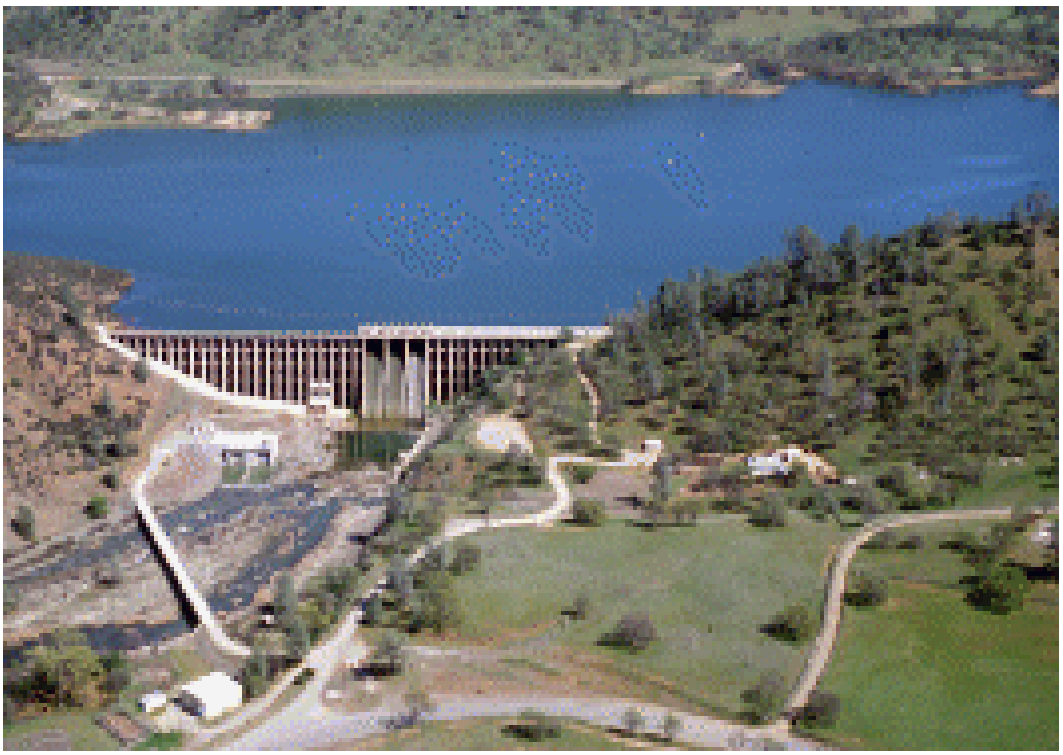
RECLAMATION
Managing Water in the West

Stony Gorge Dam
Orland Project, California
Mid-Pacific Region



FINAL DRAFT
ENVIRONMENTAL ASSESSMENT
SAFETY OF DAMS MODIFICATIONS TO
STONY GORGE DAM

GLENN COUNTY, CALIFORNIA
December 14, 2004

MISSION STATEMENTS

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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INTRODUCTION

The Bureau of Reclamation (Reclamation) proposes to modify the Stony Gorge Dam, constructed by Reclamation as part of the Orland Project in 1928. The Stony Gorge Dam, approximately 1.5 miles upstream from the community of Elk Creek in Glenn County, was identified as posing an unacceptable risk to downstream residents in an October 2001 Risk Analysis Report and a July 1, 2002, Decision Memorandum. The preferred alternative calls for structural modifications at Stony Gorge Dam to address inadequate lateral support of the concrete buttresses during a large seismic event. Additionally, a structural modification is proposed for the hydrologic failure mode that involves stabilizing the foundation below the spillway to prevent potential head cutting during an extreme flood event from progressing upstream to the buttress foundation.

The purpose of this Environmental Assessment (EA) is to evaluate and disclose the environmental consequences of the proposal to modify Stony Gorge Dam. The EA will be used to determine whether to prepare a Finding of No Significant Impact (FONSI) or prepare an Environmental Impact Statement. If the EA demonstrates that the environmental consequences do not have a significant impact on the human environment, a FONSI will be prepared and modifications will proceed with a selected alternative.

Investigations conducted under Reclamation's Dam Safety Program revealed that earthquake ground motions originating in blind thrust faults along the coastal mountain range could fail Stony Gorge Dam. The key failure mode identified is failure of the buttresses due to inadequate lateral support, subsequent failure of the dam, and rapid uncontrolled release of the reservoir.

Investigations also revealed that spillway discharges during an extreme flood event could cause severe erosion that could undermine the spillway apron and eventually progress far enough upstream causing failure of one or more of the buttresses.

At the time that Stony Gorge Dam was designed and constructed between 1926 and 1928, earthquake hazards were not considered. Seismic evaluations conducted in 1999 indicated that Reclamation needed to better refine the seismic activity for the suspected buried or "blind" thrust faults in the vicinity of the dam. In addition, it was recommended that a modern evaluation of the potential for surface faulting beneath the dam should be performed. By 2001, four active blind thrust faults associated with the Coast Range near the dam were identified.

The Risk Analysis team made a Safety of Dams recommendation to take action to reduce the failure probability and risk associated with a seismic failure of the dam. The decision memorandum issued on July 1, 2002, recommended a Corrective Action Study (CAS) to identify and perform a preliminary evaluation of structural and non-structural alternatives to reduce probability of failure and associated risk to the public. This evaluation began a screening process to identify, evaluate, and select a reasonable number of recommended alternatives for the CAS.

Work began October 8, 2002, with a meeting in Denver, Colorado, followed shortly by a CAS Scoping meeting in Willows, California, on November 13, 2002. Based on the discussions at these two meetings, a number of structural and non-structural alternatives were recommended for investigation. Dam modifications are expected to begin in 2006 and will take approximately one year to complete. This EA addresses the potential environmental impacts associated with the more promising engineering alternatives investigated during the CAS.

PURPOSE AND NEED FOR THE ACTION

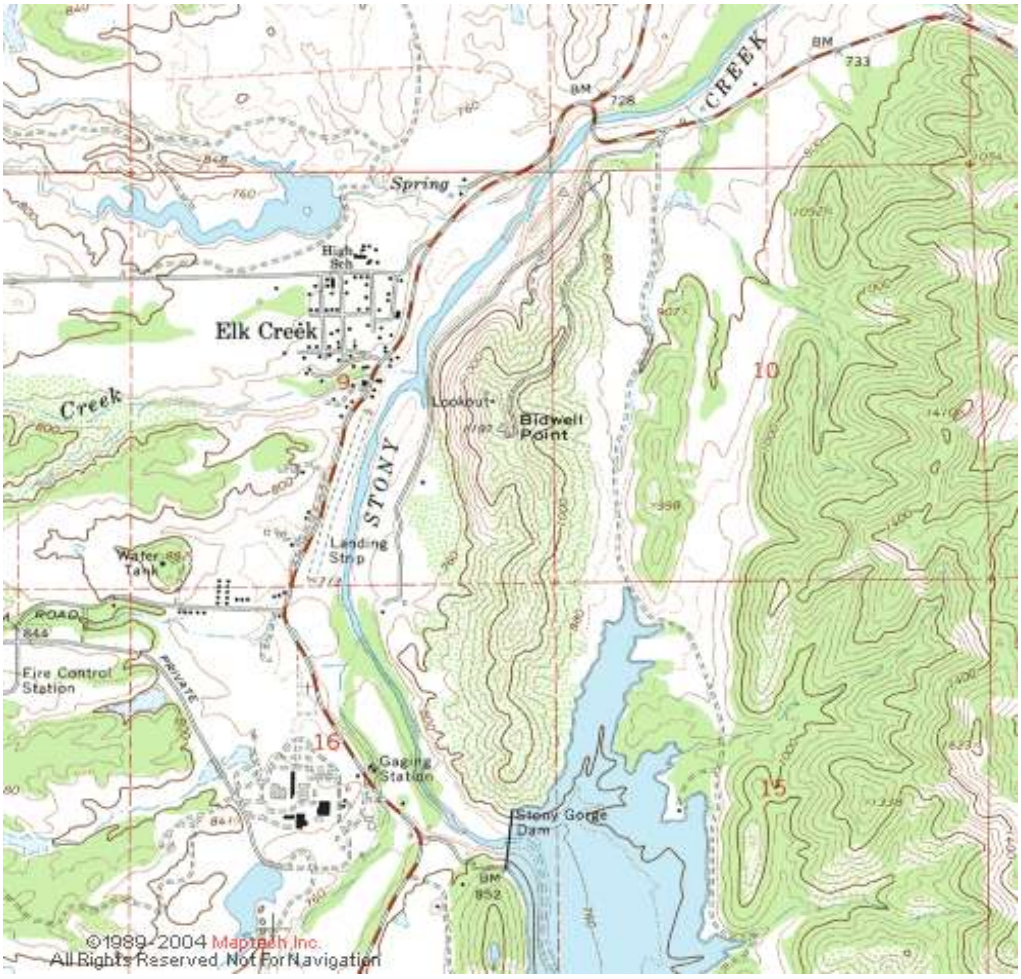
The purpose of the proposed action is to reduce the probability of dam failure and risk to the public in conformance with Reclamation guidelines. The project is needed to provide an acceptable level of protection of life and property in the reaches downstream of Stony Gorge Dam. This includes a portion of the community of Elk Creek, population 250, a small number of residences downstream of the dam, possibly the facilities at Black Butte Dam, and the downstream communities, such as Orland, which it in turn protects.

DESCRIPTION OF STONY GORGE DAM AND RESERVOIR

Stony Gorge Dam

Stony Gorge Dam is located on Stony Creek, 1.5 miles southeast of Elk Creek, California, in Section 9, Township 20 North, Range 6 West, Elk Creek quadrangle; latitude 39°35'06"N, longitude 122° 31'53"W. Stony Gorge Dam is one of the two storage dams of the Orland Project in north-central California (the other is East Park Dam). The dam is located about 21 miles northwest of Willows, California, about 18 miles downstream of East Park Reservoir and 22 miles upstream of Black Butte Dam, a Black Butte Project facility. Stony Gorge and East Park reservoirs are authorized for irrigation storage, with flood control considered a secondary

benefit. Stony Gorge and Black Butte reservoirs account for most of the flood protection provided by these three dams, with storage capacities on the order of one-third the typical annual flow in Stony Creek, a stream notable for its variable, flashy flows. Stony Gorge Dam impounds a reservoir of 50,000 acre-feet.



In 1986, Stony Gorge Dam was modified to prevent failure from extreme flood events that could overtop the dam. The fix included modifying the dam to only allow overtopping on the right (north) side (looking downstream) and placing a concrete slab downstream of the dam to prevent damage to the foundation. Stony Gorge Dam is an Ambursen-type slab and buttress structure. Completed in 1928, it is 868 feet long at the crest with a structural height of 139 feet, and a crest elevation of 847 feet. The dam contains 46 bays of slab and buttress construction with buttresses spaced 18-feet on centers. It terminates in short gravity sections at each abutment. Stony Gorge Reservoir regulates flows along the middle reach of Stony Creek and stores surplus water for irrigation purposes.

A parapet wall extending to the elevation of 859 feet was added to the dam crest left of the spillway control house as part of the 1986 modification to prevent overtopping of the left side of the dam. The original parapet wall on the right side was removed to allow for overtopping on the right side of the dam. The top of active conservation storage in the reservoir is at an

elevation of 841 feet.

All concrete in the dam is reinforced, except in the cut-off trenches, the massive portion of the spillway bucket and the spillway apron. The buttresses vary in thickness from 18-inches at the top to 3-feet 9-inches at the base of the tallest buttress. The non-overflow deck slabs vary in thickness from 15-inches to 4-feet 2-inches. Horizontal struts, 18-inches wide x 24-inches high in cross-sectional dimension, are spaced 24-feet on centers both horizontally and vertically between buttresses.

The spillway, which has a discharge capacity of 38,000 ft^3/s at a reservoir elevation of 844.50 feet, occupies six bays of the dam and is divided by piers into three equal openings. The spillway is located in the center of the dam with a crest elevation of 821.38 feet and consists of a concrete chute down the face of the dam and a stilling basin at the toe of the dam. Spillway releases are controlled by three 30 x 30-foot crawler gates, which move down the upstream face of the dam to open. A gatehouse at the top of the dam contains gate-hoisting machinery and a traveling crane. The gates are operated by screw-stem hoists driven by gasoline engines.

The outlet works, located to the right of the spillway, consists of two separate penstock conduits for the release of water from the dam to either the City of Santa Clara Powerplant or directly to the dam stilling basin. Each conduit consists of the following components:

- An upstream trashrack-protected 42-inch conduit connected to a downstream hydraulically-operated 42- x 42-inch emergency slide gate located in the gate house at the base of the dam between buttresses 35 and 37;
- A 72-inch diameter penstock conduit extending downstream from the emergency gate to a bifurcation which branches off to a lower 72-inch penstock that leads to the powerplant and
- An upper 50-inch conduit continuing from the bifurcation that terminates at a hydraulically-operated 42-inch fixed cone bypass valve for the direct release of water into the dam stilling basin.

The fixed-cone valves, with centerlines at an elevation of 740.1 feet, were installed to replace balanced needle valves during the modifications completed in 1986. The steel conveyance pipes were modified with a bifurcation to supply water to the 72-inch-diameter penstocks for the powerplant that was constructed at that time. The powerplant is owned and operated by the City of Santa Clara, California. It contains two Francis turbines and two generators. The discharge capacity of the outlet works is 1,050 ft^3/s at a reservoir water surface elevation of 841 feet. (Note: The elevations provided in this EA, as in the CAS report are in the original datum. To convert to the new datum add 1.56 feet to the old datum).

Stony Gorge Reservoir

The dam forms a reservoir five miles in length and ½ mile wide with an area of 1,275 acres, and has a total capacity of about 50,000 acre-feet at a water surface elevation of 841 feet at full pool. There are 18 miles of shoreline (25 miles has also been recorded), of which seven miles are available for public visitation. Drawdown of the reservoir is usually extreme and rapid, and normally occurs in mid-summer, which has an immediate affect on visitation.

The total land area around and under the reservoir is 2,539 acres, of which 2,367 acres is in fee title, 160 acres is withdrawn from the public domain, and 12 acres is in permanent easement, according to a 1991 Land Use Inventory Report, Property No. 01-200. Approximately 1,275 acres comprise the water surface. Of the land acres, approximately 150 acres are used by the public for recreation, with camping and sightseeing as the predominate activities. Lands surrounding the reservoir consist mainly of upland wildlife areas, and approximately 1,090 acres of these lands are available for grazing. Annual rainfall varies between 15 and 25 inches.

PROPOSED ACTION AND ALTERNATIVES

The Proposed Action is to implement a corrective action to develop a sound structure.

Corrective Action Alternatives Subjected To Screening and Eliminated From Further Analysis

The technical team screened eight action alternatives and eliminated three alternatives from further consideration. The eliminated alternatives were:

1. Relocate the downstream population, including the town of Elk Creek.

Portions of the downstream population of approximately 250 people located within the flood plain would be relocated. Restrictions on future development in the flood plain would also be required. This alternative would reduce the population now at risk but would not, in itself, eliminate the risk unless all areas subject to flooding in event of a failure were covered by easements to prevent new construction that would recreate the present risk. This alternative was deemed to be unacceptably intrusive into local land use issues and potentially expensive.

2. Implement a reservoir operational exchange.

An operation exchange would move irrigation storage from Stony Gorge Reservoir to Black Butte Reservoir in exchange for flood storage being moved to Stony Gorge Reservoir. The reduced storage in Stony Gorge could reduce the level of downstream flooding associated with a dam failure. This alternative was eliminated because it would require agreement among a number of additional parties, making it difficult to implement. This alternative would not necessarily provide the level of flood protection currently provided by Black Butte Dam and Reservoir which also impounds water from Grindstone Creek and has three times the storage of Stony Gorge Reservoir.

3. Implement a reservoir restriction.

The operational reservoir level in Stony Gorge Reservoir would be lowered in order to reduce the downstream flooding resulting from a dam failure. The probability of a dam failure during a large seismic event is not greatly influenced by the reservoir level. Reclamation guidelines would still indicate justification to reduce the probability of failure. This alternative would reduce water supplies for the Orland Project, and is therefore, unacceptable.

Corrective Action Alternatives Subjected To Engineering Analysis

Alternative 4, a dam breaching alternative, and Alternative 5, a non-structural alternative consisting of an early warning system, were evaluated as potential alternatives. Alternatives 6, 7, and 8, as probable structural solutions, were ranked using a process that comparatively evaluated each of the alternatives in 6 different categories: reliability, constructability, potential environmental and historical structural impacts, initial and long-term costs, complexity of design and analysis, and impacts on water usage. The rankings did not show a significant difference or preference among alternatives, therefore the alternatives were carried forward for more detailed engineering analysis.

4. Breach the dam.

The dam would be breached to eliminate any risk associated with a dam failure and the reservoir would be restructured. This alternative, although it would not meet the water storage needs of the Orland Project, and would be a high cost means to reduce risk, would be a reliable solution to solving the problem of inadequate lateral support for the concrete buttresses during a seismic event which could lead to failure of the buttresses and subsequent failure of the slabs. This alternative would impact the recreational resources of the area by removing a popular boating, fishing, and camping area. Recreational users would go either to East Park or Black Butte lakes, which would further increase the high numbers of visitors those areas currently sustain. This alternative would contribute to cumulative socio-economic impacts by removing business revenues contributed by recreation visitors and would cause aesthetic impacts on a temporary basis until the reservoir floor was revegetated. This alternative was ultimately rejected. The estimated cost to remove the dam, not including the cost of restoring the reservoir and the cost associated with the loss of project benefits, was higher than other alternatives that both lowered the risk and maintained the current project benefits.

5. No corrective action would be taken; an early warning system would be installed.

No structural modifications or operational changes to prevent failure of the dam would be made. Risk reduction would be accomplished by installing an early warning system and enhancing the Emergency Action Plan (EAP). An early warning system presumes the people at risk will get timely warnings and respond to them without delay, which may not be the case. Thus it would be less reliable than a structural solution and may provide inadequate protection.

6. Increase the lateral support of the dam.

Lateral support would be increased by use of steel trusses (e.g. cross bracing), diaphragm walls, additional struts, or by increasing the size or shape of the existing struts. Based on the structural analysis, a diaphragm wall was determined to be the most feasible method of increasing lateral support and reducing the probability of failure. A concrete diaphragm wall was selected for use in the CAS report. Analyses of several concrete diaphragm options were performed: single walls, multiple walls, different heights and thicknesses of walls, and walls either fixed to, or simply supported against, the buttresses.

The results of the analyses indicated that a single diaphragm wall between the buttresses could be used to reduce the failure probability enough to reduce the risk below guidelines.

7. Strengthen the buttresses.

The buttresses would be thickened by using either reinforced concrete or fiber reinforced shotcrete. The buttresses could be strengthened by increasing the thickness of the buttresses although this would involve extensive drilling to provide dowels to ensure integrity between the existing concrete and the new concrete and/or steel. While modifying the buttresses in this manner would help to decrease the high stresses that occur, the lack of lateral support would remain an issue. Therefore, this alternative would be coupled with providing some sort of additional lateral support. After considering the results of the analyses that successfully involved increased lateral support alone (diaphragm walls or in-filling between the buttresses) the additional strength achieved by increasing the thickness of each buttress was not beneficial enough to warrant continued consideration.

8. Convert a portion of the dam to a gravity section.

The lower portion of the dam would be converted into a gravity section using either mass concrete, preplaced aggregate concrete, or grout bags (instead of formed concrete) for infill between the buttresses.

Several different configurations of a gravity infill were analyzed.

Corrective Action Alternatives Subjected To Environmental Analysis

Screening Alternative 8 and two variants of Alternative 6 were deemed both structurally feasible and compliant with the project purpose and were carried forward as alternatives for environmental analysis. These were:

1. Alternative 1 – Construct a Simply Supported Diaphragm Wall
This alternative involves placing a 12-foot thick diaphragm wall between the buttresses to provide lateral support. The wall would be located just upstream of the buttress walkway and would extend to an elevation of 810 feet. In order to provide lateral support to the buttresses in the spillway section, the walls would be angled up to intersect the end spillway buttresses at elevation 834. The walls would be located in the bays between buttresses 17 and 52 (including the bays under the spillway). The 12-foot wall would be connected to the buttresses by anchoring blocks to the buttresses along a vertical line at the centerline of the diaphragm walls. These anchored blocks would act as shear keys and resist any upstream/downstream movement of the 12-foot wall. Direct anchorage of the upper portion of the wall to the spillway buttresses would be required above an elevation of 810 feet.

The Simply Supported Diaphragm Wall is shown in Figure 1.

2. Alternative 2 – Construct a Rigidly Connected Diaphragm Wall

This alternative involves the placement of a rigidly connected diaphragm wall between the buttresses to provide lateral support. The wall would be 6.5 feet wide below an elevation of 750 feet varying to 3.5-feet wide above the elevation of 786 feet. The wall would be located just upstream of the buttress walkway and would extend to the elevation of 810 feet. In order to provide lateral support to the buttresses in the spillway section, the walls would be angled up to intersect the end spillway buttresses at elevation 834. The walls would be located in all of the bays between buttresses 17 and 52 (including the bays under the spillway) and would be anchored to the buttresses. This alternative was originally conceived and analyzed as a 2-foot-thick wall. The thickness was increased to increase the spacing of the anchor bars required to connect the walls to the buttresses.

The rigidly connected diaphragm wall shows the least risk reduction of the three structural alternatives. Although it appears capable of reducing the level of risk below Reclamation guidelines, the CAS team thought that possible stress transfer associated with the rigid connection and construction difficulties associated with closer anchor bar spacing could push the estimated risk back above the guidelines.

The Rigidly Connected Diaphragm Wall is shown in Figure 2.

3. Alternative 3 – Place Gravity Infill between the Buttresses

This alternative involves placing a gravity wall between the buttresses. The vertical downstream face of the wall would be located just upstream of the buttress walkway. Between elevation 798 and elevation 810, the wall would be 12 feet thick. Below the elevation of 798 feet, the upstream face of the wall would slope at 1H: 1V. A gap would be left between the upstream face slab and the gravity infill to minimize the concrete volume. In order to provide lateral support to the buttresses in the spillway section, the walls would be angled up to intersect the end spillway buttresses at an elevation of 834 feet. The walls would be located in all of the bays between buttresses 17 and 52 (including the bays under the spillway). Direct anchorage of the upper portion of the wall to the spillway buttresses would be required above the elevation of 810 feet.

The final configuration for the Gravity Infill is shown in Figure 3.

For all alternatives, the construction of the walls/infill under the dam crest and spillway will be difficult due to very limited access. The right abutment is relatively steep and covered with a concrete slab. There is existing vehicular access to the toe of the right abutment. The left abutment is steeper with existing vehicular access to the dam crest and to an area just downstream from approximately buttress 16. The only existing access to the lower left abutment is a foot path. The only access to the bays under the spillway is the buttress walkway opening. The walkway is at elevation 750 and the openings in the buttresses are 5 feet wide by 7 feet high. Due to the poor access to the bays under the spillway, it may be necessary to cut small temporary holes in the spillway floor through which concrete can be pumped.

In addition, a No-Action alternative is also included on this EA, as required by the National Environmental Policy Act, even though it would not meet the project purpose.

4. No Action Alternative

No structural modifications or operational changes would be made to prevent failure of the dam. As this alternative would not meet the project purpose of implementing a corrective action to develop a sound structure, it was not considered a feasible alternative.

Preferred Alternative

The preferred alternative for modifying Stony Gorge Dam is to install a diaphragm wall between buttresses to provide lateral support during seismic loading. The diaphragm walls would potentially be located just upstream of the buttress walkway and would extend to elevation 810.0. To provide lateral support to the buttresses in the spillway section, the walls would be angled up to intersect the end spillway buttresses at elevation 834.0. The walls would be located in a sufficient number (possibly all) of the bays between buttress 17 and 52 (including the bays under the spillway) to assure the stability of the structure. The walls, as described for Alternatives 1 and 2, could be either simply supported or rigidly connected. While the gravity infill would provide a greater level of risk reduction, the estimated cost was significantly higher than the diaphragm walls. Final designs will consider both types of diaphragm walls. The structural analyses used for the final design will incorporate recommendations made by the Consultants Review Board. The preferred alternative provides a technically acceptable solution to reduce the risk of dam failure during seismic events, ensures continued structural integrity of the dam under normal operating conditions, and maintains full project benefits at current levels.

Additional Proposed Modifications

A large erosion hole has formed immediately downstream of the concrete spillway apron. The hole is about 100 to 120 feet wide and extends about 100 feet downstream from the spillway apron. The depth of the hole varies and is about 30 feet at its deepest. A potential failure mode exists related to continued erosion. During large spillway flows, additional erosion may occur. For an extreme flood event, the spillway discharges could be high enough to cause the erosion to start undermining the spillway apron. If this undercutting progresses far enough upstream, a foundation failure of one or more of the buttresses could occur. In order to address this potential failure, a structural modification has been proposed.

The proposed modification consists of installing anchor bars and placing a concrete slab on the upstream face of the hole. This work will require unwatering the hole (requiring the pumping out of about 1.5 million gallons of water). The water will be pumped out of the hole and into the downstream channel. The diversion during construction will probably divert seepage and outlet works discharges to downstream of the hole. A short cofferdam will probably be required downstream of the hole. Once the hole is emptied, it will refill with seepage. Once diversion is no longer required, the hole will fill faster. Once the hole is unwatered, rock excavation will be performed to create a more uniform surface for the concrete slab. Along with the rock excavation, removal of loose rock will also be required. Once the excavation is completed, anchor holes will be drilled into the upstream face of the hole. After installation of the anchors, a reinforced concrete slab will then be set in place.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Environmental impacts are expected to be less than significant because the work will be confined to the areas disturbed by prior construction activity.

AFFECTED ENVIRONMENT

Geology and Hydrology

The geology for the dam is well documented in two reports: Geologic Design Data for Stony Gorge Modification (Reclamation 1982) and the Geologic Data Package – Stony Gorge Dam (Reclamation 2000). The following descriptions are from these reports.

The reservoir basin and damsite are underlain by the Stony Creek Formation, which consists of a thick and well-indurated series of clay shales, hard sandstone, and pebble or boulder conglomerates.

The damsite is situated at the north end of the reservoir basin where Stony Creek turns westward through a low range of hills. The rock formation at the damsite is largely conglomerate with some sandstone and lesser amounts of shale. The predominant conglomerate rock is massive and of excellent quality. A tight (filled with clay gouge) and relatively minor fault, dipping 50 degrees to the northeast, crosses the damsite approximately along the north bank of the stream channel between buttresses 32 and 35. Upstream and downstream of the dam, the sandstone and conglomerate grade to interbedded, medium to thick bedded sandstone, and thin bedded siltstone, also of the Stony Creek Formation. The cutoff trench is founded in bedrock.

Jointing in the foundation rock is typically discontinuous. The most prominent joints parallel the east (upstream) dipping bedding. These joints are often well developed and occasionally are closely spaced at the ground surface but are widely spaced or absent at depth as determined by the 1979 drilling.

There are cracks in the exposed rock between several of the buttresses. Although these cracks are up to 1-1/2 inches wide, they are apparently shallow and do not extend into the buttresses and probably not below the buttress bearing elevations.

Some leakage through the foundation has been reported since the first filling of the reservoir in 1929. The amount of leakage has been small and there is no evidence that it is increasing. The character and tilted position of the underlying shale beds are such that seepage loss from the reservoir is negligible.

A large (110 feet long and 30 feet deep) plunge pool has eroded downstream of the spillway. This erosion extends across the downstream end of the 108-foot wide apron. The rock in the plunge pool is fresh, moderately to slightly fractured, and thin- to medium-bedded sandstone and siltstone.

The soils of the area consist of a high clay content earth with severe shrink/swell behavior, creating large fissures of up to eight inches. Shale and loosely cemented conglomerate along with clay loam are present, which support native grasses surrounding the reservoir. Slopes under 15 percent are found in very few areas around the reservoir, and are predominantly on the northern end of the reservoir which is the primary area for recreation. Here, steep slopes often give way to more gentle sloping benches and ridge lines at or near the normal water surface. These bench and ridge lines are traversed by the many seasonal creeks and drainage courses. The three major creeks are found in ravines with steep slopes. Topography on the southern end of the reservoir consists of gentle slopes above and below the normal pool elevations.

Annual precipitation is approximately 20-inches which occurs mostly in the winter and spring months. The primary wind direction is from the northwest, although most storms come from the south. Occasional strong winds from both the south and the north funnel down the valley onto the lake creating hazardous boating conditions (Reclamation undated).

The dam is located near the boundary between the Coast Ranges to the west and the Great Valley to the east. Background seismicity rates are higher in the Coast Ranges than in the Great Valley, with most of the moderate magnitude earthquakes (magnitude 3 to magnitude less than 6) that have occurred approximately in the past 50 years being located on strike slip faults located west of the dam. No magnitude greater than 6 earthquakes have occurred within 50 km of the dam in the past 50 years. However, the blind thrust faults that are ubiquitous along the western margin of the Great Valley (and which exist immediately below the dam) have produced several magnitude 6.5 earthquakes (approximately) in the past 112 years, including the 1983 magnitude 6.5 Coalinga earthquake and the 1992 magnitude 6.5 Winters-Vacaville earthquake. The dam is also located near the southern end of the Cascadia subduction zone, which last produced a magnitude 9 earthquake in 1700, an event with an average inter-event time of 450 years. Deep intraplate earthquakes at the southern end of the Cascadia subduction zone are capable of producing magnitude 7 (approximately) earthquakes (like the 2001 magnitude 6.8 Nisquallly, Washington, earthquake) within 50 km of the dam with an average recurrence rate of about 830 years.

Upland and Riparian Vegetation

The foothill-woodland plant community such as blue oak, interior live oak, and gray pine, interspersed with grasslands and chaparral, occupies a majority of the reservoir area land. Grasses found in this area include introduced species, such as brome grass, wild oats, and fescue. The chaparral community can be found on the reservoir's east and west sides. Chaparral is characterized by chaparral pea, chemise, manzanita, scrub oak, and sagebrush, among others. The southern end of the reservoir consists primarily of thick willows and brush with occasional open areas of grasslands and scrub oak. Most of the northern campground areas are sparsely covered with native grasses, a few oaks and cottonwoods, and remains of fig orchards which existed prior to the construction of the dam.

Soils within the boundaries of the reservoir consist of a Millsholm clay loam, derived from shale and sandstone with severe shrink/swell behavior, creating large fissures of up to 8- inches. Shale rock is present under the surface in most areas, varying to depths of 8- to 10- feet.

Riparian vegetation downstream of the work site is typical for riparian/wetland habitat, with cattails and willows, scrub oak and shrub adjacent to the right abutment, live oak, blackberry, gray pine, various brush species such as buckeye and bitterbrush, and common grasses/flowers such as penstemon adjacent to the left abutment.

Two plant species of special concern occur near the proposed work site: 1) the adobe lily and 2) the Tehama County western flax. These species either have habitats that would not be affected by the proposed action or would be in a stage that would not be affected during the proposed period of work.

1) The adobe lily (*Fritillaria pluriflora*) is a small bulb-forming perennial in the Lily Family (*Liliaceae*) with large, rose-pink flowers. It is found in chaparral, cismontane woodland, valley and foothill grassland habitats, usually in heavy clay ("adobe") soil, between 60 and 705 meters in elevation (Tibor 2001). Adobe lily is known from scattered localities in the Sacramento Valley and Sacramento-San Joaquin Delta and valleys of the Inner Coast Ranges (Butte, Colusa, Glenn, Lake, Napa, Solano, Tehama, and Yolo counties (Tibor 2001). Many historic locations have been extirpated and other locations are threatened by grazing, recreational vehicle use, development, mining, and horticultural collecting. Adobe lily is included in the California Native Plant Society (CNPS) Inventory's List 1B (Tibor 2001) (Reclamation 2003). Adobe lily flowers February to April.

According to the California Department of Fish and Game's Natural Diversity Database (CNDDB) the adobe lily (F*ritillaria pluriflora)* is found to be extant at the following locations:

a) Near Elk Creek, five miles SW of the town of Elk Creek;
b) 1.3 miles NE of the town of Elk Creek on both sides of HWY 162, seven miles east of the Elk Creek Bridge;
c) the NE tip of Stony Gorge Reservoir, 1.5 miles south of Hwy 162 on County Rd 306, SSE of Elk Creek; and
d) the east side of Stony Gorge Reservoir, two miles south of Hwy 162 on County Road 306, SSE of Elk Creek.

2) The Tehama County western flax (*Hesperolinon tehamense)* is a herbaceous annual, 3/4- to 20- inches (2 to 50 cm) tall, with branching in upper half of plant. Its leaves are alternate, linear, and 3/8- to 1-1/4- inches (0.5 to 3 cm) long. Flowers branch from leaf nodes, and flowers are light to bright yellow and can be seen May to July. The petals are 1/8- to 5/16- inch (4-to 8-mm) long with a notch in the tip, having three styles and six ovary chambers. This species can be found on the west side of the Sacramento Valley in the foothills of the Inner Coast Ranges.

Its habitat is openings in mixed chaparral on serpentine soils at elevations from 328 to 3280 feet (100 to 1000 meters) (BLM 2004). According to the CNDDB the Tehama County western flax (*Hesperolinon tehamense)* is presumed extant in the Coast Range Foothills, five miles west of the town of Elk Creek.

Threatened and Endangered Species.
A species list was requested from the Fish and Wildlife Service (FWS) and was received April

21, 2003. There are many species of concern that exist in Glenn County; however, no listed federally endangered or threatened species are known to occur in the area of Stony Gorge Reservoir except for the bald eagle, according to the CNDDB and the FWS's Endangered Species Act species lists.

The bald eagle (*Haliaeetus leucocephalus*) is listed as federally threatened, though it is proposed for delisting. Most of California's breeding populations of bald eagles are yearlong residents, with some additional populations migrating to California to winter. Bald eagles require large bodies of water or free-flowing rivers with abundant fish for feeding, and also require places to perch. Bald eagles breed February through July and build nests in old growth or dominant live trees. A nest is known to occur approximately two miles south (upstream) of the dam. Work would be performed at a time and distance that would not affect the bald eagle nesting.

Other Biological Resources

Other biological resources that occur in Glenn County and that may occur near the project area include:

Birds:

Two bird species of special concern may occur near the proposed work site. These species have habitats that would not be affected by the proposed action. In addition, work would be performed at a time and distance that would not affect bird nesting.

1) The northern goshawk (*Accipiter gentilis*) has a long narrow tail, short rounded wings and a bold white eyebrow. The adult is blue-grey with a black crown with pale underparts finely barred with grey. Young birds are brown above and streaked below. Usually silent, the Goshawk lets out a loud "kak-kak-kak-kak" when disturbed. It breeds in coniferous forests throughout Canada, wintering in farmlands, woodland edges, and open country, south of its breeding grounds. There is no known nest near the worksite.

2) The ferruginous hawk (*Buteo regalis*) is 20-inches long and has a wingspan of 54-inches. It has a short, dark, hooked beak, and large, broad wings. Its tail is also broad and its legs are feathered to its toes. The neck, breast, belly, and head are pale with rufous mottling on the underwings. The adult can also have a dark morph where the entire body plumage is dark-brown. There is no known nest near the worksite. Quail, dove, pheasants, waterfowl, and non-game birds are numerous.

Mammals:

The bats that occupy the dam are thought to be the Townsend's big-eared bat (*Plecotus townsendii*) and the Yuma myotis bat (*Myotis yumanensis*) (DFG 2003) which are on the FWS species list for Glenn County as species of concern. No bat species are indicated in the CNDDB search as occurring in this area. These species may be temporarily displaced during construction activities, but, if present, would not lose all roosting habitat in the dam, and may even experience a long term increase.

The Townsend's big-eared bat comes out late in the evening to feed, mainly on moths. In the summer, females form nursery colonies of up to about 200 bats; males are solitary. Young are

large and can fly at 2.5- to 3 weeks of age. During the winter, when Townsend's big-eared bat hibernates in a cave, its great ears are folded back; if the bat is disturbed the ears unfold and move in circles like antennas. It is a medium-size bat with huge ears half the length of its body. It has a brown or gray back, tan belly, and is about three inches long.

The Yuma myotis bat is found throughout western North America, from British Columbia through Washington, Idaho, western Montana, southern Wyoming, Colorado, New Mexico, West Texas, and into Mexico. Occasionally roosting in mines or caves, these bats are most often found in buildings or bridges. Bachelors also sometimes roost in abandoned cliff swallow nests, but tree cavities were probably the original sites for most nursery roosts. These bats typically forage over water in forested areas. A study in western Oregon showed that feeding activity was up to eight times higher along forested edges of streams compared to those in logged areas, apparently because the wooded areas contain greater insect diversity. Although Yuma myotis feed predominantly over water, they eat a variety of insects that includes moths, froghoppers, leafhoppers, June beetles, ground beetles, midges, mosquitoes, muscid flies, caddisflies, and crane flies. Yuma myotis are threatened by loss of riparian habitats and the decline in permanent water sources in the southwest.

Black-tailed deer inhabit the area as well as coyotes, bobcats, mountain lions, skunks, weasels, raccoons, foxes, squirrels, and rodents.

Fish

Available bass species in the lake include largemouth and smallmouth bass of Texan strain, as well as a thriving bluegill, crappie, and catfish population (Reclamation undated). The Stony Creek watershed above Black Butte Dam holds such fish species as rainbow trout (*Oncorhynchus mykiss*), common carp (*Cyprinus carpio*), green sunfish (*Lepomis cyanellus*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), bluegill sunfish (*Lepomis marochirus*), hardhead (*Mylopharodon conocephalus*), white crappie (*Pomoxis annularis*), black crappie (*Pomoxis nigromaculatus*), striped bass (*Morone saxatalis*), channel catfish (*Ictalurus punctatus*), white catfish (*Ameiurus catus*), threadfin shad (*Dorosoma petense*), California roach (*Lavinia symmetricus*)and redear sunfish (*Lepomis microlophus*) (Reclamation 1998).

Land Use and Recreation

Stony Gorge Reservoir is a water oriented recreation area. Fishing, boating, and camping are its primary uses. Most of the land adjacent to the reservoir is used exclusively for ranching purposes. The closest town is Elk Creek approximately 1.5 miles to the north (downstream), with a population of less than 300 people.

Cultural Resources

Stony Gorge Dam was completed in 1928 as a component of the Orland Project, the first Reclamation project in California. Construction of Stony Gorge Dam followed a drought when

settlers of the Orland Project demanded additional storage. The only other storage dam of the Orland Project, East Park Dam, is located 18 miles upstream on Little Stony Creek

The Reclamation Service (now the Bureau of Reclamation) investigated the Sacramento Valley and other parts of California for irrigation potential in 1902. The Orland Project was founded, in part, because citizens in the area petitioned the Secretary of Interior to help develop land along Stony Creek. The government believed that, "The Sacramento Valley offers the greatest opportunity for irrigation development at the least cost, and with the least complications of anything I am familiar with in the State" (quote in Autobee 1993). The project was authorized in 1907 and the East Park Dam was completed in 1910. Today, approximately 20,000 acres are cultivated by water from the Orland Project

Stony Gorge Dam, described above, is one of the first Ambursen type dams constructed for a Reclamation project. The dam has undergone some additions since it was constructed. Work was completed on the foundation in 1986 with the construction of a 12 foot counterfort wall on left side, and a protective concrete slab was placed on the right abutment downstream of the dam. Despite these modifications, Reclamation believes that the Stony Gorge Dam is eligible for inclusion in the National Register of Historic Places because of its association with an early Reclamation project in California and because of the dam's unique design. Consultation with the State Historic Preservation Office (SHPO) remains to be completed, but it will be initiated before the final EA.

Indian Trust Assets

The United States has a trust responsibility to protect and maintain rights reserved by, or granted to, federally recognized tribes and individual Indians, by treaties, statutes, and executive orders. These rights are sometimes further interpreted through court decisions and regulations. The trust responsibility requires that all federal agencies, including Reclamation, take all actions reasonably necessary to protect Indian trust assets (Reclamation 1994, Reclamation 1993).

Indian Trust Assets are legal interests in property held in trust by the federal government for federally recognized Indian tribes or individual Indians. "Assets" are anything owned that has monetary value. "Legal interest" means there is a property interest for which there is a legal remedy, such as compensation or injunction, if there is improper interference. Indian trust assets do not include things in which a tribe or individual Indians have no legal interest (Reclamation 1994, Reclamation 1993).

Indian Trust Assets can be real property, physical assets or intangible property rights, such as a lease, or a right to use something. Indian Trust Assets cannot be sold, leased, or otherwise alienated without United States' approval. While most Indian trust assets are located on-reservation, they can also be located off-reservation. Examples of things that can be Indian Trust Assets are land, minerals, hunting and fishing rights, water rights, and instream flows. Off-reservation cultural resources located on non-trust land are usually not Indian trust assets (Reclamation 1994, Reclamation 1993).

The nearest Indian trust assets to this proposed action are located on 120 acres held in trust by the United States for Grindstone Indian Rancheria, approximately 6.4 air miles north of Stony Gorge Dam. Stony Creek flows through the Grindstone Rancheria from west to east.

ENVIRONMENTAL IMPACTS OF ALTERNATIVES

The impacts of the proposed action and alternatives which are designed to prevent failure during high seismic loading, are discussed here.

Geology/Hydrology/Water Quality

Temporary turbidity increases at the construction site would be expected during excavation between the buttresses and use of the current access to the right abutment under each of the action alternatives. However, the increases would be small since the area is already clear and access currently exists to the lower portion of the right abutment. If culverts are needed for proper staging areas near the penstock area on the right abutment, erosion control measures will be used to minimize impacts to Stony Creek. Silt barriers will be placed to collect soil deposits as a result of construction and deposited in approved settling areas. To avoid undercutting of the buttresses should erosion works its way back under the apron slab, the spillway plunge pool may be unwatered (about 1.5 million gallons). River water would be pumped out of the rocky plunge pool and into the downstream creek. The plunge pool has little sediment; large pieces of rock have been removed from the area forming the plunge pool, thus little sediment is expected to affect the downstream waters. Associated activities with unwatering would include excavation of rock, drilling anchor holes, grouting anchors, and placing reinforced concrete. Drilling holes and inserting and cementing rock bolts would create minimal impact and little turbidity is expected. The fish that are present are not listed species, and impact to them as a result of the unwatering is expected to be minimal as they would move downstream to avoid the activities.

If any additional unwatering activities should occur as a result of the construction activities, the effects will be analyzed by separate environmental review.

The proposed action alternatives will implement measures to minimize short-term and long-term impacts to Stony Creek including spill prevention, erosion, and sedimentation control measures. Measures for sediment trapping and transport in the specifications will help prevent sediment from being transported to Stony Creek.

A water pollution plan that describes measures for sediment control and abatement for the whole project area will be prepared for the proposed action in the specifications. This plan will be implemented concurrently with any construction activities. Construction water will be collected and discharged into settlement ponds to meet 401, 402, and State 1680 permit requirements. An approved waste site will be located.

There is some possibility of minor erosion and sediment load into the stream as a result of machinery and vehicle access to both abutments. The right abutment is fairly free of vegetation and access activities will be confined to leveling the area adjacent to the concrete apron to locate and operate equipment. The access activities on the left abutment will involve greater

disturbance for widening, stabilizing, and graveling one or both of the roads leading to the dam. The contractor will be required to restore any roads damaged by construction traffic.

Excavation activities at the dam site will occur in the previously disturbed base of the dam and in the erosion hole located immediately downstream of the spillway. Silt, rock, and previously placed shotcrete may be excavated between the buttresses and from the erosion hole downstream of the spillway. Excavated material will be either removed from the site or left onsite in preparation for placement of forms and concrete. No native grade will be removed or altered except to a minor degree during modification of the left downstream abutment to provide construction access.

Stockpile areas are not expected onsite as most material will be hauled in from established sources. Should stockpiling occur, the worksite will be restored by contour grading and revegetation.

Borrow areas are not expected to occur at the worksite.

Vegetation

The action alternatives would not permanently affect the riparian or wetland vegetation below the dam. Less than 100 square yards of vegetation would need to be removed to provide access to the left abutment. This consists mainly of a buckeye, some blackberries, and perennial forbs, oak and grey pine limbs. Most of the area on the right bank to be disturbed by excavation would be annual grasslands.

Any areas denuded as a result of access to the left abutment would be revegetated and recontoured. A Revegetation Plan would be provided in the specifications to restore native species consistent with the ecological succession of disturbed vegetation communities. Large oak and pine trees would be avoided.

Slopes in any excavated borrow site would be recontoured to pre-project slopes. The borrow site and the dam site will be restored by revegetating with native plants that were present prior to excavation and that are compatible with surrounding areas. Topsoil will be conserved and mulched vegetation will be placed on slopes. No wetlands will be lost or adversely affected by the project.

Because the proposed action would be at least a half mile from the locations of the species of special concern, no effects on such plants are anticipated.

Threatened and Endangered Species

There are no substantial areas of sensitive habitat at risk. There should be no risk to any listed species as a result of the corrective action as the action is confined to the area directly below the dam, which has been previously disturbed. Failure to take action could lead to substantial risks to listed species, if any, which occur downstream of the dam if the dam were to fail.

A CNDDB search and on-site survey has aided Reclamation in determining that the proposed action and alternatives will have no effect on any federally listed threatened or endangered

species and will not destroy or adversely modify the critical habitat of any listed species. No critical habitat is located on or near the project site. The federally threatened bald eagle occurs on the west side of Stony Gorge Reservoir, approximately two miles south and outside the project boundary. The proposed project would not be likely to affect the eagles even during the nesting period which extends into July in Northern California, because of the distance from the worksite.

Other Biological Resources

No impacts are expected to anadromous fish as the project area is upstream of Black Butte Dam, an impassable structure. Fish and wildlife impacts under the action alternatives would be limited to some short-term sediment load in Stony Creek which could impact the aquatic and riparian habitats beneath the dam during access construction, and the native wildlife species that inhabits them. Wildlife would be only temporarily displaced and would resume use of the disturbed sites upon completion of the project.

Two species of bats which roost in the downstream dam face walls (Townsend's big-eared bat (*Plecotus townsendii*) and the Yuma myotis bat (*Myotis yumanensis)),* as well as, common pigeon species (*C. livia*) would likely be temporarily disturbed by the corrective action as there would be some reduction in the volume and distribution of voids in the dam which they use for roosting. All upland sites have been disturbed by prior construction or are presently graveled or paved, so impacts to terrestrial or avian wildlife habitat impacts would be minimal.

Land Use and Recreation

Under the proposed action and alternatives the present use of the adjacent lands would be maintained.

The dam modifications would not affect the operation of the hydroelectric plant. Timing of power generation can be accommodated to not conflict with the staging and construction. Communication with the Orland Project Water Users Association will be continuous and ongoing throughout the project. Adjacent residential and recreational land uses would not result in long-term adverse impacts.

Recreational facilities such as picnic areas and camp sites will not be directly affected. Recreational boaters may experience a temporary increase in noise and change in the visual character if they venture near the dam at the northwest end of the reservoir, however, the topography of the area will minimize and block most noise to the recreational areas. Campers in the Pines Group Camp, if present, may experience a temporary increase in noise.

The proposed project would not alter land use or adversely affect recreational uses of the area. Indeed, the construction may attract observers and measures may be needed to prevent too close an approach by boaters.

Cultural Resources

Reclamation will continue the consultation process with SHPO and other interested parties. A determination of effect will be contingent upon the final alternative selected. None of the alternatives appear to alter the external appearance of Stony Gorge Dam, but the alteration of the structure may be an adverse effect. If the safety of dams effort is determined to be an adverse effect, then Reclamation will develop a memorandum of agreement with SHPO that will describe mitigating measures. These measures will be completed before the dam is modified. If Reclamation determines that the new construction is not an adverse effect and SHPO concurs, then the project can proceed as described in the final CAS.

Indian Trust Assets Evaluation

As directed in Departmental Manual Part 512, Chapter 2, entitled Departmental Responsibilities for Indian Trust Resources, Reclamation is required to identify and evaluate any potential effects on Indian trust assets as a result of any proposed Reclamation action, plan or activity.

Reclamation has identified the 120 acres held in trust by the United States for Grindstone Indian Rancheria as an Indian trust asset. The Grindstone Rancheria may also have a diversion right from Stony Creek within the exterior boundary of its trust land. Grindstone Rancheria is located approximately 6.4 air miles north of Stony Gorge Dam. Stony Creek flows through the Grindstone Rancheria from west to east.

Reclamation's evaluation of the potential effects to Grindstone's trust assets indicates no adverse impacts to Indian trust assets. Therefore the proposed action will not adversely affect the water quality or quantity, nor the character, nature or use of Indian trust assets within the Grindstone Rancheria. There is a potential benefit to the Grindstone Rancheria and other downstream residents created by reducing the level of flood damage as a result of a potential dam failure.

Because the evaluation indicates no potential impacts to Indian trust assets, no formal consultation with the Grindstone Rancheria will occur.

Socio/Economic Resources

There are no adverse impacts under any of the alternatives. Business revenues should temporarily increase at the local store in Elk Creek.

Noise

The work area is isolated from all but a handful of residences on County Road 306. The closest residence downstream is approximately 230 yards from the dam on the left abutment and houses the Orland Project dam tender. The next closest residence occurs approximately 450 yards below the dam on the west side (left bank) of Stony Creek and in view of the dam. Five other residences occur between 0.3 and 1 mile of the dam. Those residences, however, would be partially shielded from construction noise by the hillsides.

Roadway Traffic Volume: Based on the traffic study, the increased traffic volume would not significantly affect the roadway capacity. Traffic is expected to increase from 20 vehicles per hour to 25 vehicles per hour during an 8-hour day. This is based on an initial mobilization of 20 round-trip vehicle trips per 8-hour day for several weeks, 19 round-trip vehicle trips per 8-hour

day during construction, and 20 round-trip vehicle trips per 8-hour day to demobilize. An average 8-hour day would have 40 extra vehicles on the road which averages to five extra vehicles per hour. Mobilization, demobilization, and material hauling is estimated, then, at a maximum of 3,152 truck trips to and from the site, not including employees arriving for work.

Material Hauling: To repair the dam using the alternative for a 12-foot thick diaphragm wall (or the alternative with the maximum vehicle load) the estimated maximum amount of needed concrete is 14,000 cubic yards or approximately 1,560 truck loads if each load carries 9 cubic yards. It would take approximately 19 trucks going round trip per day (170 cubic yards) for an estimated maximum number of 82 days (approximately four months) to haul the concrete. The area to be repaired between each of the identified buttresses would require 85 cubic yards of concrete. Two pours of 85 cubic yards (170 cubic yards) of concrete are estimated to be completed each day.

Vehicular noise during construction: Based on the analysis in this EA, vehicle traffic will temporarily and sporadically increase daytime ambient noise levels at the residents along Road 306 and near the dam site. Noise from truck traffic to and from the work site and through the town of Elk Creek will also temporarily increase. Glenn County has not currently adopted any noise regulations for construction noise, verified by County Code 19.23.110, Table E Additional Allowance, paragraph E. Exemptions, which states, "Local noise standards set forth in this section do not apply to: Construction site sounds between 7 a.m. and 7 p.m." However, general measurements for noise levels maintain that levels above 85 decibels (dBA) over time will cause hearing loss. As a reference, a typical conversation has been measured at 60 dBA and thunder has been measured at 120 dBA.

Construction noise: Most of the noise generated from this construction work will be at the dam. Temporary construction noises would be created, but noise levels would be low during operation, and lower than the noise created by spillway releases. The construction noise would consist mainly of the charging of transit mixer trucks and the mechanical piston noise generated by the pump truck used for the concrete placements. Temporary truck traffic would also increase normal noise levels. The remote locations of the sites would preclude adverse effects on residences or other noise-sensitive land uses.

Based on noise measurements at other facilities during similar construction activities, heavy trucks which pass by on the upper dam access road could be expected to produce approximately 75-80 dBA next to the road; light truck traffic would generate approximately 55 dBA. Most of the traffic along the upper road is expected to be light traffic for a good part of the job. Vehicles will be required to have good mufflers with air-inlet silencers, and vehicles will be required to park close to the dam, as far away from the residences as possible.

Noise levels from construction activity decrease with distance; approximately six decibels lower for every doubling of distance away from the construction vehicle or activity. With intervening structures, terrain, or noise barriers, the noise level is reduced even further. Actual sound levels would be slightly lower at distances greater than 500 feet due to air absorption and excess attenuation.

It is estimated the dam tenders house, which is the closest residence to the job site, is approximately 200 feet from the edge of road, and 610 feet from the dam. If truck traffic noise on the road next to the dam tender's house would be 75 dBA, for example, then at the dam tenders house the noise level would be approximately 63 dBA (a reduction of 12 dBA). The dam tender's house is approximately 610 feet from the dam; therefore an 84 dBA at the dam would result in a 61 dBA at the house. Noise would be further reduced to the dam tender's house based on intervening terrain.

Reclamation employees measured the current decibel level of the area at three locations:
Dam Tender's House = 45.9dBA*
Closest West Side Residence (east of Rd. 306) = 80.1dBA*
Residence @.3miles (west of Rd. 306) = 78.2 dBA*
*A-Scale

While obtaining noise measurements at the dam tender's house the background noise was observed to be coming from water releases at the power plant and an approximately five mph wind. The source of background noise for the west side residences was primarily from occasional truck traffic, a gas engine utilized for irrigating the nearby pasture, and an approximately five mph wind. Therefore noise from construction and traffic during construction is not expected to increase to a level above 80 dBA.

Air Quality

Impacts to local air quality would be localized and of a short term nature. All construction activities will be carried out in accordance with applicable Federal, State, and local laws and regulations concerning the prevention and control of air pollution. Should a conflict exist in the requirements for abatement of air pollution, the most stringent requirement will apply.

A comprehensive Air Emissions Mitigation Plan (AEMP) will be prepared, if necessary, in Glenn County for the specifications before construction begins. The plan will include measures such as the use of catalytic scrubbers and emissions offset to minimize and mitigate impacts from equipment and vehicles emissions. The AEMP will include dust control and abatement and will be in accordance with the applicable requirements of Reclamation's publication *Reclamation Safety and Health Standards*. Measures in the AEMP will be sufficient to ensure attainment and maintenance of air quality standards.

Visual Resources

The staging site on the right abutment and the road access construction on the left abutment may change the current landscape to a more gradual and smooth topography. During construction and immediately following the project, these areas will contrast with existing vegetation and be highly visible. After the revegetation of the access area, the site would no longer be recognizable as a disturbed area. The downstream dam face is not considered a significant visual feature for visitors and would be similar to existing conditions after the conclusion of the project. Reclamation will remediate for any structural impacts to roadways resulting from the proposed project.

Minor traffic delays could occur under the action alternatives.

Environmental Justice
The action alternatives are consistent with Executive Order 12898 in that there will not be a disproportionate impact on minority or low income populations.

Growth-Inducing Impacts
The action alternatives would not affect human settlement or markedly increase use of any of the proposed sites, so no growth-inducing impacts are expected.

Cumulative Impacts
The proposed action of structural dam modification would not contribute significantly to cumulative impacts.

ENVIRONMENTAL IMPACTS OF THE NO ACTION ALTERNATIVE

Impacts under the No Action Alternative would occur should the dam fail. There would be significant impacts to the health and safety of the public, temporary land use disruptions, and Orland Project operations impacts. Boating and fishing on Stony Gorge Reservoir would not exist and would be replaced by stream recreation. Biological resources such as the sensitive plant species that occur along Stony Creek, as well as, resident wildlife species would be affected in the short term. Erosion would occur in the riparian/wetland area below the dam and visual resources would be impacted until the dam was to be completely removed or rebuilt.

CONSULTATION AND COORDINATION

This proposed project was planned by Reclamation who consulted with the FWS.

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