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Legal Risks and Timeline Associated with Increasing Surface Water Storage in California

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Executive Summary

In California, surface water storage has become a hot topic. California's recent drought has fueled the discussion, with a number of agricultural interests forcefully arguing that the state needs to store more water. Their efforts have been successful, and California's water bond, Proposition 1, has earmarked \$2.7 billion for the public benefits of storage projects.

There are now dozens of proposals for Proposition 1 funding, including twenty projects that incorporate surface storage, varying in size and location from large CALFED projects supported by federal and state funding to smaller, local projects. On average, the eligible large CALFED projects seek ten times the amount of funding as the small local/regional projects.

While there has been a great deal of research and debate over the environmental impacts and cost effectiveness of surface water storage projects, there has been little consideration of the more fundamental question of their practical feasibility—in particular, the time required from project initiation

to completion. This is critically important, for it will determine when and if these projects actually make a difference to water users. This report fills that gap, detailing the time commitment associated with designing, analyzing, and implementing recent major surface water storage projects.

Our key finding is that most major surface water storage projects seriously considered since 2000 have not been completed and may never be. Among the eight projects evaluated in California since 2000, only two have been completed. Both of those expanded already existing storage facilities and still required about twelve years for permitting, approvals, and planning, followed by about two years for project construction. Including the other CALFED projects still under consideration, recent major surface storage projects have required almost fifteen years (and counting) for the permitting and analysis phase. No new major surface storage facility has been constructed in the state during this timeframe, despite millions spent on feasibility studies and environmental documentation.

Major water storage projects are complex undertakings with large impacts. The long timelines reflect the multiple assessments

Silverwood Lake, San Bernardino County, California



The long timetables of recent large surface storage projects suggest that future major projects will likely follow similarly lengthy schedules.

and permitting requirements to ensure that the projects are feasible, safe, financially viable, and not unduly harmful to downstream communities and the environment. These requirements serve important roles by ensuring that decisionmakers evaluate feasible alternatives to proposed storage projects and are fully informed about the economic and environmental consequences of the project prior to making decisions. They also ensure safety in the construction and operation of the facilities. Other types of storage projects, such as groundwater storage projects, require similar assessments and permits. But the time requirements associated with the approvals for those projects may be shorter if their environmental impacts are less significant and their costs lower.

Our analysis of storage projects also reveals that the long timelines are the result

of many different laws and political/financial concerns. There is no single silver bullet to shorten schedules. Exempting storage projects from CEQA coverage, for example, likely would not significantly shorten the timeline (and would be inadvisable for other reasons).

The long timetables of recent large surface storage projects suggest that future major projects will likely follow similarly lengthy schedules. The recent breach scare at Oroville Dam has highlighted the importance of making sure that when these projects are built, they are built right, without cutting corners on planning. As a result, Proposition 1 funding decisions should be made with much greater consideration given to the likely timeline for bringing funded projects online, based on real experience rather than hopeful estimates or, as has more often been the case, simply ignoring the issue.

Introduction

Recent new and modified major surface storage projects have required a long development time to secure funding, conduct required environmental studies, obtain permits, design, and construct.

Surface water storage has become a popular topic again in California. Editorials pepper newspapers with cries that “California desperately needs new surface storage” and more specific recommendations like “California needs to invest in Sites Reservoir.”¹ Billboards along the I-5 in the Central Valley demand more surface storage. Meanwhile, critics counter that the best surface storage locations already have dams with significant environmental impacts and that new storage may be economically infeasible.² Heightened awareness of water shortages because of the recent drought has provided newfound impetus to the debate. The resulting political will to develop surface storage facilities has led to what the California Department of Water Resources (DWR) deems a new era of surface water storage in the state.³

Water storage in California is fundamental to managing variability in the water supply. Storage controls the timing of water availability, thus allowing Californians to obtain adequate water supplies throughout the year rather than only immediately after rainfall. Storage also addresses multiannual periods of relative abundance and drought. California’s recent drought has made snowpack, surface storage, and groundwater storage particularly critical tools in state and local efforts to maintain adequate water supplies throughout the year.

Political will to develop new and enhanced surface storage facilities has grown at the federal and state levels. Multiple bills have been introduced in the U.S. Congress to authorize and fund storage projects in light of the drought.⁴ DWR has supported increasing surface storage because it would help the state cope with drought and climate change, ideally benefiting people and the environment.⁵

The confluence of support came together in November 2014, when Californian voters approved Proposition 1. This bond measure earmarked billions of dollars in funds for water

projects in the state. Of the more than \$7.5 billion authorized, the bond measure allocates \$2.7 billion for surface water and groundwater storage projects. The California Water Commission may disburse these funds as early as this spring, although current projections reflect a mid-2018 timeline. This funding almost certainly will be allocated to at least one surface water storage project, if not more.

While much attention has been paid to questions about the cost-effectiveness and environmental impacts of new surface storage projects, consideration of the related timelines for their completion has been notably absent. In fact, we have a track record with respect to dam building and expansion, and it sends a clear message: Recent new and modified major surface storage projects have required a long development time to secure funding, conduct required environmental studies, obtain permits, design, and construct.⁶ And even after years of analysis and multiple approvals, many projects have proven infeasible due to political controversies, legal challenges, or inadequate funding. Moreover, the long timelines are not due to any single law but, rather, a combination of compliance with multiple laws as well as political/financial considerations.

This brief explains the timeline and project approval risks associated with the eight major surface storage projects initiated or analyzed in California since 2000. Appendix I documents in detail the most important permits and licenses required for project approval. These requirements ensure that the financial and environmental impacts of surface storage projects are identified and assessed before project approval and implementation, and also require safe facility construction and operation. The Water Commission should explicitly account for the practical timelines and requirements for a project to move from proposal to completion as it decides how to allocate Proposition 1 funding among storage projects.

California's Surface Storage Capacity

California has surface storage capacity for 65 million acre feet (MAF) of water, primarily in the Sierra Nevada snowpack and human-made projects such as dams and reservoirs.⁷ Groundwater storage in aquifers offers between 150 million and nearly 1.5 billion acre feet additional storage capacity, depending on how it is measured.

Surface storage in California provides a flexible storage system, ideal for short-term seasonal fluctuations in water supply. The state's largest surface reservoir is the Sierra Nevada snowpack. Historically, the Sierra has stored an average of 23 MAF of water annually, although that quantity is shrinking due to climate change as more precipitation falls as rain rather than snow.⁸ Because the timing of a snowpack melt and its size cannot be controlled, the Sierra's natural storage offers less certainty than other forms of surface storage.

Dams and reservoirs, in contrast, can be controlled so that they release water when and where it is needed. Nearly every river system in California has a dam—over 1400 dams in all. Together, California's on- and off-stream constructed reservoirs have a storage capacity of approximately 42 MAF of water, approximately equal to the state's agricultural and urban annual water use and about half of total annual use. Historical storage has been approximately 70 percent of this capacity.⁹

Most surface storage facilities in the state were built between the 1930s and 1970s.¹⁰ Indeed, only eight major surface storage projects have been initiated since 2000. California's State Water Project (SWP) and the federal Central Valley Project (CVP), introduced in 1937 and 1951 respectively, include about 50 dams and reservoirs that provide 14.8 MAF storage capacity and dictate the flow of large quantities of water in the state.¹¹

It is expected that California's surface storage

capacity will shrink over time. As sediment builds up, it effectively shrinks the depths of dams and reservoirs. Although sediment builds up slowly, it could eliminate 15 percent of California's reservoir capacity within 200 years.¹² Already an estimated 1.7 MAF of sediment clogs existing California dams.¹³ Huge wildfires in source watersheds exacerbate this problem. Likewise, droughts and climate change affect the quantity of water stored in reservoirs. In October 2015, during the worst period of the drought, storage facilities contained approximately 8 MAF less water than in average years.¹⁴ A smaller snowpack due to droughts in the short term means less snowmelt to replenish reservoirs.¹⁵ Longer term, climate change has also contributed to a reduced snowpack and shifted runoff and stream flows from the spring to winter months.¹⁶ And as temperatures continue to rise, these impacts will worsen.¹⁷ As a result, water deliveries may shrink by up to 10 percent by 2050.

The recent drought and concerns regarding future scarcity have intensified a renewed public and political interest in added water storage, which can come through surface storage or groundwater storage. Surface storage capacity in California could grow through either (1) enhanced or (2) new storage facilities. Surface storage may be enhanced by physical expansion, such as increasing the height of a dam or reservoir, sediment removal to maintain the maximum existing capacity of a reservoir, and strategic reoperation to effectively incorporate forecast-based planning.¹⁸ Alternatively, new surface storage may be on- or off- stream. Off-stream storage requires a conveyance system to move water from the river to the new storage location. Ideally, an off-stream storage facility could make use of existing diversions and canals rather than requiring new conveyance systems.

Despite the large quantity of surface storage facilities in the state and the increasing interest in adding additional facilities, critics of surface storage point to several limitations.

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Surface storage has limited value during long droughts because reservoirs cannot be replenished.¹⁹ In addition, the most inexpensive and effective reservoir locations in California already have reservoirs.²⁰ Further, dams raise a number of environmental concerns by disrupting the natural flow of water and river ecosystems; and most of the state's large dams lack adequate fish ladders. Dams throughout California may alter or restrict access to fish spawning habitat and likely impact downstream flows.²¹ In fact, from 1990 to 2010, the number of freshwater species of fish listed as endangered or threatened in California doubled.²² These concerns about the value and environmental harms associated with existing surface storage have fueled some of the current debate over new storage projects.

Although this report focuses on surface water storage projects, we conclude by offering a brief comparison with groundwater storage projects, which are also eligi-

ble for Proposition 1 funding. Groundwater storage projects vary widely in size, type, and associated necessary infrastructure and water rights, and are often one component of larger, more complex projects. Proposition 1 eligible groundwater storage projects include those that bank water in an aquifer for subsequent withdrawal. As a result, concept papers submitted for Proposition 1 consideration describe widely ranging projects—from pure groundwater storage to massive projects that incorporate groundwater banking as just one component and involve extraction wells and recharge basins, with funding requests ranging from under \$1 million to over \$200 million. This wide range of projects makes direct comparison with surface storage projects difficult. Nevertheless, this report highlights some similarities and differences between the two types of projects and the assessments and permits they require.

Near Fremont, California



Proposition 1 Funding

The availability of Proposition 1 funding has sparked further interest in both surface water and groundwater storage projects. By law, this funding must support the “public benefits associated with water storage projects that improve the operation of the state water system, are cost effective, and provide a net improvement in ecosystem and water quality conditions.”²³ The California Water Commission (CWC), tasked with allocating the funds, will consider a wide range of projects in terms of size, type, cost, and location, including both new and enhanced facilities.

The mandate for Proposition 1 funding is limited in multiple ways. First, storage itself does not constitute a public benefit.²⁴ Rather, qualifying storage projects must create ecosystem or water quality improvements, or flood control, emergency response, or recreational benefits. Second, only certain types of projects may receive funding. These include the large CALFED Bay-Delta Program (now the Delta Stewardship Council) surface storage projects, except those that “adversely affect” wild and scenic rivers.²⁵ Since 2000, the CALFED Bay-Delta Program, a collaboration among 25 state and federal agencies, has overseen the assessment of five major potential surface storage projects, discussed in detail below.²⁶ Three of these projects are currently eligible to receive Proposition 1 funding. Other qualifying projects include: groundwater storage projects and groundwater contamination prevention or remediation projects that provide water storage benefits; conjunctive use and reservoir reoperation projects; and local and regional surface storage projects that improve the operation of water systems in the state and provide public benefits.

To develop its disbursement criteria, the CWC requested concept papers from storage

project proponents summarizing potential project proposals and their associated public benefits. Twenty of the 43 concept papers submitted to date include new or enhanced surface storage (CALFED or regional/local), while the remainder includes groundwater and conjunctive use storage.²⁷ While the estimated program funding requests range widely from as little as \$150,000 to as much as \$2.5 billion, concept papers for the three CALFED surface storage projects seek \$400 million to \$2.2 billion each. In fact, the CALFED projects request an average of \$1.3 billion each, whereas the eight projects that only include local/regional surface storage request an average of \$100 million each. Even the large conjunctive use projects that incorporate surface storage request an average of only \$500 million. Because of the high cost of each of the CALFED storage facilities, funding any one of them would significantly impact CWC’s other funding decisions.

The CWC adopted Proposition 1 storage funding regulations in December 2016 and filed the proposed regulations with the Office of Administrative Law in January 2017. The CWC expects to request applications for funding by late 2017 and make funding allocations in mid-2018. In that process, they will review the technical feasibility and efficacy of each proposed project. The likely approval timelines associated with recent surface storage projects should also inform the CWC’s decisions since they will directly influence when (and if) these projects are completed and available to manage the state’s water.

What has contributed to the lengthy delays between proposal and completion of major surface storage projects? Although requirements vary somewhat by type of project and jurisdiction, both new and enhanced surface storage facility proponents must conduct multiple feasibility and impact studies to understand more completely the projects’ effects on the economy and the environment. They must also obtain about a dozen major federal and

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state permits and approvals that ensure proper protection of resources and minimize risks of unintended consequences.²⁸ And before surface storage facilities may begin operation, they will likely require another hundred federal, state, and local permits, licenses, and other approvals to ensure safety and minimal public impacts associated with construction and implementation.²⁹

Feasibility studies and federal Environmental Impact Statements (EISs) and California Environmental Impact Reports (EIRs), required by the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), together provide decisionmakers a critical opportunity to evaluate feasible alternatives to proposed storage projects. They are also essential for decisionmakers and communities to understand both the economic and environmental consequences of the projects before committing to them. Importantly, they are but two of the many relevant legal requirements that must be addressed in large surface storage projects. These projects also may require:

- Federal and state Endangered Species Act (ESA) consultation, Biological Opinion, Incidental Take Statement, and State Consistency Determination
- Magnuson-Stevens Act Essential Fish Habitat Assessment
- Fish and Wildlife Coordination Act (FWCA) report
- Consultation and agreement under § 106 of National Historic Preservation Act
- Lease/purchase of land, and special use permits
- New or amended water rights if existing rights are insufficient
- Clean Water Act § 401 Certification and § 404 Permit
- Rivers and Harbors Act dredging, excavation, filling, and other modification authorization
- California Fish and Game Code § 1601/1602 Streambed Alteration Agreement
- Encroachment permits from CA Department of Transportation and Flood Protection Boards
- Federal and California Wild and Scenic Rivers Act compliance
- California Fish and Game Code § 5937 compliance
- Local permits: construction and operation permits; dust control plans; easements
- Other possible requirements: Eagle Incidental Take Permit, Federal Energy Regulatory Commission (FERC) license

Essential for adequately evaluating the impacts of the projects, these environmental permitting processes involve various federal, state, and local agencies and require significant time and cost. The appendices to this report describe these major permitting and licensing requirements and the expected time and cost associated with each. To provide context for why projects have taken so long, the following section examines the approval timelines associated with each of the major surface storage projects initiated or analyzed since 2000. The number and extent of permitting requirements, the underlying economic and environmental impacts that they highlight, and the remaining uncertainty about project feasibility are primarily responsible for these long approval timelines.

Major Storage Projects: Permitting Processes and Approval Timelines

California has been evaluating and implementing surface storage projects for more than a century. Dam construction has slowed since the 1970s—only six new dams were constructed in the 1980s and 1990s.³⁰ In the last two decades, the state has expanded two major surface storage facilities and continued assessing six other proposed facilities.

This section examines those eight projects—five CALFED and three other major surface storage projects—initiated or analyzed since 2000 in California. As described below, every project has had long permitting and approval timelines. For each year of construction, a project proponent may spend about five years addressing adverse environmental impacts, providing full information and transparency to decisionmakers and the public, and ensuring safety in construction and operation.³¹ Even then, certain legal barriers may prevent projects from being implemented, such as the unavailability of water rights and the restrictions of the Wild and Scenic Rivers Act, which protects certain rivers with outstanding natural, cultural, and recreational values for future generations' enjoyment. Uncertainty regarding funding sources has also proved a challenge for many projects. High levels of opposition and concern about the proposed location of a dam can lengthen timelines and increase costs as well. Figure 1 summarizes the timelines and key requirements for each of the eight projects.

Although this section focuses on projects since 2000, the long surface storage project approval timelines described here are not peculiar to that period. For instance, the Seven Oaks Dam (also known as the Upper Santa Ana River Dam) was completed

in 1999, after eight years of planning and permitting and six years of construction. That planning phase began only after a fifteen-year process to obtain approval of a broad plan that included the Seven Oaks proposal. Similarly, the Metropolitan Water District completed construction of the Diamond Valley Reservoir in 1999. Planning for the project began in 1987, pre-construction began in 1993, and construction began in 1995. The dam was filled from 1999 to 2002. These projects are also summarized in Figure 1.

CALFED PROJECTS

Ongoing CALFED project assessments illustrate the long timelines associated with major surface storage projects.

The CALFED Bay-Delta Program, now the Delta Stewardship Council, grew out of California's ongoing water struggles and the state's historic drought of 1987–1992. An agreement in 1994 among federal agencies and the state to better coordinate activities in the Delta established CALFED and launched a ten-year effort among state and federal agencies to develop water quality standards and coordinate operations of the SWP and CVP.³² During this time, CALFED began investigating over fifty surface storage projects throughout California (some of which had been previously investigated) and prepared a programmatic EIS/EIR in July 2000. The August 2000 CALFED Record of Decision (ROD) replaced CALFED's original agreement and detailed plans to work collaboratively to improve water quality and reliability in the state.³³ Among other actions, the Record of Decision narrowed potential surface storage projects to five that warranted further investigation by the California Department of Water Resources (DWR), the U.S. Bureau of Reclamation (USBR), and local water interests.³⁴

Figure 1: Recent Major Surface Storage Projects and Their Long Timelines*

	STATUS	TIMELINE	KEY REQUIREMENTS
CALFED PROJECTS			
In-Delta Storage	Stalled	Funding Ended 2005	---
Shasta Dam Raise	Stalled	16 years to date (15 years to FR, Final EIS)	FR; EIS; WSRA; FWCA; ESA
Los Vaqueros Phase 1	Complete 2012	12 years (4 years for CCWD to join efforts and obtain federal authorization +7 years planning +1.5 years construction)	FR; EIS
Los Vaqueros Phase 2	Ongoing	3 years to date	---
Temperance Flat	Ongoing	16 years to date (14 years to draft FR and EIS in 2014)	FWCA; ESA; FR; EIS; water rights
Sites Reservoir	Ongoing	16 years to date (14 years to preliminary draft EIS/EIR)	FR; EIS/EIR; ESA
OTHER MAJOR PROJECTS			
Upper SOFAR	Ongoing	12 years since FR was authorized; decades under construction	
Centennial	Ongoing	2 years	
San Vicente	Complete 2012	13 years from approval for smaller raise to FEIS for combined raise +3 years construction +4 years filling	
PRE-2000 MAJOR PROJECTS			
Diamond Valley	Complete 1999, filled by 2002	7 years planning +2 years construction planning +4 years construction +4 years filling	ESA/CESA
Seven Oaks (mostly dry dam)	Complete 1999	15 years study for approval of plan including Seven Oaks +8 years planning +6 years construction	

* Acronyms: FR (Feasibility Report); FEIS (Final Environmental Impact Statement); EIR (Environmental Impact Report); WSRA (Wild & Scenic Rivers Act); FWCA (Fish & Wildlife Coordination Act); ESA (Endangered Species Act); CESA (California Endangered Species Act); CCWD (Contra Costa Water District).



Shasta Dam, Shasta Lake, Shasta County

For its five projects chosen for further work, CALFED selected only those that would either create new off-stream storage or expand existing storage, excluding projects that would add new storage on a major stream.³⁵ Figure 2 identifies and summarizes these five projects. Specifically, the 2000 ROD selected a new, offstream, in-delta storage reservoir and expansions of Shasta Lake and Los Vaqueros reservoirs for analysis and projected construction as early as 2002.³⁶ CALFED also identified the new, offstream Sites reservoir and Temperance Flat reservoir expansion for further study to be completed by 2006, in partnership with local agencies. None of these projects kept pace with their projected timelines. To date, only the Los Vaqueros reservoir has actually been expanded, with phase one completed in 2012. Agencies are still assessing the pro-

posed further expansion of Los Vaqueros.

Multiple factors may explain these long timelines. There was a two-year delay in establishing a state governing body for CALFED and a four-year delay before Congress authorized federal participation in and funding for CALFED.⁴¹ Uncertain funding in the intervening years has also left some projects on hold. Environmental assessments and permitting requirements and the questions they have identified about project feasibility have contributed to the timeline as well. On average, preparation of CALFED draft feasibility reports and draft EIS/EIRs has taken eleven to twelve years,⁴² with some still ongoing long past that benchmark. The Los Vaqueros Phase I expansion took a total of eleven planning and permitting years (seven years from the beginning of Contra Costa Water District's participation) plus one construction year.

Figure 2: CALFED Surface Storage Projects Selected for Further Investigation, CALFED 2000 Record of Decision*

	NEW/ EXPANSION	STORAGE CAPACITY ADDED (ACRE FEET)	COSTS	PROJECT STATUS	TIMELINE SINCE CALFED 2000 ROD	PROP. 1 FUNDING
Shasta Dam ³⁷	Expansion	Up to 634 TAF	\$1.26B	Stalled, after issuing Final FR and EIS in 2015	16 years to date (4 years until federal authorization +11 years to complete FR and EIS, + ongoing financial and legal delays)	Ineligible due to Wild & Scenic River status
Los Vaqueros Phase 1 (Contra Costa County) ³⁸	First phase expansion	60 TAF	\$120M	Expansion completed in 2012	12 years to date (4 years until federal authorization and CCWD participation +7 years to complete FR, FEIS +1.5 years for construction)	—
Los Vaqueros Phase 2 (Contra Costa County) ³⁸	Second phase Expansion	115 TAF	\$800M	Assessment phase — no draft FR or EIS/EIR	3+ years to date	Submitted concept paper requesting \$400M
Temperance Flat (USJRBS) ³⁹	Reservoir expansion via new dam	1.26 MAF	\$3.1B	Assessment phase — Draft EIS/EIR in 2014	16 years to date (4 years until federal authorization +4 years to select site +6 years before completion of draft EIS/EIR and draft FR in 2014)	Submitted concept paper requesting \$1.4B
Sites Reservoir (NODOS) ⁴⁰	New Off-stream	1.2–1.8 MAF	\$6.3B	Assessment phase — Preliminary Draft EIS/EIR in 2014	16 years to date (4 years until federal authorization +10 years before completion of preliminary draft EIS/EIR in 2014)	Submitted concept paper requesting \$2.2B
In-Delta Storage	New Off-stream	—	—	On hold; funding ended in 2005	—	—

* Acronyms: FR (Feasibility Report); FEIS (Final Environmental Impact Statement); EIR (Environmental Impact Report); CCWD (Contra Costa Water District).

This section explores each of the four active CALFED projects identified in the 2000 ROD. We do not further address the in-delta storage project, for which funding ended in 2005 after the completion of a feasibility report.

Shasta Lake Expansion

One of the four active CALFED projects proposes to raise Shasta Dam 6.5–18.5 feet. The existing Shasta Dam and Reservoir are on the upper Sacramento River and provide about 40 percent of the CVP's total reservoir storage capacity.⁴³ The proposed dam raise would increase storage capacity by 634 TAF.⁴⁴ USBR, the federal lead agency, has completed the Feasibility Report and EIS for this project, but other questions about funding and state permitting authority, described below, have halted further progress.

Project proponents have been evaluating the proposed Shasta Lake dam raise since the 2000 ROD and federal authorization of feasibility studies in 2004. USBR issued the draft feasibility report in 2011 and the draft EIS in 2013, followed by the Final EIS (but no Record of Decision) and Final Feasibility Report in 2015. If Congressional approval were given (unlikely at this point), USBR anticipates that the project could be completed in another ten years—five for project design, permitting, and real estate acquisition and five for construction. Though these timelines are long, they would likely be even longer for projects proposing entirely new dams, which often face more legal hurdles. In the Final Feasibility Report for the project, for instance, USBR noted that no state water right amendments were necessary because the existing water rights would sufficiently cover any additional storage associated with the dam alterations, as long as the volumes fall within the highest previously authorized storage volume.⁴⁵

Meeting this anticipated ten-year timeline going forward would require adequate funding, non-federal partners, and no permitting roadblocks. Some snags, however,

already seem likely. Unless the project can be altered to avoid serious impacts to protected rivers and endangered species, it is unlikely to obtain necessary approvals.

Most worrisome for its proponents, the project likely does not comply with the Wild and Scenic Rivers Act. California Public Resources Code § 5093.542, established pursuant to the state Wild and Scenic Rivers Act, prohibits dams, reservoirs, diversions, or other water impoundment facilities for a certain distance below McCloud Dam. It also prohibits any department or agency of the state, except DWR, from assisting in the “planning or construction of” any of these facilities.⁴⁶ The Act thus safeguards rivers with particular cultural, natural, and recreational value by preventing state participation in any activities that would harm the natural flow. Because the relevant area below McCloud Dam would be periodically inundated and therefore harmed if Shasta Dam were modified, state agencies in compliance with the Act will not be able to process and issue the project permits and approvals.⁴⁷ In fact, the Final Feasibility Report acknowledges that “there has been a determination that [section 5093.542] prohibits State participation in the planning or construction of enlarging Shasta

AT A GLANCE: SHASTA DAM RAISE

- **Size:** 6.5–18.5 feet dam height raise
 - **Assessments Timeline:** Ongoing since 2000 ROD and 2004 federal authorization; 11 additional years to complete Feasibility Report and EIS in 2015; projected 5 years for permitting, and 5 years for construction
 - **Status:** Assessment phase — Final Feasibility Report and EIS/EIR issued, but project likely to be stalled
 - **Major Contributor to Timeline:** Violation of California Wild and Scenic Rivers Act; ESA assessments
 - **Prop 1 Funding Potential:** Ineligible
-

Dam other than participating in technical and economic feasibility studies.”⁴⁸ These same concerns prevent the Shasta Lake dam expansion from obtaining any Proposition 1 funds, because violation of the state or federal Wild and Scenic Rivers Act renders a project ineligible for funding. The CWC has confirmed that this project will not receive funding.

The project has also raised concerns about its effects on multiple species listed under the federal ESA. As a result, it likely will require an ESA section 7 consultation.⁴⁹ In fact, a draft U.S. Fish and Wildlife Service (FWS) report indicated that the negative impacts of the project on Chinook salmon runs may prevent the agency from approving the project.⁵⁰ (It is not yet clear whether a separate California ESA analysis will be required because funding issues have prevented preliminary assessments.⁵¹) Moreover, the project will likely need encroachment permits from the Central Valley Flood Protection Board and California Department of Transportation (DOT) to ensure safety during construction. Local agencies may require encroachment permits as well.

Los Vaqueros Expansions

The first Los Vaqueros expansion is the only one of the five CALFED projects identified in 2000 that has been completed to date. The offstream reservoir in Contra Costa County, just west of the San Francisco Bay Delta, was initially built in 1997 with a 100 TAF storage capacity. USBR and the Contra Costa Water District (CCWD) acted as lead agencies to coordinate the first expansion of the dam and reservoir, for which construction began in 2011 and was completed in fall 2012. This expansion raised the dam 34 feet, resulting in 60 TAF additional storage capacity. In January 2013, CCWD began filling the reservoir past its previous 100 TAF capacity.

The permitting process for this first expansion spanned eight years after federal authorization and CCWD became involved in 2004. After Contra Costa voters approved

AT A GLANCE: LOS VAQUEROS EXPANSIONS

- **Size:** 34 ft dam raise, 60 TAF added storage capacity (2012); 51 ft dam raise, additional 115 TAF storage capacity (current)
 - **Assessments Timeline:** Since 2000 ROD, federal authorization and beginning of CCWD participation in 2004, completed Phase 1 assessments in additional 7 years (by 2011); Phase 2 analyses ongoing since 2013.
 - **Status:** Initial dam raise completed in 2012; current phase 2 expansion in assessment phase
 - **Major Contributor to Timeline:** Uncertain funding sources
 - **Prop 1 Funding Potential:** Submitted concept paper seeking \$400 million for Phase 2 expansion
-

the project in 2004, USBR began the CALFED feasibility studies and EIS/EIR. USBR issued Notices of Intent/Preparation of the EIS/EIR in December 2005 and January 2006, the draft EIS/EIR in February 2009, and the final EIS/EIR in March 2010. By October 2010, CCWD had submitted its Clean Water Act section 404 permit application to the Army Corps of Engineers.⁵² FWS prepared the Fish and Wildlife Coordination Act Report in March 2011.⁵³ And by April 2011, the project had obtained an Incidental Take Permit, a Clean Water Act section 401 certification, a Biological Opinion and Incidental Take Statement from FWS and the National Marine Fisheries Service (NMFS), and a Golden Eagle Protection Plan. These permit and assessment processes together required demonstrations that the project would be compatible with nearby resources. Once environmental impacts had been identified and minimized and the project had its permits, it was constructed in under two years. This approximately ten-year process, from assessment to completion, is the shortest and only

complete project development among the CALFED projects.

The second phase of the Los Vaqueros expansion is still under assessment. It would raise the dam another 51 feet, adding 115 TAF of capacity. An initial lack of state funding slowed this phase, and USBR and CCWD are still analyzing it.⁵⁴ Because the 2010 Final EIS/EIR studied alternatives to expand Los Vaqueros to the full 275 TAF capacity, the lead agencies may be able to streamline Phase 2 assessment work. In fact, the agencies have set an aggressive schedule for Phase 2 assessment, anticipating a draft supplemental EIS/EIR by June 2017 and the final Supplemental EIS/EIR and feasibility study by late 2018.⁵⁵ The project timeline allows just one additional year for final design, permitting, and land acquisition before construction begins in 2020.⁵⁶ Although the other CALFED projects have not kept pace with such a tight timeline, this project may prove faster because it builds off of previous assessments. It may also confront less opposition than other projects. The first Los Vaqueros expansion garnered widespread public support and triggered no litigation.

CCWD is seeking \$400 million in Proposition 1 funds for ecosystem, water quality, and delta benefits from the second phase expansion, which it anticipates receiving in 2020.⁵⁷

Temperance Flat

Temperance Flat dam and reservoir would be located in the upstream portion of Miller-ton Lake on the San Joaquin River. The new, 665-foot high dam would add 1.26 million acre feet (MAF) capacity to the Millerton Lake area. USBR has led the project assessments to date, although the newly formed local San Joaquin Valley Water Infrastructure Authority (SJVWIA) is now coordinating to speed the process and issue a final feasibility report and EIS.

USBR has been investigating Temperance Flat and alternative sites along the Upper San Joaquin River since the 2000 ROD and federal

AT A GLANCE: TEMPERANCE FLAT (USJRBSI)

- **Size:** New 665 ft dam, expansion of existing reservoir capacity by 1.26 MAF
 - **Assessments Timeline:** Ongoing since 2000 ROD and 2004 federal authorization; Temperance Flat site selection in 2008; additional 6 years before completion of draft FR and EIS in 2014; anticipated additional 10 years of permitting and legal challenges before construction could begin
 - **Status:** Issued draft FR and EIS in 2014, nearly completed Final Feasibility Report
 - **Major Contributor to Timeline:** Uncertain funding source; no local stakeholder until recently; extra analyses; ESA; NEPA; unavailable water rights; potential WSRA violation
 - **Prop 1 Funding Potential:** Submitted concept paper requesting \$1.4 billion
-

authorization of feasibility studies in 2004. USBR released a Scoping Report in 2004 that narrowed the potential project sites to 11. An Initial Alternatives Information Report followed in 2005, and USBR selected the Temperance Flat site in a 2008 Plan Formulation Report.⁵⁸ In early 2014, USBR issued its draft Feasibility Report, assessing five project alternatives. The same year, USBR issued a draft EIS, after a decade-long environmental review process that formally began with a 2004 Notice of Intent. In its draft Feasibility Report, USBR estimated that after obtaining necessary permits and approvals, the project would need approximately 3 years for pre-construction activities (including refining designs and acquiring land) followed by 8 or more years for construction activities before operation could begin.⁵⁹

Obtaining the necessary permits and approvals may take some time because the project investigation has required, and may continue to require, extra analyses. These additional analyses have proven necessary for understanding the surface and subsur-

face impacts and stability of the proposed project. For instance, USBR conducted a preliminary geological field exploration to collect data to determine if geologic conditions in the area would support construction of the dam.⁶⁰ That activity itself required an Environmental Assessment under NEPA that examined its potential direct, indirect, and cumulative impacts. The project may also need a surface mining permit from the California Department of Conservation under the California Surface Mining and Reclamation Act, an Essential Fish Habitat assessment and consultation pursuant to the Magnuson-Stevens Act, an assessment pursuant to the Bald and Golden Eagle Protection Act, and an amended FERC license. In addition, Temperance Flat may require Special Use Permits from the Bureau of Land Management (BLM).⁶¹ Finally, the project would require local construction-related permits from Fresno and Madera Counties, and a Dust Control Plan and construction and operation permits from the San Joaquin Valley Air Pollution Control District. This list of permitting requirements is lengthy, but each one is essential for understanding a different type of impact of the proposed dam.

Other significant legal issues make the dam's approval uncertain. First, the State Water Resources Control Board has determined that no more water rights are available on the San Joaquin River.⁶² The Board also concluded that USBR's existing water rights for the San Joaquin River would not cover the proposed Temperance Flat operations.⁶³ Therefore, the Temperance Flat project may lack access to available new or amended water rights. USBR has yet to resolve this issue.⁶⁴ Further, in late 2014, BLM recommended that a portion of the San Joaquin River affected by the proposed dam be protected within the National Wild and Scenic Rivers System because of its remarkable scenic, cultural, recreational, and wildlife values.⁶⁵ However, under the current administration, BLM may not pursue this sort of protection for the river.

Despite these uncertainties, project proponents have continued assessing the project's feasibility and environmental impacts. In July 2016, USBR and the new SJVWIA signed a Memorandum of Understanding (MOU) to complete the Temperance Flat Dam feasibility studies.⁶⁶ At the time, SJVWIA's Executive Director anticipated issuing the final feasibility report for the project within two months. However, he acknowledged that the project might take as many as 15 years to complete due to issues identified in environmental assessments and legal challenges.⁶⁷ In the meantime, the SJVWIA seeks \$1.4 billion from Proposition 1 funding for the project's ecosystem, water quality, and delta benefits.

Sites (NODOS) Reservoir

The proposed new, off-stream Sites Reservoir storage facility in the Antelope Valley would have a total capacity of 1.8 MAF and would store 1.1–1.4 MAF of water annually. Water from the Sacramento River would flow through two existing canals and one new intake/outlet to the reservoir. In total, the reservoir would encompass two main dams located on ephemeral creeks, nine addi-

AT A GLANCE: SITES RESERVOIR

Size: New, offstream storage facility, 1.8 MAF capacity

Assessments Timeline: Ongoing since 2000 ROD and federal authorization in 2004; additional 10 years before completion of preliminary draft EIS/EIR in 2014

Status: Issued Preliminary Administrative Draft EIS/EIR in 2014, no additional documents

Major Contributor to Timeline: Uncertain funding sources; lack of local stakeholder until 2011; EIS/EIR; ESA

Prop 1 Funding Potential: Submitted concept paper requesting \$2.2 billion

tional dams, and a conveyance tunnel. DWR and USBR have served as the lead state and federal agencies for the project. The local Sites Joint Powers Authority (JPA) is coordinating project planning. That agency is made up of representatives of Colusa and Glenn counties, Maxwell Irrigation District, Tehama-Colusa Canal Authority, Reclamation District 108, and several local water districts.

DWR and USBR have been evaluating this project and alternatives since the 2000 ROD and federal authorization for feasibility studies in 2004. The initial scoping report was issued in October 2002. DWR completed comprehensive environmental field surveys and geotechnical explorations from 2001 to 2005, and developed an initial alternatives information report in 2006. Together with USBR, DWR then analyzed a number of project alternatives before selecting three for further evaluation in 2008. As of 2007, project proponents anticipated appropriating adequate funding for a

two-year design phase and a five-to-seven-year construction phase, to begin operation of the reservoir by 2019.⁶⁸

This timeline has expanded, however, along with growing project cost estimates. Instead of releasing a final feasibility report by 2013, as was projected, USBR issued only a progress report on the initial feasibility study by that year. A 2008 FWS Biological Opinion that found substantial project impacts on listed species required project remodeling that may have expanded the timeline. Most recently, USBR issued a preliminary administrative draft EIS/EIR in 2014. Cost estimates have also grown, from \$1.2 billion to \$6.3 billion.⁶⁹ Currently, the JPA is seeking additional partners to ensure adequate financial support. The agencies do not, however, appear to have a realistic grasp of the likely project timelines. Early in 2016, the JPA project manager suggested that the project may need just one year to fulfill its major permitting requirements, including the



Spillway, Shasta Dam, Shasta Lake, Shasta County

feasibility report, EIS/EIR, ESA requirements, and others listed above and detailed in the appendices.⁷⁰ He did not explain the basis for this projection. Nor did he acknowledge that, because Sites reservoir will add to pumped storage hydropower, it may require an authority to construct license from FERC.⁷¹ In fact, the JPA plans to construct only the pumps initially, meaning that any FERC licensing requirements necessary for energy generation features built after initial construction would be for an existing, rather than new, facility.

Despite the likely long timeline, project proponents hope to obtain Proposition 1 funding for this project. To that end, the JPA submitted a Concept Paper seeking \$2.2 billion for the project's public benefits.⁷² If the permitting process proves too slow for Proposition 1 funding, however, proponents are determined to move forward with the project without those funds.⁷³ The draft EIS/EIR is expected sometime this year.

OTHER MAJOR SURFACE STORAGE PROJECTS

In addition to the CALFED projects, local agencies have initiated or analyzed a few other major dam and reservoir projects since 2000. Of the three projects reviewed here, both the San Vicente Dam Raise and the Alder Reservoir (Upper South Fork of the American River (SOFAR)) have faced timelines similar to those for the CALFED projects. The Centennial Reservoir Project began as recently as 2014 and therefore does not provide significant data regarding project timelines.

San Vicente Dam Raise

The San Vicente Dam Raise increased the height of an existing dam north of the community of Lakeside in San Diego County in 2012. It added 117 feet in dam height and 152 TAF capacity. Though the project was initially intended as a two-phased dam raise, project

AT A GLANCE: SAN VICENTE DAM RAISE

- **Size:** Raise dam 117 feet, add 152 TAF capacity
- **Assessments Timeline:** 13 years (1996 approval for initial raise, combined the two raises and released Final EIS/EIR April 2008)
- **Status:** Completed 2012
- **Major Contributor to Timeline:** Two-phased raise proved infeasible and impractical
- **Prop 1 Funding Potential:** N/A

proponents ultimately combined the initial phase with the second phase to consolidate the construction process.

The San Diego County Water Authority released the project's Final EIS/EIR in 2008, thirteen years after project assessment began. Construction began in 2009, and the dam reached its full height by late 2012. In addition to the primary permitting requirements, the Water Authority obtained state authorization to use the reservoir for human consumption.

Alder Creek Dam and Reservoir (Upper SOFAR)

Alder Dam and Reservoir would be located near the South Fork of the American River in El Dorado County. Various federal agencies, including USBR, and state and local agencies have considered and studied many iterations of the project. In fact, Congress authorized a feasibility study as of 2004. The current project would be solely controlled by the El Dorado Irrigation District, have a storage capacity of 175 TAF, and generate 470,000 MWh annually.⁷⁵ At an elevation of 5,500 feet, the dam and reservoir would have the potential to offer a wider range of benefits than could a low-elevation reservoir, although it may not offer the ecosystem benefits required for funding eligibility.

The El Dorado Irrigation District and El

AT A GLANCE: ALDER DAM AND RESERVOIR

- **Size:** New, offstream storage facility, 175 TAF, 470,000 MWh annually
- **Assessments Timeline:** Ongoing since Congress authorized feasibility study in 2004
- **Status:** No known feasibility report or EIS/EIR released
- **Major Contributor to Timeline:** N/A due to lack of documentation
- **Prop 1 Funding Potential:** Submitted concept paper requesting \$450 million

Dorado County Water Agency submitted a Concept Paper seeking \$450 million in Proposition 1 funds. Despite the decades of analysis on multiple versions of the reservoir, the project appears to be in the early stages of development, without a completed feasibility report or EIS/EIR. The project had obtained a FERC license but lost it after failing to find project financing. Due to the lack of action, detail, and documentation about this project, it is not included in the project timeline assessments.

Centennial Reservoir

The Centennial Dam would be 275 feet high and provide 110 TAF capacity on the Bear River, east of Sacramento. The Nevada Irrigation District (NID) began planning for this reservoir in 2014, when it submitted an application for water rights to the State Water Resources Control Board.⁷⁶ In February 2016, NID released a Notice of Preparation of an EIR, and in April 2016, NID submitted an application for a permit under section 404 of the Clean Water Act. In February 2017 the Army Corps of Engineers released a Notice of Intent to prepare an EIS.⁷⁷ If the project receives all permits as planned, project proponents anticipate beginning construction in 2021.

Centennial reservoir project planning and building is expected to cost an estimated

\$200–300 million. To date, project proponents have spent over \$7 million on project studies and permits (including, among other costs, \$500 thousand for water rights, \$3.4 million for property, and \$2.7 million for consulting).⁷⁸ NID submitted a Concept Paper seeking \$100 million in Proposition 1 funds. Because this project was initiated within the last two years, it is not included in the project timeline assessments.

AT A GLANCE: CENTENNIAL RESERVOIR

- **Size:** New, 110 TAF capacity reservoir
- **Assessments Timeline:** Ongoing since 2014
- **Status:** No known feasibility report released; Notice of Preparation of EIR in February 2016, Notice of Intent to prepare EIS in February 2017; draft EIR anticipated July 2017, draft EIS anticipated January 2018; construction anticipated to begin in 2021
- **Major Contributor to Timeline:** N/A
- **Prop 1 Funding Potential:** Submitted concept paper requesting \$100 million

GROUNDWATER STORAGE PROJECTS

Groundwater storage projects may present alternatives to surface water storage projects, serving many of the same purposes and often at lower cost. While this paper focuses primarily on surface water storage projects, it is important to keep in mind the option of groundwater storage projects, particularly in terms of relevant legal requirements.

As noted above, groundwater storage projects take many forms. Costs associated with these projects vary accordingly, as do timelines to completion. Some projects require new pipes, pumps, and surface spreading basins, as well as new or amended water rights.



Sacramento River Near Shasta Dam, Shasta County

These complex projects will require significant infrastructure and may face as many permitting requirements to authorize and build as some surface storage projects. For instance, a recent EIR for a large, controversial groundwater storage project listed many of the major permits and approvals the project would require, echoing the requirements we have discussed in the surface storage context.⁷⁹ Other groundwater storage projects, however, may rely on existing pumping infrastructure and water rights, thereby avoiding many of the permitting requirements and environmental risks of surface storage projects.

These simpler groundwater storage projects likely have lower cost and shorter timelines to completion than surface storage projects. Even the large, complex groundwater projects that require the same types of permits

as large surface storage projects may face shorter times to completion if they present fewer environmental, health, and economic impacts. Groundwater projects likely affect fewer endangered species and other surface environmental features, potentially shrinking the review timeline under the ESA/CESA and NEPA/CEQA. This could result in less time-consuming analyses and less controversy for large groundwater storage projects.

While the wide range of groundwater storage projects makes blanket comparison with surface storage projects difficult, the likelihood of shorter completion timelines for groundwater storage projects gives them obvious appeal. It may make sense, therefore, to pay special attention to water storage projects that incorporate or focus primarily on groundwater.

Conclusion

Since 2000, eight major surface water storage projects have been considered in California. Seventeen years later, only two have been completed, and both of those expanded already existing storage facilities. Thus, no new major surface storage facility has been constructed in the state since 2000, despite tens of millions of federal, state, and local dollars spent on feasibility studies and environmental documentation.

This low rate of project completion since 2000 is largely the result of long project approval timelines, which reflect economic uncertainties and significant environmental impacts. The two completed projects each required about twelve years for permitting, approvals, and planning, followed by about two years for project construction, resulting in a ratio of five or six years for every year of project construction. Including the other pending CALFED projects, some of which still have no draft EIS/EIR, the average project planning and permitting timeline increases to nearly fifteen years (and counting).

The number of permitting requirements and extensive analyses they require partly explains the long approval timelines for recent and ongoing projects. In particular, every project proponent has spent multiple years completing feasibility studies and EIS/EIRs to identify and analyze economic and environmental impacts of the projects. Some have also made required project alterations in response to ESA Biological Opinions that have identified impacts to endangered or threatened species. And this is in addition to the requirements of other federal and state statutes. Project critics argue that the environmental documents have taken many years because the surface storage projects they

addressed were not environmentally feasible or financeable. Other factors have contributed, as well. Stakeholders have cited political opposition, uncertain funding sources, and the complexity associated with multiple state and federal agency involvement.⁸⁰ It is not clear that Proposition 1 funding would change any of these factors, since it only covers up to fifty percent of project costs. Project proponents will still need financial buy-in for the other fifty percent.

In sum, there is no reason to conclude that the timetable of surface storage projects to date will be any different for new projects going forward. Indeed, we should expect long timelines for future major surface storage projects, on the order of a decade or more, to continue. Because there are so many laws implicated by large surface storage projects, there is no simple regulatory or legislative “fix” to accelerate the schedule. Attempts to streamline project review from CEQA requirements, for example, would not significantly shorten the schedule and risk hiding underlying project problems and associated impacts.

We have entered a new era of water storage. Political will, financial support, and lasting drought conditions have increased public interest in new and enhanced surface storage projects. It seems likely that Proposition 1 funding will be allocated to at least one of these projects. This brief has highlighted the time commitment and uncertainties associated with planning for recent major surface water storage projects, which have proven unwieldy and risky because of a mix of feasibility concerns, community controversies, and environmental impacts. The likely timeline associated with these proposed projects should inform decisions by state and local agencies about which projects to fund and whether to emphasize ground or surface storage.

The low rate of project completion since 2000 is largely the result of long project approval timelines, which reflect economic uncertainties and significant environmental impacts.

In sum, there is no reason to conclude that the timetable of surface storage projects to date will be any different for new projects going forward.

Appendix 1: Major Environmental Permitting and Licensing Processes for Surface Water Storage Projects in California

This appendix details the major permitting requirements, associated time frames, and potential litigation or other risks that large surface storage projects face in California. This summary is based primarily on our review of CALFED projects. These requirements are aimed at ensuring project safety, environmental protection, and/or economic feasibility.

MAJOR STUDIES AND PERMITTING REQUIREMENTS

Feasibility Studies

Surface storage project proponents must conduct feasibility studies.⁸¹ In fact, a project is ineligible for Proposition 1 funding unless it has a completed feasibility study by 2022.⁸² These feasibility studies are intended to determine the type and extent of federal, state, regional, and local interests, assess benefits and effects of project alternatives, and determine the feasibility of alternative plans. The studies also indicate potential challenges and barriers for project implementation.

For CALFED projects, feasibility studies incorporate the results of plan strategy summaries, area inventories, plan formulation reports, and ecosystem restoration analyses. Draft feasibility reports developed by USBR and DWR are subject to public comment. Once feasibility studies are finalized, the Secretary of the Interior sends them, along with other documents, to Congress for consideration and, if appropriate, authorization. Only if Congress authorizes a project, and

the Department of Interior issues a Record of Decision, may the project move forward.

The feasibility study process can take years. The California Water Commission concluded in 2015 that nearly half of potential Proposition 1 storage projects would need three or more additional years to complete their feasibility studies, and that some would need more than ten years.⁸³

NEPA/CEQA EIS/EIR

Surface storage projects must comply with NEPA and CEQA.⁸⁴ These laws ensure that decisionmakers and the public are fully informed about the environmental consequences of decisions before any action is taken, and that the public and experts (including agencies with expertise in resource protection, health, and safety) have an opportunity to review and provide input into the project's impacts on health and the environment. For large storage projects, this likely requires preparation of a federal Environmental Impact Statement (EIS) and California Environmental Impact Report (EIR). These can often be completed as a combined single EIS/EIR.⁸⁵ To develop an EIS/EIR, a project proponent must accurately define the proposed project and assess environmental impacts of the project and of reasonable project alternatives. To comply with CEQA, the project proponent must also incorporate feasible ways of lessening or avoiding significant environmental impacts. Relevant environmental impacts include effects on air quality, water quality, noise, historic properties, cultural resources, and endangered species, among others. Ade-

quate assessment of many of these impacts requires detailed and costly technical and scientific studies.

The EIS/EIR process is time consuming. Before conducting detailed analyses and issuing the EIS/EIR, the lead agencies must issue a Notice of Intent and provide an opportunity for public and agency comments on the scope of the EIS/EIR. The draft EIS/EIR is subject to a public notice and comment period, and the final EIS/EIR responds to those comments. Further, both NEPA and CEQA allow citizen suits to challenge inadequate or inaccurate environmental analyses, insufficient responses to public comments, and other weaknesses in EIS/EIRs. These suits may remain in the courts for years and may deter further project action before their resolution. Because of the controversies surrounding surface storage projects and their environmental impacts, lengthy litigation is possible.

Species Protection

Federal Endangered Species Act (ESA)

Any action authorized, funded, or carried out by a federal agency must not jeopardize the continued existence of any species listed under the Endangered Species Act (ESA) as endangered or threatened.⁸⁶ To that end, the federal agency authorizing a surface water storage project that may affect a listed species must consult with the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS), and conduct a biological assessment within 180 days to identify any listed species likely to be adversely affected. If the action agency finds that the project may jeopardize a listed species, FWS/NMFS will produce a Biological Opinion determining whether the proposed storage project is likely to jeopardize the continued existence of a



Threatened species: *Gopherus agassizii*, Desert Tortoise. Joshua Tree, California

listed species, along with reasonable alternatives consistent with the project goals. FWS/NMFS will also issue an Incidental Take Statement identifying the extent to which individuals in the species will be “taken”⁸⁷ and any reasonable measures to minimize impacts.

Non-federal activities that do not involve a federal action subject to section 7 consultation require an Incidental Take Permit if they will result in the take of individual members of a listed species. For projects likely to result in a take that is “incidental to, and not the purpose of, the carrying out” of the project, an applicant must submit a habitat conservation plan (HCP) to FWS that specifies the take’s likely impact and steps to minimize and mitigate those impacts.⁸⁸ After public comment, FWS/NMFS will determine whether to issue a permit.⁸⁹

California’s Endangered Species Act (CESA)

Projects in California must also avoid jeopardizing the continued existence of species listed as endangered or threatened under the California Endangered Species Act.⁹⁰ In many cases, the species that may be affected by a project will be on both the federal and California lists. In that case, the project applicant may request a Consistency Determination from the California Department of Fish and Wildlife (DFW), which has 30 days to respond after receipt of the federal Incidental Take Statement or Permit.⁹¹ If DFW finds the documents inconsistent with the California ESA, the applicant must apply for a state Incidental Take Permit (ITP).⁹² Applicants are encouraged to apply for state ITPs even if they believe the California and federal requirements are consistent, in part because the California ESA requires more robust mitigation than the federal ESA.⁹³

The federal and state ESA processes may take approximately 18–27 months from submission of application.⁹⁴ In addition, like NEPA, the citizen suit provisions in the federal ESA allow any person to file a lawsuit to enforce

the Act, subject to standing restrictions.⁹⁵ Litigation over the biological opinions and mitigation measures may alter project timelines.

California’s Fully Protected Species

California law also lists certain “fully protected” species, including specified reptiles, amphibians, mammals, fish, and birds, for whom DFW cannot authorize any incidental take.⁹⁶ A storage project that negatively affects a California fully protected species will likely require significant alteration.

Magnuson-Stevens Act Essential Fish Habitat (EFH) Assessment and Consultation

Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996, requires federal agencies to consult with NMFS on all actions that they propose to or do authorize, fund, or undertake, and that may adversely affect Essential Fish Habitat (EFH) of marine and anadromous fish species.⁹⁷ An EFH includes waters and substrate “necessary to fish for spawning, breeding, feeding or growth to maturity.”⁹⁸

When projects have a federal nexus and may negatively impact EFHs, project proponents must prepare a written EFH Assessment of the project’s effects, proposed mitigation, and analysis of alternatives to minimize adverse effects.⁹⁹ Under certain circumstances, these assessments may be incorporated as separate sections of EIS/EIRs or ESA Biological Assessments.¹⁰⁰ Alternatively, NMFS may provide a general concurrence if actions have minimal impact on EFH or EFH Conservation Recommendations.¹⁰¹ The federal agency must respond in writing to NMFS’s findings and recommendations before the project is approved.¹⁰² An EFH assessment and consultation process is expected to take approximately 18 months.¹⁰³

Consultation under Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act¹⁰⁴ (FWCA) aims to give wildlife conservation and rehabilitation equal consideration with other features of water resource development programs.¹⁰⁵ Specifically, whenever any action requiring a federal permit is proposed or authorized to impound, divert, channel, control, or modify a water body, FWCA requires the responsible agency or project proponent to consult with FWS, NMFS, and, in California, the DFW, and to provide adequately for the conservation, maintenance, and management of wildlife resources.¹⁰⁶ Consultation generally affords an opportunity for continuing participation in planning from the early project stages, and results in periodic findings and recommendations as well as a final formal report, which could be simply a project endorsement.¹⁰⁷ Although the NEPA Guidelines require agencies where feasible to prepare draft EISs concurrently and integrated with related studies required by FWCA and the ESA,¹⁰⁸ FWS's NEPA comments and the ESA Biological Opinion are both distinct analyses from the FWCA assessment. This process has been estimated to require approximately 12 months.¹⁰⁹

Section 106 of National Historic Preservation Act of 1966

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to consider the effects of their projects on historic properties.¹¹⁰ It also gives the Advisory Council on Historic Preservation (ACHP) and the public an opportunity to comment on such projects.¹¹¹ Section 106 also requires consultation with federally recognized Indian tribes. After determining that a project could affect historic properties, the responsible

federal agency identifies the appropriate State Historic Preservation Officer (SHPO) and Tribal Historic Preservation Officer (THPO) for consultation, identifies properties that meet the National Park Service's criteria for historic properties, and assesses possible adverse effects on them. Consultation may require two years after identification of affected historic properties. It results in a Memorandum of Agreement detailing measures to avoid, minimize, or mitigate adverse effects.¹¹² This consultation and agreement process may be incorporated into NEPA/CEQA analyses. Similarly, if a project may impact properties listed on the overlapping California Register of Historical Resources, project CEQA analyses must consider these impacts.¹¹³

Real Property Lease/Purchase and Special Use Permits

A project proponent must obtain rights to the land where the dam or reservoir will be located. This may entail leasing or purchasing lands from the state or federal government or purchasing private properties. Obtaining land rights can be time consuming and costly even for dam expansion projects, and certain projects may face resistant sellers.¹¹⁴ Projects on state lands may, however, circumvent some of these high costs. Proponents of these projects must lease the land from the State Lands Commission after submitting draft environmental compliance documents and an application detailing the impacts of the project and ways to minimize necessary dredging.¹¹⁵ The State Lands Commission will approve a proposed project only after CEQA requirements have been satisfied.¹¹⁶ Although the state leasing process may take significant time for application and review,¹¹⁷ it may be less costly than private dealings would be. If the project applicant is a public agency, it may qualify for a rent-free lease after justifying in writing that the project will provide state-wide public benefits.¹¹⁸

Some storage projects must obtain additional special use permits from the Bureau of Land Management (BLM) for activities like livestock grazing or harvesting of forest products.¹¹⁹ These permits, which ensure balancing of multiple uses of land and resources, may be required even when a project proponent owns the storage project land. BLM special use permits must be renewed every ten years.

Water Rights and Water Quality Permitting

Water Rights

Unless a project proponent has existing water rights that will cover any increased storage from a new or enhanced facility, the proponent will need to obtain new or amend existing water rights from the State Water Resources Control Board (SWRCB). New water rights may be difficult to obtain because most of the state's rivers are over appropriated.¹²⁰ Even amending an existing water right to change its location or type of use requires CEQA analysis, water availability analyses, and a time-consuming application and review process that requires demonstration of no harm to any existing legal user of water.¹²¹ And challengers may submit protests that the Board must resolve before approving an application.¹²² Even without protests, project proponents may require a year after application submission to obtain any needed water rights amendments. Obtaining or modifying necessary water rights is estimated to cost over \$400,000.¹²³

Federal Clean Water Act Section 404 Permit and 401 Certification

Before discharging dredged or filled material into waters of the United States, a project proponent must obtain a Clean Water Act section 404 permit from the Army Corps of Engineers.¹²⁴ In evaluating a permit application, the Army Corps must consider EPA guidelines that require avoidance of

environmentally sensitive special aquatic sites unless no practicable alternative exists. The section 404 permit application review process is estimated to take approximately two years. Federal water resources development projects specifically approved by Congress may not require separate section 404 permits as long as the substantive analyses are contained within corresponding NEPA documents that Congress reviews before its project approval.¹²⁵

A section 404 permit application must include a section 401 certification that any discharges from the facility will comply with the Clean Water Act. The state—in California, either the State Water Resources Control Board or the relevant regional water quality control board—makes this certification.¹²⁶ Applications for certification should include draft or final CEQA documentation and must be accompanied by an application fee deposit.¹²⁷ The board has thirty days to review an application for completeness, and then sixty days to either issue or deny certification or request additional review time from the Army Corps of Engineers.¹²⁸ A project must comply with CEQA before the state may issue a section 401 Certification Final Order.

Sections 10 & 14 of the Rivers and Harbors Act of 1899

Section 10 of the Rivers and Harbors Act of 1899 requires authorization from the Army Corps of Engineers for any dredging, excavation, filling, rechannelization, or other modification activities that alter the course, condition, location, or capacity of a navigable water of the United States.¹²⁹ These permits help to accommodate and integrate other values, including resource protection, with project objectives and needs. Within 15 days of receiving a completed application, the Army Corps issues a public notice and allows up to 30 days of public comment before making its permitting decision shortly thereafter.¹³⁰ This permitting process should not increase the project

approval timeline, as the Army Corps may complete its review simultaneous with the section 404 permitting process. Alterations to existing Army Corps structures, including dams, also require approval after a similar review process under section 14 of the Act.¹³¹

Streambed Alteration Agreement

A streambed alteration agreement is necessary whenever an activity that alters a streambed will substantially adversely affect existing fish or wildlife resources.¹³² In response to a project proponent's application noting any substantial changes to, use of, or deposit of any material in a streambed, channel, or bank, DFW determines whether the activity will substantially adversely affect existing fish or wildlife resources. If there will be no substantial adverse effect, DFW will issue a statement allowing the project to commence. But any finding of substantial adverse effect requires an agreement between project proponents and DFW that includes reasonable measures necessary to protect the resources. These agreements are estimated to cost \$4000 and to be processed within nine months of submitting the application.¹³³

Encroachment permits

When an activity encroaches¹³⁴ on state property and rights-of-way, it may require a corresponding permit. This permit does not convey any land rights, but rather grants access for the permitted activity on state property or right-of-way for a limited time. Project proponents and/or responsible agencies may apply for these permits. Multiple encroachment permits may be necessary throughout the development and construction phases of a surface storage project. For instance, projects that encroach into rivers, waterways, and floodways within or next to federal and state authorized flood control projects require an encroachment permit from a flood protec-

tion board. Other encroachment permits may be necessary as well, including from the California Department of Transportation and various local agencies. These permits can be processed within a few months of application submission.¹³⁵ Processing fees vary.

Protection of Bald and Golden Eagles

A project's pre-construction survey report will assess the presence of bald and golden eagles and other migratory birds in the project area and the need for a permit under the Bald and Golden Eagle Protection Act¹³⁶ and the Migratory Bird Treaty Act of 1918.¹³⁷ The Bald and Golden Eagle Protection Act requires a permit to "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import" any bald or golden eagle or its nest or eggs.¹³⁸ Similarly, the Migratory Bird Treaty Act protects both bald and golden eagles by requiring a permit to take, kill, possess, transport, or import migratory birds or their eggs or nests.¹³⁹ Therefore, take of these birds is still regulated even though they are not listed for purposes of the ESA. California further protects both Golden Eagles and Southern Bald Eagles by including them among its fully protected bird species.¹⁴⁰

FERC Licensing

Under the Federal Power Act,¹⁴¹ the Federal Energy Regulatory Commission (FERC) is authorized to issue licenses to construct, operate, and maintain dams and reservoirs for generation of hydroelectric power. FERC begins reviewing license applications before NEPA documents have been finalized and may issue a preliminary permit that requires additional site studies. FERC does not issue licenses until after finalization of the NEPA documents.¹⁴² Private parties may submit comments to FERC on the license

Protected species: Golden Eagle



review process. FERC may license a hydro-power project only if the relevant state issues a Clean Water Act section 401 certification. In addition to power and development considerations, FERC must consider questions of energy conservation, protection and enhancement of fish and wildlife, recreational opportunities, and preservation of other environmental quality aspects.¹⁴³ Pursuant to the Fish and Wildlife Coordination Act, FERC licenses include conditions based on recommendations made by FWS, NMFS, and DFW.

Federal and California Wild and Scenic Rivers Acts

The federal Wild and Scenic Rivers Act¹⁴⁴ authorizes the designation of river segments as wild, scenic, or recreational. River segments designated as having “outstanding remarkable values” must be preserved in free-flowing con-

dition and “protected for the benefit and enjoyment of present and future generations.”¹⁴⁵ The Act explicitly restricts FERC jurisdictional hydropower projects and prohibits federal agencies from assisting in the construction of any water resources project (including water diversions and reservoirs) that would have a direct and adverse effect on the identified values of a designated river.¹⁴⁶ Similarly, the California Wild and Scenic Rivers Act¹⁴⁷ identifies certain rivers in the state as wild, scenic, or recreational, and prohibits actions that would negatively alter them.

These Acts could restrict surface storage projects in California both geographically and financially. Approximately 2000 river miles, or about one percent of total river miles, in the state are designated as wild and scenic.¹⁴⁸ Project proposals that would impact any of these 2000 miles of wild and scenic rivers are likely to be challenged and stalled. Further,

noncompliance with the state or federal Wild and Scenic Rivers Acts would disqualify a project from Proposition 1 funding.¹⁴⁹

California Fish and Game Code § 5937

Section 5937 of the California Fish and Game Code embodies the application of the state's public trust doctrine to protect fish species from the adverse impacts of dams.¹⁵⁰ Largely ignored historically, section 5937 requires "[t]he owner of any dam [to] allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam."¹⁵¹ Both state agencies and private citizens may enforce this provision, which could limit dam construction in certain locations.¹⁵²

Section 5937 applies to all California dam owners, unless explicit exceptions apply. Therefore, private, state, or local government-owned new and expanded dams are generally covered. Most federal dams are also covered.¹⁵³ Only where federal law preempts application of section 5937 or a dam is FERC-licensed does the state provision not apply. That preemption may be quite narrow—a 2004 decision from the Eastern District of California concluded that neither federal reclamation law generally nor the Central Valley Project Improvement Act preempted application of section 5937 to Friant Dam.¹⁵⁴ Therefore, most USBR and Army Corps of Engineers projects, among other federal dams, likely must comply with section 5937.¹⁵⁵

LOCAL PERMITTING REQUIREMENTS AND OTHER RELEVANT LAW AND POLICY

In addition to the federal and state permitting requirements described above, storage projects need multiple local permits and must comply with a long list of additional statutes, regulations, executive orders, and policies intended to ensure public safety and health, environmental protection, and other values.

Projects require many pre-construction and operation permits from counties and local agencies. These may include demolition and grading, encroachment, authority to construct, and operation permits.¹⁵⁶ Counties and local governments are responsible for granting many of these permits. Local air quality management and air pollution control districts grant authority to construct and permits to operate. These may require six months of processing time. Construction will also likely require Clean Water Act section 402 National Pollutant Discharge Elimination System (NPDES) permits from the regional water quality control board. In addition, project proponents may need to develop dust control plans for their construction activities and submit them to the local air quality district. Further, easements to facilitate construction may be necessary. Each of these requirements varies by project scope and location. Therefore, each project proponent must invest time identifying applicable local permitting requirements.

Appendix 2: Table of Major Permitting/Licensing Requirements

This list of permitting requirements is not intended to be comprehensive. Rather, it compiles the major requirements that all or most of the planned and proposed storage projects in California have already and will continue to face. In addition, many other federal, state, and local statutes and policies may impact project planning, design, and financing.¹⁵⁷ Executive Orders regarding environmental justice, invasive species, wetlands policy, and flood hazard policy, among others, also may influence project design and feasibility.

** Agency Acronyms: USBR (US Bureau of Reclamation); CWC (California Water Commission); DWR (CA Department of Water Resources); FWS (US Fish and Wildlife Service); NMFS (National Marine Fisheries Service); DFW (CA Department of Fish and Wildlife); THPO (Tribal Historic Preservation Officer); SHPO (State Historic Preservation Officer); ACOE (US Army Corps of Engineers); BLM (US Bureau of Land Management); SWRCB (CA State Water Resources Control Board); FERC (Federal Energy Regulatory Commission); CWC (California Water Commission).*

Major Permitting/Licensing Requirements and Barriers

PERMIT/APPROVAL	PERMITTING AGENCY*	SUBSTANTIVE REQUIREMENTS	TIMELINE
Feasibility Studies	USBR, CWC/DWR	Draft, Final Report For federal projects: Congressional approval	Multi-year process
Environmental Impact Assessment <ul style="list-style-type: none"> ■ NEPA EIS ■ CEQA EIR 	USBR, DFW	Notice of Intent Scoping Report Draft/Final EIS/EIR	Multi-year process: at least 7 years for CALFED projects; Litigation could delay timeline
Species Protection <ul style="list-style-type: none"> ■ Federal ESA § 7 consultation; § 10 Permit ■ CA ESA § 2080.1 Determination; § 2081 Permit ■ CA Fish and Game Code Fully Protected Species 	FWS/NMFS, DFW	FWS/NMFS Consultation Biological Opinion, Incidental Take Statement; or Incidental Take Permit if non-federal project; State Consistency Determination or Incidental Take Permit *Possibility of CA fully protected species	CALFED estimates: 12–18 months for federal process; 6–9 months for state process; Litigation could delay process
Magnuson-Stevens Act Essential Fish Habitat Assessment and Consultation	NMFS	EFH Assessment and Consultation	CALFED estimate: 18 months
Fish and Wildlife Coordination Act Report	DFW, FWS	FWCA Consultation, Report, and Recommendations	CALFED estimate: 12 months
National Historic Preservation Act § 106 Agreement	THPO/SHPO	Consultation with SHPO/THPO Memorandum of Agreement Mitigation measures	CALFED estimate: 2 years post identification of historic properties
Real Property <ul style="list-style-type: none"> ■ Lease/Purchase of land ■ Special Use Permit 	State Lands Commission, BLM	Purchase of private property Relocation assistance Application to State Lands Commission demonstrating public benefits	CALFED estimate of land lease: 9 months; Unwilling property owners and high costs could stall project
New/Amended Water Rights	SWRCB	Application and assessment of water availability \$440,000 fee	CALFED estimate: 1 year; Overappropriation of rivers and protests could stall water rights approvals

Major Permitting/Licensing Requirements and Barriers (cont.)

* Agency Acronyms: USBR (US Bureau of Reclamation); CWC (California Water Commission); DWR (CA Department of Water Resources); FWS (US Fish and Wildlife Service); NMFS (National Marine Fisheries Service); DFW (CA Department of Fish and Wildlife); THPO (Tribal Historic Preservation Officer); SHPO (State Historic Preservation Officer); ACOE (US Army Corps of Engineers); BLM (US Bureau of Land Management); SWRCB (CA State Water Resources Control Board); FERC (Federal Energy Regulatory Commission); CWC (California Water Commission).

PERMIT/APPROVAL	PERMITTING AGENCY*	SUBSTANTIVE REQUIREMENTS	TIMELINE
Clean Water Act <ul style="list-style-type: none"> ■ § 401 Certification ■ § 404 Permit 	SWRCB/ Regional Board ACOE	Applications Certification Final Order	CALFED estimate: 2 years for § 404; 6 months for § 401 Certification
Rivers and Harbors Act §§ 10, 14	ACOE	Application	Simultaneous with CWA § 404 review
CA Fish and Game Code §§ 1600/1602 Streambed Alteration Agreement	DFW	Application Statement and Agreement with mitigation measures	CALFED estimate: 9 months
Encroachment Permits	DOT, Flood Protection Boards	Application	CALFED estimate: up to a few months
Bird Protection <ul style="list-style-type: none"> ■ Bald and Golden Eagle Protection Act Permit ■ Migratory Bird Treaty Act Permit 	FWS	Assess presence of bald and golden eagles in project area Application for incidental take permit	Depends on the project Golden eagles and Southern bald eagles are CA fully protected species
FERC Licensing	FERC	Application License with conditions from FWS, NMFS, DFW	Depends on the project
Federal and CA Wild and Scenic Rivers Acts		Ensure facility does not adversely impact any federal or CA designated rivers	Non-compliance could indefinitely stall project (see Shasta Lake), and make ineligible for Prop 1 funding
CA Fish and Game Code § 5937		Ensure facility does not impair fish species downstream of dams	Noncompliance could lead to state or private enforcement and stalled project
Proposition 1 Funding	CWC	Identify qualifying public benefits	Funds likely to be disbursed in 2018
Local Permits <ul style="list-style-type: none"> ■ Construction and operation permits ■ Dust control plans ■ Easements 	Counties, cities, Air Quality Management Districts	Vary by type of permit	CALFED estimates: 2 months for dust control plan; 6 months for construction and operation permits; other permitting timelines project specific

Endnotes

Legal Risks and Timeline Associated with Increasing Surface Water Storage in California

- 1 *California Needs to Invest in Sites Reservoir*, Editorial Board, SACRAMENTO BEE (Dec. 26, 2015), available at <http://www.sacbee.com/opinion/editorials/article51406055.html>; Aubrey Bettencourt, *California Desperately Needs New Surface Storage*, Op-Ed, SACRAMENTO BEE (Apr. 23, 2016), available at <http://www.sacbee.com/opinion/california-forum/article73267777.html>.
- 2 See, e.g., 2016 California Water Policy Conference, Davis, CA (Apr. 21, 2016) (remarks by Ron Stork, Friends of the River).
- 3 Kurtis Alexander, *5 Fixes for California's Age-Old Water-Rights System*, SFGATE (2015), available at <http://www.sfgate.com/drought/article/Who-owns-California-s-water-6496940.php>.
- 4 See H.R. 2749, Dam Authorization, Maintenance, and Safety (DAMS) Act of 2015; S. 2533, California Long-Term Provisions for Water Supply and Short-Term Provisions for Emergency Drought Relief Act (2016) (authorizing \$600 million for CALFED federal and non-federal water storage projects, and setting deadlines for completion of feasibility studies); see also Pub. L. 114-322, Water Infrastructure Improvements of the Nation (WIIN) Act, Section 4001 - California Water (Dec. 2016) (aiming to speed delivery of water supplies to the Central Valley).
- 5 See Cal. Dept. of Water Resources, *Managing California Water through Federal, State, and Local Cooperation*, 3 (Jan. 2016) (stating as one of its two major steps to improve water supply reliability: “[d]evelop new, and efficiently re-operate, existing surface storage projects in conjunction with groundwater to capture storm and flood flows in a manner that increase supplies for people, farms, and industry, while maintaining flows for ecosystem health”), available at http://www.water.ca.gov/waterplan/docs/misc/Managing_CA_Water_January_2016.pdf.
- 6 See Cal. Dept. of Water Resources, *California Water Plan Update 2013*, 14-11 (Oct. 2014), available at <http://www.water.ca.gov/waterplan/cwpu2013/final/index.cfm>.
- 7 *Water Storage in California*, CAL. WATER BLOG (Sept. 13, 2011), available at <https://californiawaterblog.com/2011/09/13/water-storage-in-california-2/>.
- 8 Jay Lund, Armin Munevar, Ali Taghavi, Maurice Hall & Anthony Saracino, *Integrating Storage in California's Changing Water System* (Nov. 2014), available at https://watershed.ucdavis.edu/files/biblio/Storage_White_Paper_20Nov2014.pdf.
- 9 *Water In The West, Storing Water in California: What Can \$2.7 Billion Buy Us?*, Research Brief (Oct. 2014), available at http://waterinthewest.stanford.edu/sites/default/files/Storing_Water_in_CA.pdf.
- 10 PPIC Water Policy Center, *Storing Water: Storage is Essential for Managing California's Water* (Apr. 2015), available at http://www.ppic.org/content/pubs/report/R_415SWR.pdf.
- 11 See U.S. BUREAU OF RECLAMATION, Central Valley Project, http://www.usbr.gov/projects/Project.jsp?proj_Name=Central+Valley+Project (last visited July 28, 2016) (CVP includes 20 dams and reservoirs that are operated by the US Bureau of Reclamation); CAL. DEPT. OF WATER RESOURCES, State Water Project Overview, <http://water.ca.gov/swp/index.cfm> (last visited July 28, 2016) (SWP includes 30 dams and reservoirs, and is run by DWR).
- 12 J. Toby Minear & G. Matt Kondolf, *Estimating Reservoir Sedimentation Rates at Large Spatial and temporal Scales: A Case Study of California*, 45 *Water Resources Research* W12502 (Dec. 25, 2009), available at <http://water.usgs.gov/osw/ressed/references/MinearandKondolf.2009.WRR.EstResSedinCA.pdf>.
- 13 *Id.*
- 14 Jay Lund, ENSO the Wet Season Ends (almost)—March 31, 2016, CAL. WATER BLOG (Apr. 3, 2016), available at <https://californiawaterblog.com/2016/04/03/enso-the-wet-season-ends-almost/>; see also Carolyn Lochhead, *A Future of Dams: Floodgates Open to Add Barriers to Combat Drought*, SAN FRANCISCO CHRONICLE (Aug. 28, 2015), available at <http://www.sfchronicle.com/drought/article/Floodgates-open-for-adding-dams-to-battle-6471813.php> (noting water levels in the Lakes Powell and Mead reservoirs were dropping precipitously).
- 15 Michael Dettinger & Michael Anderson, *Storage in California's Reservoirs and Snowpack in this Time of Drought*, 13 *SAN FRANCISCO ESTUARY & WATERSHED SCI.* 2 (June 2015).
- 16 Lund et al., *Integrating Storage in California's Changing Water System* (Nov. 2014), *supra* note 8.
- 17 See Noah Diffenbaugh, Daniel Swain & Danielle Touma, *Anthropogenic Warming Has Increased Drought Risk in California*, *Proceedings of the Nat'l Academy of Sciences* 112:13 (Mar. 31, 2015), available at <http://www.pnas.org/content/112/13/3931.short>.
- 18 SIERRA CLUB CAL., *California's Water Storage Needs a New Management Blueprint, Not More Concrete* (April 2014) available at <http://www.sierraclub.org/sites/www.sierraclub.org/files/sce/sierra-club-california/PDFs/Water%20storage%20fact%20sheet%204-24-14.pdf>; see also Ellen Hanak, Jay Lund, Ariel Dinar, Brian Gray, Richard Howitt, Jeffrey Mount, Peter Moyle & Barton “Buzz” Thompson, *Myths of California Water – Implication and Reality*, 16 *WEST NORTHWEST* 1 (Oct. 2009), available at http://www.ppic.org/content/pubs/other/RA_1209EHRA.pdf.
- 19 PPIC Water Policy Center, *Storing Water: Storage is Essential for Managing California's Water* (Apr. 2015), *supra* note 10.
- 20 *Water storage in California*, CAL. WATER BLOG (Sept. 13, 2011), *supra* note 7.
- 21 Lund et al., *Integrating Storage in California's Changing Water System* (Nov. 2014), *supra* note 8.
- 22 See MAVEN'S NOTEBOOK, *Jay Lund: Water Storage and Drought in California Agriculture* (May 20, 2015), available at <http://mavensnotebook.com/2015/05/20/jay-lund-water-storage-and-drought-in-california-agriculture/> (noting that between 1989 and 2010, the number of listed freshwater species of fish in California doubled; the number of species of special concern increased from 50 to 70; no additional species went extinct; and the number of species considered in good condition halved).
- 23 CAL. WATER CODE § 79750.
- 24 Qualifying public benefits include: ecosystem improvements; water quality improvements in the Delta or other river systems that provide significant public trust resources or that clean up and restore groundwater resources; flood control benefits; emergency response; and recreational purposes.
- 25 See Final Regulations, Water Storage Investment Program, Cal. Water Commission, Jan. 23, 2017, available at <https://cwc.ca.gov/Documents/2017/WSIP/RegulationsSubmitted.pdf>; CAL. PUB. RES. CODE § 5093.50 *et seq.*; 16 U.S.C. §§ 1271-1287.
- 26 CALFED BAY-DELTA PROGRAM ARCHIVED WEBSITE, About CALFED, <http://calwater.ca.gov/calfed/about/index.html> (last visited July 28, 2016).
- 27 CAL. WATER COMMISSION, Water Storage Investment Program Concept Paper Solicitation, <https://cwc.ca.gov/Pages/ConceptPapers.aspx> (last visited July 28, 2016).

- 28 See, e.g., MAVEN'S NOTEBOOK, *ACWA Panel: The Future of Water Storage and Management in California* (June 10, 2015), available at <http://mavensnotebook.com/2015/06/10/acwa-panel-the-future-of-water-storage-and-management-in-california/>; U.S. Dept. of Interior, *Final Shasta Lake Water Resources Investigation Feasibility Report*, 6-40 (July 2015), available at <http://www.usbr.gov/mp/slwri/documents.html>; U.S. Bureau of Reclamation, *Upper San Joaquin River Basin Storage Investigation Draft Feasibility Report*, at 6-40-41 (Jan. 2014), available at http://www.usbr.gov/mp/sccao/storage/docs/Draft_Feasibility_Report_2014/USJRBSI_Draft_FR_2014_Full_Report.pdf
- 29 See 2016 California Water Policy Conference, Davis, CA (Apr. 21, 2016) (Jim Watson remarks).
- 30 Cal. Dept. of Water Resources, *California Water Plan Update 2013* (Oct. 2014), *supra* note 6, at 14-5.
- 31 The two major surface storage projects completed since 2000 required approximately 5 to 6 years of planning for every year of construction. See also MAVEN'S NOTEBOOK, *ACWA Panel: The Future of Water Storage and Management in California* (June 10, 2015), *supra* note 28.
- 32 CALFED BAY-DELTA PROGRAM ARCHIVED WEBSITE, History of CALFED Bay-Delta Program, <http://www.calwater.ca.gov/calfed/about/History/Detailed.html> (last visited July 26, 2016).
- 33 CALFED Bay-Delta Program, *Programmatic Record of Decision* (Aug. 2000), available at <http://www.calwater.ca.gov/content/Documents/ROD8-28-00.pdf>.
- 34 Cal. Dept. of Water Resources, *California Water Plan Update 2013* (Oct. 2014), *supra* note 6, at 13-5; CALFED Bay-Delta Program, *Programmatic Record of Decision*, *supra* note 33, at 42-45.
- 35 Cal. Dept. of Water Resources, *California Water Plan Update 2013* (Oct. 2014), *supra* note 6, at 13-6.
- 36 CALFED Bay-Delta Program, *Programmatic Record of Decision*, *supra* note 33, at 45.
- 37 See U.S. Bureau of Reclamation, *Shasta Enlargement*, Powerpoint Presentation (Mar. 5, 2012), available at http://www.usbr.gov/mp/slwri/docs/Shasta_Enlargement_Update_Briefing_03-05-2012%20.pdf; U.S. Dept. of Interior, *Final Shasta Lake Water Resources Investigation Feasibility Report*, *supra* note 28, at ES-18.
- 38 See Carolyn Lochhead, *4 Huge Dam Projects That Could Become California Realities*, SAN FRANCISCO CHRONICLE (Aug. 28, 2015), available at <http://www.sfchronicle.com/drought/article/State-considering-4-large-dam-projects-6471817.php>.
- 39 See Eric Wesselman & Antonio Inserni, *Commentary: More Dams Won't Do It, Time for a Fresh Approach on Water*, EAST BAY TIMES, Jan. 28, 2017, available at <http://www.eastbaytimes.com/2017/01/28/commentary-more-dams-wont-do-it-time-for-a-fresh-approach-on-water/>; Carolyn Lochhead, *A Future of Dams: Floodgates Open to Add Barriers to Combat Drought*, SAN FRANCISCO CHRONICLE (Aug. 28, 2015), available at <http://www.sfchronicle.com/drought/article/Floodgates-open-for-adding-dams-to-battle-6471813.php> (costs).
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- 41 See H.R. 2828, Pub. L. 108-361 (2004); CALFED BAY-DELTA PROGRAM ARCHIVED WEBSITE, History of CALFED Bay-Delta Program, *supra* note 32.
- 42 Based on Shasta Lake, Los Vaqueros Phase I, and Temperance Flat Draft Feasibility Reports and draft EIS/EIRs.
- 43 U.S. Dept. of Interior, *Final Shasta Lake Water Resources Investigation Feasibility Report*, *supra* note 28, at ES-3.
- 44 *Id.*, at ES-18.
- 45 *Id.*, at 6-40-42.
- 46 CAL. PUB. RES. CODE § 5093.542(c).
- 47 The Feasibility Report notes that "it is possible that some State agencies will be unable to process and issue permits and approvals . . . [which] could preclude Reclamation from obtaining State approvals and permits . . . and impede a project and frustrate Congressional intent." U.S. Dept. of Interior, *Final Shasta Lake Water Resources Investigation Feasibility Report*, *supra* note 28, at 6-39.
- 48 *Id.*, at ES-45.
- 49 *Id.*
- 50 See Paul Rogers, *Plan to Raise Shasta Dam Takes Hit After Federal Biologists Say They Can't Support It*, THE MERCURY NEWS (Jan. 27, 2015), available at http://www.mercurynews.com/science/ci_27406666/plan-raise-shasta-dam-takes-hit-after-federal.
- 51 U.S. Dept. of Interior, *Final Shasta Lake Water Resources Investigation Feasibility Report*, *supra* note 28, at ES-45.
- 52 LOS VAQUEROS RESERVOIR EXPANSION PROJECT, Documents, <http://lvstudies.com/documents.asp> (last visited July 26, 2016).
- 53 U.S. Dept. of Interior, Fish and Wildlife Service, *Fish and Wildlife Coordination Act Report Los Vaqueros Reservoir Expansion Project* (Mar. 2011), available at http://www.usbr.gov/mp/vaqueros/docs/2011-2-28_LVE_%20Final_CAR.pdf.
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- 57 Contra Costa Water District, *Water Storage Investment Program Concept Paper* (Mar. 31, 2016), available at https://cwc.ca.gov/Documents/2016/WSIP/ContraCostaWD_LosVaquerosExpansion.pdf.
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- 59 *Id.*
- 60 U.S. Bureau of Reclamation, *FONSI - Upper San Joaquin River Basin Storage Investigation Geotechnical Field Exploration at River Mile 274* (Aug. 2014), available at http://www.usbr.gov/mp/sccao/storage/docs/EA_FONSI_for_USJ_FER.pdf.
- 61 U.S. Bureau of Reclamation, *Upper San Joaquin River Basin Storage Investigation Draft Feasibility Report* (Jan. 2014), *supra* note 28, at 6-40.
- 62 Friends of the River, *The Temperance Flat Dam Is Costly and Produces Little Water* (May 6, 2016), available at <http://www.friendsoftheriver.org/wp-content/uploads/2016/01/TFD-dft-Fact-Sheet-5-6-2016-with-ref-tgd.pdf>.
- 63 Sierra Club, *Comments on the Upper San Joaquin River Basin Storage Investigation, dEIS* (Oct. 14, 2014), available at http://www.sierraclub.org/sites/www.sierraclub.org/files/sce/tehipite-chapter/fact-sheets/10-27-14_FOR-SC-CSPA-CWC_USJRBSI_dEIS_TFD_comments.pdf.
- 64 Friends of the River, *The Temperance Flat Dam Is Costly and Produces Little Water*, *supra* note 62.
- 65 U.S. Bureau of Reclamation, *Upper San Joaquin River Basin Storage Investigation Draft Feasibility Report* (Jan. 2014), *supra* note 28, at ES-32; Sierra Club, *Comments on the Upper San Joaquin River Basin Storage Investigation, dEIS*, *supra* note 63.

- 66 SJWIA is made of County Supervisors from Fresno, Tulare, Madera, Kings, and Merced counties, as well as cities, Tribes, and other local agencies. Patrick Cavanaugh, *Historic Temperance Flat MOU Signing*, Cal. CAL. AG. TODAY (Jul. 7, 2016), available at <http://californiaagtoday.com/temperance-flat-dam-mou-signing-historic/>; Patrick Cavanaugh, *Temperance Flat Dam Would Provide Groundwater Relief, Jobs*, Cal. AG. TODAY (July 8, 2016), available at <http://californiaagtoday.com/tag/san-joaquin-valley-water-infrastructure-authority-sjwvia/>.
- 67 Patrick Cavanaugh, *Temperance Flat Dam Would Provide Groundwater Relief, Jobs*, *supra* note 66.
- 68 SITES JPA, Sites Reservoir FAQs, Sept. 2007, <http://www.sitesjpa.net/docs/NODOS/FAQ.html#Q4> (last visited July 26, 2016).
- 69 See Eric Wesselman & Antonio Inserni, *Commentary: More Dams Won't Do It, Time for a Fresh Approach on Water*, *supra* note 39; Friends of the River, *Sites Offstream Storage Reservoir Fact Sheet* (Aug. 2013, rev'd Mar. 2016), available at http://www.friendsoftheriver.org/wp-content/uploads/2016/03/Sites-Fact-Sheet-FOR-8_8_13-2015-rev2.pdf; Sites JPA, *California Water Commission Water Storage Investment Program Concept Paper* (Mar. 2016), available at https://cwc.ca.gov/Documents/2016/WSIP/SitesJPA_SitesReservoir.pdf.
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- 71 Sites JPA, *Sites Reservoir Environmental Compliance Overview*, Powerpoint Presentation (Apr. 10, 2016).
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- 77 82 Fed. Reg. 27, 10347 (Feb. 10, 2017), available at <http://www.centennialreservoir.org/wp-content/uploads/2015/10/USACE-Notice-of-Intent-NOI-to-Prepare-a-Draft-Environmental-Impact-Statement.pdf>.
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- 80 Oversight Hearing Before the Subcommittee on Water and Power of the Committee on Natural Resources, U.S.H.R., Serial No. 112-92 (Feb. 7, 2012).

Appendix 1: Major Environmental Permitting and Licensing Processes for Surface Water Storage Projects in California

- 81 See, e.g., H.R. 2828, Pub. L. 108-361 (2004).
- 82 CAL. WATER CODE § 79757.
- 83 Cal. Water Commission, Water Storage Investment Program Public Meeting, Powerpoint Presentation (Apr. 2015), available at https://cwc.ca.gov/Documents/2015/04_April/April2015_PublicMeetings_Powerpoint.pdf.
- 84 42 U.S.C. 4321 *et seq.*; CAL. PUB. RES. CODE § 21000 *et seq.* Any federal project that has the potential to affect the quality of the human environment must comply with NEPA through a categorical exclusion, or completion of an environmental assessment and/or environmental impact statement (EIS). Similarly, California state and local projects are subject to the requirements of CEQA if they may cause either a direct physical change or a reasonably foreseeable indirect change in the environment. CEQA's environmental impact report (EIR) is similar to the NEPA EIS but also includes more substantive requirements.
- 85 See 40 C.F.R. § 1506.2; CAL. PUB. RES. CODE § 21083.7; see also 40 C.F.R. § 1508.18.
- 86 16 U.S.C. § 1536.
- 87 "Take" is defined by the ESA as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." 16 U.S.C. § 1532(19).
- 88 16 U.S.C. § 1539(a).
- 89 16 U.S.C. § 1539(a)(2)(B).
- 90 CAL. FISH & GAME CODE § 2050 *et seq.*
- 91 CAL. FISH & GAME CODE § 2080.1.
- 92 CAL. FISH & GAME CODE § 2081(b).
- 93 DFW may issue an ITP if it finds that the project will result in a take incidental to otherwise lawful activities, the impacts will be minimized and fully mitigated, measures required to minimize and mitigate the impacts are roughly proportional to the impacts of the take on the species, maintain the applicant's objectives, and can be successfully implemented by the applicant, adequate funding is provided to implement the required measures and monitor compliance, and issuing the permit will not jeopardize the continued existence of the listed species.
- 94 See U.S. Bureau of Reclamation, *Upper San Joaquin River Basin Storage Investigation Draft Feasibility Report*, *supra* note 28, at 6-40-41 (estimating 18 months for federal processing, and 9 for state processing); U.S. Dept. of Interior, *Final Shasta Lake Water Resources Investigation Feasibility Report* (July 2015), *supra* note 28, at 6-35 (estimating 12 months for federal processing, and 6 months for state processing).
- 95 16 U.S.C. § 1540(g). The California ESA does not include a comparable citizen suit provision.
- 96 CAL. FISH & GAME CODE §§ 3511, 4700, 5050, 5155.
- 97 50 C.F.R. 600.920(a); 16 U.S.C. § 1801(a)(1) (focusing on the "fish of the coasts of the United States, the highly migratory species of the high seas, the species which dwell on or in the Continental Shelf appertaining to the United States, and the anadromous species which spawn in United States rivers or estuaries").
- 98 16 U.S.C. § 1802(10).
- 99 50 C.F.R. 600.920(e)(1); NOAA, *Preparing Essential Fish Habitat Assessments: A Guide for Federal Action Agencies* (Feb. 2004), available at <http://www.habitat.noaa.gov/pdf/preparingefhassessments.pdf>.
- 100 50 C.F.R. 600.920(e).

- 101 50 C.F.R. 600.920.
 102 50 C.F.R. 600.920(k).
 103 U.S. Bureau of Reclamation, *Upper San Joaquin River Basin Storage Investigation Draft Feasibility Report*, *supra* note 28, at 6-40–41.
 104 16 U.S.C. §§ 661–667e.
 105 U.S. FISH & WILDLIFE SERV., *Water Resources Development Under the Fish and Wildlife Coordination Act* (Nov. 2004), available at <https://www.fws.gov/ecological-services/es-library/pdfs/fwca.pdf>; 16 U.S.C. § 661.
 106 16 U.S.C. § 663(a).
 107 *Id.*
 108 40 C.F.R. 1502.25(a).
 109 See U.S. Bureau of Reclamation, *Upper San Joaquin River Basin Storage Investigation Draft Feasibility Report*, *supra* note 28, at 6-40; U.S. Dept. of Interior, *Final Shasta Lake Water Resources Investigation Feasibility Report* (July 2015), *supra* note 28, at 6-35.
 110 Historic properties include districts, sites, buildings, structures, objects, artifacts, records, and remains.
 111 See 36 C.F.R. 800.
 112 See U.S. Bureau of Reclamation, *Upper San Joaquin River Basin Storage Investigation Draft Feasibility Report*, *supra* note 28, at 6-40; U.S. Dept. of Interior, *Final Shasta Lake Water Resources Investigation Feasibility Report* (July 2015), *supra* note 28, at 6-35.
 113 See CAL. PUB. RES. CODE §§ 5020, 5020.1.
 114 Costs of private land purchases associated with raising Shasta dam were estimated at approximately \$35 million. See SACRED LAND FILM PROJECT, McCloud River Watershed, <http://www.sacredland.org/2012/mccloud-river-watershed/> (last visited July 24, 2016).
 115 Both the Shasta Lake and the Temperance Flat projects expect to lease at least some of their land from the State Lands Commission in this manner. See also STATE LANDS COMMISSION, Lease Application, <http://www.sl.c.ca.gov/Forms/LMDApplication/LeaseApp.pdf>.
 116 STATE LANDS COMMISSION, Application Guidelines, http://www.sl.c.ca.gov/Forms/LMDApplication/Lease_App_Guidelines_2011.pdf.
 117 Time estimated to be 9 months by Shasta Lake and Temperance Flat Feasibility Reports.
 118 STATE LANDS COMMISSION, Lease Application, *supra* note 115.
 119 See U.S. Bureau of Land Mgmt., *Fact Sheet on the BLM's Management of Livestock* (updated July 2016), available at <http://www.blm.gov/wo/st/en/prog/grazing.html>; See U.S. Bureau of Reclamation, *Upper San Joaquin River Basin Storage Investigation Draft Feasibility Report*, *supra* note 28, at 6-40.
 120 CAL. STATE WATER RES. CONTROL BD., Fully Appropriated Streams, http://www.waterboards.ca.gov/waterrights/water_issues/programs/fully_appropriated_streams (last visited Feb. 21, 2017).
 121 CAL. WATER CODE §§ 1700–1701.4.
 122 See CAL. WATER CODE § 1703.1–6.
 123 U.S. Dept. of Interior, *Final Shasta Lake Water Resources Investigation Feasibility Report* (July 2015), *supra* note 28, at 6-40–42; U.S. Bureau of Reclamation, *Upper San Joaquin River Basin Storage Investigation Draft Feasibility Report*, *supra* note 28, at 6-41.
 124 33 U.S.C. § 1344.
 125 Clean Water Act § 404(r); see U.S. FISH & WILDLIFE SERV., *Water Resources Development Under the Fish and Wildlife Coordination Act*, *supra* note 105.
 126 CAL. STATE WATER RES. CONTROL BD., Conceptual Water Board 401 Permit Process, http://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/401_flowchart_permitprocess.pdf.
 127 23 CAL. CODE REGS. 3833(b).
 128 CAL. STATE WATER RES. CONTROL BD., Timeline for Processing of Clean Water Act Section 401 Water Quality Certification, http://www.waterboards.ca.gov/lahontan/water_issues/programs/clean_water_act_401/docs/401certaction_timeilnes052203.pdf.
 129 See 33 U.S.C. § 401 et seq.; 33 C.F.R. 322.2–3.
 130 33 C.F.R. 235.2.
 131 33 U.S.C. § 408.
 132 CAL. FISH & GAME CODE § 1602.
 133 See U.S. Bureau of Reclamation, *Upper San Joaquin River Basin Storage Investigation Draft Feasibility Report*, *supra* note 28, at 6-41.
 134 Encroaching may include going on, over, or under or using a right-of-way to interfere with its normal use.
 135 CENTRAL VALLEY FLOOD PROTECTION BOARD, Need for an Encroachment Permit, http://www.water.ca.gov/floodmgmt/docs/brochure_recboard_permit.pdf (last visited July 26, 2016); U.S. Dept. of Interior, *Final Shasta Lake Water Resources Investigation Feasibility Report* (July 2015), *supra* note 28 (estimating a 90-day processing time for the flood control encroachment permit and a 60-day processing time by the Department of Transportation); see also San Luis Obispo County Department of Public Works Fee Schedule (Nov. 24, 2015), available at <http://www.slocounty.ca.gov/Assets/PW/Fees/Fee+Schedule-DevServ.pdf> (San Luis Obispo County encroachment permits fee schedules ranging from tens to thousands of dollars).
 136 16 U.S.C. §§ 668–668c.
 137 16 U.S.C. §§ 703–12.
 138 16 U.S.C. § 668(a).
 139 16 U.S.C. § 703.
 140 CAL. FISH & GAME CODE § 3511.
 141 16 U.S.C. § 791 et seq.
 142 Fed. Energy Reg. Commission, Hydropower Licensing - Get Involved, available at <https://www.ferc.gov/resources/guides/hydropower/hydro-guide.pdf>.
 143 16 U.S.C. § 797(e).
 144 16 U.S.C. §§ 1271–1287.
 145 16 U.S.C. § 1271.
 146 16 U.S.C. § 1278(a).

147 CAL. PUB. RES. CODE § 5093.50 *et seq.*

148 See NATIONAL WILD AND SCENIC RIVERS SYSTEM, California, <https://www.rivers.gov/california.php> (last visited July 22, 2016).

149 California Water Bond Act (Proposition 1) Ch. 4, § 79711(e) states: “funds authorized pursuant to this division shall not be available for any project that could have an adverse effect on the values upon which a wild and scenic river or any other river is afforded protections pursuant to the California Wild and Scenic Rivers Act or the federal Wild and Scenic Rivers Act.”

150 See KARRIGAN S. BORK, J.F. KROVOZA, J.V. KATZ, and P.B. MOYLE, *The Rebirth of California Fish & Game Code Section 5937: Water For Fish*, 45 UC DAVIS LAW REV. 809 (2012), available at https://watershed.ucdavis.edu/files/biblio/45-3_bork.pdf.

151 CAL. FISH & GAME CODE § 5937.

152 BORK ET AL., *The Rebirth of California Fish & Game Code Section 5937: Water For Fish*, *supra* note 150, at 858–59; see also *Nat'l Audubon Society v. Super. Ct.*, 33 Cal. 3d 419, 425-26 (1983).

153 *California v. Fed. Energy Reg. Comm'n*, 495 U.S. 490, 506-07 (1990).

154 *Natural Resources Defense Council v. Patterson*, 333 F.Supp.2d 906 (E.D. Cal. 2004).

155 See BORK ET AL., *The Rebirth of California Fish & Game Code Section 5937: Water For Fish*, *supra* note 150, at 894–96.

156 See U.S. Bureau of Reclamation, *Upper San Joaquin River Basin Storage Investigation Draft Feasibility Report*, *supra* note 28, at 6-40; U.S. Dept. of Interior, *Final Shasta Lake Water Resources Investigation Feasibility Report* (July 2015), *supra* note 28, at 6-35.

157 See U.S. Bureau of Reclamation, *Upper San Joaquin River Basin Storage Investigation Draft Feasibility Report*, and U.S. Dept. of Interior, *Final Shasta Lake Water Resources Investigation Feasibility Report* for lists including approximately 50 applicable federal, state, and local laws, policies, and plans.



Pritzker Environmental Law and Policy Briefs

This policy paper is the eighth of the Pritzker Environmental Law and Policy Briefs. The Pritzker Briefs are published by UCLA School of Law and the Emmett Institute on Climate Change and the Environment in conjunction with researchers from a wide range of academic disciplines and the broader environmental law community. They are intended to provide expert analysis to further public dialogue on important issues impacting the environment.

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Acknowledgements

The authors wish to thank the following people for their thorough and thoughtful review: Cara Horowitz, Sean Hecht, Paula Daniels, Madelyn Glickfeld, Brian Gray, Doug Obegi, and Ron Stork.

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