RECLAMATION
*Managing Water in the West*

**Draft Environmental Assessment**

# Captain Tom Dam

## Safety of Dams Rehabilitation Project


**U.S. Department of the Interior**
**Bureau of Reclamation**
**Phoenix Area Office**

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# CHAPTER 1 - PURPOSE AND NEED

## 1.1 Introduction

The Bureau of Reclamation (Reclamation) has prepared this Environmental Assessment (EA) to analyze potential effects to physical, biological, and cultural resources that may result from Safety of Dams (SOD) corrective action at Captain Tom Dam on the Navajo Indian Reservation in San Juan County, New Mexico. The EA was prepared in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) Regulations (40 CFR 1500-1508), and Reclamation NEPA Handbook. Reclamation is the lead Federal agency pursuant to NEPA. The Bureau of Indian Affairs (BIA) and Navajo Nation Department of Water Resources (NNDWR) SOD Program are cooperating agencies for the preparation of this document.

This document is organized into six chapters:

- *Chapter 1 - Purpose and Need:* Presents information on the history of the project proposal, the purpose of and need for the project, and the lead agency's proposal for achieving that purpose and need. This section also details how the lead agency informed the public of the proposal and how the public responded.
- *Chapter 2 - Comparison of Alternatives, including the Proposed Action:* Provides a detailed description of the lead agency's proposed action, alternative methods for satisfying the stated purpose and need, and key environmental issues regarding the proposed action and alternatives. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Chapter 3 - Environmental Consequences:* Describes the environmental effects of implementing the proposed action and other action alternatives. The analysis is organized by affected resource topic. Within each section, the affected environment is described first, followed by the effects of no action, the proposed action, and other action alternatives.
- *Chapter 4 - Agencies and Persons Consulted:* Lists preparers and agencies consulted during the development of the EA.
- *Chapter 5 – Environmental Laws and Directives:* Lists relevant Federal environmental laws and directives.
- *Chapter 6 - Literature Cited:* Lists documents used in the preparation of this EA.
- *Appendices:* The appendices provide more detailed information to support the analysis presented in the EA.

## 1.2 Background

The Navajo Nation and BIA propose to correct verified dam safety deficiencies associated with Captain Tom Dam. Captain Tom Dam is an off-stream impoundment of Captain Tom Wash along the eastern foothills of the Chuska Mountains. Construction of the dam was completed in 1937 by the Navajo Nation to provide a reliable water supply for irrigation and livestock. Similar in many respects to other major dams on the Navajo Nation, Captain Tom Dam consists of a homogenous earthen embankment, gated outlet works, and uncontrolled spillway.

Captain Tom Dam has a length of 2,020 feet and a maximum height of 28 feet at the crest elevation of 5,673.0. The outlet works consist of a 24-inch-diameter, 168-foot-long, steel-lined concrete pipe with a concrete headwall and trashrack at the inlet. A 24-inch-diameter slide gate controls flow through the outlet works. An outlet structure consisting of a concrete headwall at the downstream embankment toe discharges into a concrete-lined irrigation canal. Water is conveyed through the canal to a complex of unlined irrigation ditches that serve agricultural fields east of the dam. Maximum computed discharge capacity of the outlet works is 64 cubic feet per second (cfs).

The spillway is located in a natural depression on the right side of the reservoir rim approximately 2,000 feet southwest of the right abutment of the dam. Founded on bedrock, the spillway consists primarily of a stone masonry wall approximately 2-feet high, 521-feet long, and 1-foot wide with an average crest elevation of 5,672.2 An additional 100-foot-long section of spillway to the right of the masonry wall is armored with partially buried boulders. This 100-foot section is about 0.5 feet lower than the existing masonry weir crest. Discharges from the spillway are conveyed through an area of low topographic relief to Captain Tom Wash. A complete operating history of the spillway is unavailable, and there are no known records of spillway flow.

Captain Tom Dam is operated by the NNDWR SOD Program. In 2004, significant safety concerns caused the NNDWR to suspend dam operations and install a siphon to drain the reservoir. Under normal operating conditions, runoff from snowmelt and rainfall is diverted from Captain Tom Wash and conveyed through a 2.5-mile-long ditch to a natural drainage that discharges into the reservoir.

## 1.3 Purpose and Need for Action

Corrective action is needed to preserve the irrigation and livestock watering value for which the reservoir was originally authorized and to reduce the probability of embankment failure and associated risk to the public from continued operation of the dam.

Failure of Captain Tom Dam, with the water level at the dam crest, would threaten all residences that are within 500 feet of Captain Tom Wash as far downstream as the confluence of the wash with the Chaco River. According to the Downstream Hazard Classification study, there are approximately 150 lives at risk if the dam fails (Leedshill-Herkenhoff 1987). Most of this population is distributed between the dam and the community of Newcomb. The Special Examination Report indicated that Captain Tom Dam is classified as high hazard because of the threat to the local population (BIA 2004).

The following verified SOD deficiencies are described in greater detail in the Report of Findings for the Deficiency Verification Analysis (DVA) prepared by Reclamation (2005a).

- *Lack of adequate erosion protection on the upstream slope*. The upstream slope protection consists of sparse and under-sized rock. Wave action has severely eroded the upstream embankment, which is comprised of highly erodible, silty sand material.

- *Inadequate freeboard*. A freeboard deficiency exists under normal operating conditions. Winds and subsequent reservoir waves could cause overtopping. Due to the nature of the embankment material, even a small amount of sustained overtopping is likely to lead to a breach of the dam.

- *Inadequate reservoir evacuation capability*. The outlet works pipe has partially collapsed, precluding operational releases through the outlet works. With no means to release water from the reservoir, the capacity to evacuate the reservoir is considered a safety deficiency.

- *Liquefaction of the dam and foundation soils*. The DVA determined that the embankment and foundation will liquefy during a 10,000-year return period earthquake resulting in dam failure.

- *Seepage and internal erosion of the embankment*. Existing seepage through the embankment could result in dam failure due to internal erosion of embankment material.

- *Seepage and internal erosion associated with the partially collapsed outlet works.* Existing seepage through the embankment and piping of embankment material into the collapsed outlet works pipe is a potentially serious failure mode.

## 1.4 Project Location

Captain Tom Dam is located in the Newcomb Chapter of the Navajo Nation approximately 55 miles north of Gallup and 2.4 miles west of Newcomb, New Mexico (Figure 1). The project area consists of the dam, a small portion of the dewatered reservoir basin, and the area between the existing dam and proposed site of a new dam (Figures 2 and 3).

## 1.5 Public Involvement

The Council on Environmental Quality defines scoping as "…an early and open process for determining the scope of issues to be addressed and for identifying significant issues related to a proposed action (40 CFR 1501.7)." Scoping is an important underpinning of the NEPA process that encourages public input and helps focus the environmental impact analysis on relevant issues. Distribution of scoping information typically heralds the beginning of the public component of the NEPA process.

On May 17, 2007, Reclamation posted the scoping notice on its Phoenix Area Office web site and mailed scoping information to public agencies, tribal governments, and interested individuals. A public scoping meeting was held at the Newcomb Chapter House in Newcomb on July 20, 2007. Fourteen people attended the Newcomb meeting. Reclamation received four letters of comment (including electronic mail) in response to public scoping.

Several issues were identified from discussions among the NEPA interdisciplinary team,[1] resource specialists from the Navajo Nation, and the public during scoping. The following environmental issues were considered early in the planning process and contributed to the development of mitigation strategies.

- potential effects to biological resources, including threatened and endangered species
- potential effects to water resources
- potential effects to cultural resources, including human burials
- potential effects to downstream water users

## 1.6 Decision to be Made

Reclamation prepared the engineering designs for the proposed project and is the lead Federal agency responsible for determining whether the proposal will have a significant effect on the human environment. In addition, Reclamation is responsible for managing the construction phase of the project. The Navajo Nation and BIA must decide whether to implement the Preferred Action, another action alternative, or take no action.

[1] The NEPA interdisciplinary team consisted of biologists, archaeologists, and engineers from Reclamation and SOD staff from the Navajo Nation and BIA.


**Figure 1. Project location map.**

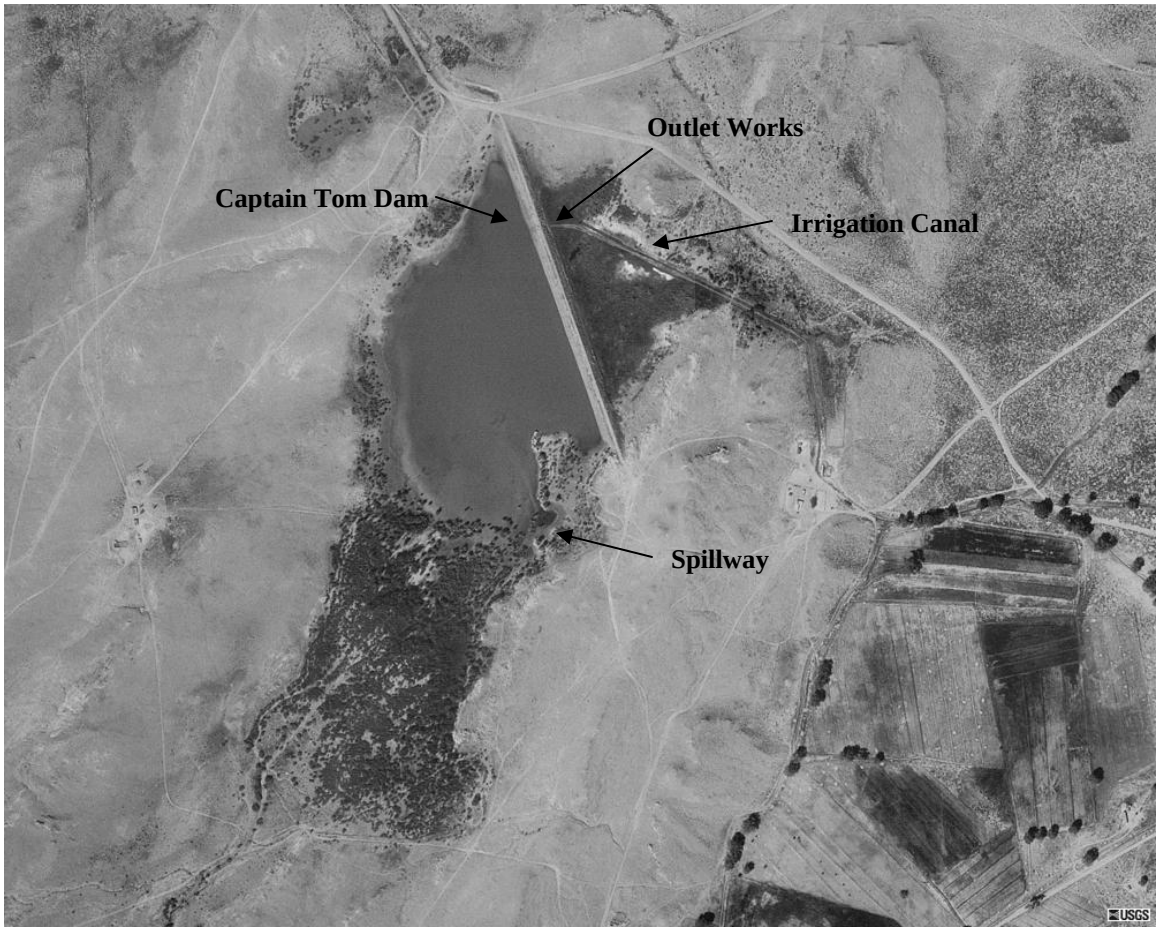


**Figure 2. Existing infrastructure at Captain Tom Dam.**

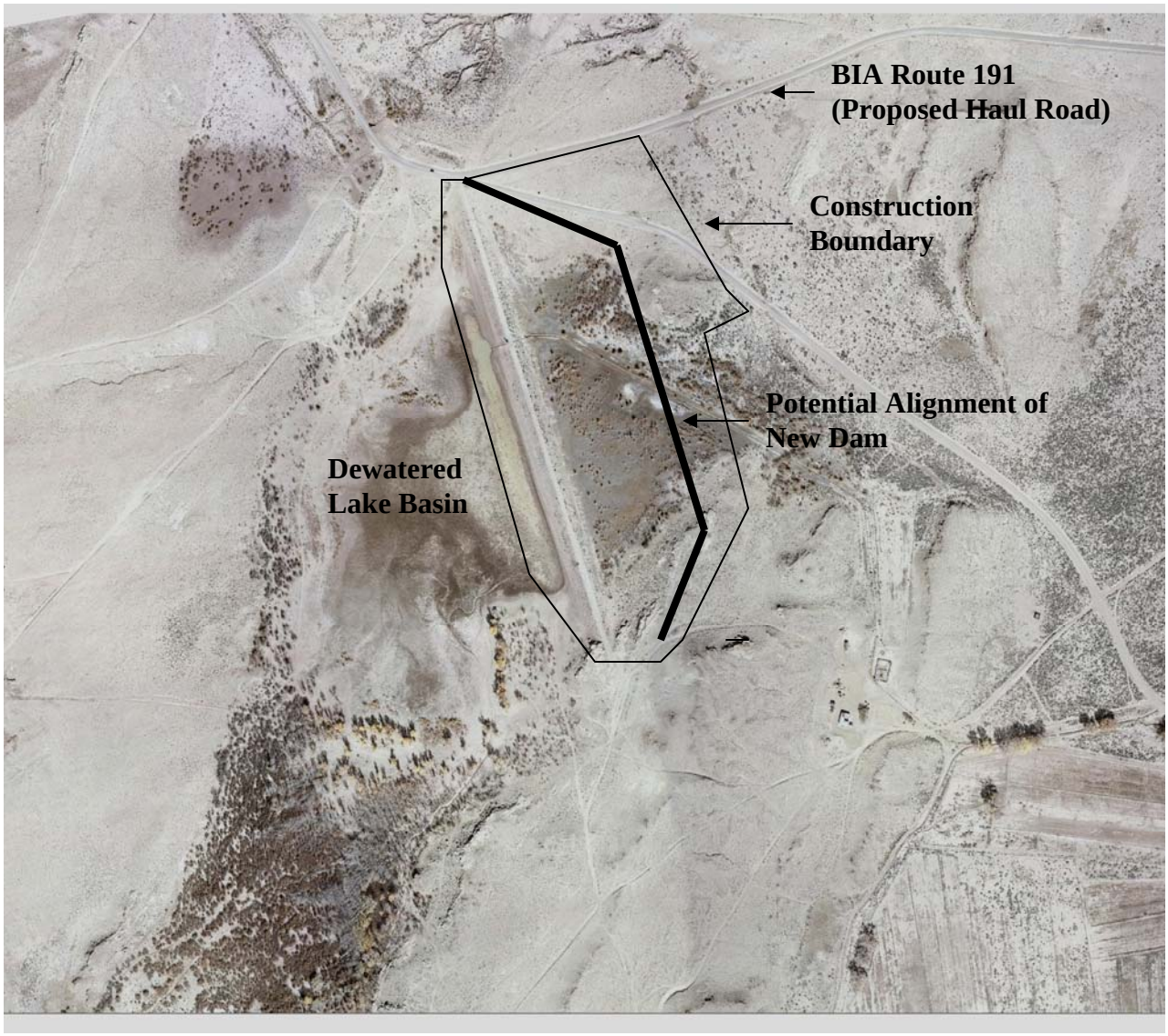


**Figure 3. Proposed construction boundary.**

# CHAPTER 2 - DESCRIPTION OF ALTERNATIVES

The EA analyzes three design alternatives for addressing the purpose and need for the project. No action is included as a baseline for comparing potential effects of the action alternatives. The alternatives are the result of an analytical process which identified safety issues (Reclamation 2005b and 2005c) and formulated conceptual engineering designs (Reclamation 2007) for correcting verified SOD deficiencies. Documentation of the design process and corresponding engineering decisions is located in the project file at Reclamation's Denver Technical Service Center. Correction of verified SOD deficiencies would result in one of the actions described below.

## 2.1 No Action

Under the No Action alternative, no SOD corrective action would be pursued. Without suitable corrective action, existing safety deficiencies will persist, and no water could be safely stored in the reservoir in the reasonably foreseeable future.

## 2.2 Preferred Action – Construct New Dam on Downstream Site

BIA and the NNDWR propose the following project to correct verified safety deficiencies and restore operation of Captain Tom Dam. Potential construction impact areas are also described. Implementation of the Preferred Action would take approximately 2 years to complete. Construction is scheduled to begin in the spring of 2009.

*Dam Embankment*. Under the Preferred Action, the existing dam would be removed and a new dam constructed on an alignment centered approximately 600 feet downstream. The new dam would have an angled configuration with a total length of 2,600 feet and maximum height of 30 feet above the streambed at the crest elevation of 5,676.0, with downstream and upstream slopes of 2.5:1 and 3:1 (H:V), respectively. Upstream slope protection would be provided by soil cement or riprap.

During construction, a shear key trench would be excavated to bedrock to provide deep reinforcement of the dam and facilitate installation of the filtered seepage collection system. The minimum width of the shear key at bedrock would be 40 feet. An earth-fill embankment with a 5-foot-wide sand filter, a 5-foot-wide gravel drain, and a piped toe drain system would be constructed over this trench, forming the body of the dam. A geotextile membrane would be placed between the gravel filter and earth-fill material to provide additional filtering capability. This network of filters and drains is designed to safely collect and convey embankment and foundation seepage.

This alternative would require approximately 350,000 cubic yards ($yd^3$) of embankment fill, 26,000 $yd^3$ of sand for the sand filter, and 25,000 $yd^3$ of gravel for the gravel drain. Embankment fill would be obtained from material recycled from the existing dam, material excavated from the shear key trench of the new dam, and possible borrow sites

located between the old and new dam alignments. Removal and recycling of the old dam embankment and excavation of the shear key trench for the new dam would require temporary stockpiling of material in the area between the old and new dam alignments. Approximately 12 acres of land between the old and new dam alignments would be needed to stockpile and process material for the new embankment and to provide staging of other construction materials and equipment.

*Outlet Works*. The outlet works would consist of an intake structure, a reinforced concrete conduit equipped with a dual-walled, high-density polyethylene (HDPE) liner, a valve house, a Type VI stilling basin, and a riprap-lined outlet channel leading to a reinforced concrete canal.

The concrete intake structure would be approximately 14-feet high with an intake at elevation 5,654. This elevation corresponds to the approximate level of sediments within the existing reservoir basin and the level to which the existing dam would be removed. A 30-inch-square sluice gate with hydraulic control lines would be installed inside the intake structure and would be operated in a fully opened or fully closed position. This gate would be controlled from a metal hoist house (recycled from the existing dam) on the crest of the dam. The existing early warning system and reservoir level sensor would be retained and reused.

The outlet conduit would consist of a pressurized dual-walled HDPE pipe with a 30-inch-diameter carrier pipe within a 42-inch-diameter, concrete-encased carrier pipe. Maximum discharge capacity would be approximately 100 cfs when the reservoir is at elevation 5,670. Discharges from the outlet works would be controlled by either a 24-inch rate-of-flow control valve or a 24-inch ball valve inside a concrete valve house at the downstream toe of the dam. A 24-inch globe valve would be used to control outlet discharges, and a 24-inch ball valve, operated in a fully open or fully closed position, would be used for releasing the maximum discharge. The ball valve would be motor operated with a manual operator that could be used as backup. Power to operate the ball valve would be provided by a solar-powered battery. An 18-inch steel pipe would be bifurcated from the main conduit to provide tie-in capability for a pressurized irrigation pipeline.

A Type-VI concrete stilling basin would be constructed to reduce flow velocities and erosion potential of discharges from the outlet works. The stilling basin would discharge into a riprapped outlet channel leading to a reinforced concrete canal that would tie into the existing canal that serves the on-farm irrigation distribution system.

*Reservoir Capacity*. The capacity of the reservoir at the spillway crest elevation would increase from 806 to 1,152 acre-feet (43 percent increase). There would be no change to the maximum operating elevation.

## 2.3 Alternative A - Remove and Replace Dam on Existing Site

*Dam Embankment*. Under Alternative A, the existing dam would be removed and replaced onsite. Embankment material from the dam, toe area, and foundation excavation would be stockpiled in the same area described under the Preferred Action for reuse. Like the Preferred Action, a shear key would be excavated to bedrock to anchor the embankment and install seepage protection. A new earth-fill embankment would be constructed over the shear key trench utilizing material salvaged from the old embankment mixed with material borrowed from the area described under the Preferred Action. The new embankment would include an 8-foot-wide sand filter, 8-foot-wide gravel drain, geotextile membrane, and new toe drain system, utilizing a design similar to the Preferred Action.

The crest height of the dam would be raised 3 feet to elevation 5,676.0 to obviate the safety deficiency associated with inadequate freeboard. Approximately 330,000 $yd^3$ of fill would be used to raise the height of the embankment and construct the downstream and upstream slopes at 2.5:1 and 4:1 (H:V), respectively. An estimated 41,000 $yd^3$ of sand for the filter and 37,000 $yd^3$ of gravel for the drain also would be required.

Excavation of the old embankment and shear key trench would require stockpiling approximately 340,000 $yd^3$ of material. Approximately 10 acres of land immediately downstream of the existing dam alignment would be needed to stockpile the excavated materials. Material borrowed from the lakebed and/or downstream area would be mixed with material recycled from the existing dam to construct the new embankment.

*Outlet Works*. New facilities consisting of a concrete intake structure; 30-inch-diameter, steel-lined, reinforced-concrete conduit (either pressurized or nonpressurized); concrete gate house at the discharge portal; and Type IV stilling basin would be constructed along the same alignment as the old outlet works. The design of the outlet works would generally be similar to the Preferred Action.

*Reservoir Capacity*. The capacity at the spillway elevation would remain unchanged at 806 acre-feet. There would be no change to the maximum operating elevation.

## 2.4 Alternative B – Construct New Outlet Works and Downstream Stability Berm on Existing Dam

*Dam Embankment*. Under Alternative B, a shear key trench would be excavated along the downstream toe of the existing dam to bedrock. Most of the existing embankment would remain in place. A 20-foot-wide bench would be established at the ground surface between the existing embankment toe and the excavation for construction stability. A substantial earth-fill berm would be constructed over the shear key trench, forming the new downstream embankment of the dam. The new embankment configuration would include a 3-foot crest height raise to elevation 5,676.0 and extend the downstream toe approximately 80 feet downstream.

During construction, an 8-foot-wide sand filter and 8-foot-wide gravel drain would be installed against the downstream slope of the existing embankment and the walls of the shear key trench. A geotextile membrane would be placed between the gravel and new earth-fill to provide additional filter capability. Embankment and foundation seepage from the gravel drain would be collected and transported to the outside by a toe drain system.

This alternative would require approximately 170,000 $yd^3$ of embankment fill to construct the downstream face to a 4:1 (H:V) slope and raise the crest height of the dam. In addition, approximately 50,000 $yd^3$ of sand and 47,000 $yd^3$ of gravel would be required for the filter and drain.

Excavation of the shear key trench and portions of the existing embankment would require stockpiling approximately 151,000 $yd^3$ of material in the same area described under the Preferred Alternative. Approximately 8 acres of land downstream from the existing dam alignment would be needed to stockpile the excavated materials and to provide space for construction of the key trench. Material borrowed from areas described under the Preferred Action would be mixed with soil excavated from the shear key trench to construct the stability berm.

*Outlet Works*. The existing outlet works would be removed by excavating approximately 12,000 $yd^3$ of embankment and underlying foundation material from the dam. New facilities consisting of a concrete intake structure; 30-inch-diameter, steel-lined, reinforced-concrete conduit (either pressurized or nonpressurized); concrete gate house at the discharge portal; and Type IV stilling basin would be constructed along the same alignment as the old outlet works. Foundation treatment (e.g., slush grout, dental concrete) and compacted embankment fill would be placed below the new outlet works. The design of the outlet works would be similar to the Preferred Action.

*Reservoir Capacity*. The capacity at the spillway elevation would remain unchanged at 806 acre-feet. There would be no change to the maximum operating elevation.

## 2.5 Comparison of Alternatives

The environmental consequences of the action alternatives and No Action are summarized in Table 1. Additional details are provided in Chapter 3.

Table 1. Comparison of alternatives.

| Attribute | No Action | Preferred Action | Alternative A | Alternative B |
|---|---|---|---|---|
| Reservoir Capacity | 0[1] (806 acre-feet)[2] | 1,152 acre-feet | 806 acre-feet | 806 acre-feet |
| Outlet Works Capacity | 0[1] (64 cfs)[2] | 100 cfs | 60 cfs | 60 cfs |
| Safety Considerations | Hazards from embankment instability. | Safety deficiencies corrected. | Safety deficiencies corrected. | Safety deficiencies corrected. |
| Water Resources | Long-term loss of reservoir storage. No impact on Captain Tom Wash. | Resumption of diversions and reservoir storage. Minor impact to water supply in lower Captain Tom Wash from increased reservoir storage. | Resumption of diversions and reservoir storage. Impact to water supply in lower Captain Tom Wash slightly less than Preferred Action. | Resumption of diversions and reservoir storage. Impact to water supply in lower Captain Tom Wash slightly less than Preferred Action. |
| Land Use | Long-term adverse impacts to agriculture and livestock watering. | Return of stored water supply for irrigation and livestock. | Return of stored water supply for irrigation and livestock. | Return of stored water supply for irrigation and livestock. |
| Soils | No change. | Short-term disturbance to 38 acres due to construction. Impacts minimized using best management practices. | Short-term disturbance of 25 acres due to construction. Impacts minimized using best management practices. | Short-term disturbance of 27.5 acres due to construction. Impacts minimized using best management practices. |
| Air Quality | No change. | Minor short-term, intermittent impacts from construction. | Minor short-term, intermittent impacts from construction. | Minor short-term, intermittent impacts from construction. |
| Biological Resources[3] | No change. | Impact to 27 acres of terrestrial habitat from construction and inundation. Long-term impacts reduced to a negligible level by revegetation. Minor displacement of wildlife from construction area. No effect to special status species. | Impact to 14 acres of terrestrial habitat from construction. Long-term impacts reduced to a negligible level by revegetation. Minor displacement of wildlife from construction area. No effect to special status species. | Impact to 16.5 acres of terrestrial habitat from construction. Long-term impacts reduced to a negligible level by revegetation. Minor displacement of wildlife from construction area. No effect to special status species. |
| Cultural Resources | No effect. | Cultural material at two sites would be damaged or lost. Data recovery required to mitigate for losses. | No effect. | No effect. |

Table 1 – continued.

| Attribute | No Action | Preferred Action | Alternative A | Alternative B |
|---|---|---|---|---|
| Environmental Justice/Socio-economic Considerations | Long-term adverse impact to agricultural productivity. | Return of stored water supply for irrigation and livestock watering and improved agricultural productivity. | Return of stored water supply for irrigation and livestock watering and improved agricultural productivity. | Return of stored water supply for irrigation and livestock watering and improved agricultural productivity. |
| Indian Trust Assets | Long-term loss of stored water supply due to permanent dewatering of reservoir. | Resumption of water storage for irrigation and livestock. Beneficial use of water right. | Resumption of water storage for irrigation and livestock. Beneficial use of water right. | Return of stored water supply for irrigation and livestock. Beneficial use of water right. |

[1] SOD operating restriction.
[2] Normal operating levels.
[3] Terrestrial impact excludes 8-acre footprint of existing dam and 3 acres of unvegetated reservoir basin.

# CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter presents the existing conditions in the project area and the environmental consequences that would result from no action and from implementation of the action alternatives.

## 3.1 Water Resources

### 3.1.1 Affected Environment

Captain Tom Reservoir is an off-stream impoundment of Captain Tom Wash with a storage capacity of 806 acre-feet (90 surface acres) at the spillway crest elevation of 5,671.2 feet. Sedimentation has reduced the maximum storage pool depth at the inlet structure by approximately 6 feet. Under normal conditions, basic operation involves filling the reservoir with diverted stream flow and releasing water through the outlet works to meet the irrigation needs of downstream Navajo farmers. A concrete diversion structure with a gated, unlined ditch directs flow from Captain Tom Wash into a natural drainage that discharges into the reservoir. Local storm runoff from a 3.4-square-mile watershed also contributes minor amounts of water. Captain Tom Dam is not currently storing water due to SOD restrictions.

Captain Tom Wash is a tributary to the Chaco River, which converges with the San Juan River near Shiprock, New Mexico. The headwaters of Captain Tom Wash originate in the Chuska Mountains at an elevation of 9,100 feet approximately 15 miles southwest of the reservoir. Portions of Captain Tom Wash are perennial near the headwaters. Wash discharges are influenced by a snowmelt hydrograph that produces flows in late winter and spring and monsoon storms that generate sporadic flows in late summer. Minimal to no flow is common in late spring through mid-summer, late fall, and early winter. August provides the maximum rainfall values for a general storm event, and February and March provide the highest values for snowmelt. The highest and lowest monthly mean discharges recorded by the NNDWR in 2006 were 6.76 cfs (March) and 0.002 cfs (July), respectively. In 2006, the highest daily discharge was 42 cfs (March); flows were recorded on 222 days. Estimated peak and daily maximum flows at the Captain Tom Wash diversion are shown in Table 2 (Reclamation 2005b).

Table 2. Estimated peak and daily maximum flows at Captain Tom Wash diversion.

| Frequency (years) | Peak Flow (cfs) | Max. 1-Day Avg (cfs) |
|---|---|---|
| 2 | 459 | 43 |
| 5 | 1,030 | 157 |
| 10 | 1,600 | 294 |
| 25 | 2,450 | 553 |
| 50 | 3,300 | 814 |
| 100 | 4,310 | 1,138 |

Flows were historically diverted from both Captain Tom and To-dil-hil Washes. However, the diversion channel from To-dil-hil Wash is plugged with sediment and has

not supplied water to the reservoir for several years. Farmers continue to locally divert water from Captain Tom and To-dil-hil Washes into irrigation ditches east of the dam.

In past years, reservoir seepage through embankment and foundation material supported minor ponding, moist soils, and wetland vegetation along the downstream toe of the dam. However, the reservoir was substantially drawn down in 2003 and totally dewatered in 2004 which resulted in cessation of foundation seepage, desiccation of soils, and loss of most of the wetland.

**No Action**

SOD restrictions would preclude refilling the reservoir, and no water would be diverted from Captain Tom Wash. The reservoir basin would remain dry into the foreseeable future.

**Preferred Action**

The U.S. Army Corps of Engineers (COE) regulates discharges of fill material to waters of the U.S., pursuant to Section 404 of the Clean Water Act (CWA) and issues permits for actions proposed within such waters. Jurisdictional, non-tidal waters of the U.S. regulated by the COE are defined in 33 CFR 328.4 (c) as those that comprise the area of a water course that extends up to the ordinary high-water mark (OHWM), in the absence of wetlands. Ground disturbances in jurisdictional waters would be restricted to portions of the dewatered reservoir basin where deconstruction of the existing dam would occur and a small (<0.5 acre) remnant *Juncus* wetland at the downstream toe of the dam. To-dil-hil and Captain Tom Washes would not be affected during construction. After construction, diversion of flow from Captain Tom Wash into the reservoir would resume. The rate at which the reservoir returns to normal operating levels would be influenced by the amount of runoff from the snowpack and monsoon storms. Storage capacity of the reservoir at the spillway crest elevation would be 1,152 acre-feet (110 surface acres).

The retention of additional water in the expanded reservoir represents water that otherwise would flow past the diversion in Captain Tom Wash toward the Chaco River. The potential indirect effect of this additional storage would be to reduce the amount of water available to Captain Tom Wash downstream of the diversion. In years with less than average runoff from snowmelt or monsoon storms, the additional reservoir storage capacity would be underutilized due to the paucity of flows that could be diverted. More storage would occur in years with above-average runoff. Retention of water at or near the maximum storage capacity has been documented on very few occasions during the operating history of the reservoir, and this low frequency of occurrence would likely be repeated in the foreseeable future.[2] The effect of expanded reservoir storage on flows in lower Captain Tom Wash would be minor.

[2] Heavy runoff contributed to an unusually high reservoir level in May and June 1995. The reservoir had reportedly been within inches of the spillway crest, representing one of the few occasions when the reservoir was near maximum operating capacity.

**Alternative A**

Under Alternative A, ground disturbances in jurisdictional waters would be restricted to portions of the dewatered reservoir basin where embankment excavation and replacement would occur and the remnant *Juncus* wetland at the downstream toe of the dam. To-dil-hil and Captain Tom Washes would not be affected during construction. Refilling the reservoir would be dependent on the availability of flow in Captain Tom Wash. The maximum operating elevation and storage capacity of the reservoir would not change.

**Alternative B**

The effects to water resources would be similar to those described in Alternative A.

**Cumulative Effects**

The retention of additional water in the expanded reservoir would have a negligible cumulative impact on water supply in Captain Tom Wash or other waters of the San Juan Basin.

**Mitigation Requirements**

- Best management practices (BMPs) would be developed and employed by the contractor to control storm-water runoff from the construction site.

- The contractor would prepare a storm water pollution prevention plan in accordance with National Pollutant Discharge Elimination System requirements.

## 3.2 Land Use

### 3.2.1 Affected Environment

Captain Tom Dam is located within the Newcomb Chapter of the Navajo Nation. The Newcomb Chapter is a political subdivision of the Navajo Nation that administers approximately 56,635 acres of tribal land. Open range, agricultural land, and scattered residences occupy the lands encompassing the project area.

Approximately 102 farm plots representing 700 acres of fallow and active farmland occupy a block of land that begins ¼-mile southeast of the dam and extends approximately 3 miles to the east (Figure 4). Under normal operating conditions, irrigation water is supplied to these plots through a complex of earthen ditches connected to a concrete-lined ditch from Captain Tom Dam and by local diversions of Captain Tom and To-dil-hil Washes. Crops typically grown in the area include alfalfa, corn, and assorted vegetables. Farm residences are dispersed throughout the agricultural area.

The existing SOD operating restrictions have disrupted normal cultivation patterns and practices. Farmers on less than half of the 102 farm plots have attempted limited cultivation with water that is sporadically captured at local diversions of Captain Tom and To-dil-hil Washes. The remaining farm plots have been retired until SOD deficiencies are corrected and irrigation releases from Captain Tom Dam are restored.

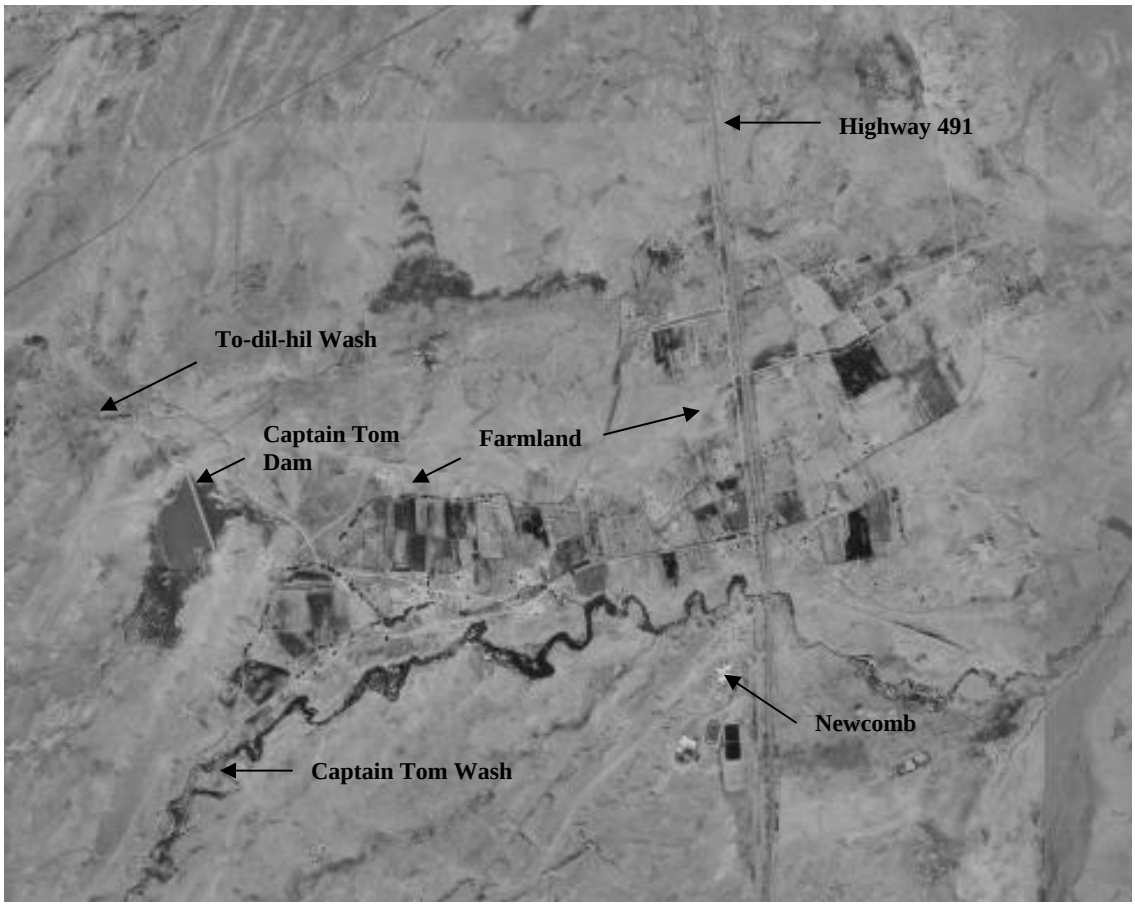

Figure 4. Land features near Captain Tom Dam.

### 3.2.2 Environmental Consequences

**No Action**

Permanent loss of the reservoir would eliminate a significant and relatively reliable source of water available to area farmers. Without water supplied from the dam, irrigation and livestock watering would be dependent on the capture of sporadic flows via on-farm diversions of Captain Tom and To-dil-hil Washes. Crop production would be constrained by the irregular and unpredictable supply of water, resulting in lower crop yields and possible permanent abandonment of numerous fields.

## Preferred Action

Construction activities, including deconstruction of the existing dam and borrow material extraction, would affect approximately 38 acres of Navajo Nation tribal land (Figure 3). Most of the area is in a low topographic trough bordered on each side by rock outcrops and wind-deposited soils forming higher ground (Figure 5). Construction outside of this trough would affect rock and soil along the abutments of the dam. Following construction, the reservoir at the spillway crest elevation would inundate approximately 20 additional acres of tribally owned land (including 8 acres constituting the former dam site), resulting in a minor loss of land that was formerly available for livestock grazing.

The long-term effect of the project would be to restore operation of the dam and improve the reliability of water supplies for irrigation and livestock watering. Much of the farmland that is currently fallow or sporadically cultivated would be returned to active production. Land use within the farmed area would approximate the pre-2004 pattern of irrigated and fallow agricultural fields.

Figure 5. Potential construction staging and borrow area downstream of existing dam. (Note existing outlet works, siphon and irrigation canal in photo.)

**Alternative A**

The impacts to land uses would be similar to those described for the Preferred Action, except 13 fewer acres downstream of the existing dam would be affected by construction. Water storage would be confined to the existing reservoir basin.

**Alternative B**

The impacts to land uses would be similar to those described for Alternative A, except 2.5 additional acres would be affected by construction.

**Cumulative Effects**

The ongoing regional drought and unpredictable water supply have limited agricultural productivity of the adjoining farm fields. Restoration of water storage behind Captain Tom Dam would create renewed farm activity and provide opportunities to return fallow land to active production.

**Mitigation Requirements**

No mitigation is recommended.

## 3.3 Geology and Soils

### 3.3.1 Affected Environment

Captain Tom Dam is located in the San Juan Basin of the Colorado Plateau. Sandstone of the Cretaceous Menefee Formation constitutes bedrock at the reservoir and forms the foundation of the upper right and left abutments of the dam. The majority of the dam foundation consists of unconsolidated alluvial deposits. These deposits consist of stratified silty sand and sandy clay, with occasional clayey sand and poorly graded sand with silt layers. Recent deposits composed primarily of windblown silt blanket the upper slopes and ridges surrounding the dam and reservoir. The reservoir basin is partially filled with lakebed sediments transported in the flows diverted from Captain Tom Wash. Approximately 6 feet of lakebed deposits fill the basin at the inlet structure to the dam.

Soils between the existing dam and the proposed new dam alignment belong to the Jeddito-Escavada Association (Natural Resources Conservation Service (NCRS) undated report). These alluvial soils, which are derived from sandstone and shale, are typically found on valley floors and consist mostly of loamy find sand and similar materials. Although soils belonging to this association have slow runoff potential and a slight hazard of water erosion, the propensity for wind erosion is very severe.

Upland soils belong to the Farb-Rock outcrop-Badland complex (NRCS undated report). Land substrates consist primarily of loamy fine sand and silt, rock outcrops, and

intrusions. Soils depth tends to be very shallow, with a rapid runoff potential, moderate water erosion hazard, and severe wind erosion hazard.

Soil conditions in the project area are also affected by differences in topographic relief and livestock grazing. Grazing on upland slopes and lowland areas downstream of the dam has reduced ground cover and likely accelerated natural rates of wind and water erosion.

### 3.3.2 Environmental Consequences

**No Action**

Existing soil conditions would likely persist into the foreseeable future.

**Preferred Action**

Construction would include removal of the existing embankment, excavation of a shear key trench along the alignment of the new dam, and stockpiling material for reuse in the new dam. Additional embankment material would be extracted from possible borrow sites between the new and old dam alignments. Material excavation, stockpiling, and equipment use would impact approximately 38 acres of alluvial and upland soils between and including the old and new dam alignments. Following construction, approximately 82 percent (31 acres) of the impacted area would be within the footprint of the new dam and expanded reservoir basin.

**Alternative A**

Construction would include removal of the existing embankment, excavation of a shear key trench, and stockpiling material for reuse in the reconstructed dam. Additional embankment material would be extracted from possible borrow sites in the area immediately downstream of the dam. Embankment deconstruction, material extraction, material stockpiling, and equipment use would impact approximately 25 acres of alluvial soils in the footprint of the existing dam, lakebed, and downstream area. Following construction, approximately 43 percent (11 acres) of the impacted area would be within the footprint of the reconstructed dam and existing reservoir basin.

**Alternative B**

Construction would include excavation of a shear key trench along the downstream toe of the existing embankment, stockpiling excavated material for reuse, construction of the stability berm, raising the crest height of the dam, and constructing a new outlet works. Like Alternative A, material processing, stockpiling, and material extraction would occur in the area immediately downstream of the dam. Construction of the reconfigured embankment would affect 27.5 acres of alluvial soils in the footprint of the existing

dam, lakebed, and downstream area. Following construction, approximately 44 percent (12 acres) of the impacted area would be within the footprint of the reconstructed dam and existing reservoir basin.

**Cumulative Effects**

The potential construction impact area located between the existing and proposed dam alignments was substantially modified during construction of Captain Tom Dam in 1937. This area was scraped and presumably used as a borrow source during construction. Subsequent tramping by livestock has had a repeated effect on soil conditions. Anticipated soil disturbances resulting from the proposed project would be incremental to these past and present impacts. Implementation of appropriated mitigation measures would minimize the cumulative effect of the proposed project on soils.

**Mitigation Requirements**

- Existing roads would be used for construction haulage to the fullest extent practicable.
- No stockpiles of material would remain following project completion.
- Construction equipment would be routinely inspected for leaks and other deficiencies that could cause spillage of petroleum products onto the ground. Substantial leaks would be promptly corrected.
- Petroleum products would be stored in a designated portion of the contractor yard. Lined secondary containment would be required for petroleum storage.
- Spills and disposal of contaminated media would be managed in accordance with Federal and tribal guidelines.
- BMPs outlined in a storm water pollution plan would be implemented to minimize soil erosion. These BMPs may include installation of silt fencing, anchored straw bales, mats, mulch, or sediment basins.
- Project impacted soils outside the reservoir basin would be reseeded to reestablish vegetative cover.
- The new dam embankment would be fenced to prevent encroachment by livestock and protect soils.

## 3.4 Biological Resources

The project area is located along the eastern foothills of the Chuska Mountains. The area is characterized by wash-dissected rolling hills that support a spartan saltbush

community. Wind erosion and overgrazing by livestock play a significant role in degrading this habitat type.

The results of inventories conducted in the June 2006 and March 2007 are summarized below. These inventories were completed from available data and field surveys of the project area.

### 3.4.1 Affected Environment

***Vegetation –*** The project area is located in the Plains and Great Basin Grassland on the approximate ecotone with Great Basin Desertscrub (Brown 1994; Brown and Lowe 1980). The upland plant community consists of shadscale (*Atriplex confertifolia*), greasewood (*Sarcobatus* sp.), fourwing saltbush (*A. canescens*), with scattered rabbitbrush (*Chrysothamnus* spp.) and snakeweed (*Gutierrezia* sp.). Herbaceous vegetation is sparse. Plant cover is less than 20 percent on most sites.

Riparian vegetation consists of nonnative tamarisk (*Tamarix ramosissima*) and cottonwood (*Populus fremontii*). Scattered stands of tamarisk (crown height generally less than 12 feet) occur along the upper margins of the dewatered reservoir basin and near the downstream toe of the dam. A formerly robust stand of cottonwood located along the upper basin has significantly declined in vigor following dewatering of the reservoir in 2004.

***Wetlands –*** Prior to 2004, lake seepage through embankment and foundation material artificially sustained wetland conditions near the downstream toe of the dam. Draining the reservoir has eliminated this water supply and caused the disappearance of hydrologic conditions that supported the wetland. Only a remnant *Juncus* (spp) wetland persists on less than 0.5 acre.

***Fisheries and Aquatic Habitats –*** There are no fisheries or aquatic habitats in the project area. Captain Tom Reservoir was substantially drawn down in 2003 and completely drained in 2004. No impoundment of water has occurred since 2004 other than infrequent, minor ponding of local storm runoff. There are no perennial streams or seeps in the area. Historic operation of the dam and reservoir has been to supply water for irrigation and livestock. According to the Navajo Nation Fish and Wildlife Department (NNFWD), the reservoir has not supported a fishery in the past due to significant drawdown and low water levels that often occur by the end of the irrigation season.

***Wildlife –*** Sixty-eight mammal species have been recorded in San Juan County (http://www.bison-m.org). Characteristic mammals of shadscale-fourwing saltbrush habitat in northwestern New Mexico include coyote (*Canis latrans*), black-tailed jackrabbit (*Lepus californicus*), and Ord's kangaroo rat (*Dipodomys ordi*).

Bird surveys in San Juan County have recorded a total of 269 species (http://www.bison-m.org), with 120 species listed as nesting (USGS 2006). Habitat diversity within San Juan County is high, ranging from Great Basin Desertscrub near the foothills to mixed

conifer communities in the Chuska Mountains, and riparian communities along perennial streams and rivers. Of these habitat types, avian diversity and density is typically lowest in desert shrub communities (Wiens and Rotenberry 1981). This is most likely due to the structural and floristic simplicity of cold desert shrub habitat (Rotenberry 1985, Wiens and Rotenberry 1981). Species that are typical in non-sagebrush shrub associations in northern New Mexico include black-throated sparrow (*Amphispiza bilineata*), vesper sparrow (*Pooecetes gramineus*), lark sparrow (*Chondestes grammacus*), and the ubiquitous common raven (*Corvus corax*) and American crow (*C. brachyrhynchos*).

Twenty-three reptile species have been recorded in the county (http://www.bison-m.org). Locally common reptiles of northwestern New Mexico include the prairie rattlesnake (*Crotalus viridis*), gopher snake (*Pituophis catenifer*), greater short-horned lizard (*Phrynosoma hernandesi*), plateau striped whiptail (*Aspidoscelis velox*), common side-blotched lizard (*Uta stansburiana*), and plateau lizard (*Sceloporus tristichus*).

***Special Status Species*** **-** Table 3 and the following discussion are based on the analysis of endangered, threatened, and candidate species included on the U.S. Fish and Wildlife Service (FWS) San Juan County list and the Navajo Nation list of special status species that may occur in the portion of the county covered by the Newcomb, New Mexico, and Tsin-Nas-Kid, New Mexico, 7.5-minute series U.S. Geological Survey quadrangle maps. The potential for species occurrence was determined on quadrangle-wide coarse habitat characteristics and species range information provided by the NNFWD. The FWS lists two additional species that potentially occur in San Juan County but are not included in Table 3. The absence of perennial surface water in the project area precludes the occurrence of Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*).

Table 3. Navajo Nation and federally listed endangered, threatened, and candidate species.[1]

| Species | | Habitat Type | Status | | Potential Occurrence |
|---|---|---|---|---|---|
| Common Name | Scientific Name | | Federal | Navajo | |
| Black-footed ferret | *Mustela nigripes* | Associated with prairie dog towns in desert grasslands | E | Group 2 | Prairie dog towns absent, no occurrence |
| Pronghorn antelope | *Antilocapra american* | Grasslands, sagebrush, or desertscrub with a high percentage of grasses on rolling or dissected hills; casual use in Great Basin rabbitbrush/shadscale habitat | | Group 3 | Grasses sparse, preferred habitat absent; no signs of species noted in field survey; occurrence unlikely |
| Bald eagle | *Haliaeetus leucocephalus* | Large trees or cliffs near water (lakes, rivers, and streams) with abundant prey. Uncommon in San Juan County | | Sensitive Species | Nesting and foraging habitat absent; no occurrence |

Table 3 – continued.

| Species | | Habitat Type | Status | | Potential Occurrence |
|---|---|---|---|---|---|
| **Common Name** | **Scientific Name** | | **Federal** | **Navajo** | |
| Ferruginous hawk | *Buteo regalis* | Occur casually in open grasslands and pinyon-juniper mesas in northern New Mexico. Uncommon in San Juan County | | Group 3 | Nesting habitat absent; dispersed foraging along foothills possible |
| Mexican spotted owl | *Strix occidentalis lucida* | Nests and roosts in mixed conifer forests and steep-walled, narrow canyons with riparian vegetation and cool microclimates | T | Group 2 | Nesting and foraging habitat absent; no occurrence |
| Yellow-billed cuckoo | *Coccyzus americanus* | Large blocks of riparian woodlands (cottonwood, willow, or tamarisk galleries) | C | Group 2 | Tamarisk and cottonwood community scattered, not suitable habitat; no occurrence |
| Southwestern willow flycatcher | *Empidonax traillii extimus* | Riparian sites with dense cottonwood, willow, or tamarisk | E | Group 2 | Tamarisk and cottonwood community scattered, no standing water or moist soils, not suitable habitat; no occurrence |
| Mountain plover | *Charadrius montanus* | Dry upland grasslands, plowed fields, and sandy desert | | Group 4 | Grassland and other suitable habitat absent; occurrence unlikely |
| Northern leopard frog | *Rana pipiens* | Streams and wetlands that support aquatic vegetation, also in wet meadows. | | Group 2 | Aquatic and wet meadow habitat absent; no occurrence |
| Knowlton cactus | *Pediocactus knowltonii* | Occurs on tertiary alluvial deposits on the San Jose formation within open pinyon-juniper woodlands; elevation 6,400 to 7,200 feet. | E | | Suitable ecological and edaphic conditions absent; no occurrence |
| Mancos milk vetch | *Astragalus humillimus* | Occurs in cracks or eroded depressions on sandstone rimrock ledges and mesa tops in Point Lookout sandstone. | E | Group 2 | Suitable ecological and edaphic conditions absent; no occurrence |

Table 3 – continued.

| Species | | Habitat Type | Status | | Potential Occurrence |
|---|---|---|---|---|---|
| Common Name | Scientific Name | | Federal | Navajo | |
| Mesa Verde cactus | *Sclerocactus mesae-verdae* | Restricted to xeric clay soils derived from shales and mudstone of alkaline, marine formations on low rolling hills; closest documented population occurs at Sheep Springs approximately 10 miles south of project area. | T | Group 3 | Project area surveyed; no occurrence |

[1] Source: NNFWD 2004 (Appendix B), Mikesic et al. 2005, and FWS county list at http://www.fws.gov/es/southwest/newmexico/.
[2] Federal = Endangered Species Act, species listed by FWS: E = endangered; T = threatened; Exp = experimental.
[3] Navajo = Navajo Nation Endangered Species List (refers to status on Navajo Nation): Group 1 = no longer occur on the Navajo Nation; Group 2 = Endangered – a species or subspecies whose prospects of survival are in jeopardy; Group 3 = Endangered - a species or subspecies whose prospects of survival or recruitment are likely to be in jeopardy in the foreseeable future; Group 4 = insufficient information on status of species or subspecies for listing as endangered.

In addition to the species listed in Table 3, the FWS has identified 13 species of concern that may occur in San Juan County. Species of concern are suspected by the FWS, State of New Mexico, or other agencies to be vulnerable and require further study to determine their conservation status, or are considered sensitive, rare, or declining. These species are listed in Table 4.

Table 4. Species of concern in San Juan County.

| Species | | Habitat Type |
|---|---|---|
| Common Name | Scientific Name | |
| New Mexico silverspot butterfy | *Speyeria nokomis nitocris* | Inhabits wet areas in or along moist meadows, seeps, and streams. |
| San Juan checkerspot butterfly | *Euphydryas anicia chuskae* | Inhabits moist areas along streams and marshes. |
| American peregrine falcon | *Falco peregrinus anatum* | Nests on steep cliffs typically near extensive wetland or forest habitat. |
| Arctic peregrine falcon | *Falco peregrinus tundrius* | Breeds on Arctic tundra and migrates to wintering areas along Gulf Coast of U.S. to South America; periodically is observed in New Mexico during spring and fall migration. |
| Baird's sparrow | *Ammodramus bairdii* | Breeds and winters in grasslands. |
| Black tern | *Chlidonias niger* | Inhabits freshwater marshes. |
| Mountain plover | *Charadrius montanus* | Nests in flat to slightly rolling expanses of grasslands, semi-desert, badlands, and occasionally in cultivated fields. |
| Northern goshawk | *Accipiter gentilis* | Inhabits forested areas. |

Table 4 - continued.

| Species | | Habitat Type |
|---|---|---|
| **Common Name** | **Scientific Name** | |
| Western burrowing owl | *Athene cunicularia hypugaea* | Nests in deserted mammal burrows (often in prairie dog burrows) in dry open grasslands or desertscrub; availability of suitable burrows is critical. |
| Roundtail chub | *Gilia formosa* | Permanent cool to warm water mid-elevation streams. |
| Bisti fleabane | *Erigeron bistiensis* | Restricted to Chinle Formation shale on selenium-bearing soils; typically found on steep, barren slopes in pinyon-juniper woodland or desertscrub. |
| Brack's fishhook cactus | *Sclerocactus cloveriae ssp. Brackii* | Sandy clay strata of the Nacimiento Formation in sparse shadscale scrub; known from limited areas on both sides of the San Juan River valley. |
| Parish's alkali grass | *Puccinellia parishii* | Alkaline seeps, springs, and seasonally wet areas. |

Source: FWS website http://www.fws.gov/es/southwest/newmexico/.

### 3.4.2 Environmental Consequences

**No Action**

***Vegetation*** – Riparian vegetation would continue to decline in response to loss of the water supply. Permanent dewatering would create an opportunity for invasive weeds to become established on sediments in the dry reservoir basin. The *Juncus* wetland would continue to decline due to the desiccated condition of the site and would likely disappear within the next few years.

***Wildlife*** – Permanent dewatering would have a minor effect on avifauna. Numerous other lakes and ponds in the Chuska Mountains and major perennial rivers such as the San Juan are regionally available to waterfowl and other migratory birds.

***Special Status Species*** - Permanent dewatering would not affect special status species.

**Preferred Action**

***Vegetation*** - Five acres of shadscale habitat would be directly or indirectly affected by the proposed project. Approximately 3.5 acres of this habitat would be lost to ground disturbances associated with construction near the right abutment of the new dam. Following construction, 1.5 additional acres would be subject to inundation within the expanded reservoir basin.

Twenty-two acres of lowland habitat consisting of grazed nonnative grasses and scattered tamarisk at the downstream toe of the existing dam would be lost due to construction and inundation by the reservoir. This area also includes the remnant *Juncus* wetland, which would be inundated by the reservoir. The cottonwood/tamarisk riparian community along the upper reservoir basin would improve following restoration of normal reservoir operations.

The remaining 11 acres within the impact area consist of the existing dam, which would be removed, and the unvegetated lakebed along the upstream toe of the dam.

Project effects on native vegetation would be reduced to the maximum extent practicable by using existing roads for construction haulage. Previously disturbed sites, such as the area between the old and new dam alignments, would be used for construction staging, material extraction, and stockpiling. Following construction, affected areas would be rehabilitated as appropriate. Direct and indirect effects of construction on native vegetation would be minor.

***Wildlife*** – There would be localized displacement of wildlife during construction. Within the project area, construction activity and noise may disrupt foraging and reproductive behavior of avian and mammalian species. Overall impact on avifauna would be low because of the availability of alternate foraging and nesting habitat in adjoining areas. Injury and death of smaller and less mobile animals such as rodents and reptiles could result from equipment use and earth-moving activities. The loss of 5 acres of shadscale/saltbush desertscrub represents a minor impact due to the abundance of similar habitat in the region. The loss of riparian habitat below the dam would be offset by long-term improvement of riparian conditions along the upper reservoir basin.

Restoration of the reservoir would provide limited benefit to resident and migratory avifauna and other wildlife. The NNFWD does not plan to stock the reservoir with fish.

***Special Status Species*** – Of the 15 federally and Navajo-protected species listed in Table 3, only the Mesa Verde cactus has the potential to occur within the project area. Surveys for Mesa Verde cactus were negative. No suitable nesting habitat for any of the seven special status bird species would be affected by the project. Range conditions are not favorable for pronghorn. No impact to federally or Navajo-listed species is anticipated.

There are no suitable edaphic conditions or habitat within the project area for the species of concern listed in Table 4. The project would have no effect on population numbers or trends of these species.

**Alternative A**

The potential biological resource impacts would be similar to those described for the Preferred Alternative, except 5 fewer acres of shadscale habitat and 8 fewer acres of lowland habitat would be affected.

**Alternative B**

The potential biological resource impacts would be similar to those described for the Preferred Alternative, except 4.5 fewer acres of shadscale habitat and 6 fewer acres of lowland habitat would be affected.

**Cumulative Effects**

The combined effects of prolonged drought, historic overgrazing, and recent loss of stored water have affected plant communities in the project area. Implementation of the SOD project would result in the permanent loss of tamarisk in the downstream toe area, although tamarisk and cottonwood that persist in the upper margins of the reservoir would benefit from resumption of water storage. Any vegetation that is disturbed by construction on upland sites would recover slowly due to low annual precipitation and the susceptibility of destabilized soils to wind erosion. Loss of habitat to construction would be incremental to other land disturbances in the region that convert or fragment habitat, such as road development, oil and gas exploration and production, and grazing pressure.

**Mitigation Requirements**

- Site restoration consisting of recontouring and seeding would be performed on disturbed upland sites. A native seed mix approved by the Navajo Nation would be used for reseeding purposes. Seeding of disturbed sites and post-project monitoring of revegetation success would be performed by the NNDWR to ensure conformance with tribal requirements.

## 3.5 Cultural Resources

### 3.5.1 Affected Environment

The area around Captain Tom Dam is rich in prehistoric and historic cultural resources. At least until the middle of the nineteenth century, it was also a productive agricultural area. Prehistoric Anasazi farm fields have been documented along Captain Tom Wash, and U.S. Army expeditions in the 1850s and 1860s noted the abundant Navajo fields in the area. During the eleventh and twelfth centuries, water from Captain Tom Wash irrigated extensive fields that supplied corn and other staples for the occupants of Chaco Canyon some 40 miles to the east. Several Chacoan outlier pueblos and numerous other Anasazi sites can be found in the region surrounding the dam. Navajo farmers realized the agricultural potential of the area, and historic and more recent evidence of their occupation can also be found. Typical cultural resources in the area include petroglyph sites, agricultural sites, resource procurement and processing sites, and a variety of habitation sites, from small single- and multiple-room masonry surface structures, larger masonry pueblos, and historic Navajo and Anglo-European structures and features.

In 2005 and 2007, Reclamation completed four Class III (intensive) cultural resource surveys encompassing 40 acres. One previously recorded site, NM-H-46-66, and one new site (Field Number CTD #1) were located during the surveys. The former site contains several prehistoric petroglyphs, while the latter site is located on a small hill downstream of the dam. It consists of four surface features and a light scatter of prehistoric ceramics and ground and chipped stone. Both sites were determined to be eligible for the National Register of Historic Places.

Reclamation also identified an historic human burial site near the project area. This site would be excluded from the project boundary and avoided during construction. A second site reported to contain an historic human burial was surveyed with ground-penetrating radar. No human remains were found at this additional site.

### 3.7.2 Environmental Consequences

**No Action Alternative**

The two National Register-eligible sites would not be affected if no action is taken.

**Preferred Action**

Construction of Captain Tom and inundation of the expanded reservoir pool would damage or result in the loss of cultural material at NM-H-46-66 and CTD#1. As mitigation for these effects, a data recovery plan was prepared by Reclamation's consultant, Archaeological Consulting Services (ACS), Inc., and approved by the Navajo Nation Historic Preservation Department (NNHPD). Field work was conducted under NNHPD Class C Cultural Resources permit (No. C0722) and an Archaeological Resource Protection Act (ARPA) permit (No. NRO-ARPA-07-007) issued November 1, 2007. Data recovery at CTD#1 and NM-H-46-66 has recovered all available data from these sites. ACS submitted a final report (Punzmann et al. 2008) to Reclamation on March 20, 2008. A copy of the report was delivered to the NNHPD for review on April 9, 2008, initiating Section 106 consultation for review and comment on the report.

As per 36 CFR, 800 the Tribal Historic Preservation Officer (THPO) had a 30-day review period from the receipt of the agency letter initiating consultation. As of July 1, 2008, the Navajo Nation THPO had not commented on the final report. ACS has submitted copies of the final report to NNHPD as required by their permit. The material collected during the data recovery project is stored at the Huhugam Heritage Center (HHC) on the Gila River Indian Reservation at the request of the NNHPD. The HHC is Reclamation's repository and is managed by the Gila River Indian Community through an agreement with Reclamation.

**Alternative A**

Implementation of Alternative A would have no impact on significant cultural resources.

**Alternative B**

Implementation of Alternative B would have no impact on significant cultural resources.

**Cumulative Effects**

The effects of implementation activities on cultural resources would be incremental to the effects of other past, present, or future development within the region. The cumulative effects of the proposed project on cultural resources would be minor.

**Mitigation Requirements**

- Data recovery from cultural resource sites potentially affected by the proposed project has been completed. No additional mitigation is required.

## 3.6 Air Quality

### 3.6.1 Affected Environment

Air quality is determined by the ambient concentrations of pollutants that are known to have detrimental effects. The Environmental Protection Agency (EPA) has promulgated National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: carbon monoxide, nitrogen dioxide, particulate matter ($PM_{10}$ and $PM_{2.5}$), ozone, sulfur dioxide, and lead. San Juan County is in attainment of standards for all criteria pollutants. Air quality in western San Juan County is considered good. The New Mexico Environmental Department has measured elevated concentrations of ozone at two monitoring stations near Farmington in the eastern part of the county, approximately 45 miles northeast of Captain Tom Dam.

The Clean Air Act (CAA) provides special protection for visibility and other air quality values in specially designated Class I areas where the cleanest and most stringent protection from air quality degradation is considered important. These areas include National Parks and Wilderness Areas which have been specifically designated Class I under Section 162(a) of the CAA. There are no Class I areas near the project area.

The project area lies along the eastern foothills of the Chuska Mountains at an approximate elevation of 5,650 feet. Rainfall averages 6 inches annually. On a regional scale, low rainfall and periodic high winds contribute to temporary increases in the levels of atmospheric dust. Agricultural activity east of the project area and local unpaved roads are a minor source of localized fugitive dust.

Farm residences that are dispersed throughout the agricultural area to the east and southeast of Captain Tom Dam are potential receptors of fugitive dust from construction associated with the proposed project.

### 3.6.2 Environmental Consequences

**No Action Alternative**

No major changes in human activities are expected in the project area that would contribute to long-term changes in air quality. Permanent dewatering would expose fine sediments in the reservoir basin to wind erosion and contribute minor amounts of atmospheric dust.

**Preferred Action**

During construction, heavy equipment operation would produce tailpipe emissions and airborne fine particulate matter from ground disturbances. Primary sources of fugitive dust would include earth moving associated with material borrowing and stockpiling, embankment construction, and grading land surfaces. Dust would also be generated by construction traffic using haul roads within the project area and local unpaved public roads. BIA Road 191 would used for construction haulage between the project area and Highway 491 to avoid or minimize fugitive dust effects to residences within the farm area. Soils that become destabilized by construction would likely become a passive source of wind-blown dust until stabilization efforts can be implemented. These impacts would be temporary and highly localized. There would be no long-term, adverse impact to air quality from implementation of the Preferred Action.

**Alternative A**

Sources of air pollution would be similar to those described for the Preferred Action.

**Alternative B**

Sources of air pollution would be similar to those described for the Preferred Action.

**Cumulative Effects**

Emissions from implementation activities would be incremental to other sources of air pollution within the regional airshed. The cumulative effects of the proposed project on air quality would be minor.

**Mitigation Requirements**

- Implement standard airborne dust abatement practices during construction.
- Maintain adequate soil moisture on unpaved haul roads to minimize visible dust emissions.
- Halt earth-moving activities during periods of high winds (i.e., sustained winds of

greater than 25 miles per hour).

- Disturbed sites would be stabilized and reseeded where appropriate.

- BIA Road 191 would be used for construction haulage between Highway 491 and the project area.

## 3.7 Hazardous Material and Solid Waste

### 3.7.1 Affected Environment

The project area encompasses the former lake basin, existing dam facilities, and undeveloped tribal land. No sites contaminated with hazardous or nonhazardous solid wastes are known to occur within the area potentially affected by the project (http://www.epa.gov/enviro/wme/). Use, storage, and disposal of hazardous materials[3]and solid waste associated with construction have the potential to adversely affect the environment if these materials are improperly managed. In general, most potential impacts are associated with the release of these materials to the environment. Direct impacts of such releases would include contamination of soil, water, and vegetation, which could result in indirect impacts to wildlife, aquatic life, and humans.

### 3.7.2 Environmental Consequences

**No Action**

Existing conditions would prevail into the foreseeable future.

**Preferred Action**

Construction would require the short-term use of fuels, lubricants, and other fluids that create a potential contamination hazard. These and other hazardous substances would be stored and handled in accordance with Federal and tribal regulations. Any spills or leaks of hazardous material would require immediate corrective action and cleanup to minimize the impact on sensitive resources.

If on-site storage occurs, lubricants and fuels would be placed in temporary, clearly marked, above-ground containers which would be provided with secondary containment. Construction equipment would be maintained and inspected regularly. Any soil contaminated by fuel or oil would be removed and disposed of by a contractor to an approved disposal site.

Hazardous materials and other hazardous substances that are used in construction would be disposed of in accordance with applicable laws and regulations. Excess or unused quantities of hazardous materials would be removed upon project completion. Although

[3] Hazardous materials are defined by Federal Standard No 313 and 29 CFR 1910.1200.

hazardous waste[4] generation is not anticipated, any such wastes produced during construction would be properly containerized, labeled, and transported to an approved hazardous waste disposal facility. All nonhazardous waste materials including construction refuse, garbage, sanitary waste, and concrete would be disposed of by removal from the work area to an approved disposal facility.

**Alternative A**

The potential impacts attributable to hazardous material use would be similar to those described for the Preferred Alternative.

**Alternative B**

The potential impacts attributable to hazardous material use would be similar to those described for the Preferred Alternative.

**Cumulative Effects**

Appropriate hazardous material management and waste disposal would obviate any cumulative impacts on the environment.

**Mitigation Requirements**

- All construction equipment used in construction of the fish barrier would be periodically inspected for leaks. Any significant leaks would be promptly corrected.

- Secondary containment would be provided for all on-site hazardous materials and hazardous waste storage, including fuels and lubricants used in construction of the fish barrier. In particular, fuel storage (for construction vehicle and equipment) would be a temporary activity occurring only for as long as is needed to support construction activities. All on-site storage would occur at designated contractor-use areas.

- All waste would be removed following construction and transported to an appropriately permitted disposal facility.

[4] Hazardous waste is defined by 40 CFR 261.

## 3.8 Indian Trust Assets

### 3.8.1 Affected Environment

Indian trust assets are legal interests in property held in trust by the United States through the Department of Interior for federally recognized Indian tribes or individual tribal members. Examples of things that may be trust assets are lands, mineral rights, hunting, fishing, or traditional gathering rights and water rights. The United States, including all of its bureaus and agencies, has a fiduciary responsibility to protect and maintain rights reserved by or granted to Indian tribes or individual tribal members by treaties, statutes, and Executive Orders. This trust responsibility requires that all Federal agencies, including Reclamation, ensure their actions protect trust assets. Secretarial Order 3175 (incorporated into the Departmental Manual at 512 DM 2) requires that if Department of Interior agency actions might affect trust assets, the agency address those potential impacts in planning and decision documents, and the agency consult with the tribal government whose trust assets are potentially affected.

Trust assets of the Navajo Nation that might be affected by the proposed project include grazing, land, and surface water resources. Reclamation and the Navajo Nation SOD Program coordinated with several Navajo Nation governmental departments, including the Land and Agriculture departments, during the planning phase of the project. The Navajo Nation SOD Program is a branch of the NNDWR.

### 3.8.2 Environmental Consequences

**No Action Alternative**

Current SOD operating restrictions would remain in effect into the foreseeable future. Permanent dewatering of the reservoir would reduce the amount of water potentially available to irrigators on the adjoining farmland. Existing land use and grazing patterns would persist into the foreseeable future.

**Preferred Action**

*Land:* The project area encompasses Captain Tom Dam, the reservoir basin, and surrounding tribally owned land. Ground disturbances resulting from construction and contractor use, including extraction of borrow material, would directly affect 38 acres of land between and encompassing the existing dam and the new dam alignment. Following construction, most of this area would constitute the lakebed of the enlarged reservoir and footprint of the new dam. Access to tribal land within active work areas would be temporarily restricted during construction to ensure public safety.

Construction activities would exercise care to preserve the natural landscape. Except where clearing is required for temporary and permanent work, approved haul roads, and borrow activity, all trees, shrubbery, and other vegetation would be protected from

damage. On completion of work, all work areas would be left in a condition to provide for proper drainage, prevent erosion, and facilitate revegetation. Impacts to land within the project area would be reduced through implementation of site stabilization and erosion control BMPs.

*Grazing:* At the spillway elevation, impounded waters of the enlarged reservoir would inundate approximately 12 acres of former open range situated between the alignments of the proposed new dam and existing dam.[5] Loss of this land is minor when compared to the total amount of range land available for livestock grazing within the region. Restoration of the reservoir would improve the availability of water resources for livestock watering.

*Water:* Operation of the new Captain Tom Dam would provide access to a reliable source of irrigation and livestock water for Navajo farmers. Potential maximum water storage would be increased by 346 acre-feet.

**Alternative A**

The effects to trust assets would be similar to those described under the Preferred Action, except Alternative A would affect fewer acres of land resources and store less water.

**Alternative B**

The effects to trust assets would be similar to those described under the Preferred Action, except Alternative B would affect fewer acres of land resources and store less water.

**Cumulative Effects**

The long-term, cumulative effect of the project would be to improve access of Navajo farmers to water resources associated with Captain Tom Wash. Improvement of water supplies for livestock watering would benefit ranchers.

**Mitigation Requirements**

- Land contours in areas not required for permanent facilities such as the dam and outlet works or subject to permanent inundation would be restored to conform to original conditions.

- Removal of native vegetation would be minimized to the extent practicable.

- Erosion control measures would be installed in work areas where site conditions warrant.

[5] Approximately 8 acres constituting the embankment of the existing dam is fenced to preclude grazing.

- Vegetation compatible with the existing biotic community and land use would be re-established in work areas following final grading as agreed to by the Navajo Nation.

## 3.9 Environmental Justice and Socioeconomic Considerations

### 3.9.1 Affected Environment

Executive Order (EO) 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," was issued by the President of the United States on February 11, 1994. This order established requirements to address Environmental Justice concerns within the context of agency operations. As part of the NEPA process, agencies are required to identify and address disproportionately high and adverse human health or environmental effects on minority or low-income communities. Federal agencies are directed to ensure that Federal programs or activities do not result, either directly or indirectly, in discrimination on the basis of race, color, or national origin. The order also requires that "the responsibilities set forth shall apply equally to Native American programs." There are no residential properties within the project area. Navajo farmers who reside downstream of the project area represent the only EO 12898 population that would be affected by implementation activities.

The Navajo Nation faces serious economic and social challenges. Data obtained from the 2000 census indicate median household income and average per capita incomes for individuals living in the Newcomb Chapter of the Navajo Nation were substantially below respective levels in San Juan County and the State of New Mexico (Table 5). The unemployment rate in the Newcomb Chapter was almost six times the rate of the general population in San Juan County. Approximately 58 percent of the families in the Chapter live below the Federal poverty levels.

**Table 5.** Income and poverty statistics.

| Attribute | Newcomb Chapter | San Juan County | New Mexico |
|---|---|---|---|
| Population | 738 | 113,801 | 1,819,046 |
| Median Household Income | $14,148 | $33,762 | $34,133 |
| Per Capita Income | $7,194 | $14,282 | $17,261 |
| Unemployment Rate | 32.1% | 5.5% | 4.4% |
| Persons Below Poverty | 57.0% | 18.4% | 17.7% |
| Families Below Poverty | 57.9% | 18.0% | 14.5% |

Source: U.S. Census Bureau, 2000 Census, http://factfinder.census.gov/home. Newcomb Chapter information extracted by LSR Innovations from 2000 census data.

The Navajo Nation has historically lost population to off-reservation communities due to slow rates of economic development and lack of employment opportunities on the

reservation. According to the 2000 census, 298,197 individuals claimed Navajo ethnicity. Approximately 168,000 were Navajo-enrolled members who reside on the Navajo Nation. The remaining Navajo population resides in communities off the reservation.

### 3.9.2 Environmental Consequences

**No Action**

Permanent loss of reservoir storage due to SOD operating restrictions would adversely impact the productivity and economic viability of farm land in the long term.

**Preferred Action**

Potential project effects include soil disturbances, dust emissions, and noise. Project construction would not introduce chemical, biological, physical agents, or situations that have the potential to disproportionately and adversely affect the health or environment of low-income or minority populations as defined in EO 12898.

The project would create long-term socioeconomic benefits by correcting SOD deficiencies and improving conditions for irrigated agriculture and associated farm productivity.

During construction, there would be a minor, short-term economic benefit for local businesses due to construction workers' expenditures on lodging and food. Most of the construction workforce would likely commute from lodging venues in Shiprock and Gallup, New Mexico.

**Alternative A**

The effects to EO 12898 populations and socioeconomic factors would be similar to those described under the Preferred Action.

**Alternative B**

The effects to EO 12898 populations and socioeconomic factors would be similar to those described under the Preferred Action.

**Cumulative Effects**

The proposed project would have a beneficial, socioeconomic cumulative impact on farmers because of improved reliability of the water supply and corresponding improvements to farm productivity.

**Mitigation Requirements**

- The project would restore access to reliable supplies of irrigation water and improve the economic viability of farm production. No mitigation is recommended.

# CHAPTER 4 - AGENCIES AND PERSONS CONSULTED

## List of Preparers

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## Other Contributors

Jeff Wormer, Reclamation, Engineer
Chuck Nixon, BIA, Engineer

## List of Agencies and Persons Contacted

Hopi Cultural Preservation Office
Hopi Tribal Council
Natural Resources Conservation Service
Navajo Nation Environmental Protection Agency
Navajo Nation Division of Natural Resources
Navajo Nation Fish and Wildlife Department
Navajo Nation Historic Preservation Department
Navajo Nation Land Department
Navajo Nation Mexican Springs Chapter
Navajo Nation Newcomb Chapter
Navajo Nation Red Lake Chapter
New Mexico Department of Game and Fish
Pueblo of Zuni
Pueblo of Zuni Cultural Resources Enterprise
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service

# CHAPTER 5 - RELATED ENVIRONMENTAL LAWS/DIRECTIVES

The following is a list of selected statutes, regulations, and EOs that apply to actions discussed in this EA:

National Environmental Policy Act (NEPA) of 1969, as amended - NEPA requires Federal agencies to evaluate the potential environmental consequences of major Federal actions. An action becomes "Federalized" when it is implemented, wholly or partially funded, or requires authorization by a Federal agency. The intent of NEPA is to promote consideration of environmental impacts in the planning and decision-making process prior to project implementation. NEPA also encourages full public disclosure of the proposed action, accompanying alternatives, potential environmental effects, and mitigation.

This EA complies with the CEQ regulations implementing NEPA. Scoping information and the draft EA were made available for public review (see Section 1.5).

Fish and Wildlife Coordination Act (FWCA) of 1934, as amended - The FWCA provides a procedural framework for the consideration of fish and wildlife conservation measures in Federal water resource development projects. Coordination with the FWS and State wildlife management agencies (or appropriate Tribal agency if implemented in Indian Country) is required on all Federal water development projects.

Scoping information and the draft EA were provided to the FWS and NNFWD for comment on mitigating losses to wildlife resources caused by the project. This review process satisfies the coordination requirements of the FWCA.

Endangered Species Act (ESA) of 1973, as amended - The ESA provides protection for plants and animals that are currently in danger of extinction (endangered) and those that may become so in the foreseeable future (threatened). Section 7 of this law requires Federal agencies to ensure that their activities do not jeopardize the continued existence of threatened or endangered species or adversely modify designated critical habitat.

Reclamation has determined that the project would not affect species listed under ESA (see Section 3.4).

Migratory Bird Treaty Act (MBTA) of 1918, as amended - The MBTA is the domestic law that implements the United States' commitment to the protection of shared migratory bird resources. The MBTA prohibits the take, possession, import, export, transport, selling, or purchase of any migratory bird, their eggs, parts, or nests.

The project would not violate provisions of the MBTA.

Clear Air Act (CAA) of 1963, as amended - The CAA requires that any Federal entity engaged in an activity that may result in the discharge of air pollutants must comply with all applicable air pollution control laws and regulations (Federal, State, or local). It also

directs the attainment and maintenance of NAAQS for six different criteria pollutants including carbon monoxide, ozone, particulate matter, sulfur oxides, oxides of nitrogen, and lead.

Air quality in the project area is in attainment of NAAQS. Short-term construction emissions associated with the proposed action would have localized and minor effects on air quality.

Clean Water Act (CWA) of 1977, as amended - The CWA strives to restore and maintain the chemical, physical, and biological integrity of the nation's waters by controlling discharge of pollutants. The basic means to achieve the goals of the CWA is through a system of water quality standards, discharge limitations, and permits. Section 404 of the CWA identifies conditions under which a permit is required for actions that result in placement of fill or dredged material into waters of the United States. In addition, a 401 water quality certification and 402 National Pollutant Discharge Elimination System (NDPES) permit are required for activities that discharge pollutants into waters of the United States. On the Navajo Nation, the EPA is responsible for issuing NPDES permits, while the tribe has primacy for issuing Water Quality Certifications.

Reclamation would obtain water quality certification under Section 401 and permit coverage under Sections 402 (NPDES) and 404 of the CWA prior to construction.

National Historic Preservation Act (NHPA) of 1966, as amended - Federally funded undertakings that have the potential to affect historic properties are subject to Section 106 of the NHPA. Under this act, Federal agencies are responsible for the identification, management, and nomination to the National Register of Historic Places of cultural resources that would be affected by Federal actions. Consultation with the Advisory Council on Historic Preservation and the State Historic Preservation Office (or Tribal Historic Preservation Office) is required when a Federal action may affect cultural resources on, or eligible for inclusion on, the National Register.

Consultation with the NNHPD regarding effects to historic properties within the project area was completed by Reclamation in 2008. A data recovery plan approved by NNHPD was implemented to mitigate for adverse effects at two cultural resource sites.

Native American Graves Protection and Repatriation Act (NAGPRA) - NAGPRA is intended to ensure that Native American human burials, associated and unassociated funerary objects, sacred objects, and items of cultural patrimony currently curated by Federal agencies, or by museums or institutions receiving Federal funding, are identified and inventoried for possible return to an appropriate tribe. NAGPRA provides regulations covering how the intentional excavation or accidental discovery of Native American human remains and associated cultural items on Federal or tribal lands must be handled.

Consultation with the NNHPD regarding effects to an historic Navajo burial site located within the area of potential effect was completed by Reclamation in 2008. The burial site

and appropriate buffer as determined by NNHPD would be excluded from the project boundary and avoided during construction.

Resource Conservation and Recovery Act (RCRA), as amended - RCRA establishes thresholds and protocols for managing and disposing of solid waste. Solid wastes that exhibit the characteristic of hazardous waste, or are listed by regulation as hazardous waste, are subject to strict accumulation, treatment, storage, and disposal controls.

The project is not expected to generate hazardous waste as defined and regulated under RCRA. To minimize the possible impact of hazardous materials (petroleum, oil, and lubricants) used during construction, all equipment would be periodically inspected for leaks. Any significant leaks would be promptly corrected. Nonhazardous solid waste would be disposed of in accordance with State and Federal regulations at an EPA-approved landfill. Spills and disposal of contaminated media would be managed in accordance with tribal and Federal requirements.

EO 11988 (Floodplain Management) - This Presidential directive encourages Federal agencies to avoid, where practicable alternatives exist, the short- and long-term adverse impacts associated with floodplain development. Federal agencies are required to reduce the risk of flood loss; minimize the impacts of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains in carrying out agency responsibility.

The proposed project would obviate potential flood losses associated with failure of Captain Tom Dam.

Secretarial Order 3175 (Indian Trust Assets) - Indian Trust Assets are legal interests in assets held in trust by the U.S. Government for Indian tribes or individual Indians. Assets are anything owned that has monetary values. They can be real property, physical assets, or intangible property rights. Common examples of trust assets include lands, minerals, water rights, hunting rights, other natural resources, money, or claims.

The project would have the long-term benefit by improving reliability of the water supply for irrigation and livestock watering (see Section 3.8).

EO 12898 (Environmental Justice) - This Order directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health and environmental effects of their programs, policies, and activities on minority and low-income populations.

No high and disproportional adverse impacts on low-income or minority populations as defined by EO 12898 would result (see Section 3.9).

# CHAPTER 6 – LITERATURE CITED


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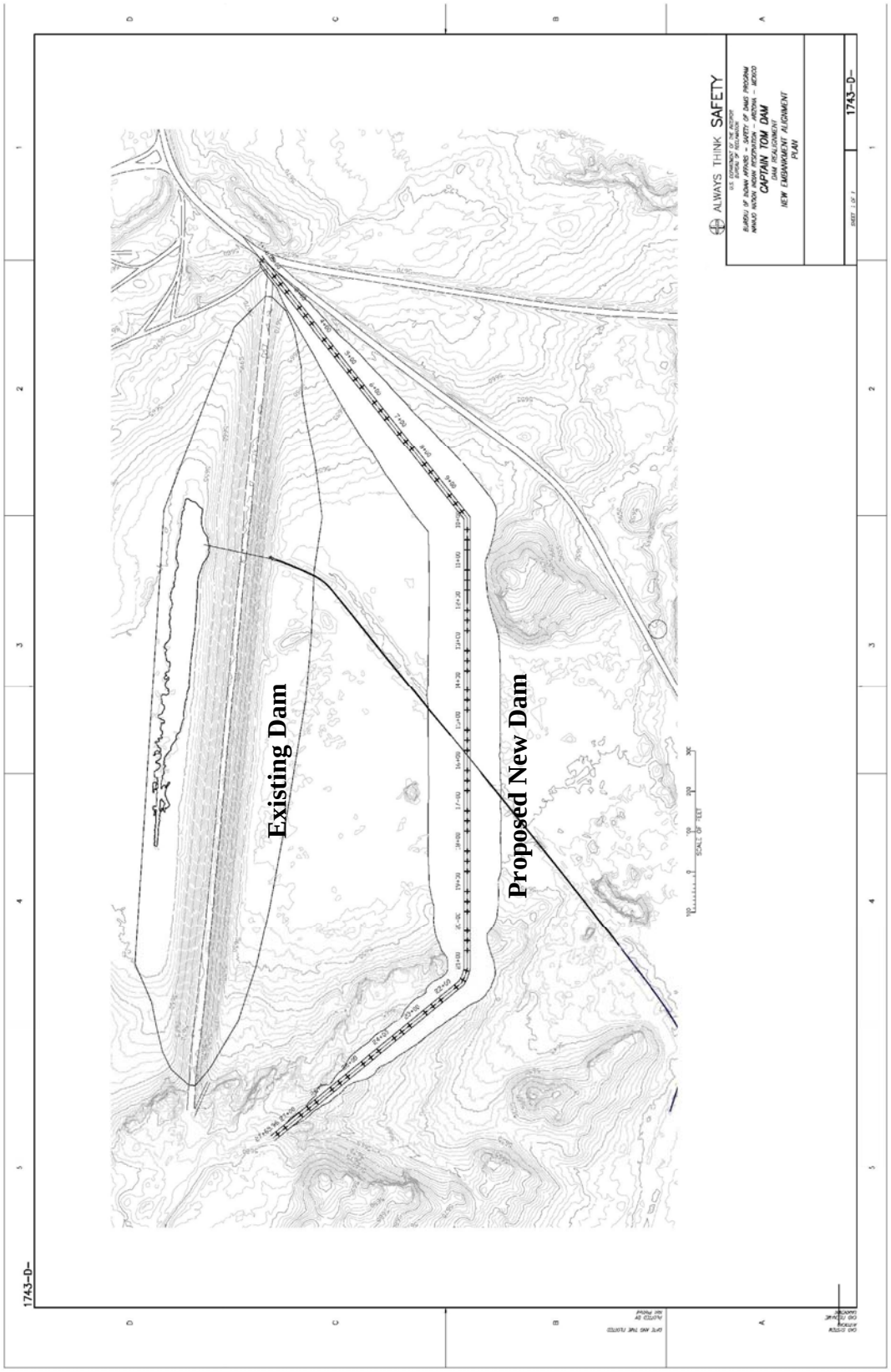
# APPENDIX A

## Proposed Location of New Captain Tom Dam (Preferred Alternative)


Existing Dam
Proposed New Dam
ALWAYS THINK SAFETY
CAPTAIN TOM DAM
DAM REALIGNMENT
NEW EMBANKMENT ALIGNMENT
PLAN
1743-D-

# APPENDIX B

## Navajo Nation Species of Concern Memorandum
## Navajo Nation Fish and Wildlife Department