Folsom Dam Safety and Flood Damage Reduction
Draft Environmental Impact Statement (EIS)/ Environmental Impact Report (EIR)

Sacramento, El Dorado, and Placer Counties, California

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State of California

Lead Agencies:
NEPA Lead Agency: U.S. Department of the Interior, Bureau of Reclamation (Reclamation)
CEQA Lead Agency: State of California Reclamation Board

NEPA Cooperating Agency:
U.S. Army Corps of Engineers (Corps)

CEQA Responsible Agency:
Sacramento Area Flood Control Agency

ABSTRACT

Both Reclamation and the Corps have multiple authorized projects addressing hydrologic, seismic, static, and flood management issues at Folsom Dam and its Appurtenant Structures (Folsom Facility). The Folsom Joint Federal Project (JFP) was developed to coordinate Reclamation and Corps efforts at the Folsom Facility. This Draft EIS/EIR evaluates implementation of the Folsom JFP by analyzing alternatives that modify the Folsom Facility to increase overall public safety. The alternatives differ in construction actions on the structures, including dams and dikes, of the Folsom Facility. Direct, indirect, and cumulative impacts resulting from the alternatives on the physical, natural, and socioeconomic environment of the region surrounding the Folsom Facility are addressed.

This Draft EIS/EIR is prepared in compliance with the National Environmental Policy Act (NEPA), Reclamation NEPA procedures, and the California Environmental Quality Act (CEQA) and CEQA guidelines and meets the requirements of the Energy and Water Development Appropriations Act of 2006.

Comments on this document must be submitted by January 22, 2007.

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The U.S. Army Corps of Engineers (Corps) is a Federal Cooperating Agency for this Environmental Impact Statement/Environmental Impact Report (EIS/EIR). The Corps intends to adopt the final version of this EIS/EIR to satisfy the requirements of the National Environmental Policy Act (NEPA) for the flood damage reduction features described in this EIS/EIR. Questions or comments on the flood damage reduction related portions of the draft EIS/EIR can be directed to the Corps at the following address: U.S. Army Engineer District, Sacramento, Attn: Ms. Becky Victorine, 1325 J Street, Sacramento, California 95814-2922, or email: Rebecca.A.Victorine@usace.army.mil.

Folsom Dam Safety and Flood Damage Reduction EIS/EIR Executive Summary

Purpose of Study and EIS/EIR

The limitations of the existing flood control system in the Sacramento area, and the urgent need to increase the level of flood protection have recently received increased public attention in the aftermath of the 2005 Gulf Coast hurricanes. Planning of significant improvements for flood protection and dam safety has been underway for some years among numerous agencies and organizations, notably the United States Army Corps of Engineers (Corps), the United States Department of the Interior, Bureau of Reclamation (Reclamation), the State of California Reclamation Board (State Reclamation Board)/State of California Department of Water Resources (DWR), and the Sacramento Area Flood Control Agency (SAFCA).

This Environmental Impact Statement/Environmental Impact Report (EIS/EIR) presents the results of a joint agency study for the planning, design, and implementation of a flood control and Safety of Dams risk reduction action at Folsom Dam and Appurtenant Facilities (Folsom Facility). The objective of the study is the identification and selection of an alternative that would significantly reduce the risk of flooding along the main stem of the American River in the Sacramento area while also meeting dam safety and public safety objectives.

The Flood Control Act of 1944 (Public Law 534) authorized the Corps to construct the Folsom Facility. The Folsom Facility was constructed by the Corps between 1948 and 1956. Upon completion in 1956, the ownership was transferred to Reclamation for operation and maintenance as an integrated feature of the Central Valley Project (CVP). Both Federal agencies have obligations and interests in relation to the Folsom Facility but differ in respect to Congressional objectives, mandates, authorities, funding, and time lines. Through cooperation, Corps and Reclamation seek to integrate flood risk reduction measures with dam safety improvements under a single plan.

Planning studies to address Folsom Facility issues were initiated during the 1990s and cumulated initially under the Corps' Folsom Dams Modification Project (Folsom Mods Project) and Folsom Dam Raise Project. The objective of the Folsom Modification Project was to reduce damages from flooding to the Sacramento area by increasing outlet efficiencies at Folsom Dam in general by releasing water earlier prior to a flood event. However, cost concerns with enlarging the existing outlets caused the Corps to reevaluate modification options that would perform as a functional equivalent to the outlet modifications. The objective of the Corp's Dam Raise Project was to increase flood storage capacity at Folsom Reservoir.

At the same time the Corps was investigating flood control options, Reclamation was evaluating Safety of Dams issues related to all of the Folsom Facilities. Reclamation initiated a Corrective Action Study (CAS) that evaluated public safety risks due to hydrologic, seismic, and static concerns. Beginning in 2004, Reclamation and the Corps established an Oversight Management Group, consisting of senior management from both agencies, to facilitate project coordination. Coordination activities included a comprehensive value planning effort to identify a joint project that the agencies' respective flood damage reduction and dam safety objectives. Congress formalized this effort in the FY 2006 Energy and Water Development Appropriations Act by directing the two agencies to continue progress toward a joint project. Since that time both agencies worked intensively to develop reasonable alternatives for a Joint Federal Project (JFP).

The objective of the Folsom Dam Safety and Flood Damage Reduction (DS/FDR) EIS/EIR is to assess engineering solutions addressing hydrologic control, and seismic and static issues that would integrate the Corps' authorized Folsom Dam Modification and Folsom Dam Raise projects with Reclamation's Safety of Dams objectives. Among other benefits, this would result in timely, cost effective completion of features at the Folsom Facility that expedite: (1) protection of public safety related to the structural integrity of the facilities and (2) improvement to flood control management for the communities along the lower American and Sacramento rivers.

The proposed structural modifications to the Folsom Facility could ultimately lead to revisions of Folsom Dam operations that would provide for earlier releases of reservoir water in advance of a major storm (hydrologic event). The modifications being considered in this EIS/EIR would allow for the release of 115,000 cubic feet per second (CFS) (the existing objective release) sooner than is now possible, with the potential for higher releases should the downstream levees be improved to accommodate the increased flows. These larger, earlier releases from Folsom would create and conserve flood storage space based on projected reservoir inflows resulting from a major storm impacting the upper American River watershed. However, the proposed modifications would be operated using existing criteria until the completion of the revised water control manual and supporting supplemental environmental compliance documentation, which would be completed one year prior to completion of proposed structural modifications, at which time the full potential benefits of the proposed modifications would be realized.

This EIS/EIR addresses project alternatives that include elements of the individual missions of Reclamation and the Corps. Due to specific Congressional authorizations limiting what actions each agency can implement, Reclamation would most likely implement separately those elements specific to its Safety of Dam's mission and the Corps would implement those elements specific to improving flood control protection, as summarized in the paragraphs below.

Study Authority

The current study was implemented under several existing authorizations. Primary authority and guidance for flood damage reduction is provided in the Folsom Dam Modification Project Authority under Section 101(a) (6) of the Water Resources Development Act (WRDA) of 1999 (Public Law (PL) 106-53) and the Folsom Dam Raise Authority under PL 108-137, the Energy and Water Development Appropriations Act for 2004. The Folsom Dam Modification and Folsom Dam Raise authorities share the objective of improving flood management on the American River, primarily through structural modifications to the existing Folsom Dam and appurtenant facilities. With the Folsom Dam Raise authority, Congress also authorized the Corps to construct an ecosystem restoration project component on the Lower American River and a permanent bridge, provided that certain funding conditions were met.

In addition, Reclamation has been pursuing Safety of Dams modifications separately through its existing Safety of Dams Program. Investigations and analyses by Reclamation have identified needed dam safety modifications at Folsom Dam and appurtenant facilities. In response to these studies, Reclamation initiated a Corrective Action Study (CAS) to identify technically feasible and environmentally and socially preferable alternatives that would address the identified safety concerns. A CAS Report, supported by the analyses in this EIS/EIR, will present a preferred alternative for incorporation into a Modification Report. This Modification Report will be submitted to Congress for approval.

Recent modifications to both agencies'existing authorities were made in the Energy and Water Appropriations Act of 2006, which directed the Secretary of the Army and the Secretary of the Interior to collaborate on authorized activities to maximize flood damage reduction improvements and address dam safety needs at Folsom Dam and Reservoir as one project; and authorized both agencies to expend funds for design of a joint project.

Facility Description and Study Area

The Folsom Facility is comprised of twelve separate structures (Figure ES-1). The main structure, used to control releases to the American River, is the concrete dam. The Main Concrete Dam is located on the mainstem of the American River and is the only facility with operational gates and outlets used to retain and release water stored within the reservoir. Adjacent to the Main Concrete Dam and looking downstream are the Right Wing Dam and Left Wing Dam. The two wing dams serve to contain water within Folsom Reservoir. The other large earthen structure is Mormon Island Auxiliary Dam (MIAD), which retains water at the location of a historic river channel. The Folsom Facility also includes eight earthen dikes. The earthen dikes span areas of terrain with lower elevations and are primarily used to contain water

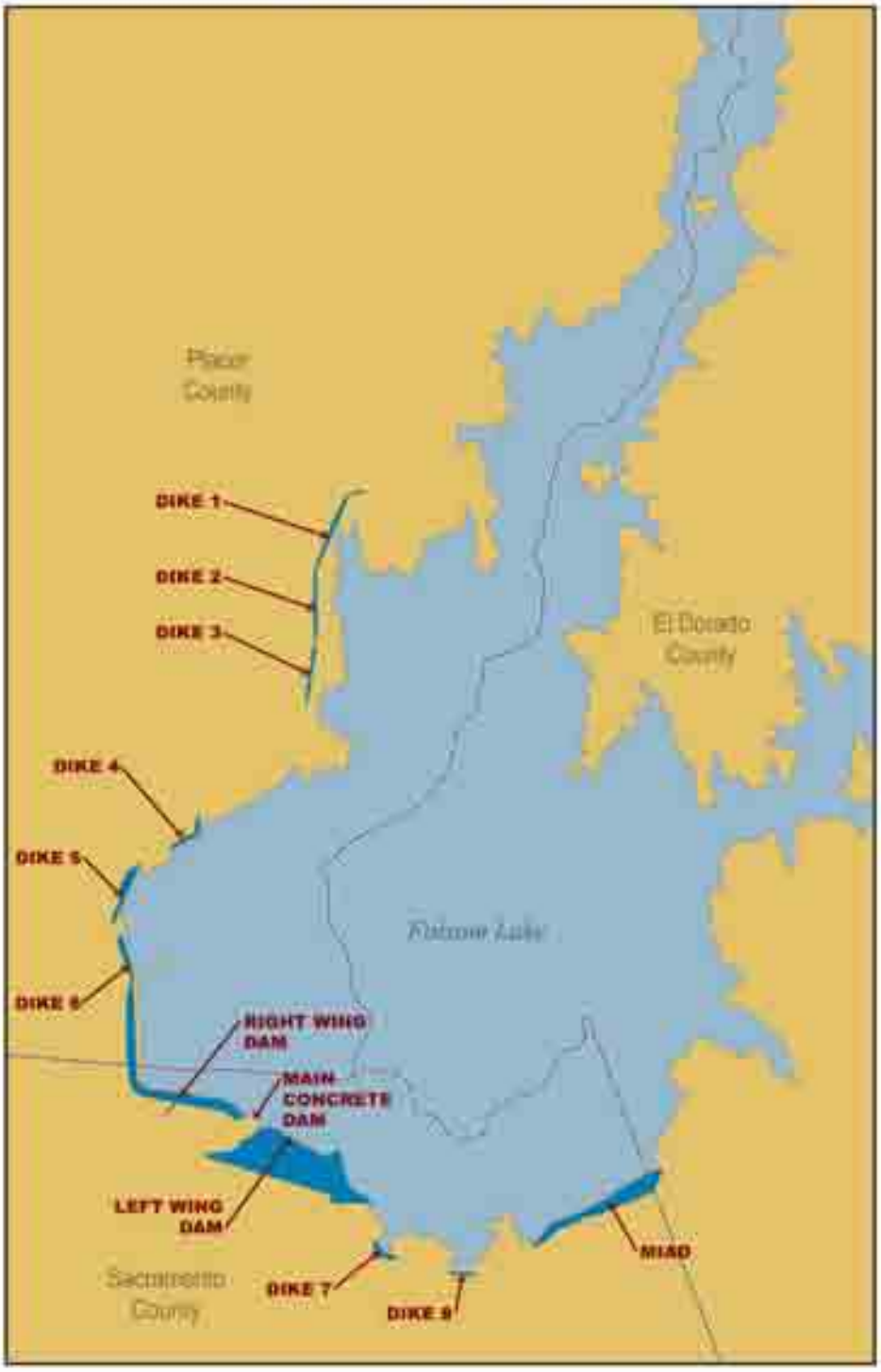

Figure ES-1
The Folsom Facility

when the reservoir is at or near capacity. Folsom Dam is also a producer of hydroelectric power.

Folsom is a multi-purpose facility operated by law for flood control, municipal and industrial (M&I) water supply, agricultural water supply, power, fish and wildlife, recreation, navigation and water quality purposes. The facility is primarily operated to maximize flood control and water supply storage benefits. To provide flood control storage capacity (protecting the Sacramento region), the reservoir is operated to provide the reservoir level at its lowest level starting in the fall of each year. The flood storage capacity is retained until April of each year when the reservoir is filled with snow-melt runoff from the Sierra Nevada. During the summer months when water elevations remain high, Folsom Lake serves a major regional recreational resource (Folsom Lake State Recreation Area).

The study area addressed in this EIS/EIR includes the entire Folsom Facility, including approximately 75 miles of shoreline surrounding the reservoir. Due to the requirement to bring in materials from outside suppliers, the study area includes adjacent roadways, the city of Folsom, and the community of Granite Bay.

Folsom DS/FDR EIS/EIR Purpose and Need/Project Objectives

As a part of their responsibilities, Reclamation and the Corps have determined that the Folsom Facilities require structural improvements to increase overall public safety by improving the facilities' ability to reduce flood damages and addressing dam safety issues posed by hydrologic (flood), seismic (earthquake), and static (seepage) events. These events have a low probability of occurrence in a given year, however due to the large population downstream of Folsom Dam, modifying the facilities is prudent and required to improve public safety.

Reclamation has identified the need for expedited action to reduce specific hydrologic, static, and seismic risks under its Safety of Dams Program. The identified risks are among the highest of all dams in Reclamation's inventory and the Folsom Facilities are among Reclamation's highest priorities within its Safety of Dams Program. Reclamation's primary interest for integrating dam safety activities with Corps' flood damage reduction projects is to expedite corrective action and realize cost sharing benefits of a coordinated effort.

The Corps in partnership with the Reclamation Board/DWR and SAFCA (non-federal sponsors) have determined that Folsom Reservoir does not have sufficient storage or release capacity to safely manage flood flows from floods with recurrence intervals greater than a 100-year recurrence level nor do the downstream levees have sufficient capacity to provide greater than 100-year flood protection (Corps letter to SAFCA dated December 9, 2004).

The non-federal sponsors have identified the need to reduce the risk of flooding in the Sacramento area. Due to the number and value of the exposed structures and the size of the population at risk, Sacramento has been identified as one of the most at risk communities in the nation. Consequently, there is a need to expeditiously reduce this risk through interim and permanent flood damage reduction measures. The goal of the non-federal sponsors is to achieve at least a 200-year level of flood protection for the Sacramento area as anticipated in the Congressionally authorized Folsom Modifications and Folsom Dam Raise Projects. Pursuit of this goal constitutes the non-federal sponsors' primary interest for integrating Corps flood damage reduction projects with Reclamation dam safety activities is to increase flood protection for the downstream and surrounding communities on an expedited basis and realize cost sharing benefits of a coordinated effort.

Given these circumstances, there is a need to expedite dam safety corrective actions for the Folsom Facilities in order to reduce potential failure due to seismic, static, and hydrologic conditions. There is also a need to incrementally increase minimum flood protection by improving reservoir pool release mechanisms and, if incrementally justified, increasing flood storage capacity. The purpose of the project will be to increase overall public safety, improve the reliability of local water supply and power generation, and maintain an important recreational resource. Project objectives are:

- Expeditiously reduce hydrologic risk of overtopping-related failure of any impoundment structure during a probable maximum flood (PMF) event in accordance with Reclamation's Public Protection Guidelines;

- Expeditiously reduce the risk of structural failure of any impoundment structure during a potential seismic (earthquake) event in accordance with Reclamation's Public Protection Guidelines;

- Expeditiously reduce the risk of structural failure of any impoundment structure during a potential static (seepage) event in accordance with Reclamation's Public Protection Guidelines;

- Expeditiously improve the flood management capacity of the facilities in a manner consistent with existing Corps authorities.

Development and Screening of Project Alternatives

The National Environmental Policy Act (NEPA) requires that a reasonable range of alternatives be analyzed, including a no action alternative. The California Environmental Quality Act (CEQA) requires that environmental documents identify and analyze a reasonable range of feasible alternatives that could meet the project objectives to varying degrees. Under CEQA, the range of potential alternatives to the proposed project shall include those that could feasibly accomplish most of the basic

objectives of the project and could avoid or substantially lessen one or more of the significant effects.

The development of alternatives presented in this document has been an iterative and collaborative process involving teams of engineers from Reclamation and the Corps. Alternative measures considered by the teams focused on addressing Corps flood damage reduction and Reclamation Safety of Dams objectives. The process commenced with an initial scoping phase followed by further refinement and selection of structural measures during a subsequent feasibility phase. Outcomes of the feasibility phase defined the proposed project/action by evaluating various structural measures that addressed the overall project's hydrologic, seismic, static, and flood control objectives.

Structural improvement measures identified during initial scoping efforts were reduced to those determined by technical experts to have the greatest potential of providing practical, implementable, cost effective, and environmentally sound means of achieving the required project objectives. Due to the number of potential structural measures with multiple design variations that achieved the same goal, representative measures were selected for further evaluation that would be reflective of similar design concepts and expected similar costs and environmental impacts.

The structural measures considered for the Folsom Facilities are summarized in Table ES-1.

Table ES-1
Features and Objectives of Folsom Facility Engineering Measures

Folsom Facility	***Engineering Measure***	***Dam Safety and Flood Control Accomplishment***
Main Concrete Dam	Dam raise Gate replacement Tendons Shear Keys Toe Blocks Pier and Gate reinforcement	Flood control Flood control Dam Safety seismic Dam Safety seismic Dam Safety seismic Dam Safety seismic
New Auxiliary Spillway	Auxiliary Spillway	Dam Safety hydrologic, flood control
Wing Dams	Earthen Raise Parapet Wall Raise Reinforced Earth Wall Raise Filters	Flood control Flood control Flood control Dam Safety static
MIAD	Earthen Raise Replace foundation Jet Grouting Downstream Overlay Filters	Flood control Dam Safety seismic Dam Safety seismic Dam Safety seismic, static Dam Safety static
Dikes	Earthen Raise Parapet Wall Raise Reinforced Earth Wall Raise Filters	Flood control Flood control Flood control Dam Safety static

Folsom DS/FDR EIS/EIR Project Description

The engineering measures proposed to address hydrologic, seismic, static, and flood control objectives vary for each of the Folsom facilities. The text below summarizes the basic features and aspects of the proposed project.

The existing authorizations for Reclamation and the Corps direct the agencies to assess different dam safety and flood damage reduction measures. Reclamation focuses on dam safety (seismic, static, and hydrologic issues) and the Corps flood damage reduction (flood and hydrologic control). In addition to stand-alone dam safety and flood damage reduction activities, the agencies seek a common solution to the hydrologic control of the dam and reservoir that addresses Reclamation's dam safety hydrologic risk (overtopping of facilities in the event of a PMF) and the Corps flood damage reduction objective (minimum 1 in 200 year protection). This combined effort has identified a gated auxiliary spillway, otherwise referred to as the Joint Federal Project (JFP), as the common feature addressing both objectives. Specifically:

> Project Description. The JFP at Folsom Dam and Reservoir will consist of six 23-ft x 33-ft submerged tainter gates at invert 368 ft combined with a concrete lined auxiliary spillway approximately 170 ft wide and 1700 ft in length. Gate dimensions and invert elevation may be optimized during design to maximize performance and/or reduce costs. To achieve the objective of expedited feasibility level design, optimization of the spillway design will focus, to the extent feasible, upon varying the invert elevation of the tainter gates, but if necessary, may include varying the dimensions of the six tainter gates, approach channel or auxiliary spillway. The optimization will seek to improve upon the flood damage reduction objective of at least 1/200 year flood protection while continuing to preserve and expedite completion of the dam safety objective of safely passing the Probable Maximum Flood (PMF).
>
> Additions. Additional features to the JFP may be proposed later as mutually determined by participating agencies in order to (1) achieve a minimum 1/200 year flood protection, or (2) as incrementally justified through appropriate analysis and evaluation. Potential additional features may include a raise of up to 3.5 feet for all embankments, or modification or replacement of the existing service gates or emergency spillway gates. Any additions to the JFP, as justified, will be for flood damage reduction purposes only.

The main feature of the JFP would be the phased construction of an auxiliary spillway in the area to the east of the concrete dam and in the left abutment and below the Left Wing Dam. The auxiliary spillway would be constructed on a natural ridge and would involve the removal of approximately 3.5 million cubic yards of

material that would form the channel of the spillway. Construction of the spillway will be phased to fully meet dam safety objectives on an interim basis while design and construction of flood control objective elements are implemented or a permanent basis should flood control elements not be in place in a timely manner. An interim control section composed of a cofferdam/rockplug that could serve as a fuseplug and a permanent control structure composed of either a gated or fuseplug structure will be constructed as the final phase.

Other stand-alone dam safety (seismic and static) and flood control features are specific to each agency's mission and are not considered part of the JFP. Flood control actions could potentially involve some version of a raise or modification or replacement of existing gates as incrementally justified. Dam safety actions include such features as adding filters, anchoring of the main dam, and reinforcement of spillway gates and piers. To develop borrow for potential earthen raises, material excavated from the auxiliary spillway site would be hauled either to a storage location near dike 7, to Folsom Point, or to a storage location near MIAD. The material would be processed for proper sizing and eventually become borrow material for the raising and/or strengthening of the Left Wing Dam, Dikes 7 and 8, and MIAD.

The Left Wing Dam, and Dikes 7 and 8 would potentially be raised by either constructing a concrete parapet wall on the existing crests, through placement of additional earthen material, or through a combination of both measures. To address static concerns at these facilities, a filter zone would be installed beneath the downstream overlay. Material for the filter would most likely be produced at Beal's point or at Folsom Point, and hauled to the construction sites using construction roads within the reservoir or via city roadways. If it is determined that local material would not meet the specifications for the filter zone, then the material would be hauled to the site from local suppliers.

MIAD would be subject to several measures addressing hydrologic, seismic and static concerns. MIAD is an earthen structure with part of its base constructed on potentially unstable river bed material. Due to the potential risk of the MIAD embankment subsiding during an earthquake, the downstream base would either be excavated and replaced, or the weak material strengthened through a jet grouting process. A downstream overlay, with filter, would be constructed on the downstream slope of MIAD to provide increased stability of the structure and to reduce static issues.

Construction work would be scheduled to coincide with reservoir levels that would allow for development of borrow within the reservoir area. Construction work would be staged at several locations within the reservoir area near the borrow sites and near each of the structures requiring modifications. Staging areas would be located at Granite Bay (Dikes 1, 2, and 3), Beal's Point (Right Wing Dam and Dikes 4, 5, and

6), at the Main Concrete Dam, at the Left Wing Dam, at Folsom Point (Dikes 7 and 8, MIAD), and at MIAD. Most staging areas would have a portable materials processing (crushing and sizing) facility to prepare earthen material for earthen raises, to produce sand from granitic rock, to store general construction materials, and to serve as a contractor work area.

At a minimum, portable concrete batch plants would be set up at Beal's Point, the concrete dam, near the Left Wing Dam, and at MIAD to mix (batch) concrete for construction of the new auxiliary spillway, conducting modifications to the main dam, miscellaneous features, and to produce grout for stabilization of MIAD.

Borrow material for earthen raises and the MIAD overlay would be developed primarily from within reservoir sources. Borrow areas would be developed adjacent to Granite Bay, Beal's Point, and Folsom Point for excavation and subsequent processing of granitic material. The material excavated at the auxiliary spillway site would also be processed for use in earthen raises. Granitic material at Beal's Point would also be processed down to sand for filters. Borrow materials would be stored near each of the processing site, near each one of the facilities, and potentially at previously identified borrow storage sites such at Dike 7, or adjacent to the downstream construction zone, such as near the base of MIAD.

Much of the borrow material would be hauled using construction roads within the reservoir rim. Transport of borrow and sand material from Beal's Point to the Left Wing Dam and MIAD areas would involve the use of local roadways unless a processing site is set up at Folsom Point or the Observation Point parking lot.

Any potential raise of the Folsom Facilities would also allow for an increase in the temporary storage capacity of the reservoir for flood control. The increased capacity in the reservoir would result in flooding of areas of land beyond the present project boundary. There are real estate solutions and construction solutions or a combination of the two that could be implemented to address occasional flooding of property not owned by the United States. The real estate solution involves the acquisition of occasional flowage easements from impacted property owners, or potentially, the acquisition of fee title, depending on the raise selected. The construction alternative would be implemented, where possible, by design and construction of new embankments on United States or non-government owned property. These flood protection embankments would be built so as to eliminate the potential for flooding on non-government property. The decision regarding which solution will work in the various impacted areas around the reservoir will be looked at on a case by case basis and depend on feasibility, cost and acceptability to the landowners. Additional analyses, including a supplemental EIS/EIR, will be required to address real estate and new embankments design and construction details should a specific raise of the Folsom Facility raise be justified and approved.

An additional action being considered by Reclamation for the Folsom Facility is an enhanced security project. Folsom Dam has been designated as a National Critical Infrastructure Facility. A compromise of its integrity could potentially result in serious property damage and loss of life. The enhanced security project has several features. First is the identification of Folsom Dam staff through the use of a proximity badge and monitoring system. The second is a closed circuit television monitoring system for surveying all critical features and access points to the facilities. Third is the remote operation from a security control center of access to dikes, wing dams, and MIAD. Fourth is a provision for supplemental lighting of key facility features.

Project Alternatives

No Action/No Project Alternative

The No Action/No Project Alternative describes the reasonably foreseeable future without any SD/FDR action. Without the project hydrologic, seismic, static, and flood damage reduction risks currently posed by the Folsom Facilities would continue into the future.

Action Alternatives

In addition to the No Action/No Project Alternative, the Folsom DS/FDR EIS/EIR evaluates five action alternatives. The basic features of the five alternatives are outlined below.

Alternative 1 – Fuseplug Auxiliary Spillway, No Concrete Dam Raise/Embankment Crest Protection

Under alternative 1, there would be no raise to the concrete structure with minimal modifications to the existing spillway. A large fuseplug auxiliary spillway would be constructed adjacent to the Left Wing Dam to address hydrologic dam safety concerns. The crests of some of the earthen structures would be strengthened to address hydrologic dam safety concerns, but not to increase the flood storage capacity of the reservoir. The basic elements of Alternative 1 are listed below.

- Main Concrete Dam
  - No raise,
  - Minor to moderate modifications to existing spillway bridge, gates, and piers
  - Tendons, shear keys, or toe blocks to address seismic concerns
  - Large fuseplug auxiliary spillway for Safety of Dams risk

- Right and Left Wing Dams
  - Crest protection for Safety of Dams risk
  - Toe drains and crest filters to address static issues

- MIAD
  - Crest protection for Safety of Dams risk
  - Jet grouting of downstream foundation for seismic issues
  - Downstream overlay for seismic and static issues
  - Full-height filters

- Dikes, 1, 2, 3, 7, & 8
  - No action

- Dikes 4, 5 & 6
  - Crest protection for Safety of Dams risk
  - Full height filters and toe drains for static concerns

- Potentially impacted real estate (no need for action)

- Other Project Features
  - Staging for construction at Beal's Point, Main Dam, Folsom Point and MIAD
  - Utility and road relocations within the reservoir boundary
  - Haul road construction within existing reservoir boundary
  - Borrow site development and processing
  - Concrete and jet grout processing

Alternative 2 – Fuseplug Auxiliary Spillway with Tunnel, 4-ft Dam/Embankment Raise

Under Alternative 2, the existing concrete parapet wall would be strengthened with some modifications to the existing spillway gates. A smaller fuseplug auxiliary spillway with a chute and a tunnel would be constructed to address hydrologic and flood control concerns. All of the earthen structures would be raised to address hydrologic concerns and to provide additional flood storage capacity. The basic elements of Alternative 2 are listed below.

- Main Concrete Dam
  - Minimal raise of existing 3.5-ft upstream parapet wall along non-overflow structure.
  - Minor to moderate modifications to the spillway bridge, gates and piers
  - Tendons, shear keys, and toe blocks to address seismic concerns
  - Foundation drain enhancements
  - Smaller fuseplug auxiliary spillway with new spillway tunnel for Safety of Dams risk and flood damage reduction

- Right and Left Wing Dams
  - <0.5-ft earthen raise with 3.5-ft parapet wall raise for Safety of Dams risk
  - Toe drains and half-height filters to address static issues

- MIAD
  - 4-ft earthen raise for Safety of Dams risk
  - Excavate and replace downstream foundation for seismic issues
  - Downstream overlay for seismic issues
  - Toe drains and full-height filters to address static concerns

- Dikes, 1, 2, 3, 7 & 8
  - 4.0-ft earthen raise for Safety of Dams risk
  - Toe drains for static concerns

- Dikes 4, 5 & 6
  - 4.0-ft earthen raise for Safety of Dams risk
  - Toe drains and half-height filters for static concerns

- Potentially impacted real estate
  - Acquisition of occasional flowage easements or fee interest may be necessary.
  - Flood protection embankments.

- Other Project Features
  - Staging for construction at Granite Bay, Beal's Point, Main Dam, Folsom Point and MIAD
  - Utility and road relocations within the reservoir boundary
  - Haul road construction within existing reservoir boundary
  - Borrow site development and processing
  - Concrete processing

Alternative 3 – JFP Gated Auxiliary Spillway with Potential 3.5-ft Parapet Wall Raise

Under Alternative 3, a gated auxiliary spillway would be constructed to address hydrologic dam safety and flood control concerns. Certain flood control enhancements could potentially be added to the gated spillway as incrementally justified. Potential flood control enhancements include an embankment raise of up to 3.5 ft and/or modification or replacement of existing service gates and emergency spillway gates. The basic elements of Alternative 3 and potential flood control enhancements are listed below:

- Main Concrete Dam
  - Major modifications to spillway bridge, gates, and piers (potential flood control enhancement as incrementally justified).
  - Tendons, shear to address seismic concerns
  - Foundation drain enhancements
  - Gated auxiliary spillway for safety of dams and flood control

- Right and Left Wing Dams
  - 3.5-ft parapet wall raise for flood control (potential flood control enhancement as incrementally justified).
  - Toe drains and full-height filters to address static issues

- MIAD
  - 3.5-ft parapet wall raise for flood control (potential flood control enhancement as incrementally justified).
  - Jet grouting of downstream foundation for seismic issues
  - Downstream overlay for seismic issues

- Dikes, 1, 2, 3, 7 & 8
  - 3.5-ft parapet wall raise for flood control (potential flood control enhancement as incrementally justified).
  - Toe drains for static concerns

- Dikes 4, 5 & 6
  - 3.5-ft parapet wall raise for flood control (potential flood control enhancement as incrementally justified).
  - Full height filters and toe drains for static concerns

- Potentially impacted real estate
  - Acquisition of occasional flowage easements will probably be necessary.
  - Flood protection embankments.

- Other Project Features
  - Same as Alternatives 2

Alternative 4 – JFP Gated Auxiliary Spillway with Potential 7-ft Dam/Embankment Raise

Under Alternative 4, a smaller auxiliary spillway would be constructed to address both dam safety hydrologic and flood control objectives. If incrementally justified, a 7-ft raise of the concrete dam and all embankments could potentially be added to enhance flood control protection. All earthen structures would be raised to increase the temporary flood storage capacity of the reservoir. The flood storage capacity would be the same as for Alternative 3, but the additional raise would provide increased freeboard (i.e. the space between the maximum surface water elevation and the crest of the dams and dikes). The basic elements of Alternative 4 and potential additions for flood control purposes are listed below.

- Main Concrete Dam
  - 7-ft concrete raise of non-overflow section (potential flood control enhancement as incrementally justified).
  - Major modifications to spillway bridge, gates, and piers

- Tendons and shear keys to address seismic concerns
- Foundation drain enhancements
- Gated auxiliary spillway for Safety of Dams and flood damage reduction risk

- Right and Left Wing Dams
  - 7-ft earthen raise for flood damage reduction (potential flood control enhancement as incrementally justified).
  - Toe drains and full height filters to address static issues

- MIAD
  - 7-ft earthen raise for flood damage reduction (potential flood control enhancement as incrementally justified).
  - Jet grouting of downstream foundation for seismic issues
  - Downstream overlay for seismic issues
  - Full-height filters for static control

- Dikes, 1, 2, 3, 7, & 8
  - 7-ft raise for flood damage reduction (potential flood control enhancement as incrementally justified).
  - Toe drains and full-height filters for static concerns

- Dikes 4, 5 & 6
  - 7-ft raise for flood damage reduction (potential flood control enhancement as incrementally justified).
  - Full height filters and toe drains for static concerns

- Potentially impacted real estate
  - Acquisition of occasional flowage easements or fee interest will be necessary. Flood protection embankments.

- Other Project Features
  - Same as for Alternatives 2 and 3

Alternative 5 – No Auxiliary Spillway, 17-ft Dam/Embankment Raise

Under alternative 5 all Folsom project facilities would be raised approximately 17 feet. No auxiliary spillway would be constructed because the reservoir capacity would be increased to contain the PMF event. All of the earthen structures would be raised to address hydrologic concerns and to increase the flood storage capacity of the reservoir. The basic elements of Alternative 5 are listed below.

- Main Concrete Dam
  - 17-ft raise of non-overflow section
  - Major modifications to spillway bridge, gates, and piers
  - Tendons and shear keys to address seismic concerns

  - Foundation drainage improvements

- Right and Left Wing Dams –
  - 17-ft earthen raise for Safety of Dams risk
  - Full-height filters and toe drains to address static issues

- MIAD
  - 17-ft earthen raise for Safety of Dams risk
  - Excavation and replacement of foundation for seismic issues
  - Downstream overlay for seismic issues
  - Full-height filters and toe drains

- Dikes, 1, 2, 3, 7 & 8
  - 17-ft raise for Safety of Dams risk
  - Full-height filters and toe drains for static concerns
  - Dikes 4, 5 & 6
  - Full height filters and toe drains for static concerns

- Potentially impacted real estate
  - Acquisition of occasional flowage easements or fee interest will be necessary. This could include the relocation of residences and/or businesses.
  - Flood protection berms will be necessary.

- Other Project Features
  - Full development of all borrow sites, otherwise same as Alternatives 2, 3, and 4

Environmental Consequences

The environmental baseline used to establish the basis for determining effects of the Folsom DS/FDR alternatives is derived from the NEPA definition of future conditions without project and the CEQA definition of existing conditions. The reader is referred to the individual resource chapters in this EIS/EIR for discussions on how the baseline is being applied to each resource. Table ES-2 provides a summary of the impacts by resource area along with the proposed mitigation measures.

Table ES-2
Impacts and Proposed Mitigation Measures Summary- Folsom DS/FDER EIS/EIR

Resource Area	*Impact*	*Potential Mitigation*
Hydrology	• Reduce water source to wetlands	• Monitor water levels during/after construction
Water Quality	• Increased siltation • Increased turbidity • MAID water quality impacts	• Best management practices • Best management practices • Best management practices
Groundwater	• Localized groundwater level fluctuations	• Monitor water levels during/after construction
Water Supply	• Potential short-term disruption of Natomas pipeline	• Establish temporary water source
Air Quality	• Uncontrolled NO_x emissions from construction vehicles exceeding de minimis thresholds • Particulate (PM_{10}) emissions exceeding de minimis thresholds	• Develop construction sequencing plan that includes best available emissions control practices. • Best management controls for roadway, processing facility, and batch plant particulate emissions
Aquatic Resources	• Less than significant impact to fish • Potential loss of seasonal wetland/vernal shrimp habitat • Displacement of non-native fish species from stilling basin	• None required for fish • Mitigation plan • None required for non-native fish
Terrestrial Vegetation and Wildlife	• Potential impact to special status plant and animal species • Direct or indirect impacts to oak woodlands • Permanent loss of wetlands • Adverse impacts to the Valley Elderberry Long-Horn Beetle and its habitat • Potential impact to protected amphibian species	• Mitigation plan • Mitigation plan • Mitigation plan • Mitigation plan • Mitigation plan
Soils	• Loss of soil resource through excavation and borrow site development	• Best management practices
Minerals	• No impact	
Geological Resources	• Commitment of geological resources for facility construction • Naturally occurring asbestos disturbance	• None • Asbestos abatement plan incorporating best management practices
Visual Resources	• Temporary reduction in visual quality as a result of borrow development and construction activities • Permanent loss of lake views from trails, shoreline and residences due to new parapet walls and embankments	• Siting of processing facilities in less obtrusive areas • Not mitigable
Agricultural Resources	• No impact	
Transportation and Circulation Element	• Significant impact to roadways with current poor level of service	• Complete a peak hour capacity analysis to identify potential roadway improvements or operations modifications • Prepare a transportation

Table ES-2
Impacts and Proposed Mitigation Measures Summary- Folsom DS/FDER EIS/EIR

Resource Area	*Impact*	*Potential Mitigation*
		management plan that outlines contractor haul routes for coordination with the local entities
Noise	• Increase in area noise levels due to construction, processing, and transport • Significant increase in nighttime noise levels at three sensitive receptor locations	• Construct portable noise barriers • Maintenance of exhaust mufflers • Scheduling truck traffic to day time hours • Blasting during daytime hours only • Monitoring of construction noise levels at sensitive locations
Cultural Resources	• Potential loss or disturbance of cultural resources	• Consultation with the State Historic Preservation Office and implementation of mitigation plan
Land Use, Planning, Zoning	• Land use change due to construction of new embankments, flowage easements, or property acquisition	• Construct flood protection berms to prevent inundation of private property • Acquire real estate rights (easement or fee title) of inundated properties
Recreation	• Significant loss of visitor days and recreation revenues	• Construction related impacts to recreation facilities will be replaced in kind by the lead construction agency and disturbed recreation areas and facilities will be restored to pre-construction condition • Prepare signage and announcements related to construction schedules and closures • Replace trail staging area at Folsom Point with comparable parking capacity • Establish detours with signs for roads/trails • Following borrow excavation, recontour beach areas for public use • Construction, borrow, and staging areas will be sited as far from recreation areas as is practical • Reconfigure entrances to Beal's Point and Granite Bay to prevent conflict between recreation and construction traffic • Use flagmen to control traffic • Construction hours scheduled to accommodate high use periods
Public Services and Utilities	• Potential for temporary disruptions • Damage to rest rooms and roads • Relocate Natoma Pipeline • Would create solid waste	• Stage utility relocations and prior announcements • Repair or relocate • Establish temporary water source • Recycle when possible, select licensed landfills
Hydropower	• No impact	

Table ES-2 *Impacts and Proposed Mitigation Measures Summary- Folsom DS/FDER EIS/EIR*		
Resource Area	***Impact***	***Potential Mitigation***
Population and Housing	• Relocation of Displaced residents or businesses	Locate comparable properties during relocation assistance work
Public Health and Safety	• Work site, roadway, and recreation site safety control	• Best management practices
Indian Trust Assets	• No impact	
Environmental Justice	• No impact	

Hydrology, Water Quality, and Groundwater

Construction of any of the DS/FDR alternatives will in themselves not change the hydrology of the American River nor alter current operations of the reservoir. Construction of the project would result in improved hydrologic control of the American River watershed flood flows, providing flood control benefits to the Sacramento region.

Excavation of in-reservoir borrow sites and construction of earthen raises would have the potential for significant water quality impacts. Water quality impacts would result from soil erosion both during and after the excavation of borrow material. The effect would be mitigated through use of best management practices.

Water Supply

Placement of excess material within the reservoir would reduce water supplies by less than 1 percent.

Air Quality

Exhaust emissions from construction equipment and materials hauling trucks, fugitive dust produced by construction equipment and haul trucks on disturbed ground, fugitive dust emissions from materials processing facilities and concrete batch plants would cumulatively produce a significant air quality impact. Depending on the alternative, NOx emissions would trigger a General Conformity evaluation, from which mitigation measures would be developed to reduce air quality impacts.

Aquatic Resources

Construction of the DS/FDR actions would have less than a significant impact on in-reservoir aquatic resources. The majority of the fish species inhabiting the reservoir are introduced game or prey species, and special status species are not known to inhabit the immediate vicinity of the project sites.

Construction near Dike 6 would have the potential to remove a seasonal wetland. Loss of the wetland would be considered to be significant requiring mitigation compensation.

Dewatering of the stilling basin would result in the removal of non-native fish species.

Terrestrial Vegetation and Wildlife

Construction of any of the project alternatives would have the potential to adversely affect special status plant species, protected oak woodlands, result in loses of native vegetation, result in a permanent loss of project area wetlands, and impact elderberry shrubs, which host to the endangered valley elderberry long-horn beetle. All vegetation impacts can be mitigated to non-significant levels. Construction activities could result in the alteration or loss of habitat for wildlife special status species. These impacts could be mitigated to non-significant level. Wetlands downstream of MIAD would be monitored through construction.

Soils, Minerals, and Geological Resources

Construction activities, particularly in the area of auxiliary spillway, the wing dams, MIAD, and dikes, would result in the loss of topsoil resources. This impact would be mitigated to non-significant levels through the implementation of best management construction practices. Use of granitic material from within the reservoir for the raising the dikes and dams represents a long-term commitment of this resource. The schist based bedrock comprising the borrow material east of dike 7 contains low-levels of asbestos. Although the concentrations of asbestos are too low to be an economic mineral, the schist will need to be managed to reduce air borne release of the asbestos fibers.

Visual Resources

Establishment of the material processing facilities, excavation of borrow sites, and construction work on the Folsom dams and dikes would result in a significant but temporary visual impact to Folsom Lake State Recreation Area visitors and to the home owners bordering the reservoir. The visual resource impairment would be an unavoidable adverse impact until construction work was completed at each facility.

Construction of new flood protection embankments and security measures would permanently change the view and visual setting of residences along some areas of Folsom Lake, and from some areas of shoreline and trails.

Agricultural Resources

The Folsom DS/FDR actions would not impact local or regional agricultural resources.

Transportation and Circulation

The hauling of materials and supplies to the Folsom DS/FDR work sites would not have a significant impact on the Level of Service for most local roadways except for

Scott Road north of White Rock, and East of Natoma Street. This impact could be mitigated through the scheduling of construction vehicles to off-peak times.

Noise

Construction equipment, materials processing facilities, and haul trucks all will increase noise levels within the project area. During the day time, there would be a perceptible increase in noise for the project area, but due to the distance between sensitive noise receptors and noise sources, the increase would not be considered as significant. However, nighttime noise increase at three residential receptor areas would exceed ambient noise criteria creating an unavoidable adverse impact, should mitigation measures not be effective in reducing noise levels.

Cultural Resources

Cultural resources are known to exist at many locations proposed for staging, borrow development, and facility construction. Cultural resources would be disturbed or destroyed under any of the action alternatives. Cultural resource impacts would be mitigated for under a programmatic agreement in consultation with the State Historic Preservation Office.

Land Use, Planning, and Zoning

Construction of Folsom staging, borrow site, and Facility improvements would be conducted in compliance with local planning and zone rules. New embankments, flowage easements, and/or property acquisition could change zoning. Construction of raises would result in the potential for temporarily increasing the surface elevation of the reservoir. This would result in the potential for flooding of non-government owned property along the current federal property boundary. This impact would be addressed by construction of flood protection embankments and/or acquisition of occasional flowage easements of affected lands.

Recreation

The establishment of staging areas and borrow sites within existing recreational use areas coupled with construction work at Folsom facilities and haul truck traffic would have significant and unavoidable adverse impacts to recreation at Folsom. State Parks, the entity managing the recreational aspects of Folsom, would be impacted by losing all public access at the Folsom Point recreation area, and portions of Beal's Point and Granite Bay recreation facilities. This would result in a significant loss of recreation revenue to the State.

Public Services and Utilities

Construction planning and sequencing will be performed so that existing utilities would not be impacted by Folsom DS/FDR construction activities. Mitigation measures would reduce interruptions in service. All roads and other utilities damaged from the project would be repaired or replaced.

Hydropower

Construction of the Folsom DS/FDR actions would not impact hydropower operations at Folsom or Nimbus Dams.

Population and Housing

Actions taken under the Folsom DS/FDR could result in the relocation of residents or businesses. Agencies would locate comparable properties during relocation assistance work.

Public Health and Safety

The Folsom DS/FDR would include construction planning and implementation elements providing safety considerations for local public and visitors to the Folsom Lake State Recreation Area.

Indian Trust Assets

There are no Indian Trust Assets within the project area that would be affected by Folsom DS/FDR construction activities.

Environmental Justice

There are no ethnic or low income groups defined by Environmental Justice guidance within the project area that would be disproportionately impacted by Folsom DS/FDR activities.

Compliance With Applicable Laws and Regulations

This EIS/EIR complies with NEPA and CEQA requirements. The Proposed Action, as defined herein, would comply with all Federal, State, and local laws and permitting requirements.

Identification of Environmentally Preferred Alternative

The No Action Alternative, because it does not involve any construction activity would have the least environmental effect to the project area, but it would not meet the project's purpose and need. The No Action Alternative would also have the greatest potential for lower American River impacts resulting from the inability to control large storm events with the existing Folsom Facility.

Alternative 1 would have the least environmental impact of the action alternatives, but it would not fully address the project's purpose and need. Alternative 1 does not adequately address the flood damage reduction goals of the Corps and state sponsors.

Alternative 2 with the inclusion of the gated auxiliary spillway tunnel partially addresses flood damage reduction objectives, but at greater impact than Alternative 3 due to the large amount of earthen material handled under Alternative 2. Alternative

3 fully addresses the project's purpose and need, although at greater impact than Alternative 1 due to the increased construction work at all facilities.

Alternative 4 would meet the project's purpose and need but would have greater environmental impact due to the increased amount of earthen material excavated, process and placed at the facilities. Alternative 5 would have the greatest environmental impact because it would require complete development of all potential in reservoir borrow sites to provide the earthen material necessary to construct the 17-ft raise.

Base on this summary, Alternative 3 has been identified as the environmentally preferred alternative addressing the CEQA requirement to address such in an EIS/EIR.