Afterbay to the Oxbow Powerhouse. Water enters the tunnel through the Ralston – Oxbow Tunnel Intake. The intake structure is located approximately 0.15 mile from the north end of the Ralston Afterbay Dam. The tunnel consists of a 13.25-foot-wide horseshoe cross-section that is 403-feet long. It is lined with concrete along 343 feet of its length and with steel along the last 60 feet before the powerhouse. It has a flow capacity of 1,088 cfs when Ralston Afterbay is full. The tunnel terminates at the Oxbow Powerhouse Penstock (5-foot-long with a 9-foot inside diameter). The penstock provides water to the Oxbow Powerhouse.

3.1.5 Powerhouses

The MFP includes four powerhouses with switchyards and one powerhouse with an associated substation. The powerhouses have a total combined nameplate operating capacity of 223.7 megawatts (MW). Provided below is a description of each powerhouse, switchyard, and points of interconnection with the Pacific Gas & Electric

Company (PG&E) transmission system. A schematic diagram showing the PG&E transmission system and the points of interconnection with the MFP is provided as Figure 3-2. The PG&E transmission interconnections and transmission system are not part of the MFP.

- French Meadows Powerhouse and Switchyard

The French Meadows Powerhouse, located on the north shore of Hell Hole Reservoir, contains a single Francis-type turbine and electrical generator with an installed generating capacity of 15.3 MW. The minimum estimated hydraulic capacity of the French Meadows Powerhouse is 50 cfs and the maximum estimated hydraulic capacity is 400 cfs. The above-grade portion of the powerhouse includes an approximately 45-foot by 68-foot concrete slab, a circular 7-foot-high generator housing, a small rectangular entry building, and a transformer. A moveable metal gantry crane stands over the powerhouse. Water to the powerhouse is delivered from French Meadows Reservoir via the French Meadows – Hell Hole Tunnel. Electricity generated at the powerhouse is increased to 60 kilovolts (kV) at the powerhouse main transformer bank and delivered to PG&E's Transmission System at the switchyard adjacent to the powerhouse. The switchyard includes metal towers and electrical switching gear. The French Meadows Powerhouse also includes a motor-generator that provides backup power to the powerhouse. The powerhouse and switchyard are enclosed in an approximately 223-foot by 58-foot fenced area that is graded.

- Hell Hole Powerhouse

The Hell Hole Powerhouse, located at the outlet works of the Hell Hole Dam, contains a single Francis-type turbine and electrical generator with an installed generating capacity of 0.73 MW. The minimum estimated hydraulic capacity of the Hell Hole Powerhouse is 10 cfs and the maximum estimated hydraulic capacity is 35 cfs. All powerhouse equipment is contained in a 24-foot by 26-foot concrete block building that is 10-feet high. Water to the powerhouse is delivered via a 20-inch-diameter pipe that is connected to the Hell Hole Dam outlet works and serves as the turbine penstock. Electricity generated at this powerhouse is increased to 12.47 kV and is transmitted on a Project powerline to the French Meadows Powerhouse via the Hell Hole Substation. The electricity is also used to provide power to nearby Project facilities.

- Hell Hole Substation

The Hell Hole Substation located near the French Meadows Powerhouse provides an interconnection to PG&E's 60 kV Transmission System, which allows PCWA to receive power from PG&E. This power can be used to run ancillary equipment and support facilities near Hell Hole Reservoir when French Meadows Powerhouse and Hell Hole Powerhouse are not in operation. The Hell Hole Substation is contained within an approximately 20-foot by 30-foot fenced area.

- Middle Fork Powerhouse and Upper and Lower Switchyards

The Middle Fork Powerhouse (also known as the L. J. Stephenson Powerhouse) contains two Pelton-type waterwheels, each connected to a 61.2 MW electrical generator with an installed generating capacity of 122.4 MW. The minimum estimated hydraulic capacity of the Middle Fork Powerhouse is 50 cfs and the maximum estimated hydraulic capacity is 940 cfs. The above-grade portion of the powerhouse includes an approximately 62-foot by 154-foot concrete slab, two circular 18-foot-high generator housings, a small rectangular entry building, and main transformers. A moveable metal gantry crane stands over the powerhouse. Water to the powerhouse is delivered from Hell Hole Reservoir via the Hell Hole – Middle Fork Tunnel and Penstock. Water from the powerhouse is discharged to Middle Fork Interbay.

Electricity generated at the powerhouse is increased to 60 kV at the powerhouse main transformer bank. There are two switchyards adjacent to the Middle Fork Powerhouse—the Upper and Lower switchyards. The switchyards provide interconnection to PG&E's 60 kV and 230 kV Transmission System. The switchyards include metal towers and electrical switching gear. The powerhouse and switchyards are contained within an approximately 250-foot by 360-foot fenced area that is graded.

- Ralston Powerhouse and Switchyard

The Ralston Powerhouse contains a single Pelton-type waterwheel and electrical generator with an installed generating capacity of 79.2 MW. The minimum estimated hydraulic capacity of the Ralston Powerhouse is 75 cfs and the maximum estimated hydraulic capacity is 924 cfs. Water to the powerhouse is delivered from Middle Fork Interbay via the Middle Fork – Ralston Tunnel and Penstock. The above-grade portion of the powerhouse includes an approximately 82-foot by 90-foot concrete slab, a circular 22-foot-high generator housing, and small rectangular entry building. A moveable metal gantry crane stands over the powerhouse. Water from the powerhouse is discharged to Ralston Afterbay.

Electricity generated at the powerhouse is increased to 230 kV at the powerhouse main transformer bank. The Ralston Powerhouse is interconnected to PG&E's 60 kV and 230 kV Transmission System through the switchyard located adjacent to the powerhouse. The switchyard includes metal towers and electrical switching gear. The powerhouse and switchyard are enclosed in an approximately 80-foot by 295-foot fenced area that is graded.

- Oxbow Powerhouse and Switchyard

The Oxbow Powerhouse contains a single Francis-type turbine and electrical generator with an installed generating capacity of 6.1 MW. The minimum estimated hydraulic capacity of the Oxbow Powerhouse is 200 cfs and the

maximum estimated hydraulic capacity is 1,025 cfs. Water to the powerhouse is delivered from the Ralston Afterbay via the Ralston – Oxbow Tunnel. The above-grade portion of the powerhouse includes an approximately 60-foot by 98-foot concrete slab, a small rectangular entry building, and transformer. A moveable metal gantry crane stands over the powerhouse. Water passing through the Oxbow Powerhouse is discharged to a short channel that joins the Middle Fork American River.

Electricity generated at the powerhouse is increased to 60 kV at the powerhouse main transformer bank and interconnected to PG&E's 60 kV Transmission System at the switchyard adjacent to the powerhouse. The switchyard includes metal towers and electrical switching gear. The powerhouse and switchyards are contained within a 120-foot by 145-foot fenced area that is graded.

3.1.6 Gaging Stations

PCWA currently maintains a network of nine gaging stations that measure stream flow; two gaging stations that measure diversion flow; six gages that measure reservoir elevation; four that measure flow at powerhouses; and seven weirs that measure dam leakage. Pole-mounted photovoltaic arrays (referred to as photovoltaic poles) and powerlines provide power to some of the gages. Refer to Table 3-2 for additional information on the location of these facilities. All stream gaging stations have been incorporated into the United States Geological Survey (USGS) gaging network.

3.1.6.1 Stream Gages

Project stream gages are installed at the following locations:

- Duncan Creek near French Meadows (USGS Gage No. 11427700) – verifies compliance with FERC-required instream flows;
- Duncan Creek below Diversion Dam (USGS Gage No. 11427750) – verifies compliance with FERC-required instream flows;
- Middle Fork American River at French Meadows (USGS Gage No. 11427500) – verifies compliance with FERC-required instream flows;
- Rubicon River below Hell Hole Dam (USGS Gage No. 11428800) – verifies compliance with FERC-required instream flows;
- North Fork Long Canyon Creek below Diversion Dam (USGS Gage No. 11433085) – verifies compliance with FERC-required instream flows;
- South Fork Long Canyon Creek below Diversion Dam (USGS Gage No. 11433065) – verifies compliance with FERC-required instream flows;
- Middle Fork American River below Interbay Dam (USGS Gage No. 11427770) – verifies compliance with FERC-required instream flows;

- Middle Fork American River above Middle Fork Powerhouse (USGS Gage No. 11427760) – collects real-time flow data; and
- Middle Fork American River near Foresthill (USGS Gage No. 11433300) – verifies compliance with FERC-required instream flows and monitors operations of Oxbow Powerhouse (ramping rate/maximum flows).

3.1.6.2 Diversion Gages

Diversion gages are located on the inlet at both the North and South Fork Long Canyon diversion tunnels. These gages directly measure diversion flows and are powered by photovoltaic cells located on a nearby pole.

3.1.6.3 Reservoir Gages

Reservoir gages and reservoir staff gages are installed at the following locations:

- French Meadows Reservoir – reservoir gage and reservoir staff gage;
- Hell Hole Reservoir – reservoir gage and reservoir staff gage;
- Middle Fork Interbay – reservoir gage; and
- Ralston Afterbay – reservoir gage.

Reservoir gages are used to directly measure the water surface elevation and determine compliance with FERC license requirements such as minimum pool in the storage reservoirs (French Meadows and Hell Hole). They also provide measurements for use by Project operators.

Reservoir staff gages, which are a series of marked posts near the reservoir shore, are used to measure the water surface elevation quarterly and provide calibration for the reservoir gages.

3.1.6.4 Powerhouse Gages

Gages are located in each of the Project powerhouses except for the Hell Hole Powerhouse. Flow is currently calculated for each powerhouse based on the measured power generated. In the future, flow will be measured directly with electronic measuring equipment.

3.1.6.5 Leakage Weirs

Six weirs that measure normal leakage are located on the downstream face of the French Meadows Dam. A single leakage weir is located on the downstream face of the Hell Hole Dam near the Hell Hole Powerhouse.

3.1.7 Communication Lines and Powerlines

Fourteen MFP communication lines and powerlines, which total approximately 6.5 miles in length, provide power to operate Project equipment and allow communication between Project facilities. Figure 3-2 shows a schematic diagram of the transmission, power, and communication lines. Maps 3-2a through 3-2e show the location of these facilities. Table 3-5 provides detailed information on each MFP communication or powerline. Ten lines serve dual purposes by providing both power and communication capabilities to MFP facilities. These dual lines have two types of lines on the same poles.

3.1.8 Support Facilities

Project support facilities consist of microwave reflectors and radio towers; disposal areas; ancillary facilities; and fences. Each of these support facilities is described below—the larger facilities are shown on Maps 3-2a through 3-2e.

3.1.8.1 Microwave Reflectors and Radio Towers

Two passive microwave reflector stations and two radio towers with a repeater are maintained for communication purposes in the Project vicinity. The passive microwave reflector stations are located near Middle Fork Interbay and Ralston Afterbay. One radio tower and repeater are located near the Hell Hole – Middle Fork Tunnel Surge Shaft and Tank, and a second tower is located near the French Meadows – Hell Hole Tunnel Gatehouse.

3.1.8.2 Disposal Areas

Sediment removed from diversion pools and reservoirs is stored at four sediment disposal areas, including:

- Duncan Creek Diversion Sediment Disposal Area;
- North Fork Long Canyon Crossing Sediment Disposal Area;
- Middle Fork Interbay Sediment Disposal Area; and
- Ralston Ridge Sediment Disposal Area.

3.1.8.3 Ancillary Facilities

- Dormitory Facility, Operator Cottages, Shop and Water Tank

The dormitory facility, operator cottages, and shop located near Hell Hole Dam provide housing for station attendants, as well as meeting facilities and temporary lodging for Project employees and associates. The dormitory consists of a 12-room, 24-bed building, which has kitchen, dining, and meeting areas. The operator housing consists of two cottages. A maintenance shop is located

near the cottages. A water tank which supplies potable water to the dormitory, cottages, and shop is located on a hill adjacent to the cottages.

- French Meadows Dam and Hell Hole Staging Areas

Maintenance work staging areas are located adjacent to the French Meadows Dam Spillway Discharge Channel and the Dormitory Facility at Hell Hole Reservoir. These unimproved staging areas are used for equipment mobilization and temporary storage of bulk materials.

- Generator Buildings

Generator buildings for site power are located at French Meadows Dam and Ralston Afterbay Dam. These facilities include fuel storage and an engine generator.

- Storage Building at Middle Fork – Ralston Tunnel Surge Shaft and Tank

A small storage building is located adjacent to the Middle Fork – Ralston Surge Shaft and Tank.

3.1.8.4 Fences

Fences are used at some facilities to contain falling rock and debris on slopes adjacent to MFP facilities and provide for PCWA worker and public safety. At French Meadows, a rock fence is maintained near the powerhouse penstock and a slope fence near the French Meadows Powerhouse. Slope fences are maintained near Long Canyon Crossing, Middle Fork Powerhouse Upper Switchyard, Middle Fork Interbay Dam, Ralston Powerhouse Penstock and Butterfly Valve House, Ralston Powerhouse, and Oxbow Powerhouse. Public safety fences are located adjacent to the Dormitory Facility, Hell Hole Dam General Parking Area, and the North Fork Long Canyon Crossing Removable Section.

3.1.9 Roads and Trails

Forty-six roads (totaling 19.7 miles) and eight trails (totaling 0.5 mile) are used for ongoing operation and maintenance of the MFP (Maps 3-2a through 3-2e). A list of these Project features is provided in Table 3-2. Descriptive information on each road and trail is provided in Table 3-6. Refer to LAND 1 – Transportation System TSR – 2008 (LAND 1 – TSR) (PCWA 2011a; SD B) located in Support Document (SD) B for additional information on Project roads and trails.

3.1.10 Recreation Facilities

PCWA constructed 21 developed recreation facilities as part of the MFP. These facilities are concentrated around French Meadows Reservoir, Hell Hole Reservoir, South Fork Long Canyon Diversion Pool, and Ralston Afterbay (Maps 3-2a through 3-2e). Amenities at each of the recreation facilities are presented in Table 3-7.

Developed campgrounds are located near the higher elevation Project facilities, including French Meadows Reservoir (6 campgrounds with a total of 139 single sites and 7 group sites), Hell Hole Reservoir (3 campgrounds with a total of 77 single sites), and South Fork Long Canyon Diversion Pool (1 campground with 2 group sites). Day-use facilities such as boat ramps, picnic areas, parking lots and scenic vistas also support recreational activities at the higher elevation reservoirs (French Meadows and Hell Hole reservoirs). These overnight and day-use facilities are typically available from late spring to early fall as inclement weather and snow prevent year-round use. Water supplies have been developed at four locations to serve recreation facilities at the French Meadows Reservoir, and campgrounds near Hell Hole Reservoir and South Fork Long Canyon Creek. Detailed information on each water supply is provided in Table 3-8.

Recreation facilities located near the lower elevation Project facilities are open year-round and consist entirely of day-use facilities. These facilities include one picnic area and cartop boat ramp located near the Middle Fork American River inflow to Ralston Afterbay, and one rafting access and parking area adjacent to the lower Middle Fork American River near the Oxbow Powerhouse. Refer to REC 1 – Recreation Use and Facilities TSR (REC 1 – TSR) (PCWA 2011b; SD B) located in SD B for additional information on Project recreation facilities.

3.2 PROJECT BOUNDARY

A list of Project facilities and features necessary for operation and maintenance of the MFP and a list of Project-related recreation facilities and features is provided in Table 3-2 and Table 3-3, respectively. Geographic Information System (GIS) maps illustrating the location of all existing Project facilities and features and Project-related recreation facilities and features in relationship to the current FERC Project boundary and land ownership data is provided in Maps 3-3a through 3-3e. Refer to LAND 4 – FERC Project Boundary and Authorization TSR – 2008 (LAND 4 – TSR) (PCWA 2011c; SD B) located in SD B for additional information on the FERC Project boundary.

3.3 ROUTINE FACILITY INSPECTIONS, TESTING, AND MAINTENANCE

Routine facility inspections, testing, and maintenance activities are implemented at Project facilities and Project recreation facilities to:

- Meet regulatory testing and inspection requirements;
- Maintain system reliability;
- Maintain facility access;
- Protect Project facilities and recreation facilities;
- Protect worker and public health and safety; and
- Preserve Project flow and storage capacities.

Routine facility testing and maintenance activities include: completion of testing, inspections, and maintenance at Project tunnels, powerhouses, and gates; vegetation management; pest management; sediment management; slope stabilization (falling rock control); debris management; facility painting; pole replacement; and road and trail maintenance (Table 3-9). Recreation facility maintenance activities include: annual maintenance, heavy maintenance, and vegetation management (Table 3-10). Refer to Table 3-9 and Table 3-10 for detailed information on location and frequency of Project facility and Project recreation facility testing and maintenance activities. A description of each activity is provided below.

3.3.1 Tunnels and Powerhouses Inspection, Testing, and Maintenance

PCWA conducts annual inspection and testing of Project facilities to verify the structural and/or functional integrity of the facilities and to identify conditions which might disrupt operation or threaten dam safety. At Ralston – Oxbow Tunnel, these inspections require dewatering of the Ralston Afterbay to allow access to the tunnel to identify any structural deterioration. None of the other Project tunnels are routinely inspected due to concerns over tunnel integrity if they are dewatered.

PCWA also conducts annual mechanical and electrical inspections and maintenance at all five Project powerhouses. These activities typically occur in the fall for facilities in the lower Project area beginning in late September, and require that the lower MFP powerhouses (Middle Fork, Ralston, and Oxbow) be taken out-of-service for approximately three to six weeks. During the fall maintenance period, Middle Fork Interbay and Ralston Afterbay water levels are lowered to allow access to the facilities. Consumptive demands and instream flow requirements downstream of Oxbow Powerhouse during the fall outage are typically met by increasing flow releases from Hell Hole Reservoir into the Rubicon River. Inspection, testing, and maintenance of facilities in the upper Project area (i.e., French Meadows and Hell Hole powerhouses) typically occur during the spring, once roads to the Project facilities are passable.

3.3.2 Spillway Gate Testing

FERC requires partial operation of spillway gates annually and to full design height at least once every five years. This testing is performed at French Meadows Dam, Middle Fork Interbay Dam, and Ralston Afterbay Dam. At French Meadows Dam, the spillway gates are operated when the reservoir level is below the spillway crest elevation. At Middle Fork Interbay and Ralston Afterbay dams, the spillway gates are tested during the maintenance outage when the reservoir levels are below the spillway crest elevation. At the end of each calendar year, PCWA submits an Annual Spillway Gate Testing Report to FERC demonstrating license compliance.

3.3.3 Vegetation Management

Vegetation management, which includes vegetation trimming by hand and with equipment, and to a lesser extent, the use of herbicides and fungicides, is implemented at Project facilities and features, and Project recreation facilities. Vegetation

management at Project recreation facilities is completed by United States Department of Agriculture-Forest Service (USDA-FS) under Collection Agreements (No. 08-CO-11051700-009 and No. 08-CO-11050300-009). Tables 3-9 and 3-10 provide the frequency of Project-related vegetation management activities. Most vegetation management activities occur during the spring and early summer to avoid work during high fire danger periods. Vegetation management is implemented within the area necessary to reduce fire hazard, provide access and protect Project facilities, and provide for worker/public health and safety. Specifically, vegetation management occurs in the following areas:

- Within 2 feet on either side of trails;
- Within 5 feet around the perimeter of the dams; outside the perimeter fence of powerhouses, switchyards, and substations; around ancillary support facilities and Project fences;
- Within 10 feet on either side of penstocks, valve houses, diversion pools, and removable sections on either side of communication lines, powerlines, photovoltaic poles and lines, and roads; and
- Within 50 feet around intakes, outlet works, gatehouses, surge tanks, adits, portals, microwave reflectors, radio towers, sediment disposal areas, drop inlets, and recreation facilities.

A description of each vegetation management activity implemented for the MFP is provided below.

3.3.3.1 Trimming by Hand

Vegetation trimming by hand includes trimming of grasses and forbs with a string trimmer and trimming of shrubs and trees with a chain saw or other handheld saw. These activities are implemented annually or infrequently depending on location and facility type (Tables 3-9 and 3-10).

3.3.3.2 Trimming with Equipment

Vegetation trimming with equipment includes removal of vegetation on the shoulder of Project roads using mechanical equipment such as a flail-type mower. A rubber-tired T- or Y-shaped flail mower is used along Project roads to cut grasses, other herbaceous vegetation, and woody vegetation (less than 0.75-inch diameter) especially in locations where there is the potential for contact with loose debris (e.g., gravel). The mower is attached to the hitch of a tractor or other vehicle. Trimming of vegetation with equipment is implemented annually (Tables 3-9 and 3-10).

3.3.3.3 Herbicide and Fungicide Use

Herbicides are used in addition to manual and mechanical vegetation management activities on an annual basis within the perimeter fences of the Middle Fork Powerhouse

and Upper and Lower Switchyards, the Oxbow Powerhouse and Switchyard, and Ralston Powerhouse and Switchyard (Tables 3-9 and 3-10). Herbicide use is restricted to the graveled parking areas within the perimeter fences. Small hand-held sprayers are used to apply over-the-counter herbicides (e.g., Roundup[®]). All herbicides are applied in accordance with label instructions.

Fungicides (e.g., Borax soap) are used infrequently by USDA-FS on tree stumps at Project recreation facilities to prevent the spread of fungus (Ed Moore and John Jue, pers. comm., 2006).

3.3.4 Pest Management

Management of rodent populations at Project facilities includes a combination of physical control and rodenticide use. The purpose of rodent control is to prevent rodent infestations in building interiors thereby protecting worker and public health and safety and maintaining system reliability. Methods are selected on a site-specific basis considering public health and safety, target species, and the effectiveness of the method. Rodent traps and over-the-counter rodenticides (e.g., d-CON[®]) are used in the interior of Project powerhouses; French Meadows Dam Generator Building; Hell Hole Dormitory Facility; Hell Hole Dormitory Facility and Cottages Water Supply Tank; Hell Hole Operator Cottages and Shop; and Ralston Afterbay Dam Generator Building.

3.3.5 Sediment Management

Sediment is routinely excavated from MFP diversion pools and select reservoirs on an as-needed basis (generally after episodic high-flow events). The MFP facilities where sediment management activities have historically occurred include:

- Duncan Creek Diversion Pool;
- North Fork Long Canyon Diversion Pool;
- South Fork Long Canyon Diversion Pool;
- Middle Fork Interbay; and
- Ralston Afterbay.

In the past, a single high-flow event (e.g., winters of 1986 and 1997) was sufficient to almost completely fill the small diversion pools and Middle Fork Interbay with sediment. At small diversion pools (Duncan Creek and North Fork Long Canyon and South Fork Long Canyon creeks) sediment is removed during the summer and fall low-flow period. Accumulated sediments in Middle Fork Interbay and Ralston Afterbay that are not immediately impacting operations are typically removed during scheduled maintenance outages, generally from mid-September through October. Once excavated, the sediment is hauled to an approved sediment disposal area on USDA-FS property or private property. All sediment removal with equipment is completed in accordance with

state and federal permit conditions (e.g., USDA-FS Special Use Permits, California Department of Fish and Game [CDFG] Streambed Alteration Agreements).

The following describes operations of the diversions during high-flow events when sediments are mobilized and transported into Project diversion pools and reservoirs:

- In the recent past, during high-flow events, the low-level outlets at all the diversion dams have remained closed to prevent damage to the gates and/or potential blockage of the outlet.
- At Middle Fork Interbay and Ralston Afterbay, the spillway gates are opened during high flows to prevent overtopping and facilitate passage of floating debris and suspended fine sediment. The spillway gates are opened in anticipation of and during high-flow events to create storage space, as well as, to manage high flows to prevent facility damage. Both bedload and fine sediments are captured in the reservoirs.
- North Fork Long Canyon and South Fork Long Canyon diversions are typically closed during the early winter to prevent sediment from being entrained into the Middle Fork Powerhouse. The diversions are opened during late winter and maintained through the spring runoff period in an effort to capture high, but relatively sediment-free runoff. The diversions are opened and closed via manually operated slide gates. Flows greater than the capacity of the North Fork Long Canyon and South Fork Long Canyon intakes (100 and 200 cfs, respectively) pass over the spillway transporting floating debris and suspended fine sediment. Both bedload and fine sediments are captured in the diversion pools. If the diversion pools become filled with sediment, then bedload material is transported downstream of the dam.
- The Duncan Creek Diversion remains open year-round under typical operations. The diversion has a stop log gate that can be manually closed, if necessary. Water is diverted only when streamflow exceeds approximately 8 cfs. Flows greater than the capacity of the intake (400 cfs or less depending of the amount of debris on the intake) pass over the spillway transporting floating debris and suspended fine sediment. Both bedload and fine sediments are captured in the diversion pool. If the diversion pool becomes filled with sediment, then bedload material is transported downstream of the dam.

Sediment management (removal methods) currently implemented are as follows:

- Planned sediment removal occurs during dry non-storm periods, typically in the late summer or fall. If a storm does occur, the work site is secured and maintained to prevent erosion and discharge of sediment to the downstream creek channels. Emergency sediment removal that is required to operate the MFP is completed as soon as possible.

- Prior to sediment removal activities, the diversion pools are dewatered and the reservoirs are drawn down. A stream flow bypass system is installed to capture and divert low flows around the work area and discharge water downstream of the dam to comply with instream flow requirements. Seepage pumps are placed in the pools and used to keep the work area free from ponded water. Temporary access roads are also constructed for ingress and egress for excavation and hauling equipment.
- Standard excavation and hauling equipment (such as, tracked excavators, articulating off-road dump trucks, 10-wheeled dump trucks, bulldozers, backhoes, loaders, and pumps) are used to remove sediment from the diversion pools and reservoirs. Excavators and loaders are used to excavate the bulk of the material with smaller equipment performing intricate work in pools. Hauling is done with either on- or off-road dump trucks, depending on the amount of material being moved and the length of the haul. A bulldozer is used to spread and compact sediment at the disposal areas.
- An Emergency Response Plan, Spill Prevention Contingency and Countermeasure Plan, and Fire Prevention Plan are prepared in accordance with resource agency requirements prior to implementation of sediment removal.
- Secondary containment is provided for diesel- and gas-powered equipment by installing an oil absorbent boom downstream of the dam.

Table 3-11 provides information on sediment removal activities at each diversion facility. The location of sediment disposal areas is provided on Maps 3-2a and 3-2c-e. Estimates of the available sediment storage capacity at each of the sediment disposal areas is provided in Table 3-12.

3.3.6 Slope Stabilization (Falling Rock Control)

Gunite (a mixture of sand, cement, and water) is applied adjacent to Middle Fork Powerhouse Penstock using a high-pressure hose. Gunite is used on an infrequent basis to stabilize soils on the steep slopes beneath the penstock. Refer to Table 3-2 for the location of Project fences.

3.3.7 Debris Management

Debris management includes removal of large woody debris at Project reservoirs and diversion pools, removal of small debris from trash racks at Project intakes, and installation of log booms at Project reservoirs. Table 3-9 summarizes the location and frequency of these activities.

Large woody debris can accumulate in Project reservoirs and diversion pools. Woody debris accumulations are managed at Middle Fork Interbay and Ralston Afterbay by opening upper level gates on an infrequent basis to allow for the passage of woody

debris. Woody debris that accumulates in Hell Hole Reservoir near the dam is gathered and burned on an infrequent basis.

Debris that accumulates on trash racks at Project intake structures is also routinely removed. Trash racks are located at Project intakes at the Duncan Creek Diversion, North Fork Long Canyon and South Fork Long Canyon diversions, Middle Fork Interbay, and Ralston Afterbay. Floating log booms are also maintained to control debris accumulation on Project dams and to protect public safety at Duncan Creek Diversion, French Meadows Reservoir, Hell Hole Reservoir, Middle Fork Interbay, and Ralston Afterbay.

3.3.8 Facility Painting

Paint is applied to the exterior of Project facilities, including metal power poles, surge shafts and tanks, penstocks, butterfly valve houses, removable sections, Project buildings, cottages, and dormitories. Facility painting at recreation facilities, including water supply tanks, restrooms, signboards, and picnic tables is conducted on an as-needed basis by USDA-FS under an agreement with PCWA.

3.3.9 Pole Replacement

Damaged power and communication line poles are replaced as necessary. New poles are placed in, or immediately adjacent to previously existing holes, using line trucks. Helicopters are used if line trucks are unable to access locations where power or communication line poles need to be replaced.

3.3.10 Road and Trail Maintenance

PCWA and the USDA-FS have entered into various agreements related to the maintenance and use of Project roads located in the ENF and TNF. Currently, one agreement, executed on April 9, 2007 (Agreement No. 07-RO-11051754-006), is in effect for Project roads. The Agreement provides for formal meetings and informal consultation between PCWA and the USDA-FS to discuss and agree on actions related to the regular maintenance of these Project roads and to coordinate assignment of maintenance responsibilities. The agreement also provides for the development of Project agreements in which improvement of a road under the jurisdiction of one party is to be financed, in whole or in part, from funds or resources provided by the other party. The current agreement expires on December 31, 2011, unless extended.

As shown on Table 3-9, maintenance of Project roads and trails includes annual and periodic maintenance. Annual maintenance generally includes, but is not limited to, the following types of activities: debris removal; vegetation management; basic repairs, including filling of potholes; maintenance of erosion control features such as culverts, drains, ditches, and water bars; repair, replacement, or installation of access control structures such as posts, cables, rails, gates, and barrier rock; repair and replacement of signage; and snow removal and sanding. Periodic maintenance generally includes, but is not limited to, the following types of activities: placement or replacement of culverts and other drainage features; bridge deck or ford replacement; major road

repairs; grading; sealing; resurfacing; road replacement; and hazard tree removal. Table 3-6 provides information on the location, length, and surface of all Project roads and trails.

3.3.11 Recreation Facility Maintenance

PCWA is responsible for the operation and maintenance of Project recreation facilities. PCWA has ongoing Collection Agreements (No. 08-CO-11051700-009 and No. 08-CO-11050300-009) with the TNF and ENF to provide the financial resources necessary to support a portion of the operation, maintenance, and restoration of these facilities by the respective National Forest. Project recreation facility maintenance includes annual and heavy maintenance, and vegetation management.

As identified on Table 3-10, annual maintenance includes: site cleaning; basic repairs and maintenance of facility features; garbage clean-up; signing; toilet cleaning and restocking; toilet pumping; graffiti removal; removal of debris from boat ramps; basic maintenance of pathways; routine testing of water supplies; annual winterizing and opening activities; and hazard tree removal. Heavy maintenance includes: repair and resurfacing of parking areas and spurs; repair or replacement of barrier structures and devices; repair and/or replacement of site/facility amenities; repair and replacement of signage, information boards, and fee tubes; repair, maintenance, and painting of bathroom structures; repair and maintenance of potable water supplies and distribution lines; repair and maintenance of septic systems; repair and sealing of boat ramps; repair or installation of retaining walls; site leveling and removal of obstacles; fuels reduction; and maintenance of pathways.

3.4 PROJECT SAFETY

This section summarizes existing Project safety measures implemented in accordance with 18 CFR Part 12 by PCWA in the vicinity of the MFP. It includes a discussion of the purpose and components of the Project's Emergency Action Plan (EAP); employee emergency training and annual training exercises; and dam inspections and reporting. In addition, it discusses procedures for Project emergencies not covered under the EAP; public and worker safety programs; the Project's Fire Plan; and Spill Prevention Control and Countermeasure Plans (SPCCP). Refer to LAND 3 – Emergency Action and Public Safety TSR (LAND 3 – TSR) (PCWA 2011d; SD B) and LAND 2 – Fire Prevention and Response TSR – 2008 (LAND 2 – TSR) (PCWA 2011e; SD B) located in SD B for additional information related to Project safety.

3.4.1 Emergency Action Plan

PCWA developed and maintains an EAP for the MFP (PCWA 2004, updated February 2010) in compliance with FERC regulations. The primary purposes of the EAP are to: (1) provide early warning to downstream recreational users, dam operators, and other persons in the vicinity of the Middle Fork American River Canyon and Folsom Reservoir who might be affected by an imminent or actual sudden release of water from Hell Hole, French Meadows, Ralston Afterbay, or Duncan Creek Diversion dams; and (2) minimize

property and environmental damage in these areas. North Fork Long Canyon and South Fork Long Canyon diversion pools and dams (<1 ac-ft storage) and Middle Fork Interbay and Dam (173 ac-ft storage) are not addressed in the EAP as public safety and flooding risk associated with failure of these individual facilities is considered minimal.

The EAP specifies pre-planned actions to be followed in the event of an emergency. The EAP includes provisions for: (1) maintenance, operation, and inspection of the dams and related facilities; (2) early warning of developing emergency conditions; (3) evaluation of emergency situations and operational responses; and (4) timely notification of emergency response agencies and individuals in remote locations. Procedures for timely and reliable detection, evaluation, and classification of an existing or potential emergency situation are also identified.

PCWA is responsible for training its employees on the protocols and procedures specified in the EAP, implementing measures for the detection of potential emergency situations, and taking specific actions once the EAP is implemented. PCWA provides annual EAP training for its Project operators and other responsible personnel and general orientation training for the maintenance crew. To the extent feasible, PCWA conducts annual EAP training exercises with participation from all the responsible response agencies and organizations. The most recent training exercise occurred on May 20, 2009.

PCWA annually reviews and updates the EAP as required by FERC. PCWA collaborates with responsible agencies and organizations, including the Office of Emergency Services (OES), land management agencies, and local emergency responders, to review and update the EAP as circumstances warrant and comments are received. PCWA notifies FERC each year if any changes are made or if none are required. PCWA also distributes any annual revisions with specific instructions for replacing outdated sections to all participating agencies/departments identified in the EAP.

3.4.1.1 Dam Inspections and Reporting

PCWA-trained operators visually inspect the dams for settlement, plugging of drains, sloughing, cracking, leakage, turbidity, vegetation, and rodent activity. Hell Hole and Ralston Afterbay dams are inspected daily, and French Meadows and Duncan Creek Diversion dams are inspected at least once per week. The leakage weirs at French Meadows and Hell Hole dams are read and recorded weekly when accessible, and analyzed for adverse trends.

All dams are surveyed for settlement at designated locations every other year. The survey data is analyzed and compared to previous surveys to determine if settlement is within expected limits. Piezometers (water level monitoring wells) at Ralston Afterbay and French Meadows dams are regularly checked and analyzed. The piezometers at Ralston Afterbay record daily and are analyzed monthly. The piezometers at French Meadows Dam are checked and recorded monthly.

Engineers from FERC and the California Department of Water Resources Division of Safety of Dams (DSOD) conduct annual inspections at each dam with PCWA personnel and review data. Once every five years, PCWA's FERC-approved dam safety consultant inspects each dam, reviews recent surveys and historical data, and issues a report on the stability and condition of the dams to FERC.

3.4.2 Procedures for Project Emergencies Not Covered Under the EAP

For planning and responding to emergencies not covered under the EAP, PCWA follows PG&E's Code of Safe Practices (PG&E 2002) and PCWA's Storm Book (PCWA 2008). The Code of Safe Practices includes basic safety requirements and helicopter safety. It also specifies safety procedures for operating motor vehicles; conducting pole handling operations, live line work projects, and electric transmission lines; and working in electric substations and hydro plants. The Storm Book outlines preparations for winter storm events and procedures for operations during events. It also includes a master phone list, including rental equipment numbers, gasoline supplies, and other emergency related numbers.

PCWA maintains notification and coordination procedures in the event of an emergency and cooperates with federal and state agencies and other local emergency responders when an emergency occurs within the FERC Project boundary or in the vicinity of the MFP.

3.4.3 Public and Worker Safety Programs

FERC is authorized by Section 10(c) of the Federal Power Act to provide regulatory oversight of dam operators to create and maintain safe hydropower projects (FERC 1992). FERC provides guidelines for establishing safety devices and other measures that could be used to enhance protection of the public from specific types of hazards. FERC also provides specific guidelines on safety signage at hydropower plants for dam operators (FERC 2001). In accordance with the aforementioned FERC guidelines, PCWA implements the following public safety programs and measures:

- PCWA utilizes various audible (sirens and security alarms) and visual warning devices (lights, signage, buoys, and log booms) to warn the public of hazardous areas and potentially dangerous conditions.
- PCWA uses various devices to restrict public access to hazardous areas including: fences around Project facilities, gates limiting access onto Project roads, trash racks in tunnel intake structures, and guardrails on dams.
- PCWA maintains and operates several gaging stations that monitor water surface elevations (WSE) in the rivers and reservoirs with alarms that transmit to the PCWA and PG&E communications systems. The alarm systems are activated if changes in river stage or reservoir water surface elevation exceed specified rates.

- There are two informal helicopter landing sites located in the vicinity of the MFP (near the Hell Hole Dormitories and near Oxbow Powerhouse). These landing sites may be used by emergency responders during emergencies in the vicinity of the MFP.

3.4.4 Fire Plan

The MFP currently does not have a Fire Plan which addresses routine operations and maintenance of the Project. PCWA developed a Fire Plan (PCWA 1962) during the period of time when the MFP was under construction in the early 1960's. This Fire Plan only pertained to activities associated with the original construction of the Project. Since construction of the Project was completed, PCWA has developed and implemented several project-specific fire plans for non-routine Project activities that require a Special Use Permit (SUP) from the USDA-FS.

3.4.5 Spill Prevention Control and Countermeasure Plan

In accordance with Section 10(c) of the Federal Power Act (FPA), PCWA maintains and implements four SPCCPs to address and minimize the potential for fuel and other hazardous materials spills at the following locations:

- French Meadows Powerhouse (updated 2008);
- Middle Fork Powerhouse (updated 2006);
- Ralston Powerhouse (updated 2006); and
- Oxbow Powerhouse (updated 2008).

Each describes procedures and available equipment for mitigation of any fuel or other hazardous materials spills that might occur. PCWA also has specific provisions for periodic inspections of all oil-containing equipment and devices to prevent spilled oil from escaping Project buildings and grounds. In addition, all oil transfer operations follow applicable United States Department of Transportation (USDOT) regulations.

3.5 PROJECT OPERATIONS

This section provides an overview of MFP operations including PCWA's operating objectives; regulatory requirements and operating agreements/contracts; consumptive water and power demands; and water management during different periods of the annual operating cycle. Hydrology on bypass and peaking reaches affected by MFP operations is provided in Table 3-13. Project maintenance activities are described in Section 3.3.

3.5.1 Operating Objectives

The MFP has been operated for over 40 years by PCWA as a multi-purpose project to benefit the people of Placer County. The MFP is operated with respect to four objectives, as follows:

- Meet FERC license requirements that protect environmental resources and provide for recreation;
- Meet PCWA's consumptive water demands;
- Generate power to help meet California's energy demand and provide valuable support services required to maintain the overall quality and reliability of the state's electrical supply system; and
- Maintain Project facilities to ensure their continued availability and reliability.

There are five key operating characteristics of the MFP that allow PCWA to meet its operating objectives. These characteristics are:

- Storage Flexibility—the flexibility to raise and lower reservoir levels (water storage) at different rates and times throughout the year subject to minimum storage level requirements. This flexibility allows:
 - Reasonable rates of drawdown through the summer to meet consumptive water demands and generate during periods of peak energy demand;
 - Evacuation of sufficient reservoir storage space in the fall to provide adequate storage capacity to manage the following spring runoff with minimum potential for spill; and
 - Higher levels of drawdown of the reservoirs under drought conditions so that consumptive water supply needs can be met.
- Combined Operation of Middle Fork and Ralston Powerhouses—the ability to operate the Middle Fork and Ralston powerhouses simultaneously over a range of flows and schedule periods. This capability is limited only by: (1) powerhouse maximum flow capacity; (2) minimum pool (storage) requirements in upstream reservoirs; and (3) flows necessary to meet minimum instream flow requirements.
- Operation of Oxbow Powerhouse and Ralston Afterbay—the ability to fluctuate Ralston Afterbay on a daily basis over a range of storage levels, so that releases to the Middle Fork American River below Oxbow Powerhouse meet minimum instream flow requirements and provide whitewater boating recreational opportunities without requiring operation of Middle Fork and Ralston powerhouses.

- Meet the Combined Patterns of Water and Energy Demand—the ability to meet the seasonal combined patterns of consumptive water demand and peak energy demand and weekly/daily peak energy demands. To meet these combined patterns of demand, the MFP must have:
 - The ability to release water from storage for downstream delivery at all times of the year in response to consumptive demand patterns; and
 - The ability to vary on a daily and hourly basis, releases through Middle Fork and Ralston powerhouses for power generation in response to changing electrical demand, grid needs, and water supply demand.
- Fall Maintenance—the ability to shutdown operations during the fall, after the peak energy and water supply demand period and during favorable runoff and weather conditions to perform annual maintenance.

3.5.2 Regulatory Requirements and Operating Agreements/Contracts

Project operations for water supply and electric power generation are constrained by regulatory requirements; operating agreements and contracts; the physical capacities of the Project facilities; and water availability. Refer to Table 3-4 for a list of the physical capacity of MFP facilities. Regulatory requirements affecting Project operations include conditions imposed by the existing FERC license, and water rights permits and license issued by the California State Water Rights Board (now the California State Water Resources Control Board [State Water Board]). Operating agreements/contracts affecting Project operations include conditions required in the existing power purchase contracts with PG&E, water supply contracts, and the Water Forum Agreement.

3.5.2.1 Regulatory Requirements

Regulatory requirements that influence MFP operations include provisions in the existing FERC license and water rights permits and license. Each is described below.

FERC License

The MFP was constructed and operates under a 50-year license (FERC Project No. 2079) that was issued on March 13, 1963. The following discussion summarizes only terms and conditions related to ongoing operations of the MFP (construction-related requirements are excluded). Subsequent to issuance of the original license by FERC, there have been several amendments including: changes to exhibits identifying MFP facilities; the addition of Hell Hole Powerhouse; changes to original license articles; inclusion of new license articles; and adjustments to rated generating capacity of MFP facilities. A complete copy of the existing FERC license and amendments is available at PCWA's publicly-accessible Internet website <<http://relicensing.pcwa.net/>> and at a Resource Library, located at the PCWA Business Center, 144 Ferguson Road, Auburn, California.

The current license contains provisions that establish minimum pool (storage) requirements for Hell Hole and French Meadows reservoirs and Duncan Creek Diversion Pool. In addition, the license identifies minimum instream flow (MIF) requirements downstream of Project diversions and ramping release requirements from Oxbow Powerhouse. Table 3-14 summarizes the current minimum pool and MIF requirements. The license also requires PCWA to annually submit accurate flow and storage records from Project gaging stations to the USGS. In addition, the two tainter gates in the French Meadows Spillway must remain open annually from November 15 to April 1.

Water Rights

PCWA currently has five water rights permits and one license issued by the State Water Board related to the MFP. The water rights permits allow for the diversion and storage of water for consumptive use, power production, and incidental recreation. PCWA holds the necessary water rights to fully utilize all the capacity of MFP facilities. In addition, PCWA also holds sufficient water rights to meet current and reasonably foreseeable future consumptive water demand.

On January 10, 1963, the State Water Board issued four permits Nos. 13855, 13856, 13857, and 13858 to PCWA for the MFP. These permits provide for direct diversion and off-stream storage of waters from Duncan Creek, Middle Fork American River, Rubicon River, and North Fork Long Canyon and South Fork Long Canyon creeks. These permits were issued for two types of beneficial use: (1) power and incidental recreation; and (2) irrigation and incidental domestic, recreational, municipal, and industrial. Water for consumptive purposes is released from the American River Pump Station, located on the North Fork American River near the City of Auburn and Folsom Reservoir. Both points of re-diversion are located downstream of MFP facilities and neither are part of the MFP as defined by the FERC License.

In addition, Permit No. 18380 was issued to PCWA for diversions to the Hell Hole Powerhouse. This permit was reissued as License No. 12644 on May 17, 1990. PCWA also received Permit No. 20754 on August 18, 1994, to allow for the diversion of additional water for operation of the Hell Hole Powerhouse.

Key provisions of the permits and license relevant to the operations of the MFP are summarized in Table 3-15. These permits and license also require:

- Protection of water quality and aquatic species;
- Public access to Project lands and water;
- Minimum pool and minimum instream flow requirements as described in Table 3-14; and
- Minimum instream flows of 75 cfs below PCWA's American River Pump Station.

PCWA's water right permits 13856 and 13858 are currently under review by the State Water Board. PCWA filed petitions for extension of time to fully develop use under the consumptive water rights for these permits with the State Water Board on November 15, 2007. PCWA is currently undertaking an environmental analysis for the petition for extension of time. Per State Water Board direction, this environmental analysis will be completed subsequent to the issuance of the new FERC License Order and State Water Board 401 Certification associated with the relicensing of the MFP.

3.5.2.2 Operating Agreements/Contracts

Operating agreements/contracts that influence MFP operations include a power purchase contract; several water supply contracts related to the sale and delivery of consumptive water; and the Water Forum Agreement that outlines water use goals, obligations, and limitations for the American River Watershed. Each agreement/contract is described below.

Power Purchase Contract

The electrical output of the MFP is currently contractually obligated to PG&E pursuant to the Middle Fork Project Power Purchase Contract, dated April 30, 1963. The contract expires on April 30, 2013.

PCWA is currently negotiating a new power purchase contract, which will be in place prior to the expiration of the current PG&E contract. It is anticipated that the new contract will be from three to ten years in length, with provisions for renewal with the mutual agreement of both parties. This power purchase contract will be consistent with the FERC license conditions, water rights, and existing operating agreements/contracts and will not result in additional limitations or constraints in Project operations.

Water Supply Contracts

PCWA has contracts with United States Bureau of Reclamation (USBR), San Juan Water District, the City of Roseville, and Sacramento Suburban Water District (formerly the Northridge Water District) regarding the sale and delivery of water from the MFP.

PCWA's contractual relationship with USBR is defined in four agreements: (1) the February 20, 1963 contract, which pertains to construction and operation of MFP reservoirs and PCWA's redirection of water; (2) the 1970 Water Service Contract (as amended in 2002) wherein USBR agrees to provide water from the Central Valley Project (CVP) to PCWA; (3) the 1977 Land Purchase Contract in which USBR agrees to provide for the redirection of MFP water to PCWA; and (4) the 2002 contract related to the American River Pump Station (i.e., consumptive water diversion; not part of the MFP).

Key provisions of the water supply agreement between PCWA and USBR that are germane to the operations of the MFP include:

- PCWA is limited to a total diversion of 120,000 ac-ft per year from the Middle Fork American River for consumptive use.
- The redirection of water for consumptive use at the American River Pump Station requires hourly MFP system balancing to meet continuous MIF requirements below the pumping station. Whereas, in regard to the withdrawal of consumptive water from Folsom Reservoir, USBR allows for a 30-day balancing of supply and demand; therefore, those hourly or even daily releases from the MFP do not need to explicitly match consumptive deliveries from Folsom Reservoir.
- In dry years, when total flow into Folsom Reservoir is forecasted by the California Department of Water Resource (DWR) to be less than 600,000 ac-ft, PCWA may be required to make releases to ensure that the total quantity of water stored in the MFP reservoirs at the end of the year is no more than at the beginning of the year.
- In dry years, PCWA may also be required to release sufficient water during the months of July through December such that the total quantity of water stored in MFP reservoirs at the end of each month is no more than the quantity stored at the beginning of each month.
- PCWA may, subject to certain limitations, withdraw up to 35,000 ac-ft from USBR's CVP at Folsom Reservoir or other locations as mutually agreed.

The water supply agreements between PCWA and local water districts provide for delivery of up to 84,000 ac-ft of water annually depending on water year type from the MFP (diverted at Folsom Reservoir) including:

- San Juan Water District—up to 25,000 ac-ft;
- City of Roseville—up to 30,000 ac-ft; and
- Sacramento Suburban Water District—up to 29,000 ac-ft, if not required to meet PCWA customer needs.

Water Forum Agreement

PCWA is a member of the Water Forum, which is a regional group of water purveyors, water users, environmental groups, and business interests focused on responsible water use planning for the Sacramento – Placer region. The Water Forum participants have produced a set of agreements outlining water use goals, obligations, and limitations for the American River Watershed referred to as the Water Forum Agreement (PCWA 2000).

PCWA's commitment within the framework of these agreements includes limiting its total water usage from the MFP to amounts commensurate with their water rights and

water supply contracts. In addition, PCWA has committed, under certain conditions depending on consumptive water deliveries, to release up to 47,000 ac-ft in drier years to augment flows in the Lower American River, when the total unimpaired inflow into Folsom Reservoir from March through November is expected to be less than 950,000 ac-ft.

3.5.3 Consumptive Water and Power Demands

The MFP is operated to meet PCWA's consumptive water demands and generate power to help meet California's energy demand and provide valuable support services to maintain the overall quality and reliability of the state's electrical supply system. The following describes consumptive water demand and power demands associated with the MFP.

3.5.3.1 Consumptive Water Demand

PCWA provides water for consumptive uses from water diverted and/or stored at MFP facilities. Deliveries to meet consumptive demand vary from month to month but follow a general seasonal pattern as shown on Figure 3-3. Demand is typically lowest during the winter then increases in the early summer to meet irrigation and landscape needs and remains high through the summer. Demand then decreases again in the fall and winter months. Consumptive demand proportionally increases in drier years and decreases in wet years.

Current water demand from the MFP is approximately 42,000 ac-ft. However, during the term of the next license, PCWA expects to utilize its full allocation of 120,000 ac-ft of water available annually from the MFP to meet increasing consumptive water demands. In drier years, when less water is available in storage, MFP releases to meet consumptive demand at full build-out may shift the timing of generation slightly to coincide with planned water deliveries. In wetter years, when water in storage is greater, releases to meet both consumptive water demand and peak energy demand can be scheduled without restrictions.

3.5.3.2 Power Demand

The MFP has sufficient reservoir storage capacity to operate some, but not all of the hours in a year, so the powerhouses are scheduled to operate at select times. By scheduling energy generation to occur during periods of peak energy demand, the greatest benefit from MFP power generation is realized.

The typical pattern of seasonal energy demand in Northern California is shown in Figure 3-4. Demand is generally highest in the summer and early fall although a modest rise also occurs in the winter period. Energy demand also varies during different days of the week and hours of the day. Figure 3-5 illustrates differences in energy demand during the week. Typically, energy demand is higher on weekdays than weekends. Within a day, demand is typically highest in the late afternoon and early evening. Figure 3-5 also compares the timing of MFP generation with timing of typical peak energy demand. The extent that MFP generation can occur during peak energy

demand periods is constrained by water availability and physical capacities of Project facilities. In drier years, when less water is available for generation, the hours of daily operation are reduced. In wetter years, the hours of daily operation are increased.

At some times, MFP generation facilities are run irrespective of the need for peak energy generation. This may occur when water is moved through the system to balance the storage reservoirs during the fill period or to move water from French Meadows Reservoir to Hell Hole Reservoir during the summer. At these times, MFP provides base load energy to the state's energy system.

An important characteristic of hydropower generation is its ability to be brought into service very rapidly or shutdown quickly, as hourly and daily energy demands change. This characteristic allows the MFP to follow daily and hourly load requirements to match peak energy demand and to provide voltage support, spinning reserve, and other services (ancillary services) to the state's energy supply system.

3.5.4 Water Management

Typical annual operation of the MFP results in the capture of runoff which is diverted to increase storage in French Meadows and Hell Hole reservoirs in the winter and spring (filling period), and drawdown of the reservoirs during the summer, fall, and early winter (release period). Operation of the MFP varies from year to year based on the timing and magnitude of spring runoff, which is influenced by the amount of winter snow pack, ambient temperature conditions, and precipitation.

The amount of water annually available for capture and storage based on runoff into Project diversions and reservoirs also varies substantially from year-to-year. Total MFP inflow (combined flows from Duncan Creek, Middle Fork American River, Rubicon River, and Long Canyon Creek) from 1975 to 2007 is shown on Figure 3-6. During this period total inflow has averaged approximately 379,015 ac-ft and ranged from a low of approximately 62,638 ac-ft to a high of more than 790,820 ac-ft per year (more than a tenfold difference). The high variability of inflow is one of the most important factors influencing annual MFP operations.

During the filling period (winter and spring), flows through MFP powerhouses are highly dependent on projected and actual runoff conditions. Flows through the powerhouses are used to manage the runoff to maximize water storage while minimizing spills. In drier years, power releases are minimized during the filling period to increase the volume of water in storage to meet upcoming summer consumptive use and peak power demands. In wetter years, power releases during the filling period are increased to minimize spills from the reservoirs. In years when storage levels to meet consumptive demands are reasonably assured and the chance of spilling is low, power releases are adjusted through the filling season based on the volume of water in storage, projected runoff, and current and projected power demands. Because the water available from runoff varies significantly from one year to the next, the amount of water held in storage at the end of the filling period (July 1) also may vary significantly. Figure 3-7 shows combined reservoir storage levels (French Meadows and Hell Hole)

and spills from 1974 through 2007. Combined reservoir storage varied from a low of approximately 70,400 ac-ft to a high of approximately 346,700 ac-ft.

During the release period (summer and fall), after the reservoirs have reached their maximum storage capacity, monthly releases for generation are largely predictable for the remainder of the year. However, daily and hourly releases for generation, which respond to demand for electricity and electrical grid reliability, remain highly variable. During the release period, flows are managed to: (1) meet storage and flow license requirements; (2) meet consumptive water supply requirements; (3) optimize power generation to meet peak electrical demand; and (4) achieve end of year carryover target storage levels.

Decisions on the extent of the drawdown and the carryover target storage level are based on balancing competing needs including: (1) providing sufficient reservoir storage space to minimize potential spills from the reservoirs during the next filling period if the runoff is high (wet year); and (2) retaining enough water in storage to ensure that license requirements and consumptive demands can be met in the following year if the next filling period runoff is low (dry year).

Project operations are prioritized to first ensure consumptive water demand (deliveries) are met and second to maximize peak power generation.

However, in all but dry years, water supply demands are easily met as a by-product of power generation. The reason is that both consumptive water and electrical demands tend to coincide seasonally. In addition, MFP generally controls and releases far more water annually in most water years (except in dry years) than PCWA requires to meet consumptive water demand. Further, the majority of PCWA's consumptive deliveries are withdrawn from Folsom Reservoir (28.2 miles downstream of the last MFP powerhouse), where USBR allows for a 30-day balancing of supply and demand. Thus, hourly and daily releases from the MFP do not need to explicitly match withdrawals from Folsom Reservoir. Only the redirection of water for consumptive demand at the American River Pump Station near Auburn (maximum 100 cfs) requires hourly MFP system balancing to meet continuous MIF requirements below the pumping station.

French Meadows Powerhouse generates electricity when water is moved from French Meadows Reservoir to Hell Hole Reservoir. It is nearly always operated in block loaded condition with the duration of the block of operation set depending on the volume of water to be moved.

Hell Hole Powerhouse, located at the base of Hell Hole Dam, has an installed generating capacity of 0.73 MW. This powerhouse generates electricity opportunistically from flow releases from Hell Hole Dam. Project operations are not modified for power generation at Hell Hole Powerhouse.

The Middle Fork and Ralston powerhouses are the heart of MFP generation. These two powerhouses generally run in tandem, using water transported from Hell Hole Reservoir to Ralston Afterbay. Together the two powerhouses have a rated capacity of 201.6 MW

and produce about 90% of the MFP annual generation. Although Middle Fork Interbay is located between these powerhouses, Middle Fork Interbay has little ability to re-regulate flows because of its small storage capacity (175 ac-ft). If flows through Middle Fork and Ralston powerhouses are not matched, Middle Fork Interbay would be either drained or overtopped very quickly.

These powerhouses, running in tandem, are often used to help maintain reliable operations of the state's transmission grid by fine-tuning the flow of electricity in the grid to balance supply and demand. When operated to provide grid regulation, flow rates through the powerhouses vary quickly to meet constantly changing energy supply and demand conditions. These powerhouses are also frequently block loaded. When block loaded, flows through the powerhouses are usually set at an efficient operating level and run for a prescribed number of hours per day depending upon hydrology.

Oxbow Powerhouse frequently runs in tandem with Middle Fork and Ralston powerhouses. The capacity of Oxbow Powerhouse (1,025 cfs) is slightly higher than the present capacity of Ralston Powerhouse (924 cfs), which allows Oxbow Powerhouse to utilize water supplied by Ralston Powerhouse as well as inflow from the Middle Fork American and Rubicon rivers. Ralston Afterbay also has sufficient operational storage capacity to allow Oxbow Powerhouse to operate independently of Middle Fork and Ralston powerhouses for several hours at a time, depending on generation level. This independent operational flexibility is used to meet the ramping rate requirement downstream of Oxbow Powerhouse and to make releases for whitewater boating without requiring operation of the Middle Fork and Ralston powerhouses. Because Ralston Afterbay is used primarily as a regulating facility, WSEs may fluctuate on a day-to-day or hour-to-hour basis. Ralston Afterbay does not follow a seasonal fill and release pattern like Hell Hole or French Meadows reservoirs.

Fluctuations at Ralston Afterbay occur daily throughout the year, but the daily pattern varies depending upon season. Hourly and daily WSE plots for representative winter, spring, summer, and fall weekdays are provided as Figures 3-8 through 3-11, respectively. Ralston Afterbay WSE fluctuation patterns vary with water year type, electrical demand, and MFP scheduled and emergency maintenance activities.

The largest fluctuations in WSE in Ralston Afterbay typically occur during the summer and fall periods when the source of inflow is predominantly from Ralston Powerhouse generation (Figures 3-10 and 3-11). During a typical 24-hour period in the summer, WSEs in Ralston Afterbay are highest from midnight to about 7:00 AM. Around 7:00 AM, energy production releases through Oxbow Powerhouse begin to ramp up, while Ralston Powerhouse is off-line. Water levels in Ralston Afterbay decline as energy production continues through Oxbow Powerhouse.

Water levels in Ralston Afterbay also fluctuate during the spring, but fluctuations typically are not as regular or as large. During this time, Ralston and Oxbow powerhouses are run more synchronously. In a typical 24-hour period in the spring, WSEs in Ralston Afterbay were highest during the late afternoon, usually at about 6:00 PM. WSE then recedes through the evening and is lowest at about midnight, at

which point WSE begins to increase. During the spring, accretion flows (runoff from the Middle Fork and Rubicon watersheds) contribute substantially more water to Ralston Afterbay than during the summer, which tends to attenuate fluctuations in Ralston Afterbay.

During the winter, regular daily fluctuations are generally minimal, but fluctuations may occur over the course of days or weeks to allow for management of runoff resulting from winter storms. In the winter, Ralston and Oxbow powerhouses are run more synchronously. In general, WSEs in Ralston Afterbay remain relatively stable during the winter; although not at full pool, to allow the capture of runoff from winter storm events and to minimize reservoir spilling. If a large storm event is projected, Ralston Afterbay may be drawn down substantially in advance in preparation for high flows.

PCWA and PG&E currently coordinate with representatives from California Department of Parks and Recreation (State Parks) and a designated commercial whitewater boating representative to schedule MFP operations during the summer and early fall (June through Labor Day) to accommodate whitewater recreation in the Middle Fork American River below Oxbow Powerhouse. Whitewater boating releases are scheduled on a voluntary basis such that they minimize effects to power generation and do not compromise consumptive water deliveries or maintenance activities. When sufficient water is available, whitewater recreation flows (approximately 950 to 1,000 cfs) are provided by scheduling generation through Oxbow Powerhouse approximately two to three hours earlier than would otherwise occur to meet peak energy demand. Over the last decade, limitation of summer flow releases for whitewater boating has only occurred in one year (2001).

Flows are also voluntarily reduced in the Middle Fork American River below Oxbow Powerhouse for two annual competitive long-distance trail events (the Western States 100 mile Endurance Run and Western States Trail Ride), whose routes cross the river at Poverty Bar. During the races, Project operations are modified, to the extent practicable, to reduce flow release into the river and facilitate river crossings by race participants.

3.5.5 Project Generation and Outflow Records

The total water available and physical capacity of the MFP limits the timing and number of hours of generation in a given year. In drier years, when less water is available, generation is concentrated during the summer and early fall as shown on Figure 3-12 (1987–1992). In dry years, if MFP powerhouses are operated at full flow, generation is limited to an average of approximately five to six hours per day. In wetter years, generation occurs throughout the year as shown on Figure 3-13 (1995–1998). In wet years, the powerhouses may be operated at full flow for 17 hours or more per day.

Annual net generation at MFP powerhouses is summarized in Table 3-16. Annual net generation for French Meadows, Middle Fork, Ralston, and Oxbow powerhouses is based on 40 years of operation (1967–2006). Hell Hole Powerhouse began operation in 1983; therefore, annual net generation is based on 24 years of operation (1983–

2006). During this period, annual generation ranged from 211,000 MWh (1977) to 1,845,000 MWh (1982). The MFP's annual average generation is 1,039,078 MWh which represents the average net generation for the five Project powerhouses based on their respective period of record.

3.5.6 Climate Change

Recent information on climate change suggests that annual temperature patterns, the amount and type of precipitation (rain vs. snow), and the timing and volume of spring runoff may change in the future. However, information on how global warming may affect the timing or magnitude of inflows and future operations of the MFP is speculative at this time. To the extent that long-term temperature and precipitation patterns vary from the historical record, MFP operations may need to be changed. For example, if water storage in the snow pack is reduced by warmer winter temperatures and runoff occurs earlier in the year, then carryover storage targets and reservoir management during the reservoir filling period may need to be altered. If climate change increases the frequency of dry and critical dry water years, then changes in carryover storage targets will need to be adjusted to ensure sufficient water supply to meet future consumptive demand. These changes may also affect the total amount and timing of energy production from the MFP, but are likely to have a far smaller impact than existing annual variation in runoff volume and timing.

3.6 EXISTING ENVIRONMENTAL PROGRAMS, MEASURES, OR FACILITIES

The following section summarizes, by major resource category, existing environmental programs, measures, or facilities maintained by PCWA for the protection and enhancement of environmental resources. The discussion identifies whether the environmental program, measure, or facility is a FERC license requirement; a requirement under one of the State Water Board water right permits or license issued for the MFP; or voluntary. Programs, measures, or facilities related to public safety required to meet general FERC regulations are discussed in Section 3.4 – Project Safety. A complete copy of the existing FERC license and amendments is available at PCWA's publicly-accessible Internet website <<http://relicensing.pcwa.net/>> and at a Resource Library, located at the PCWA Business Center, 144 Ferguson Road, Auburn, California.

3.6.1 Water Resources

- Minimum Pool Requirements

PCWA operates Project reservoirs in a manner that maintains minimum pool requirements as established in FERC License Article No. 36; State Water Board Permit Nos. 13855, 13856, 13857, 13858, and 20754; and State Water Board License No. 12644. Refer to Table 3-14 for a description of minimum pool requirements at Project reservoirs.

- Minimum Instream Flow Requirements

PCWA provides minimum instream flow releases in accordance with FERC License Article No. 37, as amended; State Water Board Permit Nos. 13855, 13856, 13857, 13858, and 20754; and State Water Board License No. 12644. Refer to Table 3-14 for a description of minimum instream flow requirements at Project facilities.

- Project Gaging Stations

PCWA maintains a network of stream, diversion, reservoir, and powerhouse gaging stations to monitor and record flow releases, flow diversions, and water storage at Project facilities in accordance with FERC License Article No. 6. This network consists of 11 stations that measure flow in streams or at diversions, six stations that measure reservoir elevation and storage at Project reservoirs, and four stations that report flows through Project powerhouses.

- Ramping Requirements

PCWA meets ramping rate requirements downstream of Oxbow Powerhouse in accordance with FERC License Article No. 37. The portion of License Article 37 pertaining to the Oxbow Powerhouse was amended on December 16, 1988 to require that releases from Oxbow Powerhouse shall not cause vertical fluctuations at the stream gage (USGS Gage No. 11433212) greater than 3 feet per hour.

- Tainter Gate Operation

PCWA keeps the two tainter gates of the French Meadows Spillway in a fully open position from November 15 of each year until the following April 1, in accordance with FERC License Article No. 30.

3.6.2 Cultural Resources

- Protection of Cultural Resources

PCWA provides training to its employees regarding the basic identification and management of cultural resources and educates them concerning the laws protecting cultural resources. If potential cultural resources are discovered during routine operation and maintenance or construction of capital improvement projects, the following measures are implemented:

- PCWA will stop work if cultural resources are discovered during ground-disturbing activities. If archaeological remains (chipped or ground stone, glass, bone, ceramic, building remains, or historic debris) are discovered during construction or maintenance, PCWA will stop all work in the immediate vicinity of the find; and a qualified archaeologist will be hired by PCWA to

evaluate the find. Construction work may continue on other parts of the Project while archaeological mitigation takes place.

- In the event of discovery or recognition of any suspected human remains, disturbance of the site will cease and PCWA will immediately notify the Placer County Coroner and an archaeologist to evaluate the find. If human remains are determined to be of Native American origin, the Coroner must notify the Native American Heritage Commission within 24 hours of this identification.

3.6.3 Recreation Resources

- Construction, Maintenance, and Operation of Project Recreation Facilities

PCWA is responsible for the construction, maintenance, and operation of Project recreation facilities in accordance with FERC License Article No. 46. Refer to Table 3-10, which identifies the type and frequency of maintenance for Project recreation facilities.

Routine operation and maintenance activities associated with Project recreation facilities are administered by the USDA-FS under ongoing collection agreements with PCWA (Eldorado National Forest Collection Agreement No. 08-CO-11050300-009 and Tahoe National Forest Collection Agreement No. 08-CO-11051700-009). Entering into the collection agreements with the USDA-FS was a voluntary measure. Refer to the REC 1 – TSR (PCWA 2011b; SD B) located in SD B for additional information.

- Public Access

In accordance with FERC License Article No. 17, PCWA allows the public access to Project waters and adjacent Project lands for the purpose of full public utilization of lands and waters for navigation and recreation purposes, unless precluded due to public safety or facility security concerns. In addition, PCWA allows representatives of the State Water Board reasonable access to Project works to determine permit compliance in accordance with State Water Board Permit Nos. 13855, 13856, 13857, 13858, and 20754; and State Water Board License No. 12644.

3.6.4 Land Management

- Maintain Project Roads

PCWA conducts maintenance activities on Project roads in accordance with FERC License Article Nos. 18 and 19. Table 3-9 identifies the type and frequency of maintenance for each Project road.

PCWA and the USDA-FS have entered into various voluntary agreements related to the maintenance and use of Project roads located in the ENF and TNF. Currently, one agreement, executed on April 9, 2007 (Agreement No. 07-RO-

11051754-006), is in effect for Project roads. The Agreement provides for formal meetings and informal consultation between PCWA and the USDA-FS to discuss and agree on actions related to the regular maintenance of these Project roads and coordinate assignment of maintenance responsibilities. The agreement also allows by mutual consent for improvement of a road under the jurisdiction of one party to be financed, in whole or in part, from funds or resources provided by the other party. The current agreement expires on December 31, 2011, unless extended. Refer to the LAND 1 – Transportation System TSR – 2008 (PCWA 2011a; SD B) located in SD B for additional information.

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PERSONAL COMMUNICATION

Ed Moore and John Jue, pers. comm., 2006.

TABLES

Table 3-1. Middle Fork American River Project History.

Year	Development Activity
1963	The Federal Power Commission, predecessor of the current Federal Energy Regulatory Commission (FERC or Commission), issues a 50-year license (Project No. 2079) to Placer County Water Agency (PCWA) for the Middle Fork American River Project (MFP).
1963	Construction begins on the MFP.
1967	Completion of the MFP at a cost of \$115 million.
1975	Remediation of the Hell Hole – Middle Fork Tunnel.
1980	PCWA files a license amendment to construct a new powerhouse at the existing outlet of Hell Hole Dam on the Rubicon River.
1983	Hell Hole Powerhouse (725 KW) goes online.
2006	PCWA begins the relicensing of the MFP.
2007	Remediation of Duncan Canyon Creek Access Road.
2010	Initiate retrofit of French Meadows Spillway Probable Maximum Flood.
2012	French Meadows Spillway retrofit complete.
2013	Current FERC license for the MFP expires on February 28, 2013.

Table 3-2. No-Action Alternative – Project Facilities and Features.

Dams, Reservoirs, and Diversion Pools
Large Dams
French Meadows Dam and Outlet Works
Hell Hole Dam and Outlet Works
Medium Dams
Middle Fork Interbay Dam and Outlet Works
Ralston Afterbay Dam and Outlet Works
Small Dams
Duncan Creek Diversion Dam
North Fork Long Canyon Diversion Dam
South Fork Long Canyon Diversion Dam
Large Reservoirs
French Meadows Reservoir
Hell Hole Reservoir
Medium Reservoirs
Middle Fork Interbay
Ralston Afterbay
Small Diversion Pools
Duncan Creek Diversion Pool
North Fork Long Canyon Diversion Pool
South Fork Long Canyon Diversion Pool
Water Conveyance Systems
Tunnels
Duncan Creek – Middle Fork Tunnel
French Meadows – Hell Hole Tunnel
Hell Hole – Middle Fork Tunnel
Middle Fork – Ralston Tunnel
Ralston – Oxbow Tunnel
Diversion Pipes and Drop Inlets
North Fork Long Canyon Diversion Pipe and Drop Inlet
South Fork Long Canyon Diversion Pipe and Drop Inlet
Surge Shafts and Adits
Brushy Canyon Adit
Hell Hole – Middle Fork Tunnel Surge Shaft and Tank
Middle Fork – Ralston Tunnel Surge Shaft and Tank
Removable Sections and Portals
Duncan Creek – Middle Fork Tunnel Portal
French Meadows – Hell Hole Tunnel Removable Section
Hell Hole – Middle Fork Tunnel Removable Section
Middle Fork – Ralston Tunnel Removable Section
North Fork Long Canyon Crossing Removable Section
Intakes and Gatehouses
Duncan Creek – Middle Fork Tunnel Intake
French Meadows – Hell Hole Tunnel Gatehouse
French Meadows – Hell Hole Tunnel Intake
Hell Hole – Middle Fork Tunnel Gatehouse
Hell Hole – Middle Fork Tunnel Intake
Middle Fork – Ralston Tunnel Intake and Gatehouse
Ralston – Oxbow Tunnel Intake

Table 3-2. No-Action Alternative – Project Facilities and Features (continued).

Water Conveyance Systems (continued)
Penstocks and Valve Houses
French Meadows Powerhouse Penstock and Butterfly Valve House
Middle Fork Powerhouse Penstock and Butterfly Valve House
Ralston Powerhouse Penstock and Butterfly Valve House
Powerhouses, Switchyards, and Substations
French Meadows Powerhouse and Switchyard
Hell Hole Powerhouse
Hell Hole Substation
Middle Fork Powerhouse and Upper and Lower Switchyards
Ralston Powerhouse and Switchyard
Oxbow Powerhouse and Switchyard
Gaging Stations and Weirs
Stream Gages and Weirs
Duncan Creek near French Meadows (USGS Gage No. 11427700)
Duncan Creek below Diversion Dam (USGS Gage No. 11427750)
Middle Fork American River at French Meadows (USGS Gage No. 11427500)
Rubicon River below Hell Hole Dam (USGS Gage No. 11428800)
North Fork Long Canyon Creek below Diversion Dam (USGS Gage No. 11433085)
South Fork Long Canyon Creek below Diversion Dam (USGS Gage No. 11433065)
Middle Fork American River below Interbay Dam (USGS Gage No. 11427770)
Middle Fork American River above Middle Fork Powerhouse (USGS Gage No. 11427760)
Middle Fork American River near Foresthill (USGS Gage No. 11433300)
Diversion Gages
North Fork Long Canyon Creek Diversion Tunnel (USGS Gage No. 11433080)
South Fork Long Canyon Creek Diversion Tunnel (USGS Gage No. 11433060)
Reservoir Gages
French Meadows Reservoir (USGS Gage No. 11427400)
French Meadows Reservoir Staff Gage
Hell Hole Reservoir (USGS Gage No. 11428700)
Hell Hole Reservoir Staff Gage
Middle Fork Interbay Reservoir
Ralston Afterbay Reservoir
Powerhouse Gages
French Meadows Powerhouse (USGS Gage No. 11427200)
Middle Fork Powerhouse (USGS Gage No. 11428600)
Ralston Powerhouse (USGS Gage No. 11427765)
Oxbow Powerhouse (USGS Gage No. 11433212)
Leakage Weirs
French Meadows Dam Leakage Weirs Nos. 1-6
Hell Hole Dam Leakage Weir

Table 3-2. No-Action Alternative – Project Facilities and Features (continued).

Project Communication Lines and Powerlines
French Meadows Area
French Meadows Dam Generator Building to French Meadows Dam Outlet Works Powerline
French Meadows Dam Generator Building to French Meadows Dam Spillway Gates Powerline
Hell Hole Area
French Meadows Powerhouse to French Meadows Powerhouse Penstock and Butterfly Valve House
French Meadows Powerhouse and Switchyard to Hell Hole – Middle Fork Tunnel Gatehouse, Dormitory Facility, Operator’s Cottages, and Hell Hole Powerhouse Communication Line/Powerline
Dormitory and Cottages Water Supply Tank Powerline
Hell Hole Powerhouse to Rubicon River Gage below Hell Hole Dam Communication Line/Powerline
Middle Fork Interbay Area
Middle Fork Powerhouse to Middle Fork Powerhouse Butterfly Valve House Communication
Middle Fork Powerhouse Butterfly Valve House to Radio Repeater near Hell Hole – Middle Fork Tunnel Surge Tank (underground) Communication Line/Powerline
Middle Fork Powerhouse to Middle Fork – Ralston Tunnel Intake and Gatehouse Communication
Middle Fork Powerhouse to Middle Fork American River Gage above Middle Fork Powerhouse
Ralston – Oxbow Area
Ralston – Oxbow Tunnel Intake to Ralston Powerhouse Communication Line
Ralston Powerhouse to Ralston Powerhouse Butterfly Valve House Communication Line/Powerline
Ralston Afterbay Dam Generator Building to Ralston – Oxbow Tunnel Intake Communication
Oxbow Powerhouse to Ralston Afterbay Dam Generator Building Communication Line/Powerline
Photovoltaic Poles and Powerlines
Photovoltaic Poles and Powerline at Duncan Creek Gage near French Meadows
Photovoltaic Pole and Powerline at Duncan Creek Gage below Diversion Dam
Photovoltaic Pole and Powerline at Middle Fork American River Gage at French Meadows
Photovoltaic Pole and Powerline at Middle Fork American River Gage above Middle Fork Powerhouse
Photovoltaic Pole and Powerline at North Fork Long Canyon Creek Gage below Diversion Dam
Photovoltaic Pole and Powerline at South Fork Long Canyon Creek Gage below Diversion Dam
Photovoltaic Pole and Powerline at Middle Fork American River Gage near Foresthill
Microwave Reflectors and Radio Towers
Passive Microwave Reflector Station above Middle Fork Interbay
Radio Communications Tower near French Meadows – Hell Hole Tunnel Gatehouse
Radio Communications Tower and Repeater near Hell Hole – Middle Fork Tunnel Surge Shaft and Tank
Passive Microwave Reflector Station above Ralston Afterbay
Disposal Areas
Duncan Creek Diversion Sediment Disposal Area
North Fork Long Canyon Crossing Sediment Disposal Area
Middle Fork Interbay Sediment Disposal Area
Ralston Ridge Sediment Disposal Area

Table 3-2. No-Action Alternative – Project Facilities and Features (continued).

Ancillary Facilities
French Meadows Dam Generator Building
French Meadows Dam Staging Area
Dormitory Facility
Dormitory and Cottages Water Supply Tank
Hell Hole Staging Areas
Operator Cottages and Shop
Ralston Afterbay Dam Generator Building
Storage Building at Middle Fork – Ralston Tunnel Surge Shaft and Tank
Ralston Afterbay Sediment Removal Access Point
Project Fences
Slope Fences
French Meadows Powerhouse Penstock Rock Fence
French Meadows Powerhouse Slope Fence
Long Canyon Crossing Slope Fence
Middle Fork Powerhouse Upper Switchyard Slope Fence
Middle Fork Interbay Dam Slope Fence
Ralston Powerhouse Penstock and Butterfly Valve House Slope Fences
Ralston Powerhouse Slope Fence
Oxbow Powerhouse Slope Fence
Public Safety Fences
Dormitory Facility Barrier Fence
Hell Hole Dam General Parking Area Barrier Fence
North Fork Long Canyon Crossing Removable Section Barrier Fence
Project Roads
Duncan Creek Area
Duncan Creek Diversion Intake Road
Duncan Creek Diversion Dam Road
Duncan Creek Diversion Pool Road
French Meadows Area
Duncan Creek – Middle Fork Tunnel Portal Road
French Meadows – Hell Hole Tunnel Gatehouse Road
French Meadows Dam Outlet Works and South Leakage Weir Road
French Meadows Dam Staging Area and Spillway West Access Road
French Meadows Spillway East Access Road
French Meadows Dam North Leakage Weir Road
French Meadows Campground Water Supply Facility Access Road
Hell Hole Area
Hell Hole Dam and Powerhouse Road
Rubicon River Gage below Hell Hole Dam Road
Hell Hole Dam Leakage Weir Road
Hell Hole Dam Spillway Northern Access Point Road
French Meadows – Hell Hole Tunnel Portal Road
French Meadows Powerhouse Road
Hell Hole – Middle Fork Tunnel Gatehouse Road
Dormitory Facility Road
Operator Cottages and Shop Road
Spur on North Side of Operator Cottages
Spur on South Side of Operator Cottages
Hell Hole Dam Spillway Discharge Channel Road Spur to Communication Line/Powerline
Hell Hole Dam Spillway Discharge Channel Road
Big Meadows Campground Water Supply Facility Access Road

Table 3-2. No-Action Alternative – Project Facilities and Features (continued).

Project Roads (continued)
Long Canyon Area
North Fork Long Canyon Diversion North Road
North Fork Long Canyon Diversion South Road
North Fork Long Canyon Diversion Drop Inlet Road
South Fork Long Canyon Diversion and Drop Inlet Road
South Fork Long Canyon Diversion and Drop Inlet Cutoff Road
South Fork Long Canyon Diversion Drop Inlet Access Road
North Fork Long Canyon Crossing Removable Section North Road
North Fork Long Canyon Crossing Removable Section South Road
Middle Meadows Group Campground Water Supply Facility Access Road
Middle Fork Interbay Area
Middle Fork Interbay Dam Road
Middle Fork Interbay Dam to Powerhouse Road
Middle Fork Powerhouse Butterfly Valve House Road
Middle Fork Powerhouse Penstock and Butterfly Valve House Road
Middle Fork Powerhouse Upper Switchyard Road
Ralston – Oxbow Area
Brushy Canyon Adit Road
Ralston Powerhouse Butterfly Valve House Road
Ralston Afterbay Dam Access Road
Indian Bar Access Road
Oxbow Powerhouse Road
Ralston – Oxbow Tunnel Intake Road
Ralston Afterbay Private Boat Ramp Road
Ralston Afterbay Dam and Access Point Road
Project Trails
Duncan Creek Area
Duncan Creek Diversion Dam North Trail
Duncan Creek Diversion Dam South Trail
Photovoltaic Poles and Powerline at Duncan Creek Gage near French Meadows Trail
Duncan Creek Gage near French Meadows Trail
Duncan Creek Gage below Diversion Dam Trail
Middle Fork Interbay Area
Middle Fork American River Gage above Middle Fork Powerhouse Trail
Passive Microwave Reflector Station above Middle Fork Interbay Trail
Ralston Afterbay Area
Passive Microwave Reflector Station above Ralston Afterbay Trail

Table 3-3. No-Action Alternative – Project Recreation Facilities and Features.

Project Recreation Facilities
French Meadows Area
Ahart Campground
Coyote Group Campground
Poppy Campground
French Meadows Campground
Gates Group Campground
Lewis Campground
French Meadows Picnic Area
French Meadows Boat Ramp
French Meadows Dump Station
McGuire Picnic Area and Beach
McGuire Boat Ramp and Associated Parking
Hell Hole Area
Big Meadows Campground
Hell Hole Campground
Upper Hell Hole Campground
Hell Hole Vista
Hell Hole Boat Ramp
Hell Hole General Parking Area and Hell Hole Boat Ramp Parking Area
Ralston Afterbay Area
Ralston Picnic Area
Ralston Picnic Area Cartop Boat Ramp
Indian Bar Rafting Access and General Parking
Long Canyon Area
Middle Meadows Group Campground
Project Recreation Facility Features
Project Recreation Facility Water Supplies
Dolly Creek Water Supply
French Meadows Campground Water Supply
Big Meadows Campground Water Supply
Middle Meadows Group Campground Water Supply

Table 3-4. Project Facility Specifications.

Duncan Creek Diversion	
Dam	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	32 ft
Dam Crest Length	165 ft
Volume	1,750 cu yd
Elevation of Dam Crest	5,275 ft
Elevation of Streambed	5,243 ft
Elevation of Spillway Crest	5,265 ft
Stream Maintenance Pipe Capacity (10-in pipe)	8 cfs
Maximum Low-Level Outlet Capacity (60-in pipe)	310 cfs
Spillway	
Type	Uncontrolled Overflow
Width	100 ft
Capacity	7,200 cfs
Reservoir	
Gross Storage	20 ac-ft
Duncan Creek – Middle Fork Tunnel	
Nominal Size/Shape	9 ft x10 ft/Horseshoe
Length:	
Total	7,864 ft or 1.5 mi
Concrete Lined (Est.)	300 ft
Maximum Diversion Capacity	400 cfs
Invert Gradient	0.0029
French Meadows Dam (<i>L L Anderson Dam</i>) and Reservoir	
Dam	
Type	Composite
Material	Rock and Gravel Fill
Height of Dam Crest above Streambed	231 ft
Dam Crest Length	2,700 ft
Dam Crest Width	32 ft
Elevation of Dam Crest	5,273 ft
Elevation of Streambed	5,040 ft
Elevation of Spillway Crest	5,244.5 ft
Volume	3,510,000 cubic yards
Slopes – Upstream	2:1
Slopes - Downstream	1.8:1 and 2.0:1
Stream Maintenance Pipe Capacity	8 cfs
Maximum Low-Level Outlet Capacity at Water Surface 5,262 (full reservoir)	1,430 cfs

Table 3-4. Project Facility Specifications (continued).

French Meadows Dam (L L Anderson Dam) and Reservoir (continued)	
Spillway	
Type	Gated Ogee Crest
Type of Gates	Radial
Number of Gates	2
Size of Gates	36.5 ft x 18.5 ft
Capacity (Res. Water Surface 5,271, 2 ft freeboard)	39,957 cfs
Reservoir	
Maximum Operating Water Surface	5,262.0 ft
Minimum Operating Water Surface	5,125 ft
Gross Storage	134,993 ac-ft
Dead Storage (as constructed), at Tunnel Intake Lip	7,635 ac-ft
Active Storage (as constructed)	127,358 ac-ft
Area at Maximum Operating Water Surface	1,408 acres
Area at Minimum Operating Water Surface	434 acres
Depth at Minimum Operating Water Surface	77 ft
Shoreline at Maximum Operating Water Surface	9 mi
French Meadows – Hell Hole Tunnel	
Nominal Size/Shape	12 ft 4 in/Horseshoe
Length:	
Total	13,694 ft or 2.6 mi
Concrete Lined (Est.)	1,617 ft
Steel Lined (Est.)	317 ft
Maximum Discharge	400 cfs ¹
Invert Gradient	0.0025
French Meadows Powerhouse	
Penstock	
Length	691 ft or 0.1 mi
Diameter	6 ft 3 in O.D.
Powerhouse	
Installed Capacity, Generator	15.3 MW
Type of Turbine	Francis
Maximum Tail Water Surface	4,630 ft
Minimum Tail Water Surface	4,608 ft
Maximum Static Head	654 ft
Minimum Static Head	517 ft
Elevation Runner	4,612 ft
Minimum Estimated Hydraulic Capacity	50 cfs
Maximum Estimated Hydraulic Capacity	400 cfs
R.P.M.	450

¹As constructed tunnel capacity is approximately 800 cfs, maximum discharge is limited to 400 cfs in French Meadows Powerhouse.

Table 3-4. Project Facility Specifications (continued).

Hell Hole Dam and Reservoir	
Dam	
Type	Rock Fill
Height of Dam Crest above Streambed	410 ft
Dam Crest Length	1,570 ft
Dam Crest Width	35 ft
Elevation of Dam Crest	4,650 ft
Elevation of Streambed	4,240 ft
Volume	8,440,000 cu yd
Slopes - Upstream	2.5:1
Slopes - Downstream	1.4:1
Stream Maintenance Pipe Capacity	20 cfs
Maximum Low-Level Outlet Capacity at Water Surface 4,630 (full reservoir)	852 cfs
Spillway	
Type	Uncontrolled
Elevation of Spillway Crest	4,630 ft
Width at Lip	350 ft
Capacity (Water Surface 4,647, 2.8 ft freeboard)	89,500 cfs
Reservoir	
Maximum Operating Water Surface	4,630 ft
Minimum Operating Water Surface	4,340 ft
Gross Storage	207,590 ac-ft
Dead Storage (as constructed), at Tunnel Intake Lip	2,533 ac-ft
Active Storage (as constructed)	205,057 ac-ft
Area at Maximum Operating Water Surface	1,253 acres
Area at Minimum Operating Water Surface	185 acres
Depth at Minimum Operating Water Surface	88 ft
Shoreline at Maximum Operating Water Surface	11 mi
Hell Hole Powerhouse	
Installed Capacity, Generator	0.73 MW
Normal Operating Tail Water Surface	4,240 ft
Maximum Static Head	391 ft
Minimum Static Head	101 ft
Minimum Estimated Hydraulic Capacity	10 cfs
Maximum Estimated Hydraulic Capacity	35 cfs
R.P.M.	1,200
Hell Hole – Middle Fork Tunnel	
Nominal Size/Shape	13 ft 5 in/Horseshoe
Length:	
Total	55,006 ft or 10.4 mi
Concrete Lined (Est.)	6,780 ft
Steel Lined (Est.)	5,180 ft
Nominal Maximum Discharge, at full reservoir	920 cfs
Invert Gradient	0.0035 and 0.0077

Table 3-4. Project Facility Specifications (continued).

North Fork Long Canyon Diversion	
Dam	
Type	Gravity
Material	Concrete
Height of Dam above Streambed	10 ft
Dam Crest Length	120 ft
Elevation of Dam Crest	4,720 ft
Elevation of Streambed	4,710 ft
Volume	636 cu yd
Stream Maintenance Pipe Capacity (12-in pipe)	2 cfs
Maximum Low-Level Outlet Capacity (36-in pipe)	100 cfs
Spillway	
Type	Uncontrolled Overflow
Elevation of Spillway Crest	4,716 ft
Width of Spillway Crest	95 ft
Capacity	3,000 cfs
Reservoir	
Gross Storage	<1 ac-ft
North Fork Long Canyon Diversion Pipe and Drop Inlet	
Pipe	
Diameter	36 in
Length	3,530 ft or 0.7 mi
Shaft	
Diameter	6 ft
Depth without 6 ft x 20 ft Standpipe	403 ft
Capacity	100 cfs
Invert Gradient	Vertical
South Fork Long Canyon Diversion	
Dam	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	27 ft
Dam Crest Length	145 ft
Elevation of Dam Crest	4,650 ft
Elevation of Streambed	4,623 ft
Volume	1,341 cu yd
Stream Maintenance Pipe Capacity (12-in pipe)	5 cfs
Maximum Low-Level Outlet Capacity (36-in pipe)	140 cfs
Spillway	
Type	Uncontrolled Overflow
Width of Spillway Crest	60 ft
Elevation of Spillway Crest	4,640 ft
Capacity	4,000 cfs

Table 3-4. Project Facility Specifications (continued).

South Fork Long Canyon Diversion Pipe and Drop Inlet	
Reservoir	
Gross Storage	<1 ac-ft
Diameter	6 ft
Depth without 6 ft x 6 ft Standpipe	387 ft
Capacity	200 cfs
Invert Gradient	Vertical
Middle Fork Powerhouse (<i>L.J. Stephenson Powerhouse</i>)	
Penstock	
Length	3,653 ft or 0.7 mi
Diameter: Above Bifurcation	7 ft 6 in to 9 ft O.D.
Diameter: Below Bifurcation	5 ft 6 in O.D.
Powerhouse	
Number of Units	2
Generator Installed Capacity (Total)	122.4 MW
Type of Turbine	Impulse
Elevation Nozzles	2,536 ft
Elevation Normal Tail Water Surface	2,529 ft
Maximum Static Head	2,096 ft
Minimum Static Head	1,806 ft
Minimum Estimated Hydraulic Capacity	50 cfs
Maximum Estimated Hydraulic Capacity	940 cfs
R.P.M.	400
Middle Fork Interbay	
Dam	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	70.5 ft
Dam Crest Length	233 ft
Elevation of Dam Crest	2,536 ft
Elevation of Streambed	2,465 ft
Volume	14,360 cu yd
Stream Maintenance Pipe Capacity	23 cfs
Low-Level Outlet Capacity at Water Surface 2,530 (full reservoir)	890 cfs
Roadway Width, Curb to Curb	14 ft
Elevation of Roadway	2,538 ft
Spillway	
Type	Gated Ogee Crest
Capacity (Water Surface 2,534)	36,506 cfs
Width of Spillway	80 ft Gated, 60 ft Uncontrolled
Number of Gates	4
Type of Gates	Radial
Size of Gates	20 ft x 20 ft
Elevation of Top of Gates	2,530 ft
Elevation of Sill of Gates	2,510 ft

Table 3-4. Project Facility Specifications (continued).

Middle Fork Interbay (continued)	
Reservoir	
Maximum Operating Water Surface	2,529 ft
Minimum Operating Water Surface	2,502 ft
Normal Operating Water Surface	2,527 ft
Gross Storage	175 ac-ft
Dead Storage (as constructed), at Tunnel Intake Lip	2 ac-ft
Active Storage (as constructed)	173 ac-ft
Area at Maximum Operating Water Surface	7 acres
Area at Minimum Operating Water Surface	3 acres
Depth at Minimum Operating Water Surface	37 ft
Middle Fork – Ralston Tunnel	
Nominal Size/Shape	13 ft 5 in/Horseshoe
Length:	
Total	35,397 ft or 6.7 mi
Concrete Lined (Est.)	8,245 ft
Steel Lined (Est.)	245 ft
Maximum Discharge	836 cfs
Invert Gradient	0.0054
Ralston Powerhouse	
Penstock	
Length	1,670 ft
Diameter	8 ft to 9 ft 6 in O.D.
Powerhouse	
Installed Capacity, Generator	79.2 MW
Type of Turbine	Impulse
Elevation Nozzles	1,186 ft
Static Head	1,344 ft
Minimum Estimated Hydraulic Capacity	75 cfs
Maximum Estimated Hydraulic Capacity	924 cfs
R.P.M.	240
Ralston Afterbay	
Dam	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	89 ft
Dam Crest Length	560 ft
Volume	76,300 cu yd
Elevation of Dam Crest	1,189 ft
Elevation of Streambed	1,100 ft
Streamflow Maintenance Pipe Capacity (30-in pipe)	155 cfs
Maximum Low-Level Outlet Capacity at water surface 1,179 (full reservoir) – calculated (72-in pipe)	1,132 cfs

Table 3-4. Project Facility Specifications (continued).

Ralston Afterbay (continued)	
Dam (continued)	
Roadway Width, Curb to Curb	12 ft
Elevation of Roadway	1,188.42 ft
Spillway	
Type	Gated Ogee Crest
Capacity at Water Surface 1,186	171,200 cfs
Elevation of Top of Gates	1,179 ft
Elevation of Sill of Gates	1,149 ft
Crest Length	232 ft
Number of Gates	5
Type of Gates	Radial
Size of Gates	30 ft x 40 ft
Reservoir	
Gross Storage	2,782 ac-ft
Active Storage	1,804 ac-ft
Ralston – Oxbow Tunnel	
Nominal Size/Shape	13 ft 3 in/Horseshoe
Length:	
Total	403 ft or 0.08 mi
Concrete Lined	343 ft
Steel Lined	60 ft
Maximum Discharge	1,088 cfs
Invert Gradient	0.12035
Oxbow Powerhouse	
Penstock	
Length	5 ft
Diameter	9 ft I.D.
Powerhouse	
Installed Capacity, Generator	6.1 MW
Type of Turbine	Francis
Elevation Runner	1,098.5 ft
Static Head	90 ft
Normal Tail Water Surface	1,089 ft
Minimum Estimated Hydraulic Capacity	200 cfs
Maximum Estimated Hydraulic Capacity	1,025 cfs
R.P.M.	200

Table 3-4. Project Facility Specifications (continued).

Summary	
Power and Energy Production	
Total Installed Capacity (at 0.9 power factor)	223.7 MW
Total Dependable Capacity (at 0.9 power factor)	223.7 MW
Average Annual Energy Production ¹	1,039,078 MWh
Maximum Total Static Head	4,162
Water Supply and Regulation	
Total Gross Storage	345,560 ac-ft
Project Features	
Earth and Rock Fill Dams	11,900,000 cu yd
Concrete Dams and Diversions	94,000 cu yd
Tunnels and Penstocks	23.2 mi
Project Completed – 1967	

¹Generation from French Meadows, Middle Fork, Ralston, and Oxbow powerhouses is averaged over a 40-year period of record (1967 to 2006). Hell Hole Powerhouse was constructed in 1983; therefore, generation from Hell Hole Powerhouse is averaged over the 24-year period that the facility has been in operation (1983 to 2006). The Average Annual Energy Production represents the sum of the average net generation for the five Project powerhouses based on their respective period of record. Refer to Table 3-16.

Notes:

ac-ft = acre-feet
cfs = cubic feet per second
cu yd = cubic yards
ft = feet
I.D. = inside diameter
in = inch
MW = megawatt
MWh = megawatt hours
mi = miles
O.D. = outside diameter

Table 3-5. Description of Project Communication Lines and Powerlines.

Name	Start	End	Length (Approximate)	Voltage	Purpose
French Meadows Area					
French Meadows Dam Generator Building to French Meadows Dam Outlet Works Powerline	French Meadows Dam Generator Building	French Meadows Dam Outlet Works	0.23 mi.	208 V	Supplies power from the motor-generator
French Meadows Dam Generator Building to French Meadows Dam Spillway Gates Powerline	French Meadows Dam Generator Building	French Meadows Dam Spillway Gates	69 ft.	208 V	Operates the spillway control equipment
Hell Hole Area					
French Meadows Powerhouse to French Meadows Powerhouse Penstock and Butterfly Valve House Communication Line/Powerline	French Meadows Powerhouse and Switchyard	Butterfly Valve House at the top of French Meadows Powerhouse Penstock	0.1 mi.	2.4 kV	Power for lighting and equipment operation and communication to the valve house
French Meadows Powerhouse and Switchyard to Hell Hole – Middle Fork Tunnel Gatehouse, Dormitory Facility, Operator Cottages and Hell Hole Powerhouse Communication Line/Powerline	French Meadows Powerhouse and Switchyard	Hell Hole – Middle Fork Tunnel Gatehouse, Dormitory Facility, Operator Cottages and Hell Hole Powerhouse	2.35 mi.	12 kV	Power for facility operation and communication between facilities
Dormitory and Cottages Water Supply Tank Powerline	Water Supply Tank	Dormitory and Cottages	0.08 mi.	2.4 kV	Controls the water tank fill system
Hell Hole Powerhouse to Rubicon River Gage below Hell Hole Dam Communication Line/Powerline	Hell Hole Powerhouse	Rubicon River Gage below Hell Hole Dam	0.12 mi.	12 kV	Power and communication to the gaging station
Middle Fork Interbay Area					
Middle Fork Powerhouse to Middle Fork Powerhouse Butterfly Valve House Communication Line/Powerline	Middle Fork Powerhouse	Middle Fork Powerhouse Butterfly Valve House	0.62 mi.	2.4 kV	Power for equipment operation and communication between facilities

Table 3-5. Description of Project Communication Lines and Powerlines (continued).

Name	Start	End	Length (Approximate)	Voltage	Purpose
Middle Fork Interbay Area (continued)					
Middle Fork Powerhouse Butterfly Valve House to Radio Repeater near Hell Hole – Middle Fork Tunnel Surge Tank (underground) Communication Line/Powerline	Middle Fork Powerhouse	Radio Repeater near Hell Hole – Middle Fork Tunnel Surge Tank	0.37 mi.	2.4 kV	Power and communication between facilities
Middle Fork Powerhouse to Middle Fork – Ralston Tunnel Intake and Gatehouse Communication Line/Powerline	Middle Fork Powerhouse	Middle Fork – Ralston Tunnel Intake and Gatehouse	0.36 mi.	2.4 kV	Power and communication to operate equipment at the tunnel intake and Middle Fork Interbay Dam
Middle Fork Powerhouse to Middle Fork American River Gage above Middle Fork Powerhouse Communication Line/Powerline	Middle Fork Powerhouse	Middle Fork American River Gage above Middle Fork Powerhouse	0.09 mi.	102 V	Power to the gaging station and communication to the Powerhouse
Ralston – Oxbow Area					
Ralston – Oxbow Tunnel Intake to Ralston Powerhouse Communication Line	Ralston – Oxbow Tunnel Intake	Ralston Powerhouse	1.51 mi.	2.4 kV	Communication between the tunnel intake and Ralston Powerhouse
Ralston Powerhouse to Ralston Powerhouse Butterfly Valve House Communication Line/Powerline	Ralston Powerhouse	Ralston Powerhouse Butterfly Valve House	0.22 mi.	4.16 kV	Communication and power to operate equipment at the butterfly valve house
Ralston Afterbay Dam Generator Building to Ralston – Oxbow Tunnel Intake Communication Line/Powerline	Ralston Afterbay Dam Generator Building	Ralston – Oxbow Tunnel Intake Gatehouse	0.14 mi.	2.16 kV	Communication and power to operate equipment at the tunnel intake
Oxbow Powerhouse to Ralston Afterbay Dam Generator Building Communication Line/Powerline	Oxbow Powerhouse	Ralston Afterbay Dam Generator Building	0.17 mi.	2.4 kV	Power and communication between facilities

Table 3-6. Description of Project Roads and Trails.

PCWA Name	USDA-FS Number	Start	End	Length (miles)	Width (feet) 8-12 ft. = single lane 20 ft. = 1.5 lane 24 ft. = double lane	Surface Treatment	Overall Condition	Bridge Crossing Locations (road mile)
Project Roads								
Duncan Creek Area								
Duncan Creek Diversion Intake Road	96-52	FR 96	Duncan Creek – Middle Fork Tunnel Intake	2.1	10–12	Aggregate/Native	Good	1.91
Duncan Creek Diversion Dam Road	96-52-06	96-52	North End of Duncan Creek Diversion Dam	0.05	10	Native	Good	N/A
Duncan Creek Diversion Pool Road	96-52-07	96-52	North Side of Duncan Creek Diversion Pool	0.06	10	Native	Poor	N/A
French Meadows Area								
Duncan Creek – Middle Fork Tunnel Portal Road	96-69	FR 96	Duncan Creek – Middle Fork Tunnel Portal	0.44	10	Aggregate/Native	Poor ¹	N/A
French Meadows – Hell Hole Tunnel Gatehouse Road	96-76	FR 96	French Meadows – Hell Hole Tunnel Gatehouse	0.17	12	Native	Fair	N/A
French Meadows Dam Outlet Works and South Leakage Weir Road	22-02	FR 22	French Meadows Dam Outlet Works and Leakage Weirs	0.53	12	Aggregate	Good – Good/Fair	N/A
French Meadows Dam Staging Area and Spillway West Access Road	96-70-02	FR 96	French Meadows Spillway	0.17	10	Aggregate	Good	N/A
French Meadows Spillway East Access Road	96-68	FR 96	French Meadows Spillway	0.23	10	Native	Not surveyed	N/A
French Meadows Dam North Leakage Weir Road	96-68-05	96-68	French Meadows Dam North Leakage Weir	0.09	10	Native	Not surveyed	N/A
French Meadows Campground Water Supply Facility Access Road	96-77-05	96-77	French Meadows Campground Water Supply Tank	0.09	12	Native	Fair	N/A
Hell Hole Area								
Hell Hole Dam and Powerhouse Road	17N02M	Hell Hole Dam Boat Ramp	Hell Hole Powerhouse and Outlet Works	0.95	12–24	Aggregate/Native/Paved	Good/Fair	0.18 – 0.26 ²
Rubicon River Gage below Hell Hole Dam Road	17N02MB	17N02M	Rubicon River Gage and Weir below Hell Hole Dam	0.07	10	Aggregate	Fair	N/A
Hell Hole Dam Leakage Weir Road	17N02MA	17N02M	Hell Hole Dam Leakage Weir below Hell Hole Dam	0.05	12	Aggregate	Poor	N/A
Hell Hole Dam Spillway Northern Access Point Road	14N33A	Hell Hole Boat Ramp Road	Hell Hole Dam Spillway	0.02	10	Native	Poor	N/A
French Meadows - Hell Hole Tunnel Portal Road	17N02J	FR 2	French Meadows Powerhouse Penstock and Butterfly Valve House	0.61	12	Native	Good/Fair	N/A
French Meadows Powerhouse Road	17N02F	FR 2	French Meadows Powerhouse	1.28	24	Aggregate	Good	N/A
Hell Hole - Middle Fork Tunnel Gatehouse Road	17N02N	FR 2	Hell Hole – Middle Fork Tunnel Gatehouse	0.37	12	Native	Good/Fair	N/A
Dormitory Facility Road	17N02L	FR 2	Hell Hole Dormitory Facility	0.13	20	Aggregate	Good	N/A
Operator Cottages and Shop Road	17N02S	FR 2	Operator Cottages and Shop	0.06	12	Aggregate	Not surveyed	N/A
Spur on North Side of Operator Cottages	17N02V	FR 2	North side of Operators Cottage	0.07	12	Native	Not surveyed	N/A
Spur on South Side of Operator Cottages	17N02U	FR 2	South side of Operators Cottage	0.04	12	Native	Not surveyed	N/A

Table 3-6. Description of Project Roads and Trails (continued).

PCWA Name	USDA-FS Number	Start	End	Length (miles)	Width (feet) 8-12 ft. = single lane 20 ft. = 1.5 lane 24 ft. = double lane	Surface Treatment	Overall Condition	Bridge Crossing Locations (road mile)
Hell Hole Area (continued)								
Hell Hole Dam Spillway Discharge Channel Road Spur to Communication/Powerline	17N02KA	17N02K	Communication Line/Powerline	0.03	8–10	Native	Poor	N/A
Hell Hole Dam Spillway Discharge Channel Road	17N02K	FR 2	Hell Hole Dam Spillway Discharge Channel below the Spillway and Dam	0.6	8–10	Native	Poor	N/A
Big Meadows Campground Water Supply Facility Access Road	14N43A	14N43	Big Meadows Campground Water Supply Tank	0.27	12	Native	Fair/Poor	N/A
Long Canyon Area								
North Fork Long Canyon Diversion North Road	14N42D	14N42	North Fork Long Canyon Diversion (north approach)	0.14	15	Native	Good – Good/Fair	N/A
North Fork Long Canyon Diversion South Road	17N02R	FR 2	North Fork Long Canyon Diversion (south approach)	0.62	12	Native	Good	N/A
North Fork Long Canyon Diversion Drop Inlet Road	17N02H	FR 2	North Fork Long Canyon Diversion Drop Inlet	0.08	10	Native	Good – Poor	N/A
South Fork Long Canyon Diversion and Drop Inlet Road	17N02P	FR 2	FR 2	0.11	20	Native	Good – Good/Fair	N/A
South Fork Long Canyon Diversion and Drop Inlet Cutoff Road	17N02PA	17N02P	17N02P	0.02	20	Native	Good – Good/Fair	N/A
South Fork Long Canyon Diversion Drop Inlet Access Road	–	17N02P	South Fork Long Canyon Diversion Drop Inlet	0.03	10	Native	Poor	N/A
North Fork Long Canyon Crossing Removable Section North Road	14N08N	FR 2	North Fork Long Canyon Crossing Removable Section and Parking Area	0.15	10	Native	Good/Fair – Fair	N/A
North Fork Long Canyon Crossing Removable Section South Road	14N16A	14N16A at ENF Boundary	North Fork Long Canyon Crossing Removable Section (southern access)	0.11	10	Native	Poor	N/A
Middle Meadows Group Campground Water Supply Facility Access Road	14N28A	14N28	Middle Meadows Group Campground Water Supply Tank	0.4	12	Native	Fair/Poor	N/A
Middle Fork Interbay Area								
Middle Fork Interbay Dam Road	96-17	FR 96	Middle Fork Interbay Dam	4.48	12–24	Paved/Aggregate	Good	N/A
Middle Fork Interbay Dam to Powerhouse Road	14N55	Middle Fork Interbay Dam	Middle Fork Powerhouse	0.38	12–24	Paved/Aggregate	Good	N/A
Middle Fork Powerhouse Butterfly Valve House Road	14N55	14N55 at ENF Boundary	Middle Fork Powerhouse Butterfly Valve House and Hell Hole – Middle Fork Tunnel Removable Section	0.74	20	Aggregate	Good	N/A
Middle Fork Powerhouse Penstock and Butterfly Valve House Road	14N55	Middle Fork Powerhouse	Middle Fork Powerhouse Butterfly Valve House and Hell Hole – Middle Fork Tunnel Removable Section	1.83	12	Paved/Chip seal/Aggregate/Native	Good/Fair – Fair	N/A
Middle Fork Powerhouse Upper Switchyard Road	14N55B	14N55	Middle Fork Powerhouse Upper Switchyard	0.12	12	Paved/Aggregate	Good/Fair	N/A
Ralston – Oxbow Area								
Brushy Canyon Adit Road	14N30	14N30 at ENF Boundary	Brush Canyon Adit (Middle Fork–Ralston Tunnel)	0.48	12	Native	Poor	N/A
Ralston Powerhouse Butterfly Valve House Road	14N25KA	FR 23	Ralston Powerhouse Butterfly Valve House and Middle Fork – Ralston Tunnel Removable Section	0.32	10	Native	Good	N/A
Ralston Afterbay Dam Access Road	23-02	FR 23	Ralston Afterbay Dam	0.59	16	Paved	Not surveyed	N/A
Ralston – Oxbow Tunnel Intake Road	23-02-04	23-02	Ralston – Oxbow Tunnel Intake	0.07	8–12	Aggregate	Good	N/A

Table 3-6. Description of Project Roads and Trails (continued).

PCWA Name	USDA-FS Number	Start	End	Length (miles)	Width (feet) 8-12 ft. = single lane 20 ft. = 1.5 lane 24 ft. = double lane	Surface Treatment	Overall Condition	Bridge Crossing Locations (road mile)
Ralston – Oxbow Area (continued)								
Ralston Afterbay Private Boat Ramp Road	23-02-06	23-02	Ralston Afterbay Boat Ramp	0.04	8–12	Aggregate	Good	N/A
Ralston Afterbay Dam and Access Point Road	23-02-08	23-02	Ralston Afterbay Reservoir (south approach)	0.21	8–12	Native (crest across the dam improved)	Good	N/A
Oxbow Powerhouse Road	23-02-10	23-02	Oxbow Powerhouse	0.14	20	Paved	Good	N/A
Indian Bar Access Road	23-02-12	23-02	Indian Bar Designated Parking Area	0.16	12	Paved	Not surveyed	N/A
Project Trails								
Duncan Creek Area								
Duncan Creek Diversion Dam North Trail	13E38	96-52-06	Duncan Creek Diversion Dam (north end)	0.01	N/A	Native	Good	N/A
Duncan Creek Diversion Dam South Trail	13E39	96-52	Duncan Creek Diversion Dam (south end)	0.03	N/A	Native	Good	N/A
Photovoltaic Poles and Powerline at Duncan Creek Gage near French Meadows Trail	13E41	96-52	Duncan Creek Gage above the Diversion Dam	0.03	N/A	Native	Good	N/A
Duncan Creek Gage near French Meadows Trail	13E32	96-52	Duncan Creek Gage and Weir above Diversion Dam	0.02	N/A	Native	Good	N/A
Duncan Creek Gage below Diversion Dam Trail	13E33	96-52	Duncan Creek Gage and Weir below Diversion Dam	0.17	N/A	Native	Good	N/A
Middle Fork Interbay Area								
Middle Fork American River Gage above Middle Fork Powerhouse Trail	14N55A**	Middle Fork Powerhouse Penstock and Butterfly Valve House Road	Cable crossing of the Middle Fork American River	0.07	N/A	Native	Good	N/A
Passive Microwave Reflector Station above Middle Fork Interbay Trail	13E36	16–26	Passive Microwave Reflector Station above Middle Fork Interbay	0.08	N/A	Native	Good	N/A
Ralston Afterbay Area								
Passive Microwave Reflector Station above Ralston Afterbay Trail	–	FR 23	Passive Microwave Reflector Station above Ralston Afterbay	0.09	N/A	Native	Poor	N/A

N/A = Not applicable

FR = Forest Route

**USDA-FS (Paul Sanders) to convert from road # to trail #.

¹This road was upgraded in 2010 as part of the French Meadows Spillway Project. Therefore, the 2008 survey condition rating is no longer applicable.²Hell Hole Spillway

Table 3-7. Description of Project Recreation Facilities.

Project Area	Single Camp Units ¹	Group Camp Units ²	Picnic Units	Handicap Accessible Units	Maximum PAOT ³ Capacity	Boat Launch	Flush Toilets	Vault Toilets	Pit Toilets	Potable Water	Parking Spaces/Spurs	Notes
French Meadows Area												
Ahart Campground	12	0	0	0	72	—	—	X	—	—	12	
Coyote Group Campground	0	4	0	0	125	—	X	X	—	X	43 ⁴	
Poppy Campground	12	0	0	0	72	—	—	—	X	—	—	Hike-in or boat-in access
French Meadows Campground	75	0	0	8	450	—	X	X	—	X	75	
Gates Group Campground	0	3	0	0	125	—	—	X	—	X	43 ⁴	
Lewis Campground	40	0	0	3	240	—	X	X	—	X	40	
French Meadows Picnic Area and Boat Ramp and Associated Parking Areas	—	—	4	0	24	X	X	X	—	X	46 ⁵	
McGuire Picnic Area and Beach	—	—	10	0	60	—	X	—	—	X	30 ⁵	
McGuire Boat Ramp and Associated Parking Areas (includes Poppy Trailhead Parking Area)	—	—	0	0	—	X	X	X	—	X	75 ⁵	
Hell Hole Area												
Big Meadows Campground	54	0	0	1	324	—	X	X	—	X	54	
Hell Hole Campground	10	0	0	0	60	—	—	X	—	X	15 ⁵	Walk in tent units only
Upper Hell Hole Campground	13	0	0	0	78	—	—	—	X	—	—	Hike-in or boat-in access
Hell Hole Vista	—	—	1	0	6	—	—	X	—	—	6 ⁵	
Hell Hole Boat Ramp and Associated Parking Areas	—	—	3	0	—	X	—	X	—	—	57 ⁴	
Ralston Afterbay Area												
Ralston Picnic Area and Cartop Boat Ramp	—	—	5	0	30	X	—	X	—	—	13 ⁵	
Indian Bar Rafting Access and General Parking	—	—	0	0	—	X	—	X	—	—	12 ⁵	
Long Canyon Area												
Middle Meadows Group Campground	0	2	0	2	75	—	X	X	—	X	15 ⁵	
Project Recreation Facility Water Supplies												
Dolly Creek Water Supply	—	—	—	—	—	—	—	—	—	X	—	Serves Lewis, Gates Group, and Coyote Group Campgrounds, McGuire Picnic Area and Boat Ramp, RV Dump Station, and the French Meadows Administrative Site
French Meadows Campground Water Supply	—	—	—	—	—	—	—	—	—	X	—	Serves French Meadows Campground, Boat Ramp, and Picnic Area
Big Meadows Campground Water Supply	—	—	—	—	—	—	—	—	—	X	—	Serves Big Meadows and Hell Hole Campgrounds
Middle Meadows Group Campground Water Supply	—	—	—	—	—	—	—	—	—	X	—	Serves Middle Meadows Group Campground

Source:

REC 1 – TSR (PCWA 2011b; SD B)

¹Single camp units typically include a parking spur, picnic table, campfire ring, pedestal cooking grill, and a bear-proof food storage locker.²Group camp units typically include parking areas, picnic tables, serving tables, a group fire ring, benches, double pedestal cooking grills, bear-proof garbage containers, and bear-proof food storage lockers.³PAOT = Persons At One Time (assumes 6 persons at one time for single camp and picnic units) and is based on number of units.⁴Determined based on number of striped stalls.⁵Estimated based on parking area dimensions.

— = Not applicable.

Table 3-8. Description of Recreation Facility Water Supplies and Associated Maintenance Access Roads.

Name	Description	Facilities Serviced	Maintenance Access Roads
Dolly Creek Water Supply	<ul style="list-style-type: none"> • Well, pump house, and 10,000 gallon concrete water storage tank (fenced) • Underground water supply pipeline from water supply to campgrounds, picnic area, and boat ramp 	<ul style="list-style-type: none"> • Ahart Campground • Coyote Group Campground • Gates Group Campground • Lewis Campground • McGuire Picnic Area and Boat Ramp 	<ul style="list-style-type: none"> • Maintenance access from Forest Route 68 and Forest Road 68.10
French Meadows Campground Water Supply	<ul style="list-style-type: none"> • Spring and 10,000 gallon concrete water storage tank • 1,000-foot-long aboveground pipeline from the spring to the water storage tank • Underground water supply pipeline from water supply tank to campground, picnic area, and boat ramp 	<ul style="list-style-type: none"> • French Meadows Campground, Picnic Area, and Boat Ramp 	<ul style="list-style-type: none"> • French Meadows Campground Water Supply Facility Access Road (96-77-05)
Big Meadows Campground Water Supply	<ul style="list-style-type: none"> • Horizontal well and 5,000 gallon steel water storage tank • 150-foot-long buried pipeline from well to water storage tank • Underground water supply pipeline from water supply to South Fork Long Canyon Creek • Aboveground water supply pipeline from creek to campgrounds 	<ul style="list-style-type: none"> • Big Meadows Campground • Hell Hole Campground 	<ul style="list-style-type: none"> • Big Meadows Campground Water Supply Facility Access Road (14N43A)
Middle Meadows Group Campground Water Supply	<ul style="list-style-type: none"> • Spring and 10,000 gallon concrete water storage tank (fenced) • Underground water supply pipeline from water supply to campground 	<ul style="list-style-type: none"> • Middle Meadows Campground 	<ul style="list-style-type: none"> • Middle Meadows Group Campground Water Supply Facility Access Road (14N28A)

Table 3-9. Description of Current Facility Inspections, Testing, and Maintenance Activities at Project Facilities and Features.

Project Facility or Feature	Inspections, Testing, and Maintenance Activities																
	Inspections and Maintenance		Vegetation Management			Pest Management		Sediment Management	Slope Stabilization (Falling Rock Control)		Debris Management			Road Maintenance			
	Tunnel and Powerhouse Inspection, Testing, & Maintenance	Spillway & Tainter Gate Testing	Trimming by Hand	Trimming w/Equipment	Herbicide Use	Physical Control (snap traps)	Over-the-Counter Rodenticide Use	Physical Removal w/Equipment	Gunite (erosion control)	Rock Removal/Fence Repair	Large Woody Debris	Cleaning Trash Racks	Log Booms	Facility Painting	Pole Replacement/Retrofit	Annual Maintenance	Periodic Maintenance
Dams, Reservoirs, and Diversion Pools																	
Large Dams																	
French Meadows Dam and Outlet Works		A	A														
Hell Hole Dam and Outlet Works	A ¹		A														
Medium Dams																	
Middle Fork Interbay Dam and Outlet Works		A	A														
Ralston Afterbay Dam and Outlet Works		A	A														
Small Dams																	
Duncan Creek Diversion Dam			A														
North Fork Long Canyon Diversion Dam			A														
South Fork Long Canyon Diversion Dam			A														
Large Reservoirs																	
French Meadows Reservoir													X				
Hell Hole Reservoir											I		X				
Medium Reservoir																	
Middle Fork Interbay								I			I	R	X				
Ralston Afterbay								I			I	R	X				
Small Diversion Pools																	
Duncan Creek Diversion Pool			A					I				R	X				
North Fork Long Canyon Diversion Pool			A					I				R					
South Fork Long Canyon Diversion Pool			A					I				R					
Water Conveyance Systems																	
Tunnels																	
Duncan Creek – Middle Fork Tunnel																	
French Meadows – Hell Hole Tunnel																	
Hell Hole – Middle Fork Tunnel																	
Middle Fork – Ralston Tunnel																	
Ralston – Oxbow Tunnel	A																
Diversion Pipes and Drop Inlets																	
North Fork Long Canyon Diversion Pipe and Drop Inlet			A														
South Fork Long Canyon Diversion Pipe and Drop Inlet			A														
Surge Shafts and Adits																	
Brushy Canyon Adit			A														
Hell Hole – Middle Fork Tunnel Surge Shaft and Tank			A										I				
Middle Fork – Ralston Tunnel Surge Shaft and Tank			A										I				
Removable Sections and Portals																	
Duncan Creek – Middle Fork Tunnel Portal			A											I			
French Meadows – Hell Hole Tunnel Removable Section			A											I			
Hell Hole – Middle Fork Tunnel Removable Section			A											I			
Middle Fork – Ralston Tunnel Removable Section			A											I			
North Fork Long Canyon Crossing Removable Section			A											I			

Table 3-9. Description of Current Facility Inspections, Testing, and Maintenance Activities at Project Facilities and Features (continued).

Project Facility or Feature	Inspections, Testing, and Maintenance Activities																
	Inspections and Maintenance		Vegetation Management			Pest Management		Sediment Management	Slope Stabilization (Falling Rock Control)		Debris Management			Facility Painting	Pole Replacement/Retrofit	Road Maintenance	
	Tunnel and Powerhouse Inspection, Testing, & Maintenance	Spillway & Tainter Gate Testing	Trimming by Hand	Trimming w/Equipment	Herbicide Use	Physical Control (snap traps)	Over-the-Counter Rodenticide Use	Physical Removal w/Equipment	Gunite (erosion control)	Rock Removal/Fence Repair	Large Woody Debris	Cleaning Trash Racks	Log Booms			Annual Maintenance	Periodic Maintenance
Water Conveyance Systems (continued)																	
Intakes and Gatehouses																	
Duncan Creek – Middle Fork Tunnel Intake			A														
French Meadows – Hell Hole Tunnel Gatehouse			A														
French Meadows – Hell Hole Tunnel Intake			A														
Hell Hole – Middle Fork Tunnel Gatehouse			A														
Hell Hole – Middle Fork Tunnel Intake			A														
Middle Fork – Ralston Tunnel Intake and Gatehouse			A														
Ralston – Oxbow Tunnel Intake			A														
Penstocks and Valve Houses																	
French Meadows Powerhouse Penstock and Butterfly Valve House			A											I			
Middle Fork Powerhouse Penstock and Butterfly Valve House			A						I					I			
Ralston Powerhouse Penstock and Butterfly Valve House			A											I			
Powerhouses, Switchyards, and Substations																	
French Meadows Powerhouse and Switchyard	A		A		A	X	X										
Hell Hole Powerhouse	A		A			X	X										
Hell Hole Substation			A			X	X										
Middle Fork Powerhouse and Upper and Lower Switchyards	A		A		A	X	X										
Ralston Powerhouse and Switchyard	A		A		A	X	X										
Oxbow Powerhouse and Switchyard	A		A		A	X	X										
Gaging Stations and Weirs																	
Stream Gages and Weirs																	
Duncan Creek near French Meadows (USGS Gage No. 11427700)			A														
Duncan Creek below Diversion Dam (USGS Gage No. 11427750)			A														
Middle Fork American River at French Meadows (USGS Gage No. 11427500)			A														
Rubicon River below Hell Hole Dam (USGS Gage No. 11428800)			A														
North Fork Long Canyon Creek below Diversion Dam (USGS Gage No. 11433085)			A														
South Fork Long Canyon Creek below Diversion Dam (USGS Gage No. 11433065)			A														
Middle Fork American River below Interbay Dam (USGS Gage No. 11427770)			A														
Middle Fork American River above Middle Fork Powerhouse (USGS Gage No. 11427760)			A														
Middle Fork American River near Foresthill (USGS Gage No. 11433300)			A														

Table 3-9. Description of Current Facility Inspections, Testing, and Maintenance Activities at Project Facilities and Features (continued).

Project Facility or Feature	Inspections, Testing, and Maintenance Activities																
	Inspections and Maintenance		Vegetation Management			Pest Management		Sediment Management	Slope Stabilization (Falling Rock Control)		Debris Management			Facility Painting	Pole Replacement/Retrofit	Road Maintenance	
	Tunnel and Powerhouse Inspection, Testing, & Maintenance	Spillway & Tainter Gate Testing	Trimming by Hand	Trimming w/Equipment	Herbicide Use	Physical Control (snap traps)	Over-the-Counter Rodenticide Use	Physical Removal w/Equipment	Gulrie (erosion control)	Rock Removal/Fence Repair	Large Woody Debris	Cleaning Trash Racks	Log Booms			Annual Maintenance	Periodic Maintenance
Gaging Stations and Weirs (continued)																	
Diversion Gages																	
North Fork Long Canyon Creek Diversion Tunnel (USGS Gage No. 11433080)																	
South Fork Long Canyon Creek Diversion Tunnel (USGS Gage No. 11433060)																	
Reservoir Gages																	
French Meadows Reservoir (USGS Gage No. 11427400)																	
French Meadows Reservoir Staff Gage																	
Hell Hole Reservoir (USGS Gage No. 11428700)																	
Hell Hole Reservoir Staff Gage																	
Middle Fork Interbay Reservoir																	
Ralston Afterbay Reservoir																	
Powerhouse Gages																	
French Meadows Powerhouse (USGS Gage No. 11427200)																	
Middle Fork Powerhouse (USGS Gage No. 11428600)																	
Ralston Powerhouse (USGS Gage No. 11427765)																	
Oxbow Powerhouse (USGS Gage No. 11433212)																	
Leakage Weirs																	
French Meadows Dam Leakage Weirs Nos. 1-6			A														
Hell Hole Dam Leakage Weir			A														
Project Communication Lines and Powerlines																	
French Meadows Area																	
French Meadows Dam Generator Building to French Meadows Dam Outlet Works Powerline			A											I			
French Meadows Dam Generator Building to French Meadows Dam Spillway Gates Powerline			A											I			
Hell Hole Area																	
French Meadows Powerhouse to French Meadows Powerhouse Penstock and Butterfly Valve House Communication Line/Powerline			A											I			
French Meadows Powerhouse and Switchyard to Hell Hole – Middle Fork Tunnel Gatehouse, Dormitory Facility, Operator’s Cottages, and Hell Hole Powerhouse Communication Line/Powerline			A											I			
Dormitory and Cottages Water Supply Tank Powerline			A											I			
Hell Hole Powerhouse to Rubicon River Gage below Hell Hole Dam Communication Line/Powerline			A											I			

Table 3-9. Description of Current Facility Inspections, Testing, and Maintenance Activities at Project Facilities and Features (continued).

Project Facility or Feature	Inspections, Testing, and Maintenance Activities																
	Inspections and Maintenance		Vegetation Management			Pest Management		Sediment Management	Slope Stabilization (Falling Rock Control)		Debris Management			Facility Painting	Pole Replacement/Retrofit	Road Maintenance	
	Tunnel and Powerhouse Inspection, Testing, & Maintenance	Spillway & Tainter Gate Testing	Trimming by Hand	Trimming w/Equipment	Herbicide Use	Physical Control (snap traps)	Over-the-Counter Rodenticide Use	Physical Removal w/Equipment	Gulrie (erosion control)	Rock Removal/Fence Repair	Large Woody Debris	Cleaning Trash Racks	Log Booms			Annual Maintenance	Periodic Maintenance
Project Communication Lines and Powerlines (continued)																	
Middle Fork Interbay Area																	
Middle Fork Powerhouse to Middle Fork Powerhouse Butterfly Valve House Communication Line/Powerline			A												I		
Middle Fork Powerhouse Butterfly Valve House to Radio Repeater near Hell Hole – Middle Fork Tunnel Surge Tank (underground) Communication Line/Powerline			A												I		
Middle Fork Powerhouse to Middle Fork – Ralston Tunnel Intake and Gatehouse Communication Line/Powerline			A												I		
Middle Fork Powerhouse to Middle Fork American River Gage above Middle Fork Powerhouse Communication Line/Powerline			A												I		
Ralston – Oxbow Area																	
Ralston – Oxbow Tunnel Intake to Ralston Powerhouse Communication Line			A												I		
Ralston Powerhouse to Ralston Powerhouse Butterfly Valve House Communication Line/Powerline			A												I		
Ralston Afterbay Dam Generator Building to Ralston – Oxbow Tunnel Intake Communication Line/Powerline			A												I		
Oxbow Powerhouse to Ralston Afterbay Dam Generator Building Communication Line/Powerline			A												I		
Photovoltaic Poles and Powerlines																	
Photovoltaic Poles and Powerline to Duncan Creek Gage near French Meadows			A														
Photovoltaic Pole and Powerline at Duncan Creek Gage below Diversion Dam			A														
Photovoltaic Pole and Powerline at Middle Fork American River Gage at French Meadows			A														
Photovoltaic Pole and Powerline at Middle Fork American River Gage above Middle Fork Powerhouse			A														
Photovoltaic Pole and Powerline at North Fork Long Canyon Creek Gage below Diversion Dam			A														
Photovoltaic Pole and Powerline at South Fork Long Canyon Creek Gage below Diversion Dam			A														
Photovoltaic Pole and Powerline at Middle Fork American River Gage near Foresthill			A														
Microwave Reflectors and Radio Towers																	
Passive Microwave Reflector Station above Middle Fork Interbay			I														
Radio Communications Tower near French Meadows – Hell Hole Tunnel Gatehouse			I														
Radio Communications Tower and Repeater near Hell Hole – Middle Fork Tunnel Surge Shaft and Tank			I														
Passive Microwave Reflector Station above Ralston Afterbay			I														

Table 3-9. Description of Current Facility Inspections, Testing, and Maintenance Activities at Project Facilities and Features (continued).

Project Facility or Feature	Inspections, Testing, and Maintenance Activities																
	Inspections and Maintenance		Vegetation Management			Pest Management		Sediment Management	Slope Stabilization (Falling Rock Control)		Debris Management			Facility Painting	Pole Replacement/Retrofit	Road Maintenance	
	Tunnel and Powerhouse Inspection, Testing, & Maintenance	Spillway & Tainter Gate Testing	Trimming by Hand	Trimming w/Equipment	Herbicide Use	Physical Control (snap traps)	Over-the-Counter Rodenticide Use	Physical Removal w/Equipment	Gunite (erosion control)	Rock Removal/Fence Repair	Large Woody Debris	Cleaning Trash Racks	Log Booms			Annual Maintenance	Periodic Maintenance
Project Communication Lines and Powerlines (continued)																	
Disposal Areas																	
Duncan Creek Diversion Sediment Disposal Area																	
North Fork Long Canyon Crossing Sediment Disposal Area																	
Middle Fork Interbay Sediment Disposal Area																	
Ralston Ridge Sediment Disposal Area																	
Ancillary Facilities																	
French Meadows Dam Generator Building			A			X	X							I			
French Meadows Dam Staging Area																	
Dormitory Facility			A			X	X							I			
Dormitory and Cottages Water Supply Tank			A			X	X							I			
Hell Hole Staging Areas																	
Operator Cottages and Shop			A			X	X							I			
Ralston Afterbay Dam Generator Building			A			X	X							I			
Storage Building at Middle Fork – Ralston Tunnel Surge Shaft and Tank			A														
Ralston Afterbay Sediment Removal Access Point			A	A													
Project Fences																	
Slope Fences																	
French Meadows Powerhouse Penstock Rock Fence										A							
French Meadows Powerhouse Slope Fence			I							A							
Long Canyon Crossing Slope Fence			I							A							
Middle Fork Powerhouse Upper Switchyard Slope Fence										A							
Middle Fork Interbay Dam Slope Fence										A							
Ralston Powerhouse Penstock and Butterfly Valve House Slope Fences										A							
Ralston Powerhouse Slope Fence										A							
Oxbow Powerhouse Slope Fence										A							
Public Safety Fences																	
Dormitory Facility Barrier Fence										A							
Hell Hole Dam General Parking Area Barrier Fence										A							
North Fork Long Canyon Crossing Removable Section Barrier Fence										A							

Table 3-9. Description of Current Facility Inspections, Testing, and Maintenance Activities at Project Facilities and Features (continued).

Project Facility or Feature	Inspections, Testing, and Maintenance Activities																
	Inspections and Maintenance		Vegetation Management			Pest Management		Sediment Management	Slope Stabilization (Falling Rock Control)		Debris Management			Facility Painting	Pole Replacement/Retrofit	Road Maintenance	
	Tunnel and Powerhouse Inspection, Testing, & Maintenance	Spillway & Tainter Gate Testing	Trimming by Hand	Trimming w/Equipment	Herbicide Use	Physical Control (snap traps)	Over-the-Counter Rodenticide Use	Physical Removal w/Equipment	Gunite (erosion control)	Rock Removal/Fence Repair	Large Woody Debris	Cleaning Trash Racks	Log Booms			Annual Maintenance	Periodic Maintenance
Project Roads																	
Duncan Creek Area																	
Duncan Creek Diversion Intake Road			A	A												X	X
Duncan Creek Diversion Dam Road			A	A												X	X
Duncan Creek Diversion Pool Road			A	A												X	X
French Meadows Area																	
Duncan Creek – Middle Fork Tunnel Portal Road			A	A												X	X
French Meadows – Hell Hole Tunnel Gatehouse Road			A	A												X	X
French Meadows Dam Outlet Works and South Leakage Weir Road			A	A												X	X
French Meadows Dam Staging Area and Spillway West Access Road			A	A												X	X
French Meadows Spillway East Access Road			A	A												X	X
French Meadows Dam North Leakage Weir Road			A	A												X	X
French Meadows Campground Water Supply Access Road			A	A												X	X
Hell Hole Area																	
Hell Hole Dam and Powerhouse Road			A													X	X
Rubicon River Gage below Hell Hole Dam Road			A	A												X	X
Hell Hole Dam Leakage Weir Road			A	A												X	X
Hell Hole Dam Spillway Northern Access Point Road			A	A												X	X
French Meadows – Hell Hole Tunnel Portal Road			A	A												X	X
French Meadows Powerhouse Road			A	A												X	X
Hell Hole – Middle Fork Tunnel Gatehouse Road			A	A												X	X
Dormitory Facility Road			A	A												X	X
Operator Cottages and Shop Road			A	A												X	X
Spur on North Side of Operator Cottages			A	A												X	X
Spur on South Side of Operator Cottages			A	A												X	X
Hell Hole Dam Spillway Discharge Channel Road Spur to Communication Line/Powerline			A	A												X	X
Hell Hole Dam Spillway Discharge Channel Road			A	A												X	X
Big Meadows Campground Water Supply Facility Access Road			A	A												X	X
Long Canyon Area																	
North Fork Long Canyon Diversion North Road			A	A												X	X
North Fork Long Canyon Diversion South Road			A	A												X	X
North Fork Long Canyon Diversion Drop Inlet Road			A	A												X	X
South Fork Long Canyon Diversion and Drop Inlet Road			A	A												X	X
South Fork Long Canyon Diversion and Drop Inlet Cutoff Road			A	A												X	X
South Fork Long Canyon Diversion Drop Inlet Access Road			A	A												X	X
North Fork Long Canyon Crossing Removable Section North Road			A	A												X	X
North Fork Long Canyon Crossing Removable Section South Road			A	A												X	X
Middle Meadows Group Campground Water Supply Access Road			A	A												X	X

Table 3-9. Description of Current Facility Inspections, Testing, and Maintenance Activities at Project Facilities and Features (continued).

Project Facility or Feature	Inspections, Testing, and Maintenance Activities																
	Inspections and Maintenance		Vegetation Management			Pest Management		Sediment Management	Slope Stabilization (Falling Rock Control)		Debris Management			Road Maintenance			
	Tunnel and Powerhouse Inspection, Testing, & Maintenance	Spillway & Tainter Gate Testing	Trimming by Hand	Trimming w/Equipment	Herbicide Use	Physical Control (snap traps)	Over-the-Counter Rodenticide Use	Physical Removal w/Equipment	Gunite (erosion control)	Rock Removal/Fence Repair	Large Woody Debris	Cleaning Trash Racks	Log Booms	Facility Painting	Pole Replacement/Retrofit	Annual Maintenance	Periodic Maintenance
Project Roads (continued)																	
Middle Fork Interbay Area																	
Middle Fork Interbay Dam Road			A	A												X	X
Middle Fork Interbay Dam to Powerhouse Road			A	A												X	X
Middle Fork Powerhouse Butterfly Valve House Road			A	A												X	X
Middle Fork Powerhouse Penstock and Butterfly Valve House Road			A	A												X	X
Middle Fork Powerhouse Upper Switchyard Road			A	A												X	X
Ralston – Oxbow Area																	
Brushy Canyon Adit Road			A	A												X	X
Ralston Powerhouse Butterfly Valve House Road			A	A												X	X
Ralston Afterbay Dam Access Road			A	A												X	X
Indian Bar Access Road			A	A												X	X
Oxbow Powerhouse Road			A	A												X	X
Ralston – Oxbow Tunnel Intake Road			A	A												X	X
Ralston Afterbay Private Boat Ramp Road			A	A												X	X
Ralston Afterbay Dam and Access Point Road			A	A												X	X
Project Trails																	
Duncan Creek Area																	
Duncan Creek Diversion Dam North Trail			A													X	X
Duncan Creek Diversion Dam South Trail			A													X	X
Photovoltaic Poles and Powerline at Duncan Creek Gage near French Meadows Trail			A													X	X
Duncan Creek Gage near French Meadows Trail			A													X	X
Duncan Creek Gage below Diversion Dam Trail			A													X	X
Middle Fork Interbay Area																	
Middle Fork American River Gage above Middle Fork Powerhouse Trail			A													X	X
Passive Microwave Reflector Station above Middle Fork Interbay Trail			A													X	X
Ralston Afterbay Area																	
Passive Microwave Reflector Station above Ralston Afterbay Trail			A													X	X

A = Activity occurs on an annual basis.
 I = Activity occurs on an infrequent basis.
 R = Completed as-needed during diversion season.
 X = Activity occurs or ancillary facility is present.
¹Inspection of 1,000 feet of outlet conduit.

Table 3-10. Description of Project Recreation Facilities Maintenance Activities.

Recreation Facility or Feature	Project Maintenance ¹			
	Annual Maintenance ²	Vegetation Management		Heavy Maintenance ³
		Trimming by Hand	Fungicide Use	
French Meadows Area				
Ahart Campground	X	A	I	X
Coyote Group Campground	X	A	I	X
Poppy Campground	X	A	I	X
French Meadows Campground	X	A	I	X
Gates Group Campground	X	A	I	X
Lewis Campground	X	A	I	X
French Meadows Picnic Area	X			X
French Meadows Boat Ramp	X			X
French Meadows Dump Station	X			X
McGuire Picnic Area and Beach	X			X
McGuire Boat Ramp and Associated Parking	X			X
Hell Hole Area				
Big Meadows Campground	X	A	I	X
Hell Hole Campground	X	A	I	X
Upper Hell Hole Campground	X	A	I	X
Hell Hole Vista	X	A	I	X
Hell Hole Boat Ramp	X	A		X
Hell Hole General Parking Area and Hell Hole Boat Ramp Parking Area	X	A		X
Ralston Afterbay Area				
Ralston Picnic Area	X	A		X
Ralston Picnic Area Cartop Boat Ramp	X	A		X
Indian Bar Rafting Access and General Parking	X	A		X
Long Canyon Area				
Middle Meadows Group Campground	X	A	I	X
Project Recreation Facility Water Supplies				
Dolly Creek Water Supply	X	I		X
French Meadows Campground Water Supply	X	I		X
Big Meadows Campground Water Supply	X	I		X
Middle Meadows Group Campground Water Supply	X	I		X

A = Activity occurs on an annual basis.

I = Activity occurs on an infrequent basis.

Sources:

PCWA Revised Recreation Plan (1989) and FERC Order Approving the Revised Recreation Plan (1992).

¹Maintenance of Project recreation facilities is completed by USDA-FS under collection agreements (No. 08-CO-11051700-009 and No. 08-CO-11050300-009).²Annual maintenance includes: site cleaning; basic repairs and maintenance of facility features; garbage clean-up; signing; toilet cleaning and restocking; toilet pumping; graffiti removal; removal of debris from boat ramps; basic maintenance of pathways; routine testing of water supplies; annual winterizing and opening activities; and hazard tree removal.³Heavy maintenance includes: repair and resurfacing of parking areas and spurs; repair or replacement of barrier structures and devices; repair and/or replacement of site/facility amenities; repair and replacement of signage, information boards, and fee tubes; repair, maintenance, and painting of bathroom structures; repair and maintenance of potable water supplies and distribution lines; repair and maintenance of septic systems; repair and sealing of boat ramps; repair or installation of retaining walls; site leveling and removal of obstacles; fuels reduction; and maintenance of pathways.

Table 3-11. Summary of Historic Sediment Maintenance Activities at MFP Diversion Pools and Medium Reservoirs (through 2009).

Year	Month ¹	Loose, Uncompacted Volume of Sediment Removed (cubic yds)
Middle Fork Interbay (period of record 1987–2009)		
1987	Oct	25,000
1988	Oct	35,000
1997	Feb	16,000
2000	Oct	68,000
Total		144,000
Frequency of Sediment Removal Activities:		once every 5.8 years
Average Volume Removed per Maintenance Activity²		36,000 cubic yards
Ralston Afterbay (period of record 1969–2009)		
1969	-	Sediment removal occurred in this year, however, no information on the volume of sediment removed is available
1981	Oct	10,000
1984	Oct	13,000
1985	Oct	12,000
1986	Mar	45,000
1986	Oct	80,000
1989	Oct	35,000
1994	Sept	77,000
1997	Feb	65,000
2002	Oct	101,000 ²
Total		438,000
Frequency of Sediment Removal Activities:		once every 4.6 years
Average Volume Removed per Maintenance Activity²		48,667 cubic yards
North Fork Long Canyon Diversion Pool (period of record 1980–2009)		
1980	-	Sediment removal occurred in these years, however, no information on the volume of sediment removed is available
1982	-	
1986	-	
1988	-	
1990	-	
1992	-	
1995	-	
1997	-	1,600
2005	-	400
2006	-	1,370
Total		3,370
Frequency of Sediment Removal Activities:		once every 3 years
Average Volume Removed per Maintenance Activity²		1,123 cubic yards

Table 3-11. Summary of Historic Sediment Maintenance Activities at MFP Diversion Pools and Medium Reservoirs (through 2009) (continued).

Year	Month¹	Loose, Uncompacted Volume of Sediment Removed (cubic yds)
South Fork Long Canyon Diversion Pool (period of record 1980–2009)		
1980	-	Sediment removal occurred in these years, however, no information on the volume of sediment removed is available
1982	-	
1986	-	
1988	-	
1995	-	
1997	-	2,500
2006	-	2,850
Total		5,350
Frequency of Sediment Removal Activities:		once every 4.3 years
Average Volume Removed per Maintenance Activity²		2,675 cubic yards
Duncan Creek Diversion Pool (period of record 1997–2009)		
1988	-	Sediment removal occurred in this year, however, no information on the volume of sediment removed is available
1998	Aug	4,500
2007	Sept	1,570
Total		6,070
Frequency of Sediment Removal Activities:		once every 7.3 years
Volume Removed per Maintenance Activity²		3,035 cubic yards

¹Includes only the years with known sediment volumes.

²Volume equals 45,000 cubic yards compacted, in-place sediment at Indian Bar; and 29,000 cubic yards compacted, in-place sediment at Ralston Ridge.

Table 3-12. Available Sediment Storage Capacities at Current MFP Sediment Disposal Areas.

Sediment Disposal Area	Total Storage Capacity (cubic yards)¹	Existing Sediment Stored (cubic yards)¹	Available Storage (cubic yards)¹
Duncan Creek Diversion Sediment Disposal Area	6,000	4,500	1,500
North Fork Long Canyon Crossing Sediment Disposal Area	20,000–30,000	10,000	10,000–20,000
Middle Fork Interbay Sediment Disposal Area	44,000	24,000	20,000
Ralston Ridge Sediment Disposal Area	49,000–54,000	29,000	20,000–25,000
TOTAL	164,000–179,000	53,000	66,500–81,500

¹Compacted, in-place volume.

Table 3-13. Bypass and Peaking Reach Average Width and Average Annual Flow.

Reach	Average Width (ft)	Average Annual Flow (cfs)
Duncan Creek	29	14
Long Canyon Creek	32	31
South Fork Long Canyon Creek	24	18
North Fork Long Canyon Creek	16	5
Rubicon River		
Rubicon River R25.7	46	42
Rubicon River R3.5	73	322
Middle Fork American River – Bypass Reach		
Middle Fork American River below French Meadows Dam	9	20
Middle Fork American River below Middle Fork Interbay	45	70
Middle Fork American River – Peaking Reach		
Middle Fork American River – Peaking Reach	150	1168

Note:

Average channel widths were calculated for the calculated average annual flow at the top or bottom of the MFP reach, as appropriate. Average channel width is the average of the surveyed channel transects at the AQ 1 – TSR study sites (PCWA 2011f; SD B). Peaking reach average channel widths are based on average annual flow at MF14.1 and channel widths of selected transects at MF14.1 (AQ 1 – TSR 2D modeling study site [PCWA 2011f; SD B]).

Table 3-14. Minimum Pool and Minimum Instream Flow Requirements.

Facility	License Requirement		
Minimum Pool Requirements			
French Meadows Reservoir	<u>Forecast/Folsom Reservoir</u> ¹	Minimum Pool (ac-ft)	
		<u>June-Sept</u>	<u>Oct-May</u>
	>2,000,000 ac-ft	60,000	50,000
	1,200,000–2,000,000 ac-ft	60,000	25,000
<1,200,000 ac-ft	28,000	8,700	
The spillway gates (tainter gates) must remain open from Nov. 15 to April 1 of each year.			
Hell Hole Reservoir	<u>Forecast/Folsom Reservoir</u> ¹	Minimum Pool (ac-ft)	
		<u>June-Sept</u>	<u>Oct-May</u>
	>2,000,000 ac-ft	70,000	50,000
	1,200,000–2,000,000 ac-ft	70,000	25,000
<1,200,000 ac-ft	26,000	5,500	
Duncan Creek Diversion Pool	Maintain water surface elevation at 5,259 feet elevation.		
Minimum Stream Maintenance Flow			
Duncan Creek Diversion Dam	<u>Forecast/Folsom Reservoir</u> ¹	<u>Release (cfs)</u>	
	>1,000,000 ac-ft	lesser of 8 or natural flow	
	<1,000,000 ac-ft	lesser of 4 or natural flow	
French Meadows Dam	Beginning of operations to March 17, 1981:		
	<u>Forecast/Folsom Reservoir</u> ¹	<u>Release (cfs)</u>	
	>1,000,000 ac-ft	8 at all times	
	<1,000,000 ac-ft	4 at all times	
	Except that total releases shall not exceed 5,800 ac-ft		
Except that total releases shall not exceed 2,900 ac-ft			
March 18, 1981, and thereafter – no limitation of total release.			

Table 3-15. Summary of Water Rights Permits.

Permit/ License No.	Type of Use	Source	Direct Diversion		Off-Stream Storage	
13855	Power/ Incidental Recreation	Duncan Creek to French Meadows Reservoir	150 cfs	Jan 1–Dec 31	25,000 ac-ft 400 cfs max	Nov 1–Jul 1
		Middle Fork American at French Meadows Reservoir	290 cfs	Jan 1–Dec 31	95,000 ac-ft	Nov 1–Jul 1
		Rubicon River at Hell Hole Reservoir	657 cfs	Jan 1–Dec 31	129,000 ac-ft	Nov 1–Jul 1
		South Fork Long Canyon to Hell Hole Reservoir or Middle Fork Powerhouse	400 cfs	Jan 1–Dec 31		
		North Fork Long Canyon to Hell Hole Reservoir or Middle Fork Powerhouse	100 cfs	Jan 1–Dec 31		
		Middle Fork American River at Middle Fork Interbay	1,000 cfs	Jan 1–Dec 31		
		Middle Fork American River at Ralston Afterbay	1,225 cfs	Jan 1–Dec 31		
13856	Irrigation, and Incidental Domestic, Recreational, Municipal and Industrial	Duncan Creek to French Meadows Reservoir			25,000 ac-ft 400 cfs max	Nov 1–Jul 1
		Middle Fork American River to French Meadows Reservoir			95,000 ac-ft	Nov 1–Jul 1
		Rubicon River to Hell Hole Reservoir	657 cfs	Jan 1–Dec 31	129,000 ac-ft	Nov 1–Jul 1
13857	Power/ Incidental Recreation	Duncan Creek	50 cfs	Jan 1–Dec 31		
		Middle Fork American River to French Meadows Reservoir	110 cfs	Jan 1–Dec 31	10,000 ac-ft	Nov 1–Jul 1
		Rubicon River at Hell Hole Reservoir	155 cfs	Jan 1–Dec 31	36,000 ac-ft	Nov 1–Jul 1
		South Fork Long Canyon to Hell Hole Reservoir			13,000 ac-ft 830 cfs max	Nov 1–Jul 1
		North Fork Long Canyon to Hell Hole Reservoir			7,000 ac-ft 830 cfs max	Nov 1–Jul 1
		Middle Fork American River to Ralston Afterbay	705 cfs	Jan 1–Dec 31		

Table 3-15. Summary of Water Rights Permits (continued).

Permit/ License No.	Type of Use	Source	Direct Diversion		Off-Stream Storage	
13858	Irrigation, and Incidental Domestic, Recreational, Municipal and Industrial	North Fork American River	800 cfs	Nov 1–Jul 1		
		Middle Fork American River to French Meadows Dam			10,000 ac-ft	Nov 1–Jul 1
		Rubicon River at Hell Hole Reservoir			36,000 ac-ft	Nov 1–Jul 1
		South Fork Long Canyon to Hell Hole Reservoir			13,000 ac-ft 830 cfs max	Nov 1–Jul 1
		North Fork Long Canyon to Hell Hole Reservoir			7,000 ac-ft 830 cfs max	Nov 1–Jul 1
13855-13858	Power/ Incidental Recreation Irrigation, and Incidental Domestic, Recreational, Municipal and Industrial	To French Meadows Reservoir			Maximum 133,700 ac-ft	
		To Hell Hole Reservoir			Maximum 208,400 ac-ft	
20754 ¹ 12644 ²	Power/ Incidental Recreation	Hell Hole Reservoir	40 cfs ²	All Year		
		Hell Hole Reservoir	40 cfs ²	All Year		
		Hell Hole Reservoir	Maximum 17,640 ac-ft/yr.			

Source:

(a) California State Water Rights Board (now the California State Water Resources Control Board [State Water Board]). Decision D-1104. Decision Approving Applications in the Matter of Application 18084, 18085, 18086, and 18087. November 21, 1962.

State Water Board. Permit Number 20754 issued August 18, 1994.

Notes:

¹Also known as Permit 20750.

²Permit 20754 and License 12644 are additive.

Table 3-16. Summary of MFP Generation (1967–2006).

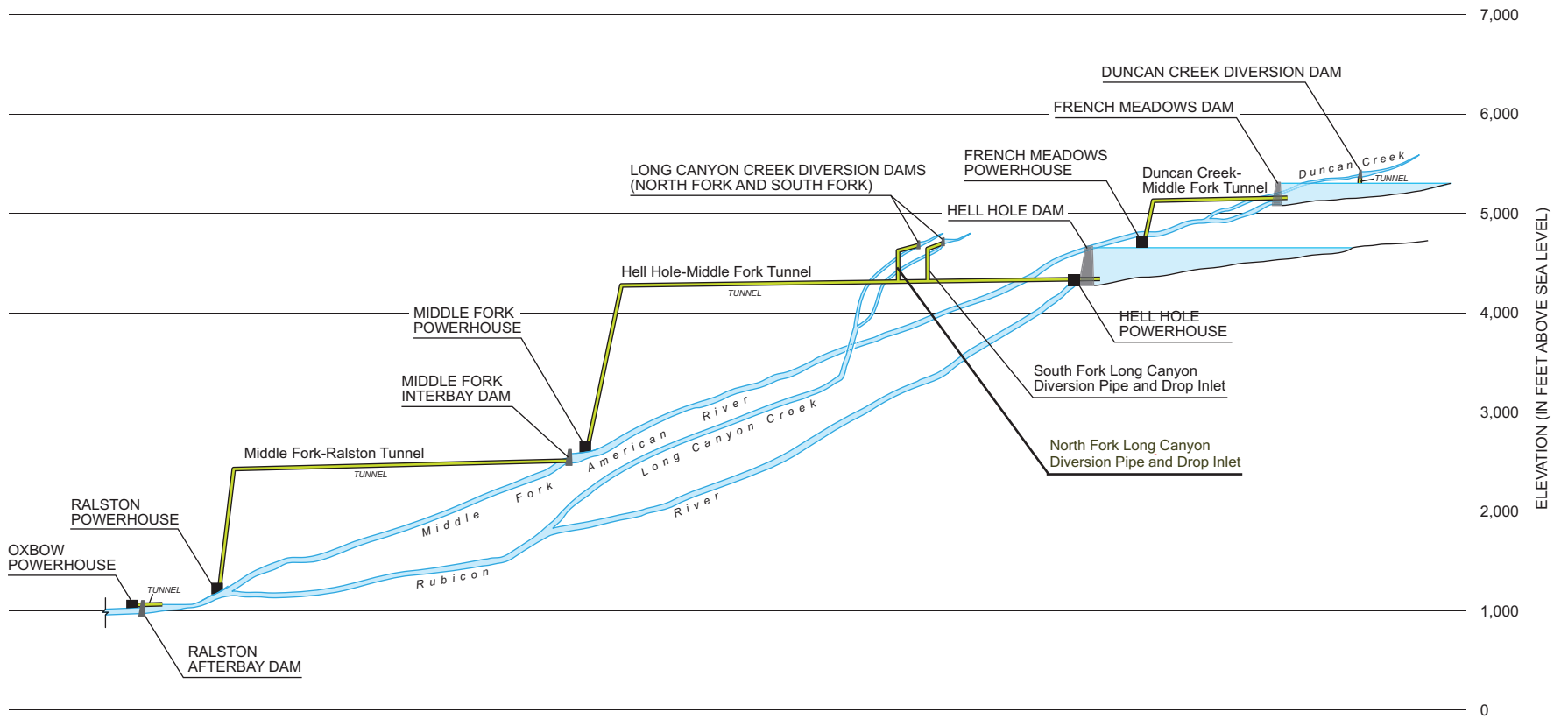
Year	Net Generation (MWh)					
	Powerhouse					Project Total
	French Meadows	Middle Fork	Ralston	Oxbow	Hell Hole ¹	
1967	103,000	845,000	552,000	40,000	-	1,540,000
1968	42,000	368,000	283,000	25,000	-	718,000
1969	101,000	872,000	616,000	45,000	-	1,634,000
1970	76,000	656,000	477,000	37,000	-	1,246,000
1971	68,000	529,000	399,000	35,000	-	1,031,000
1972	50,000	458,000	354,000	31,000	-	893,000
1973	78,000	528,000	425,000	34,000	-	1,065,000
1974	93,000	752,000	573,000	40,000	-	1,458,000
1975	52,000	451,000	364,000	32,000	-	899,000
1976	34,000	295,000	209,000	14,000	-	552,000
1977	8,000	113,000	85,000	5,000	-	211,000
1978	57,000	565,000	441,000	34,000	-	1,097,000
1979	83,000	557,000	414,000	36,000	-	1,090,000
1980	93,000	799,000	554,000	39,000	-	1,485,000
1981	35,000	285,000	221,000	18,000	-	559,000
1982	126,000	995,000	677,000	47,000	-	1,845,000
1983	125,000	970,000	669,000	48,000	1,500	1,813,500
1984	91,000	814,000	562,000	41,000	3,292	1,511,292
1985	38,000	306,000	231,000	20,000	2,943	597,943
1986	85,000	714,000	444,000	34,000	4,209	1,281,209
1987	25,000	192,000	139,000	11,000	2,960	369,960
1988	26,000	198,000	148,000	11,000	1,684	384,684
1989	76,000	630,000	460,000	34,000	3,188	1,203,188
1990	43,000	332,000	236,000	19,000	2,923	632,923
1991	36,000	318,000	236,000	19,000	2,492	611,492
1992	20,000	165,000	126,000	11,000	2,288	324,288
1993	86,000	655,000	499,000	38,000	2,770	1,280,770
1994	30,000	236,000	173,000	13,000	1,859	453,859
1995	112,000	851,000	600,000	42,000	4,128	1,609,128
1996	94,000	759,000	558,000	41,000	3,372	1,455,372
1997	86,000	757,000	420,000	36,000	4,057	1,303,057
1998	89,000	696,000	534,000	40,000	3,240	1,362,240
1999	40,000	632,000	502,000	37,000	3,116	1,214,116
2000	68,000	543,000	402,000	32,000	3,141	1,048,141
2001	30,000	301,000	231,000	18,000	1,843	581,843
2002	45,000	306,000	258,000	23,000	2,737	634,737
2003	68,000	540,000	405,000	33,000	3,256	1,049,256
2004	47,000	507,000	363,000	29,000	3,214	949,214
2005	70,000	543,000	426,000	35,000	3,615	1,077,615
2006	93,000	793,000	518,000	33,000	4,837	1,441,837
Average²	65,550	545,650	394,600	30,250	3,028	1,039,078

¹Hell Hole Powerhouse was constructed in 1983.

²Generation from French Meadows, Middle Fork, Ralston, and Oxbow powerhouses is averaged over a 40-year period of record (1967–2006) and Hell Hole Powerhouse is averaged over a 24-year period of record (1983–2006). The Project Total represents the sum of the average net generation for the five Project powerhouses based on their respective period of record.

Note: Average net generation for the 24-year period when all five Project powerhouses were in operation (1983–2006) is 1,007,986 MWh.

FIGURES



Horizontal dimension and size of facilities not to scale








Placer County Water Agency
Middle Fork American River Project



Figure 3-1

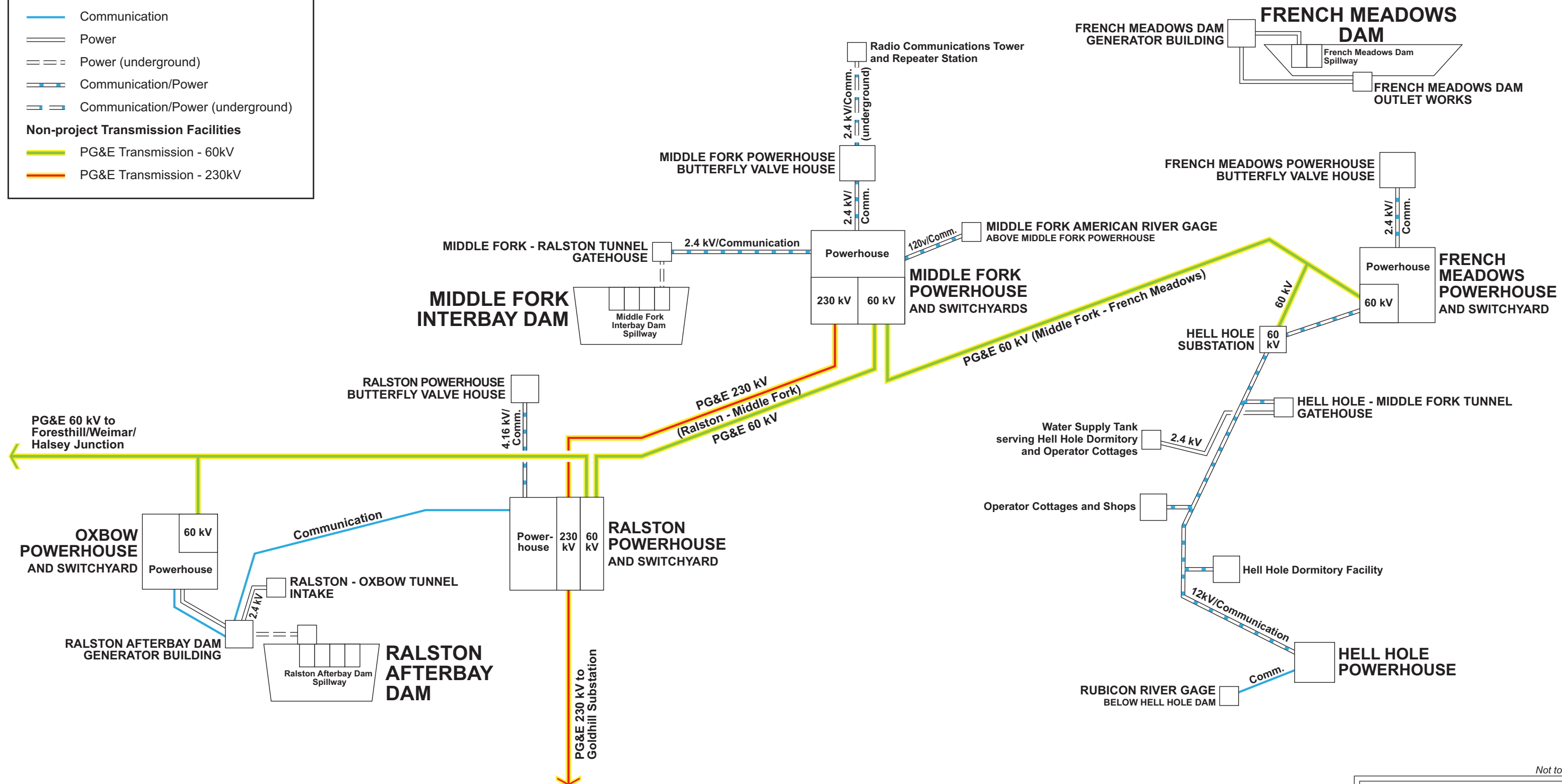
MFP Facilities
Elevation Profile

MFP Power and Communication Facilities

-  Communication
-  Power
-  Power (underground)
-  Communication/Power
-  Communication/Power (underground)

Non-project Transmission Facilities

-  PG&E Transmission - 60kV
-  PG&E Transmission - 230kV



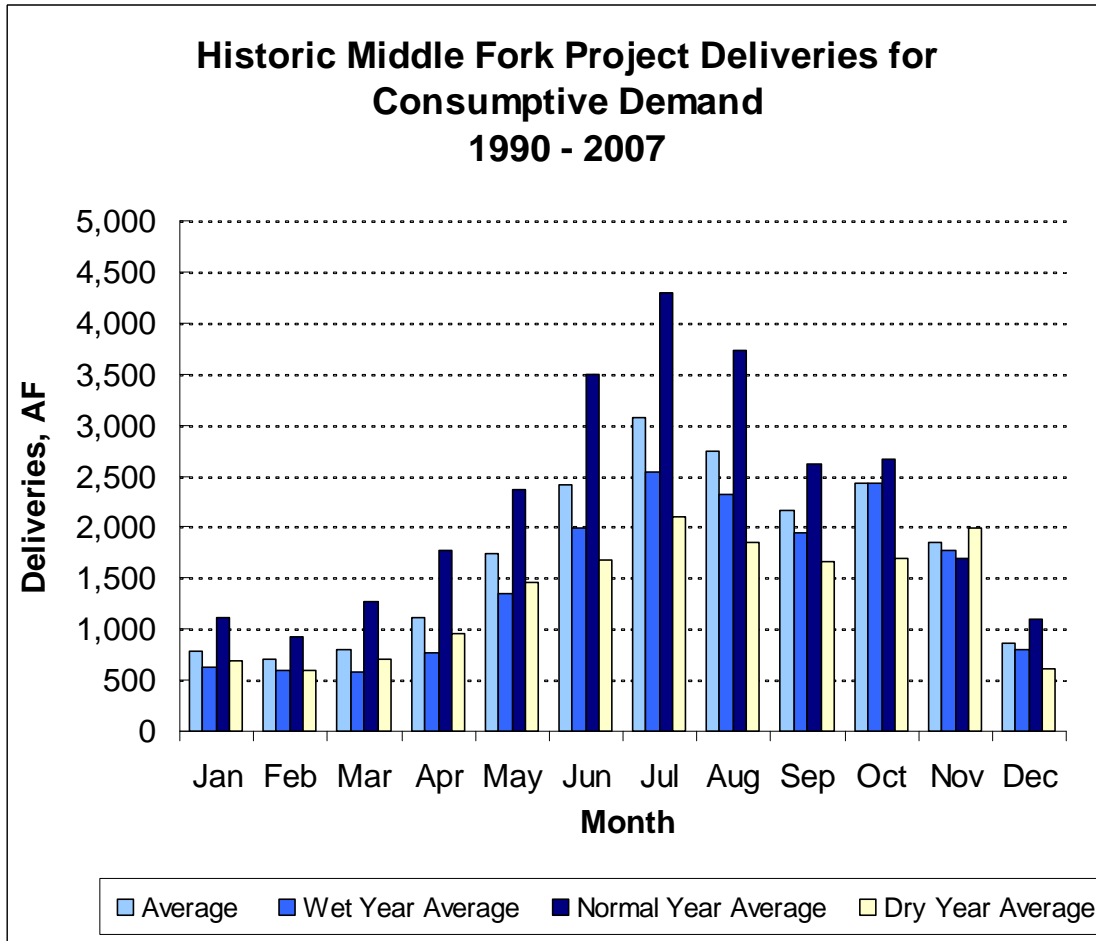
PCWA

Placer County Water Agency
Middle Fork American River Project

Figure 3-2
MFP
Transmission, Power, and
Communications Schematic

Not to scale

Figure 3-3. PCWA Deliveries for Consumptive Demand (1990–2007).



Water year designation are based on the April forecasted inflow to Folsom Reservoir. Wet: >2,000,000 AF (10 years); Normal: 2,000,000–1,200,000 AF (4 years); and Dry: <1,200,000 AF (4 years).

Totals do not include out-of-county sales.

Figure 3-4. Typical Seasonal Demand Pattern.

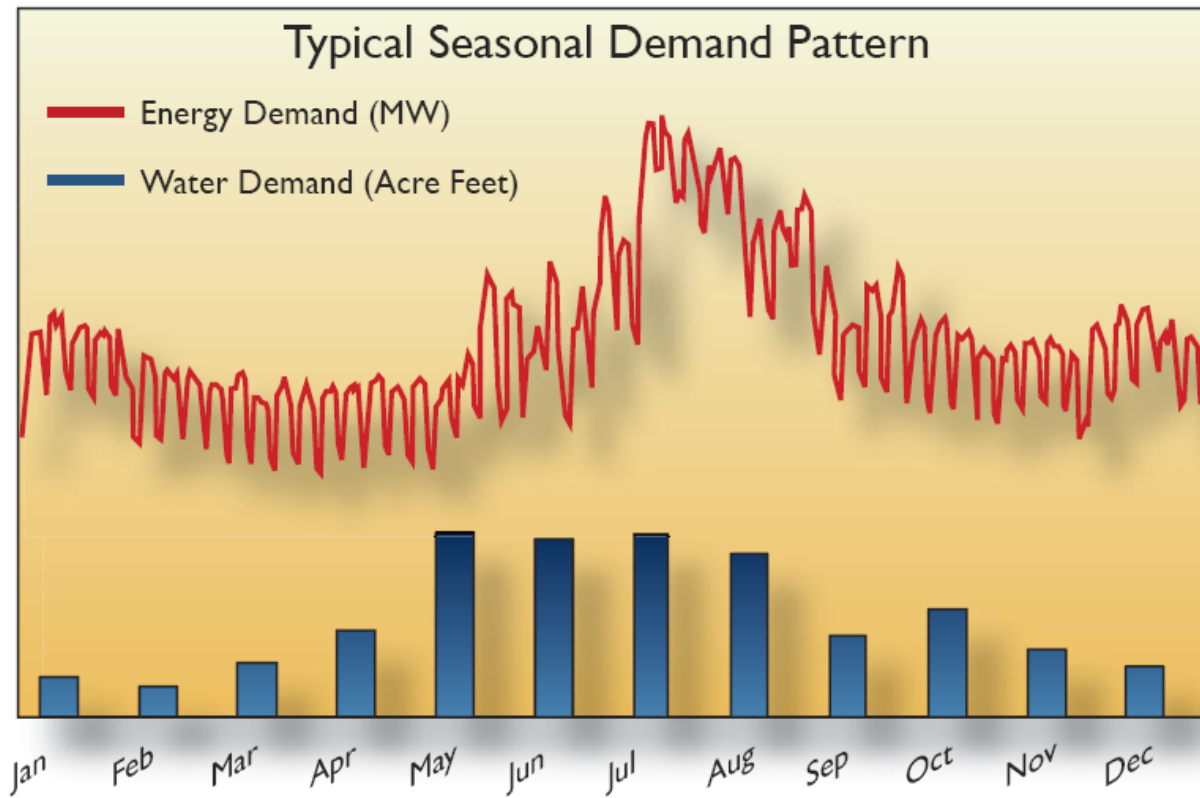


Figure 3-5. Typical Weekly Energy Demand and Production.

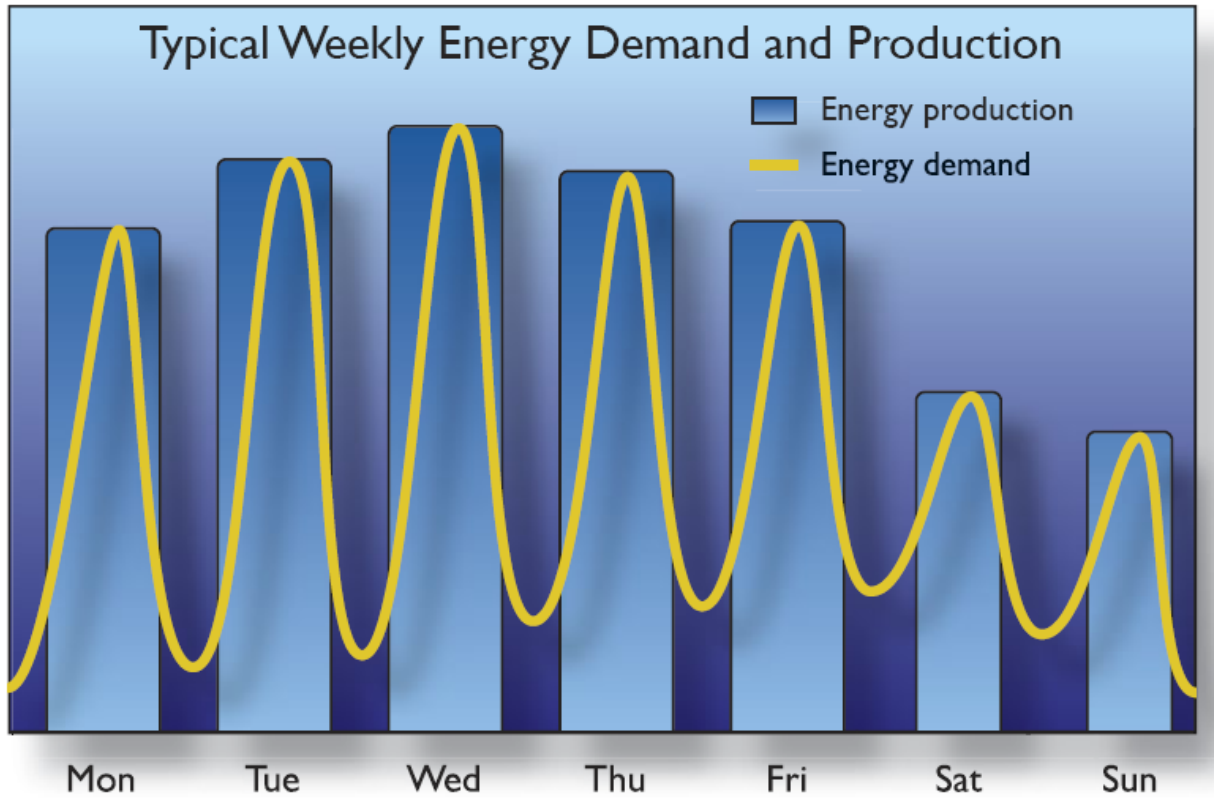


Figure 3-6. Total MFP Inflow (Combined Flows from Duncan Creek, Middle Fork American River, Rubicon River, and Long Canyon Creek) from 1975–2007.

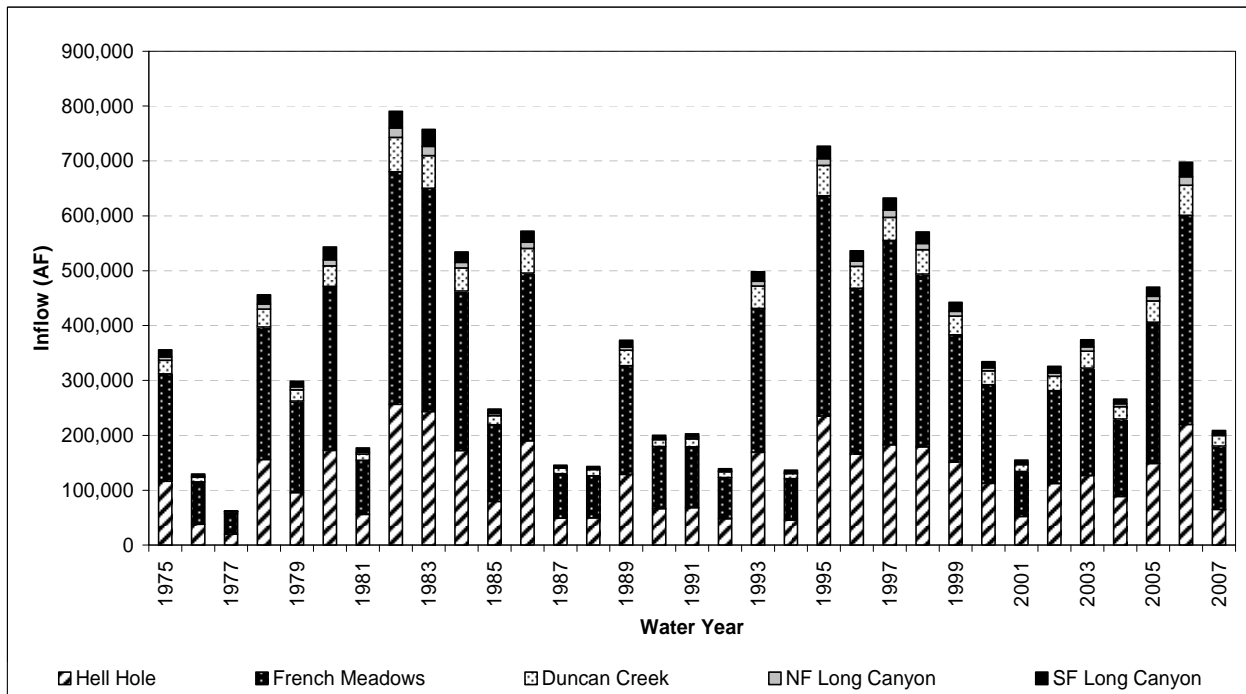


Figure 3-7. Combined Reservoir Storage Levels (French Meadows and Hell Hole) and Spills from 1974 through 2007.

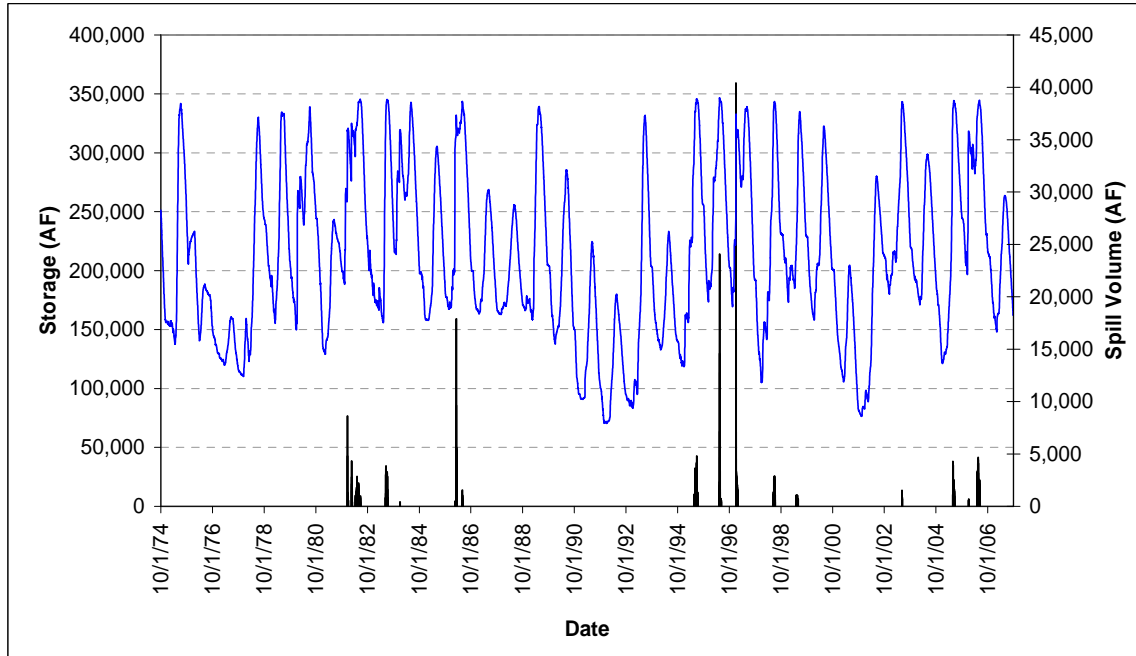


Figure 3-8. Water Surface Elevations at Ralston Afterbay – Winter.

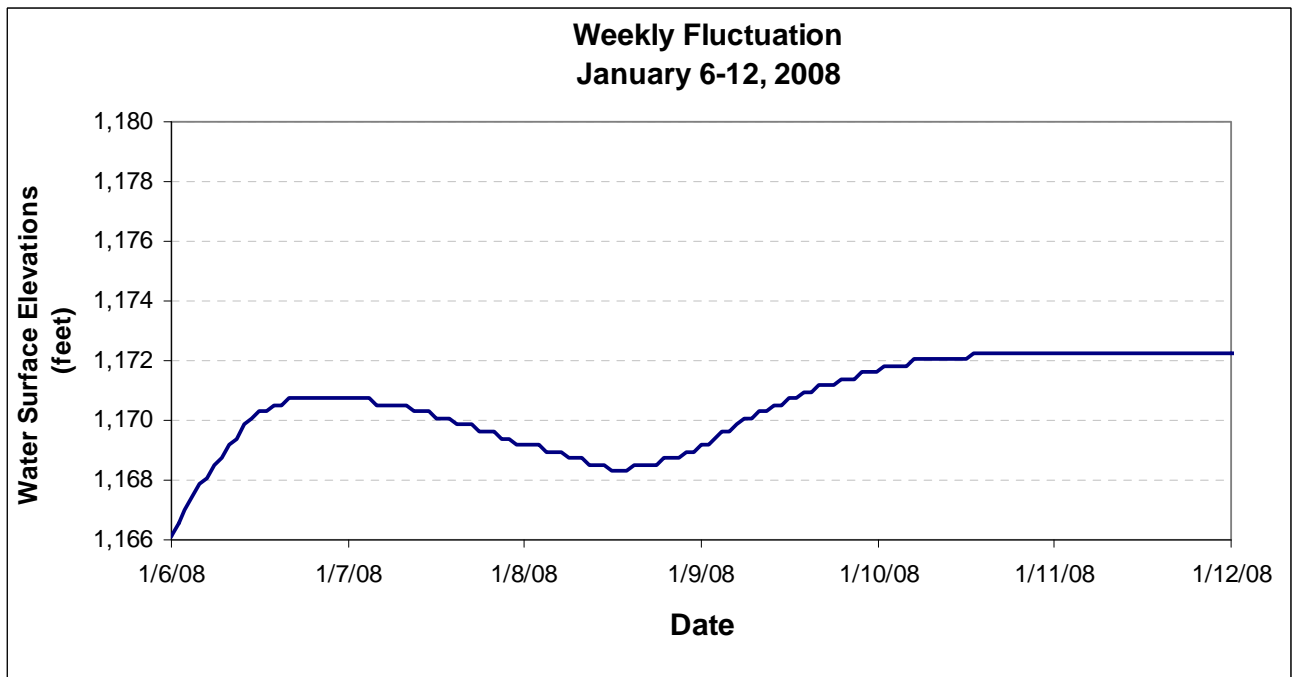
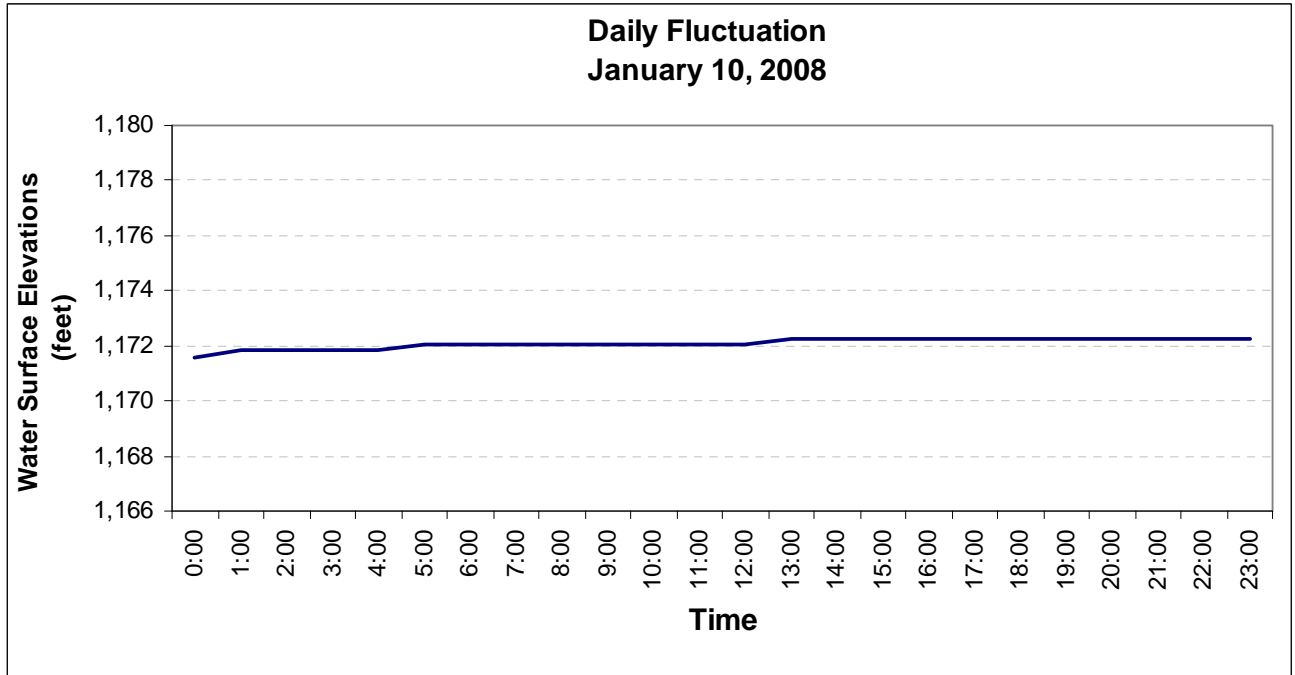


Figure 3-9. Water Surface Elevations at Ralston Afterbay – Spring.

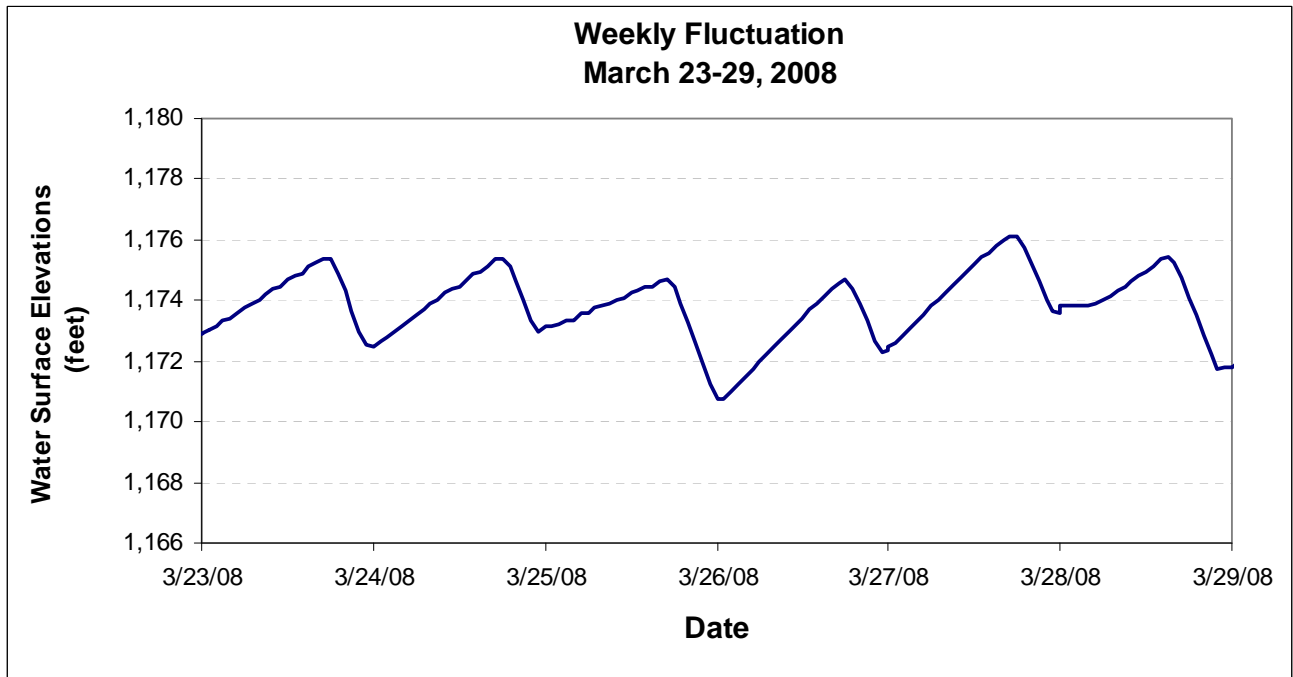
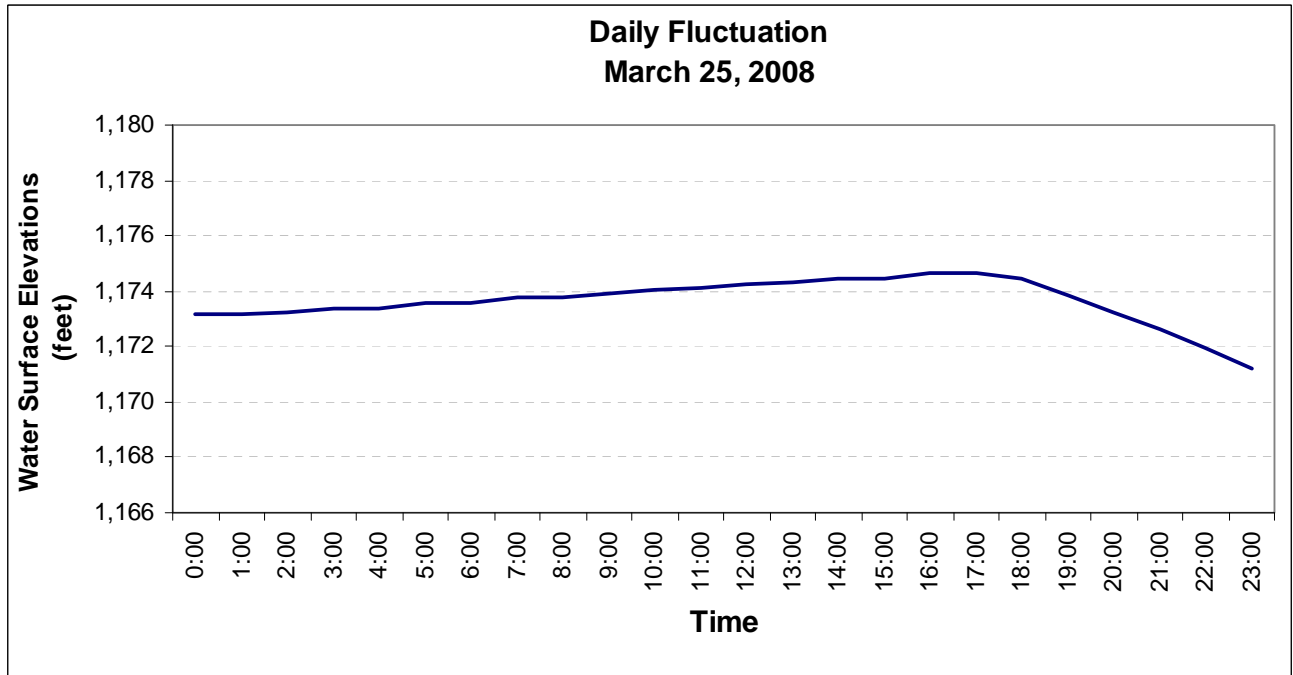


Figure 3-10. Water Surface Elevations at Ralston Afterbay – Summer.

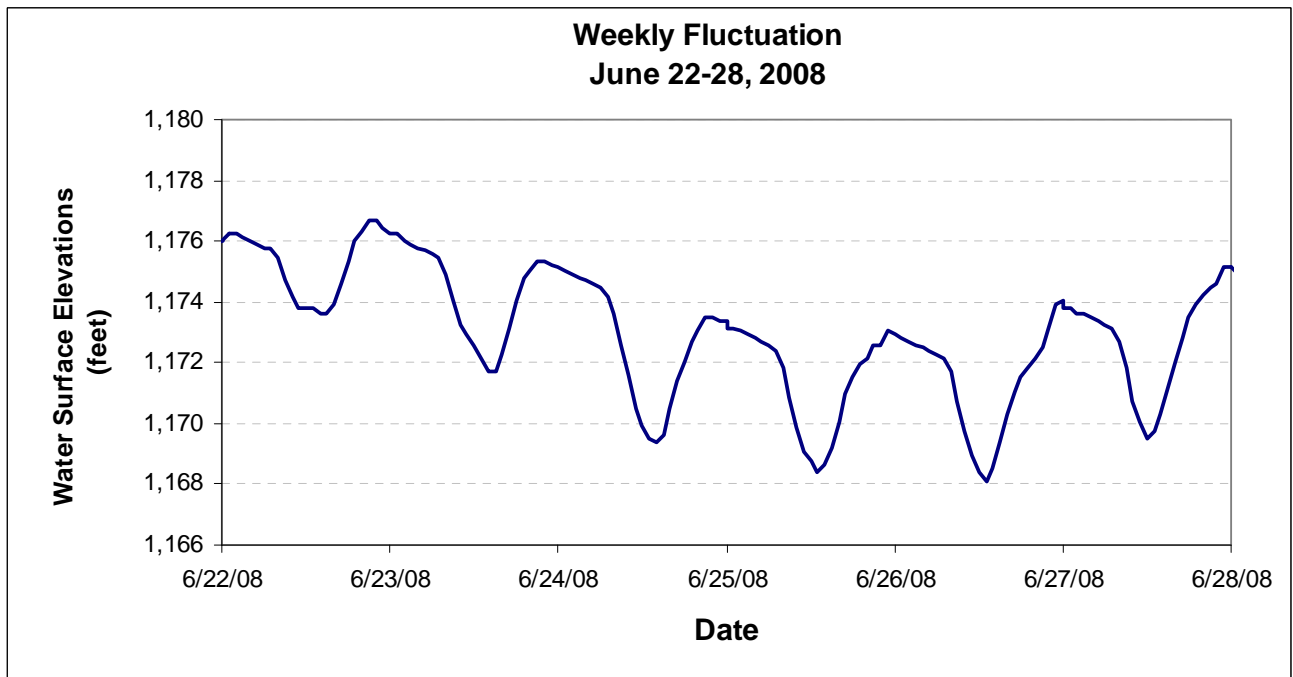
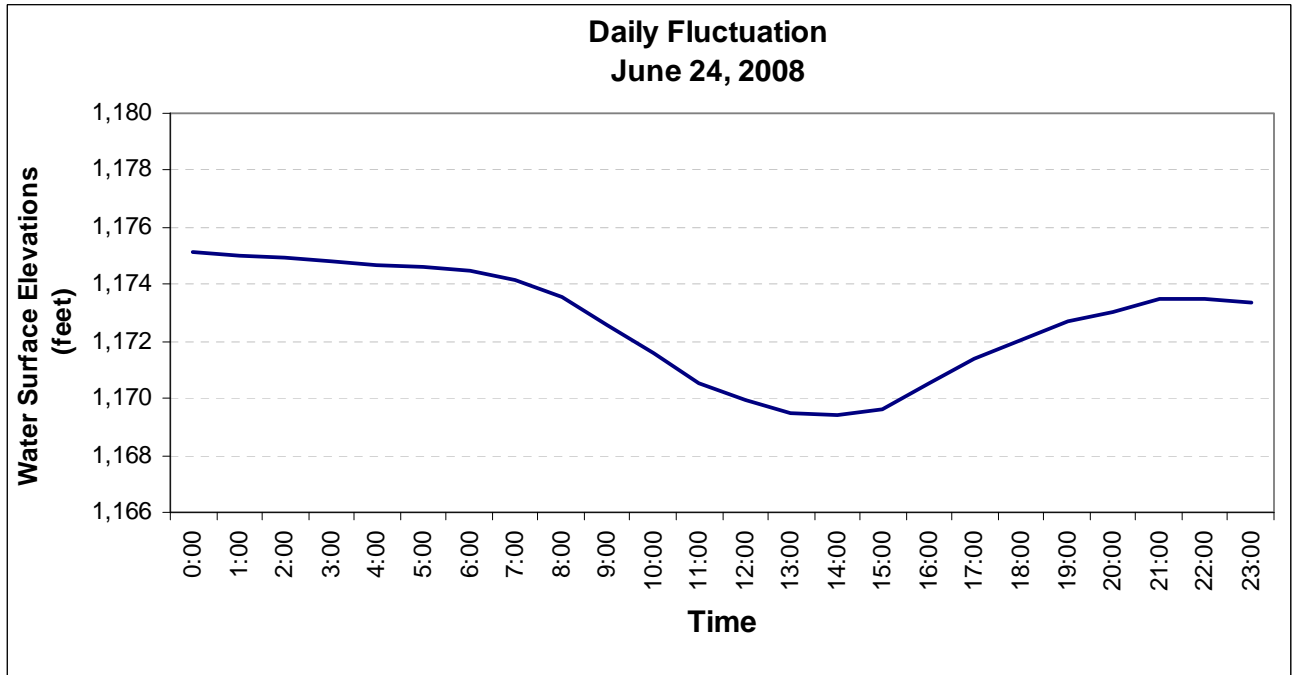


Figure 3-11. Water Surface Elevations at Ralston Afterbay – Fall.

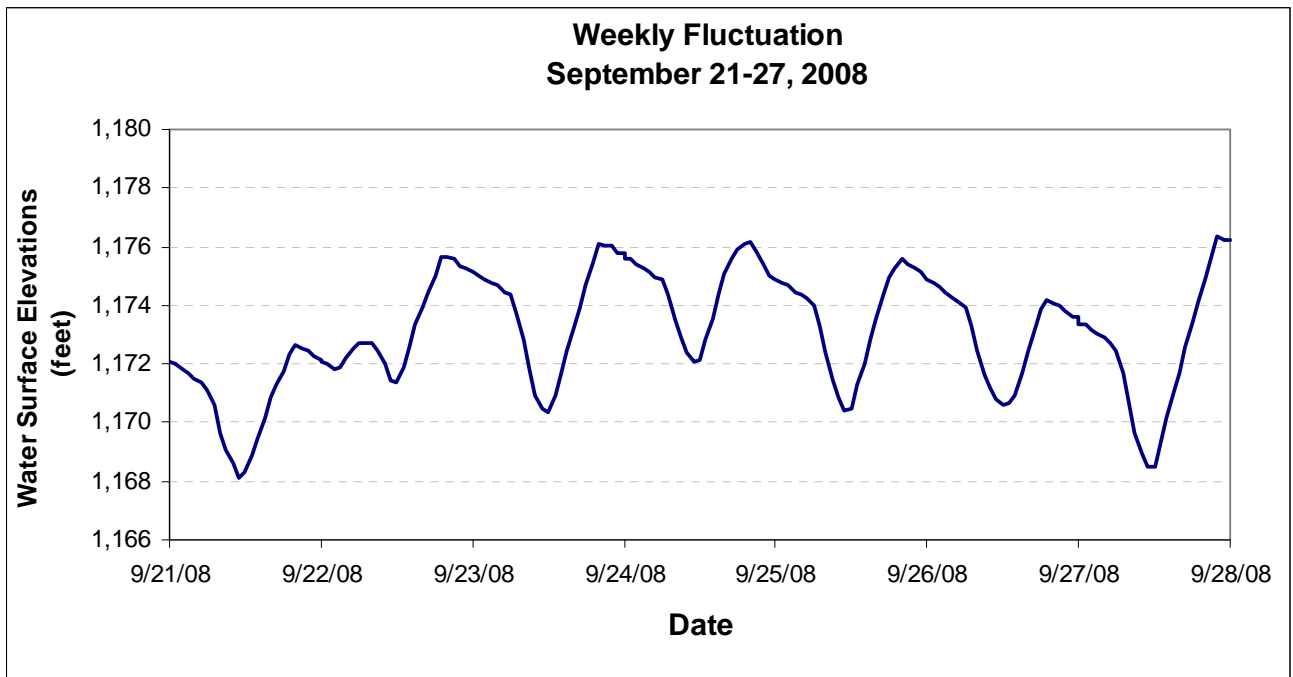
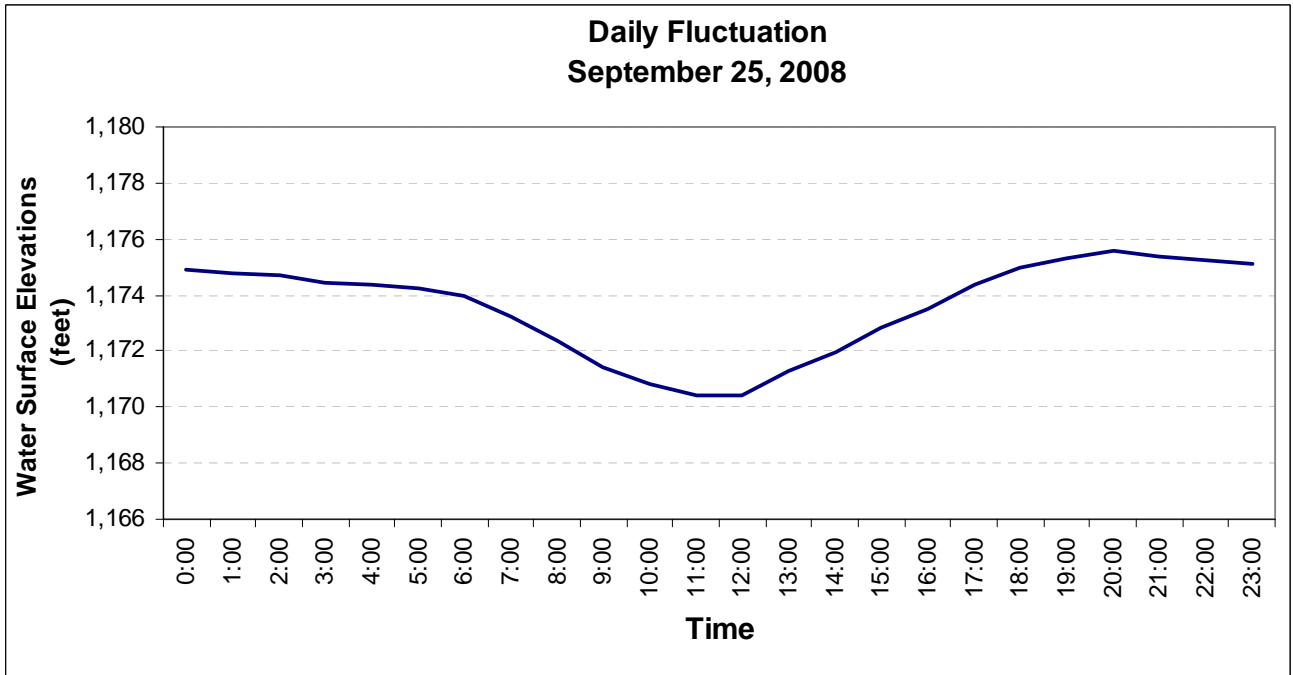
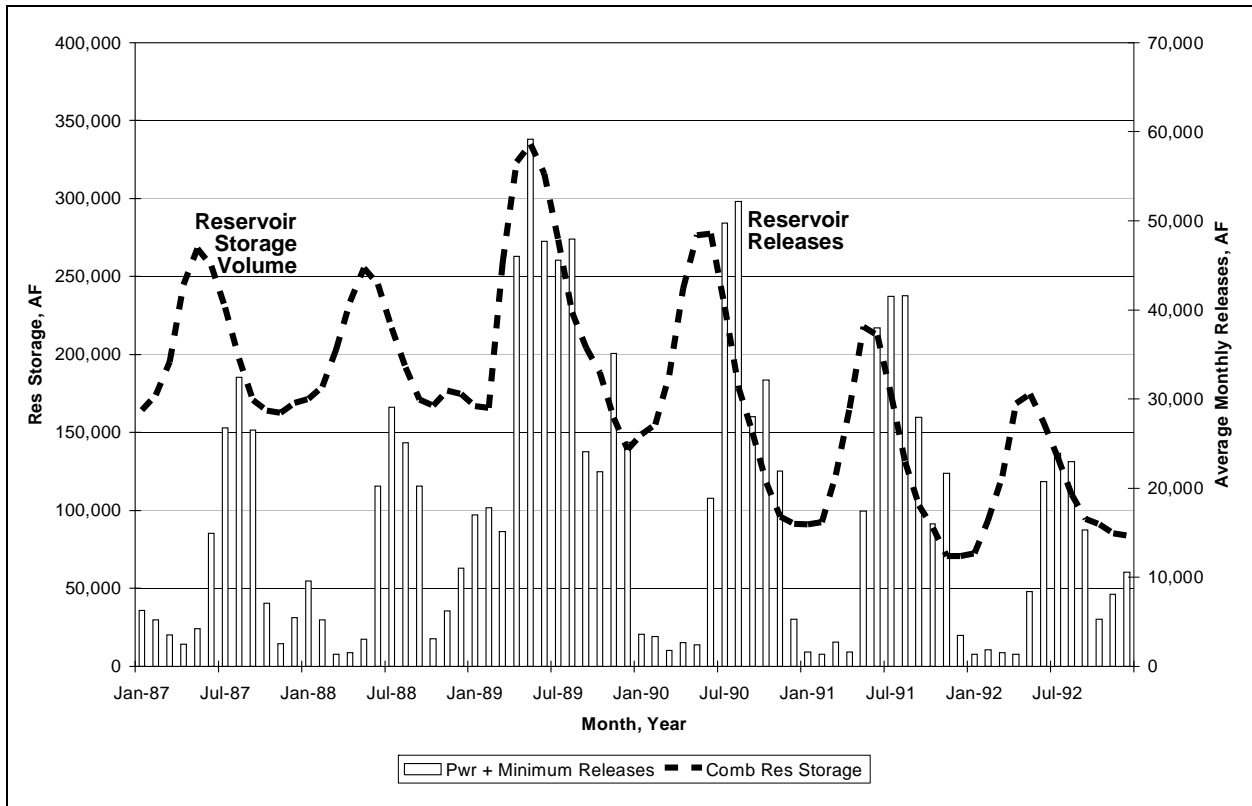
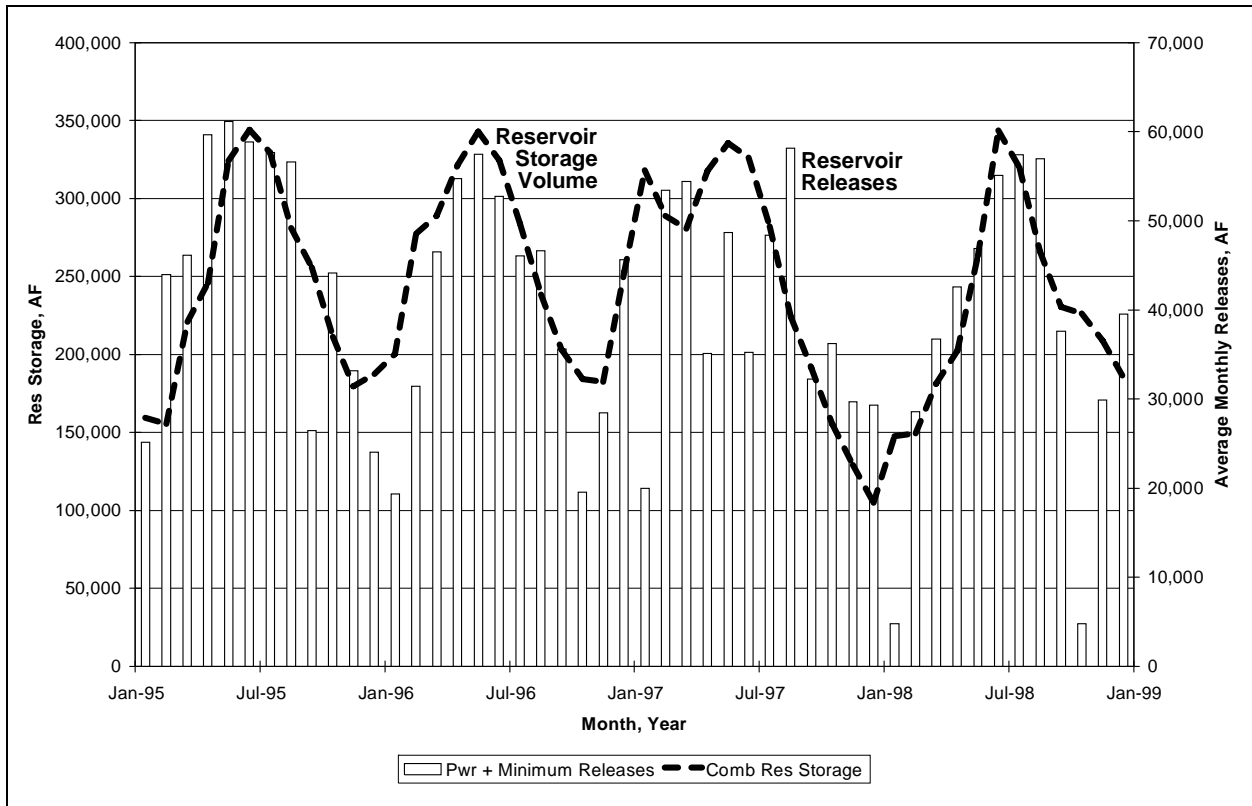


Figure 3-12. Releases vs. Reservoir Storage, Drier Period (1987–1992).



Res Storage = Combined Hell Hole Reservoir and French Meadows Reservoir Storage
 Average Monthly Releases = Releases through Middle Fork Powerhouse

Figure 3-13. Releases vs. Reservoir Storage, Wetter Period (1995–1998).



Res Storage = Combined Hell Hole Reservoir and French Meadows Reservoir Storage
Average Monthly Releases = Releases through Middle Fork Powerhouse

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