6.0 DEVELOPMENTAL AND ECONOMIC ANALYSIS

The FERC Guidelines (FERC 2001) require applicants to include a "developmental analysis" in their PDEAs to evaluate the economic benefits of the Proposed Action, the estimated costs of the various alternatives, and PM&E measures and their effect on project economics. This analysis typically evaluates economic benefits and costs of PM&E measures while focusing on power-related impacts and economic considerations. For each alternative considered, the analysis addresses the power benefits and costs derived within the context of DWR continuing to meet its operational requirements, including its water supply, flood management, and environmental commitments.

This chapter analyzes the use of available water resources of the Oroville Facilities to generate hydroelectric power after the other commitments noted above are met. It also provides estimates of the economic benefits of the Oroville Facilities and of the costs for proposed PM&E measures included in the alternatives, and quantifies the effects of these measures on Oroville Facilities operations.

Chapter 7.0, Comprehensive Development Analysis and Recommendations, takes a comprehensive look at how these resources, environmental effects, and costs could best be balanced, based on project goals and constraints.

Under the Proposed Action, DWR does not propose any modifications to the Oroville Facilities power generation plants under the new license. However, it does propose to continue to operate and maintain the Oroville Facilities for electric power generation under the terms and conditions of any new license issued by FERC. Of the Alternatives evaluated in the PDEA, only Alternative 2 includes measures that would negatively affect project operations and therefore would affect the amounts and associated costs of future power generation. The PM&E measures included in the Proposed Action and Alternative 2 would also adversely affect the cost of future water deliveries to the SWP contractors.

6.1 POWER AND ECONOMIC BENEFITS OF THE PROJECT

6.1.1 Background

6.1.1.1 SWP Water and Power Requirements

As described in Chapter 2.0, Purpose of Action and Need for Power, the Oroville Facilities are a part of the SWP, and their continued operation is vital to ensuring efficient and cost-effective water supply deliveries throughout California. The Oroville Facilities generate hydroelectric energy to meet a significant portion of the SWP's pumping load (the amount of power needed to operate pumping stations and other water conveyance facilities). Project facilities also provide other important ancillary electrical system benefits such as voltage support to California's interconnected electrical system, and thus benefit power customers throughout California. Chapter 2.0 and Section 3.1.1 of Chapter 3 describe the storage facilities, hydroelectric power plants, pumping-generating plants, and other infrastructure that comprises the Oroville

Facilities. Chapter 2.0 also describes the role of the Oroville Facilities as part of the SWP in the production of energy to supply water pumping loads as well as ancillary services required by the interconnected electrical system.

6.1.1.2 Oroville Water Supply

Oroville Facilities operations are planned and scheduled in concert with operations of other SWP and U.S. Bureau of Reclamation CVP water storage, pumping, and conveyance facilities. The economic benefits of the Oroville Facilities can only be understood within the context of their overall value as a component of the SWP. Water is generally not released from Lake Oroville for power generation purposes; except during times of pump-back operation, which are limited, power is generated only when water is released for other purposes, including water supply, flood management, meeting instream flow requirements, and/or water quality control in the Sacramento–San Joaquin Delta (Delta). Water supply costs will increase if structural or operational changes to the Oroville Facilities affecting future water deliveries are made as part of the FERC relicensing process, or if implementation of a PM&E measure reduces the amount of power generated at project facilities, thus requiring DWR to replace the lost power with more expensive and less reliable replacement sources.

In evaluating project operations, existing and future operations needed to meet water supply, flood management, and environmental commitments were simulated with the use of the CALSIM II and HYDROPS™ models (see Appendix C). Current operations were modeled using 2001 level of development modeling assumptions; future operations under the No-Action Alternative, Proposed Action, and Alternative 2 were modeled using 2020 level of development assumptions.

6.1.1.3 Oroville Power Supply

As noted above, the Oroville Facilities are a critical aspect of the SWP water storage and conveyance system. Overall, the SWP uses more energy than it produces. Thus, any decrease in power generation at the Oroville Facilities would need to be offset by increased purchases of energy from other resources and/or by construction of new power generating facilities. In 2000, the SWP required 9,190,000 MWh of generation to meet water pumping requirements and station service requirements. In the same year, the Oroville Facilities generated 2,760,000 MWh, roughly one-third of the system's total requirements.

As noted above, Oroville Facilities power operations are heavily constrained, and continued operation and maintenance of the power features of the Oroville Facilities must be consistent with DWR's many operational requirements. Moreover, power is generated at the Oroville Facilities when water is released pursuant to the SWP operating criteria, which include maintaining adequate flood control storage, Feather River flow and temperature protocols established by regulatory agencies, statutory Delta water quality requirements, Feather River Service Area (FRSA) entitlements, and export to the SWP contractors.

Potential future power generation improvements were studied under Study Plan Report SP-E3, *Evaluation of the Potential for Additional Hydropower Generation at Oroville,* but it was concluded that none of the alternatives studied had sufficient economic viability under DWR's evaluation guidelines to warrant development at any time in the near future. Therefore, no new generation facilities are being proposed as part of DWR's relicensing efforts.

Table 6.1-1 provides a comparison of average annual net power generation between the alternatives analyzed in this PDEA.

Table 6.1-1. Capacity and average annual gross power generation at the Oroville Facilities.

Alternative	Licensed Capacity (MW)	Average Gross Generation (MWh)	Foregone Capacity (MW)	Gross Foregone Generation (MWh)
2001 Existing Conditions	762	2,712,000	N/A	N/A
No-Action Alternative	762	2,708,000	0	0
Proposed Action	762	2,708,000	0	0
Alternative 2	762	2,697,000	0	11,000

Source: DWR CALSIM II modeling, 1922-1993

Based on the results of DWR's operations modeling, it is estimated that the long-term average annual generation from the three existing Oroville Facilities power plants under existing 2001 level of development is roughly 2,712,000 MWh per year. Average pump-back energy requirements are approximately 378,000 MWh per year, resulting in a net annual average generation of 2,334,000 MWh per year under 2001 Existing Conditions.

Using the 2020 level of development assumptions used to model and evaluate future conditions under the No-Action Alternative, these values would be reduced to 2,708,000 MWh, 389,900 MWh, and 2,318,100 MWh, respectively.

Under the 2020 level of development assumptions used to model and evaluate future conditions with the Proposed Action, and once these alternative PM&E measures are implemented, these values would be: 2,708,000 MWh, 389,900 MWh, and 2,318,100 MWh, respectively. The Proposed Action would not reduce power generation because the PM&E measures do not affect project operations.

Under the 2020 level of development assumptions used to model and evaluate Alternative 2, and once these alternative PM&E measures are implemented, these values would be 2,697,000 MWh, 386,700 MWh, and 2,310,300 MWh, respectively. The 800 cfs minimum flow requirement in the Low Flow Channel included in this alternative would require DWR to reduce diversions into the Thermalito Power Canal and Afterbay by approximately 200 cfs (relative to future No-Action conditions which assume the minimum flow requirement in Low Flow Channel is 600 cfs). This alternative also assesses a proposal to increase Thermalito Afterbay water temperature

by diverting 1,200 cfs into the Low Flow Channel from May 1 through June 15 each year. The additional flow releases would reduce the amount of water available for power generation and related pump-back operations.

6.1.2 Method of Economic Analysis

Table 6.1-2 illustrates the key parameters used for the economic analysis, and a brief description of each parameter follows.

Table 6.1-2. Summary of key modeling parameters for economic analysis of the Oroville Facilities.

Period of Analysis	30 years [1]
Term of Financing	30 years [1]
Interest/Discount Rate	6 percent [2]
Net Investment	$153,700,000 [3]
Relicensing Costs	$65,000,000 [4]
Annual O&M Cost	$19,890,000 per year [5]
Average On-Peak Energy Value (2005)	$34.03 per MWh [6]
Average Off-Peak Pump-back Energy Cost (2005)	$24.14 per MWh [6]
Capacity and Ancillary Services Value (2005)	$25.60 per kW-Yr[7]

Note: O&M = operations and maintenance
[1] DWR's average term of debt financing.
[2] DWR's average cost of debt financing.
[3] DWR's net Investment as of December 31, 2000, based on balance of outstanding Series A through Y water bonds, which includes funding for past improvements to the Oroville Facilities. In 1994 the remaining balance on the original construction bonds for Oroville Facilities was refinanced.
[4] Licensing costs for the period covering 1999 through 2004.
[5] DWR 2004; average O&M program costs over a 5-year period, including major capital replacement and refurbishment of approximately $5 million per year. Excludes environmental and recreation measures/programs.
[6] DWR 2003, generation and pump-back values based on North of Path 15 (NP-15) power price projections from the California Energy Commission; excludes ancillary benefits derived through DWR's participation in the California ISO.
[7] Based on three years of historical data: 1999, 2000, and 2002
Source: DWR 2004

The economic analysis is not entirely a first-year analysis in that certain costs, such as major capital investments for improvements, would not be experienced in a single year. For the current analysis, it was assumed that all capital costs would be incurred in the first year, which is assumed to be 2005. The costs were levelized over a 30-year period. For this analysis, levelized costs are the constant stream of annual values that are equivalent to the present value of the total costs, including capital costs, O&M costs, FERC licensing costs, and the cost of PM&E measures, using the given interest and discount rates, over the 30-year period of analysis.

6.1.2.1 Project Annual Costs

Annual costs of each of the alternatives were calculated by amortizing the net investment over the 30-year term of the economic analysis and adding the estimated

annual operation and maintenance (O&M) costs, annualized FERC licensing costs, and estimated annualized cost of PM&E measures included with the alternative.

6.1.2.2 Power Benefits

For this analysis, the value of the power benefits from the Oroville Facilities is assumed to be equal to the price that would be paid for the same amount of power from an alternative source. Future inflation is assumed to be zero. The value of energy was assumed to be equal to the values projected for the ISO zones North of Path 15 (NP-15) by the California Energy Commission (CEC). Energy prices are projected to vary with the time of day, time of year, and future power market conditions. To estimate the total energy value for each alternative, time-of-day energy prices were applied to the time-of-day (or hourly) shape of the generation. This generation shape was derived from the historical hourly generation records for the Oroville Facilities for the period from 1998 through 2002. The estimated value of ancillary services was then added to the above energy values, based on the assumption that DWR will continue to participate in the California ISO ancillary services market in future years.

The operations modeling work conducted for the Oroville Facilities relicensing studies used current (2001) and future (2020) as the years for the level-of-development benchmark studies (refer to Appendix C). The FERC Guidelines require that the year in which the new license application is filed with FERC (in this case, 2005) be used as the base-case year in the developmental analysis and that the period of economic analysis be set at 30 years. Results of the above-mentioned benchmark modeling studies were used to derive the base-case annual generation amounts for the economic analyses of the No-Action Alternative, the Proposed Action, and Alternative 2.

The modeled annual net power generation figure of 2,334,000 MWh per year represents 2001 Existing Conditions. This value changes for each of the alternatives studied. The CALSIM II modeling provided energy estimates for each alternative. Then a detailed assessment was made of the time-of-day power price projections prepared by the CEC, as described above, and applied to these energy estimates in order to estimate future annual net energy benefits for each alternative. Ancillary services benefits were then added to arrive at a total annual net benefit for each alternative.

6.1.2.3 Water Supply and Other Benefits

According to FERC practice, the economic value of a project's nonpower benefits—i.e., water supply, irrigation, navigation, recreation, and flood control—are typically excluded from the developmental analysis because water contractors, irrigators, recreation users, and downstream property owners, not the licensee, receive those benefits.

P2100 facilities construction, operation, and maintenance involve other State agencies, either through direct funding from DWR or other State sources stipulated by statute. Currently, DFG, DPR, and DBW manage land or fund projects located within the FERC boundary. Where these facilities and activities are expressly cited in existing P2100 license articles, we have included these costs in this analysis.

Lastly, the developmental analysis excluded benefits and costs attributable to portions of the SWP outside the Oroville Facilities project boundary. Thus, DWR's income and expenditures related to the operation of pumping plants, electric generation facilities, and water conveyances that are not part of the Oroville Facilities licensed features were excluded from the developmental analysis.

Notwithstanding the above, an analysis was performed for both the No-Action Alternative (base case) and the other two alternatives to determine the base water supply cost and estimated increase in water supply cost associated with expenditures for the various PM&E measures included within each alternative. That analysis is presented in Chapter 7.0, and related socioeconomic effects are addressed in Chapter 5.0, Section 5.12.

6.1.2.4 Economic Analysis

The values identified above yield reasonable estimates of power costs and benefits for the purposes of the economic analysis. The primary goals of the economic analysis were to provide a basis for:

- Measuring the economic benefits of continued operation of the Oroville Facilities;
- Estimating the reduction in power benefits and associated increase in water supply costs with implementation of proposed PM&E measures included in the various alternatives; and
- Estimating the cost of replacing power for any proposed PM&E measures that would reduce future Oroville Facilities power generation.

Because current-year costs were used, future increases or decreases in various cost components were not included in the evaluation of Oroville Facilities power or alternative power supply. Although the potential effects of inflation on the future cost of electricity were not explicitly considered, hydroelectric power generation is relatively insensitive to inflation compared to fossil-fueled generation.

6.1.2.5 Net Annual Benefits

Given the above annual costs and power benefits, the net annual benefits of each alternative (i.e., No-Action Alternative, Proposed Action, and Alternative 2) were estimated as:

Net annual benefits = [annual power value] – [annual project cost]

The net annual benefit serves as the basis for the analysis of the No-Action Alternative (i.e., continued operation of the Oroville Facilities under the existing FERC License) and the other two alternatives.

6.2 COST OF PROTECTION, MITIGATION, AND ENHANCEMENT MEASURES FOR THE ALTERNATIVES

6.2.1 Generation

Certain measures proposed or recommended by stakeholders during the relicensing effort would affect project economics by adding to the energy production cost (i.e., requiring new capital expenditures or additional annual costs for operation and maintenance). Other measures considered under the alternatives would reduce future power production from the Oroville Facilities, thereby reducing annual power benefits. Table 6.1-1, in Section 6.1.1.3, Oroville Power Supply, illustrates how proposed operational changes considered under the various alternatives would affect future power generation by the Oroville Facilities.

6.2.2 Environmental Measures and Other Enhancements

The cost of each PM&E measure is an annualized cost represented over the 30-year period of analysis. Tables 6.2-1 through 6.2-3 show the estimated capital cost, annual operating and maintenance cost, and levelized annual cost for the PM&E measures aggregated in each alternative**.**

Although no cost is shown for some current operational measures undertaken by DWR to meet a myriad of existing flow requirements for the Feather River, Bay-Delta estuary statutory water quality standards, and P2100 statutory flood control obligations, there are in fact significant costs to the Licensee in terms of both reduced power generation and water supply that would not be incurred absent these requirements. For example, DWR currently foregoes an estimated $500,000 to $750,000 per year in generation benefits to meet current minimum flow and ramping requirements in the Feather River. Moreover, an additional $4-6 million per year, and possibly more depending on the timing of flood inflows, is lost in power generation benefits due to the requirement to meet the USACE flood control obligation for Lake Oroville.

These tables do include an estimated capital cost to meet Feather River and Feather River Fish Hatchery temperature requirements under all of the alternatives. For the temperature modeling, DWR assumed that the existing Howell-Bunger (fixed cone dispersion type) river outlet valve from Oroville Dam could be used regularly in roughly one-third of the years in order to achieve temperature requirements for the FRH through year 2020. However, while theoretically possible, in reality this valve was not designed for such frequent use and cannot be used reliably to this end. Therefore, as a placeholder for a potential engineering solution to meet existing FRH temperature requirements under anticipated future operating conditions, we have included a $12 million estimated capital cost for achieving the same modeled temperature results under 2020 hydrologic supply and demand conditions. This estimated capital expenditure represents a mid-range value of the three reconnaissance level solutions that DWR is continuing to evaluate, although no environmental assessment of these potential solutions has been performed as yet.

Another significant cost included in the No-Action Alternative, and also carried through the other alternatives, is the approximately $1.5 million per year DWR expends on various environmental protection and conservation measures stipulated under the interim Operating Criteria and Planning Biological Opinion (OCAP BO) issued by NOAA Fisheries in 2002. These measures provide numerous benefits to aquatic species in the Feather River including federal and State listed species.

Additional capital costs delineated in Tables 6.2-1 (No-Action Alternative) and carried through to the other alternatives, reflect P2100 facilities improvements constructed or implemented by DWR since the year 2001 baseline established for this economic analysis. These enhancements generally fall within the area of recreation resources; we have referred to these improvements as “Interim Projects” in Chapter 3.0. These Interim Projects were those that could be achieved without significant permitting or study and without the need for a P2100 License amendment. These enhancements were implemented by DWR prior to filing the application for new license in good faith in anticipation that these would meet some future recreation needs. In addition, the estimated capital and annual O&M costs associated with early implementation of needed measures identified in the draft terrestrial BA are included. Not captured in Tables 6.2-1, 6.2-2, and 6.2-3 is the $3 million that DWR has contractually committed to, and partially already expended, during the Relicensing process to local recreation improvements that lie outside of the P2100 FERC Project Boundary.

Table 6.2-1. Estimated costs for PM&E measures— No-Action Alternative (in $1,000s).

Item	Capital Cost ($1,000)	Annual Operating Cost ($1,000)
Temperature Criteria/Targets	$12,130	$80
Natural Salmonid Spawning and Rearing Habitat	$0	$556
Salmonid Genetics	$0	$0
Feather River Fish Hatchery	$0	$1,625
Lower Feather River Fishery	$0	$985
Fishery Management	$0	$234
Thermalito Afterbay Terrestrial Habitat	$8	$73
OWA Terrestrial	$0	$10
Vegetation and Wildlife Management	$12	$27
Water Quality	$0	$50
Recreation— P2100 (general, incl. trails, restrooms, wildfire evac. plan, law enforcement, final RMP, and monitoring)	$244	$210
Bidwell Canyon BR/Campground/DUA/Marina	$0	$550
Loafer Creek BR/DUA/Campground/Group Campground/Equestrian Campground	$10	$675
Lime Saddle BR/DUA/Campground/Marina	$0	$425
Spillway BR/DUA	$164	$575
Enterprise BR	$0	$125
Vinton Gulch Car-top BR	$0	$30
Dark Canyon Car-top BR	$0	$40
Foreman Creek Car-top BR	$0	$170
Stringtown Car-top BR	$0	$50
Lake Oroville Visitors Center	$0	$340
Saddle Dam Equestrian Facilities and Trailhead Access	$38	$25
Bloomer Area BICs	$0	$40
Goat Ranch BIC	$0	$40
Foreman Creek BIC	$0	$40
Craig Saddle BIC	$0	$40
Oroville Dam Overlook DUA	$0	$25
Floating Campsites and Floating Restrooms	$0	$385
Upper North Fork Arm and Poe Powerhouse	$0	$0
Diversion Pool DUA (Northwest side)	$0	$25
Lakeland Boulevard	$71	$10
Recreation – Low Flow Channel/Feather River Fish Hatchery	$30	$25
North Thermalito Forebay	$0	$475
South Thermalito Forebay	$0	$80
Thermalito Afterbay—Wilbur Road BR	$7	$25
Thermalito Afterbay—Larkin Road Car-top BR	$0	$25
Thermalito Afterbay—Monument Hill BR/DUA	$0	$100
Model Aircraft Flying Area	$27	$25

Item	Capital Cost ($1,000)	Annual Operating Cost ($1,000)
OWA—Thermalito Afterbay Outlet BR/DUA/Campground	$0	$25
OWA Dispersed River and Pond Access Sites	$0	$10
Dispersed Use Sites	$0	$0
Cultural Resources	$0	$0
Land Use, Management, and Aesthetics	$0	$40
Annual Estimate of Future Recreation Capital Improvements and Replacements	$0	$800
TOTAL CAPITAL AND ANNUAL COST	**$12,741**	**$9,090**
LEVELIZED ANNUAL COST	**$10,016**	

Notes: BIC = Boat-in Camp; BR = Boat Ramp; DUA = Day Use Area
Source: developed by MWH

Table 6.2-2. Estimated costs for PM&E measures— Proposed Action (in $1,000s).

Item	Capital Cost ($1,000)	Annual Operating Cost ($1,000)
Temperature Criteria/Targets	$12,130	$80
Natural Salmonid Spawning and Rearing Habitat	$4,020	$731
Salmonid Genetics	$4,100	$215
Feather River Fish Hatchery	$0	$1,750
Lower Feather River Fishery	$0	$1,055
Lake Oroville Fishery Management	$0	$234
Thermalito Afterbay Terrestrial Habitat	$965	$107
OWA Terrestrial Habitat	$8	$100
Vegetation and Wildlife Management	$500	$112
Water Quality	$25	$75
Recreation— P2100 (general, incl. trails, restrooms, wildfire evac. plan, law enforcement, final RMP, and monitoring)	$994	$616
Bidwell Canyon BR/Parking/Campground/DUA/Marina	$9,268	$775
Loafer Creek BR/DUA/Campground/Group Campground/Equestrian Campground	$4,420	$1,050
Lime Saddle BR/DUA/Campground/Marina	$400	$500
Spillway BR/DUA	$50	$625
Enterprise BR	$3,500	$200
Vinton Gulch Car-top BR	$33	$40
Dark Canyon Car-top BR	$33	$50
Foreman Creek Car-top BR	$2,863	$250
Stringtown Car-top BR	$34	$60
Lake Oroville Visitors Center	$200	$425
Saddle Dam Trailhead	$113	$50
Bloomer Area BICs	$0	$50
Goat Ranch BIC	$0	$50
Foreman Creek BIC	$0	$50
Craig Saddle BIC	$0	$50
Oroville Dam Overlook DUA	$0	$25
Floating Campsites and Floating Restrooms	$50	$435
Upper North Fork Arm and Poe Powerhouse	$0	$0
Diversion Pool DUA (West side)	$200	$50
Lakeland Boulevard Equestrian Staging, DUA and Trail Access	$1,950	$150
Recreation – Low Flow Channel/Feather River Fish Hatchery	$30	$50

Item	Capital Cost ($1,000)	Annual Operating Cost ($1,000)
North Thermalito Forebay	$470	$550
South Thermalito Forebay	$200	$115
Thermalito Afterbay—Wilbur Road BR	$10	$25
Thermalito Afterbay—Larkin Road Car-top BR	$250	$50
Thermalito Afterbay—Monument Hill BR/DUA	$0	$100
Model Aircraft Flying Area	$27	$25
OWA—Thermalito Afterbay Outlet BR/DUA/Campground	$2,450	$300
OWA Dispersed River and Pond Access Sites	$350	$20
Dispersed Use Sites	$25	$10
Cultural Resources	$19,600	$360
Land Use, Management, and Aesthetics	$750	$75
Annual Estimate of Future Recreation Capital Improvements and Replacements	$0	$1,000
TOTAL CAPITAL AND ANNUAL COST	**$70,018**	**$12,640**
LEVELIZED ANNUAL COST	**$17,727**	

Notes: BIC = Boat-in Camp; BR = Boat Ramp; DUA = Day Use Area
Source: developed by MWH

Table 6.2-3. Estimated costs for PM&E measures—Alternative 2 (in $1,000s).

Item	Capital Cost ($1,000)	Annual Operating Cost ($1,000)
Temperature Criteria/Targets	$12,130	$418
Natural Salmonid Spawning and Rearing Habitat	$22,390	$1,059
Salmonid Genetics	$4,100	$215
Feather River Fish Hatchery	$32,500	$2,350
Lower Feather River Fishery	$8,000	$1,105
Sport Fishery Management	$0	$234
Thermalito Afterbay Terrestrial Habitat	$965	$107
OWA Terrestrial Habitat same as PA	$8	$185
Vegetation and Wildlife Management	$500	$112
Water Quality same as PA	$25	$75
Recreation— P2100 (general, incl. trails, restrooms, wildfire evac. plan, law enforcement, final RMP, and monitoring)	$1,094	$750
Bidwell Canyon BR/Campground/DUA/Marina	$11,268	$912
Loafer Creek BR/DUA/Campground/Group Campground/Equestrian Campground	$5,420	$1050
Lime Saddle BR/DUA/Campground/Marina	$3,460	$575
Spillway BR/DUA	$1,650	$675
Enterprise BR	$3,500	$200
Vinton Gulch Car-top BR	$33	$40
Dark Canyon Car-top BR	$33	$50
Foreman Creek Car-top BR	$2,863	$250
Stringtown Car-top BR	$334	$70
Lake Oroville Visitors Center	$200	425
Saddle Dam Trailhead	$113	$50
Bloomer Area BICs	$0	$50
Goat Ranch BIC	$0	$50
Foreman Creek BIC	$0	$50
Craig Saddle BIC	$0	$50
Oroville Dam Overlook DUA	$64	$75
Floating Campsites	$450	$510
Upper North Fork Arm below Poe Powerhouse	$50	$5
Diversion Pool DUA (West side)	$33,600	$550
Lakeland Boulevard Trail	$1,950	$150
Recreation – Low Flow Channel/Feather River Fish Hatchery	$200	$75
North Thermalito Forebay	$470	$550
South Thermalito Forebay	$200	$115
Thermalito Afterbay—Wilbur Road BR	$10	$25
Thermalito Afterbay—Larkin Road Car-top BR	$250	$50
Thermalito Afterbay—Monument Hill BR/DUA	$0	$100

Item	Capital Cost ($1,000)	Annual Operating Cost ($1,000)
Model Aircraft Flying Area	$27	$25
OWA—Thermalito Afterbay Outlet BR/DUA/Campground	$2,450	$300
OWA Dispersed River and Pond Access Sites	$350	$20
Dispersed Use Sites	$25	$10
Cultural Resources	$19,650	$360
Land Use, Management, and Aesthetics	$850	$125
Annual Estimate of Future Recreation Capital Improvements and Replacements	$0	$1,200
TOTAL	**$171,182**	**$15,352**
LEVELIZED ANNUAL COST	**$27,788**	

Notes: BIC = Boat-in Camp; BR = Boat Ramp; DUA = Day Use Area
Source: developed by MWH

6.3 OTHER ECONOMIC CONSIDERATIONS

Other economic considerations associated with evaluation of the various alternatives include potential effects on future SWP costs, downstream flood protection benefits afforded by Lake Oroville under USACE flood operation criteria, and economic benefits related to avoiding an increase in fossil fuel emissions. Further discussion of those considerations is presented in Chapter 7.0, Comprehensive Development Analysis and Recommendations.

6.4 COMPARISON OF ALTERNATIVES

This section provides a discussion of the annual costs, annual power benefits, and annual net benefits for the No-Action Alternative, the Proposed Action, and Alternative 2. Table 6.4-1 presents a summary, and the detailed discussion of each parameter follows. Following this, Chapter 7.0 presents a summary of both the economic and environmental considerations supporting DWR's selection of the Proposed Action.

Under the No-Action Alternative, there would be no funding of new PM&E measures beyond what is currently being provided by or arising from existing legal obligations, and the project would continue power generation as it has in the past. By contrast, under the other alternatives (the Proposed Action and Alternative 2), DWR would implement various combinations of PM&E measures that include both structural and operational changes to project facilities. This section indicates the amount of decrease in average levelized annual net benefits of these alternatives resulting from the proposed PM&E measures. Under Alternative 2, there is also a decrease in net power generation and a resulting net decrease in benefits. In addition, based on CEC's projections of power values in 2005, the average annual power value of the project under the No-Action Alternative and under each alternative is provided. The levelized average annual cost, annual benefit, and resulting average annual net benefit are also estimated.

Table 6.4-1. Summary of estimated annual benefits and costs for the alternatives.

Levelized Annual Benefits	Alternative		
	No-Action	**Proposed Action**	**Alternative 2**
Gross Energy generation value	$91,734,000	$91,734,000	$91,362,000
Capacity and ancillary services value	$12,800,000	$12,800,000	$12,800,000
Total annual benefits	**$104,534,000**	**$104,534,000**	**$104,162,000**
Levelized Annual Costs	**Alternative**		
	No-Action	**Proposed Action**	**Alternative 2**
Levelized Water Bond cost	$10,046,000	$10,046,000	$10,046,000
Base O&M cost	$19,890,000	$19,890,000	$19,890,000
Pump-back energy cost	$9,414,000	$9,414,000	$9,337,000
Levelized FERC Relicensing cost	$4,722,000	$4,722,000	$4,722,000
Protection, Mitigation, & Enhancement Measures	$10,016,000	$17,727,000	$27,788,000
Total annual costs	**$54,088,000**	**$61,799,000**	**$71,783,000**
Total Levelized Annual Net Benefit	**$50,446,000**	**$42,735,000**	**$32,379,000**

Source: developed by MWH

6.4.1 No-Action Alternative

6.4.1.1 Power Generation

Under the No-Action Alternative, there would be no funding of new PM&E measures beyond what is currently being provided or arising from existing legal obligations, and the project would continue to provide 762 MW of capacity and generate a net average of approximately 2,318,100 MWh of electricity annually.

6.4.1.2 Levelized Annual Cost

The levelized annual cost for the No-Action Alternative would be $54,088,000 ($23.33/MWh).

6.4.1.3 Levelized Annual Benefits

Over the analysis period, the levelized annual benefits of the project under the No-Action Alternative would be $104,534,000 ($45.09/MWh).

6.4.1.4 Cost of Environmental Measures

The levelized annual cost of PM&E measures under the No-Action Alternative is estimated to be $10,016,000. Extrapolating these costs over an assumed 50-year license term, results in an estimated $495,000,000.

6.4.1.5 Lost Generation as a Result of Environmental Measures

None.

6.4.1.6 Cost of Lost Generation

None.

6.4.1.7 Resulting Levelized Net Annual Benefits

The levelized annual net benefit of the No-Action Alternative would be $50,446,000 ($21.76/MWh).

6.4.2 Proposed Action

6.4.2.1 Power Generation

Under the Proposed Action, there would be new PM&E measures implemented beyond those currently being provided under the No-Action Alternative. The project would still provide 762 MW of capacity and annual generation would average 2,318,100 MWh.

6.4.2.2 Levelized Annual Cost

The levelized annual cost for the Proposed Action would be $61,799,000 ($26.66/MWh).

6.4.2.3 Levelized Annual Benefits

Based on the estimate of the current cost of replacing this amount of power with no consideration of inflation over the 30-year period of the analysis, the levelized annual benefits of the project under the Proposed Action would be $104,534,000 ($45.09/MWh).

6.4.2.4 Cost of Environmental Measures

The levelized annual cost of PM&E measures under the Proposed Action is estimated to be $17,727,000. Extrapolating these costs over an assumed 50-year license term, results in an estimated $854,000,000.

6.4.2.5 Lost Generation as a Result of Environmental Measures

None.

6.4.2.6 Cost of Lost Generation

None.

6.4.2.7 Resulting Levelized Net Annual Benefits

The levelized annual net benefit of the Proposed Action would be $42,735,000 ($18.44/MWh).

Over the assumed 50-year new license period, this would result in a decrease in net benefits of approximately $359,000,000 over the No-Action Alternative.

6.4.3 Alternative 2

6.4.3.1 Power Generation

Under Alternative 2, there would be new PM&E measures implemented beyond those currently being provided under the No-Action Alternative and the Proposed Action. The project would still provide 762 MW of capacity but annual generation would be reduced to an average of 2,310,300 MWh.

6.4.3.2 Levelized Annual Cost

The levelized annual cost for Alternative 2 would be $71,783,000 ($31.07/MWh).

6.4.3.3 Levelized Annual Benefits

Based on the estimate of the current cost of replacing this amount of power with no consideration of inflation over the 30-year period of the analysis, the levelized annual benefits of the project under Alternative 2 would be $104,162,000 ($45.09/MWh).

6.4.3.4 Cost of Environmental Measures

The levelized annual cost of PM&E measures under Alternative 2 is estimated to be $27,788,000. Extrapolating these costs over an assumed 50-year license term, results in an estimated $1,311,000,000.

6.4.3.5 Lost Generation as a Result of Environmental Measures

Annual gross generation loss associated with Alternative 2 is estimated to be 11,000 MWh (7,800 MWh net generation loss).

6.4.3.6 Cost of Lost Generation

The cost of lost generation is estimated to be approximately $496,000 per year.

6.4.3.7 Resulting Levelized Net Annual Benefits

The levelized annual net benefit of Alternative 2 would be $32,379,000 ($14.02 /MWh).

Over the assumed 50-year new license period, this would result in a decrease in net benefits of approximately $816,000,000 and $457,000,000 over the No-Action Alternative and Proposed Action, respectively.

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