Appendix D

Restoration Design Recommendations for the Farad Diversion Dam Replacement Project

Restoration Design Recommendations for the Farad Diversion Replacement Project on the Truckee River

Prepared for:

Sierra Pacific Power Company
6100 Neil Road
Reno, Nevada 89520-0024
Contact: Lee Simpkins
775/834-3528

Prepared by:

Jones & Stokes
2600 V Street
Sacramento, CA 95818-1914
Contact: John Zanzi
916/737-3000

May 7, 2001

Jones & Stokes. 2001. Restoration Design Recommendations for the Farad Diversion Replacement Project on the Truckee River. May 7. (J&S 01159.) Sacramento, CA. Prepared for Sierra Pacific Power Company, Reno, NV.

Contents

Tables and Figures

Tables

Figures

Restoration Design Recommendations for the Farad Diversion Replacement Project on the Truckee River

Introduction

After the powerful January 1997 floodwaters destroyed the Farad Diversion structure along the Truckee River, the Sierra Pacific Power Company initiated a replacement project to divert water into the power plant, provide fish passage, and allow recreational boat passage. The *Farad Diversion Dam Replacement Project Administrative Draft Environmental Impact Report* (Jones & Stokes 2001) is being reviewed by the State Water Resources Control Board; it identifies impacts of the proposed project and mitigation measures to reduce those impacts to less than significant. Final impact conclusions have not been made. However, the driving forces behind the restoration are to:

- unify and expand the visual character of the downstream habitat to the upstream habitat at the proposed diversion structure,
- stabilize banks using vegetation,
- enhance fish and bird habitat (particularly for Brewer's sparrow that forage and nest among big sagebrush scrub), and
- aesthetically enhance views of the proposed diversion from Highway 80.

The plantings at Restoration Areas A, B, C, and D are to address all driving forces for the project. The proposed plantings for the Jeffrey Pine aesthetic planting area are to address views at the project site.

The diversion replacement project is located immediately south of Interstate 80 and approximately 12 miles east of Truckee, California (figure 1). The restoration project area consists of approximately 1,000 linear feet of riverbank downstream of the proposed diversion structure. Staff restoration specialists and landscape architects examined the existing topography, scour areas, and relative water levels; studied existing vegetation patterns and revegetation opportunities; and conducted a preliminary assessment of soil conditions during a reconnaissance site visit in April 2001.

Proposed Restoration Areas

Although the project site encompasses a fairly small reach of the Truckee River, 5 distinctly different potential restoration areas were identified during the site visit (figure 2). In this report the restoration areas are identified as Restoration Areas A, B, C, D, and an aesthetic planting area "Jeffrey Pine Aesthetic Planting." The 4 restoration concepts could potentially be inter-mixed during the detailed design phase to fit the individual areas in the site. The following restoration recommendation text describes the existing conditions, proposed restoration actions, site preparation, grading and earthwork, and planting for each of the 4 restoration areas and the additional aesthetic planting area.

The plant list (table 1) identifies the recommended species for all restoration areas. Refer to the discussions for specific restoration areas for species distribution.

Table 1. Plant List

Common Name	Botanical Name	Propagule Type/Size
Black cottonwood	*Populus balsamifera* ssp. *trichoscarpa*	container/Tree-pot 4
Mountain alder	*Alnus incana tenuifolia*	container/Tree-pot 4
Sandbar willow	*Salix exigua*	cutting; container/Tree-pot 4
Yellow willow	*Salix lucida*	cutting; container/ Tree-pot 4
Jeffrey pine	*Pinus jeffreyi*	container/ 15 gallon
Interior wild rose	*Rosa woodsii*	container/ deepot
Creeping rye grass	*Leymus triticoides*	plug

Additionally, seed mixes (table 2) identify the recommended species for the restoration areas. Refer to the discussions for specific restoration areas for seed mix distribution.

Table 2. Seed Mixes

Cover Type	Common Name	Botanical Name

Type 1 Seed Mix (Upland Areas)		
Grasses and Forbs	Nebraska sedge	*Carex nebrascensis*
	Squirreltail	*Elymus elymoides*
	Bluegrass	*Poa secunda*
Shrubs	Big sagebrush	*Artemesia tridentata*
	Bitterbrush	*Purshia tridentata*
	Western chokecherry	*Prunus virginiana*
	White-stem rabbitbrush	*Chrysothamnus nauseosus*

Type 2 Seed Mixes (Bar Areas)		
Grasses and Forbs	Nebraska sedge	*Carex nebrascensis*
	Bluegrass	*Poa secunda*
Shrubs	Big sagebrush	*Artemesia tridentata*
	Bitterbrush	*Purshia tridentata*
	Western chokecherry	*Prunus virginiana*
	White-stem rabbitbrush	*Chrysothamnus nauseosus*

Restoration Area A

Located at river right, Restoration Area A begins at the proposed diversion structure and continues downstream to the remnant of the old Farad Diversion structure (figure 3). This area is characterized by an unpaved access road, lack of vegetation, existing rock revetment, and large stream boulders at the river edge. The proposed restoration (figure 3.1) of this area consists of the following (starting from the water's edge and moving up the slope):

- Place coarse fill material on top of slightly ripped existing rock revetment. Grout on-site stream boulders in position to hold the fill material in place and create a low berm terrace for revegetation 2 feet above the water line.
- Plant sandbar willow (*Salix exigua*) whips (container plants with 5-foot minimum trunk length above rootball) at 4 feet on-center in non-grouted boulder areas at a 45° angle to provide shaded riverine aquatic habitat, thermal and hiding cover, reduced flow velocities, and increased flow diversity (stream boulder placement and grouting should occur concurrently with planting).
- Plant yellow willow (*Salix lucida*) cuttings (planted 6 feet on-center) with 3 feet between rows planted in the coarse fill material and held in place by stream boulders.
- Plant creeping rye grass (*Leymus tritcoides*) plugs (planted 3 feet on-center) for understory cover and bank stabilization in the coarse material between the
- willow cuttings (creeping rye grass plugs reproduce through rhizomes, making them easier to establish from plugs than from seed).
- Create a linear middle terrace parallel to the river for planting, approximately 8 feet above the water line, by excavating existing revetment and placing coarse fill material.
- Create a linear upper terrace parallel to the river, approximately 14 feet above the water line, by excavating existing revetment and placing coarse fill material.
- Plant interior wild rose (*Rosa woodsii*) container plants (planted 6 feet on-center) and black cottonwood (*Populus balsamifera* ssp. *trichoscarpa*) container plants (planted 8 feet on-center with 3 feet between rows) in the coarse material of the middle and upper terraces.
- Reuse existing rock as new revetment between terraces and below the access road.

Restoration Area B

Located at river-right, this portion of the restoration project has the definite characteristic of a gravel bar surface with a rough transition to an existing large boulder revetment (figure 4). Incorporating plantings outlined below could increase roughness in this area, offering the opportunity to trap sediment; this could increase the success of natural riparian vegetation recruitment. Existing vegetation is minimal, with some willows dispersed along the riverbank. The proposed restoration (figure 4.1) area B consists of the following (starting from the water's edge):

- Reuse existing stream cobble transitioning from the water's edge to the bar surface.
- Place 2 feet of excavated stream cobble back-filled with coarse fill material and seeded with a type 2 seed mix of riparian plants (table 2) for erosion and scour control and habitat value.
- Plant mountain alder (*alnus incana tenuifolia*) and sandbar willow container plants at 6 feet on-center (3 feet between rows).
- Plant creeping rye grass plugs (planted 3 feet on-center) for understory cover and erosion and scour control among the alders and willows.
- Install brush layer at the back of the bar surface and middle terrace consisting of willow cuttings planted side by side, angled toward the bank to prevent scouring of the upper bank.
- Install coir log (logs composed of coconut fiber encased in a coconut fiber mesh netting) at the back of the bar surface and middle terrace to prevent scour and protect brush layer through sediment trapping and moisture retention.
- Reuse existing rock as revetment placed to form a more gentle slope transition to the bar surface and to protect slope and terraces.
- Create a linear middle terrace parallel to the river, approximately 4 feet above the water line, by excavating existing revetment and placing coarse fill material.
- Plant interior wild rose container plants (planted 6 feet on-center) and black cottonwood container plants (planted 8 feet on-center)with 3 feet between rows) in the coarse material of the middle terrace.

Restoration Area C

Located at river-left, this portion of the restoration area has a more gentle slope and is characterized by a broad terrace that terminates at the steep slope leading up toward the old Highway 40 (figure 5). Existing vegetation is greatest here along the back side of the broad terrace, while vegetation is sparse along the slope and near the water's edge. The proposed restoration (figure 5.1) of this area consists of the following (starting at the water's edge):

- Place coarse fill material on top of slightly ripped existing rock revetment. Grout on-site stream boulders in position to hold the fill material in place and create a low berm terrace for revegetation 2 feet above the water line.
- Plant sandbar willow whips (container plants with 5-foot minimum trunk length above rootball) at 4 feet on-center and set at a 45 degree angle in non-grouted boulder areas to provide shaded riverine aquatic habitat, thermal and hiding cover, reduced flow velocities and increased flow diversity (stream boulder placement should occur concurrently with planting).
- Plant yellow willow cuttings (planted 6 feet on-center) and mountain alder containers (planted 6 feet on-center with 3 feet between rows) in the coarse fill material and hold in place by stream boulders.
- Plant creeping rye grass plugs (planted 3 feet on-center) for understory cover and erosion and scour control among the alders and willows (creeping rye grass plugs reproduce through rhizomes, making them easier to establish from plugs than from seed).
- Create a linear middle terrace parallel to the river for planting, approximately 8 feet above the water line, by excavating existing revetment and placing coarse fill material.
- Plant interior wild rose container plants (planted 6 feet on-center) and black cottonwood container plants (planted 8 feet on-center) with 3 feet between rows in the coarse material of the middle terrace.
- Reuse existing rock as new revetment placement above and below the middle terrace.
- Place 1 foot depth of excavated upper terrace area back-filled with coarse fill material and seeded with an upland seed mix of plants (table 2) for habitat value and landscape congruency with areas downstream of the proposed restoration area.

Restoration Area D

Located at river-left, this portion of the restoration area is the narrowest because of the proposed construction of the diversion conduit (figure 6). An extremely steep large boulder revetment slope and minimal vegetation characterize this existing area. The intent of this proposed restoration recommendation is to increase habitat and vegetation along the water's edge and lower terrace and to also increase vegetation down slope from the diversion conduit so as to act as a visual screen (maintaining clearance from the diversion structure for maintenance purposes). The proposed restoration (figure 6.1) of this area consists of the following (starting at the water's edge):

- Place coarse fill material on top of slightly ripped existing rock revetment. Grout on-site stream boulders in position to hold the fill material in place and create a low berm terrace for revegetation 2 feet above the water line.
- Plant sandbar willow (*Salix exigua*) whips (container plants with 5-foot minimum trunk length above rootball) at 4 feet on-center in non-grouted boulder areas at a 45° angle to provide shaded riverine aquatic habitat, thermal and hiding cover, reduced flow velocities, and increased flow diversity (stream boulder placement and grouting should occur concurrently with planting).
- Plant yellow willow cuttings (planted 6 feet on-center) and mountain alder containers (planted 6 feet on-center) with 3 feet between rows planted in the coarse fill material and held in place by stream boulders.
- Plant creeping rye grass plugs (planted 3 feet on-center) for understory cover and erosion and scour control among the alders and willows (creeping rye grass plugs reproduce through rhizomes, making them easier to establish from plugs than from seed).
- Create a linear middle terrace parallel to the river for planting, approximately 10 feet above the water line, by excavating existing revetment and placing coarse fill material.
- Plant interior wild rose container plants (planted 6 feet on-center) and black cottonwood container plants (planted 8 feet on-center) with 3 feet between rows in the coarse material of the middle terrace.
- Reuse existing rock as new revetment placement above and below the middle terrace.

Jeffrey Pine Aesthetic Planting

At river-right, along the slope below Interstate 80 and above potential restoration area A, is an area of potential aesthetic planting. At this elevation in other areas of the project site, jeffrey pine (*Pinus jeffreyi*), sagebrush (*Artemesia tridentata*) and bitterbrush (*Purshia tridentata*) are thriving naturally. Adding jeffrey pines and the understory in this aesthetic planting area could screen the proposed diversion structure from view from Interstate 80 and unify the project area with the surrounding environment. It is recommended that jeffrey pines be planted from 15 gallon containers in this area along with an upland seed mix (table 2) for erosion control and habitat value.

Additional Recommendations

Site Preparation

Removing exotic species and weeds before planting would increase the success rate of establishment of the willow whips, plugs, container plants, cuttings, and seeds by decreasing the competition for resources. No fertilizer would be applied with the seed mix because it encourages vigorous weed growth. Manual, mechanical, and/or chemical (i.e., herbicides approved by the Environmental Protection Agency for use in aquatic environments) methods could be used to control weeds before and after implementation.

Plant Propagation and Collection

With the densely vegetated riparian areas downstream from the project site, plant propagation material could be collected from on-site to maintain local genotypes within the ecosystem. The plant material could be collected 9 months to 1 year before implementing restoration to allow rooting. The preferred timing for seeding application would be after the container and cutting installations are complete and all construction activities are finished, and before November 1.

Watering

The installed detailed restoration plan could be watered by hand using a watering truck for the first year of establishment. As an option, the restoration plantings could be irrigated with a temporary drip system using water from the river drawn by a mobile pump. The aesthetic plantings of jeffrey pine would need to be irrigated with a temporary drip system for establishment.

Operations and Maintenance

A detailed operations and maintenance report could be prepared along with a detailed restoration plan to clarify short-term and long-term vegetation monitoring, weed control, additional watering requirements, replacement of plant material, etc.

Next Steps

With these restoration recommendations as a basis for developing a detailed restoration design, the next step would be to conduct further analyses, such as soil fertility and hydraulic studies, to ensure a thorough understanding of the key components of a successful restoration plan. After these analyses, detailed restoration designs could be prepared, followed by construction documents, and ultimately, bidding and construction. A suggested schedule for the next steps to this restoration plan is shown in table 3.

Any issues pertaining to obtaining permits to comply with CEQA requirements would need to be addressed as outlined in the *Environmental Impact Report for the Farad Diversion Dam Replacement Project* (Jones & Stokes, 2001). A preliminary cost estimate of restoration construction cost is shown in table 4 and should be used as a preliminary planning tool

Table 3. Schedule for Restoration—Next Steps

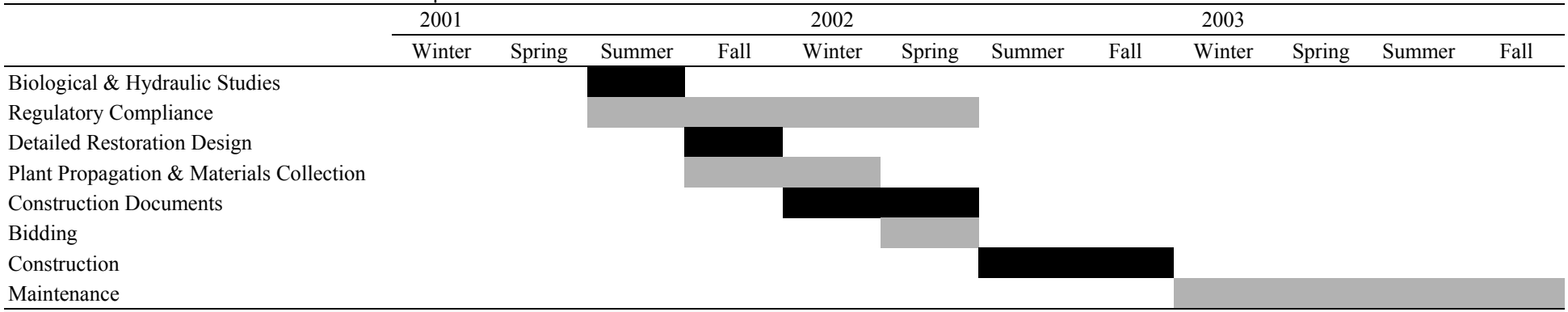

Table 4. Cost Estimate

Item No.	Description of Item	Quantity	Unit	Unit Price	Total
1	Mobilization /Demobilization	1	Lump Sum	$10,000	$10,000
2	Site Preparation	1	Lump Sum	$5,000	$5,000
3	Coir Logs	1200	Linear Foot	$18	$21,600
4	Seeding—Type 1 Seed Mix	1.02	Acre	$1,500	$1,530
5	Seeding—Type 2 Seed Mix	1.23	Acre	$1,200	$1,476
6	Container Plant Installation	1186	Each	$15	$17,790
7	Cutting Collection, Storage and Installation	473	Each	$12	$14,232
8	Container Plants In Rock	352	Each	$20	$7,040
9	Plug Plantings	1539	Each	$6	$9,234
10	Brush Layer	1200	Linear Foot	$25	$30,000
11	Aesthetic Plantings (15-gallon trees)	40	Each	$90	$3,600
12	Weed Control	1	Lump Sum	$2,500	$2,500
13	Watering	1	Lump Sum	$10,000	$10,000
14	Replacement Plants	1	Lump Sum	$10,000	$10,000
15	Record Drawings	1	Set	2,000	$2,000
Sub Total					$146,002
Contingency	(10%)				$14,600
Total					**$160,602**

Notes:

This cost estimate is based on the Restoration Recommendations Report prepared by Jones & Stokes, dated May 7, 2001.

This cost estimate is a planning tool to assess the level of effort required to perform the construction work. This estimate is preliminary, and actual costs may vary by an order of magnitude. Actual construction costs may vary from the above estimates because of competitive bidding, negotiations with the Sierra Pacific Power Company, or fluctuations in market prices. This estimate is not a bid.

Citation

Jones & Stokes. 2001. *Farad diversion dam replacement project environmental impact report.* Administrative draft. April. (J&S 00475). Prepared for State Water Resources Control Board, Sacramento, CA.