CHAPTER 4

Project Alternatives

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4.1 Introduction

The State Water Resources Control Board (State Water Board) is responsible for determining whether to issue a water quality certification to Pacific Gas and Electric Company (PG&E) for continued operation of the Upper North Fork Feather River Hydroelectric Project (UNFFR Project). The water quality certification must document that the operation of the UNFFR Project under a new Federal Energy Regulatory Commission (FERC) license will meet the water quality standards of the *Water Quality Control Plan for the Sacramento and San Joaquin River Basins* (Basin Plan), as explained in greater detail in Chapter 2, State Water Board's Regulatory Responsibilities. The State Water Board has evaluated a range of alternatives to ensure that the UNFFR Project will comply with the Basin Plan.

4.2 Project Alternative Development Process

The State Water Board used a tiered approach—known as levels 1, 2, and 3—to develop an array of project alternatives that could reduce water temperatures in the North Fork Feather River below Canyon dam. The process is briefly described below; detailed information on the approach and the measures considered are available in the "Level 1 and 2" and "Level 3" reports in Appendices D and E, respectively (Stetson Engineers, Inc. 2007 and 2009). A supplement to the Level 3 Report (Appendix E-1) was prepared in 2012 to reflect some additional modeling of alternatives.

In the Level 1 and 2 Report, a wide range of potentially feasible alternatives for seasonal cooling of water temperatures in the North Fork Feather River was considered, including measures identified by PG&E and others during the CEQA scoping process. During Level 1, the first phase in the screening process, the State Water Board "cast a wide net" to capture all possible water quality measures and then subjected them to the following initial screening criteria:

- **Effectiveness and Reliability**—Is there a reasonable potential that the alternative can effectively and reliably achieve the preliminary temperature target of 20°C (consistent with temperature objectives identified in the Rock Creek–Cresta Relicensing Settlement Agreement (Rock Creek–Cresta Hydroelectric Project, FERC Project No. 1962), or are the effectiveness and reliability of the measure overly speculative?

- **Technological Feasibility and Constructability**—Can the alternative be implemented with currently available technology and construction methods?

- **Logistics**—Can the alternative be implemented considering current legal obligations, public safety needs, right-of-way and access needs, and other real-world logistical constraints?

- **Reasonableness**—Are there clearly superior or more reasonable alternatives available based on the three criteria listed above, or would implementation of the alternative be remote and speculative?

- **Fatal Flaws**—Does the alternative have any fatal flaws?

The set of alternatives remaining after the Level 1 screening represented *a reasonable range of potentially effective and feasible* alternatives that were carried forward to Level 2, the second phase in the screening process.

Level 2 screened out the alternatives (passing Level 1 screening) that, after closer examination, would clearly be ineffective or infeasible or were inferior to the other alternatives. In Level 2, alternatives were analyzed using the best information available. The alternatives were modified or refined based on the analysis, and preliminary engineering designs and cost estimates were developed. In addition to the screening criteria used for Level 1, the following criteria were used to screen alternatives in Level 2:

- **Substantial Further Study**—Is there sufficient information currently available or can it be readily developed in order to evaluate the potential effectiveness and feasibility of the alternative, or is substantial further investigation or study required?

- **Environmental Challenges**—Are there obvious environmental consequences or problems associated with the alternative that would pose a major challenge to overcome?

- **Economic Feasibility**—Can the alternative be implemented at a reasonable cost, including capital, operations and maintenance, and energy replacement costs?

The resulting Level 2 alternatives represented *the set of potentially effective and feasible project alternatives* that were advanced to Level 3, the final phase in the alternative development process.

As described in the Level 3 Report, 16 discrete alternatives were advanced from Level 2, including those both within and outside the UNFFR Project boundary (i.e., the FERC Project No. 2105 boundary). Alternatives outside the boundary included flow-related operational measures for the downstream Rock Creek, Cresta, and Poe reaches and physical modification measures for the Poe reach. In the Level 3 Report, an alternative is labeled as a UNFFR Project-only alternative if all measures (facility or operational modifications) that constitute the alternative are entirely within the UNFFR Project boundary and subject to FERC jurisdiction in the 2105 relicensing process. No detailed screening of alternatives was conducted for reaches outside (downstream) of the UNFFR Project boundary in the Level 3 analysis, and these measures were not carried forward in this EIR.

The outcome of Level 3 was four possible modifications to UNFFR Project facilities or operations that would reduce mean daily water temperatures during the summer period by varying degrees in the North Fork Feather River from downstream of Canyon dam to the Poe reach. These alternatives are:

- install a thermal curtain at the Prattville intake on Lake Almanor,

- install a thermal curtain near the Caribou No. 1 and No. 2 intakes on Butt Valley reservoir,

- modify the low-level outlets at Canyon dam and increase releases from the dam to up to 600 cubic feet per second (cfs), while decreasing releases to the Prattville intake, and/or

- use Caribou powerhouse No. 1 preferentially over Caribou powerhouse No. 2.

These alternatives were further evaluated by the State Water Board, resulting in the elimination from further consideration of the last alternative (preferential use of Caribou powerhouse No. 1), as explained in Section 4.3 of this EIR. In conjunction with the Level 3 effort, Appendix F, *Evaluation of the Biological Performance of Potential Water Quality Measures to Improve Compliance with Temperature Objectives of the Water Quality Control Plan for the Sacramento and San Joaquin Basin*, provided the State Water Board with additional information on the coldwater beneficial uses that were included in the evaluation and development of the alternatives that are carried forward for analysis in this EIR:

- Alternative 1 – Thermal curtains at Prattville intake and Caribou intakes with modifications to Canyon dam outlet structure and associated flows to the Seneca and Belden reaches

- Alternative 2 – Thermal curtains at Prattville intake and Caribou intakes and associated flows to the Seneca and Belden reaches

The two alternatives are described in greater detail below. These two alternatives differ slightly from the combinations of water quality measures described in the Level 3 Report and evaluated in Appendix F in that they do not include excavation of submerged levees around the Prattville intake. The State Water Board believes that the alternatives evaluated in this EIR—PG&E's Proposed Project and Alternatives 1 and 2—provide a reasonable range of alternatives that could be implemented.

4.3 Project Alternatives Eliminated from Further Consideration

During the screening process used to develop the alternatives evaluated in this EIR, several alternatives and combinations of alternatives were evaluated, but were eliminated from further consideration. Detailed discussions of the rationale for excluding the measures that are not evaluated in this EIR are provided in the Level 1 and 2 Report (Stetson Engineers 2007) and the Level 3 Report (Stetson Engineers 2009). Each alternative, or combination of alternatives, was evaluated with respect to the screening criteria identified above, and those alternatives that did not pass the screening criteria were not carried forward for further analysis in this EIR.

At the completion of the Level 3 process, State Water Board staff reviewed the four remaining Level 3 alternatives and initiated an independent evaluation to further refine the alternatives using an electrical system-wide operational analysis, which can be found in Appendix J. The analysis provides estimates of energy losses and the anticipated sources for replacing the lost energy. Of the four alternatives considered, two alternatives were eliminated from further evaluation in this EIR based on the analysis presented in Appendix J. The analysis indicates that alternatives requiring preferential operation of the Caribou No. 1 powerhouse or releases of water greater than 250 cfs from Canyon dam would likely eliminate the UNFFR Project's ability to serve on-peak energy loads. It is estimated that preserving this energy production with equivalent reserve characteristics would require the construction of a gas-fired combustion turbine power plant. The cost of replacing foregone generation with a comparable combustion turbine plant ranges from $101 to $369 million (Appendix J).

As one of the conditions for the relicensing of its Rock Creek–Cresta Hydroelectric Project, PG&E was required to develop and evaluate measures to achieve colder water temperatures in the North Fork Feather River. One of the measures involved installing a submerged hooded

pipeline at the Prattville intake. PG&E determined that the "hooded pipeline" alternative would not be as effective in reducing water temperatures as a thermal curtain at Prattville, and it therefore concluded that the hooded pipeline would not be a reasonable water temperature control measure (Pacific Gas and Electric Company 2005). This alternative was also eliminated from the FERC *Final Environmental Impact Statement for the Upper North Fork Feather River Project* (FERC Final EIS) because FERC made a determination that the required dredging of submerged levees would result in adverse effects and would not be feasible from a cost-benefit standpoint (Federal Energy Regulatory Commission 2005). The State Water Board included the "hooded pipeline" alternative during the Level 1 process also determined that it was not a viable alternative to advance. The hooded pipeline alternative was therefore eliminated from further consideration in this EIR.

During the EIR scoping process, Plumas County recommended consideration of a watershed restoration and improvement alternative that would involve restoration and improvement of the East Branch of the North Fork Feather River (East Branch) in order to achieve water quality (i.e., temperature) objectives in the North Fork Feather River. The concept was that the potential compensatory benefits of improved water quality in the East Branch would offset the reduced water quality in the main branch of the North Fork Feather River. This alternative would not be capable of reducing water temperatures in the Seneca reach of the North Fork Feather River because the Seneca reach is upstream of the confluence with the East Branch; furthermore, it would improve water temperatures only in about one-fourth mile of the Belden reach. In addition, only a minor improvement in water quality could be expected in the North Fork Feather River downstream of the East Branch because the East Branch contributes only a small percentage of flow to the river during the summer months. Accordingly, this alternative was eliminated from further consideration.

4.4 Project Alternatives Evaluated in this EIR

4.4.1 The Proposed UNFFR Project

The Proposed UNFFR Project, as outlined in Section 3.5 of this EIR, consists of the elements of PG&E's application to FERC and the Project 2105 Relicensing Settlement Agreement (2004 Settlement Agreement), Section 18 Conditions, Section 4(e) Conditions, and FERC's Staff Alternative.

4.4.2 State Water Board Proposed Project Alternatives

Based on the results of the operational analysis, the State Water Board selected two alternatives that were most representative of (1) the levels of water temperature reduction that could be achieved, (2) the different types of alternatives that could be implemented, and (3) the types of potential incidental environmental impacts. Other alternatives presented in the Level 3 Report fall within the range of potential temperature benefits and would result in types and ranges of impacts similar to those described for Alternatives 1 and 2 in Chapter 6, Environmental Setting and Environmental Impacts. However, these other alternatives are not evaluated separately in this EIR because of consideration to the controllable factors by PG&E for the UNFFR Project.

The alternatives discussed in this section focus on three activity areas illustrated on Figure 4-1: the Prattville Intake Activity Area; the Canyon Dam Intake[1] Activity Area; and the Caribou Intakes Activity Area.

Alternative 1: Thermal Curtains at Prattville Intake and Caribou Intakes with Modifications to Canyon Dam Outlet Structure and Associated Flows to the Seneca and Belden Reaches

Alternative 1 includes installation of a thermal curtain at the Prattville intake on Lake Almanor, modifications to the Canyon dam outlet structure to increase releases up to 250 cfs, and installation of a thermal curtain at the Caribou intakes on Butt Valley reservoir.

Prattville Intake Thermal Curtain

The Prattville intake thermal curtain would entail installation of a U-shaped thermal curtain around the Prattville intake structure on the west shore of Lake Almanor. The purpose of the thermal curtain would be to create a barrier that prevents the flow of warm surface water into the Prattville intake. Warm water would be retained above the curtain while cool water would be drawn into the intake from the lake bottom through the open area under the curtain. The curtain would not affect operation of the Prattville intake and would not require modifications to other components of the UNFFR Project.

To be effective, the curtain would be designed such that the velocities in the open area under the curtain would be relatively low—in the range of 0.10 to 0.25 feet per second. This objective would be achieved with a synthetic rubber curtain approximately 2,582 feet long by 50 feet deep that would extend about 900 feet offshore from the high shoreline (Figure 4-2). The curtain would be fixed in place. The lower lip of the curtain would be set about 5 feet above the bottom of Lake Almanor at an elevation of 4,455 feet (United States Geological Survey [USGS] datum) and would remain constant along the lake bottom as the lake level fluctuates. This curtain design and installation would ensure that the total open area under the curtain is maintained at 5,280 square feet, the area required to maintain adequate water velocities.

To ensure maximum efficiency under fluctuating lake levels, two galvanized steel bin-type walls would be constructed, and the curtain would be attached to a trolley on the walls to allow it to move up and down as lake levels fluctuate (Figure 4-3). The curtain would fold at the bottom as the lake level decreases. At full-pool elevation, the bin walls would extend out from the shoreline about 300 feet into Lake Almanor and serve as the anchor points on either end of the curtain (Figure 4-4). To prevent the need for excavation to install the bin walls, a bi-axial strength geotechnical grid (such as Tensar S2) would be placed on the existing shoreline and lake bed and filled with 1 foot of local fill material from commercial sources. The bin wall would be constructed above the imported foundation, and additional material would be placed around the base of the bin walls at a 4:1 slope beginning 5 feet from both sides of the bin wall to provide lateral stability. The walls and fill around the base would require approximately 7,000 cubic yards of fill material, which could be acquired from a local source.

Stabilization buoys would be installed on the water surface to hold the curtain in place (Figure 4-5). These buoys would be 6 feet in diameter by 8 feet long and would be located between the curtain and the shore. Cable break buoys would be installed as needed along the cables, extending from the anchors to the curtain, to provide notification of a broken cable.

[1] Canyon dam “intake” and Canyon dam “outlet” are synonymous.

Floatable tanks, spaced at appropriate intervals, would be installed along the top of the curtain to keep it afloat. Warning signs and navigation lights would be included on the stabilization buoys and/or floatable tanks to warn boaters of the curtain's location.

Modify Canyon Dam Low-Level Outlet and Increase Releases

Increased Canyon dam flow releases would require modification of the Canyon dam outlet structure to increase the cool water discharge into the Seneca reach to as much as 250 cfs between mid-June and mid-September. Modification of the outlet structure, which focuses on one of the low-level gates near the bottom of the facility, would ensure that the UNFFR Project has the ability to provide releases of cool water from Lake Almanor as needed to reduce water temperatures in the North Fork Feather River downstream of Canyon dam during the summer months. In addition, the overall capacity of the Canyon dam system (outlet structure and tunnel) must be maintained to allow up to 2,000 cfs to be released in an emergency (Pacific Gas and Electric Company 2002).

The Canyon dam low-level outlet structure consists of a 115-foot-tall vertical tower connected to a 1,350-foot-long horseshoe-shaped tunnel that passes through the dam and discharges into the downstream river channel (Seneca reach). The upstream portion of the outlet tunnel (about 550 feet long) is steel lined, and the remaining portion consists of a 10-foot-diameter concrete conduit. The outlet tower has seven release gates. Gates 6 and 7 are located at the highest elevation at 4,475 feet. There are three low-level outlet gates—Gates 1, 3, and 5—which are located at an elevation of 4,432 feet, or about 72 feet below the maximum lake level elevation of 4,504 feet (USGS datum). The remaining two gates—Gates 2 and 4— are located at an elevation of 4,410 feet. PG&E inspections have revealed that Gates 2 and 4 are buried under 20 feet of sediment and are considered unrepairable and permanently inoperable. Inspection records have also confirmed that the gate-stems, gate connections, and bolts for Gates 1, 3, and 5 have been damaged or are in poor condition as a result of corrosion and long-term hydrostatic loading. Gate 5 was repaired in 2005 and Gate 1 was repaired in 2012 (the gate and gate-stem connection were rehabilitated), and they are currently the only low-level gates that are operable.

Under this alternative, Gate 5 would be modified by connecting a prefabricated steel bulkhead with built-in slide gates to the existing outlet to allow controllable releases of up to 250 cfs (Figure 4-6). The steel bulkhead would be fitted to Gate 5 and would have different-sized valves that could be opened and closed to allow for releases of between 60 cfs and 250 cfs. The bulkhead would be fabricated offsite and then installed using a barge-mounted crane and either diving platforms or a floating walkway. The crane would be used to lower the new bulkhead into the water, and divers would anchor it to the outlet tower below the water surface. The bulkhead would be constructed of plate steel and would be approximately 5 feet wide by 10 feet tall. If a walkway is used instead of diving platforms, it would extend from the dam to the outlet tower and would be temporarily anchored to the tower to provide a work area, which is similar to the procedure used for the earlier rehabilitation of Gate 5.

If the Canyon dam outlet tunnel needs to be temporarily closed during installation of the bulkhead, a pipeline and pump or siphon would be used to maintain existing minimum instream flows (35–60 cfs) in the Seneca reach. The pump or siphon would be used to divert flow from Lake Almanor over the spillway structure through an approximately 1,300-foot-long, 36-inch-diameter pipe, and discharge the flow down the spillway into the Seneca reach. A pump would be used to prime the siphon, and a vacuum pump would be used to prevent gases from accumulating at the high point of the pipeline. In order for the siphon to work properly, the lake

level should be at least 4,500 feet (USGS datum). If the lake level is lower than 4,500 feet, two portable diesel-powered (700-horsepower) pumps would be used instead of a siphon. The duplex pumping system would maintain flows through the pipe for a short period of time, although at a lower rate, if one of the pumps were to fail. PG&E inspection efforts would ensure that any pump failure would be identified and addressed within an eight-hour period. To prevent fish entrainment through the pump or siphon, fish screens of a compatible design and appropriate mesh-size to preclude small fish would be fitted to the pump or siphon. Figure 4-7 shows the proposed layout of the pumps on the shore just above the water level, with suction pipes reaching into the lake.

Increasing Canyon dam releases would require decreasing the Prattville intake flow commensurately to avoid lake level fluctuations or changes from the operating rules agreed to in the 2004 Settlement Agreement. The decrease in flows through the Butt Valley powerhouse would modify the volume and timing of water delivered to Butt Valley reservoir and subsequently made available to the Caribou intakes.

Caribou Intakes Thermal Curtain

A fixed Γ-shaped thermal curtain would be installed near the Caribou No. 1 and No. 2 intakes at the downstream end of Butt Valley reservoir. The purpose of the thermal curtain would be to create a barrier that prevents the flow of warm surface water into either of the intakes. Warm water would be retained above the curtain while cool water would be drawn from the bottom of the reservoir into the intakes through the open area under the curtain. The Γ-shaped curtain would not affect flow to the spillway at Butt Valley dam in the event that the reservoir capacity is exceeded (which has never occurred). The installation and operation of the thermal curtain would not affect operation of the Caribou intakes and would not require modifications to other UNFFR Project operations.

Butt Valley reservoir serves as the afterbay to the Butt Valley powerhouse and the forebay for the Caribou No. 1 and No. 2 powerhouses. The reservoir receives the majority of its inflow from Lake Almanor via the Prattville intake and subsequent discharges from the Butt Valley powerhouse. Some contribution also comes from Butt Creek. In a typical year, the natural stream flow in Butt Creek peaks at about 350 cfs in the spring and decreases to a base flow of about 50-60 cfs in the summer. Water in Butt Valley reservoir is released to the two Caribou powerhouses through two separate intake structures. The Caribou No. 1 intake is located at an invert elevation of 4,077 feet and releases up to 1,100 cfs to the Caribou No. 1 powerhouse. The Caribou No. 1 intake structure is located in a small depression zone. The Caribou No.2 intake is located in a shallow cove area with an invert elevation of 4,103 feet. The Caribou No. 2 intake normally releases up to 1,460 cfs to the Caribou No. 2 powerhouse. Both the Caribou No. 1 and No. 2 powerhouses discharge to Belden forebay on the North Fork Feather River. PG&E prefers to operate the Caribou No. 2 powerhouse because its turbine efficiency is about 15 percent higher than that of the Caribou No. 1 powerhouse.

As stated previously, the Caribou No. 1 intake draws mainly cooler, hypolimnion water while the Caribou No. 2 intake draws mainly warm surface water due to the placement of the intake at a higher elevation in the reservoir. The thermal curtain at the Caribou intakes would allow the Caribou No. 2 intake to draw cooler, hypolimnion water, thereby reducing water temperatures in Belden forebay where this intake discharges. To be effective, the curtain must be designed such that the velocities in the open area under the curtain are relatively low, in the range of 0.10 to 0.25 feet per second. This objective would be achieved with a synthetic rubber curtain approximately 1,960 feet long by 42 feet deep that extends about 980 feet offshore from the

high shoreline (Figure 4-8). The curtain would be fixed in place. The lower lip of the curtain would be set about 10 feet above the reservoir bottom. The lower lip of the curtain would remain constant along the reservoir bottom as the Butt Valley reservoir level fluctuates, which occurs on a daily basis during the summer and fall. This setting would ensure that the total open area under the curtain is maintained at 5,930 square feet, which is the area required to maintain adequate velocities.

Galvanized steel bin-type walls would extend about 200 feet offshore from the shoreline and Butt Valley dam and connect to the curtain endpoints. Similar to the Prattville curtain, the bin walls would be constructed on a foundation of imported material and would require about 1,400 cubic yards of backfill material (see Figures 4-3, 4-4, 4-5). The walls would be constructed at the two ends of the curtain from the high water line to about 30 feet beyond the low water level to reduce localized damage to the curtain from water level fluctuations. Some modifications to Butt Valley dam would be needed to install the bin wall, but installation of anchors or other structures would not affect the structural integrity of the dam. A trolley system at the end of the bin walls would allow the top of the curtain to slide up and down as the water surface fluctuates, preventing the curtain from being exposed or buried in the sand. This design would eliminate the periodic maintenance that might be necessary to free the curtain if it became buried by sand and would discourage the vandalism that could occur if it were exposed. Buoys, floatable tanks, and the geotechnical grid would be similar to those described for the Prattville intake thermal curtain. The construction process would also be similar; however, the Caribou intakes thermal curtain would require construction of a new road along the west shore of Butt Valley reservoir to allow access between the dam and bin wall. The road would be approximately 30 feet wide and 1,200 feet long (Figure 4-8).

PG&E investigated measures to minimize Butt Valley reservoir warming with the Prattville thermal curtain in place. PG&E considered two potential thermal curtain options in Butt Valley reservoir: (1) two thermal curtains, one installed up-reservoir near the Butt Valley powerhouse discharge and another installed down-reservoir near the Caribou No. 1 and No. 2 intakes; and (2) one thermal curtain installed at the up-reservoir location only. The function of the up-reservoir location would be to force the cooler discharge from the Butt Valley powerhouse to plunge to the bottom of Butt Valley reservoir. However, a special test in 2006 (“2006 special test”) demonstrated that cool water naturally plunges to the bottom, making the up-reservoir curtain unnecessary. During the 2006 special test, a submerged channel that initiates upstream of the boat ramp was identified along the west side of the Butt Valley reservoir. Water temperature stratification measurements indicated that the cool water discharge from the Butt Valley powerhouse plunged and moved primarily through this channel with little entrainment or mixing with warm surface water as it moved toward the Caribou intakes. Figure 4-9 illustrates elevation views of the proposed Caribou intakes thermal curtain.

Alternative 2: Thermal Curtains at Prattville Intake and Caribou Intakes and Associated Flows to the Seneca and Belden Reaches

Alternative 2 consists of installation of thermal curtains at the Prattville intake on Lake Almanor and at the Caribou intakes on Butt Valley reservoir as described for Alternative 1. The temperature benefits under Alternative 2 would not be as great as under Alternative 1.

Prattville Intake Thermal Curtain

As described for Alternative 1, a thermal curtain would be installed at the Prattville intake to provide for increased delivery of cool water to Butt Valley reservoir.

Caribou Intakes Thermal Curtain

As described for Alternative 1, a thermal curtain would be installed at the Caribou intakes to provide for increased delivery of cool water to Belden forebay and the Belden reach of the North Fork Feather River.

Canyon Dam Releases Up to 250 cfs Independent of Thermal Curtain

While not separately evaluated as an alternative, increased releases from Canyon dam of up to 250 cfs between June 15 and September 15 could be implemented to reduce temperatures in the North Fork Feather River. The impacts of Canyon dam releases independent of the thermal curtains would be a subset of those identified for Alternative 1 (i.e., only impacts related to modification of the Canyon dam outlet and increased flows, not impacts related to construction and operation of the thermal curtains). While the water temperature benefits of this sub-alternative would not be as great as those for Alternative 1, there would be improvements to temperature in the North Fork Feather River, as seen in the modeling results for the Seneca reach.

Features Common to Both Alternatives 1 and 2

Alternatives 1 and 2 would include the following common features:

- the Proposed UNFFR Project except for these modifications:
  - flow modifications for the Seneca reach proposed by the State Water Board as described below,
  - flow modifications for the Belden reach proposed by the State Water Board as described below,
  - removal of the provision in the 2004 Settlement Agreement that would require pulse flows in normal and wet water years,
- construction practices and methods as described below, and
- transportation routes as described below.

Changes in 2004 Settlement Agreement Flows

For both alternatives, State Water Board staff proposes to modify the flow schedules put forth in the 2004 Settlement Agreement. The purpose of the proposed modifications is to address the potential impacts of the 2004 Settlement Agreement flows on temperature. As stated in Chapter 1, Introduction, in 2006 the North Fork Feather River upstream of Lake Oroville was listed by the United States Environmental Protection Agency (USEPA) under section 303(d) of the Clean Water Act (CWA) as water quality limited for temperature. The listing was based on the State Water Board's determination that elevated water temperatures are impairing the designated beneficial use of cold freshwater habitat. The State Water Board cited hydromodification and flow regulation as potential sources of the impairment.

Alternative Seneca Reach Flows

State Water Board staff adjusted the flows proposed for the Seneca reach to provide greater flows later in the summer, when temperatures can rise. The adjustments would be water

neutral for a given water year type. In other words, on an annual basis, no additional water would be required for these adjustments; instead, the adjustments would move water from the winter and spring months to the late summer months.

State Water Board staff developed the flow schedule in Table 4-1 to protect the beneficial uses of the Seneca reach. Differences in minimum flow are in the January to August period during critically dry years; the February to August period during dry years; the March to August period during normal years; and the months of March, April, July, and August during wet years. (These differences in minimum flow are shown in bold font in Table 4-1.) The adjustments in flows increase the minimum flow during June (critically dry), July, and August, and decrease the minimum flow during January through June (dry and normal years). The difference in the alternative flows from those in the 2004 Settlement Agreement range from 5 to 20 cfs from those in the 2004 Settlement Agreement, depending on the month and water year type. Overall the changes shown in Table 4-1 are water neutral on an annual basis.

Table 4-1. Alternative Seneca Reach Minimum Flows – in cfs

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Critically Dry	**70**	**70**	**80**	**80**	**85**	**85**	**85**	**80**	60	60	60	70
Dry	90	**90**	**100**	**100**	**100**	**100**	**100**	**100**	60	60	60	75
Normal	90	100	**110**	**110**	**120**	**120**	**110**	**100**	60	60	60	75
Wet	90	100	**110**	**130**	150	150	**110**	**100**	60	60	60	75

Note: **Bold** font indicates change in minimum flow from the 2004 Settlement Agreement.

Alternative Belden Reach Flows

Under the 2004 Settlement Agreement, in certain months of certain water year types, the flows proposed for the Belden reach are lower than the flows required by the existing license. In both of the alternatives evaluated in this EIR, State Water Board staff adjusted the flows to provide higher flows in the summer months when water temperatures generally increase. These adjustments would all require the release of more water. In an effort to mitigate impacts to water supply on an annual basis, State Water Board staff excluded the provision in the 2004 Settlement Agreement that would have required pulse flows in normal and wet water years. This adjustment to the 2004 Settlement Agreement flow schedules would be water neutral.

State Water Board staff developed the following flow schedule (Table 4-2) to protect the beneficial uses of Belden reach. Differences in the minimum flows from those outlined in the 2004 Settlement Agreement are noted in bold. Under the alternatives, increased minimum flows would occur in June through January during critically dry years, July through December during dry years, and March, October, November, and December during normal and wet years. The difference in these alternative flows from those in the 2004 Settlement Agreement range from 5 to 60 cfs from those in the 2004 Settlement Agreement, depending on the month and water year type.

Table 4-2. Alternative Belden Reach Minimum Flows – in cfs

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Critically Dry	**110**	130	170	180	185	**140**	**140**	**140**	**140**	**110**	**110**	**110**
Dry	135	140	175	195	195	160	**140**	**140**	**140**	**120**	**120**	**120**
Normal	140	140	**205**	225	225	225	175	140	140	**140**	**140**	**140**
Wet	140	140	**210**	235	235	225	175	140	140	**140**	**140**	**140**

Note: **Bold** font indicates change in minimum flow from the 2004 Settlement Agreement.

Construction Practices and Methods Associated with Alternatives 1 and 2

Standard construction practices and environmental protection measures would be implemented during all construction activities. General measures are described below; resource-specific measures are identified in the appropriate resource sections in Chapter 6, Environmental Setting and Environmental Impacts.

Schedule

- Installation of the Prattville intake thermal curtain would require approximately two construction seasons and would take place while Lake Almanor is drawn down (between September and April each year).
- Modifications to the Canyon dam outlet would require approximately 3 months and could take place at any time of year.
- Installation of the Caribou intakes thermal curtain would require approximately two construction seasons and would take place while Butt Valley reservoir is drawn down (between May and October each year).

Ground Disturbance

- Staging and construction areas associated with the Prattville intake thermal curtain would require approximately 15 acres of land above Lake Almanor and 45 acres of shoreline and lake surface/lake bed in the immediate vicinity of the Prattville intake.
- Staging and construction areas associated with the modifications to the Canyon dam outlet would require approximately 30 acres of land above Lake Almanor and 50 acres of shoreline and lake surface/lake bed in the immediate vicinity of Canyon dam.
- Staging and construction areas associated with the Caribou intakes thermal curtain would require approximately 40 acres of land above Butt Valley reservoir and five acres of shoreline and lake surface/lake bed in the immediate vicinity of the Caribou intakes and Butt Valley dam.
- All construction activities would occur on lands owned by PG&E.
- Where available, existing roads and previously disturbed areas would be used to access the areas used for staging and construction. A new road would be constructed from Butt Valley dam to the proposed location for the bin wall on the west shore of Butt Valley reservoir.
- Vegetation removal would occur only as necessary. It would be scheduled during the non-nesting season for avian species (after August 1 and before March 1).
- All areas disturbed by staging or construction would be restored to pre-disturbance conditions and revegetated where appropriate.

In-Water Construction

- Construction equipment would remain on the shore or on the dams and would avoid traveling in the water to the extent feasible.

- Where in-water construction is necessary, divers would be used to the extent feasible.

- Barges would be used on the water for staging and divers. A crane on a barge at Canyon dam would be required to drop the bulkhead into the water for anchoring by divers on the existing outlet.

- Construction activities at the Canyon dam outlet may require access restrictions to the area and could require temporary closure of the nearby boat ramp. If temporary closure of the Canyon dam boat ramp is necessary, PG&E would be required to prepare a boat launch closure plan intended to minimize impacts on the boating public. The plan may include measures to limit ramp closure during high public use periods and preparation of a public information program to inform boaters of alternate launch facilities.

Invasive Species Management

PG&E would develop and implement a control plan to prevent the introduction of zebra and quagga mussels, invasive plants, and other invasive species to water bodies within the UNFFR Project boundary. The control plan would cover all workers, vehicles, watercraft, and equipment (both land and aquatic) that would come into contact with Lake Almanor, Butt Valley reservoir, or other water bodies and associated riparian areas. Control plan activities could include, but would not be limited to, the following:

- Pre-inspection and cleaning of all construction vehicles, watercraft, and equipment before being shipped to UNFFR Project areas;

- Re-inspection of all construction vehicles, watercraft, and equipment on arrival at UNFFR Project areas; and

- Inspection and cleaning of all personnel before work is conducted in UNFFR Project areas.

All inspections would be conducted by trained personnel and would include both visual and hands-on inspection methods of all vehicle and equipment surfaces, up to and including internal surfaces that have contacted raw water.

Approved cleaning methods would include a combination of the following:

- Pre-cleaning – Draining, brushing, vacuuming, high-pressure water treatment, thermal treatment; and

- Cleaning – Freezing, desiccation, thermal treatment, high-pressure water treatment, chemical treatment.

On-site cleaning would require capture, treatment, and/or disposal of any and all water needed to conduct cleaning activities.

Traffic Control/Detour

- PG&E could be required to conduct short-term traffic control in conformance with the requirements established by the appropriate jurisdictional authority for mobilization and demobilization of heavy equipment or wide-load vehicles, including seasonal or other

limitations or restrictions, payment of excess size and weight fees, and posting of bonds conditioned upon repair of damage.

- Traffic control measures would be implemented along haul routes and in the vicinity of the staging and construction areas to alert travelers to any lane closures, temporary detours, slow-moving and exiting truck traffic, etc.

Air Pollution and Dust Control

- PG&E could be required to comply with applicable air pollution control rules, regulations, ordinances, and statutes. Measures that may be implemented include limiting dust by watering disturbed areas used by equipment and vehicles and minimizing emissions.

Water Pollution Prevention

- PG&E would be required to comply with applicable water quality standards, including implementation of water pollution control measures and the use of extreme care to prevent construction dirt, debris, stormwater runoff, and miscellaneous byproducts from entering any water body.

- PG&E would be required to exercise every reasonable precaution and best management practices to protect the North Fork Feather River and associated reservoirs from being polluted by fuels, oils, bitumen, calcium chloride, and other harmful materials and would be required to conduct and schedule operations to avoid or minimize muddying and silting of the water.

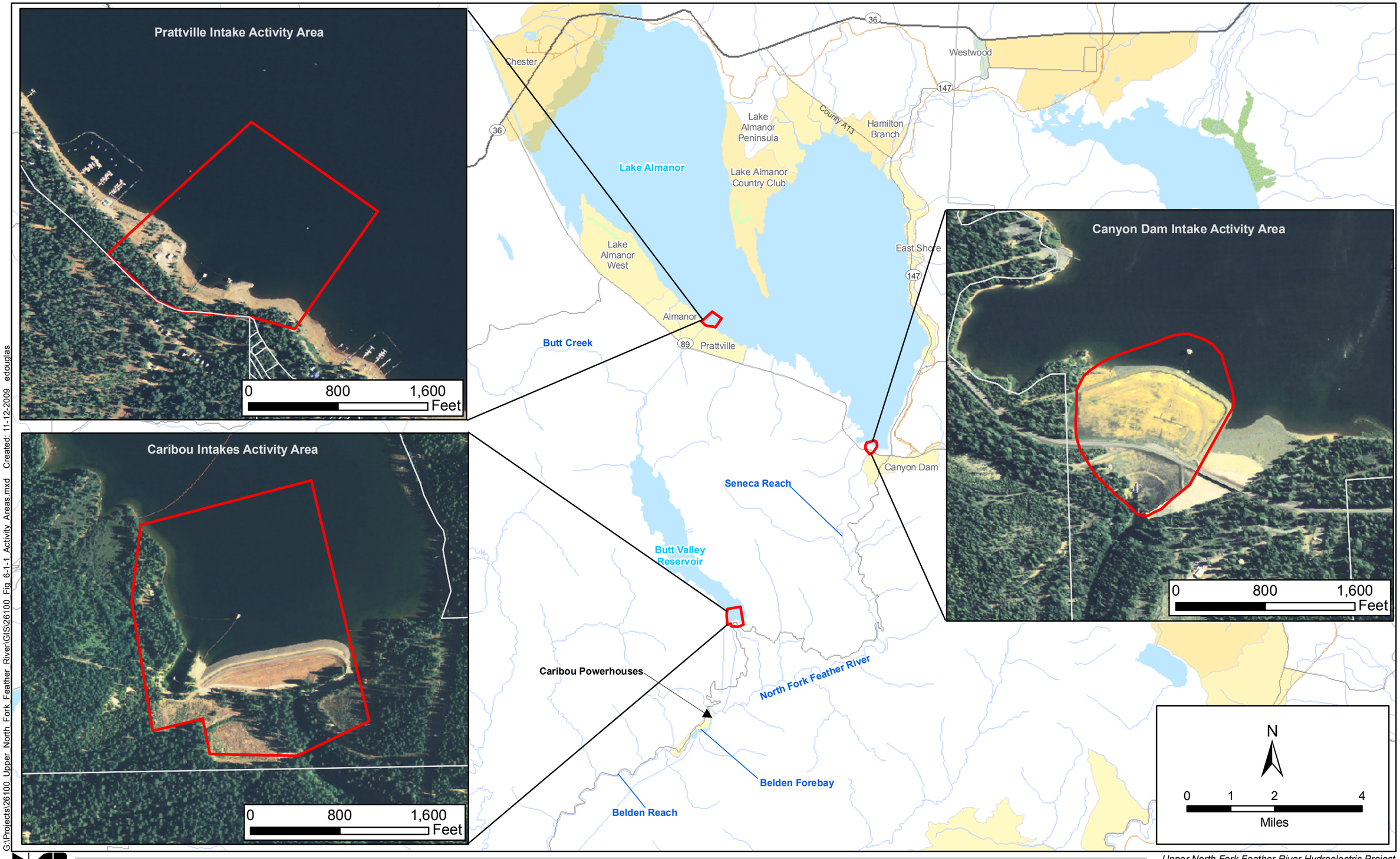
- Construction equipment would be inspected daily and maintained to ensure that fuel or lubricants do not contaminate the North Fork Feather River or associated reservoirs. Spill containment kits would be onsite at all times.

- Before starting any construction activities, PG&E would be required to prepare a plan to effectively control water pollution during construction. The plan would provide details on all water pollution control measures to be implemented during construction. No construction activities would occur until the plan has been approved by the State Water Board.

- Oily or greasy substances originating from PG&E's operations would not be allowed to enter, or be placed where they will later enter, any water body.

Transportation Routes

State Routes 36, 70, 89, and 147 would serve as the primary transportation corridors used to transport construction materials to the activity areas illustrated on Figure 4-1. In addition, local roads managed by Lassen and Plumas counties, the United States Department of Agriculture, Forest Service, and PG&E would be used for access during construction. With the exception of a short section of road necessary to access the Caribou Intakes activity area for construction and maintenance of the Caribou intakes thermal curtain, the existing road system would be used. Some construction activities may require temporary vehicular access within the activity areas below the full-pool elevation of Lake Almanor and Butt Valley reservoir when lake levels are down.



G:\Projects\26100 Upper North Fork Feather River\GIS\26100 Fig. 6-1-1 Activity Areas.mxd Created: 11-12-2009 edouglas

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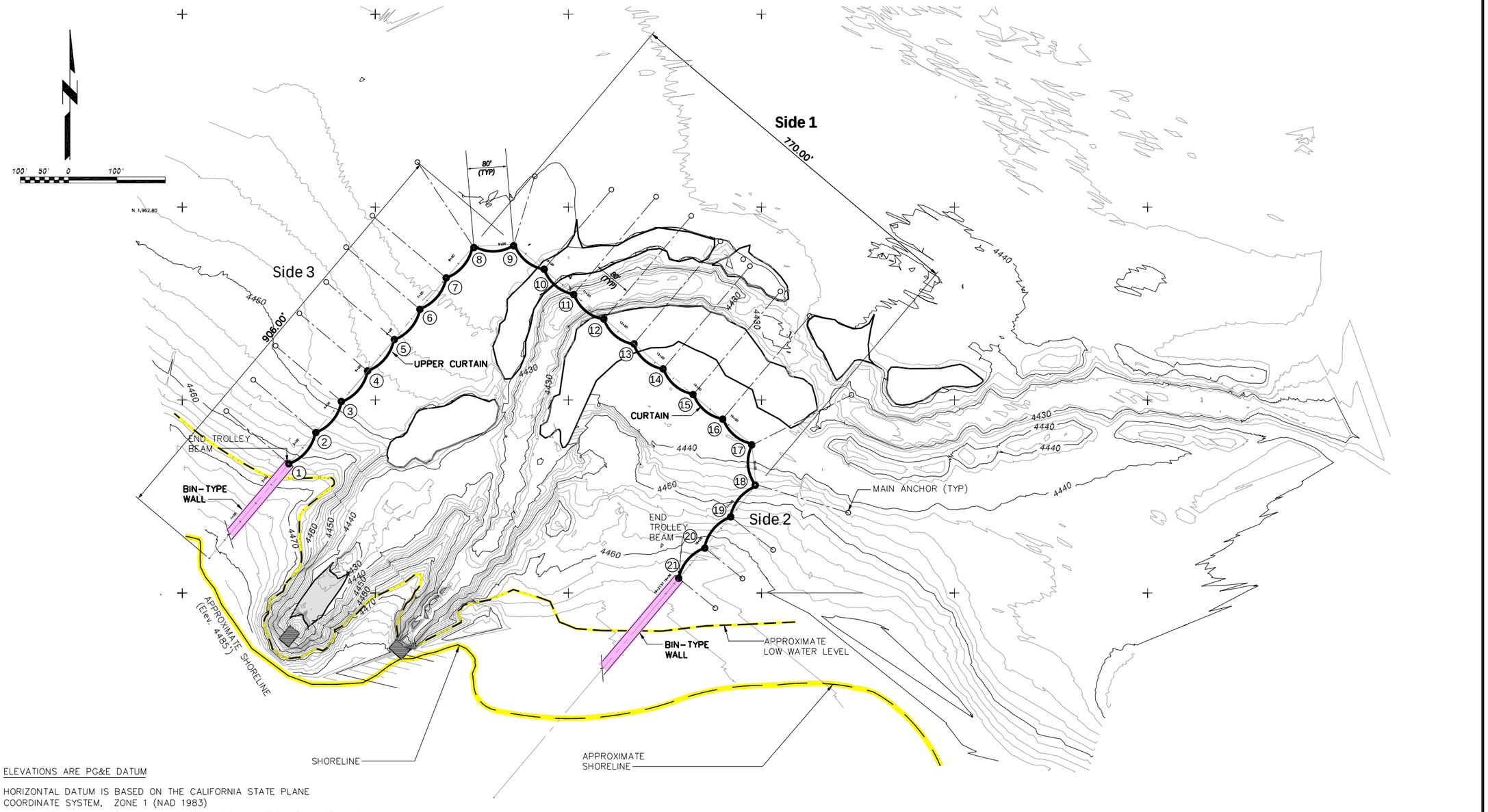
Upper North Fork Feather River Hydroelectric Project

Figure 4-1
Activity Areas



ELEVATIONS ARE PG&E DATUM

HORIZONTAL DATUM IS BASED ON THE CALIFORNIA STATE PLANE COORDINATE SYSTEM, ZONE 1 (NAD 1983)

Source: Black & Veatch, 2004: Prattville Intake modifications, Phase 3.

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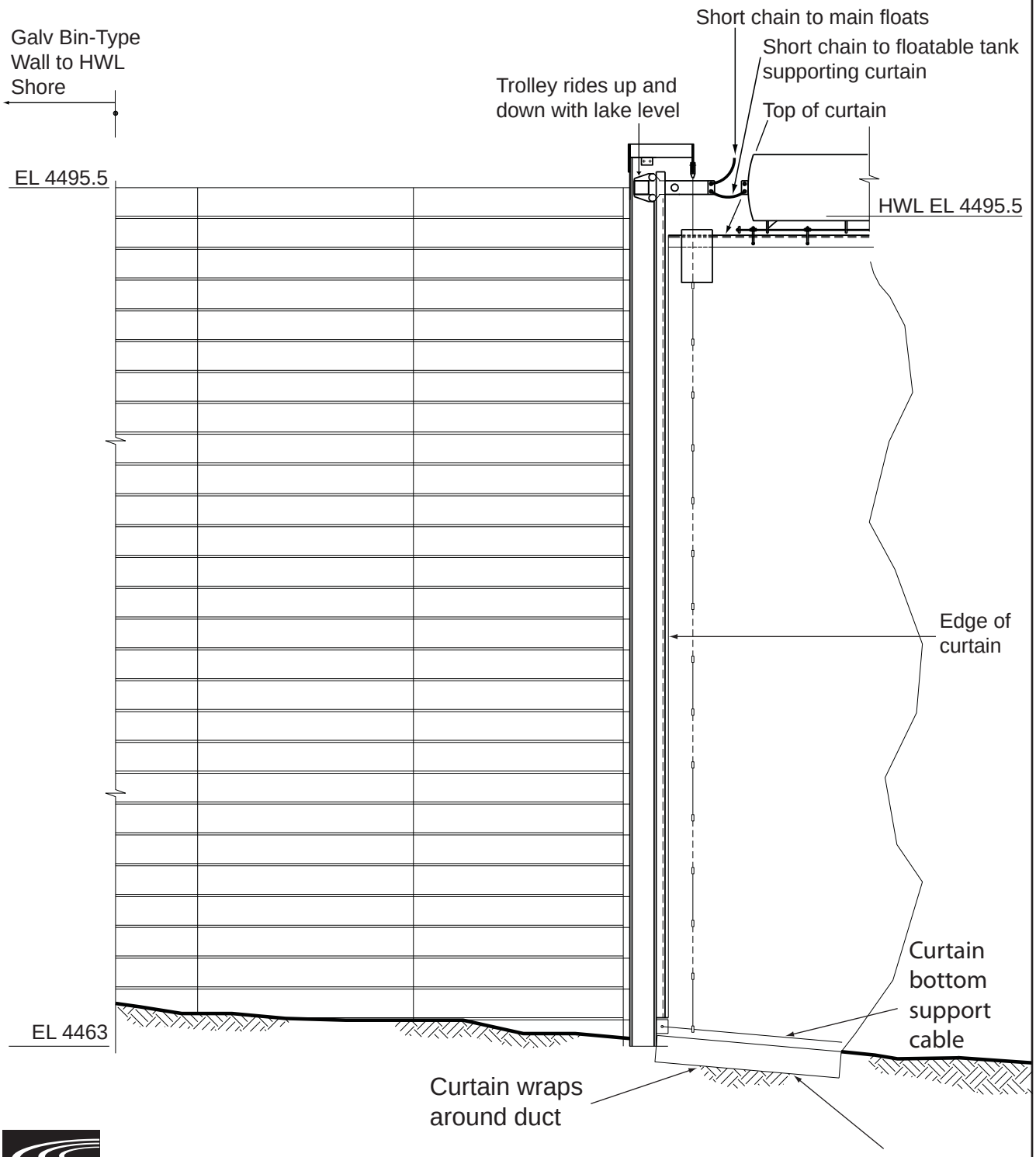
Figure 4-2
Plan View of Prattville Intake Thermal Curtain



Elevation Data: PG&E
Source: Black and Veatch, 2004: Prattville Intake Modifications, Phase 3

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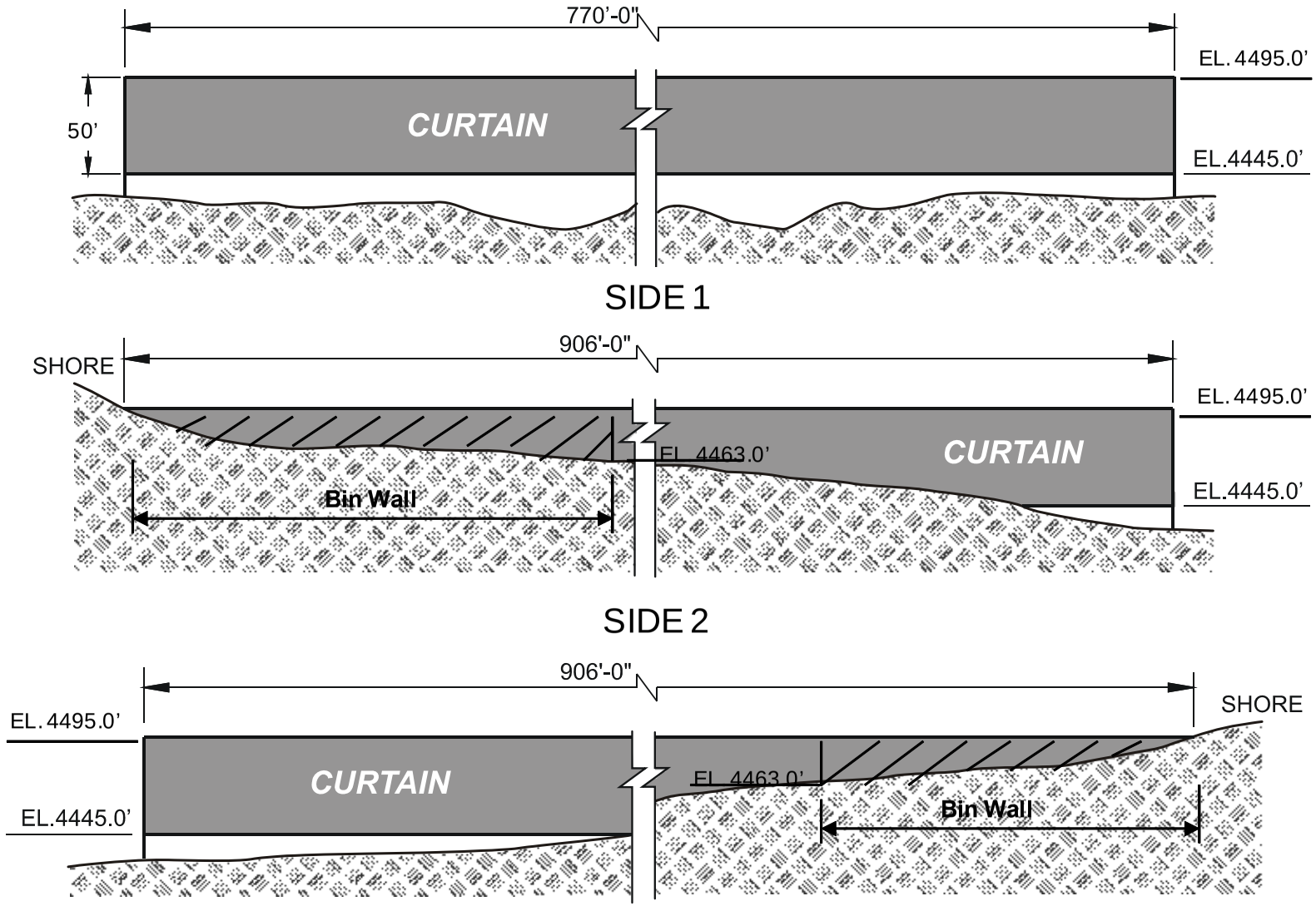
Figure 4-3
Thermal Curtain Trolley Detail



Note: Bin walls extend from the shoreline to where the bottom of the lake is at el. 4463 ft (PG&E datum)

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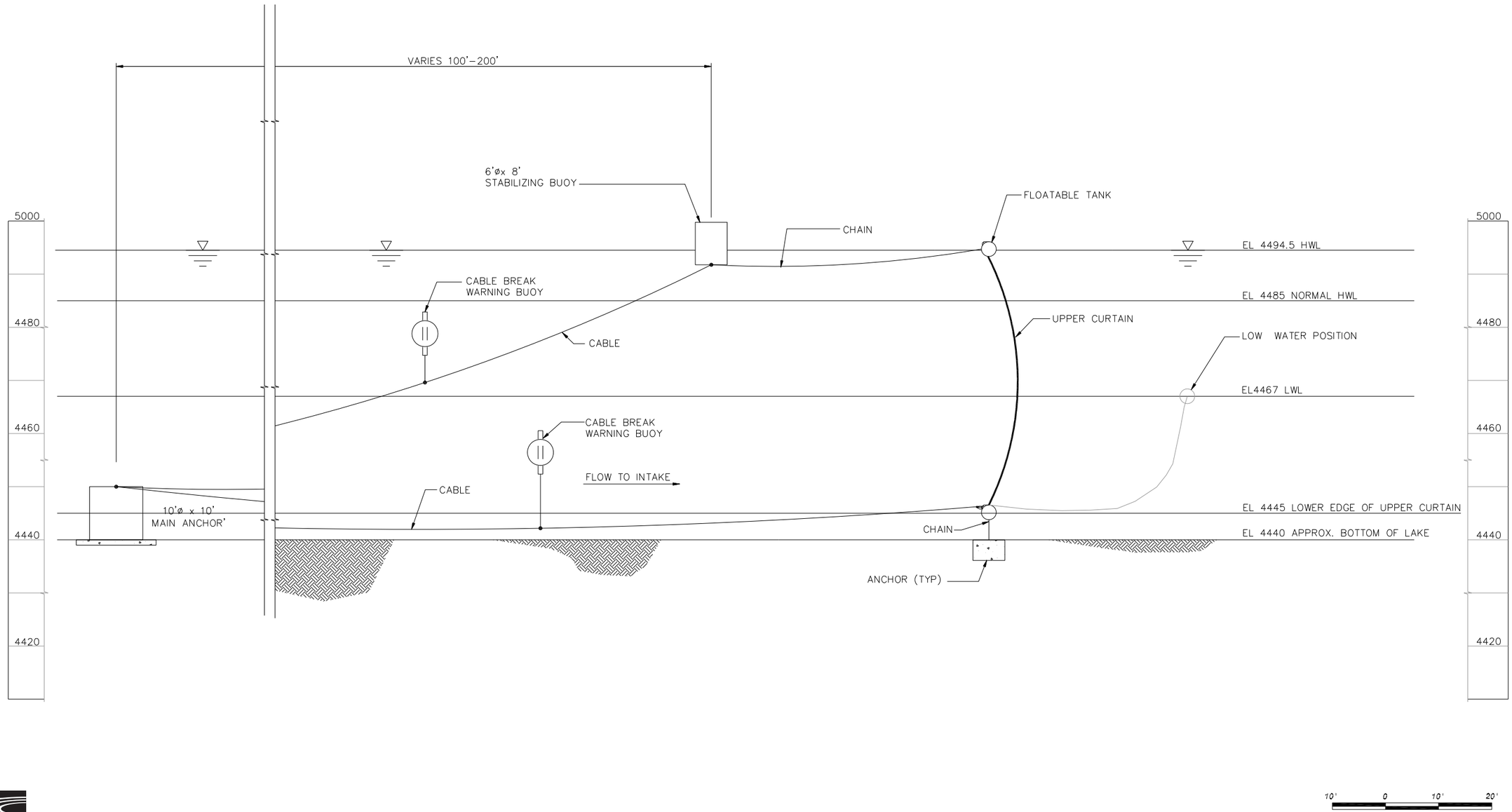
Figure 4-4
Elevation View of Prattville Intake Thermal Curtain



Elevation datum: PG&E datum

Source: Black & Veatch, 2004: Prattville Intake modifications, Phase 3.

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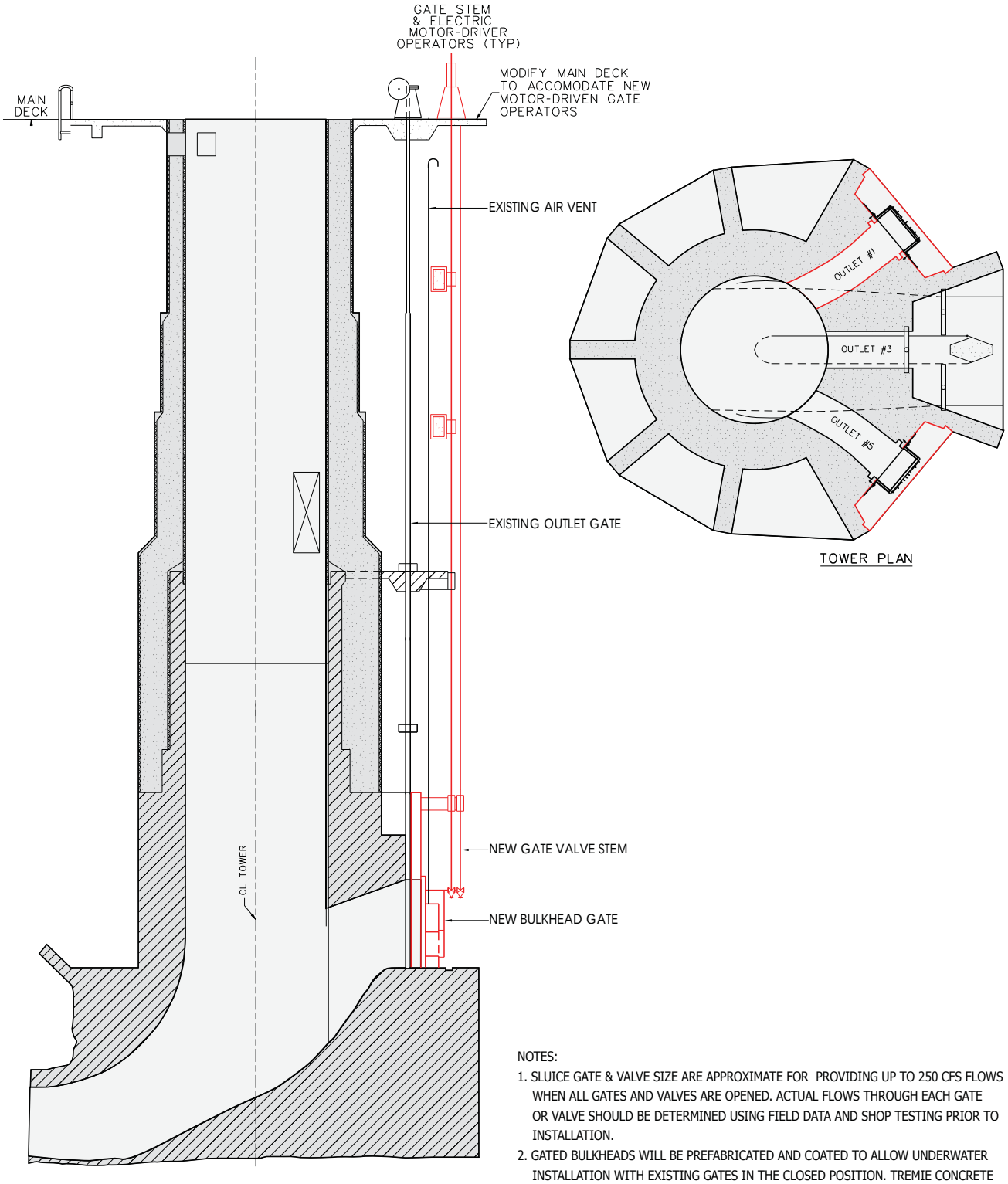
Figure 4-5
Profile View of Prattville Intake Thermal Curtain



NOTES:

1. SLUICE GATE & VALVE SIZE ARE APPROXIMATE FOR PROVIDING UP TO 250 CFS FLOWS WHEN ALL GATES AND VALVES ARE OPENED. ACTUAL FLOWS THROUGH EACH GATE OR VALVE SHOULD BE DETERMINED USING FIELD DATA AND SHOP TESTING PRIOR TO INSTALLATION.
2. GATED BULKHEADS WILL BE PREFABRICATED AND COATED TO ALLOW UNDERWATER INSTALLATION WITH EXISTING GATES IN THE CLOSED POSITION. TREMIE CONCRETE (NOT SHOWN) WILL BE PLACED ON THE SIDES OF EACH BULKHEAD.
3. GATE #5 WILL BE FURTHER MODIFIED TO ALLOW UP TO 250 CFS RELEASE.
4. TRASHRACK MODIFICATIONS WILL BE REQUIRED TO PREVENT DEBRIS CLOGGING THE VALVES OR GATES.

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Figure 4-6
Canyon Dam Outlet Structure Modifications

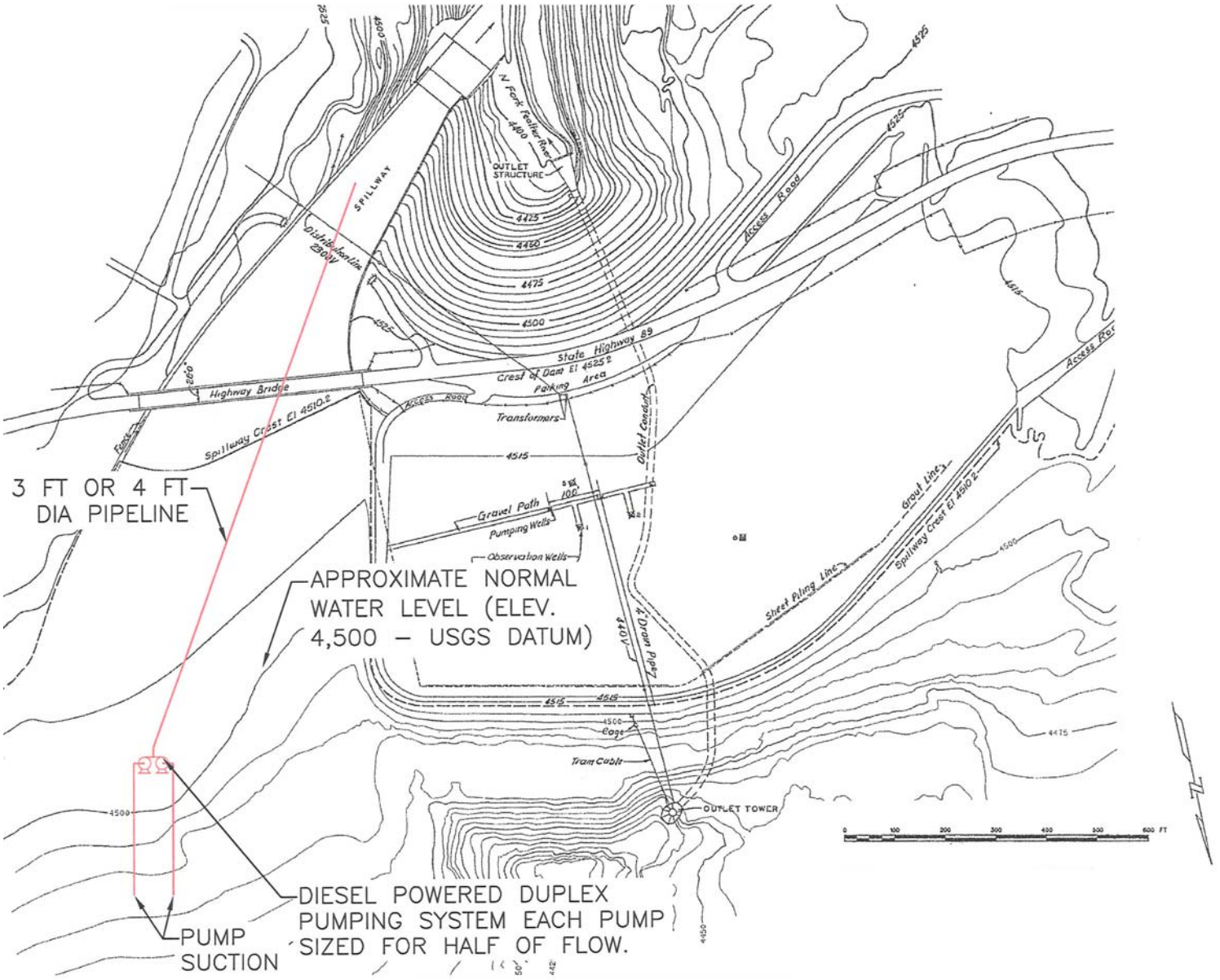
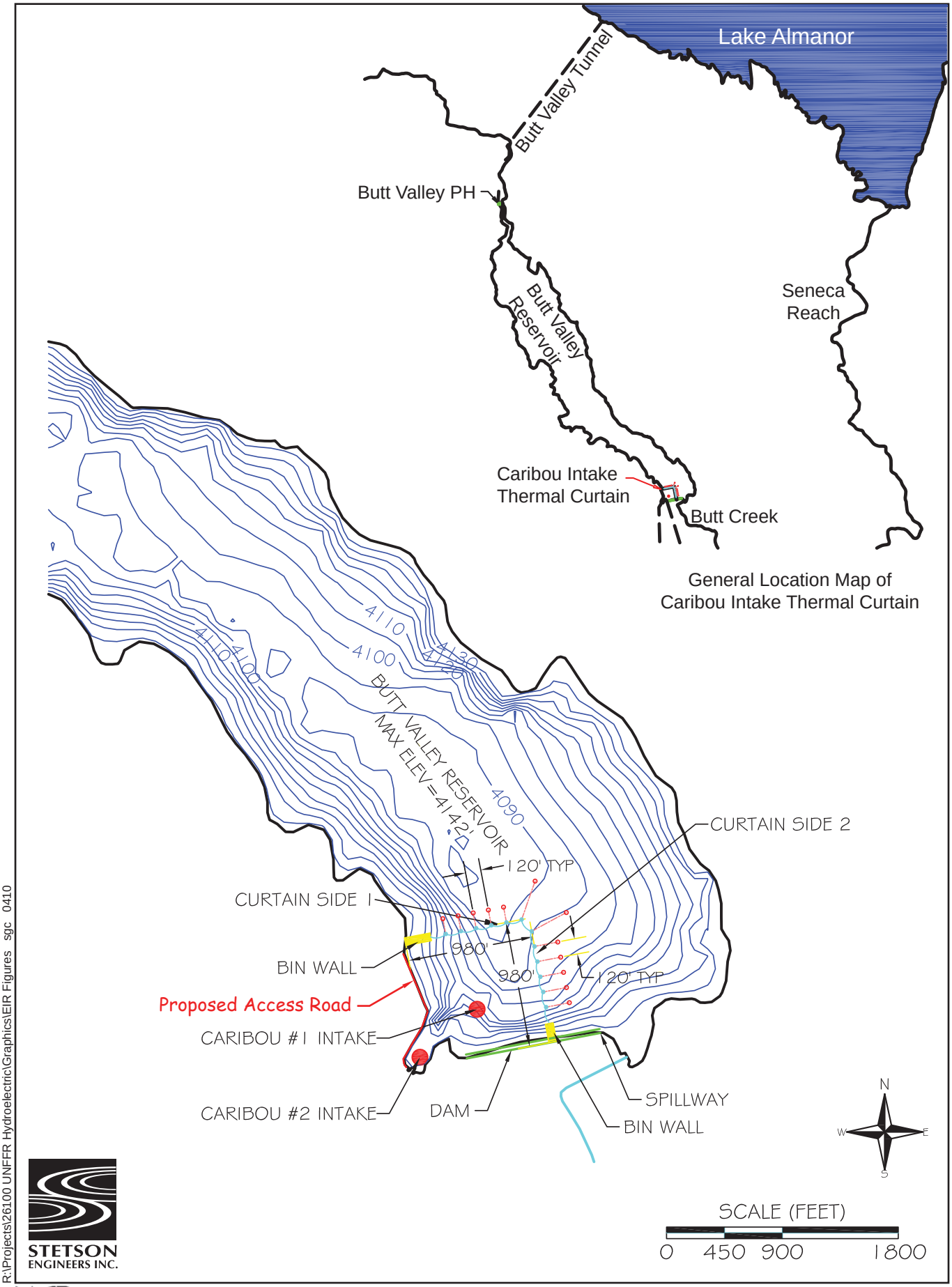


Figure 4-7
Canyon Dam Bypass Pipeline



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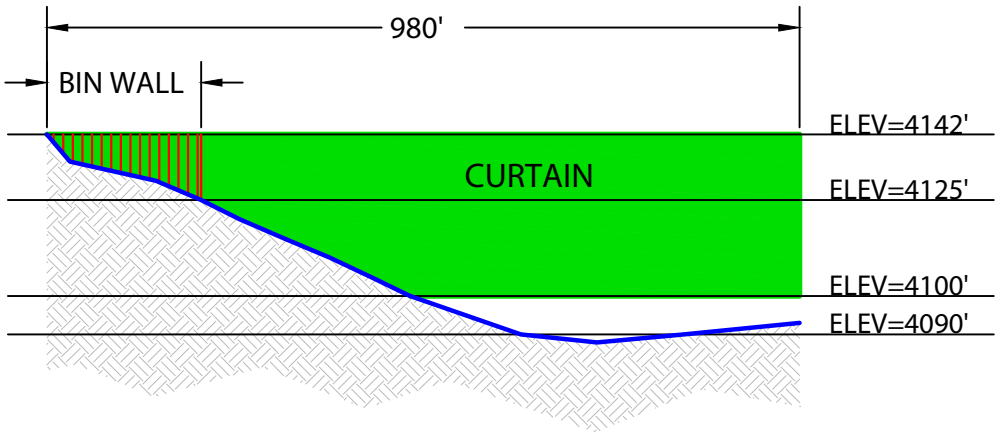
Upper North Fork Feather River Hydroelectric Project

Figure 4-8
Plan View of Caribou Intakes Thermal Curtain



SIDE 1

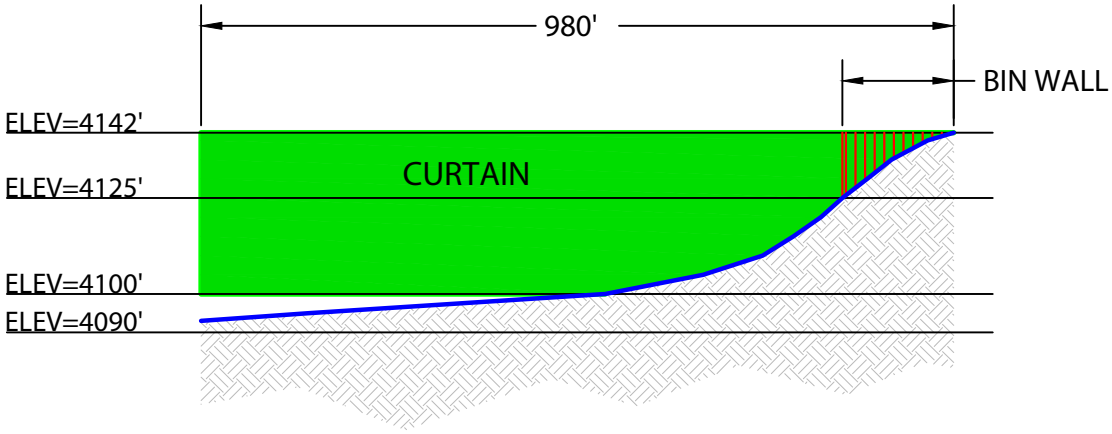


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Figure 4-9
Elevation View of Caribou Intakes Thermal Curtain