

**SACRAMENTO MUNICIPAL UTILITY DISTRICT'S
UPPER AMERICAN RIVER PROJECT
(FERC NO. 2101)**

**SUPPLEMENTAL
PRELIMINARY DRAFT
ENVIRONMENTAL ASSESSMENT**

EXECUTIVE SUMMARY

Sacramento Municipal Utility District
Sacramento, California

JULY 2006

EXECUTIVE SUMMARY

On July 15, 2005, the Sacramento Municipal Utility District (SMUD) filed its Application for New License (License Application) for SMUD's sole hydropower asset—the Upper American River Project (UARP)—with the Federal Energy Regulatory Commission (FERC). Volume 2A of the License Application included SMUD's Applicant-prepared Preliminary Draft Environmental Assessment (PDEA). In the PDEA, SMUD evaluated the developmental (energy) and non-developmental (environmental) consequences of three alternatives: SMUD's Proposed Action (UARP with the Iowa Hill Development), the UARP-only Alternative, and the No Action Alternative. As noted in the PDEA (p. 4-17), other alternatives were not examined because neither the Plenary Group nor the Settlement Negotiations Group of SMUD's FERC-approved Alternative Licensing Process (ALP) had reached settlement or otherwise identified an alternative for analysis by SMUD in the License Application.

On November 1, 2005, several agencies and stakeholders filed the "Agency Alternative" with FERC, requesting FERC to consider an alternative suite of measures when preparing its environmental impact statement (EIS) for the UARP.¹ SMUD offers this Applicant-prepared Supplemental Preliminary Draft Environmental Assessment (SPDEA) to provide FERC with a comprehensive examination of all measures identified in the Agency Alternative, and this SPDEA is intended to inform and assist in FERC's development of its EIS for the relicensing of the UARP. At this writing, SMUD, the Agencies, and the NGOs continue to seek comprehensive settlement through FERC's Dispute Resolution Service.

Alternative Evaluation

In the PDEA (p. 7-1 to 7-5), SMUD compared the No Action Alternative with SMUD's Proposed Action and the UARP-only Alternative. This SPDEA compares SMUD's Proposed Action with the Agency Alternative. As discussed in the PDEA, SMUD's Proposed Action satisfies Sections 4(e) and 10(a) of the Federal Power Act, which require FERC to consider equally a broad range of developmental and environmental purposes in licensing decisions. SMUD concludes that under this standard, SMUD's Proposed Action is better adapted than the Agency Alternative to a comprehensive plan for improving the UARP waterways for all beneficial uses. This conclusion is based on a balancing of developmental and non-developmental issues, giving equal consideration to power generation/capacity, socioeconomics, and environmental resources such as air quality, water quality, fish and wildlife, and protection of recreation opportunities.

¹ Signatories to the filing were: USDA Forest Service, USDI National Park Service, USDI Bureau of Land Management, USDI Fish and Wildlife Service, California State Water Resources Control Board, California Department of Fish and Game, California State Department of Parks and Recreation, Friends of the River, California Outdoors, American River Recreation Association and Camp Lotus, American Whitewater, Chris Shutes, and Hilde Schweitzer.

SMUD's Proposed Action and the Agency Alternative provide the following salient features to the relicensing of the UARP:

- **SMUD's Proposed Action:** This preferred alternative strikes a new balance for the UARP by foregoing a moderate amount of annual electrical generation to enhance aquatic resources and expand whitewater recreational opportunities. The current UARP configuration will be augmented by a new peak energy source: the Iowa Hill Pumped Storage Development (Iowa Hill Development). SMUD's Proposed Action also includes environmental measures to improve or extend protection of environmental resources as well as to ensure the addition of the Iowa Hill Development will impose no new significant long-term environmental impacts.
- **Agency Alternative:** The Agency Alternative includes many environmental measures similar to those of SMUD's Proposed Action, as well as some additional measures unique to the interests of the proponent agencies and stakeholders. This alternative requires SMUD to forego more than four times the annual energy generation lost under SMUD's Proposed Action. In addition, although ostensibly including the Iowa Hill Development, the Agency Alternative's water level restrictions at Slab Creek Reservoir will, practically speaking, render the Iowa Hill Development infeasible.

SMUD recommends SMUD's Proposed Action because:

- It will produce more energy than the Agency Alternative and will provide greater generation flexibility by increasing peaking capacity by 400 MW; the reduction in overall baseline energy generation is less than one-fourth the loss under the Agency Alternative;
- The greater generation capacity under SMUD's Proposed Action will avoid the need to produce substitute energy and capacity using fossil fuel-fired plants, continuing to help conserve these nonrenewable energy resources while reducing atmospheric pollution; and
- The recommended environmental measures will provide greater enhancements to aquatic resources than the Agency Alternative and will adequately protect terrestrial resources, provide whitewater recreation opportunities, improve public use of recreational facilities, and maintain and protect historic and archaeological resources within the area affected by UARP operations.

Power Generation Comparison

From a power generation value perspective, SMUD's Proposed Action will better prepare SMUD to meet the energy challenges facing the Sacramento Valley region throughout the new license's 50-year term. SMUD's Proposed Action preserves most of the UARP's energy generation capacity while expanding the generation of peaking energy through development of Iowa Hill, which will play a pivotal role in meeting system reliability needs. In contrast, the Agency Alternative results in a loss of substantially more annual energy capacity and makes Iowa Hill infeasible. Also, the Agency Alternative limits the use of the clean UARP generation resource in summer peaking periods when it is of most value to SMUD from the capacity, energy, and air quality perspectives.

The UARP is a key component of SMUD's energy portfolio, which emphasizes low-emissions and low-carbon generation. Under baseline conditions, the UARP generates an average of 1,835,000 MWh of emissions-free energy annually. Both SMUD's Proposed Action and the Agency Alternative will increase the volume of water to be released into project-related streams during the spring, decreasing the volume available to generate electricity. Under SMUD's Proposed Action, the UARP will generate an average of 1,794,000 MWh, a reduction of 41,000 MWh compared with baseline conditions (a net annual decrease in generation of 2.2%). Under the Agency Alternative, the UARP will generate an average of 1,664,000 MWh, a reduction of 171,000 MWh compared with baseline conditions (a net annual decrease in generation of 9.3%). The Agency Alternative reduces average annual UARP generation by more than four times the reduction under SMUD's Proposed Action.

Despite a 2.2% net annual energy loss, SMUD's Proposed Action will augment the UARP's capacity to meet peak energy demands through construction and operation of Iowa Hill. Operated in conjunction with Slab Creek Reservoir, Iowa Hill will consume energy during off-peak hours when water is pumped from Slab Creek Reservoir up to the Iowa Hill upper reservoir. The Iowa Hill powerhouse will then generate energy during peak demand hours. This additional 400 MW of local peaking capacity represents about six to seven years of SMUD's anticipated load growth, and will play an important role in assisting SMUD to achieve its overall long-term strategic and portfolio planning objectives, as discussed in the PDEA.

In contrast, the Agency Alternative's water level restrictions at Slab Creek Reservoir will render Iowa Hill infeasible. Without Iowa Hill, SMUD will lose all the expanded power generation benefits described above and discussed in detail in the PDEA.

The Agency Alternative's required minimum water surface levels for July, August, and September at Loon Lake, Union Valley, and Ice House reservoirs will also prohibit the release of available stored water to generate peaking energy when demand is highest. As a consequence, the Agency Alternative will reduce SMUD's ability to use the full nonemissive hydroelectric generation capacity of the UARP in the event of a summer heating event or other strenuous system condition that continues over an extended period, for example, the 11-day heat storm experienced in July 2006. A 2006 sensitivity analysis indicates that these water level restrictions will reduce UARP Project Dependable Capacity (PDC) by up to 470 MW.

SMUD's Proposed Action, with the inclusion of Iowa Hill, is far superior to the Agency Alternative from a power generation perspective, as it increases renewable, local peaking power generation capacity and preserves much more of the UARP's existing overall generation capacity to help SMUD meet projected demand throughout the 50-year term of the license.

Environmental Effects Comparison

Following are summary discussions of some major differences between SMUD's Proposed Action and the Agency Alternative.

Aquatic Resources

SMUD's Proposed Action does more to protect aquatic resources because it reflects both the full range of data developed during relicensing and employs a fish habitat optimization methodology to ensure the highest level of protection for fish species at all life stages and in all sections of project reaches; the Agency Alternative does not consider all of the relevant data, nor does it adequately balance the protection of fish habitat for all life stages.

SMUD's Proposed Action's environmental measures are based on data and material facts from the 20 aquatic resource and related technical studies conducted during the ALP relicensing process. For example, SMUD used the empirical record related to natural low summertime streamflows, accretion, and cold winter water temperatures to develop recommended streamflow releases and habitat protection measures that cumulatively enhance baseline conditions for aquatic resources of management interest. Much of this record was not incorporated into the Agency Alternative. Also, SMUD's Proposed Action reflects the complete analytical results of the ALP-approved studies, such as the functional relationships between streamflow and fish or frog habitat. The Agency Alternative, in contrast, does not reflect some of the data and analytical results, relying more on theoretical concepts such as "pass-through" flows and mimicking the natural hydrograph. In focusing heavily on mimicking the natural hydrograph, the Agency Alternative largely ignores the role of accretion, which contributes significant flows in many project reaches.

The minimum release schedules of SMUD's Proposed Action and Agency Alternative are best compared by organizing the affected stream reaches into three groups: high elevation; mid-elevation; and the low elevation Slab Creek Dam Reach.

High Elevation Reaches Minimum Releases

The Agency Alternative requires a minimum release schedule from Rubicon Reservoir that varies depending on month and water year type. The volume of water released ranges from 6 cfs or natural inflow, whichever is less, but no less than 1cfs, to a maximum of 35 cfs. At Buck Island Dam, the required volume of water release ranges between 1 cfs and 8 cfs. In both cases, the highest releases occur in the month of May and the lowest releases occur in summer and fall months. SMUD's Proposed Action maintains baseline conditions at both reservoirs, with a year round 6 cfs or natural inflow, whichever is less, release at Rubicon Reservoir and year round 1 cfs release at Buck Island Reservoir. The low summer/fall releases, characteristic of both alternatives, are the direct result of water limitation constraints that apply to the two watersheds. Both watersheds are limited in summer/fall water supply with the Rubicon and Little Rubicon rivers regularly falling to zero or very low flow levels.

Historically, both the Rubicon Dam and Buck Island reaches were fishless, and the naturalized fish populations currently residing in them are healthy, as is the benthic macroinvertebrate community. While healthy, low trout biomass levels at some of the fish sampling sites are outside the control of the UARP. Habitat structure (e.g., extensive granite slabs) and suboptimal

summer/fall water temperatures, in conjunction with anthropomorphic influences (e.g., heavy OHV recreation use), are the dominant factors limiting trout biomass.

The Agency Alternative, while providing for higher winter/spring releases than SMUD's Proposed Action does not provide an increase in habitat during these spring months that will overcome the uncontrollable low flows, physical habitat limitations, and high water temperatures that limit aquatic resources in the summer/fall. The habitat value ascribed by the Agency Alternative for the winter/spring releases is highly uncertain because it occurs at a time of year when biological activity is minimal due to near freezing water temperatures and accretion flows, not May releases of 8 cfs or 35 cfs, dominate flow throughout the project reach.

Furthermore, the 6 cfs Agency Alternative release requirement at Rubicon Reservoir in the summer and fall of wetter water years is not possible due to the limited storage capacity of Rubicon Reservoir and minimal or zero inflow from the Rubicon River. Implementing the Agency Alternative recommended release would dewater Rubicon Reservoir to the detriment of the aquatic resources that reside there.

Thus, implementing the Agency Alternative release schedules at Rubicon and Buck Island reservoirs is not possible at all times and unwarranted at those times when the release schedule is possible. Unnecessary releases at both reservoirs translate into a high loss in energy and net annual benefit due to the fact that water diverted from the Rubicon River passes through all but one of the seven UARP powerhouses. This decrease in overall project benefit is unjustified given the uncertain benefits to the aquatic resources of the increase winter/spring flows.

Mid-elevation Reaches Minimum Releases

SMUD conducted extensive studies involving detailed analytical evaluations at six mid-elevation project reaches in the UARP area. Primary studies in this area include fisheries surveys, benthic macroinvertebrate investigations, instream flow studies, hydrology studies, water temperature monitoring and modeling investigations, and flow vs. frog habitat studies. The Agency Alternative does not incorporate substantial amounts of the available information derived from these studies and has led to a required minimum flow release schedule providing less overall aquatic resource protection than SMUD's Proposed Action.

For example, to ensure a balance of flows capable of accommodating all aquatic resource life stages at all stream locations, SMUD's Proposed Action considers habitat needs throughout each project reach. Often, minimum flows that provide optimal habitat at the top of a reach result in less than optimal habitat at the bottom of the reach, particularly in the cases of long reaches with significant levels of accretion. To account for these factors, SMUD's Proposed Action used a fish habitat time series analysis that considers all identified hydrologic nodes in the reach, all life stages identified in the study plans for inclusion, and incorporated changes in habitat use between seasons. In contrast, the Agency Alternative focused only on one hydrologic node per reach—the node at the base of the dam—and thereby does not consider accretion and the balance of habitat throughout the entire reach. The Agency Alternative also focused only on

adult trout, failing to consider, for example, the consequences on other life spaces, e.g., trout spawning habitat may be reduced by high spring releases. The Agency Alternative also developed the minimum flow release rates by inappropriately applying information on summer trout feeding behavior to winter periods when trout are in hiding and typically do not feed.

Examining the Ice House Dam Reach reveals the effects of these differences between SMUD's Proposed Action and Agency Alternative. The Agency Alternative requires a minimum release schedule from Ice House Reservoir that varies between 5 and 68 cfs, depending on month and water year type. In contrast, SMUD's Proposed Action release schedule varies between 10 and 22 cfs, also depending on month and water year type.

Historically, the Ice House Dam Reach was fishless. Current populations of brown and rainbow trout in the upper portion of the reach are healthy. Low trout population biomass levels in the lower half of the reach are most likely due to baseline structural habitat limitations (few pools) and suboptimal water temperatures. The benthic macroinvertebrate community in the reach is also healthy. However, the two alternatives will provide different levels of coldwater conditions for trout in summer months. Under SMUD's Proposed Action, water temperatures will be maintained below 20°C throughout the reach at all times in all water year types, thereby improving habitat conditions for trout. Under the Agency Alternative, releases of 14 or 15 cfs in August will not reduce water temperatures to the same extent as SMUD's Proposed Action.

Compared to SMUD's Proposed Action, the Agency Alternative will also provide lower levels of habitat enhancement for adult and juvenile rainbow trout in the Ice House Dam Reach. The benefits of mimicking the natural hydrograph are not presented in the Agency Alternative. Most importantly, the Agency Alternative will also result in a significant adverse impact on spawning rainbow trout. The Agency Alternative release schedule will reduce spawning habitat by 16.2 percent from baseline. At most locations, spawning habitat will be significantly reduced over baseline levels. Moreover, the April/May whitewater boating releases of the Agency Alternative will significantly impact spawning rainbow trout. In contrast, the September whitewater boating releases of SMUD's Proposed Action will avoid this impact to spawning rainbow trout by scheduling the releases in September.

No data or information are provided to demonstrate that the benefits of mimicking the natural hydrograph override significant adverse impacts to spawning trout and demonstrated lower levels of adult and juvenile habitat enhancement compared to SMUD's Proposed Action.

Similar comparative results exist for other mid-elevation reaches, including the Loon Lake Dam, Robbs Peak Dam, Junction Dam, and Camino Dam reaches. In each of these reaches, SMUD's Proposed Action will provide as much or more trout habitat than the Agency Alternative. The higher flows of the Agency Alternative, thus, represent an unjustified and unnecessary reduction in power generation for no demonstrable gain in aquatic resource conditions. In the Camino Dam Reach, the only reach supporting foothill yellow-legged frogs (FYLF), the Agency Alternative minimum release will, in fact, significantly adversely affect FYLF populations by decreasing breeding habitat below baseline levels.

Collectively, throughout the mid-elevation UARP reaches, the Agency Alternative minimum release schedules will result in a decrease in annual net benefit of the UARP. Additional costs will be incurred to replace existing valves at certain dams to accommodate the higher release schedule. In contrast, SMUD's Proposed Action will result in a smaller loss with no additional costs. Given the significant impact to spawning rainbow trout in the Ice House Dam Reach and to breeding FYLFs in the Camino Dam Reach resulting from the Agency Alternative, and an equal or greater level of enhancement in adult and juvenile habitat under SMUD's Proposed Action, SMUD's Proposed Action will be more beneficial to aquatic resources with less energy value loss.

Slab Creek Dam Reach Minimum Releases

The Agency Alternative requires a minimum release schedule from Slab Creek Reservoir that varies between 63 and 415 cfs, depending on month and water year type. In contrast, SMUD's Proposed Action release schedule varies between 30 and 84 cfs, also depending on month and water year type. The Slab Creek Dam Reach currently supports a healthy fish community of transition species typical of Sierra Nevada foothill streams. Based on the results of the time series analysis, SMUD's Proposed Action provides for an adequate level of protection of rainbow trout habitat in the Slab Creek Dam Reach by providing 80 percent of maximum WUA during most of the year, except when competing needs between rainbow trout and hardhead (a California species of special concern and a Forest Service sensitive species) are in effect (e.g., summer months). The Agency Alternative, in contrast, will provide an incrementally larger amount of adult rainbow trout habitat at certain times of the year, primarily during the summer months, but at the expense of habitat for hardhead. Overall, the amount of adult and spawning habitat enhancement for rainbow trout is nearly identical between the two alternatives.

However, higher summer flows under the Agency Alternative will cool water temperatures in the reach, thereby reducing the water temperatures for hardhead to less than optimal conditions. Under the Agency Alternative, suitable temperatures will be restricted to the very bottom of the reach, which represents a significant impact to this special-status species.

There is no evidence in the record that the Agency Alternative release levels will provide significant benefits to water quality, FYLF breeding, gravel redistribution, and large woody debris transport. Three independent amphibian surveys conducted in the Slab Creek Dam Reach did not reveal the presence of FYLF; therefore, flows to enhance FYLF breeding habitat are not warranted. The Agency Alternative did not provide evidence for the need for releases as high as 415 cfs. Releases of this magnitude were based on the concept of "pass-through" determined by adding releases at upstream hydroelectric project reservoirs and diversion dams. However, no rationale is given in support of the concept of "pass-through" flows. Data specific to the Slab Creek Dam Reach are not presented to justify these "pass-through" releases.

In the Slab Creek Dam Reach, the Agency Alternative will result in a decrease in net annual benefit of the UARP associated with a reduction in power generation at White Rock Powerhouse, plus a one-time capital cost to replace the outlet valve at Slab Creek Dam to

accommodate the high release schedule. In contrast, SMUD's Proposed Action will result in a smaller loss in net annual benefit. We conclude the Agency Alternative will result in a significant adverse impact on the hardhead, a California species of concern. It will not provide incremental benefits to the trout populations in the UARP of sufficient magnitude to justify the more than \$1 million differential in annual project value loss between SMUD's Proposed Action and the Agency Alternative.

Resource Monitoring

Water Quality

The Agency Alternative requires SMUD to develop and implement a comprehensive plan to monitor water chemistry, bacteria, and metals bioaccumulation in UARP reservoirs and stream reaches throughout the term of the new license. However, the UARP relicensing studies demonstrate that water quality parameters are within Basin Plan objectives at almost all UARP sites, with rare exception.

Few water chemistry components exceed Basin Plan objectives, and these few exceedences reflect the analytical difficulties of sampling and accurately measuring trace quantities of constituents in the parts per trillion range, or conditions that occur naturally in the watershed. No chronic problems with water quality were uncovered during the relicensing studies. This absence of any identified chronic water quality problems is mirrored by the lack of measures in the Agency Alternative designed to mitigate on-going water quality problems. However, the Agency Alternative water chemistry monitoring imposes the unjustified requirement to repeatedly sample for 53 constituents (mostly metals) at 54 sampling stations. Of the extensive bacterial sampling conducted during the relicensing studies, no samples at any UARP site exceeded objectives at any UARP site except one type of fecal coliform test at a few locations at Union Valley Reservoir. The most plausible sources of the bacteria are upstream, non-UARP tributaries and Forest Service campgrounds near the sampling locations. Regarding bioaccumulation (mercury, copper, lead, silver), none of the relicensing study data on metals concentration levels in fish tissue indicates a chronic bioaccumulation problem with fish in UARP reservoirs. All fish tested meet the applicable guidelines for mercury and copper, and fish tissue (the part of the fish eaten by anglers) samples for lead and silver are below the level of detection at all UARP reservoirs.

Given the lack of a nexus to the UARP and SMUD's inability to alter the concentration of water quality parameters by changing UARP operations, there is no basis for requiring SMUD to develop and implement this comprehensive water quality monitoring program.

Geomorphology

The Agency Alternative requires SMUD to evaluate streambed profiles and substrate composition at an indeterminate number of cross-sectional transects in eight study sites across six project reaches throughout the duration of the license term.

Monitoring will yield no beneficial information at six of the eight sites. The first two sites are in bedrock- and boulder-dominated transport reaches (Camino and Slab Creek) where geomorphic properties are insensitive to the hydrologic regime. The second two sites (Rubicon, Robbs Peak) do not require geomorphic pulse flow releases to maintain sediment balance. The third pair of sites is in the Loon Lake Dam Reach. The upper section in this reach is functioning properly geomorphologically, and pulse flows cannot serve as a reliable source of significant sediment transport in the middle and lower sections. Moreover, monitoring is unnecessary to enhance an understanding of the processes in these sections, particularly given the limited ability of pulse flow releases to achieve significant transport.

Because large pulse flows will be released in the Ice House Dam Reach under both the Agency Alternative and SMUD's Proposed Action, a two-site monitoring program in this reach is warranted.

Fish Populations

The Agency Alternative requires SMUD to monitor fish populations at several reaches throughout the UARP area for the entire duration of the new license term. The Agency Alternative provides no scientifically defensible rationale for the reaches, methods, or frequency of monitoring. A review of the record indicates the monitoring program as proposed will have little value and is unnecessary. Fish populations throughout the project reaches are healthy. Low densities or biomass levels at certain sites like the Rubicon River are not, alone, a proper measure of fish health and, in any event, are often the result of factors outside of SMUD's control. Therefore, increased releases from UARP dams under SMUD's Proposed Action and Agency Alternative, while expected to enhance fish habitat in some areas, are not expected to significantly alter the various metrics that already clearly demonstrate the fishery is healthy. Thus, implementing the fish population monitoring program of the Agency Alternative is unwarranted.

Benthic Macroinvertebrates

The Agency Alternative requires SMUD to monitor benthic macroinvertebrates at a number of sites throughout the term of the license. The existing healthy BMI community metrics in the UARP-affected reaches reflect the prevailing excellent water quality. Thus, BMI monitoring is appropriate only if environmental measures are expected to alter water quality parameters, including water temperature, in such a way as to create a demonstrable beneficial effect on BMI communities. However, none of the Agency Alternative measures are directed specifically at altering concentrations of water quality parameters such as minerals, metals, nutrients, or petroleum products. And none of the Agency Alternative measures will significantly alter water temperature in the UARP reaches, except at the Slab Creek Dam Reach. Furthermore, under baseline conditions, BMI populations throughout the project reaches are nearly uniformly found to be healthy (or unimpaired) and comparable to reference sites. In a few locations, baseline water temperatures contribute to localized reductions in composite metric scores, such as directly downstream of large project dams, where cold summer releases are a contributing factor.

However, none of the Agency Alternative measures are directed specifically at this issue and none will significantly alter the presence of cold water directly downstream of the large reservoirs. Thus, implementing the benthic macroinvertebrate monitoring program of the Agency Alternative is unwarranted.

Foothill and Mountain Yellow-Legged Frog

The Agency Alternative includes a foothill yellow-legged frog (FYLF) monitoring program requiring SMUD to conduct surveys at multiple sites in three project reaches throughout the term of the new license. The Agency Alternative FYLF monitoring program is based on a key assumption that is not supported by the results of the amphibian surveys conducted during the relicensing process. Breeding populations of FYLF were found only in the Camino Dam Reach. No FYLF were observed during focused field surveys conducted in the Junction Dam and Slab Creek Dam reaches. Subsequent surveys performed on two separate occasions at the location of a reported sighting of a single FYLF in the Slab Creek Dam Reach also failed to uncover the presence of FYLF, but did reveal the presence of several predators, including bullfrogs. Thus, monitoring in these reaches is unwarranted.

For mountain yellow-legged frogs (MYLF), the Agency Alternative requires monitoring at two reservoirs and one non-project lake throughout the license term. However, currently MYLF populations are not known to exist at any of the identified water bodies, and no information exists to draw a nexus between the lack of MYLF and current project operation. Furthermore, water management at both reservoirs will not significantly change from baseline under SMUD's Proposed Action or Agency Alternative. Similarly, the volume and timing of water passing through the non-project lake will not significantly change either. Therefore, the Agency Alternative MYLF monitoring program is unwarranted.

Adaptive Management Program

The Agency Alternative requires SMUD to implement an ecological resources adaptive management program. Two of the measures included in the program pertain to aquatic resources, including fish surveys in the South Fork Rubicon River to investigate the need to construct a fish screen and control of algae populations in the UARP reaches.

Fish Screen in the South Fork Rubicon River

The Agency Alternative requires fish population monitoring in the South Fork Rubicon River upstream of Robbs Peak Reservoir to determine if a fish screen is required to mitigate entrainment mortality at Robbs Peak Powerhouse. However, the likelihood of a significant level of entrainment at Robbs Peak Reservoir is extremely low. The combination of seasonal stream flow patterns and water temperatures in the South Fork Rubicon River are not conducive to maintaining a large trout population upstream of Robbs Peak Reservoir. The South Fork Rubicon River typically experiences very low flow (< 2 cfs) by mid-July to mid-August and summer with water temperatures reaching peak values of 24°C. In some years, such as 2004, the river dries up, leaving remnant fish populations to live in a few isolated pools of water. Given

the intermittent nature of the stream and documented very low levels of fish production, it is highly unlikely a monitoring program will produce a sufficient amount of information to determine when and at what flow fish migration is occurring or if fish are suffering entrainment mortality at the Robbs Peak Powerhouse. If there is any entrainment mortality occurring at all, it is extremely low.

Building a fish screen in the South Fork Rubicon River upstream of Robbs Peak Reservoir would be difficult and costly. First, the flow range of the stream is zero in summer/fall to 500 cfs or more during spring snowmelt runoff. Building a screen large enough to properly protect the few downstream migrants (passive or volitional) during snowmelt runoff would be challenging, requiring a significant modification to the stream channel. The exact cost to construct a screen is unknown, but is likely to range between \$10,000,000 and \$20,000,000. Thus, performing a monitoring program to determine whether to construct a fish screen at this site is unwarranted.

Algae Growth in Silver Creek and throughout all UARP Reaches

The Agency Alternative requires SMUD to reduce or eliminate excessive algae growth in the Junction Dam Reach if the minimum release schedule does not do so. Furthermore, SMUD is required to reduce or eliminate algae growth in any other project reach in the future if pervasive algal blooms are identified. SMUD's Proposed Action does not have a similar adaptive management measure.

This measure is unwarranted given its vague and highly speculative nature. Several concepts and assumptions embedded in the measure are not well developed or supported by scientific evidence. First, the measure is included in the Agency Alternative as an adaptive management measure, but contains no long-term monitoring program. Secondly, the measure assumes algal blooms in any of the project reaches are the direct result of project operations and must be mitigated (reduced or eliminated) by SMUD. Third, there is no definition of what constitutes "excessive growth" or an "algal bloom," and there is no scientific evidence from the relicensing studies concerning the presence of algae populations in any of the project reaches or the nexus between project operations and excessive algal growth. Fourth, the measure requires SMUD to reduce excessive algae growth without defining what constitutes an acceptable level of reduction. Fifth, and most importantly, there is no evidence to demonstrate that the occurrence of algae, a common feature of many streams, poses a threat to any aquatic resource.

Thus, this adaptive management measure is unwarranted on the basis of lack of a defined problem, lack of direct nexus to UARP operation, its highly speculative nature, and potentially high costs.

Iowa Hill Development – Aquatic Resources Measures

The Agency Alternative contains a three-part measure related to aquatic resources for the Iowa Hill Pumped-storage Development. The measure requires SMUD to: 1) monitor hardhead populations in Slab Creek Reservoir; 2) demonstrate temperatures in the margins of the reservoir

do not affect hardhead during project operations; and 3) maintain water temperatures in the South Fork American River downstream of Mosquito Road Bridge above 12°C at all times in June through August.

Slab Creek Reservoir Hardhead Monitoring

The Agency Alternative requires SMUD to monitor hardhead populations in Slab Creek Reservoir for two years prior to and two years after the construction/operation of the Iowa Hill Development. The hardhead monitoring program of the Agency Alternative is unwarranted given the scientific evidence from the relicensing studies, which indicate operation of the Iowa Hill Development will not result in a significant impact to hardhead populations in Slab Creek Reservoir. Water surface elevation fluctuations due to Iowa Hill operation are not expected to impact hardhead spawning because hardhead reproduce in riverine environments upstream of reservoirs. There are no migration barriers in the South Fork American River that will impede outmigration of spawning hardhead and, therefore, no strong evidence supporting the conclusion that spawning will be affected by the operation of the Iowa Hill Development. There is also a low likelihood of hardhead entrainment mortality associated with the operation of the Iowa Hill Development. Reservoir surveys conducted from 2002 through 2004 showed hardhead to be distributed primarily along the shoreline of Slab Creek Reservoir. Low numbers of hardhead inhabiting the deeper zones of Slab Creek Reservoir, where the Iowa Hill Development intake structure will lie, are supported by the results of gill net sampling, indicating a low likelihood of entrainment.

Slab Creek Reservoir Water Temperature Monitoring

The Agency Alternative requires SMUD to demonstrate water temperatures in shoreline zones of Slab Creek Reservoir do not affect hardhead distribution during operation of the Iowa Hill Development. However, operation of the Iowa Hill Development will not significantly alter the thermal regime of Slab Creek Reservoir. Water temperature modeling studies revealed the overall nature of surface warming characteristic of Slab Creek Reservoir under baseline conditions will not be altered as a result of Iowa Hill Development operations. In essence, according to model predictions, surface waters in the lower portion of the reservoir near the dam will continue to exhibit summer temperatures between 16 and 20°C.

Maintenance of 12°C temperature in South Fork American River

The Agency Alternative requires SMUD to maintain a minimum of 12°C during the months of June through August in the South Fork American River downstream of Mosquito Road Bridge. In the month of June, this measure is to apply only “after the descending limb of the hydrograph”. The primary purpose for this measure is to provide water temperatures for breeding FYLF, but there are no confirmed populations of FYLF in the Slab Creek Dam Reach. Moreover, the operation of the Iowa Hill Development will not alter water temperatures in the Slab Creek Dam Reach downstream of the bridge, as revealed by an evaluation of four years of water temperature monitoring at the bridge (2001-2004) and the results of water temperature modeling performed in Slab Creek Reservoir. This measure will also result in potentially

adverse environmental impacts to socioeconomic resources in El Dorado County. Mosquito Bridge is located in a remote portion of the South Fork American River canyon with no power. The measure will require the construction of a series of power poles along approximately 2,000 feet of a very steep and narrow portion of Mosquito Road leading down to the bridge.

Given FYLF have not been documented to reside in the Slab Creek Dam Reach, monitoring and modeling results indicate there is no problem, this measure is unwarranted. Finally, it is unclear what actions SMUD will be required to undertake to increase water temperatures above 12°C. The only controllable options available to SMUD are to reduce release rates or create surface water spill over Slab Creek Dam, both of which could negatively affect aquatic resources in the reservoir and/or the reach.

Air Resources

The Agency Alternative's increased flow release requirements will substantially reduce the overall energy generation and capacity of the UARP. Under baseline conditions, operation of UARP facilities generates an average of 1,835,000 MWh of electricity annually while producing negligible atmospheric emissions. SMUD's Proposed Action will reduce annual UARP generation by 41,000 MWh annually, whereas the Agency Alternative will reduce UARP generation by 171,000 MWh, or four times the generation loss under SMUD's Proposed Action. In addition, the Agency Alternative's water surface elevations will reduce PDC from existing facilities by up to 470 MW and will make infeasible the 400 MW peak generation increases that would occur under SMUD's Proposed Action through development of Iowa Hill. To compensate for these energy and capacity losses, SMUD must obtain a substitute supply of electricity. Virtually all this substitute electricity will be produced in power plants operated by burning fossil fuels and that emit carbon gases, criteria pollutants, and other hazardous material with the potential to affect air quality and health.

The Sacramento region is in "serious" ozone nonattainment for the federal 8-hour ozone standard. Ozone, a primary component of smog, is a harmful pollutant when present at ground level. In addition, Sacramento County is in nonattainment for the state ozone ambient air quality standards and for state PM₁₀ and PM_{2.5} standards. PM₁₀ and PM_{2.5} are associated with serious health effects and reduced visibility.

The bulk of SMUD's non-UARP energy is generated at nine existing natural gas-fired power plants. Even with best available control technology installed, plants operated by fossil fuels emit criteria air pollutants, precursors to such pollutants, and carbon dioxide. Under the Agency Alternative, these emissions will increase by more than four times than under SMUD's Proposed Action. Even assuming all the substitute energy is produced at SMUD's cleanest and most efficient gas-fired generating facility, the Agency Alternative will result in annual emission of 4.3 more tons of ozone precursors, and 7.1 more tons of particulate matter, than under SMUD's Proposed Action. These emissions will contribute to ongoing exceedences of state and federal ozone standards in the Sacramento region. If SMUD is forced to purchase the energy from the statewide net power system, it is reasonably likely that the increased emissions from power

plants that will provide the bulk of the substitute energy purchased from the system will occur in areas that are in nonattainment for one or more of these standards. The fact that some of the generating plants that will be called upon have had their air emissions offset under state and local regulatory programs does not reduce the impact of the real increase in emissions that will occur under the Agency Alternative as compared with SMUD's Proposed Action.

The Agency Alternative will also substantially increase the number of metric tons of carbon emissions produced to meet the energy demands in SMUD's service area. The Agency Alternative will result in emission of 20,150 more metric tons of carbon each year than will SMUD's Proposed Action, making it more difficult to meet California's greenhouse gas emissions reduction targets.

In addition to reducing average annual UARP generation by increasing spring bypasses and reservoir release rates, the Agency Alternative's reservoir level restriction will decrease generation during the hotter summer months (July, August, September) in SMUD's service area, when demand is at its peak and ozone-related air quality is at its worst. UARP generation will instead be shifted to the (generally) cooler month of October. The surface level restrictions at Slab Creek Reservoir also make it infeasible to operate Iowa Hill, which would play a substantial role in meeting peak energy demands by generating up to 400 MW when demand is highest. By requiring substitute energy to be generated at that time, primarily through the operation of power plants run on natural gas, the Agency Alternative will contribute substantially to existing violations of state and federal ozone standards. In contrast, SMUD's Proposed Action will provide greater generation of emissions-free hydroelectric energy to meet peak energy demands during the summer.

Geology

The Agency Alternative requires SMUD to release substantial volumes of water for multiple days past three UARP dams (Rubicon, Loon Lake, Ice House) during spring. Once released, the water becomes unavailable for storage or electrical generation. The releases are intended primarily to balance sediment transport into and out of the applicable stream reaches. Most UARP stream reaches are made up of bedrock and boulders; these "transport" reaches are not dependent on stream flows to balance sediment. A few UARP stream reaches include "response" segments, which contain sediments that can be transported by frequently occurring flows and which have morphological characteristics controlled primarily by interactions of river flow and sediment supply. Unbalanced sediment transport can cause a stream to widen and deepen (degrade) or to fill in (aggrade).

The stream reaches targeted by the Agency Alternative will not benefit from the pulse flows. At almost all response segments below Rubicon, Loon Lake and Ice House dams, sediment transport is balanced and will continue to be balanced under SMUD's Proposed Action. At the two remaining segments, in the Loon Lake Dam Reach, the Agency Alternative pulse flows will be insufficient to reliably provide for significant sediment transport. At the same time, the pulse

flows will heighten erosion in the channel, potentially leading to adverse effects on aquatic resources.

Rubicon Dam Reach. The Agency Alternative requires releasing or bypassing 600-cfs pulse flows into the Rubicon Dam Reach for three consecutive days in spring during BN, AN, and Wet water years. SMUD's Proposed Action does not include a similar measure because all available evidence indicates the existing operation provides sufficient sediment transport and balance between sediment supply and transport capacity.

More than 70% of this 4.1-mile reach is composed of granitic bedrock- and boulder-dominated transport segments, incapable of being affected geomorphologically on anything less than a geological timeframe. There are two response segments in the reach. The first response section is a short ¼-mile-long site nestled between two transport reaches. Under baseline conditions, the channel morphology, sediment supply, and transport capacity are in balance in this segment, and will continue so under SMUD's Proposed Action. At the 0.75-mile-long lower response segment, beaver dams complicate geomorphological study. However, no evidence indicates sediment transport is any different in this segment from the upper segment. Further, under baseline conditions, stream flows of 2,500 cfs, greatly in excess of the 600 cfs pulse flows, occur every two years on average. These flows will be expected to further facilitate sediment transport and maintain the balance between sediment supply and transport capacity.

Implementing the Agency Alternative pulse flow measure will require substantial, complicated, invasive construction, and/or facilities modifications in the Desolation Wilderness. Because of limited storage in Rubicon Reservoir, the only way to implement the required pulse flows is to lower the Rubicon–Rockbound Tunnel gate for three days, which will require constructing new headwork facilities and introducing an energy source. The new headwork facilities will likely require a new gate configuration, blasting to modify the tunnel entrance, and construction of a control building. The only viable power source is a 69 kV transmission line that must be built into the Desolation Wilderness. Costs will range between \$8,000,000 and \$10,000,000; annual maintenance costs are uncertain. In addition, bypassing the pulse flows will substantially decrease the net annual benefit of the UARP because water diverted at Rubicon Reservoir passes through every UARP powerhouse except Jones Fork.

Loon Lake Dam Reach. The Agency Alternative requires a five-day release into the Loon Lake Dam Reach of Gerle Creek; the 125 to 680 cfs pulse flows will be made during spring in BN, AN, and Wet years. A sensitive site investigation and recreation facilities impact assessment, based in part on test pulse flows, are also required to refine the pulse flow levels. The Alternative further requires a fluvial geomorphic analysis to investigate sediment load and transport in the upper and middle sites in Gerle Creek as well as development of a channel stabilization plan for Gerle Creek. SMUD's Proposed Action does not include a similar measure because the studies do not indicate such flows were necessary.

Three geomorphic study sites lie in this reach. The pulse flows will provide no benefit in the short, ½-mile-long *upper* site, which is properly sized geomorphically and where sediment

transport is occurring at the proper level. Logjams occur at this site, but no data in the relicensing studies suggests the pulse flows will dislodge them. In addition, none of the data suggests additional streamside overflow, which will occur only in Wet years under the recommended pulse flows, will provide any geomorphological benefits. Since pulse flows will not achieve geomorphological benefits in this reach, the test flows will also achieve no benefit.

In the *middle and lower* sections, the pulse flows will not provide an effective means of sediment transport. Only during Wet years will the pulse flows achieve even some bedload mobilization, and it is highly unlikely the pulse flows plus any accretion flows will achieve bedload transport in the lower response section. There is no need for additional overbank flows in these sections, given the abundance of healthy riparian vegetation and mature trees.

The pulse flows will also exacerbate erosion occurring in the *upper and middle* sections. This erosion is unrelated to UARP operations, and much of it occurs on private property. The Agency Alternative's increase in erosion may, in turn, cause adverse environmental effects on aquatic resources.

The pulse flow regime is not warranted. It will provide only marginal sediment transport in only one section, and may cause adverse environmental effects upon aquatic resources by increasing erosion, primarily on private property. Further study is also not warranted. The Agency Alternative's proposed sensitive site analysis is unnecessary given that the upper section—the Agency Alternative's section of concern—is functioning properly geomorphically. Channel erosion in Gerle Creek results from non-UARP activities, occurs largely on private property, and has no nexus to the UARP. Requiring SMUD to undertake channel bank stabilization efforts under these circumstances is unwarranted.

Ice House Dam Reach. SMUD's Proposed Action and Agency Alternative both require geomorphic pulse flow releases in the Ice House Dam Reach. SMUD's Proposed Action combines recreation boating and geomorphic releases in September of AN and Wet water years, whereas the Agency Alternative flows will occur in the spring.

The five-day spring pulse flows occur during the Agency Alternative's required 20 days of boating releases, and modeling and experience indicate the releases will interfere with SMUD's ability to fill Ice House Reservoir. The flow release will also pose a serious threat to rainbow trout spawning during the same period. The releases are to be made during spring to benefit from downstream tributary accretion; however, the highest flows in the Ice House Dam Reach tributaries occur in winter, not spring, due to the low elevation (less than 5,000 ft.).

The relicensing studies and field observations of recent high-flow events in Ice House Dam Reach indicate the required pulse flows are unnecessary to balance bedload supply and transport, and will not achieve their stated objective of creating descriptive alluvial features or transporting large woody debris. Sediment transport occurs regularly in the reach at moderate flows under baseline conditions. The higher pulse flows of the Agency Alternative will exacerbate channel erosion and deposition of sand in pools. Relicensing study data indicate the Agency Alternative

pulse flows will not create pools, riffles, and runs in the channel given the reach's bedrock nature and thin alluvial deposits.

SMUD's Proposed Action's combined boating and geomorphic pulse flows will enhance geomorphic and boating resources simultaneously, a unique opportunity as other streams at this elevation in the Sierra Nevada will not be boatable at this time of year. Since the water year type will be known by early summer, SMUD can manage water with certainty during the summer months for a September release, an added benefit to flatwater recreation on Ice House Reservoir. Fall pulse flows may displace or strand young-of-the-year rainbow trout, but will avoid impacts to spawning rainbow trout and disrupt brown trout spawning/incubation, consistent with the Forest Service's goal of managing for rainbow trout over brown trout.

SMUD's Proposed Action's recreation/geomorphology flow releases at Ice House Reservoir provide greater overall benefit than the Agency Alternative. The Agency Alternative flows, while timed to coincide with spring runoff after the rainfall-derived winter flow peaks, pose water management difficulties at the reservoir, provide little geomorphological benefit, do not achieve the other objectives stated in the Agency Alternative, and are likely to seriously impact rainbow trout spawning.

Recreation – General

In general, a number of the Agency Alternative land-related recreation measures are similar in concept to SMUD's Proposed Action Recreation Plan related to the protection of recreation opportunities at existing, UARP-related recreation facilities. However, the Agency Alternative includes recreation facilities or addresses areas of the ENF outside the FERC Project Boundary that have no nexus to the UARP. In contrast, SMUD's Proposed Action Recreation Plan addresses needs and facilities related to the opportunities afforded by the UARP.

Recreation – Whitewater

Whitewater recreation opportunities in the SFAR watershed will be supplemented by new opportunities in the SFSC downstream of Ice House Dam, while the coordination of operations between PG&E and SMUD will enhance whitewater recreation in the Reach Downstream of Chili Bar. SMUD's Proposed Action and Agency Alternative both contain measures related to whitewater recreation releases in the Ice House Dam Reach, but they differ in timing, duration, and water management benefits. The Agency Alternative includes a measure for whitewater releases in the Slab Creek Dam reach; SMUD's Proposed Action does not include such a measure because only a small segment of the boating community could benefit safely from the flows, several equivalent opportunities exist in the area, the topography makes the reach ill-suited for such a purpose, and the impact on generation greatly outweighs the benefit due to operational impacts and/or facility modifications required.

Ice House Dam Reach. The Agency Alternative includes boating releases in all water year types, ranging from two weekend days in CD years to 20 weekend days in Wet years. All releases are

to be made during the months of April and May. Each day will be six hours in duration, with the magnitude ranging from 300 to 600 cfs. The Agency Alternative does not combine pulse flows and boating flows. In contrast, the measure in SMUD's Proposed Action combines recreation boating and geomorphic processes into a set of three weekends of 400 cfs pulse flows in September of AN and Wet water years. The 400 cfs weekend releases will be 30 hours in duration, extending from Saturday mornings through Sunday afternoons. The most problematic differences between the two measures relates to timing, number of boating days, and duration.

As previously discussed, the Agency Alternative whitewater recreation release measure poses a number of uncertainties and conflicts in association with proposed water level requirements at Ice House Reservoir and geomorphic pulse flow releases. Also, modeling results and UARP operators confirm 20 days of boating releases in Wet water years on top of five days of geomorphic pulse flow releases can compromise SMUD's ability to fill Ice House Reservoir and/or meet the water level requirements of the Agency Alternative. Another logistic challenge and cost issue is the number of boating days in the wetter years. In Wet water years for example, each of the 20 weekend day events will require SMUD operators to essentially be on site to check for campers potentially in harms way, ramp up to the boating flow, hold the release for six hours then ramp down to the base release. The Agency Alternative whitewater boating flows may also affect rainbow trout spawning.

As previously discussed, SMUD's Proposed Action's combined boating and geomorphic pulse flows will enhance geomorphic and boating resources simultaneously, creating a unique opportunity as other streams at this elevation in the Sierra Nevada will not be boatable at this time of year. Since the water year type will be known by early summer, SMUD can manage water with certainty during the summer months for a September release, an added benefit to flatwater recreation on Ice House Reservoir. From an aquatic resources perspective, fall flows may displace or strand young-of-the-year rainbow trout, but will avoid impacts to spawning rainbow trout and disrupt brown trout spawning/incubation, consistent with the FS resource goals to manage for rainbow trout over brown trout.

Based on these considerations, the incremental increase in the number of boating days under the Agency Alternative is not warranted given the balance of costs and benefits, nor is it consistent with the number of days required of other licensees.

Slab Creek Dam Reach. The Agency Alternative requires SMUD to make releases in all water year types following a three-tiered schedule, with each tier assigned to a different span of years through the license term. In the final tier, which represents all license term years past ten, boating releases are between 850 and 1,500 cfs in all water year types, ranging from 12 days in CD years to 36 days in Wet years. Releases will be made in the months March, April, May, and October.

SMUD's Proposed Action does not include a measure for whitewater recreation releases into the Slab Creek Dam Reach because there are other similar opportunities in the area, only a small number of highly skilled boaters will benefit, and costly in terms of generation and operational

flexibility. SMUD also believes this reach is ill-suited for this purpose. The relicensing studies also revealed several difficulties associated with access in the reach, including the lack of suitable sites to develop sufficient parking at the put-in and potential take-out locations due to steep terrain, the lack of existing legal public access to potential take-out locations, and limited possibility to achieve public access to potential take-out locations by securing easements from private landowners.

A major drawback to providing whitewater recreation in the Slab Creek Dam Reach is the difficulty of providing flows of sufficient magnitude. Implementing the Agency Alternative through a controlled release will require: 1) boring a new hole in the base of Slab Creek Dam to install a valve with the capacity to release the high release levels; or 2) converting the White Rock Tunnel Adit No. 3 (located directly downstream of the dam) into a point of release. The feasibility of boring a new hole in the base of Slab Creek Reservoir is highly uncertain from a dam stability basis. Converting the White Rock Tunnel Adit No. 3 to a release point would incur a one-time capital cost of approximately \$9,000,000; private property concerns also complicate this option.

Another option is to implement a series of controlled spills at Slab Creek Dam manufactured by maintaining a consistent elevation to provide a constant flow over the dam. Creating a spill in March-May will require careful control of water elevations in Slab Creek Reservoir during the proposed spill period. During this time of year, flows in the SFAR are volatile and SMUD has little control over the inflow to the reservoir. Natural inflow from the SFAR can climb to many thousands of cfs, with daily and hourly swings of many hundreds of cfs due to such factors as air temperature fluctuations in the upland snowfields or rain-on-snow events. Thus, once the reservoir is raised above spill crest to deliver the desired flow, the actual volume of spill is unpredictable and subject to wide fluctuations. Upramping and downramping of the spill flows will be infeasible.

Creating a spill at Slab Creek Reservoir in October is far more predictable and controllable because the majority of water entering the reservoir emanates from Camino Powerhouse. However, manufacturing a spill event requires complete coordination of operations of the Slab Creek/White Rock, Camino, Jaybird, and Union Valley developments. In essence the lower half of the system will have to be fully dedicated to releasing water from Union Valley to spill at Slab Creek Reservoir. Thus, for the period of the spill event (and three days prior to the event), the UARP cannot be operated for power generation or the very important ancillary services it provides. October releases at Slab Creek Dam will also interfere with SMUD's outage needs – a time when the White Rock Powerhouse plays an important role in maintaining important energy needs. SMUD generally schedules planned outages at specific powerhouses in October–December. During an outage of a powerhouse upstream of Slab Creek Reservoir, SMUD manages the water in Slab Creek Reservoir to maintain needed power generation at White Rock Powerhouse to maintain important ancillary services. Dedicating the lower portion of the project to whitewater recreation flows during October will severely restrict SMUD's outage scheduling.

Given the availability of alternative whitewater recreation opportunities in proximity of the UARP, the lack of adequate public access, and the operational difficulties of providing constant flows, the Slab Creek Dam Reach is unsuited for scheduled whitewater recreation releases.

Recreation – Reservoir Levels

Union Valley, Ice House, and Loon Lake Reservoirs. The Agency Alternative requires SMUD to meet specified monthly average water levels in July, August, and September at Union Valley, Ice House, and Loon Lake reservoirs. The reservoir levels vary by water year type. SMUD's Proposed Action does not contain specific water level requirements for the three storage reservoirs. Under SMUD's Proposed Action, reservoir levels will vary from year to year, but will generally reflect the basic water management objectives of filling each reservoir around July 1 and preserving sufficient carryover storage in October to prepare for the upcoming water year. In addition, SMUD's Proposed Action will require SMUD to maintain levels at all three reservoirs during the peak recreation season (June 1 through Labor Day weekend) to ensure boating access via at least one of the existing boat ramps.

Both SMUD's Proposed Action and the Agency Alternative will provide an equivalent level of protection for aesthetic values. Under both alternatives, water levels will be high at all three storage reservoirs in July based on SMUD's general water management goal to fill the reservoirs around July 1. In August and September, water levels will slowly recede like all storage reservoirs in California.

However, compared to SMUD's Proposed Action, the Agency Alternative, with its strict reservoir level requirements in every water year type, will result in significant adverse effects on the Project's developmental values during abnormal water years and unusually hot summers. The Agency Alternative does allow SMUD to confer with resource agencies during abnormal water years (defined as Super Dry water years), but only allows SMUD to implement revised operations upon approval of four resource agencies. Managing water in the reservoirs in these abnormal water years to meet strict elevation requirements, which may produce an insignificant increase in aesthetic value, is unwarranted given the likely significant impact on the Project's developmental values.

Even in years that are not abnormal water years, when full pool is achieved around July 1 at the storage reservoirs, the Agency Alternative may provide insignificant increases in aesthetic value of the reservoirs in years associated with unusually hot summers. These increases will occur primarily in September – a month outside of the primary recreation season. As discussed in Developmental Resources, Section 6, meeting the monthly average reservoir levels of the Agency Alternative will limit SMUD's capability to utilize the full generating capacity of the UARP during a summer heat storm event or other strenuous system condition that continues over an extended period. This will result in a significant loss in Project Dependable Capacity of as much as 470 MW.

There will be energy losses from the reservoir restrictions of the Agency Alternative that amount to a 1.1% reduction in UARP power generation. This incremental reduction in energy is the result of a loss of operational flexibility and additional spills at the storage reservoirs. This loss is unjustified given the *de minimis* aesthetic difference between the two alternatives.

SMUD's Proposed Action will provide an adequate level of protection for aesthetic value and recreational opportunity in the three UARP storage reservoirs, without sacrificing Project flexibility, Project Dependable Capacity, or energy generation. The insignificant benefits in aesthetic value of the storage reservoirs, which may result under the Agency Alternative primarily in abnormal water years and unusually hot summers, are unwarranted given the significant energy and capacity losses that will result.

Gerle Creek Reservoir. The Agency Alternative includes a two-part measure relative to water surface elevations at Gerle Creek Reservoir, which serves as an afterbay to Loon Lake Powerhouse. The measure is unsupported by survey results or information contained in the Agency Alternative Rationale.

The first part of this measure requires water surface elevation to be maintained as practicable with minimum fluctuations from May 1 to September 10 of each year in order to provide maximum recreational benefits. This wording is similar to the wording in the existing license, but the new language deletes recognition of power generation needs.

The measure also states, in pertinent part: "If the licensee anticipates the reservoir will be drawn down in excess of two feet below full pool, the licensee shall consult with.... The minimum reservoir levels specified may also be temporarily modified for short periods in non-emergency situations five days after Notice to FERC, and upon approval of the FS, CDFG, and SWRCB." This language creates a *de facto* minimum elevation requirement of 5,229 feet, two feet below the maximum surface elevation of 5,231, with allowance for deviation due to equipment malfunction or unforeseen operating emergencies. The Agency Alternative Rationale provides no explanation regarding the derivation of this elevation or why it is needed.

This restriction is inconsistent with the need to utilize Gerle Creek Reservoir as an afterbay to Loon Lake Powerhouse and unsupported by the information from the relicensing studies. To a large degree, the management of water in the Loon Lake and Robbs Peak powerhouses is dependent on and constrained by the hydraulics of Gerle Canal. Requiring SMUD to maintain Gerle Creek Reservoirs within a 2-foot range will add another constraint on the use of the two powerhouses. Maintaining the specific reservoir level at Gerle will require careful ramping and smoothing of the water through Loon Lake Powerhouse, will reduce the regulating and peaking capacity of the powerhouse, and may affect Project Dependable Capacity. In addition, during May and to a lesser extent June, with high inflow from the Gerle Creek watershed, spill events at Gerle Creek Reservoir are likely to increase if this water level range is implemented.

The general recreation surveys conducted in 2002 at Gerle Creek Reservoir indicated a high level of visitor satisfaction with current reservoir levels. Because there is no evidence to suggest an

ongoing aesthetic or recreation impact and given the restrictive impact of this measure on UARP operations, this Agency Alternative measure is unnecessary. SMUD's continuing operational procedure of maintaining reservoir elevations as high as practical given water management and power generation needs will adequately protect aesthetic and recreational values at Gerle Creek Reservoir through the next license term.

Slab Creek Reservoir. This reservoir is located in the SFAR canyon and serves as an afterbay to the Camino Powerhouse and a forebay to the White Rock Powerhouse. Due to steep topography, there are no developed recreation facilities at the reservoir, and recreational use is low. Access to the reservoir is possible from two routes, a designated boat access located near the dam and an undeveloped site at the upstream end of the reservoir.

The Agency Alternative measure requires SMUD to: 1) maintain the reservoir level above 1,830 feet during daylight hours; and 2) restrict daily fluctuations to less than six feet per day during daylight hours. The Agency Alternative Rationale provides no explanation for the selection of the 1,830-foot elevation and the 6-foot range.

Under the baseline condition, the reservoir levels fluctuate two to three feet per day (maximum of up to 20 feet on rare occasions) on average and up to 15 to 30 feet over the course of a month. The maximum normal water surface elevation is 1,850 feet; the elevation often drops well below 1,830 feet, especially during the November 1 to May 31 timeframe, in anticipation of large runoff events to avoid spill. Under SMUD's Proposed Action, the operation of the Iowa Hill Development will result in increases in daily fluctuations to an average of approximately 15 feet.

The relicensing studies did not identify a significant existing problem with reservoir level fluctuations at this low elevation reservoir. Access at the upstream end of the reservoir is currently not encouraged and will be actively discouraged under SMUD's Proposed Action. Little recreation or aesthetic benefit will accrue from the Agency minimum elevation of 1,830 feet when compared to existing conditions and SMUD's Proposed Action.

Relative to the proposed Iowa Hill Development, the two measures are grossly incompatible with necessary operational parameters. The restrictions will significantly limit water management creating a high incidence of spills, with an associated incremental increase in energy generation losses at White Rock Powerhouse. Moreover, as discussed in Developmental Resources, Section 6.0, *the Agency Alternative will effectively render the Iowa Hill Development infeasible.* These significant losses in developmental value associated with the Agency Alternative are unwarranted given the undefined recreation and aesthetic benefits.

Junction and Brush Creek Reservoirs. The Agency Alternative requires SMUD to maintain seasonal reservoir levels within the range of levels measured during the period of record between 1975 and 2000, but provides no rationale for these water level restrictions. In a general sense, this measure will have no effect on aesthetics or recreation because reservoir levels will be no different than under existing conditions. It is uncertain whether the Agency Alternative intends SMUD to maintain future reservoir elevations below the historical high value of the range. This

high value is associated with floodwaters entering the reservoir during the 1997 flood. Future floodwaters, outside of SMUD's control, could result in a higher water level than the historical level. Nevertheless, it is unnecessary and overly complicating to require SMUD to maintain reservoir levels within historical levels in the absence of information that would suggest SMUD intended to operate outside the historical range.

Rubicon and Buck Island Reservoirs. In terms of aesthetics and recreation values, there will be no noticeable difference between the Agency Alternative measure and SMUD's Proposed Action. However, the Agency Alternative's exclusion of language recognizing power generation values effectively changes the primary purpose of the reservoirs from forebays for clean, hydroelectric generation to recreation lakes where the water levels are managed solely to maximize recreational benefits. This change is grossly out of balance and is inconsistent with the Agency Alternative's stated objectives for recommending measures for reservoir levels, which includes consideration of "Hydropower Operations." SMUD's Proposed Action will achieve a better balance among multiple uses of the UARP by adequately protecting recreation and aesthetic values while continuing to allow the reservoirs to serve their primary roles as forebays.

Value of the UARP Under SMUD's Proposed Action and the Agency Alternative

Economic Considerations

Under baseline conditions, the UARP provides an average annual net benefit to SMUD of \$86.2 million. This accrues from a \$30 million value of the 688 MW capacity plus a \$93.1 million value of an average annual generation of 1,835 GWh, minus \$36.9 million in annual costs.

The environmental measures of SMUD's Proposed Action without Iowa Hill will result in a \$3 million loss in annual net benefit for the UARP compared to baseline, or approximately 3.5 percent loss in value. This includes project value losses associated with reduced energy output from flow-related environmental measures as well as the cost of implementing non-flow-related environmental measures. These losses are reasonable given the balance of environmental needs and power generation. However, the inclusion of the Iowa Hill Development in SMUD's Proposed Action will increase the net benefit of the UARP above baseline conditions. Under SMUD's Proposed Action, the net annual benefit of the UARP will increase by \$8.2 million to \$94.4 million, entirely as a result of the benefits accruing from the Iowa Hill Development. Capacity value will rise by \$30 million, energy value will rise by \$9.5 million, but non-environmental costs will also rise by \$30.3 million.

In contrast, the Agency Alternative will significantly reduce the net annual benefit derived from the UARP. The Agency Alternative will result in significant reductions in annual capacity and energy value, as well as a significant increase in annual costs due to non-flow-related environmental measures. Energy losses associated with the Agency Alternative will reduce net annual benefits by \$8.3 million. Additional costs will accrue to SMUD associated with the loss of up to 470 MW of PDC at the existing UARP facilities and the loss of an additional 400 MW

capacity that would have been provided by the proposed Iowa Hill Development. The reduction in annual UARP value associated with losing up to 470 MW of PDC is \$15.9 million. The non-flow-related environmental measures required by the Agency Alternative will further reduce net annual UARP benefit by \$6.2 million, with additional losses potentially resulting from adaptive management measures that may be required on the basis of the Agency Alternative adaptive management program. Furthermore, the Agency Alternative will result in the loss of all energy, capacity, and strategic benefits provided by the Iowa Hill Development. Collectively, the impacts to the various aspects of UARP value under this alternative will result in a \$30.4 million loss in annual net benefits compared to baseline conditions, i.e., \$8.3 in energy loss, \$15.9 million in capacity loss, and \$6.2 million in additional costs.

In summary, the Agency Alternative will reduce net annual UARP benefits from \$86.2 million to \$55.8 million, which represents a 35.3 percent reduction. SMUD's Proposed Action will increase net annual UARP benefits from \$86.2 million to \$94.4 million, which represents a 9.5 percent increase. The difference in percentage change in benefits between these two alternatives represents a *significant* strategic value loss to SMUD. In addition, the inability to construct and operate the Iowa Hill Development represents a setback in SMUD's ability to achieve its long-term strategic, reliability, and portfolio planning objectives:

- Meeting State public policy objectives and energy challenges in the Northern California Region
- More comprehensively developing the waterway for expanding project capabilities without a significant impact on the environment
- Producing significant local generation in the Sacramento region to maintain system reliability as well as alleviate anticipated voltage and transmission constraints during peak-demand periods
- Aiding management of greatly increased minute-by-minute load balancing and control area challenges presented by wind and other non-dispatchable generation technologies that are needed to meet SMUD's renewable portfolio standards
- Shifting energy from low-demand to significantly more valuable peak-demand periods when appropriate
- Reducing emission burdens by displacing the need for additional thermal peaking power plants in the Sacramento region, which is a air quality non-attainment area
- Providing generation diversity within SMUD's resource portfolio.

Comparison of Agency Alternative to Recent Relicensing Outcomes

Hydro relicensing generally, but not always, results in some power generation loss, as Licensees, Agencies, and FERC balance power generation needs with environmental protection and enhancement. While each hydro facility is unique, average power generation losses are periodically published as guidelines. Nationally, the average generation loss has been reported as 4.23% (Source: National Hydropower Association), while in California the average generation loss has been reported as 5.5% (Source: California Energy Commission). Table ES-1

provides a detailed benchmarking of recent relicensings of projects that are similar in size and basic environmental issues in California and elsewhere or that are in the same watershed.

PROJECT	ENERGY LOSS			CAPACITY LOSS		CAPITAL AND ONE-TIME COSTS	NET BENEFIT LOSS	
	GWh Loss	Percent Loss	Value Loss \$M	MW Loss	Value Loss \$M		\$M	\$M
Cowlitz River 462 MW – Wash.	18	1.1	0.7	0	0	16.8 ⁵	17.5	48.0
UARP (Agency Alt.) 688 MW	171	9.3	8.3	470¹	15.9	6.2²	30.4	35.3
Mokelumne 194 MW – California	41	3.7	1.4	0	0	3.1	4.5	18.8
Beardsley-Donnells 82 MW – California	18	4.8	0.9	0	0	0.6	1.5	17.0
Upper N. Fork Feather 343 MW – California	86	7.3	5.5	0	0	3.2	8.7	16.5
Spring Gap- Stanislaus 90 MW – California	23	5.6	1.0	0	0	1.4	2.4	16.0
Pelton Round Butte 367 MW – Oregon	19	1.2	0.9	0	0	5.1	6.0	10.8
Pit River 3,4,5 317 MW – California	153	7.9	5.7	0	0	2.1	7.8	9.8
UARP (UARP-only)³ 688 MW	41	2.2	2.0	0	0	1.0	3.0	3.5
Haas-Kings 193 MW – California	11	0.6	0.2	0	0	0.4	0.6	2.4
Fifteen Mile Falls 296 MW – Vermont	12	1.9	0.3	0	0	0.3	0.6	1.9
Big Creek No. 4 99 MW – California	3	0.7	0.1	0	0	0.1	0.3	1.9
El Dorado 21 MW – California	15	13.8	0.5	0	0	0.4	1.0	N/A ⁴

¹ Capacity Loss will vary by water year and weather conditions, but will be as high as 470 MW.

² Does not include PME losses associated with Chili Bar Project measures (up to \$1M in additional costs).

³ SMUD's UARP-only alternative, analyzed in the PDEA, does not include the Iowa Hill Development.

⁴ The PM&E measures result in a net annual loss for the hydro project; however, the project also provides consumptive water benefits for its licensee; a new license has yet to be issued.

⁵ High PM&E costs for this project include construction of salmon hatchery and fish passage facilities to address environmental issues not present in the UARP relicensing.