Isabella Lake Dam Safety Modification Project Environmental Impact Statement *Draft*

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U.S. Army Corps of Engineers,
Sacramento District – Lead Agency

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Sequoia National Forest – Cooperating Agency

Forest Service

Isabella Lake Dam Safety Modification Project
Draft Environmental Impact Statement
Kern County, California

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Abstract

Pursuant to the National Environmental Policy Act of 1969, as amended, the U.S. Army Corps of Engineers, Sacramento District, in cooperation with the U.S. Forest Service, Sequoia National Forest, has prepared this Draft Environmental Impact Statement (EIS) for the Federal action proposed to remediate seismic, seepage, and hydrologic dam safety concerns at the Isabella Lake Main and Auxiliary Dams. Isabella Lake is located on the Kern River approximately 45 miles northeast of Bakersfield, Kern County, California.

This Draft EIS identifies, evaluates, and documents the environmental effects of an array of remediation alternatives that are necessary to prevent loss of life, extensive downstream damage, functional loss of the project, and the loss of all project benefits. Implementing the proposed project represents a large and complex modification project that involves altering the Isabella Dams and Spillway, constructing new structures and facilities, and performing numerous associated support actions over an anticipated multi-year construction period. This Draft EIS allows opportunity for public and review agencies to provide comments and will help ensure that implementation of this needed project can be achieved with the least possible impacts.

A 45-day comment period on the Draft EIS began with the publication of the Environmental Protection Agency's Notice of Availability in the Federal Register on March 23, 2012. All comments received during the comment period will be considered in the preparation of the Final EIS. Comment letters received during the public review period along with responses, will be included in the Final EIS.

EXECUTIVE SUMMARY

INTRODUCTION

This Draft Environmental Impact Statement (Draft EIS) has been prepared by the US Army Corps of Engineers (Corps), Sacramento District in cooperation with US Forest Service, Sequoia National Forest, Kern River Ranger District (USFS). The Draft EIS evaluates the environmental, cultural, and socioeconomic impacts of implementing the proposed Isabella Lake Dam Safety Modification Project (Isabella DSM Project) to remediate existing seismic, seepage, and hydrologic deficiencies in the Main Dam, Spillway, and Auxiliary Dam. The Corps is the Federal lead agency and the USFS is the cooperating agency for the Isabella DSM Project. This analysis was carried out to meet requirements of the National Environmental Policy Act of 1969 (NEPA). Following public and agency review and comment of this Draft EIS, a Final EIS will be prepared and considered before a decision is made whether to approve the project for construction.

PROJECT PURPOSE

The Corps is proposing risk reduction measures to minimize the potential for and consequences of a catastrophic downstream flooding event by remediating the significant seismic, hydrologic, and seepage deficiencies at the Isabella Main and Auxiliary Dams and spillway for safe and effective functioning at authorized capacity, while reducing the risk to the downstream public to tolerable levels. This would support the ultimate goal of having a safe facility that meets Corps risk reduction guidelines for existing dams and allows the project to provide the benefits for which it was authorized. Risk is defined as a measure of the probability and severity of undesirable consequences or outcome.

PROJECT LOCATION

Isabella Lake is on the Kern River in the Sierra Nevada, in the southernmost part of the Sequoia National Forest, Kern County, California (Figure ES-1 and Figure ES-2). It is located approximately 35 miles (50 river miles) northeast of Bakersfield, along Highway 178 and one mile upstream of the town of Lake Isabella. The Kern River drains an area of 2,100 square miles and is the most southerly of the major streams flowing into the San Joaquin Valley. The North Fork and South Fork of the Kern River comprise the headwaters, and each flows approximately 90 miles from the High Sierra to their confluence, about 1¼ miles upstream of Isabella Main Dam. Downstream of Isabella Main Dam, the Kern River flows through the Kern River Gorge, and into the San Joaquin Valley. From the mouth of the canyon, the Kern River flows 85 miles to its terminus at Tulare Lakebed. There are five power plants on the lower portion of the river and numerous irrigation diversions off the river, between the canyon mouth and Tulare Lakebed. During years with exceptionally large runoff, when the Tulare Lake basin is threatened with flooding, all or a portion of the runoff is diverted to the California Aqueduct via the Kern River-California Aqueduct Intertie.

Figure ES-1 Study Area Location

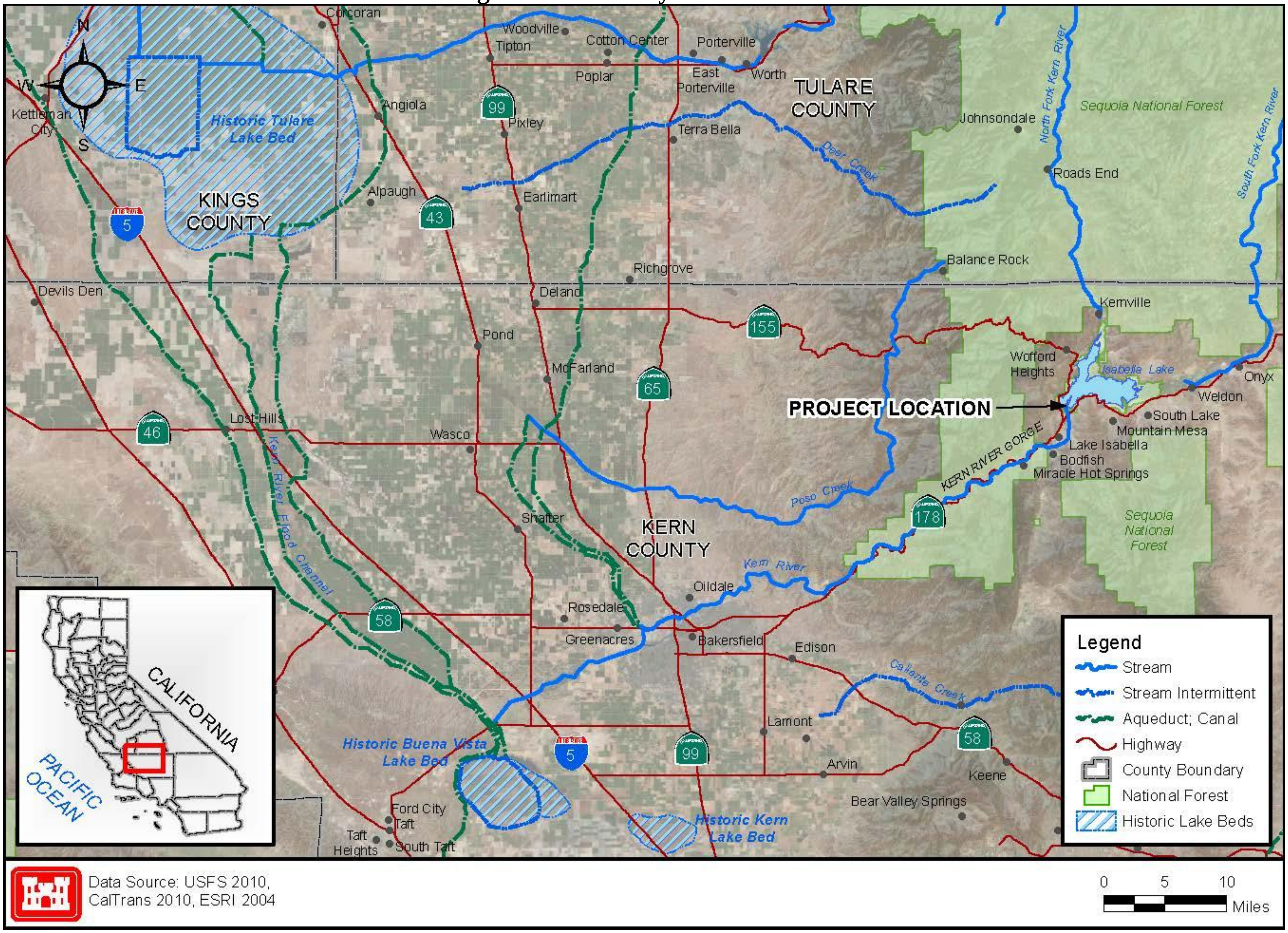
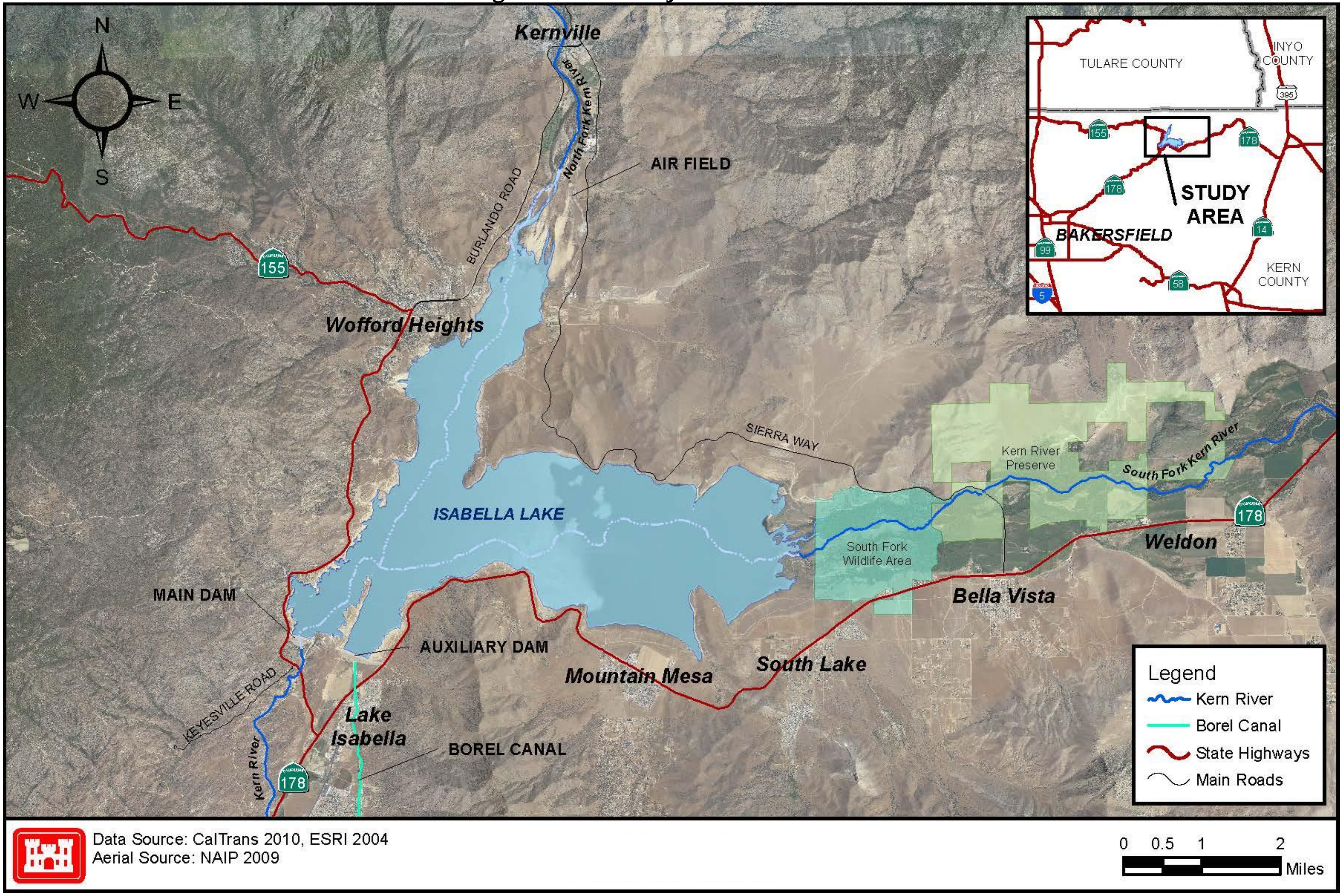


Figure ES-2 Project Area Location



NEED FOR ACTION

The Corps has determined that the Isabella Dam facilities require structural improvements in order to safely meet authorized project purposes and to reduce risk to the public and property from dam safety issues posed by floods, earthquakes, and seepage. Risk is defined as a measure of the probability and severity of undesirable consequences or outcome. The Corps has adopted a procedure for assessing risk at a dam project in terms of "tolerable risk". The procedure has been in use for the past 15 years or more by a number of Federal and international dam management agencies.

The Corps prioritizes its dams for possible remediation through a process that determines risk. As part of the risk determination, tolerable risk guidelines have been developed. While economic risk and environmental risk are important considerations when assessing risk, life safety is paramount. Simply stated, it is intolerable if a dam has an annual probability of failure greater than 1/10,000; or if the assessed annualized life loss is greater than 0.001. More information can be found in the policy document ER 1110-2-1156, which can be found at http://140.194.76.129/publications/eng-regs/.

In 2005 the Corps determined through a screening-level risk assessment process that the Isabella Dams posed unacceptable risk. Subsequently, the project received a risk classification that is described "urgent and compelling (unsafe)" and as "critically near failure", or "extremely high risk". It should be noted that the project received this classification due to the "extremely high risk", and that the project is not believed to be "critically near failure". Failure is not believed to be imminent.

Given the large population downstream of Isabella Lake as well as significant dam safety issues at the dam, urgent action is needed to address deficiencies and reduce risk. These facilities are among the Corps' highest priorities for risk reduction, and the project does not meet Corps tolerable risk guidelines, thus remedial actions are necessary. The Corps' need for action is to reduce the likelihood and consequences of dam failure and to restore the authorized project benefits.

PROJECT AUTHORITIES

The initial study for a project on the Kern River was authorized by the Flood Control Act of 1936, approved June 22, 1936. Construction of Isabella Dam and Lake was authorized by the Flood Control Act of 1944. The project is primarily authorized for flood control, with secondary benefits from water conservation.

The ER 1110-2-1156 (final 28 October 2011) prescribes the guiding principles, policy, organization, responsibilities, and procedures for implementation of risk-informed dam safety program activities and a dam safety portfolio risk management process within the Corps. The purposes of the dam safety program are to protect life, property, and the environment by ensuring that all dams are designed, constructed, operated, and maintained as safely and effectively as is reasonably practicable. Prudent stewardship of available resources is essential to preserve the existing infrastructure. When unusual circumstances threaten the integrity of a structure and the safety of the public, the Corps has the authority to take expedient actions, require personnel to evaluate the threat, and design and construct a solution.

The Corps has entered into agreements over the years with the USFS regarding the transfer and management of Isabella Dams and Lake lands and facilities between the two agencies. The USFS has provided the Corps with a Letter of Understanding (LOU) dated April 15, 2008 acknowledging that the Corps would serve as the Lead Agency for all environmental analyses required in connection with the Isabella Lake Safety Assurance Program. The USFS is participating in the NEPA process as a cooperating agency as defined by 40 CFR 1501.6.

The Ancillary Agreement No. 4 to 1991 Memorandum of Agreement transferring the lands and facilities (dated November 19, 2008) outlines in detail the specific roles and responsibilities of the Corps as the Lead Agency and the USFS as the cooperating agency. The Agreement includes provision for the coordination of the parties in connection with investigations, studies, environmental analyses and implementation of the Corps' projects for seismic, seepage and hydrologic retrofit design, through remediation stages, related to the Isabella Dams and Lake.

ALTERNATIVE FORMULATION PROCESS

The formulation of alternative risk management plans (RMPs) for evaluation in order to select a Preferred Alternative for the Isabella DSM Project was a multi-phased process beginning in 2010 and continuing to early 2012. The first phase began in early 2010 with the main purpose of identifying and describing the array of potential remediation measures (structural and nonstructural) that could be implemented to reduce the likelihood of dam failure. A key step in the first phase of the process was a workshop conducted March 16-18, 2010, in Kernville, California, that included individuals and professionals with relevant areas of expertise representing the Corps, the URS-Kleinfelder-Geomatrix Joint Venture (Isabella JV), project stakeholders, and project sponsors. This initial workshop: (a) developed an array of potential remediation measures to reduce the risk associated with seepage, seismic and hydrologic deficiencies in the Main Dam, Spillway, and Auxiliary Dam; (b) performed an initial feasibility screening of the remediation measures; and (c) began formulating alternative RMPs from various combinations of the identified remediation measures.

The second phase of the RMP formulation process got underway in Fall 2010, with the main purpose of formulating a short list of alternative RMPs. As part of this second phase, the Corps, the Isabella JV, and the EIS contractor (Tetra Tech) met in a multi-day roundtable workshop on October 18-21, 2010. The focus of this meeting included: (a) a thorough review of the results of a draft risk assessment prepared by the Corps, and the deficiencies of the dams and spillway that are driving the risk; (b) an evaluation of the first phase workshop results; and (c) a review of the second phase timeline and activities to be performed by the Corps, the Isabella JV, and Tetra Tech. During December 2010, and January 2011, the Corps, Isabella JV, and Tetra Tech met in two sequential workshops to review and fine-tune the list of remediation measures identified, and formulate them into an initial array (long-list) of alternative RMPs for comparison and further evaluation.

Following these two workshops the Corps further fine-tuned the list of remediation measures and alternative RMPs, and developed a short list of alternative RMPs. As part of this effort, the Corps refined quantities and costs, and developed potential construction schedules as a basis for alternative comparison. An in-depth comparison of the short list of alternative RMPs was conducted in a conference setting by the Corps and the Isabella JV on March 9-10, 2011. The Corps then compiled the results from the comparison conference, and through a series of internal meetings derived a final set of alternative RMPs to be considered for detailed analysis in this Draft EIS. These alternatives are briefly described in following paragraphs. A more detailed description of the alternatives is presented in Chapter 2 of this Draft EIS.

ALTERNATIVES INITIALLY CONSIDERED AND SELECTED FOR DETAILED ANALYSIS

As a result of the above-described formulation process, the following eight alternative RMPs were derived by the Corps for consideration in this Draft EIS:

- RMP#1: No Action Alternative— Implement none of the RMPs, remove the Interim Risk Reduction Measures (IRRM) currently in place, and operate Isabella Lake up to the authorized gross pool elevation of 2,609.26 feet (Note: all elevations are referenced to the NAVD88 vertical datum).
- RMP#2: Making the Interim Risk Management Measure (IRRM) Permanent—No new actions but make the current restricted Isabella Lake pool elevation of 2,589.26 feet permanent.
- RMP#3: Alternative Base Plan—Remediate those deficiencies identified for the Main Dam, Spillway, and Auxiliary Dam that if not remediated, would have an unacceptably high likelihood and large consequences for a catastrophic failure of one or both of the dams from seepage, seismic activity, or an extreme storm event.
- RMP#4: Alternative Plan 1—Remediate the deficiencies covered in the Alternative Base Plan, plus additional deficiencies identified for the Main Dam.
- RMP#5: Alternative Plan 2— Remediate the deficiencies covered in Alternative Plan 1, plus additional deficiencies identified for the Auxiliary Dam.
- RMP#6: Alternative Plan 3—Remediate the deficiencies covered in Alternative Plan 2, plus additional deficiencies identified for the Main Dam.

- RMP#7: Alternative Plan 4—Remediate all of the seismic, hydrologic, and seepage deficiencies remediated under the Alternative Base Plan, plus additional remediation measures identified for the Existing and Emergency Spillways, Main Dam, and Auxiliary Dam, to accommodate up to a 16-foot crest raise for the hydrologic overtopping deficiency. In addition, both State Highways 155 and 178 will need to be modified to accommodate a 16-foot crest raise.
- RMP#8: Removal of Structure—Remove the Main Dam and allow the Kern River Channel and reservoir to return to pre-dam conditions.
- RMP#9: Replacement of Structure—Replace the Auxiliary Dam, retrofit the Main Dam and existing Spillway, and add an emergency spillway.

From the above list of eight alternative RMPs initially considered, five of the eight Action Alternatives were selected by the Corps for detailed analysis in this Draft EIS. The five Action Alternatives selected included the Alternative Base Plan; Alternative Plan 1; Alternative Plan 2; Alternative Plan 3, and Alternative Plan 4. In addition, NEPA requires the evaluation of the No Action Alternative to provide a baseline for analysis and to identify the reasonably foreseeable consequences of not implementing the Action Alternatives. A preferred Action Alternative has not been selected in this Draft EIS.

The three Action Alternatives that were initially considered but dropped from detailed analysis in this Draft EIS included: Making the Interim Risk Management Measure (IRRM) Permanent; Removal of Structure; and Replacement of Structure. The reasons why these alternatives were dropped are summarized as follows:

- Making the IRRM Permanent – The IRRM of lowering the gross pool level of the lake by 20 feet during the Non-Flood-Control Season from April to October each year reduces by 37 percent the maximum storage capacity of the lake, as well as the surface area of the lake that would be otherwise available for recreation. While the IRRM partially reduces the likelihood and consequences of dam failure, tolerable risk guidelines are not achieved and the project is still subject to unacceptably high risk associated with seepage, seismic activity, and overtopping failure associated with very large storm events. The Corps therefore rejected this alternative because it does not meet tolerable risk guidelines.
- Removal of Structure – This alternative would remove the Main Dam and slowly drain Isabella Lake, allowing flow in the North Fork and South Fork channels and main stem of the Kern River to return over time to preconstruction conditions. This alternative was rejected because of the resulting annual flood damages and lives at risk downstream; and the loss of irrigation and power generation from not having the Isabella Dam in operation.
- Replacement of Structure – This alternative would remove the existing Auxiliary Dam and replace it with a new earth fill dam just downstream constructed to reduce risk for all deficiencies identified, and to achieve the best safety rating applied to Corps dams nation-wide. This alternative would also relocate the Borel

Canal conduit through the right abutment of the replacement dam, and include full retrofitting of the Main Dam and existing spillway, plus an additional emergency spillway. This alternative was rejected because tolerable risk guidelines can be achieved through less extensive and expensive measures.

MAJOR ENVIRONMENTAL IMPACTS

No Action Alternative

Under the No Action Alternative, Isabella Dams would resume operation in accordance with the established Water Control Plan and Flood Control Diagram, with the lake capacity (gross pool elevation) returned to the pre-IRRM elevation of 2,609.26 feet. However, under the No Action Alternative, the Isabella Dams have extremely high risk in terms of the potential for failure and life loss, which is intolerable. The potential environmental, economic, and human consequences of dam failure would be extremely high.

Five Action Alternatives

The five Action Alternatives are generally similar with respect to their major impacts on the 13 resource areas analyzed in this Draft EIS. The 13 areas analyzed included geology, soils, and seismicity; air quality; water resources; traffic and circulation; noise and vibration; hazardous, toxic, and radiological waste; biological resources; land use; recreation; aesthetic resources; cultural resources; socioeconomics and environmental justice; and public health and safety. The differences between the alternatives with respect to impacts on these resource areas are not marked; mainly associated with the different quantities of materials and equipment required; and primarily resulting in varying lengths of the construction period among the Action Alternatives. Table ES-1 compares the anticipated construction periods for the proposed Action Alternatives.

Table ES-1
Anticipated Construction Periods for the Proposed Action Alternatives

Action Alternative	Construction Duration (Months)	Start and End Dates
Alternative Base Plan	53 Months	October 2015 – March 2020
Alternative Plan 1	57 Months	October 2015 – August 2020
Alternative Plan 2	69 Months	October 2015 – July 2021
Alternative Plan 3	69 Months	October 2015 – July 2021
Alternative Plan 4	57 Months	October 2015 – August 2020

Table ES-2, inserted at the end of this Executive Summary, provides a summary of the potential impacts on the 13 resource areas evaluated in this Draft EIS from the No Action Alternative and the five Action Alternatives. Suggested mitigation measures to avoid, minimize, or reduce potential impacts are also included in the table. Chapter 3 of this

Draft EIS provides more detailed information on potential impacts and mitigation measures.

As shown in Table ES-2, the No Action Alternative would result in significant adverse impacts on 11 of the 13 resource areas analyzed, with only air quality and noise not likely to be subjected to significant impacts from no action. By contrast, implementing any of the five proposed Action Alternatives would provide significant beneficial effects in that they would greatly reduce the existing risk associated with seismic, seepage, and hydrological deficiencies present in the Isabella Main and Auxiliary Dams and Spillway. The likelihood of dam failure, with the resulting catastrophic downstream consequences would be significantly reduced. The adverse environmental impacts that would result from implementing any of the five Action Alternatives are primarily short-term; occurring only during the construction periods presented in Table ES-1. However, although short term, there would be significant and unavoidable Air Quality and Noise impacts on nearby residents during construction of any of the Action Alternatives, even after applying all identified mitigation measures. In addition, there may be substantial short-term impacts on recreation due to the temporary closure of recreation sites during construction such as Launch 19 and the Auxiliary Dam Recreation Area, and also on biological resources from potential water quality degradation during construction that could adversely affect lake fisheries. With respect to these recreation, biological resources, and water quality impacts, with implementation of the recommended and planned mitigation measures indicated in Table ES-2 and in Chapter 3, these potential impacts would be reduced to less than significant levels. With regard to hydrology and flood management, although the remediation measures proposed under all the Action Alternatives would greatly reduce the likelihood of dam failure, some could also result in higher peak discharge into the Kern River during very large and rare storm events; which would represent a noticeable and unavoidable hydrological impact on the downstream channel. With respect to the remaining eight resource areas analyzed (Geology, Soils, and Seismicity; Traffic and Circulation; Hazardous, Toxic, and Radiological Waste; Land Use; Aesthetic Resources; Cultural Resources; Socioeconomics and Environmental Justice; and Public Health and Safety), adverse impacts from any of the Action Alternatives are anticipated be low to moderate.

ISSUES TO BE RESOLVED

The Council on Environmental Quality (CEQ) regulations implementing NEPA require that related or connected actions (actions with a common purpose, timing, effects, or location) be analyzed in a single document (40 CFR 1502.4(c) and 1508.25) to avoid segmenting or the splitting a proposed action into several smaller actions and analyzing them individually. Segmentation is generally discouraged because the significance of the action as a whole might not be apparent if parts are analyzed separately. However, when complete information is lacking upfront, the CEQ encourages the use of incremental decision making through tiering and/or sequencing of impact analyses to ensure continued progress toward the critical path of meeting the overall project purpose and need (40 CFR 1508.28).

Tiering is the process of anticipating and preparing multiple levels of environmental review. Typically this involves allowing a program or complicated project (such as the Isabella DSM Project) to have a number of subsequent smaller-scale NEPA reviews of supporting follow-on actions and decisions. The smaller-scale reviews would incorporate the general discussions included in the broader analysis (i.e., this EIS) by reference, and concentrate on the issues specific to the follow-on actions.

In this Draft EIS, the anticipated construction-related activities associated with implementing the proposed Action Alternatives are addressed at a level considered appropriate, given the current status of project planning and design and available information and data. As planning proceeds, the Corps is continuing to refine remediation measures, construction methods, equipment types, and construction schedules with the intention of further reducing adverse impacts beyond the BMPs and mitigation measures proposed in Table ES-2 and Chapter 3. Also, some of the anticipated implementation actions are still in the planning stage, and not yet ready for detailed analysis of environmental impacts. Unresolved issues and actions still under discussion and analysis by the Corps at the time of publishing this Draft EIS are summarized in the following paragraphs. It is the intention of the Corps that the unresolved issues and actions discussed below will be addressed in a number of follow-on NEPA reviews that are tiered to this current EIS.

Real Estate Actions

Federal management of the lakeshore, Isabella Lake recreational amenities and some facilities were transferred from the Corps to the USFS in 1991. Those lands and facilities anticipated to be directly affected by implementing any of the Action Alternatives would be transferred back to the Corps, including the following:

- <u>Main Dam Campground.</u> This site was closed in 2006 due to a variety of concerns including problems with the water system, and safety and security issues. As a separate action, the Corps is working with the USFS to transfer this parcel back to the Corps on a permanent basis.
- <u>Current Site of the USFS Facilities between the two Isabella Dams.</u> This site is in the footprint of the proposed new Emergency Spillway; a remediation measure common to all four Action Alternatives. The impacts of the transfer, removal and relocation of the facilities, personnel and operations are discussed but not analyzed in this Draft EIS, because the needed information regarding relocation is still being developed. A subsequent NEPA analysis would be conducted for these actions if the EIS decision includes the transfer and relocation of the USFS facilities.

Other real estate actions associated with implementing the Action Alternatives involve private landowners and residences in the vicinity of the proposed construction site at the Isabella Main and Auxiliary Dams and Spillway. Because of the potential risks to human health and safety, localized environmental and human impacts, and construction access and staging needs, the temporary or permanent relocation of these residents may be necessary. The Corps is presently developing data to assess the level of human health and safety risk, prior to initiating discussions with private entities regarding potential real estate actions. The Corps is endeavoring to minimize potential impacts from construction that may require relocations or acquisitions. For the purpose of the impact analysis in the Draft EIS, the potential for these actions is assumed, but details on which properties may be affected and measures that the Corps may take are still being determined, and therefore cannot be fully analyzed in this Draft EIS. A R*eal Estate Plan* and subsequent NEPA analysis would be initiated by the Corps during 2012 and completed early in 2013, and fully implemented well before the start of construction.

Water Control Plan

The *Isabella Dam and Lake Water Control Manual* (Corps 1978) provides a detailed plan for water control and flood management, and a water control diagram for Isabella Dam and Lake. It also assigns responsibilities for water control operation of the project. In September 2006 the Corps initiated an emergency deviation from the water control plan for Isabella Dam and Lake to operate the project and maintain the reservoir elevation at or below 2,585.5 feet, Isabella Project Datum (storage at or below approximately 356,700 acre-feet). The purpose of this emergency deviation was to lower the lake level to a safe and acceptable elevation/capacity based upon recent results of the Corps' seepage investigations. Implementation of the Action Alternatives may require a new deviation or an extension to the current deviation to the current water control plan/flood control diagram. If a new deviation or an extension to the current deviation to the water control manual/flood control diagram is necessary, this would trigger a separate NEPA analysis on the effects of the deviation.

Ongoing Dam Operations and Maintenance

The planning process and the proposed construction of the Isabella DSM Project have a long duration. During this time, ongoing dam operations and maintenance (O&M) actions would continue independently of the actions analyzed to reduce likelihood of dam failure described in this Draft EIS. O&M activities would include projects that are considered separate actions, which may or may not require further NEPA analysis, even if they do occur in the same location or time frame as the Isabella DSM project.

Mitigation Sites and Actions

In developing the array of construction activities necessary to implement the Action Alternatives, the Corps has incorporated proactive actions including Best Management Practices (BMPs) to avoid or minimize anticipated impacts to the extent practicable. However, in some cases, appropriate mitigation for anticipated impacts would likely need to be further defined and analyzed in detail through subsequent planning, agency coordination, public involvement and the NEPA process. For example, an appropriate *Site Restoration Plan* addressing construction sites and subsequent uses for any land disturbed or acquired for the Isabella DSM Project would commence by the Corps immediately following release of the Final EIS. This is anticipated in Fall 2012.

Also, the temporary and permanent construction impacts on recreation sites, especially the Auxiliary Dam Recreation Area, Boat Launch 19, and Engineers Point, are important issues to the public, local businesses and the USFS. A process to prepare a comprehensive *Recreation Mitigation Plan* would be initiated in spring 2012 by the Corps and involving the USFS and key local stakeholders, to address how all affected recreational opportunities would be maintained during the multi-year construction period and how post-construction restoration of recreational sites would be accomplished. It is likely that some of the actions resulting from this process would require separate supporting NEPA analyses. The *Recreation Mitigation Plan* and all planning and projects emerging from the *Plan* would be completed before the start of the proposed Isabella DSM Project construction.

Furthermore, there is a recognized need to sustain sport fishing at Isabella Lake during and following construction, which is an important local and regional economic and recreational activity. An updated *Fisheries Management Plan* would commence by the Corps in Spring 2012 that would address managing construction impacts on fisheries, maintaining sport fishing events, and potentially enhancing post-construction sport fisheries. Preparation of the updated *Plan* would involve gathering new data such as a seasonal creel census, as well as encouraging public and agency participation in the planning process. Actions potentially proposed in the updated *Plan* may require follow-on NEPA analyses.

Finally, a separate analysis in cooperation with the US Fish and Wildlife Service is currently being conducted to evaluate potential habitat impacts and mitigation requirements resulting from implementation of the proposed Action Alternatives, and to prepare a cost-effective *Fish and Wildlife Mitigation Plan*. This *Plan* would likely be completed in time to be included with the final EIS for the Isabella DSM Project, anticipated by the end of September 2012.

Table ES-2
Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
Geology, Soils, and Seismicity			
No Action Alternative	There would be no remedial improvements at the Isabella Main Dam, Spillway, or Auxiliary Dam. The seismic and seepage deficiencies would continue and likely would worsen over time. Short-term construction impacts would not occur. The likelihood of dam failure resulting from the local geology, soils, and seismicity issues would remain, leading to significant adverse downstream impacts.	Significant Adverse	None
Alternative Base Plan	This alternative would be designed to overcome the deficiencies in the Isabella Lake Dams (particularly the Auxiliary Dam), which are directly linked to the geology, soils, and seismicity features in the project area. Therefore, this alternative would have high beneficial long-term impacts with respect to existing geology, soils, and seismicity conditions. This alternative would increase to a minor degree the potential for short-term adverse construction-related impacts such as soil erosion, unstable slopes, soil slumping, differential soil settling, and bedrock fractures. Incorporation of the recommended mitigation measures would keep the level of potential adverse impacts low and less-than-significant.	High Beneficial Low Adverse, Less-than-significant	• A contractor-prepared *Erosion and Sediment Control Plan*, identifying specific BMPs to avoid or minimize soil erosion. • Slope stability measures. • Stockpile and reuse all suitable excavated soils and fill. Dispose of unsuitable material in an approved site. • Restore temporarily disturbed areas by grading, reducing compaction, and re-vegetation. • The following dust control measures: a. Water a minimum of twice daily unpaved/untreated roads and disturbed soil areas. b. Cease all clearing, grading, earth moving, and excavation during periods of winds greater than 20 miles per hour when disturbed material is easily windblown. c. Water or secure all fine material transported off-site. d. Periodically water stockpiles of soil or other fine loose material. e. Control weeds by mowing instead of discing were acceptable to the fire department. f. Seed and water inactive soil areas in the construction site until plant growth is evident, or treat with a dust palliative, or water twice daily until restored according to a contractor-prepared *Site Restoration Plan*.
Alternative Plan 1	Potential impacts are similar to the Alternative Base Plan regarding the long-term benefits to existing geology, soils, and seismicity. This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential adverse short-term construction-related impacts mentioned above would still be anticipated to be low and less-than-significant with the incorporation of the recommended mitigation measures.	Similar to Alternative Base Plan	
Alternative Plan 2	Potential impacts are similar to the Alternative Base Plan and Alternative Plan 1 regarding the long-term benefits to existing geology, soils, and seismicity. This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term construction-related impacts would still be anticipated to be low and less-than-significant with the incorporation of the recommended mitigation measures.	Similar to Alternative Plan 1	
Alternative Plan 3	Potential impacts are similar to the Alternative Base Plan and Alternative Plans 1 and 2 regarding the long-term benefits to existing geology, soils, and seismicity. This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. Potential short-term construction-related impacts from this alternative would still be anticipated to be low and les-than-significant with the incorporation of the recommended mitigation measures.	Similar to Alternative Plan 2	
Alternative Plan 4	Potential impacts are similar to the Alternative Base Plan and Alternative Plans 3 regarding the long-term benefits to existing geology, soils, and seismicity. This alternative involves excavation and material requirements similar to but somewhat greater than Alternative 3 and a handling and construction period similar to Alternative Plan 1.	Similar to Alternative Base Plan	

Table ES-2
Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	Potential short-term construction-related impacts from this alternative are anticipated to be slightly greater than Alternative 3 due to the larger size of the Emergency Spillway, the modifications to State Hwys. 178 and 155, and the increased dam crest heights; however, the potential short-term construction-related impacts from this alternative would still be anticipated to be low and les-than-significant with the incorporation of the recommended mitigation measures.		
Air Quality and Climate Change			
No Action Alternative	Under the No Action Alternative, there would be no Federal participation in remedial improvements under the Isabella DSM Project. There would be no construction–related impacts on Air Quality, additional contributions of GHG or increased dust resulting from construction and operation of the proposed Isabella DSM Project.	None	None
Alternative Base Plan	Emissions from construction would result from fuel combustion and exhaust from construction equipment, as well as from vehicle traffic and grading. Construction-related short-term emissions of ROG, CO, $PM_{2.5}$, and SO_X would not exceed applicable national and local significance thresholds, but would be moderate to high, and less-than-significant impacts. However, construction-related short-term emissions of NO_X and PM_{10} would exceed the significance thresholds for emissions established by the Eastern Kern Air Pollution Control District (EKAPCD), and would conflict with applicable air quality plans. Therefore, this short-term direct impact is significant, even if the recommended mitigation measures were implemented. Greenhouse gas (GHG) emissions from equipment and truck use would be a short-term significant impact. By employing best management practices (BMPs) to reduce construction-related exhaust emissions, transportation-related GHG could be reduced and ensure no conflict with recommended actions based on California Air Resources Board-enforced standards. Cancer risk and chronic non-cancer risk are attributable to emissions of diesel engine exhaust particulate matter from on-site travel and vehicle idling. The potential chronic carcinogenic risk from this alternative is above the significance level of one chance in a million. Therefore, the potential short-term health risk impact is significant and unavoidable. Construction-related emissions of PM_{10} and would not be likely to contribute substantially to degraded visibility in the nearest Class I Area (Domelands Wilderness Area), and impacts would be low, and less-than significant.	Moderate to High Adverse, Less-than-significant Significant Unavoidable, Adverse Significant Adverse Significant Unavoidable Adverse Low Adverse, Less-than-significant	• See dust control measures under Geology, Soils, and Seismicity. • Limit on-site vehicle speed to 15 miles per hour. • Pave, treated with dust palliatives, or water a minimum of twice daily all areas with vehicle traffic. • Keep roadways and intersections next to the project site clean, and regularly remove project-accumulated silt and other construction debris. • Access the main project work sites via an apron from adjoining surfaced roadways. Surface or treat the apron with dust palliatives. If equipment is operating on soils that cling to wheels, use a "grizzly" or other such device using rails, pipes, or grates to dislodge mud, dirt, and debris from the tires and undercarriage of vehicles on the road exiting the project work sites, immediately before the pavement. • Maintain all equipment as recommended by manufacturers' manuals. • Shut down equipment when not in use for extended periods. • Substitute electric equipment whenever possible for diesel- or gasoline-powered equipment. • Equip all construction vehicles with proper emissions control equipment and keep in good and proper running order. • Used diesel particulate filters on on-road and off-road diesel equipment, if permitted under manufacturers' guidelines.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	

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Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a wider Emergency Spillway, modifications to State Hwys. 155 and 178, and the increase in the crest heights of the dams by 16 feet. However, it is anticipated that use of the material excavated for the Emergency Spillway to raise the dam crest heights would reduce or eliminate the need for additional borrow sites and reduce the distance of truck travel substantially in comparison to the other Action Alternatives. Therefore, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Water Resources			
No Action Alternative	There would be no impacts on water resources related to construction. The water quality of the lake would be variable depending on inflows and operations and likely similar to current and historical data. The No-Action Alternative would not reduce the likelihood of dam failure that could result in catastrophic significant adverse impacts in terms of the loss of water control and storage facilities, downstream flooding, water supply and downstream uses.	Significant Adverse	None
Alternative Base Plan	This alternative includes measures to accommodate much larger flood flows than are currently possible. Although greatly reducing the likelihood of dam failure, these measures would likely result in higher peak discharge into the Kern River during high flows that could accompany rare storm events. This may have a noticeable impact on downstream peak flows at that time, which is considered a moderate to high adverse impact. This alternative would require lowering of the lake to an elevation of 2,543.76 feet for a nine-month period to allow for construction of an Upstream Berm on the Auxiliary Dam. This lower pool elevation would also be required for two two-month periods to allow for construction and removal of a coffer dam at the Right Abutment of the Auxiliary Dam. Also, during the seven-month period that the coffer dam is in place, the top of the flood control pool would be restricted to a maximum level of four feet below the IRRM level set at 2,589.26 feet . Depending on the inflows during these time periods, releases from the Main Dam may be larger and more frequent in order to maintain these lower lake levels. The Corps would cooperate with downstream water users to ensure that annual supplies are maintained. It is anticipated that downstream users would have sufficient storage above and below ground to be able to receive greater quantities of off-season water released by the Corps from Isabella Lake, should that be necessary. This impact on downstream water users is considered adverse, low, and less-than-significant. However, during these same low-water construction periods, ongoing water quality concerns with meeting state and Federal standards and the potential for hazardous algal blooms could be exacerbated. Potential construction-related disturbance of soils and other materials around the	Moderate to High Adverse, Less-than-significant Low Adverse, Less-than-significant Moderate Adverse, Less-than-significant	• Current construction schedule of the coffer dam calls for placement of the coffer dam in the December to February timeframe. Historically, this is the timeframe in which are greatest rain floods have occurred in the region (for example, in 1966, 1986, and 1997). This would represent the most difficult time to maintain a significantly lower pool elevation of 2,543.76 feet, as this represents over 45 feet in difference from the existing restricted pool elevation. The more ideal time for coffer dam construction would be outside of the rain flood season (April through end of September). • Fit locations and alignments of staging areas and haul roads into landforms to minimize cuts and fills. • Delineate boundaries of sensitive areas should be with stakes and flagging before construction, in consultation with a designated biologist. • Locate stockpile sites, parking areas, staging areas, and disposal sites to avoid sensitive areas. • Maintain a vegetative buffer (if present) of at least 150 feet along rivers, the lake, and major travel routes. • Maintain a vegetative cover on the strip of land between the existing spillway and proposed Emergency Spillway. • Minimize widths of new roads and existing roads that are planned for widening or other improvements for on-site hauling.

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Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	lake could also contribute to degraded water quality. With the BMPs, water quality monitoring, and the other mitigation measures planned for implementation, short-term adverse impacts on water quality would be expected to be moderate and less-than-significant and limited to the duration of construction.		• Minimize the number of temporary and permanent structures and activities and combine or collocate where feasible. • Set up a conscientious and continuous water quality monitoring network during the multi-year construction period. Provide collected data via the Corps to the contractor(s) to resolve any potential environmentally detrimental activities. • Consider temporary aeration for selected areas of the lake in the event that dissolved oxygen levels are predicted to drop below the historically observed levels based on monitoring data. Potential aeration methods include: air bubblers, mechanical agitators, mechanical mixers, and the placement of rocky areas around the lake to allow for natural wind to add aeration. • Consider using turbidity curtains in some instances when construction activities are adjacent to open water. Monitor the effectiveness of these devices. • Prepare and implement a suitable *Site Restoration Plan* to restore and re-vegetate all areas subject to temporary disturbance.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a wider Emergency Spillway, modifications to State Hwys. 155 and 178, and the increase in the crest heights of the dams by 16 feet. However, the potential short-term construction-related impacts are anticipated to be similar to but nominally higher than the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Traffic and Circulation			
No Action Alternative	There would be no Federal participation in remedial improvements under the Isabella DSM Project. There would be no construction–related traffic effects and no changes in the traffic levels and circulation resulting from construction and operation of the Isabella DSM Project. However, the No-Action Alternative would not reduce the likelihood of dam failure, and the potential consequences due to dam failure and catastrophic floodwater release on traffic and circulation would be adverse and significant in the area affected by inundation of floodwater in Bakersfield.	Significant Adverse	None
Alternative Base Plan	Under this alternative, the largest contributor to short-term construction-related traffic and circulation impacts would be heavy truck traffic along Hwy 178 associated with hauling filter sand materials from the proposed South Fork Delta borrow area to Isabella Dam. Concrete trucks delivering concrete from the existing batch plant located on SR 178 would be the second largest contributor. The third largest contributor would be heavy truck deliveries of other construction materials likely originating from the Bakersfield/Kern County area via SR 178 through the Kern River Canyon and from eastern Kern County via SR 178 over Walker Pass.	Low to Moderate Adverse, Less-than-significant	• A contractor-prepared *Traffic Safety Management Plan* for the proposed Isabella DSM Project, with the following general and specific provisions: ▪ Provide a system of temporary traffic control devices, in accordance with CalTrans' California Manual on Uniform Traffic Control Devices or other suitable guidelines, to safely pass non-construction traffic through and around construction areas and access-egress points.

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Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	Employee commuting would also be a contributor to traffic and circulation impacts, particularly at the start and end of each work day and during lunch time. The typical construction work week would be 6 days, with no work on Sunday, and no off-site hauling on Saturday, thus reducing traffic impacts on weekends. The modeling of potential traffic and circulation impacts on key intersections and roadway segments conducted for this Draft EIS has indicated that although the traffic increases anticipated under this alternative from the above contributors would be noticeable, they could be accommodated within the existing roadway and intersection configurations, while maintaining acceptable service levels. On this basis, potential short-term construction-related traffic and circulation impacts are considered low to moderate, and less-than-significant. However, taking into account the anticipated daily numbers of heavy trucks and other construction vehicles and worker vehicles entering and leaving the construction areas along Hwy 178 and in the vicinity of the Isabella Dams, the potential for mud and gravel debris at these intersection areas could pose a driving hazard. With implementation of the mitigation measures presented in this table, especially a specific *Traffic Safety Management Plan*, the level of potential impact would be considered moderate and less-than-significant. Occasional short-duration closures on the stretch of SR 155 between the Main Dam and Barlow Road may become necessary during blasting for construction of the Emergency Spillway and Borel conduit tunnel. These closures would increase travel times and could also affect access for emergency response vehicles. With implementation of the recommended mitigation measures, these potential impacts are considered moderate.	Low to Moderate Adverse, Less-than-significant	▪ Schedule heavy truck hauling to the project site during non-peak periods to the extent possible. ▪ Schedule worker shift changes so as not to coincide with existing background traffic peak periods, if feasible. ▪ Schedule bulk hauling of sand filter material by spreading out the required import operation over a longer period of time, to the extent practicable. ▪ Establish procedures for coordinating with local emergency response agencies to ensure dissemination of information regarding emergency response vehicle routes affected by construction. Specifically cover temporary road closures related to controlled blasting during construction. ▪ Select material haul routes that would result in the least impact on existing transportation facilities. ▪ Expand intersections used for project access, to the extent feasible, to provide dedicated turn lanes for vehicles entering and exiting the project work sites and staging areas. ▪ Encourage carpooling among construction personnel to reduce commute trips to and from the project site.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule. Construction of the RCC Overlay would nominally increase truck traffic on SR 155 and SR 178 compared to the Alternative Base Plan. Concrete required for the RCC Overlay is proposed to be produced on site using on-site aggregate and water. Cement and fly ash would be acquired from sources near Barstow and transported to the site via SR 178 from the east over Walker Pass.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a wider	Similar to	

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Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	Emergency Spillway, modifications to State Hwys. 155 and 178, and the increase in the crest heights of the dams by 16 feet. Construction of the wider Emergency Spillway is anticipated to nominally increase truck traffic on SR 155 and SR 178 compared to the Alternative Base Plan. However, it is anticipated that use of the material excavated for the Emergency Spillway to raise the dam crest heights would reduce or eliminate the need for additional borrow sites and reduce the distance of truck travel substantially in comparison to the other Action Alternatives. The potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Alternative Base Plan	
	Noise and Vibration		
No Action Alternative	Under the No Action Alternative, there would be no Federal participation in remedial improvements under the Isabella DSM Project. There would be no construction-related noise or vibration effects and no change from current noise levels resulting from construction and operation of the Isabella DSM Project. It should be noted that some of the sensitive receptors are located in areas currently exposed to exterior and interior traffic noise levels approaching and/or exceeding the applicable Kern County noise level standards.	None	None
Alternative Base Plan	Implementation of this alternative would result in significant short-term construction-related noise impacts from heavy duty truck travel and construction equipment operating in the Primary Action Area (Isabella Dams and Spillway), which would exceed applicable standards at nearby sensitive receptors. In addition, construction activities would create substantial short-term increases in ambient noise levels and maximum instantaneous noise levels in the project vicinity that exceed applicable standards. Project-generated vibration levels could exceed standards for the prevention of structural damage and vibration standards for human annoyance for residents at existing nearby sensitive receptors. Increased project traffic and the use of local roadways for hauling project materials to the construction sites, would increase traffic noise levels at sensitive receptors living along the local roadway corridors. Receptors living closest to the roadway corridors would have the greatest potential to be affected by noise from project-related traffic. At those receptors closest to the roadways impacts would be considered adverse and high, with more moderate levels at those receptors farther away from the anticipated haul routes. This alternative would not include nighttime trucking along the anticipated routes, which would contribute to overall noise levels along haul routes being considered as less than significant. Short-duration controlled blasting is anticipated in order to break up bedrock within the proposed Emergency Spillway channel and for the Borel Canal relocation. Assuming that a *Controlled Blasting Management Plan* would be followed, adverse noise impacts associated with blasting are expected to be low to moderate and less-than-significant.	Significant Adverse Moderate to High Adverse, Less-than-significant Low to Moderate Adverse, Less-than-significant	• A contractor-prepared *Construction Noise and Vibration Monitoring Plan* prepared by an appropriate acoustical consultant before beginning work on the project. • Monitor construction noise for the project duration, at the most potentially affected sensitive receivers. Summaries of measured noise levels should be provided weekly or more often, if noise complaints arise. • Equip all construction equipment with noise control devices (e.g., mufflers), in accordance with manufacturers' specifications. • Inspect all equipment periodically to ensure proper maintenance and presence of noise control devices (e.g., lubrication, mufflers that do not leak, and shrouding). • Locate all stationary equipment as far as feasible from nearby residences and equip with engine-housing enclosures, as feasible. • Use portable noise barriers to shield stationary equipment, especially diesel powered dewatering pumps. • Maintain temporary barriers in good condition through construction. • Restrict idling of mobile equipment to no more than five minutes. • Blasting should include measures to limit noise and vibration, as determined by a qualified blasting engineer. • Designate a disturbance coordinator (DC) during the construction period and post a 24-hour contact number around the project site, and provide to nearby residents. The DC would determine cause and implement measures to alleviate the problem. • Provide written notice of construction-related activities to nearby sensitive receptors identifying the type, duration, and frequency of activities and a mechanism to register complaints.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and	Similar to	

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Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	deep in-situ treatment on the Auxiliary Dam. However, the potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Alternative Plan 1	• Limit operation of trucks and bulldozers sensitive to at least 60 feet away from sensitive structures. If operation of equipment closer than 60 feet is required, vibration monitoring should be conducted. • Limit hauling of material along sensitive routes to between 8 AM to 5 PM (daytime hours). • Discourage the use of engine braking ("jake brakes") along sensitive routes. • Encourage truckers to reduce engine noise when shifting in noise sensitive areas; and these areas should be posted. • Conduct all blasting of rock under the guidance of a qualified blasting consultant. • Notify all residences and businesses within 1,500 feet of blasting areas prior to conducting blasting.
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a wider Emergency Spillway, modifications to SR 155 and SR 178, and the increase in the crest heights of the dams by 16 feet. Construction of the wider Emergency Spillway is anticipated to nominally increase truck traffic on SR 155 and SR 178 compared to the Alternative Base Plan. Additional blasting may also be required for spillway excavation compared to the Alternative Base Plan. However, it is anticipated that use of the material excavated for the Emergency Spillway to raise the dam crest heights would reduce or eliminate the need for additional borrow sites and reduce the distance of truck travel substantially in comparison to the other Action Alternatives. The potential short-term construction-related impacts are anticipated to be similar to but nominally higher than the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Hazardous, Toxic and Radiological Waste			
No Action Alternative	Under the No Action Alternative, there would be no Federal participation in remedial improvements to the Isabella Main Dam, Spillway, Auxiliary Dam, or Borel Canal. Operation of Isabella Dam would continue in accordance with the established Water Control Plan and Flood Control Diagram. Since no construction would occur under the No Action Alternative, there would be no HTRW impacts anticipated in the Isabella DSM Project area. However, under the No Action Alternative, one or both dams are almost certain to fail under normal operations, especially if subjected to a strong seismic event. Potential consequences due to dam failure and catastrophic floodwater release would be adverse and significant in the area affected by inundation of floodwater in Bakersfield, where the number of potential HTRW sources that would be affected is substantial.	Significant Adverse	None
Alternative Base Plan	With respect to the six landfills identified as areas of potential concern, the Corps has concluded that no further action is required and that they should not have impact on or be impacted by implementation of this alternative. Construction activities associated with this alternative include use, storage, and transport of hazardous materials, including the use of aboveground fuel storage tanks. Also, heavy equipment and vehicles would be maintained at the construction sites, staging areas, and borrow areas. These activities have the potential for HTRW to be inadvertently released during fueling and maintenance operations, material hauling, and cement production. However, with appropriate measures, such as Best Management Practices (BMPs) and a Spill Prevention, Control and Countermeasures Plan (SPCC), adverse impacts from inadvertent spills or releases	None Low Adverse, Less-than-significant	• A contractor-developed *Spill Prevention and Response Plan* covering all work sites, haul routes and staging areas. • Fuel and service all vehicles in designated areas. • Minimize to the extent practicable, storage of hazardous substances at the work site and in staging areas. • Secure stored hazardous materials in closed containers away from drainage courses and areas of storm water infiltration. • Ensure that maintenance and construction personnel are trained in current procedures and best

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Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	of hazardous substances would be low, and less-than-significant.		available technology for spill prevention and cleanup of accidental spills. • Keep spill kits at the work sites at all times where hazardous materials are in use. • Stop work immediately in the event of a hazardous materials spill or release, and implementing appropriate cleanup and remediation measures. • Workers handling, using, or exposed to dry or wet cement should be trained in hazards and controls. • Ensure that appropriate worker safety is implemented at all times. • An appropriate *Storm Water Pollution Prevention Plan (SWPPP)* covering all work sites, haul routes and staging areas.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the increased Emergency Spillway width, increased dam crest heights, and modifications to SR 155 and SR178. However, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Biological Resources			
No Action Alternative	Under the No Action Alternative, Isabella Dam and Lake would be operated at the pre-IRRM elevation in accordance with the established Water Control Plan and Flood Control Diagram. There would be no construction related loss, degradation, or fragmentation of natural vegetation communities or wildlife habitat or new interference with the movement of resident or migratory wildlife species. Ongoing impacts on biological resources associated with normal operations would continue. The No-Action Alternative would not reduce the likelihood of dam failure that could result in catastrophic impacts on lake and downstream biological resources and habitats. These impacts are considered adverse and significant.	Significant Adverse	None
Alternative Base Plan	There would be moderate adverse, less-than-significant impacts on vegetative communities associated with this alternative. No known ESA-listed plant or animal species are known to occur within or in the vicinity of the proposed South Fork delta borrow area. Southwestern willow flycatcher and western snowy plover populations are located east of the proposed borrow area. However, filter sand borrow activities in the South Fork delta would likely be planned to take place primarily during the winter months when southwestern willow flycatcher and western snowy plovers are not present. Anticipated adverse impacts are therefore low and less-than-significant.	Moderate Adverse, Less-than-significant Low Adverse, Less-than-significant	• A contractor-prepared *Site Preparation Plan*, to include methods to avoid introducing non-native plant species via construction equipment. • A contractor-prepared *Stormwater Pollution Prevention Plan* (SWPPP). • A contractor-prepared *Soil and Groundwater Management Plan* (SGMP), to include handling of contaminated soil and/or groundwater that may be encountered during project construction or excavation of borrow sites. • A contractor-prepared *Controlled Blasting Management Plan*, to include anticipated disturbance

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Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	Moderate to high impacts on non-listed fish and wildlife are possible due to water level drawdown during coffer dam installation and removal, coffer dam operations, and installation of the Upstream Berm on the Auxiliary Dam. Impacts to fish and wildlife could result from water quality effects such as increased temperature, turbidity, and pH, and reduced DO. Synergistic effects of water quality degradation could result in blooms of cyanobacteria that may become harmful to wildlife and pets. With mitigation measures such as close monitoring and corrective actions, impact are expected to be less than significant.	Moderate to High Adverse, Less-than-significant	to wildlife. • Conduct bird surveys preceding any borrow excavation activities in the South Fork Delta area, focusing on southwestern willow flycatcher and least Bell's vireo. • When final boundaries of Staging Areas south of Auxiliary Dam are established, conduct a detailed wetland delineation of the emergent wetlands to specifically identify the potential area(s) and quantify the extent of potential impact. • Prepare a *Wetland Mitigation Plan* to identify the least environmentally damaging practicable alternative (LEDPA) and appropriate on- or off-site areas for any required compensatory mitigation and the appropriate ratio. • Prepare a 404(b)(1) analysis for the placement of earth and rock fill for the upstream berm on the Auxiliary Dam. • A contractor-prepared S*ite Restoration Plan* on returning the cleared areas to pre-construction conditions where feasible and practicable.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the increased Emergency Spillway width, increased dam crest heights, and modifications to SR 155 and SR178. However, it is anticipated that use of the material excavated for the Emergency Spillway to raise the dam crest heights would reduce or eliminate the need for filter sand borrow activities in the South Fork delta borrow sites. The potential short-term construction-related impacts are anticipated to be similar to but nominally less than the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Land Use			
No Action Alternative	Under the No Action Alternative, there would be no anticipated changes in current land use around Isabella Dam. The No-Action Alternative would not reduce the likelihood of dam failure that could result in catastrophic significant adverse impacts on downstream land uses and land use in the vicinity of Isabella Lake.	Significant Adverse	None
Alternative Base Plan	This alternative would involve short-term and long-term impacts on land use in the Primary Action Area (Isabella Dams and Spillway area), and in the Secondary Action Area (South Fork Delta area). The USFS Administration Building and Compound and the Corps Project Office and Shop structures would be removed to accommodate a new Emergency Spillway, changing the land use for the area. Recreational facilities at the Auxiliary Dam Recreation Area and	High Adverse, Less-than-significant	• A Corps-prepared *Real Estate Plan* during 2012-2013, to identify and address relocation of the USFS Offices and Compound, and the Corps Project Office and Shop, and other potential real estate actions, and including a separate NEPA document, should the Isabella DSM Project be approved.

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Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	Launch 19 would not be accessible for the multi-year construction period of the DSM project. Proposed staging areas for the Isabella DSM Project south of the Auxiliary Dam contain some wetlands and some land designated as State Important and Unique Farmland. If these locations cannot be avoided, land use impacts would occur. Because the structures and land uses described above would be relocated and re-established in suitable locations, and because appropriate mitigation measures would be implemented regarding all land use changes, potential land use impacts are considered high but less-than-significant.		• A Corps-prepared *Recreation Mitigation Plan* during 2012-2013 to address replacing these recreation amenities. • Avoid or reduce to the extent possible involving the wetlands and areas of important and unique farmland located south of the Auxiliary Dam. • Restore the portion of the Main Dam Campground Area that is used for a temporary staging area under Alternative Plans 1, 2, 3, and 4.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term and long-term land use impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule. This alternative also involves the temporary use of the Main Dam Campground as a staging area to support the additional work on the Main Dam.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term and long-term land use impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term and long-term land use impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the addition of a 16-foot dam crest raise, wider Emergency Spillway, and modifications to SR 155 and SR 178. However, the potential short-term and long-term land use impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule. This alternative also involves the temporary use of the Main Dam Campground as a staging area to support the additional work on the Main Dam, but would reduce or eliminate the need for additional borrow sites with sufficient material becoming available from the Emergency Spillway excavation.	Similar to Alternative Base Plan	
Recreation			
No Action Alternative	Under the No Action Alternative, there would be no changes in recreation or recreation opportunities around the around the dams related to construction. The No Action Alternative would not reduce the likelihood of dam failure that could result in significant impacts on recreation upstream and downstream of Isabella Lake. Without dam remediation, both dams have a high risk of failure under normal conditions and in the event of a disturbance such as an earthquake or large flood. This would result in significant adverse impacts.	Significant Adverse	None

Table ES-2
Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
Alternative Base Plan	Implementation of this alternative would require closing of the popular Auxiliary Dam Recreation Area and Launch 19, and substantially limiting access to Engineers Point for the duration of the multi-year construction period. Also, this alternative includes lowering the maximum lake elevation to 2,543.76 feet for a period of nine months for construction of an Auxiliary Dam upstream berm, and for two 2-month periods for construction and removal of a coffer dam at the Auxiliary Dam to complete a relocation of the Borel Canal conduit. This lowered lake elevation would have a substantial adverse impact on water–based recreation and land-based recreation and camping during the multi-year construction period. Lower lake levels and reduced lake surface could result in increased watercraft congestion and user conflict at the lake, impacts on the viability of the fishery, and fewer operable launch areas. Also, during construction the quality of the recreation experience at Isabella Lake may be considerably degraded from noise and visual disruptions, increased construction vehicle traffic and temporary delays, dust, reduced facility choices and potential overcrowding. Consequently, visitation to Isabella Lake may decline during the construction period and for a while after, as visitors may choose other areas to recreate. The above-described impacts to recreation at Isabella Lake would be moderate to high. However, with implementation of appropriate BMPs and the mitigation measures summarized in this table, these short-term impacts can be managed to less than significant levels.	Moderate to High Adverse, Less-than-significant	• A Corps-prepared *Recreation Mitigation Plan* during 2012-2013 to address replacing the recreation amenities removed from availability or otherwise affected during construction, and how affected recreational sites would be restored following construction. The planning process should involve the USFS and other key stakeholders. Actions resulting from the *Plan* would be covered in a separate NEPA document. • Schedule lake lowering to coincide with normal water release regimes and seasonally lower levels. • Delay, divert, or restrict construction to minimize traffic delays during key recreation events; • Make adjustments and post educational information at recreation areas to reduce potential user conflicts. • Apply measures to limit and/or reduce construction noise and visual disruptions in proximity to recreation sites. • Provide up-to-date information for visitors on available recreation amenities and on the what, where, and why of the construction activities. *Recreation mitigation currently being considered and/or proposed by the Corps and USFS:* • Improving access to Old Isabella Recreation Area, and accommodations for increased use in that area. • Through grant funding provided by the California Department of Boating and Waterways, improvements to several boat ramps are expected at the lake. For example, at Old Isabella, the two existing boarding floats would be replaced with two improved boarding floats to better accommodate recreation users during high and low water periods. Also, at the South Fork Recreation Area, the boarding float would be similarly replaced.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term recreation impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term recreation impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term and long-term land use impacts are anticipated to be similar to Alternative Plan 2, but slightly lower because the two 2-month periods of lower lake levels (to max of 2,543.76 feet) would not be required.	Similar to but slightly lower than Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the addition of a 16-foot dam crest raise, wider Emergency Spillway, and modifications to SR 155 and SR 178. However, the potential short-term and long-term recreation impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	

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Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
Aesthetic Resources			
No Action Alternative	Under the No Action Alternative, there would be no new construction of facilities and no impacts on visual resources during the construction period. However, the likelihood of dam failure would not be reduced and the potential catastrophic loss of one or both dams would significantly alter the visual landscape of the Isabella Lake basin, as well as the San Joaquin Valley, due to major downstream flooding of the areas between Isabella Lake and Bakersfield.	Significant Adverse	None
Alternative Base Plan	This alternative includes construction of an Emergency Spillway cutting into a portion of the hillside now supporting the USFS Offices and Compound and the Corps Project Office and Shop. Also, this alternative requires the development and operation of construction support actions that include noticeable visual features and activities such as staging and stockpile areas, haul roads, crushing plant, coffer dam, lowered lake levels, and sand washing facility. Furthermore, this alternative would increase the size of the Auxiliary Dam footprint. On this basis, moderate-to-high short-term and long-term visual impacts would occur as a result of the construction of remediation measures and landscape and landform changes created during the multi-year construction period. With implementation of the BMPs and recommended mitigation measures summarized in this table, short-term and long-term visual impacts would be considered moderate, and less-than-significant.	Moderate to High, Adverse, Less-than-significant	• Select locations and alignments for earthwork that fit into the landforms to minimize the size of cuts and fills. • Retain as much of the existing vegetation as possible. • Use existing vegetation to screen construction from public view. • Feather and thin the edges of cleared areas and retain a representative mix of plant species and sizes. • Minimize the number of temporary and permanent structures and combine different activities in one structure. • Use natural self-weathering materials and chemical treatments on surfaces to reduce color contrast. • Use road aggregate and concrete colors that match the color of the characteristic landscape surface. • Treat surfaces of all project structures and buildings visible to the public so that their colors minimize visual contrast by blending with the characteristic landscape colors and their colors and finishes do not create excessive glare. • Ensure that lighting does not cause excessive reflected glare. • Ensure that direct lighting does not illuminate the nighttime sky. • Place all construction trash and food-related waste in self-closing containers and remove daily from work sites and staging areas visible to public view. • Confine vehicular traffic to routes of travel to and from the project site, and prohibit cross-country vehicle and equipment use outside designated work and storage-staging areas. • Limit speed of vehicles on dirt routes to minimize the generation of fugitive dust. • A contractor-prepared *Site Restoration Plan*, preferably prepared before construction begins, covering all areas subject to temporary disturbance, and providing guidelines to restore these areas to conditions that mimic and complement adjacent undisturbed areas.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. The potential short-term and long-term visual impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule. Also, the 800-foot long RCC Overlay constructed on the downstream face of the dam would represent a contrasting visual change to the appearance of the existing earth-fill dam face, which would represent a moderate short-term and long-term and less-than-significant visual impact. This would not be the case with the Alternative Base Plan, since it does not include an RCC Overlay.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. The potential short-term and long-term visual impacts are anticipated to be similar to Alternative Plan 1, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term and long-term visual impacts are anticipated to be similar to Alternative Plan 2, but slightly less because the two 2-month periods of lower lake levels (to max of 2,543.76 feet), as well as the coffer dam, would not be required, as is the case for the other three alternatives.	Similar to but slightly lower than Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the addition of a 16-foot	Similar to	

Table ES-2
Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	dam crest raise, wider Emergency Spillway, and modifications to SR 155 and SR 178. The potential short-term and long-term visual impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule. Also, the higher dam crests and expanded Emergency Spillway would represent a greater change to the to the landscape and landform of the area when compared to the Alternative Base Plan. However, with implementation of the BMPs and recommended mitigation measures summarized in this table, short-term and long-term visual impacts would be considered moderate, and less-than-significant.	Alternative Base Plan	
Cultural Resources			
No Action Alternative	The No Action Alternative would not result in any impacts on cultural resources from dam safety remediation construction. However, without modification of the dams and spillway there would remain a very high likelihood of dam failure with the potential for catastrophic significant adverse impacts on cultural resources downstream.	Significant Adverse	None
Alternative Base Plan	This alternative includes establishing a construction staging area in the vicinity of an archaeological site that requires further evaluation. While much of the area of potential effects (APE) on cultural resources has been inventoried, further identification and evaluation efforts are needed after the preferred alternative and its APE are determined. The Main Dam, Auxiliary Dam, existing spillway and the Borel Canal system have been evaluated for the National Registry of Historic Places (NRHP). They are not historic properties and the proposed Isabella DSM Project remediation measures would not impact these structures. Buildings and structures making up the USFS Administrative Building and Compound, and other structures that may be removed have been evaluated and deemed not eligible for NRHP listing. With implementation of the BMPs and recommended mitigation measures listed in this table, potential short-term and long-term adverse impacts on cultural resources would be considered low and less-than-significant. The Corps will continue with identification, evaluation, and effects analysis and with the preparation of a Programmatic Agreement (PA) with key participants as appropriate. Additional mitigation measures to those listed in this table would be developed as needed to resolve any adverse effects on historic properties and mitigate any unforeseen potential impacts to a less than significant level.	Low Adverse, Less-than-significant	*The Corps has a fully executed PA in place. The PA includes stipulations and mitigation measures such as the following:* • Redesigning project elements to avoid historic properties or sensitive areas. • Conducting data recovery excavations of archaeological sites that cannot be avoided or are discovered during construction, based on an approved Historic Properties Treatment Plan (HPTP). • Monitoring all excavations in areas where buried resources are anticipated. • Surveying and protecting exposed inundated cultural deposits. • Protecting exposed archaeological sites from vandalism and erosion with fencing and revegetation, or capping sites in an approved manner with appropriate material. • Preparing and implementing a discovery plan; if previously undiscovered resources are identified during an undertaking. The plan would likely include (a) suspending work while the resource is evaluated and mitigated to avoid any further impact; and (b) consulting with interested Native American groups to identify any traditional cultural properties or resource uses and address impacts. • Developing a plan of action, pursuant to NAGPRA; between the Corps, USFS, and interested Indian Tribes to manage the disposition and treatment of human remains should any be encountered during project implementation.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term and long-term cultural resources impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term and long-term cultural resources impacts are anticipated to be similar to Alternative Plan 1, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of	Similar to Alternative Plan 2	

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Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term and long-term cultural resources impacts are anticipated to be similar to Alternative Plan 2.		
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the addition of a 16-foot dam crest raise, wider Emergency Spillway, and modifications to SR 155 and SR 178. However, the potential short-term and long-term cultural resources impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Socioeconomics and Environmental Justice			
No Action Alternative	With the No Action Alternative, there would be no remediation of the existing seismic, seepage, and hydrological deficiencies in the dams and spillway that have resulted in high-risk conditions at Isabella Dam. The risk of a catastrophic dam failure and significant downstream flooding would continue to be present. The continued high probability of dam failure under this alternative would retain the potential for long-term adverse effects on the regional economy, primarily attributable to declines in business production from structural inundation and flooding of farmland, as well as on public health and safety. These impacts would be adverse and significant.	Significant Adverse	None
Alternative Base Plan	Implementing this alternative would have a low to moderate short-term beneficial impact on the regional economy due to increased expenditures in the regional economy over the construction period. However, implementing this alternative would also have a moderate short-term adverse and less-than-significant impact on the regional economy due to reduced recreation opportunities during construction. In addition, increased construction-related traffic, delays, and detours, as well as an increased population due to the presence of a construction workforce could result in short-term increased social tension during the construction period. If the proposed project goes ahead and the selected alternative has been constructed, recreation would be expected to return to Isabella Lake and to experience a long-term growth with anticipated future growth in potential visitations resulting in low to moderate long-term beneficial impacts.	Low to Moderate Beneficial Moderate Adverse, Less-than-significant Low to Moderate Beneficial	*In order to minimize the adverse impacts of construction on recreation attendance and expenditures and their consequent impacts to income employment and social values, the Corps anticipates implementing such potential mitigation measures as:* • Initiating in cooperation with the USFS and local communities, a comprehensive recreation mitigation planning process to address how all affected recreational opportunities would be maintained during the construction period and to address post-construction recreational site restoration. The expansion, addition, or modification of recreation facilities would be considered as part of this process. It is likely that some actions resulting from this planning process would result in proposals would need subsequent analysis. Limit off-site truck hauling on weekends and other times to accommodate tourist and/or recreation-related traffic, especially those days that may be associated with special local events. • Where possible, scheduling lake lowering to coincide with normal water release regimes to maintain flows for agricultural use, recreation and power generation. • Limiting construction noise and visual disruptions to visitors; and • Providing adequate and current information on available recreation and visitor services . *If the Corps were to determine that relocations would be required associated with the proposed Isabella DSM Project, the following are recommended:* • All required property acquisitions be conducted in compliance with Federal and State relocation law.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term and long-term socioeconomic impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term and long-term socioeconomic impacts are anticipated to be similar to Alternative Plan 1, except the short-	Similar to Alternative Plan 1	

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Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	term impacts would be present for a longer time because of the extended construction schedule.		• Required relocations be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 United States Code, Section 4601 et seq.) and implementing regulation (49 Code of Federal, Regulations Part 24). This law requires that appropriate compensation be provided to displaced residential and nonresidential landowners and tenants, and that residents be relocated to comparable replacement housing and receive relocation assistance. Provisions also include relocation advisory services, moving costs reimbursement, replacement housing, and reimbursement for related expenses and rights of appeal. Also under this law, compensation for living expenses would be provided for temporarily relocated residents and negotiations regarding any compensation for temporary loss of business cover temporary relocations. This law applies to residential relocations as well as to farms and businesses if they were displaced for any length of time. • See also the mitigation previously presented under Recreation. Those mitigation measures would also help reduce the adverse impacts of construction on recreation expenditures and their potential consequent impacts to income employment and social values.
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term and long-term socioeconomic impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the addition of a 16-foot dam crest raise, wider Emergency Spillway, and modifications to SR 155 and SR 178. However, the potential short-term and long-term socioeconomic impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Public Health and Safety			
No Action Alternative	The No Action Alternative would not result in any Public Health and Safety impacts from dam safety remediation construction. However, without modification of the dams and spillways there will remain a very high likelihood of dam failure with catastrophic significant adverse public safety consequences downstream.	Significant Adverse	None
Alternative Base Plan	Implementation of this alternative over the anticipated multi-year construction period would involve an influx of large number of workers; heavy equipment use; heavy truck traffic; controlled blasting; explosives use and management; excavation; materials hauling; dust generation; hazardous material use, storage, and disposal; air emissions; noise; weather extremes; and work on steep slopes and dam infrastructure adjacent to the lake. Short-term health and safety risks during construction would be primarily associated with the onsite workers, but risks to the public would also be anticipated due to the generation of pollutant emissions and dust; accidents from increased use of public roads by heavy haul trucks; transport, storage and use of hazardous materials; delayed access to or overtaxed emergency services; increased noise and vibration; worksite and vicinity security; and potential changes in the releases from the Main Dam to accommodate construction. With implementation of the BMPs and recommended mitigation measures summarized in this table, the potential adverse short-term public health and safety impacts are anticipated to be low and less-than-significant.	Low Adverse, Less-than-significant	• A contractor-prepared *Public Safety Management Plan* to maintain public safety during all phases of construction. Components of the plan would include: a. Notifying the public of the location and duration of construction activities, and where short-term closures of recreation sites, lake access points, pedestrian and bicycle paths and trails may be occurring. b. Coordinating with the public and local jurisdictions to maintain emergency response and emergency evacuation plans, as well as the capacity of emergency services during construction. c. Posting signs locating construction sites and warning of the presence of construction equipment. d. Fencing construction staging areas if dangerous conditions exist when construction is not occurring. • A contractor-prepared *Confined Space/Ventilation Safety Plan*. • A contractor-prepared *Fire Management Plan* in consultation with the KCFD, USFS, and BLM fire suppression agencies. • A contractor-prepared *Worker Health and Safety Plan* to maintain public safety during all phases of construction. Components of the plan would include: a. Appropriate worker, public health, and environmental protection equipment and procedures. b. Emergency response procedures.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term public health and safety impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term public health and safety impacts are anticipated to be similar to Alternative Plan 1, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	

Table ES-2
Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term public health and safety impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	c. Most direct route to a hospital. d. Name of the Site Safety Officer. e. Documenting that all workers have reviewed and signed the plan. • Compliance with all applicable local, regional, State, and Federal laws, policies, and regulations regarding the transportation, storage, handling, management, and disposal of hazardous materials and wastes. • A contractor-prepared *Solid and Hazardous Materials and Waste Management Plan.* • A contractor-prepared *Controlled Blasting Management Plan*, to include any short-term road closures and other public safety management measures that may be required in the vicinity of the controlled construction blasting. • A contractor-prepared *Traffic Management Plan* to include normal and emergency access at construction sites, haul roads and staging areas, and for maintaining emergency procedures.
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the addition of a 16-foot dam crest raise, wider Emergency Spillway, and modifications to SR 155 and SR 178. However, the potential short-term public health and safety impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	

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LIST OF ACRONYMS

Acronym	Full Phrase
AAQS	Ambient Air Quality Standards
AB 32	Assembly Bill 32 – California Greenhouse Gas Initiative
ACHP	Advisory Council on Historic Preservation
ADT	Annual Daily Traffic
ADT	Average Daily Traffic
AERMOD	American Meteorological Society/EPA Regulatory Model
ALUCP	Airport Land Use Compatibility Plan
AMS/EPA Model	American Meteorological Society/US EPA Air Dispersion Model
APE	area of potential effects
basin plans	water quality control plans
BDR	biological data report
BEA	US Bureau of Economic Analysis
BKFO	Bakersfield Field Office (BLM)
BLM	Bureau of Land Management
BLS	US Bureau of Labor Statistics
BMP	best management practice
BP	years before present
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
Cal ARP	California Accidental Release Prevention Program
Cal OSHA	California OSHA
Cal-EPA	California Environmental Protection Agency
CalTrans	California Department of Transportation
Cal water	California Water Company
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CCAA	California Clean Air Act
CCR	California Code of Regulations
CDFA	California Department of Agriculture
CDFG	California Department of Fish and Game
CDL	clandestine drug labs
CEC	Corps Engineering Circular
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second

CHABA	Committee of Hearing, Bio Acoustics, and Bio Mechanics
CHP	California Highway Patrol
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNMMP	Construction Noise Mitigation and Monitoring Plan
CNPS	California Native Plant Society
CO	carbon monoxide (a criteria pollutant)
COD	chemical oxygen demand
COEHHA	California Office of Environmental Health Hazard Assessment
COLD	coldwater freshwater habitat
Corps	United States Army Corps of Engineers
Corps, the	United States Army Corps of Engineers
CPUE	catch per unit effort
CUPA	Certified Unified Program Agency
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
CWHR	California Wildlife Habitat Relationships
dB	Decibel
DEIS	draft environmental impact statement
DO	dissolved oxygen
DOPAA	Description of Proposed Actions and Alternatives
DOT	Department of Transportation
DSM	dam safety modification
DSMR	Dam Safety Modification Report
DTSC	Department of Toxic Substances Center
DWR	Department of Water Resources
EA	environmental assessment
EAP	Emergency Action Plan
Ec	electrical conductivity
EC	Corps Engineering Circular
ECOS	Environmental Conservation Online System
EIR	environmental impact report
EIS	environmental impact statement
EKAPCD	Eastern Kern Air Pollution Control District
EMT	emergency medical technician
EO	Executive Order
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
EQ	environmental quality
ER	engineering regulations
ESA	Environmental Site Assessment
FC	federal candidate
FE	federal endangered
FEIS	Final Environmental Impact Statement

FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FR	Federal Register
FRP	Facility Response Plan
FRSH	freshwater replenishment
FSM	Forest Service Manual
FT	federal threatened
FTA	Federal Transit Administration
FWPCA	Federal Pollution Control Act
FY	fiscal year
g	force of gravity
GHG	greenhouse gas
HAP	hazardous air pollutant
HARP	Hotspot Analysis and Reporting Program
HAS	Hazardous Substance Account Act
HIRA	High Impact Recreation Area
HSWA	Hazardous and Solid Waste Amendments
HTMA	Hazardous Material Transportation Act
HTRW	hazardous, toxic, and radiological waste
HUD	US Department of Housing and Urban Development
Hz	Hertz
IMPLAN	Impact Analysis for Planning
I-O	input-output
IRRM	Interim Risk Reduction Measure
JV	Joint Venture
KCEHSD	Kern County Environmental Health Services Department
KCFD	Kern County Fire Department
KernCOG	Kern Council of Governments
kHz	Kilohertz
km	kilometer
KOP	Key Observation Point
KRVSP	Kern River Valley Specific Plan
lbs/day	pounds per day
Ldn	Day-Night Level
LEDPA	least environmentally damaging precticable alternative
Leq	Equivalent Sound Level
LiDAR	Light Detection and Ranging
Lmax	Maximum Sound Level
LOS	Level of Service
LUST	Leaking Underground Storage Tank
Lxx	Percentile-Exceeded Sound Level
M	magnitude
MCACES	Micro-Computer Aided Cost Estimating System
MCE	Maximum Credible Earthquake
MDAB	Mojave Desert Air Basin

mg/m3	micrograms per cubic meter
ML	Richter (Local) Magnitude
MM	mitigation measure
mm/yr	millimeters/year
MMTCO2e	million metric tons of carbon dioxide equivalent
Monument	Giant Sequoia National Monument
MOU	Memorandum of Understanding
mPa	micro-Pascals
MSA	Mediated Settlement Agreement
msl	mean sea level
MVUM	Motor Vehicle Use Map
MW	moment magnitude
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NASS	National Agricultural Statistics Service
NAVD 88	North American Vertical Datum of 1988
NED	national economic development
NEPA	National Environmental Policy Act
NFTS	National Forest Transportation System
NHPA	National Historic Preservation Act
NOA	Naturally Occurring Asbestos
NOAA	National Oceangraphic and Atmospheric Administration
NOI	Notice of Intent
NOx	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
NPS	National Park Service
NRHP	National Register of Historic Places
NRCS	Natural Resources Conservation Service
NSR	Noise Study Report
NWI	National Wetland Inventory
O3	ozone
OBE	Operating Basis Earthquake
OES	California Office of Emergency Services
OFFROAD2007	CARB-approved Offroad Equipment Emissions Model
OHP	Office of Historic Preservation (California)
OHV	off-highway vehicle
OHWM	ordinary high water mark
OSE	other social effects
OSHA	Occupational Safety and Health Administration
PA	programmatic agreement
PCE	primary constituent elements
PG&E	Pacific Gas and Electric
pH	potential Hydrogen
PM10	particulate matter measuring 10 microns or less

PM2.5	particulate matter measuring 2.5 microns or less
PMF	probable maximal flood
POW	hydropower generation
PPA	Pollution Prevention Act
ppb	parts per billion
ppm	parts per million
PPV	Peak Particle Velocity
PSD	prevention of significant deterioration
PV	photovoltaic
RCC	roller-compacted concrete
RCRA	Resource Conservation and Recovery Act
REC-1	water contact recreation
REC-2	noncontact water recreation
RED	regional economic development
RIMS II	Regional Input-Output Modeling System II
RMP	Risk Management Plan
RMP/EIS	Resource Management Plan / Environmental Impact Statement
ROG	reactive organic gasses
ROS	Recreation Opportunity Spectrum
RWQCB	Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act
SCE	Southern California Edison
SDWA	Safe Drinking Water Act
SE	state endangered
SGMP	soil and groundwater management plan
SIP	State Implementation Plan
SMA	Special Management Area
SMARA	Surface Mining and Reclamation Act of 1975
SOx	sulfur oxides
SPCC	Spill Prevention Control and Countermeasures Plans
SPL	Sound Pressure Level
SQF	Sequoia National Forest
SR	State Route
SRMA	Special Recreation Management Area
SWFL	southwestern willow flycatcher
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TAC	toxic air contaminant
TDS	total dissolved solids
TEPS	threatened, endangered, and protected species
TES	threatened and endangered species
TMDL	Total Maximum Daily Load
TNM 2.5	FHWA Traffic Noise Model Version 2.5
TOT	transient occupancy tax

tpy	tons per year
TS	total solids
TSCA	Toxic Substances Control Act
TSS	total suspended solids
USDA	United States Department of Agriculture
USEPA	US Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
Valley	Kern River Valley
VdB	Velocity vibration level, expressed in decibels.
VOC	volatile organic compound
WARM	warm freshwater habitat
WILD	wildlife habitat
WRCB	Water Resources Control Board
°C	degrees Celsius
μg/m3	micrograms per cubic meter
μS/cm	microsiemens per centimeter

CHAPTER 1.
PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

This Draft Environmental Impact Statement (EIS) has been prepared by the US Army Corps of Engineers (Corps), Sacramento District in cooperation with US Department of Agriculture, Forest Service (USFS). Its purpose is to evaluate the environmental, cultural, and socioeconomic impacts of implementing the proposed Isabella Lake Dam Safety Modification (DSM) Project to remediate existing seismic, seepage, and hydrologic deficiencies in the Main Dam, Spillway, and Auxiliary Dam. The Corps is the Federal lead agency and the USFS is the cooperating agency for the Isabella DSM Project. This analysis was carried out to meet requirements of the National Environmental Policy Act of 1969 (NEPA).

1.2 PROJECT AUTHORITIES

1.2.1 Construction Authority

The initial study for a project on the Kern River was authorized by the Flood Control Act of 1936, approved June 22, 1936. Construction of Isabella Dam and Lake was authorized by the Flood Control Act of 1944, Public Law 78-534, Chapter 665, Section 10, page 901. The authorized project is for flood control, with secondary benefits from water conservation. The relevant portion of the authorization, approved on 22 December 1944, is as follows:

> "The project for the Isabella Reservoir on the Kern River for flood control and other purposes in San Joaquin Valley, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in his report dated 26 January 1944, contained in House Document Numbered 513, Seventy-eighth Congress, Second Session..."

1.2.2 Dam Safety Modification Authority

The Engineering Regulation (ER) 1110-2-1156 (final 28 October 2011) prescribes the guiding principles, policy, organization, responsibilities, and procedures for implementation of risk-informed dam safety program activities and a dam safety portfolio risk management process within the Corps. The purposes of the dam safety program are to protect life, property, and the environment by ensuring that all dams are designed, constructed, operated, and maintained as safely and effectively as is reasonably practicable. Prudent stewardship of available resources is essential to preserve the existing infrastructure. When unusual circumstances threaten the integrity of a structure and the safety of the public, the Corps has the authority to take expedient actions, require personnel to evaluate the threat, and design and construct a solution.

1.2.3 Interagency Authorities

The Corps has entered into agreements over the years with the USFS regarding the transfer and management of lands and facilities between the two agencies and that define roles and responsibilities of each agency. In 1991 a Memorandum of Understanding (MOU) titled *Interagency Agreement Between the Department of the Army and the Department of Agriculture Pertaining to the Interchange of Lands and Management of the Water and Land Resources at the Isabella Lake Project, Sequoia National Forest, Kern County, California*, was entered into reserving the right to use all lands transferred to the USFS "which are necessary to the operation and maintenance of the Isabella Lake Project."

The USFS has provided the Corps with a Letter of Understanding (LOU) dated April 15, 2008 acknowledging that the Corps would serve as the Lead Agency for all environmental analyses required in connection with the Isabella Lake Safety Assurance Program. The USFS is participating in the NEPA process as a cooperating agency as defined by 40 CFR 1501.6. The Sequoia National Forest has jurisdiction over lands and facilities that would be affected by the project as well as special expertise applicable to the environmental analysis. As such the USFS has been participating in the NEPA process and scoping, developing baseline information and assisting the Corps in preparing the environmental analyses.

Ancillary Agreement No. 4 to the 1991 MOU, dated November 19, 2008 granted to the Secretary of the Army for the Corps "rights to enter upon all other National Forest lands lying within the project area, together with rights of ingress and egress for the purpose of operating and maintaining said project for its intended purposes"… "and the continued use by the Corps of Engineers as is necessary for the construction, protection and unrestricted operation, maintenance and administration of the water storage and flood control facilities and functions of Isabella Lake." The Ancillary Agreement also provides for:

> "…the coordination of the parties in connection with the Isabella Dam Safety Assurance Program Project (Project), which includes the investigation, studies, environmental analyses and implementation of the Corps' projects for seismic, seepage and hydrologic retrofit design, through remediation stages, related to the Isabella Reservoir. The project responds to safety issues at the Lake Isabella Dam, including the main dam, the auxiliary dam and the reservoir. Lake Isabella Dam and these projects are located on National Forest System Lands. The Corps will undertake the necessary studies, conduct environmental analyses under the National Environmental Policy Act NEPA and implement the project."

The Ancillary Agreement outlines in detail the specific roles and responsibilities of the Corps as the Lead Agency and the USFS as the cooperating agency.

1.3 STUDY AREA DESCRIPTION

Isabella Lake is on the Kern River in the Sierra Nevada, in the southernmost part of the Sequoia National Forest, Kern County, California (Figure 1-1). It sits approximately 35 miles (50 river miles) northeast of Bakersfield, along Highway 178 and one mile upstream of the town of Lake Isabella. The Kern River drains an area of 2,100 square miles and is the most southerly of the major streams flowing into the San Joaquin Valley. The North Fork and South Fork of the Kern River comprise the headwaters, and each flows approximately 90 miles from the High Sierra to their confluence, about 1¼ miles upstream of the dam site.

Downstream of Isabella Dam, the Kern River flows through the Kern River Gorge, through the Kern Valley, and into the San Joaquin Valley. From the mouth of the canyon, the Kern River flows 85 miles to its terminus at Tulare Lakebed. There are five power plants on the lower portion of the river and numerous irrigation diversions off the river, between the canyon mouth and Tulare Lakebed. During years with exceptionally large runoff, when the Tulare Lake basin is threatened with flooding, all or a portion of the runoff is diverted to the California Aqueduct via the Kern River-California Aqueduct Intertie.

1.4 PROJECT AREA DESCRIPTION

Isabella Lake is formed by a Main Dam on the Kern River and an Auxiliary Dam to the east in the adjacent Hot Springs Valley (Figure 1-2). The construction of the Isabella Lake dams began in March 1948, and the dams were placed in full operation in early 1953. The major physical features of the Isabella Dam Project include embankments, outlet works, and a Spillway (Figure 1-3). The Isabella Lake dams provide for flood risk management, municipal and industrial water conservation, and recreation.

The project provides flood risk management benefits to the residents and business owners of the town of Lake Isabella, the Kern Valley, and Bakersfield.

A private hydroelectric project owned and operated by Isabella Partners is on the downstream toe of the Main Dam. The Borel Canal passes through the Auxiliary Dam and supplies water directly to a hydroelectric plant operated by Southern California Edison (SCE) on the Kern River, six miles south of the Auxiliary Dam.

Figure 1-1 Study Area Location

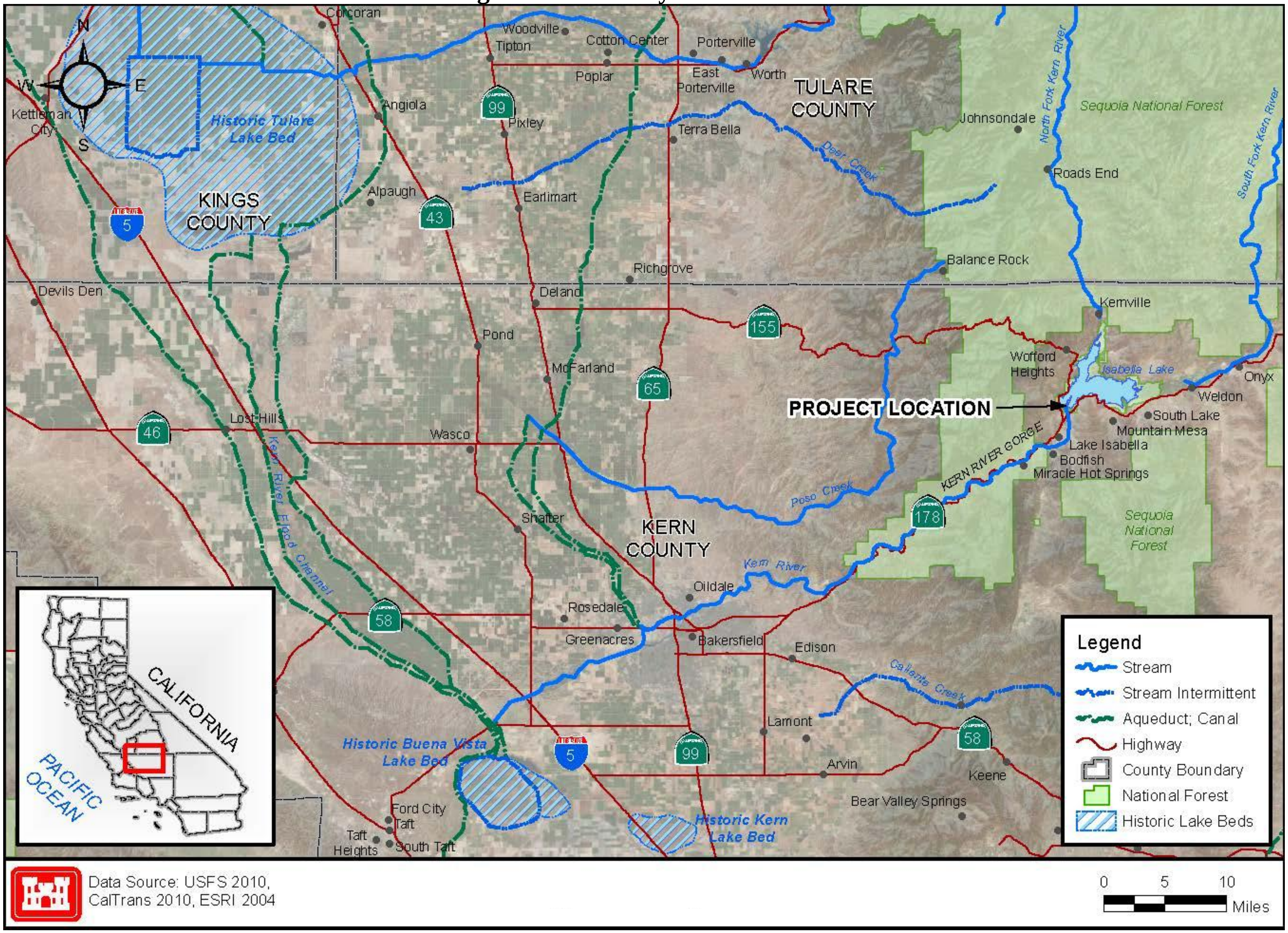


Figure 1-2 Project Area Location

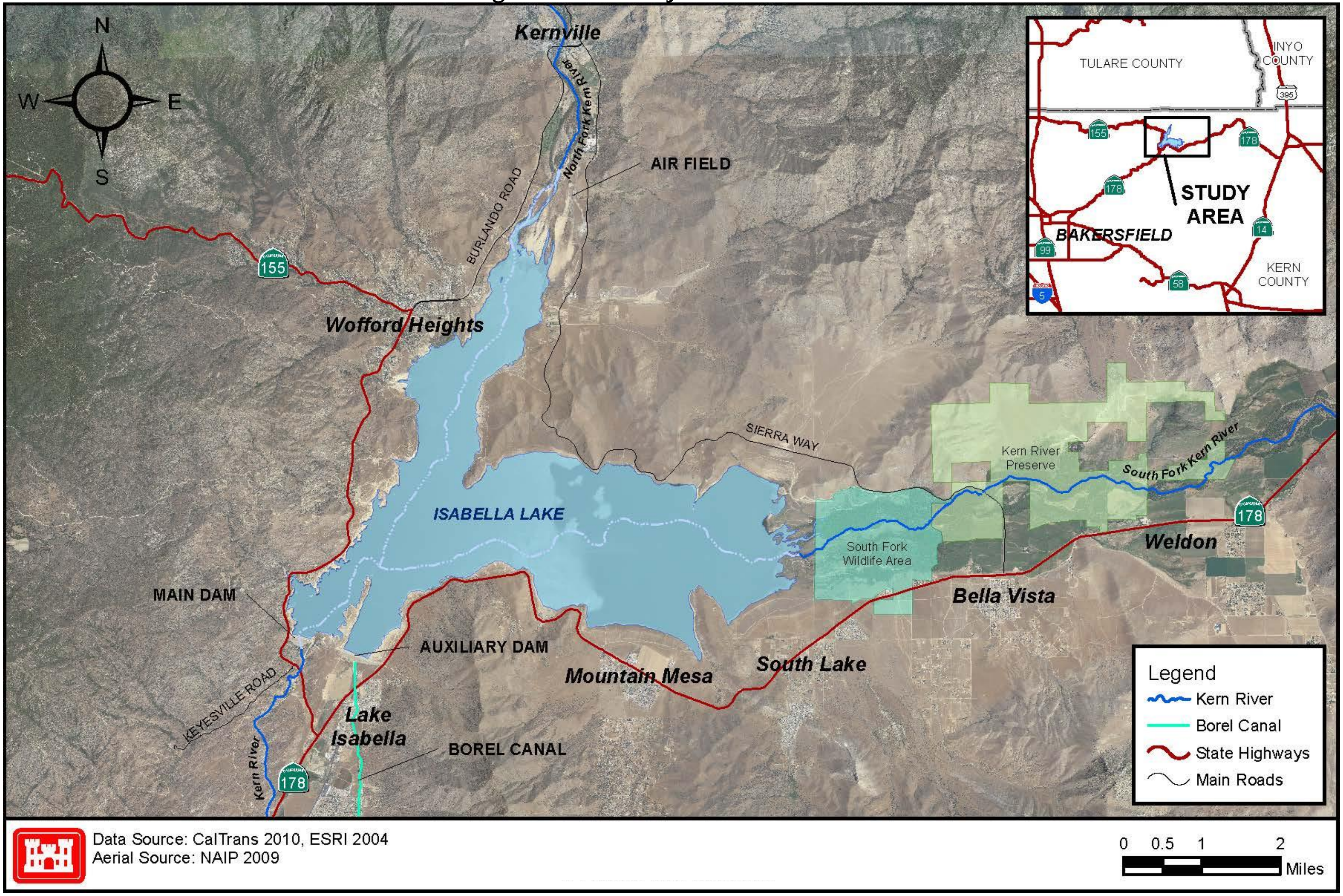
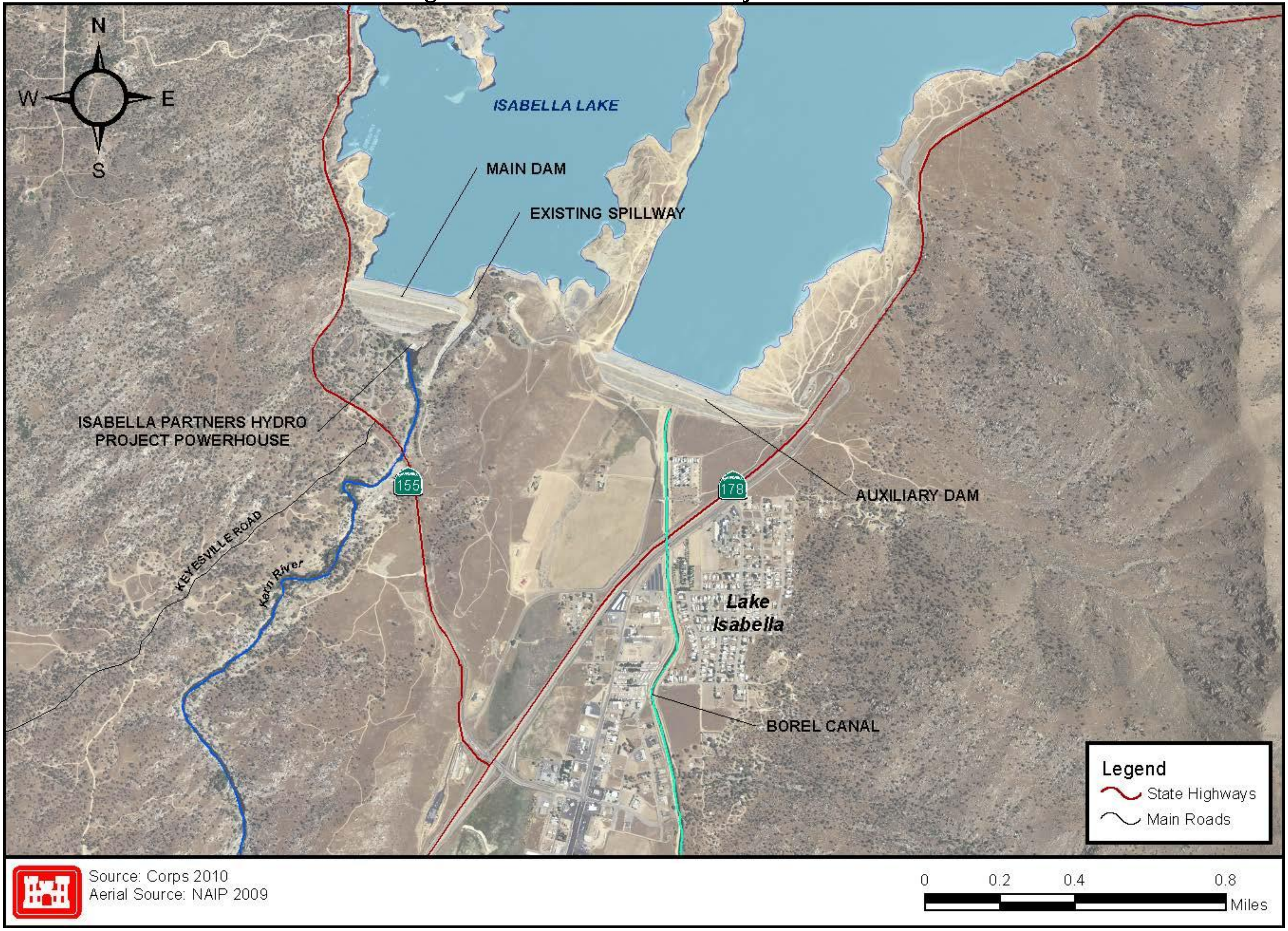


Figure 1-3 Isabella Dam Project Facilities



The dams are on Corps property; however, Isabella Lake is generally on National Forest System lands. Recreation facilities and lands associated with the lake are managed by the USFS. The Corps regulates the Isabella project for flood damage reduction from November through March. After the end of January, the flood damage reduction reservation becomes a function of rainflood potential, forecasted snowmelt runoff and the conservation use delivery schedule. The required flood reduction reservation may be adjusted as the spring runoff season progresses to account for changes in snowmelt forecasts and changes in the forecasted conservation use delivery schedule..

The Kern River Water Master directs lake releases for purposes other than flood reduction during the irrigation season, generally from March 20 through September 20 each year.

The lake is surrounded by the Kern River Valley communities of Kernville, South Lake, Mountain Mesa, Lake Isabella, and Wofford Heights. SRs 155 and 178 and Sierra Way are the access roads around the lake. The lake has a surface area of approximately 11,200 acres. Water-based recreation on the lake includes boating, sailing, water-skiing, jet-skiing, windsurfing, and fishing. The Kern River above the reservoir and below the Main Dam are popular locations for rafting and kayaking. Land-based recreation includes camping, fishing, golfing, hiking, wildlife viewing, and picture taking. The Kern River Valley is a gateway to other recreational areas in the Southern Sierras.

1.5 DESCRIPTION OF THE ISABELLA DAM PROJECT

> ***Vertical Datum***
>
> *The North American Vertical Datum of 1988 (NAVD 88) is used as the standard vertical control datum in this Draft EIS to express height above mean sea level. The NAVD 88 replaced the National Geodetic Vertical Datum of 1929 (NGVD 29). References are also made in some supporting documents to the Isabella Project Datum (IPD) that was established to construct the dam.*
>
> *Approximate conversions are:*
>
> *NGVD 29 datum to NAVD 88 datum: add 2.61 ft.*
>
> *IPD to NAVD 88 datum: add 3.76 ft.*

The Main Dam is a zoned, earth-filled structure with an impervious central core and decomposed granite outer shell. Its maximum height is 185 feet tall and its crest length is 1,695 feet, with a top width of 20 feet. The crest elevation is 2,637.76 feet NAVD 88 (unless otherwise stated. all elevations are "above mean sea level" based on NAVD 88 vertical datum). This provides 6.5 feet of freeboard above the Spillway design flood elevation of 2,630.76 feet. The storage capacity is 586,100 acre-feet (an acre-foot is the amount of water that would cover an acre to a depth of one foot). The embankment materials are essentially homogeneous. A five-foot-thick drainage blanket was placed beneath the downstream shell along about one-third the width of the base of the dam. The foundation consists primarily of granitic rock; however, a zone of streambed alluvium beneath a portion of the downstream shell (two to five feet thick) was left in place. A thick layer of riprap 2.5 feet thick armors the upstream face for erosion protection. A wedge-shaped zone of rockfill, varying from 0 feet to about 40 feet thick, was also placed on the downstream face below elevation 2,254.61 feet. A 12-foot-wide centerline cutoff/inspection trench was excavated along portions of the foundation, and then a grout curtain was installed, with a variable depth of 15 to 75 feet.

The Spillway consists of an ungated concrete ogee section at the left abutment of the Main Dam. (An ogee section is a weir in which, in cross section, the crest, downstream slope, and bucket have an “S,” or ogee, curve). The elevation of the ogee crest is 2,609.26 feet , with a length of 140 feet. The capacity of the Spillway is 52,700 cubic feet per second (cfs) at the Spillway flood pool elevation of 2,630.76 feet .

The Main Dam outlet consists of an intake structure, an intake transition section, a control tower and control section with three rectangular gated conduits, an outlet transition section, and intake and outlet conduits. Each of the control section conduits has service and emergency gates. The main outlet can release a maximum of about 10,000 cfs at gross pool, but releases are normally limited by a flow of 4,600 cfs which begins to cause damages downstream of Bakersfield. The controlling invert elevation of the main outlet, located in the approach channel, is at 2,473.76 feet . The outlet structure at the downstream face of the Main Dam has been constructed to allow for direct releases through the power generation facilities operated by Isabella Partners.

The Isabella Partners’ Hydroelectric Project is south of the downstream toe of Isabella Main Dam and southwest of the tunnel outlet portal structure. A 14-foot-diameter steel liner was installed in the last 130 feet of the original concrete-lined tunnel. The steel liner extends downstream of the original outlet portal approximately five feet to a reinforced concrete transition that changes the circular section to a square section. Downstream of the transition is a reinforced concrete bifurcation. From the bifurcation, water flows either to a new outlet works structure or to the distribution manifold, which directs flows to the two vertical Francis turbine/generator units and turbine bypass valves. The new exit structure contains two tainter valves, which regulate releases in excess of the power plant capacity. Water released through the tainter gates discharges from a flip bucket downstream of the gates.

The Auxiliary Dam is a homogeneous, rolled, earth-filled structure with a maximum height of 100 feet, a crest length of 3,257 feet, and a top width of 20 feet. The crest elevation is 2,637.26 feet , which also provides 6.5 feet of freeboard above the Spillway design flood elevation of 2,630.76 feet . The auxiliary outlet restricts releases to the Borel Canal to a maximum of 605 cfs. The auxiliary outlet consists of an intake transition structure, a conduit intake section, a cut and cover reinforced concrete intake conduit with two barrels, a control tower and control section with two gated barrels, a cut-and-cover reinforced concrete outlet conduit with two barrels, a conduit outlet section, and an outlet transition section. Each of the two control section barrels has one service gate and one emergency gate in series. A 12-inch bypass valve is provided in each barrel to allow for fine regulation of canal releases, but these valves have never been used.

The Borel Canal crosses beneath the Auxiliary Dam to supply water to a hydroelectric plant operated by the SCE six miles below the dam. The canal was realigned in the vicinity of the dam to cross the dam at a perpendicular angle. The portion of the canal beneath the dam consists of a 524.5-foot-long, reinforced concrete, double-barrel conduit within the dam foundation. A control tower was constructed on top of the conduit, 55 feet upstream of the dam axis. Upstream and downstream of the dam, the canal has a trapezoidal cross section, with a bottom width of 23 feet and side slope ratios of 1.5 feet horizontal to 1 foot vertical. The realignment construction involved removing the original canal within the footprint of the dam, placing fill for the dam embankment in two separate sections east and west of the proposed relocated canal location, partially excavating the conduit section, and constructing the conduit. The water table in the vicinity of the Borel Canal was high, so the excavation for the new Borel Canal conduit required French drains and pumps. Sheet piling was used to shore the excavation, and concrete was placed to create the walls of the new conduit. The conduit joints are spaced generally 20 feet on center, with reinforced concrete collars constructed around each joint.

1.6 PROJECT OPERATIONS AND BENEFITS

Isabella Lake is operated for the primary purposes of flood reduction and irrigation water storage. Other project uses include power generation and recreation. Operations are conducted in accordance with the Isabella Lake Regulation Manual, dated May 1953, revised January 1978 (Corps 1978) and other agreements and decisions to achieve the following objectives:

- To restrict flows in downstream channels of the Kern River and its distributaries to non-damaging rates;
- To eliminate or minimize flood flows from the Kern River into Tulare Lakebed; and
- To provide the maximum practicable amount of storage space for conservation water without impairing the flood reduction functions.

The project works in conjunction with Pine Flat Dam on the Kings River, Terminus Dam on the Kaweah River, and Success Dam on the Tule River, which are all operated by the Corps.

1.6.1 Project History

The initial study for a project on the Kern River was authorized by the Flood Control Act of 1936, approved June 22, 1936. This study provided for a preliminary examination and survey of the Sacramento and San Joaquin Valleys. Separate studies were done on various subbasins in the two watersheds. Construction of Isabella Dam and Lake was proposed in the report of the Corps' Chief of Engineers and was contained in House Document 513, January 26, 1944. The project was authorized for construction by the Flood Control Act of 1944.

The low-flow Borel Canal was constructed in 1904 to deliver water from the Kern River to a power plant six miles downstream of where the Auxiliary Dam now sits. The canal was rerouted within the lake, and the Auxiliary Dam was constructed over it. Construction required relocating roads and utilities and acquiring land. The town of Kernville was moved to its new location, upstream on the North Fork by 1952, and the town of Isabella was moved below the auxiliary dam and is now named Lake Isabella. Buildings and other floatable material were removed from the lake, and vegetation was removed in the vicinity of the Main Dam and from each side of the main river channel upstream of the Borel Canal. Construction of the Auxiliary Dam began in March of 1948 and was completed in January 1953. Construction of the Spillway began in November of 1951 and was completed in January 1953. The Main Dam was constructed from May 1952 to March 1953. In April 1953, water was stored in the project for the first time, and the project was first operated for water supply conservation in April 1954. Construction of the Isabella Partners power plant on the Main Dam outlet began in August 1989 and was completed in December 1990. Power production began in June 1991.

1.6.2 Flood Reduction

The project regulates runoff for an area of 2,074 square miles, which consists of mountains and timbered areas. The authorized maximum storage capacity is 586,100 acre-feet at gross pool elevation (2609.26 feet).

Flood storage capacity is required from November 1 through July 31. The Water Control Manual specifies that storage for 398,000 acre-feet is required on November 1. This storage may be decreased to 325,000 acre-feet on February 1, based on forecasted snowmelt runoff and forecasted irrigation demands. Supplementary space to a total of 568,100 acre-feet is provided after February 1, in accordance with predictions of subsequent inflow during the snow-melt flood season. If storage is below the top of the conservation storage requirement of 170,000 acre-feet, no releases are required.

The lake design snow-melt flood has a volume frequency of one in 100 years (1 percent), a total volume of 1,656,000 acre-feet, and a mean daily flow of 12,700 cfs. The standard project rain flood has a peak flow of about 173,000 cfs and a six-day volume of 470,000 acre-feet. Maximum non-damaging channel capacity is 4,600 cfs below the head of the Kern River canal. Flows below Isabella Lake dams have been higher, but water diverted through canals and other features and flows in the channels are closely monitored. Levee capacity through the heavily populated Bakersfield metropolitan area is estimated at 8,000 cfs. (Corps 1978).

The storage and release of flood water in the flood reduction space is under the control of the Water Management Section of the Corps. When it appears that flood water might be discharged into Tulare Lake, the Kern River Water Master is asked to provide updated diversion capabilities so that all possible use of the water can be made for conservation purposes. Since the rate at which water can be used for conservation is relatively small, releases for such purposes begin as soon as possible in order to obtain the maximum empty space storing subsequent flood waters. However, flood reduction releases to Tulare

Lake from Kern River are delayed as long as possible to minimize flooding from all tributaries to Tulare Lake. In this regard, diversions to the Kern River-California Aqueduct are maximized, consistent with the regional flood reduction plan.

1.6.3 Water Supply

Water rights for irrigation are defined for lands within the lake area and downstream of Isabella Dam. The water control manual states that the lands within Isabella Lake up to elevation 2,620.76 feet, together with their water rights, have been acquired in fee by the United States government (Corps 1978). The State of California estimated that the average amount available from these combined water rights is 6,500 acre-feet per season (April, May, and June). This is based on the assumption that the average seasonal consumption of the lake area from gravity diversion is the measure of the combined appropriative water rights of the landowners in that area. This includes 6,000 acre-feet from South Fork rights and 500 acre-feet from North Fork rights. During a dry year, the water available from the North Fork would remain at about 500 acre-feet, while that available in the South Fork would be reduced to about 2,000 acre-feet. The lands suitable for farming or grazing were available for leasing. The leases may use the water in the same manner as it was used in the past. The remainder of the water is stored in Isabella Lake for public recreation (Corps 1978).

The use of Kern River water for irrigation downstream of Isabella Dam has been governed by the Miller-Haggin agreement of July 1888 and as amended most recently in 1964.
On December 31, 1962, all the parties to the Conservation Interest in the Isabella Project entered into the Kern River Water Rights and Storage Agreement, which distributes the Kern River flow among the priority users, based on supply availability and season (Kern River Agreement 1962). The *Contract Among the United States of America and North kern Water Storage District, Buena Vista Water Storage District, Tulare Lake Basin Water Storage District, and Hacienda Water District* of 1964 (The 1964 Contract) describes the present allocation of water between the upstream parties on the Kern River. Under the contract, 535,000 acre feet of the reservoir is allocated to irrigation storage and a joint use space of 35,000 acre feet for recreation, flood control and incidental uses (US Bureau of Reclamation 1964).

Agricultural releases from Isabella Lake are used for irrigation or spread to recharge the groundwater system. If releases exceed the downstream spreading capacity, flows are diverted to the Kern River-California Aqueduct Intertie and are no longer available for use. Flows in excess of the capacity of the intertie would result in downstream flooding.

1.6.4 Power Generation

The flow of 605 cfs in the North Fork of the Kern River is made available to the SCE for diversion through Isabella Lake via the Borel Canal to its Borel Power Plant. The plant can generate up to 12 Megawatts (MW). In addition, water released from lake storage (or from current North Fork flows) for purposes other than power are made available for diversion through Borel Power Plant up to the capacity flow whenever physical facilities permit, with the possible exception of minor flows voluntarily released to preserve fish and wildlife.

The SCE also claims the following water rights in connection with the operation of their Kern River Power Plant No. 1: from October through May, the flow of Kern River (including South Fork) up to 412 cfs (the capacity of the plant); from June through September, the first 74 cfs of flow of the river, the next 50 cfs to bypass the plant for recreation, and the next 338 cfs to be diverted for power. The plant can generate up to 26.3MW. The supply of water from the lake for power use by the SCE for both facilities, over and above the Kern River flow requires payment to the United States under the Federal Power Act.

The Pacific Gas and Electric Company's (PG&E) Kern Canyon Power Plant on the lower Kern River has diversion rights of 550 cfs, under state license, and claims an additional 250 cfs under other rights. Actual maximum diversion in recent years has been about 720 cfs. However, the 550 cfs right is subject to upstream storage by irrigation interests, provided that an equivalent amount of water in excess of natural flow is made available for power use by release from storage at a later time (Corps 2006a). The plant can generate up to 10.6 MW.Water supply for power that is available over and beyond use requires payment to the United States under the Federal Power Act.

The Isabella Partners Hydroelectric Facility is located south of the downstream toe of the Main Dam and southwest of the tunnel outlet portal structure. There are no water rights associated with the facility and it only generates power when water is available. The plant can generate up to 12 MW.

1.6.5 Recreation

The recreation facilities at Isabella Lake generally do not require specific control of releases. The *Agreement for Establishment and Maintenance of a Minimum Recreation Pool of 30,000 Acre-Feet in Isabella Lake*, dated November 8, 1963, was signed by the local water users. Under this agreement, 30,000 acre-feet is designated for recreation. The release of the 30,000 acre-feet is made only if required for flood reduction or by mutual agreement of the water rights holders (Kern County 1963). This agreement was incorporated and made a part of the 1964 Contract between the United States government and the downstream water districts.

With the exception of the South Fork of the Kern River above Isabella Lake, nearly all of the Kern River is navigable. The whitewater rafting season is normally from May 15 to September 15. Whitewater rafting below Isabella Dam depends highly on the releases from the dam; however, no releases are scheduled specifically for whitewater rafting. The releases that are sufficient to support whitewater rafting are governed by historic water rights, power diversion rights, agreements on project operation, and flood reduction operation of Isabella Dam and Lake.

1.6.6 Emergency Deviation from the Water Control Plan

The Corps initiated an emergency deviation in September 2006 from the Water Control Plan for Isabella Dam and Lake, revised January 1978, to operate the project and maintain the reservoir elevation at or below 2,585.5 feet, Isabella Project Datum (storage at or below approximately 356,700 acre-feet). The purpose of this emergency deviation was to lower the lake level to a safe and acceptable elevation/capacity based upon recent results of the Corps' seepage investigations. The Corps has concluded that Isabella Lake Dam could fail due to seepage at gross pool, or during an earthquake. While a failure may be a remote probability, that probability was high enough to warrant this deviation. A failure at high reservoir levels would result in an uncontrollable release of water and would flood communities downstream of the lake. The Corps also determined that the planned deviation restricting the reservoir level would be necessary until the permanent solution, with its own environmental documentation, for the dam safety remediation is implemented.

This operational restriction at or below elevation 2,585.5 feet represents a 37 percent reduction in the maximum conservation storage space of 2,605.5 feet (568,100 ac-ft). Normal routine dam operations for flood damage reduction would continue during the time period between October and February as required under the current Water Control Plan; and to meet water demands for hydroelectric power and during the irrigation season. The Corps will continue its current operational practice of coordinating with the Kern River Watermaster to ensure that operation of the Kern River-California Aqueduct Intertie is avoided as far as possible, because any Kern River water that flows into the California Aqueduct could leave the Southern San Joaquin Valley region. Flooding the Tulare Lake is a last resort action as it causes severe crop damage. The Watermaster controls the water releases from the reservoir to meet hydroelectric and irrigations demands.

1.7 PURPOSE AND NEED FOR ACTION

1.7.1 Need for the Action

The Corps has determined that the Isabella Dam facilities require structural improvements in order to safely meet authorized project purposes and to reduce risk to the public and property from dam safety issues posed by floods, earthquakes, and seepage. Risk is defined as a measure of the probability and severity of undesirable consequences or outcome. The Corps has adopted a procedure for assessing risk at a dam project in terms of "tolerable risk". The procedure has been in use for the past 15 years or more by a number of Federal and international dam management agencies.

The Corps prioritizes its dams for possible remediation through a process that determines risk. As part of the risk determination, tolerable risk guidelines have been developed. While economic risk and environmental risk are important considerations when assessing risk, life safety is paramount. Simply stated, it is intolerable if a dam has an annual probability of failure greater than 1/10,000; or if the assessed annualized life loss is greater than 0.001. More information can be found in the policy document ER 1110-2-1156, which can be found at http://140.194.76.129/publications/eng-regs/.

In 2005 the Corps determined through a screening-level risk assessment process that the Isabella Dams posed unacceptable risk. Subsequently, the project received a risk classification that is described “urgent and compelling (unsafe)” and as “critically near failure”, or “extremely high risk”. It should be noted that the project received this classification due to the “extremely high risk”, and that the project is not believed to be “critically near failure”. Failure is not believed to be imminent.

Given the large population downstream of Isabella Lake as well as significant dam safety issues at the dam, urgent action is needed to address deficiencies and reduce risk. These facilities are among Corps’ highest priorities for risk reduction, and the project does not meet Corps tolerable risk guidelines, thus remedial actions are necessary. The Corps’ need for action is to reduce the likelihood and consequences of dam failure and to restore the authorized project benefits..

1.7.2 Purpose of the Action

A breach of either dam at the Isabella Dam facilities has the capability to cause significant loss of life and environmental and economic impacts downstream. The Corps is proposing to reduce the risk to the public from the project by remediating the significant seismic, hydrologic, and seepage deficiencies at the Main and Auxiliary Dams to a level that satisfies tolerable risk guidelines, and also to be able to fulfill the project design functions, including operating at authorized capacity. This would support the ultimate goal of having a safe facility that meets Corps tolerable risk reduction guidelines for existing dams and allows the project to provide the benefits for which it was authorized.

1.7.3 Dam Safety Studies

The Corps has reviewed investigations and other studies focusing on the safety of the Isabella Lake Project dating back to before the construction of the facilities. Recent intensive dam safety investigations primarily since 2006 have focused on geotechnical and seepage investigations, seismicity and structural analysis on the various facilities. There has also been a reevaluation of baseline risk conditions from hydrologic and seismic loading (Corps 2010a). A summary discussion of the primary dam safety concerns follows.

1.7.4 Dam Safety Concerns

Five primary dam safety issues have been identified for the Isabella Dam facilities that have resulted in the project’s high risk rating, as follows:

- **Foundation seepage and piping—**Erosion can occur underground if there are cavities, cracks, an unprotected exit, or other openings large enough so that soil particles can be washed into them and transported away by seeping water. When this type of underground erosion progresses and creates an open path for flow, it is called piping. The piping and erosion could rapidly progress and erode the dam leading to a complete breach. Higher than expected foundation seepage pressures beneath the downstream toe of the Auxiliary Dam add to the concern regarding the potential for this issue to lead to a failure.

- **Borel Canal conduit seepage and piping—** Concentrated seepage paths are suspected along the Borel Canal conduit under the Auxiliary Dam, possibly associated with seepage collars or construction practice. Erosion could progress along the conduit and create a breach of the dam.
- **Hydrologic adequacy—**The existing service Spillway located near the Main Dam is not large enough to safely convey or route rare, large flood events such as the probable maximum flood (PMF). The Corps defines the PMF as "The most severe flood that is considered reasonably possible at a site as a result of hydrologic and meteorologic conditions" (Corps ER 1110-8-2 (FR)). These rare, but possible flood events would overtop the dams, eroding the embankments and lead to a total release of the reservoir.
- **Seismicity—**Recent investigations indicate that the Kern Canyon Fault, which was previously thought to be inactive, is now known to be active in the geologically recent past. The fault passes under the right abutment of the Auxiliary Dam. An offset of the fault at this location could lead to a crack that could serve as a path for concentrated seepage and erosion. Additionally, portions of the auxiliary dam foundation are assessed as being liquefiable in an earthquake, and strong shaking from an earthquake could lead to large deformations in the dam and/or Borel conduit (URS 2010).

The failure modes judged to be of the highest risk are associated with seepage and piping of the Auxiliary Dam embankment and foundation. Other likely failure modes are associated with dam overtopping in a rare but plausible flood, leading to erosion of one or both embankments, and fault rupture at the Auxiliary Dam from the Kern Canyon Fault. The Corps put a restriction on the reservoir elevation and storage in 2006 as an Interim Risk Reduction Measure (IRRM). This restriction is a temporary measure that reduces the loading on the dams and lowers the risk until a permanent fix can be put in place (Corps 2008a).

Following is a summary of specific deficiencies at the two dams and the operational constraints of the IRRM measures that define the project need (Corps 2010b).

1.7.5 Auxiliary Dam and Borel Canal

Piping and Internal Erosion

The Auxiliary Dam was constructed as a homogenous impervious embankment, so it has no central core and no downstream rockfill zone. The Auxiliary Dam is primarily founded on a thick deposit of porous alluvium. The foundation materials are more permeable and continuous (without cutoff) than the Main Dam, which increases the likelihood for seepage and piping over time. In addition, the Borel Canal conduit and outlet through the

Auxiliary Dam provide several additional potential seepage- and piping-related failure modes due to their construction details.

A continuous permeable layer is believed to extend to the lake from the downstream toe. The Auxiliary Dam does not contain a cutoff in these materials and does not contain an effective seepage control system since the drainage blanket does not meet modern filter criteria. In addition, it appears as if a series of closely spaced discontinuous sandy lenses and a confining fine-grained layer exist in the foundation. These conditions provide a mechanism for transmitting high pore water (the water filling the spaces between grains of sediment) pressures to the downstream toe of the dam. If the pore water pressure at the base of the confining layer exceeds overburden pressure, the confining layer could heave and create an unfiltered seepage exit point. Seepage gradients sufficiently high enough to initiate piping could develop at the downstream toe. As the materials are eroded a roof could form under the confining layer. This void can grow until the roof above is no longer stable and material collapses. A failure results when this mechanism repeats itself until further erosion causes instability and a breach.

Soil between native foundation material and backfill placed around the Borel Canal also appears to have been poorly prepared and may have been disturbed by the sheetpiles that were used to support the excavation sidewalls. The piles were pulled out after construction and backfill was placed. A flaw at the interface could create a continuous seepage path that extends from the downstream toe to the lake, along the sides of the excavation made for the Borel Canal through the embankment. The upper fine-grained layer in the foundation and the conduit backfill act as a confining layer and can support a roof. These conditions provide a mechanism for transmitting high pore water pressures to the downstream toe of the dam.

Seismic Stability

The Auxiliary Dam also has the potential for failure from cracking due to seismically induced embankment deformations or differential settlement. This could result in potential seepage and erosion of the embankment material. In addition, there is the potential for joint failure due to seismically induced displacement of the Borel Canal conduit and outlet through the Auxiliary Dam. The failure of the joints could cause embankment and foundation material to move into the openings and lead to internal erosion.

The intake tower could also shear at the connection to the conduit chamber under seismic loading. Rupture due to shear failure at the gate chamber could also allow embankment and foundation material to move into the opening and lead to internal erosion. In both cases the internal erosion could progress upward to the upstream slope and form a sinkhole, leading to upstream sloughing, loss of freeboard, and breach formation.

The Kern Canyon Fault under the Auxiliary Dam right abutment is another potential failure mode. This could lead to formation of an open transverse crack in the bedrock and soil foundation and the lower embankment near the foundation contact. The potential fault rupture could lead to erosion of embankment material through this crack. The erosion could progress without flow limitation and could lead to a breach. The Kern Canyon Fault has been identified to be active based on recent fault trenching, including one near the downstream toe. The fault zone is approximately 100 to 200 feet wide, is steeply dipping (70 to 90 degrees west) striking north, and is oriented upstream/downstream. Past offsets along the fault appear to be around a minimum of 1 to 3 feet for each single splay; however, multiple splay movements are possible. The last movement on the Kern Canyon Fault appears to have occurred in the past 2,500 to 4,000 years with an average interval between large earthquakes of about 3,200 years.

1.7.6 Main Dam and Spillway

Piping and Internal Erosion

The Main Dam consists of a zoned, earth-filled structure with an impervious central core and decomposed granite outer shell. A zoned, earth-filled dam has distinct parts or zones of dissimilar material and typically employ filter and drain zones to collect and remove seepage water and preserve the integrity of the downstream outer shell zone. The embankment is on streambed alluvium that provides a seepage path through the dam foundation in addition to the underlying fractured rock. The dam features a single-line grout curtain and a 12-foot-wide core trench, from 0 to 10 feet deep, with a slush grout foundation treatment at the base. While the grout curtain likely reduces seepage, its overall effectiveness is unknown.

Seismic Stability

Another potential failure mode could result from cracking due to seismically induced deformations of the embankment or settlement, resulting in seepage and erosion of the embankment material. Seepage and piping through the embankment is possible due to inadequate filters and drains. Even though the shell embankment material is well compacted and dense, the embankment does not contain a chimney drain or filter. The embankment material appears to be highly erodible. If the crack depth exceeds the available freeboard (the distance between the waterline and the top of the dam) and if the gradient is sufficient enough to initiate scour erosion, a breach could form.

The intake tower stability during an earthquake is also a concern and could result in the loss of operability. Failure (shear off) of the intake tower where the embankment meets the rock foundation during an earthquake could damage the gates leading to inability to operate the gates. The inability to operate these gates could result in not being able to release water from the lake.

Hydrologic Loading

The existing service Spillway on the left abutment of the Main Dam is capable of safely passing only 30 percent of the PMF, which means overtopping of one or both dams could occur during the PMF event and lead to erosion of the embankment, and ultimately to catastrophic failure of one or both dams. The Spillway itself would also be subject to erosion, as has already been experienced with smaller flows events. However, the dams could be overtopped with floods that are much smaller and more frequent than the PMF, potentially eroding the crest and the downstream slope of either of the embankments and initiating dam failure.

1.7.7 Interim Risk Reduction Measures

The Corps began implementing IRRMs in 2006 to reduce the risk of potential failure. The primary IRRM currently in place is a deviation from the water control manual that reduces the authorized gross pool level of the lake, from 2,609.26 feet to a restricted elevation not to exceed 2,589.26 feet during the flood control off-season, from March through September. This restricted elevation reduced the maximum storage capacity of the lake by approximately 37 percent and reduced the potential surface area of the lake that is available for recreation. Under this restricted operation, the lake is allowed to temporarily encroach above this elevation for large inflows; however, the water level would be lowered to the maximum allowable elevation. During encroachments, water would be released to lower the lake elevation as quickly as possible, without exceeding channel capacity or causing excessive damage downstream. While reducing the likelihood and consequences of dam failure, this restriction does not allow the Corps to fully operate the dams and lake as authorized and affects the flexibility of operations in meeting flood control, irrigation, recreation, fish and wildlife, hydropower, and economic objectives. The project still does not meet tolerable risk guidelines with the restriction in place. Other actions supporting the IRRM that have been implemented include updates to the Emergency Action Plan, Dam Safety Training with Corps and US Forest Service staff, increased inspection and monitoring, updates to the inundation maps, a table top exercise, installation of an early warning siren, installation of remote monitoring, pre-position of materials, and improved communication reliability with emergency officials (Corps 2010b).

1.7.8 Dam Failure Consequences

The consequences from failure of either dam are similar. Total failure of either dam would flood portions of the town of Lake Isabella (population 3,400), portions of Bakersfield (population 334,000), and other nearby population centers. The additional population at risk downstream, such as recreationalists in campgrounds or along the Kern River, is unknown. In the event of a dam failure Highway 178 connecting Isabella Lake and the Kern River Valley to Bakersfield (approximately 40 miles) would not be accessible due to road erosion along most of its length. The economic damage including property losses and repair of the dam breach has been estimated to be in hundreds of millions of dollars, and high loss of life is predicted in the event of a dam failure (Corps 2008a). There would be massive environmental damage, particularly because of numerous oilfields and oil wells, recreation sites, and commercial enterprises in the region, along with the extensive quantities of fertilizers and pesticides that are used in the agricultural areas.

There are five federally licensed hydroelectric powerhouses downstream of the Main Dam. All five would likely undergo significant damage or would be destroyed. Although a failure of the Auxiliary Dam would not likely destroy the Main Dam powerhouse, it would put it out of commission because of flows from the Kern River would backup and inundate the facility. Power generation lost because of a failure of either dam would be approximately 75 megawatts.

Separately, the Corps has analyzed potential downstream consequences to document the need to reduce the risk posed by the project. It is the policy of the Corps, in coordination with the Department of Homeland Security, that inundation maps and related information is to be designated "For Official Use Only" (FOUO). Such information is considered "Sensitive" and shall not be released to the public in any media or format. This includes the products of risk analysis, such as potential failure causes, failure consequences and risk calculations. Applicable references include but are not limited to:

- Engineering and Construction Bulletin 2008-10, and
- CEMP letter dated 18 Nov 2008; Memorandum For Commanders, Directors, and Chiefs of Separate Offices, USACE; subj: Release of Information to the Public.

1.8 SCOPE OF THE ENVIRONMENTAL IMPACT STATEMENT

1.8.1 Public Participation and the Scoping Process

Scoping is a public process designed to determine issues and alternatives to be addressed in a NEPA document. The scoping process for this Draft EIS began on February 5, 2010, with the publication of the Notice of Intent (NOI) in the *Federal Register*. The NOI provided formal notification to the public and agencies that a Draft EIS would be prepared for the Isabella DSM Project. The US Environmental Protection Agency provided the only written comment to the Corps in response to the publication of the NOI.

In May 2010, two initial public meetings were held, one in Kernville and the other in Bakersfield. These meetings were to brief the public on the deficiencies identified for the Isabella Lake Dam facilities and to report on the ongoing investigations and activities being conducted at the facility, to outline the process moving forward, and to provide an opportunity to submit questions and general comments on the proposed Isabella DSM Project.

A second set of public informational meetings were held in December 2010 in the town of Lake Isabella and in Bakersfield. The Corps provided an update on the status of dam safety investigations and the preliminary risk reduction measures under consideration in formulating remediation alternatives. There was also a discussion of the environmental review process and the environmental studies being prepared in support of the proposed Isabella DSM Project. Again, the public was given an opportunity during the meetings to provide input regarding issues of concern and to ask questions of the panel. Summaries of the two informational meetings held in December 2010 are presented in the *Isabella Lake Dam Safety Modification Project: Preliminary Public Participation Report* dated January 2011 (Corps 2011b).

Three formal NEPA public scoping meetings were held May 17-19, 2011, in Kernville, Lake Isabella, and Bakersfield to present the Alternative Risk Management Plans (RMPs) under consideration and to seek input on the issues, resource concerns, alternatives and potential impacts that should be considered in the Draft EIS. At the meetings, the Corps described then current plans to address seismic, seepage and hydrologic deficiencies at Isabella's Main and Auxiliary Dams. The potential environmental impacts associated with these alternatives are evaluated in this Draft EIS. Summaries of these three meetings and the materials presented by the Corps are presented in the Scoping Report, provided as Appendix A.

The Corps maintains mailing and e-mail distribution lists to communicate and coordinate with various government entities and officials, tribal groups, water users, media, and other stakeholders. The Corps also maintains a public website on Isabella Lake, http://www.spk.usace.army.mil/projects/civil/Lake_Isabella_Dam/Index.html, and posts monthly Situation Reports, summarizing Corps activities in support of the proposed Isabella DSM Project.

1.8.2 Key Issues

Based on the public meetings and interagency coordination held to date, the following issues have been identified as key concerns and questions relevant to the scope of the Draft EIS:

- The urgency of the need to address public safety;
- The specific RMPs, project details and the time frames for implementation of the Isabella DSM Project;
- The construction period and long-term effects on lake levels, flood reduction and irrigation water storage;
- The downstream effects on hydropower and Kern River rafting and kayaking;
- The construction and long-term effects on water quality, fisheries and natural resources;
- The impacts on lake-based recreation, recreation opportunities, and the local recreation-based economy;
- The impacts on current grazing allotments;
- The offsite borrow sources under consideration;
- The positive and negative socioeconomic effects on the Kern River Valley economy and workforce from construction;
- Cultural resource impacts and tribal concerns with the project;
- The potential real estate acquisitions and relocations associated with the project;

- The potential impacts on federally-listed and/or special-status species that may occur in the vicinity of the proposed project;
- Worker housing during construction; and
- Impacts on traffic, noise, and air quality during construction.

1.8.3 Public Review of the Draft EIS

After a Notice of Availability and a Draft of the Isabella DSM Project EIS are released in early March 2012, public hearings will be scheduled during the 45-day comment period in Kernville, Lake Isabella, and Bakersfield to receive public comment on the Draft EIS. Comments will be considered by the Corps in the preparation of the Final EIS and in their decision on how to reduce risk to the public and property from dam safety issues and safely meet authorized project purposes. Public interest in the project is high, and the Corps will continue agency and public participation efforts throughout the project.

1.8.4 Other Public Agency Actions

In addition to satisfying requirements of NEPA, proceeding with project construction is subject to the agency permits and approvals listed in Table 1-1. Compliance with applicable laws, regulations, and executive orders is summarized in Chapter 5.

Table 1-1
Required Permits and Approvals

Agency	Permit/Approval Needed	Legal Citation
U.S. Fish and Wildlife Service	Biological Opinion – A Biological Opinion is a determination that the project would not result in jeopardy to a federally listed species.	Section 7 of the Endangered Species Act, as amended (16 U.S.C. 1536)
Regional Water Quality Control Board	NPDPES General Construction Activity Stormwater Permit – A permit is an approval of the stormwater pollution prevention plans (SWPPPs) or stormwater management programs to reduce or prevent the discharge of pollutants from construction into receiving waters.	Section 402 of the Clean Water Act of 1977, as amended (33 U.S.C. 1342)
	State Water Quality Certification – Documents project compliance with California water quality standards.	Section 401 of the Clean Water Act of 1977, as amended (33 U.S.C 1341)
	Waste Discharge Requirements – requirements to maintain water quality standards, known as water quality objectives, for both surface water and groundwater for local basins and watersheds.	Porter-Cologne Water Quality Control Act (Water Code 13260-13274)

1.8.5 Purpose and Organization of the Draft EIS

This Draft EIS identifies, evaluates, and documents the environmental effects of implementing the Isabella DSM Project (Proposed Action). Chapter 1 is a description of the purpose of and need for the Proposed Action, Isabella Lake Dam project authority, history, and background.

Chapter 2 is a description of the Proposed Action and Alternatives. This section describes the alternatives considered in detail and those that were considered but eliminated from further detailed evaluation.

Chapter 3 is a description of the current baseline condition of resources in the project area and an analysis of the environmental impacts of the alternatives on the natural, physical, and human environment. Actions or mitigations that could reduce identified impacts are discussed, where appropriate.

Chapter 4 is a discussion of the potential cumulative impacts of the Proposed Action alternatives. These are the impacts of an action when added to other past, present, and reasonably foreseeable future actions, regardless of whether the actions are Federal or nonfederal. Other regional actions are described and other required impact disclosures are outlined.

Chapter 5 is a summary of the regulatory compliance and agency and public coordination that has been conducted to date.

Chapter 6 is a list of the EIS recipients.

Chapter 7 is a list of preparers of the Draft EIS. Chapter 8 is a listing of the references used in preparing this Draft EIS and Chapter 9 is the index.

Appendix A is an abridged version of the Public Scoping Report.

Appendix B is the 2011 Water Quality Report for Isabella Lake.

Appendix C is the Fish and Wildlife Coordination Act Report prepared by the US Fish and Wildlife Service.

Appendix D is the Habitat Evaluation Report prepared by the US Fish and Wildlife Service.

Appendix E is List of Species list for the Isabella DSM Project.

Appendix F is the Cultural Resource correspondence and Draft Programmatic Agreement on the Treatment of Cultural Resources.

1.9 ISSUES TO BE RESOLVED

The Council on Environmental Quality (CEQ) regulations implementing NEPA require that related or connected actions (actions with a common purpose, timing, effects, or location) be analyzed in a single document (40 CFR 1502.4(c) and 1508.25) to avoid segmenting or the splitting a proposed action into several smaller actions and analyzing them individually. Segmentation is generally discouraged because the significance of the action as a whole might not be apparent if parts are analyzed separately. However, when complete information is lacking upfront, the CEQ encourages the use of incremental decision making through tiering and/or sequencing of impact analyses to ensure continued progress toward the critical path of meeting the overall project purpose and need (40 CFR 1508.28).

Tiering is the process of anticipating and preparing multiple levels of environmental review. Typically this involves allowing a program or complicated project (such as this Isabella DSM Project) to have a number of subsequent smaller-scale NEPA reviews of supporting follow-on actions and decisions. The smaller-scale reviews would incorporate the general discussions included in the broader analysis (i.e., this EIS) by reference, and concentrate on the issues specific to the follow-on actions.

In this Draft EIS, the anticipated construction-related activities associated with implementing the proposed Action Alternatives are addressed at a level considered appropriate, given the current status of project planning and design and available information and data. As planning proceeds, the Corps is continuing to refine remediation measures, construction methods, equipment types, and construction schedules with the intention of further reducing adverse impacts beyond the BMPs and mitigation measures proposed in Table ES-2 and Chapter 3. Also, some of the anticipated implementation actions are still in the planning stage, and not yet ready for detailed analysis of environmental impacts. Unresolved issues and actions still under discussion and analysis by the Corps at the time of publishing this Draft EIS are summarized in the following paragraphs. It is the intention of the Corps that the unresolved issues and actions discussed below will be addressed in a number of follow-on NEPA reviews that are tiered to this current EIS.

1.9.1 Real Estate Actions

Federal management of the lakeshore, Isabella Lake recreational amenities and some facilities were transferred from the Corps to the USFS in 1991. Those lands and facilities anticipated to be directly affected by implementing any of the Action Alternatives would be transferred back to the Corps, including the following:

- Former Main Dam Campground. This site was closed in 2006 due to a variety of concerns including problems with the water system and safety and security issues. As a separate action, the Corps is working with the USFS to address questions about the status and loss of this parcel and the continued need for the onsite wastewater facility.
- Current Site of the USFS Facilities between the two Isabella Dams. This site is in the footprint of the proposed new Emergency Spillway; a remediation measure common to all four Action Alternatives. The impacts of the transfer, removal and relocation of the facilities, personnel and operations are discussed but not analyzed in this Draft EIS, because the needed information regarding relocation is still being developed. A subsequent NEPA analysis would be conducted for these actions if the EIS decision includes the transfer and relocation of the USFS facilities.

Other real estate actions associated with implementing the Action Alternatives involve private landowners and residences in the vicinity of the proposed construction site at the Isabella Main and Auxiliary Dams and Spillway. Because of the potential risks to human health and safety, localized environmental and human impacts, and construction access and staging needs, the temporary or permanent relocation of these residents may be necessary. The Corps is presently developing data to assess the level of human health and safety risk, prior to initiating discussions with private entities regarding potential real estate actions. The Corps is endeavoring to minimize potential impacts from construction that may require relocations or acquisitions. For the purpose of the impact analysis in the Draft EIS, the potential for these actions is assumed, but details on which properties may be affected and measures that the Corps may take are still being determined, and therefore cannot be fully analyzed in this Draft EIS. A R*eal Estate Plan* and subsequent NEPA analysis would be initiated by the Corps during 2012 and completed early in 2013, and implemented well before the start of construction.

1.9.2 Water Control Plan

Implementation of the Action Alternatives may require a deviation to the current water control plan/flood control diagram. The *Isabella Dam and Lake Water Control Manual* (Corps 1978) provides a detailed plan for water control and flood management, and a water control diagram for Isabella Dam and Lake. It also assigns responsibilities for water control operation of the project. If a deviation to the water control manual/flood control diagram is necessary, this would trigger a separate NEPA analysis on the effects of the deviation.

1.9.3 Ongoing Dam Operations and Maintenance

The planning process and the proposed construction of the Isabella DSM Project have a long duration. During this time, ongoing dam operations and maintenance (O&M) actions would continue independently of the actions analyzed to reduce likelihood of dam failure described in this Draft EIS. O&M activities would include projects that are considered separate actions, which may or may not require further NEPA analysis, even if they do occur in the same location or time frame as the Isabella DSM Project.

1.9.4 Mitigation Sites and Actions

In developing the array of construction activities necessary to implement the Action Alternatives, the Corps has incorporated proactive actions including Best Management Practices (BMPs) to avoid or minimize anticipated impacts to the extent practicable. However, in some cases, appropriate mitigation for anticipated impacts would likely need to be further defined and analyzed in detail through subsequent planning, agency coordination, public involvement and the NEPA process. For example, an appropriate *Site Restoration Plan* addressing construction sites and subsequent uses for any land disturbed or acquired for the Isabella DSM Project would be begun by the Corps during 2012, following release of the Final EIS.

Also, the temporary and permanent construction impacts on recreation sites, especially the Auxiliary Dam Recreation Area, Boat Launch 19, and Engineers Point, are important issues to the public, local businesses and the USFS. A process to prepare a comprehensive *Recreation Mitigation Plan* would be initiated during 2012 by the Corps and involving the USFS and key local stakeholders, to address how all affected recreational opportunities would be maintained during the multi-year construction period and how post-construction restoration of recreational sites would be accomplished. It is likely that some of the actions resulting from this process would require separate supporting NEPA analyses. The *Recreation Mitigation Plan* and all planning and projects emerging from the *Plan* would be completed before the start of the proposed Isabella DSM Project construction.

Furthermore, there is a recognized need to sustain sport fishing at Isabella Lake during and following construction, which is an important local and regional economic and recreational activity. An updated *Fisheries Management Plan* would be begun by the Corps during 2012 that would address managing construction impacts on fisheries, maintaining sport fishing events, and potentially enhancing post-construction sport fisheries. Preparation of the updated *Plan* would involve gathering new data such as a seasonal creel census, as well as encouraging public and agency participation in the planning process. Actions potentially proposed in the updated *Plan* may require follow-on NEPA analyses.

Finally, a separate analysis in cooperation with the US Fish and Wildlife Service (USFWS) is being conducted during 2012 to evaluate potential habitat impacts and mitigation requirements resulting from implementation of the proposed Action Alternatives, and to prepare a cost-effective *Fish and Wildlife Mitigation Plan*. This *Plan* would likely be completed in time to be included with the final EIS for the Isabella DSM Project, anticipated by the end of September 2012. A *Draft Habitat Evaluation Plan* and *Draft Fish and Wildlife Coordination Act Report* prepared by the USFWS are included as Appendices to this Draft EIS. These documents will provide valuable inputs to the planned *Fish and Wildlife Mitigation Plan*

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CHAPTER 2.
DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

The Isabella DSM Project consists of implementing the Preferred Risk Management Plan (RMP) (Proposed Action) to remediate seismic, seepage, and hydrologic deficiencies at the Main Dam, Spillway, and Auxiliary Dam. The process for selecting a Preferred RMP (in progress) will be the evaluation and comparison of alternatives based on environmental and economic impacts in the project area and vicinity, construction cost, and risk reduction analyses. Many investigations, studies, workshops, technical meetings, and various discussions with highly qualified contractors, cooperating agencies, stakeholders, and the public have taken place. The investigations and studies began in the early to mid-2000s, accelerated in 2006, and are nearly complete today. The Corps held their first meeting with the public in March 2010 once they had a good understanding of the risk and deficiencies associate with the dams. This comprehensive effort has included the development and evaluation of an array of specific remediation measures, which have been formulated into the alternative RMPs that are described and evaluated in this Draft EIS.

Implementing the Proposed Action represents a large and complex modification project that involves altering the Isabella Dams and Spillway, constructing new structures and facilities, and performing numerous associated support actions over an anticipated multi-year construction period. This Draft EIS evaluates the potential environmental impacts associated with the Proposed Action, and the opportunity for public and review agencies to provide comments. This EIS will help ensure that implementation of this needed project can be achieved with the least- possible impacts.

This Draft EIS also represents an important step in the process by allowing public and agency review and comment of the evaluation of potential environmental impacts associated with the selected alternative RMPs. The Corps will consider all comments and input received from public and agency reviews and will select a Preferred RMP that will be included in the Final EIS and Record of Decision (ROD). The Final EIS and ROD will become part of the Dam Safety Modification Report (DSMR) for the Isabella DSM Project. The DSMR is being prepared by the Corps Sacramento District and is scheduled for submittal to Corps Headquarters (HQUSACE) in Washington DC in Fall 2012. Implementation of the Preferred RMP requires an approved DSMR, EIS, and ROD by HQUSACE. The ROD will be signed in conjunction with DSMR approval.

The following sections of this chapter documents the alternative development process, describes the alternative RMPs, discusses alternatives considered and/or evaluated in this Draft EIS, and presents the anticipated general construction schedules envisioned for the alternatives selected for detailed evaluation in the Draft EIS.

2.2 ALTERNATIVE DEVELOPMENT PROCESS

The formulation of alternative RMPs for the Isabella DSM Project was a multi-phased process beginning in 2010 and continued to early 2012. An Isabella DSM Study was undertaken following the six step framework of civil works planning guidance presented in ER 1105-2-100 "Planning Guidance Notebook" as adapted in the ER 1110-2-1156 Dam Safety Guidance for addressing dam safety issues;

- Identify dam safety issues and opportunities;
- Estimate baseline risk condition;
- Formulate alternative risk management plans;
- Evaluate alternative risk management plans;
- Compare alternative risk management plans; and
- Select a risk management plan.

The first phase of the process began in early 2010 with the main purpose of identifying and describing the array of potential remediation measures (structural and nonstructural) that could be implemented to reduce the risk of dam failure. A key step in the first phase of the process was a workshop conducted March 16-18, 2010, in Kernville, California, that included individuals and professionals with relevant areas of expertise representing the Corps, the URS-Kleinfelder-Geomatrix Joint Venture (Isabella JV), project stakeholders, and project sponsors. The primary objectives of this workshop included: (a) developing an array of potential remediation measures that would reduce the risks associated with the specific seepage, seismic and hydrologic deficiencies in the Isabella Main Dam, Spillway, and Auxiliary Dam that had been identified and described in previous recent studies; (b) performing an initial feasibility screening of the remediation measures; and (c) beginning to formulate alternative RMPs from various combinations of the measures.

The second phase of the RMP formulation process got underway in Fall 2010, with the main purpose of formulating a short list of alternative RMPs (comprised of the most feasible remediation measures) that would meet the objectives and requirements of ER 1110-2-1156. As part of this second phase, the Corps, the Isabella JV, and the EIS contractor (Tetra Tech) met in a multi-day roundtable meeting at the Corps' Sacramento District office on October 18-21, 2010. The primary objectives of this meeting included: (a) reviewing and discussing the results of the draft baseline risk assessment prepared by the Corps, and the potential failure modes of the dams and spillway that are driving the risk; (b) evaluating the first phase workshop results; and (c) clarifying the breakdown of the second phase activities to be performed by the Corps, the Isabella JV, and Tetra Tech.

During December 2010, and January 2011, the Corps, Isabella JV, and Tetra Tech met in two sequential meetings to review and fine-tune the list of remediation measures, and begin formulating them into an array of alternative RMPs for comparison and further evaluation and refinement. The first of these meetings was held December 14-15, 2010, at the Isabella Lake Corps project office, and focused on remediation measures that had been developed for the Main Dam and Spillway. The second meeting held January 10-12, 2011, at the Corps Sacramento District Office, focused on remediation measures that had been developed for the Auxiliary Dam and Borel Canal.

Following these two workshops the Corps further fine-tuned the list of remediation measures and alternative RMPs, developed a short list of alternative RMPs, and refined quantities, costs, and potential construction scheduling as a basis for alternative comparison. An in-depth comparison of the short list of alternative RMPs was conducted in a conference setting by the Corps and the Isabella JV on March 9-10, 2011 at the Sacramento District office. The Corps then compiled the results from the comparison conference, and through a series of internal meetings selected the final set of alternative RMPs described in the next section (Section 2.3) that are analyzed for potential impacts in this Draft EIS. A preferred Action Alternative has not been selected in this Draft EIS.

2.3 ALTERNATIVES CONSIDERED IN THIS EIS

2.3.1 Introduction

In accordance with the guidelines in ER 1110-2-1156, the comprehensive alternative formulation process summarized in the previous section resulted in the following nine alternative RMPs considered and/or evaluated in this Draft EIS:

- **RMP#1: No Action Alternative**—Implement none of the RMPs, remove the IRRM measures and operate the reservoir up to the authorized gross pool elevation of 2,609.26 feet.
- **RMP#2: Making the Interim Risk Management Measure (IRRM) Permanent**—Make the emergency deviation from the water control plan in 2006 the permanent water control plan. This would consist of reducing the previous lake capacity (gross pool level) from 2,609.26 feet to a restricted elevation not to exceed 2,589.26 feet during the flood-control off-season, from March 20 to September 20 of each year. This restricted elevation would permanently reduce the maximum storage capacity of the lake by 37 percent.
- **RMP#3: Alternative Base Plan**—Remediate those deficiencies identified for the Main Dam, Spillway, and Auxiliary Dam that if not remediated, could result in catastrophic failure of the dams from seepage or an occurrence of a large seismic or extreme storm event.
- **RMP#4: Alternative Plan 1**—Remediate the deficiencies covered in the Base Plan Alternative, plus additional deficiencies identified for the Main Dam.
- **RMP#5: Alternative Plan 2**— Remediate the deficiencies covered in Alternative Plan 1, plus additional deficiencies identified for the Auxiliary Dam.
- **RMP#6: Alternative Plan 3**—Remediate the deficiencies covered in Alternative Plan 2, plus additional deficiencies identified for the Main Dam, ensuring that both dams achieve the best rating regarding dam safety.

- **RMP#7: Alternative Plan 4**—Remediate the deficiencies covered in Alternative Plan 2, plus additional deficiencies identified for the Main Dam.
- **RMP#8: Removal of Structure**—Remove the Main Dam and allowing the Kern River Channel and reservoir to return to pre-dam conditions.
- **RMP#9: Replacement of Structure**—Replace the Auxiliary Dam, retrofitting the Main Dam and existing Spillway, and add an emergency spillway. All of these features would be constructed and designed to modern day standards.

These alternatives are further described in the following sections.

2.3.2 RMP#1: No Action Alternative

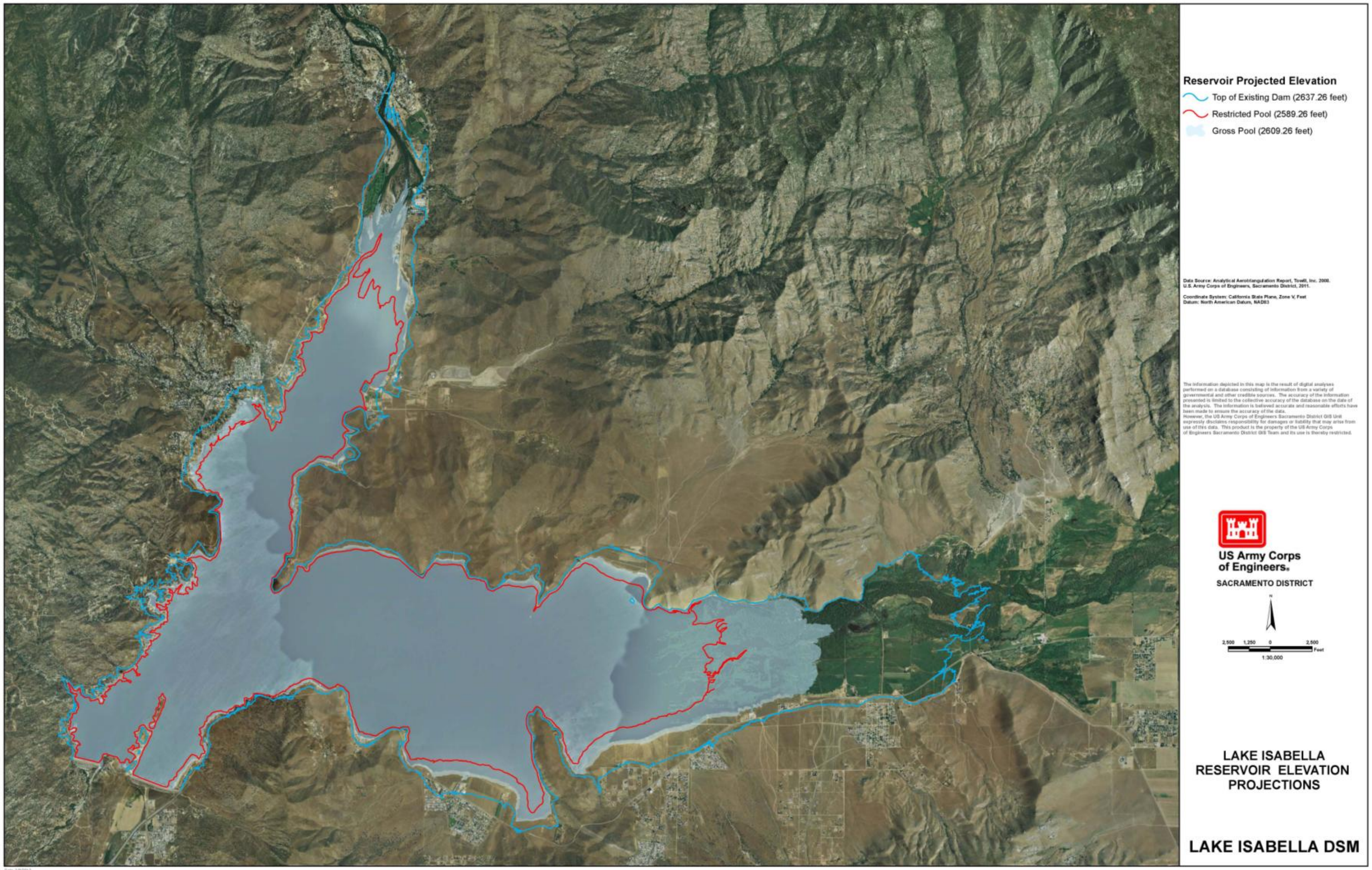
As prescribed by NEPA CEQ guidelines (40 CFR, 1502.14 [d]), a No Action Alternative is to be considered for all proposed federal actions. In accordance with ER 1110-2-1156 guidance, measurement of life loss risk due to dam failure is to be compared to a No Action Alternative reflective of normal water control operations. At the Isabella Dam project, this scenario would represent a change from the existing IRRM condition that was established in 2006 and set to expire in 2015. Although the Corps would most likely continue some form of interim risk management measures until a permanent risk management measure was in place, in order to maintain consistency with the formulation of alternatives for the DSMR, the Draft EIS No Action Alternative calls for resumption of Isabella Dam project operations in accordance with the established Water Control Plan and Flood Control Diagram. There would be no federal participation in remedial improvements to the Isabella Main Dam, Spillway, or Auxiliary Dam. The lake capacity (gross pool elevation) would be returned to the pre-IRRM elevation of 2,609.26 feet and the Dam would be operated at that level. See Figure 2-1 for lake elevations under the No Action condition. As discussed in Section 2.3.3 and Section 2.3.11 below, making the IRRM permanent was not carried forward for detailed analysis in the Draft EIS.

For operation and maintenance of the Isabella Dam project under the No Action Alternative, the Corps would continue to regulate the Isabella project for flood damage reduction as specified in the Water Control Plan. The Kern River Water Master would continue to direct lake releases for purposes other than flood reduction during the irrigation season, generally from March 20 through September 20 each year. Borel Canal and power generation operation and maintenance activities would be the same as current conditions.

Under the No Action Alternative, one or both dams could fail from seepage or under large flood or seismic loads without intervention. The potential environmental, economic, and human consequences of dam failure would be extremely high.

In accordance with NEPA guidelines, the No Action Alternative has been carried forward in this Draft EIS as a baseline for comparison with the other alternative RMPs evaluated in this Draft EIS.

Figure 2-1 Reservoir Levels under the No Action Alternative



2.3.3 RMP#2: Making the IRRM Permanent

A seepage study conducted in 2005-2006 by the Corps found that the Auxiliary Dam was being subjected to higher foundation pressures than originally believed from earlier studies, and the study concluded that the pressures in the dam foundation had reached levels that were of concern. Therefore, an emergency deviation from the water control plan was implemented on April 27, 2006, to reduce the foundation pressures and provide an acceptable factor of safety. The deviation consisted of reducing the previous lake capacity (gross pool level) from 2,609.26 feet to a restricted elevation not to exceed 2,589.26 feet during the flood-control off-season, from March 20 to September 20 of each year, as an IRRM until a more permanent solution could be implemented. This restricted elevation reduced the maximum storage capacity of the lake by 37 percent.

In addition to the restricted elevation, the IRRM included the following measures, still in effect:

- New inundation map and evacuation plan for the downstream affected area;
- Additional dam safety training to applicable personnel;
- Increased inspection and monitoring of the dams;
- Installation and operation of early warning sirens;
- Installation and use of remote-control cameras;
- Improved communications;
- Increased emergency response equipment and supplies; and
- Frequent and ongoing communication with the public.

Under this alternative, the current IRRM restricted elevation of 2,589.26 feet or some variant would be maintained as the permanent gross pool level of Isabella Lake, and the other measures listed above would be continued for the foreseeable future. The gross pool elevations of Isabella Lake recorded between 1955 and 2006 (Figure 2-2) indicates that on average the lake elevation reaches or is higher than the restricted level about one out of three years. With the IRRM made permanent, the same operational conditions in effect since 2006, dam operation would control the level of Isabella Lake so as not to exceed the restricted level in any year.

Although the alternative of *Making the IRRM Permanent* has been initially considered, it has not been evaluated in detail in this Draft EIS. The basis for this decision is presented in Section 2.3.11.

Figure 2-2 Isabella Dam Reservoir Levels - 1955 to 2006 (IPD)

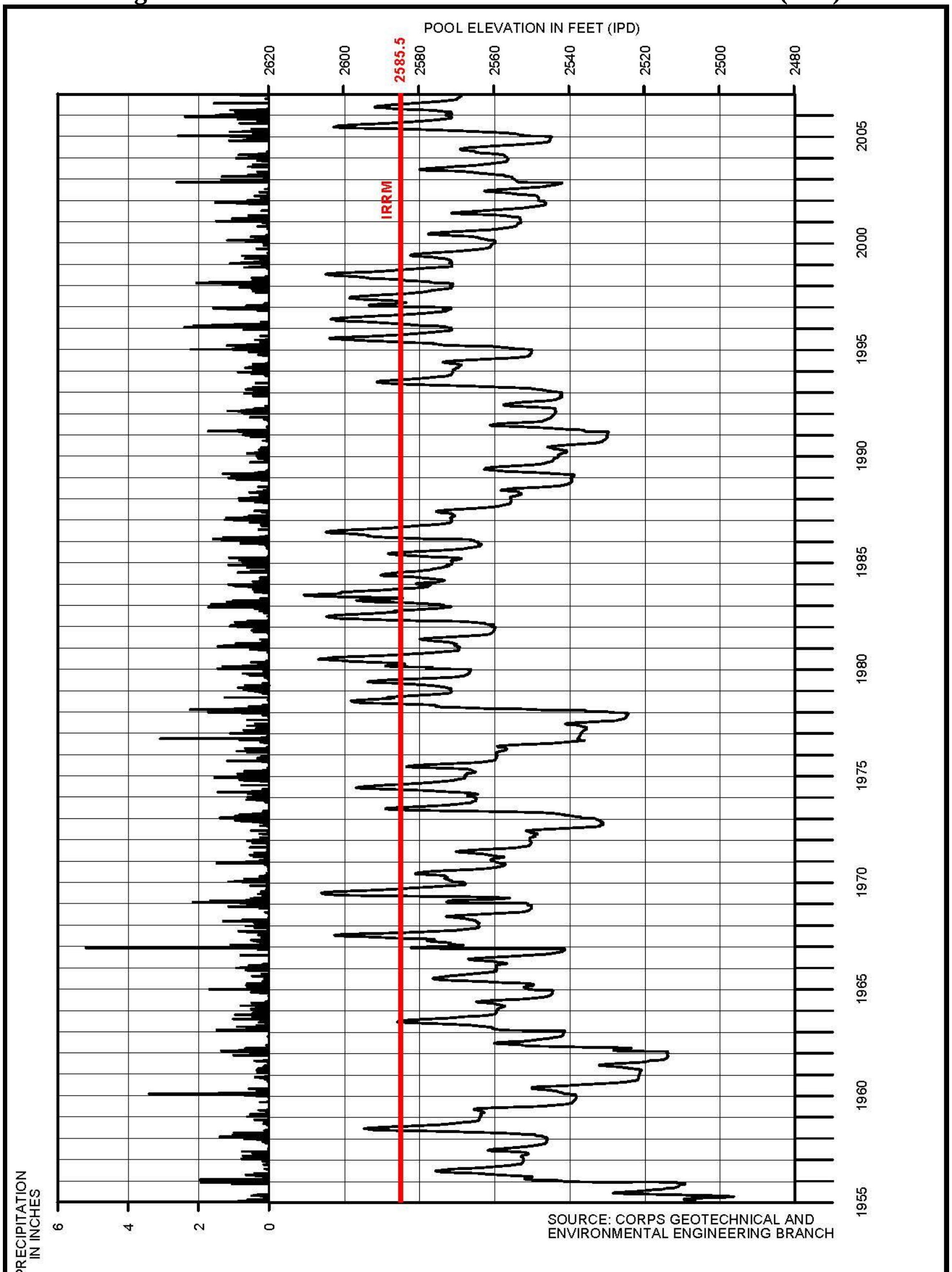


Figure 2-1: Isabella Dam Reservoir Levels - 1955 to 2006 (PRE-IRRM)

2.3.4 RMP#3: Alternative Base Plan

Under this alternative, only deficiencies that are significant contributors to the risk would be remediated. This alternative represents the minimal risk management plan that would still provide an adequate level of safety for the project. The remediation measures planned for each structure under this Alternative Base Plan are described in the following paragraphs and figures.

Main Dam

The Corps has determined that the deficiencies associated with the Main Dam could lead to potential differential settlement and seepage following a seismic event and/or overtopping during an extreme storm event (such as the Probable Maximum Flood (PMF). Under the Alternative Base Plan the Main Dam would be remediated so that it could safely pass flows of an extreme storm event and so that it could withstand an anticipated seismic event without leading to a failure (loss of reservoir). The following remediation measures would be included:

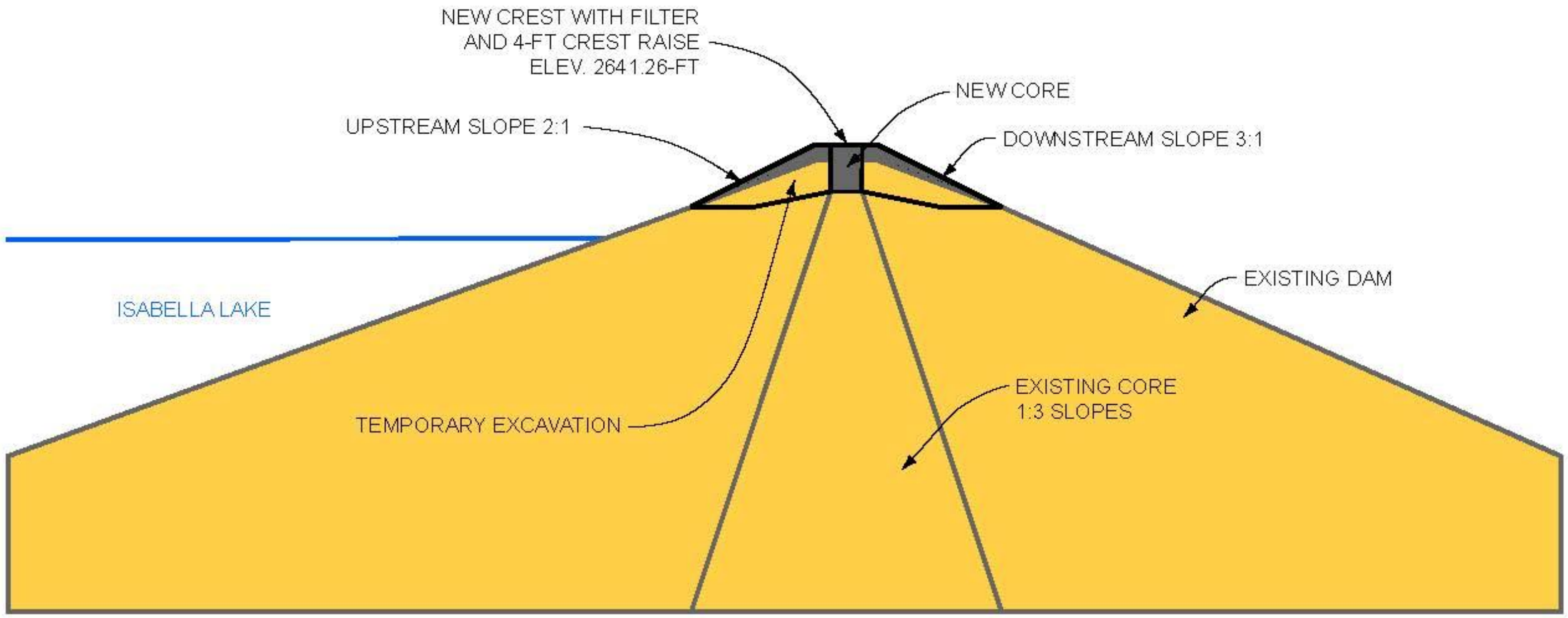
- Constructing a filter and drain near the crest of the dam to help protect from potential settlement cracking during a seismic event (Figure 2-3 and Figure 2-4).
- Retaining the existing bifurcated outlet structure and the privately owned power generating station downstream of the Main Dam.
- Constructing a four-foot crest raise, and replacing the core near the crest, to be able to safely pass an extreme flood event without overtopping.

The majority of the various rock materials needed for the Main Dam remediation would come from the excavation of the proposed Emergency Spillway; discussed below. The sand material required for the filter and drain near the crest of the Main Dam would come from two proposed “borrow” sources, if sufficient material is not able to be produced from spillway excavation. One source would be the Auxiliary Dam Recreation Area which is on-site, and an off-site source that would be the South Fork delta area just downstream of the South Fork Wildlife Area. These two proposed borrow locations along with the operations are further described in Section 2.3.13 (Support Actions Common to Alternatives).

Existing Spillway

Included in this alternative would be remediation of the deficiencies identified for the existing spillway. The remediation includes (a) select concrete placement and surface treatment of the existing spillway chute to guard against erosion undermining of the right wall; (b) addition of rock anchors along the right wall to increase seismic stability; and (c) construction of a 4-foot high retaining wall added to the crest along the right wall (closest to the Main Dam) to protect against potential erosion of the main dam during high outflows. The concrete needed for all remediation measures on the existing spillway would be supplied by the ready-mix plant located in the South Lake area along Hwy 178.

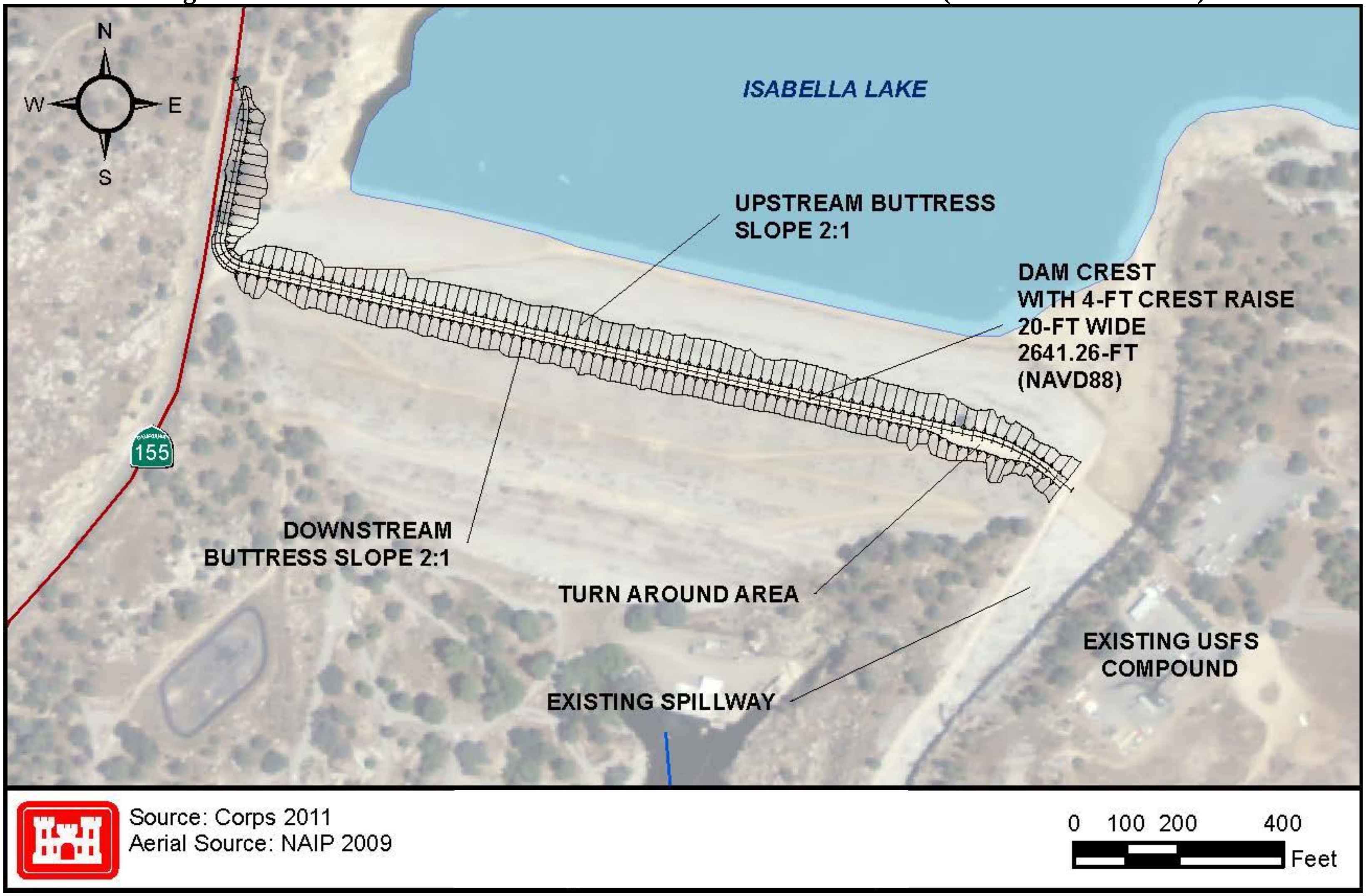
Figure 2-3 Cross-Section of Main Dam with Filter Near Crest (Alternative Base Plan)



Source: Corps 2011

-Not to Scale-

Figure 2-4 Plan View Sketch of Main Dam with Filter Near Crest (Alternative Base Plan)



Emergency Spillway

The Corps has determined that the existing spillway along the east side of the Main Dam cannot safely pass an extreme storm event (such as the PMF). It is a requirement that all Corps dams be able to safely pass the PMF, with freeboard for wind and wave run-up. Therefore, this alternative includes the construction of a new "Emergency Spillway" that would be located approximately one-hundred feet east of the existing spillway (Figures 2-5 and Figure 2-6). The additional spillway would be required to remediate the hydrologic deficiency (undersized capacity of the existing spillway) that could lead to overtopping of the dams and failure of one or both dams which could cause extreme consequences downstream.

This Emergency Spillway would function independently from the existing spillway, and would begin to function around elevation 2,620.76 feet; (11.5 feet higher than existing spillway) for outflows associated with storm events greater than a 1-in-400-year frequency. Outflows associated with more frequent storm events would be handled by the existing spillway. The new spillway would have a labyrinth type weir with four v-shaped concrete baffles and a concrete apron. It would be designed to dissipate energy and control the rate of outflow through the spillway channel (see Figures 2-5 and 2-6). The crest elevation for the Main and Auxiliary Dam would be raised approximately 4-feet in order to provide for passage of the PMF without overtopping. The 4 foot raise would provide 4 feet of freeboard for wind and wave run-up under the PMF event. Only in extreme storms would the reservoir rise to an elevation at which the Emergency Spillway would operate, with the annual probability of reaching this elevation approximately 1-in-400. Outflows associated with pool elevations up to the 1-in 400 annual probability would be handled solely by the existing spillway. Additional downstream consequences would be expected for the extra discharge with this emergency spillway (at pool elevation frequencies between 1-in-a-400 year and 1-in-10,000 years), and it is believed that this may cause this Emergency Spillway alternative to not meet tolerable risk guidelines.

The Corps has determined that construction of the Emergency Spillway would require controlled blasting during excavation to break up the rock-outcrops located in the proposed channel. The blasting program anticipated for this construction is described in Section 2.3.13 (Support Actions Common to Alternatives).

It is anticipated that excavated materials from the proposed Emergency Spillway channel would be used as the main borrow material source to construction the modification features for the Alternative Base Plan. The excavated materials likely would be crushed, screened and washed as needed to generate the various sands, gravels and rock required and either temporarily stockpiled or placed directly into permanent construction. The processing operation would likely be located at approved onsite location likely in vicinity of Emergency Spillway. The Plant operation and the assumed staging areas are described in more detail in Section 2.3.13 (Support Actions Common to Alternatives). The materials (various sized rocks) produced in the crushing operation would be stockpiled on-site in this staging area and delivered to the appropriate construction areas as needed.

Figure 2-5 Plan View Sketch of Emergency Spillway (Labyrinth Type Weir)

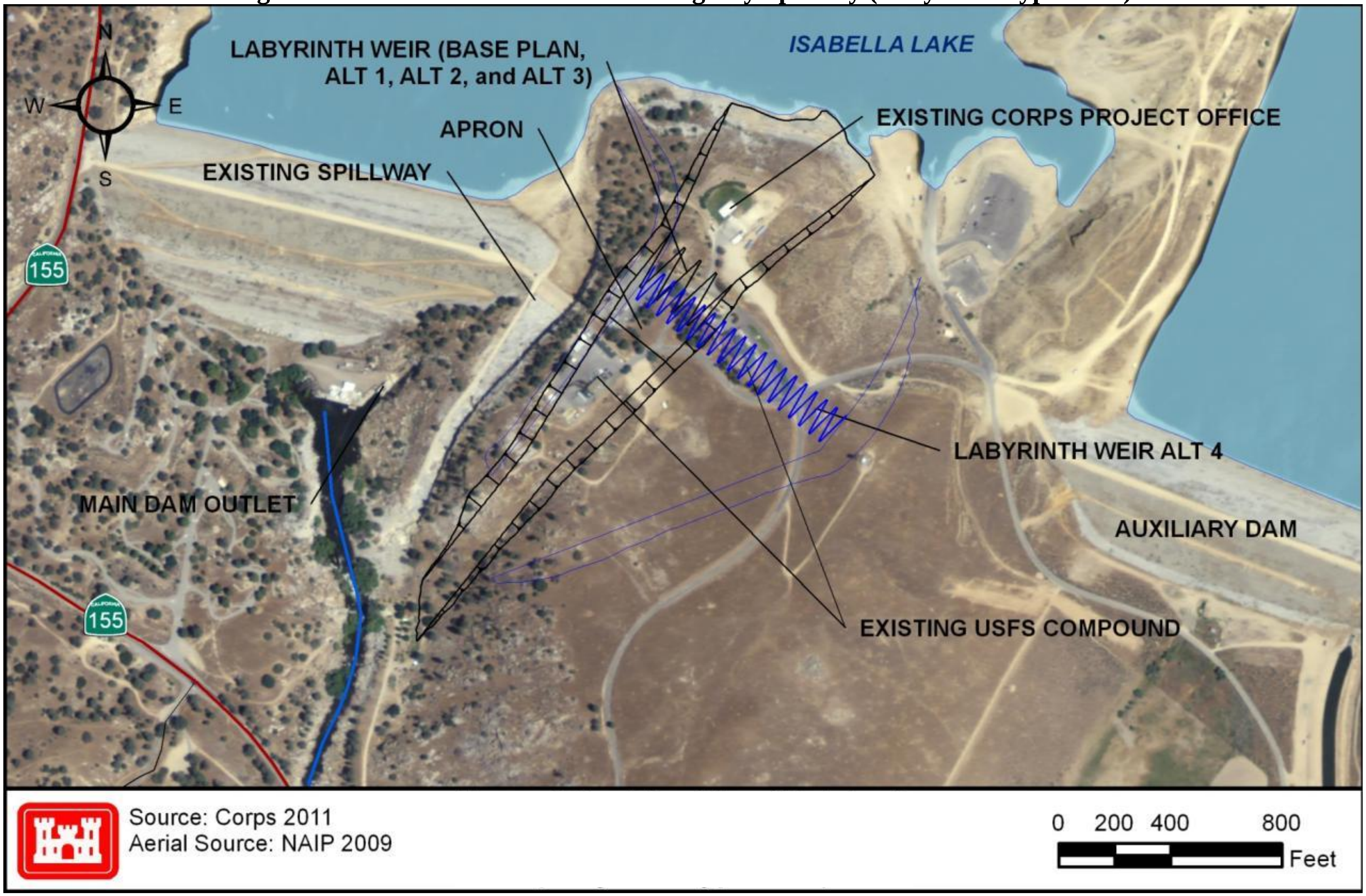


Figure 2-6 Oblique View Photo of a Typical Labyrinth Type Weir Spillway

Source: Bing Maps 2011
Ute Dam New Mexico

-Not to Scale-

The concrete needed to construct the baffles and apron of the Labyrinth Weir would be supplied from the ready-mix plant located in the South Lake area along Hwy 178.

Auxiliary Dam

The Corps has determined that the seismic, seepage, and hydrologic deficiencies associated with the Auxiliary Dam pose an unacceptably high probability of failure of the dam. Under the Alternative Base Plan the Auxiliary Dam would be remediated to withstand anticipated seismic events (including fault rupture), manage expected seepage, and survive extreme flood events. These remediation measures would include the following activities (Figures 2-7 and 2-8):

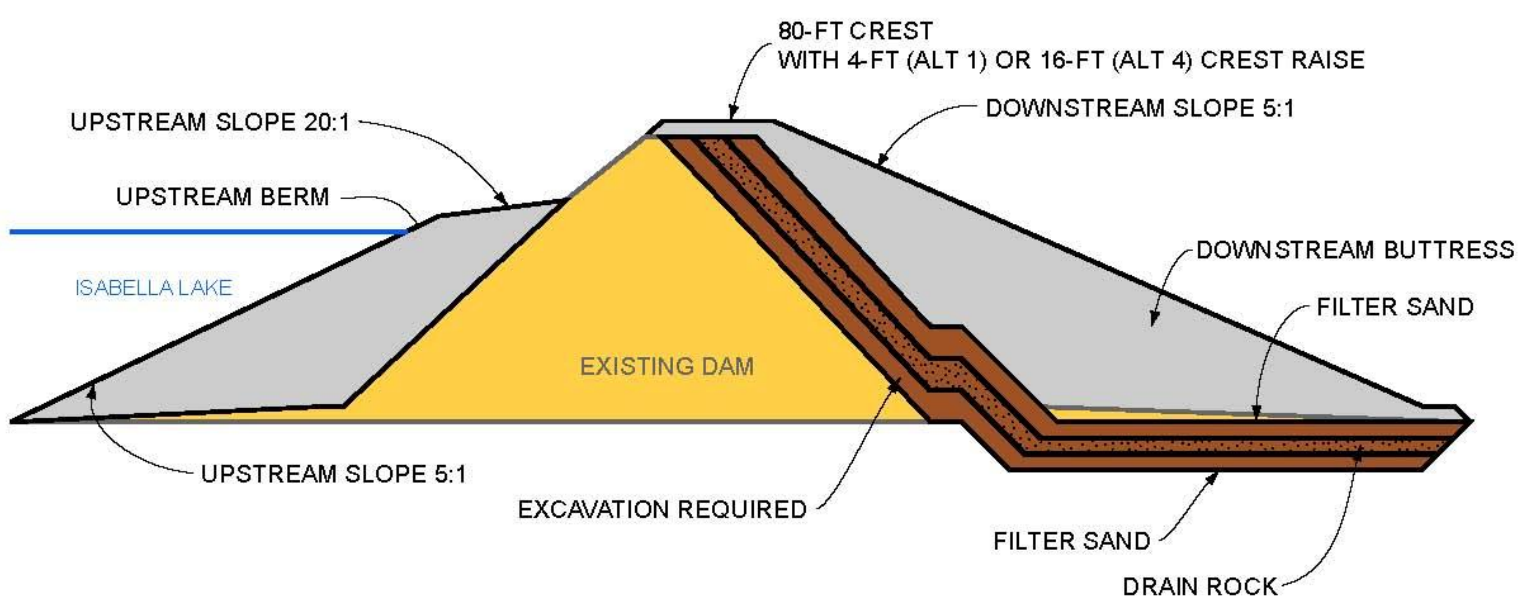
- Adding an 80-foot wide downstream buttress to the dam with a more gradual downstream slope (5:1) to increase stability of the dam, and a moderate-sized sand filter and drain rock system built into the downstream slope to better manage seepage and potential fault rupture.
- Removing the upper 25 to 30 feet of the liquefiable alluvial layer under the downstream slope of the dam and replace it with recompacted soil to reduce the potential for liquefaction during a seismic event.
- Constructing a four-foot crest raise to be able to safely pass an extreme storm event without overtopping.
- Constructing a rock fill berm on the upstream side, to increase seismic stability of the dam.

The majority of the rock materials needed to complete the downstream buttress and upstream berm on the Auxiliary Dam would come from the excavation of the proposed Emergency Spillway. The sand material required to construct the filter on the downstream slope of the Auxiliary Dam is expected to come from the spillway excavation (crushed to size) but if necessary, it could come from one or both of the additional proposed borrow sources: the Auxiliary Dam Recreation Area and/or the South Fork Delta area. The concrete needed for Auxiliary Dam remediation measures would be supplied from the ready-mix plant on Hwy 178.

Borel Canal

The Corps has determined that some of the problems associated with the Auxiliary Dam can be attributed to the existing Borel Canal conduit that passes perpendicular through the embankment of the Auxiliary Dam (Figure 2-9). The Borel Canal existed, in its present alignment from the North Fork Kern River, before the Auxiliary Dam was constructed. The Auxiliary Dam was built on top of the Borel Canal which has the first water rights to the flows out of the North Fork of the Kern River. Since the early 1900s, the canal has been supplying water via the canal to the Southern California Edison (SCE) power plant approximately six miles downstream of the Auxiliary Dam. The SCE has a water right to receive the first 605 cubic feet per second (cfs) of the North Fork Kern River flows into Isabella Lake through the Borel Canal.

Figure 2-7 Cross-Section of Auxiliary Dam Remediation Measures (Alternative Base Plan and Alternative Plan 1 and 4)



Source: Corps 2011

-Not to Scale-

Figure 2-8 Plan View Sketch of Auxiliary Dam Remediation Measures (Alternative Base Plan and Alternative Plan 1)

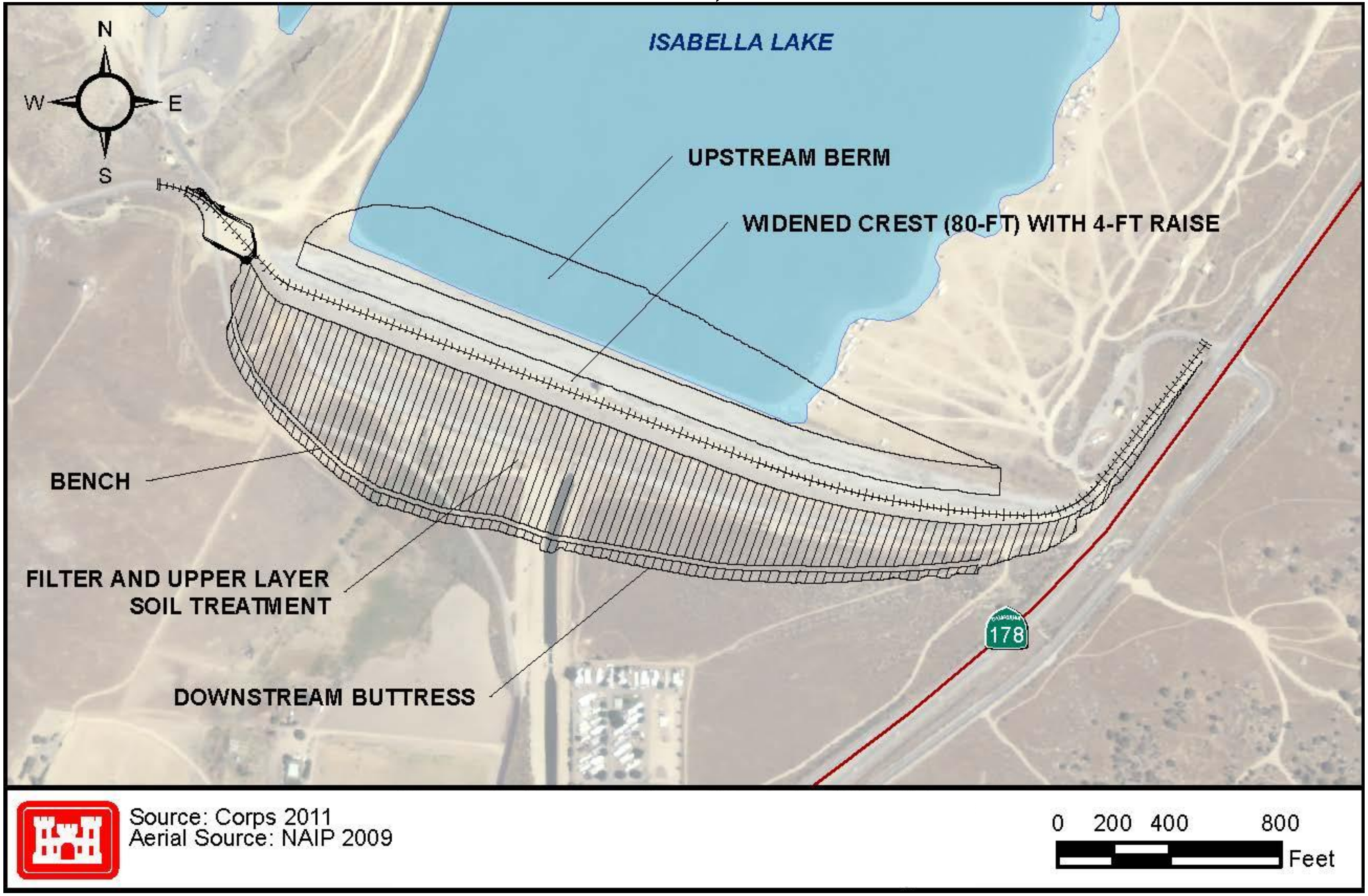
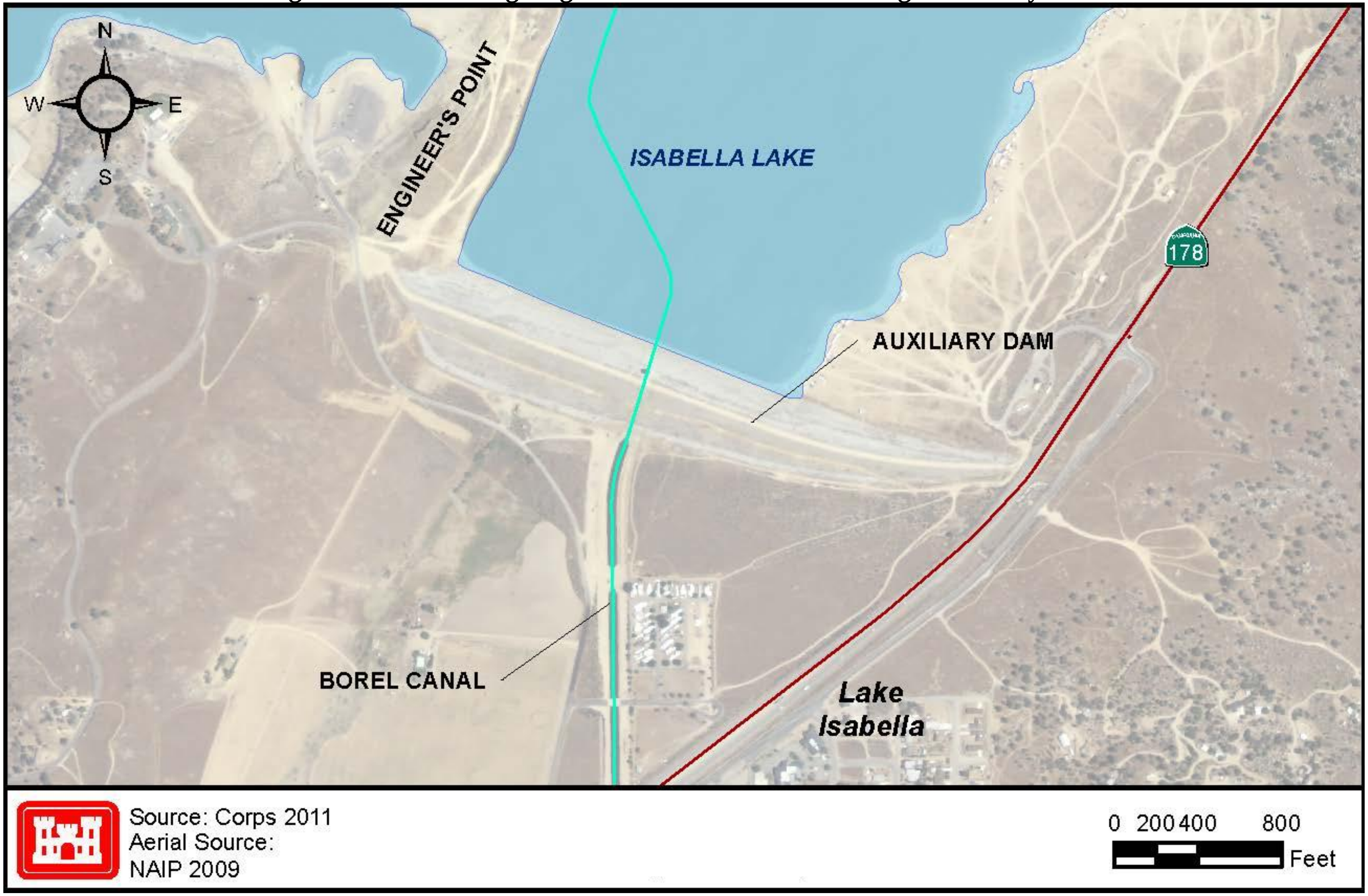


Figure 2-9 Existing Alignment of Borel Canal Through Auxiliary Dam



Under the Alternative Base Plan the existing Borel Canal conduit through the Auxiliary Dam and control tower would be taken out of operation and abandoned. A replacement Borel Canal alignment would be constructed through the right abutment of the Auxiliary Dam with an approximate diameter of 12-feet. The new tunnel would connect the existing submerged Borel Canal in the lake (upstream of the Auxiliary Dam) to the existing exposed Borel Canal downstream of the Auxiliary Dam (Figure 2-10).

The rock materials needed to complete the new tunnel, portals, and connections would come from the excavation of the tunnel and proposed Emergency Spillway. The concrete needed for the upstream portal, the tunnel lining, and the downstream portal and connection to the existing Borel Canal would be supplied from the ready-mix plant on Hwy 178.

Also with this alternative, a temporary rock-fill coffer dam might be required (depending on reservoir elevation at the time of construction) upstream of the Auxiliary Dam in the area where the right abutment joins Engineers Point (Figure 2-11). This temporary coffer dam would be required in order to sufficiently dewater the area needed for construction of the upstream portal of the new tunnel. The rock materials needed to construct the temporary coffer dam would come from the excavation of the proposed Emergency Spillway or from Engineers Point. After the construction of the upstream portal and tie-in to the existing canal in the reservoir is complete, the temporary coffer dam would be removed and the materials would be used to construct the proposed upstream berm on the Auxiliary Dam.

This Alternative Base Plan (RMP#3) has been carried forward and analyzed in detail in this Draft EIS.

2.3.5 RMP#4: Alternative Plan 1

Under this alternative, all of the seismic, hydrologic, and seepage deficiencies remediated under the Alternative Base Plan would be included, plus additional remediation measures identified for the Main Dam. The additional remediation measures for the Main Dam would include the following:

- Constructing a full-height filter and drain (rather than a filter only near crest as is described under the Alternative Base Plan) on the downstream slope of the dam to further protect the structure from potential settlement cracking and seepage during and following a seismic event (Figures 2-14 and 2-15).
- Constructing a toe filter/drain system to capture and collect seepage.
- Constructing a Roller-Compacted Concrete (RCC) Overlay on the center portion of the Main Dam, to provide an additional emergency spillway to control any overtopping of the dam from a very large and extremely rare storm event (such as the PMF). The RCC overlay would be constructed over the full-height filter and drain on the downstream face of the dam (Figures 2-14 and 2-15).

Figure 2-10 Borel Canal Relocation Through Right Abutment of Auxiliary Dam

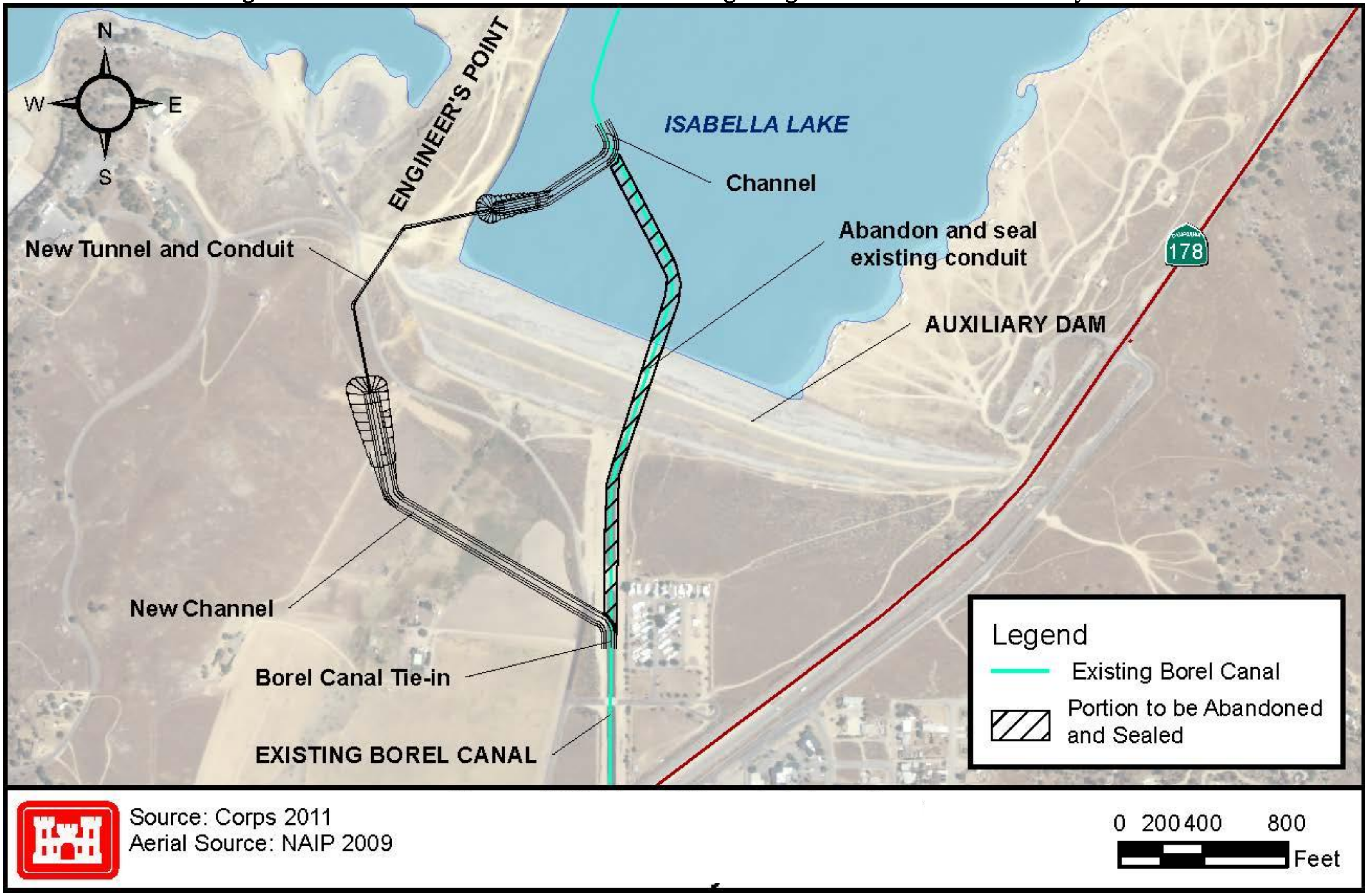


Figure 2-11 Plan View Sketch of Temporary Coffer Dam (Alternative Base Plan, Alternative Plan 1, and Alternative Plan 2)

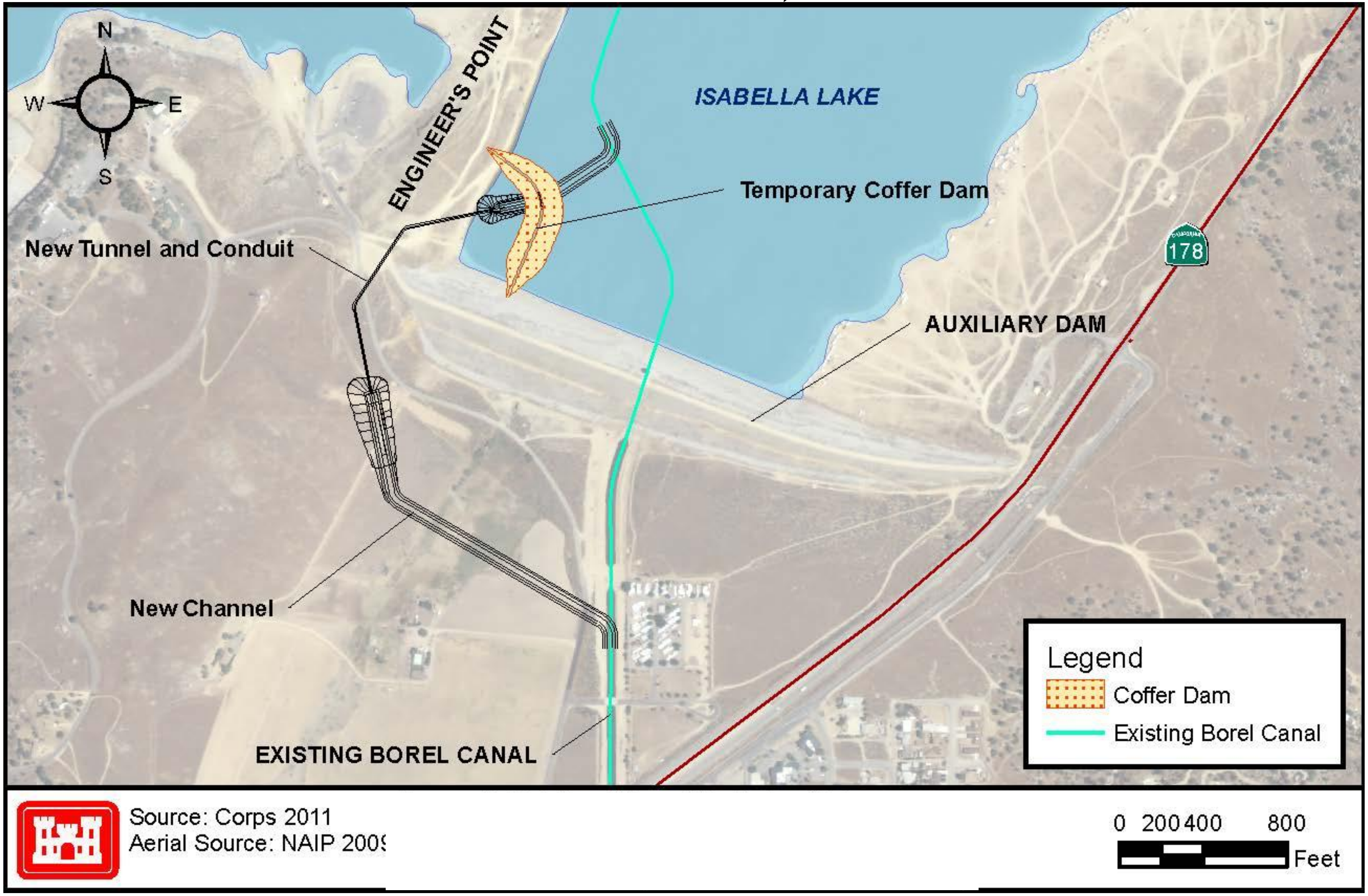
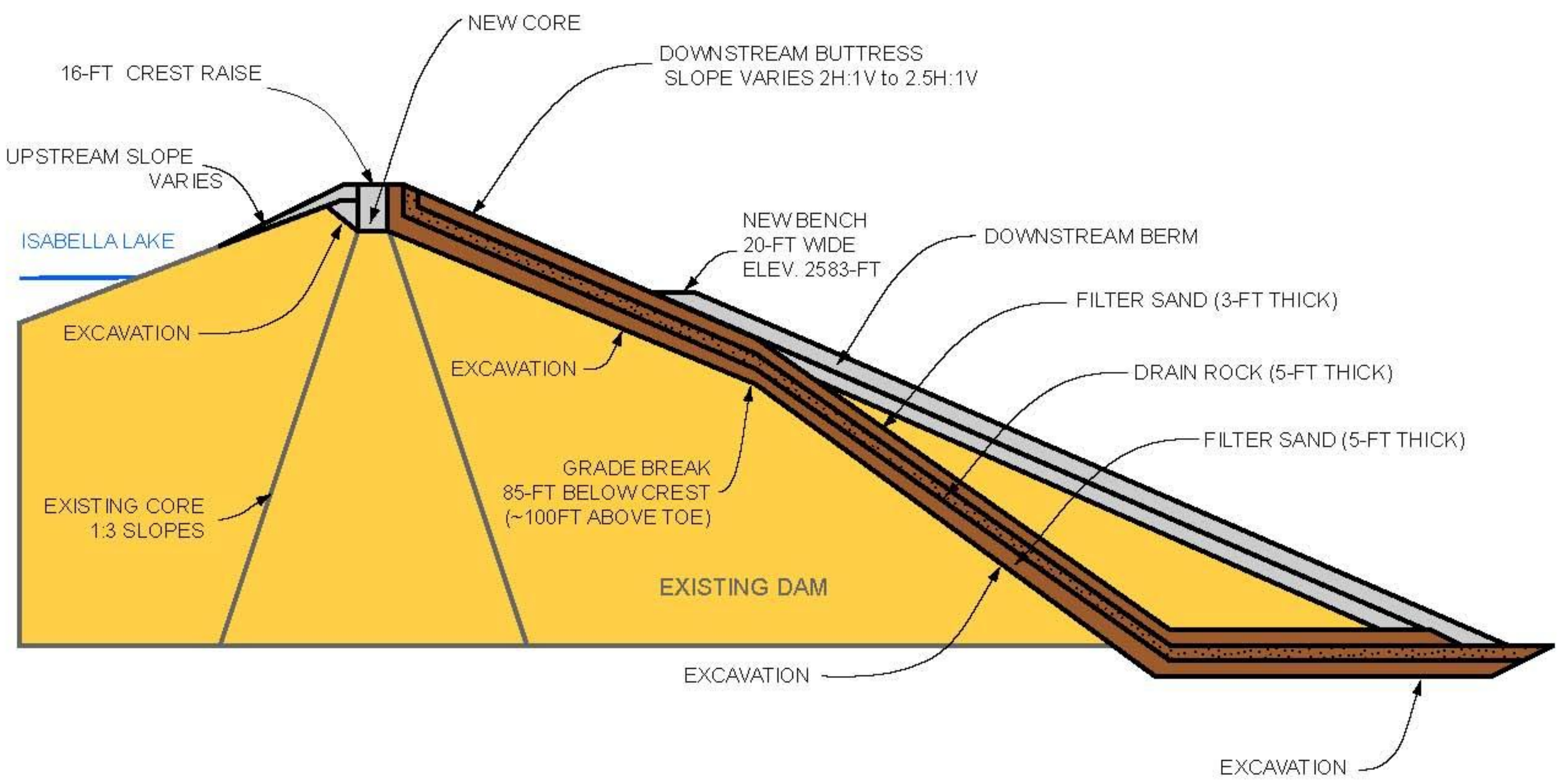


Figure 2-12 Cross-Section View of Main Dam with Full-Height Filter (Alternative Plans 1, 2, 3 and 4)



Source: Corps 2011

-Not to Scale-

Figure 2-13 Plan View Sketch of Main Dam with Full-Height Filter (Alternative Plans 1, 2, and 3)

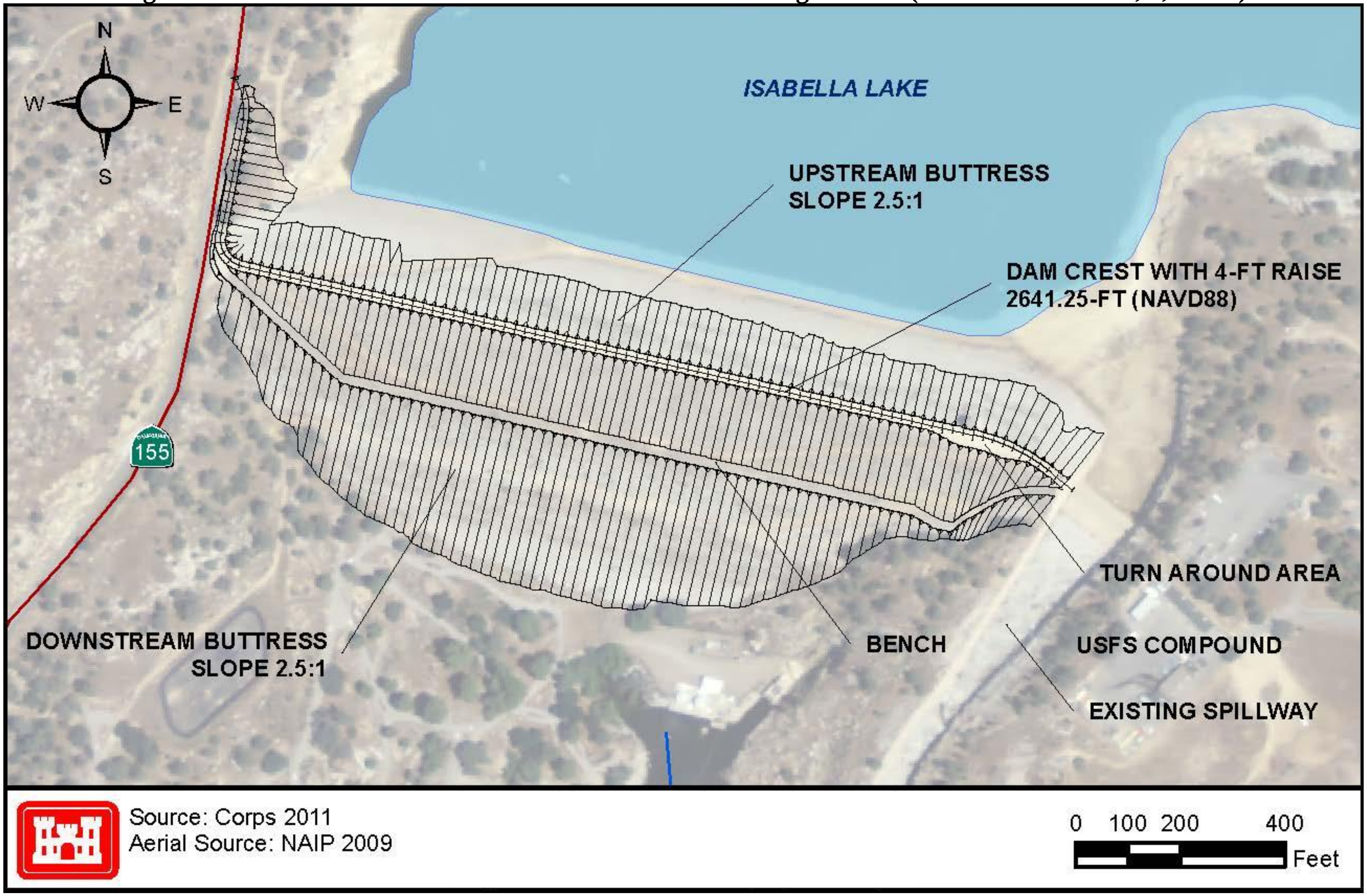
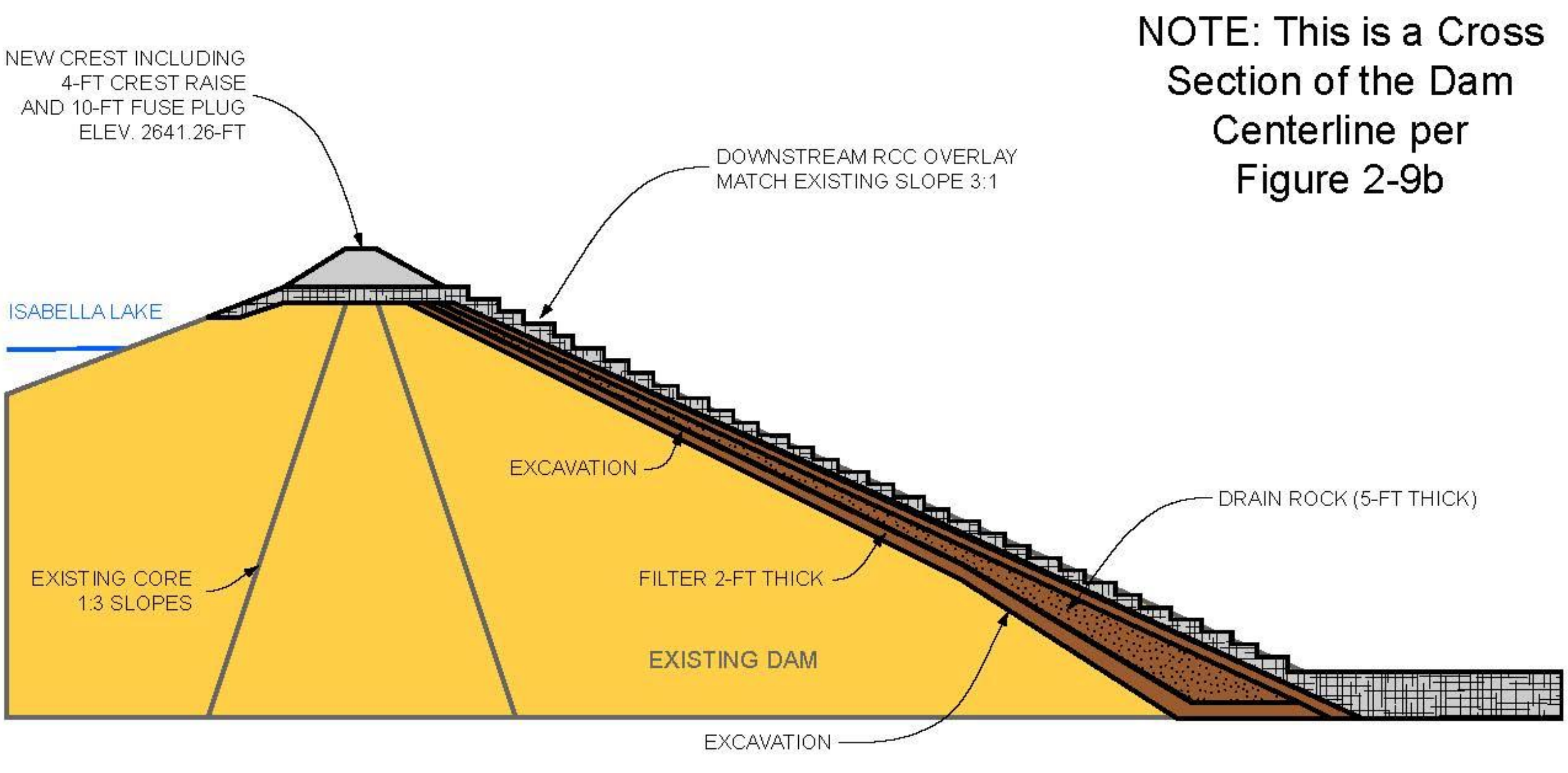


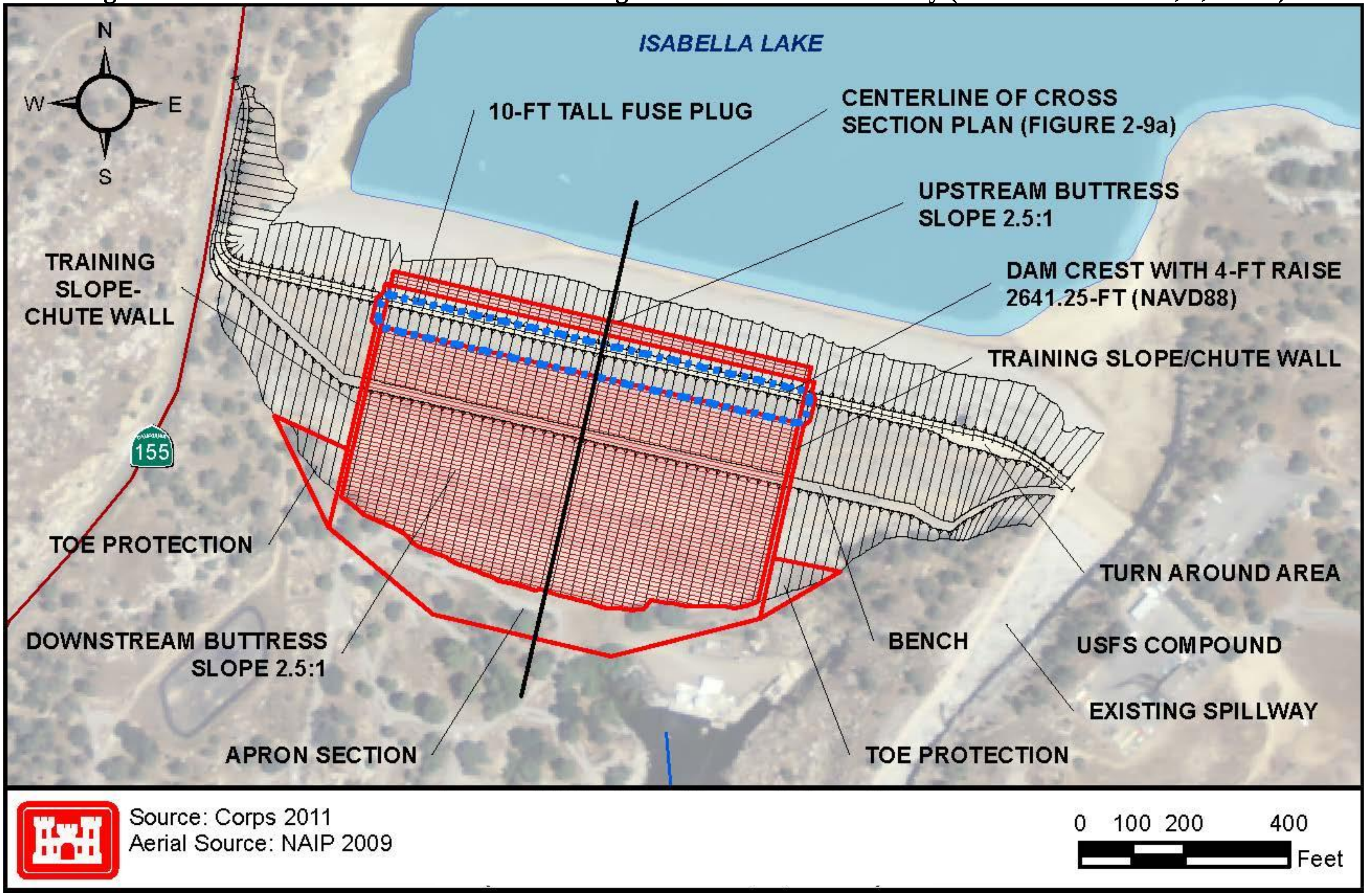
Figure 2-14 Cross-Section View of Main Dam Full-Height Filter with RCC Overlay (Alternative Plans 1, 2, and 3)



Source: Corps 2011

-Not to Scale-

Figure 2-15 Plan View of Main Dam Full-Height Filter with RCC Overlay (Alternative Plans 1, 2, and 3)



The 800-foot long RCC Overlay would be constructed from the toe up in 2-foot sections (or rises), and would likely incorporate a 10-foot high earthen fuse plug at the top of the overlay, at the same level as the Main Dam crest. The fuse plug would be designed to erode out if an extreme (and unlikely) storm event threatened an overtopping from near-crest lake levels. As the fuse plug was eroding out, the RCC overlay would manage any overtopping without compromising dam integrity. The RCC concrete would be placed using a concrete pump with a concrete mixture of fine and coarse aggregates and water from on-site sources (e.g., the two sand borrow areas, Emergency Spillway excavation, and lake), with cement and fly ash from sources near Barstow. The needed concrete would be prepared in a temporary (and portable) on-site Batch Plant set up in the Emergency Spillway excavation area. The approximate quantity of RCC concrete required would be 125,000 cubic yards.

Alternative Plan 1 (RMP#4) has been carried forward and analyzed in detail in this Draft EIS.

2.3.6 RMP#5: Alternative Plan 2

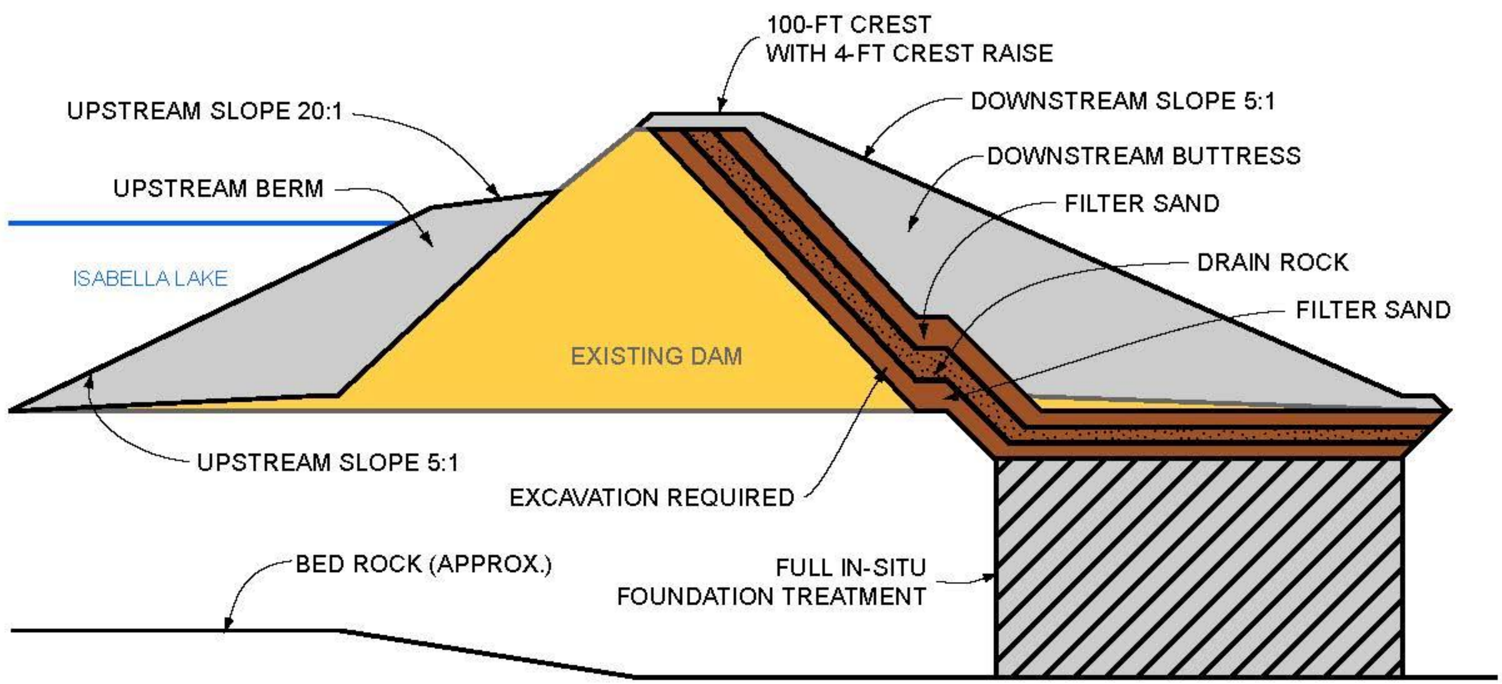
Under this alternative, all of deficiencies remediated under Alternative Plan 1 would be included, plus additional remediation measures for the Auxiliary Dam. These additional remediation measures for the Auxiliary Dam would include the following (Figures 2-16 and 2-17):

- Adding a larger downstream buttress to the dam (top width of 100 feet, instead of 80 feet as under Alternative Base Plan and Alternative Plan 1), and a more extensive filter and drain system than was proposed for the Alternative Base Plan and Alternative Plan 1, to improve fault rupture, seismic stability, and seepage control.
- Providing a complete in-situ treatment of the deeper alluvial soil foundation (instead of only shallow treatment as under Alternative Base Plan and Alternative Plan 1) under the downstream slope with a bentonite and cement slurry to further insure stability of the dam during a seismic event.

The additional rock materials needed to complete the larger downstream buttress on the Auxiliary Dam would come from the excavation of the Emergency Spillway. The sand material required to construct the larger filter on the downstream slope of the Auxiliary Dam would come from the two borrow sources (if sufficient materials cannot be generated from the auxiliary spillway excavation): Auxiliary Dam Recreation Area and South Fork Delta area. The cement and bentonite needed for the additional Auxiliary Dam remediation measures such as the deep in-situ soil treatment would be supplied from the Barstow area, and mixed on site.

Alternative Plan 2 (RMP#5) has been carried forward and analyzed in detail in this Draft EIS.

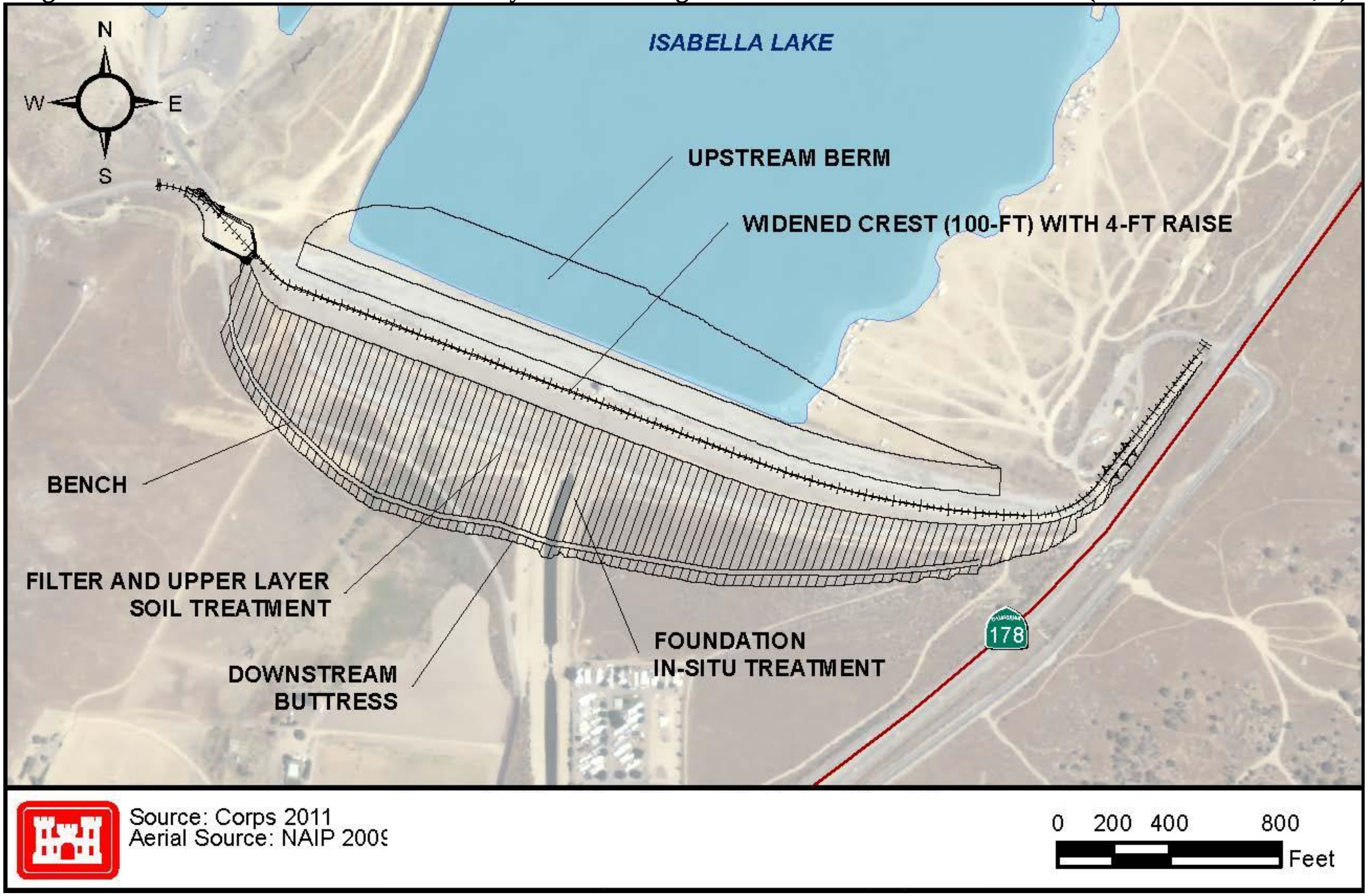
Figure 2-16 Auxiliary Dam Showing Full Set of Remediation Measures (Alternative Plans 2, 3)



Source: Corps 2011

-Not to Scale-

Figure 2-17 Plan View Sketch of Auxiliary Dam Showing Full Set of Remediation Measures (Alternative Plans 2, 3)



2.3.7 RMP#6: Alternative Plan 3

Under this alternative, all of the seismic, hydrologic, and seepage deficiencies remediated under Alternative Plan 2 would be included, plus additional remediation measures for the Main Dam. The additional remediation measures for the Main Dam would include the following:

- Adding a steel lining to the Main Dam Control Tower to better withstand an extreme seismic loading.
- Adding concrete fill to the downstream side of the Main Dam Exit Portal Structure to increase seismic stability.

Also with this alternative, instead of relocating the Borel Canal conduit through the Right Abutment of the Auxiliary Dam (as is the case for the Alternative Base Plan and Alternative Plans 1, 2 and 4), a new Borel conduit would be constructed to connect from a new structure at the Main Dam outlet works via an approximate 10-foot diameter tunnel passing under the existing and proposed spillways, and connecting to the existing Borel Canal alignment downstream of the Auxiliary Dam (Figure 2-18).

Because this alternative does not require an upstream connection to the Borel Canal, the construction of a temporary coffer dam is not needed, as is the case for the Alternative Base Plan and Alternative Plans 1, 2, and 4.

Finally, with this alternative the existing Borel Canal conduit through the Auxiliary Dam would be deactivated, sealed and abandoned, and the use of the existing Borel Canal upstream of the Auxiliary Dam would no longer be needed for water delivery. The existing Borel Canal that traverses Isabella Lake would be removed.

The rock materials needed to complete the new tunnel-conduit and connections from the Main Dam outlet would come from the tunnel excavation and/or the excavation of the Emergency Spillway. The concrete needed for the new structure at the Main Dam Outlet, the tunnel lining, and the downstream portal and connection to the existing Borel Canal would be supplied from the ready-mix concrete plant on Hwy 178.

Alternative Plan 3 (RMP#6) has been carried forward and analyzed in detail in this Draft EIS.

2.3.8 RMP#7: Alternative Plan 4

Under this alternative, all of the seismic, hydrologic, and seepage deficiencies remediated under the Alternative Base Plan would be included, plus additional remediation measures identified for the Existing and Emergency Spillways, Main Dam, and Auxiliary Dam, to accommodate up to a 16-foot crest raise for the hydrologic overtopping deficiency (see Figures 2-5, 2-6, 2-7, 2-12, 2-13, 2-19 and 2-20) . In addition, both State Highways 155 and 178 will need to be modified to accommodate a 16-foot crest raise (see Figure 2-21)

Figure 2-18 Borel Canal Relocation From Main Dam Outlet Through Engineers Point Ridge

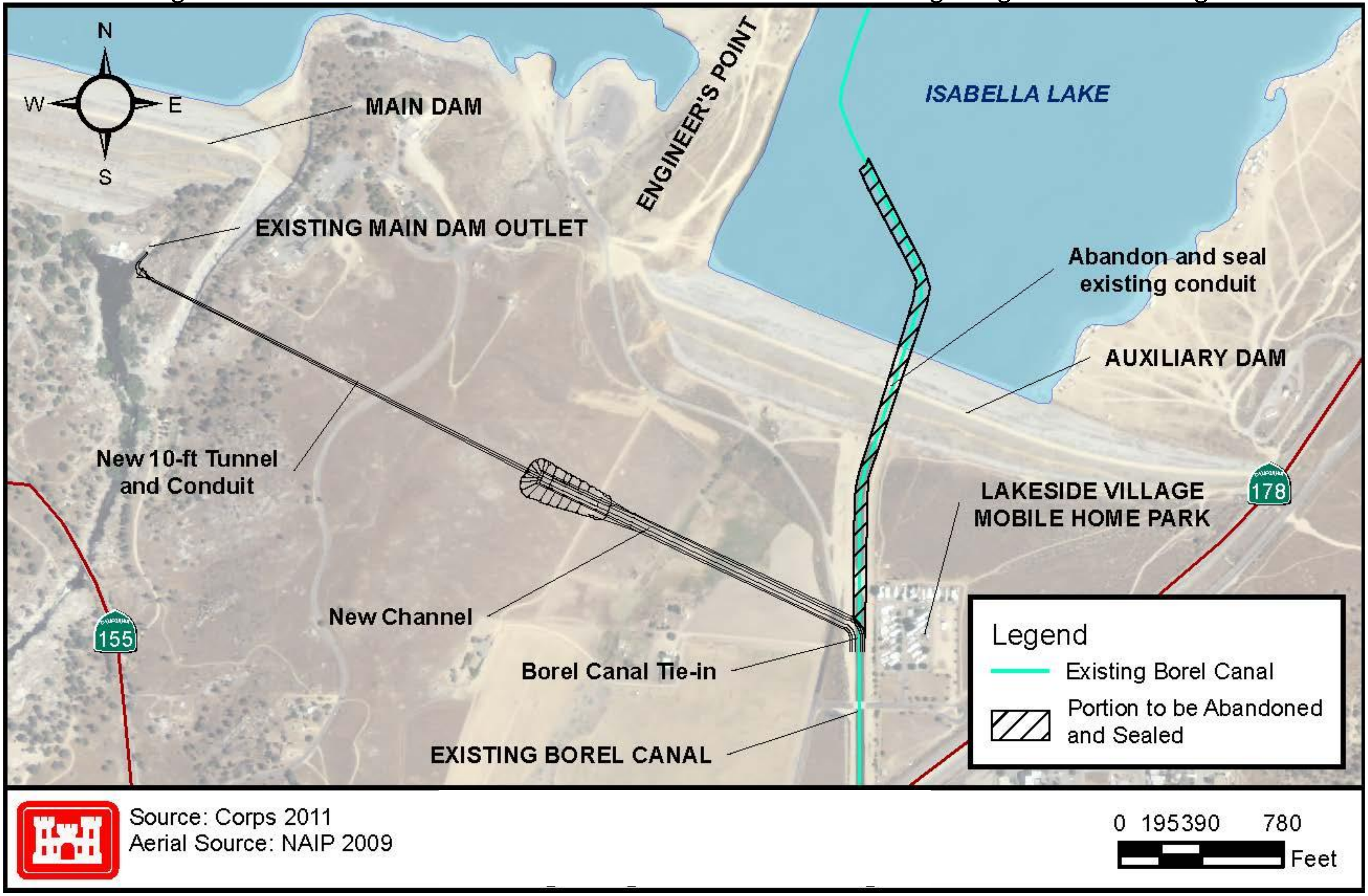


Figure 2-19 Plan View Sketch of Auxiliary Dam Remediation Measures (Alternative Plan 4)

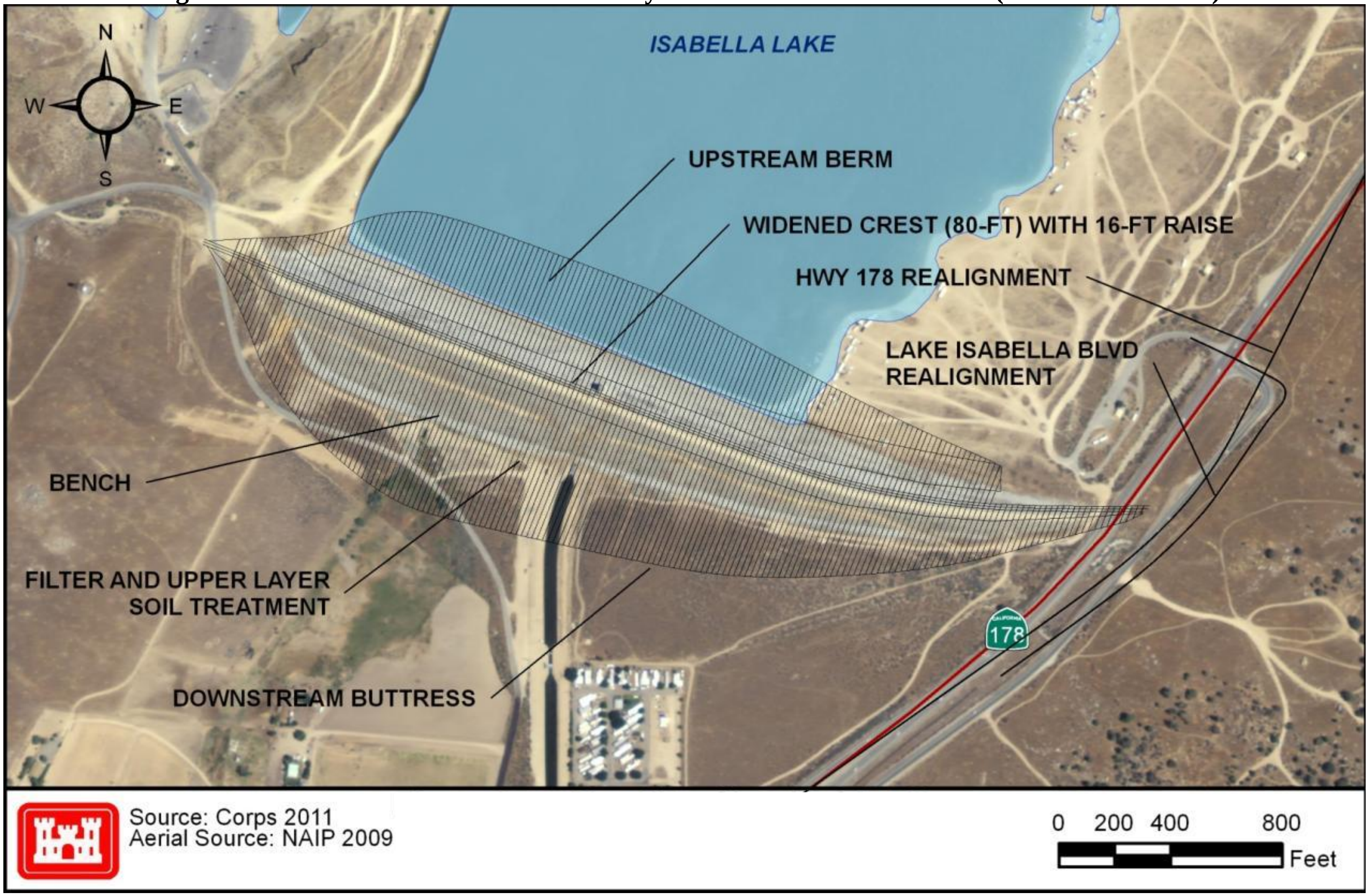


Figure 2-20 Plan View Sketch of Main Dam with Full-Height Filter (Alternative Plan 4)

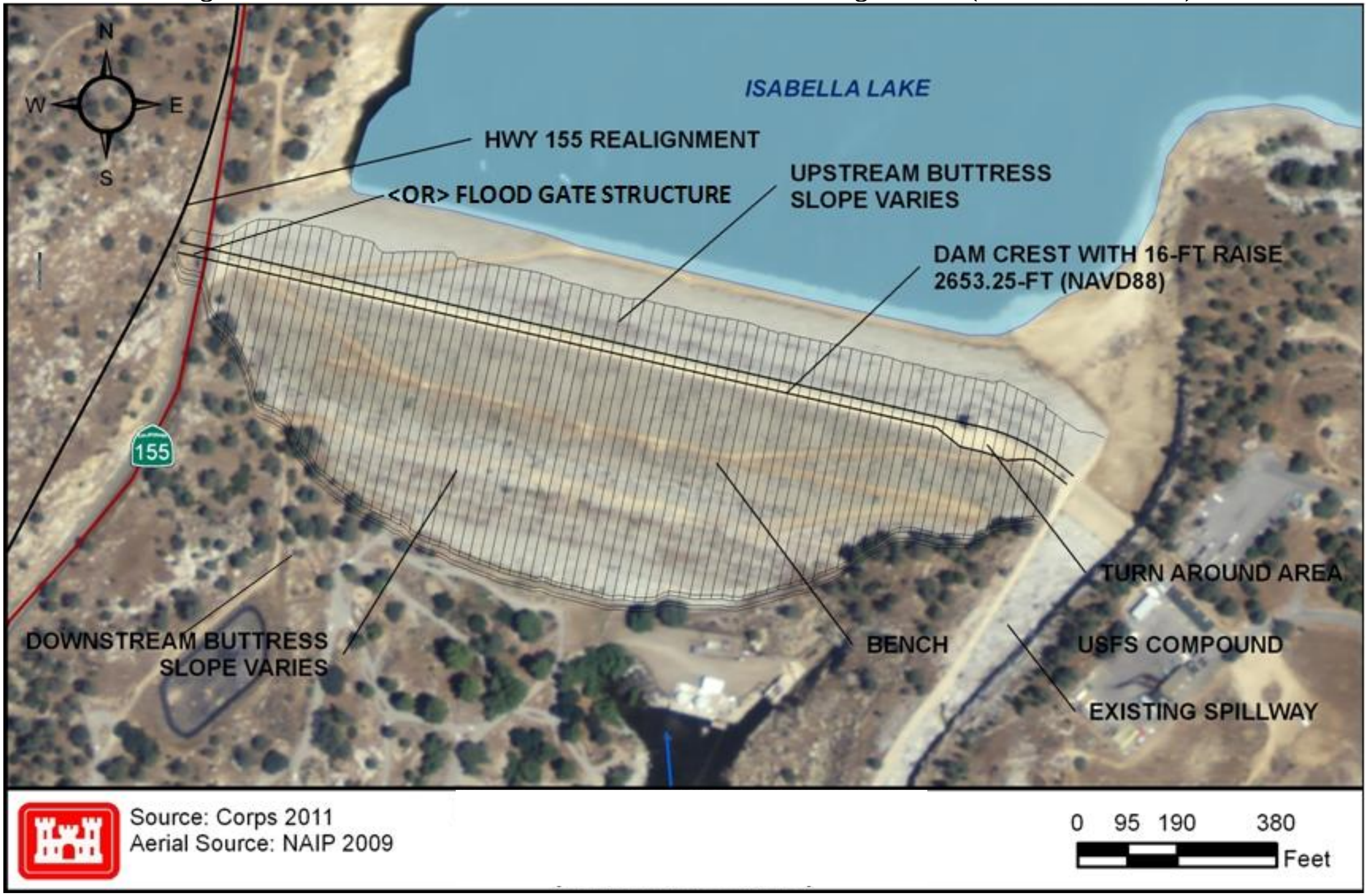
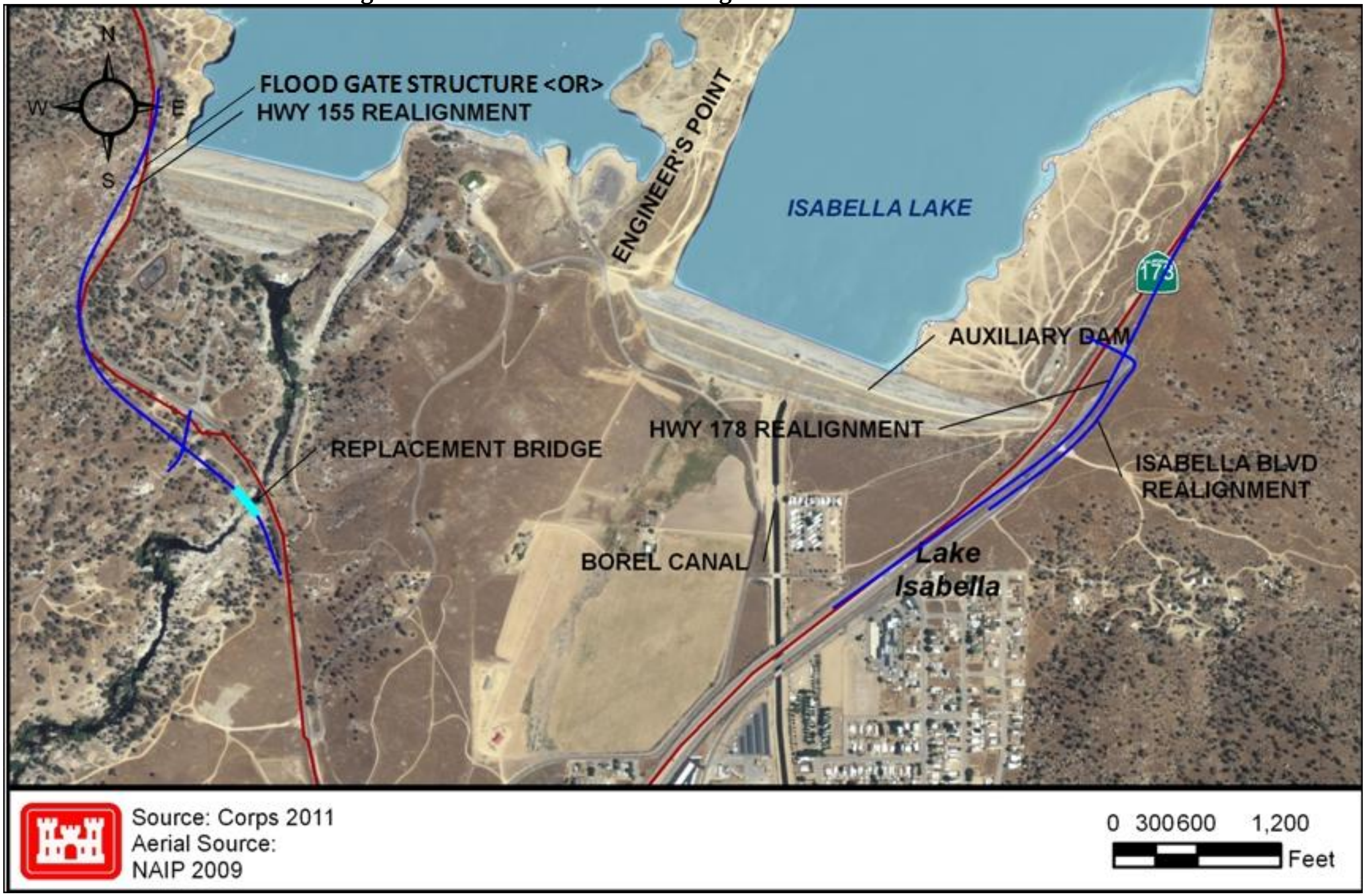


Figure 2-21 Potential Road Realignments for Alternative Plan 4



The additional measures on the Existing and Emergency Spillway would include:

- Raising of the left and right spillway walls by 16 feet on the Existing Spillway
- Anchors to the existing spillway wall and ogee crest for the additional head during operation.

The Corps has determined that the existing spillway along the east side of the Main Dam cannot safely pass an extreme storm event (such as the PMF). It is a requirement that all Corps dams be able to safely pass the PMF, with freeboard for wind and wave run-up. Therefore, this alternative includes the construction of a new "Emergency Spillway", approximately 900-feet-wide, that would be located approximately one-hundred feet east of the existing spillway (Figure 2-5). The additional spillway would be required to remediate the hydrologic deficiency (undersized capacity of the existing spillway) that could lead to overtopping of the dams, with failure of one or both dams which would cause extreme consequences downstream. This Emergency Spillway would function independently from the existing spillway, and would begin to function around elevation 2637.26 feet NAVD 88 (currently the top of dam elevation), which is 28.0 feet higher than existing spillway. The new emergency spillway would have a labyrinth type weir with v-shaped concrete baffles and a concrete apron. It would be designed to dissipate energy and control the rate of outflow through the spillway channel (see Figures 2-5 and 2-6).

The crest elevation for the Main and Auxiliary Dam would be raised approximately 16 feet in order to provide for passage of the PMF without overtopping and also for the purpose of not causing increased downstream consequences from passing additional flows. The 16 foot raise will also provide 4-feet of freeboard under the PMF event. Only in extreme storms would the reservoir rise to an elevation at which the Emergency Spillway would operate, with the annual probability of reaching this elevation being approximately 1 in 4,700. Outflows associated with pool elevations up to the 1 in 4,700 annual probability would be handled solely by the existing spillway. The emergency spillway will operate for frequencies at or near the current frequency of overtopping in order to minimize downstream consequences. It is noted that routing of the PMF with the dams as currently constructed results in an overtopping of both dams of 10.04 feet (nonfail condition), or a reservoir pool elevation of 2647.30 (NAVD 88). Under this alternative the PMF pool is estimated at 2649.26 (NAVD 88), or an increased maximum pool elevation of 1.96 feet. This would only occur under the PMF flood event, which is estimated as having a 1 in 10,000 probability of occurrence in any given year. Figure 2-22 displays the projected reservoir levels under Alternative Plan 4 as well as reservoir levels for the very low probability PMF storm event under the No Acton Alternative and Alternative Plan 4.

Under this alternative the spillway will be the primary source for all borrow material (filters, drains, random/rockfill, and riprap) for the Main Dam and Auxiliary Dam Modifications.

Figure 2-22 Reservoir Levels under Alternative Plan 4 and compared to the No Action PMF condition

The additional remediation measures for the Main Dam would include the following:

- Constructing a full-height filter and drain (rather than a filter only near crest as is described under the Alternative Base Plan) on the downstream slope of the dam to accommodate a 16-foot crest raise and to further protect the structure from potential settlement cracking and seepage during and following a seismic event.
- Constructing a toe filter/drain system to capture and collect seepage.
- The Main Dam control tower and access to the existing facility would also be raised 16-feet to match the increased dam crest elevation. Access to the raised tower would be provided by retaining walls and backfill material of the Main Dam.

The additional remediation measures for the Auxiliary Dam would include the following:

- A taller downstream buttress for the 16-foot crest raise and a slightly steeper downstream slope near the crest.

Hwy 178 would be realigned to the south of the Auxiliary Dam to accommodate the 16-foot raise on the left abutment. The relocation length would be approximately 0.8 miles. The realignment would begin in the 4-lane freeway section near PM R43.8 which is about 0.9 mile east of Route 155. The alignment would then swing south of the existing highway location and Lake Isabella Boulevard in order to allow room for the Auxiliary Dam extension. The maximum shift is about 215 feet south of the existing highway centerline. The alignment would then curve back to meet the existing highway near PM 45.8, which is about 1,500 feet east of the present Lake Isabella Boulevard/Dam Road intersection or 1.7 miles east of Route 155. The Lake Isabella Boulevard/Dam Road connection would be reconstructed at its existing location.

Hwy 155 would also be modified to accommodate the 16-foot raise on the right abutment of the Main Dam. Two alternatives are currently being considered for Hwy 155. The first option would include realigning Hwy 155 to a higher elevation north of the Main Dam. The realignment would begin at just upstream of the Main Dam and would shift to the west, but parallel to the current highway alignment to the bridge at the Kern River. The length of relocation would be approximately l.0 mile. The maximum shift of the alignment would be about 240 feet near Keyesville Road. The realignment would require a new bridge across the Kern River to allow for a maximum grade of 6 percent. The realignment would also include an uphill passing lane. The second option for Hwy 155 would not include realignment of the highway and would not change the grade and elevation of the roadway over the right abutment of the Main Dam. The second option would include about a 16-foot high flood gate on the right abutment near existing centerline of the Main Dam. The flood gate would be used to close off the low point for extreme flood events and would prevent travel on Hwy 155 for those rare events. The gate structure would include a concrete gravity retaining wall adjacent to the Main Dam and a concrete support wall near the existing rock face cut. The gate would either consist of a permanent swing gate or a gate that would be stored on the abutment and erected when needed. Access to this gate during extreme flood events may be limited, which could have a significant impact on the reliable operation of the gate.

Currently, the preferred option for modifying Highway 155 is the flood gate option; therefore, the analysis of impacts for Alternative Plan 4 discussed in this Draft EIS assume the flood gate as the modification feature to be implemented for Highway 155. However, if during the detailed design phase of the project it is determined that another option for modifying Highway 155 is preferred, supplemental NEPA documentation would be prepared as necessary.

Alternative Plan 4 (RMP#7) has been carried forward and analyzed in detail in this Draft EIS.

2.3.9 RMP#8: Removal of Structure

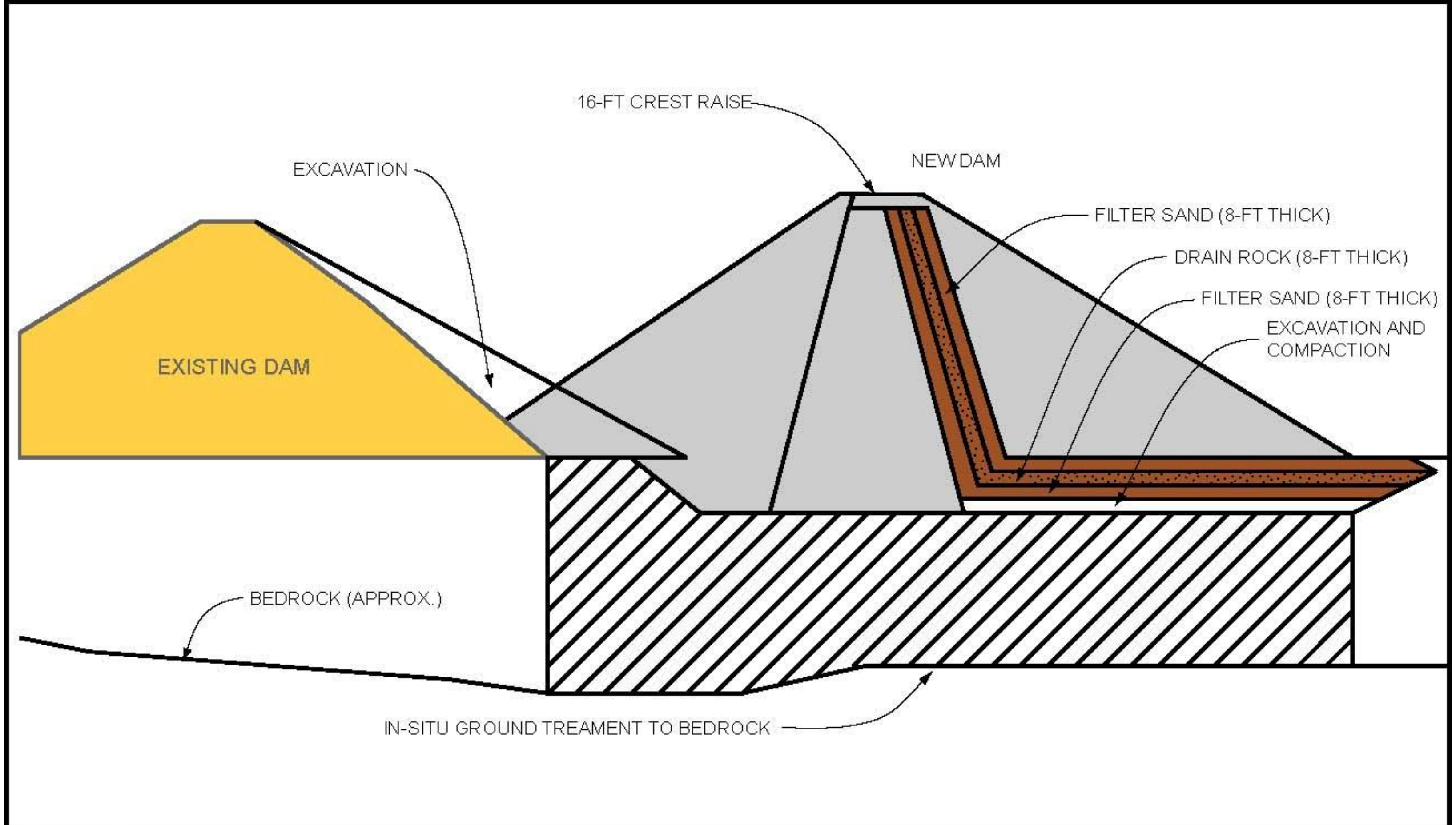
Under this alternative, the Main Dam would be removed to allow Isabella Lake to drain and to allow flow in the North Fork and South Fork channels and Main Stem of the Kern River to return over time to preconstruction conditions. For this alternative it would not be necessary to remove any of the Auxiliary Dam, since the Kern River channel flows through the Main Dam only, whose outlet is at the lowest elevation in the lake. The intake tower and outlet structures at the Main Dam would be decommissioned. The material excavated from the Main Dam would be placed in the lake area according to a prescribed plan. The Borel Canal, which traverses the lake area and passes through the Auxiliary Dam, would be maintained for use by Southern California Edison (SCE), as it is at present. The Borel Canal has existed in its present location since the early 1900s, long before the Isabella Dams were constructed, and has continued to supply water for downstream power generation by SCE.

Although this Removal of Structure alternative has been initially considered, it has not been evaluated in detail in this Draft EIS. The basis for this decision is presented in Section 2.3.11.

2.3.10 RMP#9: Replacement of Structure

Under this alternative, the Auxiliary Dam would be replaced with a modern structure built to current engineering design and construction standards. Replacement would involve constructing a new earth fill dam just downstream of the existing dam, removing the existing dam, and relocating the existing Borel Canal conduit to a new tunnel-conduit constructed through the right abutment of the replacement dam. The footprint of the replacement dam would overlap the existing Auxiliary Dam downstream buttress. The construction-remediation process would include removal and replacement of the upper 25 to 30 feet of soil, and in-situ treatment of the deeper soil and rock materials within the replacement dam's footprint (Figures 2-23 and 2-24).

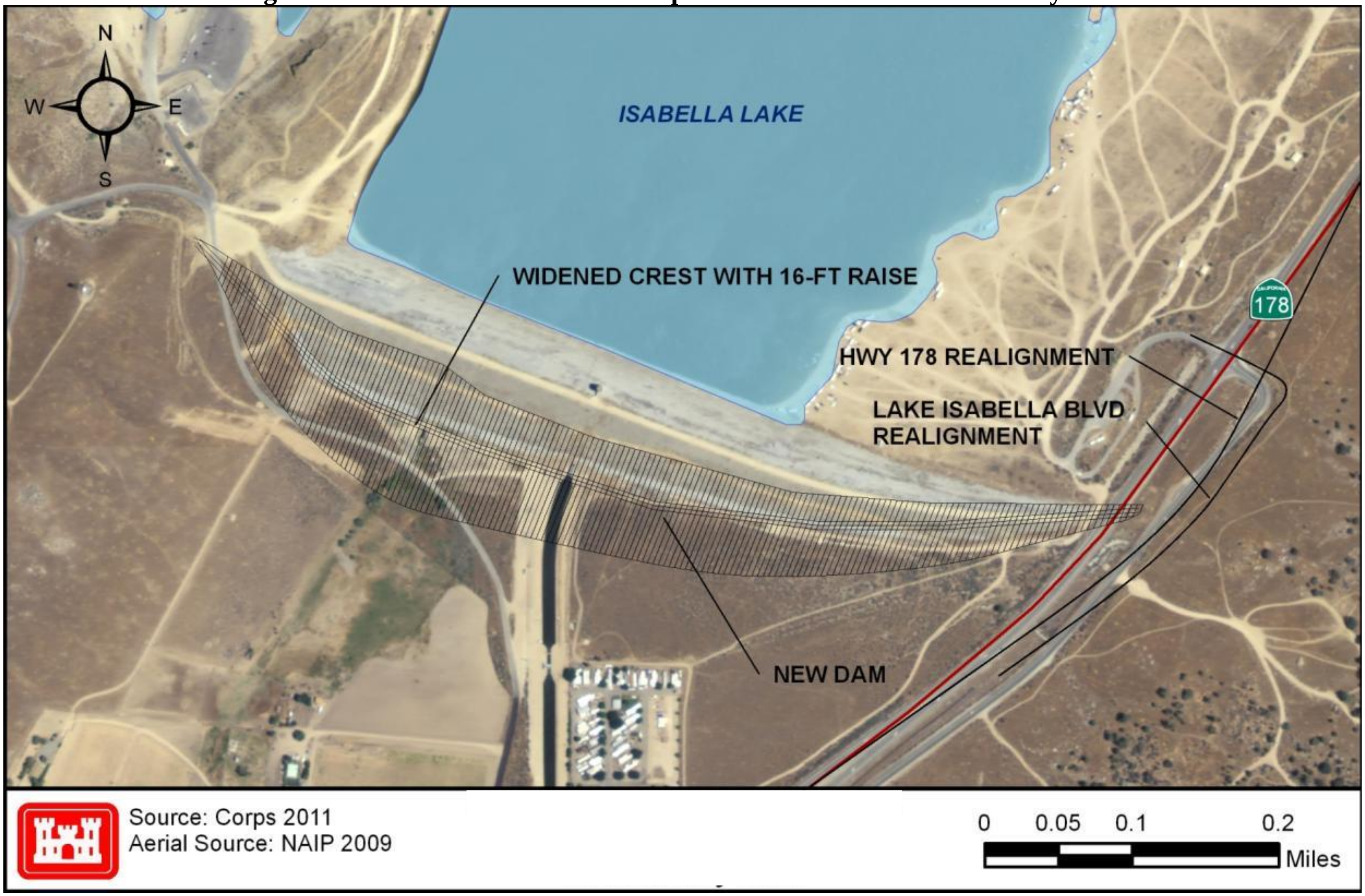
Figure 2-23 Cross-Section View of Replacement Measures for Auxiliary Dam (RMP#8)



Source: Corps 2011

-Not to Scale-

Figure 2-24 Plan View Sketch of Replacement Measures for Auxiliary Dam



Except for the complete replacement of the Auxiliary Dam, this alternative would include the array of remediation measures included with Alternative Plan 2, plus the additional measures on the Main Dam tower and outlet structures described for Alternative Plan 3, and a top elevation of dam similar to that in Alternative Plan 4.

Although this Replacement alternative has been initially considered, it has not been evaluated in detail in this Draft EIS. The basis for this decision is presented in the next section (Section 2.3.11).

2.3.11 Alternatives Considered but Not Analyzed in this Draft EIS

Three of the nine alternatives discussed previously in this section – **RMP#2 Making the IRRM Permanent**, **RMP#8 Removal of Structure**, and **RMP#9 Replacement of Structure** – have been initially considered and assessed by the Corps, but not carried forward for detailed analysis in this Draft EIS. The bases for these decisions are as follows:

- ***RMP#2 – Making the IRRM Permanent*** – The IRRM is a deviation from the Isabella Lake water control manual that lowers the gross pool level of the lake by 20 feet from April to October of each year. This restricted elevation reduces the maximum storage capacity of the lake by 37 percent and reduces the surface area of the lake that would be otherwise available for recreation. While partially reducing the likelihood of dam failure, tolerable risk guidelines are not achieved. The Corps is not willing to accept this risk and, therefore, did not consider this alternative viable.
- ***RMP#8 – Removal of Structure*** – This alternative would involve removing the Main Dam to allow Isabella Lake to drain and to allow flow in the North Fork and South Fork channels and main stem of the Kern River to return over time to preconstruction conditions. This alternative is not considered viable because of the resulting annual flood damages and lives at risk downstream; the loss of irrigation and power generation; and the cost of removal and waste generation. In general, the overall cost of this RMP, including the cost of mitigating for impacts, would be up to five times greater than the Action Alternatives brought forward for further analysis.
- ***RMP#9*** – ***Replacement of Structure*** – This alternative would involve removing the existing earth fill Auxiliary Dam and replacing it with a new earth fill dam constructed to modern standards to protect against all deficiencies identified, and to achieve the best safety rating applied to Corps dams nation-wide. This alternative would also include relocating the Borel Canal conduit through the right abutment of the replacement dam, a full retrofitting of the Main Dam and existing spillway, an RCC Overlay on the Main Dam, plus an additional Emergency Spillway. The Corps does not consider this alternative viable because it is believed that lower cost alternatives, up to 25 percent less cost, would effectively reduce risk; therefore the extra costs are not justified.

2.3.12 Alternatives Carried Forward and/or Analyzed in Detail in this Draft EIS

In accordance with NEPA CEQ guidelines, the **No Action** alternative (RMP#1) has been carried forward in this Draft EIS to provide a baseline for comparison with the five Action Alternatives analyzed in this Draft EIS.

The five Action Alternatives carried forward and analyzed in detail in this Draft EIS include:

- **RMP#3 – Alternative Base Plan**;
- **RMP#4 – Alternative Plan 1**;
- **RMP#5 – Alternative Plan 2**;
- **RMP#6 – Alternative Plan 3; and**
- **RMP#7 – Alternative Plan 4**.

These five RMPs are generally similar in their approach and in the group of measures applied to remediate deficiencies identified in the Isabaella DSM Study. However, as was described previously in Sections 2.3.4 through 2.3.8, the alternatives mainly differ as to the number of measures applied and the extent to which some of the remediation measures are applied (balancing risk reduction and cost), and in the approach to relocating the Borel Canal. These differences are generally captured in the way each succeeding alternative from the Alternative Base Plan to Alternative Plan 3 includes the measures from the proceeding alternative plus some additional measures, or more extensive applications of measures. In Table 2-1, the main differences and similarities are highlighted between the five Action Alternatives analyzed in this Draft EIS.

In identifying and analyzing the potential environmental impacts associated with the five Action Alternatives, the differences between the alternatives mainly show up in the different quantities of materials required for particular measures, the varying lengths of the construction periods associated with these measures, and the numbers and types of the construction equipment required. Also, it can be expected that these differences could result in variances between the alternatives as to the type, level, and duration of impacts on some of the environmental resources analyzed. The potential impacts on environmental resources associated with the five Action Alternatives and their inherent differences are further identified, discussed, and analyzed in Chapter 3. The Corps will identify a preferred alternative in the Final EIS upon full consideration of public and agency comments of the alternatives considered in Draft EIS.

Table 2-1
Comparison of the Five Action Alternatives (Alternative Base Plan, Alternative Plan 1, Alternative Plan 2, Alternative Plan 3, Alternative Plan 4)

STRUCTURE	ALTERNATIVE BASE PLAN (RMP#3)	ALTERNATIVE PLAN 1 (RMP#4)	ALTERNATIVE PLAN 2 (RMP#5)	ALTERNATIVE PLAN 3 (RMP#6)	ALTERNATIVE PLAN 4 (RMP#7)
MAIN DAM					
General:	Includes a 4-ft crest raise, filter and drain near crest.	Includes a 4-ft crest raise, full-height filter and drain, excavated filter and drain at downstream toe, and 800-ft wide RCC Overlay.	Includes a 4-ft crest raise, full-height filter and drain, excavated filter and drain at downstream toe, and 800-ft wide RCC Overlay.	Includes a 4-ft crest raise, full-height filter and drain, excavated filter and drain at downstream toe, 800-ft wide RCC Overlay, and retrofit of tower and outlet structures.	Includes a 16-ft crest raise, full-height filter and drain, excavated filter and drain at downstream toe.
Excavation and Materials:					
Total Excavation	42,446 CY	390,940 CY	390,940 CY	390,940 CY	410,500 CY
Core; Drain; Random Fill	50,379 CY	260,120 CY	260,120 CY	260,120 CY	286,150 CY
Filter Sand	11,235 CY	336,393 CY	336,393 CY	336,393 CY	360,400 CY
Rip Rap; Roadbase	10,000 CY	10,000 CY	10,000 CY	10,000 CY	10,000 CY
RCC Overlay	Not included.	125,000 CY	125,000 CY	125,000 CY	Not included.
EXISTING SPILLWAY					
General:	Includes channel concrete surface spot treatment, anchoring along right wall, 4-foot high retaining wall added to crest of right side wall.	Includes channel concrete surface spot treatment, anchoring along right wall, 4-foot high retaining wall added to crest of right side wall.	Includes channel concrete surface spot treatment, anchoring along right wall, 4-foot high retaining wall added to crest of right side wall.	Includes channel concrete surface spot treatment, anchoring along right wall, 4-foot high retaining wall added to crest of right side wall.	Includes channel concrete surface spot treatment, anchoring along right wall, 16-foot high retaining wall added to crest of both right side and left side walls.

STRUCTURE	ALTERNATIVE BASE PLAN (RMP#3)	ALTERNATIVE PLAN 1 (RMP#4)	ALTERNATIVE PLAN 2 (RMP#5)	ALTERNATIVE PLAN 3 (RMP#6)	ALTERNATIVE PLAN 4 (RMP#7)
Materials:					
Concrete	1,500 CY	1,500 CY	1,500 CY	1,500 CY	
EMERGENCY SPILLWAY					
General:	Includes a new 290-ft. wide channel in proximity to the existing spillway cut to a maximum depth of 210 feet into Engineers Point Ridge, and rejoining the grade of the Kern River floodway downstream of the existing power generating station.	Includes the same and new channel cut into Engineers Point Ridge that rejoins the grade of the Kern River floodway downstream of the existing power generating station.	Includes the same and new channel cut into Engineers Point Ridge that rejoins the grade of the Kern River floodway downstream of the existing power generating station.	Includes the same and new channel cut into Engineers Point Ridge that rejoins the grade of the Kern River floodway downstream of the existing power generating station.	Includes the same and new 900-foot-wide channel cut into Engineers Point Ridge that rejoins the grade of the Kern River floodway downstream of the existing power generating station.
Excavation and Materials:					
Total Excavation	1,973,360 CY	1,973,360 CY	1,973,360 CY	1,973,360 CY	2,950,000 CY
Concrete	22,560 CY	22,560 CY	22,560 CY	22,560 CY	36,529 CY
AUXILIARY DAM					
General:	Includes a downstream buttress with moderate-sized filter and drain and a 80-ft top width, partial foundation treatment to a depth of 30 ft., an upstream berm, and a relocated Borel Canal (through right abutment).	Includes a downstream buttress with moderate-sized filter and drain and a 80-ft top width, partial foundation treatment to a depth of 30 ft., an upstream berm, and a relocated Borel Canal (through right abutment).	Includes a downstream buttress with an extensive full-height filter and drain and a 100-ft top width, full in-situ foundation treatment to a depth of 120 ft., an upstream berm, and a relocated Borel Canal (through right abutment).	Includes a downstream buttress with an extensive full-height filter and drain and a 100-ft top width, full in-situ foundation treatment to a depth of 120 ft., an upstream berm, and a relocated Borel Canal (from Main Dam).	Includes a downstream buttress with moderate-sized filter and drain and a 80-ft top width, partial foundation treatment to a depth of 30 ft., an upstream berm, and a relocated Borel Canal (through right abutment).

STRUCTURE	ALTERNATIVE BASE PLAN (RMP#3)	ALTERNATIVE PLAN 1 (RMP#4)	ALTERNATIVE PLAN 2 (RMP#5)	ALTERNATIVE PLAN 3 (RMP#6)	ALTERNATIVE PLAN 4 (RMP#7)
Excavation and Materials:					
Total Downstream Excavation	904,486 CY	904,486 CY	1,060, 612 CY	1,060, 612 CY	949,710 CY
Foundation Treatment:					
Upper 25-30 ft. liquefiable layer	Includes removal and replacement of existing foundation soil.	Includes removal and replacement of existing foundation soil.	Includes removal and replacement of existing foundation soil.	Includes removal and replacement of existing foundation soil.	Includes removal and replacement of existing foundation soil.
Lower 30-120 ft. Layer	Lower layer not treated.	Lower layer not treated.	Includes installation of 75 shear wall set ups, totaling 20,600 LF. This results in treatment of 160,400 CY of existing soil and rock foundation material for depths up to 70-ft. Deep soil mixing of 39,500 CY of existing soil foundation material for areas with depths greater than 70-ft.	Includes installation of 75 shear wall set ups, totaling 20,600 LF. This results in treatment of 160,400 CY of existing soil and rock foundation material for depths up to 70-ft. Deep soil mixing of 39,500 CY of existing soil material for areas with depths greater than 70-ft.	Lower layer not treated.
Downstream Buttress:					
Filter Sand	664,200 CY	664,200 CY	696,122 CY	696,122 CY	743,580 CY
Drain and Random Fill Rock	1,441,354 CY	1,441,354 CY	1,686,789 CY	1,686,789 CY	1,754,587 CY
Upstream Berm:					
Rock & Earth Fill; Rip Rap; Roadbase	520,200 CY	571,521 CY	571,521 CY	571,521 CY	571,521 CY

STRUCTURE	ALTERNATIVE BASE PLAN (RMP#3)	ALTERNATIVE PLAN 1 (RMP#4)	ALTERNATIVE PLAN 2 (RMP#5)	ALTERNATIVE PLAN 3 (RMP#6)	ALTERNATIVE PLAN 4 (RMP#7)
Unused Rock Material from Entire Project added	711,837 CY	711,837 CY	711,837 CY	711,837 CY	1,182,000 CY
BOREL CANAL					
General:	Includes relocating Borel Canal conduit through the right abutment of the Auxiliary Dam. The proposed alignment would allow the new tunnel to tie-in to the existing canal upstream and downstream of the Auxiliary Dam. Also includes sealing and abandoning the existing Borel conduit through the Auxiliary Dam. A temporary earth fill coffer dam may be required to de-water the area upstream of the right abutment of the Auxiliary Dam to facilitate construction of the upstream portal of the new tunnel-conduit.	Includes relocating Borel Canal conduit through the right abutment of the Auxiliary Dam. The proposed alignment will allow the new tunnel to tie-in to the existing canal upstream and downstream of the Auxiliary Dam. Also includes sealing and abandoning the existing Borel conduit through the Auxiliary Dam. A temporary earth fill coffer dam may be required to de-water the area upstream of the right abutment of the Auxiliary Dam to facilitate construction of the upstream portal of the new tunnel-conduit.	Includes relocating Borel Canal conduit through the right abutment of the Auxiliary Dam. The proposed alignment will allow the new tunnel to tie-in to the existing canal upstream and downstream of the Auxiliary Dam. Also includes sealing and abandoning the existing Borel conduit through the Auxiliary Dam. A temporary earth fill coffer dam may be required to de-water the area upstream of the right abutment of the Auxiliary Dam to facilitate construction of the upstream portal of the new tunnel-conduit.	Includes relocating Borel Canal with a new tunnel that would connect via a tie-in structure at the Main Dam Outlet to the existing Borel Canal downstream of the Auxiliary Dam. Also includes sealing and abandoning the existing Borel conduit through the Auxiliary Dam, and dismantling the existing Borel Canal that traverses Isabella Lake. This alternative would not require construction of a coffer dam.	Includes relocating Borel Canal conduit through the right abutment of the Auxiliary Dam. The proposed alignment will allow the new tunnel to tie-in to the existing canal upstream and downstream of the Auxiliary Dam. Also includes sealing and abandoning the existing Borel conduit through the Auxiliary Dam. A temporary earth fill coffer dam may be required to de-water the area upstream of the right abutment of the Auxiliary Dam to facilitate construction of the upstream portal of the new tunnel-conduit.
Excavation and Materials:					
Tunnel, Portals, and Tie-in:					

STRUCTURE	**ALTERNATIVE BASE PLAN** (RMP#3)	**ALTERNATIVE PLAN 1** (RMP#4)	**ALTERNATIVE PLAN 2** (RMP#5)	**ALTERNATIVE PLAN 3** (RMP#6)	**ALTERNATIVE PLAN 4** (RMP#7)
Length and Finished Inside Diameter of Tunnel	1,260 feet long 12-ft. diameter	1,260 feet long 12-ft. diameter	1,260 feet long 12-ft. diameter	2,000 feet long 10-ft. diameter	1,260 feet long 12-ft. diameter
Excavation for Portals	27,000 CY	27,000 CY	27,000 CY	12,510 CY	27,000 CY
Concrete for Portals, Tunnel, and Tie-in	13,000 CY	13,000 CY	13,000 CY	12,500 CY	13,000 CY
Rock Fill Coffer Dam:					
Total Fill	101,000 CY	101,000 CY	101,000 CY	No Coffer Dam needed.	101,000 CY

2.3.13 Support Actions and Activity Sites Common to the Five Action Alternatives

In addition to the construction activities discussed in the previous section, there are numerous construction support actions and sites common to the alternatives that are critical to implementing the RMPs. The potential environmental impacts that these support actions and sites would have on the environmental resources are also analyzed in this Draft EIS (see Chapter 3). These common support actions and sites are described in the following paragraphs.

Action Area

The majority of the construction work activities and support actions comprising the RMPs would take place at and in the proximity of the Main Dam, spillway, and Auxiliary Dam. This area has been designated in the Draft EIS as the "Primary Action Area" (Figure 2-25). The Primary Action Area includes the primary filter sand borrow area to be located at the Auxiliary Dam Recreation Area (Figure 2-26). A supplemental filter sand borrow area, if needed, would be located in the South Fork Delta area (Secondary Action Area), has also been evaluated in the Draft EIS (Figure 2-27). These two borrow areas are further described below; in the section titled *"Filter Sand Borrow Sites"*.

Site Preparation and Equipment Mobilization

As a first step in undertaking the construction and support activities taking place within the Primary Action Area, any planned work areas and support areas that may be vegetated and/or contain large rocks, snags, and uneven terrain would need to be cleared, grubbed, and in some cases leveled to provide a flatter working surface. These clearing, grubbing, and leveling activities would be carried out in accordance with a *Site Preparation Plan* that would be developed either by the Corps or a designated construction contractor in advance of project construction. It would be the Corps' intention that following the multi-year construction period – or sooner if warranted –all the cleared areas not subject to permanent construction would be regraded and revegetated where feasible and practicable.

Following site preparations, the equipment and materials anticipated to be required for the construction of the various remediation measures would be brought in as needed to designated staging areas and set up, assembled, parked, stored, and/or stockpiled for use. It is anticipated that throughout the multi-year construction period, construction equipment, materials, and supplies would be replenished, replaced, dismantled, removed, and changed-out as needed in the appropriate staging areas to support the various construction actions.

Staging Areas and Haul Routes

To support the activities needed to construct the remediation measures on the Main Dam, spillway, and Auxiliary Dam over the multi-year construction period, the Corps has determined that five construction staging areas and four temporary haul routes would be established to support construction activities in the Primary Action Area (See Figure 2-25). In Table 2-2, some of the key information about these support staging areas and haul routes is summarized.

Figure 2-25 Primary Action Area Showing Staging Areas and Haul Routes

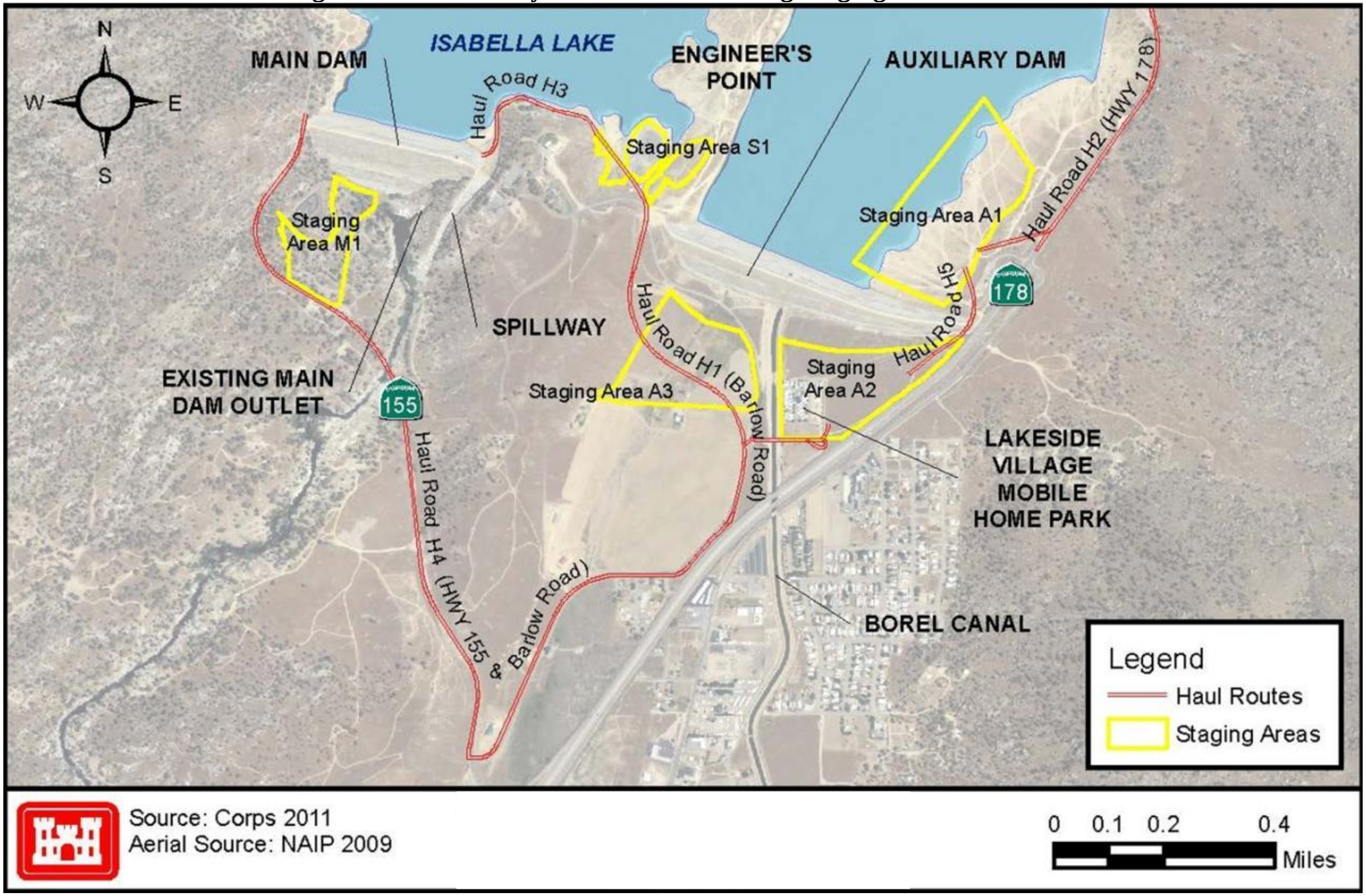


Figure 2-26 Primary Filter, Sand Borrow Area at Auxiliary Dam Recreation Area

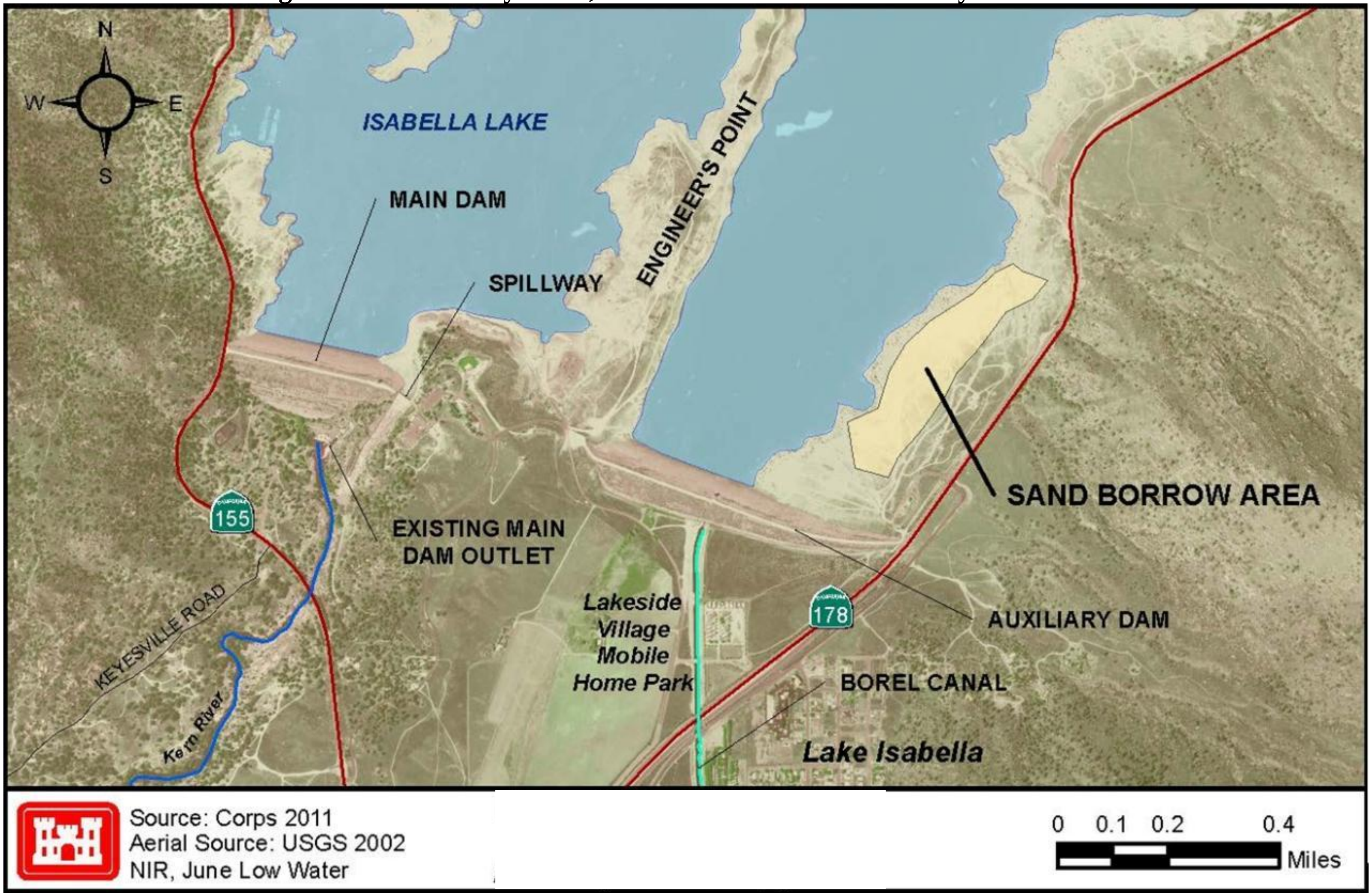


Figure 2-27 Supplemental Filter, Sand Borrow Area at South Fork Delta

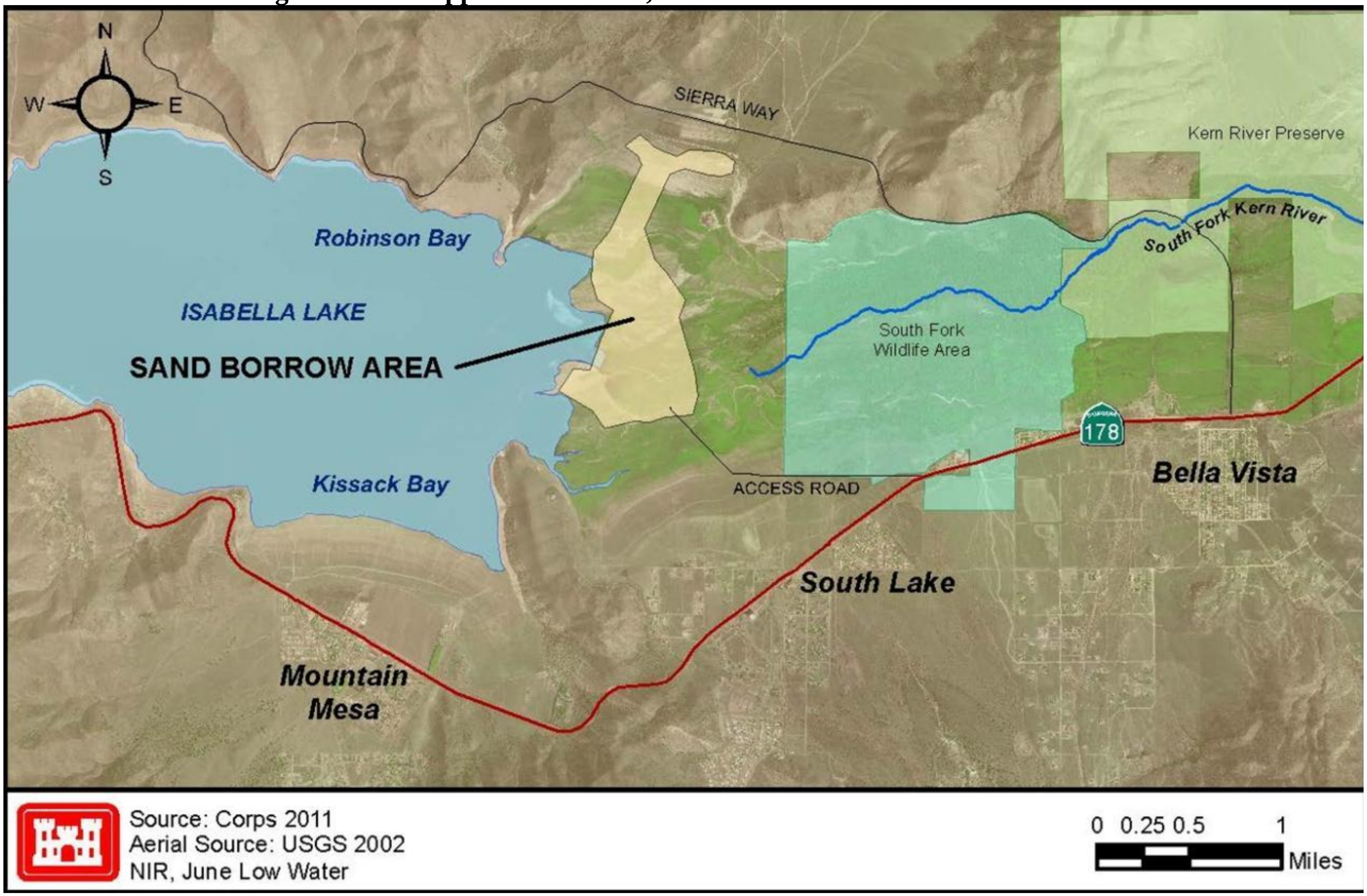


Table 2-2
Proposed Staging Areas and Haul Routes

STAGING AREA	APPROXIMATE SIZE (ac.)	ANTICIPATED PURPOSES
S1	15	This staging area would serve as a location to stockpile and process rock material from the Emergency Spillway excavation. It would also serve as the location for the temporary Rock Crushing Plant.
A1	40	This staging area would serve as a location to stockpile and process Filter Sand material from the Auxiliary Dam Recreation Area and South Fork Delta area (see discussion later in this section titled *"Filter Sand Borrow Sites"* for more description of sand borrow sites).
A2	20	This staging area would serve as a location to stockpile and process rock material from the Auxiliary Dam downstream embankment and foundation excavation. It would also serve as the location of the main vehicle and equipment maintenance area, as well as for storage of fuels, lubricants, and other construction equipment and supplies. This would also be the location of the electrical substation-switching station to supply electricity needed for some construction equipment.
A3	25	This staging area would serve as a location to stockpile and process rock material from the relocated Borel Canal conduit tunnel. It would also serve as a location for storage and staging of construction equipment and components needed for the tunnel excavation-construction and portal construction.
M1	10	This staging area would serve as a location to stockpile and process rock material from the Main Dam downstream embankment and foundation excavation. This staging area would only be used for Alternative Plans 1, 2, and 3.
HAUL ROUTE	**LENGTH (ft.)**	**ANTICIPATED PURPOSES**
H1	4,000	This is Barlow Road, and would be upgraded to serve as the primary on-site haul route for material from Staging Area S1 to construct the Auxiliary Dam downstream buttress, drain, filter and raise. Route construction would include reinforcement of the existing Barlow Road Bridge across the Borel Canal, and a connection to Staging Area A2 along Eva Drive. A replacement Barlow road would be constructed downstream of the Auxiliary Dam improvements.
H2	46,500+	This is Hwy 178, and would serve as the primary off-site haul route for Filter Sand from the South Fork Delta area borrow site to Staging Area A1 (see discussion later in this section titled *"Filter Sand Borrow Sites"* for more description of sand borrow sites). This road is also the primary haul route for bringing in ready-mix concrete for various construction uses, and cement and fly ash mix ingredients for making RCC concrete at the Batch Plant. Access to both Staging Areas A1 and A2 would be constructed off of Hwy 178.

Table 2-2
Proposed Staging Areas and Haul Routes *(continued)*

HAUL ROUTE	LENGTH (ft.)	ANTICIPATED PURPOSES
H3	1,600	This new temporary road would serve as the primary on-site haul route for rock material from Staging Area S1 to the Main Dam across the existing spillway, to construct the Main Dam downstream foundation, drain, filter and raise. Construction of the route would include a ramp over the spillway approach channel with culverts to maintain flow as needed.
H4	12,500	This is Hwy 155 and Barlow Road, and would serve as the primary route for construction vehicles to return from the Main Dam construction site to the other staging areas. Ingress-egress to Staging Area M1 may be constructed to allow for some rock material or equipment to be hauled to other staging areas.
H5	1,300	This new temporary road would serve as an on-site haul route and access between Staging Areas A1 and A2. This road would also provide a primary haul route for Filter Sand material from Staging Area A1 to construct the Auxiliary Dam downstream Filter.

The temporary haul roads would be constructed in accordance with common practices. Road bases would generally be of compacted earth with gravel coarse added where needed for stability. Road widths would vary as needed to accommodate a combination of one-way and two-way travel by a variety of off-road trucks, scrapers, and haulers. Watering trucks and other dust controlling practices would be used as needed to minimize fugitive dust emissions.

Utility and Facility Relocation
Early in the construction schedule the existing utilities and recreational infrastructure in the vicinity of the Main and Auxiliary Dams and the Auxiliary Dam Recreation Area would be removed, protected and/or relocated to accommodate the construction activities of new structures and existing structures. These include water lines, sewer lines, electrical power lines, communication lines, rest rooms and septic systems associated with the Auxiliary Dam Recreation Area, Corps project maintenance facilities and the USFS administration offices and maintenance compound on Engineers Point Ridge.

Construction Site Electric Power
It is anticipated that temporary 3-phase 220-volt electric power would be provided during the multi-year construction period to run some of the construction equipment, including the Crushing Plant, Batch Plant, and conveyors. To supply the necessary electrical power, a small temporary substation-switching station would be set up in Staging Area A2. Overhead transmission lines would be strung on single vertical wooden poles along Barlow Road and other corridors as needed to supply key distribution points in the Primary Action Area.

Crushing Plant
A temporary electric-powered rock Crushing Plant would be set up in Staging Area S1 to process rock material excavated from the Emergency Spillway channel. The Corps has determined that based on the anticipated quantity and characteristics of the material from this excavation, it could be processed on-site to supply all the various sizes of rock material needed for the remediation measures at the Main Dam, Spillway, and Auxiliary Dam. The only exception would be that if sufficient sand-sized material cannot be generated from the spillway excavation, the filter sand required for the Main and Auxiliary Dams would be supplied from the two selected borrow sites: Auxiliary Dam Recreation area and South Fork Delta area. The various types and quantities of rock material needed for these measures are identified previously in Table 2-1.

Batch Plant
A temporary electric-powered concrete Batch Plant would be set up in the vicinity of the new Emergency Spillway area to prepare concrete needed to construct the RCC Overlay and/or the concrete footing for the labyrinth spillway. This is required for either the 400-foot-wide or 900-foot-wide spillway. The concrete prepared in the Batch Plant would be moved along an electric-powered conveyor over the existing spillway channel to the Main Dam for the RCC overlay, and/or to the location of the labyrinth spillway structure. This Batch Plant would not be required for the Alternative Base Plan, but would be required

for Alternative Plans 1, 2, 3, and 4 since these four alternatives include an RCC Overlay measure on Main Dam or, in the case of Alternative Plan 4, a large spillway structure. The total amount of concrete anticipated to construct the RCC Overlay is 125,000 CY. The total amount of concrete needed for the 900-foot-wide spillway along is 36,529 CY. The water, coarse aggregates, and sand for making concrete in the Batch Plant would be supplied from on-site sources (lake, rock Crushing Plant, the two sand borrow sites), respectively. The dry cement, fly ash, and water reducer ingredients would be supplied from plants in the Barstow area and stockpiled on Staging Areas A2 and/or A3. The anticipated primary haul route for these ingredients would be HR2 (Hwy 178).

Ready-Mix Concrete

Based on the varying quantities of ready-mix concrete needed for the array of measures noted in Table 2-1, the total amount of ready-mix concrete anticipated is 37,000 CY. All ready-mix concrete required for the Isabella DSM Project would be supplied from the ready-mix plant located along Hwy 178 in the South Lake area.

Equipment and Vehicle Fueling and Maintenance

It would be essential to keeping on schedule that the variety of construction equipment and vehicles are able to be fueled on site and kept operating in accordance with manufacturer's and pollution-control specifications. This ongoing fueling and maintenance would require the establishment and operation of a secured central fuel and equipment storage and vehicle maintenance yard. The yard would serve as a fuel and lubricant depot for the on-site mobile fueling and equipment maintenance trucks, as well as a location for vehicle and equipment repairs and maintenance activities that could not be accomplished at the various work sites. As indicated in Table 2-2, this central storage and maintenance facility would be located on Staging Area A2 (see Figure 2-25).

Filter Sand Borrow Sites and Washing Facility

Sand with particular characteristics is required for constructing filter layers on the downstream slope of both the Main and Auxiliary Dams. The Corps has determined through investigations that, in addition to material generated from the spillway excavation, two sites in the project vicinity have an adequate supply of sand with the required characteristics. One of these sites is the Auxiliary Dam Recreation Area, and the other is the South Fork Delta area just west of the South Fork Wildlife Area (see Figures 2-26 and 2-27).

Constructing the filter layers on the Main and Auxiliary Dams is anticipated to require sand quantities that would range from about 675,400 CY for the Alternative Base Plan; about 1,000,600 CY for Alternative Plan 1; about 1,032,500 CY for Alternative Plans 2 and 3; and about 1,500,000 CY for Alternative Plan 4. The Corps has determined that for all five alternatives, 50% of the required amount of sand would be collected from each of the two selected borrow sites.

Although sand available from the two selected borrow sites has the required characteristics, the excavated sand would need to undergo a washing process to remove fines, organics, and other material that could reduce the filtering effectiveness of the sand. The Corps has determined that for efficiency and to help reduce potential environmental effects, a temporary sand washing operation would be established within Staging Area A1, which is the Auxiliary Dam Recreation Area (See Figures 2-23 and 2-24). Establishing the washing operation at Staging Area A1 would allow for raw sand extracted from the Auxiliary Dam Recreation Area to be directly conveyed to the washing facility, cleaned, and stockpiled in Staging Area A1. Also, raw sand extracted from the South Fork Delta area would be temporarily stockpiled at the South Fork Delta area and hauled via trucks along Patterson Lane and Hwy 178 to the washing facility and stockpiled at Staging Area A1. Patterson Lane may need to be improved with gravel or other materials to accommodate truck use.

The temporary sand washing operation set up in Staging Area A1 would consist of a receiving bin, conveyor and hopper system that would feed raw sand into one or more continuous-turning-screw-type washing troughs; a water application and piping system to provide the wash water, portable water storage tanks to stage and manage water flow for the washing operation, and a water collection system to recycle and then convey used water to one or more holding ponds that would allow for evaporation.

Solid and Hazardous Waste Management

Construction activities over the multi-year construction period associated with the five Action Alternatives are anticipated to generate a variety of solid wastes. Also, some of the construction activities would involve the use, handling, storage, and disposal of hazardous materials such as fuel, solvents, oil and other lubricants. It is anticipated that the collection, storage, and disposal of solid and hazardous materials and wastes would be done in accordance with a *Solid and Hazardous Materials and Waste Management Plan* that would be developed by the Corps or a designated contractor prior to the initiation of construction activities. As mentioned earlier, a secure central storage and handling depot for hazardous materials (e.g., fuels, lubricants, and solvents) would be established in Staging Area A2.

Controlled Blasting for Emergency Spillway Excavation

The Corps has determined that some controlled blasting would need to take place to break up the rock within the proposed Emergency Spillway channel. It is anticipated that that a *Controlled Blasting Management Plan* would be developed by the Corps or designated contractor prior to the start of construction, which would include any short-term road closures and other public safety management measures that may be required in the vicinity of the blasting.

Lake Level Management during Construction

The Water Control Plan for Isabella Lake is operational from November through March, which is considered to be the flood control season. The Kern River Valley Water Master directs releases from the lake during the irrigation season, generally from March 20 to September 20.The downstream water uses are primarily agricultural. For example, during summer the releases from Isabella Lake are used to irrigate about 1 million acres of Kern County in the San Joaquin Valley.

With a few exceptions, the Isabella Lake levels would continue to be operated as at present, with the IRRM maximum level of 2,589.26 feet in effect during the multi-year construction period. The exceptions are discussed in the following paragraphs.

For the Alternative Base Plan, and Alternative Plans 1, 2, and 4, the lake level would be lowered to an elevation of 2,543.76 feet for a two month period (December 2016-January 2017), and for another two-month period (August-September 2017), to allow for construction and removal of a coffer dam at the Right Abutment of the Auxiliary Dam. The temporary coffer dam is needed to support “dry construction” of the upstream connection between the Borel Canal and the relocated conduit through the right abutment. During the six-month period that the coffer dam is in service, the top of the flood control pool elevation would be allowed to rise up to 2,585.26 feet, which is four feet below the existing restricted pool operation elevation. These lower lake levels would not be required for Alternative Plan 3, which includes a new Borel Canal conduit tunnel being constructed from the Main Dam Outlet structure through Engineers Point, instead of a conduit tunnel through the right abutment of the Auxiliary Dam.

For all five Action Alternatives, the lake level would need to be lowered again to the elevation of 2,543.76 feet for a nine-month period (June 2019-February 2020), to allow for construction of the Upstream Berm on the Auxiliary Dam.

Achieving the lower lake levels to construct and safely operate the coffer dam may require early (pre-irrigation season) releases from Isabella Lake to downstream irrigators. If this proves to be the case, arrangements would be made between the Corps and the downstream users to store the pre-irrigation season water for use during the irrigation season. Based on current information, downstream irrigators have sufficient in-ground and surface storage to handle excess and pre-irrigation season releases of Isabella Lake water from the Corps. The USFS would also be informed of changes in river outflow.

Also, the Corps would endeavor to ensure that during the multi-year construction period, the expected flows under agreement with all the downstream users would be maintained or otherwise accounted for. This would include either continuing to provide water (up to 605 cfs) to SCE, or reaching some other agreement regarding the loss of SCE’s ability to generate electricity should the Borel Canal flow need to be interrupted. This situation would occur under all four Action Alternatives for the nine month period of June 2019-February 2020. This situation is also likely for the approximately four-month period of time required to complete the final upstream and downstream tie-ins to the Borel Canal associated with the relocation of the Borel Conduit through the Right Abutment of the Auxiliary Dam included under the Alternative Base Plan and Alternative Plans 1, 2, and 4. This situation would also occur under all five Action Alternatives for the nine-month period of June 2019-February 2020.

Work-around of Important Local Events

The Corps has determined that suitable adjustments in the ongoing multi-year construction schedule may need to be made to accommodate important short-term local reoccurring events such as the 3-day Annual Fishing Derby, traditionally held on a Saturday, Sunday, and Monday in April. The Corps would require the contractor to coordinate with the USFS, local communities and organizations to safely accommodate in so far as is practicable, local events that might be affected by construction and support activities. Adjustments to the construction schedule might include restricting off-site truck hauling on certain days to accommodate short-term spikes in tourist and/or recreation-related traffic in the Isabella Lake area that may be associated with special local events.

Site Restoration

Best management practices (BMPs) are expected to reduce, to the greatest extent possible, the physical direct and indirect impacts on land form, vegetation and infrastructure in the project area. However, it is inevitable that implementing this large complex project over a multi-year construction period would leave some areas within the project area in need of restoration. The anticipated restoration actions would be identified in concert with the Corps and USFS and have been discussed previously in Section 1.9 of Chapter 1.

2.3.14 Construction-related Assumptions Included in This Draft EIS

In formulating, structuring, and sequencing the multitude of complex and detailed construction activities and support actions required to implement the Isabella DSM Project, the Corps has made countless critical decisions that have resulted in the Proposed Action, alternatives, and schedule that are presented and analyzed in this Draft EIS. To support and help formulate the critical construction decisions and schedule, numerous well-informed construction-related assumptions have been made by the Corps regarding the construction work activities and support actions involved in completing the remediation measures associated with five alternatives evaluated in this Draft EIS. Clarifying and understanding the relevant construction-related assumptions developed by the Corps has helped the preparers of this Draft EIS to analyze the potential environmental effects associated with the four Action Alternatives evaluated. The key construction-related assumptions developed by the Corps for the Isabella DSM Project include the following:

- Construction activities would be scheduled to be continuous (not seasonal) through the multi-year construction period.
- Isabella Lake levels would be managed in accordance with the current deviation from the Water Control Plan with the exception of the lowering the maximum lake elevation to 2,543.76 feet for a period of nine months for construction of an Auxiliary Dam upstream berm. For the Alternative Base Plan and Alternatives 1 and 2 there would also be a lowered pool of 2,543.76 feet for a two month period (December 2016-January 2017), and for another two-month period (August-

September 2017), to allow for construction and removal of a coffer dam at the Right Abutment of the Auxiliary Dam. When the coffer dam is in operation, the maximum pool would be 2,585.26 feet, approximately four feet lower than the current deviation.

- The typical construction work week would be 6 days, with no work on Sunday, and no off-site hauling on Saturday,
- The typical work day (including daylight) would be 10 hours for workers, with a daily running time for the majority of equipment and vehicles of 8 (daylight) hours, except for mechanics trucks, fuel/lube trucks, and pick-up trucks, whose typical running time would be 4 (daylight) hours. A notable exception to the typical equipment running time would be the diesel generators (up to four) required at the Auxiliary Dam to keep the dewatering pumps at the Auxiliary Dam operating 24-7 for the duration of the construction periods (for each alternative) to support construction of the remediation measures at the Auxiliary Dam. The dewatering wells would be required when the downstream foundation area of the Auxiliary Dam is temporarily excavated and re-compacted below the existing ground surface. Dewatering would be required during this time to ensure dam safety and to improve constructability.
- The anticipated construction work force at Isabella Lake for the Isabella DSM Project would include 120 skilled and non-skilled workers per year for each of the multi-year construction schedule.
- It is assumed that 50% of the construction workers would reside in the Isabella Project area and 50% would travel from Bakersfield each day, using single-occupancy vehicles (worst-case).
- The Crushing Plant, Batch Plant, and all conveyors would be powered by electricity rather than diesel or gasoline.

2.3.15 Anticipated Construction Schedule for the Action Alternatives

An important part of planning for the successful implementation of the DSMS has been the development by the Corps of anticipated construction schedules to plan, manage, and sequence the array of construction activities and support actions associated with the four Action Alternatives. The proposed construction schedules were prepared taking into account the following important factors:

- The urgency of the Isabella DSM project;
- The logical sequencing and inter-dependency of related actions;
- Maintaining efficiency of effort and expenditure of resources;
- The potential direct, indirect, and cumulative environmental impacts;
- The importance of recreation to the local economy and quality of life; and
- Achieving overall cost effectiveness.

Table 2-3 provides a visual comparison of the anticipated general construction schedules for the Alternative Base Plan, Alternative Plan 1, Alternative Plan 2, Alternative Plan 3, and Alternative Plan 4. As shown in Table 2-3, the Isabella DSM Project is proposed for construction over a continuous (not seasonal) multi-year construction period that ranges from approximately 4-and-one-half years (53 months) for the Alternative Base Plan, to almost five years (57 months) for Alternative Plan 1, to nearly six years (69 months) for Alternative Plans 2 and 3.

Although not depicted in Table 2-3, it is important to note that activities common to all alternatives such as real estate acquisitions or relocations, and clearing and grubbing of some work sites would be taking place in the months and weeks prior to initiation of the major construction activities scheduled to commence in October 2015.

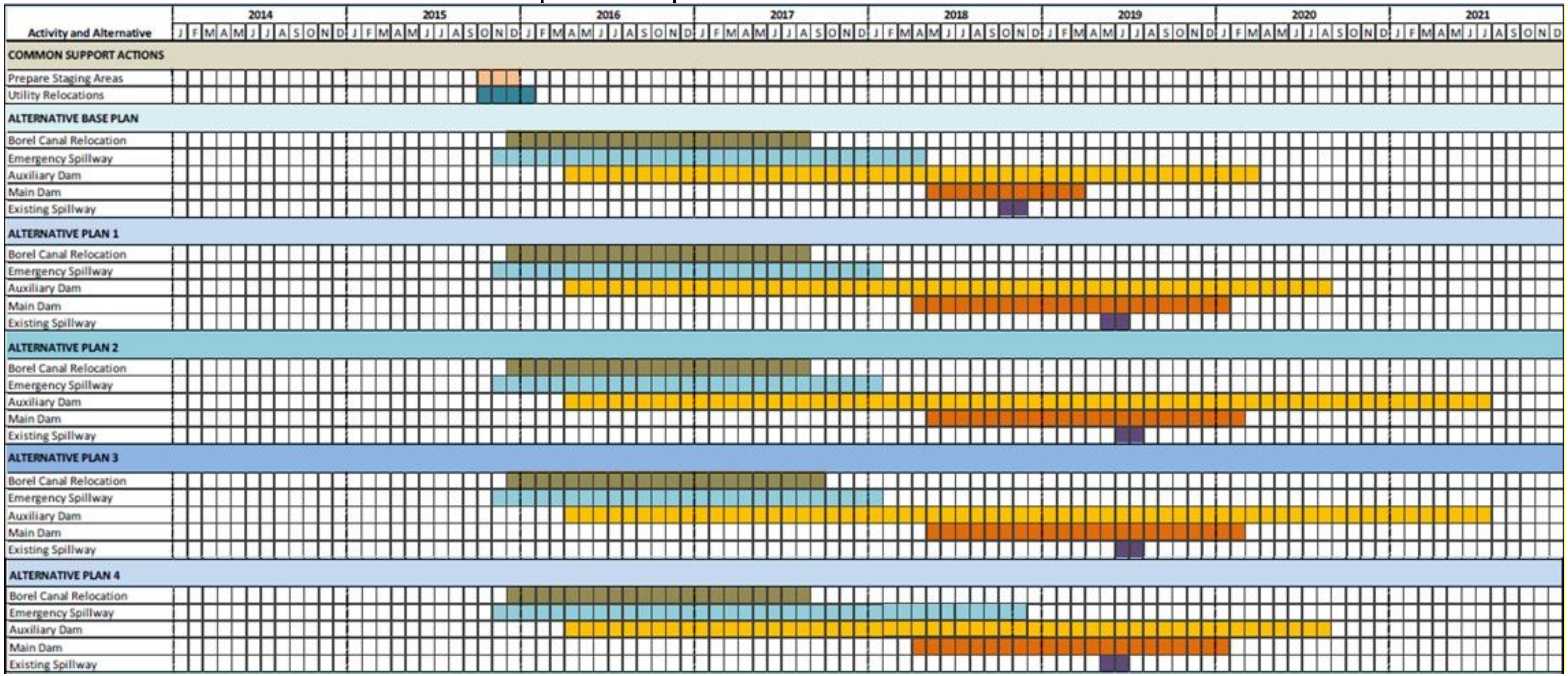
The Corps has also determined that it would be better to conduct some of the construction and support actions over the winter months, when the lake elevation is predictably low, the migratory bird populations in the South Fork area are absent, and recreation is off-season. For example, the winter season would be a good time to complete construction work on certain structures such as the upstream berm on the Auxiliary Dam, and the Borel Canal conduit coffer dam, as well as to perform certain support actions such as the collection of filter sand from the South Fork Delta area borrow site.

The anticipated construction schedules for the five alternatives prepared by the Corps have assisted the preparers of this Draft EIS in discerning and evaluating the differences among the five Action Alternatives and in analyzing potential environmental impacts associated with implementing these alternatives.

2.3.16 Operation and Maintenance for All Action Alternatives

Operation and maintenance activities would be the same for all of the Action Alternatives following completion of construction. As with the No Action Alternative, the Corps would continue to regulate the Isabella project for flood damage reduction as specified in the Water Control Plan. The Kern River Water Master would continue to direct lake releases for purposes other than flood reduction during the irrigation season, generally from March 20 through September 20 each year. Borel Canal and power generation operation and maintenance activities would be the same as current conditions.

Table 2-3
Comparison of Anticipated Construction Schedules for the Four Alternatives



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CHAPTER 3.
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This chapter presents an overview of the affected environment of the Isabella DSM Project and an evaluation of potential impacts associated with the Action Alternatives and construction assumptions provided by the Corps, Sacramento District in December 2011. In accordance with NEPA guidelines and project-specific guidance from the Corps, the following resource areas are discussed and evaluated:

- Geology, soils and seismicity;
- Air quality and climate change;
- Water resources;
- Traffic and circulation;
- Noise and vibration;
- Hazardous, toxic and radiological waste;
- Biological resources;
- Land use;
- Recreation;
- Aesthetic resources;
- Cultural resources;
- Socioeconomics and environmental justice; and
- Public health and safety.

In this chapter there is a discussion of the general setting and the scope and extent of the affected environment. Then there is an overview of the impact analysis and terminology. This is followed by a summary of the information from Chapter 2 about the alternatives that were considered but are not being analyzed and the alternatives that are being evaluated. The rest of the chapter is given over to detailed resource discussions and evaluation of impacts. Appropriate mitigation measures to reduce potential impacts are included with resource discussions, and a Summary of Impacts is provided at the end of this chapter.

3.2 GENERAL SETTING

As described in Chapter 1, Isabella Lake is on the Kern River approximately 35 miles northeast of Bakersfield, California. The lake consists of a Main Dam on the Kern River and an Auxiliary Dam in the adjacent Hot Springs Valley. The Isabella Lake project provides for flood risk management, municipal and industrial water conservation, and recreation. The lake also provides water for hydroelectric generation at the Main Dam and through the Borel Canal that passes through the Auxiliary Dam six miles south to a hydroelectric plant operated by SCE on the Kern River. The dams are on Corps property; however, Isabella Lake is on National Forest System lands. Recreation facilities and lands associated with the lake are managed by the USFS. The Corps regulates Isabella Main and Auxiliary Dams for flood control from November through June. The Kern River Water Master directs lake releases for purposes other than flood control during the rest of the year. Downstream uses include power generation and irrigation. Kern River water stored in Isabella Lake is used for irrigation, lake recreation or to recharge the groundwater basin, except in years with exceptionally large runoff.

The affected environment includes those areas where the Isabella DSM Project elements would occur, plus those geographic areas outside the Primary Action Area containing resources that could be indirectly affected by the Proposed Action. The physical limits of the affected environment can be different for individual environmental resources. For example, much of the socioeconomic data available for analysis and economic inputs resulting from the proposed construction would be derived on the county level. For air quality, potential impacts would occur to air basins as well as the Primary Action Area. This section presents information on resources both within and outside the project area that could be affected (either directly or indirectly) by the proposed activities.

The Primary Action Area includes the Main and Auxiliary Dams; the Auxiliary Dam Recreation Area; the proposed staging areas and haul routes; the USFS compound and hill east of the Main Dam and the Main Dam Campground. There are two proposed filter sand borrow sites; the primary one is located in the Auxiliary Dam Recreation Area (see Figure 2-25), and a secondary one is located in the South Fork Delta area (see Figure 2-26). This latter sand borrow site is considered to be the Secondary Action Area; also evaluated in the Draft EIS. For most resources the transportation routes, the areas exposed in the lake by the lower construction pool and the areas affected by utility work and connections are also relevant to the analysis.

3.3 IMPACT ANALYSIS

3.3.1 NEPA

The National Environmental Policy Act (NEPA) requires that an EIS be prepared when the proposed Federal action (project) as a whole has the potential "to significantly affect the quality of the human environment." The determination of significance is based on context and intensity of impacts. Under the CEQ regulations implementing NEPA (40 CFR 1502.16), indicates that the analysis of potential environmental impacts of a project should include direct and indirect effects and their significance, which, when compared among and between the individual alternatives, will assist decision-makers in choosing a course of action.

3.3.2 Impact Terms and Assumptions in this Draft EIS

Under NEPA, the environmental impacts of each action alternative are measured against the environmental conditions that would otherwise occur if no action was taken (i.e., the impacts of each of the Action Alternatives are measured from the conditions anticipated for the No Action Alternative). Impacts are to be disclosed in terms of their context, duration, intensity, and level of significance. For some resources, there are relevant quantifiable standards that the impact can be compared to such as a Federal, State, or local air quality emission or a noise standard. For other resources a qualitative assessment of relative impact is all that is possible.

There are three types of impacts that may occur when an action takes place: direct impacts, indirect impacts, and cumulative impacts. Direct impacts are impacts which are caused by the action and occur at the same time and place. Indirect impacts are those impacts which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time. Cumulative impacts associated with the DSM Action Alternatives are addressed in Chapter 4 of this Draft EIS.

An impact is either beneficial or adverse. For adverse impacts identified in this Draft EIS, the intensity of a potential impact is characterized by the following three levels of magnitude :

- Low: Changes would be measurable or noticeable, but would not alter the structure, composition, or function of the resource and would be limited in context.
- Moderate: Changes would be measurable and may influence the structure, composition, or function of the resource but would be limited in context.
- High: Changes would be measurable, would alter the structure, composition or function of the resource and may be extensive in context.

Also, the level of significance of an adverse impact has been determined and is reported on the following bases:

- Less-than-significant: is one that would result in a substantial or potentially substantial adverse change in the physical environment, but does not require mitigation.
- Significant: is one that would cause a substantial or potentially substantial adverse change in the physical environment within the project area. Mitigation measures are provided where applicable and feasible, to avoid or reduce significant impacts.

- Significant and unavoidable: is one that would result in a substantial or potentially substantial adverse impact on the environment and that cannot be reduced to a less-than-significant level even with implementation of any applicable feasible mitigation.

Finally, for this Draft EIS, short-term impacts are defined as those occurring during the Isabella DSM Project construction phase and immediately thereafter. Long-term impacts are those that are related to permanent effects on the natural and cultural environment and post-construction operations of the Isabella project.

3.3.3 Resource Section Format

The evaluation of potential environmental impacts presented in this chapter is based on the four Action Alternatives, common support actions and assumptions that were under consideration at the time of its preparation and information that was available to the preparers. The affected environment and evaluation of environmental impacts presented below address the resources and potential impacts that would likely occur from implementation of the Isabella DSM Project. These analyses inform the Corps, other agencies and groups, and the general public of the context and intensity of potential impacts of the proposed Isabella DSM Project.

In this analysis the discussion of each resource follows a common format. First, the most relevant regulations governing actions affecting the resource are defined. In this regard State and local requirements are included that were helpful in characterizing the overall context of the analyses, even though some of these requirements do not directly apply to this Federal action. Then the potentially affected resource is described in detail, typically from the perspective of the broader affected environment and then focusing in on the existing conditions on the site-specific level. The results of site- specific baseline field studies and research are presented, when available.

The discussion of environmental consequences begins with a description of the scope and methods of analyses employed; the relevant impact factors in the analysis, and a discussion of the impacts by alternatives. Analyses of impacts for Alternative Plan 4 are discussed comparatively based on the extent, duration, and magnitude of disturbance of all the Action Alternatives in order to determine level of impact. Where necessary, more detailed analyses will be completed and presented in the Final EIS.

Where impacts are identified, recommended mitigation measures, best management practices (BMP), standard operating procedures (SOPs) and /or other environmental commitments are provided for consideration by the Corps in order to avoid, minimize, or reduce environmental impacts.

3.4 GEOLOGY, SOILS, AND SEISMICITY

This section discusses the relevant laws and regulations, the existing geologic and soil conditions in the project area (affected environment), and the potential impacts associated with geology, soils, and seismicity for the proposed Action Alternatives and support actions.

3.4.1 Regulatory Setting

The relevant Federal, State, and local laws and regulations regarding geology, soils, and seismicity in the project area and vicinity are summarized in the following paragraphs. State and local requirements are included that were helpful in characterizing the overall context of the analyses, even though some of these requirements do not directly apply to this Federal action.

Federal

Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288, as amended; 42 USC 5121, et. seq.).

Section 202 of this Act states that the President shall direct appropriate Federal agencies to ensure timely and effective disaster warnings for such hazards as earthquakes, volcanic eruptions, landslides, and mudslides.

Forest and Rangeland Renewable Resources Planning Act of August 17, 1974 (88 Stat. 476; 16 USC 1600-1614) as Amended by National Forest Management Act of October 22, 1976 (90 Stat. 2949; 16 U.S.C. 1609).(FSM 1920 and FSM 2550.)

The RPA requires consideration of the geologic environment through the identification of hazardous conditions and the prevention of irreversible damages. In the development and maintenance of land management plans, the Secretary of Agriculture is required to use a systematic interdisciplinary approach to achieve integrated consideration of physical, biological, economic, and other sciences.

State

Alquist-Priolo Earthquake Fault Zoning Act (California Public Resources Code (CPRC) Section 2621 et seq.)

The 1972 Alquist-Priolo Earthquake Fault Zoning Act (California Public Resources Code (CPRC) Section 2621 et seq.) requires local agencies to regulate development within earthquake fault zones to reduce the hazards associated with surface fault ruptures. It also regulates construction in earthquake fault zones.

1990 Seismic Hazards Mapping Act (CPRC Sections 2690-2699.6)

The 1990 Seismic Hazards Mapping Act (CPRC Sections 2690-2699.6) addresses strong ground shaking, liquefaction, landslides, or other ground failures as a result of earthquakes. This Act requires statewide identification and mapping of seismic hazard zones which would be used by cities and counties to adequately prepare the safety element of their general plans and protect public health and safety. Local agencies are also required to regulate development in any seismic hazard zones, primarily through permitting. Permits for development projects are not issued until geologic investigations have been completed and mitigation has been developed to address any issues.

Surface Mining and Reclamation Act (SMARA) of 1975 (CPRC Sections 2710 et seq.)
The Surface Mining and Reclamation Act (SMARA) of 1975 (CPRC Sections 2710 et seq.) addresses surface mining and requires mitigation to reduce adverse impacts to public health, property, and the environment. SMARA applies to anyone (including a government agency) that disturbs more than one acre or removes more than 1,000 cubic yards of material through surface mining activities, even if activities occur on Federally managed lands (CDC 2011). Local city and county "lead agencies" develop ordinances for permitting that provide the regulatory framework for mining and reclamation activities. The permit generally includes a permit to mine, a reclamation plan to return the land to a useable condition, and financial reports to ensure reclamation would be feasible. The State Mining and Geology Board reviews lead agency ordinances to ensure they comply with SMARA (CDC 2011).

Memorandum of Understanding 1992
This agreement among the State of California Department of Conservation, and the State Mining and Geology Board and the Pacific Southwest Region of the USFS and the BLM accomplishes the following:

- Ensures the application of adequate and appropriate reclamation throughout California;
- Simplifies the administration of surface mining and reclamation practice requirements on Federal lands and on a combination of Federal and private lands;
- Coordinates activity governing reclamation; and
- Eliminates duplication among the aforementioned agencies and counties serving as lead agencies, to comply with the Surface Mining and Reclamation Act, Public Resources Code section 2728, in implementing State and Federal requirements.

Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations (See Title 17 CCR Section 93105)
The Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations (See Title 17 CCR Section 93105) contains the requirements for construction operations that would disturb any portion of an area that is located in a geographic ultramafic rock unit or that has naturally occurring asbestos, serpentine, or ultramafic rock. Construction or grading operations on property where the area to be disturbed is greater than one acre, require an Asbestos Dust Mitigation Plan to be submitted and approved by the air quality management district before the start of construction. The Asbestos Dust Mitigation Plan must be implemented at the beginning and must be maintained throughout the duration of the operation. In order to receive an exemption from this Airborne Toxic Control Measure, a registered geologist must conduct a geologic evaluation of the property and determine that no serpentine or

ultramafic rock is likely to be found in the area to be disturbed. This report must be presented to the executive officer or air pollution control officer of the air pollution control or air quality management district, who may then grant or deny the exemption (CARB 2011a).

Asbestos Airborne Toxic Control Measure for Surfacing Applications (17 CCR Section 93106)

The Asbestos Airborne Toxic Control Measure for Surfacing Applications (17 CCR Section 93106) applies to any person who produces, sells, supplies, offers for sale or supply, uses, applies, or transports any aggregate material extracted from property where any portion of the property is located in a geographic ultramafic rock unit or the material has been determined to be ultramafic rock, or serpentine, or material that has an asbestos content of 0.25 percent or greater. Unless exempt, the use, sale, application, or transport of material for surfacing is restricted, unless it has been tested using an approved asbestos bulk test method and determined to have an asbestos content that is less than 0.25 percent. Any recipient of such materials may need to be provided a receipt with the quantity of materials, the date of the sale, verification that the asbestos content is less than 0.25 percent, and a warning label. Anyone involved in the transportation of the material must keep copies of all receipts with the materials at all times (CARB 2011b).

Local

Local Kern River Valley Specific Plan

The Kern River Valley Specific Plan has a goal of minimizing the potential damage to structures and loss of life that could result from geologic hazards. Kern County plans to accomplish this through the adoption and enforcement of development regulations, including building and site standards that provide protection against seismic and geologic hazards and the continued evaluation of seismic-related hazards such as liquefaction, and slides, and avalanches (Kern County 2011b).

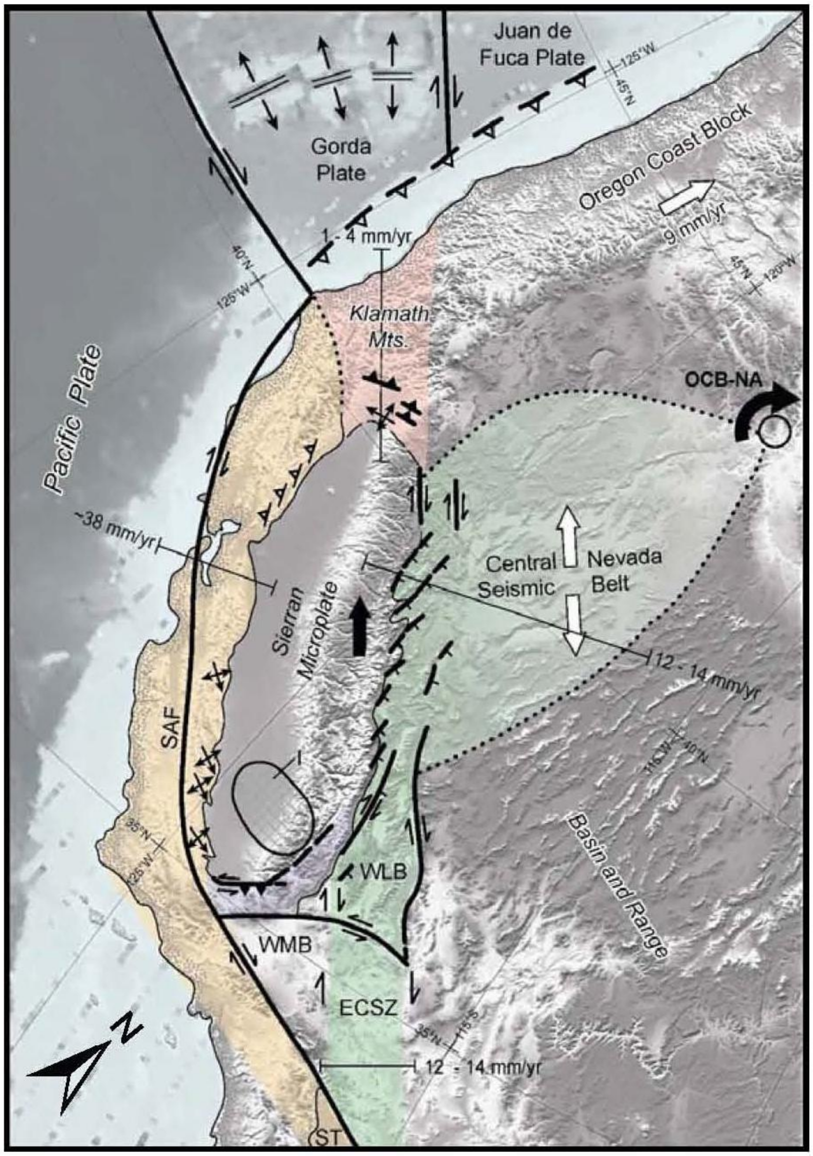
3.4.2 Affected Environment

Regional Geology

The project area is in the southern part of the Sierra Nevada geomorphic province, which lies between the Basin and Range geomorphic province to the east, the Great Valley to the west, and the Mojave Desert to the south (Figure 3-1). The Sierra Nevada forms a mountain chain more than 400 miles long and 60 miles wide. The Sierra Nevada batholith is one of the world’s largest and was assembled by multiple intrusive plutonic events, largely during Cretaceous time.

The project area and Kern River Valley are within the Sierra Nevada range. Tectonically, the mountain range and Central Valley to the west constitute a semi-rigid crustal block termed the Sierra Nevada microplate, whose velocity and rotation vectors differ from those of the rest of North America (Figure 3-1). The Sierra Nevada-Central Valley (“Sierran”) microplate is bounded on the west by the San Andreas transpressive plate junction, on the east by the Eastern California Shear Zone and its northward continuation,

Figure 3-1 Sierran Microplate



WLB - Walker Lane Belt
WMB - West Mojave Boundary
ECSZ - East California Seismic Zone
SAF - San Andreas Fault
ST - Salton Trough
OCB-NA - Ocean-Continent Boundary (North America)

Fault indicating relative displacement
Dip direction
Anticline plunge direction
mm/yr millimeters per year

Source: USACE Dam Safety Modification Report (USACE 2010a)

Sierran Microplate

-Preliminary Not to Scale-
(For Illustrative Purposes Only)

and the Walker Lane, which together form the western boundary of the Basin and Range extensional province (Corps 2009a). As a result, fault structures within the region are subject to extensional forces and earthquakes from active plate movement. The Kern Canyon Fault zone defines the Basin and Range province from the Sierran microplate.

The Sierra Nevada is composed primarily of crystalline rocks composed largely of dark hornblende-biotite quartz diorite (a coarse-grained rock closely related to granite) of Jurassic or early Cretaceous age, which have been thoroughly metamorphosed to schist, quartzite, and marble. Geologic evidence indicates the mountains were uplifted as a result of generally normal faulting along the western margin of the Basin and Range geomorphic province.

Local Geology

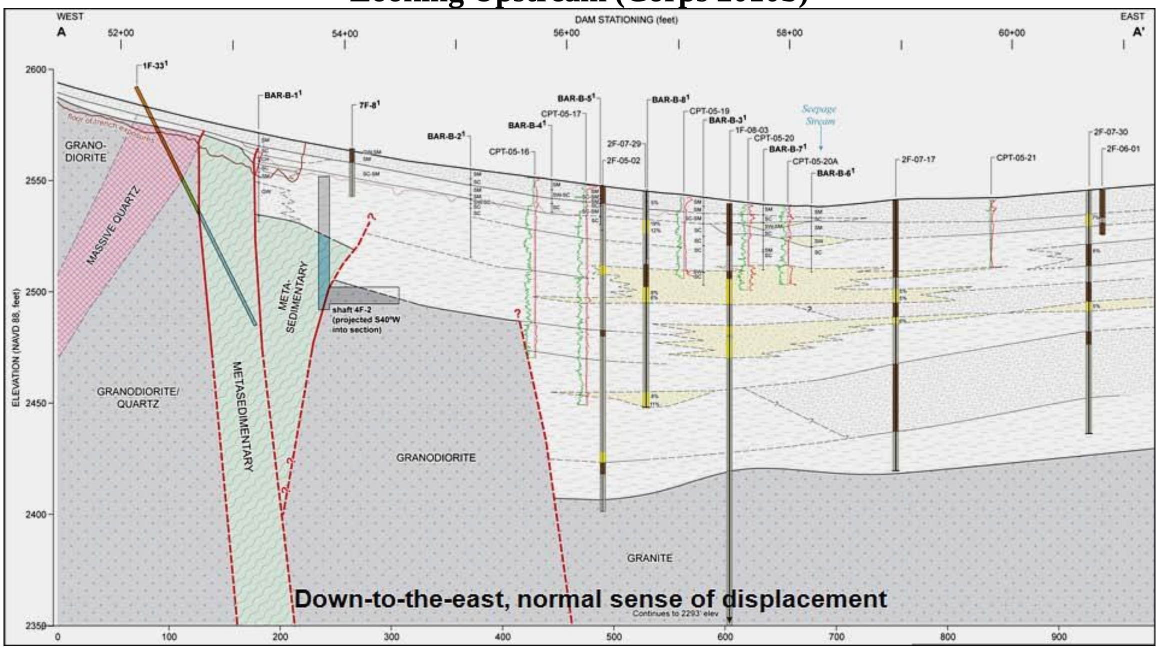
The following discussion is summarized from the Draft DSMR conducted by the Sacramento District of the Corps (2010b), unless otherwise indicated.

The rocks in the Isabella Lake area belong to the Sierra Nevada Basement complex and consist of sedimentary rocks that have been metamorphosed during emplacement of the igneous rocks of the Sierra Nevada batholiths. The age of the igneous rocks is considered to be late Jurassic. In the Kernville area, the igneous rocks are divided into Isabella granodiorite, Sacater quartz diorite, and Summit gabbro. Kern River Granite bounds the Kern Canyon Fault to the east and Granodorite of Alta Sierra to the west. Numerous dikes and veins of quartz pegmatite, apatite, and calcite intrude the igneous formations. The Corps conducted a seismic evaluation and analysis to understand the dam deficiencies to determine risk associated with the project (Corps 2010b). The results of the investigation show that near vertical dikes, composed of metasedimentary rocks as massive quartzite or crystalline marble, underlie the Auxiliary Dam foundation.

The metamorphic rocks have been referred to as the Kernville Series and are interpreted to be undivided pre-Cenozoic metasedimentary and metavolcanic rocks of great variety, mostly slate, quartzite, hornfels, chert, phyllite, mylonite, schist, gneiss, and minor marble (California Geological Survey 2010a). Hydrothermal alteration is prominent along the Kern Canyon Fault Zone with the development of secondary silica and calcite deposits. Nearly vertical and steeply dipping fracture and shear planes developed during deformation, accelerating weathering to great depths. The metamorphic rocks have weathered to a clayey soil with schist fragments. Where schistose structure is present, weathering has further softened and decomposed the underlying schist to considerable depths. Below the zone of weathering, the metamorphic rocks are unweathered and the joint fractures remain close.

The Main Dam sits on granite that is intruded by numerous dikes and veins of quartz, pegmatite, aplite, and calcite (Corps 2003). The Auxiliary Dam foundation consists of alluvial fan deposits overlying granitic bedrock , except in the Kern Canyon Fault Zone which underlies the Auxiliary Dam right abutment (Figure 3-2), where metamorphic rocks are present. The source of the alluvial fan is sediment eroded from the hills to the east of the valley that is comprised of Late Cretaceous Kern River granite. The dam is situated on the approximate centerline of the primary alluvial fan and the terrain slopes downhill to the north (upstream) and to the south (downstream); as such, the dam was built on the highest location in Hot Springs Valley. No natural watercourse

Figure 3-2 Thickness of Alluvium Near Right Abutment of Auxiliary Dam Looking Upstream (Corps 2010b)



exists in Hot Spring Valley at the Auxiliary Dam location. The alluvial material generally is composed of silty/clayey sand (SM/SC) and is progressively coarser toward the left abutment of the dam, an area closer to the source of the alluvial material. Subsurface explorations east of the Borel Canal, closer to the alluvial source area, indicated coarser cross-cutting channels within the alluvium. The channels are generally found about 10 feet below the fan's ground surface and are variable in depth and thickness. Alluvial fan deposits are poorly sorted and are formed through episodic depositional events, such as sheet floods and debris flows.

Effects of the Kern Canyon Fault beneath the Auxiliary Dam foundation are expressed as near vertical layers of crystalline limestone, sheared and severely weathered granite, and quartzite at or near the surface. Bedrock of the uplifted fault block (relative displacement) is closest to ground surface under the right abutment. Along the axis of the dam, depth to bedrock varies from about 60 feet below the left abutment to 140 feet near the maximum section of the dam abutting the Kern Canyon Fault zone (Figure 3-2); however, the top of the bedrock under the thick alluvial fan deposits is severely weathered and is difficult to distinguish from the overlying alluvial deposits. Generally, competent rock is not encountered for approximately an additional 40 feet. Pre-construction geologic mapping and boring information indicate that the bedrock surface slopes down to the south (downstream) in Hot Springs Valley.

Naturally Occurring Asbestos

Naturally occurring asbestos (NOA) is commonly found in fault zones. Asbestos is a generic term for multiple types of naturally occurring fibrous minerals distributed throughout California. Although chrysotile is the most common form of asbestos, other types (such as amphibole) are also found in California. Chrysotile asbestos is usually found in serpentine rock and its parent material, ultramafic rock. Serpentines have not been identified in geologic mapping of the Isabella Lake area, but asbestos is commonly found near fault zones.

A crystalline limestone unit was identified in the Kern Canyon Fault zone, beneath the alluvial fan materials, near the right abutment of the Auxiliary Dam (Corps 2010b), which may contain NOA. Other potential NOA regions in the project area are fault-related mafic igneous intrusions and metamorphosed marble bodies. Project areas with favorable bedrock geology for NOA are considered potentially hazardous until a site-specific investigation and lab analysis rules out NOA.

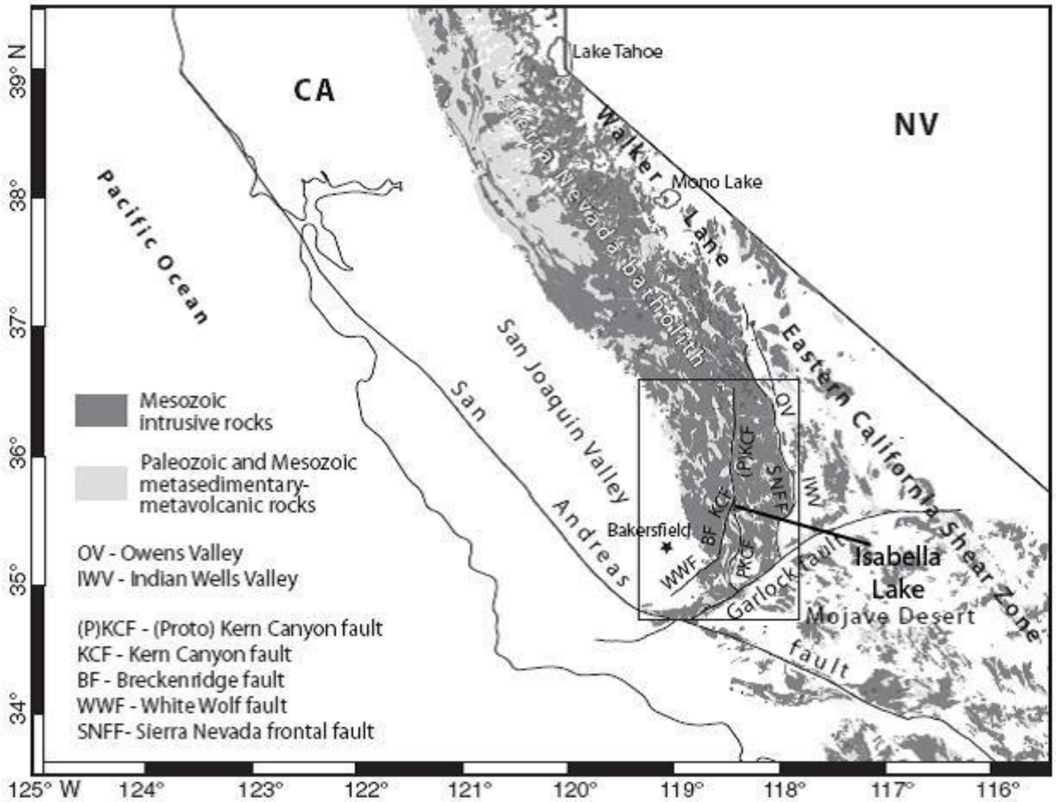
Seismicity

The project area is influenced by a number of active seismic zones. Tectonically, the Sierra Nevada has been tilted westward by rapid uplift along the Sierra Nevada Fault Zone, which forms the eastern escarpment and gentle west-sloping foothills.

The project area is in the southern part of the Sierran microplate, an independently moving block within the broad zone of distributed deformation between the Pacific Plate and the stable interior of North America (see Figure 3-3). Space-based geodesy demonstrates that the Sierran microplate moves about 13 millimeters a year to the northwest, with respect to stable North America. The motion of the Sierran microplate is directed more toward the west than the average trend of its eastern boundary, resulting in net trans-extensional deformation in the Walker Lane belt, a 62-mile-wide zone of active seismicity and late-Cenozoic faulting east of the Sierra Nevada (Corps 2010b).

The southern Sierra Nevada is bisected by a system of faults that form a zone nearly 100 miles long—the White Wolf Fault Zone, including the Breckenridge fault, to the south of the lake, and the Kern Canyon Fault Zone, which extends through the Isabella Lake Dam site to the north (Kleinfelder 2007). Other major active faults in the project's vicinity are the Garlock Fault (35 miles south), the San Andreas Fault (65 miles west), and the Owens Valley Fault (40 miles northeast).

Figure 3-3 Regional Tectonic Framework, with Features Discussed in the Text



The Garlock and San Andreas Faults are the most prominent active fault zones defining the western and southern extensions of the southern Sierra Nevada. The Owens Valley Fault defines the eastern edge of the Sierra Nevada uplift. Several large earthquakes related to these faults and affecting the Isabella Lake Dam site before and after completion in 1953 are listed in Table 3-1.

Table 3-1
Large Earthquakes Affecting the Isabella Lake Dam Site Before and After Completion in 1953

Date	Fault	Magnitude	Distance from Isabella Dam
March 26, 1872	Lone Pine (Owens Valley)	M_L7.6	75 miles NE
March 15, 1946	Kern County (Walker Pass)	M_L6.3	25 miles east
July 21, 1952	White Wolf (Kern County Earthquake)	M_L7.5	50 miles SW
July 21, 1952	White Wolf (Aftershock)	M_L6.4	50 miles SW
July 23, 1952	White Wolf (Potential aftershock)	M_L6.4	50 miles SW
August 22, 1952	White Wolf (Bakersfield)	M_L5.8	50 miles west
July 11, 1992	Garlock (Mojave)	M_W5.7	40 miles south
September 20, 1995	Kern County (Ridgecrest)	Mw5.5	60 miles east
May 1, 2008	Kern County (Scodie Mountains)	Mw4.4	11 miles east

Notes: M_L = Richter (Local) Magnitude, M_W – Moment Magnitude

The Garlock Fault is 35 miles south of Isabella Lake and the project area. The Garlock Fault zone strikes east-west, defining the northern boundary of the Mojave Block, as well as the southern end of the Sierra Nevada, and valleys of the western-most Basin and Range province. It is 155 miles long, with an estimated average slip rate of 7 millimeters/year and a calculated probable maximum moment magnitude (Mw) scale Mw6.8 to Mw7.6 earthquake. There have been sizable quakes recorded along the Garlock Fault zone. Cracks opened along a short segment of the fault in 1952, due to the shaking of the Kern County earthquake, and groundwater removal also triggered a slip in the Fremont Valley area. The most recent movement on the Garlock Fault was a magnitude (M) 5.7 earthquake near the town of Mojave on July 11, 1992, and is thought to have been triggered by the Kickapoo (Landers) earthquake (M7.3) which occurred two weeks before, approximately 115 miles southeast of the Garlock Fault zone. Despite the Kickapoo Fault's short length and previously hidden nature, it broke with a maximum of nearly 9.5 feet of right-lateral displacement (Southern California Earthquake Data Center 2010).

The San Andreas Fault forms a major tectonic boundary between the Pacific Plate and the North American Plate. The San Andreas Fault is an active, continental transform fault that runs a length of roughly 810 miles through California. It displays right lateral strike-slip movement with an average slip rate of about 35 millimeters per year. Although 65 miles west of the project site, movement on the San Andreas Fault with a calculated probable Mw6.8 to Mw8.0 or larger earthquake potential, may cause serious seismic impacts at the project site. The Fort Tejon earthquake of 1857 (M7.9) was one of the greatest earthquakes ever recorded in the United States and left an amazing surface rupture scar over 218 miles long, with an average of 15 feet of displacement, up to a maximum of 30 feet, along the San Andreas Fault. The Fort Tejon earthquake rupture was about 60 miles southwest of Isabella Lake. As a result of the shaking, the current of the Kern River was turned upstream, and water ran four feet deep over its banks. Serious ground motion effects were recorded throughout the central California region (Southern California Earthquake Data Center 2010).

The Owens Valley Fault generally strikes north along the Sierra Nevada escarpment and extends from Little Lake to Big Pine, California. The 1872 Owens Valley Fault earthquake (M7.6) occurred near Lone Pine, approximately 65 miles northeast of Isabella Lake, and involved both dip-slip and right-lateral components of movement (US Geological Survey [USGS] 2010). The most surface deformation and rupture were observed between the towns of Lone Pine and Independence, but cracks formed in the ground as far north as Bishop. The largest horizontal displacement was 21 feet, with an average vertical 3 feet of relative uplift. The shock was felt over most of California and much of Nevada, and thousands of aftershocks occurred, some of which were severe (Southern California Earthquake Data Center 2010).

The White Wolf Fault is a left-lateral reverse fault estimated at 37 miles long, with an average slip rate of 3.0 to 8.5 millimeters a year and a calculated probable maximum magnitude of Mw6.5 to M7.5. Recent rupture on the White Wolf Fault during the 1952 Kern County earthquake (M7.5) caused widespread damage (Southern California Earthquake Data Center 2010). The Breckenridge Fault extends between the White Wolf Fault and Kern Canyon Fault and is a normal fault approximately 19 miles long (Figure 3-3). The fault dip varies from vertical to steeply east-dipping. The White Wolf Fault is not believed to be structurally connected to the Kern Canyon Fault.

The Kern Canyon Fault zone is the only active structural zone that breaks the interior of the Sierra Nevada batholith, disrupting the structural coherency of the batholith. Its longevity and geometry make it well positioned to accommodate the present regional east-west extensional stress field. Structural, geomorphic, geodetic, and seismic observations indicate that the Kern Canyon Fault system has undergone Quaternary reactivation as a series of west-side-up normal fault scarps along its 81-mile length (Nadin and Saleeby 2010). Historically, the Kern Canyon Fault has been considered inactive by seismologists, but recent studies have shown otherwise. Through field studies concluding in 2010, the Corps determined that the Kern Canyon Fault is active and assessed it to be capable of a M7.5 earthquake. The recently concluded fault study show that that slip is almost purely normal and is estimated at about 0.3 millimeter a year. The conclusive evidence that led to the determination that the Kern Canyon Fault is Holocene active was primarily dateable offsets in recent alluvium. Three surface rupturing events have been seen in the last 11,000 years (Holocene). The average recurrence interval for surface rupturing earthquakes is estimated at about 3,200 years URS 2010.

The Kern Canyon Fault intersects the Auxiliary Dam right abutment. The fault's uplifted block forms a ridge that divides the Kern River Canyon from Hot Springs Valley and projects northeast next to the right abutment of the dam as an elongated spur (Engineers Point) into Isabella Lake (Figures 3-1, 3-2, and 3-3). Seismic profiling along the Auxiliary Dam's toe shows multiple splays in the Kern Canyon Fault zone (see Figures 3-4 and 3-5).

At the Main Dam, although most of the foundation is hard granitic rock and presents no concerns from a geologic standpoint, numerous joints and faults exist in the foundation and are transverse to the dam's axis. The largest fault in the foundation is at the outlet works control tower. These faults are not believed to be active seismogenic sources but likely reflect subsidiary faults associated with strike-slip movement on the Kern Canyon Fault millions of years ago. It is unknown if a major earthquake on the Kern Canyon Fault would cause any movement today on these faults beneath the Main Dam foundation (Corps 2010b).

A splay of the Kern Canyon Fault, the Big Blue Fault, parallels the Kern Canyon Fault to the north, along the North Fork of the Kern River as it enters Isabella Lake (Kleinfelder 2007). The Big Blue-Sumner shear zone is a sheared and faulted zone, as much as 125 feet wide, that strikes N30°E and dips 70°NW. Innumerable subordinate faults, splits, and sheared zones comprise the main shear zone. The Big Blue Fault is not listed as an active fault, but as a splay of the active Kern Canyon fault, should be considered active. It is not known if the Big Blue Fault represents that active strand of the fault or if the active strand is buried by recent sediments in the north fork of the reservoir (California Geological Survey 2010b, URS 2010).

New results on recent fault activity along the Kern Canyon Fault was presented as part of a larger study of the fault commissioned by the Corps Dam Safety Program to define earthquake hazards to the dams that impound Isabella Lake (Earth & Climate 2010). The Corps commissioned an airborne topographic survey of the fault zone using light detection and ranging (LiDAR), an optical remote sensing technology, to image the fault zone in areas of dense vegetation and rugged terrain typical of the remote Kern Canyon. This survey provided critical information on the location of previously undiscovered ground-surface breaks, or fault scarps, along the Kern Canyon Fault that formed during large historic earthquakes. The LiDAR survey was used to quantify the rate of movement of the Kern Canyon Fault over the past about 20,000 years at a site called Soda Spring, where the fault scarp cuts glacial moraines that formed during the last major ice age. Modern geochemical techniques were used to date the formation of these moraines and to calculate an average rate of fault movement of at least 0.2 millimeter a year over this time at Soda Spring.

Although individual earthquakes on the Kern Canyon Fault may shift the ground surface up to a meter and a half nearly instantaneously, the average slip rate includes the time between earthquakes, which ranges between hundreds and thousands of years for the Kern Canyon Fault (Amos et al. 2010).

Figure 3-4 Oblique Aerial photograph of Engineer Point

Source: Google Maps 2010
Aerial Source: Google 2009

Oblique aerial photograph of Engineer Point

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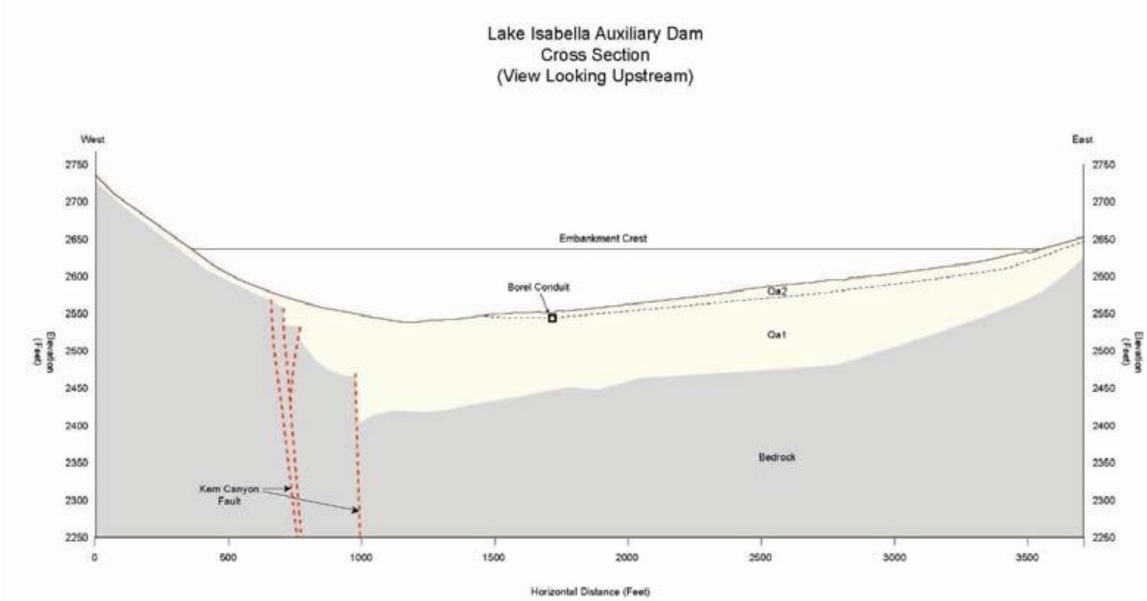
-Preliminary Not to Scale-
(For Illustrative Purposes Only)

Figure 3-5 Cross section of the Auxiliary Dam, showing depth to bedrock and the Kern Canyon Fault Zone (Corps 2010b)



Landslides

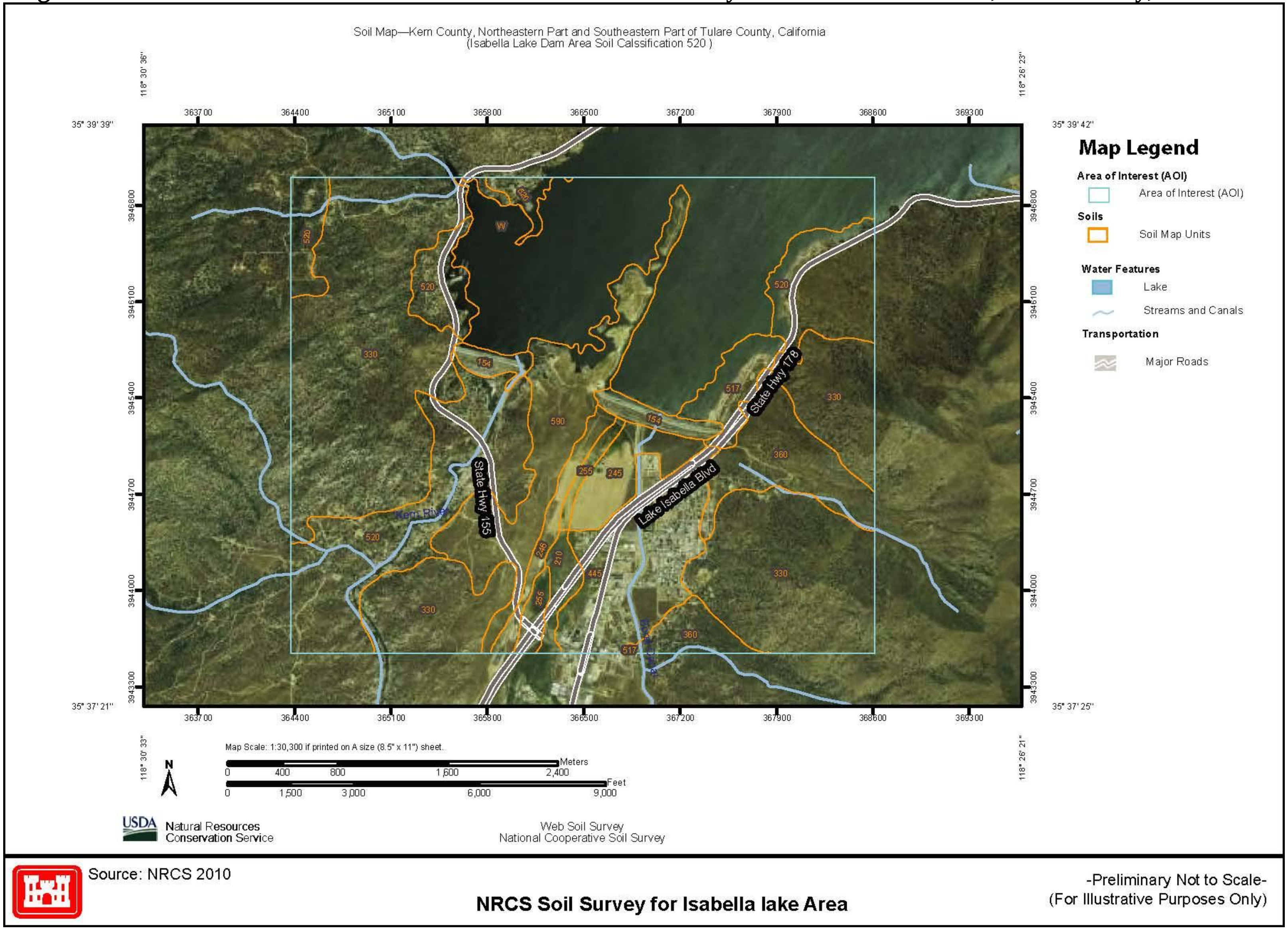
Factors that influence slope stability include slope inclination, bedrock geology geologic structure, geomorphology, weathering, and vegetation. The project area and the Kern River Valley are susceptible to mass wasting processes such as landslides, rock slides, and debris flows; specifically, the inner gorge of the Kern River was formed through such concentrated activity of mass wasting (USFS 2009a). The river gorge is considered naturally unstable, and abundant mass wasting is found as rock falls. At Isabella Lake, areas of steeply tilted metasedimentary rocks allow water to percolate downward, providing lubricant for overburden to slide and slump. In areas where the toe of a slump feature is disturbed, such as a road cut, instability is increased. In January 2011, at Stine Cove along the northern shore of east Isabella Lake, an area where near-vertical metasedimentary rocks are present, a slump block was activated by recent abundant precipitation and the massive slide blocked Sierra Way (Bolyard 2011). Similar potential geo-hazard conditions exist along the south shore, between the dam sites and the Kelso Valley Community Borrow Pit site, in locations where SR 178 cuts across two zones of uplifted, steeply titling, metasedimentary rock formations. Further investigation would be necessary to determine if these areas may produce geo-hazards.

Soils

The information that follows was taken from the Natural Resources Conservation Service (NRCS) Soil Survey for the project area (USDA NRCS 2007).

Soils classification in the project area is shown in Figure 3-6 and is based on the NRCS soil survey for the areas surrounding the Isabella Lake and Dam. Soils surrounding

Figure 3-6 Natural Resources Conservation Service Soil Survey for Isabella Lake Area, Kern County, California



Isabella Lake are characteristic of the Kernville-Hogeye-Rock outcrop complex, composed of 50 percent Kernville soils, 20 percent Hogeye soils, 15 percent rocks, and 15 percent minor material. These soils are typically shallow at 15 to 30 inches deep to bedrock, moderately steep slope at 15 to 30 percent, and excessively drained. The soil ranges from rock outcrops to gravely coarse sandy loam. Drainage consists of coarse soils developed in alluvium weathered from igneous and metamorphic rocks. Soils classification in the proposed filter sand source area near the South Fork delta at the eastern extent the Isabella Lake is shown in Figure 3-7 and is based on the NRCS soil survey and ratings for sand in soils. Soils surrounding South Fork delta depicted in Figure 3-7 that are suitable as a source of sand rated as yielding the highest percentage of sand are the Aquents-Aquolls-Riverwash complex with 0 to 5 percent slopes and the Kernfork fine sandy loam and loamy sand with 0 to 2 percent slopes, occasionally flooded. Table 3-2 shows various soils in areas of the project site and the potential erosion hazard based on the NRCS erosion factor, indicating the susceptibility of a soil to sheet and rill erosion by water. Soils in the vicinity of the project site generally show slight or slight-to-moderate potential for erosion.

Liquefaction of Alluvium Soils

Liquefaction can occur in certain types of soils that are associated with a shallow water table (Kern County 2007a). Subdivisions of surficial deposits of Quaternary age have been found to have very different potential for liquefaction and for amplification of seismic shaking (California Geological Survey 2010b). At the Main Dam, recent alluvium was left under the downstream shell after construction, but recent investigations have indicated that the material is dense and likely not subject to liquefaction, although some concern remains (Corps 2010b).

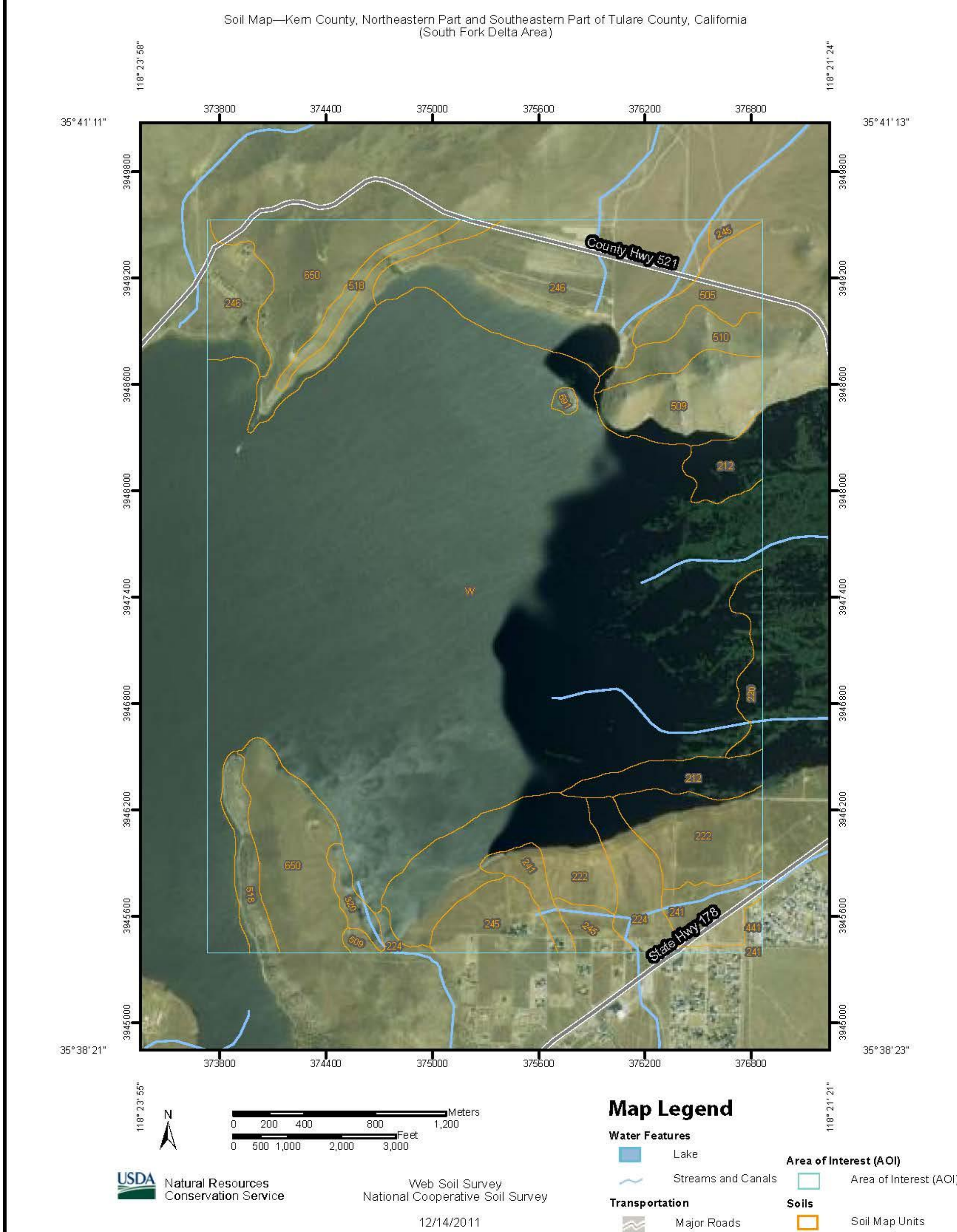
The Auxiliary Dam is constructed over alluvial fan material. A recent study of its foundation materials conducted for the Corps indicated that the dam is vulnerable to seismic activity, with the potential for catastrophic failure. The predicted strength loss of the foundation and embankment materials during a maximum credible earthquake (MCE) may result in failure of the dam and lead to a release of the lake pool. The MCE determined for the Auxiliary Dam was a moment M7.0 on the Kern Canyon Fault beneath the right abutment. The study concluded that the dam could fail if subjected to a realistically plausible ground motion that may induce liquefaction in the porous alluvial foundation materials (URS 2005).

Topography

The Isabella Lake Dams are located at 35º 37’ 57” N and 118º 28’ 35” W, in Kern County, about 35 miles northeast of Bakersfield. The Main Dam is built across the Kern River, approximately a mile below the confluence of the North and South Forks of the Kern River, and the Auxiliary Dam is constructed across the adjacent Hot Springs Valley (see Figure 1-1).

The Kernville area along the North Fork of the Kern River is a high platform that slopes gently southward with even elevated summits. The higher altitudes of the area range

Figure 3-7 NRCS Soil Survey for South Fork Delta Area Isabella Lake



Source: NRCS 2011

NRCS Soil Survey for South Fork Delta Area Isabella Lake

Table 3-2
NRCS Estimated Soil Erosion Hazard, Northeastern Kern County and Southeastern Tulare County

Location	Unit	Soil Type	Erosion Hazard
Main Dam site		Engineered Dam	
Existing Spillway	520	Kernville-Hogeye-Rock outcrop complex, 15 to 30 percent slopes	Slight
Potential Emergency Spillway and Batch Plant	520	Kernville-Hogeye-Rock outcrop complex, 15 to 30 percent slopes	Slight
	590	Xyno-Canebrake-Pilotwell complex, 5 to 30 percent slopes	Slight-to-moderate
Staging Area M1 – Rock processing and stockpiling	520	Kernville-Hogeye-Rock outcrop complex, 15 to 30 percent slopes	Slight
Staging area A1 – Sand washing facility and stockpiling	517	Southlake, gravelly-Goodale complex, 5 to 15 percent slopes	Slight
Staging Area A2 – Central storage and maintenance area	245	Chollawell gravelly loamy coarse sand, 2 to 5 percent slopes;	Slight
	445	Chollawell-Urban land complex, 0 to 5 percent slopes	Slight
Staging Area A3 - Stockpiling	245	Chollawell gravelly loamy coarse sand, 2 to 5 percent slopes;	Slight
	246	Chollawell gravelly loamy coarse sand, 5 to 15 percent slopes;	Slight
	255	Kernfork complex, 0 to 5 percent slopes;	Slight
Staging Area S1 – Rock Crushing Plant	590	Xyno-Canebrake-Pilotwell complex, 5 to 30 percent slopes	Slight to moderate
Auxiliary Dam		Engineered dam	
Borel Canal relocation area	210	Kernfork complex, fine sandy loam, 0 to 2 percent slopes, occasionally flooded;	Slight
	245	Chollawell gravelly loamy coarse sand, 2 to 5 percent slopes;	Slight
	246	Chollawell gravelly loamy coarse sand, 5 to 15 percent slopes;	Slight
	255	Kernfork complex, 0 to 5 percent slopes;	Slight
Filter sand source area – Auxiliary Dam Recreation Area	517	Southlake, gravelly-Goodale complex, 5 to 15 percent slopes	Slight
Filter sand source area – South Fork Delta	210, 212	Kernfork fine sandy loam, 0 to 2 percent slopes	Slight
	220	Aquents-Aquolls-Riverwash complex, 0 to 5 percent slopes	Slight
	215, 222	Kelval fine sandy loam, 0 to 2 percent slopes	Slight
	224, 241	Inyo gravelly loamy coarse sand, 0 to 9 percent slopes	Slight to moderate
	320	Southlake gravelly sandy loam, 2 to 15 percent slopes	Slight to moderate

Location	Unit	Soil Type	Erosion Hazard
	245, 246, 505, 512	Chollawell gravelly loamy coarse sand, 2 to 5 percent slopes (245), 5 to 15 percent slopes (246), 5 to 20 percent slopes (505, 512)	Slight
	509, 510, 591	Xyno-Faycreek-Rock outcrop complex and Xyno-Canebrake-Pilotwell association, 30 to 60 percent slopes	Slight to moderate
	518	Backcanyon-Rock outcrop complex, 15 to 50 percent slopes	Slight
	650	Stineway-Kiscove-Rock outcrop association, 30 to 75 percent slopes	Slight

Source: US Department of Agriculture 2007

between 7,000 and 9,500 feet, with Sirretta Peak marking the highest point at 9,956 feet Miller and Webb 1940). Nearby Mount Whitney, on the boundary between Inyo and Tulare Counties, is the highest summit in the contiguous United States, at 14,505 feet in elevation. The region is deeply pared by streams, carving out canyons with depths of 3,000 to 4,000 feet; the deepest of the canyons are the North and South Forks and the main stem of the Kern River below the dams. All streams drain into the southern San Joaquin Valley and the Buena Vista Lakebed via Kern River (Miller and Webb 1940).

3.4.3 Environmental Consequences

This section discusses potential impacts associated with geology, soils, and seismicity in relationship with the proposed Action Alternatives and support actions.

Scope and Methods

Potential impacts associated with geology, soils, and seismicity and the proposed project alternatives and support activities were evaluated qualitatively based on reviewing information obtained from available documents, reports, and websites and on assessing the potential for construction and support actions involved with each alternative to exacerbate seismic and soils conditions or to create other geo-hazards. The reports referenced in Section 3.6.2 were used as primary sources of relevant information for this evaluation. The analysis of geology, soils, and seismicity for this project is unique compared to the other resources evaluated in this Draft EIS. Impacts can be divided into two types—impacts of the project on the geology of the site and impacts of the geology of the site on the project.

The factors that are important for evaluating impacts include the proximity of faults and frequency of seismic activity; the characteristics and composition of rock and soils; the depth and areal extent of the blasting, excavation and disturbance of rock, mineral materials and soils; and the physical characteristics of the work site including site topography, slope, drainages, depth to groundwater and susceptibility to flooding.

An important assumption in this analysis is that all of the Action Alternatives being evaluated are designed to overcome geologic, soil and seismic conditions on the site and greatly reduce the likelihood of dam failure. It is also assumed that potential construction-related or induced geohazards would be adequately addressed by regulatory controls, Best Management Practices (BMPs) and environmental commitments.

No Action Alternative

Under the No Action Alternative, there would be no remedial improvements at the Isabella Main Dam, Spillway, or Auxiliary Dam. Isabella Dam would continue to be operated in accordance with the established Water Control Plan and Flood Control Diagram, at the pre-IRRM gross pool level (2,609.26 feet). There would be no construction–related impacts, but the seismic, seepage and hydrologic deficiencies would continue. Land surfaces and erosion and slope stability would remain essentially unchanged from current conditions. If seismic activity were to occur along the Kern Canyon Fault, fault movement could induce failure at the Auxiliary Dam. It is unknown if sympathetic movement would occur in the fault splay beneath the Main Dam. In the event of an earthquake-induced dam failure, catastrophic bank erosion and sedimentation downstream would occur with the uncontrolled release of the lake pool. Severe consequences to the health and safety of downstream residents and land use would result from dam failure and lake release of floodwaters. Potential restoration of the dam would require substantial earthwork, materials, and capital expense. On these bases, the No Action Alternative is expected to have high long-term adverse significant impacts and does not meet the project purpose and need.

Alternative Base Plan

Some of the deficiencies existing in the Isabella Lake Dams (particularly the Auxiliary Dam) are directly linked to the geology, soils, and seismicity features in the project area and vicinity. These features include the proximity to an active fault zone and the Kern Canyon Fault, and the poor dam foundation materials with soils that are prone to liquefaction, seepage, and piping. The Alternative Base Plan and all of the Action Alternatives would result in high long-term beneficial impacts with respect to correcting dam deficiencies due to existing geology, soils, and seismicity conditions in the project area.

Under this alternative, the Corps would remediate those deficiencies identified for the Main Dam, Spillway, and Auxiliary Dam that if not addressed, could result in catastrophic failure of the dams from seepage, or an occurrence of a large seismic or extreme storm event. This alternative represents the minimal risk management plan that would still provide an adequate level of safety for the project. All remediation measures under this alternative would be completed to modern construction and design standards. The remediation measures planned for each structure under this Alternative Base Plan are described below.

Main Dam. Under the Alternative Base Plan, the Main Dam remediation measures would include constructing a filter and drain near the crest of the dam, constructing a four-foot crest raise and replacing the core near the crest, and remediation of the deficiencies identified for the existing spillway. The Alternative Base Plan would remediate deficiencies associated with the Main Dam that could lead to potential differential settlement and seepage following a seismic event and/or overtopping during an extreme storm event (such as the PMF). The remediation of the existing spillway include treatment of the existing spillway chute to guard against erosion undermining of the right wall; rock anchors along the right wall to increase seismic stability; and retaining wall added to the crest along the right wall (closest to the Main Dam) to protect against potential erosion of the main dam during high outflows. The Main Dam remediation measures are intended to overcome the seismic, foundation, and hydrological deficiencies of the Main Dam and Spillway and to greatly reduce the likelihood of failure following a seismic event. Therefore, implementation of this alternative would have long-term beneficial impacts, with respect to geology, soils, and seismicity conditions in the project area.

Existing Spillway. Included in this alternative, deficiencies identified for the existing spillway would be remediated to guard against erosion undermining of the right wall, to increase seismic stability; and to protect against potential erosion of the main dam during high outflows. The existing spillway chute would be reinforced and a retaining wall would be constructed along crest of the right wall. The topography of the existing spillway site would be minimally altered by construction activities. Impacts would be adverse, short-term, low, and less-than-significant.

Emergency Spillway. This alternative includes the construction of a new "Emergency Spillway" that would be located approximately one-hundred feet east of the existing spillway (see Figure 2-5). With this configuration, the topography and surface geology of the ridge to the east of the Spillway would be permanently altered by excavation and forming activities and the USFS compound would need to be relocated. The additional spillway would be required to remediate the hydrologic deficiency (undersized capacity of the existing spillway) that could lead to overtopping and erosion of the dams. The Corps has determined that construction of the Emergency Spillway would require controlled blasting during excavation to break up the rock-outcrops located in the proposed channel.

It is anticipated that excavated materials from the proposed Emergency Spillway channel would be used as the main rock borrow material source. The Alternative Base Plan requires considerable earthwork during construction of the Emergency Spillway. The topography and surface geology of the Emergency Spillway site would be permanently altered by excavation activities. The exposed soil and steep slopes that may be temporarily created during construction could create unstable slopes that could promote erosion and minor landslides, especially in areas of exposed soil. Before achieving the finished grade for the Emergency Spillway and completing slope protection measures and establishing vegetative cover, increased erosion at the site could result in loss of topsoil from runoff. With proper design criteria and BMPs, potential impacts would be adverse, low, short-term, and less-than-significant.

Auxiliary Dam. Under the Alternative Base Plan, the Auxiliary Dam would be remediated to withstand anticipated seismic events (including fault rupture), manage expected seepage, and survive extreme flood events. Construction for the Auxiliary Dam would include an 80-foot wide crest downstream buttress, a moderate-sized sand filter and drain rock system built into the downstream slope, removing up to 30 feet of the liquefiable alluvial layer under the downstream slope of the dam and replacing it with treated soil, a four-foot crest raise, and a rock fill berm on the upstream side (see Figure 2-7). The filter and drain and crest raise would allow an extreme storm event to be able to safely pass without overtopping. Materials removed from a temporary coffer dam constructed for the Borel canal relocation would be used to construct the proposed upstream berm on the Auxiliary Dam. The Auxiliary Dam footprint would be enlarged by foundation treatment and a rock buttress at the downstream toe and slope of the Auxiliary Dam, which would permanently alter the topography. Excavation could create temporary unstable slopes that could promote erosion and sloughing, especially in areas of exposed soil. With the use of BMPs, the potential for impacts would be low. Existing slopes on the east and west side of the Auxiliary Dam would be lessened as a result of the remediation and create long term stable slopes and decrease erosion. The remedial actions to the Auxiliary Dam would provide long-term high beneficial impacts including better management of seepage, reduction of potential dam failure associated with fault rupture, reduction of the potential for liquefaction during a seismic event, and increased seismic stability of the dam.

Borel Canal. Under the Alternative Base Plan the existing Borel Canal conduit through the Auxiliary Dam and control tower would be taken out of operation and abandoned. It would remediate the piping created by the Borel Canal conduit through the dam and greatly reduce the likelihood of failure following a seismic event. Therefore, implementation of this remedial measure would have high long-term beneficial impacts on geology, soils, and seismicity conditions in the project area.

The new Borel Canal alignment would be constructed through the right abutment of the Auxiliary Dam and connect the existing submerged Borel Canal in the lake (upstream of the Auxiliary Dam) to the existing exposed Borel Canal (downstream of the Auxiliary Dam (see Figure 2-6). A temporary rock-fill coffer dam would be required upstream of the Auxiliary Dam in the area where the right abutment joins Engineers Point (see Figure 2-7) which would temporarily alter the topography. The rock materials needed to construct the temporary coffer dam would come from the excavation of the proposed Emergency Spillway or from Engineers Point.

Relocating the Borel Canal to pass through the right abutment of the Auxiliary Dam would involve constructing a new section of the canal upstream of the dam, drill and blast techniques to tunnel through competent rock in the ridge adjacent to the right abutment, and constructing a connecting section to the existing alignment downstream (see Figure 2-10). These activities would require crossing the Kern Canyon Fault both upstream and downstream of the dam. Therefore, careful attention would need to be given to these crossings and tunneling through the abutment during design and construction in order to minimize any potential for these areas to be vulnerable to seismic activity. With proper design criteria and BMPs, potential impacts would be adverse, short-term, low, and less-than-significant.

Support Actions. Five staging areas and four temporary haul routes would be established to support construction activities in the Primary Action Area (Figure 2-25 and Table 2-2 in Chapter 2). Establishing these sites would include grading and potential permanent removal of rock and soil, which would change the topography and surface geology of the source areas. Use of these staging areas over the multi-year period would be leave exposed surfaces vulnerable to erosion and compaction. Material stockpiling, processing, cement mixing and potential spills may also change the composition of soils on these sites. Assuming some degree of restoration to the site following construction (details not yet determined) and the use of BMPs, these impacts would be adverse, short-term, low, and less-than-significant.

Rock material excavated for the Emergency Spillway and Borel Tunnel would be processed and reused onsite as the main borrow material source for rock required for use in construction for the modification features for all Action Alternatives. This would include the permanent removal of rock and soil, which would change the topography and surface geology of the Emergency Spillway site. The excavated materials would be crushed and stockpiled at a temporary Crushing Plant located in a construction staging area adjacent to Engineers Point in the vicinity of Launch 19 (Staging Area S1) and delivered to the appropriate construction areas as needed. Excess rock material would be added to the upstream berm of the Auxiliary Dam, used in road work and possibly for site restoration. With implementation of the BMPs, the potential impacts would be adverse, low, short-term, and less-than-significant.

The sand material required to construct the filter and drain near the crest of the Main Dam and the filter on the downstream slope of the Auxiliary Dam, would come from one or both of the two proposed “borrow” sources— the Auxiliary Dam Recreation Area which is on-site, and an off-site source that would be the South Fork Delta area, just downstream of the South Fork Wildlife Area. This would include the permanent removal of rock and soil, which would change the topography and surface geology of the source areas. Sand sourced from within the South Fork delta would be removed in shallow excavations that would likely be inundated and filled naturally within a few seasons. All the sand would be processed and stored at Staging Area A1 at the Auxiliary Dam Recreation Area. Assuming some degree of restoration to the site following construction (details not yet determined) and the use of BMPs, the potential impacts would be adverse, low, short-term, and less-than-significant.

The temporary rock-fill coffer dam upstream of the Auxiliary Dam in the area where the right abutment joins Engineers Point (see Figure 2-9) would temporarily change the topography and surface geology. This temporary coffer dam would be required in order to sufficiently dewater the area needed for construction of the upstream portal of the new Borel Canal tunnel. After the construction of the upstream portal and tie-in to the existing canal in the reservoir is complete, the temporary coffer dam would be removed and the materials would be used to construct the proposed upstream berm on the Auxiliary Dam. It is anticipated that the topography and surface geology of these sites would be restored for a new purpose to be determined later and through the use of BMPs, the potential impacts would be adverse, low, short-term, and less-than-significant.

Alternative Plan 1

Alternative Plan 1 includes all of the actions designed to remediate the seismic, hydrologic, and seepage deficiencies identified under the Alternative Base Plan; plus additional remediation measures identified for the Main Dam. Anticipated impacts on geology, soils and seismicity would be similar to those described for Alternative Base Plan with the following additions described below.

The additional remediation measures include constructing a full-height filter and drain (rather than a filter only near crest as is described under the Alternative Base Plan) on the downstream slope of the Main Dam (see Figures 2-7), a toe filter/drain system, and a RCC Overlay on the center portion of the Main Dam. The filter and drain would be designed to capture and collect seepage. The RCC overlay would be constructed over the full-height filter and drain on the downstream face of the dam (see Figure 2-14) and would likely incorporate a 10-foot high fuse plug near the top of the Main Dam. The RCC Overlay and fuse plug would provide an additional emergency spillway to control any overtopping of the dam in the event of a very large and extremely rare storm event (such as the PMF). These actions would further protect the integrity of the dam from eroding and potentially resulting in dam failure. Therefore, implementation of Alternative Plan 1 would have high long-term beneficial impacts on geology, soils, and seismicity in the project area.

The concrete used in the RCC Overlay would require a mixture of fine and coarse aggregates and water from on-site and off-site sources (e.g., the two sand borrow areas, Emergency Spillway excavation, and lake). The needed concrete would be prepared in a temporary and portable on-site Batch Plant set up in the Emergency Spillway excavation area. An additional staging area (M1) would be located in the Main Dam Campground below the Main Dam and would serve as a location for stockpiling and processing rock material from the Main Dam downstream embankment and foundation excavation. Establishing this site for Alternative Plan 1, as well as for Alternative Plans 2 and 3 would include grading and potential permanent removal of rock and soil, which would change the topography and surface geology of the source areas. Assuming some degree of restoration to the site following construction (details not yet determined) and the use of BMPs, these impacts would be adverse, but low. . As with the Alternative Base Plan, the potential short-term impacts would be adverse, low, and less-than-significant with the incorporation of the recommended mitigation measures.

Alternative Plan 2

Alternative Plan 2 includes all of the actions designed to remediate the seismic, hydrologic, and seepage deficiencies identified under Alternative Plan 1; plus additional remediation measures identified for the Auxiliary Dam. Anticipated impacts on geology, soils and seismicity would be similar to those described for Alternative Plan 1 with the following additions.

Additional remediation measures for the Auxiliary Dam include adding a larger downstream buttress (100-foot wide crest) and a more extensive filter and drain system than was proposed for the Alternative Base Plan and Alternative Plan 1 to improve fault rupture, seismic stability, and seepage control (see Figures 2-7). Under this alternative, the dam footprint would be enlarged by foundation treatment and a rock buttress at the downstream toe and slope of the Auxiliary Dam, which would permanently alter the topography. Increasing the dimension of the downstream buttress would require additional material removal and processing that would increase the level of impact to source areas. Excavation could create temporary unstable slopes that could promote erosion and sloughing, especially in areas of exposed soil. With the use of BMPs, the potential impacts would be adverse, low, short-term, and less-than-significant.

Alternative Plan 2 would also include providing a complete in-situ treatment of the deeper alluvial soil foundation (instead of only shallow treatment as under Alternative Base Plan and Alternative Plan 1) under the downstream slope. These actions would have high long-term beneficial impacts further ensuring stability of the dam during a seismic event.

The additional rock materials needed to complete the larger downstream buttress on the Auxiliary Dam would come from the excavation of the Emergency Spillway. The sand material required to construct the larger filter on the downstream slope of the Auxiliary Dam would come from the two borrow sources, the Auxiliary Dam Recreation Area and the South Fork Delta area. Assuming some degree of restoration to the sites following construction (details not yet determined) and the use of BMPs, potential for short-term adverse impacts would be low and less-than-significant with the incorporation of the recommended mitigation measures.

Alternative Plan 3

Alternative Plan 3 includes all of the actions designed to remediate the seismic, hydrologic, and seepage deficiencies identified under Alternative Plan 2 with additional remediation measures at the Main Dam and the relocation of the Borel Canal from the Auxiliary Dam to the Main Dam. Anticipated impacts on geology, soils and seismicity would be similar to those described for Alternative Plan 2 with the following changes.

The additional remediation measures for the Main Dam include adding a steel lining to the Main Dam Control Tower to better withstand an extreme seismic loading and adding concrete fill to the downstream side of the Main Dam Exit Portal Structure to increase seismic stability, a beneficial impact. Negligible additional construction impacts would be anticipated from material use under this remedial action.

Additional remediation measures include relocating the Borel Canal to connect via a tunnel from the Main Dam Outlet through the USFS ridge to the present canal alignment below the Auxiliary Dam (see Figure 2-11). The existing Borel Canal conduit through the Auxiliary Dam would be deactivated, sealed and abandoned. These measures are intended to overcome the seismic, foundation soils, and seepage deficiencies of the Auxiliary Dam and the piping created by the Borel Canal conduit through the dam. It also would greatly reduce the risk of failure following a seismic event. Therefore, implementation of this alternative would have high long-term beneficial impacts on the geology, soils, and seismicity in the project area.

Relocating the Borel Canal would require constructing an additional outlet structure to allow the Borel Canal to branch off from the Main Dam Outlet, tunneling under the existing and proposed spillways through the ridge on which the USFS compound is located, and constructing a new section of the canal to connect to the existing alignment (see Figure 2-11). Tunneling through the ridge may involve some minor blasting, and constructing the new canal section downstream of the Auxiliary Dam would involve crossing the Kern Canyon Fault. Therefore, careful attention would need to be given to these activities during design and construction in order to minimize any potential for these areas to become more vulnerable to seismic activity. Also, tunneling and removing the material through the hillside east of the Spillway may change topography and increase the potential for soil erosion and slope instability. The rock materials needed to complete the new tunnel-conduit and connections from the Main Dam outlet would come from the tunnel excavation and/or the excavation of the Emergency Spillway. With proper design criteria and BMPs during construction focused on these concerns, potential impacts would be adverse, low, short-term, and less-than-significant.

Alternative Plan 4

Under this alternative, the deficiencies remediated in the Base Plan Alternative would be included, plus additional remediation measures identified for the Existing and Emergency Spillways, Main Dam, and Auxiliary Dam. These additional remediation measures include installing a filter and drain system, raising the dam crests and existing spillway walls by 16 feet, widening the emergency spillway to 900 feet, realigning State Highway 178, and installing a flood gate where the new Main Dam embankment would intersect State Highway 155. This alternative would have geology, soils, and seismicity impacts similar to the Base Plan Alternative, remediating for the proximity to an active fault zone and the Kern Canyon Fault, and the poor dam foundation materials with soils that are prone to liquefaction, seepage, and piping.

As with the Base Plan Alternative, this plan would address the geologic, soils, and seismic conditions that have been identified as the purpose and need of the project. Therefore, this alternative would have a beneficial effect with respect to accommodating the dam's design to the existing geologic, soils, and seismic conditions in the area.

Installing a filter and drain system and raising the dam crests and existing spillway wall by 16 feet would protect against erosion of the main dam during high flows. This alternative would include widening the emergency spillway described under the Base Plan Alternative. A wider emergency spillway would require additional controlled blasting that could result in the area being more vulnerable to future seismic events; however, the increase in vulnerability would be considered less than significant due to the relatively small area of disturbance when compared to the size and orientation of the geologic formations that form the Kern Canyon Fault.

Increased ground disturbance from widening the emergency spillway and realigning a road would further alter the topography of the area. The exposed soils and steep slopes created temporarily during construction have an adverse effect by creating unstable slopes that could promote erosion and minor landslides; however, standard BMPs to avoid or minimize soil erosion and slope stability measures would be implemented to ensure these short-term, adverse effects would be less than significant.

3.4.4 Environmental Commitments/Mitigation Measures

The following mitigation measures are recommended to reduce potential geology, soils, and seismicity impacts to the lowest extent practicable:

- The contractor would be required to prepare an erosion and sediment control plan, identifying specific BMPs to avoid or minimize soil erosion. Construction during the winter would require additional measures to prevent erosion and loss of topsoil during storms.
- Slope stability measures would be implemented, in accordance with Kern County Grading Guidelines and Regulations. Slope stability evaluations would be conducted at each construction and borrow site, as deemed appropriate by the Corps.
- All suitable excavated soils and fill would be stockpiled and reused in the project area for restoration. If any unsuitable material is found or generated, it would be disposed of at a commercial landfill or approved site.
- BMPs would be used to ensure erosion control in the project sites during construction.
- Areas temporarily disturbed by construction would be returned to pre-construction conditions by grading, reducing compaction, and revegetating. Barren areas would be seeded with native vegetation to reduce the potential for erosion.
- The following dust control measures would be implemented where they are applicable and feasible (see also Section 3.5, Air Quality):
    - Watering would take place a minimum of twice daily on unpaved/untreated roads and on disturbed soil areas with active operations,
    - All clearing, grading, earth moving, and excavation would cease during periods of winds greater than 20 miles per hour (averaged over one hour), when disturbed material is easily windblown, or when dust plumes of 20 percent or greater opacity impact public roads, occupied structures, or neighboring property,

- All fine material transported off-site would be sufficiently watered or securely covered to prevent excessive dust; areas disturbed by clearing, earth moving, or excavation would be minimized at all times,
- Stockpiles of soil or other fine loose material would be stabilized by watering or other appropriate method to prevent windblown fugitive dust,
- Where acceptable to the fire department, weeds would be controlled by mowing instead of discing, thereby leaving the ground undisturbed and with a mulch covering, and
- Once initial leveling has ceased, all inactive soil areas in the construction site would be seeded and watered until plant growth is evident, treated with a dust palliative, or watered twice daily until soil has sufficiently crusted to prevent fugitive dust emissions.

3.5 AIR QUALITY

This section provides a discussion of the regulatory setting for air quality, the affected environment, and the potential impacts on air quality from the Action Alternatives and support actions.

3.5.1 Regulatory Setting

Air quality within the Kern River Valley portion of Kern County is regulated by the US Environmental Protection Agency (EPA), California Air Resources Board (CARB), and the East Kern Air Pollution Control District, (EKAPCD). Each of these agencies develops rules, regulations, policies, and goals to comply with applicable legislation. Although EPA regulations may not be superseded, both State and local regulations may be more stringent. State and local requirements are included that were helpful in characterizing the overall context of the analyses, even though some of these requirements do not directly apply to this Federal action.

Air quality regulations focus on the air pollutants ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respiratory and fine particulate matter (PM_{10} and $PM_{2.5}$), and lead. Because these are the most prevalent air pollutants known to be deleterious to human health and extensive criteria documents are available, they are commonly referred to as criteria air pollutants.

Federal Regulations

The 1977 Federal Clean Air Act (CAA) and 1990 revisions require the EPA to identify National Ambient Air Quality Standards (NAAQS) to protect the public health and welfare (Table 3-3). In June 1997, the EPA adopted new PM_{10} Federal standards and an additional standard for suspended particulate matter at or below PM_{10}, to $PM_{2.5}$.

On March 12, 2008, the EPA implemented a new 8-hour standard for ozone of 0.075 ppm, and the new secondary standard is set at a form and level identical to the primary standard. The previous primary and secondary standards were an identical 8-hour standard, set at 0.08 ppm. On April 12, 2010, the EPA implemented a new 1-hour standard for NO_2 of 100 ppb.

In accordance with the 1990 CAA, amendments the EPA classified air basins (or portions thereof) as either in attainment or nonattainment for each criteria air pollutant, based on whether the NAAQS have been achieved. The CAA also required each State to prepare an air quality control plan (State Implementation Plan [SIP]). The 1990 amendments additionally required States containing areas that violate NAAQS to revise their SIPs to incorporate additional control measures to reduce air pollution. The EPA has the responsibility to review all SIPs to determine if they conform to the mandates of the CAA amendments and will achieve air quality goals when implemented.

Table 3-3
Federal and California Ambient Air Quality Standards

Pollutant	Averaging Time	Federal Standards[1]	California Standards[2]
O_3	8 Hours	0.075 ppm (147 µg/m^3)	0.07 ppm (137 µg/m^3)
	1 Hour	--[3]	0.09 ppm (180 µg/m^3)
Carbon monoxide (CO)	8 Hours	9 ppm (10 mg/m^3)	9.0 ppm (10 mg/m^3)
	1 Hour	35 ppm (40 mg/m^3)	20 ppm (23 mg/m^3)
Nitrogen dioxide (NO_2)	Annual average	0.053 ppm (100 µg/m^3)	0.03 ppm (56 µg/m^3)
	1 Hour	100 ppb	0.18 ppm (338 µg/m^3)
Sulfur dioxide (SO_2)	Annual average	0.03 ppm (80 µg/m^3)	--
	24 Hours	0.14 ppm (365 µg/m^3)	0.04 ppm (105 µg/m^3)
	1 Hour	0.075 ppm	0.25 ppm (655 µg/m^3)
Particulate matter (PM_{10})	Annual Arithmetic mean	--[4]	20 µg/m^3
	24 Hours	150 µg/m^3	50 µg/m^3
Particulate matter fine ($PM_{2.5}$)	Annual arithmetic mean	15 µg/m^3	12 µg/m^3
	24 Hours	35 µg/m^3 (replaced)[5]	--
Sulfates	24 Hours	--	25 µg/m^3
Lead	Calendar quarter	1.5 µg/m^3	--
	30-Day average	--	1.5 µg/m^3
	Rolling 3-month average	0.15 µg/m^3	--
Hydrogen sulfide (H_2S)	1 Hour	--	0.03 ppm (42 µg/m^3)
Vinyl chloride (chloroethene)	24 Hours	--	0.01 ppm (26 µg/m^3)
Visibility-reducing particles (VRPs)	8 Hours	--	(see note[6])

Notes:

[1]The National Ambient Air Quality Standards, other than O_3 and those based on annual averages, are not to be exceeded more than once a year. The O_3 standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.

[2]The California Ambient Air Quality Standards for O_3, CO, SO_2 (1-hour and 24-hour standards), NO_2, PM_{10}, and $PM_{2.5}$ are values not to be exceeded. All other California standards shown are values not to be equaled or exceeded.

[3]One-hour ozone standard revoked effective June 15, 2005.

[4]Annual PM_{10} standard revoked effective December 17, 2006.

[5]The 1997 $PM_{2.5}$ standards were replaced by the 2006 $PM_{2.5}$ standards, effective December 18, 2006, pending formal rulemaking by the EPA. The proposed 2008 $PM_{2.5}$ Plan addresses attainment of the 1997 $PM_{2.5}$ standards and progress toward meeting the more stringent 2006 standards. For this reason, the San Joaquin Valley Air Pollution Control District continues to list the 1997 24-hour $PM_{2.5}$ standard.

[6]Statewide VRP Standard (except Lake Tahoe Air Basin): Particles in sufficient amounts to produce an extinction coefficient of 0.23 per kilometer when the relative humidity is less than 70 percent. This standard is intended to limit the frequency and severity of visibility impairment due to regional haze and is equivalent to a 10-mile nominal visual range.

Abbreviations:

ppm = parts per million; ppb = parts per billion; mg/m^3 = milligrams per cubic meter;
µg/m^3= micrograms per cubic meter

Criteria Air Pollutants

Concentrations of the following air pollutants: Ozone, ROG, NO_2, SO_2, PM_{10} and $PM_{2.5,}$ $SO_4^{-2,}$ and lead are used as indicators of ambient air quality conditions, and as such are called Criteria Pollutants. Brief descriptions of the physical and health effects from these government-regulated Criteria Pollutants are provided in the following paragraphs.

Ozone. Ozone (O_3) occurs in two layers of the atmosphere. The layer surrounding the earth's surface is the troposphere. Here, at ground level, tropospheric, or "bad," ozone is an air pollutant that damages human health, vegetation, and many common materials. It is a key ingredient of urban smog. The troposphere extends to about 10 miles up, where it meets the second layer, the stratosphere. The stratospheric, or "good," ozone layer extends upward from about 10 to 30 miles above the troposphere and protects life on earth from the sun's harmful ultraviolet rays.

Bad ozone is what is known as a photochemical pollutant. It needs reactive organic gases (ROG), NO_X, and sunlight. ROG and NO_X are emitted from various sources throughout Kern County. Significant ozone formation generally requires an adequate amount of precursors in the atmosphere and several hours in a stable atmosphere with strong sunlight. To reduce ozone concentrations, it is necessary to control the emissions of these ozone precursors.

Ozone is a regional air pollutant. It is generated over a large area and is transported and spread by the wind. As the primary constituent of smog, ozone is the most complex, difficult to control, and pervasive of the criteria pollutants. Unlike other pollutants, it is not emitted directly into the air by specific sources but is created by sunlight acting on other air pollutants (the precursors), specifically NO_X and ROG. Sources of precursor gases number in the thousands and include common sources, such as consumer products, gasoline vapors, chemical solvents, and combustion by-products of various fuels. Originating from gas stations, motor vehicles, large industrial facilities, and small businesses, such as bakeries and dry cleaners, the ozone-forming chemical reactions often take place in another location, catalyzed by sunlight and heat. Thus, high ozone concentrations can form over large regions when emissions from motor vehicles and stationary sources are carried hundreds of miles from their origins.

While ozone in the upper atmosphere protects the earth from harmful ultraviolet radiation, high concentrations of ground-level ozone can adversely affect the human respiratory system. Many respiratory ailments, as well as cardiovascular disease, are aggravated by exposure to high ozone levels. Ozone also damages natural ecosystems, such as forests and foothill communities, agricultural crops, and some human-made materials, such as rubber, paint, and plastic. High levels of ozone may negatively affect immune systems, making people more susceptible to respiratory illnesses, including bronchitis and pneumonia. Ozone also accelerates aging and exacerbates asthma and bronchitis. For the first time, recent evidence has linked the onset of asthma to exposure to elevated ozone levels in exercising children (McConnell et al. 2002:359, 386–391). Active people who work or play outdoors appear to be more at risk from ozone exposure than those with a low level of activity. The elderly and those with respiratory disease are also considered sensitive populations for ozone.

Ozone is a powerful oxidant and can be compared to household bleach, which can kill living cells (such as germs or human skin cells) on contact. Ozone can damage the respiratory tract, causing inflammation and irritation, and can induce such symptoms as coughing, chest tightness, shortness of breath, and worsening of asthmatic symptoms. Ozone in sufficient doses increases the permeability of lung cells, rendering them more susceptible to toxins and microorganisms. Exposure to levels of ozone above the current ambient air quality standard leads to lung inflammation and lung tissue damage and a reduction in the amount of air inhaled into the lungs. Elevated ozone concentrations also reduce crop and timber yields, damage native plants, and damage materials, such as rubber, paints, fabric, and plastics (CARB ALA 2007).

Reactive Organic Compounds. Hydrocarbons are organic gases that are formed solely of hydrogen and carbon. There are several subsets of organic gases, including VOCs and ROGs, which include all hydrocarbons except those exempted by CARB. Therefore, ROGs are a set of organic gases based on State rules and regulations. VOCs are similar to ROGs in that they include all organic gases except those exempted by Federal law. The list of compounds exempted from the definition of a VOC is presented in District Rule 1102.

Both VOCs and ROGs are emitted from incomplete combustion of hydrocarbons or other carbon-based fuels. Combustion engine exhaust, oil refineries, and oil-fueled power plants are the primary sources of hydrocarbons. Another source of hydrocarbons is evaporation from petroleum fuels, solvents, dry cleaning solutions, and paint.

The primary health effects of hydrocarbons stem from ozone (see discussion above). High levels of hydrocarbons in the atmosphere can interfere with oxygen intake by reducing the amount of available oxygen through displacement. There are no separate Federal or California ambient air quality standards for ROG. Carcinogenic forms of ROG are considered toxic air contaminants (TACs), an example of which is benzene, a carcinogen. The health effects of individual ROGs are described under toxic air contaminants below.

Carbon Monoxide. CO is emitted by mobile and stationary sources as a result of incomplete combustion of hydrocarbons or other carbon-based fuels. CO is an odorless, colorless, poisonous gas that is highly reactive.

CO is a by-product of motor vehicle exhaust, which contributes more than 66 percent of all CO emissions nationwide. In cities, automobile exhaust can cause as much as 95 percent of all CO emissions. These emissions can result in high concentrations of CO, particularly in areas with heavy traffic congestion. Other sources of CO emissions include industrial processes and fuel combustion in such sources as boilers and incinerators. Despite an overall downward trend in concentrations and emissions of CO, some metropolitan areas still experience high levels.

CO enters the bloodstream and binds more readily to hemoglobin, the oxygen-carrying protein in blood, than oxygen, thereby reducing the oxygen-carrying capacity of blood and reducing oxygen delivery to organs and tissues. The health threat from CO is most serious for those who suffer from cardiovascular disease. Healthy individuals are also affected but only at higher levels of exposure. Exposure to CO can cause chest pain in heart patients, headaches, and reduced mental alertness. At high concentrations, CO can cause heart difficulties in people with chronic diseases and can impair mental abilities. Exposure to elevated CO levels is associated with visual impairment, reduced work capacity, reduced manual dexterity, poor learning ability, difficulty performing complex tasks, and, with prolonged enclosed exposure, death.

The adverse health effects associated with exposure to ambient and indoor concentrations of CO are related to the concentration of carboxyhemoglobin in the blood. Health effects observed may include an early onset of cardiovascular disease, behavioral impairment, decreased exercise performance of young healthy men, reduced birth weight, sudden infant death syndrome, and increased daily mortality rate (Fierro et al. 2001:10).

Most of the studies that evaluate the adverse health effects of CO on the central nervous system examine high-level poisoning. Such poisoning results in symptoms ranging from common flu and cold symptoms (shortness of breath or mild exertion, mild headaches, and nausea) to unconsciousness and death. Hexter and Goldsmith report an association between daily death rate and exposure to ambient CO in Los Angeles County. They postulate a concentration of 20.2 ppm (the highest daily concentration recorded during a four-year period) contributed to 11 out of 159 deaths (Hexter and Goldsmith 1971:172, 265–266).

Nitrogen Dioxide. NO_X is a family of highly reactive gases that are primary precursors to the formation of ground-level ozone; they react in the atmosphere to form acid rain. NO_X is emitted from solvents and combustion processes in which fuel is burned at high temperatures, principally motor vehicle exhaust and stationary sources, such as electric utilities and industrial boilers. A brownish gas, NO_X is a strong oxidizing agent that reacts in the air to form corrosive nitric acid and toxic organic nitrates.

NO_X is an ozone precursor that combines with ROG to form ozone (see the discussion of ozone above for the health effects of ozone).

Direct inhalation of NO_X can also cause a wide range of health effects. NO_X can irritate the lungs, cause lung damage, and lower resistance to respiratory infections, such as influenza. Short-term exposures (e.g., less than three hours) to low levels of nitrogen dioxide (NO_2) may lead to changes in airway responsiveness and lung function in individuals with respiratory illnesses. These exposures may also increase respiratory illnesses in children. Long-term exposures to NO_2 may lead to increased susceptibility to respiratory infection and may cause irreversible lung damage. Other health effects are an increase in the incidence of chronic bronchitis and lung irritation. Chronic exposure may lead to eye and mucus membrane aggravation, along with pulmonary dysfunction. NO_X can fade textile dyes and additives, deteriorate cotton and nylon, and corrode metals due to the production of particulate nitrates. Airborne NO_X can also impair visibility.

NO_X contributes to a range of environmental effects, both directly and indirectly, when combined with other precursors in acid rain and ozone. Increased nitrogen inputs to terrestrial and wetland systems can lead to changes in plant species composition and diversity. Similarly, direct nitrogen inputs to aquatic ecosystems, such as those found in estuarine and coastal waters, can lead to eutrophication (a condition that promotes excessive algae growth, which can severely deplete dissolved oxygen and increase the levels of toxins that are harmful to aquatic life). Nitrogen, alone or in acid rain, also can acidify soils and surface waters. Soil acidification causes the loss of essential plant nutrients and increased levels of soluble aluminum, which is toxic to plants. Surface water acidification creates low pH conditions and levels of aluminum that are toxic to fish and other aquatic organisms. NO_X also contributes to visibility impairment.

Particulate matter. PM_{10} and $PM_{2.5}$) pollution consists of very small liquid and solid particles floating in the air. Some particles are large or dark enough to be seen as soot or smoke. Others are so small they can be detected only with an electron microscope. Particulate matter is a mixture of materials that can include smoke, soot, dust, salt, acids, and metals. Particulate matter also forms when gases emitted from motor vehicles and industrial sources undergo chemical reactions in the atmosphere. PM_{10} refers to particles less than or equal to 10 microns in aerodynamic diameter; $PM_{2.5}$ refers to particles less than or equal to 2.5 microns in aerodynamic diameter and are a subset of PM_{10}.

In the western United States, there are sources of PM_{10} in both urban and rural areas. PM_{10} and $PM_{2.5}$ are emitted from stationary and mobile sources, including diesel trucks and other motor vehicles, power plants, industrial processes, wood-burning stoves and fireplaces, wildfires, dust from roads, construction, landfills, and agriculture, and fugitive windblown dust. Because particles originate from a variety of sources, their chemical and physical compositions vary widely.

PM_{10} and $PM_{2.5}$ particles are small enough—about one seventh the thickness of a human hair or smaller—to be inhaled and lodged in the deepest parts of the lung where they evade the respiratory system's natural defenses. Health problems begin as the body reacts to these foreign particles. Acute and chronic health effects associated with high particulate levels include the aggravation of chronic respiratory diseases, heart and lung disease, and coughing, bronchitis, and respiratory illnesses in children. Recent mortality studies have shown a statistically significant direct association between mortality and daily concentrations of particulate matter in the air. PM_{10} and $PM_{2.5}$ can aggravate respiratory disease and cause lung damage, cancer, and premature death. Sensitive populations, including children, the elderly, exercising adults, and those suffering from chronic lung disease, such as asthma and bronchitis, are especially vulnerable to the effects of PM_{10}. Effects unrelated to health include reduced visibility and soiling of buildings.

Attaining the California particulate matter standards would annually prevent about 6,500 premature deaths, or three percent of all deaths. These premature deaths shorten life by an average of 14 years. This is roughly equivalent to the same number of deaths (4,200 to 7,400) linked to secondhand smoke in 2000. In comparison, 3,200 deaths were caused by motor vehicle crashes and 2,000 deaths resulted from homicide in 2000. Attaining the

California particulate matter and ozone standards would annually prevent 4,000 hospital admissions for respiratory disease, 3,000 hospital admissions for cardiovascular disease, and 2,000 asthma-related emergency room visits. Exposure to diesel particulate matter causes about 250 excess cancer cases per year in California (CARB ALA 2007).

A recent study provides evidence that exposure to particulate air pollution is associated with lung cancer. This study found that residents who live in an area that is severely affected by particulate air pollution are at risk of lung cancer at a rate comparable to nonsmokers exposed to secondhand smoke. This study also found an approximately 16 percent excess risk of dying from lung cancer due to fine-particulate air pollution (Pope et al. 2002).

Another study shows that individuals with cardiac disease can be in a potentially life-threatening situation when exposed to high levels of ultrafine air pollution. Fine particles can penetrate the lungs, cause the heart to beat irregularly, or cause inflammation, which could lead to a heart attack (Peters et al. 2001).

Currently, 57 percent of California's population live in areas that exceed the Federal $PM_{2.5}$ air standard, while 90 percent live in areas that exceed California's $PM_{2.5}$ air standard (CARB ALA 2007).

Sulfates. Sulfates (SO_4^{-2}) are particulate products from combustion of sulfur-containing fossil fuels. When sulfur dioxide, or SO_2, is exposed to oxygen, it precipitates out into sulfates (SO_3 or SO_4). Data collected in Kern County identified sulfate levels that are significantly less than the applicable health standards.

Sulfates are the fully oxidized ionic form of sulfur and occur in combination with metal or hydrogen ions. In California, emissions of sulfur compounds occur primarily from the combustion of petroleum-derived fuels (e.g., gasoline and diesel fuel) that contain sulfur. Sulfates (SO_4^{-2}) are particulate products from combustion of sulfur-containing fossil fuels. Data collected in Kern County identified sulfate levels that are significantly less than the applicable health standards.

Sulfates are the fully oxidized ionic form of sulfur and occur in combination with metal or hydrogen ions. In California, sulfur compounds are emitted primarily from the combustion of petroleum-derived fuels (e.g., gasoline and diesel fuel) that contain sulfur. This sulfur is oxidized to SO_2 during combustion and is converted to sulfate compounds in the atmosphere. SO_2 is converted to sulfates comparatively rapidly and completely in urban areas of California because of regional meteorological features.

CARB's sulfates standard is designed to prevent aggravation of respiratory symptoms. Effects of sulfate exposure at levels above the standard include decreased oxygen intake, aggravated asthmatic symptoms, and increased risk of cardiopulmonary disease. Sulfates are particularly effective in degrading visibility and, because they are usually acidic, can harm ecosystems and damage materials and property (CARB 2009b).

Lead. Lead is a metal that is a natural constituent of air, water, and the biosphere. Lead is neither created nor destroyed in the environment, so it essentially persists forever. Historically, lead was used to increase the octane rating in automobile fuel. However, because gasoline-powered automobile engines were a major source of airborne lead through the use of leaded fuels and that use has been mostly phased out, the ambient concentrations of lead have dropped dramatically.

Exposure to lead occurs mainly through inhalation of air and ingestion of lead in food, water, soil, or dust. It accumulates in the blood, bones, and soft tissues and can adversely affect the kidneys, liver, nervous system, and other organs. Excessive exposure to lead may cause neurological impairments, such as seizures, mental retardation, and behavioral disorders. Even at low doses, lead exposure is associated with damage to the nervous systems of fetuses and young children, resulting in learning deficits and lowered IQ. Recent studies also show that lead may be a factor in high blood pressure and subsequent heart disease. Lead can also be deposited on the leaves of plants, presenting a hazard to grazing animals and humans through ingestion (USEPA 2007a).

Greenhouse Gas/Global Warming

On April 2, 2007, in Massachusetts v. USEPA, 549 US 497, the US Supreme Court found that Greenhouse Gases (GHGs) such as carbon dioxide, methane, nitrous oxide, ozone, some aerosols, and water vapor are considered air pollutants and are therefore covered by the CAA. The court held that the EPA must determine if emissions of GHGs from new motor vehicles cause or contribute to air pollution, which may reasonably be anticipated to endanger public health or welfare, or if the science is too uncertain to make a reasoned decision. In making these decisions, the EPA is required to follow the language of Section 202(a) of the CAA. The US Supreme Court decision resulted from a petition for rulemaking under Section 202(a), filed by more than a dozen environmental, renewable energy and other organizations.

On April 17, 2009, the administrator signed the Endangerment and Cause or Contribute Findings for GHGs under Section 202(a) of the CAA. The EPA provided a 60-day public comment period, which ended June 23, 2009, and received more than 380,000 public comments. These included both written comments and testimony at two public hearings in Arlington, Virginia, and Seattle, Washington. The EPA carefully reviewed, considered, and incorporated public comments and has now issued its final findings.

The EPA found that GHGs taken in combination endanger both the public health and the public welfare of current and future generations. The EPA also found that the combined emissions of these GHGs from new motor vehicles and new motor vehicle engines contribute to air pollution that endangers public health and welfare under CAA Section 202(a). These findings were based on careful consideration of the full weight of scientific evidence and a thorough review of numerous public comments received on the proposed findings published April 24, 2009. These findings became effective on January 14, 2010.

The Council on Environmental Quality (CEQ), which serves under the Executive Office of the President, published in February 2010 a Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions. The Guidance memorandum advised Federal agencies to consider the impacts of and opportunities to reduce GHG emissions caused by proposed Federal actions. The Guidance memorandum established the basis for evaluation of any proposed action to be the "*reasonably anticipated direct emissions of 25,000 metric tons or more of CO_2-equivalent GHG emissions*".

State Regulations

(Note: State and local requirements are included that were helpful in characterizing the overall context of the analyses, even though some of these requirements do not directly apply to this Federal action).

The California Air Resources Board (CARB), a department of the Cal/EPA, oversees air quality planning and control throughout California by administering the SIP. Its primary responsibility lies in ensuring implementation of the 1989 amendments to the California Clean Air Act (CCAA) and responding to the Federal CAA requirements and regulating emissions from motor vehicles sold in California. It also sets fuel specifications to reduce vehicular emissions further.

The State of California has also established a set of Ambient Air Quality Standards (CAAQS similar to the Federal standards (see Table 3.7-1). These standards apply to the same criteria pollutants as the Federal CAA; and they also include sulfate, VRPs, H_2S, and vinyl chloride and are more stringent than the Federal standards.

The MDAB is designated as a nonattainment area for the State ozone and PM_{10} standards. Concentrations of all other pollutants meet State standards.

CARB is also responsible for regulations pertaining to Toxic Air Contaminants (TACs). AB 2588 was enacted in 1987 as a means to establish a formal air toxics emission inventory risk quantification program. AB 2588, as amended, establishes a process that requires stationary sources to report information regarding the types and quantities of certain substances that their facilities routinely release into the MDAB. Each air pollution control district ranks the data into high, intermediate, and low priority categories. When considering the ranking, the potency, toxicity, quantity, volume, and proximity of the facility to receptors are given consideration by an air district.

CARB also has on-road and off-road vehicle engine emission-reduction programs that would indirectly affect the proposed project's emissions by phasing in cleaner on-road and off-road vehicle engines. For example, the State recently enacted a new regulation for reducing diesel particulate matter and criteria pollutant emissions from off-road diesel-fueled vehicles. This regulation provides target emission rates for particulate matter and NO_X emissions for owners of fleets of diesel-fueled off-road vehicles. It applies to equipment fleets of three specific sizes, and the target emission rates are reduced over time. In addition, CARB's Portable Equipment Registration Program allows owners or operators of portable engines and associated equipment to register their units under a statewide program, with specified emission requirements, without having to obtain individual permits from local air districts.

Particulate pollution, including sulfates, nitrates, organics, soot, fine soil dust, and particles, contribute to the regional haze that impairs visibility, in addition to affecting public health. California's efforts to achieve State and Federal air quality standards for health benefits will also improve visibility (CARB 2010a).

The Federal Clean Air Act of 1977 set a long-term goal of improving visibility to achieve natural conditions in selected national parks and wilderness areas of the United States, known as Class 1 Areas, by 2064. California has 29 mandatory Class 1 Areas managed by either the National Parks Service or the USFS. (CARB 2010a)

In 1999, the EPA promulgated a regional haze regulation that calls for States to establish goals and emission reduction strategies to make initial improvements in visibility at their respective Class 1 Areas. The ARB prepared a Regional Haze Plan (RH Plan) for California, demonstrating reasonable progress in reducing haze by 2018, the first benchmark year on the path to natural visibility by 2064 (CARB 2010a).

The EPA funded five Regional Planning Organizations throughout the country to coordinate regional haze rule-related activities among States in each region. California belongs to the Western Regional Air Partnership (WRAP), the consensus organization of western States, tribes, and Federal agencies, which oversees analyses of monitoring data and preparation of technical reports regarding regional haze in the western United States (CARB 2010a).

Local Regulations

<u>*Eastern Kern Air Pollution Control District*</u>

The Eastern Kern Air Pollution Control District (EKAPCD) has regulatory authority over the air emissions from the proposed Isabella DSM Project, The EKAPCD has primary responsibility for regulating stationary sources of air pollution in its jurisdictional boundaries. To this end, the EKAPCD implements air quality programs required by State and Federal mandates, enforces rules and regulations based on air pollution laws, and educates businesses and residents about its role in protecting air quality. The EKAPCD is also responsible for managing and permitting existing, new, and modified sources of air emissions within the MDAB.

The EKAPCD assesses attainment status for specific areas within its jurisdiction based on thresholds such as those presented in Table 3-4.

The policies, rules, and Air Quality Attainment Plan prepared and maintained by EKAPCD govern attainment and maintenance with federally established ambient air quality standards. The CAAQS for ozone in Kern County is 0.09 ppm, which establishes eastern Kern County as a moderate nonattainment area. As a moderate ozone

Table 3-4
Air Quality Regional Attainment Thresholds

Criteria Pollutant	Tons/Year	Lbs/Day
CO	—	—
NO_x	25	137*
PM_{10}	15	—
SO_x	27	—
ROG	25	137*

Source: Kern County 2010
— = No threshold identified
*Indirect vehicle trip emissions only

nonattainment area, the EKAPCD is required by the CCAA to adopt reasonably available control technology retrofit rules for all sources of ozone precursor emissions. VOCs and NOx are both considered ozone precursors. This mandate has been fulfilled. The EKAPCD has not established a significance threshold regarding the quantification or reduction of GHGs.

In preparing the 1991 Ozone Air Quality Attainment Plan, EKAPCD's planners had no choice but to use Barstow monitoring data in preparing their plan, using a design value of 0.11 ppm, due to the absence of ozone monitoring data collected in eastern Kern County. The CAAQS for ozone in Kern County is 0.09 ppm, which establishes eastern Kern County as a moderate nonattainment area.

In 1993, amendments of the CCCA, combined with ozone monitoring data collected at Mojave, have resulted in EKAPCD remaining a moderate nonattainment area. The 1993 amendments to the CCAA (Section 40921.5) require an air quality district to assign its degree of nonattainment based on actual monitoring data minus the impact of transported ozone (Section 40925).

An analysis of 1993 and 1994 smog season data conducted during preparation of the EKAPCD's Federal Clean Air Act Attainment Demonstration revealed there are no self-generated exceedances of the ozone CAAQS and that all exceedances occurred during transport days. It can be concluded that the actual EKAPCD's design value is lower than 0.11 ppm; CARB staff agree with this analysis, and triennial revisions to EKAPCD's plan made in 1994 reflect these findings.

Ambient ozone levels have been reduced by implementing retrofit controls for VOCs and NOx on eastern Kern County's stationary sources, but the ozone CAAQS can be attained only when inflowing air from upwind air districts does not contain ozone and ozone precursors in sufficient quantities to cause exceedances. In 1995, EKAPCD used California Health and Safety Code, Section 40925(b), to delete control measures inappropriate for an area overwhelmingly impacted by transport. EKAPCD's 1994

Federal Clean Air Act Amendments Ozone Attainment Demonstration projected attainment with NAAQS by 1999; Mojave monitoring data show the Federal ozone NAAQS of 0.12 ppm has been attained. Consequently, the EKAPCD has been redesignated as in attainment for the Federal one-hour ozone NAAQS. However, the ozone CAAQS and the new ozone eight-hour NAAQS of 0.08 ppm have not been attained. Due to ozone CAAQS exceedances being cause by overwhelming transport, Section 40925(c) (comprehensive plan revision) did not apply to the EKAPCD but did apply to upwind districts.

Due to reductions in EKAPCD pollutant emissions and upwind emissions, eastern Kern County's ozone air quality has significantly improved since 1987. CARB staff recognize the EKAPCD as a nonurbanized, moderate ozone nonattainment district, overwhelmingly impacted by upwind transport. Much progress has been made to reduce ozone precursor emissions. The mandates and intent of the California Clean Air Act have been fulfilled, and the EKAPCD has revised its attainment plan to reflect new statutory mandates and additional knowledge pertaining to sources of air quality standards exceedances.

Air Quality Determination for Transportation Plans and Programs – Conformity Rule
The CAA amendments of 1990 require a finding be made that any project, program, or plan subject to approval by a metropolitan planning organization conforms to air plans for attainment of air quality standards. Kern Council of Governments (COG) is designated as the Regional Transportation Planning Agency and a Metropolitan Planning Organization for Kern County. In that capacity, Kern COG models air quality projections based on population projections, in conjunction with current general plan designations and estimated vehicle miles and in with the current Regional Transportation Plan and the Federal Transportation Plan for Kern County. These results are compared to pollutant budgets for each basin approved by the EPA in the 1999 base year. Kern County is in two air basins: The MDAB and the San Joaquin Valley Air Basin. Each air basin has its own plans and pollutant budgets. Kern COG makes conformity findings for each air basin. The regional conformity analysis relative to the Kern County Transportation Plan considers long term emission impacts.

Kern County recently prepared a draft 8-hour ozone air quality conformity analysis to analyze its federally approved Federal Transportation Improvement Program and the Destination 2030 Regional Transportation Plan. Changes to the Federal air quality standards for ozone from a 1-hour measurement to an 8-hour measurement have triggered the need for this analysis. The Federal Transportation Improvement Program for Kern County is a six-year schedule of multimodal transportation improvements, and the Regional Transportation Plan is a long-range, 26-year transportation plan. The conformity findings conclude that the Federal Transportation Improvement Program and Regional Transportation Plan result in emissions that are less than the emission budgets of baseline emissions for CO, VOC, NO_X, and PM_{10} (Kern COG 2005).

3.5.2 Affected Environment

Air Quality Setting

The California Air Resources Board (CARB) has divided California into regional air basins according to topographic drainage features. The Isabella DSM Project is within the Mojave Desert Air Basin (MDAB), which is under the jurisdiction of the Eastern Kern Air Pollution Control District (EKAPCD, formerly the Kern County Air Pollution Control District). Natural factors that affect transport and dilution include terrain, wind, atmospheric stability, and the presence of sunlight. Therefore, existing air quality conditions in the area are determined by such natural factors as topography, meteorology, and climate, in addition to the amount of emissions released by existing air pollutant sources, as discussed separately below.

Air pollution in the MDAB is generated by vehicle traffic and heavy industry, with contributions from the topography, geography, meteorology, and climate and soil conditions.

The project area is in the northeastern portion of the MDAB in the Kern River Valley, at the Main Dam and Auxiliary Dam of Isabella Lake, and is surrounded by the Sequoia National Forest. The climate of the area is affected by its terrain and geographical location. The project site is in the valley, with mountains to the north, south, east, and west at the western extent of the Mojave Desert.

The climate of the project area is generally Mediterranean, with hot dry summers and cold wet winters. The mean maximum summer temperatures in July and August approach 100°F. Winter temperatures are more moderate, with mean maximum temperatures in the 60s and lows in the 30s.The average annual precipitation in Isabella Lake area is approximately 12 inches, most of which falls between November and April. Typically, precipitation falls as rain at elevations below about 5,000 feet and as snow at higher elevations. The project site is at an elevation of approximately 2,654 feet.

Large-scale regional weather patterns in the MDAB are generally influenced by moderately intense anticyclonic circulation associated with high pressure systems. During the summer, a large subtropical high-pressure system off the coast of California (Pacific High), in combination with the rain shadow produced by the coastal ranges and the mountain ranges that border the Mojave Desert to the west and south, keeps the Mojave Desert sunny and dry. However, the presence of a thermal low-pressure area above the Mojave Desert promotes atmospheric transport from the Los Angeles Basin. During winter, the strength of the Pacific high-pressure area wanes, and frontal systems may pass through, producing rain.

A large-scale phenomena affecting air quality in the MDAB are the transport winds from the southwest. These winds are responsible for bringing ozone (O_3) and other pollutants through the Cajon Pass from the Los Angeles Basin to the MDAB. Pollutant transport into the MDAB is the primary reason for the periods of national and California O_3 standards violations. Therefore, air pollution emissions from coastal areas are carried inland to the MDAB during the day, where weak nighttime conditions allow them to stagnate. This wind pattern is interrupted only by winter storms and infrequent but strong northeasterly Santa Ana winds from the mountains and the desert.

Locally, changing diurnal and seasonal weather conditions result in short-term windy conditions around the lake that can combine at times with exposed shoreline areas to temporarily increase PM_{10} and $PM_{2.5}$ levels, and create visible dusty conditions. According to the EKAPCD, wind-generated PM_{10} and $PM_{2.5}$ emissions have remained consistently negligible over the last several years – even during times when the lakebed has remained exposed. This is evidenced by the fact that the air basin remains in attainment with federal and state ambient air quality standards after the installation and operation of the Canebrake Air Monitoring Station located east and down-wind of Lake Isabella.

Air Quality Attainment Status

The CARB operates nine air quality and meteorological monitoring stations within the MDAB. The monitoring stations nearest to the Isabella DSM Project are the Ridgecrest monitoring station, approximately 40 miles to the east, and the Mojave monitoring station, approximately 42 miles to the south. However, these stations monitor only O_3, PM_{10}, and $PM_{2.5}$ data. The closest station monitoring all criteria pollutants except SO_2 is the Lancaster Monitoring Station, approximately 66 miles to the south. The ARB Air Quality Statistics website provides summaries of air quality data collected by the air quality monitoring stations. The most recent information available on the number of times that the National Ambient Air Quality Standards and the California Ambient Air Quality Standards (CAAQS) were exceeded for each parameter is from 2006 through 2008 (CARB 2009a).

Areas can be classified as being in attainment (air pollutant levels consistently below the standard) or as nonattainment (levels of air pollutant consistently violate the standard). The determination of whether an area meets the State and Federal standards is based on air quality monitoring data. Some areas are unclassified, which means no monitoring data are available, and are typically treated as being in attainment. Because the attainment/nonattainment designation is pollutant specific, an area may be classified as nonattainment for one pollutant and as attainment for another. Similarly, because the State and Federal standards differ, an area could be classified as attainment for the Federal standards of a pollutant and as nonattainment for the State standards of the same pollutant. Table 3-5 lists the air quality attainment status for the MDAB. Areas that do not meet the standards shown in Table 3-5 are classified as nonattainment areas

As seen in Table 3-5, the MDAB is in nonattainment for the 8-hour Federal standard for ozone and is in serious nonattainment for the Federal standard for PM_{10} in the Cummings Valley.

The EKAPCD has identified quantitative emission thresholds for NO_X, PM_{10}, SO_X and reactive ROG to assess attainment status. The air quality threshold for NO_x and ROG is

25 tons per year and 137 pounds per day (lbs/day) for indirect vehicular emissions only. The threshold of SO_X is 27 tons per year, and the threshold for PM_{10} is 15 tons per year, established as the limit at which an impact on the MDAB may occur. For CO and $PM_{2.5}$, no regional emission thresholds have been established.

Table 3-5
Mojave Desert Air Basin Attainment Designation/Classifications

Pollutant	Designation/Classification: Federal Standards	Designation/Classification: State Standards
Ozone (O_3) - 1-hour	Nonattainment	Moderate nonattainment
Ozone - 8-hour (EKAPCD)	Nonattainment	Not yet designated
Ozone - 8-hour (Indian Wells Valley)**	Unclassifiable/attainment	Not yet designated
PM_{10} (EKAPCD)	Unclassifiable/attainment	Nonattainment
PM_{10} (Kern River/Cummings Valleys)*	Serious nonattainment	Nonattainment
PM_{10} (Indian Wells Valley)**	Attainment maintenance	Nonattainment
$PM_{2.5}$	Unclassifiable/attainment	Unclassified
Carbon monoxide (CO)	Unclassifiable/attainment	Unclassified
Nitrogen dioxide (NOx)	Unclassified	Attainment
Sulfur dioxide (SO_2)	Unclassified	Attainment
Lead (particulate)	No designation	Attainment

*The Kern River Valley, Bear Valley, and Cummings Valley were previously included in the federally designated San Joaquin Valley PM_{10} Serious Nonattainment Area, but they are now proposed to be a separate nonattainment area (2008).
**Federal designations for PM_{10} and 8-hour ozone have split the Indian Wells Valley as a separate planning area from the rest of the EKAPCD.
Source: EKAPCD 2009

The Isabella DSM Project would be a source of O_3 precursor pollutant emissions, NO_X, and volatile organic compounds. The project site area is in attainment with the national 1-hour O_3 standard and in moderate nonattainment with the national 8-hour O_3 standard and is not yet designated for the California 1-hour and 8-hour O_3 standards. The national 8-hour O_3 standard was exceeded 74 days at Mojave and 23 days at Trona from 2006 to 2008.

The Isabella DSM Project area is classified as unclassifiable/attainment for the national 24-hour PM_{10} standard and nonattainment for the California 24-hour PM_{10} standard. The California PM_{10} standard was exceeded on eight days at Ridgecrest and on seven days at Mojave from 2006 to 2008. Table 3-6 summarizes the air quality data from the most recent three years.

The project area is unclassified for the California 24-hour $PM_{2.5}$ standard and is classified as unclassifiable/attainment for the national $PM_{2.5}$ standard, which was not exceeded at these sites from 2006 to 2008.

Table 3-6
Background Ambient Air Quality Data

Pollutant Standard	2006	2007	2008
Carbon monoxide (CO) – Lancaster Station			
Maximum 8-hour concentration (ppm)	1.60	1.16	1.60
Days exceeding NAAQS 8-hour (>9ppm)	0	0	0
Days exceeding CAAQS 8-hour (>9ppm)	0	0	0
Nitrogen dioxide (NO_2) – Lancaster and Trona Stations			
Maximum 1-hour concentration (ppm)	0.066	0.064	0.062
Annual average (ppm)	0.015	0.015	0.013
Days exceeding CAAQS 1-hour	0	0	0
Ozone (O_3)– Trona and Mojave Stations			
Maximum 1-hour concentration (ppm)	0.109	0.094	0.112
Maximum 8-hour concentration (ppm)	0.101	0.084	0.102
Days exceeding CAAQS 1-hour (>0.09ppm)	10	0	13
Days exceeding NAAQS 8-hour (>0.08ppm)	36	13	48
Particulate Matter (PM_{10}) – Ridgecrest, Mojave, and Trona Stations			
National Maximum 24-hour concentration (µg/m^3)	77.0	800	144.0
National annual average concentration (µg/m^3)	19.5	*	*
Days exceeding NAAQS 24-hour (>150 µg/m^3)	1	1	1
Days exceeding CAAQS 24-hour (>50 µg/m^3)	5	5	9
Particulate Matter ($PM_{2.5}$) – Ridgecrest, Mojave, and Lancaster Stations			
Maximum 24-hour concentration (µg/m^3)	21.3	25.0	26.8
National annual average concentration (µg/m^3)	7.4	8.0	7.1
Days exceeding NAAQS 24-hour (>65 µg/m^3)	0	0	0

*Data unavailable
Notes:
Wildfires were an extraordinary event in 2007.
National Annual Average PM_{10} standard was revoked in December 2006.
$PM_{2.5}$ exceedances based on 65 µg/m^3 standard; standard reduced to 35 µg/m^3 in December 2006.
Source: CARB 2009a

Toxic Air Contaminants

Concentrations of TACs are also used as indicators of ambient air quality conditions. Hazardous air pollutant (HAP) is the term used in the Federal CAA to describe a variety of pollutants generated or emitted by industrial production activities. Ten TACs have been identified through ambient air quality data as posing the most substantial health risk in California (see discussion of each below). Direct exposure to these pollutants has been shown to cause cancer, birth defects, brain and nervous system damage, and respiratory disorders.

TACs do not have ambient air quality standards because no safe levels can be determined. Instead, TAC impacts are evaluated by calculating the health risks associated with a given exposure. The requirements of the Air Toxic “Hot Spots” Information and Assessment Act (AB 2588; Connelly 1987) apply to facilities that use, produce, or emit toxic chemicals. Facilities that are subject to the toxic emission inventory requirements of the act must prepare and submit toxic emission inventory plans and reports and periodically update those reports.

According to the California Almanac of Emissions and Air Quality (CARB 2006b), most of the estimated health risk from TACs can be attributed to relatively few compounds, the most important being from diesel-fueled engines (diesel PM). Diesel PM differs from other TACs in that it is not a single substance but a complex mixture of hundreds of substances. Although diesel PM is emitted by diesel-fueled internal combustion engines, the composition of the emissions varies, depending on the engine type, operating conditions, fuel composition, and lubricating oil and on whether an emission control system is present. In California, on-road diesel-fueled engines contribute approximately 24 percent of the statewide total, with an additional 71 percent attributed to other mobile sources, such as construction and mining equipment, agricultural equipment, and transport refrigeration units. Stationary sources contribute about five percent of total diesel particulate matter.

Unlike other TACs, no ambient air monitoring data are available for diesel PM because no routine measurement method exists; however, CARB has made preliminary concentration estimates based on a PM exposure method. This method uses CARB emissions inventory's PM_{10} database, ambient PM_{10} monitoring data, and the results from various studies to estimate concentrations of diesel PM. In addition to diesel PM, acetaldehyde, benzene, 1.3 butadiene, and formaldehyde pose the greatest ambient risk identified with this project, for which data are available in California. Among these TACs mentioned, diesel PM poses the greatest health risk.

Valley Fever, or coccidioidomycosis, another of the TACs, is caused by the microscopic fungus *coccidioides immitis* (*C. immitis*), which grows in arid soil in parts of Kern County. Infection occurs when the spores of the fungus become airborne and are inhaled. The fungal spores become airborne when contaminated soil is disturbed by human activities, such as construction and agriculture, and by natural phenomena, such as wind storms, dust storms, and earthquakes.

Valley fever cases may be caused by soils containing fungal spores that become disturbed by wind erosion, vehicular transportation, construction, or farming. Even natural phenomena, such as earthquakes or wildfires, may disturb soils containing the fungi, and high winds, such as Santa Anas, may disperse the small infectious particles miles from their place of origin (Los Angeles Daily News 2004).

Global Climate Change / GHG

In the early 1960s scientists recognized that carbon dioxide levels in the atmosphere were rising every year. They also noted that several other gases, including methane and nitrous oxides, were increasing. Levels of these gases have increased by about 25 percent since large-scale industrialization began around 150 years ago, according to the EPA. After numerous computer-simulated model runs on the effects of these increases in the atmosphere, scientists concluded that the rising concentrations almost always increased average global temperature. Rising temperatures may, in turn, produce changes in weather, sea levels, and land use patterns, commonly referred to as climate change (USEPA 2010a). There is general scientific consensus that climate change is occurring and that human activity contributes in some measure (perhaps substantially) to that change. Man-made emissions of GHGs, if not sufficiently curtailed, are likely to contribute further to continued increases in global temperatures. This will reduce the polar ice caps and increase sea level, which will flood low-lying areas of the world. Additionally, climate change will shift rainfall patterns, with significant impacts on agriculture and freshwater availability worldwide.

Many chemical compounds found in the earth's atmosphere act as Greenhouse Gases (GHGs), which allow sunlight to enter the atmosphere freely. When sunlight strikes the earth's surface, some of it is reflected back to space as infrared radiation (heat). GHGs absorb this infrared radiation and trap the heat in the atmosphere. Over time, the amount of energy sent from the sun to the earth's surface should be about the same as the amount of energy radiated back into space, leaving the temperature of the earth's surface roughly constant. Many gases exhibit these greenhouse properties. Some of them occur in nature (water vapor, carbon dioxide, methane, and nitrous oxide), while others are exclusively human-made (like gases used for aerosols). The most relevant GHGs are water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). These gases prevent heat from escaping to space.

The principal climate change GHGs resulting from human activity that enter and accumulate in the atmosphere include the following:

- **Carbon dioxide—**CO_2 enters the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees, and wood products and by chemical reactions, such as the manufacture of cement. CO_2 is removed from the atmosphere (or sequestered) when it is absorbed by plants as part of the biological carbon cycle.
- **Methane—**CH_4 is emitted during the production and transport of coal, natural gas, and oil. CH_4 emissions also result from livestock and agriculture and the decay of organic waste in municipal solid waste landfills.
- **Nitrous oxide—**N_2O is emitted during agricultural and industrial activities and during combustion of fossil fuels and solid waste.
- **Fluorinated gases—**HFCs, PFCs, and SF_6 are synthetic, powerful climate-change gases that are emitted from a variety of industrial processes. Fluorinated gases are often used as substitutes for ozone-depleting substances (i.e., chlorofluorocarbons, hydrochlorofluorocarbons, and halons. These gases are typically emitted in smaller quantities, but because they are potent climate change gases, they are sometimes referred to as high global warming potential gases.

Global warming potential is a relative measure, compared to carbon dioxide, of a compound's residence time in the atmosphere and ability to warm the planet. Mass emissions of GHGs are converted into carbon dioxide equivalent (CO_2e) emissions for ease of comparison.

GHGs, in most cases, have both natural and human sources. Natural mechanisms already exist as part of the carbon cycle for removing GHGs from the atmosphere (often called land or ocean sinks). Levels of GHGs, due to the increase in human sources, have exceeded the normal rates of natural absorption. This has resulted in increased atmospheric concentrations of GHGs and potentially human-induced global warming.

GHG emissions in the United States come mostly from energy use. These are driven largely by economic growth, fuel used for electricity generation, and weather patterns affecting heating and cooling needs. Energy-related carbon dioxide emissions, resulting from fossil fuel exploration and use, account for approximately three-quarters of the human-generated GHG emissions in the United States, primarily in the form of carbon dioxide emissions from burning fossil fuels. More than half the energy-related emissions come from large stationary sources, such as power plants; approximately a third comes from transportation, while industrial processes, agriculture, forestry, other land uses, and waste management make up most of the remainder (USEPA 2010a).

Generation of electricity can produce GHGs with the criteria air pollutants that have been traditionally regulated under the Federal and State Clean Air Acts. For fossil fuel-fired power plants, the GHG emissions include primarily CO_2, with much smaller amounts of nitrous oxide (N_2O, but not NO or NO_2, which are commonly known as NO_X, or oxides of nitrogen) and CH_4 (often from unburned natural gas). For wind power energy generation projects the stationary source GHG emissions are much smaller than fossil fuel-fired power plants, but the associated maintenance vehicle emissions are higher due to the different and far afield maintenance requirements that require more vehicles and more travel within the project site. Other sources of GHG emissions include SF_6 from high-voltage equipment and HFCs and PFCs from refrigeration/chiller equipment. GHG emissions from the electricity sector are dominated by CO_2 emissions from carbon-based fuels; other sources of GHG emissions are small and also are more likely to be easily controlled or reused or recycled.

Global carbon dioxide emissions are expected to increase by 1.9 percent annually between 2001 and 2025 (EPA 2010a). Much of the increase in these emissions is expected to occur in the developing world, where emerging economies are fueled with fossil energy, such as China and India. Around 2018, developing countries' emissions are expected to surpass the emissions of industrialized countries, increasing by 2.7 percent annually between 2001 and 2025, which is faster than the world average.

Climate models predict that the average temperature at the earth's surface could increase from 2.5 to 10.4ºF above 1990 levels by the end of this century, if GHGs continue to increase. Other aspects of the climate are also changing, such as rainfall patterns, snow and ice cover, and sea level.

Climate change affects people, plants, and animals. Scientists are certain that increasing the concentration of GHGs will change the planet's climate; however, they are not sure by how much it will change, at what rate it will change, or what the exact effects will be globally or locally. They are working to better understand future climate change and how the effects will vary by region and over time.

Some changes to global climate are already occurring and include sea level rise, shrinking glaciers, changes in the range and distribution of plants and animals, lengthening of growing seasons, earlier bloom time for trees, ice on rivers and lakes freezing later and breaking up earlier, and thawing permafrost.

Scientists believe that most areas in the United States will continue to warm, although some will likely warm more than others. Predicting which parts of the country will become wetter or drier is extremely difficult, but scientists generally expect increased precipitation and evaporation and drier soil in the middle parts of the country. The northern regions, such as Alaska, are expected to experience the most warming. In order to address climate change concerns, the United States government has established a comprehensive policy to deal with global warming. This policy has three basic components:

- Slowing the growth of emissions;
- Strengthening science, technology, and institutions; and
- Enhancing international cooperation.

Currently, the Federal government is using voluntary and incentive-based programs to reduce emissions and has established a variety of programs promoting climate technology and science. The United States prepared a comprehensive strategy in February 2002 to reduce the GHG intensity by 18 percent from 2002 to 2012. GHG intensity is a measure of GHG emissions per unit of economic activity. By meeting this commitment, the United States will prevent the release of more than 500 million metric tons between 2002 and 2012 (Climate Vision 2007).

3.5.3 Environmental Consequences

This section discusses the potential impacts on air quality, greenhouse gas, and global warming from the Action Alternatives and support actions. Mitigation measures are recommended as applicable to reduce potential impacts.

Scope and Methods

<u>Air Quality</u>

Short-term construction-related impacts, as well as impacts from TACs, were assessed in accordance with EKAPCD recommended methods. Where quantification was required, project-generated emissions were modeled using the CARB-approved EMFAC2011 and URBEMIS 2007 Version 9.2.4 computer programs, as recommended by EKAPCD. URBEMIS incorporates CARB's EMFAC2007 model for on-road vehicle emissions and the OFFROAD2007 model for off-road vehicle emissions. URBEMIS is designed to model emissions for land development projects and allows for the input of project-specific information. Project-generated emissions were modeled based on specific information provided in the project description, reasonable assumptions, and, in some cases, default URBEMIS settings to estimate reasonable worst-case emissions that would be generated by the project.

The following assumptions for construction and operational sources and activities were used to analyze the emissions:

- URBEMIS 2007 v9.2.4 was used to estimate on-site construction equipment and haul trucks exhaust and fugitive dust emissions (except for those noted below) for the construction and construction activities for the staging areas, Borel Tunnel, emergency spillway, auxiliary dam downstream, auxiliary dam upstream, main dam, existing spillway, waste materials, and borrow areas. (All estimates are based on assumed hours of operation for the equipment which was provided by the Corps.)
- Construction employees' vehicular emissions were estimated using EMFAC2011 based on miles traveled.
  - An average of 120 employees per day was assumed;
  - Employees were estimated to travel a round-trip distance of 94 miles per day, for as many working days assumed during each alternative.
  - 50% of the employees were estimated to leave the construction site for lunch each day and traveling a round trip distance of 5 miles.
- Batch Plant fugitive PM emissions were estimated using an engineering analysis of a recently permitted Batch Plant in the EKAPCD.
  - The plant was assumed to be capable of producing 500 cubic yards per day, 2 tons per cubic yard, and 125,000 cubic yards during the life of the construction project.
  - The mix of materials for the concrete was 3.38 percent cement, 7.37 percent fly ash, 4.22 percent water, 56.00 percent coarse aggregates, 29.01 percent sand, and 0.03 percent water reducer.
  - Fabric collectors and water were used for control measures.
- Crushing Plant fugitive emissions were estimated using EPA-Approved Compilation of Emissions Factors (AP 42 Chapter 11, Table 11.19.2-2).
  - All throughputs were estimated based on the construction schedule provided by the Corps.
- Blasting and drilling fugitive emissions were estimated using EPA-Approved Compilation of Emissions Factors (AP 42 Chapter 11, Table 11.9-1).
  - All blasted and drilling amounts were estimated based on the construction schedule provided by the Corps.

- CH_4 and N_2O exhaust emissions were estimated using the California Climate Action Registry - IPCC Emissions Factors.
- Construction emissions were calculated for the entire life of each alternative, divided by the number of years the construction activities would occur, in order to reach and average annualized emission rate.
- Operational emissions were not calculated for the project because they remain unchanged from current operation.
- Construction-related activities would emit PM_{10}, TACs, and the precursors ROG and NO_x from construction employee commute and meal trips and material transport by heavy-duty truck travel on proposed haul routes and heavy-duty construction equipment at the dam construction, staging, and borrow sites.
- The post-construction operation of any of the Action Alternatives would not generate any new air quality or greenhouse gas emissions, because operation and maintenance of the alternatives would be unchanged, compared with existing conditions. Following construction, the office, vehicle maintenance facility, and other structures built to accommodate contractor and Corps personnel during project construction would be removed. The number of personnel on-site during construction would be reduced to the number currently operating and maintaining the facilities, so this issue is not discussed further in this analysis.

GHG/Global Warming

The analysis looked at project specific, Statewide, and Federal levels of impact; each level served as an element of the whole climate change gas analysis and was not considered separately. If any level exceeded the thresholds defined for this analysis, then the climate change gas impact was considered significant and unavoidable. It was assumed that State goals would continue to reflect weighted average emissions on a per capita or per gross state product basis.

The baseline for this analysis varied by the particular regulatory framework and manner in which the emissions and impacts were determined. In the instance of CEQA's analysis of global climate change impacts, the business-as-usual emissions estimates (and method for calculating those estimates), as well as California's stated policy objectives (as established in responsible agency actions) defined the point of relevance for impacts associated with a given discretionary act.

"Business-as-usual" is a term used by California agencies to describe the rate of climate change gas emissions, assuming no climate regulations. It is a projection of the climate change gases that could be emitted by projects based on current technologies and regulations in the absence of other reductions. Business-as-usual includes forecast demographic and economic growth, whereas the historic CEQA baseline non-climate change gas impact analysis does not include any growth factors. Understanding this difference between historic CEQA analyses and the climate change gas element of CEQA is critical to a reasoned analysis of global climate change impacts. The baseline for climate change gas is business-as-usual.

The stated policy objectives are driven by Executive Orders, AB 32, and other legislative acts. Some of the policy objectives are defined by zero net energy, low-carbon fuel standards, a renewable portfolio standard, and AB 32 objectives.

Project-specific GHG emissions were estimated using the CCAR General Reporting Protocol and the URBEMIS model, version 9.2.4, which employs on-road and off-road equipment emission factors from the CARB EMFAC 2007 and OFFROAD 2007 Models.

Regional Conformity Analysis

A conformity analysis was performed regarding the long term emissions associated with the operation of the Isabella Dam following implementation of any of the proposed Action Alternatives. The GHG analysis was conducted for the Action Alternatives even though the anticipated GHG impacts were significantly less than CEQ's recommended action level (25,000 metric tons or more of CO_2-equivalent) in their February 2010 Guidance memorandum. Furthermore, CEQ's memorandum was based on long-term impacts as opposed to short-term construction impacts posed by the proposed Action Alternatives. The GHG analysis utilized the recommended procedures, models and calculations determined appropriate by the California Climate Action Registry. These methods consider local, State and Federal energy conservation goals and alternatives as recommended in the CEQ memo. This analysis confirmed that none of the Action Alternatives would pose an adverse impact on the regional conformity requirements relative to the Kern County Regional Transportation Plan, the Federal Transportation Improvement Program, or the ozone conformity analysis. This is because the long-term emissions associated with each Action Alternative would remain essentially unchanged from current levels, and are considered de minimus, regardless of the selected alternative.

No Action Alternative

Under this alternative the lake capacity would be returned to and the dam would be operated at the pre-IRRM elevation of 2,609.26 feet. There would be no Federal participation in remedial improvements under the Isabella DSM Project at the Isabella Main Dam, Spillway, or Auxiliary Dam. Construction-related emissions and GHG contributions to climate change from the Isabella DSM Project would not occur. Construction related dust would not occur although higher lake levels may reduce particulates due to less exposure of the lake bottom.

Alternative Base Plan

Air Quality

Construction of this alternative would emit the air pollutants ROG, NO_X, CO, PM_{10}, $PM_{2.5}$, and SO_X. Emissions from construction would result from fuel combustion and exhaust from construction equipment, as well as from vehicle traffic and grading. Emissions estimates are based on assumptions provided by the project proponent. Tables 3-7 and 3-8 present the total project-related, unmitigated, annual and daily air emissions from construction. The EKAPCD thresholds of significance are also included in Tables 3-7 and 3-8, as well as information to determine if annual and daily construction emissions for ROG, NO_X, SO_X, $PM_{2.5}$ and PM_{10} would exceed those thresholds. As shown in the tables, temporary emissions during construction would exceed NOx and PM_{10} EKAPCD thresholds adopted by Kern County. As a result this short-term direct impact is significant.

Ambient concentration modeling was conducted to determine if CO, NO_2, PM_{10}, $PM_{2.5}$, and SO_2 emissions from the sources comprising this alternative would result in concentrations locally that exceed the NAAQS and CAAQS. This involved a two-step process. First, modeled impacts of the proposed sources were added to maximum representative background concentrations and compared to the CAAQS and NAAQS. Then, if any exceedances of the Ambient Air Quality Standards (AAQS) were indicated, the specific impacts were compared to the significant impact levels established by the EPA (e.g., EPA1990) to determine if the project's contributions to exceedances are less than significant.

Table 3-7
Estimated Alternative Base Plan Construction Emissions

	Criteria Pollutants (tons/year)					
Activity	**ROG**	**NO_x**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Staging Area	0.65	5.27	2.92	0.00	6.49	1.50
Borel Tunnel	1.99	15.38	9.10	0.00	4.50	1.37
Emergency Spillway	7.54	64.12	29.53	0.00	2.30	1.97
Aux Dam Downstream	5.97	46.31	24.04	0.00	61.89	14.16
Aux Dam Upstream	0.83	5.17	3.77	0.00	10.97	2.42
Waste Material	0.95	5.40	3.98	0.00	9.54	2.14
Main Dam	0.23	1.45	1.19	0.00	2.34	0.53
Existing Spillway	0.02	0.17	0.15	0.00	0.00	0.00
Borrow Areas	2.36	16.42	11.03	0.00	0.61	0.54
Employees	0.71	2.30	21.66	0.00	0.02	0.02
Total	**21.25**	**161.99**	**107.37**	**0.00**	**98.66**	**24.65**
Annualized Total (53 months)	***4.81***	***36.68***	***24.31***	***0.00***	***22.34***	***5.58***
EKAPCD significance thresholds	*25*	*25*	*--*	*27*	*15*	*--*
Exceed threshold?	*No*	*Yes*	*No*	*No*	*Yes*	*No*

Table 3-8
Estimated Daily Indirect Construction Emissions

	Criteria Pollutants (lbs/day)					
Activity	**ROG**	**NO_x**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Base Plan	5.48	17.70	166.65	0.00	0.17	0.16
EKAPCD Significance Thresholds	*137**	*137**	*--*	*--*	*--*	*--*
Exceed Threshold?	*No*	*No*	*No*	*No*	*No*	*No*

*Indirect vehicle trips emissions only.

Operational emissions were not modeled because they would not change from current operations and are expected to be below all significant thresholds.

The maximum off-site ground level concentration of each pollutant for the 1-hour, 3-hour, 8-hour, 24-hour, and annual periods was predicted using the most recent version of the ISC3 model (recompiled for the Lakes ISC-AERMOD View interface) to predict the dispersion of emissions from this alternative. The ISC3 model was used instead of AERMOD because there is currently no vetted AERMOD met data sets for the Eastern Kern Air Pollution Control District (EKAPCD). The closest met data set would be from Bakersfield but would not be considered representative of the project site and would result in unreliable predicted impacts. ISC3 is typically a more conservative model compared to AERMOD when accurate met data sets are available. Synthesized MM5 met data was obtained from Lakes for the Lake Isabella area to be used in the AERMOD model, however, MM5 data is not accepted on the Federal level. Since this project will be reviewed at the Federal level the MM5 data was not used. All of the regulatory default ISC3 keyword parameters were used. Rural dispersion parameters were used for this project, which differs from the urban setting used in the URBEMIS model, whose selection criteria are based on trip distances to the project site, while the AERMOD selection criteria are based on most of the land use surrounding the facility. This land is considered rural under the Auer Land Use Classification method.

Emissions were evaluated for each pollutant on a short-term (correlating to pollutant averaging period) and long-term (annual) basis, with the exception of CO, which was evaluated only for short-term exposures since there are no long-term significance thresholds for CO. Emissions were modeled as an area source with a release height of three feet.

A fence line coordinate grid of receptor points was constructed and consisted of a 25 meter fence line spacing and 25 meter tier spacing, extending a distance of 100 meters. Elevated terrain options were used due to the complex terrain in the project area.

For each pollutant and averaging period modeled, a total concentration was estimated by adding the maximum measured background air concentration to the maximum predicted project impacts. The maximum measured background air concentrations were calculated from measured concentrations at the nearest monitoring stations.

The results of the air dispersion modeling, presented in Table 3-9, demonstrate that the maximum impacts attributable to this alternative, when considered in addition to the existing background concentrations, are below the applicable ambient air quality standard for SO_X, CO, $PM_{2.5}$, and NO_X annual averaging period.

Table 3-9
Predicted Ambient Air Quality Impacts from the Alternative Base Plan Construction Emissions

	Averaging Period	Background ($\mu g/m^3$)	Project ($\mu g/m^3$)	Project + Background ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	CAAQS ($\mu g/m^3$)	PSD Significant Impact Level ($\mu g/m^3$)
NO_2	1-hour	1.11E+02	1.71E+02	2.82E+02	188.68	338	0
	Annual	2.70E+01	7.25E+00	3.42E+01	100	57	1
SO_2	1-hour	3.00E-02	0.00E+00	3.00E-02	196	655	0
	3-hour	1.50E-02	0.00E+00	1.50E-02	1,300	---	25
	24-hour	5.00E-03	0.00E+00	5.00E-03	365	105	5
	Annual	1.00E-03	0.00E+00	1.00E-03	80	---	1
CO	1-hour	2.47E+03	1.51E+02	2.63E+03	40,000	23,000	2,000
	8-hour	1.48E+03	3.63E+01	1.52E+03	10,000	10,000	500
PM_{10}	24-hour	9.73E+01	2.22E+01	1.20E+02	150	50	5
	Annual	2.26E+01	5.89E+00	2.85E+01	---	20	1
$PM_{2.5}$	24-hour	2.05E+01	5.55E+00	2.60E+01	35	---	5
	Annual	6.50E+00	1.47E+00	7.97E+00	15	12	1

Pre-project concentrations of PM_{10} exceed the ambient air quality standards. PM_{10} is evaluated in accordance with the Prevention of Significant Deterioration (PSD) procedure in Title 40, CFR, Part 52.21. It is the EPA's policy to use significant impact levels to determine if a proposed new or modified source would cause or contribute significantly to an AAQS or PSD increment violation. If a project's maximum impacts are below the PSD significant impact level, the project is judged to not cause or contribute significantly to an AAQS or PSD increment violation. A comparison of the proposed impact from this alternative to the PSD significant impact level values is provided in Table 3-9. The modeled PM_{10} impacts directly attributable to the Alternative Base Plan are above the EPA's significance levels for all the Action Alternatives, which is the most stringent significance threshold identified for such emissions. Therefore, PM_{10} impacts are considered significant and unavoidable.

Adverse impacts to air quality and visibility from wind-borne dust (PM_{10} and $PM_{2.5}$) resulting from operation of equipment and surface exposure at borrow sites and exposed lakebed have been considered in this analysis. The PM_{10} and $PM_{2.5}$ emission impacts noted for the Alternative Base Plan and each of the other Action Alternatives includes all combustion equipment and soil/material movement throughout the construction area and for each of the proposed filter sand borrow sites. Wind-borne emissions from these activities are expected to be negligible based on standard mitigation measures incorporated into the analyses.

According to the EKAPCD, wind-generated PM_{10} and $PM_{2.5}$ emissions have remained consistently negligible over the last several years – even as the lakebed has remained exposed. This is evidenced by the fact that the air basin remains in attainment with federal and state ambient air quality standards after the installation and operation of the Canebrake Air Monitoring Station located east and down-wind of Lake Isabella. The EKAPCD does not expect this to change even if the lakebed is lowered further during the extended construction periods planned for any of the Action Alternatives considered in this Draft EIS.

Construction-related emissions for the Alternative Base Plan would exceed the significance thresholds for the NOx 1-hour standard. Even though the construction emissions cause ambient significance levels to be exceeded, these emissions would be temporary and would not exist once construction is completed. Operational emissions would not change from current operations and are expected to be low.

GHG/Global Warming

The primary sources of GHG emissions during construction of the Alternative Base Plan would be mobile. Not all GHGs exhibit the same ability to induce climate change, so GHG contributions are commonly quantified in carbon dioxide equivalencies. The CO_2e portion of GHGs from this alternative was estimated using the URBEMIS program and CCAR General Reporting Protocol. The estimated GHG emissions are provided in Table 3-10. As a result, the transportation-related GHG emissions are a short-term significant impact.

Table 3-10
Estimated Greenhouse Gas Emissions

Source	CO_2 (tons/ year)	CH_4 (tons/ year)	N_2O (tons/ year)	CO_2e (tons/year)
Total Construction				
Base Plan Construction	39,380	12.39	0.89	39,916
Annualized Construction				
Base Plan Construction	8,916	2.81	0.20	9,038

A number of recommended actions targeted at the transportation sector would be applicable to construction equipment and maintenance vehicles associated with this alternative. However, given that these recommended actions are based on CARB-enforced standards, the Alternative Base Plan would not conflict with implementation of such standards. By requiring best management practices to reduce construction-related exhaust emissions, transportation-related GHS would be reduced and ensure no conflict with the recommended actions. However, short-term GHG-related impacts would remain significant and unavoidable.

A GHG long-term emissions analysis was conducted for the Alternative Base Plan even though the anticipated GHG level was considerably less than CEQ's recommended action level (25,000 metric tons or more of CO_2-equivalent) in their February 2010 Guidance memorandum. Also, CEQ's Guidance memorandum was based on long-term impacts as opposed to short-term construction impacts posed by the Alternative Base Plan. Because the GHG analysis for post-construction long-term emissions conducted resulted in GHG emissions impacts considerably below the CEQ's recommended evaluation level, no further analysis is required based on the CEQ Guidance.

Alternative Plan 1

Air Quality

Under this alternative, all of the deficiencies remediated under the Alternative Base Plan would be included, plus additional remediation measures identified for the Main Dam. The additional measures under Alternative Plan 1 would require the addition of a temporary concrete Batch Plant, additional excavation and construction material, and a longer construction schedule Tables 3-11 and 3-12 present the total project-related, unmitigated, annual and daily air emissions from construction of this alternative. The EKAPCD thresholds of significance are also included in Tables 3-11 and 3-12, as well as information to determine if annual and daily construction emissions for ROG, NO_X, SO_X, $PM_{2.5}$ and PM_{10} would exceed those thresholds. As shown in the tables, temporary emissions during construction would exceed NOx and PM_{10} EKAPCD thresholds adopted by Kern County. As a result this short-term direct impact is significant.

Table 3-11
Estimated Alternative Plan 1 Construction Emissions

	Criteria Pollutants (tons/year)					
Alternative 1 Plan Activity	**ROG**	**NO_x**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Staging Area	0.73	5.87	3.24	0.00	7.34	1.69
Borel Tunnel	1.99	15.38	9.10	0.00	4.58	1.37
Emergency Spillway	7.54	64.12	29.53	0.00	5.50	2.39
Aux Dam Downstream	5.97	46.31	24.04	0.00	63.10	14.35
Aux Dam Upstream	0.83	5.17	3.77	0.00	10.97	2.42
Waste Material	1.00	5.75	4.28	0.00	9.55	2.15
Main Dam	2.46	17.21	10.20	0.00	14.95	3.34
Existing Spillway	0.02	0.17	0.15	0.00	0.00	0.00
Borrow Areas	4.60	31.46	20.60	0.00	3.67	1.37
Employees	0.81	2.60	24.53	0.00	0.03	0.02
Total	**25.95**	**194.04**	**129.44**	**0.00**	**119.68**	**29.10**
Annualized Total (60 months)	***5.19***	***38.81***	***25.89***	***0.00***	***23.94***	***5.82***
EKAPCD significance thresholds	*25*	*25*	*--*	*27*	*15*	*--*
Exceed threshold?	*No*	*Yes*	*No*	*No*	*Yes*	*No*

Table 3-12
Estimated Daily Indirect Construction Emissions

	Criteria Pollutants (lbs/day)					
Activity	**ROG**	**NO_x**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Alternative Plan 1	6.20	20.04	188.66	0.00	0.20	0.18
EKAPCD Significance Thresholds	*137**	*137**	*--*	*--*	*--*	*--*
Exceed Threshold?	*No*	*No*	*No*	*No*	*No*	*No*

*Indirect vehicle trips emissions only.

The results of the air dispersion modeling, presented in Table 3-13, demonstrate that the maximum impacts attributable to construction, when considered in addition to the existing background concentrations, are below the applicable ambient air quality standard for SO_X, CO, $PM_{2.5}$, and NO_X annual averaging period for Alternative Plan 1. Pre-project concentrations of PM_{10} exceed the ambient air quality standards. PM_{10} is evaluated in accordance with the Prevention of Significant Deterioration (PSD) procedure in Title 40, CFR, Part 52.21. It is the EPA's policy to use significant impact levels to determine if a proposed new or modified source would cause or contribute significantly to an AAQS or PSD increment violation. If a project's maximum impacts are below the PSD significant impact level, the project is judged to not cause or contribute significantly to an AAQS or PSD increment violation. A comparison of the proposed impact from construction of this alternative to the PSD significant impact level values is provided in Table 3-13. The modeled PM_{10} impacts directly attributable to this project are above the EPA's significance levels for all the Action Alternatives, which is the most stringent significance threshold identified for such emissions. Therefore, the PM_{10} impacts are considered significant and unavoidable.

Table 3-13
Predicted Ambient Air Quality Impacts From Alternative Plan 1 Construction Emissions

	Averaging Period	Background ($\mu g/m^3$)	Project ($\mu g/m^3$)	Project + Background ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	CAAQS ($\mu g/m^3$)	PSD Significant Impact Level ($\mu g/m^3$)
NO_2	1-hour	1.11E+02	1.81E+02	2.92E+02	188.68	338	0
	Annual	2.70E+01	7.67E+00	3.46E+01	100	57	1
SO_2	1-hour	3.00E-02	0.00E+00	3.00E-02	196	655	0
	3-hour	1.50E-02	0.00E+00	1.50E-02	1,300	---	25
	24-hour	5.00E-03	0.00E+00	5.00E-03	365	105	5
	Annual	1.00E-03	0.00E+00	1.00E-03	80	---	1
CO	1-hour	2.47E+03	1.61E+02	2.64E+03	40,000	23,000	2,000
	8-hour	1.48E+03	3.87E+01	1.52E+03	10,000	10,000	500
PM_{10}	24-hour	9.73E+01	2.38E+01	1.21E+02	150	50	5
	Annual	2.26E+01	6.31E+00	2.89E+01	---	20	1
$PM_{2.5}$	24-hour	2.05E+01	5.78E+00	2.63E+01	35	---	5
	Annual	6.50E+00	1.53E+00	8.03E+00	15	12	1

Construction-related emissions for Alternative Plan 1 would also exceed the significance thresholds for the NOx 1-hour standard. Even though the construction emissions cause ambient significance levels to be exceeded, these emissions would be temporary and would not exist once construction is completed. Operational emissions would not change from current operations and are expected to be low.

<u>GHG/Global Warming</u>

The primary sources of GHG emissions during construction of Alternative Plan 1 would be mobile. Under this alternative, the additional excavation, construction material, and longer construction schedule would increase the GHG emissions. The estimated GHG emissions are provided in Table 3-14. As a result, the transportation-related GHG emissions are a short-term significant impact.

Table 3-14
Estimated Greenhouse Gas Emissions – Alternative Plan 1

Source	CO_2 (tons/ year)	CH_4 (tons/ year)	N_2O (tons/ year)	CO_2e (tons/year)
Total Construction				
Alternative Plan 1 Construction	47,938	14.65	1.05	48,572
Annualized Construction				
Alternative Plan 1 Construction	9,588	2.93	0.21	9,714

A number of recommended actions targeted at the transportation sector would also be applicable to construction equipment and maintenance vehicles associated with this alternative. However, given that these recommended actions are based on CARB-enforced standards, Alternative Plan 1 would not be in conflict with implementation of such standards. By requiring best management practices to reduce construction-related exhaust emissions, transportation-related GHS would be reduced and ensure no conflict with the recommended actions. However, short-term GHG-related impacts would remain significant and unavoidable.

A GHG analysis was conducted for Alternative Plan 1 even though the anticipated GHG level was considerably less than CEQ's recommended action level (25,000 metric tons or more of CO_2-equivalent) in their February 2010 Guidance memorandum. Also, CEQ's Guidance memorandum was based on long-term impacts as opposed to short-term construction impacts posed by this alternative. Because the GHG analysis conducted resulted in GHG emissions impacts considerably below the CEQ's recommended evaluation level, no further analysis is required based on the CEQ Guidance.

Alternative Plan 2

<u>Air Quality</u>

Under this alternative, all of the deficiencies remediated under the Alternative Plan 1 would be included, plus additional remediation measures identified for the Auxiliary Dam. The additional measures under Alternative Plan 2 would require additional excavation and construction material, and a longer construction schedule. Tables 3-15 and 3-16 present the total project-related, unmitigated, annual and daily air emissions from construction. The EKAPCD thresholds of significance are also included in Tables 3-15 and 3-16, as well as information to determine if annual and daily construction emissions for ROG, NO_X, SO_X, $PM_{2.5}$ and PM_{10} would exceed those thresholds. As shown in the tables, temporary emissions during construction of Alternative Plan 2 would exceed NOx and PM_{10} EKAPCD thresholds adopted by Kern County. As a result this short-term direct impact is significant.

Table 3-15
Estimated Alternative Plan 2 Construction Emissions

	Criteria Pollutants (tons/year)					
Alternative 2 Plan Activity	**ROG**	**NO_x**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Staging Area	0.73	5.87	3.24	0.00	7.34	1.69
Borel Tunnel	2.73	22.99	12.43	0.00	6.17	1.88
Emergency Spillway	7.54	64.12	29.53	0.00	5.50	2.39
Aux Dam Downstream	8.19	61.13	32.79	0.00	73.36	16.88
Aux Dam Upstream	0.83	5.17	3.77	0.00	10.97	2.42
Waste Material	0.75	4.29	3.18	0.00	4.99	1.16
Main Dam	2.46	17.21	10.20	0.00	14.95	3.34
Existing Spillway	0.02	0.17	0.15	0.00	0.00	0.00
Borrow Areas	4.60	31.46	20.60	0.00	3.67	1.37
Employees	0.94	3.04	28.61	0.00	0.03	0.03
Total Construction	**28.79**	**215.45**	**144.50**	**0.00**	**126.98**	**31.16**
Annualized Total (70 months)	***4.94***	***36.93***	***24.77***	***0.00***	***21.77***	***5.34***
EKAPCD significance thresholds	*25*	*25*	--	*27*	*15*	--
Exceed threshold?	*No*	*Yes*	*No*	*No*	*Yes*	*No*

Table 3-16
Estimated Daily Indirect Construction Emissions

	Criteria Pollutants (lbs/day)					
Activity	**ROG**	**NO_x**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Alternative Plan 2	7.23	23.37	220.05	0.00	0.23	0.21
EKAPCD Significance Thresholds	*137**	*137**	--	--	--	--
Exceed Threshold?	*No*	*No*	*No*	*No*	*No*	*No*

*Indirect vehicle trips emissions only.

The results of the air dispersion modeling, presented in Table 3-17, demonstrate that the maximum impacts attributable to construction, when considered in addition to the existing background concentrations, are below the applicable ambient air quality standard for SO_X, CO, $PM_{2.5}$, and NO_X annual averaging period for Alternative Plan 2. Pre-project concentrations of PM_{10} exceed the ambient air quality standards. PM_{10} is evaluated in accordance with the Prevention of Significant Deterioration (PSD) procedure in Title 40, CFR, Part 52.21. It is the EPA's policy to use significant impact levels to determine if a proposed new or modified source would cause or contribute significantly to an AAQS or PSD increment violation. If a project's maximum impacts are below the PSD significant impact level, the project is judged to not cause or contribute significantly to an AAQS or PSD increment violation. A comparison of the proposed impact from Alternative Plan 2 to the PSD significant impact level values is provided in Table 3-17. The modeled PM_{10} impacts directly attributable to the project are above the EPA's significance levels for all the Action Alternatives, which is the most stringent significance threshold identified for such emissions. Therefore, PM_{10} impacts are considered significant and unavoidable.

Table 3-17
Predicted Ambient Air Quality Impacts From Alternative Plan 2 Construction Emissions

	Averaging Period	Background ($\mu g/m^3$)	Project ($\mu g/m^3$)	Project + Background ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	CAAQS ($\mu g/m^3$)	PSD Significant Impact Level ($\mu g/m^3$)
NO_2	1-hour	1.11E+02	1.73E+02	2.83E+02	188.68	338	0
	Annual	2.70E+01	7.30E+00	3.43E+01	100	57	1
SO_2	1-hour	3.00E-02	0.00E+00	3.00E-02	196	655	0
	3-hour	1.50E-02	0.00E+00	1.50E-02	1,300	---	25
	24-hour	5.00E-03	0.00E+00	5.00E-03	365	105	5
	Annual	1.00E-03	0.00E+00	1.00E-03	80	---	1
CO	1-hour	2.47E+03	1.54E+02	2.63E+03	40,000	23,000	2,000
	8-hour	1.48E+03	3.70E+01	1.52E+03	10,000	10,000	500
PM_{10}	24-hour	9.73E+01	2.17E+01	1.19E+02	150	50	5
	Annual	2.26E+01	5.75E+00	2.84E+01	---	20	1
$PM_{2.5}$	24-hour	2.05E+01	5.31E+00	2.58E+01	35	---	5
	Annual	6.50E+00	1.41E+00	7.91E+00	15	12	1

Construction-related emissions associated with Alternative Plan 2 would also exceed the significance thresholds for the NOx 1-hour standard. Even though the construction emissions cause ambient significance levels to be exceeded, these emissions would be temporary and would not exist once construction is completed. Operational emissions would not change from current operations and are expected to be low.

GHG/Global Warming

The primary sources of GHG emissions during construction of Alternative Plan 2 would be mobile. Under this alternative, the additional excavation, construction material, and longer construction schedule would increase the GHG emissions. The estimated GHG emissions are provided in Table 3-18. As a result, the transportation-related GHG emissions are a short-term significant impact.

Table 3-18
Estimated Greenhouse Gas Emissions – Alternative Plan 2

Source	CO_2 (tons/ year)	CH_4 (tons/ year)	N_2O (tons/ year)	CO_2e (tons/year)
Total Construction				
Alternative Plan 2 Construction	53,297	16.24	1.17	53,999
Annualized Construction				
Alternative Plan 2 Construction	9,137	2.78	0.20	9,257

A number of recommended actions targeted at the transportation sector would also be applicable to construction equipment and maintenance vehicles associated with this alternative. However, given that these recommended actions are based on CARB-enforced standards, Alternative Plan 2 would not be in conflict with implementation of such standards. By requiring best management practices to reduce construction-related exhaust emissions, transportation-related GHS would be reduced and ensure no conflict with the recommended actions. However, short-term GHG-related impacts would remain significant and unavoidable.

A GHG analysis was conducted for Alternative Plan 2 even though the anticipated GHG level was considerably less than CEQ's recommended action level (25,000 metric tons or more of CO_2-equivalent) in their February 2010 Guidance memorandum. Also, CEQ's Guidance memorandum was based on long-term impacts as opposed to short-term construction impacts posed by this alternative. Because the GHG analysis conducted resulted in GHG emissions impacts considerably below the CEQ's recommended evaluation level, no further analysis is required based on the CEQ Guidance.

Alternative Plan 3

Air Quality

Under this alternative, all of the deficiencies remediated under Alternative Plan 2 would be included, plus additional remediation measures identified for the Main Dam. Alternative Plan 3 also involves relocating the Borel Canal conduit from the Main Dam Outlet through a tunnel under the existing and proposed spillways and reconnecting to the existing Borel Canal downstream of the Auxiliary Dam. This differs from the other three Action Alternatives, which relocate the Borel Canal conduit through the right abutment of the Auxiliary Dam. Although there would be differences, Alternative Plan 3 would require generally similar construction material, excavation, and schedule as Alternative Plan 2. Tables 3-19 and 3-20 present the total project-related, unmitigated, annual and daily air emissions from construction of Alternative Plan 3. The EKAPCD thresholds of significance are also included in Tables 3-19 and 3-20, as well as information to determine if annual and daily construction emissions for ROG, NO_X, SO_X, $PM_{2.5}$ and PM_{10} would exceed those thresholds. As shown in the tables, temporary emissions during construction would exceed NOx and PM_{10} EKAPCD thresholds adopted by Kern County. As a result this short-term direct impact is significant.

The results of the air dispersion modeling, presented in Table 3-21, demonstrate that the maximum impacts attributable to construction, when considered in addition to the existing background concentrations, are below the applicable ambient air quality standard for SO_X, CO, $PM_{2.5}$, and NO_X annual averaging period for Alternative Plan 3. Pre-project concentrations of PM_{10} exceed the ambient air quality standards. PM_{10} is evaluated in accordance with the Prevention of Significant Deterioration (PSD) procedure in Title 40, CFR, Part 52.21. It is the EPA's policy to use significant impact levels to determine if a proposed new or modified source would cause or contribute significantly to an AAQS or PSD increment violation. If a project's maximum impacts are below the PSD significant impact level, the project is judged to not cause or contribute significantly to an AAQS or PSD increment violation. A comparison of the proposed impact from the project to the

Table 3-19
Estimated Alternative Plan 3 Construction Emissions

	Criteria Pollutants (tons/year)					
Alternative 3 Plan Activity	**ROG**	**NO_x**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Staging Area	0.73	5.87	3.24	0.00	7.34	1.69
Borel Tunnel	2.54	20.31	11.43	0.00	2.85	1.11
Emergency Spillway	7.54	64.12	29.53	0.00	5.50	2.39
Aux Dam Downstream	8.19	61.13	32.79	0.00	73.70	16.92
Aux Dam Upstream	0.83	5.17	3.77	0.00	10.97	2.42
Waste Material	0.75	4.29	3.18	0.00	4.99	1.16
Main Dam	2.46	17.21	10.20	0.00	14.95	3.34
Existing Spillway	0.02	0.17	0.15	0.00	0.00	0.00
Borrow Areas	4.60	31.46	20.60	0.00	3.67	1.37
Employees	0.94	3.04	28.61	0.00	0.03	0.03
Total	**28.60**	**212.77**	**143.50**	**0.00**	**124.00**	**30.42**
Annualized Total (70 months)	***4.90***	***36.47***	***24.60***	***0.00***	***21.26***	***5.21***
EKAPCD significance thresholds	*25*	*25*	*--*	*27*	*15*	*--*
Exceed threshold?	*No*	*Yes*	*No*	*No*	*Yes*	*No*

Table 3-20
Estimated Daily Indirect Construction Emissions

	Criteria Pollutants (lbs/day)					
Activity	**ROG**	**NO_x**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Alternative Plan 3	7.23	23.37	220.05	0.00	0.23	0.21
EKAPCD Significance Thresholds	*137**	*137**	*--*	*--*	*--*	*--*
Exceed Threshold?	*No*	*No*	*No*	*No*	*No*	*No*

*Indirect vehicle trips emissions only.

Table 3-21
Predicted Ambient Air Quality Impacts From Alternative Plan 3 Construction Emissions

	Averaging Period	**Background ($\mu g/m^3$)**	**Project ($\mu g/m^3$)**	**Project + Background ($\mu g/m^3$)**	**NAAQS ($\mu g/m^3$)**	**CAAQS ($\mu g/m^3$)**	**PSD Significant Impact Level ($\mu g/m^3$)**
NO_2	1-hour	1.11E+02	1.70E+02	2.81E+02	188.68	338	0
	Annual	2.70E+01	7.21E+00	3.42E+01	100	57	1
SO_2	1-hour	3.00E-02	0.00E+00	3.00E-02	196	655	0
	3-hour	1.50E-02	0.00E+00	1.50E-02	1,300	---	25
	24-hour	5.00E-03	0.00E+00	5.00E-03	365	105	5
	Annual	1.00E-03	0.00E+00	1.00E-03	80	---	1
CO	1-hour	2.47E+03	1.53E+02	2.63E+03	40,000	23,000	2,000
	8-hour	1.48E+03	3.68E+01	1.52E+03	10,000	10,000	500
PM_{10}	24-hour	9.73E+01	2.11E+01	1.18E+02	150	50	5
	Annual	2.26E+01	5.60E+00	2.82E+01	---	20	1
$PM_{2.5}$	24-hour	2.05E+01	5.18E+00	2.57E+01	35	---	5
	Annual	6.50E+00	1.38E+00	7.88E+00	15	12	1

PSD significant impact level values is provided in Table 3-21. The modeled PM_{10} impacts directly attributable to the project are above the EPA's significance levels for all Action Alternatives, which is the most stringent significance threshold identified for such emissions. Therefore, PM_{10} impacts are considered significant and unavoidable.

Construction-related emissions for Alternative Plan 3 would also exceed the significance thresholds for the NOx 1-hour standard. Even though the construction emissions cause ambient significance levels to be exceeded, these emissions would be temporary and would not exist once construction is completed. Operational emissions would not change from current operations and are expected to be low.

GHG/Global Warming

The primary sources of GHG emissions during construction of Alternative Plan 3 would also be mobile. Under this alternative, the additional excavation, construction material, and longer construction schedule would increase the GHG emissions. The estimated GHG emissions are provided in Table 3-22. As a result, the transportation-related GHG emissions are a short-term significant impact.

Table 3-22
Estimated Greenhouse Gas Emissions - Alternative Plan 3

Source	CO_2 (tons/ year)	CH_4 (tons/ year)	N_2O (tons/ year)	CO_2e (tons/year)
Total Construction				
Alternative Plan 3 Construction	52,870	16.22	1.16	53,571
Annualized Construction				
Alternative Plan 3 Construction	9,063	2.78	0.20	9,184

A number of recommended actions targeted at the transportation sector would also be applicable to construction equipment and maintenance vehicles associated with this alternative. However, given that these recommended actions are based on CARB-enforced standards, Alternative Plan 3 would not be in conflict with implementation of such standards. By requiring best management practices to reduce construction-related exhaust emissions, transportation-related GHS would be reduced and ensure no conflict with the recommended actions. However, short-term GHG-related impacts would remain significant and unavoidable.

A GHG analysis was conducted for Alternative Plan 3 even though the anticipated GHG level was considerably less than CEQ's recommended action level (25,000 metric tons or more of CO_2-equivalent) in their February 2010 Guidance memorandum. Also, CEQ's Guidance memorandum was based on long-term impacts as opposed to short-term construction impacts posed by this alternative. Because the GHG analysis conducted resulted in GHG emissions impacts considerably below the CEQ's recommended evaluation level, no further analysis is required based on the CEQ Guidance.

Other Air Quality Impacts Common to All Action Alternatives

In addition to PM_{10} and NOx emission levels being similar for all the Action Alternatives, there are other categories of air quality impacts that are similar and common for the alternatives. These are described in the following paragraphs.

Health Risk

The basis for evaluating potential health risk is the identification of sources with increased TACs. Diesel exhaust particulate matter has been identified as a TAC with the potential to produce carcinogenic and noncancer chronic health impacts. Health risk is also determined using the Hotspots Analysis and Reporting Program (HARP) software distributed by the California Air Resources Board, which requires peak 1-hour emission rates and annual-averaged emission rates for all pollutants for each modeling source. The worst-case year would have hazardous air pollutant emissions due to vehicular traffic and construction equipment.

The carcinogenic risk and the health hazard index for chronic noncancer risk at the point of maximum impact do exceed the significance level of one in one million for carcinogenic risk but do not exceed the health hazard index for chronic risk of 0.2. For all the Action Alternatives being evaluated, the points of maximum impact are identified by receptor location, risk, and pathway in Table 3-23.

Table 3-23
Isabella DSM Project Alternatives Potential Maximum Impacts Predicted By HARP

DSM Plan	Highest On-Site Cancer Risk	Highest Off-Site Cancer Risk	Impacts to Residential Receptors	Primary Area of Receptor Impact
Base Plan	3 in one-million	1 in one-million	Minimal	East of SR 178
Alternative Plan 1	4 in one-million	1 in one-million	Slightly> Base Plan	East of SR 178
Alternative Plan 2	5 in one-million	1 in one-million	Slightly> Alt. Plan 1	East of SR 178
Alternative Plan 3	5 in one-million	1 in one-million	Slightly<Alternative Plan 2	East of SR 178

As shown in Table 3-23, the maximum predicted cancer risk for all alternatives is 5 in one-million. Since the point of maximum impact is above the significance threshold within the construction zone for cancer, all Action Alternatives are anticipated to have an adverse effect. The maximum impact on surrounding communities is highest under Alternative Plan 2 which is slightly greater than Alternative Plans 1 and 3. Cancer risk and chronic noncancer risk are attributable to emissions of diesel engine exhaust particulate matter from on-site travel and vehicle idling. The potential chronic carcinogenic risk from the Action Alternatives is above the significance level of one in a million. Therefore, the potential short-term health risk impact attributable to all the alternatives is significant and unavoidable.

Visibility

All four Action Alternatives would result in similar construction emissions of PM_{10} and would be less than one-hundred miles from the Domelands Wilderness Area; therefore, the potential risk to the visibility in the nearest Class I Area attributable to emissions of particulate matter air pollutants from the proposed project was assessed.

The next closest Class 1 area is the Sequoia National Park to the north of the Isabella DSM Project location. Visibility impacts on the Sequoia National Park were not evaluated as the area is farther from the project site and the visibility impacts are expected to be less than those modeled.

The data from Tables 3-24 and 3-25 were used as the input to the EPA VSCREEN Model to determine if expected emissions from the Action Alternatives would exceed the screening criteria. The visibility screening analysis was then conducted using three contrast values, shown in Table 3-24.

Table 3-24
Visibility Source Data – All Alternatives

Source Data – Lake Isabella Dam Project – All Alternatives		
Pollutant	**Build-Out**	**Units**
PM_{10} Emission Rate	0.30022	ton/day
NO_2 Emission Rate	0.39737	ton/day
SO_2 Emission Rate	0.00016	ton/day

Table 3-25
Visibility Receptor Data

Receptor Data		
Receptor	**Distance**	**Units**
Domeland Wilderness	17.5	km

Table 3-26
Visibility Screening Analysis

Contrast Parameter	Calculated Values	Significance Level
C_1	0.017569083	0.1
C_2	0.040490464	0.1
C_3	0.00012889	0.1

Since the absolute value of all three of the calculated contrast parameters is less than 0.1, a visibility impact at the evaluated Class 1 areas is not expected from any of the Action Alternatives, and further analysis is not required. Therefore, impacts are less than significant.

Asbestos

Asbestos can adversely affect humans only in its fibrous form, and these fibers must be broken and dispersed into the air and then inhaled. During geological processes (e.g. fault movement) the naturally-occurring asbestos (NOA) mineral can be crushed, causing it to become airborne. It also can enter the air or water from the breakdown of natural deposits. Constant regular exposure to asbestos at high levels may cause cancer in humans. The two most common forms are lung cancer and mesothelioma, a rare cancer of the lining that covers the lungs and stomach.

Typically, asbestos occurs in certain geologic environments, including fault zones. As noted previously in Section 3.6 (Geology, Soils, Seismicity), a crystalline limestone unit was identified in the Kern Canyon Fault zone, beneath the alluvial fan materials, near the right abutment of the Auxiliary Dam (Corps 2010b), which may contain NOA. Other potential NOA regions in the project area are fault-related mafic igneous intrusions and metamorphosed marble bodies. For all the Action Alternatives, construction areas with favorable bedrock geology for NOA are considered potentially hazardous until a site-specific investigation and lab analysis rules out NOA.

Alternative 4

<u>*Air Quality*</u>

Under this alternative, the deficiencies remediated in the Base Plan Alternative would be included, plus additional remediation measures identified for the Existing and Emergency Spillways, Main Dam, and Auxiliary Dam, which include installing a filter and drain system, raising the dam crests and existing spillway walls by 16 feet, widening the emergency spillway to 900 feet, realigning State Highway 178, and installing a flood gate where the new Main Dam embankment would intersect State Highway 155. Detailed air quality modeling is currently being developed for this alternative; however, this alternative would have air quality impacts similar to the Base Plan Alternative with the primary differences being an increased duration of construction for the widening of the emergency spillway and construction related to the realignment of the highways. Results of the detailed air quality modeling and analysis will be included in the Final EIS.

Construction-related emissions for Alternative Plan 4 are anticipated to be on the level of those modeled for Alternative Plan 3. Although there would be differences, Alternative Plan 4 would require generally similar construction material, excavation rates, and schedule as Alternative Plan 3. Tables 3-27 and 3-28 present the total project-related, unmitigated, annual and daily air emissions estimated for Alternative Plan 4, based on modeling completed for Alternative Plan 3. The EKAPCD thresholds of significance are also included in Tables 3-27 and 3-28, as well as information to determine if annual and daily construction emissions for ROG, NO_X, SO_X, $PM_{2.5}$ and PM_{10} would exceed those thresholds. As shown in the tables, temporary emissions during construction would exceed NOx and PM_{10} EKAPCD thresholds adopted by Kern County. As a result this short-term direct impact is significant.

The results of the air dispersion modeling, presented in Table 3-29, demonstrate that the maximum impacts attributable to construction, when considered in addition to the existing background concentrations, are below the applicable ambient air quality standard for SO_X, CO, $PM_{2.5}$, and NO_X annual averaging period for Alternative Plan 4. Pre-project

Table 3-27
Estimated Alternative Plan 4 Construction Emissions

	Criteria Pollutants (tons/year)					
Alternative 4 Plan Activity	**ROG**	**NO_x**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Staging Area	0.73	5.87	3.24	0.00	7.34	1.69
Borel Tunnel	2.54	20.31	11.43	0.00	2.85	1.11
Emergency Spillway	7.54	64.12	29.53	0.00	5.50	2.39
Aux Dam Downstream	8.19	61.13	32.79	0.00	73.70	16.92
Aux Dam Upstream	0.83	5.17	3.77	0.00	10.97	2.42
Waste Material	0.75	4.29	3.18	0.00	4.99	1.16
Main Dam	2.46	17.21	10.20	0.00	14.95	3.34
Existing Spillway	0.02	0.17	0.15	0.00	0.00	0.00
Borrow Areas	4.60	31.46	20.60	0.00	3.67	1.37
Employees	0.94	3.04	28.61	0.00	0.03	0.03
Total	**28.60**	**212.77**	**143.50**	**0.00**	**124.00**	**30.42**
Annualized Total (70 months)	***4.90***	***36.47***	***24.60***	***0.00***	***21.26***	***5.21***
EKAPCD significance thresholds	*25*	*25*	*--*	*27*	*15*	*--*
Exceed threshold?	*No*	*Yes*	*No*	*No*	*Yes*	*No*

Based on emission modeling estimates from Alternative Plan 3

Table 3-28
Estimated Daily Indirect Construction Emissions

	Criteria Pollutants (lbs/day)					
Activity	**ROG**	**NO_x**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Alternative Plan 4	7.23	23.37	220.05	0.00	0.23	0.21
EKAPCD Significance Thresholds	*137**	*137**	*--*	*--*	*--*	*--*
Exceed Threshold?	*No*	*No*	*No*	*No*	*No*	*No*

*Indirect vehicle trips emissions only.

Table 3-29
Predicted Ambient Air Quality Impacts From Alternative Plan 4 Construction Emissions

	Averaging Period	**Background ($\mu g/m^3$)**	**Project ($\mu g/m^3$)**	**Project + Background ($\mu g/m^3$)**	**NAAQS ($\mu g/m^3$)**	**CAAQS ($\mu g/m^3$)**	**PSD Significant Impact Level ($\mu g/m^3$)**
NO_2	1-hour	1.11E+02	1.70E+02	2.81E+02	188.68	338	0
	Annual	2.70E+01	7.21E+00	3.42E+01	100	57	1
SO_2	1-hour	3.00E-02	0.00E+00	3.00E-02	196	655	0
	3-hour	1.50E-02	0.00E+00	1.50E-02	1,300	---	25
	24-hour	5.00E-03	0.00E+00	5.00E-03	365	105	5
	Annual	1.00E-03	0.00E+00	1.00E-03	80	---	1
CO	1-hour	2.47E+03	1.53E+02	2.63E+03	40,000	23,000	2,000
	8-hour	1.48E+03	3.68E+01	1.52E+03	10,000	10,000	500
PM_{10}	24-hour	9.73E+01	2.11E+01	1.18E+02	150	50	5
	Annual	2.26E+01	5.60E+00	2.82E+01	---	20	1
$PM_{2.5}$	24-hour	2.05E+01	5.18E+00	2.57E+01	35	---	5
	Annual	6.50E+00	1.38E+00	7.88E+00	15	12	1

concentrations of PM_{10} exceed the ambient air quality standards. PM_{10} is evaluated in Title 40, CFR, Part 52.21. It is the EPA's policy to use significant impact levels to determine if a proposed new or modified source would cause or contribute significantly to an AAQS or PSD increment violation. If a project's maximum impacts are below the PSD significant impact level, the project is judged to not cause or contribute significantly to an AAQS or PSD increment violation. A comparison of the proposed impact from the project to the PSD significant impact level values is provided in Table 3-29. The modeled PM_{10} impacts directly attributable to the project are above the EPA's significance levels for all Action Alternatives, which is the most stringent significance threshold identified for such emissions. Therefore, PM_{10} impacts are considered significant.

Construction-related emissions for Alternative Plan 4 would be expected to exceed the significance thresholds for the NOx 1-hour standard. Even though the construction emissions cause ambient significance levels to be exceeded, these emissions would be temporary and would not exist once construction is completed. Operational emissions would not change from current operations and are expected to be less than significant.

GHG/Global Warming
The primary sources of GHG emissions during construction of Alternative Plan 4 would also be mobile. Under this alternative, the additional excavation, construction material, and longer construction schedule would increase the GHG emissions. The estimated GHG emissions are provided in Table 3-30. As a result, the transportation-related GHG emissions are a short-term significant impact.

Table 3-30
Estimated Greenhouse Gas Emissions - Alternative Plan 4

Source	CO_2 (tons/ year)	CH_4 (tons/ year)	N_2O (tons/ year)	CO_2e (tons/year)
Total Construction				
Alternative Plan 3 Construction	52,870	16.22	1.16	53,571
Annualized Construction				
Alternative Plan 3 Construction	9,063	2.78	0.20	9,184

A number of recommended actions targeted at the transportation sector would also be applicable to construction equipment and maintenance vehicles associated with this alternative. However, given that these recommended actions are based on CARB-enforced standards, Alternative Plan 4 would not be in conflict with implementation of such standards. By requiring best management practices to reduce construction-related exhaust emissions, transportation-related GHS would be reduced and ensure no conflict with the recommended actions.

3.5.4 Environmental Commitments/Mitigation Measures

Implementation of the following mitigation measures would reduce air quality impacts associated with any of the Action Alternatives. However, even with these measures, localized impacts from short-term construction emissions from all the Action Alternatives remain significant and unavoidable:

- Sufficiently water excavated or graded soil as needed to prevent excessive dust, with disturbed soil areas being completely covered. Water a minimum of twice daily on unpaved or untreated roads and on disturbed soil areas with active operations.
- Cease all clearing, grading, earth moving, and excavation during periods of winds greater than 20 miles per hour (averaged over one hour), when disturbed material is easily windblown, or when dust plumes of 20 percent or greater opacity impact public roads, occupied structures, or neighboring property.
- Sufficiently water or securely cover all fine material transported off-site to prevent excessive dust.
- Minimize areas disturbed by clearing, earth moving, or excavation.
- Stabilize by watering or other appropriate method stockpiles of soil or other fine loose material to prevent windblown fugitive dust.
- Where acceptable to the fire department, control weeds by mowing instead of discing.
- Once initial leveling has ceased, seed and water until plant growth is evident all inactive soil areas within the construction sites, or treat with a dust palliative, or water twice daily until soil has sufficiently crusted to prevent fugitive dust emissions.
- Sufficiently water at least twice daily all active disturbed soil areas to prevent excessive dust.
- Limit on-site vehicle speed to 15 miles per hour.
- Pave, treat with dust palliatives, or water a minimum of twice daily all areas with vehicle traffic.
- Keep streets next to the project site clean, and frequently remove project-related accumulated silt and debris.
- Access the main project work sites via an apron from adjoining surfaced roadways. Surface or treat the apron with dust palliatives . If equipment is operating on soils that cling to wheels, use a “grizzly” or other such device using rails, pipes, or grates to dislodge mud, dirt, and debris from the tires and undercarriage of vehicles on the road exiting the project site, immediately before the pavement, in order to remove most of the soil from vehicle tires.

- Maintain all equipment as recommended by manufacturers' manuals.
- Shut down equipment when not in use for extended periods.
- Substitute electric equipment whenever possible for diesel- or gasoline-powered equipment.
- Equip all construction vehicles with proper emissions control equipment and keep in good and proper running order to substantially reduce NO_X emissions.
- Use diesel particulate filters on on-road and off-road diesel equipment, if they are permitted under manufacturers' guidelines.

3.6 WATER RESOURCES

This section describes regulations that affect water resources at Isabella Lake, the water resources associated with Isabella Lake, and the impacts on water resources from the Action Alternatives and relevant support actions. Components of the water resources that are analyzed include surface water and groundwater, water quality and hydrology.. Additional discussion of current lake water quality is found in the *2011 Isabella Lake DSAP Monitoring Summary Report* provided as Appendix B of this Draft EIS.

Isabella Lake was created by the construction of a main dam and an auxiliary dam across the adjacent valley. The dams impound the flow of the North and South Forks of the Kern River. The Main Dam is across the Kern River, while the Auxiliary Dam is to the left (east-southeast) of the Main Dam, looking downstream across Hot Springs Valley. Water storage in the lake began in April 1954.

3.6.1 Regulatory Setting

The relevant Federal, State, and local laws and regulations regarding water resources and water quality in the project area and vicinity are summarized in the following paragraphs. State and local requirements are included that were helpful in characterizing the overall context of the analyses, even though some of these requirements do not directly apply to this Federal action.

Federal

Clean Water Act -33 USC 1251 et. seq.
The Clean Water Act (CWA) is the Federal law that regulates the discharge of pollutants into navigable waters (Clean Water Act 1972). State water quality programs and regulations are chiefly the products of Federal mandates put into effect through the CWA and managed by the EPA.

Section 401
Under Section 401 of the CWA, any person applying for a Federal permit or license, which may discharge pollutants into waters of the United States, must obtain a State water quality certification. This is required to ensure the activity complies with all applicable water quality standards, limitations, and restrictions. No license or permit may be issued by a Federal agency until after Section 401 certification has been granted, and no license or permit may be issued if certification has been denied. Permits or licenses that are subject to Section 401 of the CWA include, for example, permits issued under Section 404 of the CWA, permits issued under Sections 9 and 10 of the Rivers and Harbors Act, and licenses for hydroelectric power plants issued by the Federal Energy Regulatory Commission under the Federal Power Act (State Water Resources Control Board 2011a). The Central Valley Regional Water Quality Control Board (CVRWQCB) administers Section 401 certification and wetlands requirements of the CWA for the project area.

<u>*Section 404*</u>
Under the Section 404 regulatory program of the CWA, no discharge of dredged or fill material into waters of the United States can be permitted if a practicable alternative is less damaging to the aquatic environment or if the waters of the nation would be significantly degraded. The Corps are authorized to issue permits regulating the discharge of dredged or fill material into the waters of the United States, including wetlands. After reviewing permits issued by the Corps, the EPA can veto a Corps decision to issue a permit. Also, the EPA develops regulations with which the Corps must comply (California Natural Resources Agency 2011a). For Corps projects, the Corps does not issue itself a permit, however the Corps is required to ensure that the project complies with guidelines that the EPA develops in accordance with Section 404(b)(1) of the CWA.

<u>*Section 402*</u>
As authorized by Section 402 of the CWA, the National Pollutant Discharge Elimination System (NPDES) permit program regulates point sources that discharge pollutants into waters of the United States. Dischargers whose projects disturb one or more acres of soil are required to obtain coverage under the General Permit for Discharges of Stormwater Associated with Construction Activity. The Construction General Permit requires the development and implementation of a stormwater pollution prevention plan (SWPPP), which must identify best management practices (BMPs) that the discharger will use to protect stormwater runoff. Depending on the site's sediment risk and receiving water risk during periods of soil exposure, turbidity and pH sampling may be required for any stormwater discharge leaving the site. Additionally, the SWPPP must contain a visual monitoring program, a chemical monitoring program, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment (State Water Resources Control Board 2011b). The CVRWQCB administers NPDES permits required by the CWA.

<u>*Section 303(d)*</u>
CWA Section 303(d) requires that States develop a list of water quality limited segments that do not meet water quality standards. A total maximum daily load (TMDL) is then established for water quality limited segments in order to improve water quality (State Water Resources Control Board 2011c). A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards (EPA 2011). The Central Valley Regional Water Quality Control Board listed Isabella Lake on the Clean Water Act 303(d) list in 2010 for pH and dissolved oxygen due to their inability to meet the Basin Plan's water quality objectives and impacting cold freshwater habitats (CVRWQCB, 2010). TMDLs are anticipated to be completed in 2021.

<u>*Water Control Manual*</u>
There is a water control manual for Isabella Dam and Lake, the purpose of which is to provide descriptive information, a detailed plan for water control management, and a water control diagram for Isabella Dam and Lake (Corps 1978, Corps 2006a). It also assigns responsibilities for water control operation of the project. Isabella Lake is administered and operated by the Corps. According to the manual, Isabella Lake is

operated for flood control and conservation, in accordance with the regulations to achieve the following objectives (Corps 2006a):

- To restrict flows in downstream channels of the Kern River and its distributaries to nondamaging rates;
- To eliminate or minimize flood flows from the Kern River into Tulare Lakebed; and
- To provide the maximum practicable amount of storage space for conservation water without impairing the flood control functions.

The Corps is responsible for the integrity of Isabella Lake Dam, manages the water levels in Isabella Lake, and provides the daily water releases. The water control plan for Isabella Lake is operational from November through June, which is considered the flood control season. The Kern River Water Master directs releases from the lake during the flood control off-season (July through October) for purposes other than flood control.

Wild and Scenic Rivers

The National Wild and Scenic Rivers System was created to preserve certain rivers with outstanding natural, cultural, and recreation values in a free-flowing condition. Rivers may be designated by Congress or the Secretary of the Interior (US Fish and Wildlife Service 2011). Designated reaches near Isabella Lake are the North Fork of the Kern River from the Tulare-Kern County line to its headwaters in Sequoia National Park and the South Fork of the Kern River from its headwaters in the Inyo National Forest to the southern boundary of the Domelands Wilderness in the Sequoia National Forest. These reaches are upstream from Isabella Lake.

Executive Order 11988: Floodplain Management

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities."

State

Cobey-Alquist Floodplain Management Act

In order to protect people and property from flooding hazards, the Cobey-Alquist Floodplain Management Act encourages local governments to plan, adopt and enforce land use regulations for floodplain management. It addresses the review of floodplain management plans, the establishment of floodplain regulations, and the regulations of designated floodway use (Kern County 2011c).

Porter-Cologne Water Quality Control Act

Under the Porter-Cologne Water Quality Control Act, the State Water Resources Control Board oversees State water rights and water quality policy. It also establishes nine Regional Water Quality Control Boards to oversee water quality on a day-to-day basis at the local and regional level. The Regional Boards, for example, update Basin Plans that establish beneficial uses of water, water quality standards, and actions necessary to maintain these standards. The State Board and nine Regional Boards are also responsible for granting CWA NPDES permits (California Natural Resources Agency 2011b).

Water Quality Control Plan for the Tulare Lake Basin (Basin Plan)

The CWA requires States to establish numerical water quality criteria for various toxic discharges. Water quality objectives and standards are stated in the water quality control plans (also called basin plans) for the State. A regional water quality control board administers each hydrologic basin and associated basin plan. Isabella Lake is subject to compliance with the CVRWQCB Tulare Lake Basin Plan (CVRWQCB 2004) and additional guidelines as established by State and Federal water quality goals (CVRWQCB 2008). The Basin Plan establishes guidelines to ensure reasonable protection of beneficial uses of Isabella Lake water: hydropower generation (POW), water contact recreation (REC-1), noncontact water recreation (REC-2), warm freshwater habitat (WARM), cold freshwater habitat (COLD), wildlife habitat (WILD), and freshwater replenishment (FRSH). Water quality goals have been established for water quality parameters.

Local

Kern County Floodplain Management Ordinance

The Kern County Floodplain Management Ordinance states its purpose is, in part, to minimize public and private losses due to flood conditions in specific area. Methods for reducing flood losses include controlling the alteration of natural floodplains and stream channels; controlling filling, grading, dredging, and other development which may increase flood damage; and preventing or regulating the construction of flood barriers (Kern County 2011b, Kern County 2011c).

Kern River Valley Specific Plan

The Kern River Valley Specific Plan (KRVSP) establishes planning policies and implementation measures to guide future development of the communities in the Kern River Valley. The plan identifies issues of importance in the area and addresses the issues by stating goals, policies, and implementation measures to guide land use planning, while conserving environmental and natural resources (Kern County 2011b).

The conservation element of the plan addresses air quality. Low water levels in Isabella Lake allow the lake bottom to be periodically exposed, and dust and particulate matter are blown into the air when the wind speeds are high. Policy 5.5.6 encourages the Corps, Kern River Water Master, and the US Fish and Wildlife Service to develop a policy that maintains a minimum water level in Isabella Lake that will not allow the lake bed to go dry for an extended period (Kern County 2011b).

Kern River Valley is susceptible to several natural hazards, including flooding and seismic and geologic hazards. Isabella Lake and most of the land next to the lake are in a 100-year floodplain. The public safety element of the KRVSP focuses on controlling development in areas prone to flooding and areas susceptible to inundation from dam failure (Kern County 2011b).

With respect to seismic and geologic hazards, the Kern Canyon Fault runs directly underneath the Isabella Auxiliary Dam. A local earthquake could damage the dam and result in dam failure (Kern County 2011b). Also, when seismic waves from an earthquake pass through an area, seismic seiches (standing waves set up on rivers, lakes, ponds, and lakes) can be created. The Public Safety Element focuses on the proper location and construction of buildings and structures.

Floodwater would flow down the Kern River and wash out into the valley between Shafter to the north and Buena Vista Park near SR 119 and Kern Lake to the south. The greatest inundation depth would be approximately 100 feet along SR 178. The least inundation depth would be one to two feet in the Buena Vista Park and Shafter areas. It would take 24 to 36 hours for a Main Dam failure to inundate the Buena Vista Park and Shafter areas by one foot. It would take six to eight hours for a Main Dam failure to inundate Bakersfield by one foot.

3.6.2 Affected Environment

This section describes the water resources associated with Isabella Lake. The region of influence for water resources includes Isabella Lake and downstream water users.

General Conditions

<u>Watershed</u>

The Tulare Lake Hydrologic Region covers approximately 10.9 million acres. This region includes all of Kings and Tulare Counties and most of Fresno and Kern Counties. Four main rivers (Kings, Kern, Tule and Kaweah) in the watershed originate from the western flanks of the southern Sierra Nevada, and one substantial creek (Los Gatos) enters from the Coast Range. The Kern River has the largest drainage basin area but produces the second highest runoff after the Kings River. It originates in Inyo and Sequoia National Forests and Sequoia National Park, and flows southward into Isabella Lake. The river downstream of Isabella Dam flows southwest toward Bakersfield. Water from the river will flow into the ancient Buena Vista/Kern Lakebed during high discharge years. Buena Vista Lake historically spilled into Tulare Lake via sloughs and floodwater channels during very high discharge years (California DWR 2009).

Isabella Lake is in the Kern River Valley basin, which is in the southern Sierra Nevada, at elevations ranging from 2,500 to 4,500 feet. The drainage area of the Kern River at Isabella Dam is 2,074 square miles (Corps 2009a). The Kern River Valley basin is irregularly shaped because of the drainage pattern of the north and south forks of the Kern River, Kelso Creek, and smaller tributary creeks. The Greenhorn Mountains and Kern

Canyon Fault form the western boundary of the basin. The Piute and Kiavah Mountains bound the basin to the south and east. The southern portion of the basin is dominated by Isabella Lake, from which the Kern River flows southwest toward Bakersfield in the San Joaquin Valley. Average annual precipitation ranges from six to 14 inches in the eastern and western portions of the basin, respectively (California DWR 2004).

The two principal reaches of the Kern River are the main stem of the Kern River (North Fork) and the South Fork. The North Fork makes up about 85 percent of the total flow into Isabella Lake. Approximately 90 percent of the runoff-producing precipitation falls from November through April. Approximately two-thirds of the annual runoff occurs from April through July when snowmelt dominates the system. The average annual unimpaired flow of the Kern River at Isabella Lake Dam is about 736,000 acre-feet, while the average annual impaired flow of the Kern River in the diverted reach is about 398,000 acre-feet. Impaired stream flow is the historical flow in the Kern River with all project impairments (Corps 2009a).

The Kern River watershed is characterized by rugged mountain terrain, with several granite spires reaching above 14,000 feet. Mount Whitney is in the northeast corner of the Kern River cloud seeding target area, which is near the headwaters of the Kern River. The Kern River Basin cloud seeding effort acts to increase the overall water yield of the Kern River by promoting precipitation in the snowshed above Isabella Lake. The City of Bakersfield and its predecessors have participated in the cloud seeding program for approximately forty years (Bakersfield 2003).

Isabella Lake

Isabella Lake is roughly Y-shaped, following the two upper forks of the Kern River upstream and the Lower Kern River downstream. It is surrounded by several communities; including Lake Isabella, Mountain Mesa, South Lake/Longview, Weldon, Keyesville, Wofford Heights, and Kernville.

The operation of Isabella Lake includes storing inflow during the spring snowmelt season (April through July) and making releases from storage through the summer and fall. The lake is operated as a multipurpose water lake. Its primary function is flood reduction, but the lake is also managed to meet water supply demands of downstream users, principally those of agricultural interests, and to accommodate lake recreation (Corps 2009b).

The normal water level pattern shows sharp increases every year from May to June, followed by a gradual decrease during the rest of the year. This is due to the melting of the snowpack in the headwaters of the Kern River and its tributaries. Normal winter precipitation usually causes a slight interruption in the general pattern of decreasing lake heads, and intense storms can cause a rapid increase in water levels (Corps 2009a).

Both the Main and Auxiliary Dams are compacted earth embankments, 1,700 and 3,260 feet long, respectively. The crests of both dams are at an elevation of 2,637.26 feet (Corps 2007a). Isabella Lake has a gross pool capacity of 568,075 acre-feet when the water is at full pool elevation [2,609.26 feet]. The flood control pool elevation is 2,564.16 feet, which has a capacity of 170,000 acre-feet. The Corps Sacramento District initiated an emergency deviation in 2006 from the water plan in the Water Control Manual for Isabella Dam and Lake. This was done to safely operate the project and maintain the water elevation at or below an interim risk reduction measure (IRRM) elevation of 2,589.26 feet (storage capacity at or below approximately 360,000 acre-feet) (Corps 2011). The goal was lowering the lake level to reduce the foundation pressures and to provide an adequate factor of safety based on recent seismic investigations. The lake is operated to maintain a water elevation at or below 2,589.26 feet from March 20 to September 20. This pool restriction is 20 feet below full pool elevation, or approximately 63 percent of full lake capacity (Corps 2011).

<u>*Seepage*</u>

Water storage in the lake began in April 1954. At the time of initial construction of Isabella Dam, it was assumed that seepage would not be a concern at the Auxiliary Dam because the foundation materials were homogeneous and relatively impervious. However, seepage has been observed at the toe of the Auxiliary Dam since the first periodic inspection in January 1970. In the 1970 report, it was observed that while the area was always saturated due to underseepage, the saturated area has not increased in size since the completion of the project and that it was considered noncritical. However, soon after filling the lake, several landowners downstream of the dam claimed that there was seepage and higher groundwater levels on their properties. At the time, most analysts felt that this was due to precipitation rather lake pool levels. Recent examination of the data tends to show that the lake may have an impact on the downstream groundwater elevations in some locations. Seepage along the right half of the dam is more or less continuous as long as there is water at the upstream toe of the dam, with a surface flow of 2 to 4 gallons per minute. This seepage is collected in a drain ditch, where it flows to a sump and is pumped into the Borel Canal (Corps 2009a).

Hydrology and Flood Management at Isabella Dam

<u>*Flood Characteristics*</u>

Flood flows on the Kern River are of two major types: winter rain floods and spring snowmelt floods. In addition, cloudbursts can produce relatively large flows from small areas.

Winter rain floods generally occur during the period November through March and are caused by large general rain storms augmented at times by the melting of snow at the intermediate elevations. These winter floods have short, high peaks and are generally of short duration and comparatively small volume. The intensity of runoff is dependent to a substantial degree on the location of the snowpack in the basin. It is not uncommon for the basin to be relatively snow-free up to the 9,000- to 10,000-foot elevation during December and even January, but such a condition becomes very unlikely as the season progresses into February and March. Further, a high snow-line usually implies light antecedent precipitation or dry conditions that are not conducive to maximum runoff.

Conversely, wet antecedent conditions usually produce an accumulation of snow over the higher portion of the basin which is sufficient to inhibit runoff from that area so that only the lower part of the basin can contribute to flood flows. An example of the variation in contributing area is evident from an examination of the December 1966 and January 1969 floods. Available data indicates that the contributing area for -the December 1966 flood was below the 8,500-foot elevation and for the January 1969 flood was below the 7,000-foot elevation.

Snowmelt floods have moderate peak flows but very large volumes extending over a two to four month period from April through July. During the large snowmelt floods, the North Fork produces about 80 percent of the total runoff into Isabella Lake. The largest snowmelt flood of record occurred in 1969 when inflow to the lake was 1,657,000 acre-feet during the April through July period.

Cloudburst floods are characterized by very high peak flows of short duration and low volume. These type floods usually occur during the summer or fall and result from cloudburst-type storms. Inflows into Isabella Lake are not influenced by cloudbursts because of their small areal coverage and relatively low runoff volume.

Knowledge of current basin conditions and general basin characteristics aid in forecasting flows during floods. To help determine the forecast during flood conditions, the Corps uses information from the National Weather Service, the irrigation and spreading demands from the Water Master, real-time climatological data, antecedent basin wetness, inflow recession values, and local flow estimates (Corps 2006a).

Operations

Reservoir operations at Isabella Lake are defined by the last approved Water Control Manual (WCM), which was published in 1978. There is currently a draft WCM that is currently pending South Pacific Division approval which contains more current information, however the operations that are defined in the draft WCM are generally the same.

The Kern River Water Master coordinates the daily requests to the Corps in the operation of Isabella Dam. The exception is during those periods of declared flood reduction operations by the Corps, as outlined in the WCM (Corps 2006a).

Lake Releases. For rain season operation (as outlined in the 1978 WCM), releases are generally limited to normal irrigation and spreading demands (according to the 1978 WCM, can range from an average monthly flow of 1,220 cubic feet per second [cfs] up to 3,090 cfs), a minimum release of 15 cfs, and the Borel Canal outlet release of 600 cfs. This release continues until the flood control pool becomes encroached. At that point, the river outlet gates can open as long as the maximum release of 4,600 cfs is maintained (this value based upon downstream channel capacity estimates in the 1978 WCM). Once the reservoir rises above the spillway crest (top of the flood control pool), the river outlet gates are closed progressively such that the spillway releases, the Borel Canal releases, and the river outlet releases maintain the maximum release of 4,600 cfs. The gates are then to remain closed until the water level recedes below the elevation at which the 4,600 cfs is passing through the Borel Canal outlet and the spillway. The river outlets are then progressively opened to maintain the 4,600 cfs until a desired storage level is attained. Consistent with the 1978 WCM, the maximum rate of release increase is 500 cfs/hour and decrease is 1,000 cfs/hour for the river outlet gates. Localized flow at Bakersfield has a significant effect on the operations at Isabella Dam in the rain flood season; however it is not substantial during the snowmelt season. During operations at Isabella, the Water Master coordinates with downstream entities to ensure the maximum downstream flow of 4,600 cfs is not exceeded.

Available Flood Space. For the rain flood season, the normal top of conservation pool (bottom of flood control pool) is defined at the elevation of 2564.16 feet. The top of the flood control pool is defined as elevation 2609.26 feet, which is the existing spillway crest.

During the snowmelt season, conditional flood space that is available is based upon forecasted runoff, as specified in the 1978 WCM. This conditional flood space defines the top of the conservation pool from 1 February through 31 July based upon forecasted snowmelt runoff and can accommodate up to the full reservoir for predicted snowmelt runoff.

Currently, the reservoir is operating under the IRRM restricted pool conditions such that for the months spanning March 20 to September 20, the top of the flood control pool is defined at 2,589.26 feet.

Surface Water Quality

<u>*Monitoring Program*</u>

Water quality has been monitored at Isabella Lake by the Corps as part of an environmental monitoring program since 1974. The monitoring program was implemented to determine the water quality level for both recreation and environmental health and to satisfy the Department of Army Engineering Regulation 1110-2-8154, "Water Quality and Environmental Management for Corps Civil Works Projects" which was written under the authority of the Federal Water Pollution Control Act of 1948 (FWPCA) and its amendments, including the Clean Water Act of 1977 and the Water Quality Act of 1987. Over time, the program has expanded to include more parameters and samples have been collected since 2001 to look for constituents such as metals, nutrients, solids, and more. By collecting data, a water quality profile can be developed for Isabella Lake and the Corps can check compliance with Federal and state regulations for drinking water and aquatic life limits as well as local standards set by the Tulare Basin Plan. The Corps will need to comply with other water quality regulations such as the California Construction General Permit (CGP) and applicable discharge permits when implementing the Isabella DSM Project.

The first phase of a supplemental monitoring program was implemented in April of 2009 to measure key water quality parameters once a month and collect wet samples at least quarterly. Another phase of monitoring was implemented in April of 2011 to capture hourly readings of parameters at the surface of the water near the Main Dam. Water quality parameters measured include water temperature, depth, pH, conductivity (salinity), dissolved oxygen (DO), nitrate and turbidity. Also, a profile of the lake is taken to capture water quality levels at 1-meter intervals. The quarterly wet samples are for measuring various organics, inorganics, and metals.

Following is a description of existing water quality conditions. For more information, please reference Appendix B: *2011 Isabella Lake DSAP Monitoring Summary Report*.

Parameters Monitored

Secchi Disk Depth. A measurement of water clarity using a Secchi Disk is useful for determining the nutrient level of the lake. Isabella Lake, for the most part, has met the recreational lake clarity goal of 4 feet established in the Tulare Basin Plan.

Temperature. The spring and fall temperature profiles for Isabella Lake at the Main Dam and Auxiliary Dam indicate a well-mixed lake; with nearly uniform values along the water column. Summer temperature profiles show some unstable stratification in the deeper layers. The temperature profile for Isabella Lake is characterized by frequent or continuous periods of mixing per year. This is in contrast to other similar lakes nearby such as Kaweah and Success, which contain more stable stratification and undergo mixing typically once per year. Isabella Lake is regularly subjected to high winds which are the most likely cause of the unique mixed characteristics of the lake.

The temperatures at the Main and Auxiliary Dam outflows are very similar, and annually range between 5 and 25 degrees Celsius (41 and 77 degrees Fahrenheit), with the highest temperatures seen in September and the lowest in January. Under the Tulare Basin Plan, Isabella Lake is responsible for both cold water and warm water fish (beneficial use designation COLD and WARM); however, mainly warm water fish dwell in the lake year round.

Dissolved Oxygen (DO). Dissolved oxygen levels in the lake near the Main Dam differ between spring and fall season. Spring season has a typical average DO level of 9.9 mg/L and 7.7 mg/L for surface and bottom, respectively. Fall season has a typical average DO level of 7.6 mg/L and 1.9 mg/L for surface and bottom, respectively. Isabella Lake meets the desired DO levels for surface and bottom during the spring established in the Tulare Basin Plan for fish. However, DO levels in the fall only meet the standard for COLD beneficial use near the surface (7 mg/L) and bottom DO levels fall short of the minimum standard for even the WARM beneficial use (5 mg/L). Spring and fall averages of DO either at the surface or bottom or both are not high enough to reach the Isabella Lake specific goal of 8 mg/L. There have been instances during the fall season where DO levels at the bottom of the lake are less than 1 mg/L. This can be detrimental to aquatic life and can lead to other undesirable conditions. Low DO levels can be a result of low circulation, high temperatures, and high levels of organic decomposition at the bottom of the lake.

Monitoring of the Auxiliary Dam began in April of 2009 with the implementation of the second phase of the supplemental monitoring program. The results of the dissolved oxygen profiles of the Auxiliary Dam show higher levels of DO at the surface and bottom of the lake than profiles of the main dam. Over the last two years, the average DO at the surface was 10.1 mg/L and 9.0 mg/L at the bottom. Most of the DO readings at the Auxiliary Dam meet the DO requirements for WARM and COLD beneficial uses and the minimum proposed for Isabella Lake; however, there are still times in the late summer and early fall when these requirements are not met.

pH and Electrical Conductivity (EC). The pH values at the Main Dam of Isabella Lake are typically well within the 6.5 to 8.3 zone as required in the Tulare Basin Plan. The surface and bottom pH values are typically similar during the spring season, with more variation between surface and bottom pH values during the fall season. Contrary to what is more commonly seen in lakes such as Isabella Lake, the pH at the bottom of the lake near the Auxiliary Dam is typically at or above pH values observed on the surface. This may be due to the well-mixed characteristics of the lake and the shallow depths seasonally seen at the Auxiliary Dam.

Electrical Conductivity values typically average 134 uS/cm for the spring and 108.5 uS/cm for the fall at the Main Dam. Conductivity at the surface and bottom of the reservoir are consistently within about 1-5 µS/cm. These seasonal EC values are well below the 300 µS/cm limit established in the Tulare Basin Plan.

Turbidity. Turbidity has only been consistently monitored at Isabella Lake since the supplemental monitoring program began in April 2009. The Auxiliary Dam exhibits the highest turbidity values with an average over the last two years of 8.3 NTU at the surface and 63.3 near the bottom. The Main Dam averages 5.7 NTU at the surface and 16.7 NTU at the bottom. At the outflows of the Main and Auxiliary Dams, the values of turbidity averaged 3 NTU and 6.3 NTU respectively over the last two years of monthly monitoring. The Tulare Basin Plan does not specify specific limits of turbidity for natural conditions, but does set limits for how much the turbidity can be increased from background conditions. These limits range from a low of 1 NTU for background turbidity of 1-5 NTU, to a high of 10% for background turbidity above 100 NTU.

Inorganics. Inorganic parameters that have been measured historically include: alkalinity, ammonia, chloride, nitrate, total and ortho phosphate, sulfate, kjeldahl nitrogen, chemical oxygen demand (COD), total dissolved solids (TDS), total suspended solids (TSS), and total solids (TS). Inorganic levels for Isabella Lake within safe limits according to the “Water Quality Limits for Constituents and Parameters” established by state and Federal regulations and water quality goals.

Organics and Metals. Organic and metal parameters tested include: total organic carbon, aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc. There is no evidence of serious contamination in Isabella Lake for organic and metal constituents. The lake itself is not used for drinking water, but the Kern River downstream is a source.

There are some constituents that may be of concern in the lake. Historically, dissolved iron and manganese have periodically exceeded fish habitat and drinking water standards. Since 2001, dissolved iron levels have exceeded drinking water standards six times, and Manganese levels exceeded both the drinking water and fish habitat standard in 2001 and yearly from 2003 through 2006. -6. The comparison criteria used is based on drinking water limits, but according to the Basin Plan, Isabella Lake is not used as a municipal water source. However, downstream from the dam, the Kern River is used as a source of drinking water. Thus, using drinking water limits for the lake is a conservative approach.

A constituent of specific concern for Isabella Lake and related areas is arsenic. Arsenic levels exceeded the drinking water standard of 10 ug/L in the lake in 2001, 2003, and 2004 but levels have fallen to or below the drinking water standard limit since. The bottom of Isabella Lake has had the highest arsenic levels out of all the sampling locations and is the only sample location that has exceeded the standard, although surface and inflow concentrations are also frequently near the Maximum Concentration Limit (MCL). Historically, the MCL has only been exceeded in the summer and fall months.

The Tulare Lake Basin has had continual problems with arsenic, specifically in the ground water. Because of this, there have been many studies investigating arsenic in the area. These studies have suggested that the arsenic in the groundwater is coming from minerals occurring in sedimentary rock in surrounding mountains. The water table surrounding Isabella Lake is fairly high, and during the year when lake levels are low and the water table is above surface water levels, ground water likely seeps into the lake and inflows. This provides a source for arsenic in the lake. To avoid potential health risks, arsenic levels are continually monitored at Isabella Lake.

Phytoplankton. Phytoplankton data is only available through 2005. Historical data indicate that diatoms typically are dominant in the spring, while green algae-diatoms are dominant in the late summer. Diatoms play a major role in the lake food chain, and both green algae and diatoms are unlikely to cause water quality problems. An unusually large bloom of blue green algae was reported on the surface of the lake in late summer 2001. In 2005, fish and bird kills were reported in late August and early September. The deaths may have been linked to toxins released after the sudden increase and die off of cyanobacteria (blue-green algae) that year. Hazardous algal blooms such as the suspected blue-green bloom in 2005 are common in high temperatures and their proliferation can be encouraged by high turbidity, pH, and nutrient levels. Additional discussion of current lake water quality is found in the *2011 Isabella Lake DSAP Monitoring Summary Repor*t provided as Appendix B of the Draft EIS.

Surface Water Supply

Water Discharge

Due to water diversion and Isabella Dam, the water discharge from the Kern River changes considerably over its length. The highest mean annual flows occur just downriver of Isabella Dam. But because the dam serves to regulate the flow of water, the highest daily discharges occur above the dam on the North Fork section of the Kern River. The US Geological Survey stream gage on the North Fork Kern River has recorded an average annual mean discharge of 806 cfs and a maximum daily discharge of 33,600 cfs. The gage on the South Fork Kern River shows an average annual mean of 123 cfs and a maximum daily discharge of 14,000 cfs. In contrast, the first stream gage below Isabella Dam has recorded an average annual mean of 946 cfs but a maximum daily discharge of only 7,030 cfs. Due to water withdrawals, the three stream gage stations below Isabella Dam show a dramatically decreasing discharge. At the last gage, near Bakersfield, the average flow of the river is only 312 cfs (Corps 2009a).

The existing spillway consists of an ungated concrete ogee section at the left abutment of the Main Dam. The elevation of the ogee crest is 2,609.26 feet with a length of 140 feet. The capacity of the spillway is 52,700 cfs at the spillway flood pool elevation of 2,630.76 feet, which is 840,603 acre-feet (Corps 2008b).

The maximum release that can be safely passed through the downstream channel is 4,600 cfs, depending on conditions. Therefore, if inflows are greater than the maximum water releases, water may need to be stored above 2,589.26 feet for a brief period to protect life and property downstream. In the unlikely event that any water is stored above 2,589.26 feet due to a late season rainstorm, the lake water levels would be lowered as rapidly as possible to return the lake water to an elevation at or below 2,589.26 feet . Releases would be used that can be safely passed downstream by the local interests without exceeding the channel capacities of the downstream area below the dam (Corps 2008b).

Water Users

Except for a 30,000 acre-feet minimum pool volume in Isabella Lake, the total storage capacity of Isabella Lake is reserved for downstream water rights holders. The minimum pool volume is the least amount of water that must remain in Isabella Lake and, therefore, cannot be used by the downstream water users (Kern County 2011a). The Corps is in charge of flood control releases, and the Kern River Water Master controls non-flood releases (Corps 2009b).

Water rights to both forks of the Kern River and Isabella Reservoir are held by numerous users, including the following:

- Agricultural districts;
- Public water agencies;
- Southern California Edison;

- Landowners on the south fork of the Kern River;
- Kern River Preserve;
- California Water Company (Cal Water); and
- Various downstream irrigation interests.

Cal Water is the largest water supplier in the Kern River Valley. Its annual allotment of water—1,000 acre-feet of the north fork of the Kern River—is obtained through an agreement with the City of Bakersfield and is treated at a Cal Water treatment plant, which has a capacity of 1.5 million gallons per day, in Kernville (Kern County 2011a).

The Kern River water rights holders, who own the conservation storage rights in Isabella Lake, appoint the Kern River Water Master to represent their interests (Corps 2006a). The Water Master is the administrating entity of the Isabella Lake water, represents all downstream water rights entities, and is responsible for identifying the amount of water to be released daily from Isabella Lake by the Corps as long as the integrity of the dam is not jeopardized (Kern County 2011b). The downstream water users are primarily agricultural. During the summer, nearly all of the water released from Isabella Lake is used to irrigate approximately one million acres of Kern County land in the San Joaquin Valley (Corps 2009b). The water users of the Kern River are Buena Vista Water Storage District, City of Bakersfield Water Resources Department, Kern County Water Agency, Kern Delta Water District, North Kern Water Storage District, and Tulare Lake Base Water Storage District (Gamblin 2008).

There are four power generation facilities downstream of Isabella Dam that have diversion rights to consider when determining releases (Corps 2006a). The Borel Canal is a diverted reach of the Kern River and has a capacity of 605 cfs (Bakersfield2003). The water is diverted to the Borel Project from Isabella Lake at the Auxiliary Dam. However, during very dry years when the lake water level recedes below elevation 2,251.76 feet, flows to the Borel Canal outlet are diverted at the historical point of diversion four miles upstream from the Auxiliary Dam through an intake on the North Fork of the Kern River (Corps 2006; Bakersfield 2003). Diverted water flows through a controlled outlet at the Auxiliary Dam into the Borel Canal (Corps 2009a). This flow bypasses a seven-mile section of the Kern River and is returned to the Kern River just below the Borel Powerhouse.

The Borel Powerhouse is owned and operated by Southern California Edison (SCE). When the Borel Canal is not operating under lake head, water is diverted to Borel Powerhouse directly from the North Fork of the Kern River and passed down the Borel Canal through the Auxiliary Dam outlet. When the Borel Canal is operating under lake head, releases to Borel Canal are made from Isabella Lake and regulated by the Auxiliary Dam outlet (Corps 2006a).

The Borel Powerhouse has an installed generation capacity of 9,200 kilowatts at a gross head of 260 feet. The Borel power right is to divert up to the first 605 cfs of unimpaired

Kern River North Fork flow. Water releases from Isabella Lake, when possible, may be diverted into the Borel Canal. The Borel Powerhouse is required, as a condition of its FERC license, to maintain seasonal minimum flows through the Main Dam outlet for fish and wildlife preservation (Corps 2006a).

The Kern River Power Plant No. 1 is owned and operated by SCE. The power plant has an installed generation capacity of 16,000 kilowatts at a gross head of 877 feet. The power plant diversion rights include the pre-project flow of Kern River (including South Fork) from October through May (up to 412 cfs), which includes the required fish flow. From June through September, the diversion rights include the first 74 cfs of river flow, the next 50 cfs to bypass the plant for recreation, and the next 338 cfs to be diverted for power (Corps 2006a).

The Kern Canyon Power Plant is owned and operated by Pacific Gas and Electric. The power plant has an installed generation capacity of 8,500 kilowatts. The power plant water rights are pre-project diversion rights of 550 cfs under state license and an additional 250 cfs under other rights. The 550 cfs right is subject to upstream storage by irrigation interests, provided that the equivalent amount of water, in excess of natural flow, is made available for power use at a later time (Corps 2006a).

The Rio Bravo Power Plant is owned and operated by the Olcese Water District and has an installed generation capacity of 12,000 kilowatts. The power plant has a right to divert up to 1,600 cfs of the Kern River flow as it occurs at the diversion works for the Kern Canyon Power Plant (Corps 2006a).

Releases through the Main Dam power generation facilities, operated by Isabella Partners, are maintained as long as the lake level is above 2,536.76 feet. Once the lake level drops to this elevation, Isabella Partners takes the turbines off line (due to the low head available, which drops below the turbine design criteria) and pass all releases through the appropriate bypass valves (Corps 2006a). The total rate of diversion under Permits 20047 and 21134 is 1,632 cfs (State Water Resources Control Board, undated). However, this facility does not hold any water rights and is operated on a run-of-the-river basis (Corps 2006a).

Groundwater

Groundwater in the Kern River Valley occurs in alluvium (loose, unconsolidated soil or sediments) eroded from the granite and metamorphic bedrock surrounding the basin. Alluvium can consist of coarse deposits, such as sand and gravel, which usually have the best water storage capability and are termed aquifers. Alluvium can also consist of finer-grained deposits, such as clay and silt, which have relatively poor water storage capability, are called aquitards. With the exception of the aquitards found in the northern and southwestern portions of the Kern River Valley Groundwater Basin, most of the basin is characterized by alluvial aquifers (Kern County 2011a).

The primary water source for the Kern River Valley is groundwater that is pumped from the basin. However, groundwater rights in the Kern River Valley Groundwater Basin are not adjudicated. Furthermore, there is no established groundwater management plan for the basin. Consequently, groundwater producers generally pump as much water as is needed until groundwater levels drop to a point of declining production, resulting in various moratoriums due to groundwater quality and quantity issues (Kern County 2011a).

Groundwater recharge is through direct precipitation, through infiltration along valley margins, along the north and south forks of the Kern River, and along tributaries, such as Kelso and Canebrake Creeks (California DWR 2004). The general direction of groundwater movement is toward the southwest, down the Cook Peak Alluvial Fan (Corps 2009a).

3.6.3 Environmental Consequences

This section describes the impacts on water resources from the four Action Alternatives and associated support actions.

Scope and Methods

Potential impacts on hydrology and flood management were analyzed by the Corps through ongoing studies and assessment of the characteristics of Kern River flood flows through historic records and hydrologic modeling and their interaction with reservoir operations and available flood space in the lake.

Potential impacts of water quality were analyzed based on data and trends on a variety of parameters and locations observed through the ongoing water quality monitoring program as described in 3.8.2. The potential for construction activities and pool restrictions to affect water quality in the lake, Kern River, drainages and aquifers is assessed qualitatively with reference to local water quality standards.

Impacts on water supply for power generation, recreation and agriculture are analyzed in relation to existing water rights and agreements and the effects of construction, the lower construction pool, and the timing of available water to meet these obligations.

The factors that are important for evaluating impacts on water resources include construction pool restrictions and changes in hydrology and flood management, the potential for degradation of surface water and groundwater quality from surface disturbance, erosion, material spills, sand washing, low water levels and other construction activities; and the alteration of water supply timing and availability resulting from construction and maintaining the temporary construction pool. It is assumed that many of the potential construction site impacts on water quality would be adequately addressed by regulatory controls, BMPs, permitting stipulations and environmental commitments.

No Action Alternative

In accordance with ER 1110-2-1156 (Safety of Dams – Policy and Procedure), the lake capacity (gross pool elevation) would be returned to and the dam would be operated at a lake elevation of 2,609.26 feet. However, based on Corps studies, one or both dams have unacceptably high risk. The timing and nature of a potential dam failure cannot be specified, but the loss of one or both dams would substantially alter water use patterns in the San Joaquin Valley and would flood areas between Isabella Lake and Bakersfield and beyond. This would be a significant, long-term adverse effect.

With this alternative, the water quality of Isabella Lake would most likely remain similar to historical data as discussed previously in the Affected Environment Section. Historically the water quality at Isabella Lake has not always met the objectives of the Tulare Basin Plan or state and/or Federal standards such as fresh water aquatic life limits and human health limits for drinking water and recreational waters. Although Isabella Lake is not used as a source of municipal water supply, the Kern River downstream is used as a source. Under the No Action Alternative, returning to normal water control operations

Alternative Base Plan

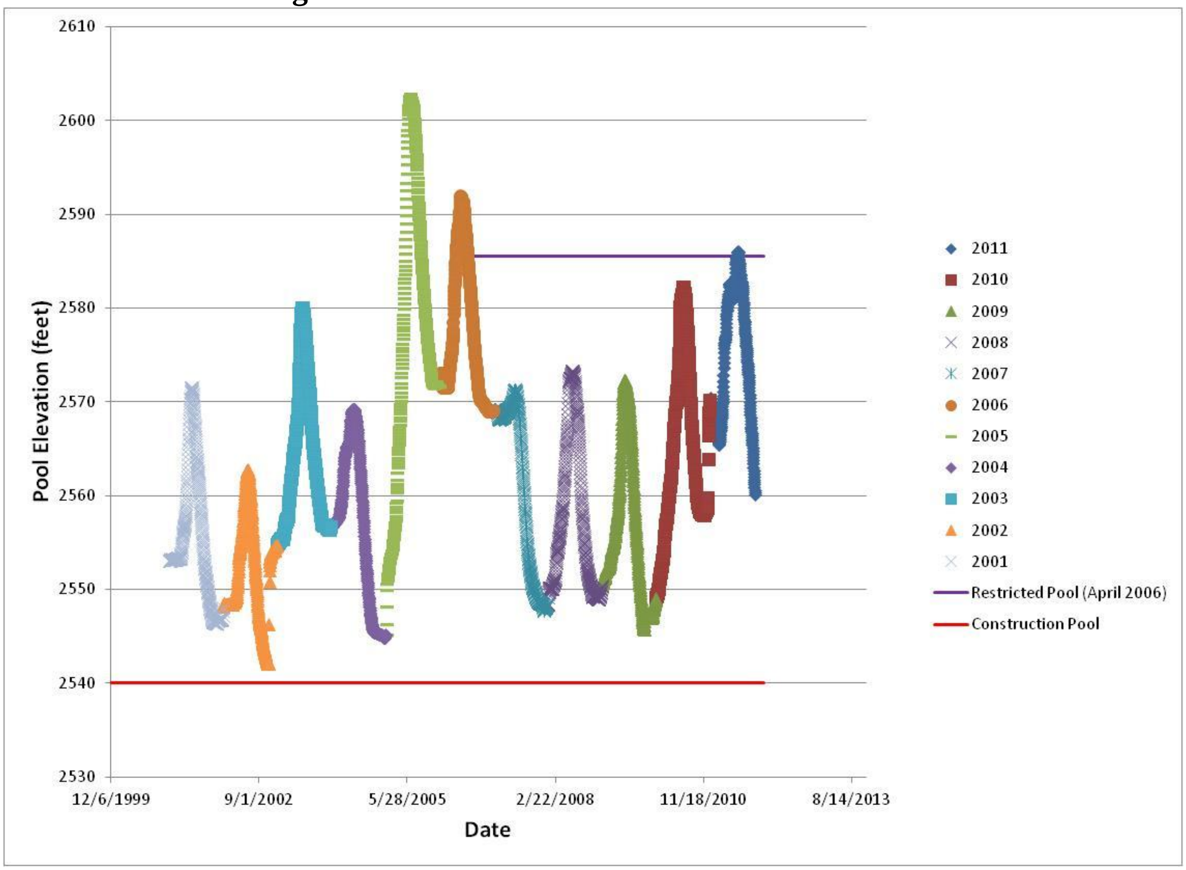
<u>*Hydrology and Flood Management*</u>

The current spillway is inadequate to pass extreme flows, leading to the potential for overtopping and failure. The construction of the Emergency Spillway, improvements to the existing spillway and the four-foot crest raise would greatly increase the capacity of the facility to safely and quickly pass extreme storm events at or near the PMF with reduced likelihood of dam failure and upstream shoreline flooding. The likelihood of downstream flooding exceeding the channel capacity of the Kern River would be unavoidable during statistically rare flood events, but is preferable to a catastrophic failure and loss of all flood control and other benefits of the dams.

During the multi-year construction period, for the Alternative Base Plan the lake level would be lowered to an elevation of 2,543.76 feet for a two month period (December 2016-January 2017), and for another two-month period (August-September 2017), to allow for construction and removal of a coffer dam at the Right Abutment of the Auxiliary Dam. The temporary coffer dam is needed to support “dry construction” of the upstream connection between the Borel Canal and the relocated conduit through the right abutment. Once the coffer dam is constructed, the top of the flood control pool elevation would be allowed to rise up to 2,585.26 feet, which is just below the existing restricted pool operation elevation. For all the Action Alternatives the lake level would be need to be lowered again to the elevation of 2,543.76 feet for a nine-month period (June 2019-February 2020), to allow for construction of the Upstream Berm on the Auxiliary Dam. Other than these three periods of operating at the lower pool elevation, the flood pool elevation of Isabella Lake would be operated at the current IRRM restricted level (2,589.26, feet).

Figure 3-8 shows pool elevations since 2001 in relation to the restricted pool elevation of 2,589.26 feet, and the proposed construction pool of 2,543.76 feet. As shown in the figure, Isabella Lake has never reached this low pool level (2,543.76 feet) in the last 10 years. The closest to this level was the fall of 2002. However, for eight out of the last 10 years the pool level has dropped below 2,553.76 feet.

Figure 3-8 Isabella Lake Levels 2001-2011[1]



[1] Note: Lake elevations in this figure are referenced to the Isabella Project Datum (IPD). For conversion to NAVD88 add 3.76 feet. IRRM Restricted Pool Elevation is 2,589.26 feet NAVD88, and Construction Pool elevation is 2,543.76 feet NAVD88.

The current construction schedule of the coffer dam calls for placement of the coffer dam in the December to February timeframe. Historically, this is the timeframe in which the greatest rain floods have occurred in the region (for example, in 1966, 1986, and 1997). This might lead to difficulty in maintaining a lower pool elevation of 2,543.76 feet, as this represents over 45 feet in difference from the existing restricted pool elevation. Regardless of the season in which the coffer dam is constructed, it is anticipated that the maximum release out of the dam would be 4,600 cfs, and the minimum release would be 15 cfs. Given the uncertainty in predicting rain flood and snowmelt inflow and downstream local flow runoff, the best estimate of expected flow rate and frequency is the controlling flows for operations (4,600 cfs). However, this flow could be expected to occur more frequently than has happened historically, due to the lowered flood control pool elevation.

Under the existing water control plan, diagram, and procedures for managing lake levels, the short-term deviations in the water control operations described above are not expected to adversely impact hydrology and flood management in Isabella Lake and less-than significant impacts are anticipated.

Surface Water Quality

Construction activities would last from November 2015 to March 2020. During this time, construction activities at the dams, spillways, staging areas, and borrow sites have the potential for affecting surface water quality and groundwater quality.

Impacts from construction would occur as a result of construction vehicles, equipment, and activities and would mostly last until construction ends. Construction of this alternative would result in surface-disturbing activities that can remove essential soil stabilizing agents, such as vegetation, soil crusts, litter, and woody debris. Loss of one or more of these agents increases potential erosion and sediment transport to water bodies, leading to water quality degradation. Surface-disturbing activities can also lead to soil compaction, which decreases infiltration rates, thereby elevating the potential for overland flow. Overland flow can increase erosion and sediment delivery potential to water bodies, thereby leading to water quality degradation.

Surface-disturbing activities occurring in areas of low reclamation potential (such as areas with fragile soils or steep slopes) or sensitive areas (such as stream channels or floodplains) are at higher risk for erosion. Increased erosion and sediment delivery from these areas has greater potential to degrade water quality, as described above.

Surface-disturbing activities within stream channels and floodplains are more likely to alter natural morphologic stability and floodplain function. Morphologic destabilization and loss of floodplain function causes accelerated stream channel/bank erosion, dewatering of near stream alluvium, loss of shoreline habitat, and deterioration of water quality.

Surface disturbance can alter natural drainage patterns. Runoff critical to recharging and sustaining springs and wetlands may be redirected elsewhere. As a result, these sensitive areas can be dewatered, compromising vegetative health and vigor, while degrading proper function and condition of the watershed.

Surface and subsurface disturbances can alter natural aquifer properties, which can increase the potential for contamination of surface and groundwater resources. Also, alteration of natural aquifer properties can result in dewatering of locally important freshwater sources.

Construction involves the use of hazardous and toxic materials and chemicals. The release of these materials and chemicals in surface waters and groundwater degrades water quality.

The Tulare Basin Plan water quality standards are not always met under existing natural conditions. For example, there have been several years in which surface levels of DO were observed below recommended values for the lake. During the summer, DO levels at the bottom of the lake are consistently depleted. This may be the result of the decomposition of organic matter occurring on the bottom, along with a lack of oxygen replenishment due to warm temperatures and low circulation. The CVRWQB listed Isabella Lake on the CWA 303(d) list in 2010 for pH and DO because they exceed the water quality standards in the Basin Plan and impact cold freshwater habitats. TMDLs are anticipated to be completed in 2021.

Construction would likely cause additional problems in meeting Basin Plan standards. An example of an anticipated problem is that the DO levels may drop, possibly causing a lack of available oxygen in the water column for fish to survive. A temporarily-lowered pool level may also lead to warmer temperatures in the lake due to the shallower waters, causing even more unsuitable conditions for fish. These construction-related impacts would be confined to the lake and impacts below the dam on fishery and minimum flow requirements are not anticipated. Also, due to the unique (continuous) mixing characteristics of the lake under natural conditions, a lowered pool level combined with high winds would likely result in the lakebed load sediments being re-suspended. Consequently, it is expected that the sediment load in the lake would increase, which would likely cause undesired water quality. Fish population levels and survival have been linked to levels of turbidity, and prolonged exposure to high levels of suspended sediment could create a loss of visual capability of fish in the lake. This could lead to reduced feeding and growth rates, thickened gills, potential loss of respiratory function, clogged and abraded gills, and increased stress levels, reducing the tolerance of fish to disease and toxicants. High turbidity levels could also exacerbate increases in water temperature and, in turn, affect DO concentrations, both of which would stress the respiration of lake fish. Also, high levels of suspended organic sediments could increase biological oxygen demand (associated with microbial decomposition); thereby further reducing DO concentrations.

Corps historical water quality monitoring has also discovered periods of high arsenic levels at the bottom of the lake that exceed drinking water standards. Arsenic levels have exceeded the drinking water standard in 2001, 2003, and 2004, but levels have fallen below or to the 10 µg/L drinking standard limit since 2005. Although levels have seemed to drop, they still hover around the drinking water standard and are considerably higher than in other lakes in the Tulare Basin. Arsenic levels will continue to be monitored closely.

A support action that is associated with all the Action Alternatives that could have an effect on water quality is the sand washing operation that is anticipated in Staging Area

A1. Sand washing is part of the process to obtain the high quality of clean sand required for the filter layers to be added to both the Main and Auxiliary Dams. Water for the sand washing would be drawn from the lake and used and re-used in the washing operation as described in Section 2.3.12 Support Actions. After a number of cycles of re-use, a fine sediment remains in the used wash water, and this used water would be pumped into temporary holding-evaporation ponds; and allowed to evaporate. The residue in the ponds would be removed and transported to properly-permitted landfills, or discharged under a suitable permit obtained from the CVRWQCB. The Corps may also explore the possible use of used wash water for dust control.

To insure the protection of water quality in the lake and downstream, the Corps would obtain the necessary permits and licenses, such as those described previously in Section 3.8.1, Regulatory Setting. The specific type of permit needed would be determined once the exact procedures and use of waste water generated as part of the sand washing process are known.

The CVRWQCB permits for sand washing typically state the following: "Discharges of dredge spoils and process discharges from sand and gravel operations to surface waters shall be regulated by a National Pollutant Discharge Elimination System (NPDES) permit. In addition, these operations are also subject to storm water regulations. Operators must submit a Notice of Intent to comply with the General Industrial Activities Storm Water Permit or obtain an individual NPDES permit. Requirements for small, short-term discharges confined to land from sand and gravel operations may be waived." Further information can be found on their website.

Lake water would most likely be used for sand washing purposes. The proper permit would be obtained for sand washing procedures and if any water would be discharged or other reuse of the water is preferred. The Corps would prepare and implement the necessary management plans, BMPs, SWPPPs, and stipulations in order to minimize adverse construction impacts on water quality and keep these impacts moderate. Recommended mitigation measures are presented in Section 3.8.4 below to further mitigate adverse impacts on water quality. Consequently, moderate, short-term adverse impacts on water quality would be less-than-significant.

Water Supply

As previously mentioned, a construction pool elevation would be maintained at a water elevation of 2,543.76 feet (a storage capacity of 74,802 acre-feet) for three periods during the multi-year construction period. These reduced pool periods include December 2016 through January 2017, August-September 2017; and June 2019-February 2020. Also, during December 2016-September 2017, the top of the flood control pool elevation would be allowed to rise up only to 2,585.26 feet, which is just below the existing restricted pool operation elevation. Otherwise, the lake would continue to be operated as normal at the IRRM maximum water level of 2,589.26 feet (a storage capacity of approximately 360,000 acre-feet) for the remainder of the multi-year construction period.

The water control plan for the Isabella Lake is operational from November through June, which is considered the flood control season. The Water Master directs releases from the lake during the non-flood control season (July through October). The Corps would inform the Water Master and other downstream water users of water storage and release operations associated with the proposed project. During the times described above when the lake is controlled at an elevation lower than the IRRM, the Corps would ensure that the expected flows under agreement with the downstream users are provided. This includes continuing to provide water (up to 605 cfs) to SCE, or reaching some other agreement regarding the loss of the ability of SCE to generate electricity if the Borel Canal flow were interrupted by work on the Auxiliary Dam. Also, it is assumed, based on current information, that downstream water users have sufficient storage above and below ground to be able to receive greater quantities of off-season water releases by the Corps from Isabella Lake so they can then make the stored water available during the summer growing season. However, the need for and provision of such storage during the multi-year construction period would be coordinated on an ongoing basis by the Corps with the downstream water users and Kern River Water Master. With close coordination the Corps anticipates that adverse effects on water supply would be low and less-than-significant.

The Kern River Basin cloud seeding effort acts to increase the overall water yield of the Kern River by promoting precipitation in the snowshed above Isabella Lake. The City of Bakersfield, its predecessors and irrigation districts have participated in the cloud seeding program for approximately forty years. The Corps would coordinate proposed project activities with cloud seeding to most effectively manage Isabella Lake water supplies.

Alternative Plan 1

<u>*Hydrology and Flood Management*</u>

Impacts associated with lowering the lake level to accommodate construction and operation of the coffer dam would be the same as the impacts described above under the Alternative Base Plan. Less-than-significant impacts are anticipated. However, a notable difference between Alternative Plan 1 and the Alternative Base Plan is that Alternative Plan 1 includes construction of an 800-foot long RCC Overlay (with fuse plug) on the Main Dam. This RCC Overlay and fuse plug are designed to provide an additional means of managing a very rare overtopping of the dam that may accompany an extreme storm event at or near the PMF. In the unlikely situation whereby the lake level is rising to the top of the Main Dam, the earthen fuse plug incorporated along the top of the RCC Overlay would rapidly erode out, allowing any overtopping water to be channeled down the non-erodable RCC Overlay to the Kern River downstream. Thus, Alternative Plan 1 would provide this additional beneficial impact. At extreme hydrologic events which would require the RCC Overlay and fuse plug to become operable, the extreme high lake level and dam would be stabilized, but would allow for more release of water downstream.

Conversely, with the Alternative Base Plan there would be no fuse plug to erode out and no RCC Overlay to safely manage overtopping water during this same extreme storm event, with the overtopping potentially contributing to a failure of the Main Dam. Also, without the RCC Overlay and fuse plug, there would likely be considerably more localized shoreline flooding accompanying rising lake levels.

Surface Water Quality

Construction activities would last from November 2015 to August 2020. These impacts would be similar to the impacts described above under the Alternative Base Plan. Although there would be additional construction associated with Alternative Plan 1, the additional construction would still adhere to and renew and expand as needed all necessary permits, licenses, BMPs, SWPPPs, stipulations intended to reduce adverse construction impacts on water quality. Also, the mitigation measures described in Section 3.8.4 would further insure that adverse impacts on water quality are reduced and less-than significant impacts are anticipated.

Water Supply

These impacts would be the same as the impacts described above under the Alternative Base Plan.

Alternative Plan 2

Hydrology and Flood Management

Impacts associated with this alternative would be the same as the impacts described above under the Alternative base Plan and Alternative Plan 1.

Surface Water Quality

Construction activities would last from November 2015 to July 2021. Impacts on water quality would be similar to the impacts described above under the Alternative Base Plan and Alternative Plan 1.

Water Supply

These impacts would be the same as the impacts described above under the Alternative Base Plan and Alternative Plan 1.

Alternative Plan 3

Hydrology and Flood Management

Under this alternative, impacts would be similar to the impacts described above under the Alternative Base Plan, and Alternative Plans 1 and 2, with one notable difference: the need to lower the lake level to 2,543.76 feet for two 2-month periods in order to construct and remove the coffer dam at the Auxiliary Dam would be eliminated, because the Borel Canal conduit would be relocated to the Main Dam outlet. Under the existing water control plan, diagram, and procedures for managing lake levels, not instituting the short-term deviations in the water control operations for the coffer dam construction and removal would have no impact on hydrology and flood management in Isabella Lake.

Surface Water Quality

Construction activities would last from November 2015 to July 2021. The construction-related impacts on water quality would be similar to the impacts described above under the Alternative Base Plan and Alternative Plans 1, and 2.

These impacts could include but would not be limited to: surface disturbances leading to increased sediment loads in the lake; release of hazardous and toxic materials; violation of Tulare Basin Plan standards; and adverse effects on fisheries from increased turbidity. However, not having to achieve and maintain the unusually low lake level for construction and removal of the coffer dam (two 2-month periods) could potentially reduce the adverse impacts to fisheries encouraged by the lower water levels, including warmer lake temperatures, periods of lower DO, and potential toxic algal blooms.

Water Supply

These impacts would be the same as the impacts described above under the Alternative Base Plan and Alternative Plans 1, and 2.

Alternative Plan 4

Under this alternative, the deficiencies remediated in the Base Plan Alternative would be included, plus additional remediation measures identified for the Existing and Emergency Spillways, Main Dam, and Auxiliary Dam, which include installing a filter and drain system, raising the dam crests and existing spillway walls by 16 feet, widening the emergency spillway to 900 feet, realigning State Highway 178, and installing a flood gate where the new Main Dam embankment would intersect State Highway 155. This alternative would have water resources impacts similar to the Base Plan Alternative with the primary difference being the widening of the emergency spillway and realignment of roads.

Hydrology and Flood Management

Impacts associated with this alternative would be the same as the impacts described above under the Base Plan Alternative. Expansion of the emergency spillway would prevent overtopping of the dam during storm events greater than 1-in-1000-year frequency. Outflows associated with more frequent storm events would continue to be handled solely by the existing spillway.

Surface Water Quality

Impacts on water quality would be similar to the impacts described above under the Alternative Base Plan; however, increased ground disturbance associated with widening the emergency spillway and realigning the highway would increase the potential for significant impacts resulting from erosion and sediment transport to water bodies. Mitigation measures presented in Section 3.8.4 below would minimize the potential for adverse impacts under this alternative, reducing impacts to surface water quality to a less than significant level.

<u>Water Supply</u>

These impacts would be the same as the impacts described above under the Alternative Base Plan.

3.6.4 Environmental Commitments/Mitigation Measures

Recommended mitigation measures are described below to minimize adverse impacts on water resources during construction and return temporarily disturbed areas to relatively natural conditions.

Maintain Construction Pool

- The current construction schedule of the coffer dam calls for placement of the coffer dam in the December to February timeframe. Historically, this is the timeframe in which the greatest rain floods have occurred in the region (for example, in 1966, 1986, and 1997). This might lead to difficulty in maintaining a significantly lower pool elevation of 2,543.76 feet, as this represents over 45 feet in difference from the existing restricted pool elevation. However, historically this is the time of year that the lake is normally at its lowest elevation.

Minimize Surface Disturbances

- Fit locations and alignments of staging areas and haul roads into landforms to minimize the size of cuts and fills.
- Locate stockpile sites, parking areas, staging areas, and disposal site locations to avoid erosion.
- Maintain a vegetative buffer (if present) within at least 150 feet of the high water mark of the rivers, lake, and major travel routes.
- Maintain a vegetative buffer, if possible, on the strip of land between the existing spillway and proposed Emergency Spillway so as to prevent erosion.
- Minimize the width of new haul roads and existing roads that are planned for widening or other improvements.
- Minimize the number of temporary and permanent structures and combine or collocate where feasible.

Protect Water Quality

- Consider an additional conscientious and continuous water quality monitoring network during the multi-year construction period. The collected data would be available to Corps water quality staff who could work with the contractor(s) to resolve any potential environmentally detrimental activities.
- Consider temporary aeration of lake water for selected areas of the lake in the event that dissolved oxygen levels were expected to drop below the historically observed levels. This is expected to provide a more hospitable habitat for lake fish and desirable aquatic species that might be stressed because of abnormal lake conditions. Potential aeration methods would include: air bubblers, mechanical

agitators, mechanical mixers, and the placement of rocky areas around the lake to allow for natural wind to add aeration. One concern with the use of aeration is the creation of an artificial system/habitat that would then be removed upon completion of the applicable construction phase.

- Consider using turbidity curtains in some instances when construction activities are adjacent to open water. Turbidity curtains would consist of a floating line of buoys with a subsurface material curtain that can contain areas of in water disturbance or turbid run-off. Since the lake is continually subjected to windy conditions, the type and configuration of potential curtains would need to be monitored.
- If it is determined through further assessments that any existing plans or design modifications may cause detrimental impacts on long term water quality conditions, additional features would be considered to provide habitat mitigation.

Restore Temporarily Disturbed Areas

- The Corps would prepare and implement a suitable *Site Restoration Plan* to restore and revegetate all areas subject to temporary disturbance. Temporarily disturbed areas in the project area include all temporary access roads, construction work areas and laydown areas, borrow sites, and construction equipment staging areas. The plan would include a description of topsoil salvage and seeding techniques and a monitoring and reporting plan and would identify performance standards. Boulders of varying sizes would be set aside during the project and returned to project areas for landscaping as part of the restoration process. The Corps would replace soil, grass, bushes, trees, rocks, and natural debris over disturbed areas. New native vegetation would be of a form, color, and texture that blend with the landscape. The *Site Restoration Plan* would also include a plan for revegetation monitoring and corrective actions to establish vegetation that failed to thrive from restoration actions.

3.7 TRAFFIC AND CIRCULATION

This section presents a discussion of the affected environment and the potential traffic- and circulation-related impacts from the proposed Action Alternatives and support actions.

3.7.1 Regulatory Setting

Federal

No Federal plans, policies, regulations, or laws related to transportation and circulation are applicable to the proposed Action Alternatives.

State

The California Department of Transportation (CalTrans) is responsible for planning, designing, constructing, operating, and maintaining all State-owned roadways in Kern County. CalTrans enforces various policies and regulations related to modification of or encroachment on state-owned roadways.

Local

The Kern County Roads Department is responsible for planning, designing, constructing, operating, and maintaining all county-owned roadways. The Kern County General Plan classifies county-maintained roads according to their physical location, function, and links to land uses. Among these classifications are expressways, major arterials, collectors, commercial-industrial streets, and local streets. The County of Kern enforces various policies and regulations related to modification of or encroachment on County maintained roadways.

The Kern Council of Governments (KernCOG), as a regional transportation agency, prepares the Regional Transportation Plan (RTP) to examine long-range transportation issues, opportunities, and needs for Kern County. KernCOG also prepares the Regional Transportation Improvement Program and the Federal Transportation Improvement Program, which are funding documents that implement projects referenced and identified in the RTP. The RTP program helps to implement the Circulation Element of the Kern County General Plan.

3.7.2 Affected Environment

The Kern River Valley is serviced by a network of major streets that traverse the perimeter of Isabella Lake: SRs 178 and 155, Wofford Heights Boulevard, Burlando Road, Kernville Road, and Sierra Way. The two state routes are under the jurisdiction of the CalTrans the others are under the jurisdiction of the County of Kern.

SR 178 is the primary access to the Kern River Valley from Bakersfield, traversing the Kern River Canyon along a winding two- and four-lane roadway. In the Isabella Lake area, SR 178 traverses the southern side of the lake, connecting the communities of Lake Isabella, Mountain Mesa, South Lake, and Weldon. SR 178 continues easterly away from the Isabella Lake area through the mountains, over Walker Pass and eventually intersecting SR 14 near the city of Ridgecrest.

SR 155 connects Wofford Heights to SR 178 next to the community of Lake Isabella. From Wofford Heights, SR 155 heads away from Isabella Lake, westward through the mountains, over Greenhorn Summit, and eventually intersects with SR 65 and terminates at SR 99 in Delano.

The remaining county roads, Burlando Road, Kernville Road, and Sierra Way, complete the circuit of roadways traversing Isabella Lake on the west, north, and east sides of the lake. Burlando Road connects Wofford Heights and Kernville, Kernville Road traverses Kernville, and Sierra Way connects Kernville and Weldon at Sierra Way's southern terminus at the intersection with SR 178.

Existing Street Configurations

The following is a summary of the configuration of the streets and designations in the Kern River Valley Specific Plan Circulation Map that may be impacted to differing degrees by the project's construction traffic generation and by implementation of the Action Alternatives (Figure 3-9).

State Route 155/Evans Road/Wofford Heights Boulevard

SR 155 is a designated major rural collector of various widths from south of Wofford Heights to its junction with SR 178 near the community of Lake Isabella. West of Wofford Heights, SR 155 exists as a two-lane undivided roadway, also known as Evans Road. At the intersection of Evans Road and Wofford Heights Boulevard in Wofford Heights, the state route designation is redirected from Evans Road southerly to Wofford Heights Boulevard and continues along this alignment to its intersection with SR 178. At the intersection where SR 155 is redirected southerly, Burlando Road continues northerly through Wofford Heights. Within Wofford Heights, Burlando Road/Wofford Heights Boulevard is a four-lane divided roadway, with dedicated left-turn lanes at major cross street intersections.

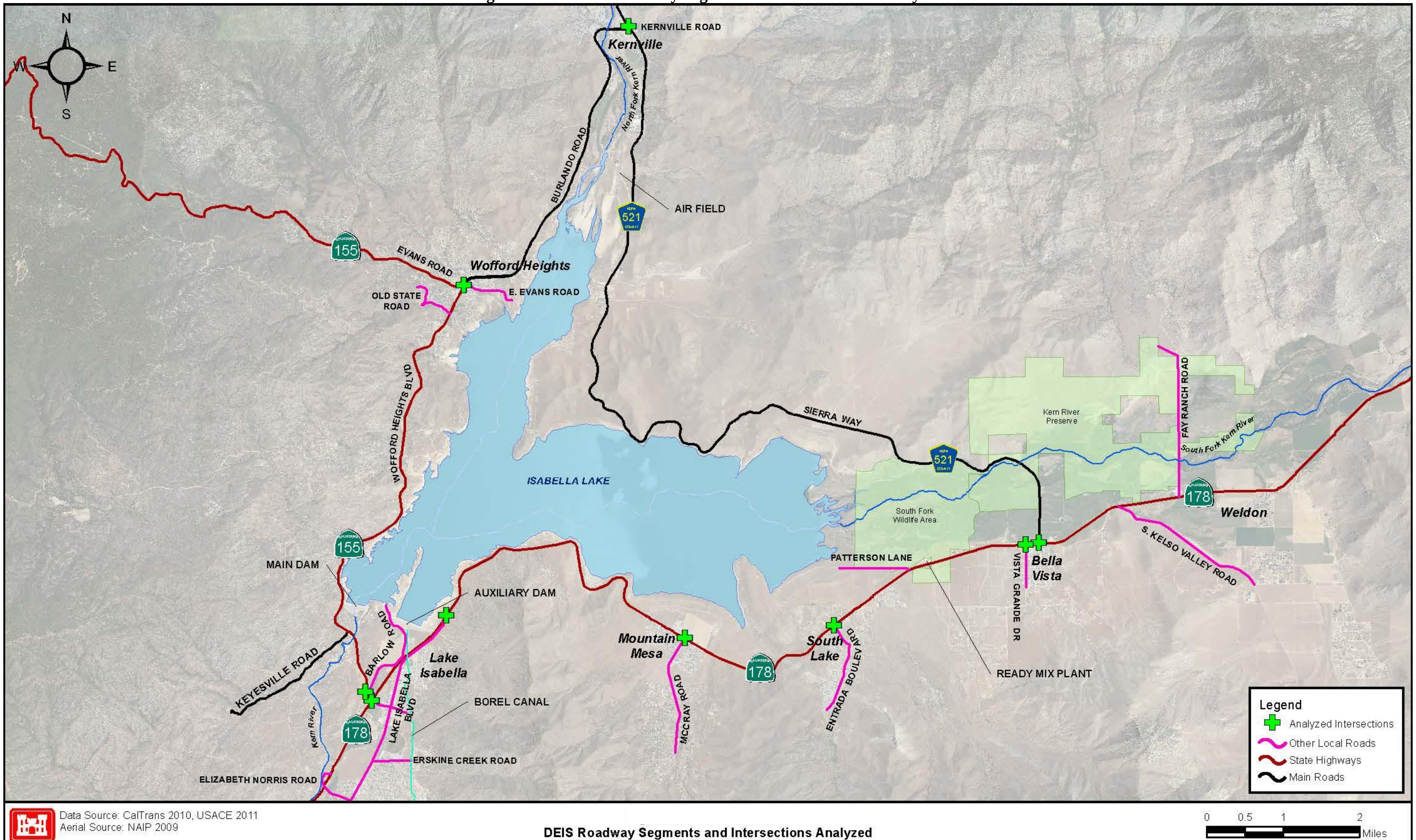
Burlando Road / Kernville Road

Burlando Road is a designated arterial in various widths between Evans Road in Wofford Heights and Sierra Way in Kernville. Within Wofford Heights it is a four-lane divided roadway. Between Wofford Heights and Kernville, Burlando Road is a two-lane undivided roadway. Within Kernville, Burlando Road transitions into Kernville Road and is a four-lane roadway, with a two-way left-turn lane or dedicated left-turn lanes at major cross streets. Kernville Road terminates at Sierra Way in eastern Kernville.

Sierra Way (a.k.a. County Road 521)

Sierra Way is a designated collector that is a two-lane undivided roadway from north of Kernville Road, southerly along the north and east sides of Isabella Lake, to its southern terminus with SR 178, next to Weldon.

Figure 3-9 DEIS Roadway Segments and Intersections Analyzed



State Route 178

SR 178 is a designated expressway west of the community of Lake Isabella. As it moves away from the project area toward Bakersfield, it is a four-lane divided roadway and eventually transitions to a two-lane undivided roadway as it traverses the lower portion of the Kern River Canyon. The intersection of SR 178 at SR 155, next to the community of Lake Isabella, is provided with a grade-separated interchange. SR 178 continues easterly from Lake Isabella, as a designated highway, along the southern perimeter of the lake, and is a two-lane roadway, traversing the communities of Mountain Mesa, South Lake, and Weldon. At its intersection with Lake Isabella Boulevard, immediately east of the community of Lake Isabella, dedicated left-turn lanes are provided. As SR 178 traverses the communities of Mountain Mesa and South Lake, dedicated left-turn lanes or a two-way left-turn lane is provided. Additionally, in these two communities, frontage roads along SR 178 allow local community traffic to pass parallel to its alignment without using SR 178. SR 178 would serve as the primary off-site haul route for filter sand from the South Fork delta borrow site to Staging Area A1. This road is also the primary haul route for bringing ready-mix concrete for various construction uses, and cement and fly ash mix ingredients for making RCC concrete at the temporary batch plant. Access to both Staging Area A1 and A2 would be constructed off of SR 178.

Lake Isabella Boulevard

Lake Isabella Boulevard is a designated arterial that traverses the community of Lake Isabella, where it is the main thoroughfare, running generally parallel to SR 178. Although project-related impacts on this roadway should not be substantial since its use would not be recommended for construction-related trucks, its use may increase by workers during lunch and break periods or by local traffic due to increased congestion on SR 178. At its terminus intersecting with SR 178, it will also be used to provide access to the project area from SR 178 as it terminates at the entrance to the Auxiliary Dam Recreation Area

Barlow Road

Barlow Road is a designated local street that would be one of primary project entrances for the proposed DSM Project Primary Action Area. Barlow Road intersects State Route 155 approximately 0.15 miles north of State Route 178. This road currently exists as a two (2) lane, undivided roadway from State Route 155, heading north, running adjacent to the Auxiliary Dam and terminating to the west between the Auxiliary Dam and the Main Dam. A staging area for construction vehicles and material lay down/processing areas (Staging Area A3) is proposed along the alignment of this roadway next to the dams (see Figure 2-25). Barlow Road within the project area would be upgraded to be the primary on-site haul route between various staging areas within the project site. Route construction would include reinforcement of the existing Barlow Road Bridge across the Borel Canal, and a connection to proposed Staging Area A2 along Eva Drive. Portions of the existing Barlow Road alignment would be affected by the proposed support actions and would require relocation/reconstruction of the roadway following construction. A replacement Barlow Road would be constructed downstream of the Auxiliary Dam improvements. Relocation of the roadway should also be coordinated with relocation of the existing USFS offices indicated herein.

Ponderosa Drive

Ponderosa Drive is an existing local street that "tee" intersects with State Route 155, approximately 0.4 miles north of the intersection of Barlow Road and State Route 155. From State Route 155, Ponderosa Drive runs generally in a northern direction providing access to, and ending at the existing USFS office located between the Main and Auxiliary Dams adjacent to the existing spillway. Although this existing roadway traverses portions of the Primary Action Area of the proposed Isabella DSM Project, it is not anticipated that it will be utilized for project access or for materials transportation. Portions of this existing roadway would require permanent removal for construction of the new Emergency Spillway. Details regarding relocation of this roadway along with relocation of the existing USFS offices have not yet been developed as previously indicated in Chapter 1 of this document and would require subsequent tiered NEPA analysis.

Patterson Lane

Patterson Lane is an existing unpaved roadway that intersects with State Route 178 approximately 8.5 miles east of the Primary Action Area. Patterson Lane would be used to transport filter sand borrow material from the South Fork Delta area to Staging Area A1, via State Route 178, which has been previously identified as Haul Route H2. Although potential impacts to this existing unpaved roadway would be negligible with respect to service levels identified in the traffic and circulation analysis, the existing roadway may require structural and surface upgrading to accommodate temporary use of the roadway by heavy truck traffic.

Existing Transit Service

The County of Kern operates transit services in the Kern River Valley. Known as Kern Regional Transit, it provides bus service between the Weldon/Onyx area to Lake Isabella via SR 178 and from Lake Isabella to Kernville via SR 155/Burlando Road, with several intermediate stops in and around the various communities between. Sierra Way, on the east side of the lake, does not serve as a transit route. Kern Regional Transit also provides several daily trips (except Sundays and holidays) from Bakersfield to Lake Isabella.

Park and Ride Facilities

In the Lake Isabella area is a park-and-ride facility along SR 155, north of and next to the grade-separated interchange of SRs 178 and 155, immediately south of the intersection of SR 155 and Barlow Road. There are also three State park-and-ride facilities in Bakersfield and an additional facility in Delano, according to the CalTrans website.

Bicycle and Pedestrian Facilities

The Isabella Lake area is a prime location for many recreation uses, including bicycling. Facilities for cyclists include a Class 3 bike route along Burlando Road, from Wofford Heights to Kernville. The County of Kern is planning on modifying this Class 3 bike route to a Class 2 bike route and extending the Class 2 bike route through Kernville to the intersection of Kernville Road and Sierra Way. The roadway modifications in Kernville to provide the Class 2 bike route and the modifications to upgrade the Class 3 bike route from Wofford Heights to Kernville will likely occur prior to commencement of the Isabella DSM Project according to the County of Kern. Class 2 bike lanes also exist along Lake Isabella Boulevard, south of the community of Lake Isabella, with plans for extending the lanes north from Kernville Road to within a half mile of the intersection of Lake Isabella Boulevard and SR 178. This extension is planned to occur within the next two years, according to County of Kern officials.

Existing Intersections

In the Kern River Valley area, AM and PM peak-hour turning movement counts were taken to determine service levels. The counts were taken at various intersections around Isabella Lake that were considered to be sample intersections typically handling larger quantities of vehicles. The analyzed intersections include those major intersections existing along the proposed haul routes for project materials. The intersections analyzed are as follows (see Figure 3-9):

- SR 178 Eastbound Off-ramp at SR 155;
- SR 178 Westbound Off-ramp at SR 155;
- SR 155 at Barlow Road;
- SR 155/Wofford Heights Boulevard at SR 155/Evans Road;
- Kernville Road at Sierra Way;
- SR 178 at Sierra Way;
- SR 178 at Vista Grande Drive;
- State Route 178 at Entrance to Ready-Mix plant (analyzed based on indication by the Corps regarding utilization of existing plant for concrete supply)
- State Route 178 at Patterson Lane (analyzed based on indication by the Corps regarding utilization of this intersection for transportation of sand filter borrow)
- SR 178 at Entrada Boulevard;
- SR 178 at McCray Road; and
- SR 178 at Lake Isabella Boulevard.

Traffic Volumes

Turning movement traffic counts were taken at the intersections listed above to determine service levels during the AM and PM peak hours. The total intersection turning movement volumes are presented in Table 3.9-1, Section 3.7.3.

Roadway segment daily traffic volumes for the state roads listed above were obtained from the CalTrans website, and for the remaining county roads, volumes were obtained from the traffic count map on the KernCOG website. These segment volumes are presented in Table 3.9-2, Section 3.7.3.

Traffic counts were conducted during the off-peak seasonal recreation period, and no information was provided to estimate peak recreation period traffic volumes. A growth factor of 1.5% was applied to the existing traffic volumes to account for traffic volume increases that may occur due to growth in the area. Project generated traffic was then added to these growth-adjusted existing volumes to determine project impacts at the time of commencement of the project. This 1.5% growth factor used is indicated in the recently adopted *Kern River Valley Specific Plan*.

3.7.3 Environmental Consequences

This section discusses the construction-related (short-term) and operation-related (long-term) effects on transportation and circulation that are expected from the proposed Action Alternatives. The following discussion also includes a description of the methods and assumptions used to conduct the analysis and the criteria used to assess the intensity of the potential impacts.

This analysis assumes that the post-construction operation of any of the Action Alternatives would not generate any new vehicle trips because operation and maintenance of the alternatives would be unchanged compared to existing conditions.

Scope and Methods

Criteria that were used to evaluate the intensity of impact on traffic and circulation effects were based on Federal, State, and local guidance regarding traffic and circulation. Relevant factors in the analysis of traffic impacts included the following:

- Conflicts with applicable plans, ordinances, or policies establishing measures of effectiveness for the circulation system, taking into account all modes of transportation, including mass transit and nonmotorized travel, and relevant components of the circulation system, including intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit;
- Conflicts with an applicable traffic congestion management programs, including level of service standards established by the County congestion management agency for designated roads or highways;
- Substantial increases in traffic hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment); and
- Conflicts with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, and/or decreases in the performance or safety of such facilities from proposed project actions.

The proposed Isabella DSM Project is not expected to change air traffic patterns, including increase traffic levels or change location that results in substantial safety risks; therefore, this issue is not discussed further in this analysis.

The following sections describe the relevant traffic analyses that were conducted for the Action Alternatives based on existing traffic and circulation levels and patterns, collected traffic counts and field data, and modeling the projected changes due to construction-related activities.

Traffic Analysis
The Level of Service (LOS) designation is the generally accepted gauge for describing the quality of operation of roadway segments and intersections. The factors that are considered in determining the LOS of a transportation facility include traffic volumes and facility capacity based on the number of lanes, traffic control, and various other physical conditions of the traffic facility. LOS is a qualitative measure of traffic operating conditions that range from LOS A, typically representing free-flow conditions, to LOS F, representing severe congestion. The County of Kern has adopted a minimum threshold of LOS D, while the State of California threshold is LOS C. For purposes of analysis, LOS C is a target goal, indicating no requirement for specific mitigation measures for any particular transportation facility.

The operational analysis of existing and proposed intersections contained in this analysis is based on methods contained in the Transportation Research Board, National Research Council's Highway Capacity Manual (TRB 2000). The operational analysis of existing and proposed roadway segments is based on the widely accepted roadway capacities contained in the Florida Department of Transportation's Generalized Service Volume Tables, Table 3 (FDOT 2009). These FDOT tables provide roadway segment capacities for the various Levels of Service based on the physical characteristics and locations of the roadway.

Intersection Analysis
Intersection service level analysis was performed for the intersections listed in Section 3.7.2 using the Highway Capacity Manual methods referenced above. Analysis was performed for existing volumes at the AM peak hour and PM peak hour and for projected intersection peak-hour volumes anticipated to occur during the project timeframe estimated to generate the peak demand for off-site hauling of construction materials. As indicated above, this timeframe of maximum project vehicles is projected to occur sometime in mid-year 2017 regardless of which Action Alternative is selected by the Corps. It was assumed that if acceptable service levels can be achieved while analyzing this worst case scenario, then it should follow, that impacts to the existing transportation facilities from any of the Action Alternatives should not adversely affect the resulting intersection service levels for the duration of the multi-year construction period. The results of the intersection analysis are presented in Table 3-31.

Table 3-31
Intersection Level of Service – Isabella DSM Project

Intersection	Scenario	Control Type	Intersection Total Volume	Intersection LOS	Average Delay (sec/veh)
SR 178 EB Ramps & SR 155 AM PEAK	Existing	U	525	A	1.5
	Year 2017 without Project	U	579	A	1.5
	Year 2017 with Project	U	648	A	2.8
SR 178 EB Ramps & SR 155 PM PEAK	Existing	U	536	A	1.9
	Year 2017 without Project	U	591	A	1.9
	Year 2017 with Project	U	649	A	2.6
SR 178 WB Ramps & SR 155 AM PEAK	Existing	U	485	A	3.1
	Year 2017 without Project	U	535	A	3.2
	Year 2017 with Project	U	657	A	3.6
SR 178 WB Ramps & SR 155 PM PEAK	Existing	U	510	A	2.4
	Year 2017 without Project	U	563	A	2.5
	Year 2017 with Project	U	685	A	2.1
SR 155 & Barlow Rd AM PEAK	Existing	U	377	A	0.9
	Year 2017 without Project	U	416	A	0.9
	Year 2017 with Project	U	581	A	1.5
SR 155 & Barlow Rd PM PEAK	Existing	U	425	A	0.6
	Year 2017 without Project	U	469	A	0.6
	Year 2017 with Project	U	634	A	4.0
SR 155/Burlando & SR 155/Evans AM PEAK	Existing	U	402	A	2.3
	Year 2017 without Project	U	444	A	2.3
	Year 2017 with Project	U	464	A	2.3
SR 155/Burlando & SR 155/Evans PM PEAK	Existing	U	473	A	2.2
	Year 2017 without Project	U	522	A	2.3
	Year 2017 with Project	U	542	A	2.2
Kernville Rd & Sierra Way AM PEAK	Existing	U	250	A	5.3
	Year 2017 without Project	U	276	A	5.4
	Year 2017 with Project	U	286	A	5.2
Kernville Rd & Sierra Way PM PEAK	Existing	U	280	A	5.1
	Year 2017 without Project	U	309	A	5.1
	Year 2017 with Project	U	319	A	5.3
SR 178 & Sierra Way AM PEAK	Existing	U	284	A	1.3
	Year 2017 without Project	U	313	A	1.3
	Year 2017 with Project	U	329	A	1.2
SR 178 & Sierra Way PM PEAK	Existing	U	311	A	1.3
	Year 2017 without Project	U	343	A	1.4
	Year 2017 with Project	U	359	A	1.3
SR 178 & Vista Grande Dr AM PEAK	Existing	U	303	A	2.6
	Year 2017 without Project	U	334	A	2.7
	Year 2017 with Project	U	350	A	2.6
SR 178 & Vista Grande Dr PM PEAK	Existing	U	366	A	1.9
	Year 2017 without Project	U	404	A	2.0
	Year 2017 with Project	U	420	A	1.9
SR 178 &	Existing	U	263	A	0.3

Intersection	Scenario	Control Type	Intersection Total Volume	Intersection LOS	Average Delay (sec/veh)
Ready-Mix Entrance AM PEAK	Year 2017 without Project	U	290	A	0.3
	Year 2017 with Project	U	328	A	0.9
SR 178 & Ready-Mix Entrance PM PEAK	Existing	U	329	A	0.2
	Year 2017 without Project	U	363	A	0.2
	Year 2017 with Project	U	401	A	0.7
SR 178 & Patterson Ln AM PEAK	Existing	U	263	A	0.3
	Year 2017 without Project	U	290	A	0.3
	Year 2017 with Project	U	374	A	1.3
SR 178 & Patterson Ln PM PEAK	Existing	U	326	A	0.2
	Year 2017 without Project	U	360	A	0.1
	Year 2017 with Project	U	444	A	1.1
SR 178 & Entrada Blvd AM PEAK	Existing	U	340	A	2.9
	Year 2017 without Project	U	375	A	3.0
	Year 2017 with Project	U	464	A	2.6
SR 178 & Entrada Blvd PM PEAK	Existing	U	403	A	2.0
	Year 2017 without Project	U	445	A	2.1
	Year 2017 with Project	U	534	A	1.8
SR 178 & McCray Rd AM PEAK	Existing	U	476	A	3.9
	Year 2017 without Project	U	525	A	4.0
	Year 2017 with Project	U	619	A	3.6
SR 178 & McCray Rd PM PEAK	Existing	U	523	A	3.3
	Year 2017 without Project	U	577	A	3.5
	Year 2017 with Project	U	671	A	3.2
SR 178 & Lake Isabella Blvd AM PEAK	Existing	U	476	A	2.7
	Year 2017 without Project	U	525	A	2.7
	Year 2017 with Project	U	624	A	3.4
SR 178 & Lake Isabella Blvd PM PEAK	Existing	U	500	A	3.4
	Year 2017 without Project	U	552	A	3.4
	Year 2017 with Project	U	651	A	3.0

Notes:
U – Unsignalized Intersection
S – Signalized Intersection
AWS – All Way Stop

Signalized Intersection LOS	
Level of Service	**Control Delay per Vehicle (sec.)**
A	<10
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	>80

Unsignalized Intersection LOS		
Level of Service	**Average Total Delay (sec/veh)**	**Expected Delay to Minor Street Traffic**
A	<10	Little or no delay.
B	>10 and <15	Short traffic delay.
C	>15 and <25	Average traffic delay.
D	>25 and <35	Long traffic delay.
E	>35 and <50	Very long traffic delay.
F	>50	Demand Volume exceeds capacity.

As indicated on the table, the effect of the increased project traffic on the analyzed intersections would cause little or no delay. The average delay, in seconds per vehicle, ranges from 0.2 to 5.3 for the existing traffic volumes, 0.1 to 5.4 sec/veh for background traffic volumes anticipated to occur in future Year 2017 without the project. The average delay, after adding the estimated project generated traffic to the future Year 2017 background traffic volumes is 0.7 to 5.3 sec/veh. These delay values all result in LOS A for all of the analyzed intersections, even after the addition of the project traffic with any of the Action Alternatives.

Roadway Segment Analysis

Roadway segment service level analysis was performed for the roadways listed in Section 3.9.2, using the volume/LOS tables published by the Florida Department of Transportation (FDOT). The LOS results using existing volumes and Future Year 2017 with project generated traffic volumes are presented in Table 3-32, along with the existing roadway configurations. Based on the lane configurations of the analyzed roadway segments, service levels are provided in the FDOT tables and depend on the Average Daily Traffic (ADT) volumes using the roadway. As shown on Table 3-32, only two of the roadway segments are operating at LOS C, based on existing traffic volumes, while the remaining segments are operating at LOS B. Segment analysis utilizing Future Year 2017 plus project generated traffic provides similar results, except that one additional segment is projected to operate at LOS "C". For all of the segments analyzed, Table 3.9-2 also indicates the amount of additional vehicles that can be added to the Future Year 2017 plus project traffic volumes to the various roadway segments, while providing an acceptable LOS C. This additional volume is indicated as "Available Capacity for Transition to LOS C/D." This volume indicated on Table 3-32 is essentially the reserve capacity of the various roadway segments that could be added to the roadway configuration, while maintaining acceptable service levels.

Of the roadway segments analyzed, SR 178 between Lake Isabella Boulevard and McCray Road is shown to have the least reserve capacity available. This segment operates at LOS C, with an ADT of 8,200 vehicles. As indicated on Table 3-32, this roadway segment has the capacity to accommodate an additional 3,962 vehicles ADT over the traffic volume which is estimated to occur at Future Year 2017 with project generated traffic, while operating at an acceptable LOS C. It was assumed that if acceptable service levels could be achieved when analyzing this worst case scenario during maximum demand for transportation of project materials, then impacts to the existing facilities from the proposed project should have no adverse effect on roadway segment service levels. As indicated, even with the addition of project generated traffic, the segment with the lowest service level can still accommodate an additional 3,962 vehicles ADT while still maintaining acceptable service levels.

Table 3-32
Roadway Segment Analysis – Isabella DSM Project

Roadway Segment	Existing Roadway[1]	Existing ADT[2]	Existing ADT Service Level[4]	Project ADT	Year 2017 Plus Project ADT	Year 2017 Plus Project ADT LOS[4]	Available Capacity for Transition to LOS C/D[4]	Available Capacity of Equiv. Truck Volume[3]
State Route 178								
– West of Elizabeth Norris Road (Bodfish Interchange)	4 lane-divided	3,400	LOS "B"	160	3,933	LOS "B"	33,267	16,634
– Elizabeth Norris Road to SR 155	4 lane-divided	4,200	LOS "B"	160	4,821	LOS "B"	32,379	16,190
– SR 155 to Lake Isabella Blvd	4 lane-divided	4,200	LOS "B"	60	4,721	LOS "B"	32,479	16,240
– Lake Isabella Blvd to McCray Road	2 lane-div/undiv	8,200	LOS "C"	1138	10,238	LOS "C"	3,962	1,981
– McCray Road to Sierra Way	2 lane-div/undiv	7,200	LOS "B"	1118	9,109	LOS "C"	5,091	2,546
– East of Sierra Way	2 lane-undivided	8,300	LOS "C"	34	9,245	LOS "C"	4,955	2,478
State Route 155 (Wofford Heights Blvd) / Burlando Road								
– State Route 178 to Old State Road	2 lane-undivided	5,800	LOS "B"	60	6,497	LOS "B"	7,703	3,852
– Old State Road to Jct SR 155/Evans Rd	4 lane-divided	6,300	LOS "B"	50	7,042	LOS "B"	30,158	15,079
– Jct SR 155/Evans Road to Bristlecone Drive	4 lane-divided	5,680	LOS "B"	50	6,354	LOS "B"	30,846	15,423
– Bristlecone Drive to Kern River Drive	2 lane-undivided	4,815	LOS "B"	40	5,384	LOS "B"	8,816	4,408
– Kern River Drive to Sierra Way	4 lane-divided	7,049	LOS "B"	20	7,843	LOS "B"	29,357	14,679
Sierra Way								
– North of Kernville Road	2 lane-undivided	4,472	LOS "B"	*10*	4,973	LOS "B"	9,227	4,614
– South of Kernville Road	2 lane-undivided	2,600	LOS "B"	*10*	2,895	LOS "B"	11,305	5,653
– North of SR 178	2 lane-undivided	1,416	LOS "B"	*10*	1,581	LOS "B"	12,619	6,310

[1]Existing roadway configurations are based on that existing at original survey in October 2010
[2]Existing ADT volumes are from California Department of Transportation (CalTrans) Traffic Data Branch's Traffic Volume Counts for California State Highways and Kern Council of Governments (KernCOG) Regional Traffic Count Data.
[3]Available Truck Capacity is based on applying a 2.0 Passenger Car Equivalent factor to the available passenger car capacity.
[4]Roadway Capacities/Service Levels for Uninterrupted Flow Highways
(From Florida Department of Transportation, Generalized Service Volume Tables, Table 4-3, Dated 9/4/09)

Configuration	LOS "B" ADT	LOS "C" ADT	LOS "D" ADT	LOS "E" ADT
2 LANE UNDIVIDED	7,800	14,200	20,000	25,600
2 LANE DIVIDED	8,190	14,910	21,000	26,880
4 LANE DIVIDED	23,800	37,200	48,000	54,600
6 LANE DIVIDED	35,600	55,800	72,000	82,000

Project Traffic – Heavy Truck Construction Traffic

The majority of project-generated heavy truck traffic occurring on existing public roadways would be associated with the transportation of the sand (filter) materials from the proposed South Fork Delta borrow area. These materials would be transported to the site from the borrow area via Patterson Lane to SR 178, then westerly along SR 178 to proposed Staging Area A-1. Additionally, this particular haul route would also be utilized by concrete trucks to transport concrete to the site from the existing batch plant located on SR 178 (approximately ¼ mile east of the intersection of Patterson Lane and SR 178). Concrete transportation would be the second largest contributor to heavy truck traffic. Additional heavy truck traffic is also attributed to various material deliveries, likely originating from the Bakersfield/Kern County area via SR 178 through the Kern River Canyon and also from eastern Kern County via SR 178 over Walker Pass. These various deliveries would be spread throughout the multi-year construction period of the project and will only minimally add to the volume of truck traffic attributed to sand and concrete transportation from the South Lake area.

For all five Action Alternatives, the worst case scenario for increased traffic volumes due to project generated traffic and commensurate traffic impacts related to heavy truck traffic, would occur during the timeframe when sand filter material transportation overlaps with the largest demand periods for ready-mix concrete being transported to the project area from the existing concrete plant located in the South Lake area. Because of this, it is generally suggested that bulk hauling of sand filter material begin as soon as on-site storage and staging areas are developed. This would result in fewer impacts on the existing facilities by spreading out the required import operation over a longer period.

Related traffic volumes based on equipment estimates and project schedules provided by the Corps are itemized below for the four Action Alternatives. Although the amount of off-site borrow materials and ready-mix concrete requirements vary between the alternatives, the amount and frequency of the equipment used to transport these items are similar if not the same for all alternatives, according to the equipment schedules provided by the Corps.

Project Employee Traffic

Employee traffic would likely consist of commuting at the start and end of each shift, in addition to a portion of these employees making midday meal trips. Based on information provided by the Corps, approximately 120 contractor and government personnel would access the site during any given shift with 50% of the personnel residing in the Isabella Lake project area and 50% travelling from the Bakersfield area each day. Assuming that no carpooling occurs, this would equate to 240 daily vehicle “trip ends” (i.e., one-way trips) since each vehicle accessing the construction site generates two daily trips, one inbound and one outbound. Assuming that 50 percent of the employees leave and reenter the site during their midday break, employee trips would increase to 360 daily trip ends.

Since it is possible that the start or end of the daily work shift may coincide with the existing AM or PM Peak Hour of the existing background traffic, for analysis purposes it was conservatively assumed that all of the arriving and departing trips associated with employee traffic would add to the existing background traffic during these peak periods. Therefore, a total increase of 120 trip ends was assumed to be attributable to employee generated traffic for both the AM and PM Peak Hour periods. The typical construction work week would be 6 days, with no work on Sunday, and no off-site hauling on Saturday, eliminating traffic impacts on weekends.

Combining the calculated employee trips with the worst-case scenario of overlapping project components, and the maximum volume of project traffic coinciding with existing peak periods, the following total passenger car equivalent project traffic volumes are estimated:

- Total project ADT volume would be 1,496 trip ends;
- Total project AM peak-hour volume would be 247 trip ends; and
- Total project PM peak-hour volume would be 247 trip ends.

Road Closure Impacts

A direct impact on existing transportation facilities, independent of project-generated traffic would be potential temporary road closures on the stretch of SR 155 between the Main Dam and Barlow Road, which may become necessary for blasting requirements during construction of the Emergency Spillway and Borel conduit tunnel. These temporary closures were not used as a parameter for analyzing overall service levels for the existing roadways, but they would have a direct impact on the existing local traffic in the form of increased travel times along that portion of SR 155. These road closures are anticipated to occur infrequently (two times per week) and for short durations (less than one hour) and would only be required during the portions of the construction schedule related to those measures (spillway and tunnel). Potential impacts from these temporary road closures would also affect access for emergency response vehicles.

No Action Alternative

Under this alternative the lake capacity would be returned to and the dam would be operated at the pre-IRRM elevation of 2,609.26 feet. There would be no Federal participation in remedial improvements under the Isabella DSM Project at the Isabella Main Dam, Spillway, or Auxiliary Dam. There would be no construction–related traffic effects and no changes in the traffic levels and circulation resulting from construction and operation of the Isabella DSM Project.

Alternative Base Plan

Heavy Truck Traffic

The largest volume of heavy truck traffic estimated to be generated by this alternative should occur when construction of the Borel Canal Tunnel Inlet Structure and construction of the Emergency Spillway Labyrinth Weir overlap with transportation of the sand filter borrow material. Based on equipment estimates provided by the Corps, construction of the Inlet Structure would require approximately 16 round trips per day for delivery of ready-mix concrete while construction of the Labyrinth Weir would require approximately 56 round trips per day for delivery of ready-mix concrete. During construction of these two measures it is possible that transportation of the sand borrow materials could be at its peak, which according to the Corps' equipment schedule would result in approximately 184 round trips per day of heavy truck traffic.

Assuming a worst case scenario whereby all of the above actions occur on any single day, the resulting traffic related to these items would result in approximately 256 round trips of heavy truck traffic per day that would be utilizing Haul Route H-2 (which the Corps has identified as SR 178 between Patterson Lane and the Primary Action Area; see Figure 2-25). Additionally, during this time period it is possible that other miscellaneous material deliveries could occur, such as formwork, rebar, explosives, and steel and concrete pipe. These deliveries may be originating from either the west or east of the study area as mentioned above. Equipment delivery to the Primary Action Area could also occur during this time, but it is more likely that the majority of equipment delivery would occur early in the project schedule and would probably not overlap with the ready-mix concrete deliveries and sand filter borrow material transportation. For analysis purposes it is assumed that an additional 20 round trips per day of heavy vehicle traffic for material and equipment deliveries would occur during the worst case scenario described above. Assuming that half of these deliveries originate from the east, the total amount of round trip heavy truck traffic utilizing Haul Route H-2 would be approximately 266 round trips per day. The remaining 10 round trips of heavy truck traffic would be utilizing SR 178 through the Kern River Canyon to the west of the project area.

The 266 round trip value equates to an estimated value of 532 trip ends. This would therefore be the increase in "Average Daily Traffic" (ADT) attributable to the project from heavy trucks utilizing SR 178 between Patterson Lane and the project area. Utilizing a passenger car equivalent factor of 2.0 for analysis purposes, this volume would equate to an increase in ADT of 1,064 passenger-car-equivalent trip ends. Project generated heavy truck traffic utilizing SR 178 west of the project area would be 10 round trips per day which would equate to an increase in ADT of 20 heavy trucks with a passenger equivalent of 40 trip ends ADT.

It is assumed that approximately 10 percent of this estimated daily truck traffic would occur during either of the AM or PM Peak Hour periods. This would therefore equate to an approximate increase in peak hour volume of 53 truck trip ends or a passenger car equivalent of 106 trip ends per peak hour attributable to heavy truck traffic utilizing Haul Route H-2, and an approximate increase in peak hour volume of 2 truck trip ends or a passenger car equivalent of 4 trip ends per peak hour attributable to heavy truck traffic utilizing SR 178 west of the project.

In addition to deliveries and materials transportation utilizing SR 178, it has been indicated by the Corps that possible use of SR 155 between its intersection with existing Barlow Road and the Main Dam area may occur for hauling processed materials from the

Auxiliary Dam Staging Areas A1 and A2 to the Main Dam area (see Figure 2-25). This route has been designated by the Corps as Haul Route H-4. Based on information contained in the Corps provided equipment schedule it has been estimated that approximately 32 round trips per day of heavy truck traffic may utilize this route. As indicated above, this then equates to 64 ADT trip ends of heavy truck traffic or a passenger car equivalent of 128 ADT trip ends, and an increase in peak hour volume of 6 truck trip ends or a passenger car equivalent of 13 trip ends attributable to project generated heavy truck traffic utilizing Haul Route H-4.

Based on the above analyses and discussions, the anticipated construction-related traffic and circulation impacts are considered direct, short-term, adverse, moderate, and less-than-significant.

In addition, under the Alternative Base Plan, during the multi-year construction period, trucks delivering materials and removing debris, as well as commute traffic, would be entering and exiting unpaved construction and borrow areas and using SR 178 and SR 155. As described previously, 266 round-trips per day of heavy truck traffic are associated with dam construction. The addition of construction-related truck traffic volumes on SR 178 and SR 155 is not expected to substantially alter traffic flow in most circumstances. However, trucks often travel more slowly than posted speed limits, and construction worker vehicles and heavy trucks entering and exiting construction areas could pose hazards to other vehicles. Also, trucks and other vehicles could track mud and gravel onto the local roadways, posing a driving hazard. With implementation of the recommended mitigation measures described in Section 3.9.4, this direct adverse short-term impact is also considered moderate, and less-than-significant.

Project Employee Traffic

Approximately 120 contractor and government personnel would access the project during any given shift with 50% of the personnel residing in the Isabella Lake project area and 50% commuting from the Bakersfield area each day, equating to 240 daily vehicle trip ends. Assuming 50 percent of the employees leave and reenter the site during the midday break, the employee trips would increase to 360 daily trip ends. It is conservatively assumed that all of the arriving and departing trips associated with employee traffic would add to the existing AM or PM Peak Hour background traffic. Therefore, a total increase of 120 trip ends is attributable to employee generated traffic for both AM and PM Peak Hour periods. This short-term direct adverse impact is considered low to moderate, and less-than-significant.

Roadway Segments and Existing Intersections

The worst-case construction period analyzed under the Alternative Base Plan in the traffic impact study would result in a substantial increase in heavy truck traffic and Peak Hour worker commute traffic, in and around the Isabella Lake and the Kern River Valley area. The resulting service levels for street segment ADT volumes are shown in Table 3-33 and the resulting service levels for intersection peak hour volumes in Table 3-34.

Table 3-33
Base Plan - Segment ADT Volumes / LOS

Roadway Segment	Year 2017 ADT without Project	Project ADT	Year 2017 Plus Project ADT	Year 2017 Plus Project ADT LOS [2]	Available Capacity for Transition to LOS C/D [2]	Available Capacity of Equiv. Truck Volume [1]
State Route 178						
– West of Elizabeth Norris Road	3,773	160	3,933	LOS "B"	33,267	16,634
– Elizabeth Norris Road to SR 155	4,661	160	4,821	LOS "B"	32,379	16,190
– SR 155 to Lake Isabella Blvd	4,661	100	4,761	LOS "B"	32,439	16,220
– Lake Isabella Blvd to McCray Road	9,100	1114	10,214	LOS "C"	3,986	1,993
– McCray Road to Ready-Mix Plant	7,991	1094	9,085	LOS "C"	5,115	2,558
– Ready-Mix Plant to Sierra Way	7,991	60	8,051	LOS "C"	6,149	3,075
– East of Sierra Way	9,211	50	9,261	LOS "C"	4,939	2,470
SR 155 (Wofford Heights Blvd) / Burlando Road						
– State Route 178 to Keyesville Road	6,659	260	6,919	LOS "B"	7,281	3,641
– Keyesville Rd to Old State Road	6,437	60	6,497	LOS "B"	7,703	3,852
– Old State Road to Jct SR 155/Evans Rd	6,992	40	7,032	LOS "B"	30,168	15,084
– Jct SR 155/Evans Road to Bristlecone Drive	6,304	30	6,334	LOS "B"	30,866	15,433
– Bristlecone Drive to Kern River Drive	5,344	30	5,374	LOS "B"	8,826	4,413
– Kern River Drive to Sierra Way	7,823	20	7,843	LOS "B"	29,357	14,679
Sierra Way						
– North of Kernville Road	4,963	*10*	4,973	LOS "B"	9,227	4,614
– South of Kernville Road	2,885	*10*	2,895	LOS "B"	11,305	5,653
– North of SR 178	1,571	*10*	1,581	LOS "B"	12,619	6,310

[1]Available Truck Capacity is based on applying a 2.0 Passenger Car Equivalent factor to the available passenger car capacity.

[2]Roadway Capacities/Service Levels for Uninterrupted Flow Highways (From Florida Department of Transportation Generalized Service Volume Table, Table 4-3, Dated 9/4/09)

Configuration	LOS "B" ADT	LOS "C" ADT	LOS "D" ADT	LOS "E" ADT
2 LANE UNDIVIDED	7,800	14,200	20,000	25,600
2 LANE DIVIDED	8,190	14,910	21,000	26,880
4 LANE DIVIDED	23,800	37,200	48,000	54,600
6 LANE DIVIDED	35,600	55,800	72,000	82,000

Table 3-34
Alternative Base Plan - Intersection Peak Hour Volumes / LOS

Intersection	Existing Peak Hour Volume	Year 2017 Peak Hour Volume	Project Peak Hour Volume (PCE)	Total 2017 Peak Hour Volume	LOS / (Ave. Delay)
SR 178 EB Ramps & SR 155 - AM Peak	525	579	69	648	A (<10 sec)
SR 178 EB Ramps & SR 155 - PM Peak	536	591	56	647	A (<10 sec)
SR 178 WB Ramps & SR 155 - AM Peak	485	535	120	655	A (<10 sec)
SR 178 WB Ramps & SR 155 - PM Peak	510	563	120	683	A (<10 sec)
SR 155 & Barlow Road - AM Peak	377	416	163	579	A (<10 sec)
SR 155 & Barlow Road - PM Peak	425	469	163	632	A (<10 sec)
SR 155/Burlando & SR155/Evans - AM Peak	402	444	20	464	A (<10 sec)
SR 155/Burlando & SR155/Evans - PM Peak	473	522	20	542	A (<10 sec)
Kernville Rd & Sierra Way - AM Peak	250	276	10	286	A (<10 sec)
Kernville Rd & Sierra Way - PM Peak	280	309	10	319	A (<10 sec)
SR 178 & Sierra Way - AM Peak	284	313	14	327	A (<10 sec)
SR 178 & Sierra Way - PM Peak	311	343	14	357	A (<10 sec)
SR 178 & Vista Grande Dr - AM Peak	303	334	14	348	A (<10 sec)
SR 178 & Vista Grande Dr - PM Peak	366	404	14	418	A (<10 sec)
SR 178 & Ready-Mix Entrance - AM Peak	263	290	36	326	A (<10 sec)
SR 178 & Ready-Mix Entrance - PM Peak	329	363	36	399	A (<10 sec)
SR 178 & Patterson Ln - AM Peak	263	290	82	372	A (<10 sec)
SR 178 & Patterson Ln - PM Peak	326	360	82	442	A (<10 sec)
SR 178 & Entrada Blvd - AM Peak	340	375	87	462	A (<10 sec)
SR 178 & Entrada Blvd - PM Peak	403	445	87	532	A (<10 sec)
SR 178 & McCray Rd - AM Peak	476	525	92	617	A (<10 sec)
SR 178 & McCray Rd - PM Peak	523	577	92	669	A (<10 sec)
SR 178 & Lake Isabella Blvd - AM Peak	476	525	97	622	A (<10 sec)
SR 178 & Lake Isabella Blvd - PM Peak	500	552	97	649	A (<10 sec)

However, even with this increase in traffic, the resulting Levels of Service are not degraded below the minimum threshold of LOS "C" established by the local and state jurisdictions having authority over the existing intersections and roadways. In addition to indicating the resulting service levels, the segment table also indicates the remaining reserve ADT capacity is substantial even after the addition of project generated traffic. Therefore, this short-term direct adverse impact is considered low, and less-than-significant.

Alternative Plan 1

Under this alternative, all of the deficiencies remediated under the Alternative Base Plan would be included, plus additional remediation measures identified for the Main Dam. The additional measures under Alternative Plan 1 would require the addition of a temporary concrete Batch Plant, additional excavation and construction material, and a longer construction schedule.

Heavy Truck Traffic

As indicated above and as derived from Corps equipment estimates, although the various alternatives require different quantities of sand filter borrow material, the quantity of highway trucks and per-day-frequency of these trucks utilized to transport the material from the South Fork Delta borrow area remain the same for each alternative. The quantity of ready-mix concrete required for Alternative Plan 1 is the same as that required for the Alternative Base Plan. Therefore the daily traffic volumes attributable to transportation of the sand filter borrow material and the ready-mix concrete remains the same for Alternative Plan 1 as for the Alternative Base Plan.

Quantities of on-site produced materials required for the Main Dam portion of the project that may be transported via Haul Route H-4 are projected to be larger for Alternative Plan 1 than those quantities required for the Alternative Base Plan. However, similar to the transportation of sand filter borrow material, the quantity of highway trucks and per-day-frequency of these trucks utilized would be similar to that for the Alternative Base Plan. Therefore the daily traffic volumes attributable to the transportation of these various on-site produced materials would be the same for Alternative Plan 1 as for the Alternative Base Plan.

The only difference in daily traffic volumes projected for Alternative Plan 1 from the Alternative Base Plan is related to construction of the RCC Overlay of the Main Dam. Concrete required for the RCC Overlay is proposed to be produced on site with a portable Batch Plant, to be located in the Emergency Spillway excavation near to the Main Dam. Required aggregate and water would be acquired from on-site sources. The required cement and fly ash would be acquired from sources near Barstow and transported to the site via SR 178 from the east over Walker Pass. According to the Corps equipment estimates, the proposed maximum quantity and per-day-frequency of heavy truck traffic transporting the fly ash and cement would result in an additional 3 round trips per day of heavy truck traffic. This then equates to 6 ADT trip ends of heavy truck traffic or a passenger car equivalent of 12 ADT trip ends, and an increase in peak hour volume of 1 truck trip end or a passenger car equivalent of 2 trip ends attributable to project generated heavy truck traffic required for transportation of fly ash and cement for the RCC Overlay at the Main Dam.

According to the Corps anticipated construction schedules, construction of the RCC Overlay is not expected to coincide with the timeframe of maximum demand for ready-mix concrete transportation and the maximum frequency of sand filter borrow material transportation along Haul Route H-2. However, to conservatively account for a worst case scenario for analysis purposes, it is assumed that transportation of the raw materials for the RCC Overlay would overlap with those timeframes. Therefore, traffic impact analysis for the Alternative Plan 1 results in an additional 6 ADT trip ends of heavy truck traffic. This nominal increase in daily traffic volumes related to Alternative Plan 1, compared to daily traffic volumes for the Alternative Base Plan, is negligible with respect to transportation facilities' service level calculations utilized for traffic impact analysis. Therefore, impact analysis results for Alternative Plan 1 is similar to the impact analysis for the Alternative Base Plan.

Project Employee Traffic

This short-term direct impact under Alternative Plan 1 is the same as under the Alternative Base Plan.

Roadway Segments and Existing Intersections

This short-term direct impact under Alternative Plan 1 is slightly greater than under the Alternative Base Plan. The resulting service levels for street segment ADT volumes are shown in Table 3-35 and the resulting service levels for intersection peak hour volumes in Table 3-36. However, even with this increase in traffic, the resulting Levels of Service are not degraded below the minimum threshold of LOS "C" established by the local and state jurisdictions having authority over the existing intersections and roadways. In addition to indicating the resulting service levels, the segment table also indicates the remaining reserve ADT capacity is substantial even after the addition of project generated traffic. Therefore, this short-term direct impact is the same as under the Alternative Base Plan.

Table 3-35
Alternative Plan 1 - Segment ADT Volumes / LOS

Roadway Segment	Year 2017 ADT without Project	Project ADT	Year 2017 Plus Project ADT	Year 2017 Plus Project ADT LOS [2]	Available Capacity for Transition to LOS C/D [2]
State Route 178					
– West of Elizabeth Norris Road	3,773	160	3,933	LOS "B"	33,267
– Elizabeth Norris Road to SR 155	4,661	160	4,821	LOS "B"	32,379
– SR 155 to Lake Isabella Blvd	4,661	112	4,773	LOS "B"	32,427
– Lake Isabella Blvd to McCray Road	9,100	1126	10,226	LOS "C"	3,974
– McCray Road to Ready-Mix Plant	7,991	1106	9,097	LOS "C"	5,103
– Ready-Mix Plant to Sierra Way	7,991	72	8,063	LOS "C"	6,137
– East of Sierra Way	9,211	62	9,273	LOS "C"	4,927
SR 155 (Wofford Heights Blvd) / Burlando Road					
– State Route 178 to Keyesville Road	6,659	272	6,931	LOS "B"	7,269
– Keyesville Rd to Old State Road	6,437	60	6,497	LOS "B"	7,703
– Old State Road to Jct SR 155/Evans Rd	6,992	40	7,032	LOS "B"	30,168
– Jct SR 155/Evans Road to Bristlecone Drive	6,304	30	6,334	LOS "B"	30,866
– Bristlecone Drive to Kern River Drive	5,344	30	5,374	LOS "B"	8,826
– Kern River Drive to Sierra Way	7,823	20	7,843	LOS "B"	29,357
Sierra Way					
– North of Kernville Road	4,963	*10*	4,973	LOS "B"	9,227
– South of Kernville Road	2,885	*10*	2,895	LOS "B"	11,305
– North of SR 178	1,571	*10*	1,581	LOS "B"	12,619

[1]Available Truck Capacity is based on applying a 2.0 Passenger Car Equivalent factor to the available passenger car capacity.
[2]Roadway Capacities/Service Levels for Uninterrupted Flow Highways (From Florida Department of Transportation, Generalized Service Volume Tables, Table 4-3, Dated 9/4/09)

Configuration	LOS "B" ADT	LOS "C" ADT	LOS "D" ADT	LOS "E" ADT
2 LANE UNDIVIDED	7,800	14,200	20,000	25,600
2 LANE DIVIDED	8,190	14,910	21,000	26,880
4 LANE DIVIDED	23,800	37,200	48,000	54,600
6 LANE DIVIDED	35,600	55,800	72,000	82,000

Table 3-36
Alternative Plan 1 – Intersection Peak Hour Volumes/LOS

Intersection	Existing Peak Hour Volume	Year 2017 Peak Hour Volume	Project Peak Hour Volume (PCE)	Total 2017 Peak Hour Volume	LOS / (Ave. Delay)
SR 178 EB Ramps & SR 155 - AM Peak	525	579	69	648	A (<10 sec)
SR 178 EB Ramps & SR 155 - PM Peak	536	591	58	649	A (<10 sec)
SR 178 WB Ramps & SR 155 - AM Peak	485	535	122	657	A (<10 sec)
SR 178 WB Ramps & SR 155 - PM Peak	510	563	122	685	A (<10 sec)
SR 155 & Barlow Road - AM Peak	377	416	165	581	A (<10 sec)
SR 155 & Barlow Road - PM Peak	425	469	165	634	A (<10 sec)
SR 155/Burlando & SR155/Evans - AM Peak	402	444	20	464	A (<10 sec)
SR 155/Burlando & SR155/Evans - PM Peak	473	522	20	542	A (<10 sec)
Kernville Rd & Sierra Way - AM Peak	250	276	10	286	A (<10 sec)
Kernville Rd & Sierra Way - PM Peak	280	309	10	319	A (<10 sec)
SR 178 & Sierra Way - AM Peak	284	313	16	329	A (<10 sec)
SR 178 & Sierra Way - PM Peak	311	343	16	359	A (<10 sec)
SR 178 & Vista Grande Dr - AM Peak	303	334	16	350	A (<10 sec)
SR 178 & Vista Grande Dr - PM Peak	366	404	16	420	A (<10 sec)
SR 178 & Ready-Mix Entrance - AM Peak	263	290	38	328	A (<10 sec)
SR 178 & Ready-Mix Entrance - PM Peak	329	363	38	401	A (<10 sec)
SR 178 & Patterson Ln - AM Peak	263	290	84	374	A (<10 sec)
SR 178 & Patterson Ln - PM Peak	326	360	84	444	A (<10 sec)
SR 178 & Entrada Blvd - AM Peak	340	375	89	464	A (<10 sec)
SR 178 & Entrada Blvd - PM Peak	403	445	89	534	A (<10 sec)
SR 178 & McCray Rd - AM Peak	476	525	94	619	A (<10 sec)
SR 178 & McCray Rd - PM Peak	523	577	94	671	A (<10 sec)
SR 178 & Lake Isabella Blvd - AM Peak	476	525	99	624	A (<10 sec)
SR 178 & Lake Isabella Blvd - PM Peak	500	552	99	651	A (<10 sec)

Notes:
PHV = Peak Hour Volume
PCE = Passenger Car Equivalent
LOS = Level of Service

Alternative Plan 2

Under this alternative, all of the deficiencies remediated under Alternative Plan 1 would be included, plus additional remediation measures identified for the Auxiliary Dam. The additional measures under Alternative Plan 2 would require additional excavation and construction material, and a longer construction schedule.

<u>Heavy Truck Traffic</u>

As indicated above, heavy truck traffic related to sand filter borrow material and ready-mix concrete transportation required for the construction of Alternative Plan 2 is comparable to that required for the Alternative Base Plan and for Alternative Plan 1. Alternative Plan 2 also includes construction of an RCC Overlay for the Main Dam similarly to Alternative Plan 1 with identical offsite truck traffic attributable to fly-ash and cement transportation. Heavy truck traffic related to transportation of on-site produced materials, utilizing proposed Haul Route H-4 from the Auxiliary Dam staging areas to the Main Dam project area, is comparable to the Alternative Base Plan and for Alternative Plan 1.

The only additional heavy truck traffic related to construction of Alternative Plan 2 would be due to the more extensive foundation treatment proposed at the Auxiliary Dam. This alternative proposes a complete in-situ treatment of the deeper alluvial soil foundation under the proposed downstream buttress. This proposed treatment includes use of cement and bentonite that would be transported to the site along SR 178 via Haul Route H-2. As with transportation of the materials required for the RCC Overlay, the cement and bentonite would be acquired from sources near Barstow and transported to the site via SR 178 from the east over Walker Pass. The deeper in-situ soil treatment is also not expected to coincide with the timeframe of maximum demand for ready-mix concrete transportation and the maximum frequency of sand filter borrow material transportation along Haul Route H-2 indicated above, but to conservatively account for a worst case scenario for analysis purposes, it is assumed that transportation of the raw materials for the deeper in-situ soil treatment would overlap with those timeframes.

According to the Corps equipment estimates, the proposed maximum quantity and per-day-frequency of heavy truck traffic transporting the bentonite and cement would result in an additional 3 round trips per day of heavy truck traffic. This then equates to 6 ADT trip ends of heavy truck traffic or a passenger car equivalent of 12 ADT trip ends, and an increase in peak hour volume of 1 truck trip end or a passenger car equivalent of 2 trip ends attributable to project generated heavy truck traffic required for transportation of bentonite and cement for the deeper in-situ soil treatment at the downstream side of the Auxiliary Dam. This nominal increase in daily traffic volumes related to Alternative Plan 2, compared to daily traffic volumes for Alternative Plan 1 and the Alternative Base Plan, is negligible with respect to transportation facilities' service level calculations utilized for traffic impact analysis. Therefore, impact analysis results for Alternative Plan 2 can be assumed to be similar to the Alternative Base Plan and Alternative Plan 1.

Project Employee Traffic
This short-term direct impact under Alternative Plan 2 is the same as under the Alternative Base Plan and Alternative Plan 1.

Roadway Segments and Existing Intersections
This short-term direct impact under Alternative Plan 2 is slightly greater than under the Alternative Plan 1. The resulting service levels for street segment ADT volumes are shown in Table 3-37 and the resulting service levels for intersection peak hour volumes in Table 3-38. However, even with this increase in traffic, the resulting Levels of Service are not degraded below the minimum threshold of LOS "C" established by the local and state jurisdictions having authority over the existing intersections and roadways. In addition to indicating the resulting service levels, the segment table also indicates the remaining reserve ADT capacity is substantial even after the addition of project generated traffic. Therefore, this short-term direct impact is the same as under the Alternative Base Plan and Alternative Plan 1.

Alternative Plan 3
Under this alternative, all of the deficiencies remediated under Alternative Plan 2 would be included, plus additional remediation measures identified for the Main Dam. Alternative Plan 3 also involves relocating the Borel Canal conduit from the Main Dam Outlet through a tunnel under the existing and proposed spillways and reconnecting to the existing Borel Canal downstream of the Auxiliary Dam. This differs from the other three Action Alternatives, which relocate the Borel Canal conduit through the right abutment of the Auxiliary Dam. Although there would be differences, Alternative Plan 3 would require generally similar construction material, excavation, and schedule as Alternative Plan 2.

Heavy Truck Traffic
As indicated above, heavy truck traffic related to sand filter borrow material and ready-mix concrete transportation required for the construction of Alternative Plan 3 is comparable to that required for the Alternative Base Plan, Alternative Plan 1 and Alternative Plan 2. Alternative Plan 3 also includes construction of an RCC Overlay for the Main Dam and complete in-situ treatment of the deeper alluvial soil foundation under the proposed downstream buttress similar to Alternative Plan 2 with identical offsite truck traffic attributable to fly-ash, cement, and bentonite transportation. Heavy truck traffic related to transportation of on-site produced materials, utilizing proposed Haul Route H-4 from the Auxiliary Dam staging areas to the Main Dam area, would also be comparable for all the Action Alternatives.

The main difference between Alternative Plan 3 and the other three Action Alternatives is related to reconstruction of the Borel Canal. With this alternative the Borel Canal is proposed to be relocated to originate at a revised outlet at the Main Dam instead of through the right abutment of the Auxiliary Dam. According to information provided by the Corps (see Table 2-1), this revised relocation would result in a slightly lower volume of ready-mix concrete required for construction (12,500 cubic yards versus 13,000 cubic

Table 3-37
Alternative Plan #2 - Segment ADT Volumes / LOS

Roadway Segment	Year 2017 ADT without Project	Project ADT	Year 2017 Plus Project ADT	Year 2017 Plus Project ADT LOS [2]	Available Capacity for Transition to LOS C/D [2]	Available Capacity of Equiv. Truck Volume [1]
State Route 178						
– West of Elizabeth Norris Road	3,773	160	3,933	LOS "B"	33,267	16,634
– Elizabeth Norris Road to SR 155	4,661	160	4,821	LOS "B"	32,379	16,190
– SR 155 to Lake Isabella Blvd	4,661	130	4,791	LOS "B"	32,409	16,205
– Lake Isabella Blvd to McCray Road	9,100	1138	10,238	LOS "C"	3,962	1,981
– McCray Road to Ready-Mix Plant	7,991	1118	9,109	LOS "C"	5,091	2,546
– Ready-Mix Plant to Sierra Way	7,991	84	8,075	LOS "C"	6,125	3,063
– East of Sierra Way	9,211	74	9,285	LOS "C"	4,915	2,458
SR 155 (Wofford Heights Blvd) / Burlando Road						
– State Route 178 to Keyesville Road	6,659	290	6,949	LOS "B"	7,251	3,626
– Keyesville Rd to Old State Road	6,437	60	6,497	LOS "B"	7,703	3,852
– Old State Road to Jct SR 155/Evans Rd	6,992	40	7,032	LOS "B"	30,168	15,084
– Jct SR 155/Evans Road to Bristlecone Drive	6,304	30	6,334	LOS "B"	30,866	15,433
– Bristlecone Drive to Kern River Drive	5,344	30	5,374	LOS "B"	8,826	4,413
– Kern River Drive to Sierra Way	7,823	20	7,843	LOS "B"	29,357	14,679
Sierra Way						
– North of Kernville Road	4,963	*10*	4,973	LOS "B"	9,227	4,614
– South of Kernville Road	2,885	*10*	2,895	LOS "B"	11,305	5,653
– North of SR 178	1,571	*10*	1,581	LOS "B"	12,619	6,310

[1]Available Truck Capacity is based on applying a 2.0 Passenger Car Equivalent factor to the available passenger car capacity.
[2]Roadway Capacities/Service Levels for Uninterrupted Flow Highways (From Florida Department of Transportation, Generalized Service Volume Tables, Table 4-3, Dated 9/4/09)

Configuration	LOS "B" ADT	LOS "C" ADT	LOS "D" ADT	LOS "E" ADT
2 LANE UNDIVIDED	7,800	14,200	20,000	25,600
2 LANE DIVIDED	8,190	14,910	21,000	26,880
4 LANE DIVIDED	23,800	37,200	48,000	54,600
6 LANE DIVIDED	35,600	55,800	72,000	82,000

Table 3-38
Alternative Plan 2 Intersection Peak Hour Volumes/LOS

Intersection	Existing Peak Hour Volume	Year 2017 Peak Hour Volume	Project Peak Hour Volume (PCE)	Total 2017 Peak Hour Volume	LOS / (Ave. Delay)
SR 178 EB Ramps & SR 155 - AM Peak	525	579	69	648	A (<10 sec)
SR 178 EB Ramps & SR 155 - PM Peak	536	591	60	651	A (<10 sec)
SR 178 WB Ramps & SR 155 - AM Peak	485	535	124	659	A (<10 sec)
SR 178 WB Ramps & SR 155 - PM Peak	510	563	124	687	A (<10 sec)
SR 155 & Barlow Road - AM Peak	377	416	167	583	A (<10 sec)
SR 155 & Barlow Road - PM Peak	425	469	167	636	A (<10 sec)
SR 155/Burlando & SR155/Evans - AM Peak	402	444	20	464	A (<10 sec)
SR 155/Burlando & SR155/Evans - PM Peak	473	522	20	542	A (<10 sec)
Kernville Rd & Sierra Way - AM Peak	250	276	10	286	A (<10 sec)
Kernville Rd & Sierra Way - PM Peak	280	309	10	319	A (<10 sec)
SR 178 & Sierra Way - AM Peak	284	313	18	331	A (<10 sec)
SR 178 & Sierra Way - PM Peak	311	343	18	361	A (<10 sec)
SR 178 & Vista Grande Dr - AM Peak	303	334	18	352	A (<10 sec)
SR 178 & Vista Grande Dr - PM Peak	366	404	18	422	A (<10 sec)
SR 178 & Ready-Mix Entrance - AM Peak	263	290	40	330	A (<10 sec)
SR 178 & Ready-Mix Entrance - PM Peak	329	363	40	403	A (<10 sec)
SR 178 & Patterson Ln - AM Peak	263	290	86	376	A (<10 sec)
SR 178 & Patterson Ln - PM Peak	326	360	86	446	A (<10 sec)
SR 178 & Entrada Blvd - AM Peak	340	375	91	466	A (<10 sec)
SR 178 & Entrada Blvd - PM Peak	403	445	91	536	A (<10 sec)
SR 178 & McCray Rd - AM Peak	476	525	96	621	A (<10 sec)
SR 178 & McCray Rd - PM Peak	523	577	96	673	A (<10 sec)
SR 178 & Lake Isabella Blvd - AM Peak	476	525	101	626	A (<10 sec)
SR 178 & Lake Isabella Blvd - PM Peak	500	552	101	653	A (<10 sec)

Notes:
PHV = Peak Hour Volume
PCE = Passenger Car Equivalent
LOS = Level of Service

yards). However, the Corps equipment estimates for this alternative indicate that the quantity of highway trucks and per-day-frequency of these trucks utilized is similar to that for the previously discussed alternatives.

Since the quantity of highway trucks and per-day frequency of these trucks required for construction of Alternative Plan 3 is comparable to that for Alternative Plan 2, impact analysis results for Alternative Plan 3 is similar to Alternative Plan 2.

Project Employee Traffic
This short-term direct impact under Alternative Plan 3 is the same as under the Alternative Base Plan and Alternative Plans 1 and 2.

Roadway Segments and Existing Intersections
This short-term direct impact under Alternative Plan 3 is slightly less than under the Alternative Plan 2. The resulting service levels for street segment ADT volumes are shown in Table 3-39 and the resulting service levels for intersection peak hour volumes in Table 3-40. However, even with this increase in traffic, the resulting Levels of Service are not degraded below the minimum threshold of LOS "C" established by the local and state jurisdictions having authority over the existing intersections and roadways. In addition to indicating the resulting service levels, the segment table also indicates the remaining reserve ADT capacity is substantial even after the addition of project generated traffic. Therefore, this short-term direct impact is the same as under the Alternative Base Plan and Alternative Plans 1 and 2.

Alternative Plan 4
Under this alternative, the deficiencies remediated in the Base Plan Alternative would be included, plus additional remediation measures identified for the Existing and Emergency Spillways, Main Dam, and Auxiliary Dam, which include installing a filter and drain system, raising the dam crests and existing spillway walls by 16 feet, widening the emergency spillway to 900 feet, realigning State Highway 178, and installing a flood gate where the new Main Dam embankment would intersect State Highway 155. A detailed traffic analysis for this alternative is being undertaken by the Corps and the results will be included in the Final EIS. However, this alternative would have traffic and circulation impacts similar to the Base Plan Alternative with the primary differences being an increase in transport of materials for the dam crest raises and spillway widening, and a realignment of State Highway 178.

Heavy Truck Traffic
As discussed under the Alternative Base Plan, the largest volume of heavy truck traffic estimated to be generated should occur when construction of Borel Canal Tunnel Inlet Structure and the construction of the Emergency Spillway Labyrinth Weir overlap with transportation of the sand filter borrow material. The number of round trips per day under this alternative would be similar to those estimated for the Alternative Base Plan; however, the duration of hauling would be extended to provide for construction of the dam raises and a widened Emergency Spillway. As discussed under the Alternative Base

Table 3-39
Alternative Plan 3 - Segment ADT Volumes / LOS

Roadway Segment	Year 2017 ADT without Project	Project ADT	Year 2017 Plus Project ADT	Year 2017 Plus Project ADT LOS [2]	Available Capacity for Transition to LOS C/D [2]	Available Capacity of Equiv. Truck Volume [1]
State Route 178						
– West of Elizabeth Norris Road	3,773	160	3,933	LOS "B"	33,267	16,634
– Elizabeth Norris Road to SR 155	4,661	160	4,821	LOS "B"	32,379	16,190
– SR 155 to Lake Isabella Blvd	4,661	124	4,785	LOS "B"	32,415	16,208
– Lake Isabella Blvd to McCray Road	9,100	1132	10,232	LOS "C"	3,968	1,984
– McCray Road to Ready-Mix Plant	7,991	1112	9,103	LOS "C"	5,097	2,549
– Ready-Mix Plant to Sierra Way	7,991	78	8,069	LOS "C"	6,131	3,066
– East of Sierra Way	9,211	68	9,279	LOS "C"	4,921	2,461
SR 155 (Wofford Heights Blvd) / Burlando Road						
– State Route 178 to Keyesville Road	6,659	284	6,943	LOS "B"	7,257	3,629
– Keyesville Rd to Old State Road	6,437	60	6,497	LOS "B"	7,703	3,852
– Old State Road to Jct SR 155/Evans Rd	6,992	40	7,032	LOS "B"	30,168	15,084
– Jct SR 155/Evans Road to Bristlecone Drive	6,304	30	6,334	LOS "B"	30,866	15,433
– Bristlecone Drive to Kern River Drive	5,344	30	5,374	LOS "B"	8,826	4,413
– Kern River Drive to Sierra Way	7,823	20	7,843	LOS "B"	29,357	14,679
Sierra Way						
– North of Kernville Road	4,963	*10*	4,973	LOS "B"	9,227	4,614
– South of Kernville Road	2,885	*10*	2,895	LOS "B"	11,305	5,653
– North of SR 178	1,571	*10*	1,581	LOS "B"	12,619	6,310

[1]Available Truck Capacity is based on applying a 2.0 Passenger Car Equivalent factor to the available passenger car capacity.
[2]Roadway Capacities/Service Levels for Uninterrupted Flow Highways (From Florida Department of Transportation, Generalized Service Volume Tables, Table 4-3, Dated 9/4/09)

Configuration	LOS "B" ADT	LOS "C" ADT	LOS "D" ADT	LOS "E" ADT
2 LANE UNDIVIDED	7,800	14,200	20,000	25,600
2 LANE DIVIDED	8,190	14,910	21,000	26,880
4 LANE DIVIDED	23,800	37,200	48,000	54,600
6 LANE DIVIDED	35,600	55,800	72,000	82,000

Table 3-40
Alternative Plan 3 – Intersection Peak Hour Volumes/LOS

Intersection	Existing Peak Hour Volume	Year 2017 Peak Hour Volume	Project Peak Hour Volume (PCE)	Total 2017 Peak Hour Volume	LOS / (Ave. Delay)
SR 178 EB Ramps & SR 155 - AM Peak	525	579	69	648	A (<10 sec)
SR 178 EB Ramps & SR 155 - PM Peak	536	591	60	651	A (<10 sec)
SR 178 WB Ramps & SR 155 - AM Peak	485	535	124	659	A (<10 sec)
SR 178 WB Ramps & SR 155 - PM Peak	510	563	124	687	A (<10 sec)
SR 155 & Barlow Road - AM Peak	377	416	167	583	A (<10 sec)
SR 155 & Barlow Road - PM Peak	425	469	167	636	A (<10 sec)
SR 155/Burlando & SR155/Evans - AM Peak	402	444	20	464	A (<10 sec)
SR 155/Burlando & SR155/Evans - PM Peak	473	522	20	542	A (<10 sec)
Kernville Rd & Sierra Way - AM Peak	250	276	10	286	A (<10 sec)
Kernville Rd & Sierra Way - PM Peak	280	309	10	319	A (<10 sec)
SR 178 & Sierra Way - AM Peak	284	313	18	331	A (<10 sec)
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SR 178 & Vista Grande Dr - AM Peak	303	334	18	352	A (<10 sec)
SR 178 & Vista Grande Dr - PM Peak	366	404	18	422	A (<10 sec)
SR 178 & Ready-Mix Entrance - AM Peak	263	290	40	330	A (<10 sec)
SR 178 & Ready-Mix Entrance - PM Peak	329	363	40	403	A (<10 sec)
SR 178 & Patterson Ln - AM Peak	263	290	86	376	A (<10 sec)
SR 178 & Patterson Ln - PM Peak	326	360	86	446	A (<10 sec)
SR 178 & Entrada Blvd - AM Peak	340	375	91	466	A (<10 sec)
SR 178 & Entrada Blvd - PM Peak	403	445	91	536	A (<10 sec)
SR 178 & McCray Rd - AM Peak	476	525	96	621	A (<10 sec)
SR 178 & McCray Rd - PM Peak	523	577	96	673	A (<10 sec)
SR 178 & Lake Isabella Blvd - AM Peak	476	525	101	626	A (<10 sec)
SR 178 & Lake Isabella Blvd - PM Peak	500	552	101	653	A (<10 sec)

Notes:
PHV = Peak Hour Volume
PCE = Passenger Car Equivalent
LOS = Level of Service

Plan, the addition of daily construction-related truck traffic volumes on SR 178 and SR 155 is not expected to substantially alter traffic flow in most circumstances.

Project Employee Traffic

This short-term direct impact under Alternative Plan 4 is similar to the Alternative Base Plan.

Roadway Segments and Existing Intersections

This short-term direct impact under Alternative Plan 4 is similar to the Alternative Base Plan. However, this alternative includes realignment of SR 178, the construction of which will increase the temporary potential for significant effects identified under the Alternative Base Plan. For the purpose of this analysis, it is assumed that necessary roadway realignment would be completed prior to the use of these routes to transport materials for dam construction; thus, the impacts would by similar to those discussed under the Alternative Base Plan.

3.7.4 Environmental Commitments/Mitigation Measures

Although there are no specific mitigation measures required for maintaining acceptable service levels at the various traffic facilities analyzed, mitigation measures listed below are recommended to reduce the level of impacts resulting from the traffic generated by construction of any of the proposed Action Alternatives. These mitigation measures should be identified in a contractor-prepared *Traffic Safety Management Plan* for the proposed Isabella DSM Project.

The appropriate construction contractor from those selected by the Corps for the Isabella DSM Project should develop and implement this Plan in coordination with the local jurisdictions having authority over the specific roadways. The Plan should be submitted and approved by the various jurisdictions before any on-site construction affecting the local transportation facilities.

The Plan should include the following general and specific provisions:

- Providing temporary traffic control devices, in accordance with CalTrans' California Manual on Uniform Traffic Control Devices. This may include slow-moving-vehicle warning signs, barriers for separating construction and non-construction traffic, use of traffic control flagmen, and any additional measures required for the sole convenience of safely passing non-construction traffic through and around construction areas and access points thereto.
- Scheduling heavy truck traffic hauling import materials to the site during non-peak periods to the maximum extent possible; Scheduling worker shift changes so as not to coincide with existing background traffic peak periods if feasible. Additionally, it is suggested that bulk hauling of sand filter material commence as soon as on-site storage and staging areas are developed. This would result in

fewer impacts to the existing facilities by spreading out the required import operation over a longer period of time.

- Establishing procedures for coordinating with local emergency response agencies to ensure dissemination of information regarding emergency response vehicle routes affected by construction. This coordination would be especially crucial for any temporary road closures required for safety measures related to blasting operations during execution of the project as indicated above. Proper notification and coordination with the local emergency response agencies will be critical for these road closures to ensure that emergency vehicle access is not affected.

- Selecting material haul routes that would result in the least impact on the transportation facilities. For instance, if additional haul routes are required, other than those already identified by the Corps, existing roadways should be selected that would result in the least amount of impact to existing background traffic. Examples would include the use of Sierra Way in lieu of SR 155 if transportation routes were required from the north side of the lake. This possible route from the north would then continue from the intersection of Sierra Way and SR 178 travelling westerly along SR 178 to the project's various staging areas. This route would have less overall impact than to travel along Burlando Road and SR 155 through Kernville and Wofford Heights since these roads are used extensively by local drivers as they pass through these communities. Sierra Way has less traffic and does not pass through any established communities. SR 178 passes through several communities, but as it traverses through the larger communities of South Lake, Mountain Mesa, and Lake Isabella, there are frontage roads that reduce the local traffic demand on SR 178.

- Expanding intersections used for project access, to the extent feasible, to provide dedicated turn lanes for vehicles entering and exiting the project. This expansion would help to reduce turning movement conflicts between existing background traffic and project-generated traffic.

- Encouraging carpooling among construction personnel to reduce commute trips to and from the project site.

3.8 NOISE AND VIBRATION

This section presents a discussion of the regulatory setting for noise and vibration, the affected environment, and the potential noise- and vibration-related impacts from the proposed Action Alternatives and support actions.

3.8.1 Regulatory Setting

The Federal, State, and local laws and regulations regarding noise and vibration that are relevant to Isabella DSM Project are summarized in the following paragraphs. State and local requirements are included that were helpful in characterizing the overall context of the analyses, even though some of these requirements do not directly apply to this Federal action.

Federal Regulations

<u>*US Environmental Protection Agency*</u>

In response to the Federal Noise Control Act of 1972, the EPA has identified noise levels requisite to protect public health and welfare against hearing loss, annoyance, and activity interference (EPA 1974; Table 3-41).

Table 3-41
Summary of Noise Levels Identified as Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety

Effect	Level dBA[1]	Activity Area
Hearing Loss	70 L_{eq} (24-hour)	All Areas
Outdoor activity interference and annoyance	55 L_{dn}[2] 55 L_{eq} (24-hour)[3]	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use. Outdoor areas where people spend limited amounts of time (e.g., school yards, playgrounds).
Indoor activity interference and annoyance	45 L_{dn}[2] 45 L_{eq} (24-hour)[3]	Indoor residential areas. Other indoor areas with human activities (e.g., school yards, playgrounds).

Source: EPA 1974

[1]A-weighted decibel is a measure on a logarithmic scale which indicates the squared ratio of sound pressure to a reference sound pressure. A-weighted (A) refers to the specific frequency-dependent rating scale that is used to approximate human response.

[2]Day-night level is the energy-average of the A-weighted noise levels during 24 hours with 10 dBA added to the night (10 PM to 7 AM).

[3]Equivalent noise level (L_{eq} is the energy mean (average) noise level. The instantaneous noise levels during a specific period (e.g., 24 hours) in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value is calculated, which is then converted back to dBA to determine the 24-hour L_{eq}.

One of the purposes of this document is to provide a basis for State and local governments' judgments in setting standards. In doing so, the information presented by the EPA must be used along with other relevant factors. These factors include the balance between costs and benefits associated with setting standards at particular noise levels, the nature of the existing or projected noise problems in any particular area, and the local aspirations and the means available to control environmental noise.

The document (EPA 1974) identifies a 24-hour exposure level of 70 A-weighted decibels (dBA) as the level of environmental noise that would prevent any measurable hearing loss over a lifetime. Likewise, levels of 55 dBA outdoors and 45 dBA indoors are identified as preventing activity interference and annoyance. These levels of noise are considered those that permit spoken conversation and other activities, such as sleeping, working, and recreation that are part of daily living. The levels are not single event or peak levels but represent averages of acoustic energy over such periods as 8 or 24 hours and over even longer periods, such as years.

US Department of Transportation

The US Department of Transportation (DOT) Federal Highway Administration (FHWA) has established two types of criteria for evaluating noise impacts associated with highway projects: one related to land-use type and the other to the existing noise levels. The first type of noise assessment criteria (NAC) is shown in Table 3-42.

Table 3-42
Summary of Noise Abatement Criteria

Activity Category	NAC, Hourly A-Weighted Noise Level (dBA-L_{eq}[h])	Description of Activities
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67(Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in categories A or B above.
D	—	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: FHWA 1995

FHWA requires that primary consideration be given to exterior areas (Activity Categories A, B, and C). The interior NAC is used only where either there are no affected exterior activities or exterior activities are not impacted because of sufficient distance or shielding from the roadway. The second type of NAC is a substantial increase in noise levels.

The DOT Federal Transit Administration (FTA) has established a method for assessing construction source noise levels (FTA 2006). Unless local noise ordinances can be found to apply, this method can be used to develop criteria on a project-specific basis. For major construction projects where a known noise-sensitive receptor (e.g., residential land use) is next to the site, the use of the levels in Table 3-43 is recommended by the FTA.

To address the human response to ground-borne vibration, the FTA has also set forth guidelines for maximum-acceptable vibration criteria for different types of land uses. These include 65 vibration decibels (VdB) referenced to 1 micro-inch per second (μin/sec) and based on the root mean square (RMS) velocity amplitude for land uses, where low ambient vibration is essential for interior operations (e.g., hospitals, high-

Table 3-43
Summary of Recommended Noise Levels for Major Construction Projects with Adjacent Noise-Sensitive Receptors

	L_{eq} (8-Hour) dBA		L_{dn} (30-Day Average) dBA
Land Use	**Day**	**Night**	
Residential	80	70	75

Source: FTA 2006

tech manufacturing, laboratory facilities), 80 VdB for residential uses and buildings where people normally sleep, and 83 VdB for instructional land uses with primarily daytime operations (e.g., schools, churches, clinics, offices; FTA 2006).

State Regulations

<u>*Governor's Office of Planning and Research*</u>

The California Governor's Office of Planning and Research (OPR) published the General Plan Guidelines (COPR 2003), which provides guidance for the acceptability of projects within specific L_{dn} contours. Generally, residential uses (e.g., mobile homes) are considered to be acceptable in areas where exterior noise levels do not exceed 60 dBA L_{dn}. Residential uses are normally unacceptable in areas exceeding 70 dBA L_{dn} and are conditionally acceptable within 55 to 70 dBA L_{dn}. Schools are normally acceptable in areas up to 70 dBA L_{dn} and normally are unacceptable in areas exceeding 70 dBA L_{dn}. Commercial uses are normally acceptable in areas up to 70 dBA Community Noise Equivalent Level (CNEL). At between 67.5 and 77.5 dBA L_{dn}, commercial uses are conditionally acceptable, depending on the noise insulation features and the noise reduction requirements. The guidelines also present adjustment factors that may be used to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

<u>*California Department of Transportation*</u>

CalTrans adopts the NAC criteria shown in Table 3-42 for state- or Federal government-funded roadway projects. However, CalTrans guidelines also define a noise increase as substantial when the predicted noise levels with project implementation exceed existing noise levels by 12 dBA (CalTrans 2006).

For the protection of fragile, historic, and residential structures, CalTrans recommends a more conservative threshold of 0.2 in/sec Peak Particle Velocity (PPV) for normal residential buildings and 0.08 in/sec PPV for old or historically significant structures (CalTrans 2004). These standards are more stringent than the Federal standard established by Committee of Hearing, Bio Acoustics, and Bio Mechanics, presented above.

Local Regulations

The Kern River Valley Specific Plan (KRVSP) Noise Element establishes specific goals, policies, and implementation measures for noise within the Plan area, which includes Isabella Lake and vicinity. The intent of these items is to minimize the impacts of noise on sensitive receptors, while preserving the rural small-town atmosphere of the area. The specific goals, policies, and implementation measures of the noise element are shown below.

The KRVSP notes that the community noise environment consists of a variety of sounds, some near and some far, that vary over 24 hours. Correspondingly, the KRVSP uses L_{dn} for its noise standard; this conforms to the Kern County General Plan Noise Element, which establishes acceptable noise standards of 65 dB L_{dn} for exterior areas and 45 dB L_{dn} for interior areas.

Noise Goals of the KRVSP Noise Element include:

- **Goal 7.1.1—**Minimize the impacts of noise on sensitive land uses;
- **Goal 7.1.2—**Reduce temporary noise disturbances; and
- **Goal 7.1.3—**Preserve the rural small-town atmosphere by controlling noise levels.

Noise Policies of the KRVSP Noise Element include:

- **Policy 7.1.1—**Require noise compatibility between existing and future development. Effective mitigation measures may be incorporated into project design. Such mitigation should be designed to reduce noise to
  - 65 dB L_{dn} or less in outdoor activity areas and
  - 45 dB L_{dn} or less in interior living spaces or other noise sensitive interior spaces;
- **Policy 7.1.2**—The burden of providing acoustical compatibility should not be placed on existing development but rather the proposed discretionary project.
- **Policy 7.1.3**—Commercial and industrial uses sited next to sensitive land uses should minimize potential noise and health hazards.
- **Policy 7.1.4**—Noise attenuation measures, as defined by the Kern County Noise Element, Development Standards, and any pertinent noise studies (such as setbacks, clustering, berming, and sound walls), should guide future planning and development decisions.

- **Policy 7.1.5**—Find that existing noise impacts have been reduced to 45 dB L_{eq} (interior) and 65 dB L_{eq} (exterior) by using the best available noise control methods.

Implementation Measures of the KRVSP Noise Element include:

- **IM 7.1.1**—During future discretionary projects, identify noise impact areas exposed to existing or projected noise levels exceeding 65 dB L_{eq} (exterior).
- **IM 7.1.2—**An acoustical study should be required for discretionary projects, as determined by the Planning Director.
- **IM 7.1.3—**Noise attenuation measures (such as setbacks, clustering, berming, and sound walls) should be required as conditions of project approval before or as part of construction in areas subject to excessive noise.
- **IM 7.1.4—**A condition of approval for developments subject to discretionary review should require that grading and building plans contain the text, "During grading and construction, all activities shall be limited to 7:00 AM to 7:00 PM Monday through Friday. Construction will not be allowed on weekends or Federal holidays." Verification of compliance with this statement would be the responsibility of the Kern County Building Inspection Department.
- **IM 7.1.5—**All discretionary development proposals should be reviewed for compatibility with the adopted Airport Land Use Compatibility Plan. Appropriate limitations and conditions should be incorporated to address compatibility with the Kern Valley Airport. Incompatible uses should not be permitted unless appropriate findings regarding public health and safety could be made.

3.8.2 Affected Environment

Characteristics of Environmental Noise

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound that disrupts or interferes with normal human activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise, the perceived importance of the noise and its appropriateness in the setting, the time of day and the type of activity during which the noise occurs, and the sensitivity of the individual.

Sound is a physical phenomenon consisting of minute pressure variations that travel through a medium, such as air, and are sensed by the human ear. Sound is generally characterized by a number of variables, including frequency and intensity. Frequency describes the sound's pitch and is measured in hertz (Hz), while intensity describes the sound's loudness and is measured in decibels (dB). Decibels are measured using a logarithmic scale. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above about 120 dB begin to be felt inside the human ear as discomfort and eventually pain at still higher levels.

Because of the logarithmic nature of the decibel, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. However, some simple rules of thumb are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example: 60 dB + 60 dB = 63 dB, and 80 dB + 80 dB = 83 dB.

Hertz is an indicator of the rate at which pressure fluctuations occur. For example, when a drummer beats a drum, the skin of the drum vibrates a number of times per second. A particular tone that makes the drum skin vibrate 100 times per second generates a sound pressure wave that is oscillating at 100 Hz, and this pressure oscillation is perceived as a tonal pitch of 100 Hz. Sound frequencies between 20 Hz and 20,000 Hz are within the range of sensitivity of the best human ear.

Sound from a tuning fork contains a single frequency referred to as a tone. In contrast, most sounds heard in the environment do not consist of a single frequency but a broad band of frequencies differing in sound level. The method commonly used to quantify environmental sounds consists of evaluating all of the frequencies of a sound according to a weighting system that reflects how human hearing is less sensitive at lower frequencies and higher frequencies than at the mid-range frequencies, about 200 Hz to 5,000 Hz. The most commonly used filter introduces an A weighting, and the decibel level measured is called the A-weighted sound level (dBA). In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve.

Although the A-weighted sound level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of noise from distant sources that creates a relatively steady background noise in which no particular source is identifiable. A single descriptor called the equivalent sound level (L_{eq}) is used. The L_{eq} is the energy-mean A-weighted sound level during a measured interval. It is the "equivalent" constant sound level that would have to be produced by a given source to equal the fluctuating level measured.

Two other descriptors describe noise exposure over a 24-hour period. The first is known as the day-night average noise Level (L_{dn}). It is calculated by adding a 10-decibel penalty to sound levels at night (10:00 PM to 7:00 AM) to compensate for the increased sensitivity to noise during the quieter nighttime hours. The L_{dn} is used by jurisdictions (such as the State of California and Kern County) to define acceptable land use compatibility with respect to noise. Sound levels of typical noise sources and environments are provided in Table 3-44 to provide a frame of reference.

Table 3-44
Typical A-Weighted Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 1,000 feet		
	— 100 —	
Gas lawn mower at 3 feet		
	— 90 —	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	— 80 —	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	— 70 —	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	— 60 —	
		Large business office
Quiet urban daytime	— 50 —	Dishwasher next room
Quiet urban nighttime	— 40 —	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night, concert
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing

Source: CalTrans 1998

The second sound level descriptor commonly used to describe noise exposure over a 24-hour period is known as the CNEL. This is similar to the L_{dn} described above but with an additional 5 dBA "penalty" added to noise events that occur during the noise-sensitive hours between 7:00 PM and 10:00 PM, which are typically reserved for relaxation, conversation, reading, and television. If using the same 24-hour noise data, the reported CNEL is typically approximately 0.5 dBA higher than the L_{dn}.

With respect to how humans perceive and react to changes in noise levels, a 1-dBA increase is imperceptible, a 3-dBA increase is barely perceptible, a 6-dBA increase is clearly noticeable, and a 10-dBA increase is subjectively perceived as approximately twice as loud (Egan 1988), as presented in Table 3.10-5. This table was developed on the basis of test subjects' reactions to changes in the levels of steady-state pure tones or broadband noise and to changes in levels of a given noise source. It is probably most applicable to noise levels in the range of 50 to 70 dBA, as this is the usual range of voice and interior noise levels.

Table 3-45
Subjective Reaction to Changes in Noise Levels of Similar Sources

Change in Level, dBA	Subjective Reaction	Factor Change in Acoustical Energy
1	Imperceptible (except for tones)	1.3
3	Just barely perceptible	2.0
6	Clearly noticeable	4.0
10	About twice (or half) as loud	10.0

Source: Architectural Acoustics, M. David Egan, 1988

Sound Propagation and Attenuation

As sound propagates from the source to the receptor, its attenuation, or manner of noise reduction in relation to distance, depends on surface characteristics, atmospheric conditions, and the presence of physical barriers. The inverse-square law describes the attenuation caused by the pattern in which sound travels from the source to receptor. Sound travels uniformly outward from a point source in a spherical pattern with an attenuation rate of 6 dBA per doubling of distance (dBA/DD). However, from a line source (e.g., a road), sound travels uniformly outward in a cylindrical pattern with an attenuation rate of 3 dBA/DD. The surface characteristics between the source and the receptor may result in additional sound absorption or reflection. Atmospheric conditions, such as wind speed, temperature, and humidity, may affect noise levels. Furthermore, the presence of a barrier between the source and the receptor may also attenuate noise levels. The actual amount of attenuation depends on the size of the barrier and the frequency of the noise. A noise barrier may be any natural or human-made feature, such as a hill, tree, building, wall, or berm (CalTrans 2009b).

All buildings provide some exterior-to-interior noise reduction. A building constructed with a wood frame and stucco or wood sheathing exterior and dual pane windows typically provides a minimum exterior-to-interior noise reduction of 25 dBA with its windows closed. A typical mobile home or light frame structure would be expected to provide an exterior-to-interior noise level reduction of 15 to 20 dBA with windows closed (FHWA 2010).

Noise Descriptors

Environmental noise generally derives, in part, from a conglomeration of distant noise sources. Such sources may include distant traffic, wind in trees, and distant industrial or farming activities, all part of our daily lives. These distant sources create a low-level background noise in which no particular individual source is identifiable. Background noise is often relatively constant from moment to moment but varies slowly from hour to hour as natural forces change or as human activity follows its daily cycle. Superimposed on this low-level, slow varying background noise is a succession of identifiable noise events of relatively brief duration. These events may include single-vehicle passbys, aircraft flyovers, screeching brakes, and other short-term events, all causing noise level to fluctuate significantly from moment to moment (FTA 2006).

It is possible to describe these fluctuating noises in the environment using single-number descriptors. To do this allows manageable measurement, computations, and impact assessment. The following are some of the descriptors commonly used in environmental noise assessment, including this report:

- **L_{max} (Maximum Noise Level)**—The maximum instantaneous noise level during a specific period. The L_{max} may also be referred to as the "peak (noise) level";
- **L_{min} (Minimum Noise Level)—**The minimum instantaneous noise level during a specific period;
- **L_X (Statistical Descriptor)**—The noise level exceeded X percent of a specific period;
- **L_{eq} (Equivalent Noise Level)**—The energy mean (average) noise level. The instantaneous noise levels during a specific period in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value is calculated, which is then converted back to dBA to determine the L_{eq}. In noise environments determined by major noise events, such as aircraft overflights, the L_{eq} value is heavily influenced by the magnitude and number of single events that produce the high noise levels;
- **L_{dn} (Day-Night Noise Level)—**The 24-hour L_{eq} with a 10 dBA penalty for noise events that occur during the noise-sensitive hours between 10:00 PM and 7:00 AM. In other words, 10 dBA is added to noise events that occur in the nighttime, and this generates a higher reported noise level when determining compliance with noise standards. The L_{dn} attempts to account for increased sensitivity to noise at night, when most people are asleep.
- **CNEL (Community Noise Equivalent Level)—**The CNEL is similar to the L_{dn} described above but with an additional 5 dBA penalty added to noise events that occur during the noise-sensitive hours between 7:00 PM and 10:00 PM, which are typically reserved for relaxation, conversation, reading, and television. If using the same 24-hour noise data, the reported CNEL is typically approximately 0.5 dBA higher than the L_{dn}.
- **SEL (Sound Exposure Level)**—The SEL represents the total sound energy of one noise event, typically a vehicle passby or other discrete operation. SELs typically represent the noise events used to calculate the L_{eq}, L_{dn}, and CNEL.

Characteristics of Construction Vibration

Vibration is the periodic oscillation of a medium or object. The rumbling caused by the vibration of room surfaces is called structure-borne noise. Sources of ground-borne vibrations include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) or human-made causes (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, such as factory machinery, or transient, such as explosions. As is the case with airborne sound, ground-borne vibrations may be described by amplitude and frequency.

Vibration amplitudes are usually expressed in PPV or RMS, as in RMS vibration velocity. The PPV and RMS velocity are normally described in inches per second. PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal. PPV is often used in monitoring blasting vibration because it is related to the stresses that are experienced by buildings (FTA 2006; CalTrans 2004).

Although PPV is appropriate for evaluating the potential for building damage, it is not always suitable for evaluating human response. It takes some time for the human body to respond to vibration signals. In a sense, the human body responds to average vibration amplitude. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a 1-second period. As with airborne sound, the RMS velocity is often expressed in decibel notation as VdB, which serves to compress the range of numbers required to describe vibration (FTA 2006). This is based on a reference value of 1 μin/sec.

The background vibration-velocity level in residential areas is usually approximately 50 VdB. Ground-borne vibration is normally perceptible to humans at approximately 65 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels (FTA 2006).

Typical outdoor sources of perceptible ground-borne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground-borne vibration is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings. Construction can generate ground-borne vibrations, which can pose a risk to nearby structures. Constant or transient vibrations can weaken structures, crack facades, and disturb occupants (FTA 2006).

Construction vibrations can be transient, random, or continuous. Transient construction vibrations are generated by blasting, impact pile driving, and wrecking balls. Continuous vibrations result from vibratory pile drivers, large pumps, horizontal directional drilling, and compressors. Random vibration can result from jackhammers, pavement breakers, and heavy construction equipment. Table 3-46 describes the general human response to different levels of ground-borne vibration-velocity levels.

Table 3-46
Human Response to Ground-Borne Vibration Levels

Vibration Velocity VdB	Human Response
65	Approximate threshold of perception for many humans.
75	Approximate dividing line between barely perceptible and distinctly perceptible.
85	Vibration acceptable only if there are an infrequent number of events per day.

Source: FTA 2006

Local Noise Setting

Major noise sources in the vicinity of the proposed Isabella DSM Project are primarily transportation related. Traffic on local roadways is the primary noise source in the project area. Major sources of roadway noise include SRs 155 and 178. In addition to traffic noise on local roadways, occasional overflights from regional airports and the nearby Kern Valley airport contribute to the local noise environment. Other noise includes recreational noise sources, such as motor boats on Isabella Lake, and generators at Isabella Lake recreation areas.

Measured Background Noise Levels

A series of sound level measurements were conducted on Thursday and Friday, October 14 and 15, 2010, in order to quantify the existing noise environment around the project site. Measurements were conducted at locations shown on Figure3-10, with short-term ambient noise measurements of 10 minutes in duration being attended, with concurrent observations of traffic conditions, and continuous ambient noise measurements of 24 hours in duration.

Short-Term Noise Level Measurements

Short-term ambient noise data were gathered using a Larson Davis Model 824 ANSI (American National Standards Institute) Type 1 integrating sound level meter. The meter was field calibrated before each measurement with a Larson Davis Model CAL200 acoustic calibrator. The meter was mounted on a tripod five feet above the ground to simulate the average height of the human ear. The details for each measurement are described below. The results of the short-term measurements are summarized in Table 3-47.

Site ST-1 This site is on Ponderosa Road, a single-family residence, approximately 3,000 feet southeast of the center of the Isabella Lake Main Dam. ST-1 represents the closest residential receptor to the Main Dam. Noise sources at this location include vehicles on Ponderosa Road, distant traffic on SR 155, and occasional aircraft flyovers.

Site ST-2 This site is in the Pioneer Point Recreation Area, approximately 2,000 feet northwest of the center of the Isabella Lake Main Dam. ST-2 represents the closest Isabella Lake campground area to the Main Dam. Noise sources include traffic on SR 155. The campground was closed at the time of the noise measurements.

Site ST-3 This site is in the Auxiliary Dam Recreation Area, approximately 1,300 feet east of the center of the Isabella Lake Auxiliary Dam. ST-3 represents the closest Isabella Lake campground area to the Auxiliary Dam. Noise sources included traffic noise from SR 178 and recreational generators.

Figure 3-10 Noise Measurement Locations

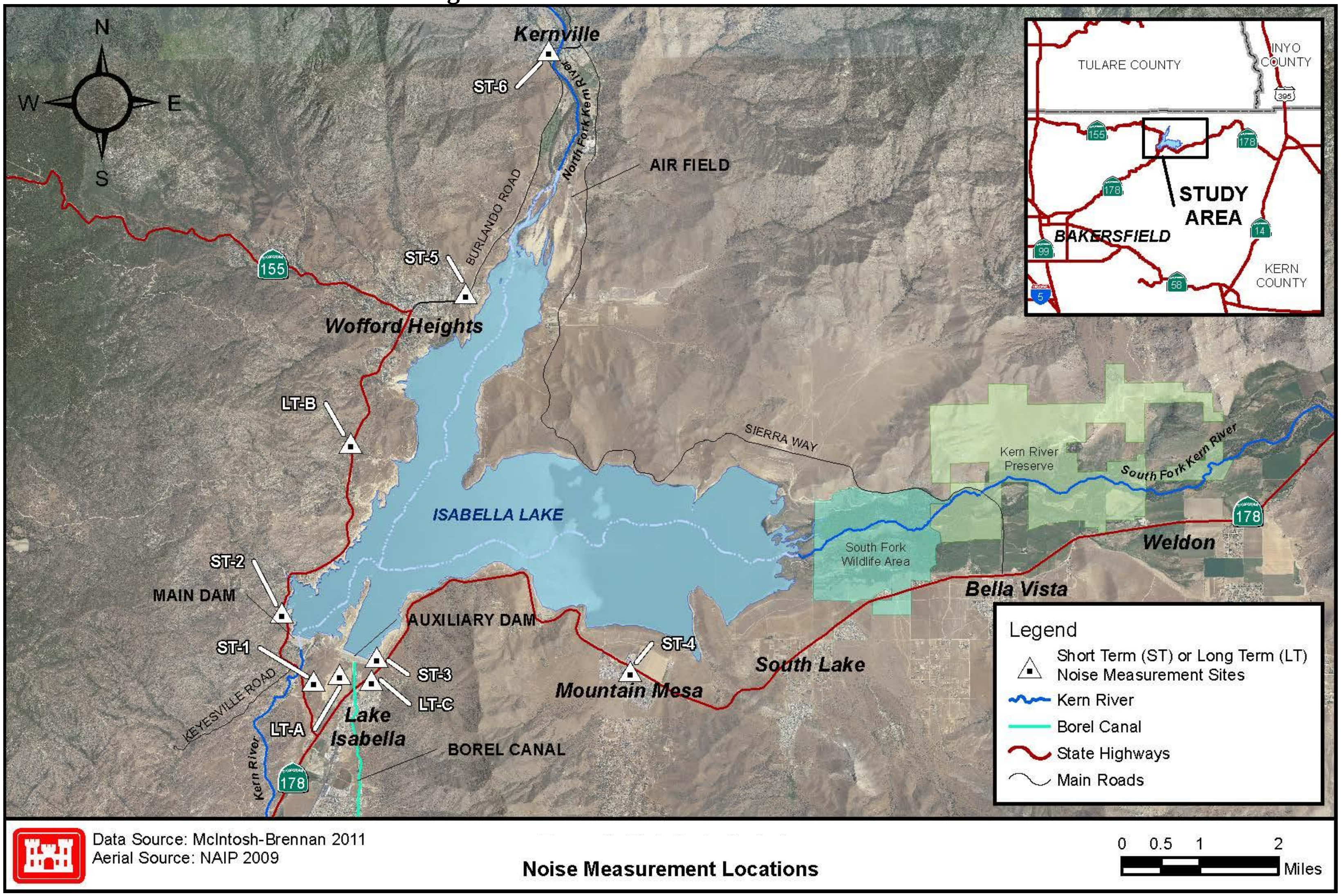


Table 3-47
Results of the Existing Ambient Noise Level Measurements

					Daytime (7 AM to 7 PM)			Evening (7 PM to 10 PM)			Nighttime (10 PM to 7 AM)		
Location	**Location Description**	**Date**	**Time**	**Ldn**	L_{eq}	L_{50}	L_{max}	L_{eq}	L_{50}	L_{max}	L_{eq}	L_{50}	L_{max}
LT-A	Barlow Drive	October 14-15, 2010	24-hr.	52	52	43	68	46	43	60	41	33	56
LT-B	Sawmill Road	October 14-15, 2010	24-hr.	61	60	56	73	56	51	72	52	44	68
LT-C	Balboa Street	October 14-15, 2010	24-hr.	55	52	48	69	49	46	64	47	36	64
ST-1	Ponderosa Road	October 14-15, 2010	Various	52[1]	54	42	72	48	39	62	36	35	41
ST-2	Pioneer Point Rec. Area	October 14-15, 2010	Various	55[1]	57	53	69	52	43	67	42	35	61
ST-3	Auxiliary Dam Rec. Area	October 14-15, 2010	Various	55[1]	43	41	54	44	43	50	49	49	54
ST-4	Mountain Mesa Road	October 14-15, 2010	Various	62[1]	63	60	75	61	59	71	52	50	62
ST-5	Nellie Dent Drive	October 14-15, 2010	Various	59[1]	61	56	73	57	45	70	47	35	64
ST-6	Circle Park, Kernville	October 14-15, 2010	Various	60[1]	57	51	66	56	54	63	52	51	63

Source: j.c. brennan & associates 2010
[1]L_{dn} values at short-term noise monitoring locations are estimated based on daytime, evening, and nighttime measured L_{eq} values.

Site ST-4 This site is on Mountain Mesa Road, near the intersection of Pine Lane and Mountain Mesa Road in the community of Mountain Mesa. The noise measurement was conducted at a distance of 120 feet from the centerline of SR 178. Noise sources included traffic on SR 178 and some noise from commercial uses.

Site ST-5 This site is in the parking lot on Nellie Dent Drive in Wofford Heights. The noise measurement was conducted at a distance of 100 feet from the centerline of Burlando Road. Noise sources included traffic on Burlando Road and occasional aircraft overflights.

Site ST-6 This site is in Circle Park in the community of Kernville. The noise measurement was conducted at a distance of 100 feet from the centerline of Kernville Road. Noise sources included traffic on Kernville Road, pedestrians, and noise from local businesses.

Continuous Noise Level Measurements

Continuous noise level data were gathered using Larson Davis Model 820 ANSI Type 1 integrating sound level meters, programmed to collect hourly noise level intervals at each site. L_{max} represents the highest noise level measured during an interval. The average value (L_{eq}) represents the energy average of all of the noise measured during an interval. The median value (L_{50}) represents the sound level exceeded 50 percent of the time during an interval. The meters were placed in watertight containers, and the microphone was mounted securely on a microphone boom in an environmental shroud so that the microphone was approximately five feet above ground level. The details for each measurement site are described below.

Site LT-A This continuous noise measurement site is on Barlow Drive, approximately 1,600 feet southwest of the center of Isabella Lake Auxiliary Dam. LT-A represents the residential receptors immediately downstream of Isabella Lake Auxiliary Dam. Noise sources at this location included distant traffic on SR 178 and occasional aircraft flyovers.

Site LT-B This continuous noise measurement site is on Sawmill Road. The noise measurement was conducted at a distance of 100 feet from the centerline of SR 155. Noise sources included traffic on SR 155 and occasional aircraft overflights.

Site LT-C This continuous noise measurement site is on Balboa Street. The noise measurement was conducted at a distance of 435 feet from the centerline of SR 178. Noise sources included traffic on SR 178 and occasional aircraft overflights.

Traffic Noise Levels

The Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA-RD-77-108) was used to determine the traffic noise levels at noise sensitive land uses in the project vicinity. The FHWA model is based on the Calveno reference noise factors for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA model inputs consisted of ADT volumes obtained from the traffic section prepared for the proposed project, CalTrans truck counts, and posted speed limits. Table 3-48 shows the predicted traffic noise levels in terms of the L_{dn} at a standard distance from the centerlines of pertinent project-area roadways for existing conditions, as well as distances to existing traffic noise contours. The extent by which land uses in the project-area are affected by traffic noise depends on their respective proximity to the roadways and their individual sensitivity to noise.

Table 3-48
Existing Traffic Noise Levels within the Project Area

Roadway	Segment	Traffic Noise Level, L_{dn}	Distance to L_{dn} Traffic Noise Contours[1]		
			70 dB	65 dB	60 dB
SR 155	Old State Road to Jct. SR 155/Evans Rd.	64.2	31	66	143
SR 155	Jct. SR 155/Evans Road to Bristlecone Drive	63.8	29	62	133
SR 155	Bristlecone Drive to Kern River Drive	63.0	26	55	120
SR 155	Kern River Drive to Sierra Way	65.1	35	76	164
Sierra Way	North of Kernville Road	60.4	17	37	80
Sierra Way	South of Kernville Road	58.0	12	26	55
Sierra Way	North of SR 178	56.5	9	20	44

Source: j.c. brennan & associates 2010
[1]Distances are reference distances from centerline of roadway

Sensitive Receptors

This section identifies sensitive receptors and land uses throughout the project area. Residences are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Other noise-sensitive land uses include schools, hospitals, convalescent facilities, parks and recreation areas, hotels, places of worship, libraries, and other uses where low interior noise levels are essential.

The following lists the noise sensitive receptors closest to the proposed project construction areas. Other noise-sensitive receptors have the potential to be affected but are farther from the project construction areas.

<u>*Main Dam/Spillway Construction*</u>

- Residences—Single-family homes on Ponderosa Road (approximately 1,000 to 3,500 feet from primary dam/spillway construction activities).

- Pioneer Point Recreation Area (approximately 1,000 to 3,500 feet from dam/spillway construction.
- French Gulch Recreation Area (approximately 3,800 to 5,500 feet from dam/spillway construction.

Auxiliary Dam and Borel Canal Construction

- Residences—Lakeside Village Mobile Home Community, located immediately south of the Auxiliary Dam and east of the Borel Canal (approximately 25 feet from the Borel Canal and 600 to 2,000 feet from the Auxiliary Dam construction).
- Residences—Single-family homes immediately south of the Auxiliary Dam and west of the Borel Canal at the end of Barlow Drive (approximately 850 feet from the Borel Canal and 1,200 to 3,000 feet from the Auxiliary Dam construction).
- Residences—Single-family homes immediately southeast of the Auxiliary Dam, east of SR 178, along Balboa Street (approximately 1,000 to 3,000 feet from the Auxiliary Dam construction.
- Auxiliary Dam Recreation Area (to be closed during construction) To be used as sand borrow and staging location).
- Old Isabella Recreation Area (approximately 1,000 feet from sand borrow site at Auxiliary Dam Recreation Area and 3,500 feet from Auxiliary Dam construction).

Receptors Along Potential Trucking Routes

- Various sensitive receptors located along SR 178. Setback distances, measured from roadway centerline, range between 40 feet and several hundred feet. This analysis conservatively assumes that a typical setback distance is approximately 75-100 feet for receptors along this roadway.
- Various sensitive receptors along SR 155/Wofford Heights Blvd./Burlando Road. Setback distances, measured from roadway centerline, range between 60 feet and several hundred feet. This analysis conservatively assumes that a typical setback distance is approximately 75 feet for receptors along this roadway.
- Various Sensitive Receptors along Sierra Way. Setback distances, measured from roadway centerline, range between 60 feet and several hundred feet. This analysis conservatively assumes that a typical setback distance is approximately 75 feet for receptors along this roadway.

South Fork Delta Sand Borrow

- Residences—Single-family homes located in the vicinity of the South Fork Delta sand borrow area (approximately 2,000 to 7,000 feet from the proposed borrow location and haul routes).

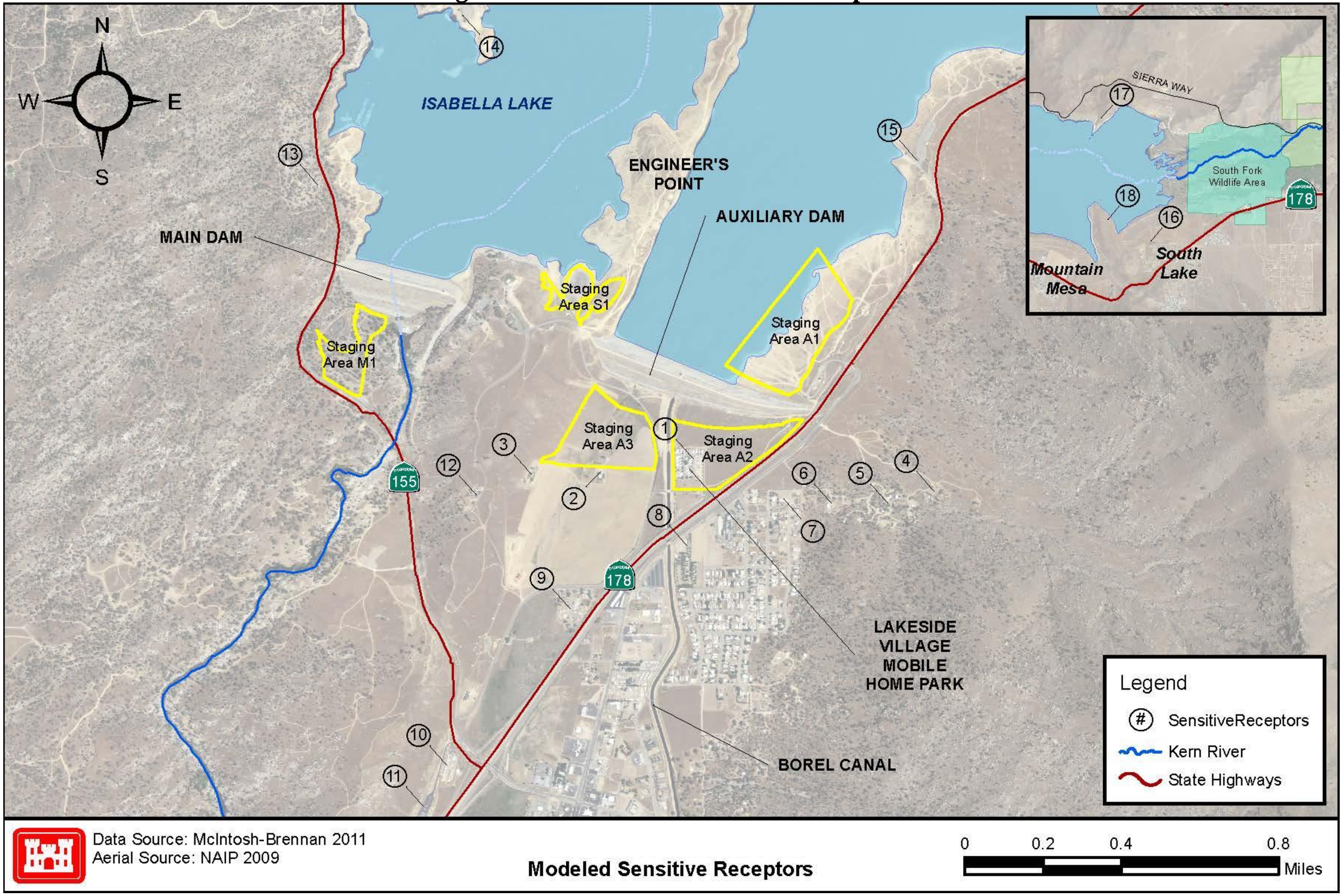
Table 3-49 identifies specific noise-sensitive receptors used in the construction noise modeling process. Figure 3-11 shows the receptor locations.

Table 3-49
Modeled Noise Sensitive Receptor Locations Next to the Isabella DSM Project

Sensitive Receptor	Description	Existing Ambient Noise Level, L_{dn}[1]	Approximate Location Coordinates
R1	Lakeside Village Mobile Home Community	52 dB	35.638878°, -118.472951°
R2	Single-family residential	52 dB	35.638823°, -118.473266°
R3	Single-family residential	52 dB	35.638829°, -118.476265°
R4	Single-family residential	52 dB	35.638067°, -118.457821°
R5	Single-family residential	52 dB	35.637709°, -118.459946°
R6	Single-family residential	55 dB	35.638065°, -118.462424°
R7	Single-family residential Subdivision	55 dB	35.638078°, -118.465264°
R8	Happy Trails Trailer Park	55 dB	35.636486°, -118.469115°
R9	Single-family residential subdivision	55 dB	35.634352°, -118.474497°
R10	Lake Isabella Motel	55 dB	35.628656°, -118.479905°
R11	Shepherd of the Hills Lutheran Church	55 dB	35.626156°, -118.481195°
R12	Single-family residential	52 dB	35.638057°, -118.479135°
R13	Pioneer Point Recreation Area	55 dB	35.649552°, -118.486245°
R14	French Gulf Recreation Area	55 dB	35.657265°, -118.480216°
R15	Old Isabella Recreation Area	55 dB	35.649517°, -118.458950°
R16	Single-family residential	52 dB	35.645847°, --118.375441°
R17	Single-family residential	52 dB	35.676786°, --118.389795°
R18	Single-family residential	52 dB	35.650926°, --118.388507°

Source: j.c. brennan & associates 2010
[1]Existing ambient noise levels are based on results obtained at nearest representative ambient noise monitoring location.

Figure 3-11 Modeled Sensitive Receptors



3.8.3 Environmental Consequences

This section discusses the potential construction-related (short-term) and operation-related (long-term) noise impacts that are anticipated from the Proposed Action Alternatives and support actions. Recommended mitigation measures and BMPs to reduce potential impacts are also discussed.

Scope and Methods

Construction-related activities would generate noise levels from heavy-duty truck travel on proposed haul routes for material transport and heavy-duty construction equipment at the proposed dam construction, staging, and borrow sites. Construction equipment would likely include scrapers, excavators, bulldozers, compactors, loaders, trucks, crushers, pumps, generators, and other miscellaneous pieces of equipment. Typical noise levels of construction equipment used in the analysis of potential impacts are shown in Table 3-50.

Worst-case, project-generated, construction-related noise levels from heavy-duty truck travel on potential haul routes were modeled using the FHWA Traffic Noise Model and the data obtained for this project. Construction-related noise impacts were determined by comparing these modeling results with applicable standards.

Also, construction-related activities would result in project-generated vibration levels from heavy-duty truck travel on proposed haul routes for material transport and heavy-duty construction equipment at the proposed dam construction, staging, and borrow sites (Figure 3-11). Construction-related impacts were determined by comparing these vibration levels at nearby sensitive receptors with applicable standards. Typical vibration levels of construction equipment used in this analysis of potential impacts are shown in Table 3-51.

This analysis assumed that the operation of the Isabella Lake dams under any of the Action Alternatives would not generate any new noise sources, because operation and maintenance of the dams would be unchanged compared with existing conditions. Following completion of the project construction, the office, vehicle maintenance, and other structures that would likely be built to accommodate contractor and Corps personnel during project construction would be removed. The number of personnel serving on-site during construction would be reduced to the number currently serving to operate and maintain the facilities.

None of the proposed project alternatives would expose people residing or working in the project area to excessive aircraft-generated noise levels. Thus, this issue is not discussed further in this analysis.

Table 3-50
Typical Construction Equipment Noise Levels

Equipment Description	Noise Level, L_{max} at 50 ft. (dBA, slow)
Auger drill rig	84
Backhoe	78
Blasting	94
Boring jack power unit	83
Chain saw	84
Clam shovel (dropping)	87
Compactor (ground)	83
Compressor (air)	78
Batch Plant	83
Concrete mixer truck	79
Concrete pump truck	81
Concrete saw	90
Crane	81
Dozer	82
Drill rig truck	79
Drum mixer	80
Dump truck	76
Excavator	81
Flatbed truck	74
Front-end loader	79
Generator	81
Gradall	83
Grader	85
Grapple (on backhoe)	87
Horizontal boring hydr. jack	82
Hydra break ram	90
Impact pile driver	101
Jackhammer	89
Man lift	75
Mounted impact hammer (hoe ram)	90
Pavement scarafier	90
Paver	77
Pickup truck	75
Pneumatic tools	85
Pumps	81
Refrigerator unit	73
Rivit buster/chipping gun	79
Rock drill	81
Roller	80
Sand blasting (single nozzle)	96
Scraper	84
Shears (on backhoe)	96
Slurry plant	78
Slurry trenching machine	80

Table 3-50
Typical Construction Equipment Noise Levels

Equipment Description	Noise Level, L_{max} at 50 ft. (dBA, slow)
Soil mix drill rig	80
Tractor	84
Vacuum excavator (vac-truck)	85
Vacuum street sweeper	82
Ventilation fan	79
Vibrating hopper	87
Vibratory concrete mixer	80
Vibratory pile driver	101
Warning horn	83
Welder/torch	74

Source: FHWA 2006

Table 3-51
Typical Construction-Equipment Vibration Levels

Equipment		PPV at 25 feet (in/sec)[1]	Approximate Lv at 25 feet[2]
Pile driver (impact)	Upper range	1.518	112
	Typical	0.644	104
Pile driver (sonic)	Upper range	0.734	105
	Typical	0.170	93
Clam shovel drop (slurry wall)		0.202	94
Large bulldozer		0.089	87
Drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58
Significance threshold		0.2/0.08[3]	80

Sources: CalTrans 2002; FTA 2006
[1]Where PPV is the peak particle velocity.
[2]Where Lv is the velocity level in decibels (VdB) referenced to 1 μinch/second and based on the root mean square (RMS) velocity amplitude.
[3]For normal residential buildings and for buildings more susceptible to structural damage, respectively.

Criteria for determining the level of noise impacts associated with the proposed Action Alternatives were based on Federal, State, and local guidance regarding noise and vibration impacts. On that basis, noise impacts were considered significant if the project would result in the following:

- Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies;
- Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels;
- Substantial permanent increase in ambient noise levels in the project vicinity above existing levels, generally defined as 3-5 dB, as shown in Table 3-47; or
- Substantial temporary or periodic increase in ambient noise levels in the project vicinity above existing levels, generally defined as 3-5 dB, as shown in Table 3-47.

The proposed Isabella DSM Project is not expected to create new sensitive receptors to excessive aircraft-generated noise levels. Therefore, this issue was not used and is not discussed further in this analysis.

No Action Alternative

Under this alternative the lake capacity would be returned to and the dam would be operated at the pre-IRRM elevation of 2,609.26 feet. There would be no Federal participation in remedial improvements under the Isabella DSM Project at the Isabella Main Dam, Spillway, or Auxiliary Dam. There would be no construction–related noise or vibration effects and no change from current noise levels resulting from construction and operation of the Isabella DSM Project. Some of the identified sensitive receptors are located in areas currently exposed to exterior and interior traffic noise levels approaching and/or exceeding the applicable Kern County noise level standards.

Alternative Base Plan

Construction Noise

Construction activities under the Alternative Base Plan would result in a direct noise impacts. Based on the modeling results for the Alternative Base Plan shown in Tables 3-52, project-generated construction-related noise levels from heavy duty truck travel on proposed haul routes; and from heavy-duty construction equipment at the proposed dam construction, staging, and borrow sites would exceed applicable standards at nearby sensitive receptors shown in Figure 3-11. In addition, construction would also create substantial temporary increases (e.g., 5 dBA) in ambient noise levels in the project vicinity at existing nearby sensitive receptors. Because construction would result in elevated noise levels that exceed applicable standards, and substantial increase in ambient noise and other maximum (L_{max}) instantaneous noise levels (e.g., backup beepers, blasting), implementation of this alternative would also result in annoyance and/or sleep disruption to occupants of the nearby existing noise-sensitive receptors. As a result, these short-term noise impacts would be adverse, high, and significant.

Based on the modeling results for this alternative (Table 3-52), project-generated construction-related noise levels from heavy-duty truck travel on potential haul routes and from heavy-duty construction equipment at the proposed dam construction sites, staging, and borrow sites would exceed applicable noise standards, or would create a significant increase (5 dBA or more) in ambient noise levels at 9 of the 18 modeled sensitive receptor locations under the Alternative Base Plan.

Therefore, short-term noise impacts associated with the Alternative Base Plan are considered adverse, high, and significant.

Vibration

Heavy equipment, such as trucks and bulldozers, would be operated during construction of the Alternative Base Plan. Vibration levels associated with the use of trucks and bulldozers are 0.076 and 0.089 in/sec PPV and 86 and 87 VdB at 25 feet, respectively

Table 3-52
Summary of Modeled Project-Generated, Construction Noise Levels Under the Alternative Base Plan

Sensitive Receptor[1]	Existing Ambient Noise Level (L_{dn}), dBA[2]	Exterior Noise Level (dBA)[3] Hourly, Leq	Exterior Noise Level (dBA)[3] Daily L_{dn}/CNEL	Estimated # of Days Exceeding 65 dB Ldn	Maximum Increase in Daily Ambient Noise Level, Ldn	Interior (dBA)[4] Maximum Daily L_{dn}/CNEL
R1	52	49-82	48-81	543	29 dB	56 dB
R2	52	50-71	49-70	258	18 dB	45 dB
R3	52	51-68	50-67	120	12 dB	42 dB
R4	52	38-62	37-61	0	7 dB	36 dB
R5	52	39-63	38-62	0	8 dB	37 dB
R6	55	41-65	40-64	0	7 dB	39 dB
R7	55	43-69	42-68	216	11 dB	43 dB
R8	55	45-66	44-65	0	8 dB	50 dB
R9	55	45-64	44-63	0	4 dB	38 dB
R10	55	38-58	37-57	0	0 dB	32 dB
R11	55	37-57	36-56	0	0 dB	31 dB
R12	52	47-66	46-65	0	8 dB	40 dB
R13	55	39-62	38-61	0	2 dB	N/A (Rec. Area)
R14	55	37-60	36-59	0	1 dB	N/A (Rec. Area)
R15	55	37-63	36-62	0	4 dB	N/A (Rec. Area)
R16	52	23-50	22-49	0	0 dB	24 dB
R17	52	23-53	22-52	0	0 dB	27 dB
R18	52	23-52	22-51	0	0 dB	26 dB

Gray shading indicates an exceedance of one of the listed noise criteria below.

Significance Threshold[5]	67 dBA L_{eq}	67 dBA L_{eq}	65 dBA L_{dn}	5 dBA Increase over Ambient	45 dBA L_{dn}

Sources: j.c. brennan & associates 2010; FHWA RCNM 2006

[1]Locations of modeled sensitive receptors are shown on Figure 3-10.

[2]Existing ambient noise levels are based on results obtained at nearest representative ambient noise monitoring location.

[3]Modeled project-generated construction-related noise levels include the following sources: heavy-duty truck travel on potential haul routes for material transport, and the major pieces of heavy-duty construction equipment at the proposed dam construction, staging, and borrow sites, and occurring for one 10-hour daylight shift/day for L_{dn} calculation. Calculations assume one nighttime (6:00 a.m. – 7:00 a.m.) hour of operation and seven daytime (7:00 p.m. – 10:00 p.m.) hours of operation for most equipment. Stationary dewatering pumps were assumed to round 24-hr/day.

[4]Based on exterior-to-interior noise reductions of 15 dBA (for mobile homes and adobe structures) and 25 dBA (for typical single-family residences).

[5]Kern County has not adopted a noise ordinance; as such, these standards represent applicable levels specified by the EPA, US Department of Transportation, the State of California, and Kern County (in the General Plan Noise Element). Noise level is not considered significant where existing noise levels currently exceed the noise standard.

(Table 3-51). Project-generated vibration levels could exceed CalTrans' recommended standard with respect to the prevention of structural damage (0.08 in/sec PPV for more susceptible buildings) and the FTA's maximum-acceptable vibration standard of 80 VdB with respect to human annoyance for residential uses at existing nearby sensitive receptors. Thus, implementation of the Alternative Base Plan could result in the generation and exposure of persons to excessive ground borne vibration or noise levels. As a result, this short-term impact is adverse, high, and significant.

Traffic Noise

The primary on-highway haul route for the proposed project would be Haul Road H2 (SR 178, east of the Auxiliary Dam). The traffic analysis (Section 3.9) estimated that 51 peak hour heavy trucks or 512 heavy truck trips per day could occur on State Route 178, east of the Auxiliary Dam staging area A1 and A2. Other haul routes include SR 155 and Barlow Road. However, these routes are predicted to carry only 20-64 truck trips per day. Employee traffic trip are predicted to be 120 trips per day, or less, on the local roadway network. The calculated traffic noise levels modeled for anticipated project truck traffic are shown in Table 3-53.

Based on the data in Table 3-53, increased project traffic and the use of local roadways for hauling project materials to the construction sites, would increase traffic noise levels at sensitive receptors living along the local roadway corridors. Receptors living closest to the roadway corridors have the greatest potential to be affected by both exterior and interior noise levels from project-related traffic noise levels. The proposed project is not anticipated to include nighttime trucking along the project haul routes. Therefore, the potential for sleep disturbance at sensitive receivers is minimized.

Table 3-53 indicates that receptors along the area roadways could be exposed to exterior and interior noise levels exceeding local noise level standards. Therefore, this short-term impact is considered adverse, high, and significant.

Table 3-53
Summary of Modeled Project-Related Traffic Noise Levels on the Local Roadway Network (Pertains to All Alternatives)

Roadway	Segment	Exterior Noise Level (dBA)[1] Existing	Exterior Noise Level (dBA)[1] Plus Project	Increase in Traffic Noise Level	Interior (dBA)[2] Daily L_{dn}/CNEL
SR 178	West of Elizabeth Norris Road	63.5	63.9	0.4	39-49
SR 178	Elizabeth Norris Road to SR 155	64.5	64.6	0.1	40-50
SR 178	SR 155 to Lake Isabella Blvd.	62.3	62.5	0.2	38-48
SR 178	Lake Isabella Blvd. to McCray Road	65.2	66.9	1.7	42-52
SR 178	McCray Road to Sierra Way	64.6	66.6	2.0	42-52
SR 178	East of Sierra Way	67.1	67.2	0.1	42-52
SR155	State Route 178 to Old State Road	63.9	64.1	0.2	39-49
SR 155	Old State Road to the junction of SR 155 and Evans Road	64.2	64.3	0.1	39-49
Burlando Road	Junction of SR 155 and Evans Road to Bristlecone Drive	63.8	63.8	0.0	39-49
Burlando Road	Bristlecone Drive to Kern River Drive	63.0	63.1	0.1	38-48
Burlando Road	Kern River Drive to Sierra Way	65.1	65.2	0.1	40-50
Sierra Way	North of Kernville Road	60.4	60.5	0.1	36-46
Sierra Way	South of Kernville Road	58.0	58.2	0.2	33-43
Sierra Way	North of SR 178	56.5	56.9	0.4	32-42
Gray shading indicates an exceedance of one of the listed noise criteria below					
	Significance Threshold[3]	N/A	65 dBA L_{dn}	5 dBA Increase	45 dBA L_{dn}

Source: j.c. brennan & associates 2010
[1]Predicted based on the worst-case traffic assumptions prepared by McIntosh & Associates.
[2]Based on exterior-to-interior noise reductions of 15 (for mobile homes and adobe structures) and 25 dBA (for typical single-family residences).
[3]Kern County has not adopted a noise ordinance; as such these standards represent applicable levels specified by the EPA, US Department of Transportation, the State of California, and Kern County (in the General Plan Noise Element). Noise level is not considered significant where existing noise levels exceed the noise standard.

It should be noted that some of the sensitive receptors predicted to be exposed to elevated traffic noise levels are located in areas currently exposed to exterior and interior traffic noise levels approaching and/or exceeding the applicable Kern County noise level standards.

<u>*Blasting Noise*</u>
The Corps has determined that some short-duration controlled blasting would need to take place to break up the bedrock within the proposed Emergency Spillway channel. It is also anticipated that some blasting may be required for the Borel Canal relocation. A *Controlled Blasting Management Plan* would be developed by the Corps or designated contractor prior to the start of construction, which would include any short-term road

closures and other public safety management measures that may be required in the vicinity of the blasting.

Blasting generally includes a series of small charges or shots which are placed in holes drilled into the rock formation. The charges or shots are detonated and are timed so that they occur in sequence (generally milliseconds apart). This is referred to as the "shot timing". The noise levels associated with blasting are generally a function of shot sizes, number of shots, depth of the blasting charges and the shot timing. Noise levels associated with blasting is generally very low frequency in nature. Assuming a *Controlled Blasting Management Plan* would be developed and followed the short-duration blasting noise impacts associated with this alternative are anticipated to be low to moderate and less-than–significant.

Alternative Plan 1

Under Alternative Plan 1, all of the deficiencies remediated under the Alternative Base Plan would be included, plus additional remediation measures identified for the Main Dam. The additional measures under Alternative Plan 1 would require the set-up and operation of a temporary concrete Batch Plant, as well as additional excavation and construction material and a longer construction schedule.

<u>Construction Noise</u>

Based on the modeling results for Alternative Plan 1 shown in Table 3-54, project-generated construction-related noise levels from heavy duty truck travel on proposed haul routes; and from heavy-duty construction equipment at the proposed dam construction, staging, and borrow sites would exceed applicable standards at nearby sensitive receptors shown on Figure 3-11. In addition, construction would also create substantial (e.g., 5 dBA) temporary increases in ambient noise levels in the project vicinity at existing nearby sensitive receptors. Because construction would result in noise levels that exceed applicable standards, a substantial increase in ambient noise, and other maximum (L_{max}) instantaneous noise levels (e.g., backup beepers, blasting), implementation of Alternative Plan 1 would also result in annoyance and/or sleep disruption to occupants of the nearby existing noise-sensitive receptors. As a result, these short-term impacts would be adverse, high and significant.

Based on the modeling results for this alternative (Table 3-54), project-generated construction-related noise levels from heavy-duty truck travel on potential haul routes and from heavy-duty construction equipment at the proposed dam construction sites, staging, and borrow sites would exceed applicable noise standards or would create a significant increase (5 dBA or more) in ambient noise levels at 12 of the 18 modeled sensitive receptor locations under Alternative Plan 1.

Therefore, short-term noise impacts associated with Alternative Plan 1 are considered adverse, high and significant.

Table 3-54
Summary of Modeled Project-Generated, Construction Noise Levels Under Alternative Plan 1

Sensitive Receptor[1]	Existing Ambient Noise Level (L_{dn}), dBA[2]	Exterior Noise Level (dBA)[3] Hourly, Leq	Exterior Noise Level (dBA)[3] Daily L_{dn}/CNEL	Estimated # of Days Exceeding 65 dB Ldn	Maximum Increase in Daily Ambient Noise Level, Ldn	Interior (dBA)[4] Maximum Daily L_{dn}/CNEL
R1	52	35-82	34-81	543	29 dB	56 dB
R2	52	36-71	35-70	258	18 dB	45 dB
R3	52	34-68	33-67	120	15 dB	42 dB
R4	52	28-62	27-61	0	9 dB	36 dB
R5	52	29-63	28-62	0	10 dB	37 dB
R6	55	30-65	29-64	0	9 dB	39 dB
R7	55	32-69	31-68	216	13 dB	43 dB
R8	55	33-66	32-65	0	10 dB	50 dB
R9	55	31-64	30-63	0	8 dB	38 dB
R10	55	26-58	25-57	0	2 dB	32 dB
R11	55	25-57	24-56	0	1 dB	31 dB
R12	52	32-66	31-65	0	13 dB	40 dB
R13	55	27-62	26-61	0	6 dB	N/A (Rec. Area)
R14	55	26-60	25-59	0	4 dB	N/A (Rec. Area)
R15	55	26-63	25-62	0	7 dB	N/A (Rec. Area)
R16	52	23-50	22-49	0	0 dB	24 dB
R17	52	23-53	22-52	0	0 dB	27 dB
R18	52	23-52	22-51	0	0 dB	26 dB
Gray shading indicates an exceedance of one of the listed noise criteria below.						
Significance Threshold[5]		67 dBA L_{eq}	67 dBA L_{eq}	65 dBA L_{dn}	5 dBA Increase over Ambient	45 dBA L_{dn}

Sources: j.c. brennan & associates 2010; FHWA RCNM 2006

[1]Locations of modeled sensitive receptors are shown on Figure 3-11.

[2]Existing ambient noise levels are based on results obtained at nearest representative ambient noise monitoring location.

[3]Modeled project-generated construction-related noise levels include the following sources: heavy-duty truck travel on potential haul routes for material transport, and the major pieces of heavy-duty construction equipment at the proposed dam construction, staging, and borrow sites, and occurring for one 10-hour daylight shift/day for L_{dn} calculation. Calculations assume one nighttime (6:00 a.m. – 7:00 a.m.) hour of operation and seven daytime (7:00 p.m. – 10:00 p.m.) hours of operation for most equipment. Stationary dewatering pumps were assumed to round 24-hr/day.

[4]Based on exterior-to-interior noise reductions of 15 dBA (for mobile homes and adobe structures) and 25 dBA (for typical single-family residences).

[5]Kern County has not adopted a noise ordinance; as such, these standards represent applicable levels specified by the EPA, US Department of Transportation, the State of California, and Kern County (in the General Plan Noise Element). Noise level is not considered significant where existing noise levels currently exceed the noise standard.

Vibration
Direct construction-related vibration impacts associated with Alternative Plan 1 would be the same as the Alternative Base Plan, which could result in the generation and exposure of persons to excessive ground borne vibration. These impacts would be considered adverse, high and significant.

Traffic Noise
Under this alternative, impacts from construction-related traffic on sensitive receptors living along local roadway corridors would be the same as with the Alternative Base Plan. The modeling results previously summarized in Table 3-53 for the Alternative Base Plan also pertain to Alternative Plan 1. Table 3-53 indicates that receptors along area roadways could be exposed to exterior and interior noise levels exceeding local noise level standards. Therefore, this impact is considered adverse, high and significant.

Blasting Noise
Under this alternative, expected short-duration noise impacts associated with blasting would be the same as with the Alternative Base Plan, and would be low to moderate and less-than-significant.

Alternative Plan 2
Under this alternative, all of the deficiencies remediated under Alternative Plan 1 would be included, plus additional remediation measures identified for the Auxiliary Dam. The additional measures under Alternative Plan 2 would require additional excavation and construction material, and a longer construction schedule.

Construction Noise
Based on the modeling results for Alternative Plan 2 shown in Table 3-55, project-generated construction-related noise levels from heavy duty truck travel on proposed haul routes; and from heavy-duty construction equipment at the proposed dam construction, staging, and borrow sites would exceed applicable standards at nearby sensitive receptors shown on Figure 3-11. In addition, construction would also create substantial (e.g., 5 dBA) temporary increases in ambient noise levels in the project vicinity at existing nearby sensitive receptors. Because construction would result in noise levels that exceed applicable standards, a substantial increase in ambient noise, and other maximum (L_{max}) instantaneous noise levels (e.g., backup beepers, blasting), implementation of Alternative Plan 2 would also result in annoyance and/or sleep disruption to occupants of the nearby existing noise-sensitive receptors. As a result, this short-term impact would be adverse, high and significant.

Based on the modeling results for this alternative (Table 3-55), project-generated construction-related noise levels from heavy-duty truck travel on potential haul routes and from heavy-duty construction equipment at the proposed dam construction sites, staging and borrow sites would exceed applicable noise standards, or create a significant increase (5 dBA or more) in ambient noise levels at 12 of the 18 modeled sensitive receptor locations under Alternative Plan 2.

Therefore, short-term noise impacts associated with Alternative Plan 2 are considered adverse, high and significant.

Vibration

Direct construction-related vibration impacts associated with Alternative Plan 2 would be the same as the Alternative Base Plan and Alternative Plan 1, which could result in the generation and exposure of persons to excessive ground borne vibration. These short-term impacts would be considered adverse, high and significant.

Traffic Noise

Under this alternative, impacts from construction-related traffic on sensitive receptors living along local roadway corridors would be the same as with the Alternative Base Plan and Alternative Plan 1. The modeling results previously summarized in Table 3-53 for the Alternative Base Plan also pertain to Alternative Plan 2. Table 3-53 indicates

Table 3-55
Summary of Modeled Project-Generated, Construction Noise Levels Under Alternative Plan 2

Sensitive Receptor[1]	Existing Ambient Noise Level (L_{dn}), dBA[2]	Exterior Noise Level (dBA)[3] Hourly, Leq	Exterior Noise Level (dBA)[3] Daily L_{dn}/CNEL	Estimated # of Days Exceeding 65 dB Ldn	Maximum Increase in Daily Ambient Noise Level, Ldn	Interior (dBA)[4] Maximum Daily L_{dn}/CNEL
R1	52	35-82	34-81	1028	29 dB	56 dB
R2	52	36-71	35-70	258	18 dB	45 dB
R3	52	34-68	33-67	120	15 dB	42 dB
R4	52	28-62	27-61	0	9 dB	36 dB
R5	52	29-63	28-62	0	10 dB	37 dB
R6	55	30-65	29-64	0	9 dB	39 dB
R7	55	32-69	31-68	216	13 dB	43 dB
R8	55	33-66	32-65	0	10 dB	50 dB
R9	55	31-64	30-63	0	8 dB	38 dB
R10	55	26-58	25-57	0	2 dB	32 dB
R11	55	25-57	24-56	0	1 dB	31 dB
R12[5]	52	32-66	31-65	0	13 dB	40 dB
R13	55	27-62	26-61	0	6 dB	N/A (Rec. Area)
R14	55	26-60	25-59	0	4 dB	N/A (Rec. Area)
R15	55	26-63	25-62	0	7 dB	N/A (Rec. Area)
R16	52	23-50	22-49	0	0 dB	24 dB
R17	52	23-53	22-52	0	0 dB	27 dB
R18	52	23-52	22-51	0	0 dB	26 dB
Gray shading indicates an exceedance of one of the listed noise criteria below.						
Significance Threshold[5]		67 dBA L_{eq}	67 dBA L_{eq}	65 dBA L_{dn}	5 dBA Increase over Ambient	45 dBA L_{dn}

Sources: j.c. brennan & associates 2010; FHWA RCNM 2006
[1]Locations of modeled sensitive receptors are shown on Figure 3-11.
[2]Existing ambient noise levels are based on results obtained at nearest representative ambient noise monitoring location.
[3]Modeled project-generated construction-related noise levels include the following sources: heavy-duty truck travel on potential haul routes for material transport, and the major pieces of heavy-duty construction equipment at the proposed dam construction, staging, and borrow sites, and occurring for one 10-hour daylight shift/day for L_{dn} calculation. Calculations assume one nighttime (6:00 a.m. – 7:00 a.m.) hour of operation and seven daytime (7:00 p.m. – 10:00 p.m.) hours of operation for most equipment. Stationary dewatering pumps were assumed to round 24-hr/day.
[4]Based on exterior-to-interior noise reductions of 15 dBA (for mobile homes and adobe structures) and 25 dBA (for typical single-family residences).
[5]Kern County has not adopted a noise ordinance; as such, these standards represent applicable levels specified by the EPA, US Department of Transportation, the State of California, and Kern County (in the General Plan Noise Element). Noise level is not considered significant where existing noise levels currently exceed the noise standard.

that receptors along area roadways could be exposed to exterior and interior noise levels exceeding local noise level standards. Therefore, this short-term impact is considered adverse, high and significant.

Blasting Noise
Under this alternative, expected short-duration noise impacts associated with blasting would be the same as with the Alternative Base Plan and Alternative Plan 1, and would be low to moderate and less-than-significant.

Alternative Plan 3
Under this alternative, all of the deficiencies remediated under Alternative Plan 2 would be included, plus additional remediation measures identified for the Main Dam. Alternative Plan 3 also involves relocating the Borel Canal conduit from the Main Dam Outlet through a tunnel under the existing and proposed spillways and reconnecting to the existing Borel Canal downstream of the Auxiliary Dam. This differs from the other three Action Alternatives, which relocate the Borel Canal conduit through the right abutment of the Auxiliary Dam. Although there would be differences, Alternative Plan 3 would require generally similar construction material, excavation, and schedule as Alternative Plan 2.

Construction Noise
Based on the modeling results for Alternative Plan 3 shown in Tables 3-56, project-generated construction-related noise levels from heavy duty truck travel on proposed haul routes; and from heavy-duty construction equipment at the proposed dam construction, staging, and borrow sites would exceed applicable standards at nearby sensitive receptors shown on Figure 3-11. In addition, construction would also create substantial (e.g., 5 dBA) temporary increases in ambient noise levels in the project vicinity at existing nearby sensitive receptors. Because construction would result in noise levels that exceed applicable standards, a substantial increase in ambient noise, and other maximum (L_{max}) instantaneous noise levels (e.g., backup beepers, blasting), implementation of Alternative Plan 3 would also result in annoyance and/or sleep disruption to occupants of the nearby

existing noise-sensitive receptors. As a result, this short-term impact would be adverse, high and significant.

Based on the modeling results for this alternative (Table 3-56), project-generated construction-related noise levels from heavy-duty truck travel on potential haul routes and from heavy-duty construction equipment at the proposed dam construction sites, staging and borrow sites would exceed applicable noise standards, or create a significant increase (5 dBA or more) in ambient noise levels at 12 of the 18 modeled sensitive receptor locations under Alternative Plan 3.

Therefore, short-term noise impacts associated with Alternative Plan 3 are considered adverse, high and significant.

Table 3-56
Summary of Modeled Project-Generated, Construction Noise Levels Under Alternative Plan 3

		Exterior Noise Level (dBA)[3]				Interior (dBA)[4]
Sensitive Receptor[1]	**Existing Ambient Noise Level (L_{dn}), dBA[2]**	**Hourly, Leq**	**Daily L_{dn}/CNEL**	**Estimated # of Days Exceeding 65 dB Ldn**	**Maximum Increase in Daily Ambient Noise Level, Ldn**	**Maximum Daily L_{dn}/CNEL**
R1	52	35-84	34-83	1028	32 dB	58 dB
R2	52	36-71	35-70	328	22 dB	45 dB
R3	52	34-68	33-67	130	16 dB	42 dB
R4	52	28-62	27-61	0	9 dB	36 dB
R5	52	29-63	28-62	0	10 dB	37 dB
R6	55	30-65	29-64	0	9 dB	39 dB
R7	55	32-69	31-68	210	13 dB	43 dB
R8	55	33-66	32-65	0	10 dB	50 dB
R9	55	31-64	30-63	0	8 dB	38 dB
R10	55	26-58	25-57	0	2 dB	32 dB
R11	55	25-57	24-56	0	1 dB	31 dB
R12	52	32-66	31-65	0	13 dB	40 dB
R13	55	27-62	26-61	0	6 dB	N/A (Rec. Area)
R14	55	26-60	25-59	0	4 dB	N/A (Rec. Area)
R15	55	26-63	25-62	0	7 dB	N/A (Rec. Area)
R16	52	23-50	22-49	0	0 dB	24 dB
R17	52	23-53	22-52	0	0 dB	27 dB
R18	52	23-52	22-51	0	0 dB	26 dB
Gray shading indicates an exceedance of one of the listed noise criteria below.						
Significance Threshold[5]		67 dBA L_{eq}	67 dBA L_{eq}	65 dBA L_{dn}	5 dBA Increase over Ambient	45 dBA L_{dn}

Sources: j.c. brennan & associates 2010; FHWA RCNM 2006
[1]Locations of modeled sensitive receptors are shown on Figure 3-11.
[2]Existing ambient noise levels are based on results obtained at nearest representative ambient noise monitoring location.

[3]Modeled project-generated construction-related noise levels include the following sources: heavy-duty truck travel on potential haul routes for material transport, and the major pieces of heavy-duty construction equipment at the proposed dam construction, staging, and borrow sites, and occurring for one 10-hour daylight shift/day for L_{dn} calculation. Calculations assume one nighttime (6:00 a.m. – 7:00 a.m.) hour of operation and seven daytime (7:00 p.m. – 10:00 p.m.) hours of operation for most equipment. Stationary dewatering pumps were assumed to round 24-hr/day.
[4]Based on exterior-to-interior noise reductions of 15 dBA (for mobile homes and adobe structures) and 25 dBA (for typical single-family residences).
[5]Kern County has not adopted a noise ordinance; as such, these standards represent applicable levels specified by the EPA, US Department of Transportation, the State of California, and Kern County (in the General Plan Noise Element). Noise level is not considered significant where existing noise levels currently exceed the noise standard.

Vibration
Direct construction-related vibration impacts associated with Alternative Plan 3 would be the same as the Alternative Base Plan and Alternative Plans 1 and 2, which could result in the generation and exposure of persons to excessive ground borne vibration. These short-term impacts would be considered adverse, high and significant.

Traffic Noise
Under this alternative, impacts from construction-related traffic on sensitive receptors living along local roadway corridors would be the same as with the Alternative Base Plan and Alternative Plans 1 and 2. The modeling results previously summarized in Table 3-53 for the Alternative Base Plan also pertain to Alternative Plan 3. Table 3-53 indicates that receptors along area roadways could be exposed to exterior and interior noise levels exceeding local noise level standards. Therefore, this short-term impact is considered adverse, high and significant.

Blasting Noise
Under this alternative, expected short-duration noise impacts associated with blasting would be the same as with the Alternative Base Plan and Alternative Plans 1 and 2, and would be low to moderate and less-than-significant.

Alternative Plan 4
Under this alternative, the deficiencies remediated in the Base Plan Alternative would be included, plus additional remediation measures identified for the Existing and Emergency Spillways, Main Dam, and Auxiliary Dam, which include installing a filter and drain system, raising the dam crests and existing spillway walls by 16 feet, widening the emergency spillway to 900 feet, realigning State Highway 178, and installing a flood gate where the new Main Dam embankment would intersect State Highway 155. A detailed analysis of noise and vibration levels that could be generated by this alternative is being undertaken by the Corps and the results will be included in the Final EIS. However, this alternative would have noise and vibration impacts similar to the Base Plan Alternative with the primary differences being an increased area of ground disturbance associated with the widening of the emergency spillway and the realignment of the roads.

Construction Noise

As with the Alternative Base Plan, this alternative would result in construction-related noise levels that would exceed applicable standards at nearby sensitive receptors. In addition, construction would also create temporary increases in ambient noise levels in the project vicinity at existing nearby sensitive receptors. The duration of significant temporary impacts would be increased by the additional construction necessary for the widening of the emergency spillway and realignment of roads. The impacts for Alternative Plan 4 would be similar to those modeled for Alternative Base Plan 3 as shown in table 3-57 below. As a result, this short-term impact would be adverse, high and significant.

Vibration

Direct construction-related vibration impacts associated with Alternative Plan 4 would be similar to the significant impacts described under the Alternative Base Plan. An extended duration of the construction of the widened emergency spillway would prolong the exposure of persons to excessive groundborne vibration. These short-term impacts would be considered adverse, high and significant.

Traffic Noise

Under this alternative, impacts from construction-related traffic on sensitive receptors living along local roadway corridors would be similar to those with the Alternative Base Plan. The modeling results previously summarized in Table 3-53 for the Alternative Base Plan also pertain to Alternative Plan 4. Table 3-53 indicates that receptors along area roadways could be exposed to exterior and interior noise levels exceeding local noise level standards. These short-term impacts would be considered adverse, high and significant.

Blasting Noise

Under this alternative, expected noise impacts associated with blasting would be the similar to those described for the Alternative Base Plan; however, the duration of impacts would be increased by the need for additional blasting for the widening of the emergency spillway and less-than-significant.

3.8.4 Environmental Commitments/Mitigation Measures

Recommended mitigation measures and BMPs to reduce potential noise impacts are described below. Even with the implementation of these measures and BMPs, it is anticipated that most of the localized noise impacts from short-term construction activities would remain significant and unavoidable.

The Corps is continuing to refine alternatives, construction methods, and schedules in an effort to avoid or reduce significant adverse noise and vibration impacts on nearby sensitive receptors. However, it may become necessary to temporarily or permanently relocate some sensitive receptors if localized noise impacts from short-term construction activities remain significant and unavoidable.

Table 3-57
Summary of Estimated Project-Generated, Construction Noise Levels Under Alternative Plan 3

Sensitive Receptor[1]	Existing Ambient Noise Level (L_{dn}), dBA[2]	Exterior Noise Level (dBA)[3] Hourly, Leq	Exterior Noise Level (dBA)[3] Daily L_{dn}/CNEL	Estimated # of Days Exceeding 65 dB Ldn	Maximum Increase in Daily Ambient Noise Level, Ldn	Interior (dBA)[4] Maximum Daily L_{dn}/CNEL
R1[5]	52	35-84	34-83	1028	32 dB	58 dB
R2	52	36-71	35-70	328	22 dB	45 dB
R3	52	34-68	33-67	130	16 dB	42 dB
R4	52	28-62	27-61	0	9 dB	36 dB
R5	52	29-63	28-62	0	10 dB	37 dB
R6	55	30-65	29-64	0	9 dB	39 dB
R7	55	32-69	31-68	210	13 dB	43 dB
R8	55	33-66	32-65	0	10 dB	50 dB
R9	55	31-64	30-63	0	8 dB	38 dB
R10	55	26-58	25-57	0	2 dB	32 dB
R11	55	25-57	24-56	0	1 dB	31 dB
R12 [5]	52	32-66	31-65	0	13 dB	40 dB
R13	55	27-62	26-61	0	6 dB	N/A (Rec. Area)
R14	55	26-60	25-59	0	4 dB	N/A (Rec. Area)
R15	55	26-63	25-62	0	7 dB	N/A (Rec. Area)
R16	52	23-50	22-49	0	0 dB	24 dB
R17	52	23-53	22-52	0	0 dB	27 dB
R18	52	23-52	22-51	0	0 dB	26 dB
Gray shading indicates an exceedance of one of the listed noise criteria below.						
Significance Threshold[6]		67 dBA L_{eq}	67 dBA L_{eq}	65 dBA L_{dn}	5 dBA Increase over Ambient	45 dBA L_{dn}

Sources: j.c. brennan & associates 2010; FHWA RCNM 2006
[1]Locations of modeled sensitive receptors are shown on Figure 3-11.
[2]Existing ambient noise levels are based on results obtained at nearest representative ambient noise monitoring location.
[3]Modeled project-generated construction-related noise levels include the following sources: heavy-duty truck travel on potential haul routes for material transport, and the major pieces of heavy-duty construction equipment at the proposed dam construction, staging, and borrow sites, and occurring for one 10-hour daylight shift/day for L_{dn} calculation. Calculations assume one nighttime (6:00 a.m. – 7:00 a.m.) hour of operation and seven daytime (7:00 p.m. – 10:00 p.m.) hours of operation for most equipment. Stationary dewatering pumps were assumed to round 24-hr/day.
[4]Based on exterior-to-interior noise reductions of 15 dBA (for mobile homes and adobe structures) and 25 dBA (for typical single-family residences).

The following mitigation measures and BMPs are recommended:

- A contractor-prepared *Construction Noise and Vibration Monitoring Plan* (CNVMP) before beginning work on the project. The plan would be prepared by an acoustical consultant recognized by Kern County. The CNVMP would include site-specific noise and vibration attenuation measures to ensure that maximum feasible noise and vibration attenuation is achieved. The CNVMP would include as many of the control strategies listed below as are feasible for this project. Project workers would be trained on the CNVMP before construction begins.

- Monitor construction noise for the project duration. The most potentially affected of the four sensitive receivers at the following locations would be selected: Main Dam construction (one receiver), Auxiliary Dam construction (one receiver), and primary haul routes (two sensitive locations). Summaries of measured noise levels would be provided weekly or more often, if noise complaints arise.
- Equip all equipment with noise control devices (e.g., mufflers), in accordance with manufacturers' specifications.
- Inspect all equipment periodically to ensure proper maintenance and presence of noise control devices (e.g., lubrication, mufflers that do not leak, and shrouding).
- Locate all stationary equipment as far as feasible from nearby residences and should be equipped with engine-housing enclosures, as feasible.
- Use portable noise barriers to shield stationary equipment, especially diesel powered dewatering pumps. Portable noise barrier placement and type would be discussed in the CNVMP.
- Use materials for temporary barriers sufficient to last through construction and maintain in good condition.
- Prevent equipment from idling more than five minutes.
- Limit blasting to daytime, and employ other measures to limit noise and vibration of blasting, such as burying charges and/or using blasting mats, spacing timing of shots, using appropriate shot size, or other measures determined by a qualified blasting engineer.
- Designate a disturbance coordinator and conspicuously post a 24-hour contact number around the project site, and supply to nearby residents. The disturbance coordinator would receive all public complaints and be responsible for determining the cause of the complaint and implementing any feasible measures to alleviate the problem.
- Provide written notice of construction-related activities to nearby sensitive receptors identifying the type, duration, and frequency of activities and a mechanism to register complaints.
- Prevent trucks and bulldozers from operating within 60 feet of any sensitive structure. If operation of equipment closer than 60 feet is required, vibration monitoring would be conducted to ensure that levels do not exceed the allowable thresholds established in this study.
- Encourage the hauling of material along sensitive routes only from 8 AM to 5 PM (daytime hours).

- Discourage the use of engine braking (“jake brakes”) along sensitive routes.
- Encourage truckers to reduce engine noise when shifting in noise sensitive areas, and post these areas.
- Conducted all rock blasting under the guidance of a qualified blasting consultant. Charges would be buried with sufficient overburden and shot timing would be included to minimize noise associated with blasting.
- Notify all residences and businesses within 1,500 feet of construction areas prior to conducting blasting.

3.9 HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTE

The following section discusses the regulatory setting for hazardous, toxic, and radiological waste (HTRW) conditions in the project area and surrounding vicinity, and potential HTRW related impacts associated with the proposed project alternatives and support actions. State and local requirements are included that were helpful in characterizing the overall context of the analyses, even though some of these requirements do not directly apply to this Federal action.

3.9.1 Regulatory Setting

A hazardous material is defined a substance that poses a present or potential hazard to human health and safety or the environment if released due to quantity, concentration, or physical or chemical characteristics (26 California Code of Regulations [CCR], 25501). Common hazardous materials include petroleum hydrocarbons, pesticides, volatile organic chemicals, and certain metals. Hazardous waste is a by-product or combination of waste that due to quantity, concentration, or physical, chemical, or infectious characteristics, may cause or contribute to an increase in deaths or an increase in serious irreversible or incapacitation-reversible illness. Substances that are a present or potential hazard to human health or the environment also constitute hazardous materials. HTRW includes any material listed as a hazardous substance under the Comprehensive Environmental Response, Compensation and Liability Act, 42 USC, 9601 et seq. (CERCLA).

The Corps provides engineering regulations for consideration of environmental issues and problems associated with civil works projects. Various Federal and State agencies exercise regulatory authority over the use, generation, transport, and disposal of hazardous substances.

Federal Regulations

The primary Federal regulatory agency responsible for HTRW oversight is the Environmental Protection Agency (EPA). Federal regulations applicable to hazardous substances are contained primarily in the Code of Federal Regulations (CFR), Titles 29 (Labor), 40 (Protection of Environment), and 49 (Transportation). Examples of other Federal regulatory agencies include the Occupational Safety and Health Administration (OSHA), the Nuclear Regulatory Commission (NRC), the Department of Transportation (DOT), and the National Institute of Health (NIH). Federal regulations governing hazardous substances are listed below.

<u>CERCLA (42 USC, 9601 et seq.)</u>

CERCLA (also called the Superfund Act; 42 USC, Sec. 9601 et seq.) is intended to protect the public and the environment from the effects of prior hazardous waste disposal and new hazardous material spills. In accordance with CERCLA, the EPA maintains a National Priority List of uncontrolled or abandoned hazardous waste sites identified for priority remediation under the Superfund program.

Superfund Amendments and Reauthorization Act (SARA) Public Law 99-499 (100 Stats. 1613)

SARA amended CERCLA on October 17, 1986, and specifically addresses the management of hazardous materials by requiring public disclosure of information on the types and quantities of hazardous materials used at various types of facilities. SARA Title III (42 USC, § 11001 et seq.) is referred to as the Emergency Planning and Community Right to Know Act. The act addresses community emergency planning, emergency release notification, and hazardous materials chemical inventory reporting.

Resource Conservation and Recovery Act (RCRA) (42 USC, 6901 et seq.)

RCRA was enacted in 1976 as an amendment to the Solid Waste Disposal Act to address the nationwide generation of municipal and industrial solid waste. RCRA gives the EPA authority to control the generation, transportation, treatment, storage, and disposal of hazardous waste, including underground tanks storing hazardous substances. RCRA addresses only active and future facilities; it does not address abandoned or historical sites, which are covered by CERCLA (see preceding section).

Clean Water Act (CWA) (33 USC, 1251 et seq.)

The CWA is the principal Federal statute protecting navigable waters and adjoining shorelines from pollution. Under the CWA, the EPA has implemented pollution control programs, such as setting wastewater standards for industry. The oil pollution regulation contains two major types of requirements: spill prevention, control, and countermeasure (SPCC) prevention requirements (SPCC rule) and facility response plan requirements.

Clean Air Act (CAA) (42 USC, 7401 et seq.)

The CAA is the comprehensive Federal law that regulates air emissions from stationary and mobile sources. This law authorizes the EPA to establish national ambient air quality standards to protect public health and welfare and regulate emissions of hazardous air pollutants.

OSHA (29 USC, 651 et seq.)

OSHA is the agency responsible for ensuring worker safety and sets Federal standards for facilitating training in the work place, setting exposure limits, and for setting safety procedures for handling hazardous substances (as well as other hazards). OSHA also establishes criteria which allow States to implement their own health and safety program.

Hazardous Material Transportation Act

The US Department of Transportation has the regulatory responsibility safe transport of hazardous materials. This act specifies driver-training requirements, load labeling procedures, and container design and safety specifications. Transporters of hazardous wastes must also meet the requirements of additional statutes such as RCRA.

Safe Drinking Water Act (42 USC, 300f et seq.)

The Safe Drinking Water Act was established to protect the quality of drinking water in the United States. This law focuses on all waters identified for drinking use, whether from above ground or underground sources. Under the Act, EPA also establishes minimum standards for State programs to protect underground sources of drinking water from contamination by underground injection of fluids.

Toxic Substances Control Act (TSCA) (15 USC 2601 et seq.)
The Toxic Substances Control Act of 1976 provides EPA with authority to require reporting, record-keeping and testing requirements, and restrictions relating to chemical substances and/or mixtures. Certain substances are generally excluded from TSCA, including food, drugs, cosmetics and pesticides.

Pollution Prevention Act (42 USC, 13101 et seq.)
The Pollution Prevention Act focused industry, government, and public attention on reducing the amount of pollution through cost-effective changes in production, operation, and raw materials use.

Corps Engineering Regulation 1165-2-132, HTRW Guidance for Civil Works Projects
This document provides guidance for consideration of issues and problems associated with HTRW, which may be within project boundaries and affect Corps civil works projects. The guidance provides information on how these considerations are factored into project planning and implementation. According to Paragraph 9a, a project in Preconstruction, Engineering and Design Phase, with no prior HTRW consideration, should have an initial assessment as appropriate for a reconnaissance study.

State Regulations
The EPA has granted states primary oversight responsibility to administer and enforce hazardous waste management programs. In addition, California State regulations, which are equal to or more stringent than Federal regulations, require planning and management to ensure that hazardous wastes are handled, stored, and disposed of properly to reduce risks to human health and the environment. State regulations are contained in CCR Title 13 (Motor Vehicles), Title 19 (Public Safety), Title 22 (Social Security), and Title 26 (Toxics).

Regulations governing the project area originate at both the Federal and State level, but many are implemented and enforced at the local or regional level.. State regulations that affect hazardous waste management are listed below.

Hazardous Waste Control Act (26 CCR)
This act created the State hazardous waste management program, which is similar to, but more stringent than, the Federal program under RCRA.

Emergency Services Act
Under this act, the State of California developed an emergency response plan to coordinate emergency services provided by Federal, State, and local agencies. Rapid response to incidents involving hazardous materials or hazardous waste is an important part of the plan, which is administered by the California Office of Emergency Services.

This office coordinates the responses of other agencies, including the EPA, the California Highway Patrol, the nine regional water quality control boards, the various air quality management districts, and county disaster response offices.

Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65)
This act requires labeling of substances known or suspected by the State to cause cancer. *California Government Code, Section 65962.5*. This code requires the Office of Permit Assistance to compile a list of potentially contaminated sites in the State. The Department of Toxic Substances Control maintains this list, which is called the Cortese List.

Hazardous Materials Transportation (Title 22 CCR, Chapter 13)
California law requires that hazardous waste (as defined in California Health and Safety Code Division 20, Chapter 6.5) be transported by a State-registered hazardous waste transporter that meets specific registration requirements.

Local Regulations

Kern County General Plan. Chapter 4 Safety Element
Section 65302 (g) of the California Government Code requires implementation of a safety element for the protection of the community from any unreasonable risks from the effects of seismicity and dam failure; from geo-hazards, in accordance with Chapter 7.8 (beginning with Section 2690) of the Public Resources Codes, and other geologic hazards known to the legislative body; flooding; and wildland and urban fires. The safety element includes mapping of known seismic and other geologic hazards. It also addresses evacuation routes, peak load water supply requirements, and minimum road widths and clearances around structures, as those items relate to identified fire and geologic hazards.

3.9.2 Affected Environment

For this analysis, the affected environment is the project construction areas and support actions described in Chapter 2 (Proposed Action and Alternatives). These include the Main Dam and Spillway construction areas, the Auxiliary Dam and Borel Canal construction areas, the staging areas and haul roads, the borrow areas at the Auxiliary Dam Recreation Area and South Fork Delta, and other areas associated with support actions.

To identify potential HTRW sources in the affected environment, the Corps conducted a Phase I environmental site assessment (ESA) during October and November 2010 (Corps 2010e). The ESA also addressed HTRW in USFS property surrounding the lake that could be affected by the proposed project (Corps 2010d). The ESA included an environmental database search conducted by Environmental Data Resources, Inc. (EDR). EDR reviewed numerous publicly available databases to identify recognized environmental conditions in the project area, such as the presence or likely presence of any hazardous substances or petroleum products under conditions that indicate an existing release, a past release, or the material threat of a release into structures, the ground, and groundwater or surface waters (EDR 2009). Table 3-58 lists the Federal and

State databases searched by EDR. The ESA also included an on-site reconnaissance

Table 3-58
EDR Federal and State Records Databases Searched for the Study Area

Database	Description	No. of sites
	FEDERAL RECORDS	
RCRA-LQG	The EPA's comprehensive information system, providing access to data supporting RCRA and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the RCRA. Large quantity generators (LQGs) generate over 1,000 kg of hazardous waste, or over 1 kg of acutely hazardous waste per month.	2
RCRA-SQG	The database includes selective information on sites that generate, transport, store, treat, or dispose of hazardous waste, as defined by the RCRA. Small quantity generators (SQGs) generate between 100 kilograms (kg) and 1,000 kg of hazardous waste per month.	2
RCRA-CESQG	The database includes selective information on sites that generate, transport, store, treat, or dispose of hazardous waste, as defined by the RCRA. Non-Generators do not presently generate hazardous waste.	1
ERNS	The EPA's Emergency Response Notification System records and stores information on reported releases of oil and hazardous substances.	3
FINDS	The Facility Index System contains both facility information and pointers to other sources of information that contain more detail. These include RCRIS, Permit Compliance System , Aerometric Information Retrieval System; FATES (Federal Insecticide Fungicide Rodenticide Act and TSCA Enforcement System); FTTS (FIFRA/TSCA Tracking System); CERCLIS; DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes); Federal Underground Injection Control; Federal Reporting Data System ; Surface Impoundments; TSCA Chemicals in Commerce Information System; PADS; RCRA-J (medical waste transporters/disposers); TRIS; and TSCA. The source of this database is the EPA/NTIS.	9
	STATE AND LOCAL RECORDS	
SWF/LF	The Solid Waste Facilities/Landfill Sites records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. The data come from the Integrated Waste Management Board's Solid Waste Information System database.	6
WDS	California Water Resources Control Board, Waste Discharge System.	4
NPDES	A listing of NPDES permits, including storm water.	4
HIST CORTESE	The sites for the list are designated by the State Water Resource Control Board, Leaking Underground Storage Tank (LUST), the Integrated Waste Board (SWF/LS), and the Department of Toxic Substances Control (CALSITES).	10
SWRCY	A listing of recycling facilities in California.	2

Database	Description	No. of sites
LUST	The LUST Incident Reports contain an inventory of reported leaking underground storage tank incidents. The data come from the State Water Resources Control Board LUST Information System.	10
UST	The Underground Storage Tank database contains registered USTs, which are regulated under Subtitle I of the RCRA. The data come from the State Water Resources Control Board's Hazardous Substance Storage Container Database.	25
HIST UST	Historical UST Registered Database.	16
SWEEPS UST:	Statewide Environmental Evaluation and Planning System. This UST listing was updated and maintained by a company contacted by the SWRCB in the early 1990s. The listing is no longer updated or maintained. The local agency is the contact for more information on a site on the SWEEPS list.	13
CHMIRS	The California Hazardous Material Incident Report System contains information on reported hazardous material incidents, i.e., accidental releases or spills. The source is the California Office of Emergency Services.	4
LDS	The Land Disposal program regulates of waste discharge to land for treatment, storage, and disposal in waste management units.	1

Source: EDR 2009

investigation in order to verify findings and gather additional local HTRW information. The ESA did not include sampling or analysis of soil or groundwater.

Figure 3-12 displays the key to the maps of HTRW study locations within the Isabella Lake area basin. Maps that are in the vicinity of, or include portions of the Primary Action Area and borrow areas are displayed as Figures 3-13, 3-14, 3-15, and 3-16.

The EDR report identified 170 sources of potential contamination within 0.25 mile of the lake boundary. Based on the database research results, five sites with the potential to affect public health and safety during construction were identified on or in the vicinity the Primary Action Area and borrow areas. The sites reported by the database search identify numerous generators of hazardous waste or owners of storage tanks that hold potentially hazardous materials. The existence of these generators and storage facilities does not necessarily indicate that the contents have been released to the environment; and they do not affect dam safety construction activities. The following sites were identified as potentially contaminated sites warranting further evaluation:

- ***Crane's Waste Oil Incorporated.*** **(**Map Location #40, 16095 Highway 178, Weldon, CA 93283). Facility that treats and/or disposes of liquid or semisolid wastes from any servicing, producing, manufacturing or processing operation of

Figure 3-12 Key to Isabella Lake Basin HTRW Focus Area Maps

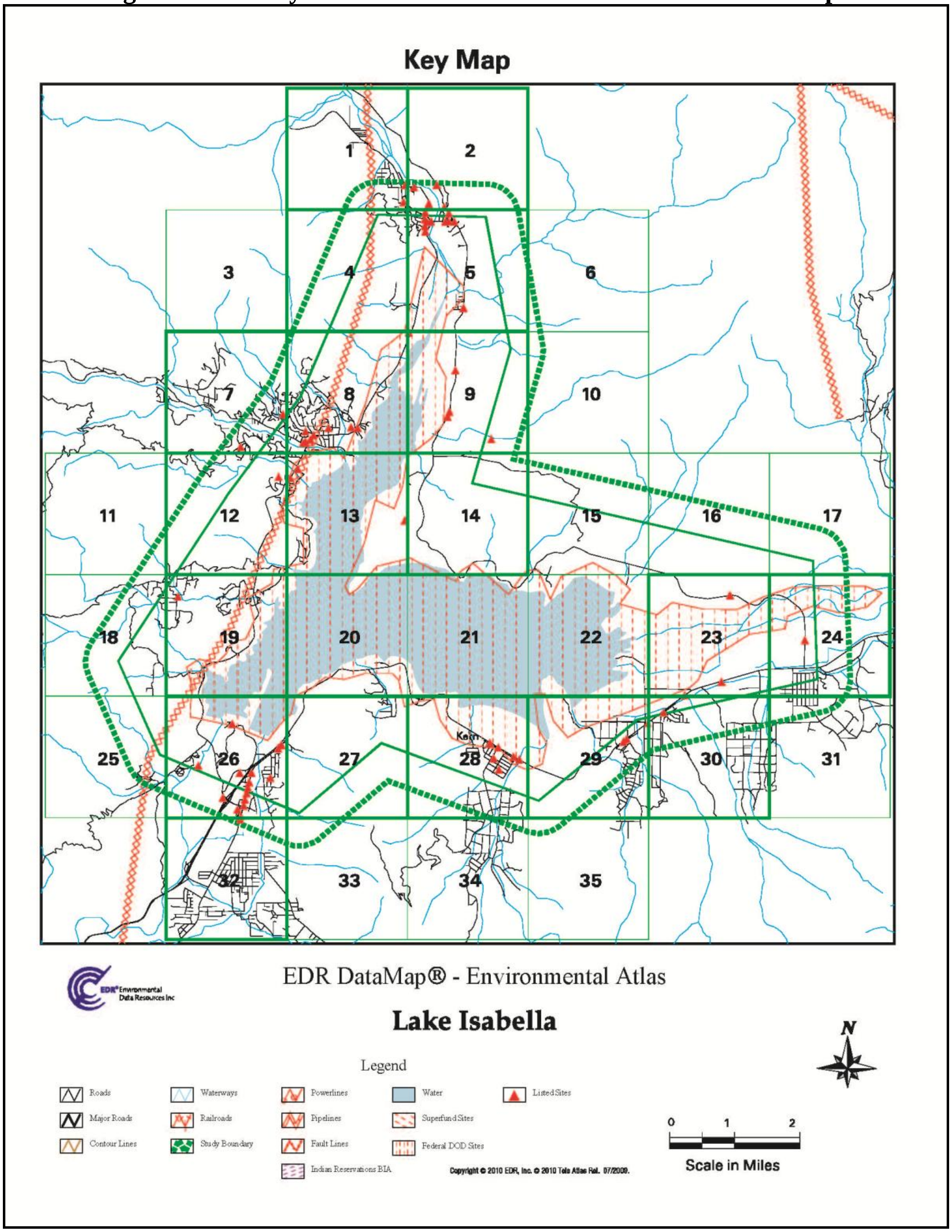


Figure 3-13 HTRW Focus Area Map 22 – South Fork Delta Borrow Area

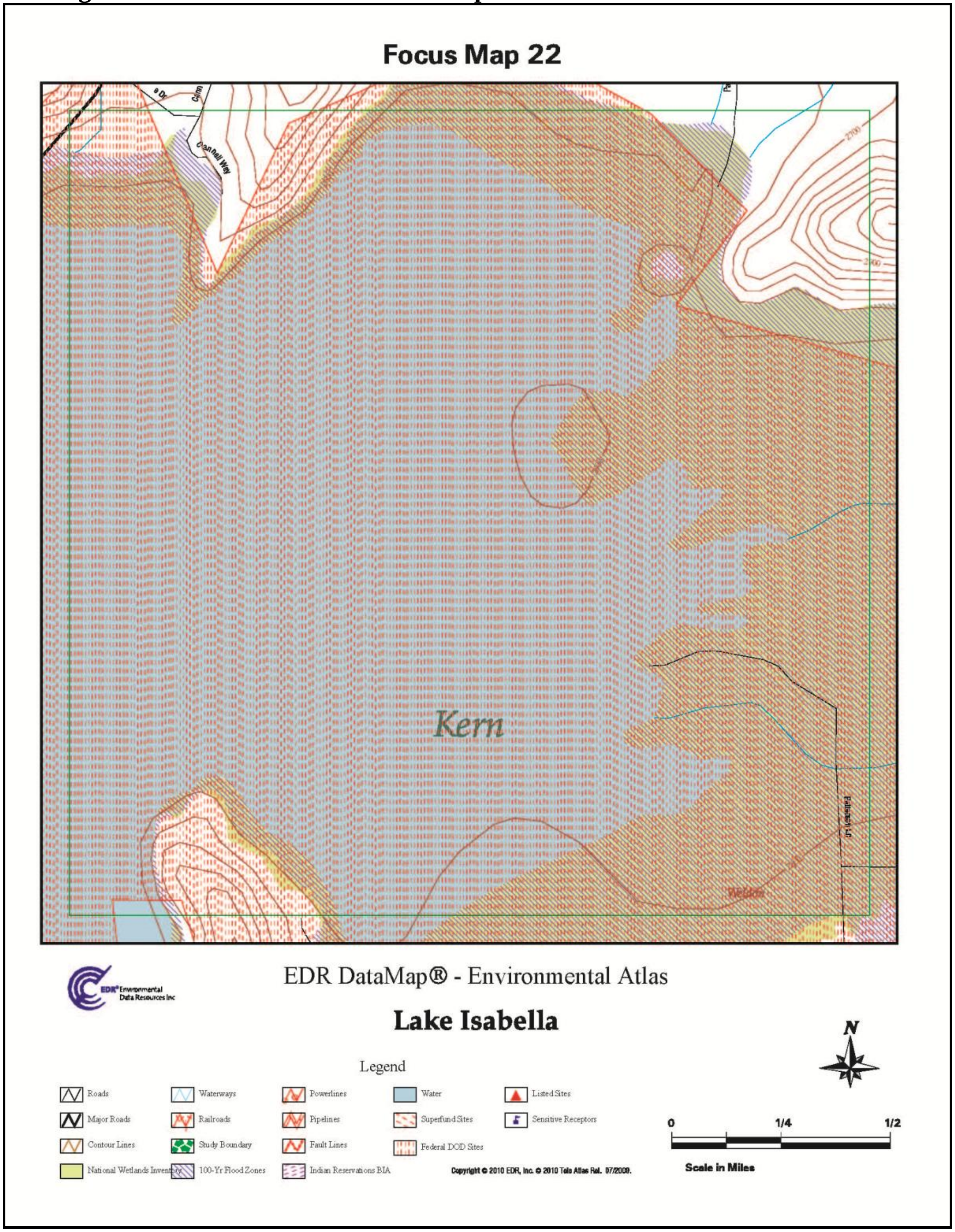


Figure 3-14 HTRW Focus Area Map 23 – Access to the South Fork Delta Borrow Area

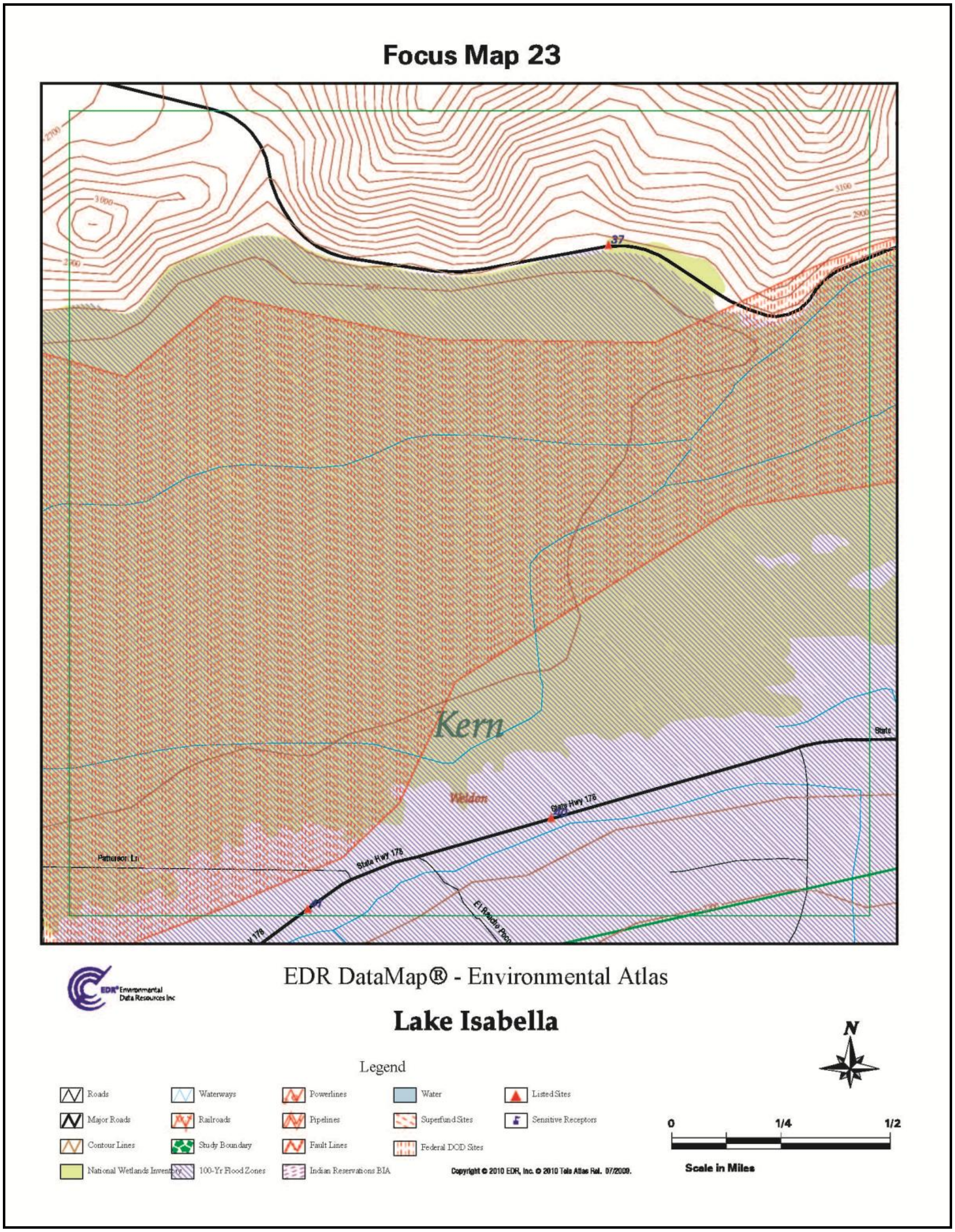


Figure 3-15 South Fork Delta Vicinity

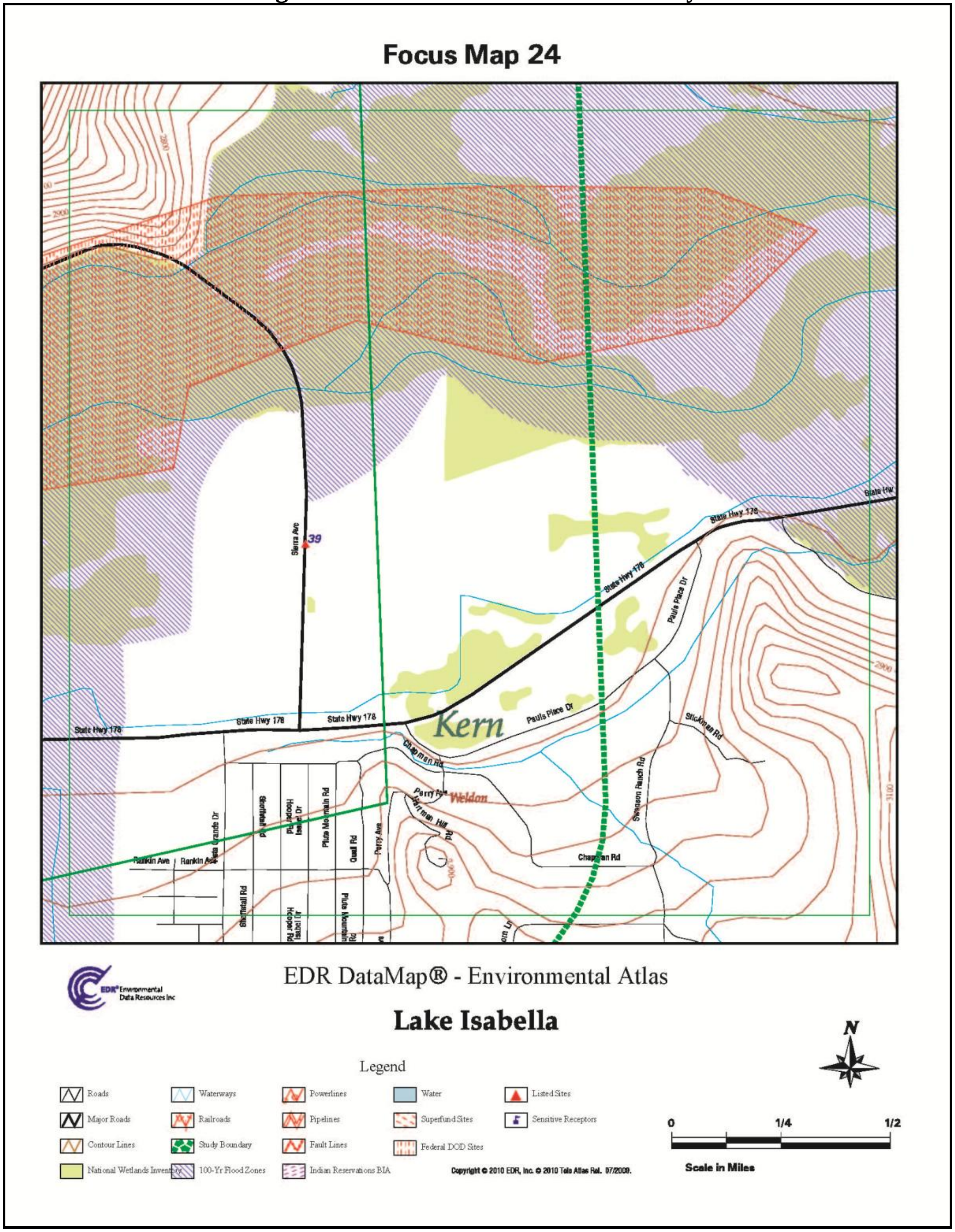
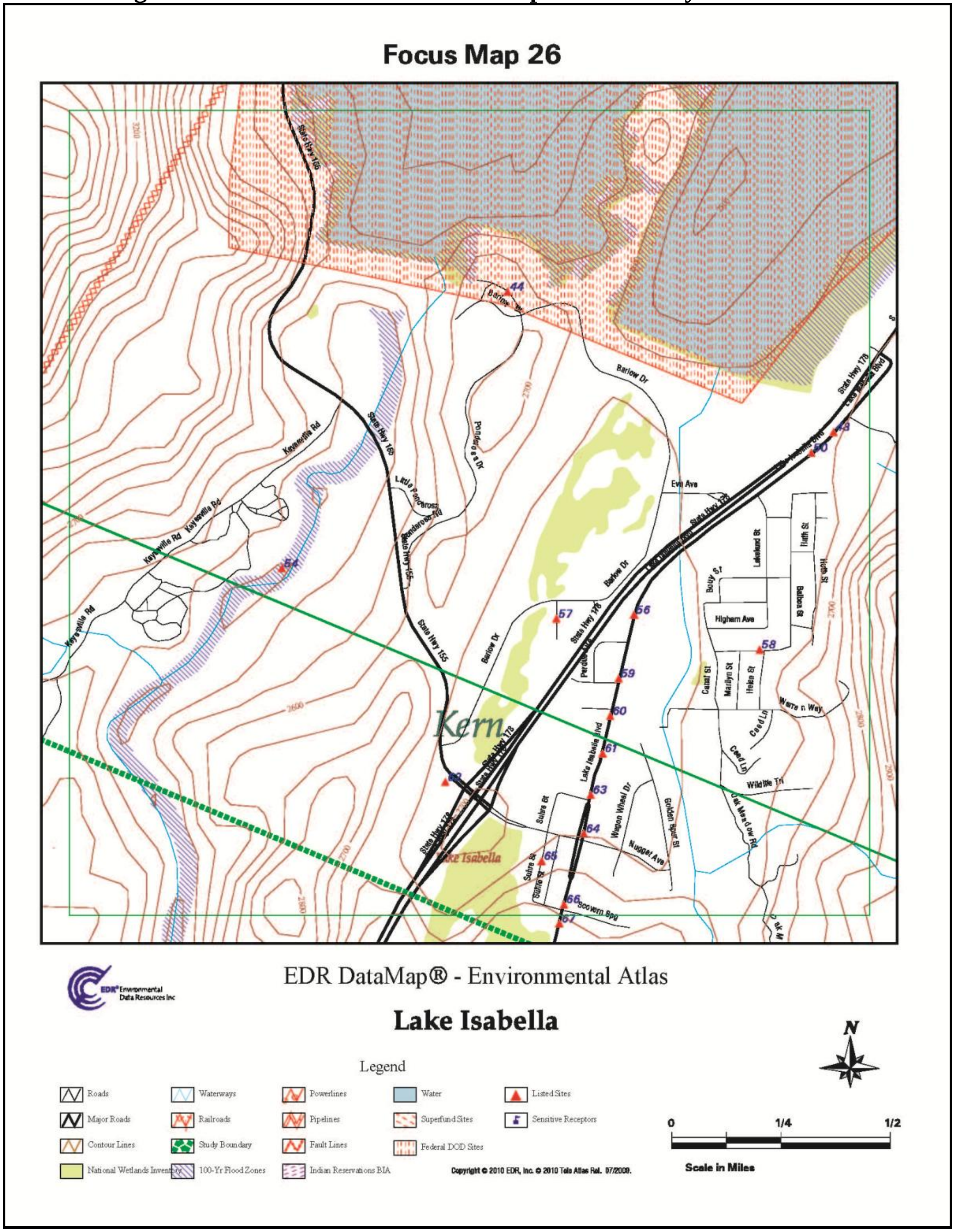


Figure 3-16 HTRW Focus Area Map 26 – Primary Action Area



whatever nature, including mining, gravel washing, geothermal operations, air conditioning, ship building and repairing, oil production, storage and disposal operations, water pumping.

- ***US Army Corps of Engineers.*** (Map Location #44, 4901 Ponderosa Drive, Lake Isabella, CA 93240). Waste Category: Other organic solids.
- ***US Forest Service.*** (Map Location #44, 4875 Ponderosa Drive, Lake Isabella, CA 93240). Waste Category: Off-specification, aged, or surplus organics.
- ***California Water Service Company (CWSC).*** (Map Location #48, 7138 Lake Isabella Blvd, Lake Isabella, CA 93240) Handler: generates more than 100 and less than 1000 kg of hazardous waste during any calendar month and accumulates less than 6000 kg of hazardous waste at any time; or generates 100 kg or less of hazardous waste during any calendar month, and accumulates more than 1000 kg of hazardous waste at any time.
- ***Kern County General Services.*** (Map Location #50, 7046 Lake Isabella Blvd, Lake Isabella, CA 93240). Illegal Drug Lab location where an illegal drug lab was operated or drug lab equipment and/or materials were stored.

The ESA also included an on-site reconnaissance investigation in order to verify findings and gather additional local HTRW information. The ESA did not include sampling or analysis of soil or groundwater. The objective of the site visit was to identify recognizable environmental concerns in connection with the property that indicate an existing release, a past release, or a material threat of a release on or into the ground, groundwater, or surface water.

All of the facilities relevant to the DEIS Project that appeared on the data base were checked for the status of investigation and/or remediation, and none of the sites appear to be of concern for the Isabella DSM Project. Generally, the facilities that appeared on the data base were already being remediated, have been remediated or are located so far away from potential project construction site that they would not be affected by the project.

After a review of the information provided in the EDR report, the Corps concluded that, of the 170 sources identified in the extended study area, only the six landfills/transfer stations/materials recovery facilities identified appear to present any potential for HTRW contamination to USFS lands or the project area. The primary concern involves suspected methane gas derived from the landfills. Although the database search and the site reconnaissance did not indicate that contamination was present at these sites, they were identified in the ESA as areas of potential concern (Corps 2010e).

The ESA also discussed the potential for contamination associated with the residue and tailings from the Big Blue Mine, located within the project area north of Wofford Heights on the western slope of Isabella Lake and the North Fork Kern River. Although the Big Blue Mine does not appear on any Federal, State, or local databases, the mine is known to have high levels of arsenic discharge associated with the mine tailings. Mine tailings associated with the Big Blue Mine have been identified along the eastern alluvial fan of the North Fork Kern River below the gross pool of the lake at an elevation of 2,585.76 feet (Corps 2010e).

The sewage oxidation pond that serves both Pioneer Point and the Main Dam campgrounds is located in Main Dam Campground, but not in an area contemplated for any construction activities.

The Corps also reported that the USFS office next to Main Dam is known to contain asbestos. Other buildings at the Isabella Lake work center may also contain lead or asbestos materials (Corps 2010e).

3.9.3 Environmental Consequences

Scope and Methods

The presence of HTRW in the project area and vicinity and the potential for HTRW-related impacts from the proposed project alternatives were evaluated in this analysis by researching documents and reports made available from the Corps. Once identified, the potential HTRW related impacts were analyzed and evaluated qualitatively. The primary reports reviewed for HTRW data relative to the project site and surrounding areas were the Environmental Assessment for the Isabella Auxiliary Dam Rock Barrier Project (Corps 2009b), the Preliminary Environmental Baseline Report (Corps 2009a), and the Isabella Lake-Main Dam Phase I ESA for the project site (Corps 2010e).

The following factors were important in determining the context and intensity of potential HTRW-related impacts associated with the proposed project alternatives and support actions. Significant impacts would occur if the action would:

- Create an unmanageable hazard to the public or the environment through the transport, use, storage, or disposal of hazardous materials, in the form of an accidental release of hazardous materials to the environment;
- Involve construction or substantial ground disturbance on a site included on a list of hazardous materials sites compiled in accordance with California Government Code 65962.5 or CERCLA;
- Interfere with or impede implementation of an adopted emergency response plan; or
- Interfere with emergency vehicle access to or passage routes through the project area that would greatly increase response times of emergency response vehicles.

No Action Alternative

Under the No Action Alternative, there would be no Federal participation in remedial improvements to the Isabella Main Dam, Spillway, Auxiliary Dam, or Borel Canal. Operation of Isabella Dam would continue in accordance with the established Water

Control Plan and Flood Control Diagram. Since no construction would occur under the No Action Alternative, there would be no effects on HTRW in the project area.

However, seepage would continue to deteriorate the Auxiliary Dam foundation, and the likelihood and consequences of dam failure would remain high. With the No Action Alternative, one or both dams have unacceptably high risk. Potential consequences due to dam failure and catastrophic floodwater release would be high, adverse, and significant in the area affected by inundation of floodwater in Bakersfield, where the number of potential HTRW sources that could be affected is substantial.

Alternative Base Plan

The Alternative Base Plan entails remediation of those deficiencies identified for the Main Dam, Spillway, and Auxiliary Dam that could result in catastrophic (potentially life-threatening) failure of the dams.

The ESA study found that no past or present hazardous waste releases have been identified in or near the project area. Construction and support activities associated with the Alternative Base Plan include use, storage, and transport of hazardous materials. Also, heavy equipment and vehicles would be maintained at the construction sites, staging areas, and borrow areas; it is likely for a project of this size that a vehicle and equipment refueling station would be developed, including the use of above ground fuel storage tanks. Associated with these activities is the potential for HTRW to be accidently released during construction and support activities from fueling and maintenance operations, material hauling, and concrete production. However, with appropriate measures, such as BMP and SPCC plans, adverse impacts related to the potential for inadvertent spills or releases of hazardous substances are expected to be low, short-term, and less-than-significant.

Activities associated with the Alternative Base Plan and support actions are not expected to interfere with or impede emergency evacuation plans or emergency response actions. However, particular attention would need to be paid to maintaining safe emergency vehicle operation on SR 155 during the temporary and short term closures between the Main Dam and Barlow Road that may be required for controlled blasting associated with the Emergency Spillway excavation. With a proper *Controlled Blasting Management Plan* that would be developed for this area, any impacts are anticipated to be low, short-term, and less-than-significant.

Alternative Plan 1

Under this alternative, the deficiencies remediated in the Base Plan Alternative would be included, plus additional remediation measures identified for the Main Dam. This alternative would have similar impacts as the Alternative Base Plan; with the primary difference being the RCC Overlay. The concrete required for construction of the RCC Overlay would be manufactured in a temporary Batch Plant established and operated for that purpose in the area excavated for the Emergency Spillway. The proposed cement mix materials stored for use during on-site manufacture could be subject to release of hazardous materials. Cement can cause ill health by skin contact, eye contact, or inhalation. In addition, the concrete produced in the Batch Plant could result in a hazardous condition since prolonged contact between skin and wet concrete allows alkaline compounds to penetrate and burn the skin. With proper precautions taken and BMPs used in handling the cement materials and concrete, potential adverse HTRW impacts are anticipated to be low, short-term, and less-than-significant.

Alternative Plan 2

This alternative would include remediation of the deficiencies covered in Alternative Plan 1, plus additional remediation measures identified for the Auxiliary Dam. These added measures include a larger Downstream Buttress, a more extensive filter, and full foundation treatment. This alternative would have similar HTRW impacts as Alternative Plan 1.

Alternative Plan 3

This alternative includes the remediation measures prescribed for Alternative Plan 2, plus additional remediation measures for the Main Dam; ensuring that both dams achieve the best rating regarding dam safety. This alternative would have similar impacts as Alternative Plan 2.

Alternative Plan 4

Under this alternative, the deficiencies remediated in the Base Plan Alternative would be included, plus additional remediation measures identified for the Existing and Emergency Spillways, Main Dam, and Auxiliary Dam, which include installing a filter and drain system, raising the dam crests and existing spillway walls by 16 feet, widening the emergency spillway to 900 feet, and realigning State Highway 178, and installing a flood gate where the new Main Dam embankment would intersect State Highway 155. No past or present hazardous waste releases have been recorded within the increased footprint associated with this alternative. Heavy equipment and construction vehicles would be maintained at the same areas described under the Alternative Base Plan. The potential for construction of roadway realignments to interfere with or impede emergency evacuation plans or emergency response actions are addressed in Section 3.18, Public Health and Safety. This alternative would therefore have HTRW impacts similar to the Base Plan Alternative.

3.9.4 Environmental Commitments/Mitigation Measures

The measures described below are recommended to reduce to the lowest practicable level potential HTRW-related impacts associated with the proposed project alternatives and support actions.

Best Management Practices

Contractors would comply with all applicable State and Federal laws, regulations, and requirements pertaining to hazardous materials and hazardous wastes, and utilize BMPs and environmental management plans to prevent and manage potential accidental releases. The Corps has an ongoing hazardous materials safety program outlined in EM 385-1-1 Safety and Health Requirements dated 15 November 2008 that requires staff and contractors to follow BMPs, such as the following:

- Fueling and servicing all vehicles in designated areas;
- Minimizing, to the extent practicable, storage of hazardous substances at the work site and in staging areas;
- Securing hazardous materials that must be kept on the work site and staging areas in closed containers away from drainage courses and areas of storm water infiltration;
- Ensuring that maintenance and construction personnel have been trained in current procedures and best available technology for spill prevention and cleanup of accidental spills;
- Keeping spill kits at the work site at all times when hazardous materials are in use and ensuring that all personnel know how to access and use the kits;
- Stopping work immediately in the event of a hazardous materials spill or release, and implementing appropriate cleanup and remediation measures to protect terrestrial ecosystems, surface water quality and aquatic ecosystems, groundwater quality, and human health;
- Educating workers handling, using, or exposed to dry or wet cement in hazards and controls.
- Ensuring that appropriate worker safety is implemented, including hygiene, training, and first aid; and
- Developing and implementing a S*pill Prevention and Response Plan* to identify and mitigate releases to the environment during construction and support activities.

Storm Water Pollution Prevention Plan

For activities with the potential to disturb an area in excess of an acre, the Federal CWA requires the preparation of a Storm Water Pollution Prevention Plan (SWPPP) (See Section 3.8). The SWPPP must include a spill prevention and response plan to identify the hazardous materials to be used during construction, describing: (a) measures to prevent, control, and minimize the spilling of hazardous substances; (b) safe methods and procedures to transport, store, and dispose of these substances; and (c) to outline procedures to be followed in case of a spill.

3.10 BIOLOGICAL RESOURCES

This section presents a discussion of the regulatory setting, methods of data collection, an overview of the affected environment (including special status species), summarizes the environmental consequences from implementing the Action Alternatives, and includes mitigation measures for reducing potential impacts on biological resources.

3.10.1 Regulatory Setting

The laws, regulations, or policies relevant to the biological resources affected by the Isabella DSM Project are described in the following paragraphs. State and local requirements are included that were helpful in characterizing the overall context of the analyses, even though some of these requirements do not directly apply to this Federal action.

Federal

Fish and Wildlife Coordination Act of 1958, as amended (16 USC §661 et seq.)
This act authorizes the Secretaries of Agriculture and Commerce to provide assistance to and cooperate with Federal and State agencies to protect, rear, stock, and increase the supply of game and fur-bearing animals. Amendments enacted in 1946 require consultation with the USFWS and the fish and wildlife agencies of states where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified" by any agency under a Federal permit or license. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources." (For more information see Appendix C).

Federal Endangered Species Act (16 USC §1531 et seq)
This act requires that any action authorized by a Federal agency not be likely to jeopardize the continued existence of a threatened or endangered species, or result in the destruction or adverse modification of habitat of such species that is determined to be critical. Section 7 of the ESA, as amended, requires Federal agencies to consult with the USFWS and National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service to ensure that project actions do not jeopardize the continued existence of endangered or threatened species, or result in the destruction or adverse modification of the critical habitat of these species. (For more information see Appendices C, D and E).

Federal Water Pollution Control Act (Clean Water Act), Section 404 and 401(33 USC §1344)
Under Section 404 of the Clean Water Act, the US Army Corps of Engineers (Corps) and the US Environmental Protection Agency (EPA) regulate the discharge of dredge and fill materials into waters of the United States. Section 401 of the act delegates authority to the states to regulate waters of the United States within their borders.

Executive Order 13112, Invasive Species (3 February 1999)

This Executive Order requires that Federal agencies, to the extent possible, use relevant programs and authorities to (i) prevent the introduction of invasive species, (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner, (iii) monitor invasive species populations accurately and reliably, (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them.

Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds (10 January 2001)

This Executive Order directs Executive departments and agencies to take further actions to implement the Migratory Bird Treaty Act. Federal agencies taking actions that have , or are likely to have, a measurable negative effect on migratory bird populations are directed to develop and implement, within two years, a Memorandum of Understanding (MOU) with the USFWS that shall promote the conservation of migratory bird populations.

Forest Service Manual and Handbook (FSM/H 2670)

The USFS develops and implements management practices to ensure that plants and animals do not become threatened or endangered and to ensure their continued viability in national forests. The USFS maintains lists of sensitive plant or animal species identified by the regional forester for which population viability is a concern. It is USFS policy to analyze impacts on sensitive species to ensure management activities do not create a significant trend toward Federal listing or loss of viability.

Migratory Bird Treaty Act (16 USC §703-712)

This act implements treaties that the United States has signed with a number of countries to protect birds that migrate across national borders. The act makes unlawful the taking, possessing, pursing, capturing, transporting, or selling of any migratory bird, its nest or its eggs.

National Environmental Policy Act of 1969, as amended (42 USC 4321 et seq)

This act establishes policy that promotes the enhancement of the environment by establishing procedural requirements for all Federal agencies to integrate environmental values into their decision making process by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions. This is accomplished through the preparation of an Environmental Impact Statement (EIS).

Sequoia National Forest Land and Resource Management Plan, as amended by the Sierra Nevada Forest Plan Amendment (2001) and the Mediated Settlement Agreement

This *Plan* requires that field surveys for threatened, endangered, proposed, and sensitive plant species be conducted early enough in the project planning process that the project can be designed to conserve or enhance these plants and their habitat. Additionally, sensitive plant species will be managed to prevent the need for Federal listing as threatened and endangered.

USFS National Forest Management Act of 1976

The National Forest Management Act of 1976 (NFMA) (90 Stat. 2949, et seq.; 16 U.S.C. 1601-1614), set standards for land and resource management planning across the National Forest System, including a requirement related to diversity of plant and animal communities. Each forest plan developed under the 1982 Planning Rule for the NFMA was required to identify certain vertebrate and/or invertebrate species as Management Indicator Species (MIS) as one of various elements to address NFMA requirements related to diversity of plant and animal communities [1982: 36 CFR 219.19(a)]. The direction for MIS is related to forest plan development, forest project implementation, and forest plan monitoring. On December 14, 2007, based on a review of all the alternatives assessed in the Final Environmental Impact Statement (FEIS), the Regional Forester for the Pacific Southwest Region made the decision to adopt a common list of MIS and associated monitoring strategies for ten forests in the Sierra Nevada, including the Sequoia National Forest. Rule (1982: 36 CFR 219.19(a)(1)) and in the Forest Service Manual (FSM 2621.1). The 1982 Planning Rule states that species are to be selected as MIS because their population changes are believed to indicate the effects of land management activities (1982: 36 CFR 219.19 (a)(1)).

USFS, National Threatened, Endangered, and Sensitive Species Program

This program provides an initiative dedicated to conserve and recover plant and animal species that need special management attention and to restore National Forest and Grassland ecosystems and habitat. Isabella Lake is on National Forest System lands and recreation facilities. Lands associated with the lake are managed by the USFS, which is the cooperating agency for the Isabella DSM Project.

USFWS Mitigation Policy (46 FR 7644, 23 January 1981)

Under this policy, resources are assigned to one of four distinct resource categories, each having a mitigation planning goal consistent with USFWS values. The Mitigation Policy does not apply to threatened and endangered species, nor does it apply to USFWS recommendations for completed Federal projects, projects permitted or licensed prior to the enactment of USFWS authorities, or USFWS recommendations related to the enhancement of fish and wildlife resources.

State

California Endangered Species Act (CESA)

The USFWS works with all interested persons, agencies, and organizations to protect and preserve sensitive biological resources and their habitats. These resources include all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants and their habitats that are threatened with extinction and those experiencing a significant decline. The CESA also allows for take incidental to otherwise lawful development projects. CESA emphasizes early consultation to avoid potential impacts on rare, endangered, and threatened species and to develop appropriate mitigation planning to offset losses of listed species caused by the project.

California Fish and Game Code (Sections 3511, 4700, 5050, and 5515)
This code defines Fully Protected Animals. Fish, mammal, amphibian, reptile, and bird species that may not be taken or possessed at any time and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research and relocation of the bird species for the protection of livestock. Most fully protected species have been listed as State threatened or endangered under more recent endangered species laws and regulations.

California Native Plant Society (CNPS) Inventory of Rare and Endangered Vascular Plants
The CNPS maintains a comprehensive database of rare and endangered plants. Although the society has no regulatory authority, its lists are generally consulted when preparing baseline conditions reports.

Porter-Cologne Water Quality Control Act
This act establishes Water Quality Control Boards in California responsible for overseeing water quality and preparing Water Quality Control Plans (Basin Plans) that establish beneficial uses of a water body, water quality standards, and actions to maintain the identified standards.

Local

Kern River Valley Specific Plan and Environmental Impact Report
The *Specific Plan* addresses approximately 110,510 acres in the northeastern portion of Kern County. Currently, the land use development in the Specific Plan Area is guided by the Kern County General Plan and the South Lake Specific Plan and the Kelso Valley Specific Plan. The county plans to implement the General Plan and to replace the specific plans with a single comprehensive planning document. This will integrate the policies and programs of the General Plan, the South Lake Specific Plan, and the Kelso Valley Specific Plan to provide a clear and unified vision and direction to guide future land use development within the Kern River Valley (Kern County 2011a, 2011b).

3.10.2 Affected Environment

Physical
Isabella Lake and much of the Kern River are in the foothills of Sequoia National Forest. Hydrologic features, such as natural springs, hot springs, tributaries of the Kern River, and the Kern River itself, dominate the surrounding landscape and support extensive areas of riparian and limnetic habitat, as well as some fringing wetland habitat, flanked by upland that is dominated by oak and pine woodlands or patches of sagebrush-scrub uplands. Urban, rural, and public lands also surround Isabella Lake. Climate in this region is generally Mediterranean, with cool wet winters and hot dry summers.

Vegetation

Isabella Lake is in the California Floristic Province (Hickman 1993), which is the largest and most significant geographic unit in California (Hickman 1993; see Smithsonian Institution 2010). Vegetation alliances in the proposed project area were classified according to Sawyer et al. (2009). This method was used to describe vegetation communities because this is the only system accepted by the California Department of Fish and Game's (CDFG) Vegetation Classification and Mapping Program (CDFG 2009). The Sawyer et al. (2009) classification system is hierarchical, with alliances representing the generic vegetation units. This system relies on diagnostic species which have similar composition and reflects subregional climate, substrates, hydrology, moisture/nutrient factors, and disturbance regimes (CDFG 2009a). The primary purpose of this system is to assist in locating and determining the significance and abundance of vegetation types for tracking purposes in the California Natural Diversity Database (CNDDB) (CDFG 2010).

Vegetation alliances identified in the proposed project area include: *Salix gooddingii*, *Populus fremontii* and *S. laevigata* Woodland Alliances (collectively riparian woodlands), *Quercus wislizeni* Woodland Alliance (oak woodlands), *Pinus sabiniana* Woodland Alliance (pine woodlands), *Ericameria nauseosa* Shrubland Alliance (sagebrush-scrub upland) and *Bromus rubens-Schismus (arabicus, barbatus)* Semi-Natural Herbaceous Stands (valley grasslands). General cover types in the proposed project area are illustrated in Figures 3-17 to 3-19.

Numerous non-native and invasive plant species are also found in the project area.

<u>Riparian woodlands (*Salix gooddingii*, *Populus fremontii*, and *S. laevigata* Woodland Alliances)</u>

Riparian woodlands are common in the proposed project area upstream of the limnetic zone of Isabella Lake along the North and South Fork Kern Rivers (Figure 3-17). The riparian woodland cover type is dominated by Goodding's willow (*Salix gooddingii*), Fremont cottonwood (*Populus fremontii*), and red willow (*S. laevigata*). Also common in some areas is Pacific willow (*S. lasiandra*), yellow willow (*S. lutea*), narrowleaf willow (*S. exigua*), shining willow (*S. lucida* ssp.), boxelder (*Acer negundo*), California buckeye (*Aesculus californica*), and white alder (*Alnus rhombifolia*) (Sawyer et al. 2009). Black elderberry (*Sambucus nigra*) is also found in this vegetation type. Tree canopy height can be up to 80 feet and is open to continuous (Sawyer et al. 2009). Common shrubs in the riparian woodlands include mule-fat (*Baccharis salicifolia*), coyote brush (*B. pilularis*), and redosier dogwood (*Cornus sericea*), which also form an open to continuous cover (Sawyer et al. 2009). The herbaceous layer is variable and is often dominated by primary colonizers such as rough cocklebur (*Xanthium strumarium*), stinging nettle (*Urtica dioica*), goosegrass (*Elusine indica*), common rush (*Juncus effusus*), common knotweed (*Polygonum lapathifolium*), common plantain (*Plantago major*), and cress (*Cardamine* sp.) (Sawyer et al. 2009).

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Figure 3-17 Overview of Vegetation Cover Types and Isabella DSM Project Action Areas

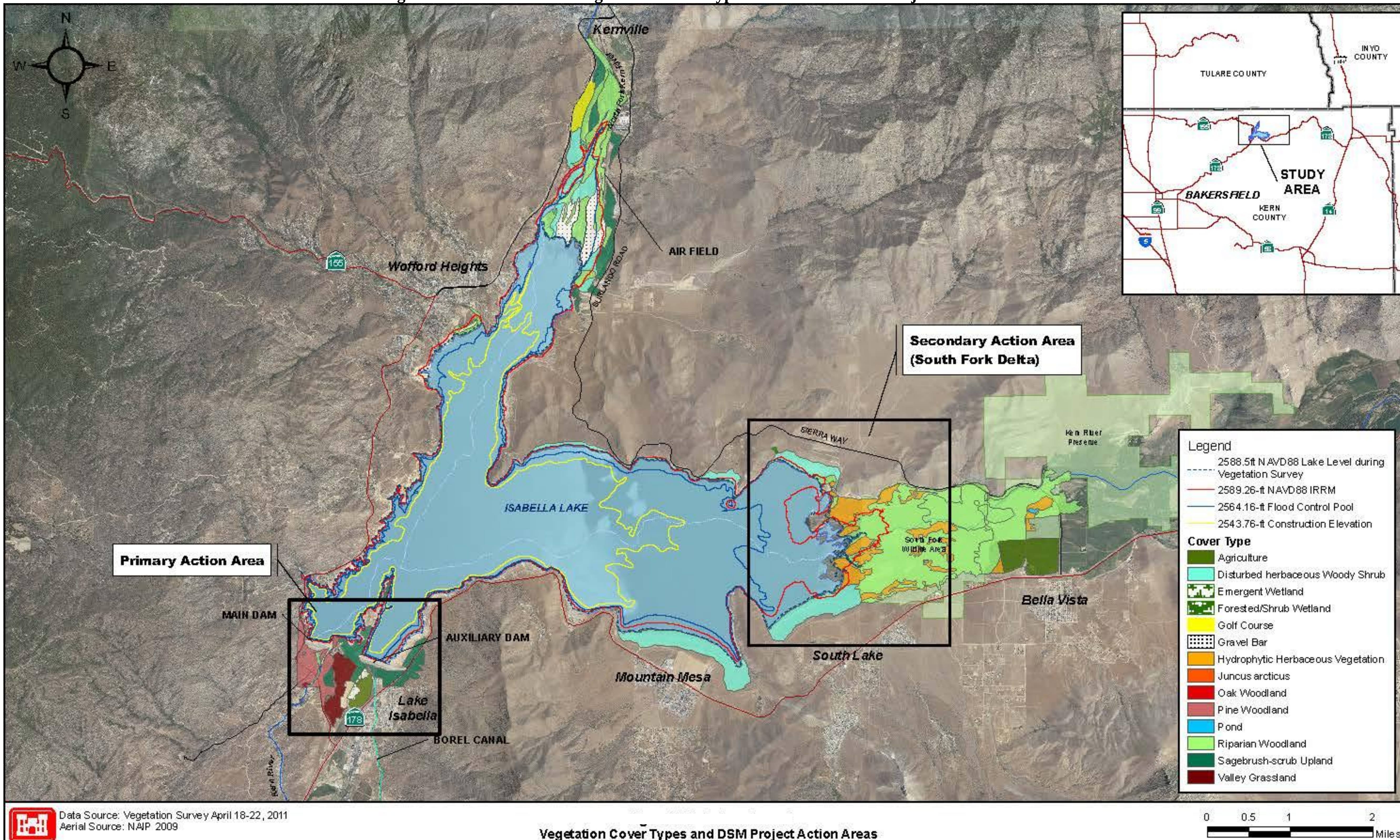

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Figure 3-18 Vegetation Cover Types in the Secondary Action Area (South Fork Delta)

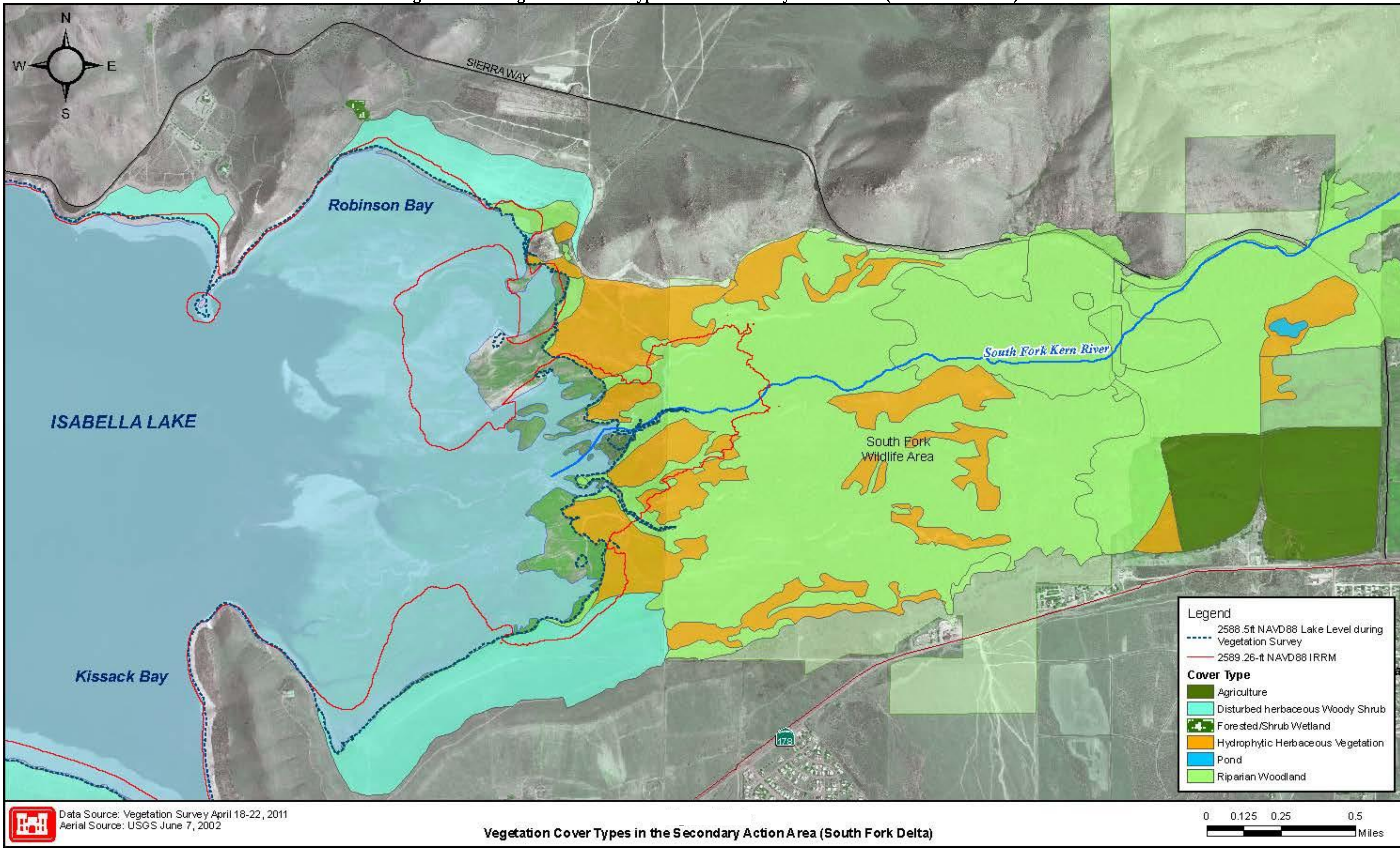
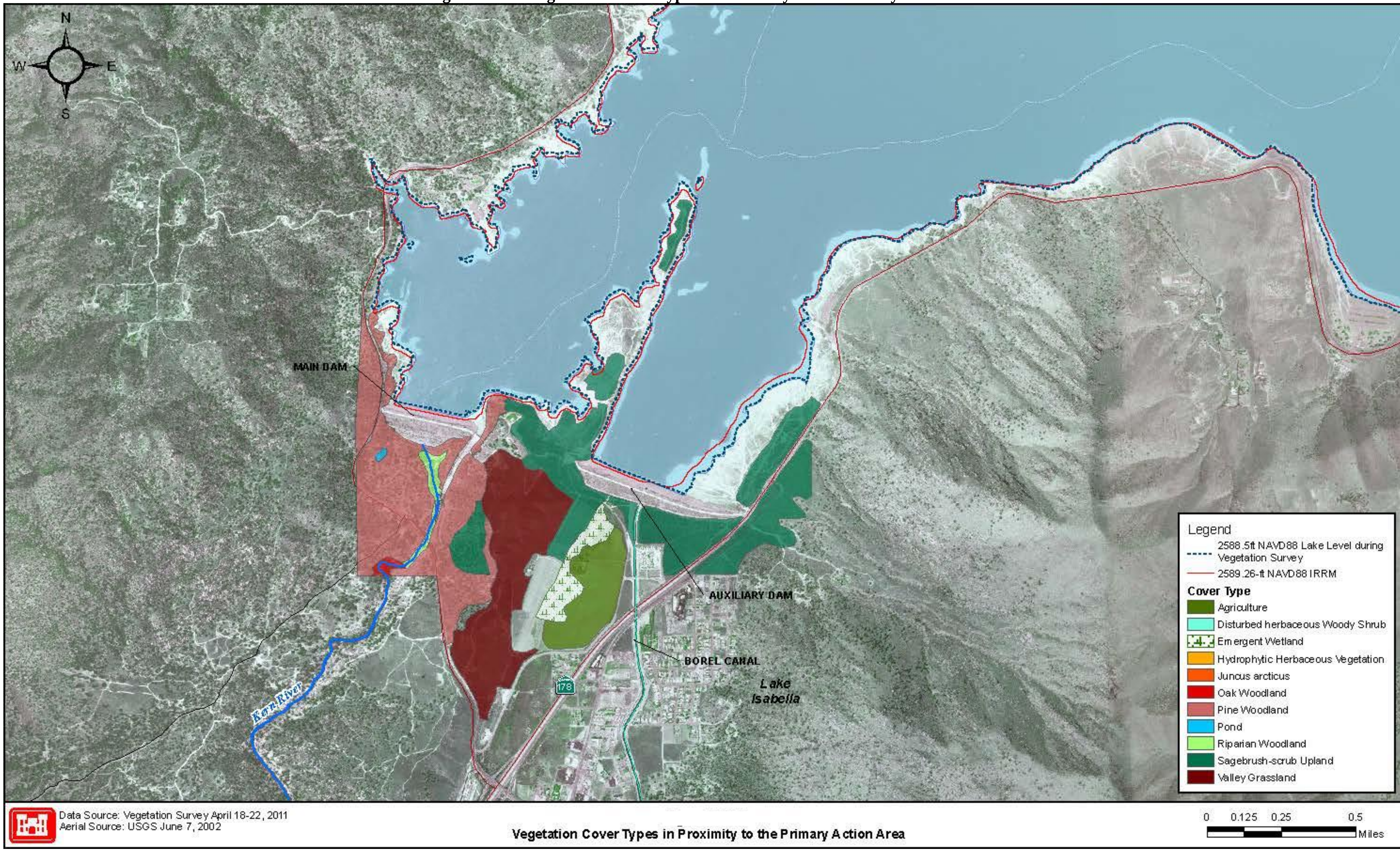


Figure 3-19 Vegetation Cover Types in Proximity to the Primary Action Area



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The broad floodplain along the South Fork Kern River gently slopes up from Isabella Lake, causing it to be frequently inundated, contributing to the regeneration of Goodding's willow and long-term maintenance of the riparian forest (Figure 3-18). These characteristics function to maintain diverse species composition and forest structure essential for Federally listed species, such as southwestern willow flycatchers (*Empidonax traillii extimus*) and least Bell’s vireos (*Vireo bellii pusillus*) (Jones & Stokes 2003, 2004, 2006, 2008; Whitfield and Henneman 2009).

Oak Woodlands (*Quercus wislizeni* Woodland Alliance)

Oak woodland in the Primary Action Area is restricted to a thin patchy band on either side of the Kern River, downstream of the Main Dam and west of Hwy 155 (Figure 3-19). The oak woodland cover type is dominated in the tree canopy by interior live oak (*Quercus wislizeni*), California buckeye, gray pine (*Pinus sabiniana*), canyon live oak (*Quercus chrysolepis*), and blue oak (*Q. douglasii*) (Sawyer et al. 2009). The tree canopy of oak woodland is usually less than 65 feet high and forms either intermittent or continuous cover in canyons or basins, or in open areas, a savanna-like canopy (Sawyer et al. 2009). The shrub and herbaceous layers are open to intermittent and host a diversity of species common to grasslands or other upland plant communities, disturbed areas, or riparian buffers. This cover type occurs on upland slopes, valley bottoms, or on terraces with soils that are shallow and moderately to excessively drained (Sawyer et al. 2009).

Along the Kern River, clusters of interior live oaks grow, primarily with gray pine, immediately above the ordinary high-water elevation of the Lower Kern River. In this area, stream flows are buffered due to modulation by the Main Dam (Pope et al. 2004), and the presence of well-drained soils and steep stream banks that abruptly transition to upland conditions all likely contribute to this alliance becoming established so near the streambed.

Pine-Oak Woodland (*Pinus sabiniana* and *Quercus wislizeni* Woodland Alliances)

Pine-oak woodland dominates much of the upland area surrounding Isabella Lake; however, in the Primary Action Area, it is found only downstream of the Main Dam, specifically in the Main Dam Campground (see Figure 3-19). The pine-oak woodland cover type is dominated by gray pine with intermittent interior live oak, blue oak, canyon live oak, California buckeye, western juniper (*Juniperus occidentalis*), and Coulter pine (*Pinus coulteri*) (Sawyer et al. 2009). Tree canopy is typically less than 65 feet high and is open to intermittent and one to two tiered (Sawyer et al. 2009). Shrubs are common or infrequent and include a mix of such species as rubber rabbitbrush (*Ericameria nauseosa*), black mustard (*Brassica nigra*), California buckwheat (*Eriogonum fasciculatum*), Russian thistle (*Salsola tragus*), Mormon tea (*Ephedra viridis*), California scrub oak (*Quercus berberidifolia*), *Datura* sp., *Cirsium* spp., yerba santa (*Eriodictyon trichocalyx*), flatspine bur ragweed (*Ambrosia acanthicarpa*), chaparral yucca (*Hesperoyucca whipplei*), and common mullein (*Verbascum thapsus*). The herbaceous layer is sparse or grassy and hosts species such as Italian rye grass (*Lolium multiflorum*), foxtail chess (*Bromus madritensis*), and common fiddleneck (*Amsinckia menziesii*). Pine-oak woodland is found on streamside terraces, valleys, slopes, and ridges where soils are shallow, often stony, infertile, moderately to excessively drained, and at elevations between 990 and 6,990 feet (Sawyer et al. 2009).

The patch of pine-oak woodland near the Main Dam has been partially altered by the establishment of the campground and the outlet facility for the Main Dam. Construction of dam infrastructure, access roads, campsites, parking areas, and a small constructed reservoir have all diminished the extent of native habitat in this area. Human disturbance has allowed for the introduction and establishment of various invasive plant species. Planting of ornamental species, mainly Aleppo pine (*Pinus halepensis*), has also reduced the quality of native habitat.

Sagebrush-scrub upland (*Ericameria nauseosa* Shrubland Alliance)

Sagebrush-scrub upland dominates much of the upland area surrounding Isabella Lake. In the Primary Action Area, it is found in upland areas near the Main and Auxiliary Dams (see Figure 3-19). The sagebrush-scrub upland cover type is dominated by rubber rabbitbrush with other species including big sagebrush (*Artemisia tridentata*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), Mormon tea, California buckwheat, western juniper, and antelope bitterbrush (*Purshia tridentata*); immature junipers or pine may also be present at low cover (Sawyer et al. 2009). The shrub canopy is typically less than 10 feet high and is open to continuous (Sawyer et al. 2009). The herbaceous layer is sparse or grassy and primarily includes annual grasses and herbs, such as *Bromus* spp., California poppy (*Eschscholzia californica*), longbeak stork's bill (*Erodium boytrys*), red-stemmed filaree (*E. cicutarium*), perennial goldfields (*Lasthenia californica*), miniature lupine (*Lupinus bicolor*), slender oat (*Avena barbata*), wild oat (*A. fatua*), mustards (*Brassica* spp.), owl's-clover (*Castilleja exserta*), Italian rye grass, and yellow star-thistle (*Centaurea solstitialis*) (Sawyer and Keeler-Wolf 1995). Sagebrush-scrub upland is found in all topographic settings, especially in disturbed settings. Soils are well-drained sand and gravel at elevations ranging between 0 and 10,500 feet (Sawyer et al. 2009). Locally, stands are usually associated with broad intermittent watercourses, road cuts, and other clearings.

Many of the areas dominated by sagebrush-scrub species are frequently disturbed by vehicles and machinery.

Valley Grasslands (*Bromus rubens-Schismus (arabicus, barbatus)* Semi-Natural Herbaceous Stands)

Valley grasslands are restricted to a small ridgeline between and downstream of the Main and Auxiliary Dams (see Figure 3-19). The valley grassland cover type is dominated by red brome grass (*Bromus rubens*), Mediterranean grass (*Schismus barbatus*), and Arabian schismus (*Schismus arabicus*), along with other nonnative species growing in the herbaceous layer (Sawyer et al. 2009). Other common species include California poppy, longbeak stork's bill, red-stemmed filaree, perennial goldfields, miniature lupine, slender oat, wild oat, mustards, owl's-clover, Italian rye grass, and yellow star-thistle. Emergent shrubs may be present at low cover. Herbs in this stand are usually less than 2.5 feet tall, and cover is intermittent to continuous (Sawyer et al. 2009).

The ridgeline between the Main and Auxiliary Dams dominated by valley grasslands has been highly disturbed in the past by human activities, including cattle ranching and off-road vehicle use.

Wetlands and Other Waters of the U.S.

A preliminary delineation of wetlands and other waters of the U.S. was conducted in the project area by Tetra Tech biologists on April 19 to 22, 2011. Wetlands were described according to Cowardin et al. (1979). Within the Primary and Secondary Action Areas, riverine, freshwater emergent wetlands and freshwater forested/shrub wetlands were observed (Table 3-59); however, it should be noted that these acreages are estimates due to limited access (e.g., private property, flooding, etc.).

Table 3-59
Wetland Type and Preliminary Coverage Estimate within the Proposed Project Area

Wetland	Type	Approximate Acres
Auxiliary Dam	Emergent	18
Hanning Flat	Forested/Shrub	1.8
South Fork Mosaic 1	Forested/Shrub	1,360
South Fork Mosaic 2	Emergent	337

Approximately 18 acres of emergent wetlands were observed below the Auxiliary Dam, just south of Barlow Road (see Figure 3-19). During the site visit, there was no access to the adjacent private property to the south, but wetland vegetation was observed in the area. Therefore, acreage estimates for this wetland are thus largely based on aerial photography and data from the National Wetland Inventory (NWI) (USFWS 2011). It should be noted that NWI was only used for descriptive purposes and not for the purpose of determining the actual extent of jurisdictional features. Wetland plant species observed included: *Juncus balticus* (an obligate [OBL] wetland species meaning there is more than a 99% probability the species will occur in a wetland) and *Rumex crispus* (a facultative wetland [FACW] species meaning there is between 67% and 99% probability the species will be occur in a wetland).

A mosaic of forested/shrub and emergent wetlands were observed in the South Fork Delta area, although much of the wetlands are east of the Secondary Action Area (Supplemental sand filter borrow area west of Patterson Lane and Rabbit Island). A 1.8 acre, spring-fed, forested wetland was observed on the western edge of Hanning Flat, located northwest of Rabbit Island. Dominant wetland species observed near Hanning Flat included: *J. balticus*, *Distichlis spicata* (FACW), *Salix laevigata* (FACW), *Scirpus americanus* (OBL), and *Polygonum lapathifolium* (OBL).

The North Fork and South Fork Kern Rivers are the dominant riverine systems in the project area. The North Fork Kern River has a fairly defined bed and bank, with sediment deposited bars and a developing riparian community (see Figure 3-17). Near the confluence with Isabella Lake, the North Fork Kern River is braided, with intermittent freshwater emergent and forested/shrub wetlands. By contrast, much of the South Fork Kern River is highly braided, with a mosaic of forested/shrub and freshwater emergent wetlands, particularly at the confluence with Isabella Lake (see Figure 3-17; Table 3-18). Dominant wetland plant species in the South Fork area included: *Salix gooddingii* (OBL), *J. balticus*, *Urtica dioica* (FACW), *Eleocharis macrostachya* (OBL).

The lower Kern River is located downstream of the Main Dam where water is released directly into the natural stream channel and through the Isabella Partners Hydroelectric Project facility. The lower Kern River is characterized by a defined bed and bank without associated riparian wetlands. The Auxiliary Dam releases water directly into the Borel Canal or through seepage that is collected in a drain ditch, where it flows to a sump and is pumped into the Borel Canal.

Isabella Lake is the dominant lacustrine system in the project area. Isabella Lake is operated as a multipurpose reservoir for flood control, downstream water users, and recreation. As previously mentioned, the maximum conservation storage level is 2,609.26 feet (Corps 2008a); however, the lake is maintained at or below 2,589.26 feet as an IRRM.

Other freshwater emergent wetlands within the ordinary high water mark (OHWM) of Isabella Lake were observed in the vicinity of Wofford Heights and another south of the golf course west of the North Fork Kern River; however these wetlands are not in the Isabella DSM Project Action Areas.

Three freshwater ponds were identified in proximity to the project area: a previously mentioned seepage collection channel below the Auxiliary Dam, an oxidation pond below the Main Dam, and Prince Pond east of the South Fork Wildlife Area.

Non-native and Invasive Vegetation

Numerous non-native and/or nuisance plants are found in the vicinity of Isabella Lake (Table 3-60). No invasive plants found in the project area are listed on the Federal Noxious Weed List (USDA 2006); however, some are listed by California Department of Food and Agriculture's (CDFA) Pest Ratings of Noxious Weed Species and Noxious Weed Seed (CDFA 2010). These include common Russian thistle (*Salsola tragus*), perennial pepperweed (*Lepidium latifolium*), purple loosestrife (*Lythrum salicari*), and tree-of-heaven (*Ailanthus altissima*).

Of particular concern for the proposed Isabella DSM Project is the potential for non-native or invasive plant species to be transported from one location to another during construction.

Table 3-60
Non-native or Nuisance Plant Species in or near the Proposed Project Area

Common Name	Species	CDFA List[1]
Bermuda grass	*Cynodon dactylon* L.	NA
black mustard	*Brassica nigra*	NA
brass buttons	*Cortula coronopifolia* L.	NA
broadleaf birdsfoot trefoil	*Lotus corniculatus*	NA
Cheatgrass	*Bromus tectorum*	NA
common Russian thistle	*Salsola tragus* L.	C
curly dock	*Rumex crispus* L.	NA
flix weed/tansy mustard	*Descurainia sophia*	NA
floating primrose willow	*Ludwigia peploides*	NA
Kentucky bluegrass	*Poa pratensis* L.	NA
perennial pepperweed	*Lepidium latifolium*	B
prickly sow thistle	*Sonchus asper*	NA
prickly wild rose	*Rosa acicularis*	NA
purple loosestrife	*Lythrum salicaria*	B
red brome	*Bromus rubens* L.	NA
redstem filaree	*Erodium cicatarium*	NA
rough cocklebur	*Xanthium strumarium*	NA
Russian olive	*Elaeagnus angustifolia* L.	NA
spotted knapweed	*Centaurea stoebe*	NA
tree-of-heaven	*Ailanthus altissima*	C
wild oat	*Avena fatua*	NA

[1] CDFA 2010
A list (noxious weed)
B list (noxious weed)
C list (noxious weed)

Wildlife

The diversity of habitats around Isabella Lake attracts a variety of wildlife species, including many residents and abundant migrants. The extensive riparian areas found in the deltas of the North and South Fork Kern Rivers are the most substantial habitat for wildlife found in the vicinity of Isabella Lake. These areas host expanses of mature riparian woodland growing in braided stream channels, pools, and wetlands. In particular, the South Fork Wildlife Area has been identified as one of the largest intact patches of riparian habitat remaining in California. It is estimated that over 300 species of birds use this area, with most being neotropical migrants that nest and forage during summer and overwinter in Central and South America (Audubon 2011).

Common birds include passerines such as flycatchers, warblers, kinglets, chickadees, thrushes, jays, blackbirds, sparrows, finches, towhees, wrens, nuthatches, and swallows. Other common birds are hummingbirds, woodpeckers, water birds, waders, and various raptors such as owls, buteos, and smaller accipiters (Audubon 2011). Wildlife species common in this area include mammals such as foxes, coyote, bobcat, striped skunk, spotted skunk, raccoon, Virginia opossum, bats, and woodrats. Reptiles and amphibians that are relatively common include the Pacific chorus frog, western toad, bullfrog, and valley garter snake (Audubon 2011). Many invertebrates are also common in this area and provide the dietary basis for the high densities seen in some wildlife species.

Much of the upland habitat around Isabella Lake hosts species adapted to arid environments. Common reptiles include side-blotched lizard, southern alligator lizard, western fence lizard, California kingsnake, Pacific gopher snake, and Northern Pacific rattlesnake (Audubon 2011). Common upland bird species include California quail, scrub jay, goldfinches, wrentit, and acorn woodpecker. Mammals that are expected to be in the area include pocket gophers, mice, tree and ground squirrels, mule deer, mountain lion, and a diversity of bats. Isabella Lake and the Kern River host a variety of waterfowl, including migratory and resident waterfowl such as American coot, grebes, cormorants, gulls, and waders (Audubon 2011).

Fish

The open water of Isabella Lake and the Kern River hosts a variety of aquatic species, including native fishes (e.g. Sacramento pikeminnow, hardhead, Sacramento sucker, Kern River rainbow trout), and introduced fishes (e.g. smallmouth bass, rainbow trout, redear sunfish, spotted bass, crappie, bluegill, brown bullhead, brown trout) (Table 3-61).

Table 3-61
Fish Species of Isabella Lake and Vicinity

Common Name	Species	Status
black crappie	*Pomoxis nigromaculatus*	Introduced
bluegill	*Lepomis macrochirus*	Introduced
brown bullhead	*Ameiurus nebulosus*	Introduced
brown trout	*Salmo trutta*	Introduced
carp	*Cyprinus carpio*	Introduced
channel catfish	*Ictalurus punctatus*	Introduced
Chinook salmon	*Oncorhynchus tshawytscha*	Introduced
coho salmon	*Oncorhynchus kisutch*	Introduced
fathead minnow	*Pimephales promelas*	Introduced
golden shiner	*Notemigonus crysoleucas*	Introduced
goldfish	*Carassius auratus*	Introduced
green sunfish	*Lepomis cyanellus*	Introduced
hardhead	*Mylopharodon conocephalus*	Native
Kern River rainbow trout[1]	*Oncorhynchus mykiss gilberti*	Native
kokanee salmon	*Oncorhynchus nerka*	Introduced
largemouth bass	*Micropterus salmoides*	Introduced
Little Kern golden trout	*Oncorhynchus mykiss whitei*	Native
mosquitofish	*Gambusia affinis*	Introduced
rainbow trout[2]	*Oncorhynchus mykiss*	Introduced
redear sunfish	*Lepomis microlophus*	Introduced
Sacramento pike minnow	*Ptychocheilus grandis*	Native
Sacramento hitch	*Lavinia exilicauda*	Native
Sacramento sucker	*Catostomus occidentalis*	Native
San Joaquin roach	*Lavinia symmetricus*	Native
smallmouth bass	*Micropterus dolomieui*	Introduced
spotted bass	*Micropterus punctulatus*	Introduced

Common Name	Species	Status
threadfin shad	*Dorosoma petenense*	Introduced
white catfish	*Ictalurus catus*	Introduced
white crappie	*Pomoxis annularis*	Introduced

Sources: CDFG et al. 1999, SCE 1991a.
[1] Likely extirpated from Isabella Lake
[2] Hatchery-reared stock

Isabella Lake has been managed as both a coldwater and warmwater fishery since the 1950s, (CDFG et al. 1999). Introductions of coldwater fish include domesticated rainbow trout that began in 1927 with the establishment of the Kern River Fish Hatchery. The native rainbow trout population of Isabella Lake has been supplemented with several strains of rainbow trout in an effort to develop a self-perpetuating population adapted to conditions in the lake and Kern River above the lake. Since 1969 California Department of Fish and Game (CDFG) has stocked catchable-size rainbow trout when water temperatures are cooler - during the winter and spring months (CDFG et al. 1999).

The optimal temperature range for adult rainbow trout is about 9 to 17°C (48.2 to 62.6°F) with an upper limit of 28 to 29°C (82.4 to 84.2°F) (Lee and Rinne 1980; McCauley et al. 1977; Molony 2001). Chinook salmon have also been introduced to Isabella Lake and, while they grow well in the lake, they are not successful spawners in the Kern River thus their population is not self-sustaining (CDFG et al. 1999).

Numerous warmwater fish species have also been introduced to Isabella Lake since the 1950s - specifically, sport fish such as largemouth bass, black crappie, white crappie, and white catfish (see Table 3-61). Similarly, various forage fish have been introduced including golden shiners and fathead minnows; bluegill were introduced as both a forage food and sport fish. Later introductions included threadfin shad to compensate for declines in the crappie populations observed in the 1960s. The hardy and long-lived Florida strain largemouth bass, smallmouth bass, and spotted bass were introduced in the 1970s; however, smallmouth are now only observed in the Kern River above the lake and spotted bass have not been appreciably successful (CDFG et al. 1999). Carp were likely illegally introduced for live bait and have successfully established in Isabella Lake. Adult largemouth bass have an optimum temperature range of 25 to 30°C (77 to 86°F) and an upper limit of 36°C (96.8°F) (summarized in Jobling 1981).

The warmwater fish species are self-sustaining in Isabella Lake; however, increased temperatures, low pH and low dissolved oxygen negatively impacts cold freshwater habitat beneficial uses such that continuous stocking of rainbow trout is required. CDFG maintains a hatchery facility along the North Fork Kern River. Rainbow trout are stocked by CDFG according to the following criteria:

> *"Catchable trout shall not be stocked in streams when water temperatures reach 75°F and it appears that such temperatures will continue to occur regularly, or when stream flows drop below 10 cfs. The exception is that suitable streams with flows between 2 and 10 cfs may be planted if water*

> *temperatures do not exceed 70°F and other conditions are satisfactory. Stocking shall be discontinued if conditions are unsuitable because of shallow water, lack of pools, growth of algae, poor water quality, or other reasons*
>
> *Catchable trout shall not be stocked in lakes or reservoirs after surface water temperatures reach 78°F and it appears that such temperatures will continue to occur regularly, nor after a trout die-off is attributed in whole or in part to an oxygen deficiency. Stocking shall be discontinued if algae blooms, aquatic weed growth, high turbidity, high alkalinity, or other conditions render the lake unsuitable for catchable trout or for fishing.*
>
> *Catchable trout shall not be stocked in lakes or reservoirs until water temperatures reach 42°F or higher most afternoons, or in streams until water temperatures reach 45°F or higher most afternoons. Catchable trout stocking may be suspended in reservoirs during periods of spill in order to avoid losses of planted fish to downstream areas where the trout may not be readily available to anglers" (CDFG 2011).*

Natural fish habitat in Isabella Lake is extremely limited. This is largely attributed to 1) the extreme changes in water level in Isabella Lake that results in little recruitment of large wood from riparian corridors or establishment of submersed aquatic vegetation and 2) the basin morphology is quite flat with soils that are typically alluvium derived sand and silt (USDA-NRCS 2010). Nest-building spawners such as largemouth bass and bluegill prefer sand and gravel substrates; however, known areas with appropriate nest building materials are limited to Hanning Flat, Brown's Cove, Kissack Cove, near the South Fork boat launch, French Gulch, Boulder Gulch north to Orick Cove, and the western side of the North Fork Kern River confluence with the lake (CDFG et al. 1999). Various habitat improvements and artificial structures have been added to Isabella Lake including cages of various designs and materials and wood structure such as planted willows and anchored Christmas trees (CDFG et al. 1999).

Threatened, Endangered, and Other Special Status Species

The special status species addressed in this Draft EIS include the following:

- Those species considered endangered, threatened, or of special concern by the USFWS.
- Those considered sensitive by the USFS.
- Those considered threatened, endangered, or fully protected by CDFG.
- Those considered threatened by the California Native Plant Society (CNPS).

Federal (USFWS and USFS) and State (CDFG) special status plant and animal species are legally protected according to provisions and codes previously identified in Section 3.12.1 Regulatory Setting. Overall, there are 45 special status species (USFWS, USFS, CDFG, and CNPS) with the potential (low, medium, or high) to occur in or near the proposed Isabella DSM Project area (Tables 3-62, 3-63, and 3-64).

The USFWS (2011) identified 29 special status invertebrate, fish, amphibian, reptile, bird, mammal and plant species within Kern County and the following U.S .Geologic Survey (USGS) Quads: Breckenridge Mtn (238A), Mt. Adelaide (238B), Rio Bravo Ranch (239A), Oil Center (239B), Stevens (240C), Tupman (241D), Walker Pass (259A), Onyx (259B), Cane Canyon (259C), Weldon (260A), Lake Isabella North (260B), Lake Isabella South (260C), Woostalf Creek (260D), Alta Sierra (261A), Glennville (261B), and Democrat Hot Springs (261C) (Appendix E). Of the 29 USFWS (2011) special status species, those with “low” potential for occurrence were excluded from further evaluation in this Draft EIS. This exclusion was done in consultation with the USFWS (Biological Resources Meeting 7/19/2011; notes available in the Administrative Record). In general, species were excluded because sufficient suitable habitat (e.g., habitat for breeding rearing, cover, food, water, and protection from disturbance) is not available and/or the species is not known to occur in or near the Proposed Action areas (Corps 2012).

The USFS Sequoia National Forest lists five plant species and nine animal species as sensitive (USFS 2007a). CNPS lists level 1, 2, and 3 Threat Rank plants near Isabella Lake. CDFG lists two rare and five endangered plant species and six threatened, four endangered, and one fully protected animal species.

Life history characteristics of species with a “high” potential for occurring in the action areas of the Isabella DSM Project are further discussed following Table 3-62 through Table 3-64. Information on the plant and animal species with a high potential to occur in or near the Isabella DSM Project Action Areas was gathered from a variety of sources including: CNDDB (2011), Corps (2010a), CDFG (2011b), USFWS (2010), and USFWS (2011i). Aside from recent surveys conducted for other studies (e.g. *Barlow Road Geotechnical Investigations, Final Environmental Assessment for the Planned Deviation from the Water Control Plan*, and compliance reports for the *Valley Elderberry Longhorn Beetle [VELB] Management Plan*), additional targeted field surveys have not yet been conducted within the Isabella DSM Project Action Areas.

Those species identified in Table 3-62 that have a high probability of occurring in the project action Areas are briefly described in the following paragraphs.

<u>*Alkali mariposa lily*</u>

Alkali mariposa lily (Calochortus striatus) is listed as USFS sensitive. Alkali mariposa lily is a small perennial herb that arises from an underground bulb and flowers in the spring, roughly from April to June. It occurs in elevations 2,000 to 3,700 feet and prefers springs and wet alkaline meadows. The plant is considered a facultative wetland (FACW) species according to USFWS (1993a). FACW plant species usually occur in wetlands (estimated probability 67% to 99%), but occasionally are found in non-wetlands.

Table 3-62
Special Status Plant Species Known to Occur in or near the Project Area

Common Name	Species	Status			Potential to Occur in Action Areas	Justification
		Federal[1/2]	CDFG[3]	CNPS[4]		
Alkali mariposa lily	*Calochortus striatus*	None/S	None	1B.2	High	Suitable habitat near the action areas; occurs within one mile of action areas
Bakersfield cactus	*Opuntia treleasei*	FE/S	SE	1B.1	Low	Suitable habitat not found within the action areas
Bakersfield smallscale	*Atriplex tularensis*	None	SE	1B.1	Low	Habitat absent in action area; requires low elevation (91-96m) subalkaline margins of alkali sinks
California jewel-flower	*Caulanthus californicus*	FE/S	SE	1B.1	Low	Habitat absent in action area; requires undisturbed low elevation, open subalkaline or sandy loam basins
Keck's checkerbloom	*Sidalcea keckii*	FE	None	1B.1	Low	Habitat absent in action area; requires relatively open areas on grassy slopes with serpentine soils; poor competitor
Kern mallow	*Eremalche kernensis*	FE	None	1B.1	Low	Habitat absent in action area; grows under and around *Atriplex* spp. and in patches with other herbaceous cover but with shrub cover less than 25% and variable herbaceous cover; soils are alkaline, sandy loam, or clay.
Mojave tarplant	*Deinandra mohavensis*	None	SE	1B.3	Low	Suitable habitat not found within the action areas
Red rock tarplant	*Deinandra arida (=Hemizonia arida)*	None	Rare	1B.2	Low	Habitat absent in action area; requires clay soil of washes with creosote bush scrub at moderate elevations; only known from Red Rock Canyon
San Joaquin adobe sunburst	*Pseudobahia peirsonii*	FT/S	SE	1B.1	Low	Suitable habitat (heavy clay adobe soils) not present in the project area; elevation range (0 to 1,000 ft.) well below that of the project area
San Joaquin woollythreads	*Monolopia congdonii (=Lembertia congdonii)*	FE	None	1B.2	Low	Historically occurred in the San Joaquin Valley; nearest populations near Bakersfield

Common Name	Species	Status			Potential to Occur in Action Areas	Justification
Striped adobe lily	*Fritillaria striata*	None/S	ST	1B.1	Low	Suitable habitat (open areas in grassland and blue oak woodland, pockets or islands of heavy adobe clay) not found within the action areas
Twisselmann's nemacladus	*Nemacladus twisselmannii*	None	Rare	1B.2	Low	Habitat absent in action area; grows among high-elevation granite in the southern Sierra Nevada

[1] USFWS URL: http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=06029. Accessed 27 October 2010.
[2] USDA Forest Service. 2011. Regional Foresters Sensitive Plant List, dated 2006. Pacific Southwest Region. Received January 12, 2011.
[3] CNDDB 2010. URL: http://www.dfg.ca.gov/biogeodata/cnddb/plants_and_animals.asp. Accessed October 27, 2010
[4] CNPS URL: http://cnps.site.aplus.net/cgi-bin/inv/inventory.cgi. Accessed October 27, 2010
FT = Federal threatened
FE = Federal endangered
FC = Federal candidate
S = USFS sensitive
SE = State endangered
ST = State threatened

Table 3-63
Special Status Plant Species CNPS Threat Ranking

Rank	Description
CNPS Threat Rank 0.1	Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat).
CNPS Threat Rank 0.2	Fairly threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat).
CNPS Threat Rank 0.3	Not very threatened in California (<20% of occurrences threatened / low degree and immediacy of threat or no current threats known).

Table 3-64
Special Status Animal Species that may occur in or near the Project Area

Common Name	Species	Status: Federal[1/2]	Status: CDFG[3]	Potential to Occur in Action Areas	Justification
Invertebrates					
Conservancy fairy shrimp	*Branchinecta conservatio*	FE	None	Low	Suitable habitat not found within the action areas
Longhorn fairy shrimp	*Branchinecta longiantenna*	FE	None	Low	Suitable habitat not found within the action areas
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT	None	Low	Suitable habitat (vernal pools) not found within the action areas
Kern primrose sphinx moth	*Euproserpinus euterpe*	FT	None	Low	Limited or no habitat present in action area; requires desert scrub, particularly in and around washes, where its host plant (an evening primrose) grows
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FT	None	High	Host plant known to occur within the Isabella DSM Project Action Areas
Fish					
Delta smelt	*Hypomesus transpacificus*	FT	SE	Low	No suitable habitat (freshwater-saltwater mixing zones) in the Action Areas
Hardhead	*Mylopharodon conocephalus*	S	None	High	Species observed in the Isabella DSM Project Action Areas
Volcano Creek (=California) golden trout	*Oncorhynchus. mykiss aguabonita*	S	None	Medium	Observed in drainages of the Kern River in the vicinity of Bald Mountain, upstream of Isabella Lake

Common Name	Species	Status		Potential to Occur in Action Areas	Justification
		Federal[1/2]	CDFG[3]		
Amphibians					
California red-legged frog	*Rana draytonii*	FT	None	Low	Isabella DMS Project Action Areas are outside current species distributional range
California tiger salamander	*Ambystoma californiense*	FT	None	Low	Habitat absent in action area; requires annual grassland and grassy understory of valley-foothill hardwoods; breeds in vernal pools and some human-made ponds w/o fish, <1,000 feet in elevation
Foothill yellow-legged frog	*Rana boylii*	S	None	Medium	Suitable habitat (low gradient streams) and reported population (CNDDB) north of Wofford Heights; no known populations or suitable habitat in the vicinity of the action areas
Kern Canyon slender salamander	*Batrachoseps simatus*	None	ST	Medium	Limited to lower Kern River Canyon which has not been identified as occurring in the action area
Mountain yellow-legged frog	*Rana muscosa*	FC/S	None	Low	Suitable habitat not found within the action areas; nearest CNDDB reported population in the Taylor Creek drainage of the South Fork Kern River outside the action areas
Tehachapi slender salamander	*Batrachoseps stebbinsi*	None	ST	Low	Limited to the Caliente Creek drainage and Piute Mountains; neither of these areas fall within the action area
Reptiles					
Blunt-nosed leopard lizard	*Gambelia (=Crotaphytus) sila*	E	SE	Low	Not in action area; found in open grassland of the valley floor below 1,000' elevation

Common Name	Species	Status		Potential to Occur in Action Areas	Justification
		Federal[1/2]	CDFG[3]		
California legless lizard	*Anniella pulchra*	S	None	Medium	CNDDB indicates two populations, one in Orchard quad in SW Kern County and other in Gosford quad west of Bakersfield
Giant garter snake	*Thamnophis couchi gigas*	FT	ST	Low	Endemic to wetlands in the Sacramento and San Joaquin Valleys; historic range limited to Bakersfield area; suitable habitat (low gradient streams and wetlands) present in the project area, but not known to historically or currently occur
Southwestern pond turtle	*Clemmys marmorata pallida*	S	None	High	Species known to occur upstream (Kern R. to Cannell Creek in Tulare Co. and downstream of Lake Isabella; potential habitat in SFWA
Birds					
Bald eagle	*Haliaeetus leucocephalus*	D, S	SE	High	Common winter resident to Isabella Lake
Bank swallow	*Riparia riparia*	None	ST	Low	Habitat not present in action area; require eroding mud banks they can excavate into for nesting and roost sites
California condor	*Gymnogyps californianus*	FE	SFP	Low	Isabella DSM Project Action Areas do not contain suitable roosting habitat and does not overlap with designated Critical Habitat
Least Bell's vireo	*Vireo bellii pusillus*	FE	SE	High	Species observed in the Isabella DSM Project Action Areas
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE	SE	High	Species observed in the Isabella DSM Project Action Areas
Swainson's hawk	*Buteo swainsoni*	None	ST	Low	Habitat not present in action area; require open grassland with moderately tall trees or structures for nesting and hunting
Western snowy plover	*Charadrius alexandrinus nivosus*	FT	None	High	Species observed in the Isabella DSM Project Action Areas

Common Name	Species	Status		Potential to Occur in Action Areas	Justification
		Federal[1/2]	CDFG[3]		
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	FC/S	SE	High	Species observed in the Isabella DSM Project Action Areas
Mammals					
Buena Vista Lake shrew	*Sorex ornatus relictus*	FE	None	Low	Habitat not present in action area; only known from marshes in the San Joaquin Valley
Fisher	*Martes pennanti*	FC	SCT	Low	Habitat not present in action area; found in mature coniferous and mixed conifer and hardwood forests
Giant kangaroo rat	*Dipodomys ingens*	FE	SE	Low	Habitat not present in action area; inhabit undisturbed grassland and shrub communities on a variety of soils at elevations up to 2,850 feet
Pallid bat	*Antrozous pallidus*	S	None	High	Species known to occur near the Isabella DSM Project Action Areas
San Joaquin kit fox	*Vulpes macrotis mutica*	FE	ST	Low	Not present in the project area Nearest historic distribution included San Joaquin Valley in southern Kern County; suitable habitat (grasslands and shrublands)
Sierra Nevada big horn sheep	*Ovis canadensis californiana*	FE	SE	Low	Not present in the action area; inhabit portions of eastern Sierra Nevada at elevations between 1,460 m and 4,300 m
Tipton kangaroo rat	*Dipodomys nitratoides nitratoides*	FE	SE	Low	Not present in the action area; limited to arid-land communities occupying the Tulare Basin Valley floor in level or nearly level terrain

[1] USFWS, URL: http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=06029. Accessed 27 October 2010.
[2] USDA Forest Service. 2011. Regional Foresters Sensitive Animal List (Sequoia National Forest), dated 2007. Pacific Southwest Region. Received January 12, 2011.
[3] CNDDB 2010. URL: http://www.dfg.ca.gov/biogeodata/cnddb/plants_and_animals.asp. Accessed October 27, 2010.
D = Federal delisted
FT = Federal threatened
FE = Federal endangered

FC = Federal candidate
FP = Federal proposed
S = USFS sensitive
SE = State endangered
SCT = State candidate threatened
SFP = State fully protected
ST = State threatened

There are no USFWS NWI mapped wetlands near the Main Dam or campground; however, USFWS NWI forested/shrub and emergent wetlands are identified in the vicinity of the Kern Valley Airport (USFWS 2010a) where the CNDBB (2010) also indicates an occurrence of alkali mariposa lily. Also, CNDDB (2010) indicates an occurrence of the alkali mariposa lily within a mile of the main dam and spillway.

Bald eagle

Although the bald eagle (*Haliaeetus leucocephalus*) was federally delisted as threatened in 2007, it has been listed as state endangered since 1980 and is USFS sensitive. The bald eagle inhabits forested areas near large bodies of water, nesting in large, old growth, or dominant live trees with open branches (e.g., ponderosa pine). During the winter, they can be found in coastal areas along large rivers and large unfrozen lakes. They can be found from Alaska throughout Canada and in scattered localities in nearly all of the lower 48 states of the United States. There are no occurrences of bald eagles near Isabella Lake recorded in the CNDDB (2010); however, Audubon - California birders commonly see them around Isabella Lake during winter, in and near the Kern River Preserve (Audubon - California 2010).

Least Bell's vireo

Least Bell's vireo (*Vireo bellii pusillus*) was listed as federally endangered May 2, 1986 (Federal Register 51(85): 16474-16481) and as State endangered October 10, 1980. The least Bell's vireo is a migratory songbird that depends on riparian habitat for breeding. The least Bell's vireo inhabits dense, low, shrubby vegetation, generally early successional stages in riparian areas, brushy fields, young second-growth forest or woodland, scrub oak, coastal chaparral, and mesquite brushland, often near water in arid regions below 2,000 feet.

The historic range of the least Bell's vireo included western Kern and Tulare counties, including the proposed project area. There are areas of mature riparian willows and other shrubby vegetation along the Kern River corridor; however, much of this area lacks substantial understory vegetation and is therefore less suitable for nesting than more early and mid-successional riparian stands where dense understory vegetation is present (Douglas 2008). Least Bell's vireo is endangered primarily from loss of riparian habitat and cowbird parasitism, and populations continue to decline throughout its range.

Surveys for least Bell's vireos have been conducted along the South Fork Kern River since 1997 to determine its current status in the Kern River Valley (Douglas 2008). Although only one male has been observed (July 9, 2002), from 1992 through 1997, at least eight other individuals have been reported to have moved through the Kern River Valley (Douglas 2008). The CNDDB (2011) documents one occurrence in southwestern Kern County along the San Emigdio River.

There is no critical habitat designation for the least Bell's vireo within the proposed Isabella DSM Project area (Federal Register 59(22): 4845-4867).

<u>*Southwestern willow flycatcher*</u>

Southwestern willow flycatcher (*Empidonax traillii extimus*) was listed as Federal endangered February 27, 1995 (Federal Register 60: 10693). The geographic area occupied by the southwestern willow flycatcher is widespread as a result of its behavior, breeding range, known migration, and dispersal habits (USFWS 2005). The southwestern willow flycatcher, a neotropical migrant, travels annually through diverse migratory habitats from its wintering grounds in Central and South America to its breeding grounds in the United States. The riparian habitat it uses for breeding, foraging, migrating, dispersing, and shelter is dynamic in quality, growth, and location due to its proximity to water and susceptibility to disturbance by flooding (USFWS 2002c; Koronkiewicz et al. 2004; Cardinal and Paxton 2005).

Southwestern willow flycatchers are a riparian obligate species that have specific habitat requirements, typically dominated by willows (*Salix* spp.) and alders (*Alnus* spp.), and permanent water often in the form of low-gradient watercourses, ponds, lakes, wet meadows, marshes, and seeps in and next to forested landscapes (Sogge et al. 1997; Craig and Williams 1998; USFWS 2005). In general, southwestern willow flycatchers inhabit monotypic high-elevation willow forests, monotypic exotic stands of saltcedar (*Tamarix* spp.) or Russian olive (*Elaeagnus* spp.), native broadleaf deciduous forests, and mixed native/exotic forests (Sogge et al. 1997). The dynamic habitat preferred by southwestern willow flycatchers is regularly disturbed by flooding, drought, or occasionally by fire, continually driving successional transitions in vegetation. Throughout this process, some trees and shrubs of appropriate height and structure must remain in the system in order for it to remain useful to flycatchers. Although nesting typically requires larger mature trees (Jones & Stokes 2004, 2006, 2008; Whitfield and Henneman 2009), even if this feature is lacking, a habitat patch could retain utility for migration or foraging. Transitions are usually temporary, and patches may cycle back into suitability for breeding if allowed to mature (USFWS 2002c).

Survey results suggest that southwestern willow flycatchers do not settle randomly in willow and cottonwood forest but choose to establish territories and nest sites in areas with specific vegetative features (Whitfield and Henneman 2009). Southwestern willow flycatchers have been shown to prefer areas with greater canopy cover and understory vegetation than what has been generally available in the area, clarifying why only a small fraction of the area that appears suitable for breeding is actually used (Whitfield and Henneman 2009).

Southwestern willow flycatchers forage either by aerially gleaning (capturing an insect from a substrate while hovering) from trees, shrubs, and herbaceous vegetation, or by hawking larger insects on the wing by waiting on exposed forage perches and capturing insects in flight (Craig and Williams 1998). During the breeding season, the qualities that are important for this species are a high-quality local source of nutrients to meet the nutritional needs of territorial establishment and defense, mating, nest building, egg laying, brooding, and nestling rearing (Craig and Williams 1998). After the breeding season, when fledglings become more mobile and are able to forage for themselves, the adults are not as dependent on local food sources (Craig and Williams 1998), allowing them to forage more broadly.

Individuals typically breed in different locations each year (Luff et al. 2000; Kenwood and Paxton 2001; USFWS 2002c; Newell et al. 2003). Although they do not usually exhibit nest-site fidelity, they demonstrate loose territory fidelity by returning to the same general area where they previously bred or hatched (Luff et al. 2000; Kenwood and Paxton 2001; USFWS 2002c; Newell et al. 2003). This life history trait results in the geographical area occupied by this species to be much broader than what the specific locations used while nesting would indicate.

Studies have estimated that only 938 to 1,256 southwestern willow flycatcher territories remain (Sogge et al. 2003; Durst et al. 2005). Riparian woodlands found throughout the riparian zone of the SFWA forms one of the most extensive riparian woodlands remaining in California (USFS 2010), and provides essential structure for Southwestern willow flycatchers which have been closely monitored in the area since 1989 (Whitfield 1990, Jones & Stokes 2004, 2006, 2008; Whitfield and Henneman 2009). In fact, the South Fork Kern River Valley population may be the largest in California (Unitt 1987; Craig and Williams 1998).On the South Fork Kern River, southwestern willow flycatchers tend to nest in areas that have more trees greater than 17 feet tall, a larger amount of tree canopy cover, and a larger amount of foliage volume (Copeland 2004), from 0 to 13 feet (Whitfield 1990).

Southwestern willow flycatchers migrate across a wide distribution over the lowlands of California, from as early as April at the South Fork Kern River to as late as mid-June in Red Bluff (Craig and Williams 1998). Transients are observed in California through mid-September (Zeiner et al. 1990), but little is known about the post-breeding season movements of each local subspecies (Craig and Williams 1998). Grinnell and Miller (1944) reported that post-breeding fall migrations may include invasions of the species into habitat higher in elevation than the highest breeding habitat. At desert oases in eastern Kern County, the earliest summer date is July 28 and the latest fall record is October 18, with peak of migration from mid-August to early September (Craig and Williams 1998). Other observations document adults departing mainly during the last half of August, remaining rarely as late as September 4 (Unitt 1987). Juveniles remain later in September, but all depart by October 1 (Unitt 1987). Little data exists on use of migratory stopover sites, but it appears that willow flycatchers pause only briefly in these areas (Craig and Williams 1998).

Since surveys began, the population size of breeding southwestern willow flycatchers in the South Fork Kern River Valley has steadily decreased from 40 males and 30 females in 1989 to 13 males and 7 females in 2008 (Jones & Stokes 2004, 2006, 2008; Whitfield and Henneman 2009). During the same interval, Mayfield Nest Success Estimates have ranged from a low of 17 percent in 1991, to 90 percent in 2008, and the annual number of fledglings may be in decline (see Whitfield and Henneman 2009). Results of resident southwestern willow flycatcher surveys from 1998 to 2011 are provided in Table 3-65.

The mechanism for this decline remains unclear, despite comparable breeding parameters between this population and those measured in stable or increasing populations elsewhere (Whitfield and Henneman 2009).

Table 3-65
Numbers of Adult Resident Southwestern Willow Flycatchers Detected in the South Fork Wildlife Area (1988-2011)

Year	No. Residents Detected	Year	No. Residents Detected
1988	2[a]	2000	1
1989	15	2001	4
1990	10	2002	10
1991	8	2003	10
1992	4	2004	15
1993	10	2005	11
1994	8	2006	8
1995	13	2007	4
1996	4	2008	0
1997	7	2009	3
1998	6	2010	4[b]
1999	2	2011	3

Source: Correspondence from Mary J. Whitfield, Research Director, Southern Sierra Research Station, to Mitch Stewart, U.S. Army Corps of Engineers, Sacramento District, September 14, 2011.

[a] No willow flycatcher surveys conducted in 1988, these birds were detected while doing other bird work.

[b] Only a few, limited willow flycatcher surveys conducted in 2010, some birds were detected while conducting other bird fieldwork.

Loss and degradation of riparian habitat and brood parasitism by the invading brown-headed cowbird appears to be responsible for the southwestern willow flycatcher's decline (Unitt 1987; Marshall and Stoleson 2000; Periman and Kelly 2000; USFWS 2005; Brodhead et al. 2007). Overgrazing by cattle has also been an important factor in habitat reduction in some areas (Marshall and Stoleson 2000; Periman and Kelly 2000). Cattle eat and trample understory vegetation that southwestern willow flycatcher rely upon (Unitt 1987; USFWS 2005). Loss of vegetation reduces cover for the birds and reduces soil permeability which in turn causes declines in the water table (Unitt 1987; USFWS 2005). This can lead to the desiccation of wetlands and ultimately the elimination of quality habitat (Marshall and Stoleson 2000). Other processes that disrupt the water table, such as overpumping for agriculture, urban use, soil compaction, or accelerating runoff, also adversely affect the flycatcher's habitat (Unitt 1987; USFWS 2005).

Water level can play a significant role in the availability of riparian habitat for southwestern willow flycatcher. For some lakes, such as Isabella Lake, drought can lead to reduced water storage which in turn increases the exposure of wet soils along the shoreline and allows for increased vegetation. The increase in riparian vegetation may provide sufficient nesting habitat for flycatchers (Ellis et al. 2008). Conversely, in 1995, 700 acres of willow habitat were inundated in the SFWA, resulting in the loss of flycatcher nests and subsequent decline in the number of breeding flycatchers (Whitfield and Strong 1995; USFWS 1997).

Critical Habitat. The action addressed within this Draft EIS does not fall within the current critical habitat under Section 4(b)(2) of the ESA for the southwestern willow flycatcher. Critical habitat was designated on October 19, 2005 (50 CFR, Part 17) although it was excluded from the SFWA, Sprague Ranch and an easement on the Haffenfeld property. These areas were excluded because a panel of scientists, convened by the USFWS, determined that the impacts of routine operations of Isabella Lake was an attractive nuisance resulting from periodic inundation, and further determined that the SFWA had no value to southwestern willow flycatcher habitat. These areas are co-managed by the Corps and USFS to protect riparian habitat values, in accordance with a long-term biological opinion (USFWS 2005).

According to the Corp's 1999 Revised Project Description in the Isabella Lake and Dam Routine Operating Procedures for Anticipated Future Operations,

> *"…routine reservoir operations contemplate storage ranging between 30,000 acre-feet and 245,000 acre-feet during the November through February period. Any storage in excess of the 2,584-foot elevation during the winter period of October 1 to March 20, which results in inundation of a portion of the SFWA, would be due to temporary rain flood conditions. An evacuation of water above 2,584 feet after March 20 would require a deviation from the Isabella Water Control Plan. Such short-term inundation does not coincide with the breeding and nesting cycle of the flycatcher since the flycatcher arrives in the area in mid-May and has migrated south and out of the region by the end of August or early September. Likewise, any such short-term inundation is predominantly during the dormant non-growing season for riparian trees and herbaceous plants located in the SFWA."*

On August 15, 2011, USFWS proposed to revise critical habitat for the southwestern willow flycatcher under ESA. The revised critical habitat proposal includes the upper 1.0 km (0.6 mi) of Isabella Lake (including the SFWA), and the Sprague Ranch and Haffenfeld conservation easement. Comments on the proposed rule were accepted until October 14, 2011. All Primary Constituent Elements (PCE) of critical habitat for the southwestern willow flycatcher are found in the riparian ecosystem in the 100-year floodplain of the South Fork Kern River Delta (see USFWS 2005). The PCEs include: (a) PCE 1 – Riparian Vegetation; and (b) PCE 2 – Insect Prey Populations. These elements are discussed below.

PCE 1 – Riparian Vegetation. Riparian habitat in a dynamic river or lakeside, natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is comprised of trees and shrubs (that can include Gooddings willow, coyote willow, Geyer's willow, arroyo willow, red willow, yewleaf willow, pacific willow, boxelder, tamarisk, Russian olive, buttonbush, cottonwood, stinging nettle, alder, velvet ash, poison hemlock, blackberry, seep willow, oak, rose, sycamore, false indigo, Pacific poison ivy, grape, Virginia creeper, Siberian elm, and walnut) and some combination of the following:

- Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 2 m to 30 m (about 6 to 98 ft.). Lower-stature thickets (2 to 4 m or 6 to 13 ft. tall) are found at higher elevation riparian forests and tall-stature thickets are found at middle and lower-elevation riparian forests; and/or
- Areas of dense riparian foliage at least from the ground level up to approximately 4 m (13 ft.) above ground or dense foliage only at the shrub or tree level as a low, dense canopy; and/or
- Sites for nesting that contain a dense (about 50 percent to 100 percent) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground); and/or
- Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.1 ha (0.25 ac) or as large as 70 ha (175 ac).

PCE 2 – Insect prey populations. A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, which can include: flying ants, wasps, and bees (Hymenoptera); dragonflies (Odonata); flies (Diptera); true bugs (Hemiptera); beetles (Coleoptera); butterflies, moths, and caterpillars (Lepidoptera); and spittlebugs (Homoptera).

<u>*Western snowy plover*</u>
The western snowy plover (*Charadrius alexandrinus nivosus*) was federally listed as threatened March 5, 1993 (Federal Register 66: 42676-42677). The western snowy plover can be found across North and South America, Eurasia, and Africa. In North America, it is restricted to the Gulf and Pacific coasts of the United States and scattered inland localities from Saskatchewan to California and Texas (USFWS 1993b).

Winter range habitat is primarily coastal beaches, tidal flats, lagoon margins, and salt-evaporation ponds. Inland populations in California regularly winter at agricultural wastewater ponds in the San Joaquin Valley and at desert saline lakes in Southern California (e.g., the Salton Sea) (USFWS 1993b).

Western snowy plovers breed up to 10,000 feet in elevation on barren to sparsely vegetated ground, generally near alkaline or saline lakes, reservoirs, and ponds, on riverine sand bars, and at sewage, salt-evaporation, and agricultural wastewater ponds (USFWS 1993b). The snowy plover frequently raises two broods a year and sometimes three in places where the breeding season is long (USFWS 1993b). At around the time chick's hatch, females, which brood the precocial chicks, desert their mate and initiate a new breeding attempt with a different male.

The CNDDB (2011) lists limited occurrences of the western snowy plover in Kern County, near the mouth of the Kern River, in areas of appropriate habitat in the Buena Vista Lakebed, and in the Freemont Valley southeast of the proposed project area. The proposed project area encompasses some aspects of preferred habitat for the western snowy plover, and birds were observed in the South Fork Kern River area during a site visit August 2011 by the Corps and USFWS.

There is no critical habitat designation under Section 4(b)(2) of the ESA for the western snowy plover in the proposed Isabella DSM Project area.

Western yellow billed cuckoo
The western yellow billed cuckoo *(Coccyzus americanus occidentalis)* is a Federal species of concern and listed as endangered by the State of California and sensitive by the USFS. Nesting habitat for the western yellow-billed cuckoo is characterized by a dense subcanopy or shrub layer (regeneration canopy trees, willows, or other riparian shrubs) in lowland riparian areas. Overstory in these habitats may be either large gallery-forming trees 33 to 90 feet, or developing trees 10 to 33 feet, usually cottonwoods (USFWS 1982; Wiggins 2005). Riparian habitat is critical for breeding, wintering, migration stopovers, and as corridors for juvenile dispersal. The earliest spring arrival date for western yellow-billed cuckoo in California is April 23 (Laymon 1998). While there are regularly a few arrivals in May, although not every year, most breeding pairs arrive from June to early July (Laymon and Halterman 1989). Western yellow-billed cuckoos are rarely detected during spring migration in California.

Distribution, habitat, and life history information on the western yellow-billed cuckoo was compiled primarily from the Layman (1998), Layman et al. (1997), Laymon and Halterman (1985, 1989), and USFWS (1982, 2010b, 2010c). Recent distribution information for the action area was provided by Whitfield and Stanek (2010).

Historically, the western yellow-billed cuckoo was a common breeding species in riparian habitat throughout much of lowland California (Grinnell 1915; Grinnell and Miller 1944; Laymon 1998). Early accounts from the Central Valley list the species as common (Belding 1890). Grinnell and Miller (1944) described the cuckoo's range as the coastal valleys from the Mexican border to Sebastopol, Sonoma County, and the Central Valley, from Bakersfield and Weldon, Kern County, north to Redding, Shasta County. Small populations were also found in Northern California along the Shasta River, Siskiyou County, and in Surprise Valley, Modoc County. Populations were also found in suitable habitat east of the Sierra Nevada in the Owens Valley and along the Colorado and Mojave Rivers. By 1944, cuckoos were no longer present in many areas where they were once found "because of removal widely of essential habitat conditions" (Grinnell and Miller 1944). Estimates of the number of current breeding pairs range widely but it is apparent that cuckoos' population and range have been largely diminished since Ridgway (1877) first described the subspecies. Currently, the range of the cuckoo is limited to fragments of riparian habitats (USFWS 2010c).

Western yellow-billed cuckoos are long-range migrants that winter in northern South America in tropical deciduous and evergreen forests (Ehrlich et al. 1988). In California, breeding populations of greater than five pairs that persist every year are limited to the Sacramento River, from Red Bluff to Colusa, and the South Fork Kern River, from Isabella Reservoir to Canebrake Ecological Reserve (Layman 1998), although they may breed in a few other California locations (Laymon and Halterman 1997). Prior surveys also showed cuckoo populations to be most consistent in these locations (Layman and Halterman 1989; Halterman 1991), which have proved to be the only localities in California that sustain breeding populations (USFWS 2010c). Continuous surveys along the South Fork Kern River from 1985 to 2000 showed a population that varied from a low of two pairs in 1990 to a high of 24 pairs in 1992 (Laymon et al. 1997; Whitfield and Stanek 2010). The most recent survey in this area (Whitfield and Stanek 2010) detected a total of 71 cuckoos during the breeding season (mid-June to mid-August). The majority of detections (68 of the 71) were in the SFWA, although 3 detections were made in the Kern River Preserve.

Western yellow-billed cuckoos along the South Fork Kern River are typically associated with upland sites early in the season during wet years but not in dry years (Laymon 1998). It is likely that flooding in wet years reduces the survival of the larvae of the preferred prey (katydids [Tettigonioidea] and sphinx moth [Sphingidae]), which winter underground (Laymon 1998). These conditions restrict cuckoos to foraging in upland areas until the prey base in the lower floodplain begins to recover later in the breeding season (Laymon 1998). Locally, most extant riparian habitat is in the primary floodplain making the potential high for a large reduction in the prey base during wet years (Laymon 1998). If this occurs along with baseline habitat losses from agriculture and urban development (USFWS 1982), the cuckoo population in the action area could be significantly compromised. Restoration would include planting at least a portion of forests on upper terrace sites that do not regularly flood.

The peak of the breeding season at the South Fork Kern River is in the first half of July, though nests have been started as early as June and as late as early August (Laymon 1998). The period of incubation to the point when nestlings leave the nest is typically 16 to 20 days, and while typically only one brood is raised per year (Laymon 1998) at the South Fork Kern River, in years of abundant food resources, two and even three broods have been successfully fledged (Laymon et al. 1997). While nests are almost always placed in willows, cottonwoods are extremely important for foraging. These birds are primarily foliage gleaners in riparian habitats, though at times they sally from a perch and catch flying prey, such as dragonflies (Odonata) or butterflies (Lepidoptera), or drop to the ground to catch grasshoppers (Orthoptera) or tree frogs (*Pseudacris regilla*) (Laymon 1998). They also require upland habitat where they can forage on various other insect species (Laymon 1998). The humid shady environment creates a microclimate that protects the nesting birds, eggs, and fledglings from the dry heat of late summer in the western United States (USFWS 1982). Territory size at the South Fork Kern River ranges from 8 to 100 acres (Laymon and Halterman 1985).

The CDFG's CNDDB (2010) lists only one occurrence of the western yellow-billed cuckoo in the general region of Isabella Lake. The single occurrence is found within the boundary of the nine quads directly surrounding the lake. Birders know the cuckoo from the South Fork Valley of the Kern River, and while they are rarely spotted, they possibly nest in vicinity of the SFWA (Audubon - California 2010).

Hardhead Minnow

The hardhead minnow (*Mylopharodon conocephalus*) is a USFS sensitive and State species of concern. They typically inhabit deep, rocky and sandy pools of small and large rivers (e.g. Sacramento-San Joaquin and Russian River drainages) (Page and Burr 1991). Hardhead are present in the Kern River, Lake Isabella, and the lower Kern River. Little is known about their juvenile life history, but based on gill net sampling and shore seining in Isabella Lake in 1999 and 2000; their numbers represented only 1% of the total fish population of the lake (USFS unpublished data in McGuire 2009).

Isabella Lake is not the preferred habitat for the hardhead minnow, and similar to the rainbow trout, hardheads are intolerant of low DO, high water temperatures, and high turbidity (Moyle 2002). Unlike rainbow trout, hardhead prefer water temperatures of 20°C (68°F) or better (McGuire 2009). Though it has been suggested that rainbow trout prey upon hardheads, there is insufficient evidence to support this due to incongruent water temperature preferences between the two species (McGuire 2009).

Valley elderberry longhorn beetle

Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) was listed as federally threatened in August 8, 1980 (Federal Register 45: 52803). The valley elderberry longhorn beetle depends on its host plant, the elderberry (*Sambucus* spp.), which is a locally common component of the fragmented riparian forests and savannas of the Central Valley. In most cases, the only evidence of the shrub's use by the beetle is an exit hole created by the larva just before the pupal stage. Larvae tend to be distributed in elderberry stems that are one inch or greater in diameter at ground level (USFWS 1999). Studies suggest that based on the spatial distribution of occupied shrubs, the beetle is a poor disperser (Barr 1991; Collinge et al. 2001). Low density and limited dispersal capability adversely impact the beetle, particularly isolated small subpopulations in fragmented habitat. Moreover, once a small beetle population has been extirpated from an isolated habitat patch, the species may be unable to recolonize the patch if it is unable to disperse from nearby occupied habitat (USFWS 2007a).

The nearest extant population of valley elderberry longhorn beetles is found along the South Tule River east of Porterville (CNDDB 2011).

Potential habitat that could support valley elderberry longhorn beetles is present in the action area. Three valley elderberry shrubs were identified below the Auxiliary Dam during a site visit on April 8, 2008 (Corps 2008b). Although no exit holes were observed, based on the shrubs diameter, they could provide potential habitat. Habitat features that could potentially support longhorn beetles were also identified along the Borel Canal. During surveys conducted in 2001 at the Borel facilities, three elderberry stands were found within the fenced Borel powerhouse area and were determined to provide suitable habitat (Psomas 2010). However, no beetles were observed during these surveys or within 150 feet of the Borel Canal or the elevated flumes, which run between the Lake Isabella Auxiliary Dam and the Bodfish siphon (Psomas 2010). Additional elderberry shrubs were identified along the Kern River away from the Borel Project but no exit holes were observed. The elderberry stands near the Borel Canal were re-surveyed in 2008, 2009, and 2010. The shrubs remained relatively intact as they were found in 2001, but no beetles were observed and only 6 new exit holes were apparent (Psomas 2010).

There is no critical habitat designation under Section 4(b)(2) of the Endangered Species Act (ESA) for the valley elderberry longhorn beetle within the proposed Isabella DSM Project area.

Pallid bat

The pallid bat *(Antrozous pallidus)* is a USFS sensitive species. Pallid bats are found statewide except Sierra Nevada, northwest portions of the Kern Valley and the southern Tehachapi Mountains. They prefer deserts, grasslands, shrubslands, woodlands, and forests and are most common in open, dry habitats, with rocky areas for roosting. Pallid bats are opportunistic generalist that feed on beetles, centipedes, cicadas, crickets, and other invertebrates, and either capture prey on substrates or on the wing. Mating occurs from October to February and females have one to two pups per year. Adult and yearling males may roost in maternity colony structures, but remain separate from females. Little is known about its winter habitat; however, they do not appear to migrate long distances between summer and winter sites, when they occasionally use different sites. Overwinter sites tend to have relatively cool and stable temperatures and are located in protected structures beneath the forest canopy or on the ground and out of direct sunlight. In the summer, roosts must protect bats from high temperatures. Pallid bats are very sensitive to disturbance of roosting sites, such as vandalism, recreational activities, or where man-made structures are occupied, demolished, or modified.

CNDDB (2010) indicates two occurrences of pallid bats in the vicinity of Isabella Lake. The nearest to Isabella DSM Project action area is an occurrence along Hwy 155 at the Kern River and an occurrence along the South Fork Kern River northeast of the community of Bella Vista.

Southwestern pond turtle

The southwestern pond turtle (*Clemmys marmorata pallida)* is a USFS sensitive species. Western pond turtles occur from northern Baja California Norte, Mexico to the Puget Sound region in Washington (Bury 1970, Nussbaum et al. 1983, Iverson 1986, Stebbins 2003). They occur in a variety of aquatic habitats including rivers, streams, ponds, lakes, marshes, vernal pools, and even wastewater and stock ponds (Storer 1930, Germano and

Bury 2001, Buskirk 2002) in areas with mild wet winters and dry, hot summers (Bury and Germano 2008).

Though they prefer low gradient ponds and streams, they can be found up to one mile from perennial waters for as long as six months (Bury and Germano 2008). Preferential aquatic habitat features include abundant basking sites (logs, boulders, vegetation mats, and muddy riparian zones), sufficient plunge pools Western pond turtles are opportunistic feeders, primarily consuming aquatic larvae of mayfies, dragonflies, stoneflies, caddisflies, beetles, midges, and beetles (Holland 1985, Bury 1986). Lesser food items include fishes, anurans, macrophytes, and filamentous algae.

Historic threats to the Western pond turtle population was commercial harvesting for human consumption and the aquarium trade (Bury and Germano 2008). Current primary threats to the southwestern pond include loss, alteration, and fragmentation of aquatic and terrestrial habitat (Bury and Germano 2008). The CNDDB does not report observations of Clemmys sp. in the vicinity of Isabella Lake; however, the USFS reports their presence in the Kern River to Cannell Creek (north of Kernville).

3.10.3 Environmental Consequences

This section discusses the potential impacts on biological resources that are anticipated from the Proposed Action Alternatives and support actions. The discussion includes a description of the methods and assumptions used to conduct the analysis and the criteria for determining the level of the potential impacts.

Scope and Methods

Numerous sources of information were used to compile information to characterize the biological resources found in the Primary and Secondary Action Areas. Tetra Tech obtained a list of endangered, threatened, proposed, and candidate species from the USFWS on January 11, 2012 (Document No. 120111031623; Appendix E). Additional sources of information included: California Department of Fish and Game's (CDFG) California Natural Diversity Database (CNDDB) and the California Native Plant Society's (CNPS) Inventory of Rare and Endangered Plants. Following review of existing information, a reconnaissance-level habitat and vegetation survey was conducted in the proposed project area from October 12 to 14, 2010 by Tetra Tech biologists. During the survey, the surface elevation of Isabella Lake was at 2,562.75 feet. A follow up vegetation and preliminary wetland and other waters of the U.S. delineation was conducted April 18 to 22, 2011 when Isabella Lake was between 2,581.25 and 2,583.15 feet. The USFWS list, information from the field reconnaissance and existing information was used in the development by Tetra Tech of a Biological Data Report (BDR) that was provided to the Corps and the USFWS in April 2011. Information in the BDR was used by the USFWS for the planning aid letter provided to the Corps (letter dated May 10, 2011 (Appendix E).

The factors that are important for evaluating the context and intensity of impacts on vegetation and wildlife species include a qualitative assessment of whether the action would cause a substantial loss, degradation, or fragmentation of any sensitive natural vegetation communities or wildlife habitat or if it were to interfere with the movement of any resident or migratory wildlife species. For special status species, high adverse effects would be indicated if the action would result in harm or "take" of listed species or their habitat, if it affected a population of a non-listed species to the point where it became listed or a candidate for listing or resulted in loss of wetlands or other waters of the US that could not be mitigated.

No Action Alternative

Under the No Action Alternative, operation of Isabella Dam would continue in accordance with the established Water Control Plan and Flood Control Diagram and the lake capacity (gross pool elevation) operated at the pre-IRRM elevation of 2,609.25 feet. That is, under the No Action Alternative, there would be no substantial loss, degradation, or fragmentation of natural vegetation communities or wildlife habitat, nor would the No Action Alternative interfere with the movement of resident or migratory wildlife species beyond impacts those associated with normal operations. Routine flood reduction and water storage operations at Isabella Dam and Lake sometimes result in prolonged inundation of riparian vegetation along the South Fork Kern River, especially within the South Fork Wildlife Area. The South Fork Wildlife Area currently supports the largest contiguous riparian forest in California and provides important habitat for the flycatcher as well as habitat for Least Bell's Vireo. Both species are listed as endangered under Federal and California endangered species acts. Fluctuations in lake levels due to operations also impacts the habitat available for fish in the lake and low lake levels have led to water quality issues affecting fisheries in the past. The No-Action Alternative would not reduce the likelihood and consequences of dam failure that could result in catastrophic (significant adverse) impacts on lake and downstream biological resources and habitats.

Impacts Common to All Action Alternatives

The following paragraphs present a discussion of impacts on biological resources resulting from actions that are common to the five Action Alternatives. A discussion of impacts on biological resources under each Action Alternative is provided following this discussion.

<u>Site Preparation, Staging Areas and Borrow Areas</u>

Site preparation, which involves clearing, grubbing, and leveling to provide suitable work surfaces for construction activities, would occur within The Primary Action Area (in proximity to the Main and Auxiliary Dams), and within the Secondary Action Area (South Fork Delta borrow area). These areas are illustrated in Figure 2-25, and 3-20. An overview of impacts to biological resources from actions common to the five Action Alternatives is presented in Table 3-66.

Of the five proposed staging areas, three are common to all alternatives: S1, A1, and A2. Staging Area S1, located on the ridge between the Main and Auxiliary Dams, would serve as a location to stockpile process rock material from the New Emergency Spillway excavation and be the location for a rock Crushing Plant. No ESA-listed plant or animal species are known to occur in the area; however, there is approximately 10 acres of sagebrush-shrub upland cover that would be impacted (Figure 3-20).

Staging Area A1, located at the existing Auxiliary Dam Recreation Area, would serve as a location to stockpile and process filter sand material from the Recreation Area and the South Fork Delta (see Figure 3-20). Staging Area A1 is largely within the OHWM of Isabella Lake and is largely exposed shoreline with little to no vegetation.

The preparation of Staging Area A2 would result in the loss of approximately 17 acres of sagebrush-scrub uplands (see Figure 3-20). A vehicle storage and maintenance facility is proposed for Staging Area A2 which is adjacent to the existing Borel Canal. Also proposed for Staging Area A2 is the installation of a small temporary substation-switching station capable of providing 3-phase 220-volt electric power to various construction equipment (e.g. Crushing Plant, Batch Plant, and conveyors). Power would be delivered to the action areas by overhead transmission lines strung from single vertical wooden poles along Barlow Road. The specific location of the poles has not yet been determined thus it is unknown which vegetation communities would be impacted; however, it is assumed that impacts would be small and of limited duration. Noise and lights associated with the operation would likely result in avoidance of the area by mammals and birds at all staging areas.

Five haul roads and one access road are proposed under all five Action Alternatives (see Figure 2-25). Haul Road H1 would link Staging Area S1 to Hwy 178. From Staging Area S1, the proposed road would traverse sagebrush-scrub uplands, and emergent wetland (included in Staging Area A3) and an agricultural field before reconnecting with Hwy 178. Haul Road H2 is largely the existing Hwy 178 thus no impacts to biological resources in the immediate vicinity of the action areas are anticipated beyond existing conditions; however, CNDDB (2010) reports a population of USFS sensitive pallid bats in the vicinity of Hwy 178 and the lower Kern River. Haul Road H3 would be used for activities associated with the Main Dam and New Emergency Spillway, to the west of Staging area S1 and linking to Haul Road H1 east of Staging Area S1. Pine woodlands and sparse sagebrush-scrub uplands would be impacted by Haul Road H3. Haul Road H4 is the existing Hwy 155 thus no impacts to biological resources are anticipated beyond existing conditions. Haul Road H5 links activities in the Auxiliary Dam Recreation area (sand borrow) with Staging Area A2. Minimal impacts to sparse sagebrush-shrub uplands are anticipated. Again, according to the CNDDB (2010) there is an occurrence of the USFS sensitive pallid bat downstream of the Main Dam (west of the town of Lake Isabella); however, no occurrences are recorded within the two proposed Action Areas.

Figure 3-20 Impacts on Biological Resources in Primary Action Area

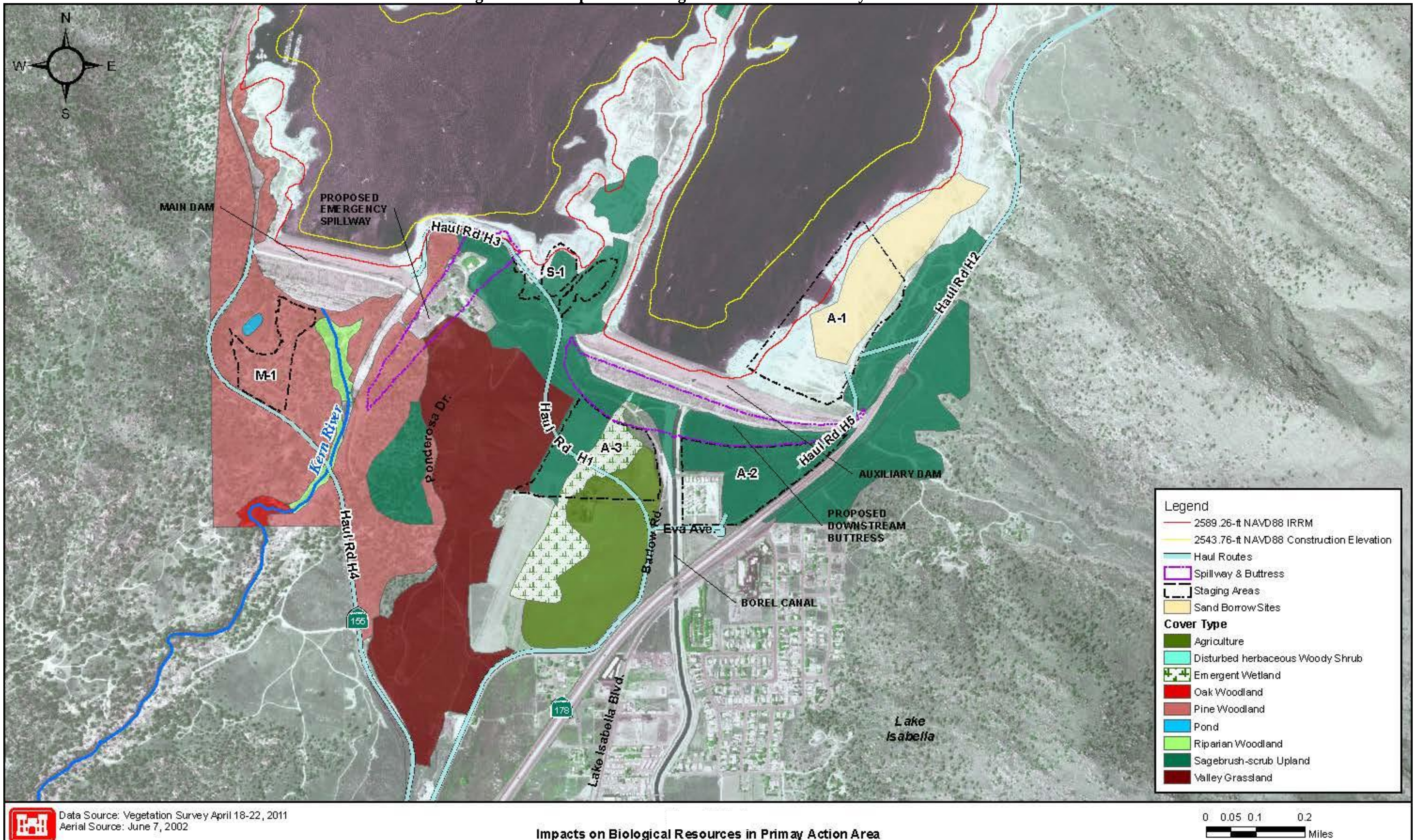

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Table 3-66
Anticipated Impacts to Biological Resources from Proposed Staging Areas, Haul Routes, and Borrow Areas

	Feature[1] (size)	Alternative: Base Plan	Plan 1	Plan 2	Plan 3	Plan 4	Anticipated Impacts to Resource
Staging Areas	S1 (15 ac)	•	•	•	•	•	Removal of sparse areas of sagebrush-scrub uplands, and disturbance to seasonally exposed shoreline between the Main and Auxiliary Dams.
	A1 (40 ac)	•	•	•	•	•	Removal of sparse areas of sagebrush-scrub uplands, and disturbance to seasonally exposed shorelines in the vicinity of the Auxiliary Dam Recreation Area.
	A2 (20 ac)	•	•	•	•	•	Removal of robust sagebrush-scrub uplands below the Auxiliary Dam and adjacent to the Lakeside Village Mobile Home Park.
	A3 (25 ac)	•	•	•			Disturbance of approximately 12 acres of emergent wetlands and agricultural field below the Auxiliary Dam.
	M1 (10 ac)		•	•	•	•	Removal of and disturbance to mixed pine woodlands below the Main Dam.
Haul Routes	H1 (4,000 ft.)	•	•	•	•	•	Disturbance to sparse sagebrush-scrub uplands, emergent wetlands, and agricultural field.
	H2 (46,500 ft.+)	•	•	•	•	•	No anticipated impacts to biological resources.
	H3 (1,600 ft.)	•	•	•	•	•	Disturbance to pine woodlands and sagebrush-scrub upland east of the Main Dam, and to seasonally exposed shorelines.
	H4 (12,500 ft.)	•	•	•	•	•	No anticipated impacts to biological resources where existing roads would be used (e.g. Hwy 155 and Barlow Road); however, impacts to agricultural field where existing roads join new roads.
	H5 (1,300 ft.)	•	•	•	•	•	Disturbance to sagebrush-scrub upland.
	Patterson Lane Access Rd	•	•	•	•	•	Potential disturbance to riparian woodland; however, the proposed area was inundated during the April 2011 site visit.
Borrow Areas	Auxiliary Dam Recreation Site (66.7 ac)	•	•	•	•	•	Removal of sparse sagebrush-scrub upland, and disturbance to seasonally exposed shoreline.
	South Fork Delta (522.5 ac)	•	•	•	•		Disturbance to patches of riparian woodland, woody vegetation, and hydrophytic herbaceous vegetation; potential disturbance to the western yellow-billed cuckoo which is a federal candidate for listing, USFS sensitive, and state endangered species; however, it is not expected during the spring, uncommon in the summer, and rare in the fall (Audubon 2011); potential habitat for southwestern pond turtle in the vicinity of the SFWA.

[1] Feature locations identified in Figures 3.19 and 3.20.

In addition to filter sand from the Auxiliary Dam Recreation Area, additional borrow would come from the South Fork Delta (Figure 3-21). An access road from Patterson Lane to the South Fork Delta sand borrow area would mainly use the existing roadway above the current IRRM water level; however, the northwesterly portion of the proposed access road was inundated during the April 2011 field visit thus existing conditions are not known. Based on adjacent conditions, however, it is assumed that sparse and newly established willows are in the area. Southwestern willow flycatcher and western snowy plovers are known to occur in riparian woodlands east of the proposed South Fork Delta borrow site; however, work in the Delta is planned to occur mainly during the low water months, when southwestern willow flycatcher and western snowy plovers are not present. Furthermore, borrow work would occur at a distance of over one-quarter mile from the riparian forest.

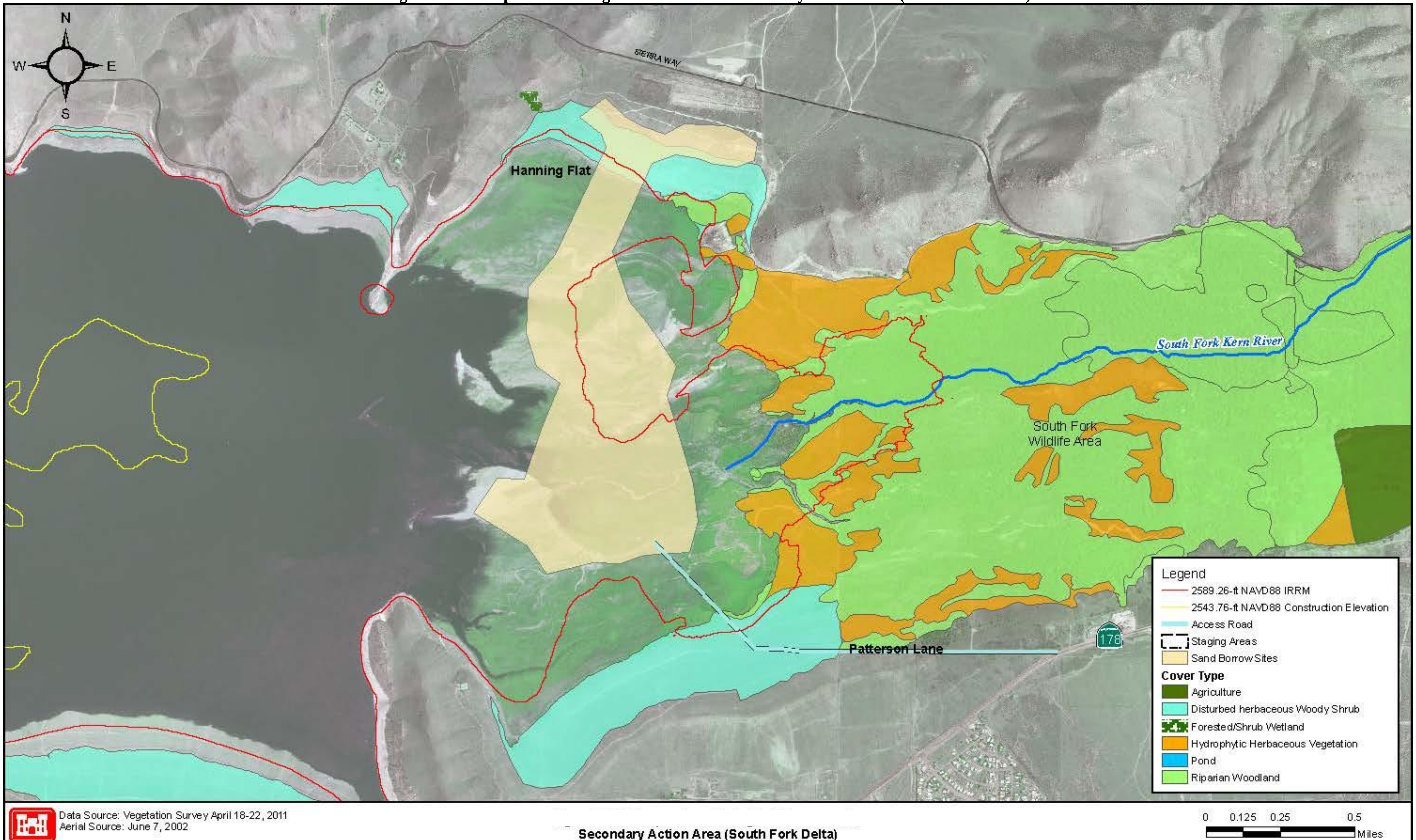
A spring-fed 1.8 acre forested wetland was identified on the western edge of Hanning Flat, just west of the borrow site of the Kern Fork Delta borrow site (see Figure 3-21). Sand excavation activities should remain sufficiently away from the wetland to avoid impacts; however, the borrow area is below the OHWM; therefore impacts to resources in this area will be assessed during the preparation of a CWA Section 404(b)(1) analysis upon selection of a preferred alternative.

Based on the preceding discussions regarding some of the support actions common to all the Action Alternatives, with implementation of recommended mitigation measures and BMPs described in Section 3.12.4, the anticipated impacts on biological resources from these actions are anticipated to be direct, adverse, short-term, and less-than-significant.

Emergency Spillway

Activities associated with the construction of the Emergency Spillway include removal of between 1,973,360 CY and approximately 3,000,000 CY of existing material to excavate and prepare the proposed spillway channel. Approximately 9 acres of pine woodlands and sparse sagebrush-scrub uplands and valley grasslands would be permanently lost due to the construction of the Emergency Spillway. No State or Federal listed plant or animal species are known to occur in the vicinity of the proposed Emergency Spillway; however, according to the CNDDB (2010), there is an occurrence of the USFS sensitive alkali mariposa lily within a mile of the Main and Auxiliary Dams. The alkali mariposa lily is considered a facultative wetland (FACW) species, according to the USFWS (1993). FACW plant species usually occur in wetlands (estimated probability 67 to 99 percent), but occasionally it is found in non-wetlands. There are no USFWS NWI-mapped wetlands near the Main Dam thus impacts to the alkali mariposa lily as a result of actions at the Emergency Spillway are not anticipated. Impacts from noise and dust are anticipated to be short-term direct disturbance to animal species; which would likely temporarily avoid the construction area. Therefore, these impacts are considered adverse, low, and less-than-significant.

Figure 3-21 Impacts on Biological Resources in Secondary Action Area (South Fork Delta)



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Existing Spillway

Activities to remediate deficiencies in the existing spillway include surface treatment of the existing chute to guard against erosion, addition of anchors to increase seismic stability, and construction of a 4-foot high retaining wall to the crest along the right wall, or, in the case of Alternative Plan 4, two 16-feet high retaining walls on either side of the existing spillway to the new dam crest height. A small amount of the pine woodlands adjacent to the existing spillway could be removed or disturbed by remedial actions for the existing spillway. However, most of the work would likely be done by accessing the site from Haul Road H3 (see Figure 3-20). No known ESA-listed plants or animals are known to occur in the area. Therefore, these impacts are considered adverse, low, and less-than-significant.

In summary, with implementation of the mitigation measures and BMPs described in Section 3.12.4, anticipated impacts on biological resources from support actions common to all Action Alternatives are considered low to be direct, adverse, short-term, low to moderate, and less-than-significant. A more comprehensive delineation of wetlands on the private lands adjacent to Staging Area A3 once the final boundary of the staging area is determined, would more accurately define the aerial extent of impact on these wetlands.

Alternative Base Plan

Site Preparation, Staging Areas and Borrow Areas

Previously described impacts from Staging Areas S1, A1, and A2 would occur during site preparation activities associated with the Alternative Base Plan (see Table 3.12-8). Additionally, Staging Area A3, located below the Auxiliary Dam, would be used to stockpile and process rock material obtained from the relocated Borel Canal conduit tunnel (see Figure 2-10). Approximately 6 acres of emergent wetlands are known to occur in the footprint of proposed Staging Area A3. These wetlands were identified during a field evaluation in April 2011 and by NWI maps for adjacent areas on private property. A detailed wetland delineation and mitigation plan for the vicinity of Staging Area A3 would be completed prior to site preparation activities. Potential impacts and mitigation strategies related to these wetlands would be included as part of a 404(b)(1) analysis that would be performed on the preferred alternative before completion of the Final EIS. There is a risk of introducing noxious weeds and reduced soil cover from equipment used during construction. Reduced soil cover also allows opportunistic weeds to become established, which deleteriously affect native plant communities. With implementation of the mitigation measures and BMPs described in Section 3.12.4, anticipated impacts on biological resources from these support actions associated with the Alternative Base Plan are considered to be direct, adverse, short-term, low to moderate, and less-than significant. A more comprehensive delineation of wetlands on the private lands adjacent to Staging Area A3 once the final boundary of the staging area is determined, would more accurately define the aerial extent of impact on these wetlands.

Borel Canal Relocation

Under the Alternative Base Plan, the Borel Canal would be relocated through the right abutment of the Auxiliary Dam. Because the proposed alignment would allow the new tunnel to tie in to the existing canal upstream and downstream of the Auxiliary Dam, a temporary 101,000 CY rock fill coffer dam would be required to de-water the area upstream of the right abutment to facilitate construction of the upstream portal of the new tunnel-conduit. To allow for construction of the rock fill coffer dam at the Auxiliary Dam, the level of Isabella Lake would need to be lowered to 2,543.76 feet for about two months from December 2016 through January 2017. The coffer dam is expected to remain in place until August 2017, during which time the lake will be maintained at a restricted pool of 2,585.26 feet (4-feet below the current IRRM) to avoid overtopping the coffer dam. Removal of the coffer dam would again require lowering Isabella Lake to 2,543.26 feet for approximately two months (August-September 2017).

As discussed previously in Section 3.8 (Water Resources), water quality standards in the Tulare Basin Plan are not always met under existing reservoir operations. Lowering the lake to 2,543.76 feet for coffer dam installation and removal and maintaining the water level at 2,585.26 feet over two consecutive summers could result in increased turbidity, temperature, and pH, and decreased DO. This would likely have adverse impacts on water quality, which in turn could adversely affect fish and wildlife, particularly the USFS sensitive hardhead. As discussed in Section 3.8, modeling of existing water quality data to predict conditions, and monitoring of water quality during construction to assess impacts may be needed to develop measures to reduce potential impacts, especially during the summer months.

The vegetation community in the vicinity of the proposed Borel Canal is sagebrush-scrub uplands. Additionally, there are approximately 7 acres of emergent wetlands known to occur in the vicinity of the proposed new Borel Canal portal structure and connection to the existing Borel Canal and within proposed Staging Area A3 (see Figures 2-25 and 3-20). Mitigation for impacts to these wetlands would be determined after the preparation of a CWA Section 404(b)(1) analysis by the Corps on the preferred alternative planned for completion prior to the Final EIS. There is potential for occurrence of the USFS sensitive alkali mariposa lily to occur in these wetlands.

Under the Alternative Base Plan, based on the above discussion of construction activities associated with the Borel Canal relocation, with implementation of the mitigation measures and BMPs described in Section 3.12.4, anticipated impacts on biological resources from these construction activities are considered to be direct, adverse, short-term, moderate to high, and less-than significant.

Auxiliary Dam

As previously mentioned, remediation actions to increase the seismic stability at the Auxiliary Dam include a downstream buttress, shallow foundation treatment, and an upstream berm. Construction of the downstream buttress and the shallow foundation treatment would directly impact approximately 13 acres of sagebrush-scrub uplands adjacent to the Auxiliary Dam and proposed Staging Areas A2 and A3. Construction of the upstream berm would occur during June 2019 through February 2020, and require that Isabella Lake also be drawn down to 2,543.76 feet during that time.

Water quality standards in the Tulare Basin Plan are not always met under existing reservoir operations. Construction activities may cause additional problems in meeting the basin plan standards for DO, temperature, and pH. Additionally, a lowered pool level combined with high winds would likely result in resuspension of bedload sediments (i.e. turbidity). Algal blooms in the lake commonly occur during the summer months when temperature, nutrients, and turbidity levels are the highest. The consequences of these exceedances could result in blooms of potentially toxic cyanobacteria that could adversely affect fish and birds. Additionally, direct effects of decreased DO levels and increased water temperatures could be fatal to USFS sensitive hardhead, rainbow trout and possibly largemouth bass and other sport fish if suitable cold water habitat is not available. As previously mentioned, modeling and monitoring of water quality may be needed to manage potential adverse impacts. The Corps plans to prepare a *Fisheries Management Plan* to address these potential adverse impacts to fish.

Under the Alternative Base Plan, based on the above discussion of construction activities associated with the Auxiliary Dam remediation measures, with implementation of the mitigation measures and BMPs described in Section 3.12.4, anticipated impacts on biological resources from these construction activities are considered to be direct, adverse, short-term, moderate to high, and less-than significant.

Alternative Plan 1

Potential impacts associated with this alternative are similar to those described for the Alternative Base Plan.

Additional remediation measures for the Main Dam under Alternative Plan 1 include a full-height filter and drain (rather than a filter only near the crest under the Alternative Base Plan), a toe filter/drain system to capture and collect seepage, and an 800-foot long RCC Overlay constructed on the center portion of the Main Dam to provide potential emergency overtopping control.

Construction of the full height filter would require additional sand from the sand borrow source areas and extend the duration of the project by a few months. Construction of the additional remediation measures on the Main Dam would require that Staging Area M1 be established in the vicinity of the Main Dam Campground (see Figures 2-13 and 3-20). Staging Area M1 would likely remove and otherwise disturb approximately 10 acres of pine woodland.

Alternative Plan 2

Potential impacts associated with this alternative are similar to those described for the Alternative Base Plan and Alternative Plan 1. The larger downstream buttress and deeper foundation treatment at the Auxiliary Dam would extend the duration of the project by nearly a year.

In addition, Alternative Plan 2 includes construction of a 20-foot wider downstream buttress on the Auxiliary Dam to further increase the stability. This would likely impact approximately one more acre of sagebrush-scrub upland vegetation. Also, the proposed foundation treatment of the Auxiliary Dam under this alternative would include complete in-situ treatment of the soil material to a depth of 120 feet.

Even with the proposed additional remediation measures, the potential impacts on biological resources from Alternative Plan 2 would be similar to those described for the Alternative Base Plan and Alternative Plan 1.

Alternative Plan 3

Potential impacts associated with Alternative Plan 3 are similar to those described for the Alternative Base Plan, and Alternative Plans 1 and 2. However, Alternative Plan 3 involves relocating the Borel Canal conduit from the Main Dam Outlet through a tunnel under the existing and proposed spillways and reconnecting to the existing Borel Canal downstream of the Auxiliary Dam. This differs from the other three Action Alternatives, which relocate the Borel Canal conduit through the right abutment of the Auxiliary Dam. Although there would be differences, Alternative Plan 3 would require generally similar construction material, excavation, and schedule as Alternative Plan 2. The potential impacts on biological resources from Alternative Plan 3 would be similar to those described for the Alternative Base Plan and Alternative Plans 1 and 2.

Alternative Plan 4

Under this alternative, the deficiencies remediated in the Base Plan Alternative would be included, plus additional remediation measures identified for the Existing and Emergency Spillways, Main Dam, and Auxiliary Dam, which include installing a filter and drain system, raising the dam crests and existing spillway walls by 16 feet, widening the emergency spillway to 900 feet, realigning State Highway 178, and installing a flood gate where the new Main Dam embankment would intersect State Highway 155. This alternative would have biological resources impacts similar to the Base Plan Alternative with the primary differences being an increased area of ground disturbance associated with the widening of the spillway and the realignment of the roads. As with the Alternative Base Plan, construction-related impacts to fisheries and wildlife would be moderate to high, while construction-related impacts to all other biological resources would be low. However, with implementation of mitigation measures identified in Section 3.12.4 these short-term impacts would be reduced to a level of less-than-significant.

While this alternative includes a 16-foot increase in dam crest height, the existing spillway crest will remain at its current elevation. This would allow the dam to return to normal operating conditions following construction without experiencing changes in gross pool elevation under all but the most infrequent (1 in 4,720 occurrence probability and less) of flood events. This means that inundation of habitat surrounding the lake would be to the same depth and frequency under this alternative as is experienced under current conditions.

Emergency Spillway Widening
Activities associated with the construction of the widened Emergency Spillway include removal of approximately 976,640 CY of additional existing material to excavate and prepare the proposed widened spillway channel. Approximately 20 additional acres of pine woodlands and sparse sagebrush-scrub uplands and valley grasslands would be permanently lost due to the construction of the widened Emergency Spillway. As discussed under the Alternative Base Plan, no State or Federal listed plant or animal species are known to occur in the vicinity of the proposed Emergency Spillway; however, according to the CNDDB (2010), there is an occurrence of the USFS sensitive alkali mariposa lily within a mile of the Main and Auxiliary Dams. The alkali mariposa lily is considered a facultative wetland (FACW) species, according to the USFWS (1993). FACW plant species usually occur in wetlands (estimated probability 67 to 99 percent), but occasionally it is found in non-wetlands. There are no USFWS NWI-mapped wetlands near the Main Dam and, therefore, no impacts to the alkali mariposa lily as a result of actions at the Emergency Spillway are anticipated. Impacts from noise and dust are anticipated to be short-term disturbance to animal species, which would likely temporarily avoid the construction area; therefore, impacts to biological resources as a result of constructing the 900-foot-wide Emergency Spillway would be considered less than significant.

State Highways 155 and 178
This alternative would include modification of State Highways 178 and 155 to accommodate the 16-foot raise on the crests of the Main Dam and the Auxiliary Dam.

Accommodating the raise on the Main Dam would involve installing an approximately 16-foot-high flood gate system across State Highway 155 near the existing centerline of the Main Dam. Impacts to biological resources would be similar to those described under the Alternative Base Plan and are considered less than significant.

Approximately 0.8 miles of State Highway 178 would be realigned to accommodate the raise on the left of the Auxiliary Dam. The proposed alignment would be largely within the existing alignment and right of way for Lake Isabella Boulevard. The realignment would require the removal of sparse areas of sagebrush-scrub uplands growing between the existing alignments of State Highway 178 and Lake Isabella Boulevard. Due to the disturbed nature of this upland habitat and its proximity to existing roadways, the loss of this habitat is considered less than significant.

3.10.4 Environmental Commitments and Mitigation Measures

Protective Actions

Prior to site preparation, the Corps or a designated contractor would develop and implement protective actions to reduce adverse impacts from construction of the proposed Isabella DSM Project. These actions would include preparation of the following:

- A *Site Preparation Plan* – That would outline methods to avoid introducing non-native plant species via construction equipment.
- A *Stormwater Pollution Prevention Plan* (SWPPP) – That would address stormwater runoff to aquatic sites such as Isabella Lake, the Kern River, and the Borel Canal.
- A *Soil and Groundwater Management Plan* (SGMP) – that would address contaminated soil and/or groundwater that may be encountered during project construction or excavation of borrow sites.
- A *Controlled Blasting Management Plan* – That would address traffic and public safety concerns, and to the extent feasible, anticipated disturbance to wildlife.
- Where applicable, follow best management practices (BMPs) as identified in *Water Quality Management for Forest System Lands in California: Best Management Practices* (USDA 2000).

In addition, efforts would be made during the multi-year construction period to avoid or reduce impacts to known biological resources. Immediately preceding the borrow excavation activities in the South Fork Delta area, bird surveys would be conducted by the Corps or its designated contractors, focusing on southwestern willow flycatcher and least Bell's vireo.

Mitigation for Known Impacts

<u>*Wetlands and Other Waters of the U.S.*</u>

Emergent wetlands are known to occur below the Auxiliary Dam and on existing private property in the vicinity of the proposed Staging Area A3, Haul Road H1, and the Relocated Borel Canal. Once access to the property is granted, the Corps or its designated contractors would conduct a detailed wetland delineation to specifically identify the potential area(s) and quantify the extent of impact. Additionally, a *Wetland Mitigation Plan* would be prepared to identify the least environmentally damaging practicable alternative (LEDPA) and appropriate on- or off-site areas for any required compensatory mitigation and the appropriate ratio.

The placement of earth and rock fill for the upstream berm on the Auxiliary Dam involves placement of fill below OHWM, which is an impact under the CWA and similarly requires 404(b)(1) analysis. This analysis will be performed and included in the Final EIS.

<u>*Vegetation*</u>

A *Site Restoration Plan* would be developed in advance of project construction and would include information on returning the cleared areas to pre-construction conditions where feasible and practicable. The *Site Restoration Plan* would be prepared prior to construction and implemented at the end of the project or sooner as project elements are completed.

3.11 LAND USE

This section discusses existing land uses and the land use plans relevant to the project area, the affected environment, and potential land use impacts associated with implementing the proposed project alternatives and support actions.

3.11.1 Regulatory Setting

Federal land represents the largest overall ownership structure in the Kern River Valley. Most Federal land in the Kern River Valley is either administered by the BLM or the USFS. The Corps owns and manages the dams and spillways and maintains the pool levels in Isabella Lake, and the Kern River Water Master manages water rights of downstream users. Lands above the extent of Isabella Lake pool are subject to the land use regulations of Kern County. The relevant laws, regulations, and plans relevant to land use in and surrounding the project area are briefly described in the following paragraphs. Local planning considerations and responsibilities are included that were helpful in characterizing the overall context of the analyses, even though these considerations do not directly apply to this Federal action.

Federal Regulations

Federal Power Act of 1920

The Federal Power Commission was created by the Federal Power Act of 1920 to provide for the improvement of navigation, the development of hydroelectric power, the use of the public lands in relation thereto, and to repeal Section 18 of the River and Harbor Appropriation Act, approved August 8, 1917.

Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 as amended (URA) 49 CFR Part 24

This was enacted to ensure that owners of real property to be acquired for Federal and Federally assisted projects are treated fairly and consistently, to encourage and expedite acquisition by agreements with such owners, to minimize litigation and relieve congestion in the courts, and to promote public confidence in Federal and Federally assisted land acquisition programs. The act also ensures that persons displaced as a direct result of Federal or federally assisted projects are treated fairly, consistently, and equitably so they will not suffer disproportionate injuries as a result of projects designed for the benefit of the public as a whole, and that agencies implement these regulations in a manner that is efficient and cost effective.

Sequoia National Forest Management Plan

This plan is the principal document that guides the decision making of USFS managers. It guides where and under what conditions an activity or project on national forest lands can generally proceed. The plan provides long-range management direction, such as desired conditions and objectives, the kinds of uses that are generally suitable for various areas of a national forest, the management guidelines that apply to different kinds of activities, and the designation of special areas, like Research Natural Areas.

Forest Service Manual Title 2300 – Recreation, Wilderness, and Related Resource Management, Chapter 2350 – Trail, River, and Similar Recreation Opportunities

The Forest Service Manual guidance on managing recreation lands and resources includes the following three primary objectives:

- Provide recreation-related opportunities for responsible use of national forests and national grasslands.
- Provide opportunities for a variety of recreational pursuits, with emphasis on activities that harmonize with the natural environment and are consistent with the applicable land management plan.
- Mitigate adverse impacts of recreational uses on natural, cultural, and historical resources and on other uses through education, outdoor ethics programs, and on-the-ground management, including law enforcement and restoration.

Farmland Protection Act

In 1980, the Farmland Mapping Program to supplement the Soil Conservation Service Program was initiated to address conversion of agricultural lands. This led to the 1981 passage of the Farmland Protection Act, amended in 1994. Under the act, the USDA was charged with implementing a program to develop criteria for identifying the effects of Federal programs on the conversion of farmlands to nonagricultural uses. The major requirements are Federal agencies must use USDA criteria to identify and take into account the adverse effects of their programs on the preservation of farmland, and these agencies must consider alternative actions, as appropriate, to lessen such adverse effects and ensure that their programs, to the extent practicable, are compatible with state, local, and private programs. The act also authorizes local governments to identify farmland of local importance and exempts land already committed to urban development (CDC 2011).

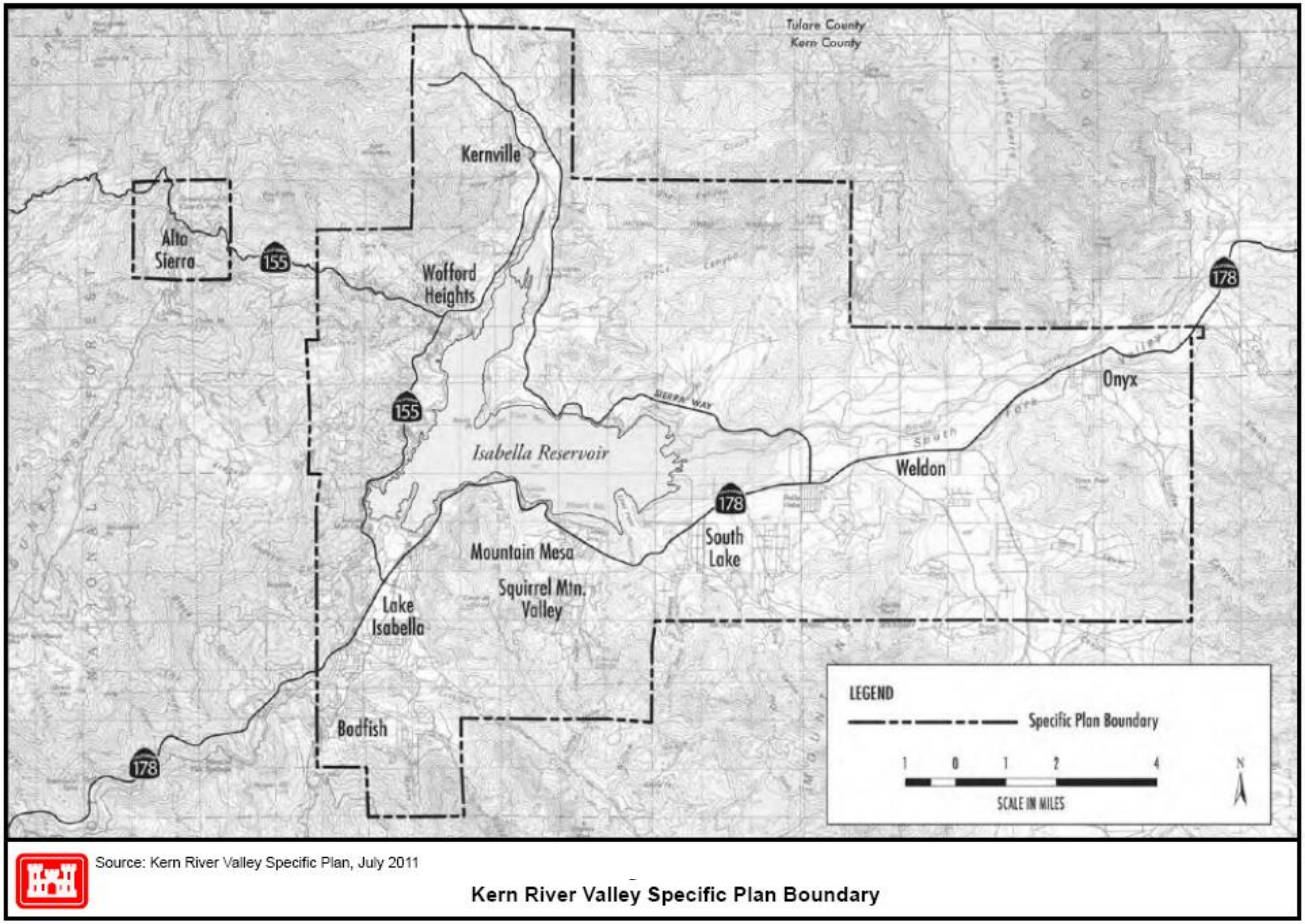
Local Regulations

Land use and planning decisions for land in and surrounding the project area are regulated by a variety of plans and programs of Kern County. These plans, which are briefly discussed below, are characterized by goals, objectives, and policies and provide an overall foundation for establishing land use patterns. For purposes of impact analysis, relevant local goals and policies related to the proposed project are included in the following discussion.

Kern River Valley Specific Plan

The Kern River Valley Specific Plan (KRVSP) was approved on June 28, 2011 (Kern County 2011b). This plan addresses the area that includes the Isabella Lake, the North and South Forks of the Kern River, and the base of the Sierra Nevada Mountains (Kern County 2011b). The KRSVP area includes the unincorporated communities of Lake Isabella, Alta Sierra, Kernville, Bodfish, Wofford Heights, Weldon, Onyx, Mountain Mesa, and Squirrel Mountain Valley (Figure 3-22). State Routes 178 and 155 connect these communities (Kern County 2011b). The Specific Plan supersedes and rescinds the

Figure 3-22 Kern River Valley Specific Plan Area Boundaries



Kelso Valley Specific Plan and the South Lake Isabella Specific Plan by providing one comprehensive planning document that integrates the existing specific plans as well as the Kern County General Plan land use plan, policies, and programs within a cohesive framework, and provides a clear and unified vision, direction, and implementation strategies to guide future development of the Kern River Valley.

Kern County General Plan

The General Plan is a policy document with planned land use maps and related information that are designed to give long-range guidance to those County officials making decisions affecting the growth and resources of the unincorporated Kern County jurisdiction, excluding the metropolitan Bakersfield planning area. This document helps to ensure that day-to-day decisions are in conformance with the long-range program designed to protect and further the public interest related to Kern County's growth and development. The General Plan also serves as a guide to the private sector of the economy in relating its development initiatives to the public plans, objectives, and policies of the County.

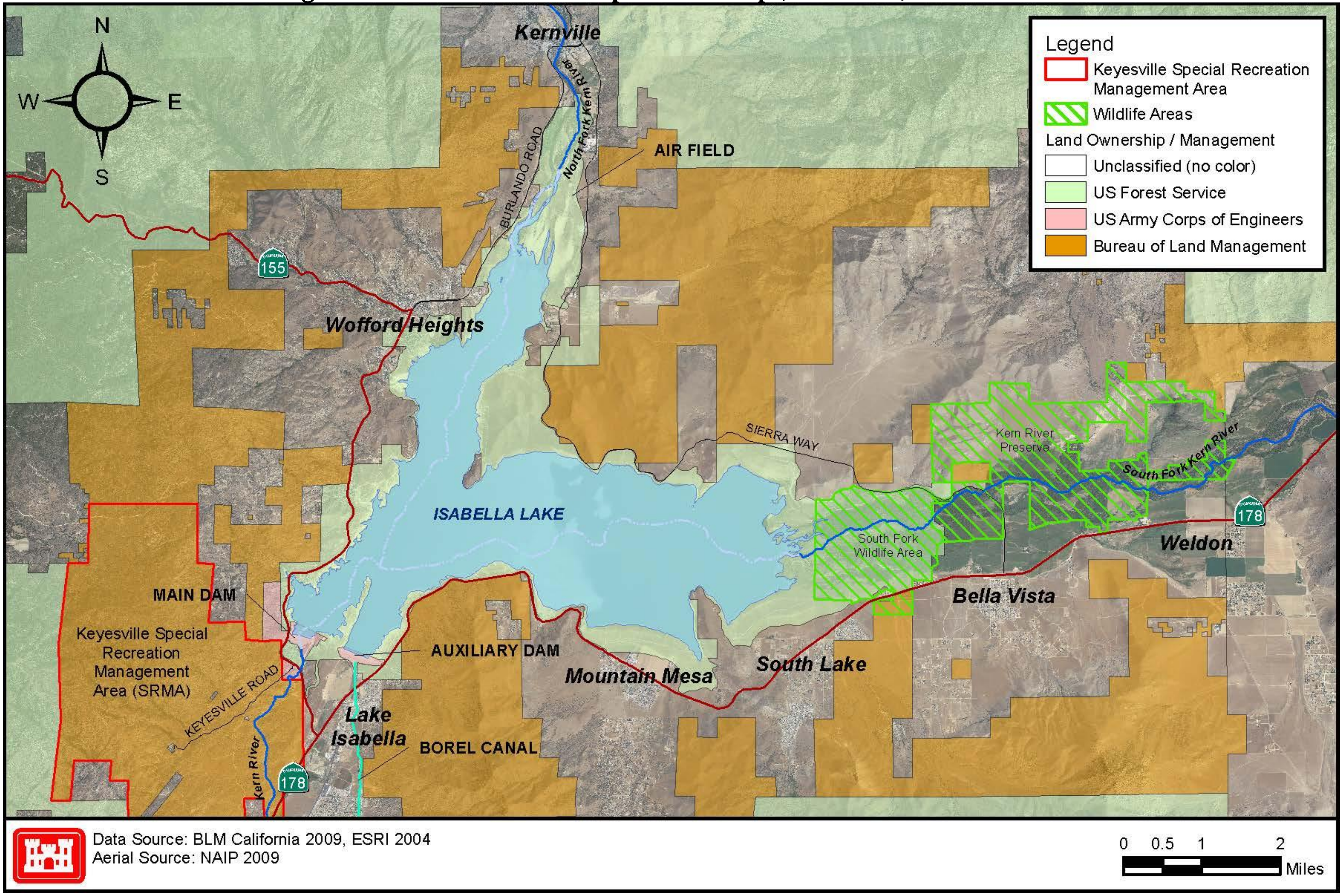
Agency Responsibilities

The Kern River Valley provides a unique challenge, in that several agencies have jurisdiction over land use planning programs and projects covering a patchwork of land ownership. Figure 3-23 illustrates land ownership for the Corps, the USFS, and the BLM. The jurisdictional responsibilities of the agencies involved with the project area and vicinity are described below.

USFS

The USFS lands in the project area include portions of the Kern River Ranger District of the Sequoia National Forest (SQF). The USFS administers more than 9,000 acres of land within the KRVSP area as a part of the Sequoia National Forest. This represents about 19 percent of the federally owned land and eight percent of the overall KRVSP area. In addition to managing its lands, the USFS manages the Isabella Lake recreation areas. The USFS is involved in several activities that affect the project area, including the identification of an official OHV trail system, providing wildfire fuel reduction measures near the communities of Alta Sierra and Kernville, implementing the SQF Motorized Transportation Management Plan, and revising the SQF Land and Resource Management Plan. In addition, the SQF administers a wide variety of special uses in the Isabella Lake area such as grazing permits, fishing outfitter/guides, marinas, bass tournaments, fishing derbies, a junior pheasant hunt, bicycle events, fireworks celebrations, a model airplane flying field, local school sporting events, filming permits, a target range, the Cyrus Canyon OHV park, and the Nuui Cunni Cultural Center.

Figure 3-23 Land Ownership for the Corps, the USFS, and the BLM



US Bureau of Land Management

The largest landholder in the KRVSP area is the BLM. BLM administers approximately 38,000 acres, comprising roughly 75 percent of the federally owned land and 35 percent of the overall KRVSP area. The Keyesville Special Management Area (SMA) is managed by BLM and is located partially within the KRVSP Area. The Keyesville SMA is a 7,133-acre land area that provides river access, dispersed camping opportunities, and designated multiuse trails. The remaining BLM owned/managed lands in the project area are maintained as resource areas for grazing, mining, and open space (Kern County 2011b).

US Army Corps of Engineers

The Corps is responsible for the integrity of Isabella Lake and Dams and provides daily water releases, in cooperation with the Kern River Water Master. The campgrounds surrounding the Isabella Lake were originally planned and built under the direction of the Corps, but operation and management of those areas were subsequently transferred to the USFS. The 1991 Memorandum of Understanding (MOU) executed between the Federal agencies for the transfer reserves the Corps' "right to use all [Army exchanged] lands which are necessary for the operation and maintenance of the Lake Isabella Project for its intended purposes." The USFS also expressly granted to the Corps' "rights to enter upon all other National Forest lands lying within the project area, together with rights of ingress and egress for the purpose of operating and maintaining said project for its intended purposes (MOU 1991)."

Kern River Water Master

The Kern River Water Master represents all downstream water rights entities and administers Isabella Lake water releases during the flood control off-season (July through October). Unless the integrity of the dam is jeopardized, the Water Master is responsible for identifying the amount of water to be released daily from the Isabella Lake by the Corps during this time each year. The Water Master is also responsible for preparing and keeping complete daily records on the flow of the Kern River waters.

California Department of Transportation

CalTrans is responsible for planning, designing, building, operating, and maintaining California's State highway system. Although the entire length of SR 178 is in the administrative boundaries of CalTrans District 6, maintenance is divided between District 6 and District 9. For SR 178, CalTrans District 6 maintenance extends from Bakersfield to Weldon, and District 9 provides maintenance from Weldon to Kern County's eastern border. District 6 is also responsible for SR 155 through the project area.

Kern County Parks and Recreation Department

In addition to the responsibilities of administering county parks and recreation facilities in the area, the Kern County Parks and Recreation Department is responsible for the safety of watercraft users and enforcement of California Boating Law on Isabella Lake. A Boat Patrol monitors lake activities from sunrise to sunset.

Kern County Department of Airports
The Kern Valley Airport is owned by Kern County. The Kern County Department of Airports is responsible for the safe operation and maintenance of the Kern Valley Airport.

3.11.2 Affected Environment

Land uses in and surrounding the project area that could be affected by the proposed project alternatives and support actions are discussed below. These land uses generally include residential, commercial, industrial, public facilities, agricultural lands, resource lands, undeveloped lands, and streets/rights-of-way (Corps 2009a).

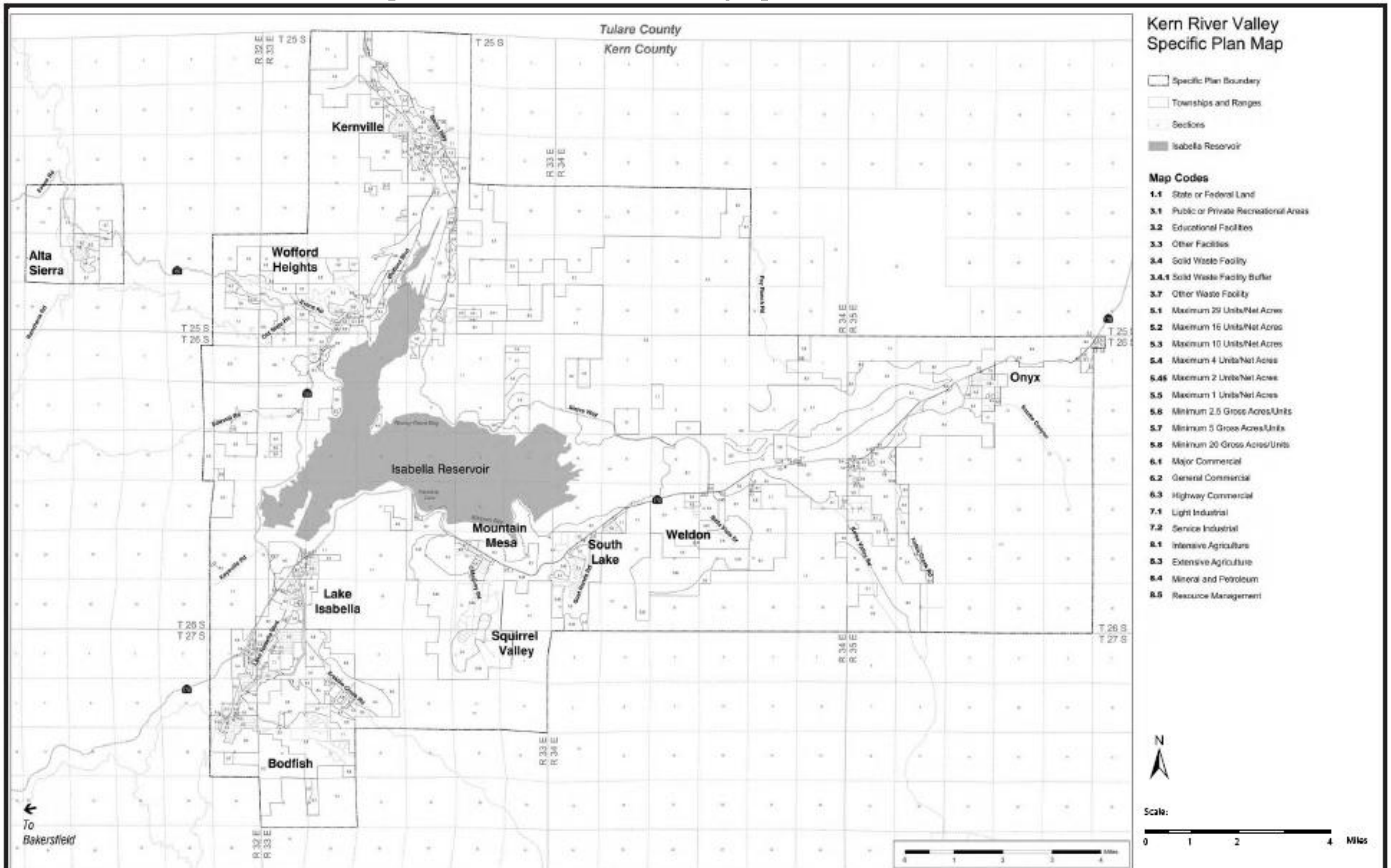
Kern River Valley
Approximately 50,000 acres, or 45 percent of the acreage within the KRVSP area, is under the jurisdiction of the USFS, the BLM, the Corps (Isabella Lake), or other Federal agencies (Figure 3-23) (Kern County 2011b). Residential, commercial, and industrial uses make up approximately 5,600, or 5 percent (Corps 2009a). Nearly 15,200 acres, or 14 percent, is undeveloped land, consisting of areas that are designated for future residential, commercial, or industrial uses but are currently vacant (Figure 3-24). Resource and agricultural lands consist of 23,200 acres, or 14 percent. Table 3-67 summarizes land uses in the Kern River Valley area, as of 2004 (Corps 2009a). The nearest major urban-industrial center is Bakersfield.

The project area includes the unincorporated communities of Lake Isabella, Bodfish, Alta Sierra, Wofford Heights, Kernville, Weldon, Onyx, Southlake/Longview, Mountain Mesa, and Squirrel Mountain Valley (see Figure 3-24). Brief highlights about each of these communities are presented in the following paragraphs (Kern County 2011b).

Lake Isabella
This is the largest community in the Kern River Valley, located adjacent to and south of the Isabella Main and Auxiliary Dams. The largest commercial center in the Kern River Valley is in Lake Isabella, as well as several government facilities, the Kern Valley High School, and the Cerro Coso Community College, Kern Valley Campus. SR 178 travels along the southeast side of Isabella Lake and is considered the main access route into the project area. Erskine Creek, Borel Canal, and a large wetland are in Lake Isabella.

Bodfish
Bodfish is immediately south of Lake Isabella. The three distinct geographical areas in Bodfish are Bodfish Oaks, Bodfish Canyon, and Canyon Meadows. The terrain surrounding Bodfish is mountainous, covered with oak and pine and natural forage and traversed by seasonal creeks. Bodfish Creek and the Silver City Ghost Town are in Bodfish, along with a small commercial area that includes several small businesses, restaurants, and antique shops.

Figure 3-24 Kern River Valley Specific Plan - Land Use



Source: Kern River Valley Specific Plan Map, July 2011

Kern River Valley Specific Plan Land Use for Isabella Lake Area

Table 3-67
Summary of Existing County General Plan Land Use Designations in the Kern River Valley Area

Code	Land Use	Land Area (Gross Acres)	Percent of Total Land Area
Nonjurisdictional Land			
1.1	State or Federal Land	52,651	47.64%
3.1	Parks and recreation areas	257	0.23%
3.2	Education facilities	111	0.10%
3.3	Other facilities	515	0.47%
3.1	Solid waste facility	33	0.03%
3.4.1	Solid waste facility buffer	146	0.13%
3.7	Other waste facility	18	0.02%
Residential			
5.1	Residential maximum 29 units/net acre	50	0.05%
5.2	Residential maximum 16 units/net acre	232	0.01%
5.3	Residential maximum 10 units/net acre	1,581	1.43%
5.4	Residential maximum 4 units/net acre	3,321	3.01%
5.45	Residential maximum 2 units/net acre	0	0%
5.5	Residential maximum 1 unit/net acre	540	0.49%
5.6	Residential minimum 2.5 gross acres/unit	2,088	1.89%
5.7	Residential minimum 5 gross acres/unit	1,276	1.15%
5.8	Residential minimum 20 gross acres/unit	269	0.24%
Commercial			
6.1	Regional commercial	114	0.10%
6.2	General commercial	443	0.40%
6.3	Highway commercial	41	0.04%
Industrial			
7.1	Light industrial	136	0.40%
7.2	Service industrial	141	0.13%
Resource			
8.1	Intensive agriculture (minimum 20-acre parcel)	4,453	4.03%
8.3	Intensive agriculture (min. 20-or 80-acre parcel size)	13,991	0.02%
8.4	Mineral and petroleum (minimum 5-acre parcel)	1,525	1.38%
8.5	Resource management (minimum 20- or 80-acre parcel)	5,500	4.98
Total		**110,510**	**100.00%**

Source: Kern County Planning Department 2008

Alta Sierra

Alta Sierra is a mountain-summit community with a small permanent population and a larger part-time seasonal and recreational population. It is on a plateau in the Greenhorn Mountains, approximately 6,000 feet in elevation, along SR 155. The community is hidden in tall pine and cedar trees and is surrounded by the Sequoia National Forest.

Wofford Heights

Wofford Heights is between Lake Isabella and Kernville, to the north of Isabella Lake. Wofford Heights offers a business center with restaurants, an Elks Lodge, recreational vehicle parks, small shops, a rural medical clinic, and antique stores. Wofford Heights has a mix of residential development. Many homes are on large parcels, and several areas have concentrations of mobile home units on 6,000-square-foot lots. The town is also the gateway to the Greenhorn Mountains in the Sequoia National Forest, which is along SR 155.

Kernville

Kernville is along the North Fork of the Kern River, north of Isabella Lake, and is composed of restaurants and motels, bed and breakfast accommodations, antique stores, specialty gift shops, camping, and recreational vehicle parks. Kernville is also the center of the Kern River's whitewater recreation activities, home to the Kern Valley Golf Course, and is the nearest community to the Kern Valley Airport.

Weldon and Onyx

Weldon and Onyx, located along the South Fork of the Kern River, showcase the valley's ranching history and setting. This area contains one of the largest contiguous Great Valley riparian cottonwood and willow forest habitats in California. Most of the property in this area contains many large farms, horse ranches, and working cattle ranches. The Onyx Store on SR 178 is one of the oldest stores in California, having operated nearly continuously since 1861. In addition, Audubon California's Kern River Preserve is along the South Fork of the Kern River near Weldon.

Mountain Mesa

Mountain Mesa is a residential community approximately six miles east of Lake Isabella. It is a rural community along the south shore of the Isabella Lake. Commercial properties along SR 178 provide community services, small businesses, and restaurants for the area. Kern Valley Hospital, the largest medical facility in the KRVSP Area, is also in Mountain Mesa.

South Lake/Longview

South Lake and its sister community Longview are three miles east of Mountain Mesa, close to the south shore of the Isabella Lake. These communities offer peaceful enjoyment of the rolling hills and high mountains. South Lake includes a combination of conventional housing and mobile homes, while Longview consists mainly of mobile homes.

Squirrel Mountain Valley

Squirrel Mountain Valley is south of Mountain Mesa and overlooks Isabella Lake. Squirrel Mountain Valley offers homes on acreage zoned for horses and includes riding trails, mountains, pine and oak trees, and lake and mountain views.

Kern Valley Airport

Kern Valley Airport is a public use, general aviation airport approximately two miles south of Kernville (Figure 3-23). The airport is primarily used for local business, recreation, and public services. Primary land use compatibility concerns include aircraft noise, safety with respect to people and property on the ground and in the air, protection of airspace, and other general concerns related to aircraft overflights. As a part of the Kern County Airport System, the Kern Valley Airport is subject to the compatibility policies of the Kern Valley Airport Master Plan and the Airport Land Use Compatibility Plan (ALUCP) administered by the Kern County Planning and Community Development Department (Kern County 2011b).

Keyesville Special Recreation Management Area (SRMA)

The Keyesville SRMA is southeast of the project site consisting of approximately 7,000 acres of BLM-managed land contiguous to the USFS SQF (see Figure 3-24). The Keyesville SRMA provides river access, dispersed camping opportunities, designated OHV trails, and recreational mining areas.

Isabella Lake Recreational Facilities

The USFS manages the recreation areas next to Isabella Lake. Needs for campsite improvements, additional boat launch facilities, adequate day use areas, and other recreational attributes are the responsibility of the USFS. Twenty-six areas in the project lake boundaries have been developed for recreation. Facilities, operated by the USFS in these areas, include picnicking, camping, boat-launching, and swimming, three marina concessions, a visitor’s center, public access, parking and hiking, cycling, and equestrian and nature trails. The facilities at these areas have been provided by the Corps, Kern County, California Department of Boating and Waterways, California Wildlife Conservation Board, and private concessionaires. (A more detailed discussion of recreation sites and activities in the project area are discussed in Section 3.12.)

Agriculture (Prime, Important, and Unique Farmlands)

Under the Farmland Protection Act, the NRCS (formerly Soil Conservation Service) is charged with identifying the effects of Federal programs on the conversion of farmlands to nonagricultural uses (USDA NRCS 2007). The act also authorizes state governments to identify farmland of local importance and exempts land already committed to urban development (CDC 2010). Three designations for farmland by the NRCS and California are relevant to the project area: Prime Farmland, Farmland of Statewide Importance, and Unique Farmland, described as follows:

- **Prime Farmland** has the best combination of physical and chemical characteristics for the production of crops. It has the soil quality, growing season, and moisture regime needed to produce sustained high yields of crops when treated and managed according to current farming methods. Prime farmland must have been under irrigated agricultural production for the previous three years. It does not include publicly owned lands that have a policy preventing agricultural use.
- **Farmland of Statewide Importance** is areas with a good combination of physical and chemical characteristics for crop production. Like prime farmland, the land must have been used for the production of irrigated crops for the last three years. It, too, does not include publicly owned lands that have a policy preventing agricultural use.

- **Unique Farmland** does not meet the criteria for the preceding categories but is used for the production of high economic value crops. This land has the special combination of soil quality, location, growing season, and the moisture supply needed to produce high quality and high yields of a crop when managed according to current farming methods. It does not include publicly owned lands for that have a policy preventing agricultural use.

A land use trend in some parts of the project area and surrounding region has been the steady conversion of prime, important, and unique farmland to urban use. The loss of prime farmland to other uses places greater pressure for agricultural production on marginal farmland, which generally are more erodible, drought-susceptible, not easily cultivated, and less productive (USDA NRCS 2007). Prime Farmland locations surrounding Isabella Lake are depicted in Figure 3-25. As shown, there is one property identified as Unique Farmland below the Auxiliary Dam in Hot Springs Valley between SR 155 and SR 178. West of this property is another property classified as Farmland of Statewide Importance.

Cattle Grazing Land

Grazing lands consist of fields covered with grass or herbage that are suitable for livestock grazing. According to the California Department of Conservation, over 37,000 acres of grazing land existed in the Kern River Valley in 2002 (Kern County 2011). In addition to the Isabella Lake Dam facilities and offices for the Corps and the USFS, the primary land uses surrounding the lake include recreation, wildlife preserve, scattered residential, and cattle grazing. The land made available for cattle grazing is limited and influenced by pool level fluctuations in the lake area. The USFS permits cattle grazing in designated areas under an allotment plan, generally authorized through 10-year grazing permits. The area of SQF where the South Fork Kern River outflows into the eastern portion of Isabella Lake is designated as cattle grazing land. The grazing allotment is for the lake bottom, so the area available for grazing is contingent on the water year, and the cattle are generally permitted to graze during the late summer through fall (until 15 February) when lake levels are low. The area is enclosed with fences, and cattle guards are used across roadways to contain the cattle to the designated grazing land.

Audubon-California Kern River Preserve

The Kern River Preserve (See Figure 3-26) was acquired through several purchases. In 1979, the Nature Conservancy obtained the A. Brown Ranch, a 1,136-acre Kern River Preserve. The Kern River Preserve was transferred from The Nature Conservancy to the National Audubon Society on November 25, 1998. The Kern River Preserve is the core of one of the first ten Globally Important Bird Areas to be designated in the United States. Audubon California and the California Department of Fish and Game took ownership of 4,358 acres of Sprague Ranch along the South Fork Kern River and up Fay Canyon in 2005. This purchase was in part to mitigate for the flooding of the South Fork Wildlife Area during high water years and loss of 1,400 acres of willow flycatcher habitat. Audubon took ownership of 1,640 acres, which more than doubled the size of the preserve.

Figure 3-25 Prime Farmland Locations Surrounding Isabella Lake

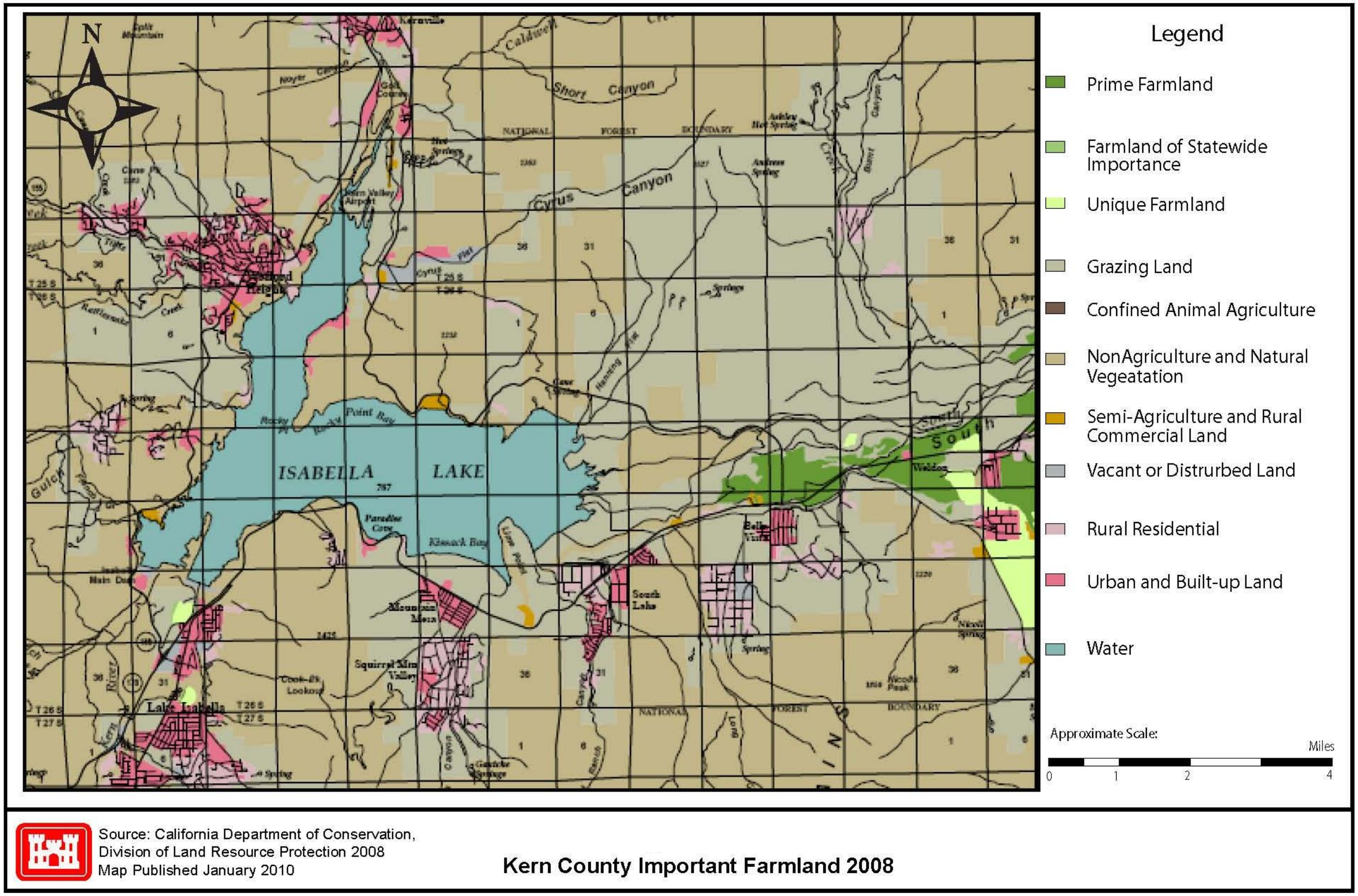
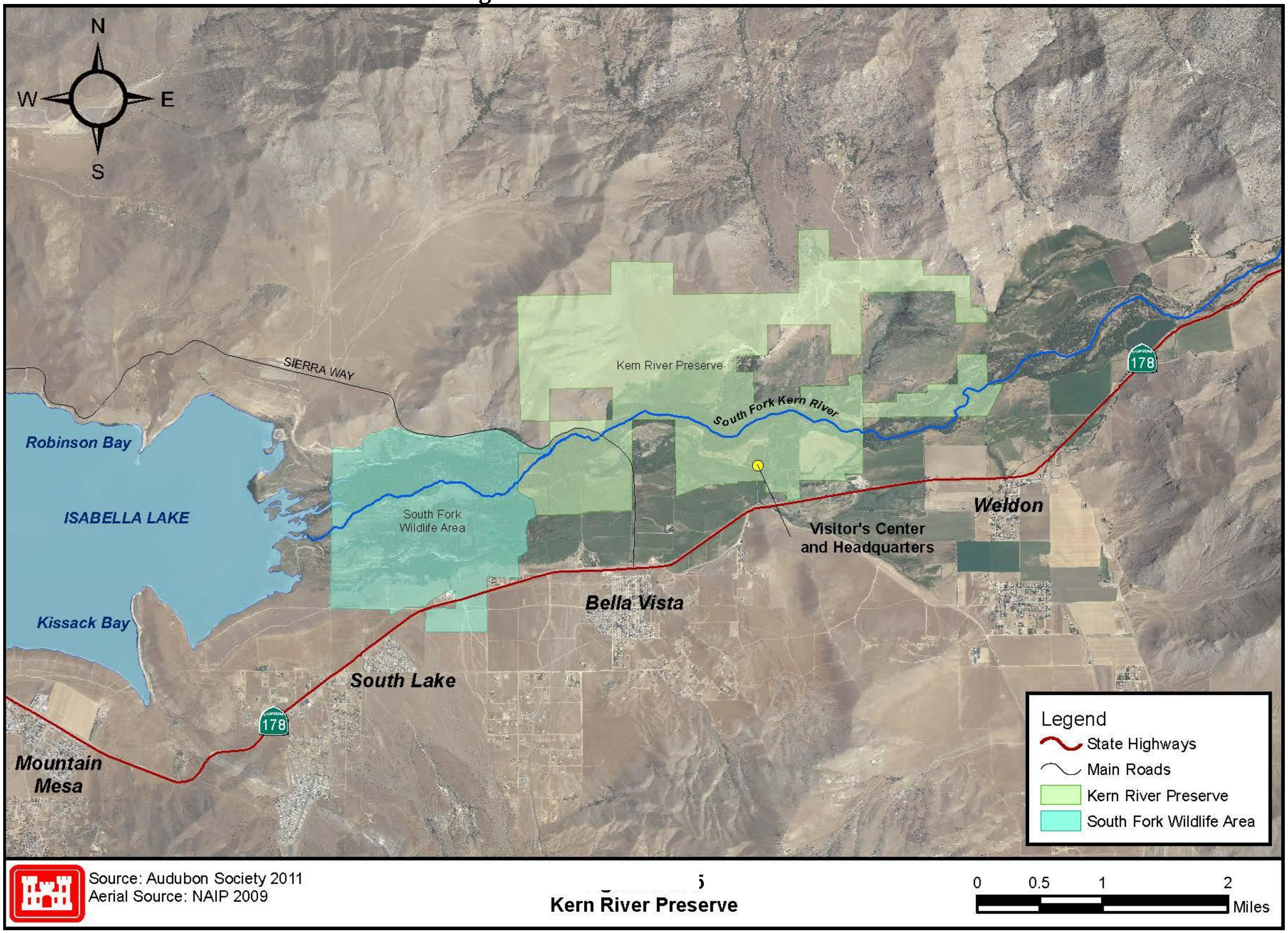


Figure 3-26 Kern River Preserve



In 2006, the 105-acre Alexander Ranch on the South Fork Kern River was purchased with a private grant. The ranch occupies land along Fay Ranch Road and along SR 178. This acquisition increased Audubon's holdings of contiguous property in Weldon to 2,884 acres. An additional 26 acres along Fay Ranch Road was acquired in 2009 with the purchase of the Vig property. This piece is next to the Kern River Preserve's Alexander Ranch addition and the South Fork Elementary School. The final tract of land along the South Fork Kern River, between Fay Ranch Road and Sierra Way, was acquired in late 2009. This purchase brought the total acreage of Audubon California's contiguous acreage for the Kern River Preserve to 2,987 acres (Audubon-California 2010).

3.11.3 Environmental Consequences

This section discusses potential land use impacts associated with proposed project alternatives and support actions.

Scope and Methods

Information useful to the evaluation of potential land use impacts associated with the proposed Isabella DSM Project was gathered and compiled from available documents and reports and through discussions with knowledgeable local agencies. The potential land use changes associated with the project were identified and assessed qualitatively for each Action Alternative and the support actions described in Chapter 2.

The factors that are important for evaluating impacts on land use include determining whether the action conflicts with established land uses in the area; physically disrupts or divides an established community; conflicts with any applicable or adopted land use plan, policy, or regulation of an agency with jurisdiction in the project area (including a general plan, specific plan, or zoning ordinance); or conflict with any applicable habitat conservation plan or resource management plan.

Once potential land use changes were identified, they were evaluated for consistency with regulations and compatibility with existing lands use plans and adjacent land uses to determine if any conflicts existed. The potential land use impacts were analyzed and evaluated as to level of impact.

No Action Alternative

Under the No Action Alternative, land use conditions in the project area and vicinity would stay substantially the same; there would be no short-term or long-term land use impacts since there would be no construction to affect adjacent land use. However, the No Action Alternative would allow existing deficiencies in the Main and Auxiliary Dams (e.g., seepage and piping, poor foundation materials, and seismic weakness) and the likelihood of dam failure to remain. In the event of dam failure, catastrophic and extensive damages would likely occur to current land uses in the vicinity of the dam and downstream, including floodwater inundation in the Bakersfield area. This would constitute a significant adverse impact on downstream land use.

Alternative Base Plan

Most of the impacts on land use would be common to all alternatives. Types of impacts from the construction of dam safety remediation measures would include long-term and short-term changes in land use.

The current site of the USFS Administration Building and Compound and the Corps Project Office and Shop area between the two dams are within the footprint proposed for constructing the Emergency Spillway. The 50–acre USFS site includes office and work space for approximately 60 employees, visitor information services, an engine bay, outbuildings, garages, workshops, storage yards, parking and utilities. The 5-acre Corps site includes office space for approximately 5 staff, meeting rooms, a workshop, storage, parking and utilities. Permanent removal of the structures and facilities and relocation of office and services would be necessary under each of the Action Alternatives. This change in the current established land use would be considered a direct, adverse, short- and long-term, high, and less-than-significant impact on land use.

Plans for possible temporary or permanent relocation of facilities and personnel have not been developed and are not ready to be analyzed in this document. Relocation is likely to also result in change in current land use elsewhere. The USFS Administration Building and Compound and Corps Project Office sites would be under Corps management and unusable during construction for any other purposes. Plans for post-construction uses of any portions of these sites not included in the Emergency Spillway or site restoration have not been developed, and potential impacts from those actions would be analyzed in a subsequent NEPA document, as previously discussed in Chapter 1.

Other real estate actions are possible involving private landowners and residences within or in proximity to the Primary Action Area due to the potential risks to human health and safety, localized environmental and human impacts, and construction access and staging needs. The Corps is developing data to assess the level of human health and safety risks prior to initiating any real estate actions with private entities. The Corps is endeavoring to minimize the impacts that may require acquisitions or other mitigations and to work with those parties whose properties may be impacted. A real estate plan and subsequent analysis will be completed by the Corps as these potential actions become better defined, as previously discussed in Chapter 1. The impacts on land use from the potential real estate actions associated with the proposed Isabella DSM Project are considered likely to be direct, adverse, short- and long-term, high and less-than-significant. Any relocation of homes or businesses would be done in compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act.

The Auxiliary Dam Recreation Area would be developed (as Staging Area A1) to stockpile and process sand material obtained onsite and from the South Fork Delta sand source area. The land use would temporarily change during the construction from recreation to industrial use. Impacts on land use would be considered direct, adverse, short-term, high, and less-than-significant. Likewise, excavated rock materials would be crushed and stockpiled at a temporary Crushing Plant located in a construction staging area adjacent to Engineers Point (Staging Area S1) (See Figure 2-25 in Chapter 2). Access to Boat Launch 19 would be closed during the multi-year duration of construction. The level of impact from this potential land use change would be adverse, short-term, high, and less-than-significant. Post construction restoration of these sites as recreational facilities and the development of other mitigations for their temporary loss are anticipated, but plans have not yet been developed and are not analyzed. These actions would be part of follow-on actions anticipated by the Corps, as discussed previously in Chapter 1.

The South Fork Delta area is proposed as a supplemental filter sand borrow source for filter and drain systems at both dams. Surface sand at the Delta would be scraped and trucked in for cleaning and processing at the Auxiliary Dam Recreation Area (Staging Area A1). It is anticipated that this sand collection at the Delta would occur in the lakebed, when pool elevations are low and water is not present. Removing sands from the lake bottom sediments would mitigate sediment build-up in the Delta and be an indirect beneficial impact to aquatic habitat. The operation would be temporary and seasonal, and sediments would be refreshed by the river. Grazing lands in the lake bottom would return to pre-project conditions. There would be essentially no permanent change in land use.

Potential changes in land use could result from locating Staging Areas A2 and A3 south of the Auxiliary Dam, between SR 155 and SR 178, in the Hot Springs Valley (See Figure 2-25 in Chapter 2). These locations contain wetlands and areas designated as State Important and Unique Farmland. Assuming that these sensitive areas cannot be avoided, the impact on land use would be direct, adverse, short- and long-term, high and less-than-significant. The Corps will coordinate with the NRCS regarding potential impacts on farmland.

Alternative Plans 1, 2, 3 and 4

Land use impacts associated with these Action Alternatives would be basically the same as under the Alternative Base Plan. More sand and rock materials would be needed for construction, but would be obtained from the same source locations and thus not change land use further. Portions of the Main Dam Campground would be developed as a temporary staging area (Staging Area M1) supporting the construction of the RCC Overlay. As a separate action, the Corps is working with the USFS to transfer this parcel back to the Corps on a permanent basis. It is likely that the campground would remain closed and continue to be managed as a buffer for dam security. Site preparation and use as a staging area would result in a temporary change in land use and probable removal of mature trees and campground equipment. The change in land use is not in conflict with existing plans for the site and its current use; and therefore the potential impact would be direct, adverse, short- and long-term, low, and less-than-significant.

For Alternative Plan 3, the coffer dam would not be required as the Borel tunnel would pass through the ridge from the Main Dam outlet to the existing downstream Borel channel. There would not be any additional land use change.

For Alternative Plan 4, realignment of State Highway 178 may require adjustment of existing rights of ways or the attainment of additional rights of ways. This could result in a change in land use. The exact alignment will be determined during final design with rerouting options determined in consultation with Caltrans. The preliminary realignment is sited on a narrow strip between two existing roads; therefore, the impacts of a change in land use would not be significant.

3.11.4 Environmental Commitments/Mitigation Measures

The Corps will prepare follow-on plans and NEPA analyses addressing land use impacts from the potential use of the USFS compound and Corps Office and Shop area, real estate actions regarding public health and safety, loss of recreational opportunities, and impacts on wetland and farmland. Appropriate mitigation measures to reduce potential land use impacts would likely accompany the following actions:

- *Relocation of the USFS and Corps Facilities between the two Isabella Dams*. A *Relocation Plan* and NEPA analysis would be prepared for these actions if the EIS decision includes the transfer and relocation of the USFS facilities.
- *Other Real Estate Actions.* The Corps is presently developing data to assess the level of human health and safety risk, prior to initiating discussions with private entities regarding potential real estate actions. A *Real Estate Plan* and NEPA analysis would be initiated by the Corps during 2012 and completed early in 2013, and implemented well before the start of construction. Any relocation of homes or businesses would be done in compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act.
- *Construction Site Restoration*. An appropriate *Site Restoration Plan* addressing construction sites and subsequent uses for any land disturbed or acquired for the Isabella DSM Project would be begun by the Corps during 2012, following release of the Final EIS.
- *Recreation Site Mitigation*. A process to prepare a comprehensive *Recreation Mitigation Plan* would be initiated during 2012 by the Corps and involving the USFS and key local stakeholders, to address how all affected recreational opportunities would be maintained during the multi-year construction period and how post-construction restoration of recreational sites would be accomplished. It is likely that some of the actions resulting from this process would require separate supporting NEPA analyses. The *Recreation Mitigation Plan* and all planning and projects emerging from the *Plan* would be completed before the start of the proposed Isabella DSM Project construction.
- *Farmland Protection Policy Act*. The Corps will coordinate with the NRCS regarding the potential effects to the Prime and Unique Farmland, including preparation of a *Farmland Conversion Impact Rating* and include the results and correspondence in the Final EIS.

3.12 RECREATION

This section presents information on the relevant regulatory setting, the recreation setting, historical use, description of recreational activities, and potential impacts from the proposed Action Alternatives and support actions for the proposed Isabella DSM Project. Proposed mitigation measures to reduce potential impacts on recreation are also addressed.

3.12.1 Regulatory Setting

The immediate perimeter of Isabella Lake is surrounded by public lands administered by the USFS. Landowners and land managers in the Kern River Valley include the USFS, the Corps, the BLM, the County of Kern, and private landowners. The following guidelines, policies, and management prescriptions guide analysis of the availability, accessibility, and development of recreation opportunities on the public lands and other areas surrounding Isabella Lake. The relevant Federal, State, and local laws and regulations regarding recreation in the project area and vicinity are summarized in the following paragraphs. State and local requirements are included that were helpful in characterizing the overall context of the analyses, even though some of these requirements do not directly apply to this Federal action.

Federal Regulations

US Forest Service, Manual Title 2300, Chapter 2350 – Trail, River, and Similar Recreation Opportunities

The Forest Service Manual (FSM) Title 2300, Chapter 2350, specifically relates to management of recreation features in the National Forest System, including Isabella Lake, with the following primary objectives:

- Provide recreation opportunities for users of the general forest, water, and cave resources;
- Provide opportunities for a variety of recreation pursuits, with an emphasis on activities that are in harmony with the natural environment and consistent with the recreation role of the National Forest; and
- Mitigate adverse impacts of users on natural and cultural and historical resources and on other users (USFS 2008a).

US Forest Service, Interpretive Plan for the Sequoia National Forest and Giant Sequoia National Monument

The US Forest Service Interpretive Plan for the Sequoia National Forest and Giant Sequoia National Monument, drafted in 2008, establishes a strategy and makes recommendations for the Sequoia National Forest's interpretive program to increase visitation, return visits, long stays, and visitor satisfaction to include recreation opportunities in the Sequoia National Forest and Giant Sequoia National Monument.

The plan also contains the 12 forest-wide recreation settings developed in 2005 for the Sequoia National Forest. It highlights the particular recreation settings that are found within the Sequoia National Forest and Giant Sequoia National Monument as: Rivers and Lakes, Scenic Routes, Great Western Divide, Lloyd Meadow, Hume High Elevation, Wildlands, Front Country, and the Kings River Special Management Off-Highway Vehicle (OHV) Area.

Isabella Lake falls in the Rivers and Lakes recreation setting, where the main recreation attraction is water. According to the plan, the desired condition is to "maintain a mix of development levels; implement use quotas, as needed; expand to accommodate groups where developed facilities are located; and address overuse in concentrated use areas" (USFS 2009a).

US Forest Service, Sequoia National Forest Motorized Travel Management Plan

The USFS released the plan for the Sequoia National Forest's Motorized Travel Management Plan in October 2009. The FEIS describes alternatives that propose changes to the National Forest Transportation System (NFTS) in the Sequoia National Forest, including changes to motorized uses.

Alternatives analyzed in the plan include prohibiting cross-country travel for managing motorized travel in the Kern River and Western Divide Ranger Districts of the Sequoia National Forest. In the Isabella Lake area, this includes 37 miles of NFTS routes open to public motorized use and 91 miles of inventoried unauthorized routes, 11,070 acres of which, out of 14,260 acres, is in the lake pool at the high water mark. The plan also includes an alternative that proposes to establish 17 developed areas around the shore of Isabella Lake where cross-country motor vehicle use would continue to be allowed. These areas would include some of the currently unauthorized routes around the lake, which would also be added to the NFTS (Kelly 2009). According to the plan, the Recreation Opportunity Spectrum (ROS) classifications are not applied to the Isabella Lake region.

US Forest Service, Sequoia National Forest Strategic Recreation Action Plan

The USFS prepared a Strategic Recreation Action Plan for Lake Isabella High-impact Recreation Areas (HIRAs): Auxiliary Dam, Old Isabella, South Fork Recreation Areas and the Camp 9 Recreation Area. This document describes the resources of a few high-impact recreation areas and sets goals for improving these facilities, some of which would be affected by the Action Alternatives (USFS 2009c).

US Forest Service, Giant Sequoia National Monument Draft Management Plan

Released for public comment in August 2010, the purpose of the Giant Sequoia National Monument Management Plan is to provide overall strategic guidance for managing the monument. This plan provides for and encourages continued public and recreational access and use consistent with the monument and contributes to social, economic, and ecological sustainability by guiding the restoration or maintenance of the health of the land in the monument. A draft plan released by the USFS discusses the effects of the proposed alternative for implementation of the draft management plan (USFS 2010b).

The USFS received over 79,000 comments on the draft plan. The USFS is working on responding to comments and completing the final plan.

Local Regulations

<u>*Kern County, Kern River Valley Specific Plan, 2011*</u>

This plan establishes planning policies and implementation measures to guide future development of the communities in the Kern River Valley for the next 20 to 25 years. Goals directly related to supporting recreation are intended to create and promote a tourism setting that contains a balance of activities, seasonal stability, and environmental sensitivity, while preserving the historic and rural character of the area (Kern County 2011b).

These goals include (1) protecting and maintaining water and related natural systems for all existing and future reasonable and beneficial uses in the South Fork Kern and Upper Kern watersheds, (2) preserving open spaces as visual and environmental resources, (3) maintaining the rural atmosphere of the Kern River Valley; and (4) providing a variety of recreation opportunities throughout the Kern River Valley in both developed and natural areas.

<u>*Kern County Parks Master Plan, 2010*</u>

Serving the unincorporated towns in Kern County, including Kernville and Lake Isabella, the Kern County Parks and Recreation Department adopted a master plan in 2010 that sets forth goals toward which the department may reach in the future. These goals include to "incorporate natural areas and unique ecological and archeological features into the park and open space system to protect threatened species, conserve significant natural and cultural resources and retain critical habitat areas that are unique to Kern County" (Kern County 2010d).

3.12.2 Affected Environment

This section provides a description of the existing recreational opportunities available in and around Isabella Lake that may be affected by the proposed Action Alternatives and support actions. The recreational opportunities described in this section are based upon current uses and management decisions.

Regional Recreation Setting and Use

The Kern River Valley consists of a unique mix of rivers, forests, hills and scenic views, open space and natural settings. Large open spaces support many recreational uses that define the valley's character. Recreation includes a range of activities incorporating natural landforms and human-made features. In areas like the Kern River Valley, recreation activities are often centered on the natural environment, such as waterways, mountains, and natural features, which present opportunities for camping, water sports, hunting and fishing, wildlife viewing, hiking, and off-road vehicle use.

Visitor participation in these pursuits is partially influenced by the proximity to major urban areas and the willingness of visitors to travel distances to take part in recreation. Isabella Lake is the largest freshwater lake in the southern Sierra Nevada and the Kern River provides the closest commercial whitewater rafting opportunity to southern California. Over 28 million people live within a half-day's drive of the area, including residents of the San Francisco Bay Area, Sacramento, San Diego, and Las Vegas. More than 2 million people live within an hour's drive of the Sequoia National Forest. While all of these people are potential visitors to the area, numerous other recreation opportunities in these areas may also attract this population base. People from the Los Angeles basin visit the forest's southern portions, especially Kern Canyon, Isabella Lake, and the Kern Plateau (USFS 2010d).

Recreational use in the area is expected to increase commensurate with projected regional population growth. Kern County's regional population is projected to grow from an existing population of approximately 800,000 to 1.6 million by the year 2030, and to 2.1 million by the year 2050 (Kern COG 2009). Due to this projected population increase, the demand for recreational opportunities at the lake and surrounding area is anticipated to increase.

Local Recreation Setting

The Kern River Valley, centered on the lower Kern River and Isabella Lake, is surrounded by mountains that reach an elevation of approximately 7,000 feet, bounded by low rolling hills of the Greenhorn Mountains to the west and southwest, the Tehachapi Mountains to the south, high alpine mountains of the Sierra Nevada to the north, and El Paso Mountains to the east. The valley is considered a gateway to the Giant Sequoia National Monument, the Sequoia National Forest, and other nearby public lands.

In 1987, segments of the North Fork Kern River from the Tulare-Kern County line to its headwaters in Sequoia National Park, and the South Fork Kern River from its headwaters in the Inyo National Forest to the southern boundary of the Domeland Wilderness in the Sequoia National Forest, were designated as Wild and Scenic River segments.

West of Isabella Lake is the Keyesville Special Recreation Management Area (SRMA), an important regional recreation resource managed by the US Bureau of Land Management (BLM). This SRMA consists of approximately 7,000 acres of BLM-managed land contiguous to the USFS Sequoia National Forest. The area provides river access for whitewater boating, dispersed camping opportunities, designated OHV trails, mountain biking, visitation to historical and cultural points of interest, and recreational mining areas.

Other important areas in the region that attract visitors are the South Fork Wildlife Area and the adjacent Kern River Preserve, eastward up the South Fork Kern River, where bird watching and wildlife viewing opportunities abound.

The communities closest to Isabella Lake are Wofford Heights, Lake Isabella, Mountain Mesa, South Lake, Bella Vista, Longview, and Kernville, all of which are within approximately three miles. The primary public access point to Isabella Lake is the Auxiliary Dam Recreation Area, located at the southern end of the lake, just north of the community of Lake Isabella. The largest metropolitan area is Bakersfield, approximately 40 miles to the southwest.

Historic Recreation Use

Isabella Lake became fully operational in 1954. Although recreation was not an Federally-authorized purpose of the original project, recreation has been an important benefit from the beginning. Records of recreational use began in 1955. In 1963, an agreement was made between Kern County and local water users to retain a minimum 30,000 acre-feet of water in the lake for recreation purposes**.** Historically, this minimum pool level has occurred only four times since 1954 (Corps 2006a)**.**

Historic recreation use at Isabella Lake showed an increase between 1955 and 1970. Subsequently, annual visitation was more variable. According to the Corps' 1979 Master Plan for Isabella Lake, fluctuations in visitation were attributed to enforcement of a prohibition against camping below the gross pool elevation, drought periods (with resulting diminished fishing and boating opportunities), lack of facilities, inconvenience associated with construction improvements of SR 178, and opening of three new lakes closer to the Los Angeles area (Corps 1979). In May 1991, the USFS took over operation and maintenance of records of all recreational facilities at the project from the Corps.

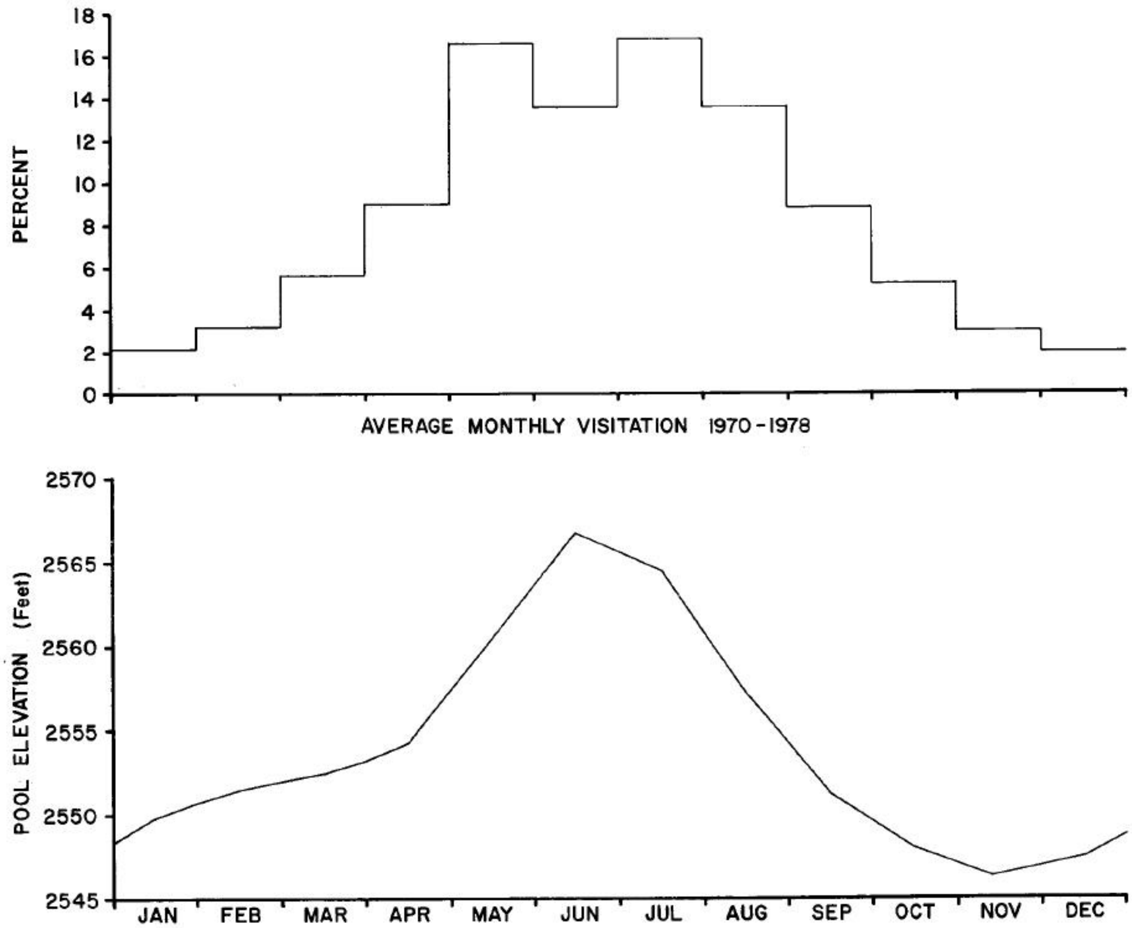
Generally, the amount of recreation use has coincided with the gross pool of Isabella Lake, and in drought years, recreation use at Isabella Lake has declined. Specifically, the increase in fishing at Isabella Lake has been closely linked to the level of water. According to a Fisheries Management Strategy developed for Isabella Lake by the California Department of Fish and Game in 1999, high rainfall and snowpack in 1967, 1969, and 1974 resulted in high water levels above 450,000 acre-feet, and mostly high water levels also occurred from 1978 through 1986 and 1995 through 1998. Both the catch per hour and the size of fish caught, both of which measure fishing success, were higher than normal during those periods (CDFG 1999).

In years with low water levels below 300,000 acre-feet, the catch per hour and sizes of fish caught decreased dramatically. Those years with low rainfall and snowpack included 1959 through 1962, 1971, 1972, 1976, 1977, and 1987 through 1994. Successful fishing at the lake typically rebounds with the increased gross pool once the drought conditions cease (CDFG 1999).

Summer has historically shown the greatest recreation use at Isabella Lake. The type and location of use is generally slightly different, based on the activities taking place either during the weekdays or the weekends and holidays. In a pattern that generally exists today, the elevation of the lake normally rapidly increases in elevation in May, reaches its peak in June, and gradually draws down starting in July. This pattern generally follows the months of the greatest recreation demand, as shown in Figure 3-27.

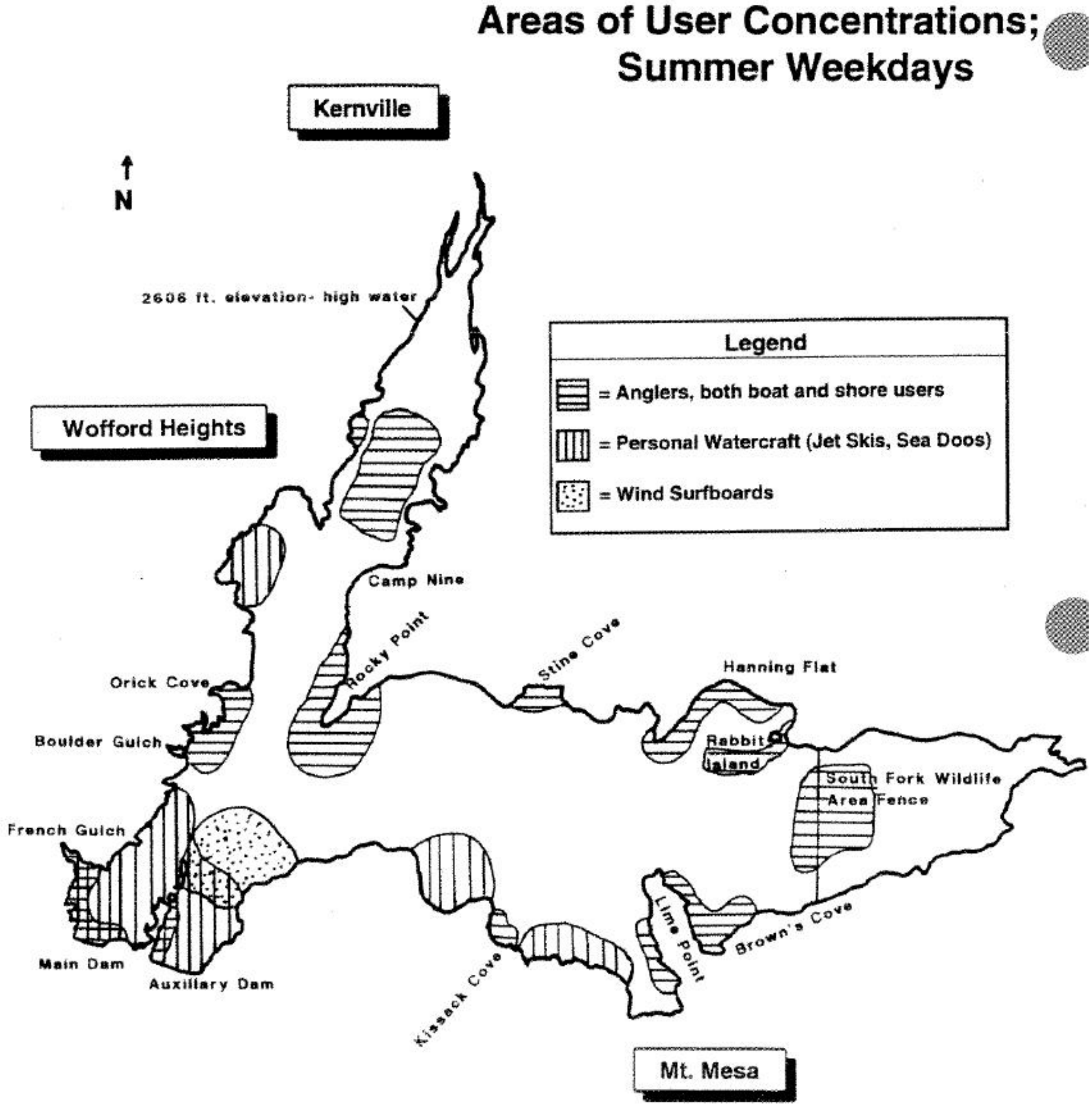
Figure 3-28 and 3-29 present examples of the variety of use, based on timing during the summer (CDFG 1999).

Figure 3-27 Isabella Lake Average Monthly Pool Elevation (1970-1978) and Visitation[1]



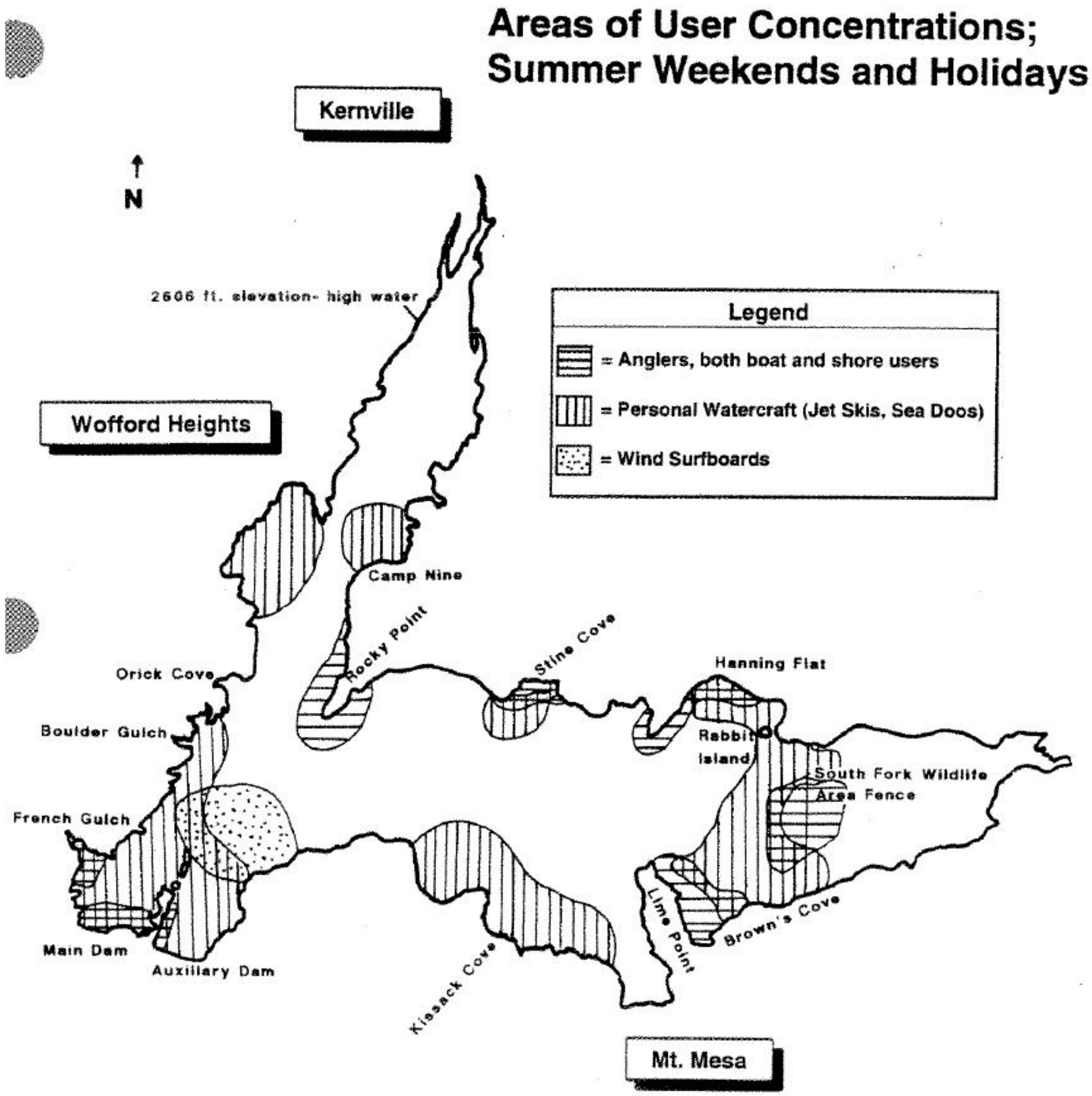
[1] Note: Source (Corps 1979). Lake elevations from this document are referenced to the Isabella Project Datum (IPD). For conversion to NAVD 88 add 3.76 feet.

Figure 3-28 Isabella Lake Summer Weekdays Areas of User Concentrations[1]



[1] Note: Source (CDFG 1999).

Figure 3-29 Isabella Lake Summer Weekends and Holidays Areas of User Concentrations[1]



[1] Note: Source (CDFG 1999).

Overview of Current Recreation Use

Twenty-six areas in the immediate vicinity of the Isabella DSM Project are developed for recreation. Developed facilities at these areas are provided by the USFS, BLM, Kern County Parks and Recreation, the California Department of Boating and Waterways, and the California Wildlife Conservation Board. These areas provide opportunities for picnicking, camping, boat-launching, swimming, marina concessions, a visitor's center, public access, parking and hiking, cycling, and horseback riding. Currently, private concessionaires include a camping concessionaire for USFS, three marinas, and five outfitter guides.

Recreation at Isabella Lake includes a variety of water- and land-based activities, including picnicking, camping, lake boating and whitewater boating, swimming, fishing, hiking, off-road motorcycling, hunting, sightseeing, mountain biking, road cycling and horseback riding.

Most water-oriented visitor use originates at permanent and portable facilities developed along the western shore of the North Fork area and the southern shore of the South Fork area, where the water surface is relatively accessible at all lake stages due to the ability of the marine docks to adjust to the lake level. These areas have been developed to respond to the large annual fluctuations in lake level elevation, which cause extensive drawdown areas to be exposed at the upstream portions of the South Fork and North Fork arms. Recreation along the remainder of the lakeshore takes place primarily at high lake stages. Portable restroom facilities are provided at several sites along lakeshore, and several unimproved areas are frequently used.

Windsurfing, kite boarding, and parasailing take place in the open areas on the South Fork, such as Auxiliary Dam and Old Isabella.

Current Visitation and Revenue

Visitation to the Isabella Lake area is composed of local visitors, weekend visitors from surrounding cities and metropolitan areas, and out-of-state and international visitors. The visitation to Sequoia National Forest via SR 155, which passes through the communities of Lake Isabella and Wofford Heights on the North Fork of the Kern River, is an indicator of general recreation visitation and is typically a visitor’s primary destination. According to a USFS National Visitor Use Monitoring report released August 2011, about 820,000 visitors spend nearly $38 million annually in the Sequoia National Forest, including the Giant Sequoia National Monument. According to the report, the event with the most visitor draw to the forest was the Lake Isabella Fishing Derby, attracting 20,000 visitors (USFS 2011a, 2011b).

Another means of tracking recreational visitation to the lake and surrounding area is through sales of national park passes. The Federal government established the America the Beautiful – National Parks and Federal Recreational Lands Pass in January 2007. These passes allow the public to enter Federal fee areas without additional charge. The Southern Sierra Pass is the primary pass for this area and can be purchased from USFS offices or from local vendors. The pass can be used at both the Isabella Lake High Impact Recreation Area and at Camp 9, on the western side of the North Fork Arm, as a day pass. For 2010, the sales of Daily, Annual, and Second Vehicle Pass sales totaled $76,700. The further breakdown of number of sales by pass and location where passes were sold is shown in Table 3-68.

Table 3-68
Southern Sierra Daily, Annual, and Second Vehicle Passes for 2010

Sales Location	Daily Pass $10	Annual Pass $50	Second Vehicle Pass $10
Kernville and Blackrock	1,914	88	69
Revenue	$19,140	$4,400	$690
Isabella Lake	1,953	369	264
Revenue	$19,530	$18,450	$2,640
Vendor Sales	425	130	110
Revenue	$4,250	$6,500	$1,100
Total Pass Sales	**4,292**	**587**	**443**
Total Revenue	**$42,920**	**$29,350**	**$4,430**
Total Combined Pass Sales	**$76,700**		

Based on the number of Southern Sierra Daily, Annual, and Second Vehicle Passes sold in 2010, estimates of visitor use can be calculated. The USFS considers it a reasonable estimate that 65 percent of the use from these passes occurs at the Isabella Lake Auxiliary Dam Recreation Area. Each pass is assumed to represent an average family of five, given that the family size for a vehicle pass can vary greatly, from a single user to a family of up to twenty. These assumptions result in the following calculations:

- 4,292 Daily Passes multiplied by 65 percent = 2,790 Daily Passes intended for use at the Isabella Lake Auxiliary Dam Recreation Area and
- 2,790 Daily Passes multiplied by average of five family members per pass = 13,949 users visiting Isabella Lake Auxiliary Dam Recreation Area annually.

The USFS estimates that an Annual Pass holder would likely use his or her pass at least six times. Because the Second Vehicle Pass often represents the Daily or Annual Pass holder’s second vehicle, this is not factored into this overall use estimate. This assumption results in the following calculations:

- 587 Annual Passes multiplied by 65 percent = 382 Annual Passes intended for use at Isabella Lake Auxiliary Dam Recreation Area and
- 382 Annual Pass users multiplied by six visits per year = 2,292 visits to Isabella Lake Auxiliary Dam Recreation Area by Annual Pass holders.

Combining the total estimates for the Daily Pass users visiting the Auxiliary Dam Recreation Area (13,949) and the Annual Pass visits (2,292) results in a rough estimate of

16,241 visits to the Isabella Lake Auxiliary Dam Recreation Area per year by pass holders.

For overall visitors in 2010, including those visitors beyond those counted in the Southern Sierra passes, the estimate for Kernville is 10,846, for Blackrock is 3,265, and for Isabella Lake is 12,438, with a total of 26,549 visitors to the overall area (Norris 2010).

Recreation Activities at Isabella Lake

Recreation on and around Isabella Lake includes an array of seasonal primitive and developed activities, both water- and land-based. The peak season of water-based recreation at Isabella Lake is the summer, generally April through September, when swimming, boating, fishing, and access to marinas and boat rentals is high. (Recreation facilities in and around Isabella Lake are shown on Figure 3-30.)

The Kern River Valley 2010 Official Visitors Guide, a publication of the Kern Valley Sun, offers the public information concerning the variety of recreation activities offered in the area, including whitewater rafting, fishing, sailing and windsurfing, birding and wildlife viewing, mountain biking, and day trips to cultural and historical sites around the lake. These activities draw large numbers of people during the peak summer season.

<u>*Water-Based Recreation*</u>

Many water-based activities are offered at Isabella Lake, including fishing, boating/marina, parasailing, personal watercraft use, swimming, windsurfing, whitewater rafting, and water skiing. Peak recreation season occurs from Memorial Day weekend in May through the Labor Day weekend in September, with the exception of a few important annual events occurring in the spring and fall. This analysis focuses on fishing and boating/marinas, with the understanding that such activities as parasailing, personal watercraft use, windsurfing, and water-skiing are included in the boating/marina analysis below. Visitors swim and use the area at their own risk, and swimming beyond 300 feet of the lake shore is prohibited.

Fishing. There are approximately 22 access points for fishing on Isabella Lake, and several areas along the Kern River for fishing. Anglers are required to obtain an annual CDFG fishing license, which is valid for the calendar year. Anglers can fish from the shores of Isabella Lake or by boat with a boat permit from Kern County. Rainbow trout, crappie, bluegill, catfish, and largemouth bass are the most popular fish sought by anglers. Others species include smallmouth bass, kokanee salmon, carp, sucker fish, and pikeminnow. Following CDFG guidelines for stocking fish, some species, such as rainbow trout, are stocked between November and April. In addition to open permitted fishing, special fishing activities and contests take place at Isabella Lake.

The Forest Service has issued temporary recreation event special use permits (SUP) for bass tournaments on Lake Isabella since the early 1990’s. Launch 19, located below the USFS compound is used as the launch area and weigh-in area for all of the tournaments. Launch Ramp 19 receives a high amount of public use throughout the year; however, the tournaments are generally scheduled for non-peak use periods. Forest Service patrols monitor this area for potential conflicts between recreationists and tournament participants (USFS 2011b).

The Annual Isabella Lake Fishing Derby, held in April each year since 1989, is considered the largest amateur trout derby in the United States, attracting 8,000 registrants in 2011. Many registrants come from outside Kern County. This popular activity generated approximately $2.5 million dollars in revenue for the communities around Isabella Lake in 2010 (Roach 2011).

In addition to the fishing derby, the CDFG also approves smaller regional fishing contests. For 2012, it has approved or approval is pending for nine fishing contests proposed to take place on the lake. These contests range from a single day to three days, with the earliest in March and the latest in October (CDFG 2011b).

Motorized and Non-Motorized Boating / Marinas. Operators of all motorized and non-motorized watercraft are required to have a permit through Kern County Parks and Recreation. Public docks are provided for loading and unloading boats only; mooring is prohibited. There are six boat launch areas, all of which are maintained by USFS. These are Tillie Creek, Launch 19, Old Isabella, South Fork Recreation Area, Kissack Cove, and Camp 9. Old Isabella and Kissack Cove have both low and high water launch areas. In addition, three privately operated, full-service marinas provide fuel, food, fishing supplies, and information (See Figure 3-30). These are French Gulch Marina, located on the western side of Isabella Lake off Highway 155, the North Fork Marina, also located on the western side of Isabella Lake off Highway 155; and the Red's Kern Valley Marina, located on the southern side of Isabella Lake off Highway 158. Table 3-69 presents these three full service marinas and available capacity at Isabella Lake. Marinas can permit customers to launch from the docks, but do not have or administer shore-based launch areas.

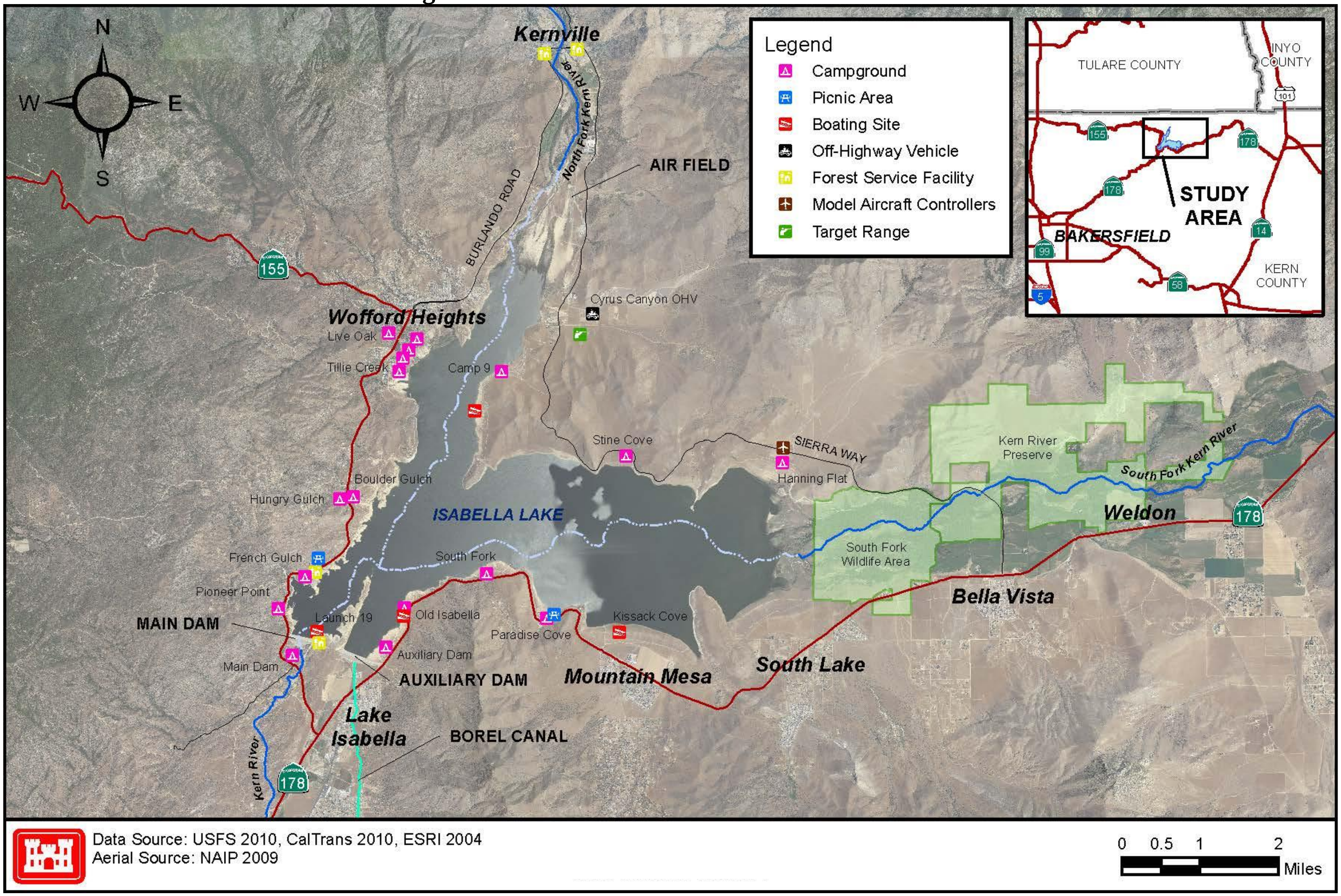
Table 3-69
Isabella Lake Full Service Marinas and Capacity

	French Gulch	North Fork	Reds
Private slips	104	14	3
Private mooring	2	0	10
Rental slips	10	18	3

Source: Ehmann 2010

The four remaining sites are informal boat launch facilities with limited services. One is near the Main Dam (Launch 19), a second at the Auxiliary Dam near the Old Isabella Recreation Area, a third near Kissack Cove, and a fourth just south of the Camp 9 Recreation Area. Because these are informal sites, user data is not collected.

Figure 3-30 Isabella Lake Recreation Facilities



Lake levels have a direct impact on the ability for the marinas to be at full capacity. At the current IRRM high water lake levels of 360,000 acre-feet, the marinas are at full capacity. At low water lake levels of 180,000 acre-feet, French Gulch is at 78 percent capacity, North Fork is at 67 percent capacity, and Red's is at 69 percent capacity (Colson 2011).

Lake kayaking and canoeing are also popular sports on Isabella Lake. USFS records dating from 2007-2010 indicate an average of 280 lake kayaking permits per year issued by two private outfitter guides.

Kern County Parks and Recreation Department maintains a boat patrol at the lake, for safety and to issue citations. The department also issues boat permits for all motorized and non-motorized watercraft, available at all marinas and at several convenience stores in the Lake Isabella and Kernville areas. Permits sold in the Lake Isabella area totaled $135,243.00 in 2011 (Whitener, 2011). Permit types are broken down into three categories: Lake Isabella-only, one-day permits (1,809 issued, revenue $75,073.50); Lake Isabella-only, three-day permits (2,405 issued, revenue $32,467.50); and all lakes permits (513 issued, revenue $27,702.00).

While recreation is not an authorized purpose of Isabella Lake, an agreement was made in 1963 between Kern County and recreation water users to maintain a minimum recreation pool of 30,000 acre-feet (Corps 1978); this minimum pool level has occurred only four times since 1954.

Windsurfing / Kiteboarding / Parasailing. The lake is also one of the State's most popular windsurfing areas. Reliable afternoon winds from 35 to 50 miles an hour create ideal conditions for intermediate to advanced windsurfers. Windsurfers come from many western states to participate in the annual Week at the Lake each June. All users of non-motorized watercraft, including kayaks and windsurfers, must have a permit.

Land-Based Recreation

Land-based recreation activities around Isabella Lake include wildlife viewing, primitive and developed camping, mountain biking, road bicycling, hiking, picnicking, wildlife viewing and sight-seeing, off-highway vehicle use, motocross, hunting, golfing, target shooting, rock climbing, and horseback riding. Nordic skiing and other snow-oriented sports are offered on the Kern Plateau, approximately 26 miles northeast of Kernville, via Sherman Pass Road. For this analysis, only camping, wildlife viewing, and hunting will be investigated, as these activities would most likely be impacted by the proposed project.

Camping. Twenty seven recreation areas in the Isabella Lake area and Kern River Valley provide both developed and primitive camping in open and designated campsites (see Figure 3-30 for campsite locations). California Land Management (CLM) manages most of the recreation areas in the Isabella Lake area under a permit from USFS. The USFS also independently administers and operates ten developed campgrounds and maintains the restroom, trails, and parking facilities. Select campgrounds around Isabella Lake offer amenities such as recreation vehicle dump stations, restrooms, fire rings, tables and grills, metered showers, fish-cleaning stations, playgrounds, and sheltered areas, while others are less developed. Many such areas are preferred by local and visiting public users, the most popular of which is the Auxiliary Dam Recreation Area, where many recreational vehicles are parked on both weekdays and weekends. A 14-day camping limit is enforced at all sites.

Table 3-70 details the capacity of the campgrounds surrounding Isabella Lake. It provides the number of family and group campsites and the total visitor capacity at each campsite (Ehmann 2010).

As presented in Table 3-70, the Auxiliary Dam Recreation Area has the largest visitor capacity at 1,250. Total capacity at all 27 recreation areas is 11,030 visitors. The former Main Dam Campground at the southern end of Isabella Lake directly off SR 155 has been permanently closed to public access. To accommodate visitors, the USFS encourages and accepts reservations at some of its campsites. Reservations may also be made online through www.Recreation.gov. To ensure a high-quality recreation experience, California Land Managementrecords visitor usage of campsites at Isabella Lake. Table 3-71 details the visitor information available for 2010 (Ehmann 2010).

As presented in Table 3-72, the Tillie Creek Campground, located near SR 155, experienced the highest level of visitor use accommodating approximately 26,987 visitors in 2010. Recreation area fee data from 2006-2010 indicated a steady rise in total gross fees collected by CLM, from $611,464 in 2006 to $695,504 in 2009. A drop in gross fees occurred in 2010, to $660,938.

Hunting. The Kern River Valley offers thousands of square miles of diversified habitat that house many different species of game animals, including deer, bear, wild pig, duck, wild turkey, and other various game birds. The California Department of Fish and Game administers hunting permits in the State. Hunting is an important part of the regional infrastructure, as it is a popular recreation activity in the region, as evidenced by the annual Junior Pheasant Shoot held at Hanning Flat recreation area each November.

Wildlife Viewing/Birding. Due to the abundance and diversity of natural habitat, the Isabella Lake and greater Kern River Valley offer opportunities for wildlife viewing for many animal species. Birding is an especially popular activity. For seven years running Kern County has won the title of America's "Birdiest" Inland County, a designation awarded by the Dauphin Island Bird Sanctuaries; 242 bird species were counted, many of them found in the Kern River Preserve east of Isabella Lake, along the South Fork Kern River. The area is managed by Audubon-California for preservation of one of the State's remaining riparian forests and supported wildlife (Audubon-California 2010). Other animals found in the area include mule deer, beaver, coyote, gray fox, bobcat, raccoon, and occasionally black bear and mountain lion. A population of southwestern pond turtles lives in the ponds of the wildlife area, east of the lake.

Table 3-70
Capacity of Recreation Areas Surrounding Isabella Lake

Recreation Area	Number of Family Units	Number of Group Sites	Total Campground or Group Site Capacity
Camp 9 Campground	109	-	654
Camp 9 Group Areas	-	2	80
Stine Cove	Open camping. No designated sites.		500
Hanning Flat	Open camping. No designated sites.		1,000
Kissack Cove	N/A	N/A	N/A
Paradise Cove	138	-	828
South Fork	Open camping. No designated sites.		500
Old Isabella Road	Open camping. No designated sites.		500
Auxiliary Dam	Open camping. No designated sites		1,250
Pioneer Point	78	-	468
French Gulch Group	-	1	100
Hungry Gulch	78	-	468
Boulder Gulch	78	-	468
Tillie Creek	159	-	954
Tillie Creek Group Areas	-	4	350
Live Oak North	60	-	360
Live Oak South	90	-	540
Live Oak Group	-	1	100
Limestone Campground	19	0	114
Fairview Campground	54	0	324
Goldledge Campground	37	0	222
Hospital Flat Campground	40	0	240
Camp 3 Campground	52	0	312
Camp 3 Group Area	0	1	20
Headquarters Campground	44	0	264
Hobo Campground	35	0	210
Sandy Flat Campground	34	0	204
Total	1,105	9	11,030

N/A = Data not available

Table 3-71
Developed Campsite Visitor Information at Isabella Lake in 2010

Campground	Number of Persons	Number of Sites Rented	Number of Extra Vehicles
Limestone	3,142	786	94
Fairview	11,406	2,637	137
Goldledge	6,393	1,351	142
Hospital Flat	7,046	1,698	287
Camp 3	9,569	1,974	303
Headquarters	13,487	3,171	444
Live Oak North	1,835	322	128
Live Oak South	4,169	753	232
Tillie Creek	26,987	5,324	1,346
Boulder Gulch	9,763	2,044	517
Hungry Gulch	8,732	2,033	512
Pioneer Point	7,787	1,721	233
Paradise Cove	13,700	3,527	598
Hobo	7,961	1,914	51
Sandy Flat	6,895	1,631	197
Campground Total	**138,872**	**30,886**	**5,221**
Camp 3	932	40	-
Live Oak South	2,048	23	-
Tillie Creek	7,344	130	-
French Gulch	3,833	348	-
Group Total	**14,157**	**541**	**-**
Live Oak	596	141	-
Miracle Day Use	791	199	-
Lower Richbar Day Use	1,128	269	-
Upper Richbar Day Use	4,131	934	-
Day Use Total	**6,646**	**1,543**	**-**

- = Not available or not applicable

Table 3-72
Campsite Fee Data for 2006 through 2010 at Isabella Lake

Year	Gross Fees Total
2006 Total	$611,464.00
2007 Total	$647,736.00
2008 Total	$667,558.00
2009 Total	$695,504.00
2010 Total	$660,938.00

Biking. The local trail system at Isabella Lake is primarily unpaved roads that can be used for mountain biking. Three formal trails exist on the western side of Isabella Lake north of the French Gulch Marina, comprising a total of 2.2 miles: these are the Coco Mine Loop which is approximately 1.2 miles long; Vista Del Lago at 0.3 miles long; and Isabella Peak Trails at 0.7miles long. Portions of SR 155 are marked as bike lanes for road cycling.

Hiking and Day Use. The trails around the lake offer opportunities for day hiking, walking, and general recreation. Developed sites provide recreation at several areas around the lake.

Recreation on the Lower Kern River

Due to the location of Isabella Lake at the confluence of the North Fork and South Fork of the Kern River and its placement within the Giant Sequoia National Forest, the lake is in the unique position of affecting the recreation opportunities of the surrounding communities, as well as affecting downstream recreation activities, including camping, picnicking, fishing, and whitewater boating. Although downstream water users are primarily agricultural, recreation on the Lower Kern River (downstream of the dam) is very popular, not only for its recreational value but for its scenic value. River conservation, recreation, and environmental organizations, such as American Whitewater and the Sierra Club, have emphasized the importance of outdoor recreation on the Kern River. Table 3-73 details the recreation use (excluding whitewater boating) along the Lower Kern River by location and season, May 2001 through April 2002 (Southern Cal Edison, 2003).

Whitewater Boating. The Kern River Valley has over 60 miles of whitewater recreation. Whitewater rafting, kayaking, and tubing on the Kern River above and below the lake is a popular attraction. Commercial whitewater rafting companies are authorized by the USFS to outfit and guide day and overnight whitewater trips on the upper and lower Kern River. Gross receipts for the 2010 rafting season totaled $3,019,136.40, representing 20,049 user service days (USFS, 2010).

Table 3-73
Recreation Along the Lower Kern River by Location and Season

	Summer (May thru September)				Off-Summer (October thru April)				Year-Round (May thru April)			
	Day Use		Camping		Day Use		Camping		Day Use		Camping	
Reach/Location	No. of Days	% of Reach	No. of Days	% of Reach	No. of Days	% of Reach	No. of Days	% of Reach	No. of Days	% of Reach	No. of Days	% of Reach
Diverted Reach												
Black Gulch	2,757	28	6,335	24	830	25	204	32	3,587	27	6,539	24
Keyesville South	3,677	37	17,596	66	2,034	62	434	68	5,711	43	18,030	66
Main Dam CG	1,448	15	2,598	10	139	4	0	0	1,587	12	2,598	10
Slippery Rock	1,541	15	0	0	201	6	0	0	1,742	13	0	0
BLM North	503	5	0	0	92	3	0	0	595	5	0	0
Reach Total	9,926	100	26,529	100	3,296	100	638	100	13,222	100	27,167	100
Downstream Reach												
Democrat	1,946	15	180	1	1,240	18	22	1	3,186	16	202	1
China Gardens	1,440	11	6,626	24	222	3	142	8	1,662	8	6,768	23
Delonegha	690	5	0	0	896	13	0	0	1,586	8	0	0
Miracle Hot Springs	5,937	47	0	0	2,957	42	0	0	8,894	45	0	0
Hobo CG	1,186	9	9,619	35	1,123	16	962	56	2,309	12	10,581	36
Sandy Flat	1,627	13	11,242	40	568	8	592	35	2,195	11	11,834	40
Reach Total	12,826	100	27,667	100	7,006	100	1,718	100	19,832	100	29,385	100

Note: Camping is reported in RVDs, which is 12 hours of recreation activity. Day use is reported in visitor days, which varies in duration by average length of stay at different locations. Reach percentages are approximate and are rounded to whole numbers.

Typically, the whitewater season begins in April, as the snowpack from the western slope begins to melt and drains into the upper river basin to Isabella Lake. Upstream of the lake, whitewater boating on the North Fork of the Kern River relies completely on spring snowmelt. A whitewater river park was developed on the North Fork Kern River in the Kernville area in the 1970s, which provides an opportunity for beginning kayakers to practice skills and advanced boaters to continue boating in the later summer season. Plans are currently being developed by the Kern Valley River Council, the Kern County Parks and Recreation Department, the USFS and local community members to improve these facilities (Kern Valley Sun, 2011).

Below Isabella Dam on the Lower Kern River, instream flows from the dam form a 21-mile stretch of Class II-III whitewater through September, the end of the typical recreation season. There are seven ingress and egress locations for whitewater boating, with the various stretches of Class I to Class V+ runs ranging from 3 to 12 miles in length (Kern River Wild and Scenic 2010). Table 3-74 describes the minimum, maximum, and optimum flows from gauges both above and below Isabella Dam (Shackleton 2011).

Table 3-74
Minimum, Maximum, Optimal Flows for Whitewater Recreation

Section	Gage	Min	Min Opt	Max Opt	Max Good
North Kern	At Kernville	400	1,250	1,700	2,500
Brush Creek	At Take-Out Bridge	3.50ft	---	---	4.50ft
South Kern	Near Onyx	300	420	500	500
Kern	Above Borel Powerhouse	400	1,000	1,400	2,500
Kern	Release Lake Isabella	500	1,000	1,400	3,000
Kern	Below Democrat	600	850	1,150	2,500

Source: Shackleton 2011

As it is designed and operated for the primary purpose of flood risk reduction, and second for municipal water, Isabella Dam releases are not driven by hydropower or recreation. Flows from the Main Dam have historically been drawn down in November each year, to the minimum allowable flow of 30 cubic feet per second, as the agricultural and municipal demand has been satisfied.

Table 3.14-8 is a summary of recreational activities of the Kern River Valley and at Lake Isabella.

Giant Sequoia National Monument

The Giant Sequoia National Monument, designated by President Clinton in 2000, now encompasses 353,000 acres near Isabella Lake at the southern end of the Sequoia National Forest. It is one of 19 National Forests in California and is named for the 33 groves of giant sequoia, (*Sequoiadendron giganteum*), in its boundaries (USFS 2010c). Isabella Lake serves as the southern entrance to this area.

Table 3-75
Recreational Activities of the Kern River Valley

Region	Activity	Region	Activity	Region	Activity
Isabella Lake	Boating	Regional	Antiquing	Destinations	A. Brown Mill
	Marinas		Bird-watching		Audubon Wildlife Area
	Parasailing		Camping		Giant Sequoia National Monument
	Personal Watercraft		Fishing & Hunting		Kern River Fish Hatchery
	Sailing		Golf		Kern River Valley Museum
	Windsurfing		Hiking, Walking & Biking		Kern River Preserve
Kern River	Fishing		Horseback Riding & Packing		Nuii Cunni Native American Cultural Center
	Kayaking		Rock Climbing		Onyx Store
	Whitewater Rafting		Snowboarding & Skiing		Rich Pelletreau Art Gallery
					Trail of 100 Giants

A number of recreation opportunities draw visitors to the monument and forest and nearby Isabella Lake. Inside the monument, many concentrated use areas and dispersed areas provide a full range of camping experiences. Trails offer hiking, backpacking, horseback riding, and mountain biking. The rivers, lakes, and lakes offer boating, fishing, swimming, whitewater rafting, and kayaking. In the winter, high elevations accommodate alpine and Nordic skiing, cross-country skiing, snowshoeing, snowmobiling, and snow play. Developed recreation facilities in the monument encompass 660 acres and provide a variety of opportunities for the recreating public. The monument has 21 family campgrounds, with approximately 500 campsites, and seven group campgrounds (USFS 2010d).

Other Special Recreation Events

The Kern River Valley hosts a variety of special recreation events each year. These include: Whiskey Flat Days, the Sierra Art Show, Keyesville Classic Mountain Bike Race, Annual Kern River Races, Annual Kern Valley Festival ("A Celebration of the Bioregions"), Annual Whitewater Raft Race, Annual Discovery Drive Auto Show, Spring Art Festival, Children's Fishing Derby, Kernville Butterfly Count, Dirt Diggers Kernville Motocross, Whitewater Wednesday, Kern River Valley Rotary Club's Annual Raft for Valley Fever, Personal Watercraft Race, Annual Rubber Ducky Race, Annual Turkey Vulture Festival, Kernville Rod Run, Antiques and Collectibles Show, Wild West Daze Rodeo, Dam Tough Run, Kern Valley Fat Tire Festival, July 4th festival, and Junior Pheasant Shoot.

3.12.3 Environmental Consequences

This section addresses the construction-related (short-term) and post-construction (long-term) impacts on recreation from the proposed Action Alternatives and support actions.

Scope and Methods

The scope of this analysis includes water-and land-based recreation on and around Isabella Lake. Methods used to conduct the analysis include reference to agency management prescriptions relative to the Kern River Valley, potential restrictions on recreation in the area, and qualitative impacts on the recreation experience.

The following factors were used in assessing the context and intensity of potential impacts on recreation. Significant impacts would occur if the action would:

- Result in a permanent loss of recreational opportunities or resources;
- Severely restrict or eliminate access to recreational opportunities and facilities;
- Cause a substantial disruption in a recreational use or activity; or
- Substantially diminish the quality of the recreational experience.

A comprehensive recreation mitigation planning process will be initiated to address how all affected recreational opportunities would be maintained during the construction period and to address post-construction recreational site restoration. It is likely that some actions resulting from this planning process would result in proposals that cannot be addressed at this time and would need subsequent analysis.

No Action Alternative

Under the no action alternative, the lake level would return to a pre-IRRM elevation of 2,609.26 feet, returning access to recreational facilities and resources to their previous use. The likelihood and consequences of dam failure would continue.

In the event of a dam failure, nearly all existing water-based recreational opportunities, resources, facilities, and activities would be lost or severely disrupted during emergency operations and subsequent replacement of the dam. While land-based recreation would remain, such as hiking, camping, and urban recreation, the use and quality of these activities would substantially diminish due to inundation damage. Since replacement of the dam and restoration of associated recreation would take many years to complete, the loss, substantial disruption, and reduced quality in recreation would be considered to be high and adverse.

Alternative Base Plan

Short-term Impacts of Project Features on Recreation

Under the Alternative Base Plan, short-term impacts on recreation access and the overall quality of the recreational experience would result from land uses, activities, and lowering of lake levels during construction, especially from April through October, typically the peak season of recreational activity at Isabella Lake. Types of impacts are discussed below. These adverse impacts would be short-term and moderate during construction and not considered significant due to the limited area or degree of effect.

Site preparation would involve the real estate acquisition and use of areas for staging, processing, construction, borrowing or disposing of material. These areas include portions of the lake, dam, and river that are currently used for recreation or to provide support services for recreation around the lake including the Launch 19 at the current USFS compound and Corps Project Office site, the Auxiliary Dam Recreation Area and fishing opportunities in the Borel Canal south of the Auxiliary Dam. The public would not have recreational access to these areas during construction and the support services for recreation provided by the staff of the USFS would be relocated.

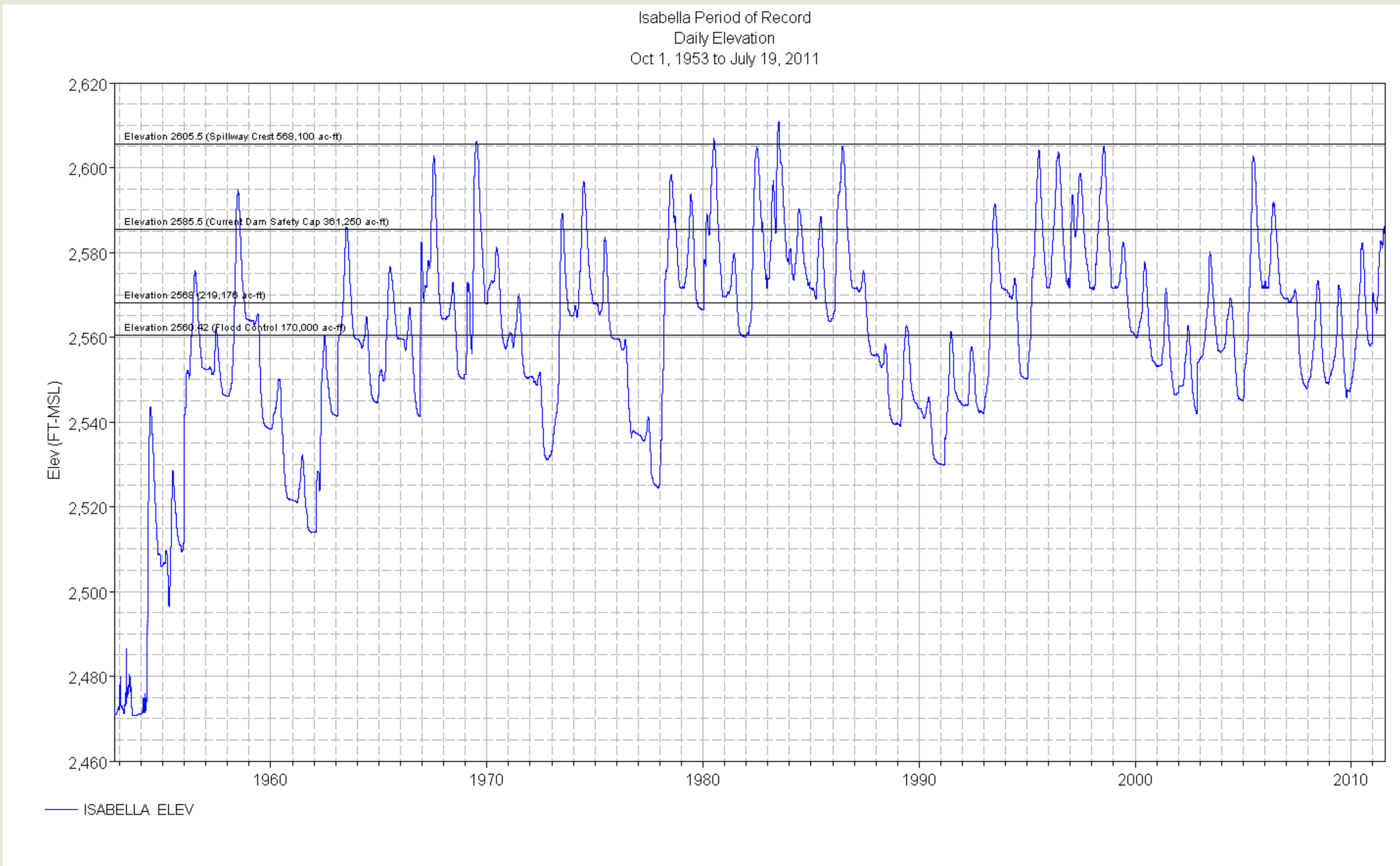
Excavation for the new emergency spillway would include blasting and ripping, which would temporarily increase noise levels for recreation in the area. Blasting safety zones and security measures may impact visitor access to the lake and travel to the surrounding recreation areas. Also construction of the Auxiliary Dam modification would include installing a dewatering system that would be powered by generators running 24/7 during certain periods of the multi-year construction period. Noise from this system could impact both day use and overnight recreation near the area, and may adversely impact certain activities such as wildlife viewing.

The lake would be lowered to an elevation of 2,543.76 feet during December 2016 through January 2017, and again during August and September 2017, to construct and remove a temporary earth-fill cofferdam at the right abutment of the Auxiliary Dam, with a top elevation of the cofferdam at the IRRM restricted pool elevation of 2,589.26 feet. The pool would be restricted when the coffer dam is in operation by approximately 4 feet lower than the IRRM level. The construction of the upstream berm at the Auxiliary Dam would also require a restricted pool elevation of 2,543.76 feet for 9 months from August 2019 through February 2020. The periods of lowered lake elevation would have an impact on water–based recreation and recreation access, as well as the overall experience for camping and other land-based recreation activities. The typical drawdown of the lake through the summer months is followed by a reduction in recreation use at the lake.

In order to assess impacts on recreation from these lowered lake pool levels, the levels should be compared to the historic summer averages recorded for Isabella Lake. Except for the 4 months of construction and removal of the coffer dam, and the 9 months for construction of the upstream berm, the restricted lake levels under the Alternative Base Plan are not atypical from what has been experienced in recent years under the IRRM restrictions (see Figure 3-31). Also, while the design gross pool elevation prior to the implementation of the restricted IRRM pool was much higher, historically the average summer elevation of the lake has been approximately 2,572 feet .

The low lake level of 2,543.76 feet needed for 13 months of the project is similar to levels experienced under drought conditions in the summer of 2002. The construction of

Figure 3-31 Isabella Lake Daily Elevation Record 1953 through 2011[1]



[1] Note: Lake elevations in this figure are referenced to the Isabella Project Datum (IPD). For conversion to NAVD 88 add 3.76 feet.

the coffer dam is currently scheduled outside of the recreation season at a time when lower pool levels are expected; however, the removal of the coffer dam is currently scheduled for the late summer of 2017. Likewise, the current construction schedule for placement of the upstream berm also overlaps with the most of the summer recreation season in 2020. It may be possible in the future to adjust the construction schedule to coincide with a low seasonal pool in the off-season and reduce impacts on recreation. With those exceptions, it is anticipated that most of the construction proposed within the gross pool of the lake may be accomplished without a major reduction of the average summer recreation pool level shown in Figure 3-31.

The existing Borel conduit that runs through the center of the embankment of the Auxiliary Dam would remain active and experience no major change from baseline conditions until the tie-in to the upstream canal in the lake is ready. The tie-in would take approximately 3 months to complete. Flows from the Borel conduit would be affected during this period, but otherwise would have very little impact on the current baseline capacities of flow through the existing Borel conduit. Whitewater recreation downstream of the Main Dam and Auxiliary Dam would be affected by cofferdam installation and conduit realignment, as flows from the Main Dam are expected to increase and flows from the Auxiliary Dam are expected to decrease during this period.

Short-term Impacts on Activities

Impacts on recreation activities during construction are anticipated from restriction or closure of areas to public access, loss of recreational opportunities and facilities, and reduced quality of the recreational experience, especially from April through October, typically the peak season of recreational activity at Isabella Lake. Specific effects on both water- and land-based recreation activities are discussed below. These adverse impacts would be short-term, moderate, and less-than-significant during construction. Recreation activities and access to recreational opportunities and facilities would be restored once construction is completed.

Fishing. Temporary reductions in water levels required for construction may impact open permitted fishing. At very low lake levels, natural reproduction and viability of stocked fish would be impacted through overall depletion of the quantity and diversity of available fish habitat and known spawning areas in the lake, potentially reducing fish catch. While temporary lower lake levels are not beneficial to the fisheries and a lower lake level during warm months could lead to water quality concerns affecting fish; impacts on fishing conditions due to lake levels for most of the construction period are not expected to change greatly from those experienced under IRRM levels in recent years and summer lake levels historically. The exception would be the 13 months of very low levels required for the construction and removal of the coffer dam and construction of the Auxiliary Dam upstream berm. The Corps may be able to adjust the construction schedule to reduce impacts. There is always the potential for drought in any given year and pool restrictions may affect the Corps ability to store water that may be needed to maintain levels beneficial to fisheries immediately after the construction period.

Visitation from outside the area may decrease in the short term due to lower lake elevations, which would affect the recreation visitor capacity at the lake and its ability to accommodate the crowds of people that typically attend the derby and other similar fishing contests. The Annual Isabella Lake Fishing Derby is held in April, which is typically a wet month and does not correspond with the current schedule for the most restricted pool. Visitation to the lake for fishing may continue to decrease during the construction period if there are impacts on fishing and the overall degraded recreation experience of Isabella Lake, from low fish catches, diminished water surface, and increased distance between amenities such as campgrounds to the new construction-level shoreline. However, the longest period of the most restricted pool is scheduled near the end of the Isabella DSM Project construction schedule, just prior to restoring full dam operations that would permit more water storage than have been available since 2006. Restrictions to lake access for boating and fishing are anticipated which would increase congestion at open campgrounds and launch areas, especially during special recreation events such as the Annual Isabella Lake Fishing Derby.

Lake Boating. Under all alternatives, both Auxiliary Dam Recreation Area and Launch 19 would serve as staging areas for construction support actions. These access points would be closed for the construction period, resulting in a displacement of recreation access for both lake boating and launching. Closure of these access points for lake boating would result in increased use at other launch sites. Congestion, increased delay, and user conflict may degrade the lake boating recreation experience at Isabella Lake.

Lower lake levels would directly impact public boat launch facilities, making some unusable and increasing visitor congestion at others. The Camp 9 and Tillie Creek boat launch facilities near the north fork of the lake require a lake level of between 110,000 and 115,000 acre-feet to be usable (Corps 2008b). These facilities would become unusable during the periods of the most restricted construction pool of approximately 74,802 acre-feet. Pool restrictions under the IRRM or when construction is occurring behind the coffer dam should not inhibit use of these facilities, but dam operations or natural drought conditions could also create low lake levels. The remaining boat launch on the southern and western shores of the lake would become the only facilities accessible to the public, likely resulting in increased congestion; longer wait times for access, and user conflict.

Although the marinas would be directly impacted by lower lake levels, French Gulch and Red's Kern Valley/South Fork are designed with cables and deadman anchors that allow them to adjust with the lake level, a method which has been used in the past (Corps 2008b). Significant and sudden increases or decreases in lake level have an adverse effect on the marinas; any advance notice of any water releases would minimize the effect.

Public access to North Fork Marina would be adversely impacted as the lake level would be too low for access. However, mitigation measures, such as installation of a portable and removable bridge capable of carrying vehicular traffic, would reduce adverse impacts. Access to the boat launch put-ins around the lake, specifically the Camp 9 put-in and Kissack Cove put-in, would require people to drive further in to the lake bed to access the water. The water level at the remaining boat launch put-ins would remain high enough for people to access, therefore not adversely impacting these put-ins. Although lower lake levels would not likely eliminate parasailing, sailing, personal watercraft use, and windsurfing on the lake, lower lake levels may expose features, such as rocks, tree stumps, shallow spots, and other hazards normally covered by water. To avoid this potential problem, users would need to stay near the middle of the lake, where the water is deeper, and to give the shoreline a wider berth.

Whitewater Boating. Changes in the frequency and volume of water releases during construction also could directly affect downstream recreation on the Lower Kern River, such as whitewater rafting, kayaking and tubing. To facilitate construction under the most restricted lake pools and when the Borel Canal is offline, releases would likely increase in volume and frequency during the peak runoff months in the spring to remove water from the construction site. This increased flow may provide a higher quality whitewater recreation experience than in the late summer and fall when the water level is normally reduced. The degree of impacts, including visitation, would depend on the volume of water released and downstream commercial outfitters' ability to provide a quality whitewater recreation experience. However, it is understood that during the multi-year construction period, the Corps would ensure that water releases provided the expected flows under agricultural agreements with downstream users, which may also support continuance of whitewater-based recreation at some level.

Commercial entities and members of the public have expressed the desire to be informed of anticipated flows, and whenever possible, be given a flow regime for the Kern River outflows from Isabella Dam. The Corps' plan to ensure that the expected flows are provided, under agreement with the downstream users, would likely minimize the short-term impacts on water-based recreation downstream of the lake, primarily whitewater rafting and kayaking. However, because the agreement for flows is primarily for agricultural purposes, there is no guarantee that enough water would be released to ensure a high quality whitewater rafting experience.

Camping. Although most campgrounds would remain open during construction, the Auxiliary Dam Recreation Area would be closed during the construction period and used for sand borrow and processing. The facility permits open camping with no designated sites, but can accommodate up to 1,250 campsites – more than any of the other camping areas around the lake. Visitor use data is not available, but due to its visible location near the town of Lake Isabella and the boat launch; it is one of the most popular camping areas on the lake. Plans for mitigating the temporary loss of this facility and post-construction restoration of the facility are anticipated, but have not been sufficiently developed to include in the Draft EIS.

While construction is not scheduled during nighttime hours, there would be extended periods during the construction schedule where dewatering of construction areas would require generators and pumps to run 24/7. Noise generated during construction may result in annoyance or sleep disruption to campers. The camping experience would be further degraded by introducing new sources of light for safety and illumination and fugitive dust from construction. Construction could add light to areas that area usually dark, which would degrade the camping experience by impacting views of the night sky.

Camping at the south end of the lake and in the vicinity of proposed sand borrow operations at the South Fork Delta may be disrupted due to the audible intrusion of heavy construction equipment and sand hauling dump trucks, thereby degrading the quietness and less developed recreation experience often sought by campers.

Construction and support action would also generate dust from the movement of vehicles, soil excavation, and wind blowing across exposed soil. Fugitive dust would indirectly affect the recreation experience by diminishing atmospheric clarity.

In addition to the loss of the camping opportunities at the Auxiliary Dam Recreation Area, impacts would likely be realized at the Old Isabella, Pioneer Point, and French Gulch campgrounds as these are the closest campgrounds to the dam construction site. Other areas that are farther from the construction site, such as Kissack Cove, Paradise Cove, South Fork, Hanning Flat, Stine Cove, Hungry Gulch, and Boulder Gulch may experience adverse indirect impacts on the camping experience due to increased congestion.

During construction access to the lake from some of these campsites would be directly impacted as campers would have to walk further to the lake due to the lower lake level. For example, campers at the Hanning Flat Recreation Area and Stine Cove Recreation Area (two of several campgrounds that also host fishing derby participants) would be approximately 2.5 miles and 1 mile away, respectively, from the shoreline of the lake at the reduced level.

Impacts on the camping experience during construction would likely result in reduced visitation to the lake over time as campers would seek other areas for a high quality camping experience. Camping may also be temporarily indirectly impacted due to increased traffic resulting in heavy load construction equipment in and around the lake. Disruptions to these recreation activities may cause some visitors to avoid camping in the Isabella Lake area.

Wildlife Viewing and Hunting. Birds and other animal species popular for wildlife viewing may avoid the Isabella Lake area during construction due to the lowered lake level, increased noise from heavy equipment and overall increase in human activity. Although hunting is not expected to be directly impacted in the lake area, the visitor use of these areas is likely to diminish because of the decrease in wildlife viewing and hunting opportunities. However, most of these opportunities do not occur in the vicinity of Primary Action Area for the Isabella DSM Project.

Day Use Visitation. Construction activities would have some temporary impacts on day-use recreation and visitation. The closure of the Main Dam Recreation Area, the Launch 19 boat ramp, and Engineers' Point would reduce the availability of easily accessible day use facilities and increase the use and congestion of facilities elsewhere. Construction noise, dust, traffic and emissions would temporarily degrade the recreational experience. There may be short closures on Highway 155 and the access road to the Keyesville SRMA area in the south lake area for public safety during blasting for the Emergency Spillway excavation, causing inconvenience for day users. However, the blasting may be able to be scheduled for a time when visitor use is lowest, such as mid-day, and during the week. Popular activities in the Keyesville SRMA such as hiking and mountain biking would not likely be adversely impacted. However, if the project work sites and support actions could be viewed or heard from these locations, the recreation experience may be temporarily degraded.

Special Recreation Events. Water-based special recreation events such as the Annual Isabella Lake Fishing Derby, generally held in April each year, would continue at Isabella Lake during the construction period. None of the periods of the lowest construction pools are scheduled during the derby, and April is usually one of the peak months for spring inflows to the lake from winter runoff. However, in low water years or if the lake levels have not recovered sufficiently from restricted pools in prior months, the quality of the derby may be degraded due to the reduced water level and reduced water surface area in which to hold the event. If the water level is reduced there may be over-crowding during the event, which would likely impact the volume and quality of fish catches. It is also uncertain what impacts the lowered lake level would have on the pens that are used to stock and feed derby fish from the months of November through April. The 2011 derby attracted 8,000 people, and with the closure of the Auxiliary Dam Recreation Area and Launch 19 there is likely to be more congestion, parking problems and fewer campsites than in previous years.

Other water-based events, such as the Personal Watercraft Race, could also be temporarily impacted by reduced water level due to the reduced water surface in which to hold these events. Whitewater boating events that occur below the dam may be temporarily impacted due to the uncertainty of outflow from the dam during the construction period.

Land-based recreation events, such as the Keyesville Classic Mountain Bike Race, Whiskey Flat Days, and various running races would continue and are not expected to be directly impacted during the construction period.

Regional Recreation. Recreation and visitation to the Giant Sequoia National Monument or other regional destinations would not be directly impacted from the proposed project, due to distance from the Isabella Lake construction site, and the ability of the Monument and other attractions to draw visitors independent of Isabella Lake. However, during construction the Isabella DSM Project may have a negative impact on visitors who might choose to stay overnight or camp in the Isabella Project area on the way to visit other public lands. Visitors may also choose a different route to the connected wilderness areas.

Long-Term Impacts on Recreation Activities

After construction is completed, all equipment and temporary structures would be removed from the work areas. All disturbed areas and recreation activities would be restored or replaced to at least pre-project conditions. Recreation visitation would be expected to increase over time as visitors learn of the project's completion and restoration of recreation facilities. Recreation facilities, opportunities, and activities would continue to be managed by the various Federal, State, and local agencies. Consistent with the project purpose and need, the likelihood of dam failure and subsequent loss or substantial disruption of recreation activities at the lake would be minimized. No long-term adverse effects on overall recreation activities would be anticipated.

Alternative Plan 1

Alternative Plan 1 incorporates all of the same remediation measures, support actions and anticipated impacts as the Alternative Base Plan, with an additional measure of constructing an RCC Overlay to manage overtopping in an extreme storm event. This alternative includes creating an additional staging area on a portion of the Main Dam Campground downstream of the Main Dam. There would be no additional impacts on recreation associated with the use of this site with the exception of those associated with construction noise, traffic, emissions, dust and security lighting. The campground facility has been closed for years and there are no plans to reopen it.

Alternative Plan 1 would add additional material borrowing, processing and transport. The additional material used for the filter and RCC Overlay would include sand from the Auxiliary Dam Recreation Area and the South Fork delta, coarse aggregates from the spillway excavation, and cement from a plant located on Highway 178. The project duration is anticipated to be 5 months longer than the Alternative Base Plan. There would be additional construction impacts on recreation over a longer duration from noise, traffic, emissions, dust and security lighting in the vicinity of the Main Dam and from material transport. Impacts resulting from lake lowering would be the same as the Alternative Base Plan, with an additional 5 months of construction. These adverse impacts would be short-term and moderate during construction and not considered substantial due to the limited area or degree of effect.

Alternative Plan 2

Alternative Plan 2 incorporates all of the same remedial measures, actions and anticipated impacts as Alternative Plan 1, with additional measures including a larger downstream buttress and a full foundation treatment of the Auxiliary Dam. Construction of these additional remediation measures would require more material borrowing, processing and transport. The project duration is anticipated to be one year longer than Alternative Plan 1. There would be additional construction impacts over a longer duration from noise, onsite and offsite traffic, emissions, dust and security lighting in the vicinity of the Auxiliary Dam and from material transport. Impacts resulting from lake lowering would be the same as the Alternative Base Plan and Alternative Plan 1,with an additional one year of construction. These impacts would be short-term and moderate during construction and not considered significant due to the limited area or degree of effect.

Alternative Plan 3

Alternative Plan 3 incorporates all of the same remedial measures, actions and anticipated impacts as Alternative Plan 2 with an important exception. Instead of relocating the Borel Canal conduit through the right abutment of the Auxiliary Dam a new Borel Canal conduit would be constructed at the Main Dam outlet works, and connecting via a tunnel under the existing and proposed spillways, to the existing Borel Canal alignment downstream of the Auxiliary Dam. The existing Borel Canal conduit through the Auxiliary Dam would be deactivated, sealed and abandoned. This alternative plan includes additional measures to retrofit the Main Dam control tower and outlet works.

Under this alternative, because re-routing of the Borel conduit through the right abutment of the Auxiliary Dam would not be done, there would be no need to construct and operate a coffer dam, as is the case for the other three alternative plans. Therefore, there would be no requirement for lowering the pool level to 2,543.76 feet for construction and removal of the coffer dam or for lowering the pool to approximately 2,585.26 feet when the cofferdam is in place. However, the requirement would remain to lower the pool to 2,543.76 feet for construction of the Upstream Berm at the Auxiliary Dam. For all other times during the multi-year construction period, the current IRRM restricted pool level of 2,589.26 would remain in effect. Compared to the other three alternatives, this alternative would reduce the potential for impacts on recreation, recreational fisheries, lake access and recreation facilities resulting from restricted lake levels.

The construction duration for this alternative is anticipated to be the same as Alternative Plan 2. Other impacts on recreation other than those discussed above would be the same as or similar to those under Alternative Plan 2. Impacts resulting from lake lowering would be the same as the Alternative Base Plan and Alternative Plan 2. These impacts would be short-term and moderate during construction and not considered significant due to the limited area or degree of effect.

Alternative Plan 4

Under this alternative, the deficiencies remediated in the Base Plan Alternative would be included, plus additional remediation measures identified for the Existing and Emergency Spillways, Main Dam, and Auxiliary Dam, which include installing a filter and drain system, raising the dam crests and existing spillway walls by 16 feet, widening the emergency spillway to 900 feet, realigning State Highway 178, and installing a flood gate where the new Main Dam embankment would intersect State Highway 155. This alternative would have recreation impacts similar to the Base Plan Alternative with the primary differences being impediments to access caused by an extended construction schedule and realignment of State Highway 178.

Widening the emergency spillway from that proposed under the Alternative Base Plan has the potential to increase impacts associated with the construction of that component of the project. In particular, blasting safety zones and security measures may have a temporary significant impact by impeding visitor access to the lake and travel to the surrounding recreational areas. Realignment of Highway 178 may also temporarily impact travel through the area. However, adverse, short-term, construction-related impacts to traffic circulation would be minimized through the implementation of the Traffic Safety Management Plan described in Section 3.9, Traffic and Circulation, and the impacts to recreation would be considered less than significant.

3.12.4 Environmental Commitments / Mitigation Measures

Under the Action Alternatives there would be short-term impacts on both water-based and land-based recreation during construction. It is preferred to minimize impacts when possible, or if this is not possible, to provide suitable mitigation measures.

Efforts to minimize adverse impacts may include:

- scheduling lake lowering to coincide with normal water release regimes;
- delaying, diverting, or halting construction to minimize traffic delays on weekends and at key recreation events;
- reducing user conflicts at impacted facilities;
- limiting construction noise and visual disruptions to visitors; and
- providing adequate and current information on available recreation for visitors.

A comprehensive recreation mitigation planning process would be initiated to address how all affected recreational opportunities would be maintained during the construction period and to address post-construction recreational site restoration. It is likely that some actions resulting from this planning process would result in proposals that cannot be addressed at this time and would need subsequent analysis.

Lake Lowering

A lowered lake elevation would have an impact on the access to the lake for recreation, as well as the overall experience for camping and other land-based recreation activities. The lowered lake elevation and access to recreation facilities and resources is consistent with the IRRM restrictions of the past four years. When possible, construction of some alternatives may be deferred while waiting for a naturally occurring drought condition (see Fig. 3.14-5). Further description and details of these types of deferred actions would be subsequently handled under an independent, site-specific environmental analysis.

Boat Launch Closures

Launch 19 at the Main Dam would be closed for the period of construction. This is the most popular and well-developed boat launch at Isabella Lake. It is proposed to improve access to the northeast portion of the Auxiliary Dam launch site and accommodate for increased use in that area.

Through grant funding provided by the California Department of Boating and Waterways, improvements to several boat ramps are expected at the lake. For example, at Old Isabella, the proposed project includes replacing the two existing boarding floats with two new boarding floats to better accommodate recreation users during high and low water periods. Both the upper and lower boat ramps would receive new 80-foot long by 8-foot wide boarding floats and 16-foot long by 5-foot wide gangways, in addition to new wire rope and concrete anchors. Also, at the South Fork Recreation Area, the proposed project includes replacing the boarding float with an 80-foot long by 8-foot wide boarding float and a 16-foot long by 5-foot wide gangway. These improvements may help minimize the impact caused by closing Launch 19 during construction. Further details relating to boat launch closures would be subsequently handled under an independent, site-specific environmental analysis.

Campsite Closures

The closure of Main Dam Campground in 2006 is anticipated to be permanent. In the short-term, the site would be within the blast zone for the Emergency Spillway and is proposed for a staging area under Alternative Plan 3. Closure in the long term would be due to a security risk to the dam. Potential alternate camping sites would include the development of the Live Oak Campground and the Keyesville Recreation Area adjacent to the Main Dam, currently managed by the BLM for day use only.

The Auxiliary Dam Recreation Area is the most heavily used area for recreational vehicle parking and camping, and it is the staging area for special use events such as the fishing derby. Because there is no equivalent area near the lake, proposed mitigation for the short term impacts to this site includes partial closures of sections of the area, scheduled at strategic times. The development of additional camping and vehicle parking facilities for during construction may be addressed in follow on analyses. It is anticipated that the area would be restored to its former use of recreational vehicle parking and camping, after completion of the Isabella DSM Project.

Construction, Blasting, and Hauling

Short-term road closures are expected to occur during the periods of blasting of the Emergency Spillway excavation, and delays can be expected due to increased use of both Hwy 178 and 155. It is proposed to schedule construction during the weekdays, and to coordinate construction and blasting to minimize impacts to travelers coming to the lake for special recreation events.

3.13 AESTHETIC RESOURCES

This section describes the affected visual environment and potential impacts on visual resources from proposed Action Alternatives and support actions.

3.13.1 Regulatory Setting

There are no known Federal, State, or local regulations governing the visual resources associated with the many natural and scenic resources in the Kern River Valley and Isabella DSM Project area. The Sierra Nevada range is composed of prominent ridgelines, canyons, lakes, and rivers, and extensive forests and wildflowers are found in these areas. These resources are valuable to the identity and economy of the valley by enhancing the visual character of local communities and providing distinguishing characteristics. The conservation element of the KRVSP includes goals, policies, and implementation actions for scenic resources and light pollution in order to preserve these visual resources in the Kern River Valley. Also, the open space and recreation element contains an open space/watershed goal to preserve open space as a visual and environmental resource and to maintain the rural atmosphere of the valley (Kern County 2011b).

3.13.2 Affected Environment

Sierra Bioregion

Isabella Lake is in the Sierra bioregion, a vast and rugged mountainous area that extends approximately 380 miles along the eastern side of California (California Natural Resources Agency 2010). The bioregion extends from the northern edge of the Plumas National Forest (between Ref Bluff, California and Reno, Nevada) south to Tejon Pass in the Tehachapi Mountains (near Mojave, California). The southern half of the Sierra bioregion extends westward from the Nevada state line to the San Joaquin Valley floor.

Named for the Sierra Nevada range it encompasses, the Sierra bioregion includes mountain peaks, forests, lakes, and rivers (California Natural Resources Agency 2010). It features eight national forests, three national parks, numerous state parks, historical sites, wilderness, and special recreation and national scenic areas.

The climate varies with the elevation. At higher elevations, there are cold snowy winters and cool summers. In the foothills, there are rainy winters and mild summers (California Natural Resources Agency 2010). When high pressure areas elevate temperatures and gusty winds blow, the mountains are vulnerable to wildfires that consume thousands of acres of brush and timber every year.

The Sierra bioregion is diverse, containing over half the plant species found in California and more than 400 of the terrestrial wildlife species of the State (about two-thirds of the birds and mammals and half the reptiles and amphibians) (California Natural Resources Agency 2010). The Sierra bioregion habitat types include annual grassland, blue oak savannah, chaparral, ponderosa pine, black oak woodland, mixed conifer, red fir, riparian, alpine meadow, Jeffrey pine, sagebrush, and bitter brush. Animals that inhabit the area include lodgepole chipmunk, mountain beaver, California mountain king snake, black bear, wolverine, California bighorn sheep, Pacific fisher, mule deer, mountain lion, California golden trout, northern goshawk, mountain chickadee, pine grosbeak, California spotted owl, mountain quail, willow flycatcher, bald eagle, and great gray owl.

Isabella Lake

General Setting

Isabella Lake is at the southern end of the Sierra Nevada, approximately 40 miles northeast of Bakersfield and 50 river miles upstream on the Lower Kern River of Bakersfield (Corps 2007a). The drainage area is 2,074 square miles. It is on National Forest System lands and is at an elevation of approximately 2,500 feet. Isabella Lake is surrounded by intermingled lands managed by the BLM and USFS. Figures 3-32 and 3-33 show views of the Isabella Lake basin.

The community clusters of Kernville, South Lake, Mountain Mesa, Lake Isabella, and Wofford Heights surround Isabella Lake. SRs 155 and 178 and Sierra Way are used to drive around Isabella Lake. The North and South Forks of the Upper Kern River flow into Lake Isabella, and the Lower Kern River flows out of Isabella Lake from Isabella Dam at the junction of the two forks at Whiskey Flat. Isabella Dam created Isabella Lake, a lake with a surface area of approximately 11,200 acres. Water-based recreation includes boating, sailing, water-skiing, jet-skiing, windsurfing, and fishing. Land-based recreation includes camping, fishing, golfing, hiking, wildlife viewing, and picture taking.

Viewer groups associated with the lake and dam include individuals involved with water- and land-based recreation, individuals involved with dispersed recreation at higher elevations in the surrounding mountains, residents and businesses surrounding Isabella Lake, and travelers on roads encircling Isabella Lake. Because Isabella Lake is a popular area for water-based recreation, more viewer groups would be present during seasons popular with this type of recreation.

Surrounding Landscape

Isabella Lake is mostly surrounded by mountains that reach an elevation of approximately 7,000 feet. The lower rolling hills vary in size, height, and steepness. The hilltops range from smooth and rounded to more rough and pointed with exposed rock. Boulders are scattered across various hillsides and are clustered at the bottom of hills. The color of the terrain is shades of tan and light brown, which appear darker when wet.

Vegetation follows the contours of the terrain. Swaths of rounded shrubs and trees are mostly evenly distributed over the landscape, except where exposed rock and boulders are found. Low brush and grasses evenly cover the landscape. Although the dominant vegetation colors are shades of green, additional vegetation colors are expected during spring and summer. Snow cover during the winter also influences the color of the landscape.

Figure 3-32 View from Engineers Point of west side of Isabella Lake

Source: Field visit on January 6, 2011

View from Engineers Point of west side of Isabella Lake

Figure 3-33 View from Engineers Point of north and east sides of Isabella Lake

Source: Field visit on January 6, 2011

View from Engineers Point of north and east sides of Isabella Lake

In addition to the clustered communities of Kernville, South Lake, Mountain Mesa, Lake Isabella, and Wofford Heights, there are also smaller networks of neighborhoods between the clustered communities and recreation sites surrounding Isabella Lake. The visibility of residences, businesses, and recreation sites varies greatly, depending on the size and color of structures and vegetation and topography to screen views.

Lake Landscape

Isabella Lake is roughly Y-shaped, following the two upper forks of the Kern River upstream and the Lower Kern River downstream. There is a striking contrast between the dark blue water and the surrounding muted earth tones of the terrain and vegetation. The contrast is further accentuated between the horizontal and smooth water surface and the diagonal, vertical, and coarser terrain surrounding Isabella Lake. Depending on various factors, such as the season, weather, and temperature, the water surface can either be absent of commotion or crisscrossed by those engaged in water-based recreation.

At its fullest, Isabella Lake reaches an elevation of 2,609.26 feet; the flood control pool elevation is 2,564.16 feet. The elevation of the restricted pool (the storage available above the restricted elevation that would normally be used to store the additional runoff until needed later in the season) is 2,589.26 feet.

Isabella Dam Landscape

Isabella Dam consists of the 185-foot-high Main Dam and the 100-foot-high Auxiliary Dam (Corps 2007a). Both the Main and Auxiliary Dams are compacted earth embankments, 1,700 and 3,260 feet long. The Main Dam is across the Kern River, while the Auxiliary Dam is to the left of the Main Dam looking downstream across Hot Springs Valley. The crests of both dams are at an elevation of 2,609.26 feet. Downstream releases are made through a 15-foot-diameter concrete-lined tunnel at the Main Dam, constructed in and through the granite in the left abutment and through a double-barreled conduit under the Auxiliary Dam, which discharges into the Borel Canal (Corps 2007a). The Borel Canal was in place before the Auxiliary Dam and conveys water downstream to hydroelectric facilities. Normal maximum releases are 3,000 cfs from the Main Dam and 600 cfs from the Auxiliary Dam. The Spillway consists of an uncontrolled, 140-foot-wide S-shaped weir in the left abutment of the Main Dam. The Spillway transitions to an unlined chute cut in granite below the weir.

The dams are rectangular and are gray and light tan. Because of their angular form and flat lines, they are a conspicuous diversion from the more natural and less repetitious forms and diagonal line in the surrounding landscape. With the exception of the top of the dams, which is mostly smooth, the primary texture of the dams on the upstream and downstream sides is moderately coarse. Similar textures can be found in the surrounding mountains. The sloped tan and brown terrain immediately downstream of the dam is mostly barren and sparsely developed with permanent and mobile structures and buildings of various colors. However, trees, bushes, and grasses of various shades of green are found along the banks of the Lower Kern River. Numerous roads cross the land immediately downstream of the dam. Although the Spillway is coarse and light gray and light tan, it does not resemble the surrounding terrain because of its lack of aggregate, vegetation, and soil.

3.13.3 Environmental Consequences

This section describes the impacts on visual resources from the Action Alternatives and associated support actions.

Scope and Methods

Visual resources in the Isabella DSM Project area are the natural and man-made, moving and stationary physical features that compose the character of the landscape as visually observed from a given location. The physical features that are visible in the landscape (e.g., landforms, water bodies, animals, vegetation, and structures) contribute to the scenery, visual quality, and visual appeal of the project area and vicinity. The region of influence (or geographic extent that is being evaluated) for the visual resources analysis performed for this Draft EIS is the Isabella Lake basin.

Because of the large amount of land surrounding Isabella Lake that is under the management of BLM, the Visual Resource Contrast Rating Process of the BLM VRM system (BLM 1986), was used to analyze potential visual impacts of the proposed Isabella DSM Project Action Alternatives and support actions. In that process, the degree to which the proposed Action Alternatives would impact the visual quality of a landscape, and the resulting level of significance of these impacts generally depends on the visual contrast created between the proposed project features and the existing landscape.

The BLM visual resource contrast rating process would typically involve determining whether the proposed Isabella DSM Project meets VRM objectives for the area. However, because the proposed Isabella DSM Project is not on land administered by the BLM, there are no established VRM objectives for the project area. Therefore, determining if the proposed Isabella DSM Project meets VRM objectives was not applicable. Consequently, this analysis focused on the contrast between proposed DSM remediation features and construction activities associated with the Action Alternatives, and the major existing features in the landscape, rather than determining if the project meets VRM objectives. However, in accordance with the BLM contrast rating process, the basic design elements of form, line, color, and texture were used to describe the visual contrasts created by proposed Isabella DSM Project features.

More specifically, the visual resources contrast rating process used involved the following steps:

1. Reviewing the description of the proposed Isabella DSM Project and alternatives (Chapter 2);
2. Selecting and visiting the most critical viewpoints; referred to as key observation points (KOPs) for viewing existing and proposed project features associated with the Action Alternatives;

3. Preparing visual simulations of selected alternatives at each KOP; and
4. Completing a BLM Visual Contrast Rating Form (Form 8400-4) for each KOP.

Based on the degree of contrast discerned between the proposed Isabella DSM Project features included in this analysis a conclusion as to the level and significance of visual impacts was determined. If there was a low degree of contrast discerned between the landscape and a proposed project feature, the proposed project feature was considered as either not being easily seen or capable of being seen but not attracting attention, with a corresponding low level of visual impact assigned. If a moderate degree of contrast was discerned, a proposed feature was considered as beginning to attract attention within the characteristic landscape; and a corresponding moderate level of visual impact was assigned. If a high degree of contrast was discerned, a proposed project feature was considered readily visible and prominent within the existing landscape; and a corresponding high level of visual impact was assigned. If a proposed project feature was discerned to have a high level of contrast resulting in a feature that in form, line, and texture that was visually incompatible with the existing landscape, this feature would be considered to result in a visually significant impact.

In accordance with the BLM process, KOPs were selected in coordination with the Corps to represent views of the project area that viewer groups or individuals are likely to encounter around Isabella Lake. Factors that were considered in selecting the KOPs included angle of observation, number of viewers, length of time the project is in view, relative project size, and topography.

Figures 3-34 and 3-35 show the locations of the six selected KOPs. The locations of the KOPs are described as follows:

- **KOP 1** is a southeastward view from near SR 155 of the Main Dam, Spillway, and Main Dam Campground. The project site is approximately 0.2 mile from the KOP.
- **KOP 2** is a northward view from Barlow Road of the area south of the Auxiliary Dam. A proposed staging area is next to the KOP.
- **KOP 3** is a northeastward view from near Barlow Road of Engineers Point, the Auxiliary Dam, Isabella Lake, and Auxiliary Dam Recreation Area. A proposed staging area is next to the KOP.
- **KOP 4** is a northward view from near Ponderosa Drive of the Main Dam and Main Dam Campground. The project site is approximately 0.08 mile from the KOP.
- **KOP 5** is a northeastward view from near Tuttle Road of Isabella Lake. Isabella Lake is next to the KOP.
- **KOP 6** is a northeastward view from Yankee Canyon Drive of Isabella Lake. Isabella Lake is approximately 0.5 mile from the KOP.

Figure 3-34 KOP Key Map A

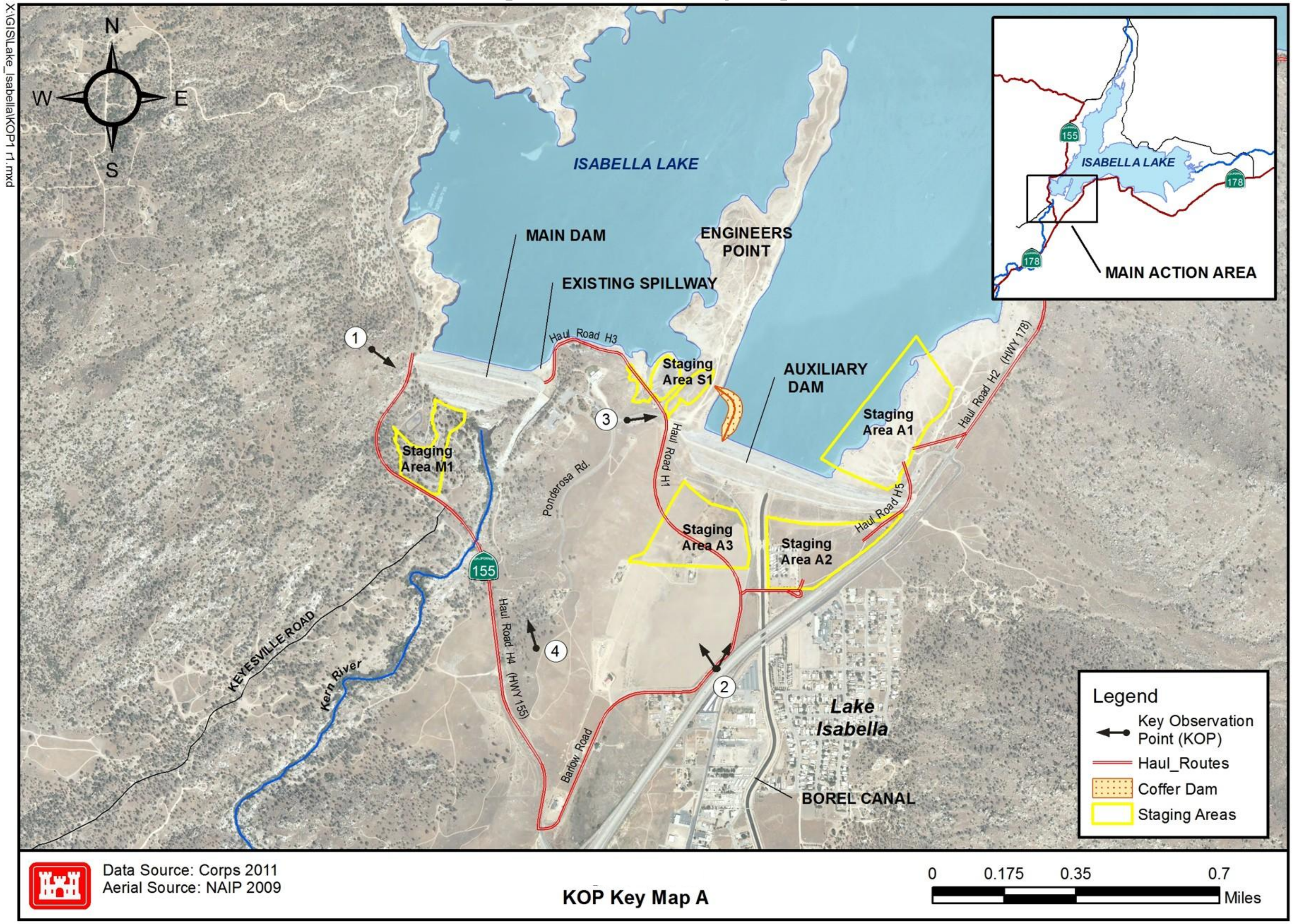
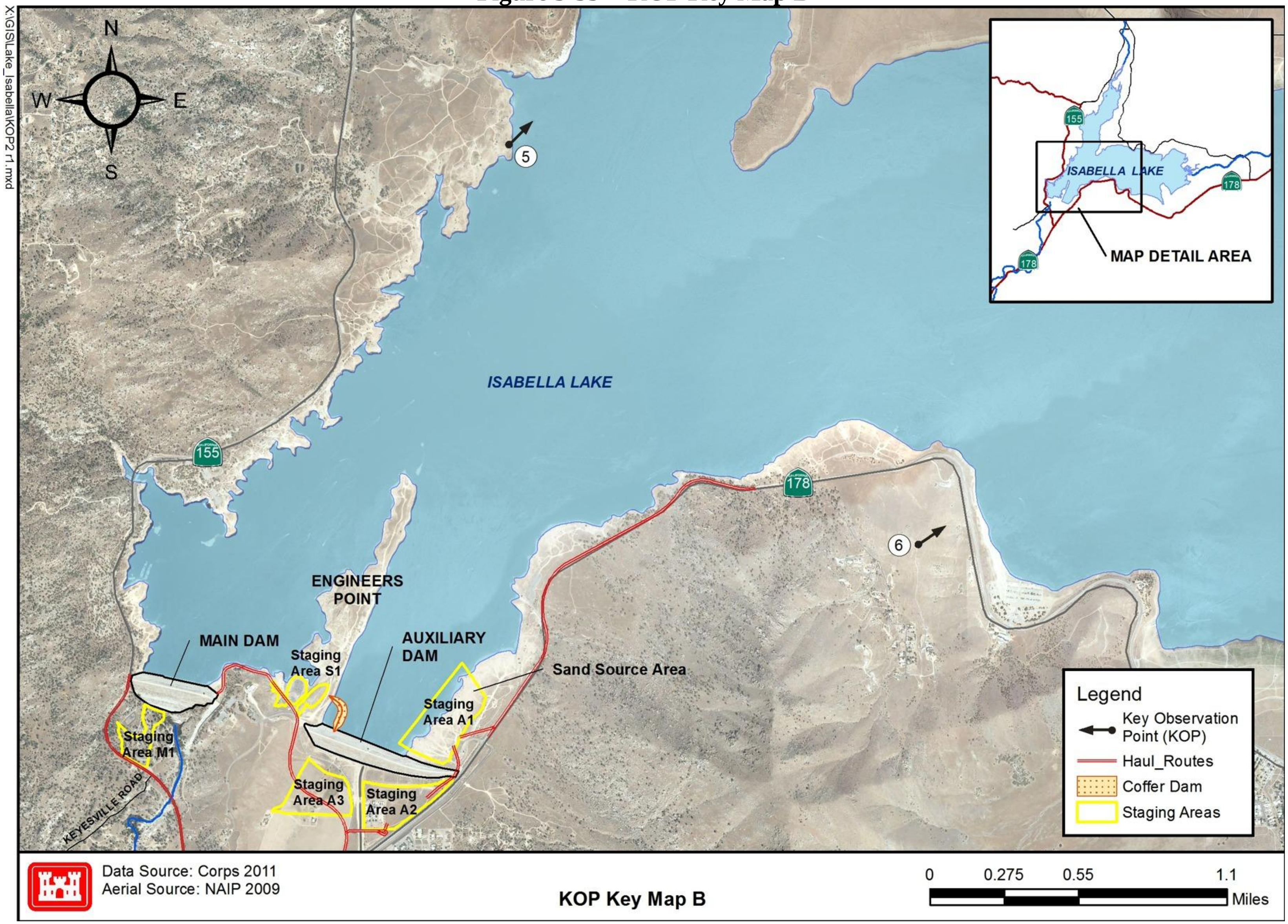


Figure 3-35 KOP Key Map B



During October 2010 and January 2011, the KOPs were visited and photographed and site conditions were recorded. Photo (visual) simulations were then prepared for each KOP, depicting remediation features and support actions accompanying one of the Action Alternatives. The KOP photos and visual simulations are presented in Figures 3-36 through 3-41.

Table 3-76 identifies which Action Alternative was simulated for each KOP in Figures 3-36 through 3-41, as well as which remediation features are captured by each simulation. The types of viewers affected by the impacts described for each KOP include: (a) are those involved with water-and land-based recreation in and around Isabella Lake; (b) those engaging in dispersed recreation at higher elevations in the surrounding mountains; (c) residents and businesses in the vicinity of the project; and (d) travelers on roads in the vicinity of project construction and support actions. Due to topography, most readily apparent changes to the landscape would be visible within approximately one mile of these sites. The duration that the views would be visible would vary by activity (e.g., hiking versus driving).

No Action Alternative

Under this alternative, the IRRM pool level restriction would be discontinued, and Isabella Dam and lake would be operated at a lake elevation of 2,609.26 feet. This would continue to maintain the visual landscape of the Isabella Lake basin. However, based on Corps studies, the project would continue to present an unacceptable risk. The timing and nature of such an event cannot be specified. The catastrophic loss of one or both dams would significantly alter the visual landscape of the Isabella Lake basin, as well as the San Joaquin Valley, due to major downstream flooding of the areas between Isabella Lake and Bakersfield, and the visual impact would continue long-term. This would be considered a significant adverse impact on visual resources.

Action Alternatives

With few exceptions, the outward visual appearance of the remediation measures and structural features comprising each of the Action Alternatives, and the associated support actions do not vary markedly across the alternatives so as to create different impacts on visual resources that would be very noticeable. One notable exception would occur at the Main Dam. Alternative Plans 1, 2, and 3 each include the remediation feature of an 800-foot long RCC Overlay constructed on the downstream face of the dam. Under these three alternatives, the concrete overlay would represent a moderate contrasting visual change to the appearance of the existing earth-fill Main Dam face. This visual change would constitute a direct, adverse, short-and-long-term, moderate, and less-than-significant impact on visual resources in this area. Since the RCC Overlay is not included under the Alternative Base Plan, this alternative would result in a lower contrasting visual change than the other three alternatives with respect to the Main Dam area.

Figure 3-36 KOP 1

X:\GIS\LAKE_ISABELLA\VISUAL\KOP_1.CDR

KOP 1 is a southeastward view from near State Route 155 of the Main Dam, Spillway, and Main Dam Campground. Photograph taken on January 6, 2011.

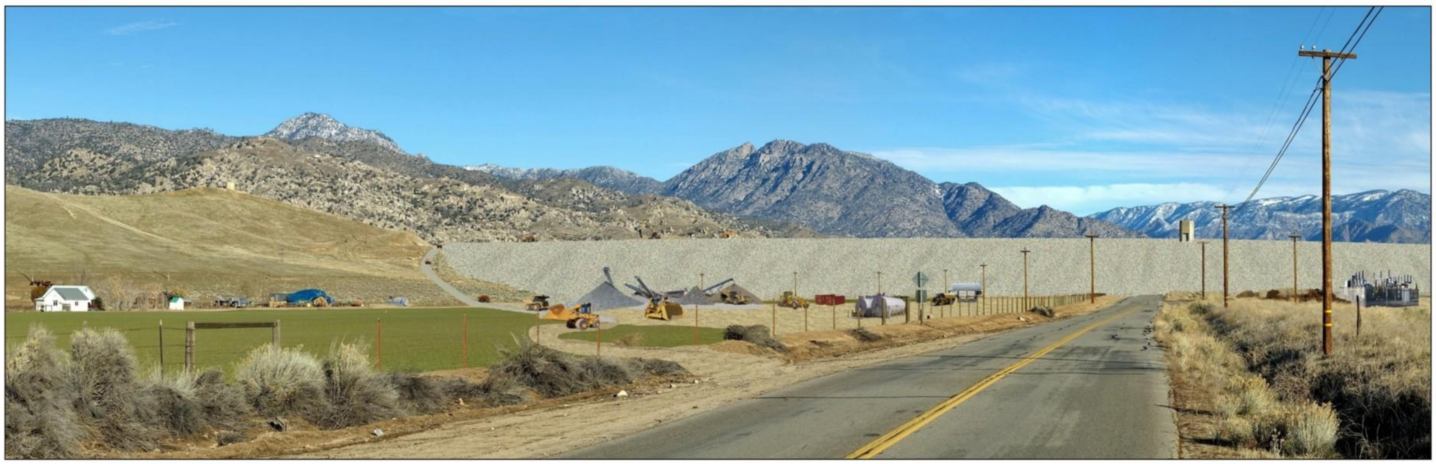
Simulation of Main Dam 800-ft RCC Overlay with Fuse Plug, Staging Area M1, portion of Emergency Spillway, and Concrete Conveyor.
Alternative Plans 1, 2, and 3.

KOP 1

Figure 3-37 KOP 2

X:\GIS\LAKE_ISABELLA\VISUAL\KOP_2_2011.CDR

KOP 2 is a northward view from Barlow Road of the area south of the Auxiliary Dam. Photograph taken on January 6, 2011.



Simulation of Staging Area A3, Rock Stockpiling, and Electric Substation. All Alternative Plans.

KOP 2

Figure 3-38 KOP 3

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KOP 3 is a northeast view near Ponderosa Road and Forest Service Center of the area north of the Auxiliary Dam. Photograph taken on December 19, 2010.

Simulation of Staging Area A1, Sand Borrow Site and Washing Area, Water Holding Ponds, Haul Roads H1 (foreground) and H5, and Coffer Dam. Lake elevation at 2,543.76 feet (NAVD 88).

KOP 3

Figure 3-39 KOP 4

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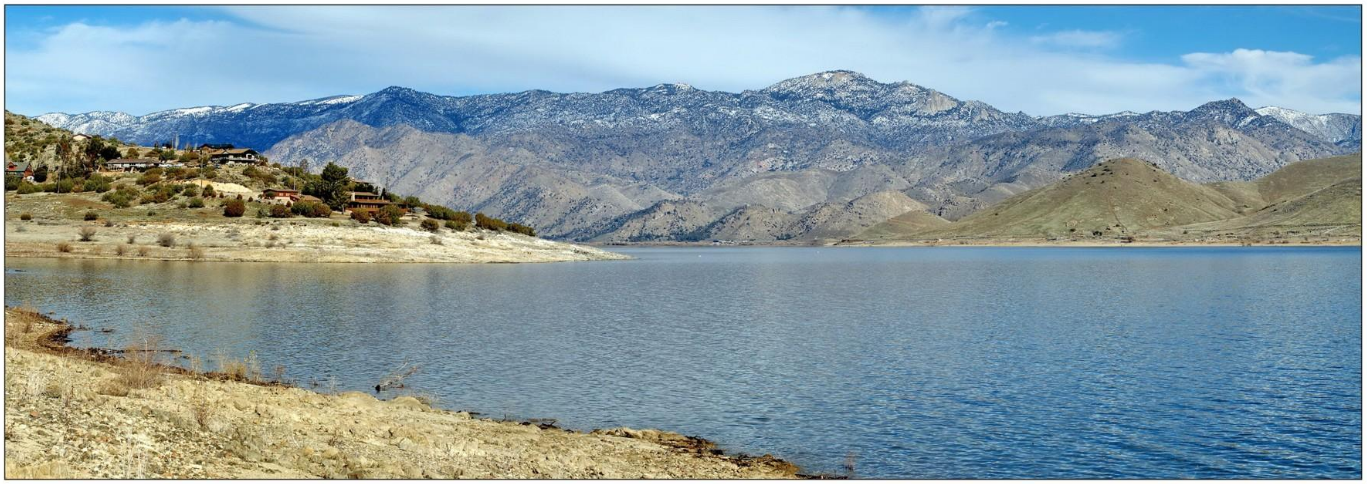
KOP 4 is a northwestward view from near Ponderosa Road of the downstream side of the Main Dam.
Photograph taken January 6, 2011.

Simulation of Main Dam with 800-ft RCC Overlay and Fuse Plug, visible portions of Emergency Spillway, and Staging Area M1.
Alternative Plan 2.

KOP 4

Figure 3-40 KOP 5

X:\GIS\LAKE_ISABELLA\VISUAL\KOP_5_2011.CDR



KOP 5 is a northeastward view from near Tuttle Road of Isabella Lake. Photograph taken on January 6, 2011.

Simulation of lake elevation at 2,543.76 feet. This lake elevation is required to construct Coffer Dam at Auxiliary Dam Right Abutment. Alternative Base Plan and Alternative Plans 1 and 2.

KOP 5

Figure 3-41 KOP 6

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KOP 6 is an eastward view from Yankee Canyon Drive of Isabella Lake. Photograph taken on January 6, 2011.

Simulation of lake elevation at 2,543.76 feet. Alternative Base Plan and Alternative Plans 1 and 2.

KOP 6

Table 3-76
Action Alternative and Remediation Features Simulated for each KOP

KOP	Project Alternative and Project Element Simulation Description
1	**Alternative Plan 3:** Main Dam 800-foot RCC overlay, Main Dam 4-foot crest raise, Borel Canal (10-foot tall half circle) underneath existing spillway, existing spillway construction of a 4-foot tall retaining wall added to the crest along the right wall (closest to the Main Dam), Main Dam fuse plug, visible portions of the Emergency Spillway, and Staging Area M1 with rock stockpile and vehicles.
2	**Alternative Plan 2:** Staging Area A3, part of Staging Area A2, rock stockpiling, supplies storage, substation, transmission line, maintenance/parking/fueling for vehicles/equipment, Auxiliary Dam 100-foot downstream buttress, and Auxiliary Dam 4-foot crest raise.
3	**Alternative Plan 2:** Staging Area S1, Haul Road H1, coffer dam, Auxiliary Dam 100-foot downstream buttress, Auxiliary Dam 4-foot crest raise, Auxiliary Dam upstream rock-fill berm (visibility depends on height of lake though), Staging Area A1 sand borrow site, Staging Area A1 sand washing, Staging Area A1 sand stockpiling, Staging Area A1 water holding ponds, Haul Road H5, and construction pool elevation of 2,543.76 feet.
4	**Alternative Plan 2:** Main Dam 800-ft RCC overlay, Main Dam 4-ft crest raise, Main Dam fuse plug, visible portions of the Emergency Spillway, and Staging Area M1 with rock stockpile and vehicles.
5	**Alternative Base Plan, Alternative Plan 1, and Alternative Plan 2:** Construction pool elevation of 2,543.76 feet.
6	**Alternative Base Plan, Alternative Plan 1, and Alternative Plan 2:** Construction pool elevation of 2,543.76 feet.

All of the Action Alternatives include the construction of an Emergency Spillway, taking a portion of the hillside now supporting the USFS Offices and Compound and the Corps Project Office and Shop. The contrasting visual change created by the creation of the Emergency Spillway would result in a direct, adverse, short-and-long-term, moderate-to-high, and less-than-significant impact on visual resources for all the Action Alternatives. The prominence of the altered terrain and loss of vegetation in the Emergency Spillway feature (common to all alternatives) would likely represent the most contrasting long-term visual change and impact on visual resources. However, because the existing landscape in the area already contains similar visual features, this visual impact is considered to be less-than-significant.

Also, for all the Action Alternatives, direct, adverse short-term-and-long-term moderate and less-than-significant visual impacts would occur as a result of the construction of remediation measures and landscape and landform changes created during the multi-year construction period. Because implementation of the alternatives involves the modification of existing structures and the construction of new permanent structures, some impacts on visual resources would last during the lifespan of the project. With all of the Action Alternatives, there would be a noticeable short-term moderate to high contrast between construction activities and the existing features of the landscape. However, because the visual contrast and associated visual impacts of the construction activities would be short term, and with the implementation of the mitigation measures and BMPs described in Section 3.13.4, these impacts would be less-than-significant.

In the following paragraphs, for each KOP, the short-term, construction-related and long-term visual impacts of the remediation features captured in each simulation (Figures 3-36 through 3-41) are discussed. Although each of the simulated impacts on visual resources illustrates a specific Action Alternative, the visual impacts are generally similar for all of the Action Alternatives, unless otherwise noted in the following discussions.

KOP 1 (Depicting Alternative Plan 3)

Construction-related Impacts. Construction would disturb the ground surface by removing low-growing vegetation, shifting soil, and altering drainage patterns. Surface disturbances would affect visual resources by creating exposed soil across the landscape with a different texture and color and by creating land barren of vegetation, aggregate, and topsoil.

A butt edge of vegetation would appear along roads and around work areas because the roads and work areas would lack vegetation found on adjacent land. The band of road lines would abruptly divide the landscape because the roads would lack vegetation and the natural lines of the topography would be altered.

Construction would generate dust from the movement of vehicles, from excavation, and from wind blowing across exposed soil. Fugitive dust would affect visual resources by diminishing atmospheric clarity.

Because of the presence of construction equipment and vehicles, there would be glare from reflective surfaces. The intensity and amount of glare would vary throughout the day and would depend on atmospheric conditions. For example, the amount of glare would likely be less during overcast days than during sunny days. The intensity and amount of glare would vary during the construction cycle, depending on such factors as the number of construction equipment and vehicles present.

Construction would involve material deliveries to and from the project sites and the presence of construction equipment and vehicles. Construction would affect visual resources by adding a noticeable level of commotion to areas with little activity. Supplies and equipment would create clutter. Also, the color of construction equipment and vehicles would not resemble the muted tans and greens of the terrain and vegetation.

Construction may generate windblown litter across the landscape. This would affect visual resources because the blight of litter draws attention away from and degrades the natural landscape aesthetics.

The regular, geometric, and boxy forms of construction structures and equipment would contrast with the rolling form of the terrain and the scattered vegetation. The rigid vertical elements would create various focal points on a mostly open landscape and would not mimic other landscape elements, which are mostly vegetation and large rocks. The horizontal and vertical lines of construction structures and equipment would stand out against the sloped and rounded lines of the terrain. Construction structures and equipment would be various colors and would not resemble the muted tans and greens of the terrain and vegetation. The rigid texture of the construction structures and equipment would stand out against the moderately coarse texture of the terrain and coarse and prickly texture of the vegetation. Smooth access roads would stand out against the moderately coarse texture of the terrain.

Due to the above construction impacts on visual resources, there would be a moderate-to-high degree of contrast between construction sites and the major features in the landscape during construction. This would be considered a direct, adverse, short-term, moderate-to-high, and less-than-significant visual impact. After construction is completed, all equipment and temporary structures, including sources of exterior lighting, would be removed from project areas. The staging areas and haul routes would be restored to a natural state or pre-project condition. To minimize construction impacts during and after construction, mitigation measures are described below in Section 3.13.4. After construction and a reclamation and restoration period, there would be a low degree of contrast between construction sites and the major features in the landscape resulting in low and less-than-significant visual impact.

Long-term Impacts. Although the appearance of the Main Dam would change, its location in the landscape would not change. The Main Dam would be rectangular and gray and light tan. The Main Dam would be more geometric and angular, with repetitive lines, creating a more artificial appearance to the site. This also creates both a smooth and bumpy texture, depending on the angle of view. The intensity and amount of sources of lighting at the Main Dam would not change. There would be a moderate degree of contrast between the Main Dam and the major features in the landscape, mostly due to its increased size and change in texture. This would result in a direct, adverse, short-and-long-term, moderate, and less-than-significant visual impact. (Note: because the Alternative Base Plan does not involve an RCC overlay, these Main Dam impacts on visual resource would not occur for the Alternative Base Plan. However, there would still be a minor degree of contrast between the Main Dam and the major features in the landscape, because there would be a relatively small change to the landscape from the increase in the Main Dam height.)

The Emergency Spillway would be funnel shaped, with the wide end next to Isabella Lake and the narrow end next to the Lower Kern River. The assumption is that it would have a texture and color similar to the Main Dam. Although there would be a high degree of contrast between the Emergency Spillway and the major features in the landscape, mostly due to its size, form, and texture, because the existing landscape in the area already contains similar visual features, this visual impact is considered to be direct, high, adverse, long-term, and less-than-significant.

KOP 2 (Depicting Alternative Plan 2)

Construction-related Impacts. Construction work would disturb the ground surface by removing low-growing vegetation, shifting soil, and altering drainage patterns. Surface disturbances would affect visual resources by creating exposed soil across the landscape with a different texture and color and by creating land barren of vegetation, aggregate, and topsoil.

A butt edge of vegetation would appear along roads and around work areas because the roads and work areas would lack vegetation found on adjacent land. The band of road lines would abruptly divide the landscape because the roads would lack vegetation and the natural lines of the topography would be altered.

Construction work would generate dust from the movement of vehicles, from excavation, and from wind blowing across exposed soil. Fugitive dust would affect visual resources by diminishing atmospheric clarity.

Construction work would use lights for safety and illumination. This would affect visual resources because it would light previously unlit areas. Project site lighting is expected to be kept to a minimum, would be equipped with shrouds, and would be focused downward and toward the interior of the site to minimize lighting and glare impacts on the night sky and on surrounding areas.

Because of the presence of construction equipment and vehicles, there would be glare from reflective surfaces. The intensity and amount of glare would vary throughout the day and would depend on atmospheric conditions. For example, the amount of glare would likely be less during overcast days than during sunny days. The intensity and amount of glare would vary during the construction cycle, depending on such factors as the number of construction equipment and vehicles present.

Construction work would involve material deliveries to and from the project site and the presence of construction equipment and vehicles. Construction would affect visual resources by adding a noticeable level of commotion to an area with little activity. Supplies and equipment would create clutter. Also, the color of construction equipment and vehicles would not resemble the muted tans and greens of the terrain and vegetation.

Construction work may generate windblown litter across the landscape. This would affect visual resources because the blight of litter draws attention away from and degrades the natural landscape aesthetics.

The regular, geometric, and boxy forms of construction structures and equipment would contrast with the rolling form of the terrain and the scattered vegetation. The rigid vertical elements would create various focal points on a mostly open landscape and would not mimic other landscape elements, which are mostly vegetation and large rocks. The horizontal and vertical lines of construction structures and equipment would stand out against the sloped and rounded lines of the terrain. Construction structures and equipment would be various colors and would not resemble the muted tans and greens of the terrain and vegetation. The rigid texture of the construction structures and equipment would stand out against the moderately coarse texture of the terrain and coarse and prickly texture of the vegetation. Smooth access roads would stand out against the moderately coarse texture of the terrain.

Due to the above construction impacts on visual resources, there would be a strong degree of contrast between construction sites and the major features in the landscape during construction. This would be considered a direct, adverse, short-term, moderate-to-high, and less-than-significant visual impact. After construction is completed, all equipment and temporary structures, including sources of exterior lighting, would be removed from project areas. The staging areas and haul routes would be restored to a natural state or pre-project condition. To minimize construction impacts during and after construction, mitigation measures are described below in Section 3.15.4. After construction and a reclamation and restoration period, there would be a low degree of contrast between construction sites and the major features in the landscape, resulting in low and less-than-significant visual impact.

Long-term Impacts. Although the appearance of the Auxiliary Dam would change, its location in the landscape would not change. The downstream buttress is expected to resemble the line, texture, and color of the downstream face of the Auxiliary Dam. The color of the downstream buttress would resemble the color of the surrounding terrain, because the rock for the downstream buttress would come from the excavation of the Emergency Spillway. The form of the Auxiliary Dam would widen, creating a more prominent artificial element in the landscape. There would be a moderate degree of contrast between the Auxiliary Dam and the major features in the landscape, mostly due to its increased size. Therefore, the long-term visual impacts at this KOP would be adverse, direct, moderate, and less-than-significant.

KOP 3 (Depicting Alternative Plan 2)

Construction-related Impacts. Construction work would disturb the ground surface by removing low-growing vegetation, shifting soil, and altering drainage patterns. Surface disturbances would affect visual resources by creating exposed soil across the landscape with a different texture and color and by creating land barren of vegetation, aggregate, and topsoil.

A butt edge of vegetation would appear along roads and around work areas because the roads and work areas would lack vegetation found on adjacent land. The band of road lines would abruptly divide the landscape because the roads would lack vegetation and the natural lines of the topography would be altered.

Construction work would generate dust from the movement of vehicles, from excavation, and from wind blowing across exposed soil. Fugitive dust would affect visual resources by diminishing atmospheric clarity.

Construction work would use lights for safety and illumination. This would affect visual resources because it would light previously unlit areas. Project site lighting is expected to be kept to a minimum, would be equipped with shrouds, and would be focused downward and toward the interior of the site to minimize lighting and glare impacts on the night sky and on surrounding areas.

Because of the presence of construction equipment and vehicles, there would be glare from reflective surfaces. The intensity and amount of glare would vary throughout the day and would depend on atmospheric conditions. For example, the amount of glare would likely be less during overcast days than during sunny days. The intensity and amount of glare would vary during the construction cycle, depending on such factors as the number of construction equipment and vehicles present.

Construction work would involve material deliveries to and from the project site and the presence of construction equipment and vehicles. Construction would affect visual resources by adding a noticeable level of commotion to an area with little activity. Supplies and equipment would create clutter. Also, the color of construction equipment and vehicles would not resemble the muted tans and greens of the terrain and vegetation.

Construction work may generate windblown litter across the landscape. This would affect visual resources because the blight of litter draws attention away from and degrades the natural landscape aesthetics.

The regular, geometric, and boxy forms of construction structures and equipment would contrast with the rolling form of the terrain and the scattered vegetation. The rigid vertical elements would create various focal points on a mostly open landscape and would not mimic other landscape elements, which are mostly vegetation and large rocks. The horizontal and vertical lines of construction structures and equipment would stand out against the sloped and rounded lines of the terrain. Construction structures and equipment would be various colors and would not resemble the muted tans and greens of the terrain and vegetation. The rigid texture of the construction structures and equipment would stand out against the moderately coarse texture of the terrain and coarse and prickly texture of the vegetation. Smooth access roads would stand out against the moderately coarse texture of the terrain.

A sizeable structure (a coffer dam) would be visible in the lake during construction activities. It would be composed of material from the excavation of the Emergency Spillway or from Engineers Point. It would be a temporary structure, only visible during work on the Auxiliary Dam and Borel Canal. (Note: because Alternative Plan #3 does not involve a coffer dam, these coffer dam impacts on visual resource would not occur for Alternative Plan #3.)

Due to the above construction impacts on visual resources, there would be a strong degree of contrast between construction sites and the major features in the landscape during construction. This would be considered a direct, adverse, short-term, moderate-to-high, and less-than-significant visual impact. After construction is completed, all equipment and temporary structures, including sources of exterior lighting, would be removed from project areas. The staging areas and haul routes would be restored to a natural state or pre-project condition. To minimize construction impacts during and after construction, mitigation measures are described below in Section 3.15.4. After construction and a reclamation and restoration period, there would be a low degree of contrast between construction sites and the major features in the landscape, resulting in low and less-than-significant visual impact.Although construction activities would last from November 2015 to March 2020, a construction pool of 2,543.76 feet would be needed during December 2016 through January 2017, and during August and September 2017, to allow for construction and removal of a coffer dam for dewatering the area adjacent to Engineers Point and the Auxiliary Dam. That same elevation would be needed for the period between June 2019 and February 2020 for constructing the Upstream Berm of the Auxiliary Dam. Figure 3-35 shows the areas that would be exposed by lowering the water level to the required construction pool level.

Lowering the water elevation would change the shoreline circumference from 42.95 miles (when the water is at 2,609.26 feet to 26.70 miles (when the water is at 2,543.76 feet). This would create a band of exposed sediment typically covered by water. Shallow areas would be exposed more quickly than deep areas as the water level is lowered. The areas with the most noticeable exposed sediment would be the northern and eastern portions of Isabella Lake, the western shoreline, and the shoreline upstream of the east side of the Auxiliary Dam.

The exposed sediment would follow the outline of the lake and would be smooth, compared to the terrain of the current lakeshore. Although the exposed sediment would at first appear dark brown, it would lighten as it dries out and forms a crust on the sediment surface from being exposed to the air. Depending on precipitation, cracks in the crust are likely to develop, especially in areas that were first exposed as the lake was lowered.

Wind blowing across the dry sediment would create fugitive dust, which would affect atmospheric clarity. Individuals disturbing the dry sediment, for example to gain access to the lake, would further loosen sediment capable of contributing to fugitive dust.

During precipitation, stormwater runoff would also erode the dry sediment into the lake. Both the lower water level during the four construction seasons and the additional sediment in the water during stormwater runoff would alter the color of the lake.

Water level is a determining element in the location, biomass, and annual production of shoreline plants. Because shoreline plants are influenced by the water level, changes in typical water level fluctuations would alter the characteristics of shoreline plants. Consequently, shoreline plant locations, biomass, and annual production would likely decrease with less water nearby. Furthermore, both changes in water level and resulting changes in shoreline characteristics would affect wildlife, such as birds and mammals, inhabiting or temporarily using the shoreline. This would affect the presence of wildlife for viewing.

Due to the above construction pool impacts on visual resources, there would be a strong degree of contrast between the lake landscape and the major features in the landscape during a portion of the construction period. This would be considered a direct, adverse, short-term, moderate-to-high, and less-than-significant visual impact. Once the lake level is returned to a typical level, there would be no impact. (Note: because Alternative Plan #3 does not involve a construction pool, these construction pool impacts on visual resource would not occur for Alternative Plan #3.)

Long-term Impacts. Although the appearance of the Auxiliary Dam would change, its location in the landscape would not change. The downstream buttress and upstream berm are expected to resemble the line, texture, and color of the downstream and upstream faces of the Auxiliary Dam. The color of the downstream buttress and upstream berm would resemble the color of the surrounding terrain, because the rock for the buttress and berm would come from the excavation of the Emergency Spillway. The form of the Auxiliary Dam would widen, creating a more prominent artificial element in the landscape. However, the visibility of the berm would depend on the water level in the lake.

The Auxiliary Dam Recreation Area landscape would be permanently altered because of sand removed during excavation. This would change the form and line of the terrain in that area. It is assumed the Corps would contour excavated areas to mimic the natural contours of the shoreline so the sand borrow areas blend in with adjacent areas. Also, the visibility of the sand borrow areas would depend on the water level in the lake.

There would be a moderate degree of contrast between both the Auxiliary Dam and Auxiliary Dam Recreation Area and the major features in the landscape. This would mostly be due to the increased size of the Auxiliary Dam and the loss of a landscape feature (sand) in a popular recreation area. Therefore, the long-term visual impacts at this KOP would be adverse, direct, moderate, and less-than-significant.

KOP 4 (Depicting Alternative Plan 2)

Construction-related Impacts. Construction would disturb the ground surface by removing low-growing vegetation, shifting soil, and altering drainage patterns. Surface disturbances would affect visual resources by creating exposed soil across the landscape with a different texture and color and by creating land barren of vegetation, aggregate, and topsoil.

A butt edge of vegetation would appear along roads and around work areas because the roads and work areas would lack vegetation found on adjacent land. The band of road lines would abruptly divide the landscape because the roads would lack vegetation and the natural lines of the topography would be altered.

Construction would generate dust from the movement of vehicles, from excavation, and from wind blowing across exposed soil. Fugitive dust would affect visual resources by diminishing atmospheric clarity.

Because of the presence of construction equipment and vehicles, there would be glare from reflective surfaces. The intensity and amount of glare would vary throughout the day and would depend on atmospheric conditions. For example, the amount of glare would likely be less during overcast days than during sunny days. The intensity and amount of glare would vary during the construction cycle, depending on such factors as the number of construction equipment and vehicles present.

Construction would involve material deliveries to and from the project sites and the presence of construction equipment and vehicles. Construction would affect visual resources by adding a noticeable level of commotion to areas with little activity. Supplies and equipment would create clutter. Also, the color of construction equipment and vehicles would not resemble the muted tans and greens of the terrain and vegetation.

Construction may generate windblown litter across the landscape. This would affect visual resources because the blight of litter draws attention away from and degrades the natural landscape aesthetics.

The regular, geometric, and boxy forms of construction structures and equipment would contrast with the rolling form of the terrain and the scattered vegetation. The rigid vertical elements would create various focal points on a mostly open landscape and would not mimic other landscape elements, which are mostly vegetation and large rocks. The horizontal and vertical lines of construction structures and equipment would stand out against the sloped and rounded lines of the terrain. Construction structures and equipment would be various colors and would not resemble the muted tans and greens of the terrain and vegetation. The rigid texture of the construction structures and equipment would stand out against the moderately coarse texture of the terrain and coarse and prickly texture of the vegetation. Smooth access roads would stand out against the moderately coarse texture of the terrain.

Due to the above construction impacts on visual resources, there would be a strong degree of contrast between construction sites and the major features in the landscape during construction. This would be considered a direct, adverse, short-term, moderate-to-high, and less-than-significant visual impact. After construction is completed, all equipment and temporary structures, including sources of exterior lighting, would be removed from project areas. The staging areas and haul routes would be restored to a natural state or pre-project condition. To minimize construction impacts during and after construction, mitigation measures are described below in Section 3.15.4. After construction and a reclamation and restoration period, there would be a low degree of contrast between construction sites and the major features in the landscape, resulting in low and less-than-significant visual impact.

Long-term Impacts. Although the appearance of the Main Dam would change, its location in the landscape would not change. The Main Dam would be rectangular and gray and light tan. The Main Dam would be more geometric and angular, with repetitive lines, creating a more artificial appearance to the site. This also creates both a smooth and bumpy texture, depending on the angle of view. The intensity and amount of sources of lighting at the Main Dam would not change. There would be a moderate degree of contrast between the Main Dam and the major features in the landscape, mostly due to its increased size and change in texture. This would result in a direct, adverse, short-and-long-term, moderate, and less-than-significant visual impact. (Note: because the Alternative Base Plan does not involve an RCC overlay, these Main Dam impacts on visual resource would not occur for the Alternative Base Plan. However, there would still be a minor degree of contrast between the Main Dam and the major features in the landscape, because there would be a relatively small change to the landscape from the increase in the Main Dam height.)

The Emergency Spillway would be funnel shaped, with the wide end next to Isabella Lake and the narrow end next to the Lower Kern River. The assumption is that it would have a texture and color similar to the Main Dam. Although there would be a high degree of contrast between the Emergency Spillway and the major features in the landscape, mostly due to its size, form, and texture, because the existing landscape in the area already contains similar visual features, this visual impact is considered to be direct, high, adverse, long-term, and less-than-significant.

KOPs 5 and 6 (Depicting Alternative Base Plan, and Alternative Plans 1, 2,and 4)

Construction-related Impacts. During the multi-year construction period, for the Alternative Base Plan, and Alternative Plans 1, 2, and 4 the lake level would be lowered to an elevation of 2,543.76 feet for three a two month period (December 2016-January 2017), and for another two-month period (August-September 2017), to allow for construction and removal of a coffer dam at the Right Abutment of the Auxiliary Dam. The temporary coffer dam is needed to support “dry construction” of the upstream connection between the Borel Canal and the relocated conduit through the right abutment. The lake level would need to be lowered again to the elevation of 2,543.76 feet for a nine-month period (June 2019-February 2020), to allow for construction of the Upstream Berm on the Auxiliary Dam. Figure 3-35 illustrates the areas that would be exposed by temporarily lowering the water level to this construction pool level.

Lowering the water elevation would change the shoreline circumference from 42.95 miles at 2,609.26 feet to 26.70 miles at 2,543.76 feet. This would create a band of exposed sediment typically covered by water. Shallow areas would be exposed more quickly than deep areas as the water level is lowered. The areas with the most noticeable exposed sediment would be the northern and eastern portions of Isabella Lake, the western shoreline, and the shoreline upstream of the east side of the Auxiliary Dam.

The exposed sediment would follow the outline of the lake and would be smooth, compared to the terrain of the current lakeshore. Although the exposed sediment would at first appear dark brown, it would lighten as it dries out and forms a crust on the sediment surface from being exposed to the air. Depending on precipitation, cracks in the crust are likely to develop, especially in areas that were first exposed as the lake was lowered.

Wind blowing across the dry sediment would create fugitive dust, which would affect atmospheric clarity. Individuals disturbing the dry sediment, for example to gain access to the lake, would further loosen sediment capable of contributing to fugitive dust.

During precipitation, stormwater runoff would also erode the dry sediment into the lake. Both the lower water level during the four construction seasons and the additional sediment in the water during stormwater runoff would alter the color of the lake.

Water level is a determining element in the location, biomass, and annual production of shoreline plants. Because shoreline plants are influenced by the water level, changes in typical water level fluctuations would alter the characteristics of shoreline plants. Consequently, shoreline plant locations, biomass, and annual production would likely decrease with less water nearby. Furthermore, both changes in water level and resulting changes in shoreline characteristics would affect wildlife, such as birds and mammals, inhabiting or temporarily using the shoreline. This would affect the presence of wildlife for viewing.

Due to the above construction pool impacts on visual resources, there would be a strong degree of contrast between the lake landscape and the major features in the landscape during a portion of the construction period. It is assumed that the Corps would time the lowering and raising of Isabella Lake water so that lowered lake levels would occur for as little time as possible. This would be considered a direct, adverse, short-term, moderate-to-high, and less-than-significant visual impact. Once the lake level is returned to a typical level, there would be no impact. (Note: because Alternative Plan #3 does not involve a construction pool, these construction pool impacts on visual resource would not occur for Alternative Plan #3.)

Long-term Impacts. Lowered construction pool elevations would be needed for three periods of time during the multi-year construction period. Otherwise, the lake would continue to be operated at the IRRM water levels during construction. Following project completion, the lake operation would be expected to return to pre-IRRM levels. On that basis, there would be no long-term impacts on visual resources from the intermittent lowering of the construction pool.

3.13.4 Environmental Commitments/Mitigation Measures

The following mitigation measures are recommended to minimize adverse impacts on visual resources during construction and to return temporarily disturbed areas to relatively natural conditions:

- Select locations and alignments for earthwork that fit into the landforms to minimize the size of cuts and fills.
- Retain as much of the existing vegetation as possible.
- Use existing vegetation to screen construction from public view.

- Feather and thin the edges of cleared areas and retain a representative mix of plant species and sizes.
- Minimize the number of temporary and permanent structures and combine different activities in one structure.
- Use natural self-weathering materials and chemical treatments on surfaces to reduce color contrast.
- Use road aggregate and concrete colors that match the color of the characteristic landscape surface.
- Treat surfaces of all project structures and buildings visible to the public so that their colors minimize visual contrast by blending with the characteristic landscape colors and their colors and finishes do not create excessive glare.
- Ensure that lighting does not cause excessive reflected glare.
- Ensure that direct lighting does not illuminate the nighttime sky.
- Place all construction trash and food-related waste in self-closing containers and remove daily from work sites and staging areas visible to public view.
- Confine vehicular traffic to routes of travel to and from the project site, and prohibit cross-country vehicle and equipment use outside designated work and storage-staging areas.
- Limit speed of vehicles on dirt routes to minimize the generation of fugitive dust.
- Prepare a *Restoration Plan* Prior to the commencement of the project, covering all areas subject to temporary disturbance that provides guidelines to restore and revegetate these areas to conditions that mimic and complement adjacent undisturbed areas.

3.14 CULTURAL RESOURCES

The term "cultural resource" refers to the imprint of human occupation left on the landscape. This imprint is manifested in the form of prehistoric and historic archeological sites, and historic buildings, structures, and objects. Archeological sites consist of artifacts, plant and faunal remains, trash deposits, and many types of features. Artifacts reflect anything that was manufactured or modified by human hands. Features can include structural remains, fire pits, and storage areas. Prehistoric archeological sites are loci of human activity occurring before European contact. Prehistoric artifacts include flaked stone tools such as projectile points, knives, scrapers, and chopping tools; ground stone implements such as manos and metates; plain and decorated ceramics; and features or facilities that include subterranean and above-ground architectural units, hearths, granaries and storage cysts, and trash deposits known as middens.

Historic archeological sites reflect occupation after the advent of written records. Material remains on historic archeological sites include refuse dumps, structure foundations, roads, privies, or any other physical evidence of historic occupation. Refuse consists of food waste, bottles, ceramic dinnerware, and cans. In a number of historic archeological situations, privies are important because they often served as secondary trash deposits. There is usually a strong interplay between historic archeological sites and written records. The archeological data are frequently used to verify or supplement historic records. Types of historic structures include industrial facilities; roadways and bridges; and water transport or detention systems such as canals, ditches, aqueducts, pumps, and dams. Historic buildings include commercial, residential, agricultural, and ecclesiastical buildings.

Cultural resources that are specific to Native Americans or possibly other ethnic groups are typically referred to as Traditional Cultural Properties. A traditional cultural property is a type of cultural resource may be eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community and that are rooted in that community's history, and are important in maintaining the continuing cultural identity of the community. Sites that fall into, but are not limited to this category may be geographic locations such as mountain peaks, plant gathering areas, locations where an important event took place, and ancestral village sites.

This section describes the regulations that govern consideration of cultural resources, the history of the human use of the Isabella Lake area, and the potential impacts on cultural resources resulting from the alternatives.

3.14.1 Regulatory Setting

Federal Regulations

National Historic Preservation Act of 1966, as Amended

The identification and management of cultural resources and the Federal agency responsible for them are addressed by a number of laws, regulations, Executive Orders, and agreement documents. The principal Federal law addressing cultural resources is

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (16 USC, Section 470), and its implementing regulations, Protection of Historic Properties (36 CFR 800). In the NHPA the compliance procedure for cultural resources, known as the Section 106 process, outlines the steps for identifying and evaluating historic properties, for assessing the effects of Federal actions on historic properties, and for consulting to avoid, reduce, or minimize adverse effects.

"Historic properties" refers to cultural resources that meet specific criteria for eligibility for listing on the National Register of Historic Places (NRHP). After a cultural resource has been determined eligible for listing in the National Register, it is regarded the same as any other property that is listed and becomes formally known as a "historic property," regardless of age. The term "historic property" refers exclusively to National Register listed or eligible properties. The Section 106 process does not require historic properties to be preserved but does ensure that the decisions of Federal agencies concerning the treatment of these places result from meaningful consideration of cultural and historic values and the options available to protect the properties.

The Section 106 process is triggered when historic properties may be affected by a federally funded, or licensed action, or by actions on Federal land. Any project that has the potential to adversely affect historic properties is known as a Federal undertaking. In the case of the Isabella DSM Project, Federally owned land is involved, and Federal funding and permits would be required to implement the project. The identification and evaluation of cultural resources for NRHP eligibility is the responsibility of the lead Federal agency (in this case, the Corps), with the cooperation of the USFS and the concurrence of the State Historic Preservation Officer (SHPO). The lead agency is also required to provide an opportunity to the Advisory Council on Historic Preservation (ACHP) to comment on the undertaking and to participate in the development of agreement documents resulting from an adverse effect determination on historic properties. Typically the ACHP does not choose to be involved in most undertakings, but it has indicated its interest in this project.

The Section 106 process is usually conducted in phases. First, the area of potential effects (APE) is determined, and the type and level of the identification efforts are defined with consulting parties. The APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. However, in the case of projects with multiple alternatives, the overall project study area is reviewed and the APE is not formally defined until the recommended preferred alternative is selected. Methods used to identify the presence of cultural resources and to determine their significance vary among the resource types and the scale of the action.

Identifying cultural resources, for example, requires an initial search of all site records and survey reports and, if needed, additional intensive pedestrian field survey in the APE. Identifying historic buildings and historic transportation or water systems would more appropriately start with archival research, followed by fieldwork to document the current buildings or structures. Identifying any traditional cultural properties or religious sites requires direct consultation with Native American and other potentially affected communities.

Cultural resources are evaluated to determine if they are eligible for listing in the NRHP. Resources that are already listed or that are determined eligible for listing will require mitigation of adverse effects if they are to be either directly or indirectly affected by an undertaking. Cultural resources whose eligibility has not been determined will require evaluation for their potential for NRHP eligibility if they are to be affected by an undertaking

Despite previous disturbances (including inundation), undiscovered and submerged NRHP-eligible prehistoric or historical period archaeological sites are possible. Evaluation of archaeological sites usually requires a test excavation phase to determine a site's potential for NRHP eligibility. Further consultation with Native American tribes is also required if the resource could be related to ancestral or spiritual use, and/or if it contains burials. For historic buildings and structures, evaluation typically requires archival research and a field evaluation of historic integrity. When eligible properties are within the project's APE, the Federal agency consults with the SHPO on methods to avoid the potential for direct or indirect adverse effects. If eligible resources are identified but cannot be avoided, acceptable measures to mitigate impacts are developed with the SHPO and other consulting parties. For archaeological sites that are eligible only for their information potential (criterion d), additional data recovery excavations are commonly acceptable as mitigation.

The NRHP criteria for evaluation (36 CFR 60.4) are the quality of significance in American history, architecture, archaeology, engineering, and culture in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and

- That are associated with events that have made a significant contribution to the broad patterns of our history;
- That are associated with the lives of persons significant in our past;
- That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- That have yielded, or may be likely to yield, information important in prehistory or history.

The Corps has prepared a draft programmatic agreement (PA) to provide guidelines for compliance with Section 106 when the effects on historic properties are unknown. The Corps has invited the USFS to be a signatory to the PA, and has invited the Tule River

Indian Tribe, The Bishop Paiute Tribe, the Santa Rosa Tachi Yokut Rancheria, and the Tübatulabal Tribe to be concurring parties. The draft PA is still undergoing review.

Compliance with these and other provisions of the NHPA is required as a process separate from but concurrent with NEPA. Other Federal laws that are, or may be relevant to implementing the Isabella DSM Project include:

Archaeological Resources Protection Act (ARPA) of 1979, as amended

The Archaeological Resources Protection Act was enacted ...to secure, for the present and future benefit of the American people, the protection of archaeological resources and sites which are on public lands and Indian lands, and to foster increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals (Sec. 2(4)(b)). ARPA is implemented by regulations at 43 CFR, Part 7.

An "archaeological resource" is defined as material remains of past human life or activities which are of archaeological interest, as determined under the uniform regulations set forth in this Act. Regulations containing such determination shall include, but not be limited to: pottery, basketry, bottles, weapons, weapon projectiles, tools, structures or portions of structures, pit houses, rock paintings, rock carvings, intaglios, graves, human skeletal materials, or any portion or piece of any of the foregoing items. Non fossilized and fossilized paleontological specimens, or any portion or piece thereof, shall not be considered archaeological resources, under the regulations under this paragraph, unless found in an archaeological context. No item shall be treated as an archaeological resource under regulations under this paragraph unless the item is at least 100 years of age.

Permits are required to excavate and remove those cultural remains are required to insure that individuals wishing to work with Federal resources have the necessary professional qualifications and that meet Federal standards and guidelines for research and curation are followed. A condition of the permit is that the permitting agency receives a report of the investigations, and documentation of appropriate curation of materials.

The law specifies that no person may sell, purchase, exchange, transport, receive, or offer to sell, purchase, or exchange, in interstate or foreign commerce, any archaeological resources excavated, removed, sold, purchased, exchanged, transported, or received in violation of any provision, rule, regulation, ordinance, or permit in effect under State or local law. Any person who knowingly violates, or counsels, procures, solicits, or employs any other person to violate, any prohibition can be subjected fined and/ or imprisoned.

Native American Graves Protection and Repatriation Act of 1990, as amended

The Native American Graves Protection and Repatriation Act is a Federal law passed in 1990. NAGPRA provides a process for museums and Federal agencies to return certain Native American cultural items -- human remains, funerary objects, sacred objects, or objects of cultural patrimony -- to lineal descendants, and culturally affiliated Indian tribes and Native Hawaiian organizations. NAGPRA includes provisions for unclaimed and culturally unidentifiable Native American cultural items, intentional and inadvertent discovery of Native American cultural items on Federal and tribal lands, and penalties for noncompliance and illegal trafficking. The Secretary of the Interior's implementing regulations are at 43 CFR, Part 10. Permits for excavating or removing cultural items protected by the act require Native American consultation, as do discoveries of cultural items made during Federal land use activities.

American Indian Religious Freedom Act of 1978, as amended (PL 95-431; 92 Stat. 469; 42 USC 1996)

This law states that is the policy of the United States to protect and preserve the inherent right of freedom of American Indians to believe, express, and exercise their traditional religions, including access to religious sites, use and possession of sacred objects, and freedom to worship through ceremonial and traditional rites. The act is a specific expression of First Amendment guarantees of religious freedom and has no implementing regulations.

3.14.2 Affected Environment

Cultural Overview and Chronology

This section provides an overview of the context and chronology of the human use of the Isabella Lake region, followed by the results of cultural resource inventories relevant to the proposed Isabella DSM Project.

Prehistoric Context

A number of survey level investigations have taken place in the Isabella Lake area, some of which were quite extensive (Fenenga 1947 [cited in Meighan et al. 1984]; Schiffman 1976; Glassow and Moore 1978; Meighan et al. 1984; Kelly 2009), but few excavations have taken place beyond limited testing (Fenenga 1947 [cited in Meighan et al.1984]; Sutton et al. 1994; Cuevas 2002). Consequently chronological associations have been typically adopted from sequences developed elsewhere. McGuire and Garfinkel (1980) synthesized a chronology based on survey and testing work conducted east of Isabella Lake, in an area approximately 4,000 to 5,000 feet higher in elevation. The McGuire and Garfinkel chronology has been applied broadly by researchers in the southern Sierra. For the sake of consistency, their terminology and general chronological framework has been retained here. Though close to the area for which that chronology was derived, Isabella Lake is at a lower elevation and covers a different range of biotic zones; therefore, the specific characteristics of each period under their outline are not assumed to be perfectly applicable to the much lower elevation Isabella Lake area, and diagnostic artifacts are treated with caution.

Archaeological evidence for human occupation of the Americas before 12,000 years before present (BP) is scant at best and remains controversial. The earliest known occupations in the western Sierra, dating from between 10,000 and 4000 years BP, are marked by the presence of Lake Mojave type large-stemmed projectile points (Stevens

2002), crescents, and at least one fluted point encountered a few miles southwest of Isabella Lake (Zimmerman et al. 1989). Data are too sparse to generate a convincing description of lifeways during this period, though people are generally assumed to have been highly mobile, probably subsisting on a selective diet of both plants and animals.

McGuire and Garfinkel's (1980) Lamont Phase, placed between 5,950 and 2,150 BP, is distinguished by basalt toolstone and large bifurcated-stemmed (Pinto) projectile points. This is followed by the Canebrake Phase, between 2,150 and 1,350 BP, a period marked by large lanceolate and corner-notched (Elko) projectile points. Probably concurrent with the adoption of the bow and arrow is the Sawtooth Phase, from about 1,350 to 650 BP. This period is associated with small corner and basally notched projectile points (Rose Spring and Eastgate). The final phase, associated with the introduction of Brown Ware pottery (Meighan et al. 1984:57) and small triangular and side-notched (Desert series) projectile points, is the Chimney Phase, dating from 650 BP to European contact.

Dating archaeological contexts in the Isabella Lake area has been problematic for several reasons. No data-recovery excavations have taken place in the area, so there have been no radiometrically dated cultural components. Chronometric control has been limited to projectile point associations with other areas and limited obsidian hydration.

The two dating techniques most readily applicable to the Isabella Lake archaeological record are useful but not flawless. The first is projectile point cross-dating. Archaeologists have long observed that the forms of projectile points have changed through time. Attempts to sort these changing forms into specific types that could be associated with periods were largely impressionistic, descriptive, and imprecise until Thomas introduced the first metrically quantified typology in the 1970s (Thomas 1970, 1981). Though some have argued against the validity of point typologies in general (e.g., Flenniken and Wilke 1989), for most archaeologists point types are considered reasonable temporal indicators. Problems in using such data to date sites are the length of time in which different point types were in use prehistorically, the inconsistent typologies, and the common occurrence of aberrantly shaped points. Despite these limitations, projectile point cross-dating is a generally reliable method of approximating the age of a site, especially when a number of points are recorded or collected.

The second dating technique is obsidian hydration. Obsidian is a naturally occurring volcanic glass which, when broken, gradually forms a hydration layer on the fresh surface as water diffuses into the material. This layer is visible microscopically in cross-section and may be used to estimate how long ago the rock was broken. Several factors influence the rate at which a hydration layer develops; the most significant are the specific chemical composition of the glass and the temperature in which the hydration layer is formed (Friedman and Smith 1960; Friedman and Trembour 1997; Friedman et al. 1997). Archaeologists are largely able to control for these two variables.

Different obsidian sources are chemically uniform, though they differ from each other. For this reason, archaeologists typically derive hydration rates for specific sources. This controls for the chemical variability that exists between different types of obsidian. Temperature variation occurs between different areas and elevations, and at different depths underground (Ridings 1996), making the factor challenging to control. This complicates things, though the problem is not intractable. Several means of accounting for temperature variation have been put forward (e.g., Friedman and Trembour 1983; Ridings 1996; Stevens 2004).

A more difficult complication is the intrinsic water content of obsidian. This may vary within a single geologic source and it affects the rate at which the glass hydrates (Stevenson et al. 1993; Rogers 2008); this is a costly and difficult factor to control. Fortunately, intrinsic water content tends to vary within a relatively narrow range at any given source locality, so the degree to which this factor will skew hydration rates is limited (Stevenson et al. 2000). Relative humidity may also affect hydration rate, but to a lesser degree; experimental work has shown that this variable is not significant (Friedman et al. 1994).

Given the range of factors affecting the rate at which obsidian hydrates, it is unsurprising that obsidian hydration measurements often display a range of values in any given context. Fortunately that range is finite; given a reasonable sample of hydration readings and a well-developed hydration rate, archaeologists can estimate the approximate age of a given context with reasonable certainty.

Though most of the obsidian found in the Isabella Lake area is derived from the Coso Volcanic Field (Coso) sources (Dillon 1984; Sutton et al. 1994), establishing a hydration rate has been problematic because of the significant vertical relief between Sierran sites and the corresponding variation in effective temperature. Stevens (2004) developed rates for three common obsidian sources found in Sierran contexts, including Coso, which incorporate effective temperature. Using these rates he produced histograms illustrating the frequencies of three projectile point series: Elko, Rosegate (Thomas 1981), and Desert.

Stevens' (2004) data indicate that Elko series projectile points occur through most of the known archaeological record but peak in frequency during the late Lamont and Canebrake Phases. Rosegate (Rose Spring and Eastgate) points occur throughout the Sawtooth Phase, though intriguingly there is a spike in their occurrence toward the later end of the Canebrake Phase. Desert series projectiles are dominant during the Chimney phase. Stevens' (2004) analysis, taken in concert with the work of McGuire and Garfinkel et al. (1980), establishes a reasonable projectile point chronology for the southern Sierra.

Data from excavations at Buchanan Lake and New Melones Lake indicate a fluorescence of occupational intensity beginning around 3,000 BP (Stevens 2002). Applying the obsidian hydration curve for Coso glass established by Stevens (2004), adjusted for 2,600 feet elevation on the west slope of the Sierra, to obsidian hydration data collected around Isabella Lake by Meighan et al. (1984) and Sutton et al. (1994), indicates that this period may also mark the onset of significant occupation there.

Based on glottochronology (a means of estimating the period of a language, based on an assumed rate of linguistic change), rock art styles, and other material factors, Moratto (1984), following the work of McGuire and Garfinkel (1980) and Lamb (1958), argues that the Tübatulabal language began to separate from Numic tongues by around 3,500 BP and that the two had diverged entirely by around 3,000 BP. For a number of reasons, glottochronological dating is unconvincing by itself, as are arguments based on rock art styles. However, combined with the apparently concurrent arrival of increasing numbers of people in the Isabella Lake area, this makes for an intriguing hypothesis.

Whether they spoke Tübatulabal, it seems likely that people were arriving in the area in increasing numbers sometime in the Lamont Phase and certainly by the Canebrake Phase. Obsidian assemblages from sites CA-KER-1, CA-KER-4, and CA-KER-692 (Meighan et al. 1984) indicate relatively steady cultural accumulation from the Canebrake Phase through the Sawtooth Phase and into the Chimney phase. Dated by the presence of diagnostic shell beads, glass trade beads, obsidian hydration, and diagnostic projectile points, sites CA-KER-405 and CA-KER-2517 appear to have been occupied from the Canebrake to Chimney Phases also (Sutton et al. 1994). Earlier obsidian hydration dates may be anomalous.

Groundstone is common on all of the sites for which any dating has been possible, with both manos and pestles present in most cases. Sutton et al. (1994) note that site deposits were generally mixed, so the comparative frequency of groundstone styles with depth is difficult to interpret. An exception is CA-KER-2517, where a number of pestles were recovered only between 0 and 20 centimeters (cm) below ground, whereas manos were most frequent below 30 cm. Obsidian hydration on flakes below 30 cm and a diagnostic shell bead from a similar depth indicate that the manos may have been associated with Canebrake Phase occupations. This may indicate that intensive acorn consumption, associated with mortar and pestle technology, did not begin until somewhat later (cf. Basgall 1987).

The above discussion of the Isabella Lake cultural chronology must be understood to be very tentative at best. Though the area has been thoroughly surveyed, very little excavation has taken place, and no extensive data recovery projects have been undertaken. The existing surveys are mostly outdated and all property that is in the APE will require new surveys that follow contemporary guidelines for field procedures and documentation standards. As more data are collected, the tentative conclusions and hypotheses outlined here will certainly change and develop. The ethnographically documented Tübatulabal are considerably better known than their prehistoric forbearers.

Ethnographic Context

The Isabella Lake project area includes lands traditionally used by two Native American groups, the Kawaiisu and the Tübatulabal. Both cultures are regarded as being Uto-Aztecan speakers, but the Kawaiisu spoke a Numic dialect, while the Tübatulabal spoke Tübatulabalic (Kelly 2011). There is no clearly discernible boundary between the groups, but the Tübatulabal mostly lived in the Kern River Valley and along the forks of the

Kern. Seasonal forays were made into the Piute Mountains for hunting and gathering pinyon nuts. Maps of tribal territories presented by Smith (1978), Zigmond (1986), and Voegelin (1983) indicate that the entirety of modern day Isabella Lake is in the tribal territory of the Tübatulabal. Several named Tübatulabal village sites were located along the main stem and North Fork Kern River, the South Fork Kern River, and in the inundated area below the former confluence of the rivers (Smith 1978) where Isabella Lake stands today.

The Kawaiisu were located to the south of the Tübatulabal, occupying the Tehachapi Mountains and Walker Basin. The northern extent of Kawaiisu territory came very near the southern end of the Isabella Lake property, and these people may have made occasional forays into the nearby Tübatulabal territory. Zigmond (1938) wrote that "most informants placed the boundary line between the two tribes a few miles south of the South Fork of the Kern River and the augmented Kern, and running parallel to them."

Territorial and cultural boundaries likely shifted through time with the availability of resources and transitions in the political landscape. The material archaeological record and oral histories reflect exchange and interchange among those who adapted to life in these lands. Also, accounts of the different tribal groups are based on information that was recorded after contact with various Euro-American influences which modified traditional ways of life.

Tübatulabal

The most exhaustive descriptive treatment of Tübatulabal life is that offered by Ermine Voegelin (1938), who spent the summers of 1931, 1932, and 1933 visiting with "old timers" whose parents or grandparents lived in the area before the influx of European-American miners in the 1850s. All the ethnographic information presented here comes from that source unless otherwise noted.

The Tübatulabal living in the Isabella Lake area in the 1930s divided themselves into three groups, each of which spoke slightly different but mutually understood dialects. These were Pahkanapïl (or simply Tübatulabal), Palagewan, and Bankalachi. The three Tübatulabal dialects comprise the only language in the subgroup of the Uto-Aztecan language family (Smith 1978).

The inhabitants of the Kern River Valley were acquainted with the Spanish after 1776, but intensive European occupation of the area did not begin until the 1850s. Though indirect contact with Europeans exerted quiet influence on the parents and grandparents of Voegelin's old timers, their recollections and stories captured much of the local pre-European lifestyle and adaptations to the early phases of contact.

The first recorded contact between Tübatulabal people and Europeans came when the Spanish Padre Francisco Garcés arrived in 1776. Later that year, guides of Padre Pedro Font explored upriver at least as far as the modern day Isabella Lake. After 1782 the Tübatulabal made more regular contact with Mission San Buenaventura during trading trips to the coast. By the 1850s and 1860s the Tübatulabal were in more or less constant contact with the European-American ranchers and miners living in the Kern River valley. It is within this context that the ethnographic description provided by Voegelin should be understood.

The Tübatulabal lived most of the year in small villages composed of a few family groups. They built semi-permanent dome-shaped houses of willow and rabbitbrush, plastered with clay, and thatched with tule. In the same villages, people would also build open ramadas for shelter during the hotter summer months. From mid-August through mid-October, they occupied more ephemeral wikiups and brush structures at higher altitude pinyon camps.

A yearly cycle began in mid-August when the Tübatulabal moved into the lower pinyon zones and began to collect green cones. In September they moved to higher altitude pinyon collection areas, where they mostly remained until mid-October. It was also around this time that they would begin collecting acorns near the more permanent lowland villages. People shifted back to the villages to collect gray pine nuts and acorns until the middle of November. This was also the season when large game hunting was said to be best.

The winter was passed in the village; people lived on the stores of pine nuts and acorns supplemented by fishing in the river and occasional hunting. By February, they began collecting a variety of plant resources and resumed hunting in earnest. This collection continued through the early summer, expanding to include a variety of small seeds in May and rush, tobacco, and salt grass from July into August.

Tübatulabal trade networks were expansive, reaching east across the Sierra Nevada into the Mojave Desert, to the Pacific Coast near modern day Ventura, and well into the Central Valley, as far as the former Tulare Lake in the San Joaquin Valley. Trade with the coastal Chumash appears to have been especially important as it was they who supplied the Tübatulabal with their clamshell disk currency. Other commonly traded items were pine nuts, acorns, and dried meat. Exchange occurred on a more local scale as well, and Tübatulabal would purchase food and tobacco balls from one another with clamshell disks.

Kawaiisu

The Spanish explorer Francisco Garcés was perhaps the first to discuss the Kawaiisu. His account recorded information provided by his Mojave guides who referred to them as Cobaji. In 1844 John C. Fremont encountered Indians, possibly Kawaiisu, harvesting Carrizo grass along Canebrake and Kelso Creeks. In the early 1850s many prospectors entered the area in search of gold (Comfort 1934). It did not take long for the area to become inundated with mining claims around Havilah, Piute, Claraville, and Sageland greatly with a devastating effect on native life.

The Kawaiisu are known as purely hunter and gatherers. Their documented attempts at manipulating the environment were pruning stands of wild tobacco and firing dry brush in late summer to facilitate a heartier growth of the next season's tobacco yield. The extensive use of plants by the Kawaiisu has been documented and includes 233 plant species. Among these, 112 were food and beverages, 94 were medicinal, 87 were miscellaneous products, and 27 had purported supernatural and mythological uses (Zigmond 1986).

Food collecting and processing involved a number of different types of baskets, such as seed beaters, burden baskets, generalized containers, and winnowers, trays and hoppers. They had pointed digging sticks and flat-ended, long, and sometimes hooked poles. They used bedrock mortars with long round-ended pestles, portable metates, manos, and obsidian knives.

Kawaiisu housing depended on the season of the year. In winter they lived in houses called tomokahni that were built on a ground-level circular base with vertical forked willow poles that were tied on the inside and outside of the vertical shafts then filled with brush. Tule rush mats were used for a door and served to waterproof the houses. They had a fire pit in the center of the floor, and the occupants slept with their feet toward the fire. During the summer the women worked in open flat-roofed shade houses known as havakahni. The Kawaiisu also had brush-covered sweat houses, located close to water, that were known as tivikahni. Acorns, nuts, and seeds were stored in small aboveground granaries.

They hunted with a juniper wood and sinew backed bows and used three-piece arrows with obsidian points for hunting large game. Smaller game and birds were hunted using either a one- or two-piece arrow. There was some evidence of the limited use of pottery, probably traded in Owens Valley Brown Ware. The Kawaiisu were not pottery makers.

The Kawaiisu basket makers employed both twined and coiled basket weaving techniques. They had a unique coiling style, called wičikadi, which meant "wrapped around" (Zigmond 1978). No particular reason was given for this deviation from other more routine basket styles other than perhaps to introduce some diversity to the craft.

The Kawaiisu are very loosely organized politically and socially and existed primarily on the family level. In some cases, a few families lived close to one another in a sort of informal band setting. There was no paramount chief in the formal sense; someone might have been appointed chief by agreement from the people of his own sphere of influence. There was no concept of tribal unity, so the Kawaiisu may have had several leaders at any given time.

Historic Context

Euro-American Contact

Although the first recorded contact between Europeans and native populations in upper California occurred on Santa Catalina Island in 1542, Spanish settlement of the interior was not attempted for over two hundred years, and there is no evidence of long-term early Spanish use of the Kern River Valley. California and the Kern River area were under the nominal control of the Spanish until 1822, when Mexico gained its independence. European influence in the proposed project area was slight, however, until the decades after Mexico ceded California to the United States in 1848.

Conflicts between the native Indian people and the colonizing Euro-Americans were a constant in the latter years of the nineteenth century. Eleven tribes in the Kern River area entered into a peace treaty with the United States in 1851, but it was never ratified by the Senate (Comfort 1934). In subsequent years Indian raids on Euro-American settlers, especially cattlemen, teamsters, and miners, were common from Walker Pass east into the Owens Valley. Eventually, American cattlemen and miners were driven almost entirely from the valley.

A new peace accord was drafted in 1862 but was of limited efficacy. Soon thereafter Indians killed two men near Canebrake Creek, and a few cattle raids continued (Belden 1961). Federal authorities were quick to select a guilty party and exact brutal revenge. Captain Moses A. McLaughlin was ordered to the Kern Valley in the spring of 1863 to confront a group of Indians who were camped several miles upriver from Keyesville. The guilt of this group was established based on the fact that they were “for the most part strangers in the valley” (M. A. McLaughlin to W. Jones, letter, April 24, 1863, reprinted in Boyd et al. 1982). Local Indians known to be friendly to US interests were asked to vouch for certain of the people in the encampment and women, children, and old men were released. The remaining 35 men were massacred by rifle or sword by McLaughlin’s troops.

Indian resistance to European encroachment is sometimes highlighted in historical accounts of the area (Boyd 1952) occasionally in graphic detail (Belden 1961). In reality, there was little to stem the tide of colonists, which began in earnest in the 1850s and accelerated rapidly from there.

Mining

The mining history of the Isabella Lake area has been summarized effectively in a context summary for the Isabella Lake Geotechnical Project by (Kelly and Hasty 2011). The following section is adapted from that piece:

In 1851, gold was discovered on Greenhorn Creek, a tributary of the Kern River by a former member of Fremont’s party (Bradley 1933; Troxel & Morton 1962). Rumors of this strike, coupled with legends of gold on the Kern, drew a few miners to the Kern River Valley, but it took the discovery of a 42 ounce gold nugget in Rich Gulch (now Boulder Gulch) to bring a “gold rush” to the area (Schiffman 1982). In 1854 some 600 miners passed through Visalia en route to the Kern River gold fields (Schiffman 1982).

By 1855, mining activity in the southern Sierra had drawn sufficient population to the region for the California Legislature to authorize the creation of Buena Vista County out of the southern portion of Tulare County (Comfort 1934). Though signed into law on April 13, 1855, the act stipulated that the actual formation of the county could not proceed until petitions to that effect were signed by the majority of voters in Tulare County—these petitions were never completed and the effort fizzled out in 1859 or 1860 (Comfort 1934; Boyd 1952).

While the newspapers crowed the glory of the Kern River mines, not all of the miners on the ground agreed. Boyd quotes a miner of the times who claimed the disgruntled were "disposed to wreak their vengeance on the merchants, stage-drivers, and others through whose false representations they had been so egregiously hoaxed" (Boyd 1952). Bancroft describes the gold rush to the Kern River mines as consisting of "5,000 disappointed fortune hunters" (Bancroft 1890).

Powers notes that by the end of 1855 only 250 or so miners remained in the area (Powers 1979). By the middle of the 1850s, those miners still working placer deposits near the confluence of the North and South Forks of the Kern River had gathered rather haphazardly into the community of Keyesville. The community was named for Colonel Richard M. Keyes, a soldier turned-prospector who located the Keyes Mine in 1852 (Troxel & Morton 1962).

In the course of such things, lode mining followed placer mining as the parent ore bodies of the placer deposits were identified. In 1855, Captain Theodore Maltby located the Mammoth Mine on a small gulch some ¾ of a mile south of the Keyes Mine (Troxel & Morton 1962). Keyes built the region's first crude stamp mill in 1856, and a post office was established in 1857. Following the success of the Keyes Mill, other mills were erected in short order including the custom mill of Captain Albia Lightner, the Marsh Co. Mill, and the small 2-stamp mill of Erskine and Sons (Powers 1979). Though the stamp mill was more efficient, the arrastre and the Chilean mill continued to be utilized in the area.

The Keyes Mine and the Mammoth Mine were the leading mines of the district. The Keyes Mine followed quartz veins located in Mesozoic quartz diorite deposits (Troxel & Morton 1962). Ultimately several thousand feet of underground workings were developed (Troxel & Morton 1962). By 1859 the ownership of the mine had passed to Albia Lightner. However, shortly thereafter the mine ceased production (Powers 1979).

Mining development in the Keyesville district was plagued by the lack of water—a situation which was exacerbated by drought years in the late 1850s. While the drought made creek and river bottoms accessible to placer miners, they lacked the water with which to process their gravels. Mills lacked the water needed for motive power and for the milling process itself. To address the water shortages caused by the drought, two water ditches were constructed to carry water to the placer sites in nearby Rich Gulch, Birdseye Gulch, and Dutch Flat with at least one of the ditches being in operation by the fall of 1861 (Powers 1979; Boyd 1952). Joseph Sumner, who would later develop the Sumner Mine near Kernville, was one of the early investors in these ditches (Boyd 1952).

The floods of 1861-2 caused heavy damage to the mine and it did not reopen until 1894 (Powers 1979). The mine saw considerable activity in the 1920s with some 800 feet of new underground workings being excavated (Tucker and Sampson 1933). The Keyes Mine was credited with production of some $450,000 of gold production between 1852 and 1938 and it struggled on until 1948 (Powers 1979; Troxel & Morton 1962). Mining continued at the Mammoth Mine following the flood.

In 1888 the mine was operated by Joseph Sumner and possessed the only remaining stamp mill in the Keyesville area (Powers 1979). A new stamp mill was constructed in 1896 to process ores from the Mammoth Mine (Powers 1979). After the turn of the century the Mammoth Mine would enter its most productive phase in the years 1909-1915 and 1938-1941 (Troxel & Morton 1962). The Mammoth Mine produced approximately $500,000 of gold and silver between 1855 and 1941 (Troxel & Morton 1962).

The Cove Mining District was organized shortly after Lovely Rogers's discovery to regulate development of mining in the area north of Keyesville (Troxel & Morton 1962). Mining in the Cove Mining District tended to be concentrated on two groups of veins: the Big Blue-Sumner shear zone and the Lady Belle system of veins (Troxel & Morton 1962). The area of these veins is relatively compact, measuring approximately 10,000 feet in length by roughly 4,000 feet in width (Prout 1940). Principal mines of the Big Blue-Sumner vein included the Nellie Dent, the Big Blue, the Sumner, the North Extension Sumner, and the Blue Gouge #2 (Troxel & Morton 1962). Mines on the Lady Belle system included the Lady Belle, the Bull Run, the Jeff Davis, the Beauregard, and the Urbana (Troxel & Morton 1962).

Rumors of gold in placer deposits created a short lived rush of independent miners, peaking around 1855. By 1858 returns had declined significantly and the brief boom ended (Comfort 1934).

It was not until Richard Keyes and other miners from the east established more substantial hard rock mining operations, exploiting the abundant gold found in deep quartz deposits that the industry took off (Bailey n.d.; R. Dillon 1984). Keyes established the first town in the area, Keyesville. Within a couple of years the first stamp mill arrived. Previously quartz had to be broken up using stone wheel mills called arrastras. The stamp mill increased efficiency, and profits rose.

By 1862, two small communities had been founded on the flats below the Big Blue lode (Boyd 1952). The northernmost of these communities was associated with the Big Blue Mill and though initially named Rogersville in honor of Lovely Rogers, the town came to be called Quartzburg, and a little later, Burkeville (named for the superintendent of the mine, E.R. Burke) (Powers 1979; Boyd 1952). A mile or so south of Quartzburg, a community known as Williamsburg was laid out on the west bank of the Kern River. The developers of the Sumner Mine frowned on the establishment of a saloon in the community of Quartzburg, and when Adam Hamilton improvised one with two whiskey barrels and a plank, they ordered him out of town (Comfort 1934). Undeterred, Hamilton moved his barrels to a flat next to the river a mile or so south of Quartzburg and re-established himself. Around this time Adam Hamilton founded the town of Whisky Flat near the confluence of the Kern River proper and the South Fork (Comfort 1934). Whiskey Flat would later become Kernville, the most important mining town in the area. A dozen or so small stamp mills had been established in the Kernville area by the early 1870s.

Agriculture and ranching activities near the Kern began in the early days of the mining industry. Sheep were introduced to the area in the 1850s and in 1862 the first cotton crop was laid in (Bailey n.d.). Agriculture around Bakersfield, along the east side of the San Joaquin valley, intensified in the late 1880s producing cotton, hay, vegetables, and alfalfa (Comfort 1934). Gradually these industries displaced mining in economic importance.

Isabella Dam and Lake

The initial study for a project on the Kern River was authorized by the Flood Control Act of 1936. This study provided for a preliminary examination and survey of the Sacramento and San Joaquin Valleys. Separate studies were done on various subbasins in the two watersheds. Construction of Isabella Dam and Lake was proposed in the report of the Corps' Chief of Engineers and was contained in House Document 513, January 26, 1944. The project was authorized for construction by the Flood Control Act of 1944.

Construction of the lake from 1948 to 1953 required the creation of two earthen dams and the relocation of the small settlement of Isabella on the South Fork of the Kern River, the town of Kernville on the North Fork, SR 155, and SR 178. The low-flow Borel Canal, which had been constructed in 1904 to deliver water to a downstream power plant, was rerouted within the lake, and the Auxiliary Dam was constructed over it. Construction also required relocating roads and utilities and acquiring land. Buildings and other floatable material were removed from the lake. In April 1953, water was stored in the project for the first time, and the project was first operated for water supply conservation in April 1954. Construction of the Isabella Partners power plant on the Main Dam outlet began in August 1989 and was completed in December 1990. Power production began in June 1991.

Isabella DSM Project - Inventories and Investigations

In 2011 Basin Research Anthropological Research Group (Basin Research), was contracted by the Corps, to initiate a comprehensive cultural resources records and literature search of the perimeter of the entire lake as preliminary requirement to identifying historic properties that may be affected by the Isabella DSM Project (See Table 3-77). The search was first conducted at the Southern San Joaquin Valley Information Center, California State University, Bakersfield in August 2008. In 2009 Basin Research also obtained records from the Kernville Ranger District, and Corps' Sacramento District files. The record search includes the results of previous archaeological or historical surveys. Basin Research conducted fieldwork in 2009 to verify, and/or correct all site locations; update site record forms as necessary and prepared interactive maps of the confirmed data.

Table 3-77
Cultural Resource Inventories Relevant to the Isabella DSM Project

Author	Year	Title	Results
Chang. D. H.	2010	Auxiliary Dam Left Abutment Project	Negative survey
Fenenga, Franklin	1947	Preliminary Survey of Archaeological Resources in the Isabella Reservoir, Kern County, California.	Identified 14 archeology sites. In 1948, F. A. Riddell found six additional sites.
Glasgow, M. & Moore, J. D.	1978	Evaluation of Cultural Resources, Isabella Lake, California.	The survey relocated 27 of Schiffman's sites recorded in 1976, and identified 14 new sites.
Kelly, Tim	2009	Addendum to a Preliminary Archaeological Survey for the Sequoia National Forest Public Wheeled Motorized Travel Management EIS, Kern River Ranger District, Sequoia National Forest. Kern County, California.	Approximately 1,179 acres were intensively surveyed for the Travel Management Project. Eighty-six cultural resources were identified of which 46 are archaeological sites.
Kelly, Tim	2011	Lake Isabella Geotechnical Project: Archaeological Reconnaissance Report R2011051354046	Negative survey
Kelly, Tim	2011	Lake Isabella Geotechnical Project: Addendum to the Archaeological Reconnaissance Report R2011051354046	Negative survey
Kelly, Tim	2011	Lake Isabella Geotechnical Project: Second Addendum to the Archaeological Reconnaissance Report R2011051354046	Negative survey
Kelly, Tim	2011	Lake Isabella Geotechnical Project: Third Addendum to the Archaeological Reconnaissance Report R2011051354046	Negative survey
Kelly, Tim	2011	Lake Isabella Geotechnical Project: Fourth Addendum to the Archaeological Reconnaissance Report R2011051354046	Negative survey
Kelly, Tim	2011	Lake Isabella Geotechnical Project: Fourth Addendum to the Archaeological Reconnaissance Report R2011051354046 (Revised April 28, 2011)	Negative survey

Author	Year	Title	Results
Schiffman, R. A.	1976	Archaeological Reconnaissance of the Lake Isabella Reservoir and Adjacent Lands	46 Archeology sites were identified.
Mikesell, S.	1996	Evaluation of National Register Eligibility for the Borel System Southern California Edison Company, Kern Count y, California	Determined to be ineligible with SHPO concurrence.
Montag, M.	2010	Cultural Resources Recordation and National Register Evaluation of Isabella Dam for the Lake Isabella Dam Safety Modification Project, Kern County, California	Determined to be ineligible with SHPO concurrence.
URS	2008	Kern River Fault Evaluation: Archaeological Reconnaissance Report of Seismic Study Locations at Brush Creek, Rincon Spring, and Corral Creek. Sequoia National Forest, Tulare County, California	Two sites were recorded north of the lake but avoided by the Seismic trenching activity. One site at Brush Creek was previously recorded in 2002. The other site at Rincon Springs was assigned P-54-004454 by the Southern San Joaquin Valley Information center.

The Main and Auxiliary Dams have been recorded and evaluated to determine their eligibility for listing on the NRHP. The Corps determined that the dams were not eligible, and the California SHPO concurred with the determination. The USFS, on behalf of the Corps, has been conducting cultural resources surveys of the selected geotechnical boring and trenching locations under consideration for borrow materials. After the recommended alternative is selected, new cultural resource surveys will be conducted all affected areas that have not been inventoried to current standards.

The Corps is continuing efforts to work with interested tribes on a government-to-government basis to inform them of the project and coordination protocols. The Corps has also initiated consultation efforts on a programmatic agreement (PA) in cooperation with the USFS, the SHPO, the ACHP, and interested tribes.

Discussion of Recorded Cultural Resources

The majority of the study area for the proposed alternatives has been previously surveyed for cultural resources. Table 3-78 and Table 3-79 include cultural resources that were identified in the records and literature search, and that have been recorded as a result of investigations associated with the Isabella DSM Project. The resources include cultural properties that are both in, and or near the footprints of the proposed project alternatives.

Prehistoric Cultural Resources

Table 3-78
Prehistoric Cultural Resources Relevant to the Isabella DSM Project

Resource Designation	Resource Type	NRHP Eligibility	Condition
CAL-KER –12	Large prehistoric habitation and milling site w/ 16 boulders with bedrock features.	Unevaluated	Highly disturbed site
CA-KER-25	Petroglyphs on water worn boulders. The site is on both sides of the Kern River	Unevaluated	Needs additional documentation
CAL-KER -410/411	Two adjacent sites that involve comprise the 1863 McLaughlin Massacre Site	Expected to be eligible	Listed as a traditional cultural property
CA-KER-1684	4 boulders, each with a milling slick	Unevaluated	Lack of integrity
CA-KER-2528	Large Boulder w/ greenish pictograph	Unevaluated	On private property

CA-KER-12. Originally recorded by Fenenga in 1947 for the River Basin Surveys, CA-KER-12 is a large, 170x100 meters habitation and milling site. The site contains 16 bedrock milling features (mortars and slicks), and remnant patches of midden. When it was first recorded Fenenga noted numerous surface artifacts; obsidian projectile points, a steatite sherd, and milling equipment. The site has been heavily impacted and it is in the middle of a campground, but appears to be NHPA eligible under criterion d.

CA-KER-25. Riddell recorded this site in 1948. It consists of petroglyphs and three milling features that are found on both sides of the Kern River. Dillon (Meighan, et al. 1984) recorded the site as being 200x150 meters. During Basin Research's (2011) project, they found additional boulders with petroglyphs on them. The site is also known as the Slippery Rock Petroglyphs site (Schiffman and Andrews, 1981). The site appears to be NRHP eligible under criterion d.

CA-KER-410/411. KER-410 is a large milling site near the old Kern River channel. The site has two milling areas and a rock shelter. The site record form that was updated by Perez (1977) made note that the site has 120 bedrock mortars in two clusters that were periodically inundated by rising lake levels. The site is close to the Borel Canal. KER-411 is a small habitation and milling site consisting of approximately 55 bedrock mortars on two slabs, and an area of dense, dark midden. These two sites combined are the location of the 1863 McLaughlin Massacre. As such they have been listed as a TCP by (Taylor 2004). KER-410 and KER-411 are both probably eligible for the NRHP under criteria a and d. The two sites are a substantial distance from any of the proposed alternative locations except for their proximity to the intake for the Borel Hydroelectric system.

CA-KER-1684. KER-1684 was recorded by Dillon in 1983 as "four separate boulders, each having one poorly defined bedrock slick. One boulder has an incipient mortar ground through the slick" (Meighan et al. 1984). A field inventory conducted by Basin Research Associates, Inc. in September 2009 relocated the site, but two previously recorded and mapped features were not found. The site has been disturbed by landscaping since the 1983 record was completed and many smaller boulders have apparently been moved or removed. The 1983 sketch map does not reflect the current conditions. Dillon noted that the site is part of a chain of resources along the southern shore of the South Fork of the Kern River with KER -1683, KER-16, KER-14 and KER-418. The 1983 sketch map does not reflect the current conditions and the site should be rerecorded to reflect current conditions. The resource does not appear eligible for the National Register due to integrity issues.

CA-KER-2528. KER-2528 was recorded by Jackson and Ptomey (1989) as a large boulder outcrop with a greenish pictograph. No artifacts or other features were observed. The pictograph had been photographed and drawn at the time of its recording. A field inventory conducted by Basin Research Associates, Inc. in September 2009 was unable to access the property to evaluate the site. The site is on private property and the integrity and current condition of the site is unknown. The site is unevaluated but may be eligible for the National Register under criterion d due to the presence of a Native American pictograph with a rare pigment color.

Submerged sites. There are also four submerged archeological sites between Engineer Point and the southwestern shoreline of the lake. Sites: CA-KER-8, -KER-10, -KER-11, -KER-13, will not be affected by the lowering of the lake or during construction activities involving the Main or Auxiliary Dams.

Historic Cultural Resources

Table 3-79
Historic Cultural Resources Relevant to the Isabella DSM Project

Resource Designation	Resource Type	NRHP Eligibility	Condition
CA-KER-7791H	Old Paved Road segment	Not eligible	Degraded
Borel Hydroelectric System	Submerged flumes, upper and lower conduits, and power house complex	Not eligible	Excellent
Isabella Main and Auxiliary Dams	Earthen filled dam structures	Not eligible	Structural deficiencies
Unrecorded	Homestead remains in the South Fork Delta borrow area	Unevaluated	Needs to be recorded and documented
Forest Service Administrative Complex	Government office and shop facilities	Not Eligible	Modified, non-distinctive and lacks integrity

CA-KER-7791H. This site was recorded in 2010 for the Corps' Auxiliary Dam Raise project. It is a remnant of a haul road that was probably built for the construction of the Auxiliary Dam. No historical records were found for it. The road is badly deteriorated, and was determined to be ineligible for the NRHP in consultation with SHPO.

Borel System. Southern California Edison recorded the entire Borel system in 1997 (Mikesell 1997). The complex has been online since 1904, with the majority of additions and refinements having occurred since 1945. Components of the Borel system include a hydroelectric power plant in the Kern River Canyon, 11.2 miles of conduit between the intake near Kernville and the power plant at Borel in the Kern River Canyon. The original intake alignment was modified to accommodate construction of Isabella Lake Dam. The system incorporates four major segments (Mikesell 1997); the old conduit, the intake and associated features, that are beneath Isabella Lake, the upper conduit that runs from the Isabella Auxiliary Dam through the hot Springs Valley, the lower conduit that ruins to the Kern River Canyon, and finally the power house complex at the southern end of the system. Even though the Borel System is of the requisite age for NRHP consideration, it failed to qualify because of a lack of integrity.

Isabella Lake Main and Auxiliary Dams; and the Main Dam Spillway. The dam of earth fill construction consists of two sections, a main dam across the Kern River and an auxiliary dam in a low area on the left abutment. The main dam is 1,695 feet long with a maximum height of 185 feet, and the auxiliary dam is 3,257 feet long and 100 feet high, and the spillway is 140 feet long (Montag 2010). Construction of the dam and appurtenances commenced in March 1948 and completed in April 1953, with impoundment of water in the reservoir starting in December 1952. Isabella Lake Dam was determined ineligible for the NRHP because it failed to meet the significance criteria under NRHP criteria a through d.

Unrecorded Historic Scatter - South Fork Delta Borrow Area. In November 2011, USFS Heritage Program archeologist, Mr. Tim Kelley was surveying and monitoring the Corps geotechnical trenching investigation in the proposed South Fork delta borrow area. He encountered a rather large historic period artifact scatter that appears to be associated with an unknown early 20th Century homesteads. The site is as yet unrecorded and will be investigated further by Corps archeologists prior to the release of the Final EIS.

Forest Service Administrative Complex. The SHPO has concurred with the USFS determination that the Lake Isabella Forest Service Administrative Complex is ineligible for listing as a district on the NRHP and that no buildings within the complex are individually eligible for NRHP listing. The complex consists of 15 buildings and structures. Due to substantial alterations to the complex’s original layout and structures in conjunction with the construction of new buildings at the complex, the site’s overall integrity has been compromised.

Of the 15 buildings evaluated, eight are less than 50 years of age. Of the remaining seven, only two, the Overlook Public Restrooms and Small Engine Shed have been determined to have retained their integrity, but do not appear to be individually eligible for the NRHP. The other five consist of the Administrative building, Garage/Fire Office, Mechanic Shop and Engine Bay, Wood Shop and an elevated Water Tank. These five structures have been subject to structural modifications and do not convey the facility’s appearance during its period of significance (1948 to1960).

Native American Consultation

Prior to initiating Native American consultation, Corps Isabella DSM Project archeologist, Mr. Richard Perry obtained a list of all Tribes, both federally and non-federally recognized, individuals, and cultural groups that are interested in all activities on the Sequoia National Forest from Mr. Dirk Charley. On May 5, 2009, Mr. Perry wrote 17 different Native American entities to inform them of the upcoming cultural resources activities under the Isabella DSM Study, formerly known as the Dam Safety Assurance Program (DSAP).

Mr. Charley provided Mr. Perry with a list of three federally recognized tribes that would be appropriate to participate in the PA. On May 12, 2010 Mr. Perry wrote Tribal Chairs and the Tribal Cultural resources coordinators with an invitation to participate as concurring parties to the development and execution of the Isabella DSM Project PA. Follow-up telephone calls were made to the cultural resources coordinators. No responses were received.

In March 10, 2011, the Corps Tribal liaison, Mr. Mark Gilfillan attended the quarterly USFS Tribal meeting whereupon he gave a presentation on the Corps efforts to engage the Tribal community in the Isabella DSM Study. On June 8, 2011, Mr. Perry and the Isabella DSM Study Environmental Manager, Mr. Mitch Stewart, attended the Tribal meeting and gave presentations on the status of the EIS and the project in general, and the Corps' efforts at identifying cultural resources and the status of the draft PA.

The Corps in response to a letter from the Tübatulabal Tribal Chairwoman, Ms. Donna Miranda-Begay dated September 27, 2011 replied on November 30, 2011. In the reply, Ms. Alicia Kirchner, chief of Planning Division, addressed all of Chairwoman Miranda-Begay's concerns. Ms. Kirncher's letter informed her of our efforts toward Native American consultation, our plans to address NAGPRA issues if they arise, and the Tübatulabal were invited to participate in the PA as a concurring party. Chairwoman Miranda-Begay responded to the invitation to participate in the PA and offered a number of comments on it. Most of the comments were addressable without making any changes to the PA with the exception of the inclusion of a Stipulation regarding confidentiality. Additionally, Chairwoman Miranda-Begay sent Mr. Perry ethnographic information that had been compiled by ethnographer Dr. Dorothea Theodoratus. . Consultation correspondence is found in Appendix E.

3.14.3 Environmental Consequences

This section is an evaluation of potential impacts on cultural resources from the proposed Isabella DSM Project Action Alternatives. Potential impacts associated with the No Action Alternative are also discussed. The impact analysis is based on incomplete inventory information and the likely presence in some areas of subsurface or submerged archaeological resources that may be impacted. Also identified are further actions required to identify resources and to reduce potential adverse impacts on cultural resources.

Scope and Methods

The context and intensity of impacts that may be associated with implementing the Isabella DSM Project alternatives are based on the Federal "criteria of adverse effect. The "criteria of adverse effect" is defined in 36 CFR 800.5(a), as follows:

> *"An adverse effect is found when an action may alter the characteristics of a historic property that qualify it for inclusion in NRHP in a manner that would diminish the integrity of the property's location, design, setting, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the action that may occur later in time, be farther removed in distance, or be cumulative."*

The criteria of adverse effect also provide a general framework for determining the context and intensity of potential impacts on ethnographic resources or traditional cultural properties. Assessment of impacts involving traditional cultural properties or effects on traditional practices or resources also requires focused consultation with the affected group.

The factors that are important for evaluating impacts on cultural resources are as follows:

- The extent of ground surface-disturbing activities and their potential for affecting known or unknown cultural resources or areas of importance to Native American communities;
- Increased access to, or activity in, areas where resources are present or anticipated. Public or worker access to areas where cultural resources are present can increase the potential for vandalism or unauthorized collection of materials;
- The extent to which an action changes the potential for erosion or other natural processes that could affect cultural resources. Natural processes, such as erosion or weathering, will degrade the integrity of many types of cultural resources over time;
- The extent of the possible exposure of inundated cultural resources, if present, and the effects of fluctuating pool levels on cultural resources from wave action and erosion from cyclical inundation and exposure;
- The extent to which an action alters the setting (such as visual and audible factors) where relevant to certain cultural resources; and
- The extent to which an action alters the availability of cultural resources for appropriate traditional uses, including access to spiritual sites or traditional resource gathering areas by Native Americans.

The APE for the proposed Isabella DSM Project has been tentatively defined for each alternative. Generally the APE includes the Primary Action Area, the Secondary Action Area (South Fork Delta area) of Isabella Lake and the Isabella Lake pool.

As the final alternatives are defined and cultural resources are identified, evaluated and the effects are assessed, the Section 106 process would be completed in accordance with the executed PA. The Corps may determine that adverse effects on historic properties would be expected. In some cases, these adverse effects may be resolved through mitigation; in other cases, mitigation measures may not be adequate to avoid adverse effects. High adverse and significant impacts under NEPA would result if there remained an adverse effect under the NHPA that could not be resolved through consultation or mitigation on NRHP-eligible resources or areas of importance to Native American or other traditional communities.

For cultural resources, the duration of an impact is usually not considered in assessing effects in terms of NHPA. Cultural resources are basically non-renewable resources, and damage or destruction to cultural resource sites is generally permanent and irreversible.

Cultural resources that could be affected by various actions supporting the Isabella DSM Project correlates with the degree, nature, depth, and quantity of surface-disturbing activities in the planning area and the cultural sensitivity of the area. The impacts on cultural resource from the different alternatives are described below.

No Action Alternative

Under the No Action Alternative, Isabella Dam would continue to operate in accordance with the established Water Control Plan and Flood Control Diagram. The lake capacity (gross pool elevation) operated at the pre-IRRM elevation of 2,589.26 feet. The Isabella DSM Project would not be implemented and there would be no construction, removal of structures, borrow excavations, removal of rock, temporary operation of mix plant or rock crusher, truck and equipment traffic, or lake dewatering. Potential impacts on cultural resources, resulting from ground disturbance, rock removal, vandalism, artifact collection, exposure of inundated and buried cultural resources, and alterations to the setting of cultural resources would not occur.

The impacts of a catastrophic flood and dam failure are not within the scope of this analysis but the likelihood and consequences of this occurring would continue to be present under the No Action Alternative. The high probability of dam failure under this alternative would retain the potential for long-term direct significant impacts on recorded and unrecorded cultural resources downstream of dam from flooding and erosion.

Alternative Base Plan

The physical APE for this alternative would be the locations that could be directly disturbed by the project construction and supporting activities. These include the Primary Action Area at the Main and Auxiliary Dams, including all proposed staging areas and haul roads, the hill between the two dams, the proposed material borrow and sand processing site at the Auxiliary Dam Recreation Area, and areas affected by the road and utility work. The APE also includes the Secondary Action Area (proposed South Fork Delta filter sand source) and any areas exposed in the lake by a lowered construction pool. The Corps will further refine the APE for completing the Section 106 process in accordance with the executed PA after the preferred alternative is selected.

Much of the APE for the Alternative Base Plan has been surveyed for cultural resources. However, the older surveys are out of date, and were possibly inadequate by contemporary standards. All of the APE would require resurvey that meets contemporary standards for survey procedures and documentation standards. Additional inventory and access to private lands would be needed to complete the identification and NRHP evaluation effort for the APE. Cultural resources have been recorded that are either in, or near the footprints of the project Action Alternatives. Unrecorded, undiscovered or buried cultural resources may also be present and unevaluated structures may be acquired. In accordance with the executed PA, effects on NRHP eligible resources will be assessed. If adverse effects are found and cannot be avoided, acceptable measures will be developed to resolve adverse effects and thus mitigate impacts to a less-than-significant level. A significant impact would result if the action were to have an adverse effect that could not be resolved through consultation or mitigation on NRHP-eligible resources or areas of importance to Native American or other traditional communities..

Preparing the construction site, clearing and developing staging areas, creating haul roads, and adding utilities would involve ground-disturbing activities at the intensity and depths that could affect the integrity of cultural resources, if present. Only one prehistoric archaeological site is known to be in proximity to a proposed staging area in the APE and may be impacted.

Alterations to the Main Dam, Auxiliary Dam, existing spillway and Borel Canal would not impact cultural resources. These structures have been evaluated and are not eligible for listing on the NRHP. Their modification would have no effect on historic properties. The Auxiliary Dam foundation treatment, downstream buttress, temporary coffer dam and upstream berm are not in locations where cultural resources are recorded and intact submerged or buried resources are unlikely due to past dam construction and maintenance disturbance.

Replacement of the Borel Canal conduit through the right abutment of the Auxiliary Dam would require creating a coffer dam at the new inlet; lowering the lake pool to 2,543.76 feet during coffer dam construction and removal; excavating and blasting for the tunnel; and sealing the existing Borel Canal conduit. The lake would also be lowered for the construction of the Upstream Berm at the Auxiliary Dam. None of the known submerged archeological sites are in danger of exposure from the temporary lowering of the lake level. However, as the lake level is lowered additional cultural resources investigations may be conducted in order to determine the potential for unrecorded buried or submerged sites. No impacts are anticipated from the other actions required to replace the Borel Canal conduit.

Much of the hill between the two dams where the USFS compound is located would be altered by construction of the new Emergency Spillway and construction staging. Rock blasted, excavated and processed from the Emergency Spillway site would be used in the remediation construction. Buildings and structures making up the USFS Administrative Building and Compound, Corps Project Office site, and private residences in the vicinity of the Emergency Spillway would be removed. There would be no effects resulting from removal of the Forest Service Administrative Complex as it has been found ineligible for listing on the NRHP.

Sand borrow sources would be established at the Auxiliary Dam Recreation Area and the South Fork delta offsite. Staging Area A1 at the Auxiliary Dam Recreation Area would also be the processing and stockpiling location for both sand sources. Although there is a potential for encountering unrecorded buried sites in the course of borrow operations, there are no known cultural resources at Staging Area A1 and the use of vehicles and equipment are not expected to cause impacts on cultural resources at that location. Borrow excavations at the South Fork delta sand source area are anticipated to be shallower and not concentrated in a single area. With the exception of an unrecorded historic scatter, there are no known cultural resources at this location.

Impacts on cultural resources associated with worker activity, access to cultural sites, vandalism and the exposure of the locations of cultural resources due to the lower lake pool or removal of vegetation are not expected. If eligible resources are present in areas accessible to workers or the public, measures would be taken to protect these locations from inadvertent and deliberate damage.

If the Corps determines through Section 106 process in accordance with the executed PA, that an adverse effect would result from the undertaking, acceptable measures will be developed to resolve adverse effects and thus mitigate impacts to a less-than-significant level. If the action were to have an adverse effect that could not be resolved, a significant impact under NEPA could result.

Alternative Plans 1, 2, 3, and 4.

The APE and anticipated impacts are similar to those described for the Alternative Base Plan. With the addition of the RCC Overlay, portions of the former Main Dam Campground would be developed as a temporary staging area. The campground does contain cultural resources and would need further evaluation and possible mitigations prior to construction. Each of these alternatives, and especially Alternative Plans 2 and 3, would require more sand and rock materials than the Alternative Base Plan, but these would be obtained from the same source locations and thus are not likely to impact cultural resources. For Alternative Plan 3, the coffer dam would not be required as the Borel conduit would pass under the existing and proposed spillways and through the ridge from the Main Dam outlet to the existing downstream Borel channel. The lake level would not be lowered for construction and removal of the coffer dam, reducing the potential for possible exposure of submerged sites. Because the Main Dam and Borel System are not historic properties, no additional impacts are anticipated due to alteration of structures and relocation of the conduit. Alternative Plan 4 includes additional ground disturbance for the widening of the emergency spillway and the realignment of State

Highway 178. The potential for cultural resources within the enlarged APE would be assessed and mitigated in accordance with the executed PA described under the Alternative Base Plan. This alternative would have a potential for impacts similar to that of the Alternative Base Plan. While the potential exists that previously undiscovered cultural resources could be encountered during ground-disturbing activities, implementation of the procedures and commitments outlined in the PA would ensure that impacts to cultural resources would be reduced to less than significant.

3.14.4 Environmental Commitments/Mitigation Measures

Prior to the initiation of DSM related ground disturbing activities the Corps would have a fully executed PA in place. The PA has stipulations to address the development and implementation of identification, evaluation of cultural resources, and historic property treatment plans (HPTP). Specific mitigation measures would be developed to address any adverse effects on historic properties. Depending on the nature of the adverse effect, these could include the following:

- Redesigning the project to avoid historic properties or sensitive areas;
- Conducting data recovery excavations of archaeological sites that cannot be avoided or are discovered during construction, based on an approved HPTP;
- Monitoring all excavations in areas where buried resources are anticipated;
- Surveying and protecting exposed inundated cultural deposits;
- Protecting exposed archaeological sites from vandalism and erosion with fencing and revegetation, or capping sites in an approved manner with appropriate material;
- Preparing and implementing a discovery plan; if previously undiscovered resources are identified during an undertaking, suspend work while the resource is evaluated and mitigated to avoid any further impact. Continue to consult with Native American groups to identify any traditional cultural properties or resource uses and address impacts.
- Developing a plan of action, pursuant to NAGPRA; between the Corps, USFS, and interested Indian Tribes to manage the disposition and treatment of human remains should any be encountered during project implementation. The principle purpose of the plan will be to prevent halting construction, while the remains are disinterred, and to determine the cultural affiliation of any human remains, sacred objects or items of cultural patrimony.

3.15 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

This section discusses the regulatory setting relevant to socioeconomics and environmental justice, the demographic, economic, and social conditions in the project vicinity, and the potential socioeconomic and environmental justice impacts from the proposed Action Alternatives and support actions. A regional economic development (RED) report will be prepared for the selected alternative plan.

Delineating an appropriate area of influence (AOI) for this analysis is important, in order to adequately cover the effects on the population and economy and to generate information meaningful to project stakeholders and decision makers. Kern County was chosen as the AOI for socioeconomics and environmental justice because all of the physical risk reduction measures, borrow sites and material sources, staging and laydown areas, Crushing Plant, Batch Plant, traffic and transportation modifications, and recreation impacts would occur there. Data for California is presented for comparison and as a backdrop for the possible broader effects of the proposed project, and data for Bakersfield is presented where applicable since it is the largest metropolitan area in Kern County.

3.15.1 Regulatory Setting

NEPA and Executive Order 12898 concerning environmental justice provide direction on the analysis of social and economic effects that would be applicable to the selected alternative plan. NEPA calls for an analysis of socioeconomic effects, but a project cannot be terminated solely on the basis of socioeconomic impacts.

On February 11, 1994, President Clinton signed EO 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations. It requires that environmental analyses of proposed Federal actions address any disproportionately high and adverse human health or environmental effects on minority and low-income communities. Federal agencies' responsibility under this order also applies equally to Native American programs. In addition, each Federal agency must ensure that public documents, notices, and hearings are readily accessible to the public.

In April 1997, President Clinton signed Executive Order EO 13045, Protection of Children from Environmental Health Risks and Safety Risks. This EO requires Federal agencies to identify, assess, and address disproportionate environmental health and safety risks to children from Federal actions.

3.15.2 Affected Environment

This section describes the existing social, economic and environmental justice characteristics, as well as some projected data for the AOI. This information provides the baseline to evaluate potential impacts on socioeconomics and environmental justice resulting from the proposed Action Alternatives.

Socioeconomic conditions addressed are population, ethnicity, housing and schools and educational attainment, employment, employment growth, unemployment, income, earnings, and poverty. The population figures provided include the number of residents, growth, and projected growth; ethnicity and race data is presented to identify populations that could experience environmental justice effects. Housing includes numbers of units, ownership, and vacancy rates, and school enrollment and capacity are important considerations in assessing the effects of potential growth. Employment data take into account labor sectors, labor force, and statistics on unemployment. Income information is provided as per capita personal income, and earnings by industry show which Kern County industry sectors provide the greatest income.

The population in poverty and median income are presented as measures of potential low-income populations, and race and ethnicity data also are provided. If these population groups were disproportionately affected by an action, this effect would be an environmental justice impact.

Population and Housing

Table 3-80 presents the population characteristics of Kern County, Bakersfield, and California. As of January 2010, the population in Kern County was roughly 840,000, about 40 percent of which resides in Bakersfield. The population of Kern County grew by 23.1 percent between 1990 and 2000 and by 26.9 percent between 2000 and 2010. In comparison, Bakersfield grew by 43.2 percent and 37.3 percent during those two periods, and California grew by 14.6 percent and 14.1 percent. Between 1990 and 2010, Bakersfield grew by two percent more annually than Kern County, which grew by about 1.3 percent more than California each year on average.

Table 3-80
Population and Population Growth, Bakersfield, Kern County, and California

Location	1990	2000*	1990-2000 Percent Change	January 2010	2000-January 2010 Percent Change	Average Annual Growth 1990-2010	Average Annual Growth 2000-2010
Bakersfield	172,400	246,899	43.2	338,952	37.3	4.8	3.7
Kern County	537,300	661,653	23.1	839,587	26.9	2.8	2.7
California	29,558,000	33,873,086	14.6	38,648,090	14.1	1.5	1.4

*April 1, 2000, data
Source: CDF 2003, 2010a

Projected population growth from 2000 to 2040 is much greater in Kern County than in California. The differences are relatively consistent for each decade but are greatest between 2030 and 2040, when the population of Kern County is projected to increase by 26.2 percent and California to increase 10.2 percent (see Table 3-81). Both Kern County and California are projected to experience the greatest growth between 2010 and 2020 (29.4 percent and 14.2 percent). It is common for smaller regions to experience a greater percentage of growth than larger entities, due to the potential for migration among a larger number of smaller areas.

Table 3-81
Projected Population and Population Growth, Kern County and California

Location	January 2010	2020	2030	2040	January 2010-2020 Percent Change	2020-2030 Percent Change	2030-2040 Percent Change
Kern County	839,587	1,086,113	1,352,627	1,707,239	29.4	24.5	26.2
California	38,648,090	44,135,923	49,240,891	54,266,115	14.2	11.6	10.2

Source: CDF 2007a, 2010b

According to the US Census 2005 to 2009 American Community Survey Five-Year Estimates, children in Kern County (that is, the population under 18) comprised about 31.2 percent of the total population, the working-age population (ages 18 through 64) comprised 59.9 percent, and the population over the age of 65 comprised 8.9 percent. In the communities surrounding Isabella Lake (Bodfish, Kernville, Lake Isabella, Mountain Mesa, Squirrel Mountain Valley, Weldon, and Wofford Heights), the population of children was substantially lower than the county average. Mountain Mesa had the highest percentage under the age of 18 years, with 26.5 percent (US Census Bureau 2010c).

Housing vacancy rates and types are presented in Table 3-82. They provide a perspective on the availability of housing for a potential influx of population during project construction or growth in the long term as a result of project reoperation. Median values are presented to show the relative affordability of housing in the AOI region and the availability of housing for the construction workforce. Kern County, as of January 2010, has the highest number of occupants per household (3.156) and the highest percentage of mobile homes (9.4 percent), compared to Bakersfield and the State. Kern County also has the lowest percentage of multiple family units (17.7 percent) and the lowest rate of occupancy (90.1 percent), compared to Bakersfield and California. In general, Table 3-82 indicates that housing availability in Bakersfield is more limited than in the surrounding region of Kern County.

Table 3-82
Housing Characteristics, January 2010, Bakersfield, Kern County, and California

Location	Total Housing Units	Occupants per Household	Percent Single Family Units	Percent Multiple Family Units	Percent Mobile Homes	Percent Occupied	Number (Percent) Vacant
Bakersfield	116,692	3.041	73.9	23.7	2.4	94.5	6,376 (5.5 percent)
Unincorporated Kern County	113,831	3.125	70.7	11.3	18.0	84.7	17,391 (15.3 percent)
Kern County	281,735	3.156	72.9	17.7	9.4	90.1	27,778 (9.9 percent)
California	13,591,866	2.955	64.4	31.3	4.4	94.1	801,723 (5.9 percent)

Source: CDF 2010c

The communities surrounding Isabella Lake are part of unincorporated Kern County, which has the highest vacancy rate shown in Table 3-82 and a greater quantity of vacant housing than the City of Bakersfield. The availability of housing in areas such as Lake Isabella, Kernville, Wofford Heights, and Mountain Mesa may vary from this average. Lake Isabella has a 29 percent vacancy rate; 28 percent of its housing is rental housing; and the median home cost is $105,000. In Kernville the vacancy rate is almost 30 percent with nearly 21 percent rental and a median home value of $163,500. Wofford Heights has a vacancy rate of about 37 percent; an approximately 13 percent rental rate; and a median home value of $114,600. In Mountain Mesa the vacancy rate is roughly 23 percent; the rental rate is 15 percent; and the median house value is $142,100 (Sperling's Best Places 2011).

In 2008 the annual average median house value for Bakersfield, Kern County, California was $191,000, $183,333, and $467,000 (California Association of Realtors 2010). The annual median household income for the State was $61,017 higher than for Bakersfield and Kern County, but it made up only about 13 percent of the median of the value of the median-priced house. About 24 percent of the value of the median-priced house was covered by the annual median household income for Kern County ($44,716; US Census Bureau 2010b), indicating that potentially more residents in Kern County could afford the median-priced house than overall in the State.

Employment, Employment Growth, and Unemployment

As shown in Table 3-83, between 1990 and 2009, the labor force in Kern County increased by 42.8 percent, with the greatest increase occurring between 2000 and 2009 (25.0 percent). Similarly, the labor force in California increased between 1990 and 2009, but by a much lower percentage (20.3 percent), and most of that growth occurred between 1990 and 2000. These differing rates of growth between 1990 and 2009 reflect the greater rate of population growth in Kern County, compared to the State. The rate of unemployment in Kern County also was higher in 1990, 2000, and 2009 than the State average, although the gap between the two levels decreased each decade. Overall, the unemployment rate for both Kern County and California decreased between 1990 and 2000 and increased between 2000 and 2009 to levels greater than those shown for 1990, as a result of the nationwide recession that was particularly pronounced in California (CEDD 2010a and 2010c). By September 2010, the labor force in Kern County had decreased by 0.6 percent to 364,700, and the unemployment rate had increased to 15.1 percent (CEDD 2010b).

Table 3-84 presents employment levels and employment growth in Kern County and California. In both, employment grew between 1990 and 2009, although the percentage growth in Kern County (37.2 percent) was more than double that of the State (13.1 percent). In addition, employment growth in Kern County was comparatively consistent from 1990 to 2000 (17.7 percent) and from 2000 to 2009 (16.6 percent), whereas employment growth fell off sharply in California between 2000 and 2009 (CEDD 2010a, 2010c). By September 2010, employment in Kern County had decreased by 1.4 percent to 309,700 (CEDD 2010b).

Table 3-83
Labor Force and Unemployment, Kern County and California

	1990		2000		2009	
Location	**Labor Force**	**Unemployment Rate**	**Labor Force**	**Unemployment Rate**	**Labor Force**	**Unemployment Rate**
Kern County	257,000	10.9 percent	293,600	8.2 percent	366,900	14.4 percent
California	15,168,500	5.8 percent	16,857,600	4.9 percent	18,250,200	11.4 percent

Source: CEDD 2010a, 2010c

Table 3-84
Employment and Employment Growth, Kern County and California

Location	1990	2000	2009	Percent Change 1990-2000	Percent Change 2000-2009	Percent Change 1990-2009
Kern County	228,900	269,400	314,100	17.7	16.6	37.2
California	14,294,100	16,024,300	16,163,900	12.1	0.9	13.1

Source: CEDD 2010a, 2010c

As shown in Table 3-85, the dominant employment sectors in Kern County differ from those at the State level. The largest employment sectors in Kern County in 2009 (which is the most recent annual average) were farming (16.4 percent), local government (14.9 percent), and retail trade (9.4 percent), while professional and business services was the largest employer statewide (14.2 percent), with local government (12.1 percent) and retail trade (10.5 percent) as the second and third largest sectors (as they were in Kern County). These sectors continued to be the largest employers as of September 2010; however, both the retail trade and local government sectors saw job losses between 2009 and September 2010 in both Kern County and California. The sector with the greatest percentage of employment decrease in Kern County and California was construction, with a decrease of 15.4 percent and 11.1 percent. Farming saw the greatest percentage increase in employment in both Kern County and the State (5.2 percent and 14.3 percent).

Table 3-86 lists Kern County's major employers, by number of employees. As shown, the largest employers in Kern County are the military, health care, and farms and farm product producers.

Income and Earnings

As shown in Table 3-87, per capita personal income in Kern County (adjusted to 2008 dollars for an even basis of comparison) grew by only 0.5 percent between 1990 and 2000 and an additional 11.7 percent between 2000 and 2008. Over the same periods, the State average grew by 18.6 percent and 5.0 percent, while that in California grew by 29 percent and 4 percent.

Table 3-85
Percent Employment by Industry, Kern County, 1990 and September 2010

Industry Type	2009		September 2010*		Percent Change 2009-September 2010	
	Kern County	California	Kern County	California	Kern County	California
Total	272,400**	14,455,100**	266,500**	14,267,800**	-2.2	-1.3
Total farm	16.4	2.6	17.6	3.0	5.2	14.3
Mining and logging	3.6	0.2	3.7	0.2	-1.0	2.7
Construction	4.8	4.3	4.1	3.9	-15.4	-11.1
Manufacturing	4.8	8.9	5.0	8.8	0.0	-2.3
Wholesale trade	2.7	4.5	2.6	4.3	-6.8	-4.4
Retail trade	9.4	10.5	9.3	10.5	-3.5	-1.2
Transportation, warehousing and utilities	3.4	3.3	3.5	3.3	1.1	-1.9
Information	1.0	3.1	1.0	3.1	-7.1	-0.9
Financial activities	3.1	5.5	3.1	5.5	-3.5	-1.8
Professional and business services	8.8	14.2	8.9	14.5	-0.8	0.9
Educational services	0.7	2.1	0.7	2.2	-10.0	2.3
Health care and social assistance	8.8	9.9	9.1	10.1	1.3	0.2
Arts, entertainment, and recreation	0.9	1.7	0.9	1.6	-4.0	-4.8
Accommodation and food services	6.8	8.7	7.0	8.9	0.5	0.9
Other services	2.5	3.4	2.5	3.3	0.0	-1.8
Federal government	3.7	1.7	4.0	1.7	3.9	-2.1
State government	3.7	3.4	3.7	3.3	-2.9	-4.1
Local government	14.9	12.1	13.5	11.8	-11.3	-3.6

*Not seasonally adjusted and does not account for fluctuations in employment due to the influences of predictable seasonal patterns.
**Total number employed in all industries.
Source: CEDD 2010a, 2010b

Table 3-86
Major Employers in Kern County, 2010

Employer Name	Location	Industry	Number of Employees
Edwards Air Force Base	Edwards AFB	Federal Government-National Security	10,000+
Naval Air Warfare Center	Ridgecrest	Military Bases	5,000-9,999
US Navy Public Affairs Office	Ridgecrest	Federal Government-National Security	5,000-9,999
Bakersfield Memorial Hospital	Bakersfield	Hospitals	1,000-4,999
Bolthouse Farms	Bakersfield	Fruits and Vegetables-Brokers (Wholesale)	1,000-4,999
Chevron Corporation	Bakersfield	Oil Refiners (Manufacturers)	1,000-4,999
Grimmway Farms	Arvin	Fruits and Vegetables-Brokers (Wholesale)	1,000-4,999
Kern County Human Services Department	Bakersfield	County Government-Social/Human Resources	1,000-4,999
Kern County School Superintendent	Bakersfield	Schools	1,000-4,999
Kern Medical Center	Bakersfield	Hospitals	1,000-4,999
Marko Zaninovich, Inc.	Delano	Fruits and Vegetables-Growers and Shippers	1,000-4,999
Mercy Hospital	Bakersfield	Hospitals	1,000-4,999
Nabors Well Service Company	Bakersfield	Oil Well Services	1,000-4,999
San Joaquin Hospital	Bakersfield	Hospitals	1,000-4,999
State Farm Operations Center	Bakersfield	Management Services	1,000-4,999
Sun Pacific Farming	Bakersfield	General Farms-Primarily Crop	1,000-4,999
US Borax Inc.	Boron	Mining Companies	1,000-4,999
Frito-Lay Inc.	Bakersfield	Potato Chip Factories (Manufacturers)	500-999
Giumarra Vineyards Corp.	Bakersfield	Wineries (Manufacturers)	500-999
Human Services Dept.	Bakersfield	County Government-Social/Human Resources	500-999
John J Kovacevich and Sons	Arvin	Fruits and Vegetables-Growers and Shippers	500-999
Paramount Citrus	Delano	Food Products (Wholesale)	500-999
Paramount Farms	Lost Hills	Fruits and Vegetables-Growers and Shippers	500-999
TUV Industry Service	Ridgecrest	Contractors-Engineering General	500-999
US Naval Air Weapons Station	Ridgecrest	Federal Government-National Security	500-999

Source: CEDD 2010e

Table 3-87
Per Capita Personal Income, Kern County and California

Location	1990*	2000*	Percent Change 1990-2000	2008	Percent Change 2000-2008	Percent Change 1990-2008
Kern County	$26,777 ($16,255)	$26,903 ($21,517)	0.5 (32.4)	$30,047 ($30,047)	11.7 (39.6)	12.2 (84.8)
California	$35,219 ($21,380)	$41,758 ($33,398)	18.6 (56.2)	$43,852 ($43,852)	5.0 (31.3)	24.5 (105.1)

*Values presented in the tables are in constant 2008 dollars (adjusted based on Consumer Price Index) to provide a more accurate estimate on the real value of income increases. Values and percentage changes in parentheses are unadjusted.
Sources: BEA 2010b; BLS 2010

The data presented in Table 3-88 indicates that the local government, health care and social assistance, and mining industries provided the greatest earnings by workplace in Kern County. Educational services and arts, entertainment, and recreation provided the least earnings from employment. In California, professional, technical, and scientific services, manufacturing, and local government provided the greatest earnings. Mining and forestry and fishing and related activities provided the lowest earnings statewide.

Table 3-88
Earnings by Industry, Kern County and California, 2008

Industry Type	Thousands of Dollars		Percentage	
	Kern County	California	Kern County	California
Earnings by place of work	$18,288,207	$1,204,900,423	100.0	100.0
Farm earnings	$945,067	$9,994,442	5.2	0.8
Forestry, fishing, and related activities	$858,966	$6,672,205	4.7	0.6
Mining	$1,429,998	$4,630,204	7.8	0.4
Utilities	$202,896	$9,202,231	1.1	0.8
Construction	$1,338,691	$73,812,096	7.3	6.1
Manufacturing	$953,598	$125,793,173	5.2	10.4
Wholesale trade	$723,018	$62,026,176	4.0	5.1
Retail trade	$1,212,394	$76,516,815	6.6	6.4
Transportation and warehousing	$746,709	$33,929,774	4.1	2.8
Information	$194,527	$59,057,156	1.1	4.9
Finance and insurance	$422,925	$77,288,239	2.3	6.4
Real estate and rental and leasing	$183,446	$25,741,450	1.0	2.1
Professional, scientific, and technical services	$954,542	$143,643,774	5.2	11.9
Management of companies and enterprises	$173,642	$22,680,581	0.9	1.9
Administrative and waste services	$605,235	$48,123,502	3.3	4.0
Educational services	$46,968	$15,370,780	0.3	1.3
Health care and social assistance	$1,503,138	$104,252,176	8.2	8.7
Arts, entertainment, and recreation	$84,226	$20,533,003	0.5	1.7
Accommodation and food services	$425,313	$37,334,544	2.3	3.1
Other services, except public administration	$839,737	$46,673,128	4.6	3.9
Federal, civilian	$1,089,764	$24,460,074	6.0	2.0
Military	$302,183	$17,671,604	1.7	1.5
State government	$511,244	$36,088,653	2.8	3.0
Local government	$2,539,980	$123,404,643	13.9	10.2

Source: BEA 2010a

Key Industries Potentially Affected by the Proposed Isabella DSM Project

Several industries in the Kern County economy would be the most likely to be affected by the proposed Isabella DSM Project, regardless of which alternative is selected for implementation, whose impacts could be direct and indirect and temporary during construction and long term as a result of reoperating the dams and lake. These industries include recreation, agriculture, and hydropower generation.

Recreation

Isabella Lake provides an important public recreation resource, not only to residents but also to visitors, for example, from the Los Angeles area. Recreation at Isabella Lake and the surrounding land includes boating, swimming, fishing, hunting, cycling, hiking, horseback riding, picnicking, target shooting, off-highway vehicle (OHV) use, and camping. The USFS operates 12 developed campgrounds and one undeveloped campground in the Sequoia National Forest surrounding Isabella Lake and five boat ramps at the lake. In addition there are three privately operated marinas at the lake: North Fork, French Gulch, and Red's Kern Valley. Recreation downstream of the Isabella Lake dams include camping, picnicking, fishing, and whitewater boating. The whitewater boating season downstream of the lake has been historically extended through August by releases from the dam. Upstream of the lake, whitewater boating on the North Fork of the Kern River is limited to the spring runoff from April through May. A 1963 agreement between Kern County and recreation water users establishes a minimum lake volume of 30,000 acre-feet (Corps 2008b). Isabella Lake attracts visitors not only from Kern County but also from such urban areas as Los Angeles. Recreation facilities, opportunities, and use are more fully described in Section 3.12, Recreation.

As described in Section 3.12, Recreation, recreation visits play an important role in the regional economy. Non-local visitors spent more than $33 million annually to visit the Sequoia National Forest. Both local and non-local visitors spent $9 million on gas and oil, $6.8 million on groceries, $5.5 million in restaurants, and $3.2 million on souvenirs (Porterville Recorder 2011). In addition $76,700 was spent on the purchase of annual vehicle passes, about 65 percent of which were probably used at the Auxiliary Dam Recreation Area. The Annual Isabella Lake Fishing Derby alone brought in approximately $2.5 million in revenue for the communities surrounding Isabella Lake. Boating permits sold in the Lake Isabella area totaled $135,243.00 in 2011 (Whitener, 2011), and $660,938 in campground fees were collected in 2010 for the area around Isabella Lake.

The total effects on the Kern County economy from recreation visits to the Isabella Lake area were modeled using the MGM2 model, which was developed originally to estimate the effects of recreation expenditures in the regional economy by visitors to areas managed by the National Park Service (NPS). Although, the USFS manages the recreation at Isabella Lake and dams, its role in managing the area is similar to that of the NPS's management of national parks.

As identified in the Sequoia National Forest, Kern River Ranger District, Water Safety and Regulations on Lake Isabella, about two million tourists visit Isabella Lake annually (USFS 2010c). Table 3.17-10 provides a breakdown of visits by activity type, day and overnight use, and local visitors and visitors from outside the region. Visitation analyses provided in the Fiscal Year 2006 Visitor Use Monitoring Results for the Sequoia National Forest (USFS 2009b) were adjusted to exclude all trips for which the National Forest was not the intended destination to estimate the distribution of visitors among the types listed in Table 3-89. In order to obtain the number of visitor party nights that make up the input for the MGM2 model, the preparers used the average stay of 2.9 days (for overnight visitors) and the average party size of 2.9 visitors per party from the visitor use monitoring results. The report on Spending Profiles of National Forest Visitors,

Table 3-89
Isabella Lake Average Annual Visits

Visit Type	Percentage of Total Visits	Total Visits	Visitor Party Nights**	Total Party Nights** (Percentage)
Total visitors	2,000,000	2,000,000	647,973	100 percent
L-day user*	19.75	39,505,858	128,315	20 percent
NL-day user*	15.40	30,794,702	100,053	15 percent
Camp-in*	48.73	97,452,878	115,886	18 percent
Motel-out*	16.12	32,246,561	303,719	47 percent

*L-day user=Local visitor for day use; NL-day user=Visitor from over 50 miles away; Camp-in=Overnight visitors camping in the USFS-managed campgrounds surrounding Isabella Lake; Motel-out=Visitors in motel/bed-and-breakfast/cabin/rented condominium not managed by the USFS at Isabella Lake.
**Generated using MGM2 from USFS 2010e and USFS 2009b data
Sources: USFS 2010e, 2009b; Stynes et al. 2000; Tetra Tech 2011

NVUM Four Year Report (Stynes and White 2005) indicated that visitors to the Sequoia National Forest had a high spending profile. Since the most recent spending profile in the Stynes and White report indicated that visitor spending in the Sequoia National Forest was higher than average, the MGM2 high spending profile was used to compute expenditures in 2007 dollars. Regional economic impacts were obtained by applying the changes in spending to a set of economic ratios and multipliers for the region. The default multipliers for a typical rural region were selected for recreation at Isabella Lake.

Table 3-90 shows the total spending by visitor-type to Isabella Lake in 2007 dollars. The expenditures generated by current visitation levels and the consequent direct sales, jobs, personal income, and value added are presented in Table 3-91. The greatest economic activity was generated in the lodging sector, followed by restaurants and bars, then admissions and fees (other than camping fees). Overall, visitors to Lake Isabella generated $110,863,000 in direct sales, slightly more than 2,208 jobs, $41,181,000 in personal income, and $63,084,000 in value added (total sales less the cost of inputs). The direct effects are the economic impacts on firms receiving direct visitor expenditures. Secondary effects include both indirect effects (resulting from these firms spending the money generated by the initial visitor expenditure) and induced effects (a result of spending a portion of earnings paid to the employees in the original industry and the other indirectly impacted industries) from circulation of the original expenditures throughout the economy and captured by multipliers (Stynes et al. 2000; Colorado State Demography Office 2006).

Table 3-90
Isabella Lake Spending and Visits by Type

Visit Type	Visits in Party Nights	Average Spending	Total Spending (in Thousands)	Percent of Spending
L-Day User	128,315	$58.08	$7,452.60	7 percent
NL-Day User	100,053	$86.00	$8,604.60	8 percent
Camp-In	115,886	$108.25	$12,545.10	12 percent
Motel-Out	303,719	$261.77	$79,505.70	74 percent
TOTAL	647,973	$166.84	$108,108	100 percent

Sources: USFS 2010e, 2009b; Stynes et al. 2000; Tetra Tech 2011

Table 3-91
Economic Impacts of Visitor Spending: Direct and Secondary Effects

Sector/Spending Category	Direct Sales (in Thousands)	Jobs	Personal Income (in Thousands)	Value Added (in Thousands)
Lodging	$36,220	760.47	$15,798	$25,650
Camping fees	$2,764	32.13	$313	$754
Restaurants and bars	$24,301	570.08	$9,196	$10,378
Admissions and fees	$9,106	239.10	$3,307	$5,532
Other vehicle expenses	$1,041	14.09	$203	$463
Local transportation	$313	5.57	$169	$189
Grocery stores	$2,220	49.33	$849	$1,135
Gas stations	$2,800	42.18	$1,003	$1,303
Other retail	$6,136	139.01	$2,786	$3,894
Wholesale trade	$1,418	38.16	$767	$859
Total direct effects	$86,319	1,890.10	$34,391	$50,157
Secondary effects	$24,544	318.26	$6,790	$12,927
Total effects	$110,863	2,208.37	$41,181	$63,084
Multiplier	1.28	1.17	1.20	1.26

Sources: USFS 2010e, 2009b; Stynes et al. 2000; Tetra Tech 2011

Tourism expenditures by those from outside the area would generate new economic activity by spending at Isabella Lake area businesses. Although visitors to Isabella Lake also make these types of expenditures in the local economy for recreation, these users would make expenditures locally for other purposes, including alternate recreation opportunities, if Isabella Lake were not available to them. Therefore, they would already be contributing to the local economy. Nonresident travel expenditures in Kern County in 2009 averaged $88 per person per day, and the transient occupancy tax (TOT) revenue in the Kern River Valley (Bodfish, Glennville, Kernville, Lake Isabella, Mountain Mesa, Wofford Heights) was $160,849 (Kern County 2010). The TOT is for the privilege of occupying a room or rooms or other living space, in a hotel, inn, tourist home or house, motel, or other lodging (Justia.com 2010), for which changes in the revenue can be used as indicators of changes in recreation visitation. From 2007 to 2008, the TOT made up 5.1 percent of general revenues in Bakersfield, and 14.1 percent, 7.8 percent, and 6.6 percent of general revenues in Ridgecrest, Tehachapi, and Maricopa. TOT rates revised in

2009 ranged from zero to 12 percent (California Local Government Finance Almanac 2010).

Approximately 76 percent of visits to the SQF for which it was the intended destination (USFS 2009) were from outside the area, generating new economic activity within 50 miles of Isabella Lake. Applying this percentage to the two million visits to Isabella Lake results in 1,515,028 visits from outside the area (more than 50 miles away), or 637,237 party nights. Table 3-92 shows the economic activity produced these visitor expenditures from outside the local area.

Table 3-92
Economic Impacts of Non-Local Visitor Spending: Direct and Secondary Effects

Sector/Spending Category	Direct Sales (in Thousands)	Jobs	Personal Income (in Thousands)	Value Added (in Thousands)
Lodging	$29,209	613.27	$12,740	$20,686
Camping fees	$7,366	85.61	$835	$2,008
Restaurants and bars	$21,065	494.17	$7,971	$8,996
Admissions and fees	$8,816	231.47	$3,202	$5,355
Other vehicle expenses	$1,011	13.67	$197	$450
Local transportation	$335	5.96	$181	$203
Grocery stores	$2,614	58.10	$1,000	$1,336
Gas stations	$3,190	48.04	$1,142	$1,484
Other retail	$5,760	130.57	$2,614	$3,653
Wholesale trade	$1,515	40.76	$819	$917
Total direct effects	$80,880	1,721.63	$30,701	$45,089
Secondary effects	$23,314	301.51	$6,462	$12,318
Total effects	$104,194	2,023.13	$37,163	$57,407
Multiplier	1.29	1.18	1.21	1.27

Sources: USFS 2010e, 2009b; Stynes et al. 2000; Tetra Tech 2011

Agriculture

As identified above under employment, employment growth, and unemployment, farming was the largest source of employment in Kern County in 2009. That same year, the top five agricultural products in Kern County were grapes, milk, almonds, carrots, and citrus. There were 836,198 harvested acres out of 2,334,198 acres in agricultural use (including rangeland), with a total value of production of $3,606,498,000 (Kern County 2010b). The 2007 Census of Agriculture indicates that there were 2,117 farms in Kern County, covering a total of 2,361,765 acres. The average farm size was 1,116 acres, with an average market value of production of $1,513,532. Assuming 80 percent of this was from crop sales (the average for Kern County), the average market value of crop sales per farm was $1,210,826 in 2007 (NASS 2007).

The farming economy downstream of Isabella Lake depends on irrigation water. Releases to meet irrigation demands are made in accordance with the Kern River Water Master, in coordination with the Corps, unless a release is required for flood space. Both the SCE

Borel Canal Hydropower Facility and SCE Kern River 1 facility have water rights that must be met before the water districts supplied by Kern River are allowed to store water (North Kern Water Storage District 2010). Typically, agricultural releases from Isabella Lake are either spread to recharge the groundwater system or are used for irrigation. If releases exceed the downstream spreading capacity, flows are diverted to the Kern River-California Aqueduct Intertie and are no longer available for use. Flows in excess of the capacity of the intertie would result in downstream flooding.

Hydropower

Five hydropower facilities along the Kern River downstream of Isabella Lake could be affected by the alternatives. The SCE Borel Canal Hydropower Facility and the Isabella Partners Hydroelectric Facility are directly associated with the Isabella Lake facilities. The other facilities along the Kern River are SCE Kern River 1, PG&E Kern Canyon, and the Rio Bravo Power Project. Flows to these facilities and power generation vary, based on the time of year, the demand for power, and the natural water supply. The auxiliary dam diverts water to the Borel Canal, approximately six miles downstream to the SCE power plant, next to the canal. The SCE Borel plant has rights to receive the first 605 cubic feet per second of the flow from the North Fork of the Kern River north into Lake Isabella. The Isabella Partners Hydroelectric Facility has no water rights and generates power when water is available. In low water years, the Borel Canal facility benefits from the water stored in Isabella Lake to supplement its intake, as does the Isabella Partners facility (Bakersfield 2010).

The SCE Kern River 1 facility has rights to the first 412 cubic feet per second of the inflow to Isabella Lake, and PG&E Kern River receives a maximum of 600 cubic feet per second from the Kern River. The Rio Bravo facility has no rights to water but has the right to generate electric power if water is available. Availability is contingent on a flow of more than 335 cubic feet per second over its diversion dam (Bakersfield 2010). The weighted average wholesale price of electric power in California for December 13, 2010, was $38.98 per megawatt-hour.

Environmental Justice

According to CEQ and EPA guidelines established to assist Federal and State agencies in examining the potential for environmental justice impacts, the first step in conducting an environmental justice analysis is to define minority and low-income populations. Based on these guidelines, a minority population is present in a project study area if:

- The minority population of the affected area exceeds 50 percent, or
- The minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

The same rule would apply to the presence of a low-income population. A low income population is present if the project study area is composed of 50 percent or more people living below the poverty threshold, as defined by the US Census Bureau, or is significantly greater than the poverty percentage of the general population or other appropriate unit of geographic analysis.

The second step of an environmental justice analysis requires a finding of a high and adverse impact, which is discussed below under Section 3.15.3, Environmental Consequences.

As shown in Table 3-93, in both Kern County and California, Whites were the dominant racial group in 2008, forming about two-fifths of the population (42.6 percent of Kern County and 40.8 percent of California). Hispanics were the principal ethnic minority in both Kern County and the State, with 45.9 and 37.2 percent of the population. The Black population was a similar percentage of the total population of Kern County and California, at 5.4 and 5.8 percent; however, Asians formed a much greater proportion of the population of California (12.4 percent) than Kern County (3.5 percent).

Table 3-93
Race and Ethnicity (Percent of Total Population), Kern County and California, 2008

Location	White	Black	American Indian	Asian	Native Hawaiian	Multi-Race	Hispanic*
Kern County	42.6	5.4	0.8	3.5	0.1	1.6	45.9
California	40.8	5.8	0.6	12.4	0.4	2.8	37.2

*Hispanic is not a racial minority; it is an ethnic group that can belong to any race (White, Black, American Indian, Asian, Native Hawaiian, or Multi-Race).
Source: CDF 2010a

Table 3-94 provides median income and poverty statistics for Kern County and the state for 2008. Kern County's average median household income ($44,716) was more than $16,000 lower than that of California ($61,017); however, it was nearly $33,000 greater than the poverty threshold for individuals and almost $23,000 greater than the poverty threshold for a four-person household. The Kern County poverty rate was seven percent higher than the State average.

Table 3-94
Median Income and Poverty, Kern County and California, 2008

Location	Median Household Income	Poverty Threshold		Percent in Poverty
		Individual	Four-Person Household	
Kern County	$44,716	$10,991	$22,025	20.5 percent
California	$61,017	$10,991	$22,025	13.3 percent

Source: US Census Bureau 2010a, 2010b

As shown in Table 3-95, the Hispanic ethnic minority in Kern County is greater than the State average. In addition, as shown in Table 3-96, the median household income in Kern

Table 3-95
Race/Ethnicity Percentage, 2010

Location	White	Black	American Indian or Alaska Native	Asian	Native Hawaiian or Other Pacific Islander	Some Other Race	Multi-Race	Total Minority Races	Hispanic*
California	57.6	6.2	1.0	13.0	0.4	17.0	4.9	42.4	37.6
Kern County	59.5	5.8	1.5	4.2	0.1	24.3	4.5	40.5	49.2
Bakersfield	56.8	8.2	1.5	6.2	0.1	22.4	4.9	43.2	45.5
Bodfish	89.9	0.2	2.6	0.7	0.2	2.5	4	10.1	9.7
Kernville	90.1	0.1	1.4	0.5	0.0	2.4	5.6	9.9	5.9
Lake Isabella	88.5	0.2	2.8	0.5	0.2	2.1	5.7	11.5	9.8
Mountain Mesa	88.4	0.9	2.1	0.8	0.3	3.5	4.1	11.6	9.9
Squirrel Mountain Valley	93.1	0.4	1.6	0.2	0.0	2.4	2.4	6.9	4.0
Weldon	89.9	0.2	3.1	0.4	0.0	2.0	4.4	10.1	8.2
Wofford Heights	92.6	0.3	1.9	0.5	0.0	1.2	3.6	7.4	7.1
Census Tract 52.01	89.7	0.3	2.2	0.6	0.0	2.2	5.0	10.3	7.4
Block Group 3	92.3	0.0	1.5	0.5	0.1	2.4	3.2	7.7	7.8
Block Group 4	92.1	0.4	2.1	0.4	0.1	0.9	4.0	7.9	7.2
Census Tract 52.03	89.8	0.3	2.9	0.4	0.1	2.2	4.2	10.2	7.4
Block Group 1	89.8	0.2	2.3	0.5	0.1	1.3	5.9	10.2	9.3
Block Group 3	89.0	0.6	3.2	0.7	0.1	3.2	3.1	11	7.8
Census Tract 52.04	88.8	0.2	2.6	0.6	0.2	2.6	5.0	11.2	10.1
Block Group 1	88.1	0.3	2.6	0.6	0.0	4.8	3.6	11.9	12.0
Block Group 2	89.0	0.0	2.7	0.5	0.1	2.8	5.0	11	10.8
Block 2027	89.7	0.0	0.0	0.0	0.0	6.9	3.4	10.3	10.3
Block 2028	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
Block 2029	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
Block Group 3	87.7	0.2	2.8	0.6	0.4	1.9	6.4	12.3	10.2
Block Group 5	87.9	0.3	2.7	0.4	0.0	2.8	6.1	12.1	9.4

*Hispanic is not a racial minority; it is an ethnic group that can belong to any race (White, Black, American Indian, Asian, Native Hawaiian, or Multi-Race), so rows do not sum to 100 percent.
Source: US Census Bureau 2000d, 2000e

Table 3-96
Poverty and Median Household Income

Location	Census 2000 Percent in Poverty	Census 2000 Median Household Income	Census 2000 Average Household Size	Census 2000 Poverty Threshold	ACS 2010 Percent in Poverty	ACS 2010 Median Household Income	Census 2010 Average Household Size	Census 2010 Poverty Threshold
California	14.2	$47,493	2.87	$13,738	10.2	$60,883	2.9	$17,374
Kern County	20.8	$35,446	3.03	$13,738	16.8	$47,089	3.2	$17,374
Bakersfield	18.0	$39,982	2.92	$13,738	13.9	$53,997	3.1	$17,374
Bodfish	15.9	$22,368	2.17	$11,239	12.0	$82,266	2.2	$14,218
Kernville	17.3	$28,352	1.99	$11,239	8.4	$32,667	1.9	$14,218
Lake Isabella	20.5	$19,813	2.17	$11,239	8.5	$37,411	2.1	$14,218
Mountain Mesa	27.7	$23,875	2.19	$11,239	16.6	$36,850	2.4	$14,218
Squirrel Mountain Valley	2.5	$42,083	2.28	$13,738	0.0	$47,038	2.2	$14,218
Weldon	18.7	$22,857	2.20	$11,239	12.5	$45,903	2.3	$14,218
Wofford Heights	20.2	$24,326	1.94	$11,239	19.5	$35,102	1.9	$14,218
Census Tract 52.01	21.3	$25,063	2.06	$11,239	NA	NA	NA	NA
Block Group 3	16.9	$33,864	2.07	$11,239	NA	NA	NA	NA
Block Group 4	18.4	$24,750	1.93	$11,239	NA	NA	NA	NA
Block Group 5	21.4	$24,310	1.97	$11,239	NA	NA	NA	NA
Block Group 6	21.6	$36,944	2.49	$13,738	NA	NA	NA	NA
Census Tract 52.02	19.2	$22,368	2.20	$11,239	NA	NA	NA	NA
Block Group 2	21.2	$21,061	2.25	$11,239	NA	NA	NA	NA
Block Group 3	14.0	$30,899	2.15	$11,239	NA	NA	NA	NA
Block Group 4	34.7	$14,716	1.91	$11,239	NA	NA	NA	NA
Block Group 5	16.9	$23,365	2.31	$11,239	NA	NA	NA	NA
Block Group 6	15.2	$22,060	2.30	$11,239	NA	NA	NA	NA
Block Group 7	16.6	$21,645	2.18	$11,239	NA	NA	NA	NA
Block Group 8	20.9	$26,071	2.31	$11,239	NA	NA	NA	NA

*****NA=Not Available.

Source: US Census Bureau 2000c, 2000d, 2000e, 2010a, 2010f, 2010g, 2010h, 2010i, and 2010j

County is $16,301 below the State average; at 20.5 percent, the poverty rate is 7.2 percent higher than the State average. Both of these indicators signify that environmental justice populations are present in Kern County. Although these groups form less than 50 percent of the population, they are a measurably greater proportion of the population than the average for the State.

The most recent more-detailed data concerning the areas that might be directly affected by the project alternatives comes from the 2010 Census for Bakersfield and the Kern County Census Designated Places surrounding Isabella Lake; Census Tracts 52.01 and 52.03, and 52.04 which cover the area in Kern County surrounding Isabella Lake; Block Groups 3 and 4 of Tract 52.01, Block Groups 1 and 3 of Tract 52.03, Block Groups 1, 2, 3, and 5 of Tract 52.04, which are next to most of Isabella Lake; and Census Blocks 2027, 2028, and 2029 of Block Group 2 of Tract 52.04, which includes only the Lakeside Village Mobile Home Park and surrounding property below the auxiliary dam. Table 3-95 presents the ethnicity data for these areas, and Table 3-96 presents the poverty data for the subset of these areas for which data are available.The residents of the Lakeside Village Mobile Home Park on Eva Avenue in Lake Isabella (Census Blocks 2027, 2028, and 2029) would not be considered an environmental justice population based on race/ethnicity, according to US Census data from 2010. As shown in Table 3-96, none of the Census Designated Places, Census Tracts, or Block Groups surrounding Isabella Lake had total racial minority populations greater than the State average (42.4 percent) or Kern County average (40.5 percent). However, the percentage of racial minorities in the city of Bakersfield, which was within the area mapped for flooding in the Dambreak Inundation Mapping for Lake Isabella (Corps 2008a), was above both the county and State averages. However, it was not above 50 percent of the population. The percentage of Black population in Bakersfield was higher than the State and county averages; the percentage of Indian and Alaskan Native population was higher in most areas shown in Table 3-96 than these averages. The highest percentages were in Weldon and Block Group 3 of Census Tract 52.03; however, none were above 3.2 percent of the population. The percentages of the populations of Bodfish, Mountain Mesa, Lake Isabella, Census Tract 520.04, and Block Group 3 of Census Tract 52.04 made up of Hawaiians or Other Pacific Islanders exceeded the county average, but none was greater than the average for California. All were below 0.5 percent. The largest minority was of Some Other Race; however, the percentage in Bakersfield was the only one greater than the State average but it was below the county average. None were close to 50 percent or greater of the area population. The percentage of the populations of Kernville, Lake Isabella, Census Tract 52.01, Census Tract 52.03 Block Group 1, and Census Tract 52.04 Block Groups 2, 3, and 5 that were made up of more than one race were greater than the California and Kern County averages, but all were below seven percent. Kern County as a whole and Bakersfield had Hispanic or Latino populations that were more than one percentage point greater than the State average.

The most recent detailed data concerning median income and poverty in the areas that might be directly affected by the project alternatives comes from the 2000 Census for

Bakersfield and other Kern County cities and Census Designated Places; Census 2000 Tracts 52.01 and 52.02, which cover the area in Kern County surrounding Isabella Lake; Block Groups 3, 4, 5, and 6 of Tract 52.01 and Groups 2 through 8 of Tract 52.02, which are next to most of Isabella Lake; and Census Blocks 5015, 5029, 5030, and 5031 of Group 5 of Tract 52.02, which includes only the mobile home park and surrounding property below the auxiliary dam. 2010 Census data are available for the Census Designated Places (towns) surrounding Isabella Lake, but data are not yet available for smaller geographic areas. In addition, most of the 2010 data is derived from the American Community Survey (ACS) and presents five-year estimates from 2006 to 2010, and error margins in this data are often greater than 10 percent. Table 3-95 presents the poverty percentages, median household income levels, average household size, and poverty threshold for the areas that might be directly affected by the project alternatives from the 2000 Census and the limited information from the 2010 Census. In 2000 the percentage of the population in poverty in most of the areas shown in Table 3-95, except Squirrel Mountain Valley, was greater than the State average, and many were also above the county average (Mountain Mesa, Census Tract 52.01, Block Groups 5 and 6 of Census Tract 52.01, and Block Group 4 of Census Tract 52.02). Notably, the poverty percentage of the population of Block Group 5 of Census Tract 52.02 was lower than both the State and county averages.

Similar to the 2000 Census data, 2010 data indicates that most of the towns surrounding Isabella Lake had higher percentages of their populations living in poverty than the statewide average (10.2 percent); however, only Mountain Mesa's poverty level was greater than the Kern County average (16.8 percent). The median household income for Kern County ($47,089) was nearly $14,000 lower than the State average ($60,883). In both Bakersfield and Bodfish the median household income was higher than both the State and county averages. For the majority of the towns surrounding Isabella Lake, it was at or below the county average. Squirrel Mountain Valley had the lowest poverty rate of all of these areas at 0.0 percent, and its median household income was nearly equal to that of Kern County as a whole.

Based on the information presented in Tables 3-95 and 3-96, there is no evidence to suggest that the population of the Lakeside Village Mobile Home Park, just below the Auxiliary Dam, is an environmental justice population. Census Block Group data for 2000, updated for 2010 by the US Department of Housing and Urban Development (HUD), shows that approximately 48.1 percent of the population of Block Group 5 of Census Tract 52.02 falls within the income group defined by HUD as low to moderate income ($33,700 for a four-person household); about 21 percent would be considered low-income ($21,050 for a four-person household) and 22 percent very low income ($12,650 for a four-person household) (HUD 2007, 2010). Project information would be distributed to property owners and potentially affected persons and institutions without any distinction based on minority or income status; the populations that could be affected would be determined by their proximity to the Primary Action Area. Displacements would be to protect that population from potential exposure to public health hazards.

3.15.3 Environmental Consequences

This section addresses the potential direct and indirect impacts of the Action Alternatives on socioeconomic conditions within the AOI (Kern County). Impact analyses and conclusions are based on the existing and projected population, housing, employment, income, earnings, and environmental justice populations, summarized in Section 3.15.2. Changes in these indicators could result from construction and reoperation of the Isabella Lake dams, particularly form temporary or permanent population displacements, from changes to the economic contribution of the key industries that would be directly affected by construction and subsequent dam reoperation (mainly recreation, agriculture, and hydropower), and from the potential influx of construction population and expenditures in the local economy.

Scope and Methods

Criteria that were used to evaluate the intensity of impact on socioeconomic conditions and environmental justice were based on an assessment of impacts on the demographic, economic, and social factors described above that could measurably alter the economic conditions (the availability of employment and income), the accessibility of goods, infrastructure, and services, and the quality of life in the AOI. These types of impacts would be significant to the affected population. More specifically, a proposed project alternative would have a significant socioeconomic impact if it were to result in any of the following effects:

- Long-term increases in population that could not be accommodated by regional infrastructure (for example, housing, utilities, roads, hospitals, and schools) or services (such as police and emergency services);
- A reduction in the availability of affordable housing (which could occur either through a large increase in housing prices or a large decline in the supply of affordable housing);
- Long-term decrease in earnings or employment that would affect the regional economy;
- Long-term displacement of population that could not be accommodated within the region;
- Long-term displacement or disruption of local businesses that could not be accommodated within the region;
- A loss in community facilities, events, population, or major industry that would result in an overall loss in community cohesion; or
- Disruption of emergency services or creation of a public health risk that could not be avoided by the public, especially if it would particularly affect the health and safety of children.

Likewise, relevant factors in the analysis of environmental justice include a determination that there is a minority or low-income population in the impact zone; that high and adverse impact would result; and that the impact would be disproportionately high and adverse on the minority or low-income population either directly, indirectly, or cumulatively.

For this analysis, the methods used to estimate economic effects of proposed Action Alternatives varied with the economic parameters analyzed. In addition, the levels of analysis vary, based on the magnitude of the potential effects and availability of data. Therefore, a mix of quantitative and qualitative approaches was applied.

The potential socioeconomic impacts from the alternatives were evaluated relative to the No Action Alternative, based on the significance factors listed above. The analysis addressed identified key economic sectors and populations that would be affected by the alternatives, which included the following:

- Expenditures related to project construction;
- Effects on recreation during project construction and from reoperation of the dams and lake;
- Effects on agriculture during project construction and from reoperation of the dams and lake;
- Effects on hydropower during construction and implementation of the project alternatives; and
- Displacement impacts and effects on public health and safety, community growth, and community cohesion from construction and reoperation of the dams and lake.

The analysis considered both the potential beneficial and adverse regional socioeconomic effects of the proposed Isabella DSM Project. Analyzing the effects associated with potential dam failure and catastrophic flooding was beyond the scope of this analysis.

Effects on agriculture, hydropower production, recreation, and community factors are discussed mostly qualitatively. Construction-related expenditures are modeled using IMPLAN. The qualitative discussion of the impacts to recreation-related expenditures is based on the elimination of facilities, traffic disruptions, and noise, air quality, and visual effects that would occur during construction of the alternative actions.

IMPLAN is a regional input-output (I-O) computer modeling package that accounts for the inter-industry relationships within regions. I-O analyses use four main metrics to measure economic impacts: industry output, value added, labor income, and employment. Industry output refers to the value of goods and services produced in a region. Value added consists of four components: employee compensation, proprietor income, other property income, and indirect business tax. Labor income represents the sum of employee compensation and proprietor income. Lastly, employment is measured by the number of full- and part time jobs. The primary input variable for I-O analysis is the dollar change in purchases of products or services for final use, the “final demand.” Final demand changes drive I-O models. Industries respond to meet demands directly or indirectly by supplying goods and services to industries responding directly to final demand changes. The primary output variables are predicted changes in direct, indirect, and induced economic output, employment, and income for the affected industries within a study area.

Direct economic effects refer to the response of a given industry (i.e., changes in output, income, and employment) based on final demand for that industry. Indirect effects refer to changes in output, income, and employment resulting from the iterations of industries purchasing from other industries caused by the direct economic effects. Induced economic effects refer to changes in output, income, and employment caused by the expenditures associated with new household income generated by direct and indirect economic effects.

The measurement of direct, indirect, and induced linkages within a regional economy is based on the concept of a multiplier. A multiplier is a single number that quantifies the total economic effect resulting from direct effects. For example, an output multiplier of 1.7 for the “widget” production sector indicates that every $100,000 of widgets produced (the direct output of this industry) supports a total of $170,000 in business sales throughout the economy (total output of all industries), including the initial $100,000 in widget output. Several types of multipliers are incorporated into an I-O model, including output, employment, and income multipliers.

The IMPLAN (IMpact Analysis for PLANning) model was used to estimate regional economic effects of construction of any of the Action Alternatives as measured against the No Action Alternative. IMPLAN is a computer-driven system of software and data commonly used to perform economic impact analysis. Changes can be made to data elements to account for regional conditions when better information is available. The 2009 IMPLAN dataset for Kern County was used in the analysis, and no adjustments were made to the regional data. Impacts from construction may be both beneficial and adverse from a regional perspective. For example, it is likely that a large infrastructure project impacts regional employment beneficially due to infusion of new money into the regional economy and demand for construction labor and materials. However, there may be localized adverse revenue impacts to business owners directly affected by construction noise, accessibility, or traffic congestion.

Of interest from a regional economic perspective is new money that is infused into the regional economy as a result of the project. New money is usually defined as funds that are uniquely available for expenditure on the subject project, and would not otherwise enter the regional economy. It was assumed that 65 percent of construction cost would be an infusion of new money into the economy that would not have been available for spending in the region if not for this project. The cost estimate was distributed among four IMPLAN sectors (dam and reservoir new construction, ready-mix concrete, new construction nonresidential, and erosion control) for analysis within IMPLAN.

Generally, a project is expected to promote growth if it contributes substantially to the population or economics of the area. In addition, each municipality or county controls growth in their respective areas through land use and growth policies. Other socioeconomic considerations also directly influence area growth, including birth rates, age distribution, immigration, and favorable economic, social, cultural, and housing conditions.

Community cohesion is generally defined as the degree to which residents feel a sense of belonging to their neighborhood or municipality. Other important measurements include the level of commitment residents feel to the community and the level of attachment residents have to certain neighbors, groups, or institutions. Generally, these levels are higher as a result of continued association over time. Major impacts on community cohesion are commonly caused by displacements to important community businesses, centers of community interactions (churches, community centers, recreation areas) or large tracts of residences. Impacts can also occur through a project separating or dividing individual communities. Finally, visual impacts can affect the quality of adjacent communities, which can sometimes affect community cohesion, depending on the severity of the impact.

The CEQ guidance for the evaluation of environmental justice impacts indicates that when determining whether the effects are high and adverse, agencies are to consider whether the risks or rates of impact "are significant (as employed by NEPA) or above generally accepted norms." The final step requires a finding that the impact on the minority or low-income population be disproportionately high and adverse. Although none of the published guidelines define the term "disproportionately high and adverse," CEQ includes a qualitative definition stating that an effect is disproportionate if it appreciably exceeds the risk or rate to the general population.

As defined in EPA's Final Guidance for Incorporating Environmental Justice Concerns, for the purposes of an environmental justice screening, the study area is at least a six-mile radius surrounding the project site. To use a comparable distance in this analysis, data from the US Census Bureau, 2000 Census, for race and poverty status was obtained. Census tracts near the project were included in this analysis.

No Action Alternative

Implementing the No Action Alternative would not generate additional construction-related economic activity since water operations at Isabella Lake would continue in accordance with the established Water Control Plan and Flood Control Diagram. No new structures would be constructed, and no structures would be removed. Thus there would be no construction-related expenditures for the Isabella Lake dams that would generate economic activity in the region, No recreation-related closures or reduced visitation would be anticipated under the No Action Alternative, and visitation and recreation expenditures and the income and employment generated by them would continue, as identified in Section 3.17.2, Affected Environment.

Implementation of the No Action Alternative would maintain Kern River flows to the Kern River water districts to supply agricultural users, in accordance with current practices. Therefore, this alternative would be unlikely to alter the economics of agriculture. Water would continue to be supplied to the SCE Borel Canal and SCE Kern River 1 hydropower facilities from the Kern River North Fork and Kern River, respectively, in accordance with the rights afforded to them; the Isabella Partners, PG&E Kern Canyon, and Rio Bravo facilities would continue to generate power, based on the availability of water, once these and any other upstream rights have been satisfied and water levels required for fish habitat have been achieved. This alternative does not represent a change in the value of hydropower that could be produced; however, the likelihood and consequences of dam failure would continue and, with it, the risk of disruption of flows to these facilities and the potential for lost power generation and its associated costs.

Impacts on or displacement of any particular population (including environmental justice populations) also would not occur. This alternative would have no impacts on public health and safety from exposure to noise, degraded air quality, or reduced access to emergency services. It would not displace or impact businesses and recreation, generate community growth, or interrupt community cohesion.

The continued unacceptably high likelihood of dam failure under this alternative would retain the potential for long-term, significant adverse impacts on the regional economy, primarily attributable to declines in business production from structural inundation and flooding of farmland, and public health and safety.

Alternative Base Plan

Implementation of the Alternative Base Plan would generate construction expenditures and demand for construction labor. Construction expenditures and the demand for construction labor would provide temporary short-term benefits (increased employment and income) to the regional economy. In addition, project implementation would support a number of Federal employees, primarily Corps staff, to provide pre-engineering and design, construction management, and oversight. Expenditures on construction goods, materials, and equipment that are made in the region would generate additional economic benefits as spending ripples through the local economy via inter-industry links. Further, both construction and Federal workers would be spending their wages, in part, in the local economy, generating additional economic activity. Therefore, construction expenditures would provide a short-term benefit to regional earnings and employment. Because the Alternative Base Plan would involve the fewest modifications of the alternative actions, the contribution of construction expenditures to the local economy would be the lowest of the alternative actions and would also be over the shortest duration (4.5 years). There would be less-than-significant beneficial impacts on the regional economy from expenditures and labor.

The employment effect to the industries would vary by alternative. For the Alternative Base Plan, average annual employment impacts during its 4.5 years of construction for industries are shown in Table 3-97.

The Alternative Base Plan is estimated to annually create 141.1 direct employment opportunities and an additional 87.5 jobs indirectly or induced. The top ten employment sectors for the Alternative Base Plan are shown in Table 3-98.

Table 3-97
Impact Detail for Employment – Alternative Base Plan

Industry	Direct	Indirect	Induced	Total
Total	141.1	37.7	49.8	228.6
Agriculture	0.0	0.0	0.2	0.2
Mining	0.0	0.2	0.0	0.2
Construction	136.1	0.3	0.5	136.8
Manufacturing	4.1	0.8	0.1	5.0
TIPU	0.0	3.5	1.1	4.6
Trade	0.0	4.8	11.9	16.7
Service	0.9	27.9	35.3	64.0
Government	0.0	0.3	0.8	1.1

Table 3-98
Top Ten Employment Sectors – Alternative Base Plan

Sector	Description	Total Employment
36	Construction of other new nonresidential structures	133.6
369	Architectural, engineering, and related services	12.2
413	Food services and drinking places	7.8
161	Ready-mix concrete manufacturing	4.3
394	Offices of physicians, dentists, and other health practitioners	3.9
382	Employment services	3.7
335	Transport by truck	3.1
329	Retail Stores - General merchandise	3.0
39	Maintenance and repair construction of nonresidential structures	2.9
324	Retail Stores - Food and beverage	2.7

The labor income impacts (employee compensation and proprietary income) for the top employment sectors estimated by the IMPLAN model are described below in Table 3-99.

Table 3-100 presents the IMPLAN estimates of the value added (employee compensation, proprietary income, other property type income, and indirect business taxes) impacts for the regional economy for the Alternative Base Plan.

Sector output impacts estimated by IMPLAN sector are shown in Table 3-101.

Annual industry and summary impacts for the Alternative Base Plan are shown in Tables 3-102 and 3-103.

Table 3-99
Top Ten Industries for Employment Labor Income - Alternative Base Plan

Sector	Description	Labor Income
36	Construction of other new nonresidential structures	$8,502,999
369	Architectural, engineering, and related services	$898,445
413	Food services and drinking places	$165,906
161	Ready-mix concrete manufacturing	$275,525
394	Offices of physicians, dentists, and other health practitioners	$277,709
382	Employment services	$97,851
335	Transport by truck	$167,155
329	Retail Stores - General merchandise	$87,222
39	Maintenance and repair construction of nonresidential structures	$176,263
324	Retail Stores - Food and beverage	$92,721

Table 3-100
Top Ten Industries for Employment Value Added - Alternative Base Plan

Sector	Description	Value Added
36	Construction of other new nonresidential structures	$9,663,513
369	Architectural, engineering, and related services	$949,105
413	Food services and drinking places	$235,885
161	Ready-mix concrete manufacturing	$417,045
394	Offices of physicians, dentists, and other health practitioners	$296,257
382	Employment services	$116,522
335	Transport by truck	$215,071
329	Retail Stores - General merchandise	$141,912
39	Maintenance and repair construction of nonresidential structures	$208,717
324	Retail Stores - Food and beverage	$150,572

Table 3-101
Top Ten Industries for Employment Total Output - Alternative Base Plan

Sector	Description	Total Output
36	Construction of other new nonresidential structures	$19,392,350
369	Architectural, engineering, and related services	$1,604,774
413	Food services and drinking places	$457,308
161	Ready-mix concrete manufacturing	$1,380,439
394	Offices of physicians, dentists, and other health practitioners	$492,846
382	Employment services	$143,735
335	Transport by truck	$457,409
329	Retail Stores - General merchandise	$163,200
39	Maintenance and repair construction of nonresidential structures	$375,105
324	Retail Stores - Food and beverage	$174,108

Table 3-102
Impact Summary - Alternative Base Plan

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	141.1	$8,936,694	$10,267,206	$21,076,624
Indirect Effect	37.7	$2,115,596	$2,899,543	$5,015,737
Induced Effect	49.8	$1,972,774	$3,635,728	$5,806,704
Total Effect	228.6	$13,025,064	$16,802,477	$31,899,065

Table 3-103
Industry Impacts - Alternative Base Plan

Industry	Employment	Labor Income	Value Added	Output
Construction	136.8	$8,699,556	$9,897,411	$19,813,898
Service	64.0	$2,986,755	$4,815,087	$7,918,098
Trade	16.7	$633,969	$1,014,917	$1,223,901
Manufacturing	5.0	$321,840	$517,283	$1,773,859
TIPU	4.6	$277,896	$453,947	$886,035
Government	1.1	$79,248	$65,510	$213,148
Agriculture	0.2	$11,507	$14,892	$30,227
Mining	0.2	$14,293	$23,429	$39,898

Construction of the Alternative Base Plan may adversely affect recreation at Isabella Lake if recreation facilities were closed, activities were restricted to accommodate construction, or recreation use declined as a result of low lake levels and reduced fishing catches. Reduced recreation use, in turn, would affect recreation-related spending patterns and therefore local economic activity, resulting in temporary adverse impacts on income and employment in the region, particularly in the small towns surrounding the Lake. The 2008 Final Environmental Assessment for Planned Deviation from the Water Control Plan, Isabella Dam and Lake, Kern County, California (Corps 2008b) indicates that the economic activity of the small businesses near the lake is derived in part by expenditures by recreation visitors. Use restrictions and a potential perceived decrease in recreation quality over the 4.5 year construction period could divert business away from the nearby towns of Wofford Heights, Kernville, South Lake, Mountain Mesa, and Lake Isabella.

The supply of construction materials and construction staging areas would occupy several recreation areas: the Main Dam Campground, the Auxiliary Dam Recreation Area, and Launch 19. As identified in Section 3.12, Recreation, the Auxiliary Recreation Area is the primary public access point to the lake. Eliminating these recreation areas during construction could result in increased congestion in other areas. The Corps is investigating implementation of several measures to minimize the potential effects of construction on the Isabella Lake recreation experience and its economic contribution to the surrounding communities and Kern County, including potentially expanding the area available at the Old Isabella recreation site, particularly during the time of the fishing derby, and adjustments to the construction schedule to accommodate short-term spikes in tourist and/or recreation-related traffic in the Isabella Lake area that may be associated with special local events.

Exposure of the Borel Canal that occurs most years at lower lake levels has presented access issues for suppliers and visitors with disabilities to the North Fork Marina, since the marina must place a temporary walking bridge before installing the portable load-bearing vehicle bridge (Corps 2008b). The reduction in the level of the lake during construction and removal of the rock fill coffer dam and the construction of the Upstream Berm on the Auxiliary Dam could increase the distance between facilities and the lake and could contribute to the exposure of the Borel Canal. This may affect recreation and recreation-related expenditures in the short term during these construction periods.

Since there would be no decrease in pool elevation over most of the construction period from the IRRM level that has been in effect since 2008, the number of visitors during construction would not likely be greatly affected by the pool level. The Final EA for the Isabella Lake Planned Deviation from the Water Control Plan found no significant effects to recreation because reservoir conditions under IRRM would be similar to those during lower than normal water years (Corps 2008b). However, if construction noise and disturbance resulted in low fish catches and traffic congestion and limited facilities caused a decreased appeal for the area for tourism during construction, visitation would decrease, which would reduce the economic activity in Kern County associated with recreation and services at Isabella Lake. There may be increased demand for lodging by workers which could reduce room availability for recreation. This would likely result in some decreases in employment and income during the 4.5 years of construction that would be felt more acutely in the nearby towns of Wofford Heights, Kernville, South Lake, Mountain Mesa, and Lake Isabella. Because planned recreation events would continue, community cohesion would be unlikely to be affected. Short-term impacts on the recreation-based economy in the immediate Isabella lake area would be adverse, moderate, but less-than-significant.

Once the Alternative Base Plan is completed, visitation and visitor expenditures for recreation at Isabella Lake would return to at least pre-construction levels. In general, the demand for recreation regionally would increase with increased population and incomes, the presence of visitor facilities, increased recreation quality, and visually pleasing surroundings. Increased transportation costs and the availability of alternate recreation sites could decrease the level of visitation beyond the construction period. Assuming that many of the recreation visitors to Isabella Lake would be from the Los Angeles area, the level of external visitation would be expected to increase, since the population of Los Angeles County is projected to increase between 2010 and 2050.

Changes in the frequency and volume of water releases during construction also could affect the efficiency of agricultural production in the Kern River Valley in the short term. However, restrictions below the level of the IRRM would occur only over a two-month period that would not be during the typical irrigation season. The total economic effect on agriculture in Kern County of maintaining water storage in Isabella Lake during construction at the IRRM level would depend on annual precipitation levels and if the water that would have been stored in Isabella Lake could be used for municipal uses and groundwater aquifer recharge, if it could be stored in the Buena Vista or Tulare Lake

Beds, if it would have to be diverted to the Kern River-California Aqueduct Intertie, or if it would result in flooding. The farming economy downstream of Isabella Lake depends on irrigation water; therefore, releases of inflows during construction could reduce the available water supply during the irrigation season from March 20 through September 20, which would likely increase the cost of water to farmers. It is likely that releases to preserve the lake level at 2,589.26 feet during construction would increase in magnitude and frequency during the peak runoff months in the spring to remove water from the construction site than would occur under the No Action Alternative, which would limit the water available in the drier summer and fall. This reduction could be mitigated in part by storing excess surface water releases at alternate locations, such as by spreading or in the Buena Vista and Tulare Lake Beds.

The 2008 Final Environmental Assessment for the Planned Deviation from the Water Control Plan indicates that irrigation water that normally would have been stored at Isabella Lake would increase water management costs by approximately $5 per acre-foot for operation and maintenance to spread the water and about $65 per acre-foot to extract the water by pumping from the aquifer, which would accrue to the local agencies responsible for managing this water supply (Corps 2008b). Farms supplied with irrigation water from Isabella Lake could experience reduced crop production, with more fallow fields during construction, if additional releases of surface water that would be contained in Isabella Lake under the No Action Alternative could not be stored. However, this would not differ from the existing condition at Isabella Lake.

The Corps anticipates that downstream irrigators have sufficient in-ground and surface storage to handle excess and pre-irrigation-season releases of Isabella Lake water. Should pre-irrigation-season releases from Isabella Lake to downstream irrigation districts be needed to maintain the IRRM lake level construction conditions or during the period that the lake would be maintained at 2,543.76 feet for construction of the coffer dam and the Upstream Berm on the Auxiliary Dam, arrangements would be made between the Corps and the downstream users to store the pre-irrigation-season water for use during the irrigation season to minimize the economic effects on the downstream farm economy.

Irrigation water storage and supply at Isabella Lake would be restored to the full authorized use once construction is completed, which would return water supply costs and allow for adjustments in productivity to levels similar to those in effect before construction. However, there could be a long-term effect on the depth to groundwater and the consequent costs of pumping as a result of the groundwater pumping to meet irrigation demands during the construction period in lieu of surface water use from Isabella Lake, as would occur under existing conditions. Pumping the difference between the supply from Isabella Lake and irrigation demands could lower the groundwater table, increasing the costs of extraction, which could result in a long-term decrease in earnings in the regional economy. The extent of this effect would depend on the amount of storage and spreading that occurs to recharge the aquifer and the precipitation levels during construction. Adverse impacts on water supply for agriculture would be low, short-term and less-than-significant.

The retention of a lake level at 2,589.26 feet during construction would not result in a reduction in storage in Isabella Lake during construction and would not alter the economic conditions of hydropower production from current operations under the IRRM management, except for potentially the during the construction of the proposed coffer dam and the Upstream Berm on the Auxiliary Dam and an approximate four-foot reduction in the IRRM when the coffer dam is in place. As under the IRRM conditions that have been in effect, during periods of low flow in the North and South Forks of the Kern River, the Borel Facility would be less likely to supplement its intake and would produce less power, and SCE Kern River 1 also would be likely to produce less power. If flows were not great enough to supply SCE Borel Canal and SCE Kern River 1, which have water rights, the other hydropower generating facilities would be less likely to produce electric power as well. It is possible that in the dry months during construction of the Main Dam and Spillway Alternatives, hydroelectric power generation would be reduced as a result of the construction-period limits on storage at Isabella Lake. However, these conditions would not represent a project-related change to the existing economic conditions for hydropower on the Kern River, except potentially during December 2016 and January 2017. The weighted average wholesale price of electric power in California for December 13, 2010, was $38.98 per megawatt-hour, which would be the value of the loss of one megawatt-hour to each facility. The Corps would ensure that the expected flows under agreement with the downstream users, including the SCE facilities, are provided to minimize this potential short-term impact. Adverse impacts on water supply for power generation would be low, short-term and less-than-significant.

Travel on SR 155 and SR 178 would likely be disrupted during construction of the Main Dam and Spillway Alternatives, since both roads would be used as haul routes from the various construction staging and materials supply areas. Traffic along these roads becomes congested mainly during peak tourism seasons and annual events, particularly in Kernville (Kern County 2011b). Because tourism along Isabella Lake would be reduced during construction of this alternative, some of the traffic volume would be reduced. However, the potential for delays and access issues would occur, particularly for residents of Wofford Heights traveling south toward Lake Isabella, for residents of Lake Isabella traveling north to Wofford Heights, Kernville, and the Sequoia National Forest in Kern County, and for visitors traveling from Southern California for recreation in the Sequoia National Forest. These issues also could occur to travelers from Weldon, Bella Vista, South Lake and Mountain Mesa toward Lake Isabella and Bakersfield. Traffic delays could inhibit some recreation visitors, which could decrease the level of economic activity in Kern County beyond that of the restrictions at Isabella Lake; however, these delays also could result in drivers stopping at businesses in Kern County, which they might not otherwise do. These traffic delays are not expected to result in a barrier between consumers and local businesses but could cause slightly higher individual fuel use and costs.

The Corps has not yet determined what actions would be required to maintain public health and safety. However, the Alternative Base Plan could require the temporary or permanent displacement of residents but would not likely require the temporary or permanent displacement of businesses. If the Corps should determine that relocations would be required to protect public health and safety, all property acquisitions would be conducted in compliance with Federal and State relocation laws, and relocation would be in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 United States Code, Section 4601 et seq.), and implementing regulation, 49 Code of Federal Regulations, Part 24. This law requires that appropriate compensation be provided to displaced residential and nonresidential landowners and tenants and that residents be relocated to comparable replacement housing and receive relocation assistance. Provisions include relocation advisory services, moving costs reimbursement, replacement housing, and reimbursement for related expenses and rights of appeal. Compensation for living expenses would be provided for temporarily relocated residents and negotiations regarding any compensation for temporary loss of business would cover temporary relocations. This law applies to residential relocations as well as farms and businesses if they would be displaced for any length of time. If relocations are required, the impacts on a small number of affected parties would be long-term, high and adverse, and possibly significant. The above-mentioned relocation provisions and other mitigations would reduce these potential impacts to less-than-significant levels.

The proximity of activities in Staging Areas A2 and A3, along with construction at the Auxiliary Dam, could require the temporary or permanent displacement of residence during construction to ensure the health and safety of those residents. As identified in Section 3.17.2, the 2000 Census does not provide an indication that these residents would be an environmental justice population. However, the data adjusted by HUD indicates a high percentage of low- to moderate-income households in Census Block Group 5 of Census Tract 52.02. More recent 2010 Census data for 2010 Census Tract 52.04, Blocks 2027, 2028, and 2029 also indicates that the residents would not be considered an environmental justice population, based on race or ethnicity (US Census 2010e). If the Corps should determine that relocations would be required to protect public health and safety, all property would be acquired in compliance with Federal and State relocation law, and relocation services would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act.

The construction and demolition associated with the Alternative Base Plan are likely to produce some adverse health and safety effects from increased noise levels and decreased air quality and the presence of heavy equipment and potentially hazardous substances in the construction/demolition area. These potential adverse effects would be most prevalent in the areas surrounding the project's features. Where these areas are close to residential areas and other sensitive land uses, direct construction-related effects on health and safety are expected. Stone crushing and mixing and placing concrete, soil, and rock materials, removing structures, and transporting materials would be accompanied by some temporary increase in noise level, limited decrease in air quality, and the potential for safety concerns associated with exposure to heavy equipment or hazardous substances (such as oils and fuels for this equipment). However, the effects of these activities on public health could be minimized by implementing site-specific safety plans, temporarily relocating residents near hazardous areas, posting signs, erecting fencing, imposing dust control measures, and dispersing information on construction timing and activity to the public. In addition, these effects would be temporary and localized and would be unlikely to result in construction-related indirect effects on health and safety.

Project information would be distributed to property owners and potentially affected persons and institutions without any distinction based on minority or income status; the populations that could be affected by these health and safety risks would be determined by their proximity to the proposed project. Although environmental justice populations could be present nearby (particularly in Mountain Mesa, Lake Isabella, and Wofford Heights), they would not be subject to a high and adverse impact, and they would not be disproportionately affected. These impacts are expected to be less-than-significant.

The site safety measures would be equally protective of the health and safety of children, as well. As described in Section 3.15.2, Affected Environment, Population and Housing, the percentage of the populations of the towns surrounding Isabella Lake under the age of 18 is substantially lower than the county average, which reduces the likelihood that children living in these areas would be affected. In addition, there would not be centers where children would congregate (such as playgrounds, day care facilities, and schools) at the construction site or proposed staging area. These potential health and safety issues would be temporary and would not result in long-term disproportionately high and adverse impacts on residents, including environmental justice populations or children.

The Alternative Base Plan would not require relocating or displacing any emergency or health-related public services. Increased levels of construction in the project area raise the possibility of emergency services experiencing increased activity responding to work-related injuries. However, given standard construction health and safety practices, it is unlikely that any incremental increase in emergency services demand would be significant. Roadway detours and lane closures during construction could delay emergency vehicles. However, notifying the public and emergency services of roadway closures and detours in advance and posting signs should minimize these delays and the potential for health and safety effects. Thus, construction-related indirect effects on health and safety would be minimal, in regard to access to emergency services. These impacts are expected to be less-than-significant.

The Alternative Base Plan would result in the increased construction-related direct and indirect economic activity described above over the 4.5 year construction period. However, the project is not expected to contribute to a rise in area population, directly or indirectly, during construction, except for an increase due to an influx of construction workers, 60 of which would be anticipated to reside in Bakersfield and 60 of which would be anticipated to reside in the area surrounding Isabella Lake each year. As identified in Section 3.15.2 Affected Environment, Population and Housing, it appears that there would be adequate housing vacancy in both Bakersfield and surrounding Isabella Lake to accommodate the Alternative Base Plan construction workers. Thus, the construction of the project alternatives is not expected to affect community growth, either directly or indirectly.

A large temporary population with potentially different values than and few ties to the surrounding communities, yet placing demands on community resources, could strain community cohesion during construction. Following construction, the departure of a large group of temporary residents also could require adjustment in community attitudes. However, the workforce anticipated for this alternative that would reside in the project area (60 workers annually) would represent less than one percent of the combined population of Kernville, Wofford Heights, Lake Isabella, Mountain Mesa and Bella Vista and 1.7 percent of the 2010 population of Lake Isabella alone. A construction population of 60 workers in Bakersfield would represent less than 0.1 percent of the population (US Census Bureau 2010d).

Completion of the Alternative Base Plan and the return of water operations to the levels mandated in the water plan, the return of recreation to Isabella Lake, and the redevelopment and re-operation of recreation facilities surrounding the lake, could draw more visitors to the area than under the No Action Alternative. This could beneficially affect economic growth and potentially population growth. In the overall region of socioeconomic influence, these potential changes would likely be relatively small. Impacts are anticipated to be low, short-term and less-than-significant.

Construction of the Alternative Base Plan is not expected to displace important community institutions. However, the temporary reduction in recreation at Isabella Lake during construction could cause visitors to travel to unaffected points of recreation. This drop in attendance over the construction period could affect cohesion in Wofford Heights, Lake Isabella, and Kernville, which cater to outdoor recreation visitors associated with Isabella Lake and shoreline activities. In the long term, the Alternative Base Plan could increase community cohesion through the safer dam configuration, improved recreation facilities, unrestricted and more reliable water storage, and availability for recreation and community events.

Alternative Plan 1

Construction of Alternative Plan 1 would have the same impacts to socioeconomic and environmental justice resources as described above under the Alternative Base Plan, except that the greater construction expenditures under Alternative Plan 1 would generate the greater economic activity described below over a longer construction period. Annualized income and employment would be generated over a 4.9-year period (59 months).

For Alternative Plan 1, average annual employment impacts during its 4.9 years of construction for industries are shown in Table 3-104.

Alternative Plan 1 is estimated to annually create 147.3 direct employment opportunities and an additional 91.2 jobs indirectly or induced. The top ten employment sectors for the Alternative Plan 1 are shown in Table 3105.

Table 3-104
Impact Detail for Employment – Alternative Plan 1

Industry	Direct	Indirect	Induced	Total
Total	147.3	39.2	52.0	238.5
Agriculture	0.0	0.0	0.2	0.2
Mining	0.0	0.1	0.0	0.2
Construction	142.8	0.3	0.5	143.6
Manufacturing	3.7	0.8	0.1	4.7
TIPU	0.0	3.4	1.1	4.6
Trade	0.0	5.0	12.4	17.5
Service	0.8	29.1	36.8	66.7
Government	0.0	0.3	0.8	1.2

Table 3-105
Top Ten Employment Sectors – Alternative Plan 1

Sector	Description	Total Employment
36	Construction of other new nonresidential structures	140.6
369	Architectural, engineering, and related services	12.8
413	Food services and drinking places	8.1
394	Offices of physicians, dentists, and other health practitioners	4.0
161	Ready-mix concrete manufacturing	3.9
382	Employment services	3.8
329	Retail Stores - General merchandise	3.1
335	Transport by truck	3.1
324	Retail Stores - Food and beverage	2.8
39	Maintenance and repair construction of nonresidential structures	2.6

The labor income impacts (employee compensation and proprietary income) for the top employment sectors estimated by the IMPLAN model are described below in Table 3-106.

Table 3-107 presents the IMPLAN estimates of the value added (employee compensation, proprietary income, other property type income, and indirect business taxes) impacts for the regional economy for Alternative Plan 1.

Sector output impacts estimated by IMPLAN sector are shown in Table 3-108.

Annual industry and summary impacts for Alternative Plan 1 are shown in Tables 3-109 and 3-110.

Table 3-106
Top Ten Industries for Employment Labor Income - Alternative Plan 1

Sector	Description	Labor Income
36	Construction of other new nonresidential structures	$8,948,710
369	Architectural, engineering, and related services	$943,449
413	Food services and drinking places	$172,972
394	Offices of physicians, dentists, and other health practitioners	$289,870
161	Ready-mix concrete manufacturing	$250,742
382	Employment services	$101,936
329	Retail Stores - General merchandise	$91,096
335	Transport by truck	$166,818
324	Retail Stores - Food and beverage	$96,828
39	Maintenance and repair construction of nonresidential structures	$161,809

Table 3-107
Top Ten Industries for Employment Value Added - Alternative Plan 1

Sector	Description	Value Added
36	Construction of other new nonresidential structures	$10,170,055
369	Architectural, engineering, and related services	$996,648
413	Food services and drinking places	$245,932
394	Offices of physicians, dentists, and other health practitioners	$309,230
161	Ready-mix concrete manufacturing	$379,532
382	Employment services	$121,387
329	Retail Stores - General merchandise	$148,214
335	Transport by truck	$214,638
324	Retail Stores - Food and beverage	$157,241
39	Maintenance and repair construction of nonresidential structures	$191,601

Table 3-108
Top Ten Industries for Employment Total Output - Alternative Plan 1

Sector	Description	Total Output
36	Construction of other new nonresidential structures	$20,408,859
369	Architectural, engineering, and related services	$1,685,160
413	Food services and drinking places	$476,784
394	Offices of physicians, dentists, and other health practitioners	$514,427
161	Ready-mix concrete manufacturing	$1,256,269
382	Employment services	$149,736
329	Retail Stores - General merchandise	$170,447
335	Transport by truck	$456,487
324	Retail Stores - Food and beverage	$181,820
39	Maintenance and repair construction of nonresidential structures	$344,344

Table 3-109
Impact Summary – Alternative Plan 1

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	147.3	$9,339,662	$10,714,328	$21,927,846
Indirect Effect	39.2	$2,195,661	$3,004,148	$5,188,241
Induced Effect	52.0	$2,059,245	$3,795,138	$6,061,266
Total Effect	238.5	$13,594,567	$17,513,614	$33,177,353

Table 3-110
Industry Impacts - Alternative Plan 1

Industry	Employment	Labor Income	Value Added	Output
Construction	143.6	$9,131,700	$10,387,939	$20,801,679
Service	66.7	$3,116,231	$5,021,412	$8,256,453
Trade	17.5	$661,299	$1,058,568	$1,276,257
Manufacturing	4.7	$297,322	$479,875	$1,655,669
TIPU	4.6	$280,073	$459,741	$895,530
Government	1.2	$82,281	$67,991	$221,671
Agriculture	0.2	$12,006	$15,539	$31,541
Mining	0.2	$13,655	$22,548	$38,552

Alternative Plan 1 would have similar effects to those of the Alternative Base Plan on the level of recreation expenditures due to the elimination of facilities and detractions from the recreation experience. However, the longer construction period could result in a longer period of reduced recreation activity associated with Isabella Lake, potentially resulting in reduced expenditures and the associated income and employment generation over a longer period.

Similar to the Alternative Base Plan, completion of the Alternative Plan 1 and the return of water operations to the levels mandated in the water plan, the return of recreation to Isabella Lake, and the redevelopment and re-operation of recreation facilities surrounding the lake, could draw more visitors to the area than under the No Action Alternative. This could beneficially affect economic growth and potentially population growth. In the overall region of socioeconomic influence, these potential changes would likely be relatively small.

Construction of Alternative Plan 1 is not expected to displace important community institutions. However, similar to the Alternative Base Plan, the temporary reduction in recreation at Isabella Lake during construction of Alternative Plan 1 could affect cohesion in Wofford Heights, Lake Isabella, and Kernville, which cater to outdoor recreation visitors associated with Isabella Lake and shoreline activities. This effect would occur over a longer period under Alternative Plan 1 than under the Alternative Base Plan. Similar to the Alternative Base Plan, Alternative Plan 1 could increase community cohesion in the long term through the safer dam configuration, improved recreation facilities, unrestricted and more reliable water storage, and availability for recreation and community events.

Alternative Plan 2

Construction of Alternative Plan 2 would have the same impacts to socioeconomic and environmental justice resources as described above under the Alternative Base Plan and Alternative Plan 1, except that the greater construction expenditures under Alternative Plan 2 would generate the greater economic activity described below over a longer construction period. Annualized income and employment would be generated over a 5.8-year period (70 months).

For Alternative Plan 2, average annual employment impacts during its 5.8 years of construction for industries are shown in Table 3-111.

Table 3-111
Impact Detail for Employment – Alternative Plan 2

Industry	Direct	Indirect	Induced	Total
Total	161.6	42.5	57.0	261.1
Agriculture	0.0	0.0	0.2	0.2
Mining	0.0	0.1	0.0	0.1
Construction	157.8	0.3	0.6	158.7
Manufacturing	3.1	0.9	0.2	4.1
TIPU	0.0	3.5	1.2	4.7
Trade	0.0	5.5	13.6	19.1
Service	0.7	31.9	40.3	72.9
Government	0.0	0.4	0.9	1.3

Alternative Plan 2 is estimated to annually create 161.6 direct employment opportunities and an additional 99.5 jobs indirectly or induced. The top ten employment sectors for Alternative Plan 2 are shown in Table 3-112.

Table 3-112
Top Ten Employment Sectors – Alternative Plan 2

Sector	Description	Total Employment
36	Construction of other new nonresidential structures	156.0
369	Architectural, engineering, and related services	14.2
413	Food services and drinking places	8.9
394	Offices of physicians, dentists, and other health practitioners	4.4
382	Employment services	4.2
329	Retail Stores - General merchandise	3.4
161	Ready-mix concrete manufacturing	3.3
335	Transport by truck	3.1
324	Retail Stores - Food and beverage	3.1
397	Private hospitals	2.8

The labor income impacts (employee compensation and proprietary income) for the top employment sectors estimated by the IMPLAN model are described below in Table 3-113.

Table 3-113
Top Ten Industries for Employment Labor Income - Alternative Plan 2

Sector	Description	Labor Income
36	Construction of other new nonresidential structures	$9,928,123
369	Architectural, engineering, and related services	$1,043,280
413	Food services and drinking places	$189,209
394	Offices of physicians, dentists, and other health practitioners	$317,638
382	Employment services	$111,367
329	Retail Stores - General merchandise	$99,915
161	Ready-mix concrete manufacturing	$213,033
335	Transport by truck	$169,974
324	Retail Stores - Food and beverage	$106,184
397	Private hospitals	$214,629

Table 3-114 presents the IMPLAN estimates of the value added (employee compensation, proprietary income, other property type income, and indirect business taxes) impacts for the regional economy for Alternative Plan 2.

Sector output impacts estimated by IMPLAN sector are shown in Table 3-115. Annual industry and summary impacts for Alternative Plan 2 are shown in Tables 3-116 and 3-117.

Alternative Plan 2 would have similar effects to those of the Alternative Base Plan and Alternative Plan 1 on the level of recreation expenditures due to the elimination of facilities and detractions from the recreation experience. However, the longer construction period than either of these two alternatives could result in a longer period of reduced recreation activity associated with Isabella Lake, potentially resulting in reduced expenditures and the associated income and employment generation over a longer period.

Table 3-114
Top Ten Industries for Employment Value Added - Alternative Plan 2

Sector	Description	Value Added
36	Construction of other new nonresidential structures	$11,283,142
369	Architectural, engineering, and related services	$1,102,108
413	Food services and drinking places	$269,018
394	Offices of physicians, dentists, and other health practitioners	$338,853
382	Employment services	$132,617
329	Retail Stores - General merchandise	$162,563
161	Ready-mix concrete manufacturing	$322,455
335	Transport by truck	$218,698
324	Retail Stores - Food and beverage	$172,435
397	Private hospitals	$229,112

Table 3-115
Top Ten Industries for Employment Total Output - Alternative Plan 2

Sector	Description	Total Output
36	Construction of other new nonresidential structures	$22,642,557
369	Architectural, engineering, and related services	$1,863,475
413	Food services and drinking places	$521,541
394	Offices of physicians, dentists, and other health practitioners	$563,708
382	Employment services	$163,589
329	Retail Stores - General merchandise	$186,949
161	Ready-mix concrete manufacturing	$1,067,342
335	Transport by truck	$465,123
324	Retail Stores - Food and beverage	$199,388
397	Private hospitals	$434,017

Table 3-116
Impact Summary – Alternative Plan 2

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	161.6	$10,253,917	$11,736,702	$23,908,379
Indirect Effect	42.5	$2,384,902	$3,254,442	$5,606,248
Induced Effect	57.0	$2,256,659	$4,159,050	$6,642,415
Total Effect	261.1	$14,895,477	$19,150,195	$36,157,041

Table 3-117
Industry Impacts - Alternative Plan 2

Industry	Employment	Labor Income	Value Added	Output
Construction	158.7	$10,092,199	$11,478,743	$22,995,449
Service	72.9	$3,412,629	$5,494,975	$9,033,576
Trade	19.1	$723,937	$1,158,666	$1,396,464
TIPU	4.7	$290,166	$480,189	$932,231
Manufacturing	4.1	$261,122	$425,233	$1,486,162
Government	1.3	$89,430	$73,856	$241,549
Agriculture	0.2	$13,148	$17,018	$34,547
Mining	0.1	$12,846	$21,514	$37,063

Similar to the Alternative Base Plan, completion of the Alternative Plan 2 and the return of water operations to the levels mandated in the water plan, the return of recreation to Isabella Lake, and the redevelopment and re-operation of recreation facilities surrounding the lake, could draw more visitors to the area than under the No Action Alternative. This could beneficially affect economic growth and potentially population growth. In the overall region of socioeconomic influence, these potential changes would likely be relatively small.

Construction of Alternative Plan 2 is not expected to displace important community institutions. However, similar to the Alternative Base Plan and Alternative Plan 1, the temporary reduction in recreation at Isabella Lake during construction of Alternative Plan

2 could affect cohesion in the communities surrounding the lake which cater to outdoor recreation visitors associated with Isabella Lake and shoreline activities. This effect would occur over a longer period under Alternative Plan 2 than under the other alternatives. Similar to the Alternative Base Plan and Alternative 1, Alternative Plan 2 could increase community cohesion in the long term through the safer dam configuration, improved recreation facilities, unrestricted and more reliable water storage, and availability for recreation and community events.

Alternative Plan 3

Construction of Alternative Plan 3 would have similar impacts to socioeconomic and environmental justice resources as described above under the other three alternatives, except that the effects on recreation and construction expenditures could differ slightly since:

- The reduction in the lake level associated with the construction, use and removal of the coffer dam would not be required and
- The greater construction expenditures under Alternative Plan 3 would generate the greater economic activity described below over a longer construction period than the Alternative Base Plan and Alternative Plan 1 (same period as Alternative Plan 2).

Annualized income and employment would be generated over a 5.8-year period (70 months).

For Alternative Plan 3, average annual employment impacts during its 5.8 years of construction for industries are shown in Table 3-118.

Table 3-118
Impact Detail for Employment – Alternative Plan 3

Industry	Direct	Indirect	Induced	Total
Total	166.9	43.9	58.9	269.7
Agriculture	0.0	0.0	0.2	0.2
Mining	0.0	0.1	0.0	0.1
Construction	163.2	0.3	0.6	164.1
Manufacturing	3.1	0.9	0.2	4.1
TIPU	0.0	3.6	1.3	4.9
Trade	0.0	5.7	14.1	19.8
Service	0.7	32.9	41.7	75.3
Government	0.0	0.4	0.9	1.3

Alternative Plan 3 is estimated to annually create 166.9 direct employment opportunities and an additional 102.8 jobs indirectly or induced. The top ten employment sectors for the Alternative Plan 3 are shown in Table 3-119.

The labor income impacts (employee compensation and proprietary income) for the top employment sectors estimated by the IMPLAN model are described below in Table 3-120.

Table 3-119
Top Ten Employment Sectors – Alternative Plan 3

Sector	Description	Total Employment
36	Construction of other new nonresidential structures	161.3
369	Architectural, engineering, and related services	14.7
413	Food services and drinking places	9.1
394	Offices of physicians, dentists, and other health practitioners	4.6
382	Employment services	4.3
329	Retail Stores - General merchandise	3.5
161	Ready-mix concrete manufacturing	3.4
335	Transport by truck	3.2
324	Retail Stores - Food and beverage	3.2
397	Private hospitals	2.9

Table 3-120
Top Ten Industries for Employment Labor Income - Alternative Plan 3

Sector	Description	Labor Income
36	Construction of other new nonresidential structures	$10,268,129
369	Architectural, engineering, and related services	$1,078,655
413	Food services and drinking places	$195,411
394	Offices of physicians, dentists, and other health practitioners	$328,107
382	Employment services	$115,002
329	Retail Stores - General merchandise	$103,218
161	Ready-mix concrete manufacturing	$213,595
335	Transport by truck	$174,234
324	Retail Stores - Food and beverage	$109,692
397	Private hospitals	$221,702

Table 3-121 presents the IMPLAN estimates of the value added (employee compensation, proprietary income, other property type income, and indirect business taxes) impacts for the regional economy for Alternative Plan 3.

Sector output impacts estimated by IMPLAN sector are shown in Table 3-122.

Annual industry and summary impacts for Alternative Plan 3 are shown in Tables 3-123 and 3-124.

Table 3-121
Top Ten Industries for Employment Value Added - Alternative Plan 3

Sector	Description	Value Added
36	Construction of other new nonresidential structures	$11,669,553
369	Architectural, engineering, and related services	$1,139,477
413	Food services and drinking places	$277,835
394	Offices of physicians, dentists, and other health practitioners	$350,022
382	Employment services	$136,946
329	Retail Stores - General merchandise	$167,937
161	Ready-mix concrete manufacturing	$323,305
335	Transport by truck	$224,179
324	Retail Stores - Food and beverage	$178,131
397	Private hospitals	$236,663

Table 3-122
Top Ten Industries for Employment Total Output - Alternative Plan 3

Sector	Description	Total Output
36	Construction of other new nonresidential structures	$23,417,990
369	Architectural, engineering, and related services	$1,926,660
413	Food services and drinking places	$538,634
394	Offices of physicians, dentists, and other health practitioners	$582,287
382	Employment services	$168,929
329	Retail Stores - General merchandise	$193,128
161	Ready-mix concrete manufacturing	$1,070,156
335	Transport by truck	$476,780
324	Retail Stores - Food and beverage	$205,975
397	Private hospitals	$448,321

Table 3-123
Impact Summary – Alternative Plan 3

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	166.9	$10,593,923	$12,123,113	$24,683,812
Indirect Effect	43.9	$2,461,298	$3,357,782	$5,782,757
Induced Effect	58.9	$2,331,051	$4,296,166	$6,861,395
Total Effect	269.7	$15,386,272	$19,777,061	$37,327,964

Table 3-124
Industry Impacts - Alternative Plan 3

Industry	Employment	Labor Income	Value Added	Output
Construction	164.1	$10,433,798	$11,867,085	$23,774,397
Service	75.3	$3,524,884	$5,675,303	$9,329,870
Trade	19.8	$747,723	$1,196,718	$1,442,275
TIPU	4.9	$297,978	$493,546	$957,820
Manufacturing	4.1	$262,960	$428,720	$1,500,809
Government	1.3	$92,301	$76,222	$249,368
Agriculture	0.2	$13,581	$17,578	$35,684
Mining	0.1	$13,048	$21,889	$37,742

Alternative Plan 3 would have similar effects to those of the other alternatives on the level of recreation expenditures due to the elimination of facilities and detractions from the recreation experience. However, the longer construction period than either the Alternative Base Plan or Alternative Plan 1 could result in a longer period of reduced recreation activity associated with Isabella Lake, potentially resulting in reduced expenditures and the associated income and employment generation over a longer period. No reduction in the lake level would be needed for coffer dam construction, use and removal however; this is not expected to have a measurable effect on recreation expenditures.

Similar to the other alternatives, completion of Alternative Plan 3 and the return of water operations to the levels mandated in the water plan, the return of recreation to Isabella Lake, and the redevelopment and re-operation of recreation facilities surrounding the lake, could draw more visitors to the area than under the No Action Alternative. This could beneficially affect economic growth and potentially population growth. In the overall region of socioeconomic influence, these potential changes would likely be relatively small.

Construction of Alternative Plan 3 is not expected to displace important community institutions. However, similar to the other alternatives, the temporary reduction in recreation at Isabella Lake during construction of Alternative Plan 3 could affect cohesion in the communities surrounding the lake which cater to outdoor recreation visitors associated with Isabella Lake and shoreline activities. This effect would occur over a longer period under Alternative Plans 3 and 2 than under the other alternatives. Similar to the other alternatives, Alternative Plan 3 could increase community cohesion in the long term through the safer dam configuration, improved recreation facilities, unrestricted and more reliable water storage, and availability for recreation and community events.

Alternative Plan 4

Under this alternative, the deficiencies remediated in the Base Plan Alternative would be included, plus additional remediation measures identified for the Existing and Emergency Spillways, Main Dam, and Auxiliary Dam, which include installing a filter and drain system, raising the dam crests and existing spillway walls by 16 feet, widening the emergency spillway to 900 feet, realigning State Highway 178, and installing a flood gate where the new Main Dam embankment would intersect State Highway 155.

This alternative would have socioeconomic and environmental justice impacts similar to the Base Plan Alternative. Additional construction expenditures and employment opportunities under this alternative would generate increased local and regional economic activity. The increased activity would be on the scale assessed for Alternative Plan 3. For Alternative Plan 4, average annual employment impacts during its 5.8 years of construction are expected to be similar to those reported for Alternative 3. Based on the similar kind, intensity, and duration of construction activities, Alternative Plan 4 is estimated to annually create the same number of direct or indirect employment opportunities as Alternative Plan 3. The top ten employment sectors for the Alternative Plan 4 are expected to be similar to those reported for Alternative 3.

The increased construction under this alternative is not expected to displace important community institutions. However, temporary impacts associated with more construction over a longer period than the Base Plan Alternative could further affect cohesion in the communities surrounding the lake which cater to outdoor recreation visitors associated with Isabella Lake and shoreline activities. Implementation of mitigation measures proposed in Section 3.15.4 would contribute to reducing construction-related impacts on socioeconomic resources in the project area; however, these short-term impacts would still be considered significant. Similar to the other alternative plans, this alternative could increase community cohesion in the long term through the safer dam configuration, improved recreational facilities, unrestricted and more reliable water storage, and availability for recreation. These impacts are expected to be less-than-significant.

3.15.4 Environmental Commitments/Mitigation Measures

Implementing any of the Action Alternatives would have a beneficial impact on the regional economy due to increased expenditures during the construction period. However, the economy dependent on recreation and water availability for agriculture and hydropower would be adversely affected during the same period. Moderate impacts on the recreation-based economy would be most acutely felt in the communities around the lake.

In order to minimize the adverse impacts of construction on recreation attendance and expenditures and their consequent impacts to income employment and social values, the Corps anticipates implementing such potential mitigation measures as:

- Initiating in cooperation with the USFS and local communities, a comprehensive recreation mitigation planning process to address how all affected recreational opportunities would be maintained during the construction period and to address post-construction recreational site restoration. The expansion, addition, or modification of recreation facilities would be considered as part of this process. It is likely that some actions resulting from this planning process would result in proposals would need subsequent analysis. Potential mitigation measures for impacts on recreation and are discussed more completely in Section 3.12,

- Limiting off-site truck hauling on weekends and other times to accommodate tourist and/or recreation-related traffic, especially those days that may be associated with special local events.
- Where possible. scheduling lake lowering to coincide with normal water release regimes to maintain flows for agricultural use, recreation and power generation.
- Limiting construction noise and visual disruptions to visitors; and
- Providing adequate and current information on available recreation and visitor services.

If the Corps were to determine that relocations would be required to protect public health and safety, all property acquisitions would be conducted in compliance with Federal and State relocation law. Relocation would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 United States Code, Section 4601 et seq.) and implementing regulation (49 Code of Federal, Regulations Part 24). This law requires that appropriate compensation be provided to displaced residential and nonresidential landowners and tenants and that residents be relocated to comparable replacement housing and receive relocation assistance. Provisions include relocation advisory services, moving costs reimbursement, replacement housing, and reimbursement for related expenses and rights of appeal. Compensation for living expenses would be provided for temporarily relocated residents and negotiations regarding any compensation for temporary loss of business cover temporary relocations. This law applies to residential relocations as well as to farms and businesses if they were displaced for any length of time.

3.16 PUBLIC HEALTH AND SAFETY

This section discusses the affected environment, methods of analysis, the potential public health and safety impacts associated with the proposed Action Alternatives and support actions and mitigations.

3.16.1 Regulatory Setting

(Note: State and local requirements are included that were helpful in characterizing the overall context of the analyses, even though some of these requirements do not directly apply to this Federal action).

Federal Regulations

To ensure protection of the public from potential health and safety concerns, project area activities are regulated under the following Federal laws:

- Comprehensive Environmental Response Compensation and Liability Act (CERCLA) 42 USC, 9601 et seq.);
- Superfund Amendments and Reauthorization Act (SARA) Public Law 99-499 (100 Stats. 1613);
- Resource Conservation and Recovery Act (RCRA; 42 USC, 6901 et seq.). Clean Water Act (CWA) (33 USC, 1251 et seq.);
- Hazardous Material Transportation Act (HMTA);
- Toxic Substances Control Act (TSCA) (15 USC, 2601 et seq.);
- Federal Regulations on Hazardous Waste Management (40 CFR, 260-279);
- Chemical Accident Prevention Provisions;
- Emergency Planning and Community Right-to-Know Act (EPCRA);
- Occupational Safety and Health Standards;
- Spill Prevention Control and Countermeasures Plans (SPCC); and an
- Emergency Evacuation Plan.

State Regulations

The EPA has granted the State of California primary oversight responsibility to administer and enforce hazardous waste management programs. State regulations require planning and management to ensure that hazardous wastes are handled, stored, and disposed of properly to reduce risks to human and environmental health. Applicable State and local laws are as follows:

- Hazardous Waste Control Law (California Health and Safety Code, Section 25100);
- Title 17 CCR, Public Health;

- Title 19 CCR, Public Safety;
- Title 22 CCR, Division 4.5 - Environmental Health Standards for the Management of Hazardous Waste;
- Title 26 CCR, Toxics;
- California Department of Motor Vehicles, Hazardous Waste and Materials Transportation Requirements (Vehicle Code Section 31303);
- California Safe Drinking Water and Toxic Enforcement Act (Proposition 65);
- Aboveground Petroleum Storage Tank Spill SPCC;
- Hazardous Materials Release Response Plans and Inventory Program (a.k.a., Hazardous Materials Disclosure or "Community-Right-to-Know");
- California Accidental Release Prevention Program (Cal ARP);
- Risk management plans;
- Safety management plans;
- Hazardous material business plan;
- Hazardous Material Worker Safety, California Occupational Safety and Health Act;
- Hazardous substance information and training;
- Hazardous Materials Release Response Plans and Inventory Act of 1985;
- Hazardous Waste Control Act;
- Uniform Fire Code Plans and Inventory Requirements; and
- California Multi-Hazard Mitigation Plan.

California has developed an emergency response plan to coordinate emergency services provided by Federal, State, and local government and private agencies. Response to hazardous materials incidents is one part of this plan. The plan is managed by the State Office of Emergency Services (OES), which coordinates the responses of other agencies, including the Cal-EPA, the California Highway Patrol (CHP), the California Department of Fish and Game (CDFG), the Regional Water Quality Control Board (RWQCB), the Kern County Sheriff's Department, and the Kern County Fire Department (KCFD).

Within Cal-EPA, the Department of Toxic Substance Control (DTSC) has primary regulatory responsibility, with delegation of enforcement to local jurisdictions that enter into agreements with the State agency, for the generation, transport, and disposal of hazardous substances under the authority of the Hazardous Waste Control Law. Other agencies that enforce hazards or hazardous materials regulations include the RWQCB and KCFD.

Local Regulations

Health and Safety Code, Ordinance Code of Kern County, Title 8.
These regulations govern the use, generation, storage, and disposal of hazardous materials and wastes within the county.

Kern County General Plan, Safety Element Chapter 4.
The Kern River Valley is susceptible to several natural hazards: public health and safety constraints and hazards, including wildland fires, flooding, shallow groundwater, steep slopes, and seismic and geologic hazards. These hazards are factored into the Kern River Valley's land use planning through the goals, policies, and implementation measures of the Public Safety Element.

Kern County has developed a safety plan for the protection of the community from any unreasonable risks associated with the effects of seismically induced surface rupture, ground shaking, ground failure, tsunami, seiche, and dam failure; slope instability leading to mudslides and landslides; subsidence, liquefaction, and other seismic hazards identified in Chapter 7.8 of the Public Resources Codes, and other geologic hazards; flooding; and wildland and urban fires. The safety element includes mapping of known seismic and other geologic hazards. It also addresses evacuation routes, peak load water supply requirements, and minimum road widths and clearances around structures, as those items relate to identified fire and geologic hazards (Kern County 2011b).

Kern County Ordinance Code, Section 4016; Uniform Fire Code, Section 1.49H.
Hazardous fire areas consist mainly of wildlands but include some urban influence and agricultural use, such as that around Isabella Lake and the Kern River. The Kern County Hazardous Fire Area was established by an amendment to the Uniform Fire Code, Section 1.49H under Section 4016 of the Kern County Ordinance Code.

Kern County, California, Multi-Hazard Mitigation Plan.
The Kern County, California, Multi-Hazard Mitigation Plan was adopted in compliance with the Disaster Mitigation Act of 2000, provides long-term planning to reduce the impacts of future disasters. The County government encourages public support of local, State, and Federal research programs on geologic, fire, flood hazards, valley fever, plague, and other studies so that acceptable risk may be continually reevaluated and kept current with contemporary values.

Kern County maintains close coordination with law enforcement and the Corps and with fire, medical, and emergency responders in the area. The Corps, USFS, BLM, and Kern County collaborate to manage and implement public health and safety prevention programs and response measures.

3.16.2 Affected Environment

In the Isabella DSM Project area and vicinity, public health and safety topics of interest include provision of protective and health emergency services; seismic activity and landslides; flooding; degraded air quality; traffic obstructions to emergency response; HTRW; noise and vibration; recreation safety; vector-borne diseases (such As West Nile virus); air-borne fungal spores from disturbed soils (such as Valley Fever); water-borne threats (such as cyano bacteria); and homeland security. Many of these topics are addressed in other sections of this Draft EIS and are therefore not discussed in this section. These include the following:

- Seismic activity and landslides (Section 3.6);
- Degraded air quality (Section 3.7);
- Water-borne threats (Section 3.8);
- Traffic obstructions to emergency response (Section 3.9);
- Noise and vibration (Section 3.10); and
- HTRW (Section 3.11).

Those health and safety topics of interest in the project area and vicinity not addressed in other sections are briefly described below.

Fire, Police, Medical, and Emergency Services

Law enforcement at the recreation facilities in the Kern River Valley is provided by the Kern County Sheriff's Department. In an emergency, the Sheriff Department's 911 dispatcher contacts other agencies for response, as required by the nature of the emergency. Fire protection and EMT services are provided by the Kern County Fire Department, Battalion 7, with assistance as necessary from the BLM and USFS, with whom the County maintains mutual aid agreements for police and fire services. Emergency room and hospital services are found at Kern Valley Hospital in Lake Isabella, approximately half a mile south of the dam sites.

Public health and safety incidents associated with recreation are vehicle accidents, use conflicts, intoxication, hypothermia and drowning, and a variety of sports and activity-related accidents and injuries. A number of public service agencies provide security or emergency response to the Isabella Lake area (Table 3-125).

An *Emergency Action Plan* (EAP) has been prepared by the Corps and USFS to reduce the risk of human life loss and injury and to minimize property damage during an unusual or emergency event in the project area. It defines responsibilities and provides procedures to identify conditions that may endanger Isabella Dam and to specify planned actions to be followed to minimize property damage and loss of life in a dam failure. After the emergency level has been determined, the people on the corresponding emergency level notification chart included in the EAP are notified immediately.

Table 3-125
Public Services in the Isabella Lake Area

Service	Name and Address	Contact	Phone Number
Law enforcement (Isabella Lake Recreation Area)	Kern County Sheriff's Department		911
Fire/EMT	Kern County Fire Department Battalion 7		911
Emergency service	Sequoia Forest Service	Mike Ryan	(760) 379-5646
Facility threats (Homeland Security)	US Army Corps of Engineers Sacramento District 1325 J Street, Sacramento	Jonathan Payton	(916) 557-6920
Hospital (emergency services)	Kern Valley Hospital 6412 Laurel Avenue Lake Isabella		(760) 379-2271
Boating safety (Isabella Lake)	Kern County Parks and Recreation	Sergeant Norman Eades	(661)319-4814
Vector control	Kern Mosquito and Vector Control District 4705 Allen Road, Bakersfield	Ray Gonzalez	(760) 376-4268

Local Flooding

In the event of local flooding from heavy rainstorms, hazards could occur at Isabella Lake and vicinity. SRs 178 and 155 pass through the Kern River Valley Recreation Area and are subject to flooding. The communities of Weldon, Kelso Valley, and Onyx, areas in Lake Isabella along Erskine Creek, and portions of Mountain Mesa are all subject to flooding in a severe rainstorm, during which several roads historically have flooded, including Sierra Way, SR 178, and Lake Isabella Boulevard. In addition, the Sierra Way Bridge in South Fork is periodically flooded and thus temporarily hinders area circulation. Alternative access is available for all public services except the recreation facilities (Kern County 2011b).

Dam Safety

Storms and greater than normal flood inflows can be forecast with sufficient lead time to clear the areas of recreation areas. The Corps has a formal notification process in which the Kern River Water Master contacts any known entity likely to be affected by flood inflow to the Kern River Valley, based on forecasted runoff and estimates of how high the lake pool will rise; these notifications are updated continuously as hydrologic and Isabella Lake conditions change (Corps 2009b). Overall, the potential rate of rise of the surface water elevation would be slow enough that anyone could readily walk to safety by moving to higher ground. Kern County would ensure that public use of the Isabella Lake and downstream areas during a flood would be curtailed through erecting roadway barriers and signs and by having authorities in place to redirect traffic. Kern County maintains close coordination with law enforcement and the Corps, as well as fire, medical, and emergency response agencies in the area.

Recreational Safety

The USFS is the main recreational lease holder for the Isabella Lake area, and public safety is a primary concern at the many recreation sites in the project area. In addition to managing US Forest lands, the USFS manages the Isabella Lake recreation areas including the Auxiliary Dam Recreation Area, Launch 19, and the closed Main Dam Campground. The BLM Keyesville SRMA, southeast of the Main Dam, is also a recreation area and includes two boat launches along the Kern River south of the Main Dam. Recreation activities in the project area are numerous and include picnicking, camping, small boat activities, kayaking and white water rafting, swimming, hiking, cycling, recreational mining, off-highway vehicle use, and horseback riding. Facilities at these recreation areas have been provided by the Corps, Kern County, California Department of Boating and Waterways, California Wildlife Conservation Board, and private concessionaires. These facilities attract a large number of people who come to the Isabella Lake area to engage in a variety of outdoor recreation activities.

Swift Water Kern River Safety.

Federal and State laws require that all canoes, kayaks, and other inflatable watercraft carry a Coast Guard-approved personal flotation device for each person aboard. Most accidents occur when boaters attempt water conditions that are more demanding than their skills, knowledge, and experience or are inattentive to their surroundings. There have been many fatalities recorded in the Kern River below Isabella Lake.

Isabella Lake Water Safety.

Boating at Lake Isabella is regulated by Federal, State, and County boating laws. Those in power, sail, and manually operated boats use the lake, as well as water-skiers, windsurfers, and water cyclists. Kern County and the USFS require that all operating watercraft on the lake obtain a permit, including water cyclists and windsurfers. Flotation devices are required on all vessels for every person on board. The SQF Kern River Ranger District has published boating safety measures to inform the public of the hazards of boating on Kern River and Isabella Lake. Contact information for USFS Boating Safety is included in Table 3-125.

Boating hazards at Isabella Lake are submerged obstacles, including rock outcroppings, land or sand spits, and snags at the lake that are not marked. Strong winds can cause unsafe conditions; lake users are advised not to attempt crossing open water. Man-made hazards at Lake Isabella include the Borel Canal concrete-lined channel. At certain times of the year, the canal is exposed and poses a hazard in many areas. The most extreme areas are in front of the Auxiliary Dam and by Tillie Creek Campground when the water is low. Bulkhead and Tainter Gates are part of the dam’s intake structure and are in front of the dam towers. With the lake fluctuations varying so regularly, these areas can pose a hazard to unknowing boaters.

For additional discussion of recreation, see Section 3.12 of this Draft EIS.

Wildfire

The Kern River Valley includes naturally vegetated areas that are susceptible to wildfire. During the dry season, the area surrounding Isabella Lake is at risk for fires, particularly at the interface between residential development and open space. Kern County requires that all development comply with the requirements of the Kern County Fire Department or other appropriate agency regarding access, fire flows, and fire protection facilities.

The project area is in a moderate to high fire hazard severity zone. Construction of the Isabella DSM Project may introduce potential sources for fire. During construction, equipment and vehicles may come in contact with heavily vegetated areas and accidentally spark and ignite the vegetation. Potential effects related to wildland fires are considered significant. Kern County categorizes the project and surrounding areas fire hazard level as high and very high.

Kern County Fire Battalion 7 covers the northeast portion of Kern County, including the project area. It is a diverse mixture of direct protection areas with Federal responsibility areas, both USFS and BLM, and the Sequoia Recreation Area (253,776 acres). Highways are SR 178, SR 14, and SR 155. Unincorporated towns under protection of Kern County Fire Battalion 7 are Havilah, Lake Isabella, Bodfish, Wofford Heights, Kernville, and Southlake. All of these towns are listed by the California Fire Alliance as being at high risk for wildfire (KCFD 2004).

Vector-borne Diseases

Mosquitoes are known to be the carriers of many serious diseases. In Kern County, two species of mosquito are primary targets for suppression: *Culex pipiens quinquefasciatus* and *C. tarsalis*. These insects are potential vectors of encephalitis and West Nile virus. Other species of mosquitoes in Kern County can also cause a nuisance in local communities.

Land features in the project area such as ponds and low spots can provide potential breeding sites for mosquitoes. The project area is under the jurisdiction of the Kern Mosquito and Vector Control District (see Table 3-125). It is charged with exterminating mosquitoes, flies, or other insects, abating stagnant pools of water and other breeding places, and doing anything necessary to carry out these objectives under the powers set forth under Section 2270 of the Health and Safety Code.

Homeland and Project Security

The Corps has established programs to detect, protect, and respond to threats to Corps facilities and infrastructure. Areas of focus for dam security are surveillance detection, identification of site vulnerabilities, emergency response and prevention, and assessment of infrastructure interdependencies. Surveillance detection is monitoring for the presence of suspicious activities or individuals. Identification of site vulnerabilities includes evaluating access and dam operational security and cyber security measures. The Corps also develops plans to prevent and respond to security emergencies including consideration of the interdependencies with other water control infrastructure needed to maintain the dams' function. The Corps continues to evolve the measures that it takes to ensure that potential national security threats to dam infrastructure are addressed.

In 2009, the Corps installed a rock barrier along Barlow Drive, the Borel Canal, and the downstream section of the Isabella Auxiliary Dam to protect piezometers (a device for measuring pressure) at the toe of the dam. The piezometers are protected from accidental or intentional damage by a rock wall. Reducing vehicle access to both the toe of the Auxiliary Dam and the piezometers reduces the threat to the integrity of the dam and the instruments (Corps 2009b).

3.16.3 Environmental Consequences

This section discusses the potential public health and safety impacts associated with the proposed Isabella DSM Project Action Alternatives and support actions.

Scope and Methods

It was determined that potential public health and safety impacts associated with the proposed Isabella DSM Project would be short-term and occurring during the construction period, and that post-construction impacts would return to pre-construction (existing) conditions at the Isabella Dam project. The potential construction-related impacts were qualitatively assessed based on the potential to expose the public and site workers to construction-related health and safety hazards, and the potential for construction-related activities to adversely affect the public health and safety topics discussed in the previous section. Criteria and considerations used to evaluate the intensity and significance level of the potential health and safety impacts associated with construction activities included the following:

- The potential for construction activities in the Primary and Secondary Action Areas to increase the likelihood of injury accidents.
- The likelihood of the routine transport, use, or disposal of hazardous materials to create environmental health and/or safety hazards.
- The extent to which active construction sites and materials and equipment storage areas would present potential unmanaged dangers to the public or attract or expose the public to potentially hazardous areas.
- The potential for construction activities to impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan.
- Whether access to and/or passage through Isabella DSM Project construction areas by emergency vehicles would be blocked at any time.
- If construction activities could create or contribute to situations resulting in personal injury or property losses from wildfires.

No Action Alternative

Under the No Action Alternative, no construction would occur, so this alternative would result in no change in public health and safety risks from construction of dam remediation elements. However, the existing risks to public health and safety from seismic, seepage, and hydrological dam deficiencies would remain critical. The likelihood of failure of the Isabella Lake Dams could flood downstream populations and cause substantial property damage and loss of human life. The No Action Alternative would continue an unacceptable level of risk of significant impacts on public safety downstream of Isabella Dam and not meet the purpose and need for action. This is considered a significant adverse impact.

Alternative Base Plan

Implementation of the Alternative Base Plan would create a large construction zone concentrated in the Primary Action Area, but also including the Secondary Action Area (South Fork Delta area) and the transportation route between the sites. The duration of construction under this alternative is more than five years and would include an estimated 120 workers each year with approximately 60 commuting from outside of the Kern River Valley communities. Primary health and safety risks would be to the workers, but potential impacts to the public are also anticipated. These are discussed below, and references to other sections of this Draft EIS are included to indicate where additional analyses are presented.

The use of construction and earthmoving equipment, large and small trucks and other diesel vehicles would generate emissions that would exceed local health standards. More information on this topic and an analysis of impact levels associated with these activities was provided previously in Section 3.5 Air Quality. The Corps is continuing to study the health risks associated with the proposed Isabella DSM Project to determine the full extent of mitigation measures that can be taken to reduce emissions and control the potential for dust generation from construction activities.

Sand and other construction materials would be transported and workers would also use public roads, increasing the potential for accidents and delays for emergency response vehicles. Blasting for the Emergency Spillway and Borel Canal tunnel may require temporary road closures for safety reasons. With the development and use of a *Controlled Blasting Management Plan* and a *Traffic Management Plan*, potential adverse public health and safety impacts associated with these actions would be managed and are anticipated to be direct, adverse, short-term, low, and less-than-significant.

Throughout the construction period, construction activities would involve the use, handling, storage, and disposal of hazardous materials such as fuel, solvents, oil and other lubricants. A secure central storage and handling depot for hazardous materials would be established in a suitable location. It is anticipated that the collection, storage, and disposal of solid and hazardous materials and wastes would be performed in accordance with a *Solid and Hazardous Materials and Waste Management Plan* that would be developed by the Corps or a designated contractor prior to the initiation of construction activities. With the use of the waste management plan, potential adverse public health and safety impacts associated with these actions are anticipated to be direct, adverse, short-term, low, and less-than-significant.

This alternative requires significant excavation and controlled blasting of the ridge where the USFS Administration Building and Compound, and the Corps Project Office and Shop are located. Controlled blasting would also be required to relocate the Borel Canal conduit through the right abutment of the Auxiliary Dam. A *Controlled Blasting Management Plan* would be developed by the Corps or designated contractor prior to the start of construction, which would include buffers and other public and worker safety management measures that may be required in the vicinity of the blasting. With the use of this management plan, potential adverse public health and safety impacts associated with these actions are anticipated to be direct, adverse, short-term, low, and less-than-significant.

Removal of the USFS Administration Buildings and Compound and Corps Project Office and Shop, would include buildings known to contain asbestos and would require handling and removal according to State and Federal regulations regarding asbestos. Also, septic systems associated with the USFS facility would be removed. With the use of approved removal methods, potential adverse public health and safety impacts associated with these actions are anticipated to be direct, adverse, short-term, low, and less-than-significant.

It is likely that even with a comprehensive worker safety program there would be accidents and incidents that would require emergency services related to construction activities. The provision of emergency response services may be taxed if project activities lead to more service calls than the fire, medical, or police personnel are able to attend to. As a popular recreation area the Kern River Valley is better prepared to provide emergency services and planning for contingencies than other similarly sized communities. It is anticipated that the Corps would coordinate with local emergency and health services in the project vicinity to ensure that adequate levels of service are available through the construction period. Therefore, it is anticipated that the potential for these services to become overtaxed would be low, and less-than-significant.

The project area is in a moderate to high fire hazard severity zone. Construction activities may increase the potential for fires in and around the project area. Because of the public health and safety programs, management, and collaborative activities in place in the Kern River Valley and the project vicinity and at the lake, and the anticipated BMPs to be used during construction, these potential adverse impacts are expected to be direct, adverse, short-term, low, and less-than-significant.

The Primary Action Area would be used and accessed by workers for several years to support the construction. The worksite is in the vicinity of critical infrastructure posing special security concerns beyond those normally encountered in most construction projects. The Corps would work with the contractor to ensure controlled site access and implement measures to reduce the risk of unauthorized activities, theft, and vandalism.

Therefore, any potential adverse impacts are expected to be direct, adverse, short-term, low, and less-than-significant.

Dam operations during construction may affect flows downstream of the dam. The timing and quantity of releases could change with the construction and temporary closure of the Borel Canal and the need to manage construction and flood pools. The expected consequences would be the potential for more frequent short-term larger releases of up to 4,600cfs in order to maintain the flood pool. Outflows may be too high for safe rafting more often than is the case currently - especially in late winter. The Corps would work to improve communication with rafting entities and provide better notification to the public of potentially dangerous flow conditions and reduce the risk to rafters. On this basis, anticipated adverse impacts would be direct, adverse, short-term, low, and less-than-significant.

Alternative Plan 1

Potential impacts associated with this alternative are similar to those described for the Alternative Base Plan. In addition, the Main Dam remediation would include the full-height filter with RCC Overlay. Construction of the full height filter would require additional sand from the two proposed sand source areas and extend the duration of the project by a few months. Rock material from the excavations would be stored within Staging Area M1 in the Main Dam Campground area. With the use of approved BMPs and mitigation measures discussed in this Draft EIS, potential public health and safety impacts associated with these additional construction activities are anticipated to be direct, adverse, short-term, low, and less-than-significant.

Alternative Plan 2

Potential impacts associated with this alternative are similar to those described for the Alternative Plan 1. The larger downstream buttress and deeper foundation treatment at the Auxiliary Dam would extend the duration of the project by nearly a year. With the use of approved BMPs and mitigation measures discussed in this Draft EIS, potential public health and safety impacts associated with these additional construction activities are anticipated to be direct, adverse, short-term, low, and less-than-significant.

Alternative Plan 3

Potential impacts associated with this alternative are similar to those described for the Alternative Plan 2, with the exception that the Borel Canal would be tunneled from the Main Dam outlet works instead of upstream of the Auxiliary Dam. With the use of approved BMPs and mitigation measures discussed in this Draft EIS, potential public health and safety impacts associated with these construction activities are anticipated to be direct, adverse, short-term, low, and less-than-significant.

Alternative Plan 4

Under this alternative, the deficiencies remediated in the Base Plan Alternative would be included, plus additional remediation measures identified for the Existing and Emergency Spillways, Main Dam, and Auxiliary Dam, which include installing a filter and drain system, raising the dam crests and existing spillway walls by 16 feet, widening the emergency spillway to 900 feet, realigning State Highway 178, and installing a flood gate where the new Main Dam embankment would intersect State Highway 155.

Potential impacts associated with this alternative are similar to those described for the Alternative Base Plan. However, increasing the width of the new emergency spillway to 900 feet, increasing the crest height of the dams by 16 feet, and realigning State Highway 178 could increase the impacts to public health and safety above those described for the Alternative Base Plan due to a longer construction period, greater excavation needs, and more construction-related traffic on roadways. Potential significant public health and safety impacts associated with construction would be reduced to less than significant through the implementation of mitigation measures discussed in Section 3.16.4, including implementation of a Controlled Blasting Management Plan, a Traffic Management Plan, and a Solid and Hazardous Materials and Waste Plan, as described for the Alternative Base Plan.

3.16.4 Environmental Commitments/Mitigation Measures

The following mitigation measures are recommended to reduce potential public health and safety impacts:

- Implement a contractor-prepared *Public Safety Management Plan* to maintain public health and safety during all phases of construction. Components of the plan would include:
    - Notifying the public of the location and duration of construction activities, closing pedestrian and bicycle paths and trails, and restricting portion lake use for boating, water-skiing, fishing, and swimming;
    - Coordinating with the public and local jurisdictions to minimize impacts and to plan contingencies for maintaining emergency response, emergency evacuation plans and capacity of emergency services during construction;
    - Posting signs locating construction sites and warning of the presence of construction equipment;
    - Fencing construction staging areas if dangerous conditions exist when construction is not occurring; and
    - Providing temporary walkways (with appropriate markings, barriers, and signs to safely separate pedestrians from vehicular traffic) and posting detour signs where a sidewalk or pedestrian or bicycle path or trail would be closed during construction.
- A contractor-prepared *Confined Space/Ventilation Safety Plan.*
- The Corps, in consultation with the KCFD, USFS, and BLM fire suppression agencies, before construction begins, require the contractors to prepare and implement a F*ire Management Plan*. The plan would include fire prevention and

response methods, including fire precaution, prevention, and suppression measures consistent with the policies and standards in the affected jurisdictions.

- The Corps require all contractors to prepare and implement a *Worker Health and Safety Plan* before construction activities start; at a minimum the plan would include:
    - All appropriate worker, public health, and environmental protection equipment and procedures;
    - Designated heavy equipment traffic circulation route plans;
    - Emergency evacuation routes and procedures;
    - Emergency response procedures;
    - Most direct route to a hospital and safe air ambulance landing zone;
    - Name of the Site Safety Officer; and
    - A requirement for documenting that all workers have reviewed and signed the plan.
- Compliance with all applicable local, regional, State, and Federal laws, policies, and regulations regarding the transportation, storage, handling, management, and disposal of hazardous materials and wastes.
- A contractor-prepared *Solid and Hazardous Materials and Waste Management Plan.* Details of this plan are provided in Section 3.8 (HTRW).
- Contractor consultations with local jurisdictions to ensure that construction activities do not impede adopted emergency response plans.
- A contractor-prepared *Controlled Blasting Management Plan* that would include any short-term road closures and other public safety management measures that may be required in the vicinity of the blasting.
- A contractor-prepared *Traffic Management Plan* to address emergency access to the construction site areas and contingencies for addressing road closures affecting emergency response.

3.17 SUMMARY OF IMPACTS

Table 3.19-1 Summary of Impacts provides a summary of the potential impacts on the 13 resource areas evaluated in this Draft EIS from the No Action Alternative and the four Action Alternatives. Suggested mitigation measures to avoid, minimize, or reduce potential impacts are also included in the table. More detailed information on potential impacts and mitigation measures is found in each of the resource sections in this Chapter.

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Table 3-125
Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
Geology, Soils, and Seismicity			
No Action Alternative	There would be no remedial improvements at the Isabella Main Dam, Spillway, or Auxiliary Dam. The seismic and seepage deficiencies would continue and likely would worsen over time. Short-term construction impacts would not occur. The likelihood of dam failure resulting from the local geology, soils, and seismicity issues would remain, leading to significant adverse downstream impacts.	Significant Adverse	None
Alternative Base Plan	This alternative would be designed to overcome the deficiencies in the Isabella Lake Dams (particularly the Auxiliary Dam), which are directly linked to the geology, soils, and seismicity features in the project area. Therefore, this alternative would have high beneficial long-term impacts with respect to existing geology, soils, and seismicity conditions. This alternative would increase to a minor degree the potential for short-term adverse construction-related impacts such as soil erosion, unstable slopes, soil slumping, differential soil settling, and bedrock fractures. Incorporation of the recommended mitigation measures would keep the level of potential adverse impacts low and less-than-significant.	High Beneficial Low Adverse, Less-than-significant	• A contractor-prepared *Erosion and Sediment Control Plan*, identifying specific BMPs to avoid or minimize soil erosion. • Slope stability measures. • Stockpile and reuse all suitable excavated soils and fill. Dispose of unsuitable material in an approved site. • Restore temporarily disturbed areas by grading, reducing compaction, and re-vegetation. • <u>The following dust control measures:</u> g. Water a minimum of twice daily unpaved/untreated roads and disturbed soil areas. h. Cease all clearing, grading, earth moving, and excavation during periods of winds greater than 20 miles per hour when disturbed material is easily windblown. i. Water or secure all fine material transported off-site. j. Periodically water stockpiles of soil or other fine loose material. k. Control weeds by mowing instead of discing were acceptable to the fire department. l. Seed and water inactive soil areas in the construction site until plant growth is evident, or treat with a dust palliative, or water twice daily until restored according to a contractor-prepared *Site Restoration Plan*.
Alternative Plan 1	Potential impacts are similar to the Alternative Base Plan regarding the long-term benefits to existing geology, soils, and seismicity. This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential adverse short-term construction-related impacts mentioned above would still be anticipated to be low and less-than-significant with the incorporation of the recommended mitigation measures.	Similar to Alternative Base Plan	
Alternative Plan 2	Potential impacts are similar to the Alternative Base Plan and Alternative Plan 1 regarding the long-term benefits to existing geology, soils, and seismicity. This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term construction-related impacts would still be anticipated to be low and less-than-significant with the incorporation of the recommended mitigation measures.	Similar to Alternative Plan 1	
Alternative Plan 3	Potential impacts are similar to the Alternative Base Plan and Alternative Plans 1 and 2 regarding the long-term benefits to existing geology, soils, and seismicity. This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. Potential short-term construction-related impacts from this alternative would still be anticipated to be low and les-than-significant with the incorporation of the recommended mitigation measures.	Similar to Alternative Plan 2	
Alternative Plan 4	Potential impacts are similar to the Alternative Base Plan and Alternative Plans 3 regarding the long-term benefits to existing geology, soils, and seismicity. This alternative involves excavation and material requirements similar to but somewhat greater than Alternative 3 and a handling and construction period similar to Alternative Plan 1.	Similar to Alternative Base Plan	

Table 3-125
Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	Potential short-term construction-related impacts from this alternative are anticipated to be slightly greater than Alternative 3 due to the larger size of the Emergency Spillway, the modifications to State Hwys. 178 and 155, and the increased dam crest heights; however, the potential short-term construction-related impacts from this alternative would still be anticipated to be low and les-than-significant with the incorporation of the recommended mitigation measures.		
Air Quality and Climate Change			
No Action Alternative	Under the No Action Alternative, there would be no Federal participation in remedial improvements under the Isabella DSM Project. There would be no construction–related impacts on Air Quality, additional contributions of GHG or increased dust resulting from construction and operation of the proposed Isabella DSM Project.	None	None
Alternative Base Plan	Emissions from construction would result from fuel combustion and exhaust from construction equipment, as well as from vehicle traffic and grading. Construction-related short-term emissions of ROG, CO, $PM_{2.5}$, and SO_X would not exceed applicable national and local significance thresholds, but would be moderate to high, and less-than-significant impacts. However, construction-related short-term emissions of NO_X and PM_{10} would exceed the significance thresholds for emissions established by the Eastern Kern Air Pollution Control District (EKAPCD), and would conflict with applicable air quality plans. Therefore, this short-term direct impact is significant, even if the recommended mitigation measures were implemented. Greenhouse gas (GHG) emissions from equipment and truck use would be a short-term significant impact. By employing best management practices (BMPs) to reduce construction-related exhaust emissions, transportation-related GHG could be reduced and ensure no conflict with recommended actions based on California Air Resources Board-enforced standards. Cancer risk and chronic non-cancer risk are attributable to emissions of diesel engine exhaust particulate matter from on-site travel and vehicle idling. The potential chronic carcinogenic risk from this alternative is above the significance level of one chance in a million. Therefore, the potential short-term health risk impact is significant and unavoidable. Construction-related emissions of PM_{10} and would not be likely to contribute substantially to degraded visibility in the nearest Class I Area (Domelands Wilderness Area), and impacts would be low, and less-than significant.	Moderate to High Adverse, Less-than-significant Significant Unavoidable, Adverse Significant Adverse Significant Unavoidable Adverse Low Adverse, Less-than-significant	• See dust control measures under Geology, Soils, and Seismicity. • Limit on-site vehicle speed to 15 miles per hour. • Pave, treated with dust palliatives, or water a minimum of twice daily all areas with vehicle traffic. • Keep roadways and intersections next to the project site clean, and regularly remove project-accumulated silt and other construction debris. • Access the main project work sites via an apron from adjoining surfaced roadways. Surface or treat the apron with dust palliatives. If equipment is operating on soils that cling to wheels, use a “grizzly” or other such device using rails, pipes, or grates to dislodge mud, dirt, and debris from the tires and undercarriage of vehicles on the road exiting the project work sites, immediately before the pavement. • Maintain all equipment as recommended by manufacturers’ manuals. • Shut down equipment when not in use for extended periods. • Substitute electric equipment whenever possible for diesel- or gasoline-powered equipment. • Equip all construction vehicles with proper emissions control equipment and keep in good and proper running order. • Used diesel particulate filters on on-road and off-road diesel equipment, if permitted under manufacturers’ guidelines.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	

Table 3-125
Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a wider Emergency Spillway, modifications to State Hwys. 155 and 178, and the increase in the crest heights of the dams by 16 feet. However, it is anticipated that use of the material excavated for the Emergency Spillway to raise the dam crest heights would reduce or eliminate the need for additional borrow sites and reduce the distance of truck travel substantially in comparison to the other Action Alternatives. Therefore, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Water Resources			
No Action Alternative	There would be no impacts on water resources related to construction. The water quality of the lake would be variable depending on inflows and operations and likely similar to current and historical data. The No-Action Alternative would not reduce the likelihood of dam failure that could result in catastrophic significant adverse impacts in terms of the loss of water control and storage facilities, downstream flooding, water supply and downstream uses.	Significant Adverse	None
Alternative Base Plan	This alternative includes measures to accommodate much larger flood flows than are currently possible. Although greatly reducing the likelihood of dam failure, these measures would likely result in higher peak discharge into the Kern River during high flows that could accompany rare storm events. This may have a noticeable impact on downstream peak flows at that time, which is considered a moderate to high adverse impact. This alternative would require lowering of the lake to an elevation of 2,543.76 feet for a nine-month period to allow for construction of an Upstream Berm on the Auxiliary Dam. This lower pool elevation would also be required for two two-month periods to allow for construction and removal of a coffer dam at the Right Abutment of the Auxiliary Dam. Also, during the seven-month period that the coffer dam is in place, the top of the flood control pool would be restricted to a maximum level of four feet below the IRRM level set at 2,589.26 feet . Depending on the inflows during these time periods, releases from the Main Dam may be larger and more frequent in order to maintain these lower lake levels. The Corps would cooperate with downstream water users to ensure that annual supplies are maintained. It is anticipated that downstream users would have sufficient storage above and below ground to be able to receive greater quantities of off-season water released by the Corps from Isabella Lake, should that be necessary. This impact on downstream water users is considered adverse, low, and less-than-significant. However, during these same low-water construction periods, ongoing water quality concerns with meeting state and Federal standards and the potential for hazardous algal blooms could be exacerbated. Potential construction-related disturbance of soils and other materials around the	Moderate to High Adverse, Less-than-significant Low Adverse, Less-than-significant Moderate Adverse, Less-than-significant	• Current construction schedule of the coffer dam calls for placement of the coffer dam in the December to February timeframe. Historically, this is the timeframe in which are greatest rain floods have occurred in the region (for example, in 1966, 1986, and 1997). This would represent the most difficult time to maintain a significantly lower pool elevation of 2,543.76 feet, as this represents over 45 feet in difference from the existing restricted pool elevation. The more ideal time for coffer dam construction would be outside of the rain flood season (April through end of September). • Fit locations and alignments of staging areas and haul roads into landforms to minimize cuts and fills. • Delineate boundaries of sensitive areas should be with stakes and flagging before construction, in consultation with a designated biologist. • Locate stockpile sites, parking areas, staging areas, and disposal sites to avoid sensitive areas. • Maintain a vegetative buffer (if present) of at least 150 feet along rivers, the lake, and major travel routes. • Maintain a vegetative cover on the strip of land between the existing spillway and proposed Emergency Spillway. • Minimize widths of new roads and existing roads that are planned for widening or other improvements for on-site hauling.

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Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	lake could also contribute to degraded water quality. With the BMPs, water quality monitoring, and the other mitigation measures planned for implementation, short-term adverse impacts on water quality would be expected to be moderate and less-than-significant and limited to the duration of construction.		• Minimize the number of temporary and permanent structures and activities and combine or collocate where feasible. • Set up a conscientious and continuous water quality monitoring network during the multi-year construction period. Provide collected data via the Corps to the contractor(s) to resolve any potential environmentally detrimental activities. • Consider temporary aeration for selected areas of the lake in the event that dissolved oxygen levels are predicted to drop below the historically observed levels based on monitoring data. Potential aeration methods include: air bubblers, mechanical agitators, mechanical mixers, and the placement of rocky areas around the lake to allow for natural wind to add aeration. • Consider using turbidity curtains in some instances when construction activities are adjacent to open water. Monitor the effectiveness of these devices. • Prepare and implement a suitable *Site Restoration Plan* to restore and re-vegetate all areas subject to temporary disturbance.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a wider Emergency Spillway, modifications to State Hwys. 155 and 178, and the increase in the crest heights of the dams by 16 feet. However, the potential short-term construction-related impacts are anticipated to be similar to but nominally higher than the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Traffic and Circulation			
No Action Alternative	There would be no Federal participation in remedial improvements under the Isabella DSM Project. There would be no construction–related traffic effects and no changes in the traffic levels and circulation resulting from construction and operation of the Isabella DSM Project. However, the No-Action Alternative would not reduce the likelihood of dam failure, and the potential consequences due to dam failure and catastrophic floodwater release on traffic and circulation would be adverse and significant in the area affected by inundation of floodwater in Bakersfield.	Significant Adverse	None
Alternative Base Plan	Under this alternative, the largest contributor to short-term construction-related traffic and circulation impacts would be heavy truck traffic along Hwy 178 associated with hauling filter sand materials from the proposed South Fork Delta borrow area to Isabella Dam. Concrete trucks delivering concrete from the existing batch plant located on SR 178 would be the second largest contributor. The third largest contributor would be heavy truck deliveries of other construction materials likely originating from the Bakersfield/Kern County area via SR 178 through the Kern River Canyon and from eastern Kern County via SR 178 over Walker Pass.	Low to Moderate Adverse, Less-than-significant	• A contractor-prepared *Traffic Safety Management Plan* for the proposed Isabella DSM Project, with the following general and specific provisions: ▪ Provide a system of temporary traffic control devices, in accordance with CalTrans' California Manual on Uniform Traffic Control Devices or other suitable guidelines, to safely pass non-construction traffic through and around construction areas and access-egress points.

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Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	Employee commuting would also be a contributor to traffic and circulation impacts, particularly at the start and end of each work day and during lunch time. The typical construction work week would be 6 days, with no work on Sunday, and no off-site hauling on Saturday, thus reducing traffic impacts on weekends. The modeling of potential traffic and circulation impacts on key intersections and roadway segments conducted for this Draft EIS has indicated that although the traffic increases anticipated under this alternative from the above contributors would be noticeable, they could be accommodated within the existing roadway and intersection configurations, while maintaining acceptable service levels. On this basis, potential short-term construction-related traffic and circulation impacts are considered low to moderate, and less-than-significant. However, taking into account the anticipated daily numbers of heavy trucks and other construction vehicles and worker vehicles entering and leaving the construction areas along Hwy 178 and in the vicinity of the Isabella Dams, the potential for mud and gravel debris at these intersection areas could pose a driving hazard. With implementation of the mitigation measures presented in this table, especially a specific *Traffic Safety Management Plan*, the level of potential impact would be considered moderate and less-than-significant. Occasional short-duration closures on the stretch of SR 155 between the Main Dam and Barlow Road may become necessary during blasting for construction of the Emergency Spillway and Borel conduit tunnel. These closures would increase travel times and could also affect access for emergency response vehicles. With implementation of the recommended mitigation measures, these potential impacts are considered moderate.	Low to Moderate Adverse, Less-than-significant	▪ Schedule heavy truck hauling to the project site during non-peak periods to the extent possible. ▪ Schedule worker shift changes so as not to coincide with existing background traffic peak periods, if feasible. ▪ Schedule bulk hauling of sand filter material by spreading out the required import operation over a longer period of time, to the extent practicable. ▪ Establish procedures for coordinating with local emergency response agencies to ensure dissemination of information regarding emergency response vehicle routes affected by construction. Specifically cover temporary road closures related to controlled blasting during construction. ▪ Select material haul routes that would result in the least impact on existing transportation facilities. ▪ Expand intersections used for project access, to the extent feasible, to provide dedicated turn lanes for vehicles entering and exiting the project work sites and staging areas. ▪ Encourage carpooling among construction personnel to reduce commute trips to and from the project site.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule. Construction of the RCC Overlay would nominally increase truck traffic on SR 155 and SR 178 compared to the Alternative Base Plan. Concrete required for the RCC Overlay is proposed to be produced on site using on-site aggregate and water. Cement and fly ash would be acquired from sources near Barstow and transported to the site via SR 178 from the east over Walker Pass.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a wider	Similar to	

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Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	Emergency Spillway, modifications to State Hwys. 155 and 178, and the increase in the crest heights of the dams by 16 feet. Construction of the wider Emergency Spillway is anticipated to nominally increase truck traffic on SR 155 and SR 178 compared to the Alternative Base Plan. However, it is anticipated that use of the material excavated for the Emergency Spillway to raise the dam crest heights would reduce or eliminate the need for additional borrow sites and reduce the distance of truck travel substantially in comparison to the other Action Alternatives. The potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Alternative Base Plan	
Noise and Vibration			
No Action Alternative	Under the No Action Alternative, there would be no Federal participation in remedial improvements under the Isabella DSM Project. There would be no construction-related noise or vibration effects and no change from current noise levels resulting from construction and operation of the Isabella DSM Project. It should be noted that some of the sensitive receptors are located in areas currently exposed to exterior and interior traffic noise levels approaching and/or exceeding the applicable Kern County noise level standards.	None	None
Alternative Base Plan	Implementation of this alternative would result in significant short-term construction-related noise impacts from heavy duty truck travel and construction equipment operating in the Primary Action Area (Isabella Dams and Spillway), which would exceed applicable standards at nearby sensitive receptors. In addition, construction activities would create substantial short-term increases in ambient noise levels and maximum instantaneous noise levels in the project vicinity that exceed applicable standards. Project-generated vibration levels could exceed standards for the prevention of structural damage and vibration standards for human annoyance for residents at existing nearby sensitive receptors. Increased project traffic and the use of local roadways for hauling project materials to the construction sites, would increase traffic noise levels at sensitive receptors living along the local roadway corridors. Receptors living closest to the roadway corridors would have the greatest potential to be affected by noise from project-related traffic. At those receptors closest to the roadways impacts would be considered adverse and high, with more moderate levels at those receptors farther away from the anticipated haul routes. This alternative would not include nighttime trucking along the anticipated routes, which would contribute to overall noise levels along haul routes being considered as less than significant. Short-duration controlled blasting is anticipated in order to break up bedrock within the proposed Emergency Spillway channel and for the Borel Canal relocation. Assuming that a *Controlled Blasting Management Plan* would be followed, adverse noise impacts associated with blasting are expected to be low to moderate and less-than-significant.	Significant Adverse Moderate to High Adverse, Less-than-significant Low to Moderate Adverse, Less-than-significant	• A contractor-prepared *Construction Noise and Vibration Monitoring Plan* prepared by an appropriate acoustical consultant before beginning work on the project. • Monitor construction noise for the project duration, at the most potentially affected sensitive receivers. Summaries of measured noise levels should be provided weekly or more often, if noise complaints arise. • Equip all construction equipment with noise control devices (e.g., mufflers), in accordance with manufacturers' specifications. • Inspect all equipment periodically to ensure proper maintenance and presence of noise control devices (e.g., lubrication, mufflers that do not leak, and shrouding). • Locate all stationary equipment as far as feasible from nearby residences and equip with engine-housing enclosures, as feasible. • Use portable noise barriers to shield stationary equipment, especially diesel powered dewatering pumps. • Maintain temporary barriers in good condition through construction. • Restrict idling of mobile equipment to no more than five minutes. • Blasting should include measures to limit noise and vibration, as determined by a qualified blasting engineer. • Designate a disturbance coordinator (DC) during the construction period and post a 24-hour contact number around the project site, and provide to nearby residents. The DC would determine cause and implement measures to alleviate the problem. • Provide written notice of construction-related activities to nearby sensitive receptors identifying the type, duration, and frequency of activities and a mechanism to register complaints.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and	Similar to	

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Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	deep in-situ treatment on the Auxiliary Dam. However, the potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Alternative Plan 1	• Limit operation of trucks and bulldozers sensitive to at least 60 feet away from sensitive structures. If operation of equipment closer than 60 feet is required, vibration monitoring should be conducted. • Limit hauling of material along sensitive routes to between 8 AM to 5 PM (daytime hours). • Discourage the use of engine braking ("jake brakes") along sensitive routes. • Encourage truckers to reduce engine noise when shifting in noise sensitive areas; and these areas should be posted. • Conduct all blasting of rock under the guidance of a qualified blasting consultant. • Notify all residences and businesses within 1,500 feet of blasting areas prior to conducting blasting.
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a wider Emergency Spillway, modifications to SR 155 and SR 178, and the increase in the crest heights of the dams by 16 feet. Construction of the wider Emergency Spillway is anticipated to nominally increase truck traffic on SR 155 and SR 178 compared to the Alternative Base Plan. Additional blasting may also be required for spillway excavation compared to the Alternative Base Plan. However, it is anticipated that use of the material excavated for the Emergency Spillway to raise the dam crest heights would reduce or eliminate the need for additional borrow sites and reduce the distance of truck travel substantially in comparison to the other Action Alternatives. The potential short-term construction-related impacts are anticipated to be similar to but nominally higher than the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Hazardous, Toxic and Radiological Waste			
No Action Alternative	Under the No Action Alternative, there would be no Federal participation in remedial improvements to the Isabella Main Dam, Spillway, Auxiliary Dam, or Borel Canal. Operation of Isabella Dam would continue in accordance with the established Water Control Plan and Flood Control Diagram. Since no construction would occur under the No Action Alternative, there would be no HTRW impacts anticipated in the Isabella DSM Project area. However, under the No Action Alternative, one or both dams are almost certain to fail under normal operations, especially if subjected to a strong seismic event. Potential consequences due to dam failure and catastrophic floodwater release would be adverse and significant in the area affected by inundation of floodwater in Bakersfield, where the number of potential HTRW sources that would be affected is substantial.	Significant Adverse	None
Alternative Base Plan	With respect to the six landfills identified as areas of potential concern, the Corps has concluded that no further action is required and that they should not have impact on or be impacted by implementation of this alternative. Construction activities associated with this alternative include use, storage, and transport of hazardous materials, including the use of aboveground fuel storage tanks. Also, heavy equipment and vehicles would be maintained at the construction sites, staging areas, and borrow areas. These activities have the potential for HTRW to be inadvertently released during fueling and maintenance operations, material hauling, and cement production. However, with appropriate measures, such as Best Management Practices (BMPs) and a Spill Prevention, Control and Countermeasures Plan (SPCC), adverse impacts from inadvertent spills or releases	None Low Adverse, Less-than-significant	• A contractor-developed *Spill Prevention and Response Plan* covering all work sites, haul routes and staging areas. • Fuel and service all vehicles in designated areas. • Minimize to the extent practicable, storage of hazardous substances at the work site and in staging areas. • Secure stored hazardous materials in closed containers away from drainage courses and areas of storm water infiltration. • Ensure that maintenance and construction personnel are trained in current procedures and best

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Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	of hazardous substances would be low, and less-than-significant.		available technology for spill prevention and cleanup of accidental spills. • Keep spill kits at the work sites at all times where hazardous materials are in use. • Stop work immediately in the event of a hazardous materials spill or release, and implementing appropriate cleanup and remediation measures. • Workers handling, using, or exposed to dry or wet cement should be trained in hazards and controls. • Ensure that appropriate worker safety is implemented at all times. • An appropriate *Storm Water Pollution Prevention Plan (SWPPP)* covering all work sites, haul routes and staging areas.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the increased Emergency Spillway width, increased dam crest heights, and modifications to SR 155 and SR178. However, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Biological Resources			
No Action Alternative	Under the No Action Alternative, Isabella Dam and Lake would be operated at the pre-IRRM elevation in accordance with the established Water Control Plan and Flood Control Diagram. There would be no construction related loss, degradation, or fragmentation of natural vegetation communities or wildlife habitat or new interference with the movement of resident or migratory wildlife species. Ongoing impacts on biological resources associated with normal operations would continue. The No-Action Alternative would not reduce the likelihood of dam failure that could result in catastrophic impacts on lake and downstream biological resources and habitats. These impacts are considered adverse and significant.	Significant Adverse	None
Alternative Base Plan	There would be moderate adverse, less-than-significant impacts on vegetative communities associated with this alternative. No known ESA-listed plant or animal species are known to occur within or in the vicinity of the proposed South Fork delta borrow area. Southwestern willow flycatcher and western snowy plover populations are located east of the proposed borrow area. However, filter sand borrow activities in the South Fork delta would likely be planned to take place primarily during the winter months when southwestern willow flycatcher and western snowy plovers are not present. Anticipated adverse impacts are therefore low and less-than-significant.	Moderate Adverse, Less-than-significant Low Adverse, Less-than-significant	• A contractor-prepared *Site Preparation Plan*, to include methods to avoid introducing non-native plant species via construction equipment. • A contractor-prepared *Stormwater Pollution Prevention Plan* (SWPPP). • A contractor-prepared *Soil and Groundwater Management Plan* (SGMP), to include handling of contaminated soil and/or groundwater that may be encountered during project construction or excavation of borrow sites. • A contractor-prepared *Controlled Blasting Management Plan*, to include anticipated disturbance

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Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	Moderate to high impacts on non-listed fish and wildlife are possible due to water level drawdown during coffer dam installation and removal, coffer dam operations, and installation of the Upstream Berm on the Auxiliary Dam. Impacts to fish and wildlife could result from water quality effects such as increased temperature, turbidity, and pH, and reduced DO. Synergistic effects of water quality degradation could result in blooms of cyanobacteria that may become harmful to wildlife and pets. With mitigation measures such as close monitoring and corrective actions, impact are expected to be less than significant.	Moderate to High Adverse, Less-than-significant	to wildlife. • Conduct bird surveys preceding any borrow excavation activities in the South Fork Delta area, focusing on southwestern willow flycatcher and least Bell's vireo. • When final boundaries of Staging Areas south of Auxiliary Dam are established, conduct a detailed wetland delineation of the emergent wetlands to specifically identify the potential area(s) and quantify the extent of potential impact. • Prepare a *Wetland Mitigation Plan* to identify the least environmentally damaging practicable alternative (LEDPA) and appropriate on- or off-site areas for any required compensatory mitigation and the appropriate ratio. • Prepare a 404(b)(1) analysis for the placement of earth and rock fill for the upstream berm on the Auxiliary Dam. • A contractor-prepared S*ite Restoration Plan* on returning the cleared areas to pre-construction conditions where feasible and practicable.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term construction-related impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term construction-related impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the increased Emergency Spillway width, increased dam crest heights, and modifications to SR 155 and SR178. However, it is anticipated that use of the material excavated for the Emergency Spillway to raise the dam crest heights would reduce or eliminate the need for filter sand borrow activities in the South Fork delta borrow sites. The potential short-term construction-related impacts are anticipated to be similar to but nominally less than the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Land Use			
No Action Alternative	Under the No Action Alternative, there would be no anticipated changes in current land use around Isabella Dam. The No-Action Alternative would not reduce the likelihood of dam failure that could result in catastrophic significant adverse impacts on downstream land uses and land use in the vicinity of Isabella Lake.	Significant Adverse	None
Alternative Base Plan	This alternative would involve short-term and long-term impacts on land use in the Primary Action Area (Isabella Dams and Spillway area), and in the Secondary Action Area (South Fork Delta area). The USFS Administration Building and Compound and the Corps Project Office and Shop structures would be removed to accommodate a new Emergency Spillway, changing the land use for the area. Recreational facilities at the Auxiliary Dam Recreation Area and	High Adverse, Less-than-significant	• A Corps-prepared *Real Estate Plan* during 2012-2013, to identify and address relocation of the USFS Offices and Compound, and the Corps Project Office and Shop, and other potential real estate actions, and including a separate NEPA document, should the Isabella DSM Project be approved.

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Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	Launch 19 would not be accessible for the multi-year construction period of the Isabella DSM Project. Proposed staging areas for the Isabella DSM Project south of the Auxiliary Dam contain some wetlands and some land designated as State Important and Unique Farmland. If these locations cannot be avoided, land use impacts would occur. Because the structures and land uses described above would be relocated and re-established in suitable locations, and because appropriate mitigation measures would be implemented regarding all land use changes, potential land use impacts are considered high but less-than-significant.		• A Corps-prepared *Recreation Mitigation Plan* during 2012-2013 to address replacing these recreation amenities. • Avoid or reduce to the extent possible involving the wetlands and areas of important and unique farmland located south of the Auxiliary Dam. • Restore the portion of the Main Dam Campground Area that is used for a temporary staging area under Alternative Plans 1, 2, 3, and 4.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term and long-term land use impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule. This alternative also involves the temporary use of the Main Dam Campground as a staging area to support the additional work on the Main Dam.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term and long-term land use impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term and long-term land use impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the addition of a 16-foot dam crest raise, wider Emergency Spillway, and modifications to SR 155 and SR 178. However, the potential short-term and long-term land use impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule. This alternative also involves the temporary use of the Main Dam Campground as a staging area to support the additional work on the Main Dam, but would reduce or eliminate the need for additional borrow sites with sufficient material becoming available from the Emergency Spillway excavation.	Similar to Alternative Base Plan	
Recreation			
No Action Alternative	Under the No Action Alternative, there would be no changes in recreation or recreation opportunities around the around the dams related to construction. The No Action Alternative would not reduce the likelihood of dam failure that could result in significant impacts on recreation upstream and downstream of Isabella Lake. Without dam remediation, both dams have a high risk of failure under normal conditions and in the event of a disturbance such as an earthquake or large flood. This would result in significant adverse impacts.	Significant Adverse	None

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Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
Alternative Base Plan	Implementation of this alternative would require closing of the popular Auxiliary Dam Recreation Area and Launch 19, and substantially limiting access to Engineers Point for the duration of the multi-year construction period. Also, this alternative includes lowering the maximum lake elevation to 2,543.76 feet for a period of nine months for construction of an Auxiliary Dam upstream berm, and for two 2-month periods for construction and removal of a coffer dam at the Auxiliary Dam to complete a relocation of the Borel Canal conduit. This lowered lake elevation would have a substantial adverse impact on water–based recreation and land-based recreation and camping during the multi-year construction period. Lower lake levels and reduced lake surface could result in increased watercraft congestion and user conflict at the lake, impacts on the viability of the fishery, and fewer operable launch areas. Also, during construction the quality of the recreation experience at Isabella Lake may be considerably degraded from noise and visual disruptions, increased construction vehicle traffic and temporary delays, dust, reduced facility choices and potential overcrowding. Consequently, visitation to Isabella Lake may decline during the construction period and for a while after, as visitors may choose other areas to recreate. The above-described impacts to recreation at Isabella Lake would be moderate to high. However, with implementation of appropriate BMPs and the mitigation measures summarized in this table, these short-term impacts can be managed to less than significant levels.	Moderate to High Adverse, Less-than-significant	• A Corps-prepared *Recreation Mitigation Plan* during 2012-2013 to address replacing the recreation amenities removed from availability or otherwise affected during construction, and how affected recreational sites would be restored following construction. The planning process should involve the USFS and other key stakeholders. Actions resulting from the *Plan* would be covered in a separate NEPA document. • Schedule lake lowering to coincide with normal water release regimes and seasonally lower levels. • Delay, divert, or restrict construction to minimize traffic delays during key recreation events; • Make adjustments and post educational information at recreation areas to reduce potential user conflicts. • Apply measures to limit and/or reduce construction noise and visual disruptions in proximity to recreation sites. • Provide up-to-date information for visitors on available recreation amenities and on the what, where, and why of the construction activities. *Recreation mitigation currently being considered and/or proposed by the Corps and USFS:* • Improving access to Old Isabella Recreation Area, and accommodations for increased use in that area. • Through grant funding provided by the California Department of Boating and Waterways, improvements to several boat ramps are expected at the lake. For example, at Old Isabella, the two existing boarding floats would be replaced with two improved boarding floats to better accommodate recreation users during high and low water periods. Also, at the South Fork Recreation Area, the boarding float would be similarly replaced.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term recreation impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term recreation impacts are anticipated to be similar to Alternative Plan 1, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term and long-term land use impacts are anticipated to be similar to Alternative Plan 2, but slightly lower because the two 2-month periods of lower lake levels (to max of 2,543.76 feet) would not be required.	Similar to but slightly lower than Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the addition of a 16-foot dam crest raise, wider Emergency Spillway, and modifications to SR 155 and SR 178. However, the potential short-term and long-term recreation impacts are anticipated to be similar to the Alternative Base Plan, except they would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	

Table 3-125
Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
Aesthetic Resources			
No Action Alternative	Under the No Action Alternative, there would be no new construction of facilities and no impacts on visual resources during the construction period. However, the likelihood of dam failure would not be reduced and the potential catastrophic loss of one or both dams would significantly alter the visual landscape of the Isabella Lake basin, as well as the San Joaquin Valley, due to major downstream flooding of the areas between Isabella Lake and Bakersfield.	Significant Adverse	None
Alternative Base Plan	This alternative includes construction of an Emergency Spillway cutting into a portion of the hillside now supporting the USFS Offices and Compound and the Corps Project Office and Shop. Also, this alternative requires the development and operation of construction support actions that include noticeable visual features and activities such as staging and stockpile areas, haul roads, crushing plant, coffer dam, lowered lake levels, and sand washing facility. Furthermore, this alternative would increase the size of the Auxiliary Dam footprint. On this basis, moderate-to-high short-term and long-term visual impacts would occur as a result of the construction of remediation measures and landscape and landform changes created during the multi-year construction period. With implementation of the BMPs and recommended mitigation measures summarized in this table, short-term and long-term visual impacts would be considered moderate, and less-than-significant.	Moderate to High, Adverse, Less-than-significant	• Select locations and alignments for earthwork that fit into the landforms to minimize the size of cuts and fills. • Retain as much of the existing vegetation as possible. • Use existing vegetation to screen construction from public view. • Feather and thin the edges of cleared areas and retain a representative mix of plant species and sizes. • Minimize the number of temporary and permanent structures and combine different activities in one structure. • Use natural self-weathering materials and chemical treatments on surfaces to reduce color contrast. • Use road aggregate and concrete colors that match the color of the characteristic landscape surface. • Treat surfaces of all project structures and buildings visible to the public so that their colors minimize visual contrast by blending with the characteristic landscape colors and their colors and finishes do not create excessive glare. • Ensure that lighting does not cause excessive reflected glare. • Ensure that direct lighting does not illuminate the nighttime sky. • Place all construction trash and food-related waste in self-closing containers and remove daily from work sites and staging areas visible to public view. • Confine vehicular traffic to routes of travel to and from the project site, and prohibit cross-country vehicle and equipment use outside designated work and storage-staging areas. • Limit speed of vehicles on dirt routes to minimize the generation of fugitive dust. • A contractor-prepared *Site Restoration Plan*, preferably prepared before construction begins, covering all areas subject to temporary disturbance, and providing guidelines to restore these areas to conditions that mimic and complement adjacent undisturbed areas.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. The potential short-term and long-term visual impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule. Also, the 800-foot long RCC Overlay constructed on the downstream face of the dam would represent a contrasting visual change to the appearance of the existing earth-fill dam face, which would represent a moderate short-term and long-term and less-than-significant visual impact. This would not be the case with the Alternative Base Plan, since it does not include an RCC Overlay.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. The potential short-term and long-term visual impacts are anticipated to be similar to Alternative Plan 1, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term and long-term visual impacts are anticipated to be similar to Alternative Plan 2, but slightly less because the two 2-month periods of lower lake levels (to max of 2,543.76 feet), as well as the coffer dam, would not be required, as is the case for the other three alternatives.	Similar to but slightly lower than Alternative Plan 2	
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the addition of a 16-foot	Similar to	

Table 3-125
Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	dam crest raise, wider Emergency Spillway, and modifications to SR 155 and SR 178. The potential short-term and long-term visual impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule. Also, the higher dam crests and expanded Emergency Spillway would represent a greater change to the to the landscape and landform of the area when compared to the Alternative Base Plan. However, with implementation of the BMPs and recommended mitigation measures summarized in this table, short-term and long-term visual impacts would be considered moderate, and less-than-significant.	Alternative Base Plan	
Cultural Resources			
No Action Alternative	The No Action Alternative would not result in any impacts on cultural resources from dam safety remediation construction. However, without modification of the dams and spillway there would remain a very high likelihood of dam failure with the potential for catastrophic significant adverse impacts on cultural resources downstream.	Significant Adverse	None
Alternative Base Plan	This alternative includes establishing a construction staging area in the vicinity of an archaeological site that requires further evaluation. While much of the area of potential effects (APE) on cultural resources has been inventoried, further identification and evaluation efforts are needed after the preferred alternative and its APE are determined. The Main Dam, Auxiliary Dam, existing spillway and the Borel Canal system have been evaluated for the National Registry of Historic Places (NRHP). They are not historic properties and the proposed DSM remediation measures would not impact these structures. Buildings and structures making up the USFS Administrative Building and Compound, and other structures that may be removed have been evaluated and deemed not eligible for NRHP listing. With implementation of the BMPs and recommended mitigation measures listed in this table, potential short-term and long-term adverse impacts on cultural resources would be considered low and less-than-significant. The Corps will continue with identification, evaluation, and effects analysis and with the preparation of a Programmatic Agreement (PA) with key participants as appropriate. Additional mitigation measures to those listed in this table would be developed as needed to resolve any adverse effects on historic properties and mitigate any unforeseen potential impacts to a less than significant level.	Low Adverse, Less-than-significant	*The Corps has a fully executed PA in place. The PA includes stipulations and mitigation measures such as the following:* • Redesigning project elements to avoid historic properties or sensitive areas. • Conducting data recovery excavations of archaeological sites that cannot be avoided or are discovered during construction, based on an approved Historic Properties Treatment Plan (HPTP). • Monitoring all excavations in areas where buried resources are anticipated. • Surveying and protecting exposed inundated cultural deposits. • Protecting exposed archaeological sites from vandalism and erosion with fencing and revegetation, or capping sites in an approved manner with appropriate material. • Preparing and implementing a discovery plan; if previously undiscovered resources are identified during an undertaking. The plan would likely include (a) suspending work while the resource is evaluated and mitigated to avoid any further impact; and (b) consulting with interested Native American groups to identify any traditional cultural properties or resource uses and address impacts. • Developing a plan of action, pursuant to NAGPRA; between the Corps, USFS, and interested Indian Tribes to manage the disposition and treatment of human remains should any be encountered during project implementation.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term and long-term cultural resources impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term and long-term cultural resources impacts are anticipated to be similar to Alternative Plan 1, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through	Similar to Alternative Plan 2	

Table 3-125
Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
	a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term and long-term cultural resources impacts are anticipated to be similar to Alternative Plan 2.		
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the addition of a 16-foot dam crest raise, wider Emergency Spillway, and modifications to SR 155 and SR 178. However, the potential short-term and long-term cultural resources impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Socioeconomics and Environmental Justice			
No Action Alternative	With the No Action Alternative, there would be no remediation of the existing seismic, seepage, and hydrological deficiencies in the dams and spillway that have resulted in high-risk conditions at Isabella Dam. The risk of a catastrophic dam failure and significant downstream flooding would continue to be present. The continued high probability of dam failure under this alternative would retain the potential for long-term adverse effects on the regional economy, primarily attributable to declines in business production from structural inundation and flooding of farmland, as well as on public health and safety. These impacts would be adverse and significant.	Significant Adverse	None
Alternative Base Plan	Implementing this alternative would have a low to moderate short-term beneficial impact on the regional economy due to increased expenditures in the regional economy over the construction period. However, implementing this alternative would also have a moderate short-term adverse and less-than-significant impact on the regional economy due to reduced recreation opportunities during construction. In addition, increased construction-related traffic, delays, and detours, as well as an increased population due to the presence of a construction workforce could result in short-term increased social tension during the construction period. If the proposed project goes ahead and the selected alternative has been constructed, recreation would be expected to return to Isabella Lake and to experience a long-term growth with anticipated future growth in potential visitations resulting in low to moderate long-term beneficial impacts.	Low to Moderate Beneficial Moderate Adverse, Less-than-significant Low to Moderate Beneficial	*In order to minimize the adverse impacts of construction on recreation attendance and expenditures and their consequent impacts to income employment and social values, the Corps anticipates implementing such potential mitigation measures as:* • Initiating in cooperation with the USFS and local communities, a comprehensive recreation mitigation planning process to address how all affected recreational opportunities would be maintained during the construction period and to address post-construction recreational site restoration. The expansion, addition, or modification of recreation facilities would be considered as part of this process. It is likely that some actions resulting from this planning process would result in proposals would need subsequent analysis. Limit off-site truck hauling on weekends and other times to accommodate tourist and/or recreation-related traffic, especially those days that may be associated with special local events. • Where possible, scheduling lake lowering to coincide with normal water release regimes to maintain flows for agricultural use, recreation and power generation. • Limiting construction noise and visual disruptions to visitors; and • Providing adequate and current information on available recreation and visitor services . *If the Corps were to determine that relocations would be required associated with the proposed Isabella DSM Project, the following are recommended:* • All required property acquisitions be conducted in compliance with Federal and State relocation law.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term and long-term socioeconomic impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term and long-term socioeconomic impacts are anticipated to be similar to Alternative Plan 1, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	

Table 3-125
Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term and long-term socioeconomic impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	• Required relocations be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 United States Code, Section 4601 et seq.) and implementing regulation (49 Code of Federal, Regulations Part 24). This law requires that appropriate compensation be provided to displaced residential and nonresidential landowners and tenants, and that residents be relocated to comparable replacement housing and receive relocation assistance. Provisions also include relocation advisory services, moving costs reimbursement, replacement housing, and reimbursement for related expenses and rights of appeal. Also under this law, compensation for living expenses would be provided for temporarily relocated residents and negotiations regarding any compensation for temporary loss of business cover temporary relocations. This law applies to residential relocations as well as to farms and businesses if they were displaced for any length of time. • See also the mitigation previously presented under Recreation. Those mitigation measures would also help reduce the adverse impacts of construction on recreation expenditures and their potential consequent impacts to income employment and social values.
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the addition of a 16-foot dam crest raise, wider Emergency Spillway, and modifications to SR 155 and SR 178. However, the potential short-term and long-term socioeconomic impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Public Health and Safety			
No Action Alternative	The No Action Alternative would not result in any Public Health and Safety impacts from dam safety remediation construction. However, without modification of the dams and spillways there will remain a very high likelihood of dam failure with catastrophic significant adverse public safety consequences downstream.	Significant Adverse	None
Alternative Base Plan	Implementation of this alternative over the anticipated multi-year construction period would involve an influx of large number of workers; heavy equipment use; heavy truck traffic; controlled blasting; explosives use and management; excavation; materials hauling; dust generation; hazardous material use, storage, and disposal; air emissions; noise; weather extremes; and work on steep slopes and dam infrastructure adjacent to the lake. Short-term health and safety risks during construction would be primarily associated with the onsite workers, but risks to the public would also be anticipated due to the generation of pollutant emissions and dust; accidents from increased use of public roads by heavy haul trucks; transport, storage and use of hazardous materials; delayed access to or overtaxed emergency services; increased noise and vibration; worksite and vicinity security; and potential changes in the releases from the Main Dam to accommodate construction. With implementation of the BMPs and recommended mitigation measures summarized in this table, the potential adverse short-term public health and safety impacts are anticipated to be low and less-than-significant.	Low Adverse, Less-than-significant	• A contractor-prepared *Public Safety Management Plan* to maintain public safety during all phases of construction. Components of the plan would include: e. Notifying the public of the location and duration of construction activities, and where short-term closures of recreation sites, lake access points, pedestrian and bicycle paths and trails may be occurring. f. Coordinating with the public and local jurisdictions to maintain emergency response and emergency evacuation plans, as well as the capacity of emergency services during construction. g. Posting signs locating construction sites and warning of the presence of construction equipment. h. Fencing construction staging areas if dangerous conditions exist when construction is not occurring. • A contractor-prepared *Confined Space/Ventilation Safety Plan.* • A contractor-prepared F*ire Management Plan* in consultation with the KCFD, USFS, and BLM fire suppression agencies. • A contractor-prepared *Worker Health and Safety Plan* to maintain public safety during all phases of construction. Components of the plan would include: f. Appropriate worker, public health, and environmental protection equipment and procedures. g. Emergency response procedures.
Alternative Plan 1	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan, with the addition of a full-height filter, and RCC Overlay. However, the potential short-term public health and safety impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	
Alternative Plan 2	This alternative involves more excavation, material requirements and handling and a 12-month longer construction period than Alternative Plan 1, with the additional downstream buttress and deep in-situ treatment on the Auxiliary Dam. However, the potential short-term public health and safety impacts are anticipated to be similar to Alternative Plan 1, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Plan 1	

Table 3-125
Summary of Potential Impacts

Alternative	Potential Impacts	Level of Impact	Recommended Mitigation Measures/Best Management Practices
Alternative Plan 3	This alternative involves excavation, material requirements and handling and construction period similar to Alternative Plan 2, although this alternative would not require construction of a coffer dam, but would involve relocating the Borel Conduit from the Auxiliary Dam through a tunnel from the Main Dam outlet rather than through the Auxiliary Dam right abutment. However, the construction period for this alternative is similar to Alternative Plan 2. The potential short-term public health and safety impacts are anticipated to be similar to Alternative Plan 2.	Similar to Alternative Plan 2	h. Most direct route to a hospital. i. Name of the Site Safety Officer. j. Documenting that all workers have reviewed and signed the plan. • Compliance with all applicable local, regional, State, and Federal laws, policies, and regulations regarding the transportation, storage, handling, management, and disposal of hazardous materials and wastes. • A contractor-prepared *Solid and Hazardous Materials and Waste Management Plan.* • A contractor-prepared *Controlled Blasting Management Plan*, to include any short-term road closures and other public safety management measures that may be required in the vicinity of the controlled construction blasting. • A contractor-prepared *Traffic Management Plan* to include normal and emergency access at construction sites, haul roads and staging areas, and for maintaining emergency procedures.
Alternative Plan 4	This alternative involves more excavation, material requirements and handling and a four-month longer construction period than the Alternative Base Plan with the addition of a 16-foot dam crest raise, wider Emergency Spillway, and modifications to SR 155 and SR 178. However, the potential short-term public health and safety impacts are anticipated to be similar to the Alternative Base Plan, except the short-term impacts would be present for a longer time because of the extended construction schedule.	Similar to Alternative Base Plan	

CHAPTER 4.
CUMULATIVE IMPACTS AND OTHER REQUIRED DISCLOSURES

This chapter presents a discussion of the potential cumulative impacts associated with the implementation of the proposed Isabella DSM Project (Proposed Action). Also included in this chapter are discussions of the: (a) Relationship Between Local Short-term Uses of the Environment and Maintenance and Enhancement of Long-term Productivity; and (b) Irreversible and Irretrievable Commitment of Resources.

4.1 REGULATORY FRAMEWORK FOR CUMULATIVE IMPACTS

This evaluation of potential cumulative effects from the Proposed Action is consistent with the following regulations and guidance:

- Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR Part 1500-1508);
- Corps' "Procedures for Implementing the Requirements of the National Environmental Policy Act" (33 CFR Part 230);
- CEQ's "Considering Cumulative Effects under the National Environmental Policy Act" (January 1997); and
- EPA's "Consideration of Cumulative Impacts in EPA Review of NEPA Documents" (EPA 315-R-99-002/May 1999).

Cumulative impacts are generally defined in the regulations as the impact on the environment (typically a specific ecosystem) resulting from the incremental impact of a proposed action when added to other past, present and reasonably foreseeable future actions in that area. Such cumulative impacts can result from the additive effect over time from actions that may individually have minor impacts but that collectively may have significant impacts.

4.2 OTHER RELEVANT ACTIONS SELECTED FOR THIS ANALYSIS

Based on a review of published material, available information about the Isabella Lake region on various agency and corporate websites, and discussions with agencies and interested stakeholders the following list of existing, proposed, and reasonably foreseeable actions in the region were assembled and assessed for inclusion in this cumulative impacts evaluation:

- Forest Service Motorized Travel Management EIS (October 2009) (USFS 2009a);
- Forest Service Giant Sequoia Monument Management Plan EIS (August 2010) (USFS 2010b);
- Kern River Valley Specific Plan (July 2011) (Kern County 2011b);

- Kern River Preserve (ongoing);
- Borel Canal Hydroelectric Project (ongoing);
- Isabella Partners Hydroelectric Project (ongoing);
- Bakersfield Resource Management Plan (ongoing); and
- Weldon Ranch Solar Project (ongoing).
- Weldon (Foresight) Solar Projects (ongoing).

The actions on the above list were assessed as to their relevance for inclusion in this cumulative impact analysis based on their geographic area of influence, proximity to Isabella Lake, and time frame as a viable action and/or planning period involved. On this basis, all of the listed actions were deemed relevant for inclusion in this cumulative impact analysis, and have therefore been included. These relevant actions are described in the following section.

4.3 DESCRIPTIONS OF RELEVANT ACTIONS

4.3.1 Forest Service Motorized Travel Management EIS (October 2009)

Background

Over the past few decades, the availability and capability of motor vehicles, particularly off-highway vehicles (OHVs) and sport utility vehicles have increased tremendously. Nationally, the number of OHV users has climbed to over sevenfold in the past 30 years, from approximately 5 million in 1972 to 36 million in 2000. California is experiencing the highest level of OHV use of any state in the nation. Unmanaged OHV use has resulted in unplanned roads and trails, erosion, watershed and habitat degradation, user conflicts, and impacts on cultural resource sites.

Compaction and erosion are the primary effects of OHV use on soils. Riparian areas and water-dependent species are particularly vulnerable to damage from OHV use. Unmanaged recreation is one of four key threats facing the nation’s forests and grasslands.

The Sequoia National Forest (SQF) manages and maintains approximately 1,623 miles of roads and 351 miles of motorized trails in three ranger districts: Hume Lake, Western Divide, and Kern River (Isabella Lake). The Sequoia National Forest Transportation System (NFTS) was developed over many decades to meet a variety of needs, including timber management, fuel treatment, private inholdings access, fire control, utility management, special uses management, and recreation. Other roads were acquired with past land exchanges or acquisitions. Harvesting special forest products, such as greenery, firewood, mushrooms, and plants, is one of the many opportunities afforded by the NFTS.

The NFTS is always changing, depending on resource needs and management concerns. The Forest Service’s Motorized Travel Management EIS is part of the SQF’s continuing effort to manage the transportation system to meet current and future needs. Previous decisions may have reduced or added to the number of miles of National Forest System (NFS) roads and trails available for motor vehicle use. These decisions have closed roads, imposed seasonal restrictions, and decommissioned selected routes. This has been accomplished through forest planning and projects to manage vegetation, restore watersheds, treat fuels, construct trails, make trail management decisions, and perform landscape, watershed, and road analyses. All of these efforts have contributed to sustainable management of the SQF NFTS.

Ongoing efforts include the following:

- The interim forest order, which prohibits cross-country travel off existing routes pending completion of this project;
- Project-specific efforts to reduce the impacts from routes outside the system; and
- Impacts associated with the current FTS through the USFS's road operation and maintenance program.

Implementation of this project is only one step in the overall management of motor vehicle travel on the SQF.

On April 15, 2000, the Giant Sequoia National Monument (GSNM) was established by presidential proclamation, encompassing a large portion of the Hume Lake and Western Divide Ranger Districts. The GSNM proclamation prohibits cross-country motorized vehicle use, permitting it only on designated roads and requiring a transportation plan for the monument. A motor vehicle use map has been produced for this area.

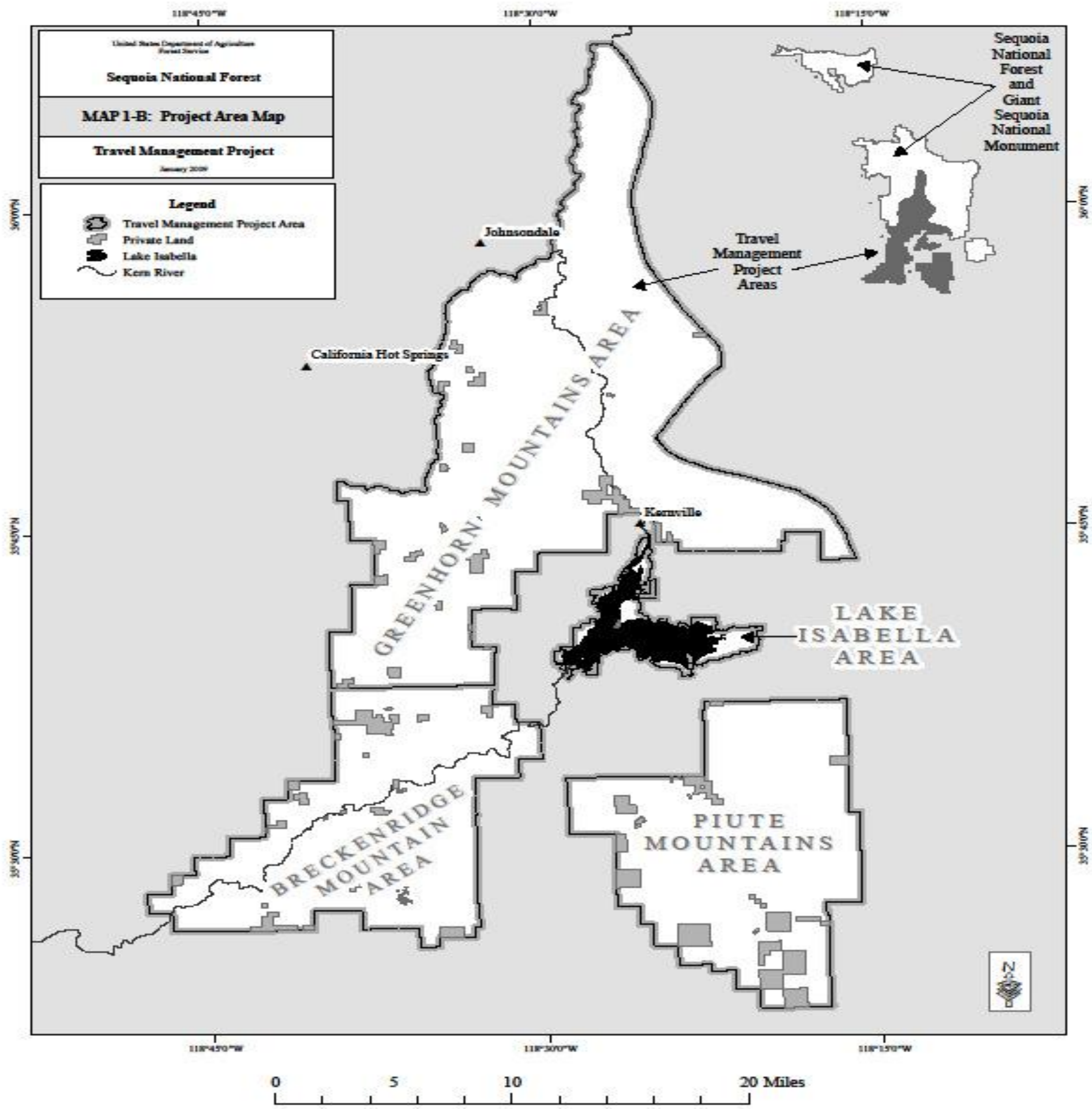
About 17,425 acres in the Western Divide Ranger District lie outside of the GSNM, where cross-country motorized travel is allowed. This portion of the Ranger Districts included in the Travel Management Project area. The Kern River Ranger District covers approximately 320,989 acres of NFS land. Of that, the prohibition of cross-country travel is enforced on about 14,260 acres, known primarily as the Kern Plateau. On the remaining roaded area, cross-country travel is allowed.

Project Area Description and Location

The project area covers approximately 336,988 acres of the Western Divide and Kern River Ranger Districts and is made up of four distinct areas: the Greenhorn Mountains, Breckenridge Mountain, the Piute Mountains, and Isabella Lake (Figure 4-1). The project area contains approximately 526 miles of NFTS roads and trails available for public motor vehicle use. In 2005, the SQF completed an inventory of unauthorized motorized routes within the project area and identified approximately 411 miles of such routes.

The proliferation of unplanned, unauthorized, unsustainable roads, trails, and areas created by cross-country travel adversely impacts the environment. The 2005 Travel Management Rule, 36 CFR, Section 212, Subpart B, provides for a system of NFTS roads, trails, and areas on NFS lands that are designated for motor vehicle use. Following

Figure 4-1 Project Area - Forest Service Motorized Travel Management EIS



the designation of roads, trails, and areas, motor vehicle use off the NFTS is prohibited by 36 CFR, 261.13.

A substantial portion of known dispersed recreation activities are not typically located directly adjacent to NFTS roads or NFTS motorized trails. Some dispersed recreation activities depend on foot or horseback access, and some depend on motor vehicle access. Those activities accessed by motor vehicles are typically reached on short spurs that have been created primarily by the passage of motor vehicles. Many such unauthorized or "user-created" routes are not currently part of the NFTS. Without adding them to the NFTS and designating them on a Motor Vehicle Use Map (MVUM), the regulatory changes noted above would make continued use of such routes illegal and would preclude access by the public to many dispersed recreation activities. Forest Service policy calls for providing a diversity of road and trail opportunities for experiencing a variety of environments and modes of travel consistent with the National Forest recreation role and land capability.

4.3.2 Forest Service Giant Sequoia Monument Management Plan EIS (August 2010)

Background

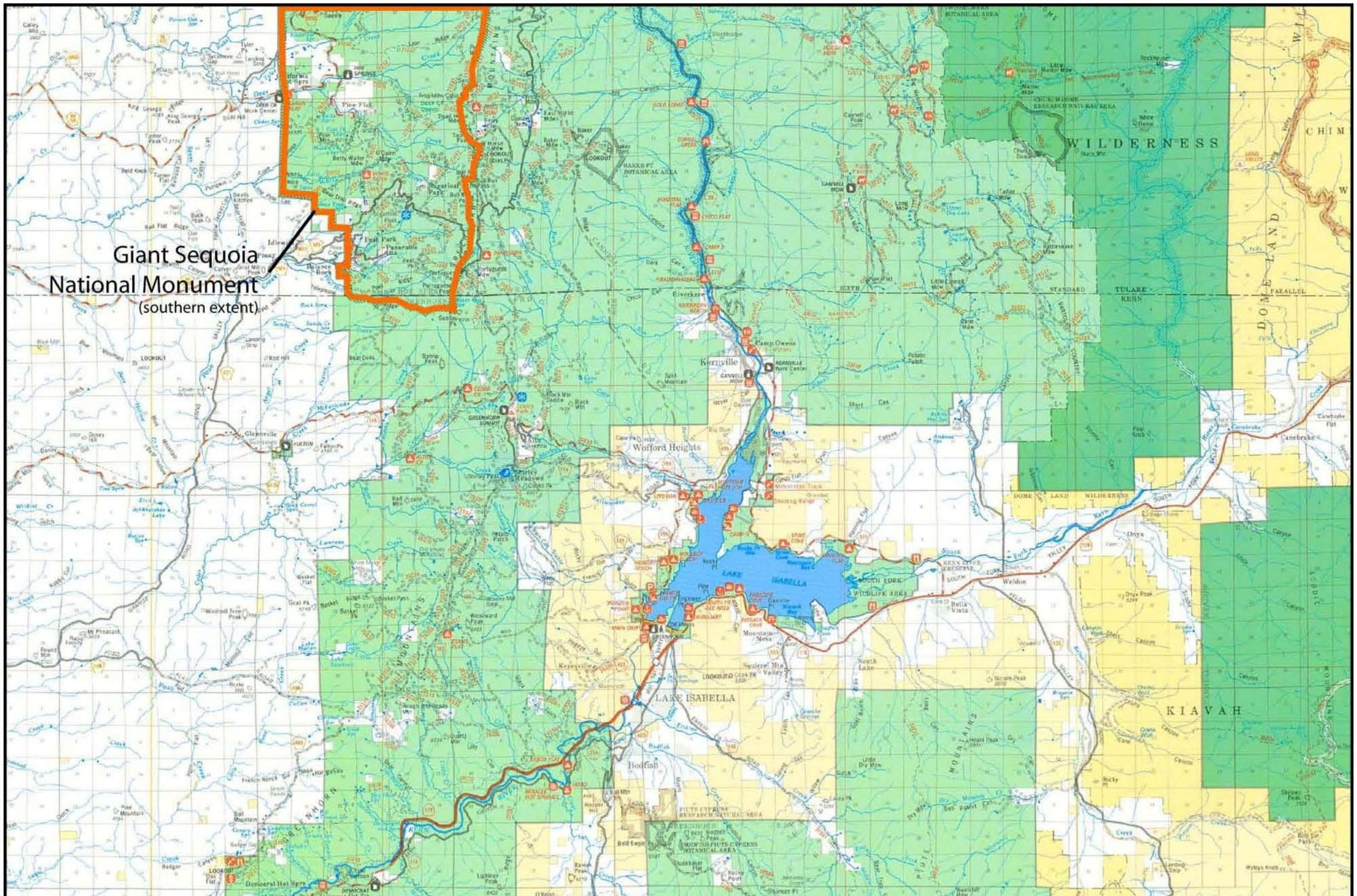
On April 15, 2000, President Bill Clinton signed the presidential proclamation establishing the Giant Sequoia National Monument. The monument was designated because 'The rich and varied landscape of the monument holds a diverse array of scientific and historic resources. Magnificent groves of towering giant sequoias, the world's largest trees, are interspersed within a great belt of coniferous forest, jeweled with mountain meadows." The monument is in south-central California and is administered by the Forest Service, Sequoia National Forest (Figure 4-2).

The Clinton proclamation required establishment of a monument management plan within three years. A Giant Sequoia National Monument Final Environmental Impact Statement Record of Decision was signed on January 12, 2004. The plan was challenged and lawsuits were filed in the United States District Court for the Northern District of California on January 27, 2005 (*Sierra Club, et al. v. Bosworth, et al., No. C-05-00397 CRB*) and March 3, 2005 (*People of the State of California, ex rel. Lockyer v. United States Department of Agriculture, et al., No. C-05-00898 CRB*).

In October 2006, Federal District Court Judge Charles Breyer found in favor of the plaintiffs in both cases and remanded the management plan to the Forest Service "…so that a proper Monument Plan can be developed in accordance with the Presidential Proclamation…and in compliance with the National Environmental Policy Act (NEPA)…" (*Calif. Ex rel. Lockyer v. USDA,* No. C-05-00898 [N.D. Cal., Oct. 11, 2006]).

There is a need for a single comprehensive management plan for the monument. The current management direction (including the Forest Plan, the 2001 Sierra Nevada Forest

Figure 4-2 Giant Sequoia Monument Management Plan Area



Source: Giant Sequioa National Monument 2011

Plan Amendment, the Kings River Special Management Area, the 2007 Sierra Nevada Forest Management Indicator Species, the Mediated Settlement Agreement (MSA), and the presidential proclamations provide redundant and at times conflicting management direction. This makes it difficult to discern which of the above documents contains the appropriate direction for project planning. Both the Forest Service and the public have difficulty determining current management direction.

There is also a need for compliance with the Clinton proclamation requiring the preparation of a management plan for the monument. The Clinton proclamation directs the Forest Service to develop a management plan specific to the monument that will protect the objects of interest and manage monument resources to restore ecosystems and provide opportunities for public use.

This EIS is a renewed effort to conduct the environmental analysis necessary to establish a monument management plan. Three documents are being produced as part of this effort: the EIS, a record of decision (ROD), and a separate Giant Sequoia National Monument Management Plan. This EIS focuses on the environmental impacts of alternative amendments to existing management that are necessary to comply with the Clinton proclamation.

Issues of Interest

Comments from the public, other agencies, the Tule River Indian Tribe, and other Native American groups received during the scoping period from March 18 to May 4, 2009, raised the following issues for the monument:

- Recreational use and enjoyment of the monument is increasing, resulting in competition between different types of public use and a greater need to protect the objects of interest.
- A road and trail system should provide safe access for a diversity of uses, while among different types of use (motorized and nonmotorized).
- Proposed fuel reduction and ecological restoration treatments may adversely affect the amount and distribution of wildlife species and their habitat, especially the Pacific fisher.
- Fuels reduction as proposed, to protect communities and the objects of interest in the monument, may not be effective in terms of how much is treated and the kinds of treatments used.
- There is considerable and meaningful debate about the conditions under which trees need to be cut and about when and in what form a tree should be removed from the monument for ecological restoration.
- There is ongoing debate about the methods that would successfully promote the regeneration, establishment, and growth of giant sequoias.

- A large wildfire from the monument spreading to the Tule River Indian Reservation could result in irreversible damage to the tribe's watershed resources and community.
- The agreements set forth by the MSA should be brought forward and used to analyze the effects in the NEPA process.
- Since this federal land is now a national monument, it should be managed like a national park, in particular like Sequoia and Kings Canyon National Parks.

Alternatives Considered in Detail

The following alternatives have been considered in the detailed analysis for the monument:

- **Alternative A** is the No Action Alternative. Under this alternative, current management direction would continue to guide management of the monument through the planning period (about 10 to 15 years). Alternative A includes the management strategies that the SQF has developed to comply with the MSA and the Clinton proclamation. Under this alternative, the current direction would not be amended.
- **Alternative B,** the Proposed Action, identifies what changes in management direction are necessary from Alternative A, to comply with the Clinton proclamation. Alternative B is the Preferred Alternative and would protect the objects of interest and manage monument resources to promote resiliency, adaptability to climate change, and heterogeneity across ecosystems. This alternative responds to the issues of fuels management and community protection and fire affecting adjacent tribal lands. This alternative would continue to provide recreation opportunities that include dispersed camping, developed camping, and motorized travel on designated roads.
- **Alternative C** would protect the objects of interest and manage monument resources to promote resiliency, adaptability to climate change, and heterogeneity across ecosystems. This alternative responds to the issues of managing the monument similar to a national park, in particular Sequoia and Kings Canyon National Parks (SEKI), and fire affecting adjacent tribal lands. It was developed to manage the monument similar to SEKI in a manner that is consistent with Forest Service regulation and the direction of the Clinton proclamation. It was determined that some management policies or direction from SEKI would not apply to the monument because of differences in law, regulation, and policy for the two federal agencies. Under this alternative, restoration would focus on areas that have been affected by human use and occupation.
- **Alternative D** would protect the objects of interest and manage monument resources to promote resiliency, adaptability to climate change, and heterogeneity across ecosystems. It would rely on naturally occurring fire to reduce fuels in order to protect the objects of interest and to promote giant sequoia regeneration.

This alternative responds to the issues of tree removal, fuels management and community protection, and methods for giant sequoia regeneration. It focuses on natural processes with little to no human manipulation. Dispersed and developed camping would still be available, although creation of new sites would be limited.

- **Alternative E** represents management practices, implemented in the Sequoia National Forest that follow the Forest Plan and the MSA, that were modified to comply with the Clinton proclamation. It would protect the objects of interest and manage monument resources to promote resiliency, adaptability to climate change, and heterogeneity across ecosystems. This alternative is designed to meet the obligation to consider and analyze the proposed plan amendments contained in the MSA. Alternative E is based on management direction that has evolved to comply with the MSA and the proclamations.
- **Alternative F** would protect the objects of interest and manage monument resources to promote resiliency, adaptability to climate change, and heterogeneity across ecosystems. This alternative responds to the issues of tree removal, fuels management and community protection, fire affecting adjacent tribal lands, and methods for giant sequoia regeneration. It is similar to Alternative B, except in vegetation management. Alternative F contains no upper diameter limits for tree cutting and removal when clearly needed for ecological restoration and maintenance or public safety, except for giant sequoias. This would allow more flexibility in treatment methods for forest health and ecological restoration.

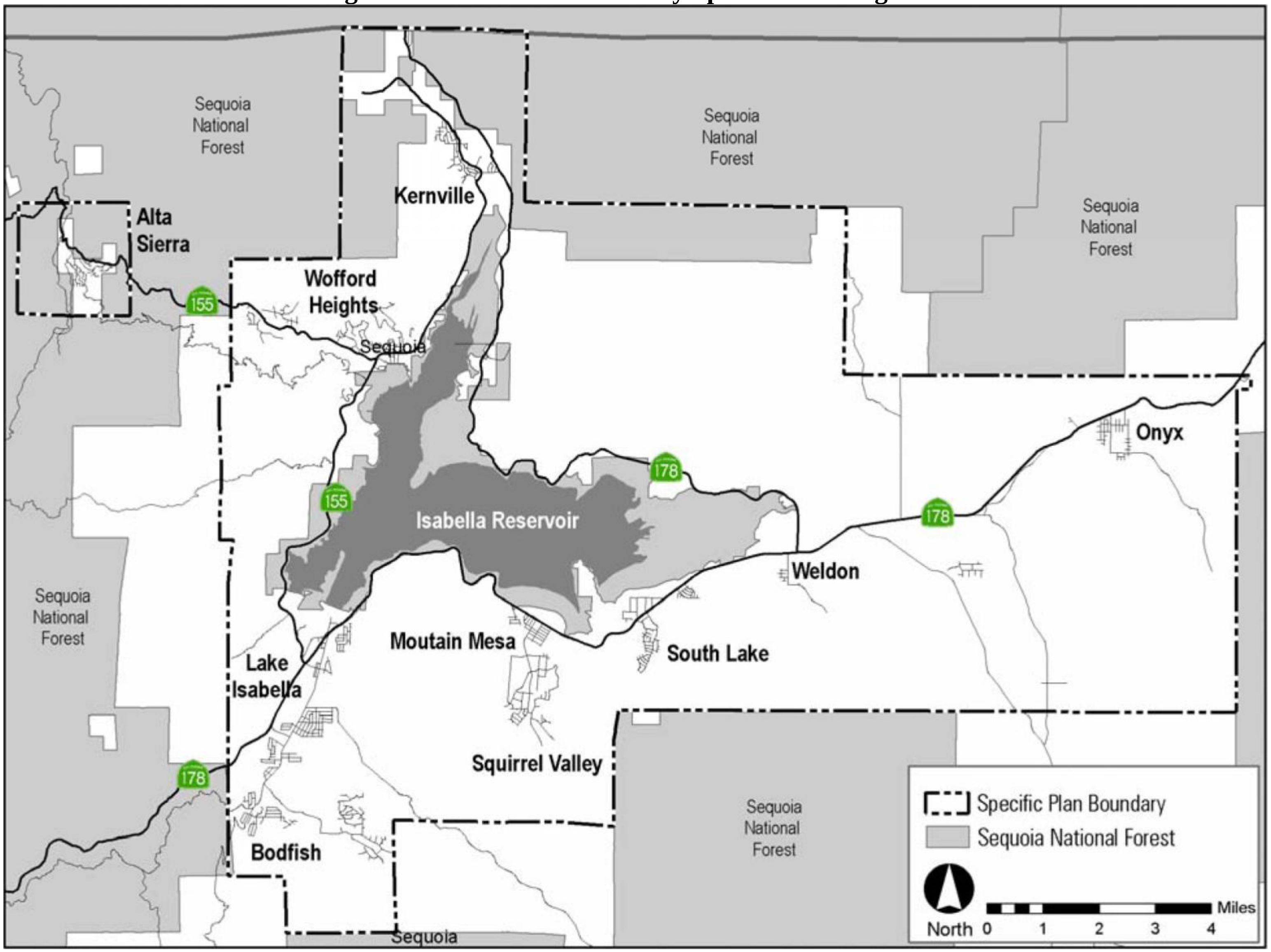
Alternative B is the Preferred Alternative and would protect the objects of interest and manage monument resources to promote resiliency, adaptability to climate change, and heterogeneity across ecosystems. Alternative B allows for treatment methods to meet the ecological restoration and maintenance or public safety intent of the Clinton proclamation. Alternative B focuses on fuels reduction. The priorities for the management tools used would be prescribed fire, mechanical treatments, and managed wildfire (unplanned natural ignitions).

4.3.3 Kern River Valley Specific Plan (July 2011)

Location and Description

The Kern River Valley Specific Plan (KRVSP) area covers approximately 110,500 acres (173 square miles) in the northeastern portion of Kern County in the Sierra Nevada, next to the Kern/Tulare County boundary. As shown in Figure 4-3, the plan area includes the unincorporated communities of Lake Isabella, Alta Sierra, Kernville, Bodfish, Wofford Heights, Weldon, Onyx, Mountain Mesa, and Squirrel Mountain Valley. State Routes

Figure 4-3 Kern River Valley Specific Planning Area



178 and 155 regionally connect these communities. SR 178 provides access to and from Bakersfield through the Kern Canyon and continues eastward through the plan area to the Ridgecrest and Death Valley. SR 155 connects Death Valley with Alta Sierra and farther west to Delano.

The KRVSP addresses an area that includes the Isabella Reservoir, the north and south forks of the Kern River, and the base of the Sierra Nevada. The northern and eastern portions of the plan area encompass the Greenhorn Mountains, with elevations ranging from 3,100 to 7,100 feet. Alta Sierra is on a plateau in the Greenhorn Mountains at an elevation of approximately 6,000 feet. The southeastern portion of the plan area encompasses the Piute and Scodie Mountains, with elevations ranging from 3,300 to 5,900 feet.

The KRVSP is a single comprehensive planning document that integrates the Kern County General Plan and South Lake and Kelso Valley Specific Plans' policies and programs into a unified vision and direction to guide future land use.

Existing Land Uses

Existing land uses in the KRVSP plan area include residential, commercial, industrial, public facilities, resource lands, undeveloped lands, streets, and rights-of-way. Residential, commercial, and industrial uses make up approximately 5,600 acres, or five percent of the land area. Approximately 59,500 acres, or 54 percent of the land within the plan area, is under the jurisdiction of the US Forest Service, the BLM, the Corps (Isabella Reservoir), or other federal agencies. Nearly 15,200 acres, or 14 percent, is undeveloped land, consisting of areas that are designated for future residential, commercial, or industrial uses, but are currently vacant. Resource and agricultural lands consist of 23,200 acres, or 14 percent.

According to the 2000 Census, the communities in the Kern River Valley had a combined population of approximately 14,000 persons living in 9,500 housing units. Residential development is concentrated in the various communities located throughout the plan area. Nearly, all of the units are detached single-family homes. There are limited multifamily units in the plan area.

Plan Objectives

The KRVSP is a regulatory tool that implements the Kern County General Plan. The plan integrates existing policies and programs within a cohesive framework, expresses long-term goals specific to the Kern River Valley, and provides a clear and unified vision, direction, and implementation strategies for future land use and development. The plan contains the following project objectives for the Kern River Valley:

- Protect the natural environment;
- Manage future growth responsibly and encourage an appropriate balance between private property rights and community development, environmental, and social objectives;

- Maintain and enhance the health of the valley's natural systems and resources;
- Retain the rural character of the valley.
- Improve the visual qualities of the built environment;
- Increase and improve accessibility to natural, historic, and cultural amenities within the valley for all users;
- Enhance the valley's tourism and hospitality markets;
- Encourage economic diversity and stability; and
- Maintain long-term economic viability of ranching and farming operations.

Agency Responsibilities in the KRVSP Plan Area

The Kern River Valley provides a unique challenge in that several agencies have jurisdiction over land use planning programs and projects. The KRVSP identifies policies and implementation to ensure an open dialogue and coordination between the County and these various agencies. The following agencies have jurisdictional responsibilities within the plan area:

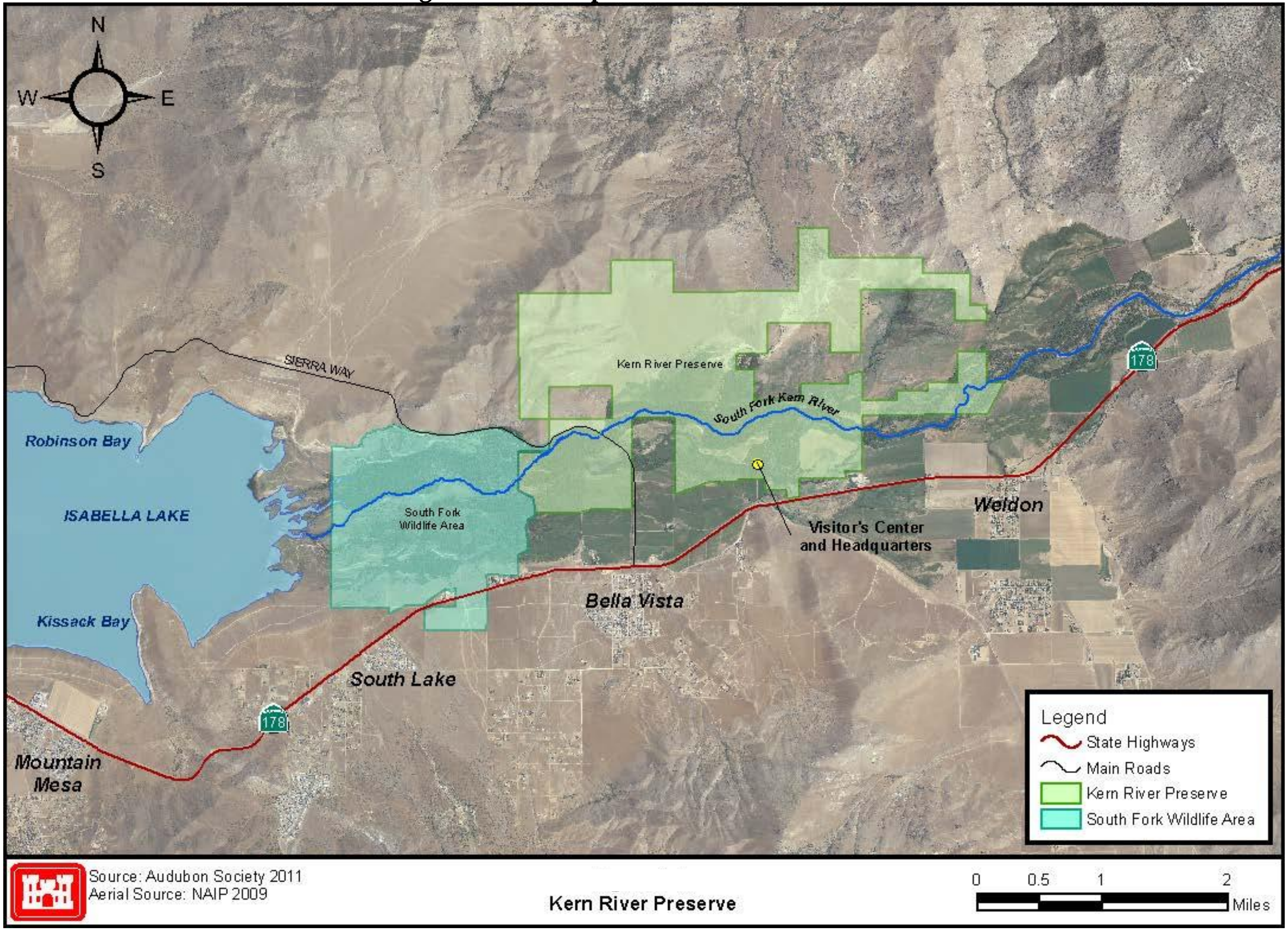
- **US Forest Service.** The KRVSP area encompasses portions of the US Forest Service – Sequoia National Forest (Cannel Meadow and Greenhorn Ranger Districts), including portions of the Domeland Wilderness. In addition to managing USFS lands, the USFS manages the Isabella Lake recreation areas. The USFS is currently involved in several activities which affect the KRVSP Area including: the identification of an "official" Off Highway Vehicle (OHV) trail system, providing wildfire fuel reduction measures near the communities of Alta Sierra and Kernville, and updating the Sequoia Forest Management Plan. In conjunction with the Kern County Parks Department, the Forest Service was able to install a public restroom at the Cyrus Canyon OHV area in 2005.
- **US Bureau of Land Management.** The majority of non-jurisdictional property located within the KRVSP area is under the jurisdiction of the Bureau of Land Management (BLM). The Keyesville Special Management Area (SMA) is managed by BLM and is located partially within the Plan area. The Keyesville SMA is a 7,133-acre site that provides river access, dispersed camping opportunities, and designated multi-use trails. The remaining BLM managed lands within the Plan area are maintained as resource areas for grazing, mining, and open space.
- **US Army Corps of Engineers.** The Corps is responsible for the integrity of the Isabella Main and Auxiliary Dams and provides daily water releases, per instructions from the Kern County Water Master. The recreation areas surrounding Isabella Lake were originally planned and built under the direction of Corps, but operation and management of those areas were subsequently transferred to the USFS.

- **The Kern River Water Master.** The water master is the administrating entity for Isabella Lake water, representing all downstream water rights entities. Unless the integrity of the dam is jeopardized, the water master is responsible for identifying the amount of water to be released daily from the Isabella Lake by the Corps. The water master is also responsible for preparing and keeping complete daily records on the flow of the Kern River waters. The water master has used the Central Records staff of Bakersfield's Water Resources Department since 1977.
- **The California Department of Transportation (CalTrans).** This agency is responsible for planning, designing, building, operating, and maintaining California's state highway system. Although the entire length of State Route 178 is within the administrative boundaries of Caltrans District 6, maintenance is divided between District 6 and District 9. For SR 178, Caltrans District 6 maintenance extends from Bakersfield to Weldon, and District 9 provides maintenance from Weldon to Kern County's eastern border. District 6 is also responsible for SR 155 through the KRVSP area.
- **The California Department of Fish and Game (CDFG).** This agency is responsible for regulations and enforcement of the California Endangered Species Act. In the Kern River Valley, the CDFG operates a local fish hatchery along the Kern River in Kernville and is responsible for stocking the lake and Kern River with fish. The CDFG also enforces hunting and fishing regulations throughout the plan area.
- **The Central Valley Regional Water Quality Control Board.** This agency has jurisdiction over the plan area.
- **The Eastern Kern Air Pollution Control District.** This agency has jurisdiction over the KRVSP area for all criteria pollutants. The Eastern Kern Air Pollution Control District also includes much of the eastern portion of Kern County.
- **The Kern County Parks and Recreation Department. In** addition to administering plan area parks and recreational facilities, this agency is responsible for the safety of watercraft users and enforcement of California Boating Law on Isabella Lake. A boat patrol monitors lake activities from sunrise to sunset.
- **The Kern County Department of Airports.** This agency is responsible for the safe operation and maintenance of the Kern Valley Airport, which is owned by Kern County.

4.3.4 Kern River Preserve (Ongoing)

The Audubon Kern River Preserve (KRP) is a riparian nature preserve owned by the National Audubon Society of California, near Weldon in Kern County (Figure 4-4). The KRP is in one of the largest contiguous riparian forests remaining in the state. The 3,000-acre preserve provides habitat for rare and Audubon-designated endangered birds, one of which is the federally listed endangered southwestern willow flycatcher, a subspecies of the willow flycatcher. The KRP is in a designated Globally Important Bird Area, a

Figure 4-4 Map of Preserve and Location



program of the National Audubon Society with its partner BirdLife International to identify and protect critical avian habitats. The South Fork Kern River, designated a national Wild and Scenic River since 1987, flows down the South Fork Valley, through the KRP and then into Isabella Lake. The South Fork is the source for irrigation water for agriculture and the rare riparian forests of the valley. The river's upper reaches have populations of golden trout, California's state fish. The golden trout is being reviewed by the USFWS for listing under the Endangered Species Act. Scientific research studies are conducted at the Kern River Preserve, including the Grinnell Resurvey Project during 2008-2009, by University of California Berkeley students, of zoologist Joseph Grinnell's 1914 landmark survey of California species.

The KRP features a visitor center, a self-guided nature trail, monthly nature events, monthly volunteer work days, and a variety of festivals during the year. The KRP is on the former cattle ranch of Andrew Brown, which dates to the 1860s. The ranch was bought by The Nature Conservancy in 1979 and the deed transferred to National Audubon Society in 1998.

Andrew Brown was born in Ireland in 1829, arrived in California in 1852, and eventually settled in Kern County. He operated a general store in Kernville, and expanded into Weldon Township with the purchase of a second store and a ranch. Brown raised cattle, sheep, hogs, and wheat. He built a flour mill in Weldon and later built a sawmill near what is now Wofford Heights. Business success enabled Brown to purchase and trade for other ranch and farmland, and he incorporated all his interests into the A. Brown Company in 1901. He was company president until his death in 1909. The Brown family continued operations until the 1970s, when the heirs sold the Brown Ranch to the Kern County Land and Cattle Company.

Development of the property was a possibility, but The Nature Conservancy moved quickly to purchase 1,600 acres of the ranch in 1979 with funds from donors, two of which were Getty Oil Company and the W. M. Keck Foundation.

The Nature Conservancy acquired adjacent acreage through a program of land trades and swapped pasture land parcels for riparian forest parcels with nearby Sprague Ranch and the Prince Ranch in 1980. The preserve now borders the Corps' Sequoia National Forest South Fork Wildlife Area on the west and the eastern end of Lake Isabella, where the South Fork Kern River enters the reservoir. In 1981, a fence was constructed to protect the streamside vegetation from grazing cattle.

On March 31, 2005, the Audubon California chapter and CDFG acquired title to 4,358 acres of the Sprague Ranch, in part to mitigate for the flooding of the South Fork Wildlife Area from Lake Isabella during high water years and resulting loss of willow flycatcher habitat. A total of 1,640 acres was added to the preserve; the remaining 2,718 acres of Sprague Ranch went to the CDFG. Funding was provided by the Corps, California Wildlife Conservation Board, and the National Audubon Society from a grant from the Packard Foundation's Conserving California's Landscape Initiative.

On January 31, 2006, the purchase of 105 acres of the Alexander Ranch that flanks the South Fork Kern River was completed with funds from the Resources Legacy Foundation. The riverfront property has nesting sites of vermilion flycatchers, yellow warblers, bullock's orioles, and southwestern willow flycatcher. The land is in good condition, with ponds of duckweed and other wetland plants that harbor several pond turtles.

There were two land acquisitions in 2009: On August 28, the 26-acre Vig property was purchased by Audubon, and on November 20, the 80-acre Pond Ranch sale closed a gap between Fay Ranch Road and Sierra Way Road. The Pond Ranch purchase added one-quarter mile of the South Fork Kern River frontage to the preserve.

In addition to real estate purchases, the Audubon California organization continues to work with private landowners in the South Fork Valley on conservation issues. Bruce Hafenfeld, of the California Cattlemen's Association, operates a family ranch, raising commercial calves and cows on both private property and public lands on a federal grazing allotment. Hafenfeld has entered into a perpetual conservation easement with the Natural Resources Conservation Service (formerly Soil Conservation Service) to ensure the property is maintained as a working ranch. "We developed a management plan for 1.3 acres along the Kern River Preserve, went after a wetland reserve grant, and developed habitat that increased opportunities for species to come onto my land. We were trying to show that we were not a liability, but an asset," Hafenfeld said, speaking at the 2007 Conference of the Riparian Habitat Joint Venture. The Riparian Habitat Joint Venture is a cooperative conservation agreement between federal, state, and private entities modeled after the Joint Venture projects of the North American Waterfowl Management Plan. It was started in 1994 by Partners In Flight.

The South Fork Kern River is the heart of the KRP and the South Fork Valley. The river begins at elevation 10,400 feet in the Inyo National Forest at Mulkey Meadows, named after Cyrus Mulkey, sheriff of Inyo County from 1871 to 1874. The river flows down the South Fork Valley, through the Audubon Kern River Preserve to Lake Isabella at 2,605 feet elevation. The South Fork Valley, only a few miles wide and 15 miles long, is at the southern end of the Sierra Nevada in northeastern Kern County. Although the valley was the first area settled in the county, it contains the largest contiguous riparian forest still remaining in the state. There are several types of riparian forest. The South Fork Valley has the Great Valley Cottonwood Forest, distinguished by a majority of Fremont cottonwood and willow tree species. The understory is dense with wild rose and shade-tolerant Oregon ash. The soils are fine-grained alluvial with annual river flooding that maintains fertility.

The University of California Santa Barbara's Biogeography Lab report describes the distribution of this type of riparian forest as "formerly extensive along the major low-gradient (depositional) streams throughout the Great Valley, but [are] now reduced to scattered, isolated remnants or young stands because of flood control, water diversion, agricultural development, and urban expansion..."

Rare wildflowers include the alkali mariposa lily. Listed by California Native Plant Society as rare, threatened or endangered in California and elsewhere, it has been observed near the South Fork Kern River, as well as the surrounding counties and in Nevada. It is a perennial bulb that blooms in April and May and is threatened by grazing, trampling, road construction, urbanization and horticultural collecting. Water diversions can also impact this primarily wetland species.

The streamside habitat provides nesting sites for riparian-dependent bird species: the western yellow-billed cuckoo, endangered in California; the brown-crested flycatcher, a cavity-nester; the yellow warbler, the yellow-breasted chat, and the southwestern willow flycatcher.

The federally listed endangered southwestern willow flycatcher has small populations in the preserve and is closely monitored by Audubon volunteers and staff. The US Fish and Wildlife Service designated critical habitat for the southwestern willow flycatcher, which includes 9.6 miles of the South Fork Kern River and excludes Hafenfeld Ranch, which has the conservation easement in place. Although critical habitat has been designated for this species, it does not apply to the South Fork Wildlife Area. These areas are excluded from southwestern willow flycatcher critical habitat designation (Section 4[b][2]) of the Endangered Species Act), they are co-managed by the Corps and USFS to protect riparian habitat values, in accordance with a long-term biological opinion.

Another notable bird is the summer tanager, which breeds in lowlands along streams and is known as a bee and wasp specialist. The summer tanager will remove the bee's stinger before ingesting by rubbing the bee on a branch. The least Bell's vireo is a species that will reestablish nesting in the South Fork Kern River Valley. It is one of four subspecies of bell's vireo, which disappeared from California's Central Valley by the 1960s and has been federally listed as endangered since 1986. The US Fish and Wildlife Service's five-year review of least Bell's vireo, dated September 2006, lists the primary cause of population declines to loss of riparian habitat in California. Another threat listed by the review is from the brown-headed cowbird, which lays its eggs in other birds' nests, which is called egg parasitism. The Southern Sierra Research Station, which conducts research on the Kern River Preserve, has a cowbird eradication program, which has reduced the rate of parasitism to 20 per cent from 60 to 70 per cent (percentage of willow flycatcher nests studied by Southern Sierra Research Station staff).

Common mammals include mule deer, coyote, dusky-footed woodrat, long-tailed weasel, California ground squirrel, American black bear, and bobcat. Uncommon species include mountain lion and an introduced species of beaver. There are 50 species of mammals found on the Kern River Preserve.

There are three species of amphibians and 24 species of reptiles, including the common garter snake, California king snake, several lizard species, and the California toad. The only poisonous snake at the preserve is the northern Pacific rattlesnake. Also found at the preserve is the Pacific pond turtle, a species of concern in California and listed as endangered in Washington state.

The South Fork Valley is unique in California, as three of the ten floristic provinces in the nation meet and overlap here. The floristic provinces are Great Basin Desert, Mojave Desert, and Californian Province (in which one finds grassland, riparian forest, oak woodland, interior chaparral, mixed conifer, sequoia, red fir, subalpine.) The resulting diversity is evident in the numbers of species; there are 31 species of dragonfly and 53 species of butterfly.

4.3.5 Borel Canal Hydroelectric Project (Ongoing)

The 12-megawatt (MW) hydroelectric project, owned and operated by Southern California Edison (SCE), is on the North Fork and the main stem of the Kern River, within the SQF. The project uses water supplied by the Borel Canal and is authorized to withdraw the first 605 cfs of water in the North Fork Kern River that feeds into Isabella Lake. During normal water years, the Corps releases water from Isabella Lake into SCE's second intake structure at the Auxiliary Dam. The water is carried through the lower seven miles of the Borel Canal and then to the project's powerhouse. Figure 4-5 shows the lower portion of the Borel Canal and the powerhouse location.

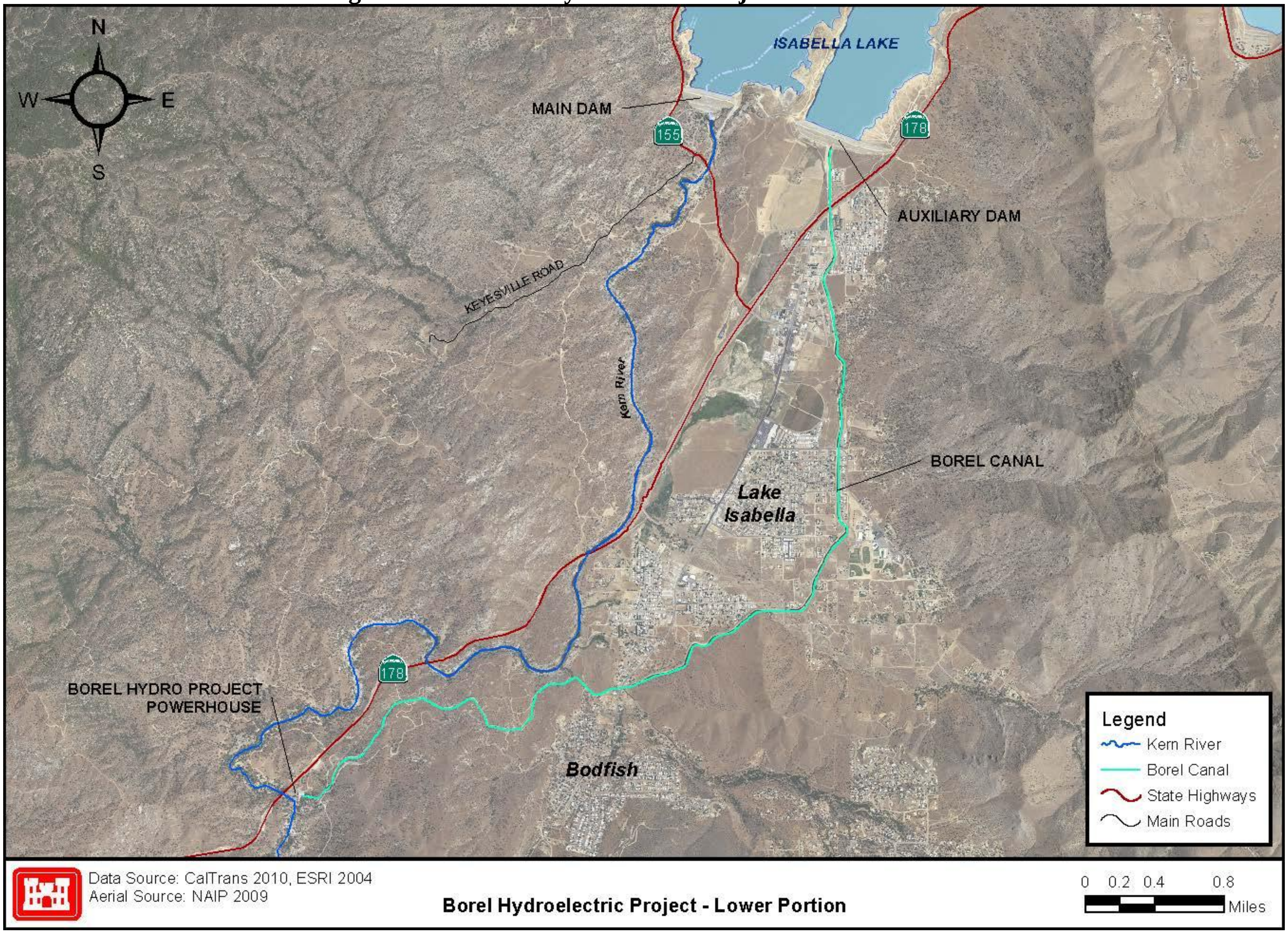
The Borel Project occupies approximately 159 acres of SQF lands administered by the USFS. The project includes a diversion dam with an intake structure on the North Fork of the Kern River; the 11.2-mile-long Borel Canal, with a second intake structure at Isabella Auxiliary Dam, about four miles below the diversion dam; and four penstocks (conduits) leading to the powerhouse. Water is discharged from the powerhouse into the Kern River.

The powerhouse is on the Kern River near the town of Bodfish. The Borel Hydroelectric Project consists of the following:

- A 158-foot long, 4-foot-high concrete diversion dam with fishway;
- A 61-foot-long intake structure with three 10-foot by 10-foot radial gates;
- A canal inlet structure, consisting of a canal intake, trash racks, and a sluice gate;
- A flowline, with a total length of 1,985 feet of tunnel, 1,651 feet of steel Lennon flume, 3,683 feet of steel siphon, and 51,835 feet of concrete-lined canal;
- Four steel penstocks; penstock 1 is 526 feet long and penstock 2 is 565 feet long, with varying diameters between 42 and 60 inches, penstocks 3 and 4 each have a 60-inch diameter and extend 622 feet, at which point they join to form a single 84-inch-diameter, 94-foot-long penstock;
- A powerhouse with two 3,000-kW generators and a 6,000-kW generator for a total capacity of 12,000 kW or 12 MW; and
- Appurtenant facilities.

The Project has no storage capability and relies on the Corps to release water from Lake Isabella.

Figure 4-5 Borel Hydroelectric Project – Lower Portion



Hydroelectric development began along the Kern River in 1894. In that year, the Power, Transit, and Light Company (PT&L) started constructing a small power plant at the mouth of Kern Canyon that was in operation by 1897. In 1895, the Kern River and Los Angeles Electric Power Company (KR&LAEP), organized by William G. Kerckhoff, obtained water rights on the Kern River and planned construction of a power plant designed by engineer Henry Hawgood. KR&LAEP was unable to finance the project, but beginning in 1897, it began just enough work on a canal to retain its water rights. In 1902, Henry E. Huntington and partners, including Kerckhoff, formed the PT&L, which then, in need of electrical energy to power Huntington's growing streetcar system in Los Angeles, purchased the KR&LAEP stock, reconstituted the company as a subsidiary, named the Kern River Company, and pushed construction as rapidly as possible. The plant, which Huntington named Borel for associate and San Francisco financier Antoine Borel, was completed in 1904. Kern River Company was absorbed into PT&L in 1908 and ceased to exist as a separate entity. PT&L merged with SCE in 1917.

The Borel Project was built at a time when Henry Huntington's finances were spread thin by his initial investments in Southern California real estate. Consequently, the plant was built on a tight budget, and many corners were cut. As a result, within a decade of completion the Project was already undergoing major repairs and reconstruction. One of the most significant changes to the Borel Project occurred in the mid-1950s when the Corps built Isabella Dam and flooded Kern Valley. The dam and lake affected the upper half of the water conveyance system. The solution the Corps negotiated with SCE was to rebuild the diversion structure, canal, and trestles within the inundation zone in concrete, replace the trestle across the Kern River main fork with a siphon, and construct the Lake Isabella Auxiliary Dam as the Borel intake. At that time, the Corps thought Lake Isabella would be drawn down to minimal levels each year, which has not been the case. Consequently, the canal requires sediment excavation and other repairs to make it serviceable when the canal is exposed, such as during the droughts of the late 1980s.

In January 2009, SCE filed a request the Federal Energy Regulatory Commission (FERC) to amend its license to delete the requirement to augment flows in the project's bypassed reach for whitewater boating and replace it with a requirement to provide funds to the Forest Service to improve a boat takeout downstream of the project. In March 2010, FERC ruled in favor of SCE's request to amend its license.

Early in 2010, SCE submitted a proposal to the SQF to make improvements at two locations next to the Borel Powerhouse, located off Highway 178 in Kern Canyon. The proposed improvements were the Borel Forebay Rehabilitation Project, to replace the deteriorated intake and rack structures, and the Borel Switchyard Rehabilitation Project, to replace deteriorated equipment in the Borel Powerhouse switchyard. Both projects were proposed to take three to four months once all approvals were obtained. In September 2010, the Forest Service approved SCE's proposal, and the improvements are complete.

4.3.6 Isabella Partners Hydroelectric Project (Ongoing)

This 11.8-MW hydroelectric project is at the Isabella Lake Main Dam outlet on the downstream toe of the dam in the SQF (Figure 4-6). The powerhouse has been operating since 1988 under a license issued originally by FERC to the Central Hydroelectric Corporation, which was transferred to Isabella Partners in 1991. The license is scheduled to expire in 2038.

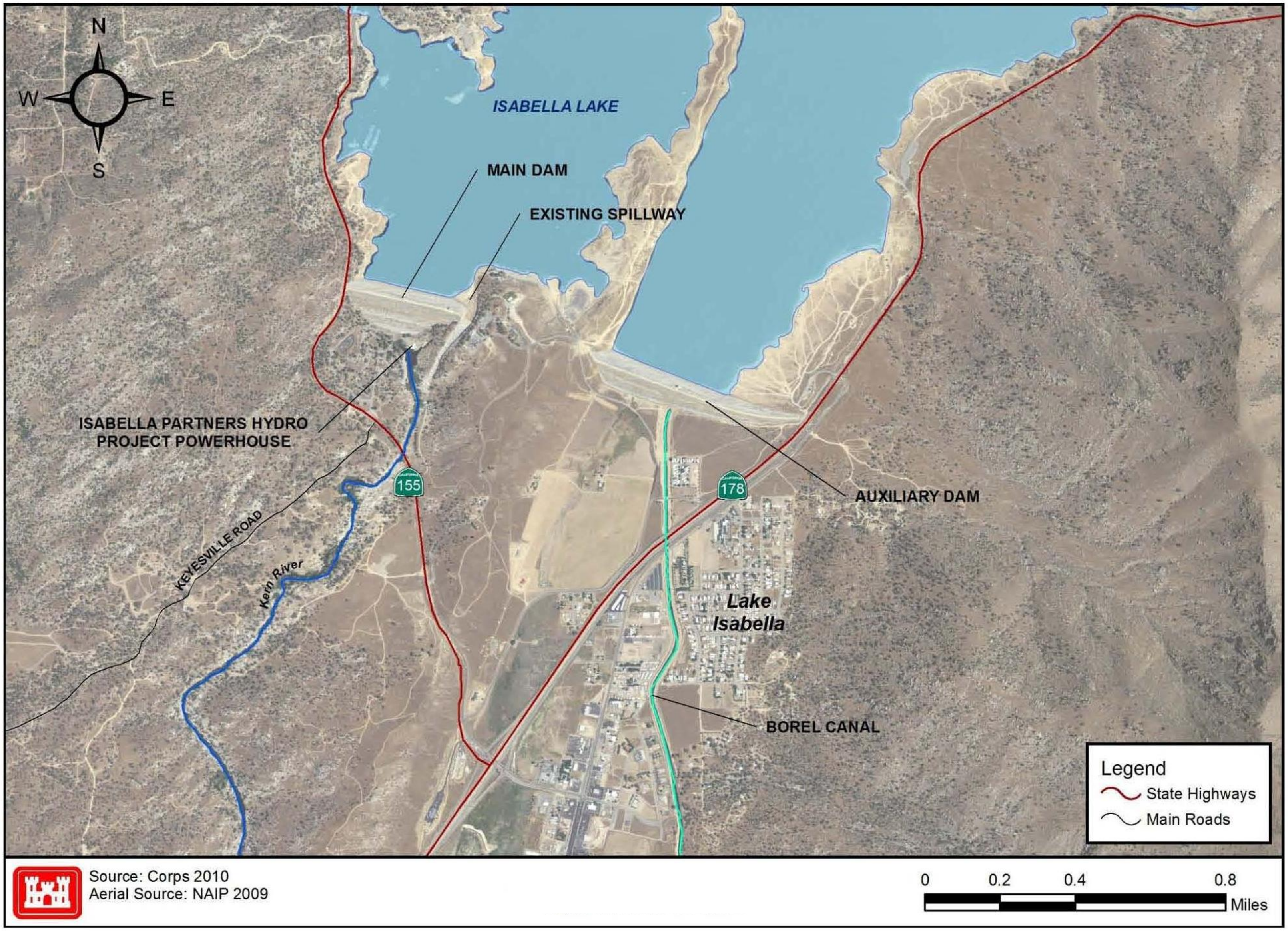
Isabella Partners operates the project with water diverted from the main dam outlet. The diversion of 1,300 cfs of water was authorized under Water Right Permit 20047, issued by the California Water Resources Control Board (WRCB) in April 1987. An additional water right for 332 cfs was issued to Isabella Partners in 2002. Authorized facilities at the project as follows:

- A 13.5-foot-diameter steel liner installed in the Corps tunnel;
- A bifurcated 210-foot-long penstock that varies between 10.5 feet and 8.5 feet in diameter;
- A powerhouse containing two generating units rated at 5,975 kilowatts each;
- A tailrace channel;
- 6.9-kV generator leads, a 6.9/66-kV 23-MVA transformer, and a 1,300-foot-long 66-kV transmission line; and
- Appurtenant facilities.

In August 2008, Isabella Partners filed with the FERC an application to amend its license in order to install a new cross-flow turbine on an existing bypass system within the project's existing footprint. Isabella Partners is required by the WRCB to maintain a dissolved oxygen concentration of six milligrams per liter in water discharged from the project. At times, this standard cannot be met using the existing turbines, and these flows are discharged through a bypass valve, which is also used to discharge flows in excess of the capacity of the turbines. In order to maintain generation while discharging through the bypass valve, Isabella Partners proposed to install a new 850-kW cross-flow turbine on an existing bypass release.

The project includes installing new piping to supply the unit, using a "Y" on the 30-inch-diameter small bypass. The new piping would be 30 inches in diameter and less than 30 feet in length. The proposed unit, along with related controls and switchgear, would be housed in a new 25-foot-wide by 35-foot-long by 18-foot-high reinforced concrete structure. Water would be discharged from this unit into the downstream dam outlet channel, which upstream of the tailrace of the units. The project would also install a new pad-mounted transformer next to the new powerhouse to transform the generator output to the project system voltage of 6.9 kV. No new transmission lines would be necessary as the new unit would connect to the 6.9-kV bus of the existing powerhouse.

Figure 4-6 Isabella Partners Hydroelectric Project Location



Isabella Partners had applied in April 2007 to the WRCB for Water Quality Certification for the project. After review, the WRCB rejected the application in April 2008 for insufficient supporting information. Isabella Partners reapplied in August 2008. After further review, the WRCB certified the project in August 2009.

During this period, the FERC staff thoroughly reviewed the application to amend its license and found that the proposed addition by Isabella Partners would not significantly affect the quality of the environment, and in February 2010 FERC issued an order to allow the amendment to the license. The project is being implemented.

4.3.7 Bakersfield Resource Management Plan (Ongoing)

The Bureau of Land Management (BLM) is in a multiyear process to revise the Resource Management Plan EIS (RMP/EIS) that provides management direction for most of the public lands managed by the BLM's Bakersfield Field Office (BKFO). (A separate plan that covers the Carrizo Plain National Monument, also managed by the BKFO, was recently completed.) The current RMP/EIS, prepared in 1997 for BLM lands managed by the Caliente Resource Area, identified goals, objectives, and management direction for nearly 600,000 acres of public land. The plan is being revised to address several new concerns. The primary consideration is the need to properly evaluate the impacts of increased oil and gas activity on public lands. Other factors include the need to more clearly address the management of the newly acquired Piedras Blancas Light Station, the Buena Vista Hills Oilfield (formerly known as Naval Petroleum Reserve No. 2), and Atwell Island; the need to provide updated management direction for Madera and eastern Fresno Counties (formerly managed by the Hollister Field Office); and the need to address growing recreation demands.

California has undergone many changes since the completion of the Hollister and Caliente plans, resulting in a tremendous increase in the demand for and the diversity of public uses of public lands. The rapid growth of nearby communities places a growing demand for use of the public land and open space as a place for recreation. Rural communities next to public lands have a desire to use public lands as fuel breaks and to add open space around their communities to help maintain the rural atmosphere. The focus on increased domestic oil and gas production and renewable energy has placed additional requests for development on public lands. These changes have presented some complex management issues that can best be addressed by an updated land use plan.

The revised BKFO RMP/EIS provides an updated assessment of resources, uses, conditions, and trends, a forum for enhanced public collaboration and involvement, and a comprehensive impact analysis of reasonable management alternatives and resulting land use decisions.

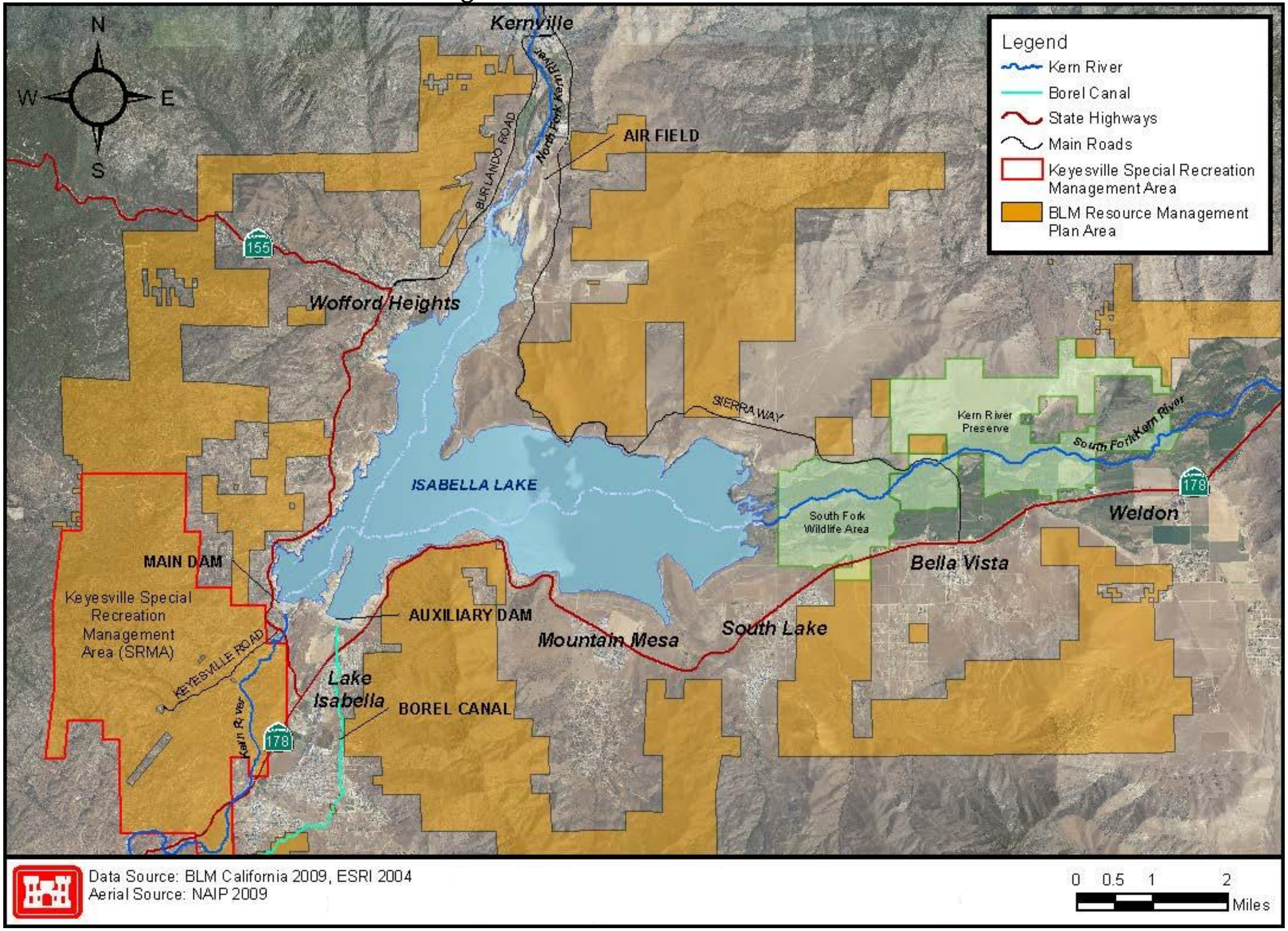
The BKFO planning area encompasses about 17 million acres throughout Kings, San Luis Obispo, Santa Barbara, Tulare, Ventura, Madera, eastern Fresno, and western Kern Counties and includes all lands within the BKFO administrative boundary, regardless of jurisdiction or ownership. BLM-managed public lands are scattered across the planning area in numerous small parcels. The larger blocks of public land lie in the Carrizo Plain National Monument, the Three Rivers-Kaweah River region of Tulare County, and in the Lake Isabella-Chimney Peak-Walker Pass region of Kern County. The BLM also administers subsurface minerals on approximately 539,620 acres of "split estate," where the BLM administers federal subsurface minerals but the surface is owned by an entity other than the federal government. The BLM's mission is to sustain the health, diversity, and productivity of these public lands for the use and enjoyment of present and future generations. While the planning area encompasses the entire area within the boundaries of the BKFO, regardless of jurisdiction or ownership, the "decision area" encompasses about 404,000 acres of public lands for which the BLM has authority and makes decisions. However, when addressing federal minerals and decisions regarding these minerals, BLM-administered lands also include the federal subsurface minerals or split estate. The decision area does not include other private lands, state lands, Indian reservations, or federal lands not administered by the BLM. The area covered by the RMP/EIS in the vicinity of Isabella Lake is shown in Figure 4-7.

While the plan decisions do not apply to lands not administered by BLM, lands that are interspersed with BLM-managed public lands could be indirectly affected by BLM management actions. The planning effort recognizes that nearby lands, communities, resource values, and uses are all affected by management of the BKFO decision area, and their use and values in turn affect BLM management of public lands. The plan includes recommendations for the BLM to work with entities that manage areas or programs that are not under the BLM's jurisdiction but directly affect its management, such as county roads, tourism information programs, and hunting. However, final decisions regarding these actions rest with the appropriate agency or community government.

The BLM conducted scoping for the RMP/EIS in 2008 then prepared internal supporting resource studies, conducted an alternative development process, and released a draft RMP and EIS in 2011. Alternatives under consideration are the continuation of current management practices, with updates developed and implemented as needed, an alternative emphasizing resource conservation and protection, an alternative emphasizing development and resource use, and an alternative blending conservation and development measures developed by BLM staff. The RMP/EIS will assess alternatives for managing over 20 resource and resource use categories on public lands.

Measures especially relevant to the Isabella Lake area are wildland fire, travel management, land and realty actions, mining law withdrawals, surface use restrictions, cultural resource protections, borrow areas, access closures, and the recreation uses and facilities at the Keyesville Special Recreation Management Area (SRMA). Lands managed by BLM and included in the decision area for the RMP/EIS are near Isabella Lake. In general, the Corps manages dam facilities, the Forest Service manages shorelines, and the BLM manages lands farther removed from the lake or they are in private hands.

Figure 4-7 Bakersfield RMP Area



The Keyesville SRMA consists of approximately 7,000 acres of BLM-managed land west and downstream of the Main Dam. The area is named for its historic mining community and provides such recreation opportunities as white-water rafting, mountain biking, gold prospecting, hunting, fishing, OHV use, and camping. The SRMA includes both dispersed camping and developed facilities, including three raft launch sites, numerous campsites (picnic tables and fire rings), vault toilets and a variety of kiosks, information boards, and signs. Cultural resources include historic structures from the mining era, prehistoric archaeological sites, and traditional cultural properties. Many actions under consideration in the RMP/EIS specifically address the management of the SMRA.

The Corps manages a small parcel south of State Highway 155 on the Kern River that abuts the SMRA and may be part of the project area for the Main Dam. BLM lands in other locations may be considered for material sources.

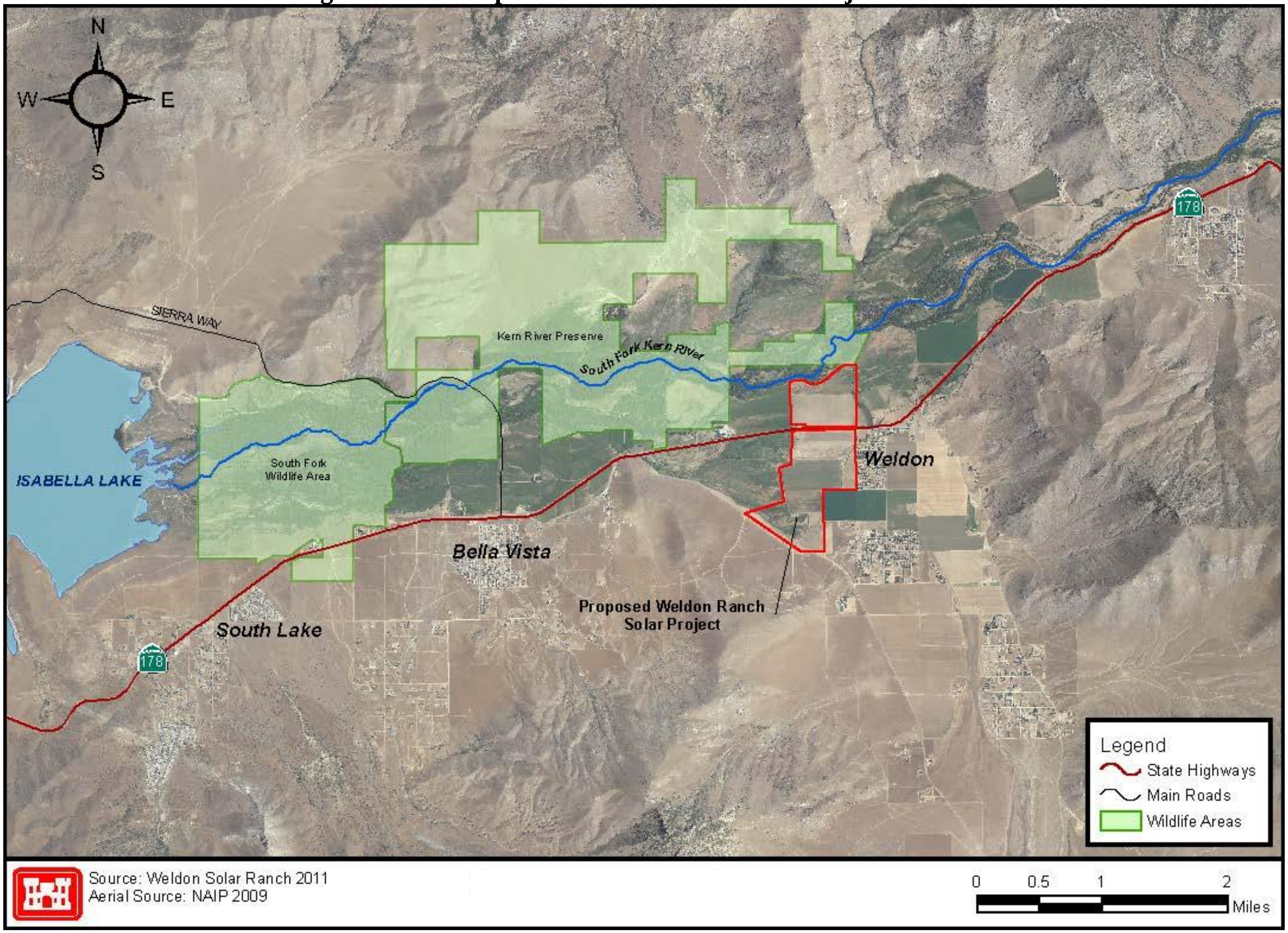
4.3.8 Weldon Ranch Solar Project (Ongoing)

The proposed Weldon Ranch Solar Project is a 60-MW solar PV electrical generating facility, to be located in the northeastern portion of Kern County in the unincorporated town of Weldon, approximately 5.5 miles east of Isabella Lake in the unincorporated town of Weldon. Figure 4-8 shows the proposed location, and the site covers approximately 500 acres; with generally flat topography. The proposed project is located along Highway 178 in the South Fork of the Kern River Valley, east of the intersection of Highway 178 and Kelso Valley Road. The site project is within a 38,000-acre working ranch that employs a ranch foreman, irrigators, and cowboys.

The property is partially developed with a farmhouse and portable trailer in the northwest corner, which would be removed during project implementation. Kern County land use designations on the project site include Intensive and Extensive Agriculture, Flood Hazard, Steep Slope, and Five-Acre Minimum Dwellings and is zoned A-1 (Limited Agriculture). The parcel north of Highway 178 and most of the parcels south of the highway have been historically farmed, with the remainder being historically grazed. The eastern portions of the parcels are presently farmed. Surrounding land uses include residential development, farmland, and natural habitat.

A residential subdivision zoned E (1/2) RS MH (Estate 0.5 Acre, Residential Suburban Combining, Mobile Home) is on the eastern boundary of the project site, and a similarly zoned subdivision is about a quarter mile to the southeast, with active farmland interspersed. The area south of the project site is zoned RF (Recreational Forestry) and E (2 ½) – Estate 2.5 Acres. The area to the west is zoned A-1 (Limited Agriculture), and the area to the north includes riparian habitat and the Kern River. The proposed project includes approval of a zoning change from A-1 (Limited Agricultural) to A (Extensive Agricultural) and conditional use permits to allow for construction and operation of a 60-MW solar PV electrical generating facility and associated infrastructure and site access and connection to the electricity transmission grid on three contiguous parcels. The

Figure 4-8 Proposed Weldon Ranch Solar Project Location



power produced by the project would be conveyed to the grid through a nearby SCE substation.

Within the assembly area footprint a permanent 1,700-square-foot 16-foot-tall operations and maintenance (O&M) building would be constructed, along with an outdoor storage yard for materials and equipment. The O&M building would include a restroom and on-site septic system, to accommodate up to three full-time employees.

While most of the site has nearly level to gently sloping topography, some of the parcels would require light grubbing and minimal grading for leveling and trenching. Site access roads, a small portion of the overall plant site, would be paved. Earthen or gravel roads would be located throughout the site to provide access to the solar equipment. Construction for the project, beginning with site preparation and minimal grading and continuing through cleanup and restoration, is expected to last approximately 12 months. An average of 50 daily construction workers is expected during construction.

4.3.9 Weldon (Foresight) Solar Projects

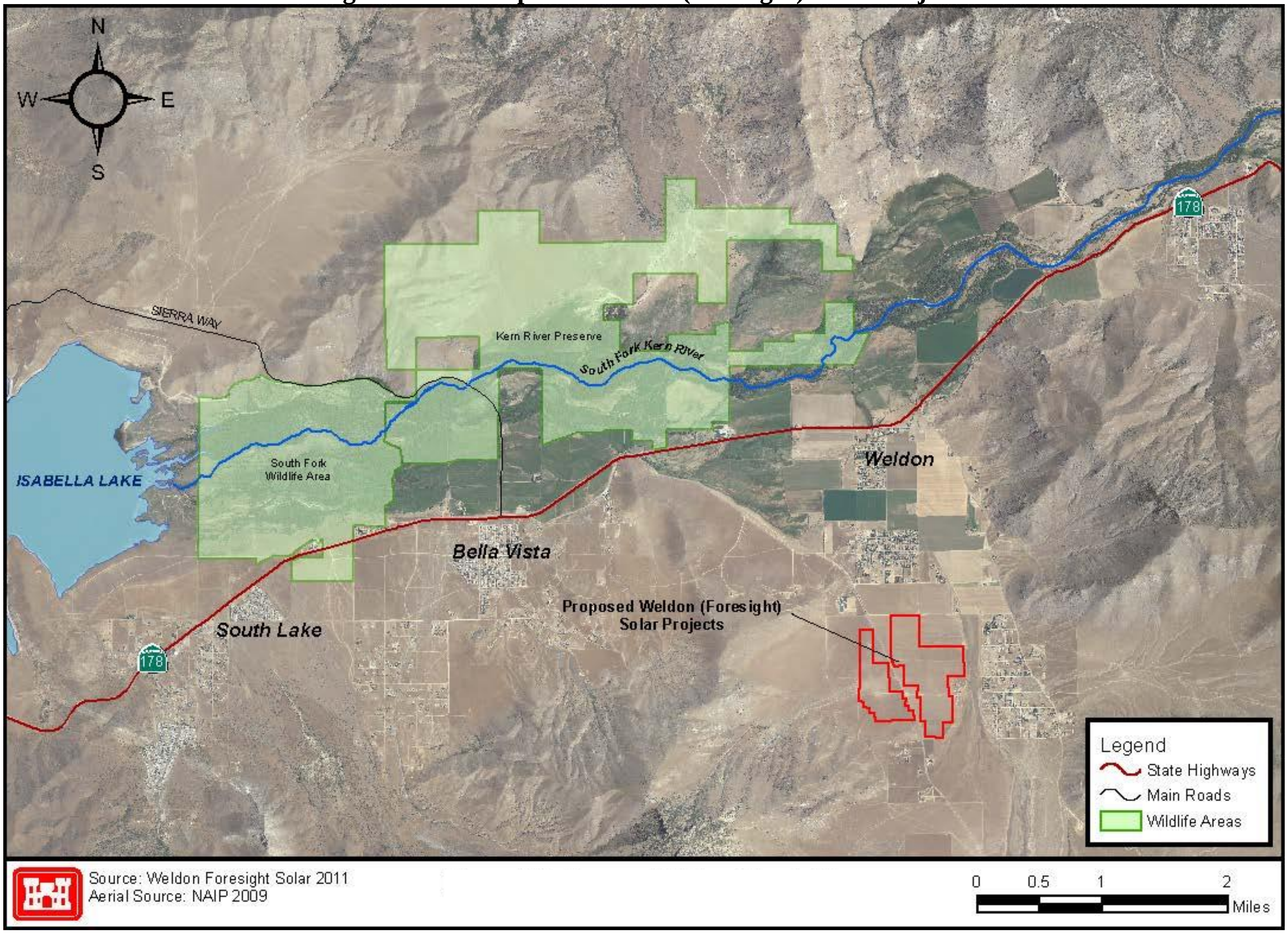
The proposed Weldon (Foresight) Solar Projects consist of two co-located renewable energy projects that would produce electric power using solar photovoltaic (PV) modules. Figure 4-9 shows the proposed projects location, with the combined sites covering approximately 540 acres on the east and west sides of Kelso Valley Road. The combined maximum generating capacity of the two sites would be 32 megawatts (MW).

The two projects would be located on vacant and agricultural land that is relatively flat with a gentle grade downward to the north. Site access is provided from Kelso Valley Road via State Route 178. The area surrounding the projects sites consists of rural agricultural land, rural residences, open space hillsides, a middle school and Kelso Creek. The site is bounded on the north by a private, dirt driveway, and Kelso Creek on the east.

The project sites are currently zoned Limited Agriculture (A-1), and would require a zoning change to Exclusive Agriculture (A). Permitted uses in the A District are limited primarily to agricultural uses and other activities compatible with agricultural uses. However, Solar PV power generating facilities are included as allowable uses under A with a Conditional Use Permit (CUP).

The Projects would consist of solar array blocks arranged in a grid pattern that would convert solar energy directly to electrical power. Power from the projects would be conveyed via on-site overhead tie-line that would interconnect to the SCE Weldon Substation, located approximately 1.5 miles north of the project site. Alternatively, the projects' generation tie-line could interconnect directly into the existing 66kV transmission system near the existing SCE substation.

Figure 4-9 Proposed Weldon (Foresight) Solar Projects



The solar facilities would include a central building as a maintenance and equipment facility, located on the project site east of Kelso Valley Road. An approximately 2,000-sq-ft building would be designed to accommodate up to three operations personnel, be approximately 13 feet high, and include a storage room, control room, office area, and restroom. A parking area for approximately 5 parking vehicles would be located adjacent to this facility; this area is expected to be gravel or aggregate base.

The projects would have gated primary access points from Kelso Valley Road for each site. In addition, 20-foot fire access roads would line the perimeter of and bisect the two sites. No asphalt concrete pavement is proposed, with the potential exception of driveway aprons from Kelso Valley Road if required. It is expected that emergency service access roads would be constructed using compacted aggregate base. Service roads between the solar arrays would provide access for routine inspection and maintenance. Internal service roads would be compacted native soil.

Construction of the projects is scheduled to begin December 2012, and be completed by September 2013. The projects are anticipated to commence commercial operations and begin delivering 32 MW of electrical energy to the grid by September 15, 2013.

All development on the project sites would comply with building codes and regulations required by Kern County and all necessary Federal and State agencies. Construction activities would follow a Stormwater Pollution Prevention Plan (SWPP) that incorporates Best Management Practices (BMPs) for runoff and erosion control. The projects would also comply with applicable post-construction water quality requirements adopted by the Central Valley Regional Water Quality Control Board (Region 5).

4.4 SUMMARY OF CUMULATIVE IMPACTS BY RESOURCE AREA

The potential cumulative impacts from implementation of any of the five Isabella DSM Project Action Alternatives, when considered with the described relevant other actions in the general vicinity of Isabella Lake, have been assessed and are discussed in this section.

The potential cumulative impacts associated with each of the resources are summarized in the following paragraphs, arranged under the 13 environmental resource areas analyzed in this Draft EIS.

4.4.1 Geology, Soils, and Seismicity

The proposed Isabella DSM Project Action Alternatives would have a high beneficial cumulative impact by remediating the seismic, seepage, and hydrological deficiencies of the Isabella Main and Auxiliary Dams and Spillway, and avoiding the significant impacts of dam failure on the lower Kern River and downstream Bakersfield area from flooding, erosion, and sedimentation.

4.4.2 Air Quality

Cumulative air quality impacts from the proposed Isabella DSM Project Action Alternatives could occur as a result of short-term increased traffic, construction traffic, and construction equipment. Under all the proposed Action Alternatives for the Isabella DSM Project, the exposure of sensitive receptors to project-generated construction equipment and operation emissions, in combination with the emissions of other proposed or ongoing projects within one to six miles, would result in short-term high cumulative impacts on sensitive receptors in this area. There are sensitive air quality receptors within one to six miles that would be subjected to the proposed Isabella DSM Project and other project emissions, primarily from construction. Mitigation has been identified for the temporary construction-related air quality effects to reduce this direct impact. However, this short-term cumulative impact would be high and unavoidable.

4.4.3 Greenhouse Gas/Global Climate Change

The EKAPCD and the MDAB do not have GHG inventories. On December 6, 2007, CARB established a GHG emissions limit for 2020, which is based on the 1990 level, and adopted regulations requiring mandatory reporting of GHGs for large facilities. After a year of investigation, CARB found that the state's 1990 emissions were 427 MMTCO2e. Preliminary estimates indicate that 2020 emissions could be 600 MMTCO2e if no actions were taken to reduce GHGs ("business-as-usual"). CARB determined that California must prevent 173 MMTCO2e from being emitted by 2020 to meet the 1990 level, as required by AB 32.

The main source of GHG emissions from the proposed Isabella DSM Project Action Alternatives would be vehicle trips during construction. Transportation sources account for 38 percent of California's total GHG emissions. The effect of other anticipated actions by CARB to address transportation issues, such as the development of fuels with less carbon, is not known at this time.

All of the proposed Isabella DSM Project Action Alternatives would contribute to cumulative GHG emissions in California during the multi-year construction period. Operation of the completed project would not contribute to cumulative GHG emissions in California since operational emissions from the proposed project are minimal.

All of the proposed Isabella DSM Project Action Alternatives' GHG emissions would be high and adverse. Implementing the mitigation measures described previously in Section 3.7 (Air Quality) would help reduce transportation-related GHG emissions. However, even with mitigation measures, the proposed Isabella DSM Project Action Alternatives are expected to have short-term, cumulatively high, traffic-related air quality impacts on GHG.

4.4.4 Water Resources

Because some of the other planned actions in the Isabella Lake area described in Section 4.3 would involve construction, moderate adverse cumulative water resources impacts in the region could occur. Construction would cause surface disturbances by removing vegetation cover, displacing and compacting soils, and altering soil structure and chemistry. The result is exposed and denuded surfaces that increase runoff rates and erosion and deliver sediment and contaminants to nearby waterways. Sedimentation in waterways can cause changes in water chemistry, as well as geomorphic adjustments that could have negative impacts on stream function. The assumption is that the cumulative actions would not violate water quality standards and that the Corps would obtain the necessary permits and licenses and would prepare and implement the necessary plans, BMPs, and stipulations intended to minimize adverse construction impacts on water resources. Consequently, adverse impacts on water resources are anticipated to be limited to the construction periods. Alternative actions that allow the least amount of soil disturbance, loss of vegetation, and roadway development would have the least amount of adverse cumulative impacts on water resources from construction.

A further assumption is that there would continue to be an expansion of county communities, which could increase the domestic or agricultural demand for water. The expansion of developed land would result in the loss of vegetation and the altering of soil and ground surface properties. Corresponding impacts on water resources are similar to those described above for construction. However, these impacts would be more permanent, because areas would be developed and would not be temporarily altered by construction. Also, an increase in the domestic or agricultural demand for water could reduce surface or groundwater supplies. However, because all of the proposed Isabella DSM Project Action Alternatives would temporarily impact vegetation and soil characteristics and would temporarily impact water supplies, the proposed Isabella DSM Project Action Alternatives are expected to contribute moderately to long-term cumulative adverse impacts on water quality and quantity.

4.4.5 Traffic and Circulation

Under all of the proposed Isabella DSM Project Action Alternatives, cumulative traffic impacts could occur as a result of short-term increased construction traffic, in combination with the construction traffic from the Weldon Ranch Solar Project (currently on hold) if the project were to be approved and implemented during the multi-year construction period. The Weldon (Foresight) Solar Projects, proposed in the same general vicinity as the Weldon Ranch Solar Project, if approved, are scheduled for construction in 2013, and would likely be completed before the Isabella DSM Project construction would begin. Therefore, no cumulative traffic impacts are anticipated regarding the Isabella DSM Project Action Alternatives and the Foresight Solar Projects. However, if the Weldon (Foresight) Solar Projects are delayed, then their construction period could also overlap with the proposed Isabella DSM Project.

Although local construction-related traffic anticipated for the proposed Weldon Ranch Solar Project and the proposed Weldon (Foresight) Solar Projects would increase during the projected 12-month construction period, since the proposed solar projects are separated by at least 12 miles from the proposed Isabella DSM Project, it is unlikely that these projects would directly affect each other with respect to entering and exiting traffic at their respective access points.

Also, even if the construction of either (or both) of the two proposed solar projects were to occur at the same time as the Isabella DSM Project, the addition of the projected traffic from the proposed solar projects to the daily traffic generated by the proposed Isabella DSM Project would have no significant cumulative impact on the service levels of the traffic facilities in the study area. As indicated in Section 3.7 (Traffic and Circulation), the roadway segment (SR 178) between the proposed Isabella DSM Project and the proposed solar projects in the Weldon area currently operates with reserve capacity, and would be able to sustain operating at LOS C.

Therefore, the cumulative impacts on this segment (or any other roadway segments analyzed in this Draft EIS) would be low.

4.4.6 Noise and Vibration

Under all the proposed Isabella DSM Project Action Alternatives, the exposure of sensitive receptors to project-generated, construction equipment-related vibration levels would result in short-term high impacts. Mitigation has been identified for the temporary construction-related noise effects to reduce this direct impact. However, this impact would remain high. The cumulative projects described in Section 4.3 in the vicinity of the proposed Isabella DSM Project include the Borel Canal Hydroelectric Project and the Isabella Partners Hydroelectric Project. These cumulative projects could increase traffic levels and noise in the vicinity of the Isabella DSM Project construction site. As a result, implementation of any of the Isabella DSM Project Action Alternatives would contribute significantly to cumulative noise impacts.

Similarly, under any of the proposed Isabella DSM Project alternatives the exposure of sensitive receptors to project-generated, construction equipment-related vibration levels would result in a direct high impact. The two cumulative hydroelectric projects in the vicinity of the Isabella DSM Project could contribute cumulatively to these vibration impacts. Mitigation has been identified for the temporary construction-related vibration impacts that would reduce the level of effect. Therefore, implementation of the mitigation measures is expected to also reduce potential cumulative impacts from vibration to less than significant levels.

4.4.7 HTRW

Potential HTRW impacts associated with implementation of any of the proposed Isabella DSM Project Action Alternatives would occur primarily as a result of construction activities at construction sites, staging areas, and borrow areas in the Isabella Lake project area. These activities would include the use, storage, and transport of hazardous materials, and the maintenance of heavy equipment and vehicles. These activities have the potential for HTRW to be inadvertently released during fueling and maintenance operations, material hauling, and cement production. These construction activities are sufficiently far away from any other construction activities that would be associated with the other relevant actions described in Section 4.3. Therefore, implementation of any of the Isabella DSM Project Action Alternatives is not anticipated to contribute to cumulative HTRW impacts.

4.4.8 Biological Resources

Forest Service Motorized Travel Management EIS

Under all four Action Alternatives, maintaining a maximum construction pool elevation of 2,543.76 feet during the nine months required for construction of the Upstream Berm at the Auxiliary Dam could increase the volume of OHV users and the extent of user-created trails. An additional four months of this lowered lake level would be required under the Alternative Base Plan and Alternative Plans 1 and 2. Greater OHV use around the lake could increase the spread of nuisance vegetation around the exposed shoreline of Isabella Lake, as motorized vehicles are known to contribute to their introduction and spread (Trombulak and Frissel 2000). The contribution to cumulative impacts regarding the introduction and spread of nuisance vegetation is considered low to moderate. The introduction and spread of noxious weeds were considered in the alternatives analysis for the Forest Service Motorized Travel Management EIS, along with other resource impacts, including wildlife, recreation, transportation, and visual; in fact, a noxious weed risk assessment was specifically included in the EIS. The USFS developed a national strategy for invasive species management to provide for prevention, early detection and rapid response, control and management, and rehabilitation and restoration (USFS 2004).). It would be the intention of the Corps regarding Isabella Lake to follow the USFS national strategy for invasive species management.

Kern River Valley Specific Plan

Under all proposed Isabella DSM Project alternatives, two fairly large staging areas are proposed below the Auxiliary Dam. There are USFWS National Wetland Inventory mapped wetlands below the Auxiliary Dam. Two objectives of the KRVSP are to protect the natural environment and maintain and enhance the health of the valley's natural systems and resources. Similarly, borrow sites proposed in the South Fork Delta area and the Auxiliary Dam Recreation Area could conflict with the above-mentioned objectives of the KRVSP. Efforts to restore borrow sites to preconstruction conditions or better and to mitigate for wetland impacts (on- or off-site) may reduce potential conflicts between the Isabella DSM Project and the KRVSP. With this mitigation, potential cumulative impacts from implementing any of the proposed Action Alternatives would be considered low.

4.4.9 Land Use

Under all four proposed Isabella DSM Project Action Alternatives, some of the land in Hot Springs Valley between SR 178 and SR 155 would be used for staging areas. This area contains some parcels designated as State Important and Unique Farmland. If these parcels were to be incorporated into the proposed staging areas, the proposed Isabella DSM Project would be considered as contributing to the ongoing loss of this designated farmland, which would be considered a moderate impact. However, if the final boundaries of the required staging areas could avoid or minimize the use of these parcels, this would avoid or reduce to low this potential cumulative impact.

4.4.10 Recreation

Implementation of any of the proposed Isabella DSM Project Action Alternatives would not have long-term adverse recreation impacts that could contribute incrementally to potential recreation impacts of the other relevant actions projects identified in Section 4.3. The potential adverse recreation impacts from implementing any of the proposed Isabella DSM Project Action Alternatives would be temporary occurring only during the construction period within the Isabella DSM Project area. Such impacts would include temporary closures of and restricted access to existing recreation sites at Isabella Lake such as Launch 19, Engineers Point, and the Auxiliary Dam Recreatoin Area; periodic lower lake levels reducing the areas available for water-based recreation; and somewhat degraded recreation experiences from construction noise, lights, dust, and increased traffic, and possible over-crowding at the available sites. These impacts on recreation at Isabella Lake could result in some potential visitors leaving or bypassing Isabella and seeking recreation opportunities in other locations that may be within the project and plan areas of other relevant actions described in Section 4.3; which could result in greater demand (and stress) on recreation sites in these other locations. Because the Corps and USFS would intend to maintain to the extent possible the quantity of recreation sites and the quality of the recreation experience at Isabella Lake during the Isabella DSM Project construction period, the potential cumulative impacts to recreation are anticipated to be low.

4.4.11 Aesthetic Resources

Because construction activities associated with implementing any of the proposed Isabella DSM Project Action Alternatives would be visible from several viewing points in the vicinity of Isabella Lake, adverse short-term visual impacts would result. This would be due to the visible presence of construction equipment, vehicles, materials, traffic, personnel, and nighttime light. These visual impacts would be temporary, lasting only the duration of the construction period. Also, because some of the proposed remediation measures, such as the large Emergency Spillway and RCC Overlay on the Main Dam, and larger Auxiliary Dam footprint would transform the landscape at and around the dams into a more artificial landscape, some visual impacts would also be long-term. However, with regard to potential cumulative impacts, because the proposed Isabella DSM Project does not involve the same fields of view as any of the other relevant actions analyzed, implementation of any of the proposed Isabella DSM Project Action Alternatives would not contribute to cumulative impacts on Aesthetic Resources.

4.4.12 Cultural Resources

Nearly all of the identified relevant actions (see Section 4.2) are federal undertakings subject to Section 106 and NEPA review or are actions that would be reviewed under CEQA. Although ground-disturbing and other activities that could affect cultural resources are associated with these actions, compliance with cultural resources laws and regulation would reduce the level of impact. Planning actions by the BLM, the USFS, and Kern County explicitly attempt to reduce conflicts between other land uses and cultural resource protection; however, the recreation emphasis at Keyesville may increase impacts there. The management of the Kern River Preserve does not preclude potential impacts on cultural resources, but its habitat preservation mission is largely compatible with cultural resource protection.

The impacts of the Isabella DSM Project on cultural resources have not been fully identified. The Corps is in the final stages of developing a programmatic agreement (PA). The PA would comply with Section 106 of the National Historic Preservation Act of 1966, as amended, and would work to reduce any identified adverse effects, in consultation with interested parties. Some adverse effects may be unavoidable; and the Corps may not be able to adequately mitigate the loss of unique resources, such as traditional cultural properties. Although the cultural resource inventory of the cumulative effects area is difficult to ascertain, the Corps contribution to new impacts is likely to affect a small fraction of the total inventory and would be subject to an extensive review. Therefore, the Corps' actions are unlikely to contribute to cumulative impacts on cultural resources.

4.4.13 Socioeconomics and Environmental Justice

The temporary closures of and restricted access to such recreational facilities as the Auxiliary Dam Camping area, Launch 19, and Engineers Point, as well as increased vehicle traffic and congestion during construction of any of the proposed Isabella DSM Project Action Alternatives would affect recreation users and recreation expenditures in the area surrounding Isabella Lake. This could result in a moderate incremental impact on the local and regional economy in combination with some of the other relevant actions described in Section 7.3, such as the Forest Service Giant Sequoia Monument Management Plan EIS, KRVSP, and Bakersfield Resource Management Plan, that could affect recreation spending and the income, value added, and employment they generate. However, with respect to the Isabella DSM Project, implementation of potential mitigation measures such as expanding the Old Isabella recreation area and adjusting the construction schedule to accommodate short-term spikes in tourist and/or recreation-related traffic in the Isabella Lake area, would reduce these potential short-term socioeconomic impacts, which would in turn reduce to low the contribution to adverse cumulative impacts on recreation expenditures.

If construction of the proposed Weldon Solar Projects were to take place during the construction period for the Isabella DSM Project, the potential socioeconomic cumulative impacts would be considered low, because housing for construction workers and local and regional community services that may be required during these construction periods would be accommodated within the existing capacity of the area.

4.4.14 Public Health and Safety

Potential public health and safety impacts associated with implementation of any of the proposed Isabella DSM Project Action Alternatives would occur primarily as a result of construction activities at construction sites, staging areas, and borrow areas in the Isabella Lake project area. These activities would include heavy equipment use; heavy truck traffic; controlled blasting; explosive use and management; excavation; materials hauling; hazardous material use, storage, and disposal; and work on steep slopes and dam infrastructure adjacent to the lake. These construction activities are sufficiently far away from any other construction activities that would be associated with the other relevant actions described in Section 4.3. Therefore, implementation of any of the Isabella DSM Project Action Alternatives is not anticipated to contribute to cumulative public health and safety impacts.

4.5 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

NEPA requires that an EIS consider the relationship between short-term uses of the environment and the impacts that such uses may have on the maintenance and enhancement of long-term productivity of the affected environment. This section compares the short- and long-term environmental effects of the proposed project.

Short-term (construction-related) impacts caused by the project would be similar for any of the proposed Action Alternatives. These impacts would occur during and immediately after construction and would generally result in adverse effects. However, the long-term impacts that would occur over the life of the project would result in overall beneficial effects.

Temporarily adversely affected resources include water resources, biological resources, air quality, aesthetics, noise, recreation, and transportation. However, most of these impacts would be temporary, lasting only the duration of construction activities.

Implementation of any of the proposed Action Alternatives would result in beneficial long-term impacts. The proposed Isabella DSM Project would address the seismic, seepage, and hydrologic deficiencies that exist with the Isabella Main and Auxiliary Dams and Spillway; which currently threaten property and public safety. Failure of either of the existing dams in an earthquake would result in extensive downstream flooding and loss of life. Not taking action would continue the adverse effects to water irrigation storage and recreation from a restricted dam operation. Once the dam safety concern is addressed, the Corps would restore Isabella Dam to normal operation to provide full irrigation water storage and recreation benefits.

4.6 IRREVERSIBLE AND IRRETRIEVABLE ENVIRONMENTAL COMMITMENT OF RESOURCES

Construction of the proposed Isabella DSM Project remediation measures, as well as the associated support actions, would result in an irretrievable and irreversible commitment of natural resources through the direct consumption of fossil fuels and use of materials. With completion of the Isabella DSM Project remediation project, that commitment of resources would end. The primary irreversible commitment of resources resulting from the project is the permanent change in land use in the area that would be excavated for the Emergency Spillway channel adjacent to the existing spillway. This remediation action would remove approximately 10 acres of pine woodlands, upland sagebrush-scrub, and valley grasslands, as well as the USFS Administration Offices and maintenance compound, and the Corps Project Offices and shop.

CHAPTER 5.
REGULATORY COMPLIANCE AND CONSULTATION

This chapter addresses Federal statutes, implementing regulations, and Executive Orders potentially applicable to the proposed Isabella DSM Project. Also included is an overview of the agency consultation and public participation being undertaken to comply with these statutes, regulations, and Orders. This Draft EIS is being sent to tribes, Federal Agencies, and State and local governments as part of the consultation process for this project.

5.1 COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS

The relationship of the Isabella DSM Project to applicable Federal and State environmental requirements is summarized in the following paragraphs.

5.1.1 Federal Requirements

National Historic Preservation Act of 1966, as amended (16 U.S.C. SEC. 470 ET SEQ.)

The Act requires Federal agencies to take into account the effects of Federal undertakings on historical and archeological resources. Under these requirements, the area of potential effect of the selected project shall be inventoried and evaluated to identify historical or archeological properties that have been placed on the National Register of Historic Places (NRHP) and those that the agency and the State Historic Preservation Office (SHPO) agree are eligible for listing in the National Register. If the project is determined to have an effect on such properties, the agency must consult with the SHPO and the Advisory Council on Historic Preservation (Council) to develop alternatives or mitigation measures. Compliance with these and other provisions of the NHPA is required as a process separate from but concurrent with NEPA.

The evaluation of cultural resources as part this Draft EIS comply with the National Historic Preservation Act (NHPA). Research (literature and archival research) and field surveys in the Area of Potential Effect (APE) are summarized in this Draft EIS. The Corps has prepared a draft programmatic agreement (PA) to provide guidelines for compliance with Section 106 when the effects on historic properties are unknown (Appendix F). The Corps has invited the USFS to be a signatory to the PA, and has invited the Tule River Indian Tribe, The Bishop Paiute Tribe, the Santa Rosa Tachi Yokut Rancheria, and the Tübatulabal Tribe to be concurring parties (Appendix F). A signed final PA will be include in the Final EIS.

Farmland Protection Policy Act (7 U.S.C. Section 4201 ET SEQ.)

This act requires a Federal agency to consider the effects of its action and programs on the Nation’s farmlands. The Farmland Protection Policy Act is regulated by the Natural Resources Conservation Service (NRCS). The NRCS is authorized to review Federal projects to see if the project is regulated under the act and establish what the farmland conversion impact rating is for a Federal project.

Temporary disturbance or perhaps permanent conversion of approximately 10 acres of agricultural land is required for preparation and use of Staging Area A3 under all action Alternatives considered in the Draft EIS. Although not considered to be prime farmland, the site is adjacent to an area designated as unique farmland by the California Department of Conservation (see Figure 3-25).

Clean Air Act (42 U.S.C. SEC. 1857 ET SEQ. (1990), as amended and re-codified 42 U.S.C. SEC 7401 ET SEQ. (SUPP II 1978))

The proposed Isabella DSM Project is subject to the General Conformity Rule (40 CFR Part 51, Subpart W) promulgated by the US Environmental Protection Agency (EPA). The purpose of the General Conformity Rule is to ensure Federal projects conform to applicable State Implementation Plans (SIP) so that they do not interfere with strategies employed to attain National Ambient Air Quality Standards (NAAQSs). The rule applies to Federal projects in areas designated nonattainment for criteria pollutants for which EPA has established NAAQSs and some areas designated as maintenance areas. The project is in a nonattainment area for ozone, and a serious nonattainment area for PM_{10}. In Section 3.7 of this Draft EIS the proposed project's impacts on local and regional air quality were summarized. The chapter discusses the issues relative to the Isabella DSM Project's Action Alternatives compliance with the State Implementation Plan for air quality. A conformity determination is required since all the proposed Action Alternatives exceed *de minimis* thresholds for PM_{10}. A conformity determination will be prepared and coordinated with the the California Air Resources Board, EKAPCD and County air quality authorities to identify and implement feasible measures for reduction of emissions to reduce PM_{10} emissions and ensure that the proposed action will not violate the emissions allowance of the SIP, and USEPA air quality standards.

Clean Water Act 33 U.S.C. SEC. 1251 ET SEQ.

The Corps will ensure that the Isabella DSM Project will comply with the Federal Clean Water Act, including Section 404(b)(1) and Section 401. A section 404(b)(1) evaluation will be conducted upon selection of a preferred alternative. A Section 401 State Water Quality Certification for activities within this body is required and the Corps will submit a 401 certification application to the Central Valley Regional Water Quality Control Board (CVRWQCB).

Endangered Species Act (16 U.S.C. SEC 1531 ET SEQ.)

Section 7 of the Endangered Species Act requires Federal agencies, in consultation with the Secretary of the Interior, to ensure that their actions do not jeopardize the continued existence of endangered or threatened species, or result in the destruction or adverse modification of the critical habitat of these species.

A discussion of Federal listed species and the USFS and state species of interest has been included in Section 3.8 of this Draft EIS. A list of threatened and endangered species relating to this project was obtained from the USFWS (see Appendix E).

Based on the analysis of impacts in this document and coordination with the USFWS, the project may affect listed species and require formal Section 7 consultation. Three valley elderberry shrubs, host plant for the threatened valley elderberry longhorn beetle, will likely require relocation. A biological opinion would be obtained from the USFWS for listed species that may be affected.

Fish and Wildlife Coordination Act (16 U.S.C. SEC. 661 ET SEQ.)

This act requires Federal agencies to consult with the USFWS and the California Department of Fish and Game (CDFG) before undertaking projects that control or modify surface water. The consultation is intended to promote conservation of wildlife resources by preventing loss of or damage to fish and wildlife, and to provide for the development and improvement of these resources in connection with water projects. The USFWS and CDFG are authorized to conduct surveys and investigations to determine the potential damages, and to determine measures to prevent losses. Representatives of the Corps participated in these studies. Recommendations of USFWS and CDFG must be integrated into reports seeking permission to construct a project or to modify plans for previously authorized projects. This act requires the Corps to incorporate justifiable means for the benefit of wildlife that should be adopted to obtain maximum overall project benefits. The USFWS has provided a Planning Aid Letter to the Corps for the Isabella DSM Project (see Appendix C). The Draft Coordination Act Report (CAR), prepared by USFWS, is also included in Appendix C. The Corps has collaborated in the USFWS's Habitat Evaluation Procedures (HEP), and the Draft HEP Report is provided in Appendix D. The recommendations of the USFWS regarding mitigation for adverse effects of the project are included in the Draft CAR. A Final CAR and HEP will accompany the Final EIS and will be updated to include any refinements made to the proposed project alternatives. The Corps has and will continue to maintain continuous coordination with the USFWS and CDFG if the project is implemented.

National Environmental Policy Act (42 U.S.C. SEC 4321 ET SEQ.)

This document provides the information required by NEPA for the decision-makers to consider the environmental consequences of the proposed action and alternatives. The Final EIS will include as an appendix the comments received on the Draft EIS and the Corps responses. A Record of Decision issued by the Corps as the lead Federal agency would complete the environmental process required by the act.

Wild and Scenic River Act (16 U.S.C. SEC. 1271 ET SEQ.), President's Environmental Message of August 1979, and CEQ Memorandum of August 10, 1980, for Heads of Agencies

The project complies with this act as no river segments designated as Wild and Scenic Rivers exist in the project area.

Executive Order 11988, Flood Plain Management

This Executive Order requires the Corps to provide leadership and to take action to (1) avoid development in the existing 100-year flood plain, unless such development is the only practicable alternative; (2) reduce the hazards and risk associated with floods; (3)

minimize the impact of floods on human health, safety, and welfare; and (4) restore and preserve the natural and beneficial values of the current flood plain.

To comply with this Executive Order, the policy of the Corps is to formulate projects which, to the extent possible, avoid or minimize adverse effects associated with use of the without-project flood plain, and avoid inducing development in the existing flood plain unless there is no practicable alternative. All proposed Action Alternatives for the Isabella DSM Project would include construction of an improved berm on the upstream side of the Auxiliary Dam; within the lakebed. This remediation measure is considered essential to upgrading the seismic stability of the dam, and there is no practicable alternative. The placement of this upstream berm would not induce development within the lakebed or floodplain. The project would address the potential flood risks associated with dam failure risk as required under the Executive Order. The proposed Isabella DSM Project, once implemented, would maintain the level of flood protection provided by the Isabella Dam Project existing prior to the present IRRM restriction. Therefore, the proposed Isabella DSM Project is in compliance with this Executive Order.

Executive Order 11990, Protection of Wetlands

This order directs the Corps to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in implementing Civil Works projects. The project would cause short-term destruction of existing wetlands and short-term loss of beneficial wetland values when the reservoir is dewatered for project re-construction. Approximately 7 acres of emergent wetland habitat would be lost downstream of the Auxiliary Dam due to the construction of the relocated Borel Canal outlet and the remediation measures at the Auxiliary Dam, as well as the preparation and use of Staging Area A3. Unavoidable wetland lossesThe loss of this habitat will would be mitigated as prescribed in Draft HEP evaluation recommendations (see Appendix D) with no long-term loss of wetland habitats or beneficial values. Construction of the proposed project would not adversely affect any wetlands in the reservoir area.Thus, there would be no net reduction of wetlands or beneficial values within the project area. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

This order requires that Federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. Anticipated impacts from the proposed Isabella DSM Project were reviewed to determine whether low-income or minority neighborhoods would be disproportionately affected by the Proposed Action. No impacts, associated with social equity or environmental justice, are anticipated from the proposed Isabella DSM Project. While the proposed project, under any of the Action Alternatives, could require the relocation of local residents at the nearby Lakeside Village Mobile Home Park and other residences near the existing dams because of health concerns during construction, the impact of not taking action to remediate the dams would significantly endanger the health and welfare of these residents and a substantially greater population at risk downstream of the dams. The Corps has determined that there is a significant likelihood of dam failure from an earthquake and/or extreme storm event, and therefore calls for action to protect public safety.

5.1.2 State Requirements

State Water Resources Control Board, Division of Water Quality, and the California Regional Quality Control Board, Central Valley Region

The State Water Resources Control Board and the CVRWQB review activities that affect water quality in the Central Valley. The boards administer the requirements mandated by State and Federal law (Clean Water Act). The CVRWQB establishes water quality standards and reviews individual projects for compliance with the standards. The Corps will submit a 401 certification application to the CVRWQB.

California Department of Fish and Game, Region 4

Generally, the Department of Fish and Game (DFG) administers the State laws providing protection of fish and wildlife resources. The DFG administers the California Endangered Species Act of 1984. This act requires that non-Federal lead agencies prepare biological assessments if a project adversely affects one or more State-listed endangered species.

Federal agencies are not subject to the State Endangered Species Act. There are no local agencies having discretionary authority that are involved in implementing the proposed Isabella DSM Project.

State Mining and Geology Board

The State Mining and Geology Board oversees the implementation of relevant State laws and regulations. One of the laws within its jurisdiction is the Surface Mining and Reclamation Act of 1975 (Public Resources Code, Div. 2, Chapter 9, Sec. 1710, et seq.). The Surface Mining and Reclamation Act requires that an entity seeking to conduct a surface-mining operation obtain a permit from and submit a reclamation plan to the lead agency overseeing that operation. To be adequate, the reclamation plan must contain all categories of information specified in the Surface Mining and Reclamation Act. This State requirement does not apply to the project because it is proposed by a Federal agency on Federal lands.

State Lands Commission

In addition to such State-owned lands as parks and State highways, the State Lands Commission has exclusive jurisdiction over all ungranted tidelands and submerged lands owned by the State and the beds of navigable rivers, sloughs, and lakes (Public Resources Code, Section 6301). State ownership extends to lands lying below the ordinary high-water mark of tidal waterways and below the low-water mark of nontidal waterways (Civil Code, Section 830). The area between the ordinary high and low water on nontidal waterways is subject to a “public trust easement”. Projects such as bridges, transmission lines, and pipelines fall into this category. A proposed project cannot use these State lands unless a lease is first obtained from the State Lands Commission. The Commission also issues separate permits for dredging. For the proposed Isabella DSM Project, no lands of the State have been identified that require State Lands Commission's review and approval.

California Department of Transportation (CalTrans), District 6
CalTrans is responsible for ensuring the safety and integrity of the State of California's highway system. Under California law, any relocation or realignment of a State highway must be approved by the California Transportation Commission. Any necessary permits for construction would be obtained from CalTrans.

5.1.3 Local Plans and Policies

This section discusses the degree to which individual project components comply with locally adopted plans and policies. Evaluating the level of compliance with locally adopted plans can be complicated due to the following: (1) the intentionally broad and unspecific goals articulated in local general plans, (2) the potential of a Federal project to influence the location, density, and rate of development in ways that differ from existing local plans and policies, and (3) the currency of local plans. The study area is located within the jurisdiction of the Kern County General Plan and the Kern River Valley Specific Plan. The proposed project is expected to comply with the provisions of all of the necessary local plans.

Air Pollution Control Districts
The project construction falls under the jurisdiction of the EKAPCD. The District determines whether project emission levels significantly affect air quality, based on Federal standards established by EPA, and the California Air Resources Board. The District would first issue a permit to construct, followed by a permit to operate, which would be evaluated to determine whether all facilities have been constructed in accordance with the authority to construct permit.

Public Works and Transportation Departments
All proposed project activity involving the placement of encroachments within, under, or over County or City road rights-of-way must be covered by an encroachment permit. For the proposed Isabella DSM Project, the Corps would require the selected construction contractor(s) to consult with all appropriate local agencies as necessary to obtain the encroachment permits.

5.2 LIST OF AGENCIES CONSULTED

The Sequoia Nation Forest – Kern River District of the USFS has served officially as the Cooperating Agency in the preparation of this Draft EIS. Other agencies and organizations that have collaborated and/or participated in this process to date include the following:

- US Fish and Wildlife Service.
- US Department of Agriculture.
- Central Valley Regional Water Quality Control Board.
- Kern County Water Agency.
- Water Association of Kern County.
- Kern River Water master.
- Buena Vista Water Storage District.
- Kern Delta Water District.
- North Kern Water Storage District.
- Tulare Lake Basin Water Storage District.
- Southern California Edison.
- Kern County Board of Supervisors.
- Kern River Valley Chamber of Commerce.
- Kern River Valley Revitalization.
- Kern River Preserve.
- Kernville Chamber of Commerce.
- City of Bakersfield.
- Sierra Club.
- Tule River Indian Reservation.
- Santa Rosa Rancheria – Tachi Yokuts.
- Bishop Paiute Tribe.
- Tübatulabals of Kern Valley.
- Kern Valley Indian Council.
- Kawaiisu Tribe.
- Kern River Paiute Council.
- Monache Intertribal Association.

A complete list of those agencies, organizations, individuals, and other stakeholders that have participated in this process, is provided in Appendix A.

5.3 PUBLIC INVOLVEMENT

This section summarizes the public involvement efforts undertaken during the alternative formulation process and preparation of this Draft EIS.

5.3.1 Scoping

The scoping process for the Isabella DSM Project began on February 5, 2010, with the publication of the Notice of Intent (NOI) in the Federal Register., The NOI provided formal notification to the public and agencies that an Environmental Impact Statement (EIS) would be prepared by the US Army Corps of Engineers (Corps), Sacramento District for the Isabella DSM Project to correct seismic, static, and hydrologic issues associated with the structures that make up the Isabella Lake Dam in the Kern River Valley. The US Environmental Protection Agency provided the only written comment to the Corps in response to the publication of the NOI.

In May 2010, two Initial Public Meetings were held, one in Kernville, and another in Bakersfield. These meetings were conducted to brief the public on the deficiencies identified with the Isabella Lake Dams and to report on the ongoing investigations and activities being conducted at the facility, to outline the process going forward, and to provide an opportunity to submit questions and general comments on the Isabella DSM Project. Fact sheets about the project and comment forms were distributed. Summaries of these meetings and the materials presented by the Corps are contained in the *Initial Public Scoping Meetings, Scoping Report, Isabella Lake DSM Project,* dated August 2010 (Corps 2010g).

A second set of Public Informational Meetings were held on December 14 and 15, 2010, this time in Lake Isabella and Bakersfield. The Corps provided an update on the status of the Isabella DSM Project, including the dam safety investigations and the preliminary risk reduction measures under consideration in formulating remediation alternatives. There was also a discussion of the environmental review process and the environmental studies being prepared in support of the project. Again, the public was given an opportunity during the meetings to provide input regarding issues of concern and to ask questions of the panel. Fact sheets about the project and comment forms were distributed. Summaries of these two information meetings and the materials presented by the Corps are contained in the *Preliminary Public Participation Report, Isabella Lake DSM Project,* dated January 2011 (Corps 2011b).

Three Public Scoping Meetings were held May 17-19, 2011, in Kernville, Lake Isabella, and Bakersfield to present the Alternative Risk Management Plans (RMPs) being considered and evaluated in the EIS, and to seek input on the issues, resource concerns, alternatives and potential impacts that should be considered in the EIS. At the meetings, the Corps described the Alternative RMPs that are being evaluated that address seismic, seepage and hydrologic deficiencies at Isabella's Main and Auxiliary Dams. The potential environmental impacts associated with these alternatives are evaluated in this Draft EIS. Summaries of these three meetings and the materials presented by the Corps are presented in the Public Scoping Report, *Isabella Lake DSM Project*, dated September 2011 (Corps 2011c). An abridged version of this report is provided as Appendix A of this DEIS and should be consulted for a more complete description of the public involvement process to date for the proposed Isabella DSM Project.

More than 400 people attended the seven public meetings, including members of the public, elected officials, and representatives from public agencies, waterways, and electric power and flood control. All seven public meetings were held in an open house forum. Displays were set up to provide information on issues, impacts, agency roles, and opportunities for public involvement and for questions and answers. For more information on these public meetings please see Appendix A.

5.3.2 Ongoing Participation

The Corps maintains mailing and e-mail distribution lists to communicate and coordinate with stakeholders, including government entities and officials, tribal groups, water users, media, and those who have signed up at public meetings or otherwise asked to be added to the mailing list. The Corps also maintains a public website on Isabella Lake and the Isabella DSM Project, http://www.spk.usace.army.mil/projects/civil/Lake_Isabella_Dam/Index.html, and posts monthly situation reports and other materials summarizing Corps activities in support of the Isabella DSM Project.

Public interest in the Isabella DSM Project is high, and the Corps will continue the public participation efforts and opportunities throughout the EIS development process. After a Notice of Availability and a Draft of the Isabella DSM Project EIS are released in early March 2012, public hearings will be scheduled during the 45-day comment period in Kernville, Lake Isabella, and Bakersfield to receive public comment on the Draft EIS. Advance notices of these hearings will be sent out to interested parties on the mailing lists, and advertised in local and regional news media. A list of the document recipients for the Draft EIS is included in Chapter 6.

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CHAPTER 6.
DOCUMENT RECIPIENTS

6.1 INTRODUCTION

This chapter lists Federal, State, regional, and local public and private agencies and organizations that have either received a copy of this Draft EIS or a notification of document availability. In addition to the regulatory agencies, agencies with special expertise or interest in evaluating environmental issues related to the project are included. Elected officials and representatives, government department and agencies, private organizations and businesses, Native American governments and representatives, and individuals who may be affected by the project or who have expressed an interest in the project through the public involvement process are also included.

The Isabella DSM Project Draft EIS is available on the internet at:

http://www.spk.usace.army.mil/

Copies of the Draft EIS are available for public review at the following locations:

USDA Forest Service, Sequoia National Forest, Kern River Ranger District - Lake Isabella Office, 4875 Ponderosa Drive, P.O. Box 3810, Lake Isabella, CA 93240

USDA Forest Service, Sequoia National Forest, Kern River Ranger District – Kernville Office, 105 Whitney Road, P.O. Box 9, Kernville, CA 93238

Lake Isabella Public Library, 7054 Lake Isabella Blvd, Lake Isabella, CA 93240

Beale Memorial Library, 701 Truxtun Avenue, Bakersfield, CA 93301

Southwest Branch Library, 8301 Ming Avenue, Bakersfield, CA 93311

Ridgecrest Branch Library, 131 East Las Flores Avenue, Ridgecrest, CA 93501

6.2 ELECTED OFFICIALS AND REPRESENTATIVES

Governor of California
    Honorable Edmund G. Brown Jr.

United States Senate
    Honorable Barbara Boxer
    Honorable Dianne Feinstein

House of Representatives
    Honorable Jim Costa
    Honorable Kevin McCarthy
    Honorable Daniel Lungren

California Senate
    Honorable Jean Fuller
    Honorable Michael J. Rubio

California Assembly
    Honorable Shannon Grove
    Honorable David Valadao

6.3 GOVERNMENT DEPARTMENTS AND AGENCIES

6.3.1 U.S. Government

Agricultural Stabilization and Conservation Service
Army Corps of Engineers
Bureau of Land Management
Council on Environmental Quality
Department of Agriculture
Environmental Protection Agency
Federal Emergency Management Agency
Federal Highway Commission
Fish and Wildlife Service
Forest Service
Geological Survey
National Park Service
Natural Resources Conservation Service
Office of Environmental Project Review
Western Area Power Administration

6.3.2 State of California

Air Resources Board
Assembly Committee on Water, Parks, and Wildlife
Caltrans – District 6
Central Valley Regional Water Quality Control Board
Department of Conservation
Department of Fish and Game
Department of Parks and Recreation
Department of Transportation
Department of Water Resources
Native American Heritage Preservation
Office of Historic Preservation – State Historic Preservation Officer
Office of Transportation Planning
Reclamation Board
Senate Committee on Natural Resources
State Clearinghouse
State Lands Commission
Water Commission
Water Resources Control Board

6.3.3 Regional, County, and City

City of Bakersfield
City of Bakersfield – Water Resources Department
Desert Mountain Resource and Conservation Development Council
Grater Bakersfield Chamber of Commerce
Kern Council of Governments
Kern County
Kern County Air Pollution Control District
Kern County Emergency Services
Kern County Farm Bureau
Kern County Fire Department
Kern County Planning Department
Kern County Sheriff's Department
Kern County Water Agency
Kern Economic Development Cooperation
Kern River Valley Chamber of Commerce
Kernville Chamber of Commerce
Lindsay Chamber of Commerce
Porterville Chamber of Commerce
Ridgecrest Chamber of Commerce
Springville Chamber of Commerce
Tulare County Planning Department

6.3.4 Private Organizations and Businesses

American Red Cross – Kern Chapter
Audubon California – Kern River Preserve
Beyond Juice
Buena Vista Water Storage District
California Land Management Services
Century 21 – Lake Isabella
French Gulch Marina
GEI Consultants
Harris and Associates
Insight Environmental
International Mt. Biking Association
Isabella Partners
Kern Delta Water District
Kern River Outfitters
Kern River Valley Community Emergency Response Team
Kern River Valley Revitalization
Kern River Watermaster
Lake Isabella KOA
Lake Isabella/Bodfish Homeowners Association
Lakeside Village Mobile Home Park
Lassen Resources
Law Offices of Young Wooldridge
Lodge at Painted Rock
Lusich and Associates
Mountain and River Adventures
North Fork Marina
North Kern Water Storage District
Pacific Gas and Electric
Red's Marina
Rio Bravo Power Plant
Salvation Army
Sierra Club – Kern-Kaweah Chapter
Southern California Edison Company
Springville Inn
Stewards of the Sequoia
The Kern Lodge
Tulare Lake Basin Water Storage District
Water Association of Kern County
Watson Reality

6.4 NATIVE AMERICAN GOVERNMENTS AND REPRESENTATIVES

Big Pine Paiute Tribe of Owens Valley

Bishop Paiute Tribe
California Indian Basket Weavers Association
California Native American Indians
Dunlap Band of Mono Indians-Historical Preservation Society
Eshom Gathering c/o Stephan Gamboa
Kawaiisu Tribe
Kern River Paiute Council
Kern Valley Indian Community Council
Lone Pine Paiute-Shoshone Indian Reservation
Monache Intertribal Association
Santa Rosa Rancheria - Tachi Yokuts
Sierra Nevada Native American Coalition
Table Mountain Rancheria
Tubatulabals of Kern Valley
Tule River Indian Tribe
Tule River Tribal Elders Committee
Tule River Tribe
White Blanket Allotment

6.5 MEMBERS OF THE PUBLIC

All members of the general public who requested a copy of the Draft EIS will be mailed either an electronic version (on CD) or a hard copy of the document. Additionally, those who submitted comments during the scoping process and provided complete mailing addresses will also receive a copy of the Draft EIS.

CHAPTER 7.
LIST OF PREPARERS

The following individuals participated in the preparation of this DEIS.

7.1 FEDERAL GOVERNMENT

U.S. Army Corps of Engineers

Mitch Stewart Dan Artho Doug Edwards	Senior Environmental Managers – EIS direction and coordination
Richard Perry	District Archaeologist – EIS Cultural Resources Section
S. Joe Griffin	Archaeologist – EIS Cultural Resources Section
Melissa Montag	Recreation Specialist – EIS Recreation Section
Hunter Merritt	Recreation Specialist – EIS Recreation Section
John Baum	Environmental Engineer – EIS Water Quality Section
Heather Jackson	Environmental Engineer – EIS Water Quality Section
Angela Carmi	Hydrologist – Hydrology Section
Bruce VanEtten	Environmental Engineer – EIS HTRW Section
Brad Johnson	Environmental Manager – EIS HTRW Section
David Serafini	Technical Team Lead – Alternatives Descriptions
Marci Jackson	Planning Lead – Alternatives Descriptions
Bill Halzcek	Engineer – Air Quality Review
Ronn Rose	Engineer – Dam Safety

U.S. Forest Service

Brenda Ehmann	Deputy District Ranger – EIS Review Coordinator
Tim Kelly	Archaeologist – EIS Cultural Resources Review
Karen Miller	Archeologist – EIS Cultural Resources Review
Dennis Dougherty	Archeologist – EIS Cultural Resources Review

Dirk Charley	Tribal Relations – EIS Cultural Resources Review
Steve Anderson	Resource Officer – Biological Resources Review
Mary Cole	Landscape Architect – Aesthetics Review
Ricardo Cisneros	Environmental Engineer – Air Quality Review
Fletcher Linton	Botanist – Vegetation Review
Steven Ray	Environmental Engineer – Noise/Vibration Review
Penelope Shibley	District Planner – NEPA Review
Cheryl Bauer	Recreation Specialist – Recreation Review
Chris Stewart	Hydrologist – Water Quality Review

7.2 CONTRACTORS

The following contractors supported the Corps by conducting resource studies, analyzing the impacts of the Alternative Base Plan, Alternative Plan 1, Alternative Plan 2, Alternative Plan 3 and No Action Alternative and by preparing internal drafts of this Draft EIS. The Draft EIS was prepared and finalized for public release by the Corps with the addition of Alternative Plan 4.

Tetra Tech, Inc.

David Broadfoot	Senior Environmental Planner-Scientist – EIS Project Manager, Chapter 2, Chapter 4, Chapter 5.
Kevin Doyle	Senior Environmental and Cultural Resources Planner – EIS Deputy Project Manager; Chapter 1, Cultural Resources Section, Chapter 7, Chapter 8.
Derek Holmgren	Environmental Planner-Scientist – EIS Aesthetic Resources Section; Water Resources Section.
Diane Love	Principal Geologist – EIS Geology, Soils Seismicity Section; HTRW Section; Land Use Section; Public Health and Safety Section.
Jeff Barna	Biologist – EIS Biological Resources Section.
Toni Pennington	Lead Biologist – EIS Biological Resources Section.
Genevieve Kaiser	Environmental Planner-GIS Specialist – EIS Socioeconomics and Environmental Justice Section.

Matt Loscalzo	Environmental and Recreation Planner – EIS Recreation Section.
Steve Parker	GIS Specialist – EIS Figures.
Steve Hoerber	GIS Specialist – Photo Simulations.
Cindy Schad	Word Processor – Document Production and Formatting.
Yashekia Evans	GIS Analyst/Production Manager – Document Production Coordination.

McIntosh & Associates, Bakersfield, CA

Darcie Larman	Senior Environmental Planner – EIS Traffic and Circulation Section; Noise and Vibration Section; Air Quality Section.
Roger A McIntosh	Principal Consultant – Project Oversight.
Gregg A. Buckle	Civil Engineer – EIS Traffic and Circulation Section
Donna Luttrell	Photogrammetrist – Graphics Support.

j.c. brennan & associates, Auburn, CA (under contract to McIntosh & Tetra Tech)

Luke Saxelby	Senior Consultant – EIS Noise and Vibration Section.

Insight Environmental Consultants, Bakersfield, CA (under contract to McIntosh & Tetra Tech)

Ronald W. Hunter	Principal Consultant – EIS Air Quality Section.
Matt Daniel	Consultant – EIS Air Quality Section.

CHAPTER 8.
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