Chapter 2
Description of Project Alternatives

2.1 Regional Location

The Truckee River basin encompasses the 3,060-square-mile area that includes Lake Tahoe and upland tributaries of the Sierra Nevada (figure 2-1). The main Truckee River begins at the outlet of Lake Tahoe at Tahoe City, California, and flows approximately 120 miles through northeastern California and northwestern Nevada to Pyramid Lake, which is located entirely within the Pyramid Lake Indian Reservation. From Tahoe City, the river flows in a northwesterly direction, along State Route (SR) 89 toward the town of Truckee, California. Near Truckee, the river begins to follow a predominantly northeasterly path, along I-80, and is joined by several large tributaries, including Martis Creek, Prosser Creek, and the Little Truckee River. As the Truckee River crosses the Nevada border, it flows east near the town of Verdi, Nevada, and continues through metropolitan Reno, Nevada, where it is joined by Steamboat Creek. The river then flows in a predominantly northwesterly direction toward its terminus at Pyramid Lake.

Most of the Truckee River's flow originates from the upland regions of the Sierra Nevada. A significant portion of this water is stored in both federal and private reservoirs in northeastern California. The U.S. Bureau of Reclamation (USBR) owns dam facilities and controls Lake Tahoe, Prosser Creek, and Boca, Stampede, and Martis Creek Reservoirs. There are 2 private reservoirs, Independence Lake and Donner Lake. Independence Lake is owned and operated by Truckee Meadows Water Authority (TMWA), a joint powers authority whose members are the City of Reno, the City of Sparks, and Washoe County; Donner Lake is jointly owned and operated by TMWA and the Truckee-Carson Irrigation District. Together, the federal and private reservoirs are operated to control Truckee River flows throughout the year. Much of the water stored in the reservoirs is used to maintain flows to Pyramid Lake in Nevada to meet fishery, irrigation, hydropower, environmental, municipal, and industrial needs. Numerous water diversions occur along the river; the largest of these is at the Derby Diversion Dam located about 20 miles east of Reno. At this location, approximately one-fifth of the river's annual flow is directed out of the Truckee River basin into the Truckee Canal, where it flows 32 miles to the Lahontan Reservoir in the Carson River basin (U.S. Bureau of Reclamation 1998).

2.2 Project Location

The proposed project is located on the Truckee River in the town of Floriston, California, which is approximately 12 miles from Truckee and 20 miles from Reno (figure 2-2). This segment of the Truckee River is characterized by a steep, predominantly north-south–trending canyon that cuts through intermixed volcanic flows and consolidated stream-terrace deposits. I-80 and a railroad line follow the course of the river and are adjacent to the project area.

The total project area is composed of a construction area and an operation area. The construction area is approximately 7 acres; it is bordered on the north and west by Old Highway 40 and the Toiyabe National Forest (hereafter this area is referred to as *river left* when facing downstream) and on the south and east by I-80 and a Caltrans right-of-way (hereafter this area is referred to as *river right* when facing downstream). The operation area is downstream of the construction area and includes an approximately 2-mile stretch of the Truckee River between the Farad Diversion Dam fish return and the Farad Power Plant. The majority of the land surrounding the 2-mile stretch of river below the diversion is in the Toiyabe National Forest.

2.3 Sierra Pacific Power Company's Water Right

The 1944 final Orr Ditch Decree affirms SPPC's right to divert water for hydroelectric power production. The decree states

> The Sierra Pacific Power Company…is entitled to and is allowed to divert at all times from the Truckee River through the Farad Power Flume…sufficient water, with a priority year of 1899, to deliver, after transportation loss, to the wheel of the Farad Hydro-Electric power plant, 325 cubic feet of water per second and sufficient additional water with a priority of 1906 to deliver, after transportation loss, to the wheel of said power plant, 75 cubic feet of water per second…for the generation of electric power in said plant.

The decree states that SPPC is allowed to divert water from the Truckee River into the Farad flume at the north bank of the river (S 1/2 of Lot 6 NW 1/4 of section 30 T18N R18E MDBM). Additional water rights information is provided in appendix B.

2.4 Statement of Objectives

SPPC's objective for the proposed project is to replace the diversion structure and restore flows to the Farad Power Plant, allowing for continued power generation. While meeting this objective, SPPC also wants to ensure adequate fish, recreational boat, and sediment passage; stabilize the river banks; maintain water quality; maintain a healthy ecosystem downstream of the dam; and keep maintenance and operation costs associated with the diversion and related structure low.

The SWRCB's objective is to certify that the project meets water quality standards.

2.5 Alternatives Screening Process

During the alternatives screening process the following alternatives were considered:

- in-kind replacement,
- upstream dam,
- downstream dam,
- downstream diversions,
- operational alternatives,
- power generation alternatives, and
- no project.

The downstream diversions, operational alternatives, and power-generation alternatives were eliminated from consideration because they would not meet the project objectives, and for the following reasons:

- Other downstream alternatives, such diversions at a different location, were eliminated from consideration because they would not have provided adequate head pressure to move water into the existing flume grade to deliver water to the Farad Power Plant.
- Operational alternatives for the upstream reservoirs were eliminated from detailed evaluation because SPPC no longer has the direct ability to reoperate the reservoirs. Operational alternatives such as months without diversions were eliminated because they would not allow for continued power generation during some months and because they were considered cost prohibitive.
- Power-generation alternatives were not selected for detailed evaluation because they could result in substantial environmental effects elsewhere and would be cost prohibitive. For example, generating hydropower at another location would require purchasing new land, damming another river, constructing the infrastructure, and securing the water rights to deliver water. Alternatively, generating power with another fuel such as natural gas or fuel would not achieve the project objective of restoring flows to the Farad Power Plant for continued power generation; would result in other environmental

effects, such as effects on air quality; and would result in costs associated with constructing, expanding, and operating another facility.

A no-project alternative does not meet the project objectives, but is required by CEQA and is included and analyzed in this EIR.

Aware of the concerns expressed about this project by the public and state and federal agencies regarding recreational boat navigation and fish passage, the project applicant contracted with McLaughlin Water Engineers and Chinook Engineering for development of a series of alternatives that would fulfill the project objectives. The project applicant selected McLaughlin Water Engineers based on that company's experience designing boat chutes and whitewater facilities, including boat chutes throughout the United States and the 1996 Olympic whitewater course on the Ocoee River in Tennessee. In addition to being whitewater boaters, the company staff has experience with drainage master planning; drainage engineering; river restoration; closed conduit flow; design of pipelines and diversions, computer modeling, hydrology, hydraulics, and multi-use (recreational and drainage) facilities that could be applied to this project. The project applicant also selected Chinook Engineering for its qualifications and its staff's experience in designing anadromous fish passage facilities.

Three alternatives were designed and analyzed in detail in an alternative evaluation and design development report prepared for the project applicant (Sierra Pacific Power Company 1999a). Two of the 3 alternatives, an in-kind replacement and a new dam upstream of the old location, were retained for analysis in this EIR. A downstream dam alternative was eliminated from consideration because of the extensive work in the river and substantial river channel modifications that would have been required.

Further design work and refinements were added to the new upstream dam alternative. This work was accomplished largely in cooperation and early consultation with regulatory agencies, including the Lahontan RWQCB, USACE, DFG, and USFWS. A physical model was built at the USBR hydraulics laboratory in Denver, Colorado. Tests using the model prompted modifications to the upstream dam alternative design to improve hydraulic efficiency and distribute flows more evenly across the river; this alternative became the proposed project. Additional alternatives that were considered and evaluated in this EIR are described at the end of this chapter.

2.6 Alternative A: Proposed Project

2.6.1 Project Design

The following objectives were incorporated into the project design:

- Maintain water surface elevations sufficient to divert flows under low-flow conditions.
- Provide fish passage.
- Provide boater passage.
- Maximize passage of debris and sediment.
- Minimize impacts on the river by using existing natural features.
- Maintain the project area's aesthetic value.
- Minimize sedimentation during construction and reduce erosion during operation.
- Maximize channel capacity.
- Prevent erosion on river left.

The specific project elements are described below, and include an adjustable crest diversion structure and boat/debris chute, an intake structure, a diversion conduit, roughened channels, fine-plate fish screen and return, an access road and portage, and slope stabilization (figure 2-3).

2.6.1.1 Adjustable-Crest Diversion Structure and Boat/Debris Chute

The proposed diversion structure consists of a concrete trapezoidal boat/debris chute that will be approximately 5 feet high and 35 feet wide with 1.5:1 side slopes (figure 2-4), and an adjustable-crest dam that will be constructed of a rubber fabric that will inflate or deflate with air pressure. When Truckee River flows are 900 cfs or less, the fabric will be elevated to create a pool of water sufficient to divert water into the intake structure. When the fabric is down, or not fully elevated, the boat/debris chute will convey water and provide downstream passage for boats, debris, and sediment through the dam.

The trapezoidal channel is designed to have a smooth, concrete bottom and will serve as a boat/debris chute. The channel bottom will be excavated approximately 5 feet to install the entire diversion structure, and large grouted core rock will be installed under the diversion structure and boat/debris chute.

2.6.1.2 Intake Structure

On river left, an intake structure will be constructed to convey water to the diversion conduit. The intake structure will be a box structure that will allow the diversion of water into a box conduit. The intake structure is designed to be approximately 75 feet long, 20 feet wide, and 15 feet tall (figure 2-5). The structure will include a screened intake rack that will be oriented parallel to the river flow, with louvers to control water entering the intake, and 3 air vents. The screened intake rack will be oriented at approximately 50° to the river bottom and will be approximately 10 feet tall and 70 feet long. It will have a screen opening with dimensions of 4 inches by 6 feet. The openings to the intake rack will be aligned parallel to river flow. The intake structure will be operated to ensure even intake of water and water pressure across the intake screen. Approach velocities in the vicinity of the intake structure will be 2–4 feet per second to minimize clogging of debris or entrapment of boats, and the intake rack will be designed so that it could be removed for maintenance. The louvers will be designed to regulate where water enters, and the air vents will relieve pressure on the structure when the intake is full. The intake structure will be excavated into the bedrock; this excavation will require blasting.

2.6.1.3 Diversion Conduit

After passing through the intake structure, water will enter a diversion conduit. The proposed diversion conduit will have internal dimensions of 10 feet by 10 feet and will extend approximately 680 feet from the intake structure to the sediment detention channel. The diversion conduit will be constructed at the toe of the existing slope on river left. Like the intake structure, the conduit will be founded on bedrock or on piles drilled to bedrock. The toe of the slope will be reinforced with a rock-bolted wall, and concrete fill will be placed between the reinforced wall and the diversion conduit. Grouted boulders and large boulders removed during excavation will be placed on the right side of the conduit, facing the river. Portions of the side of the conduit will be exposed along its entire length, and the top will be used for maintenance access. A control gate will be located inside the conduit to regulate flow in the diversion conduit. Removable stop-logs will also be integrated into the structure at the upstream end of the conduit near the intake structure to further regulate flows and allow maintenance inside the conduit.

2.6.1.4 Roughened Channels

On river right and integrated into the diversion structure, roughened channels will be constructed for fish to migrate upstream. A roughened channel is a humanmade riverbed channel that mimics the natural channel. A multitude of fish passage pathways exists in roughened channels. No 1 exact route exists except at minimum flows, and water flow provides a wide range of passage opportunities for the fish. Water flows between, over, and around the many “roughness elements,” rocks and boulders planned for placement. The riverbed is stabilized to maintain the desired shape and geometry so that hydraulic conditions meet criteria for fish passage through a range of flows. A flow range for fish passage of 50–6,000 cfs was established using measurements taken at the Farad gage. The 50-cfs river flow was analyzed so that roughness channels could be designed to provide target fish species with a passage pathway during historic minimum flows. When the flows are high, fish passage pathways exist along the banks of the river, as they naturally would occur.

The roughened channels will consist of boulders ranging in size from 2 feet to 6 feet in diameter that are placed, secured, cemented, and/or grouted into the channel bottom on river right, upstream of the diversion structure and boat/debris chute. The slope will be held at approximately 5% to ensure fish passage over various river stages. The roughened channels include a low-flow area and a high-flow area (figure 2-4). The low-flow area will be adjacent to the boat/debris chute, and the high-flow area will be upstream on river right. The low-flow area will be operational at flows of 50 cfs. The low-flow channel will become inundated at flows of more than 1,500 cfs, but the high-flow channel will be available. The high-flow channel will be operational at flows of more than 800 cfs. The low-flow roughened channel will be approximately 75 feet long, and the high-flow roughened channel will be approximately 100 feet long.

2.6.1.5 Fine-Plate Fish Screen and Return

A large fine-plate fish screen will be constructed at the end of the sediment detention channel (see next section) before the head of the flume. The screen will prevent any juvenile or adult fish from entering the flume. This stainless-steel, vertical-plate, wedge-wire screen will bisect and run the length of the sediment detention channel. At the downstream end of the sediment detention channel, a 32-inch or larger high-density polyethylene, smooth-wall pipe will return juvenile fish back to the river. A manual control system will regulate the amount of water in the fish return. The fine-plate fish screen will be designed to be self-cleaning. The fish bypass flow must be equal to or greater than 10 cfs and will have a maximum fish bypass design of 50 cfs. The exact flows will depend on actual field performance and the amount of debris on the fish screen. Under most conditions the minimum flow will be used to clean the screen and return fish to the river. The final screen-and-return design is subject to approval by USFWS (figure 2-6).

2.6.1.6 Sediment Detention Channel

The sediment detention channel is an existing dirt channel that provides an opportunity to capture suspended sediment before water is conveyed down the flume. The sediment detention channel will be reconstructed at or slightly below existing grade in several areas. Concrete walls will be added downstream of the terminus of the diversion conduit, on the river side of the sediment detention channel; vehicle access and a catwalk across the channel will also be provided in this area. Concrete walls will be constructed at a length of approximately 300 feet upstream of the flume to provide foundations on which to anchor the fish screen. Some river bank restoration will occur on the side of the sediment detention channel facing I-80 (see "Restoration Plan" later in this chapter).

2.6.1.7 Access Roads and Portage

An access road will be constructed on river left, from the cul-de-sac near the westbound I-80 Floriston exit to the top of the intake structure. This road will be closed to the public and used for maintenance activities associated with the diversion structure.

Caltrans has indicated that it will provide an unfinished path on river right under I-80, at the upstream end of the project construction area. The project applicant will finish the path and make it a usable portage trail by placing and compacting small rock on the trail. This road will be closed to public vehicles, but, at Caltrans' discretion, will be open to the public. The road will serve as a portage trail to provide boaters with an opportunity to avoid the boat/debris chute or scout the drop before deciding to boat the chute. The portage trail begins at an eddy under I-80. Signs will be posted warning boaters of the diversion and boat/debris chute.

2.6.1.8 Slope Stabilization

A mechanically stabilized earthwall (MSE) and soil-nail wall is planned for river right, between the I-80 embankment and the portage trail and for river left above the new access road and diversion conduit. MSEs are composed of a mortared-rock face and welded-wire fabric that is used to stabilize dirt sideslopes and prevent erosion. Soil-nail walls are composed of 15- to 20-foot-long anchors that extend into the underlying geology of an area and provide structural support to a slope. The MSE and soil-nail wall on river right is needed to provide an adequate area for construction dewatering, fish passage-and-drop structure construction, and to provide maintenance and portage access around the site. The base of the wall will be covered with armored fill after construction of the drop is complete. The upper part of the wall, which will be located immediately uphill of the maintenance access and portage trail, will remain exposed.

The MSE and soil-nail wall on river left is needed to stabilize the slope for construction and for long-term slope stability. The base of the wall will be flush with the top of the diversion conduit near the intake structure; it will gradually become taller as it expands higher up the slope, then will be flush again with the diversion conduit. It will extend approximately 120 feet downstream toward the sediment detention channel; at its widest point it will be approximately 10 feet above the diversion conduit. Rock netting will be placed on the nearly vertical rock slope between Old Highway 40 and the intake structure.

A rock catchment fence will be erected along Old Highway 40 to stop rocks from falling from Toiyabe National Forest land onto the project construction area. No soil-stabilization work is proposed for the river-left canyon wall uphill from Old Highway 40 or on Toiyabe National Forest property. To further ensure slope stability between Old Highway 40 and the Truckee River, the project applicant will improve the existing drainage system from Old Highway 40 by constructing a drainage ditch west of Old Highway 40 and regrading Old Highway 40 with a 1% slope toward the ditch. An existing corrugated metal pipe culvert will be cleared of debris, facilitating drainage via the pipe rather than over Old Highway 40 onto the soil slope.

2.6.1.9 Features Designed to Minimize Adverse Impacts on Recreation

The proposed diversion structure is designed to

- keep the overall structure small (approximately 5 feet above the river bottom at the river bottom's lowest point);
- keep the river gradient near existing grade, with 16 feet of fall over 700 feet of length (average slope is 2.3%, or 120 feet per mile);
- retain the downstream popular boating play wave;
- align the boat/debris chute to direct water into the boating "play wave" that is created by remnants of the previous structure;
- provide self-rescue areas on river right by constructing eddy structures into the roughened channel;
- design the boat/debris chute to dissipate the energy of the weir and to minimize hydraulic effects;
- include a marked portage trail on river right, connected to a convenient landing point near the I-80 bridge; and
- prevent entrapment of boaters passing over the dam.

2.6.1.10 Features Designed to Minimize Adverse Effects on Fish

The proposed diversion structure is designed to

- keep the overall structure small (approximately 5 feet above the river bottom at the river bottom's lowest point);
- keep the river gradient near existing grade, with 16 feet of fall over 700 feet of length (average slope is 2.3%, or 120 feet per mile);
- provide upstream and downstream passage for juvenile and adult salmonids;
- provide a facility with no vertical water drops greater than 12 inches and water velocities no greater than 8 feet per second;
- provide a fish passage structure that mimics the natural channel;
- provide a structure that allows for fish passage for a wide range of flows;

- provide for fish passage at flows of 50 cfs when the facility is operational;
- prevent fish entrainment on the intake screen;
- provide attraction flows for fish; and
- provide a fish screen and return structure to avoid fish entrapment in the flume.

2.6.2 Construction Activities

2.6.2.1 Construction Access and Staging

Construction access and staging will predominantly take place on river left at the former diversion location. Construction vehicles carrying supplies and materials for the project will access the construction area via Old Highway 40 by exiting I-80 at Floriston or the I-80 exit west of Mystic (figure 2-7). The construction area will also be accessed on river left just above the proposed diversion facility.

Some construction access and staging will also take place on river right; however, access on river right is much more limited because of its proximity to I-80 and because Caltrans is planning to replace the I-80 Floriston bridge in 2002 and 2003. During Caltrans' construction, access off the westbound lane of I-80 will be closed and access under the I-80 Floriston bridge likely will be blocked.

Preparatory actions, such as delivery of equipment and supplies, will be implemented between low-flow seasons. Equipment and supplies will not be staged within the floodplain until the risk of seasonal flooding has passed. Whenever possible, equipment will be staged immediately before construction begins.

Because of the potential for simultaneous construction periods and Caltrans' traffic safety concerns regarding construction ingress and egress off the shoulder of I-80, a temporary prefabricated bridge (i.e., Bailey bridge) or equivalent structure will be installed to connect the right bank to the left bank. The bridge will be placed approximately 30 feet upstream of the old dam. It will span the approximately 160 feet and carry construction equipment, personnel, and dewatering lines across the river. If Caltrans is not constructing, most access will occur beneath the I-80 bridge, with some limited access from the westbound lane of I-80.

2.6.2.2 Caltrans Easements

Several easements will be secured from Caltrans, including

- temporary egress easements under and adjacent to I-80 on river right,
- an easement to construct the soil-nail wall,
- a long-term recreation portage/maintenance easement under I-80, and
- a long-term maintenance road easement on river left to the intake structure.

2.6.2.3 Construction Schedule

Construction will occur between May and November of 2002 and possibly between May and November of 2003. Some out-of-river activities might continue until December during both years.

2.6.2.4 Construction Sequence

1. **Sediment Detention Channel:** The sediment detention channel will be reconstructed. The concrete and foundations for the fish screen will be installed, minus the screens, as will the overflow area and the catwalk structure.
2. **Diversion Conduit Outlet:** The conduit on river left will be constructed, starting on the north end and heading south (upriver). Construction of the conduit will continue upriver, until the river needs to be diverted from the left bank; then construction on the remainder of the conduit will be delayed until the temporary bridge (step 3) and temporary diversion barrier (step 6) are installed. Concurrently with both this step and the first step, the access road near I-80 at the upstream end of the site will be constructed on river left.
3. **Temporary Bridge:** The temporary bridge will be installed. The temporary bridge will cross the river slightly upstream of the old diversion structure, and will use the conduit as 1 footing; another footing will be constructed on river right. The bridge will remain in place during construction years and will be located above the 100-year flood level, allowing boaters to pass unimpeded.
4. **Temporary Diversion Channel:** The temporary diversion channel will be installed. The temporary diversion channel will be built on river right between the temporary diversion barrier (step 6) and I-80, outside of the portion of the river containing flowing water. This temporary channel will be installed by cutting the right bank and installing the MSE. The channel will be constructed of grouted boulders, concrete, and rocks, and will accommodate river flows up to 2,000 cfs. It will be located along the

alignment of the proposed portage path/access road. During the construction period, hydrology data indicate that flows will not exceed 2,000 cfs.

5. **Preparation for Dewatering:** Construction contractors will prepare for dewatering activities by placing trench boxes at the terminus of the temporary diversion channel on river right and Baker tanks on river right and left. Trench boxes are steel-reinforced, open-topped boxes that, when placed end-to-end, will convey water from the outlet of the temporary diversion channel downstream beyond the temporary bridge. The trench boxes will facilitate construction dewatering for construction of the diversion conduit on river left.

6. **Temporary Diversion:** Upon completion of the temporary channel and during the first available low-flow period, a temporary diversion barrier will be placed across the river. The barrier will consist of k-rail, gravel bags, or other suitable materials that will divert the river through the temporary channel. The river will be diverted so that construction of the permanent diversion structure can begin and work on the diversion conduit can resume. A dewatering system will be used to keep the construction site dry and to capture and neutralize any water that could contain sediment. As work on the diversion conduit proceeds up river, the trench boxes will be removed.

7. **Bank Stabilization and Rock Foundation:** Construction contractors will stabilize the left bank slope and prepare for construction of the permanent diversion dam and intake structure. A rock foundation will be grouted into the dry riverbed downstream of the temporary diversion and upstream of the permanent dam site. This foundation will be used to support a cofferdam that will be needed later in the construction process. If constructed over 2 years, following completion of this foundation, equipment will be removed, the temporary channel blocked, and the site secured for winter flows. Further instream construction will not occur until the next suitable low-flow season.

8. **Diversion Dam and Associated Facilities:** Construction contractors will complete construction on the diversion structure, the intake structure, and the diversion conduit. If conducted over 2 seasons, as soon as appropriate low-flow conditions occur, a cofferdam will be placed on the previously constructed foundation. The cofferdam will consist of rock-filled containers or similar modular blocks that can be lowered into the riverbed with a crane, resulting in minimal disturbance. The temporary channel will be reopened, and the river flow will again be diverted around the site of the permanent diversion. The dewatering system will again be installed to keep the construction site dry. Temporary barriers and sediment fencing will be installed to prevent inadvertent downstream discharge into the river from the project site. As needed, the sediment detention channel may be used as a settling area for treated water before it is discharged back into the river. Construction vehicles will operate within the dewatered reach of the riverbed. The intake structure will be grouted into bedrock and permanently anchored to the riverbed. The boat/debris chute and roughened channels will be constructed, a portage and maintenance road will be installed under I-80

to allow recreational boaters to walk around the diversion, and the diversion conduit will be completed. The fish screen and the fish return system will also be installed.

9. **Site Restoration:** Construction contractors will restore the construction site. The riverbed adjacent to the diversion conduit will be restored and partially covered with suitable rock, gravel, and boulders. The cofferdam will be lifted from the river and the temporary channel will be backfilled and the remainder of the portage path/maintenance road will be completed. The project includes a revegetation and soil stabilization program along the banks of the river. Signs will be posted warning boaters of the diversion.

2.6.2.5 Removal of Former Dam Facilities

The existing radial-gate intake structure and concrete wall on river left will be removed during the second step of the construction sequence. However, the dam remnant in the river is of particular interest to boaters because it creates a surfing hydraulic ("play wave"). This structure will not be removed. The footing of the former dam on river right, which is located on Caltrans property, will not be removed.

2.6.2.6 Construction Equipment

Standard construction equipment will be used for this project, including backhoes, excavators, dump trucks, concrete trucks, watering trucks, Baker tanks, drill rigs, and pile drivers. The specific equipment used will be at the discretion of the contractor selected to build the facility.

2.6.2.7 Techniques to Minimize Erosion and Sedimentation

Disturbed areas that did not support vegetation before project implementation or that are not suitable for revegetation because of the use intended for the area (e.g., access roads) will be stabilized and protected from erosion using structural methods. The most substantive of these measures are

- **Old Highway 40 Drainage:** A shallow V-ditch will be constructed along the western side of Old Highway 40. The ditch will improve road drainage and prevent runoff from the road and upslope areas from overtopping and eroding the short embankment between the river and Old Highway 40.
- **Road Surfacing:** The river-left maintenance road to the intake structure will be surfaced with aggregate and SS-1 oil sealant, which will greatly reduce the potential for these surfaces to erode and contribute sediment to the Truckee River.

- **Retaining Walls:** As described above, MSEs and permanent soil-nail walls will be installed on the upslope and downslope sides of the northern and southern access roads, as well as on the upslope side of the diversion conduit. These retaining wall structures will greatly reduce the potential for constructed cutslopes to fail, erode, and contribute sediment to the Truckee River during project operation.

During construction the following measures will be implemented:

- **Timing of Construction:** All construction activities will be conducted during the dry and low-flow season (May 1–October 15), minimizing the potential for disturbed areas to be eroded by rainfall and runoff.
- **Equipment Access and Staging:** Equipment will access the construction area via existing frontage and access roads, thereby minimizing the area of disturbance. Whenever possible, equipment will be staged in the floodplain only immediately before construction activity begins.
- **Temporary Diversion Structure and Channel:** A temporary diversion structure and channel will be constructed to divert and convey river flows around the construction area, allowing construction to take place in a dry environment. The bed of the diversion channel will be lined with grouted rock to prevent scour and incision, and the banks will be armored with large rock riprap to prevent bank erosion.
- **Baker Tanks:** River flows that bypass the temporary diversion structure will be pumped from the construction area into nearby Baker tanks, where they will be stored temporarily to precipitate suspended sediment and neutralize excess alkalinity before being discharged back into the river.
- **Sediment Fencing:** Sediment fences or a similar device will be installed at the downstream end of the construction area to prevent inadvertent discharge of sediment-laden water from the construction area into the river.
- **Rock-Netting:** Wire rock-netting will be installed on the steep, poorly vegetated embankment located between Old Highway 40 and the proposed intake structure to prevent large earthen materials from sloughing and crumbling into the river channel during construction.
- **Retaining Walls:** As described above, soil-nail walls and MSEs will be installed on constructed cutslopes to prevent earthen materials from sloughing into the Truckee River channel or the temporary diversion channel during construction.

The procedural and design provisions listed above will serve as the primary means for controlling erosion and sedimentation during construction. Erosion and sediment control issues are further described in the erosion control plan or Stormwater Pollution Prevention Plan (SWPPP) in appendix C. Some of the temporary best management practices (BMPs) that are incorporated into to the SWPPP include the following:

- **Erosion Control BMPs:** A temporary mulch will be applied to disturbed areas before large precipitation events. The mulch will dissipate the energy of rainfall and reduce the velocity of subsequent runoff.
- **Sediment Control BMPs:** Rice-straw bales, sediment fences, fiber rolls, or similar devices will be installed along the perimeter of disturbed areas or at regular intervals throughout the construction area to control the migration and discharge of sediment.
- **Soil Stockpiles BMPs:** Temporary soil and sediment stockpiles will be located away from the Truckee River channel. All stockpiles will be covered with plastic or geotextile fabric and surrounded with fiber roles or sediment fences to protect them from the erosive forces of wind and water and to control the migration of sediment from the stockpiles. If not used for excavation backfill, all stockpiled soil and sediment will be hauled off-site and disposed of at approved facilities.

2.6.2.8 Restoration Plan

A restoration plan for areas disturbed by project implementation will be completed before construction and will be an integral part of the postconstruction erosion control strategy. The restoration plan will be implemented during and immediately after construction is complete. In addition to specifying the materials and methods that would be used during the restoration process, the program will prescribe BMPs that will be used to control erosion until vegetation is established, as well as monitoring and maintenance procedures that will be implemented to ensure revegetation success.

A preliminary restoration plan was prepared for the project and is included in appendix D. The restoration plan is designed to

- unify and expand the visual character in the project area,
- stabilize the river banks using vegetation,
- enhance fish and bird habitat, and
- enhance views of the proposed diversion facilities.

The restoration plan has 5 distinct planting areas: near the diversion structure on river right, near the portage/maintenance path, near the "play wave," near the sediment detention channel, and near the diversion conduit on river left. Recommended plant species are black cottonwood, mountain alder, sandbar willow, yellow willow, Jeffrey pine, interior wild rose, and creeping rye grass. In addition, 2 types of native seed mix are recommended.

2.6.3 Operational Activities

2.6.3.1 Project Diversions and Instream Flows

Depending on weather conditions and river flows, the project applicant plans to use its full water right and operate the diversion facility as frequently as possible to generate power at the Farad Power Plant. During periods suitable for diversion, the project will divert as much water as possible up to the limit of the project applicant's water right, 24 hours per day, 7 days a week, and as described in additional detail below.

2.6.3.2 Facility Operations

Facility operations are largely dependent on weather conditions and river flows. During winter storms and snow events, for example, the formation of frazil ice can prevent diversions for power generation until the ice is removed. During critically dry water years, when there are low flows in the river (i.e., flows less than 100 cfs), the low flows may prevent diversions for power generation until there are additional reservoir releases or large storm events.

The range of operational flows for the adjustable-crest diversion structure and boat/debris chute, intake structure, diversion conduit, roughened channels, fish screen and return, sediment detention channel, and powerhouse are described in more detail below.

The rubber dam of the diversion structure can be adjusted to create a pool of water at the intake structure. Sensors will monitor the level of the pool and regulate the rubber dam and radial gate; the radial gate is a structure that regulates flow and is located inside the diversion conduit. During low flows, sensors will raise the rubber dam to maintain 50 cfs in the low-flow channel if it is available. As river flows increase, the sensors will begin to lower the rubber dam and open the radial gate.

Diversion pool surface elevations were modeled, and a scale model was built to verify water surface elevations. Water surface elevations will fluctuate approximately 6 feet at the diversion structure, depending on river stage and whether the inflatable dam is up, down, or partially inflated. The intake structure and diversion conduit are sized to accommodate enough water for the fish return (10–50 cfs), transportation losses (25 cfs), and power generation (400 cfs), for a total of approximately 475 cfs (figure 2-8). The actual diversion rate could vary from approximately 5 cfs to 475 cfs, depending on the flow in the Truckee River. The smallest diversions (5–7 cfs) will be used to prevent drying of the flume. Power-generating diversions will begin when flows are above 185 cfs because

- 50 cfs will remain instream,
- 10 cfs is required to operate the fish screen,
- a minimum of 100 cfs is required at the powerhouse to operate the generating facility, and
- up to 25 cfs is needed as carriage water for flume losses.

A flow of 10 cfs is required to operate the fish screen and will be used approximately 95% of the time that facilities are operating; when river flows exceed 2,000 cfs, approximately 5% of the time, up to an additional 40 cfs can be accommodated. If the diversion is being used, 50 cfs, when it is available in the river, will pass through the low-flow channel; approximately 700 feet downstream, another 10 cfs will be returned to the river from the fish return. In total, 60 cfs will remain in the operation area.

As river flows increase, the inflatable dam will be operated to maximize the diversion for power generation. At lower flows, the dam will be fully inflated. At higher flows, the dam will not be inflated. Water will begin spilling over the inflatable dam at a river flow of approximately 550 cfs. At a river flow of 835 cfs, the rubber dam will be partially inflated; approximately 435 cfs will be diverted and 400 cfs will pass over the boat/debris chute. At a river flow of 1,035 cfs, the rubber dam will be down; approximately 435 cfs will be diverted and 600 cfs will pass over the boat/debris chute.

In the past, the project applicant has operated continuously for as many days as possible each year based on flow releases (approximately 310–350 days per year). Nonoperation periods occurred because of maintenance, frazil ice, and lack of water during drought. The 5-year average annual generation for the Farad Power Plant is 13.3 x 10^6 kWh per year (Williams pers. comm.).

During wet, normal, and dry years, the applicant will be able to operate on approximately 350, 310, and 109 days per year, respectively. Additional operational scenarios are described and evaluated in chapter 3, “Hydrology.” During dry years or months, when power is not being generated, the flume is made inactive, although a minimum of approximately 6–7 cfs will be diverted through the intake structure to keep the flume wet.

2.6.4 Maintenance Activities

2.6.4.1 Maintenance Access

On river left, access to the proposed diversion structure will be provided by a maintenance path from the existing parking area north of the diversion location. Additional access will be provided along the top of the diversion conduit. Access on river right will be provided via the proposed maintenance road and portage located under I-80.

2.6.4.2 Sediment and Debris Removal

The adjustable-crest diversion and boat/debris chute will also serve as a debris chute to aid in the passage of sediment and debris. The chute will act to pass floatable debris and sediments so that the pool upstream of the diversion structure will remain deep. The intake screen will serve as a debris rack that will ensure that debris does not enter the diversion conduit.

The proposed diversion location and local geology will minimize the amount of soil removal required; an extensive sediment-flushing system is not planned. Although low diversion structures such as the proposed structure do not trap and store large quantities of sediment, sediment may need to be removed periodically.

2.6.4.3 Frazil Ice Removal

Frazil ice consists of small, needle-like ice particles or thin, flat, circular plates of ice suspended in water. In rivers and lakes, this type of ice accumulates on metal or other thermally conductive materials. This accumulation may restrict the flow of water and limit the capabilities of the diversion and conveyance facilities. The design of the previous diversion structure resolved these problems through the use of radial gates that withdrew water from the bottom of the diversion pool. However, this technique increased the amount of sediment diverted.

By aligning the intake structure parallel to river flow and maintaining the pool level at the top of the screened intake rack, SPPC expects that frazil ice formation will be minimized because river flows will carry ice downstream and over the drop structure. In the event that problems with frazil ice arise, the project applicant will use removable hoisting equipment to temporarily remove the intake screen for cleaning. For the fish screen, two 5-foot-wide stop logs incorporated into the fish screen design will be removed when frazil ice conditions exist, so that water can continue to flow to the powerhouse. From past experience, the project applicant expects frazil ice conditions to last 2 weeks per year, on average.

2.6.4.4 Fish-Screen Maintenance

The fine-plate fish screen will be designed to be self-cleaning, mechanized, and telemetered to alert operators of problems. The final fish screen-and-return design and construction, including a bypass system for frazil ice conditions, will follow USFWS and National Marine Fisheries Service (NMFS) criteria. The fish screen design has been reviewed and tentatively approved by DFG.

2.7 Alternative B: In-Kind Replacement

2.7.1 Design Features

Alternative B consists of the replacement of the previous diversion with a low-head dam structure in its original location. This type of structure could be made of numerous materials, including wood, roller-compacted concrete, grouted boulders, or conventional concrete; however, for the purposes of this report, a stepped, grouted-boulder dam will be evaluated (figure 2-9).

Although this type of dam is not designed for recreational use or passage, it does reduce the formation of “keeper” hydraulics. Warning signs and a portage route on river right will be provided. As is typical with low-head dams, fish passage will be provided by a conventional fish ladder. This ladder will be similar to the slotted fish passage that previously existed and will be installed on river right.

Alternative B includes floodgates to allow for flushing of sediment from the upstream pool. However, because of the location, sediment will accumulate behind the dam and require annual dredging. No bank stabilization is proposed under this alternative.

2.7.2 Construction Activities

The construction access, staging, sequence, and methods to minimize adverse environmental impacts under Alternative B will be nearly identical to those under Alternative A. However, the temporary diversion structure likely will be an enclosed-box culvert that begins 150 feet upstream of the original diversion location. The temporary diversion will be capped over winter and reopened the following spring to allow construction over 2 seasons. A Bailey bridge or similar structure will be used under this alternative; it will be placed just downstream of the temporary diversion. Two new footings will need to be constructed for the temporary bridge. The existing recreational boating play wave will be removed to accommodate the low-head dam. No blasting will be required.

2.7.3 Operational Activities

Project operations under Alternative B will be identical to operations under Alternative A.

2.7.4 Maintenance Activities

Maintenance activities under Alternative B include the removal of sediment and debris, frazil ice, and emergency maintenance. The site will be accessed by the existing access road. Sediment and debris will be removed by dredging and by operating the floodgates so that sediment and debris are flushed from the upstream pool. Frazil ice will be managed by operating the floodgates to inhibit the buildup of ice.

2.8 Alternative C: No Project

Alternative C is the No-Project Alternative. Under this alternative, the project applicant will not build the proposed dam or rebuild any dam. The 13.3 x 10^6 kWh of power per year the project applicant produced for its electric customers will have to be produced by other means.