BUREAU OF RECLAMATION

Draft Environmental Assessment

Fresno Dam-Safety of Dams Modification

Milk River Project, Montana

Montana Area Office - Missouri Basin Region

U.S. Department of the Interior August 2021

Mission Statements

The Department of the Interior (DOI) conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

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.

Fresno Dam- Safety of Dams Modification

Draft Environmental Assessment

Milk River Project, Hill County Montana

The 30-day comment period will start on August 4, 2021 and end September 2, 2021

Electronic comments may be submitted to BOR-sha-MTA-FEACOMMENTS@usbr.gov

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Acronyms and Abbreviations

APE	Area of Potential Effect
BMP	Best Management Practice
CAA	Clean Air Act
CAS	Corrective Action Study
CFR	Comprehensive Facility Review
cfs	cubic feet per second
CWA	Clean Water Act
DEQ	Montana Department of Environmental Quality
DSPR	Dam Safety Priority Rating
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
GHG	Greenhouse gas
IDF	Inflow Design Flood
ITAs	Indian Trust Assets
M&I	Municipal and Industrial
mph	miles per hour
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Properties Act
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance
PA	Programmatic Agreement
PAR	Population at Risk
PL	Public Law
PM	particulate matter
PMF	probable maximum flood
P&G	Principles and Guidelines
PPG	Public Protection Guideline
Reclamation	Bureau of Reclamation
RWS	reservoir water surface
SEED	Safety Evaluation of Existing Dams
SHPO	State Historic Preservation Officer
SOD	Safety of Dams
SWPPP	Storm Water Pollution Prevention Plan
TMDL	total maximum daily load
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

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Introduction

The United States Department of the Interior, Bureau of Reclamation (Reclamation) is responsible for ensuring that its facilities do not present unreasonable risks to the public, public safety, property and/or the environment. Reclamation has determined that safety deficiencies exist at the Milk River Project's Fresno Dam. In accordance with the requirements of the National Environmental Policy Act (NEPA) this Environmental Analysis (EA) evaluates the effects of undertaking corrective actions to reduce safety risks at Fresno Dam as part of Reclamation's Dam Safety Program.

The Milk River Project

The Milk River Project (Project) was conditionally approved on March 14, 1903 by the Secretary of the Interior under the Reclamation Act (1902 Public Law 57–161). The Project includes three storage reservoirs: Lake Sherburne, Fresno, and Nelson. Spanning both the St. Mary River and the Milk River basins, Reclamation's Project facilities in both basins are presently operated as a synchronized system. Fresno Dam impounds the Milk River forming Fresno Reservoir and is owned, operated, and maintained by Reclamation.

Fresno Dam, the main water storage facility for the Project was approved by the President in August 1935 under the National Industrial Recovery Act. Authorizing legislation is an important consideration in Reclamation projects because it states the authorized project purpose and determines the use of storage water and the limits within which a federal facility can be operated.

Construction of Fresno dam began on March 29, 1937 and was completed December 13, 1939. The contract was awarded to the low bidder in the amount of $980,804, plus numerous change orders for additional work. At the time wages averaged from .50 cents per hour for labor to $1.20 per hour for skilled labor. The US Government furnished all materials entering into and becoming part of the completed construction work.

This portion of the Milk River drainage in northcentral Montana is known as the "Hi-Line," the Hi-Line runs east-west across the northern part of Montana defined by the Burlington Northern Santa Fe (BNSF) rail line and State Highway 2. This is a region of rolling prairies, agriculture fields, and large herds of cattle. See Figure 1, Project location map.

Figure 1 - Project Location Map

Fresno Dam and Operations

Fresno Dam is located on the Milk River, in the SE1/4 Section 19, Township 33 North, Range 14 East, in Hill County, 14 miles west of Havre, Montana.

The dam is a homogenous (clay, sand, and gravel) earth fill dam with a structural height of 110 feet, a crest width of 22 feet, and crest length of 2,070 feet. The reservoir has a storage capacity of 91,746 acre-feet (AF) at normal water surface elevation 2,575 feet, with 21 feet of freeboard. The upstream face of the dam is protected by 24 inches of imported riprap placed on 12 inches of gravel bedding. The downstream face is covered by 12 inches of grass-covered fine rock and gravel material. A rockfill section, with the upper surface at elevation 2,540, approximately 130 feet wide is located along the downstream toe. A seepage cutoff trench in the alluvial foundation soils is present under the upstream slope.

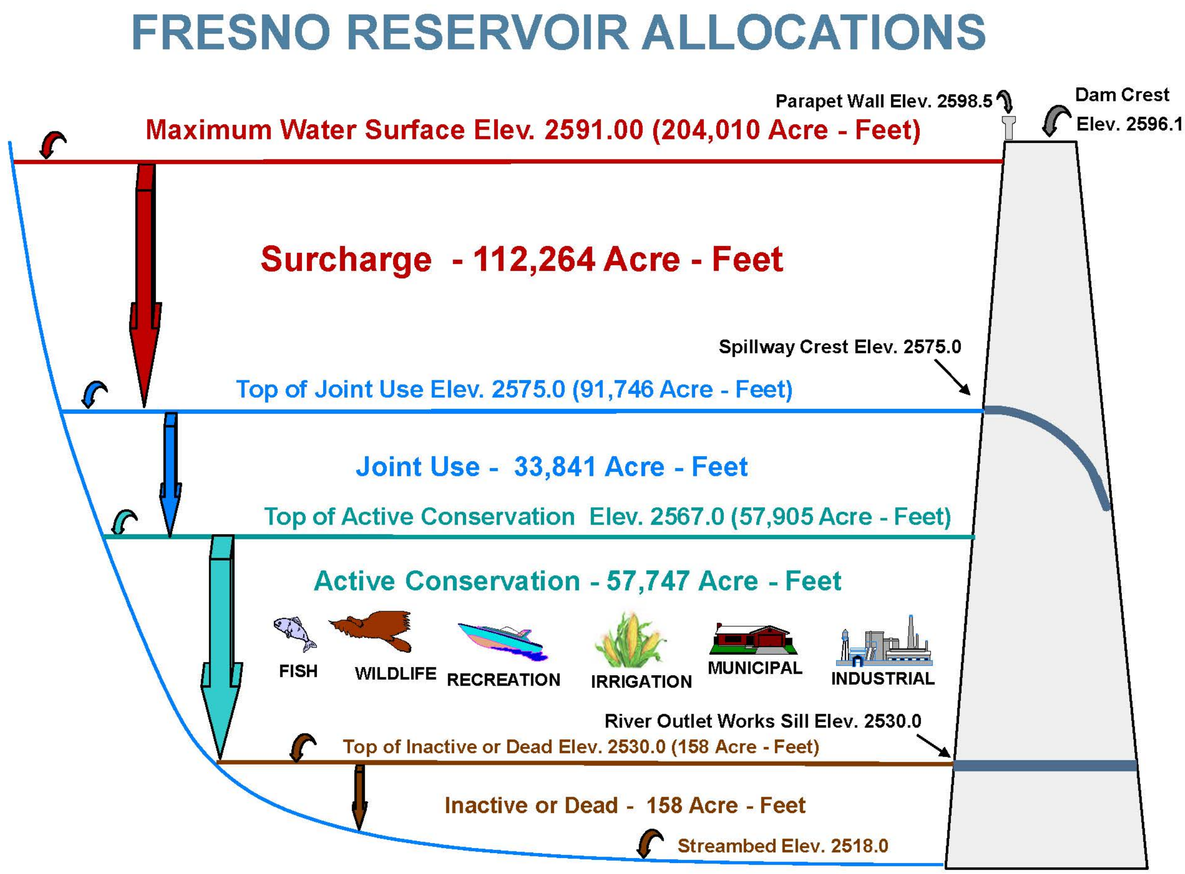
The spillway is located near the left abutment (right and left abutments are designated as one looks downstream) and consists of a riprap-lined inlet channel, a concrete overflow crest structure, a concrete chute and stilling basin, and a riprap-lined discharge channel to the river. The chute varies in width from 201 feet at the crest structure to 190 feet at the stilling basin. The uncontrolled spillway crest has a length of 210 feet at elevation 2,575 feet. The crest of the dam is paved and serves as public access between US Highway 2 and Montana state highway 232; a steel truss bridge provides access over the spillway.

The outlet works consist of an intake structure with a trash-rack; a 12-foot diameter, 475-feet-long concrete-lined tunnel leading to a gate chamber; two, 6-foot diameter, 290-foot-long welded steel outlet pipes within the tunnel; and a valve house. Flow from the intake passes through the concrete tunnel where it bifurcates at the gate chamber into the welded steel outlet pipes. The outlet works have a capacity of 2,180 cfs at a reservoir elevation of 2,575 feet. Flow through the outlet pipes is discharged into the stilling basin, and controlled by two, 5-foot-wide by 6-foot high, high-pressure sluice gates contained in the valve house.

The embankment has experienced large foundation settlement up to about ten feet during and after construction. The settlement is a result of compression of the alluvium and low strength Judith River Formation beneath the dam. In 1939, transverse cracks were observed in the downstream slopes near the dam abutments. The dam crest was modified after construction to compensate for the settlement and raising the crest to the design elevation. Otherwise, Fresno Dam has performed satisfactorily since it's construction.

Reclamation operates the Fresno Dam and Reservoir primarily for irrigation storage and municipal water supply, with some storage used for flood control benefits at downstream Fort Peck Reservoir (Figure 2). The 1957 agreement with the US Army Corps of Engineers (USACE) states that "the reservoir water surface elevation at the beginning of the spring runoff shall not be higher than elevation 2567 feet (8-feet below the spillway crest), and that "releases from the reservoir during seasons of ice cover on the Milk River downstream of the dam shall be maintained at a relatively constant rate." This flood control target elevation allows for 32,534 AF of storage space available for anticipated spring runoff. Operation of the joint use storage space provides both conservation use and flood control.

Figure 2: Fresno Reservoir Allocations



Each year irrigation allotments and release schedules are set by the Milk River Joint Board of Control (Joint Board). Regulation of the reservoir and corresponding water releases are made in accordance with operating plans developed based on forecasted and actual inflows and weather information. Typically, in March or April, during peak runoff in the basin, releases from Fresno Dam are set to minimize flooding downstream and maintain storage in Fresno Reservoir at or below the normal full pool elevation of 2,575 ft. Mean monthly discharges for this period generally range from about 160 cfs in March to 300 cfs in May. Once the peak runoff event has ended and reservoir elevations decrease below normal full pool, the dam is operated to release flows to meet the irrigation demands set by the Joint Board. Typically, in September, when the irrigation season ends, the available storage in Fresno Reservoir is evaluated. Water in excess of 50,000 AF may be transferred downstream to Nelson Reservoir. During the non-irrigation season, a minimum release of 25 cfs from Fresno Reservoir is maintained to provide contracted water for the municipalities downstream and mixing flows for treated wastewater that is discharged into the Milk River; however, because of the gate configurations, the minimum flow typically ranges from 40 to 50 cfs.

The Project supplies water to irrigation districts, individual irrigators, and communities pursuant to contracts with Reclamation, subject to the availability of water. The lands extend about 165 miles along the river from near Havre to a point six miles below Nashua, Montana. Diverted water irrigates approximately 140,000 acres of Project lands. This water is used for irrigation water, drinking water, recreation, wildlife habitat, and is considered the "Lifeline of the Hi-line."

Standard Operating Procedures

Each Reclamation high and significant hazard dam (and related facilities) have specific operating practices and procedures (FAC TRMR-66), the specifications are known as standard operating procedures (SOP). The SOP is a comprehensive single-source document that covers all aspects of dam and reservoir operations and maintenance (O&M) and emergency procedures. This framework ensures the operational reliability, structural integrity, and safe operation of Reclamation facilities. Within the SOPs, emergency action plans (EAP) are a formal plan of procedures developed to help protect the public and property located downstream of the dam in the event of a dam failure or other unusual occurrence. Per the Fresno Dam EAP, the general sequence of actions in the event of an emergency include:

1. Evaluate the abnormal event using the hazard analysis protocol.
2. Determine the appropriate response level.
3. Utilize the appropriate emergency response procedure(s).

The Montana Area Office Facility Operations and Maintenance Division is responsible for notifying downstream authorities when releases or natural flows are expected to approach channel capacity/bankful stage. Those entities include County, State, Tribal, and Federal management agencies, local leaders, and emergency response organizations (law enforcement, public works, health, and medical services, etc.).

Reclamation Safety of Dams

The Safety of Dams Act (Act, Public Law 95-578, as amended) established a dam safety program to ensure Reclamation dams do not present unacceptable risk to people, property, and the environment. The Safety of Dams Act provides the legal structure for operation and maintenance (O&M) of Reclamation dams

Dams must be operated and maintained in a safe manner, ensured through inspections for safety deficiencies, and examinations utilizing current technologies. The Dam Safety Public Protection Guidelines provide procedures for evaluation of dam safety risks at high or significant hazard dams. Reclamation uses risk to make informed dam safety decisions. A Dam Safety Priority Rating (DSPR) is given to each facility to provide a means for Reclamation to establish the urgency of risk management activities and the relative priority of these actions within Reclamation's inventory.

Reclamation began analyzing the potential failure modes related to internal erosion resulting from historic differential settlement at Fresno Dam in 2013. Analysis efforts included crack exploration trenches, geotechnical data collection, site topographic surveys, numerical modeling, a Consultant Review, and risk analysis.

Proposed Federal Action

The Bureau of Reclamation proposes to correct unsatisfactory dam safety conditions at Fresno Dam by constructing a state-of-the-practice embankment overlay on Fresno Dam that would include a vertical sand filter and new toe drainage system.

Purpose and Need

The purpose of the Proposed Federal Action is to maintain the authorized Project purposes while correcting safety deficiencies at Fresno Dam. To meet this purpose, a Corrective Action Study (Fresno CAS-Reclamation 2019) was completed that identified actions needed to reduce the risk of dam failure below Reclamation's Public Protection Guidelines (PPGs).

Based upon Reclamation's SOD evaluations, Fresno Dam is classified as a DSPR 2 (urgent priority) risk facility. DSPR 2 facilities have very high risks or likelihoods of failure but do not pose "imminent" danger. Taking corrective actions would serve the following purposes:

- Downgrade the DSPR 2 rating at Fresno Dam to an acceptable level that would meet Public Protection Guidelines, as well as the Safety of Dams Act, and other Federal Guidelines.
- Correct the existing deficiencies of the 80+ year old dam through modern engineering design and techniques.
- Maintain secure water supply deliveries to the Milk River valley in northcentral Montana.

Overall, the Proposed Federal Action is needed to meet Reclamation's duty under the Safety of Dams Act to ensure that Fresno Dam does not present unreasonable risks to people, property, and the environment.

Alternatives

This section describes all practical and reasonable alternatives developed to meet the purpose and need, as defined in the previous section. The alternatives were developed according to the NEPA §102(2)(E) requirements, which directs Federal agencies to "study, develop, and describe appropriate alternatives to recommend courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources."

This EA evaluates alternatives developed as a part of a planning study consistent with the Department of the Interior Agency Specific Procedures for implementing the Council on Environmental Quality's Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies (PR&G-United States Department of the Interior 2015), Reclamation directives and standards, local agency guidance, applicable environmental laws, executive orders, and policies.

A team comprised of personnel from Reclamation's Dam Safety Office, Technical Service Center, Missouri Basin Regional Office, and the Montana Area Office completed the identification of potential corrective action alternatives, preliminary designs, and estimates of each alternative in accordance with Reclamation Policy (FAC-P02) and the Interim Dam Safety Public Protection Guidelines *(*August 2011*)*. In addition, a Consultant Review Board contributed subject matter expertise through a comprehensive review of decisions and actions at critical phases of the project.

A decision matrix was used to evaluate, measure and weigh issues and concerns to determine the alternative(s) that best fit the purpose and need of the proposed action. Each alternative was evaluated for the following:

- Critical Items to Consider
- Ways to Implement
- Potential Risks
- Advantages
- Disadvantages

Following the decision matrix evaluation, a basic function analysis was preformed to determine which functions are necessary to meet the purpose of the project. The functions were then used to generate a Function Analysis System Technique (FAST) diagram to describe the solution from a functional point of view. The combined process helped to identify alternatives carried forward for analysis or eliminated from detailed consideration.

The No Action Alternative and the Proposed Action Alternative analyzed in this EA are described below. Alternatives were eliminated from further consideration if they did not meet the Project's purpose and need, would require excessive cost expenditures, or would have substantial adverse environmental effects. Alternatives considered, but eliminated from detailed study are briefly described at the end on this section

No Action Alternative

The No Action Alternative serves as a baseline from which to measure benefits and impacts to the human environment that may occur as a result of the Proposed Action Alternative. The baseline refers to the existing condition, including past, present, and ongoing activities or actions in the project area. This includes original construction of the Fresno Dam and Reservoir that occurred in the late 1930s to present day activities; either natural or human caused.

Under the No Action Alternative, there would be no changes to the dam or how it is operated. Consequences of taking No Action could result in continued internal erosion and increased settlement of the foundation. The SOD Program focuses on evaluating and implementing actions to resolve safety deficiencies at Reclamation dams. Based on technical evaluations, there is high confidence that the total risk for Fresno Dam in its current condition is above Reclamation's PPGs.

Proposed Action Alternative

Under the Proposed Action Alternative, the existing Fresno Dam would be modified to correct safety deficiencies in accordance with the SOD program guidance and CAS recommendations. These actions would include installation of a state-of-the practice sand filter and toe drain system with an embankment fill overlay on the downstream slope of the dam and a vertical sand filter trench in the bottom of the excavation. Removing the existing toe drain and installing a vertical sand filter trench in the bottom of the excavation would reduce the risk of potential failure modes (PFM) associated with internal erosion through the foundation. See figure 3, Extent of Project Construction for a detailed map of the project area.

A high-density polyethylene (HDPE) pipe (toe drain) would be placed in a trench at the bottom of the excavation and embedded in a gravel envelope. The filter sand and drainage gravel layers would be overlain with common fill to provide sufficient weight to resist uplift pressures. Construction of the downstream filter, drain, and buttresses would connect the filter drain to the right spillway wall to protect against seepage and erosion paths adjacent to the wall.

The Proposed Action Alternative would require a three-year construction period with a reservoir restriction to elevation 2,555 for a 1.5-month period spanning approximately August 15 to October 1 during construction. The reduced reservoir level would allow for excavation on the spillway and protect from potential erosion. Excavation adjacent to the spillway would be required for placement of the sand filter, toe drain, and associated components (manholes, cleanouts, etc.).

A full road closure of Fresno Reservoir Road across the spillway bridge would be needed during the spillway excavation (approximately 1.5-months). Thereafter, the road would be reduced to one-lane traffic for the duration of construction and project restoration. Additional temporary restrictions may apply if weather conditions, traffic, or other issues arise during construction. A traffic control plan would be in place for the duration of the project.

The Proposed Action Alternative would:

- Maintain the authorized Project purposes.
- Reduce the annualized failure probability and annualized loss of life below PPG guidelines.
- Modernize the existing dam by providing a state of the practice sand filter to protect against internal erosion and provide a filtered exit.
- Reduce the risk of static and hydrologic PFMs associated with internal erosion through the embankment and along the right spillway wall.
- Provide additional defensive measures against damage caused by earthquakes, thereby reducing seismic risks from current estimates.

The robust filter and drain system would provide a controlled exit for seepage through the dam and protect from additional settlement that might occur.

Principle features of the Proposed Action Alternative include the following:

- Worksite preparation
- Installing and operating dewatering systems

- Excavating existing dam embankment
- Construction of a vertical sand filter trench supported with bio-polymer slurry
- Installation of geotextile material
- Installation of a sand filter and gravel drain
- Construction of cast in place concrete support bases for toe drain access manholes
- Installation of access manholes and cleanouts
- Installation of HDPE toe drainpipes
- Excavation, screening, and delivery of borrow material for the embankment overlay
- Construction of a new filter and drain embankment overlay
- Installation of sediment traps and weir boxes
- Restoration of all ground disturbance within the construction use area
- Placement of asphalt pavement along the dam crest and other damaged areas

Specific actions include the following:

Site Preparation and Restoration

The downstream slope would be stripped of topsoil and vegetation. The earth blanket, rockfill zone, existing gravel blanket drain, and the foundation soils beneath the blanket would be excavated to an elevation of 2,515 feet. This would leave the main compacted embankment zone relatively intact. Topsoil would be stockpiled for use following construction. Following construction, the contractor would be required to restore all disturbed areas, including temporary staging and stockpiling areas, borrow areas, haul roads, and abandoned road segments.

Excavation

The Proposed Action Alternative requires excavation along the spillway wall to ensure the filter is tied into the spillway wall and abutment. To reduce the impacts to water deliveries, excavation and construction of the spillway wall should be timed to coincide with times of regularly occurring low reservoir levels and low flood risk (fall and early spring). This provides more flexibility during construction (timing of completing the spillway tie-in, timing of installing the dewatering system, etc.) and allows some activities to be completed during the winter.

Reservoir Restrictions

Excavation of the compacted embankment next to the spillway wall would require the reservoir to be at an elevation below 2,555 feet. The volume of excavation material is minor and could coincide with times when the reservoir is typically low. A minimum reservoir elevation of 2,547 is required by October 15 to maintain a minimum fall and winter release to the Milk River to provide municipalities with a water supply. It is estimated that the reservoir restriction to below 2,555 feet would be for 1.5 months during excavation of the spillway wall. Reservoir restrictions would not be necessary during most of the construction period.

Dewatering

Dewatering of the dam foundation and Judith River formation is a critical part of the Proposed Action Alternative. Dewatering is necessary for excavation stability and toe drain installation. Three phase power would be brought to the site to operate the dewatering system; however, the dewatering system would require several large generators and dedicated maintenance staff to ensure consistent operations. A reliable dewatering system is important to help maintain temporary slope stability of the embankment during excavation.

Biopolymer Filter Trench

A vertical sand filter trench would be constructed through the foundation to reduce the risk associated with internal erosion beneath the embankment. The vertical trench would be supported with bio-polymer slurry and backfilled with filter sand. The function of the bio-polymer slurry is to impose shear strength (viscosity) and density on the trench walls to exert hydrostatic pressure and prevent caving during excavation.

Bio-polymers are high molecular weight, organic chemicals that swell in water and increase the viscosity of the water. Degradable biopolymer slurry is designed to revert either naturally, or with the addition of chlorine or hypochlorite solutions, to the viscosity of water so that it can drain naturally out of the trench or be recovered.

Spillway Bridge

The spillway bridge has no load rating restrictions and is safe for all legal highway loads. The bridge is a one lane bridge and has maximum vehicle dimensions of 14 feet-3 inches high and 18 feet-6 inches wide, which limits the use of large off-highway haul equipment. The asphalt surface would be repaired from highway to the dam upon completion of construction.

Staging Areas

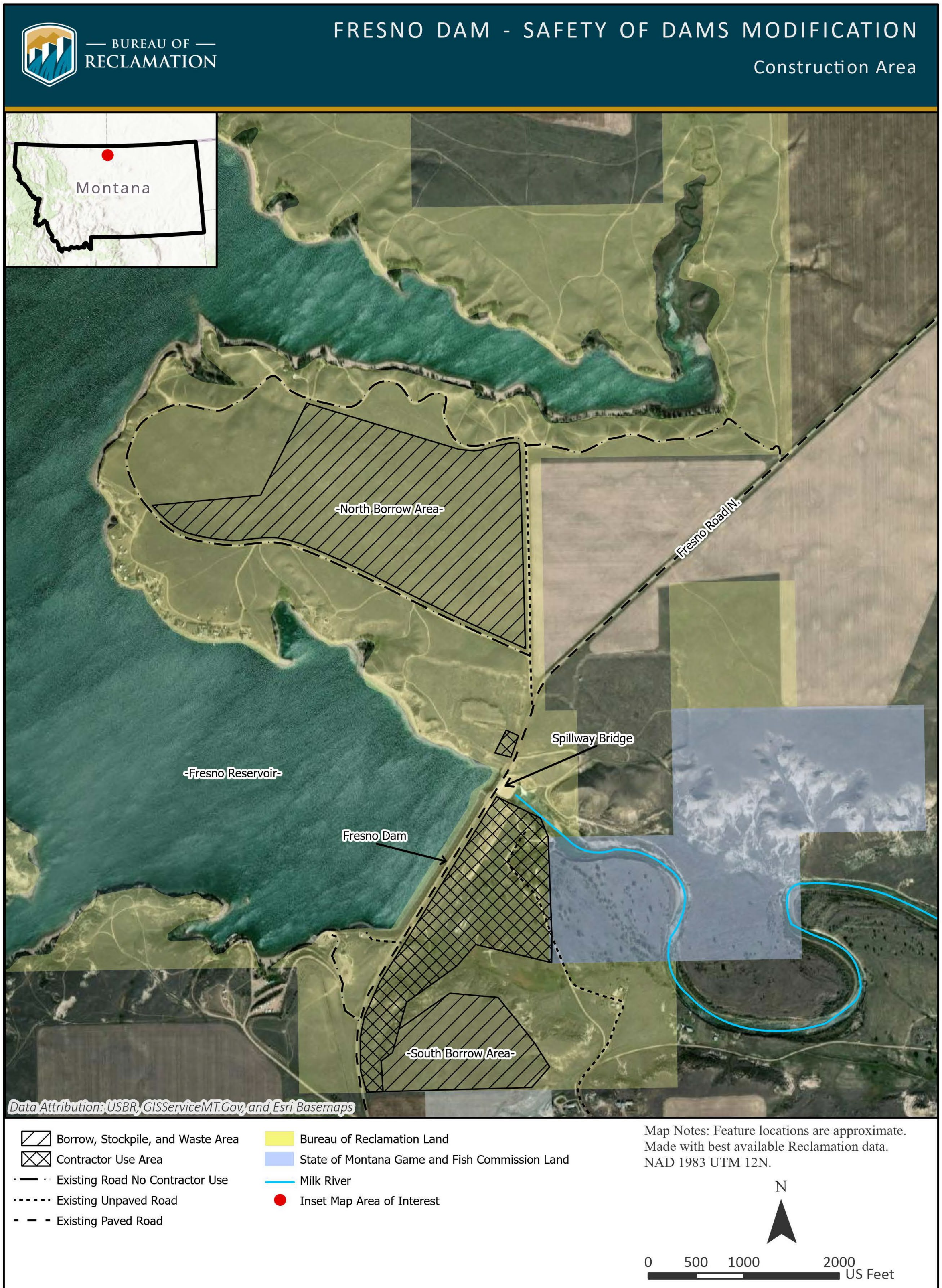
Land near the dam's abutments and along the toe of the dam would be needed for staging equipment, materials, and construction buildings. It is anticipated that the construction offices would be located on top of the right abutment. Most of the equipment and stockpiled materials will be staged along the downstream toe borrow and stockpile areas

Two areas are identified (North and South) for potential borrow, stockpile, and waste areas (not all areas may be used). The borrow area would be stripped to approximately 1-foot below the surface. The buttress material would potentially come from the south borrow area located less than a mile from the right abutment. The rockfill excavations would require stockpiling of materials. Reclamation-owned land at the downstream toe of the dam would likely accommodate the amount of area needed for stockpiling rock.

Minimization Measures

The use of minimization measures would be implemented to minimize impacts associated with the short-term modification/disturbance.

Figure 3: Extent of Project Construction



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Alternatives Considered, but Eliminated from Detailed Study

The Fresno Dam – Dam Safety Advisory Team was tasked with reviewing potential alternatives that would meet the purpose and need for the proposed project. The Value Planning Study identified five structural modification alternatives for feasibility-level development. Four of the five (one dropped) structural alternatives were carried forward to feasibility-level design. The three structural modification alternatives that were not selected as the preferred alternative are listed below.

1. Sand Filter, Gravel Drain, and Buttress Fill:

   Due to the risk of slope instability and intercepting potential cracks through the embankment after excavation, the reservoir would be lowered to dead pool. This alternative would limit water storage over the first construction season and significantly reduce the water storage capability the second season. This alternative would result in the greatest net increase of weight on the foundation and would result in the most additional settlement.

2. Geomembrane Cutoff Wall within a Biopolymer Filter Trench from the Crest of the Dam:

   There is no reliable way to ensure that the geomembrane is not damaged, continuous, and seated in the bottom of the trench. Furthermore, fitting the geomembrane wall to the irregular sandstone at the abutments would be difficult. Cut-off walls are not as effective as sand filters, usually costlier, and potentially risky during construction.

3. Cement Bentonite Cutoff Wall through the Crest of the Dam:

   Construction of a stem wall to connect the cement bentonite cutoff (CB) wall would require substantial excavation of the dam's crest adjacent to the spillway. Construction of the CB wall would include demolition and reconstruction of the parapet wall. In addition, reconstruction of the crest would take significant time and likely would not start until after construction of the CB wall.

Two non-structural alternatives were also evaluated:

1. Dam Breach:

   The dam breach would result in the loss of all project benefits including irrigation storage, flood control, wildlife habitat, and recreation. The breach alternative would affect a large area of land by releasing large amounts of sediment. In addition, flooding conditions could affect downstream populations.

2. Permanent Reservoir Restriction:

   The permanent reservoir restriction would limit the reservoir to dead pool. This would require sediment removal and revegetation of a large percentage of the current reservoir area. This alternative would negatively affect authorized Project purposes, wildlife habitat, downstream water quality, and recreation.

Affected Environment and Environmental Consequences

This section describes the existing conditions and potential impacts to resources potentially affected by the Fresno Dam Modification project. The affected environment includes the existing communities, land, water, and biological resources that might be affected. Only those resource areas that would potentially be affected by the Proposed Action are discussed in detail.

The area of potential impacts (affected area) is resource-specific and is defined in each individual resource discussion. The boundary of the affected area for each resource extends to where effects can be reasonably and meaningfully measured. Each Alternative is comparatively evaluated against each environmental resource to describe potential impacts. Direct impacts would generally occur within the Project Area footprint; however, some impacts (indirect) may occur on a broader scale.

The following resources potentially affected by the Proposed Action discussed in this document include:

- **Economic and Social Factor**s
- **Geology and Soils**
- **Hydrology**
- **Climate**
- **Lands and Vegetation**
- **Air Quality and Noise**
- **Recreation**
- **Fish, Wildlife, Aquatic Invasive, and Avian Species**
- **Cultural and Paleontological Resources**
- **Indian Trust Assets**

Economic and Social Factors

The area of analysis for economic and social factors, including environmental justice, includes the counties of Hill, Blaine, Phillips, and Valley, the Milk River Water Users, and other entities. The four-county area includes eight irrigation districts, individual river pumpers, and the Fort Belknap Indian Irrigation Project. The Bowdoin National Wildlife Refuge, and various natural resources such as fish, wildlife, and vegetation benefit from the diverted water. In addition, Fresno Reservoir provides flood control for downstream Fort Peck Reservoir. Table 1: Project Water Beneficiaries provides a list of entities who benefit from Project water.

Table 1: Project Water Beneficiaries

Municipal	
City of Chinook	City of Havre
Hill County Water Supply	North Havre County Water District
Grandview Cemetery Association of Saco	City of Harlem
GSA – Piegan Border Station	
Irrigation	
Malta Irrigation District	Glasgow Irrigation District
Dodson Irrigation District	Fort Belknap Irrigation District
Alfalfa Valley Irrigation District	Zurich Irrigation District
Paradise Valley Irrigation District	Harlem Irrigation District
Individual Pump Contractors	Fort Belknap Irrigation Project
Wildlife	Bowdoin National Wildlife Refuge
Flood Control	Fort Peck Reservoir

Population of the Four County Area

Havre, Montana is the county seat of Hill County and Montana's eighth largest city, with an estimated population of 9,791 (2019). Havre is the nearest population center to Fresno Dam and the economic hub of the area. Blaine, Phillips, and Valley Counties also benefit from Milk River water. The combined estimated 2019 population of Hill, Blaine, Phillips, and Valley Counties (US Census) was 34,515. All lands that receive Project irrigation water are referred to as Project-irrigated lands. The Project-irrigated lands fall within the four-county area identified above, and in Table 2 below.

Table 2: Four County Economic Statistics

County	Hill	Blaine	Phillips	Valley
Population (2019)	16,484	6,681	3,954	7,396
Median Household income (2015-2019)	$49,321	$41,279	$46,212	$53,162
Poverty Level	15.7%	21.3%	14.3%	12.8%
American Indian	24.9%	50.6%	9.6%	9.2%
White alone	70.5%	47.5%	85.4%	86.5%
Owner Occupied Housing	61.8%	58.0%	77.1%	74.9%
Employment (2018)	5,032	991	818	2,168

US Census Bureau QuickFacts 2021

The total population for the State of Montana was 1,068,778 in 2019. The median household income (2019) for Montana was $54,970, and the overall poverty rate was 12.6%. In comparison median incomes of the four-county area are well below the State average. Hill, Blaine, and Phillips Counties are all below the poverty rate for the state of Montana, while Valley County is just below the state average.

Environmental Justice

Environmental Justice (E.O. 12898) refers to the fair treatment and meaningful involvement of all people regardless of race, color, national origin, culture, education, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no group should bear a disproportionate share of negative impacts.

Low-income populations are identified by several socioeconomic characteristics. Table 2 provides income, poverty, ethnicity, employment, and housing information for each county in the potential area of impact.

Repayment Contract

In accordance with the Safety of Dam Act of 1978 (Public Law 95-578), as amended, the Project water users are responsible for repayment of the reimbursable costs accrued due to SOD modifications at Fresno Dam. Irrigation and M&I water supply are the SOD-reimbursable purposes for the Project and, therefore, repayment of the 15 percent cost share is to be allocated between these purposes proportional to net present benefits. The total cost of this SOD modification project is estimated at approximately $71 million dollar construction cost, making the reimbursable portion of the project about $10.7 million.

Dam Benefits

Dam Benefits are the present value benefits or the replacement cost of services the dam provides, as identified in Table 3:

Table 3: Total Benefits Provided by Fresno Dam and Reservoir

Project Purpose	Annual Project Benefits (Million-2019 $'s)	Present Value (Million $'s)[a]
Irrigation water supply	$1.2	$32.3
M&I water supply	$0.5	$12.9
Recreation	$1.1	$27.9
Flood control	$0.6	$16.2
TOTAL	$3.4	$89.3

[a] Calculated over a 50-year planning horizon using the FY2019 Planning Rate of 2.875 percent.

Irrigation Water Supply

Delivery of water for agricultural irrigation is a major purpose of most dams and reservoirs. In addition, irrigation generally increases the productivity rating of the land. The type of soil becomes less important to production as the amount, quality, and consistency of irrigation increases. For example, irrigated hay land typically produces two to three cuttings annually, while non-irrigated hay land generally receives only one cutting per year. In Montana, irrigated land must be valued at or above the value it would have if it wasn't irrigated (15- 7-201, MCA).

The 2018 Hydrological analysis for Fresno Reservoir was used to evaluate the difference between historic irrigation releases from Fresno Reservoir and irrigation releases that could be made with a reservoir elevation restriction of 2,530 feet. The months of interest in this analysis were April through September, for a 30-year period (1988-2017) to provide a variety of hydrologic conditions.

The difference between historic irrigation deliveries and irrigation deliveries when restricted to elevation 2,530 feet averaged 49,100 AF per year for the 30-year period. This is the amount of water Fresno Dam provides for irrigation on average.

Some entities are part of the Joint Board—a body consisting of representatives from the eight irrigation districts that work with Reclamation to develop annual O&M plans and in setting annual water allotments. The Joint Board is the umbrella organization for the state-chartered irrigation districts that receive Project water. The Joint Board performs much of the maintenance on the conveyance system in cooperation with Reclamation.

Entities that irrigate agricultural lands with Project water are classified into five general categories as depicted in Table 4.

Table 4: Project Irrigators and Irrigated Lands

Irrigators	Irrigated Acres
1. IRRIGATION DISTRICTS (Joint Board))	101,134
Malta	44,844
Glasgow	18,011
Harlem	11,148
Paradise Valley	8,315
Zurich	7,664
Fort Belknap	6,482
Alfalfa Valley	3,664
Dodson Pumping Unit	1,006
2. DISTRICT PUMPERS	559
Glasgow	327
Malta	232
3. RIVER PUMPERS	8,211
~150 Contracts with Reclamation	8,211
4. PRIVATE LAND IRRIGATORS	25,000
Water rights held with the State of Montana	25,000
5. INDIAN RESERVATIONS	5,500
Fort Belknap Indian Reservation	5,500
Total Joint Board Project-irrigated lands	101,693
Total non-Joint Board Project Irrigated lands	38,711
GRAND TOTAL PROJECT-IRRIGATED LANDS	140,404

Reclamation Benefits Analysis & Repayment. Reclamation 2019

M&I Water Supply

M&I water supply is defined by Reclamation as, "The use of contract water for municipal, industrial, and miscellaneous other purposes not falling under the definition of 'irrigation use' or within another category of water use under an applicable Federal authority." M&I water supply is further defined as the use of contract water that is not used to irrigate land primarily used to produce agricultural crops or livestock.

M&I water supplies are delivered to cities, towns, industries, and other entities for various purposes such as drinking water, lawn application, and cooling water. Fresno Reservoir provides municipal water to the communities of Havre, Chinook, and Harlem, along with other M&I uses.

On average, Project M&I users divert 2,079 AF of water annually (2004-2017). The economic benefit of water is measured in terms of willingness to pay, or the dollar amount that an entity is willing to pay to use Project water. The willingness to pay for Project water is based on the quantity of water available and demanded for water at a certain price level. The present benefit of water is calculated over a 50-year planning horizon, using a rate of 2.875 percent, total Project benefits are shown in Table 5.

Table 5: Total M&I benefits provided by the Project

Annual M&I diversions (AF)	Annual gross benefits per AF	Annual M&I benefits	Present M&I benefits
2,079	$236.26	$491,185	$12,944,000

Recreation/Tourism

Fresno Reservoir serves as a major source of recreation in northcentral Montana. The six primary recreation activities at Fresno Reservoir include fishing, boating, camping, picnicking, wildlife viewing, and hunting. Based on the recreation activities, facilities at the reservoir provide campgrounds with handicap accessible restrooms, concrete boat ramps, picnic shelters, and swimming beaches.

Fish and wildlife benefit from the stored water in the reservoir, as well as diverted water that provides forage for terrestrial species. In turn fish and wildlife species provide food and recreation for locals and visitors to northcentral Montana. Visitors from outside the region are especially important for the local economy because they bring in money in that would otherwise be spent elsewhere.

Table 6: Consumer Surplus per Recreation Day

Recreation Activity	Participation Rate	Consumer Surplus per Recreation Visit
Fishing	75%	$49.12
Boating	5%	$67.82
Camping	5%	$44.01
Picnicking	5%	$39.13
Wildlife Viewing	5%	$41.37
Hunting	5%	$68.03
Consumer surplus of a "typical" visitor day		**$37.39**

Fresno Dam SOD Economic Benefit Analysis (Reclamation 2019).

Fresno Reservoir supports an average of 24,175 angler days annually (2007-2015). Each recreation visit has a net consumer surplus of $37.39 (2018 dollars). Multiplying the number of angler days (24,175) by $37.39 yields a net recreation benefit of more than $0.9 million annually (2018 dollars).

Flood Control

The 1957 agreement between Reclamation and the USACE provides for flood control (under Sec. 7 of the Flood Control Act of 1944). Fresno Reservoir stores water that could contribute to downstream flooding on the Milk River and downstream on the main stem of the Missouri River below Fort Peck Reservoir, during certain hydrologic conditions.

Fresno Reservoir has 33,841 AF allocated to joint-use storage which is used for flood control as well as irrigation and other conservation uses. Flood control benefits, calculated annually by the USACE, estimates economic impact associated with flood prevention. From 1951 to 2017, Fresno Dam and Reservoir has provided an accumulated $20 million in unadjusted flood control benefits.

No Action Alternative

Without the proposed structural modifications, dam failure could occur. Consequences of dam failure can include loss of life, property damage, lost benefits, significant economic impacts, and environmental damages. Results of large downstream flows include the release of reservoir sediment and a near complete loss of irrigation water.

Failure of Fresno Dam would place approximately 9,791 (2019 population of Havre, MT) people at immediate risk. Downstream property and infrastructure damages would occur, plus loss of revenue in the form of jobs, crops, and other production. Failure of Fresno Dam could impact the performance of the Nelson, Dodson, Vandalia, and Paradise Diversion Dams, the Dodson Pumping Plant, and other appurtenant structures downstream within the Project system. Project lands extend approximately 165 miles downstream along the river from near Havre to six miles below Nashua, MT.

Given the potential severity of consequences in terms of loss of human life, lost benefits, and property damage that could result from the failure of Fresno Dam, the categories of impacts for analysis of the No Action Alternative are:

- Population at Risk of Dam Failure- potential loss of life because of dam failure.
- Downstream Property Damages – the costs of the downstream damages produced by the failure event.
- Dam Benefit Losses –the direct economic costs associated with a failure event.

Population at Risk of Dam Failure

The Milk River floodplain below Fresno Dam is primarily farm and ranch land until it reaches Havre, about 16 river miles downstream. There are no major communities and minimal development of infrastructure between the dam and Havre. In terms of potential failure, Havre has the highest population at risk (PAR)and would likely suffer from the greatest amount of damage including potential loss of life. After the Milk River reaches Havre, it parallels US Highway 2 and the Burlington Northern railway line. There are numerous small towns along the river as well as developed infrastructure.

Downstream distance to PAR scenarios:

- Time of day affects where people may be located and can affect the ability to respond to warning and to effectively evacuate. Historically, more fatalities have occurred during nighttime flood events, due to people sleeping, darkness, decreased ability to spread warning, and a slower evacuation response.
- Day of the week can (weekday/weekend,) influence life loss estimates. Recreational areas such as campgrounds, or along rivers where fishing or boating are popular, would see higher PAR numbers on weekends.
- For areas with significant seasonal variation of recreational there may be large differences in numbers of PAR present between summer and winter months.

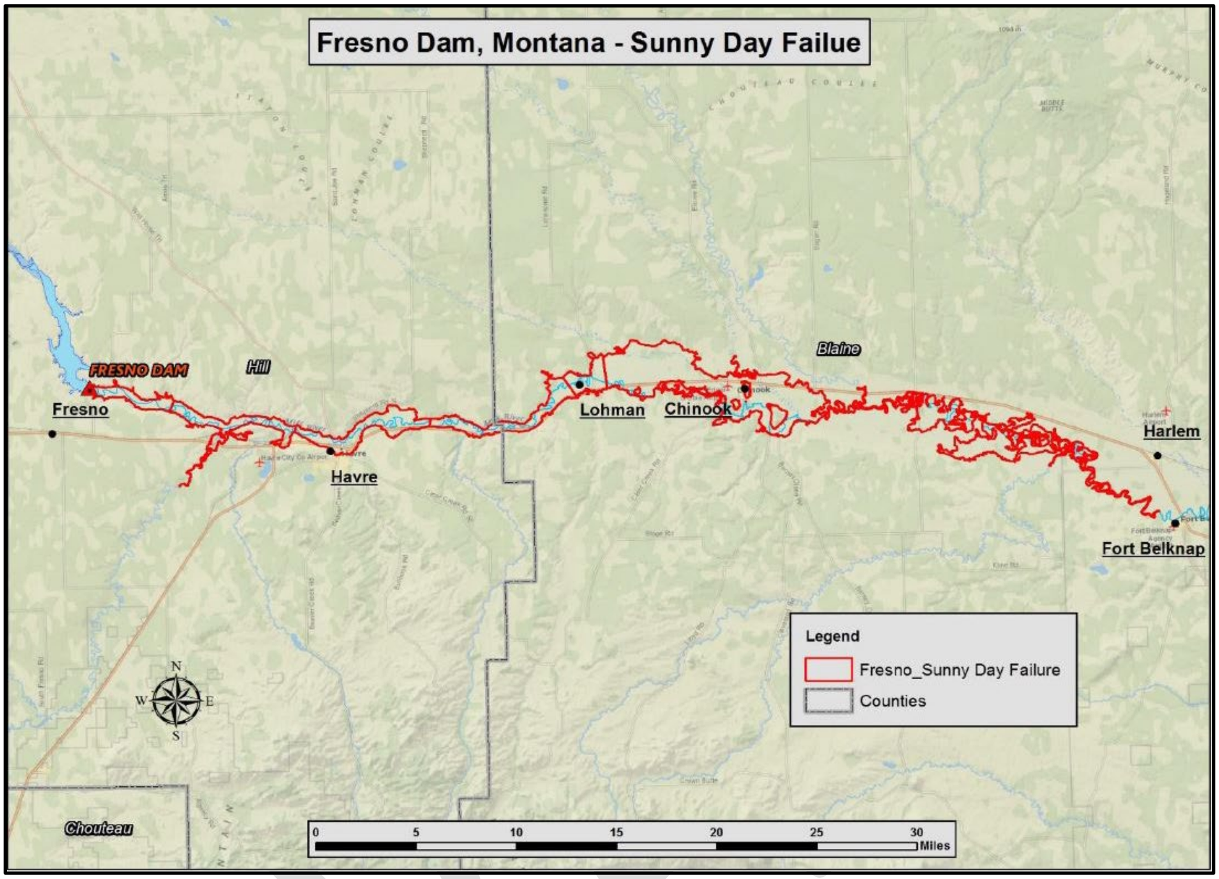
Should Fresno Dam be threatened with an extreme flood event, warnings would be issued in accordance with SOPs and the EAP. Although populations below Fresno Reservoir would be made aware that potential dam failure and flooding is imminent, there would likely be some loss of life. The consequences of failure were estimated based on Reclamation's Consequence Estimation Methodology using PAR and depth times velocity. Table 7 shows the high, average, and low depth times velocity estimates for various failure scenarios.

Table 7: Depth Times Velocity Estimates

Failure Scenario	High	Average	Low
Estimated Life Loss for Failure During Times of Normal Operation	43	28	12
Estimated Life Loss Internal Erosion Caused by Unprecedented Reservoir Levels	6	3	1
Estimated Life Loss for Slowly Developing Failure Caused by Earthquake-induced deformation	61	39	18
Estimated Life Loss for Quickly Developing Failure Caused by Earthquake-Induced Deformation	77	51	24
Estimated Life Loss for Slowly developing internal erosion thought the abutments	43	22	1

The inundation study included a sunny day failure scenario with the reservoir at normal operating elevation of 2,575 feet and internal erosion as the failure mechanism. A sunny day failure is an unexpected failure scenario used to evaluate inundation and damages from an unanticipated event as compared to a probable maximum flood event in which there would be a larger volume of water but potentially fewer people at risk with less damage due to warnings and evacuations.

Figure 4: Sunny Day Failure Flood Inundation Map



The inundation modeling extends approximately 107 river miles downstream along the Milk River, beginning at Fresno Reservoir and continuing through Havre, to Fort Belknap.

Downstream Property Damages

To begin the assessment of property damages which result from flooding, an inundation boundary for the scenario must be obtained. For purposes of this EA, the sunny day failure flood inundation boundary for Fresno Dam is used to determine economic consequences (Figure 3). With this scenario, it is estimated that a total volume of 92,880 AF would be released. The peak breach discharge would be 357,850 cfs. The area of inundation starts at Fresno Dam and extends down river to Fort Belknap—approximately 107 river miles. From there water and damage would gradually dissipate.

Downstream property damages include the replacement costs of residential, commercial, and industrial property as well as infrastructure such as roads, bridges, railroads, and utility lines. When a dam breaches, water generally moves downstream, giving the flood time to attenuate as it travels, thus reducing impact for communities as distance from the dam increases. The peak flow at a location determines the maximum inundation extent and depths. Consequences of dam failure can include economic losses due to property damage, lost Project benefits, and ripple effects through the economy. Environmental damages from large downstream flows, and release of reservoir sediment could affect downstream communities. Without the benefit of irrigation water, land values would decrease.

Table 8: Estimated Damage Summary

Property Category	Quantity/Category	$ Damage Estimate
Building-Related Losses	839 buildings and contents	1.4 billion
Transportation	101 miles of Road, 12 bridges	$199.5 Million
Essential Facilities	Fire, police, school	$22.3 Million
Utilities and other Infrastructure	Oil & gas pipelines, electric power/transmission lines and communication systems, railway, canals and diversion dams	$106.1 million
Vehicles	Cars/light and heavy-duty trucks	$85.9 million
Agriculture	157,662-Acres	$33.5 million
	2018 Dollars **TOTAL**	**$1.8 Billion**

Direct economic consequences include downstream property damage, lost benefits, and reconstruction costs. These direct economic losses can be compared to the costs of dam modification providing a measure of economic efficiency of the Proposed Action. Indirect economic consequences can be widespread, including loss of employment and business output.

Additional indirect non-monetary consequence could be the exposure of people and the ecosystem to hazardous and toxic material released from landfills, warehouses, and other facilities that are inundated by the dam failure flood. Additionally, sediment is a primary carrier of suspended pollutants such as nitrogen, phosphorous and heavy metals. Sediments released as a result of a dam breach may have environmental effects that can persist for decades.

Dam Benefit Losses

As previously discussed, floods resulting from a dam breach may inundate large areas, enterprises, farmlands, and infrastructure, causing economic losses. No situationally specific attempt is made to quantify the cost of emergency services, environmental damages, disruption of government services, cleanup, the disruption of people's lives, or other categories of loss that would follow a dam breach. Data constraints impede such an estimate for this analysis. However, it can be assumed most Project benefits would be lost because of a dam breach. Table 9 identifies Reclamation's annual Project benefits over a 50-year period.

Intangible consequences are those that have no directly observable physical dimensions but can result in affected individuals feeling stress or grief in dealing with loss. Table 9 provides the value of lost project benefits if no action is taken. Table 10 provides a summary of estimated damage caused from dam failure.

Table 9: Value of Lost Project Benefits Under the No Action Alternative

Project Purpose	Dam Failure*
Irrigation water supply	$32.3
M&I water supply	$12.9
Recreation	$27.9
Flood control	$16.2
TOTAL	**$89.3**

All lost benefits are calculated over a 50-year planning horizon using the FY2019 Planning Rate of 2.875 percent and stated in millions of dollars.

The failure of Fresno Dam would be catastrophic to the economy of northcentral Montana. The supply of irrigation water provided by the Project secures the "lifeline" of the region's agricultural communities and economy. Without irrigated agriculture in the Milk River Basin the influx of local dollars generated would appreciably decrease.

Table 10: Dam Failure Estimated Damage Summary

Loss of Life	1-77 People
Downstream Property Damages	$1.8 Billion
Dam Benefit Losses	$89.3 Million

If Fresno dam were to fail, approximately 9,791 people would be at risk, with potential loss of life between 1 to 77 persons. This could present a disproportionate effect on minority groups and low-income populations over the four-county area. Intangible consequences in dealing with loss of life and loss of property would have long-term effects. Without irrigation water, the lifeline of the Hi-Line would no longer exist.

Proposed Action Alternative

The Proposed Action has a 36-month construction period requiring a reservoir restriction to elevation 2555 for a 1.5-month period spanning August 15 to October 1 in the first year of construction. This restriction would have a negligible impact on irrigation deliveries in the first year of construction but would create an average expected loss of 3,200 AF of irrigation deliveries in the second year of construction, due to decreased carryover from year one (Reclamation, 2018). The loss of 3,200 AF in irrigation deliveries equates to $79,872 in lost irrigation benefits (2018 dollars). Once the construction phase is complete, the reservoir resumes normal operation and storage capacity, and there would be no further losses in irrigation benefits.

Construction activities are expected to bring positive short-term economic benefit to the area. Workforces would utilize nearby towns, such as the City of Havre to acquire goods and services during the proposed 36-month construction period. Table 11 provides estimated short-term economic benefits that would be lost under the Proposed Action Alternative.

Table 11: Economic Benefits Lost Under the Proposed Action

Alternative	Years(s)[a]	Annual lost deliveries (AF)[b]	Annual lost benefits (2018$'s)[c]	PV annual lost benefits[d]
Proposed Action	1	0	0	$0
	2	3,200	$79,872	$75,000
	3-50	0	$0	$0
Total lost benefits over the planning horizon				**$75,000**

[a] Year in 50-year planning horizon being evaluated.
[b] Based on lost irrigation deliveries due to required reservoir restriction or breach of Fresno Dam under the respective alternative.
[c] Calculated as annual lost AF of irrigation deliveries multiplied by the derived benefit per AF of Project irrigation water of $24.96
[d] Discounted to the respective year using the FY2019 Planning Rate of 2.875 percent and rounded to the nearest $1,000.
[e] The present value of lost irrigation benefits over the 50-year planning horizon.

Recreation, fish and wildlife, and irrigation water supply would likely see a temporary decline in conditions, but this would be a short-term economic loss; benefits and conditions would fully rebound after construction is completed.

The total cost of the Fresno Dam-SOD Modification project is estimated at approximately $71 million dollar construction cost, making the reimbursable portion of the project about $10.6 million. The water users would be responsible for making annual payments. Based upon the repayment term and the actual total project costs, annual payments could vary from the values presented above.

Geology and Soils

Fresno Dam is in the glaciated portion of the Missouri Plateau region of the northern Great Plains physiographic province, about 160 miles east of the continental divide. Glaciers were an important influence on the geologic history of the area; most of the landforms, drainage patterns, and associated soil development are the direct result of continental glaciation. As ice sheets melted glaciofluvial materials were deposited, leaving a variety of localized deposits of silt, sand, and gravel. The geomorphology of Milk River watershed is the result of wind, water, glaciers, and tectonics.

Fresno Dam is in a melt-water carved valley, which the Milk River has cut in sandstone and shales of the Judith River formation (Upper Cretaceous). The floodplain is entrenched about 130-feet below the adjacent uplands. The foundation is of river silts and gravel in riverbed, irregularly cemented, leaky Fresno sandstone in the right abutment; sandstone underlain by impervious and fairly stable Sprague shale in the left abutment.

The design and construction of the embankment was based on three major considerations: foundations of fine silt; an abundance of material for impervious core, but not much coarse material for filters; and a scarce amount of suitable rock for fill. Because of the lack of filter source materials, the impervious section of the embankment was designed to be extra wide.

The embankment material consists primarily of glacial till composed of sandy lean clay and sandy silt. Underlying the embankment is a thick quaternary alluvial deposit consisting of a variable mixture of sandy silt, sandy lean clay, and silty sand. The Judith River Formation deposits underlie the alluvium and are non-marine and brackish water origin, consisting of poorly lithified sandstone, siltstone, and claystone. The spillway is founded on the Judith River Formation.

The stratigraphic units relevant to the dam foundation are:

Alluvium or Colluvium (undifferentiated)

Quaternary – Both Alluvium and colluvium cover the valley floor and obscure much of the bedrock in the valley walls. The deposits consist of highly variable amounts of clay, silt, fine sand, and a minor amount of coarser sand and fine gravel. A large portion of the alluvium was derived from erosion of Judith River Formation bedrock upstream of the dam. Large flood events following the end of the last ice age would have rapidly deposited alluvium materials at the transition between high and low gradients. This would have resulted in a looser, lower density, and more compressible material. Additionally, it is possible some of the salts present in the marine bedrock were incorporated into the alluvium when it was deposited then were later leached out. This could have left void space for compression upon loading. It is difficult to distinguish between alluvium and the underlying Judith River Formation because of the high degree of weathering of the upper elevations of the formation, and similar mineralogy of the deposits and source rock.

Judith River Formation

Cretaceous – Sandstone and shale of the Judith River Formation occurs as foundation and underlies alluvium in the river channel and glacial till in the abutments and age estimates are of 65 to 70 million years. The formation is fine grained, easily erodible, gray, or greenish gray sandstone that varies in degree of softness. The sandstone is considered poorly to uncemented and sometimes quick. Although, some hard, lenticular masses or concretions which are strongly cemented with calcium carbonate and iron oxide are exposed in the abutments. The sandstones are interbedded with siltstone and shale units and have the consistency of muddy silt and clay.

In the valley floor, beneath the alluvium, the unit has the physical characteristics of soil and is difficult to distinguish from the overlying alluvium. Most, if not all, of the bedrock at the dam site is of marine origin and was never very hard. When the river eroded the current bedrock channel, much of the salt in the upper portions of bedrock, along with other soluble materials, was dissolved upon exposure to fresh water and likely continues to leach out where conditions are favorable. This leaves bedrock in a softer, lower density, and more compressible condition.

Soils in the Milk River basin are derived from the alluvial deposits, glacial drift, and disintegration of geological formations. Soils in the area surrounding the dam range from loams, clayey loams, sandy, and rock outcroppings reaching from the floodplains to hillslopes. Table 12 provides detailed descriptions of the soil types present in the project area.

Table 12 - Soil Types in the Project Area

Soil Type	Description
Hillion loam	Hillslope (15-60% slope), well drained, fine-loamy till, more than 80-inches to restrictive layer.
Hanly loam	Floodplains (0-2% slope), somewhat excessively drained, fine-loamy till, more than 80-inches to restrictive layer

Soil Type	Description
Cabbart-Rock outcrop Complex	Hills (25-60% slope), well drained, loam, 10-20 inches to paralithic bedrock.
Telstad-Joplin loams	Ground moraines (0-4 % slope), well drained, fine-loamy till, more than 80 inches to restrictive feature.
Havre-Harlake clay loams	Floodplains (0-2 % slope), well drained., clayey, more than 80-inches to restrictive feature.
Havre-Glendive complex	Floodplains (0-2 % slope), well drained, clayey, more than 80-inches to restrictive feature. Farmland of statewide importance
Kenilworth-Fort Benton fine loams	Till plains (0-4 % slopes), well drained, sandy, more than 80-inches to restrictive feature.

In general, most soils are a heterogeneous accumulation of mineral grains that are not cemented together. However, the term "soil" as used in engineering includes virtually every type of uncemented or partially cemented inorganic and organic material in the ground. Only hard rock, which remains firm after exposure, is excluded. In the design and construction of foundations and earthwork, the physical and engineering properties of soils, such as density, permeability, shear strength, compressibility, and interaction with water, are of primary importance.

Seismic Action

Fresno Dam is located in an area subject to moderate seismic intensity. To better understand how the added sand filter, gravel drain, and buttress fill might improve seismic stability, a post-earthquake stability analysis was conducted with a simplified cross section of the dam. The principal objective of the study was to evaluate seismic hazards from natural, tectonic earthquakes, and earthquakes that produce ground motion that could result in seismic related dam failure. Findings indicate there are no identified Quaternary faults within 62 miles (100 km) of the dam. Therefore, background seismicity is considered the sole seismic source at the location. The potential risk of seismic failure of Fresno Dam is a consequence of deformation caused by potentially liquefiable soils beneath the dam.

No Action Alternative

Under the No Action Alternative, the dam embankment foundation would continue to settle as the underlying alluvium is compressed. Settlement of the foundation would continue over time, increasing the potential for cracking and internal erosion. Without the proposed structural modifications dam failure could occur.

Dam failure would affect a large amount of land upstream of the dam, leaving a large sediment covered landscape. Large volumes of sediments would accumulate in the reservoir and along stream and riverbanks. Sediment would need removed to restore the river channel, side gullies, and small creeks to normal functioning condition. Dam failure would result in long term impacts to the immediate area and areas downstream of Fresno Reservoir.

Proposed Action

Under the Proposed Action Alternative, a state-of-the-practice embankment overlay would be constructed on Fresno Dam. The vertical sand filter trench through the foundation would provide a reliable and technically acceptable solution to mitigate risk associated with internal erosion through

Fresno Dam and its foundation. In addition, the Proposed Action would provide additional defensive measures against damage caused by earthquakes, thereby reducing seismic risks from current estimates.

This alternative would result in soil disturbance to the area of construction, staging, stockpile, and borrow areas, and temporary access routes. Locations proposed for staging and stockpiling, borrow areas, and haul roads would be located in areas with gentle slopes where erosion potential is slight. Use of the borrow areas would result in disturbance to topsoil and alluvial materials, both of which were previously disturbed during original construction of the dam.

Site preparation activities necessary for construction (tree removal, clearing of vegetation, and stripping and stockpiling topsoil) would result in exposed soils and increased potential for sediment deposition in the nearby Milk River. The use of heavy equipment would likely increase soil compaction and, as a result, increased surface water runoff and potential for erosion. All areas would receive temporary, short-term disturbance but would be fully restored following construction activities.

Minimization Measures

Implementation of the following required minimization measures would minimize the potential impacts on soil resources:

- Reclamation would require the contractor to obtain a National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Discharge Permit.
- Development and implementation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP addresses specific erosion and sedimentation prevention and control measures needed to protect soils and water during construction.
- Approved Best Management Practices (BMPs) to minimize impacts of sedimentation and runoff associated with construction activities from entering the river
- Areas of ground disturbance would be identified in advance of construction and limited to only those areas necessary to complete project work. Bare soil would be kept to the minimum required by designs.
- Storm water runoff origination on upslope areas would be diverted away from disturbed areas. Runoff on bare ground would be dispersed to reduce concentrated flows that might lead to erosion and sedimentation.
- All vehicular construction traffic would be confined to the designated access routes and staging areas.
- All disturbed areas would be restored to pre-existing conditions, with exception of the borrow areas which will be restored using typical restoration techniques. Restoration techniques include contouring and grading, planting erosion control grass species for revegetation using a Reclamation-approved seed mix.

With the implementation of the above-described measures, effects to soil resources would be both short-term and minor in nature.

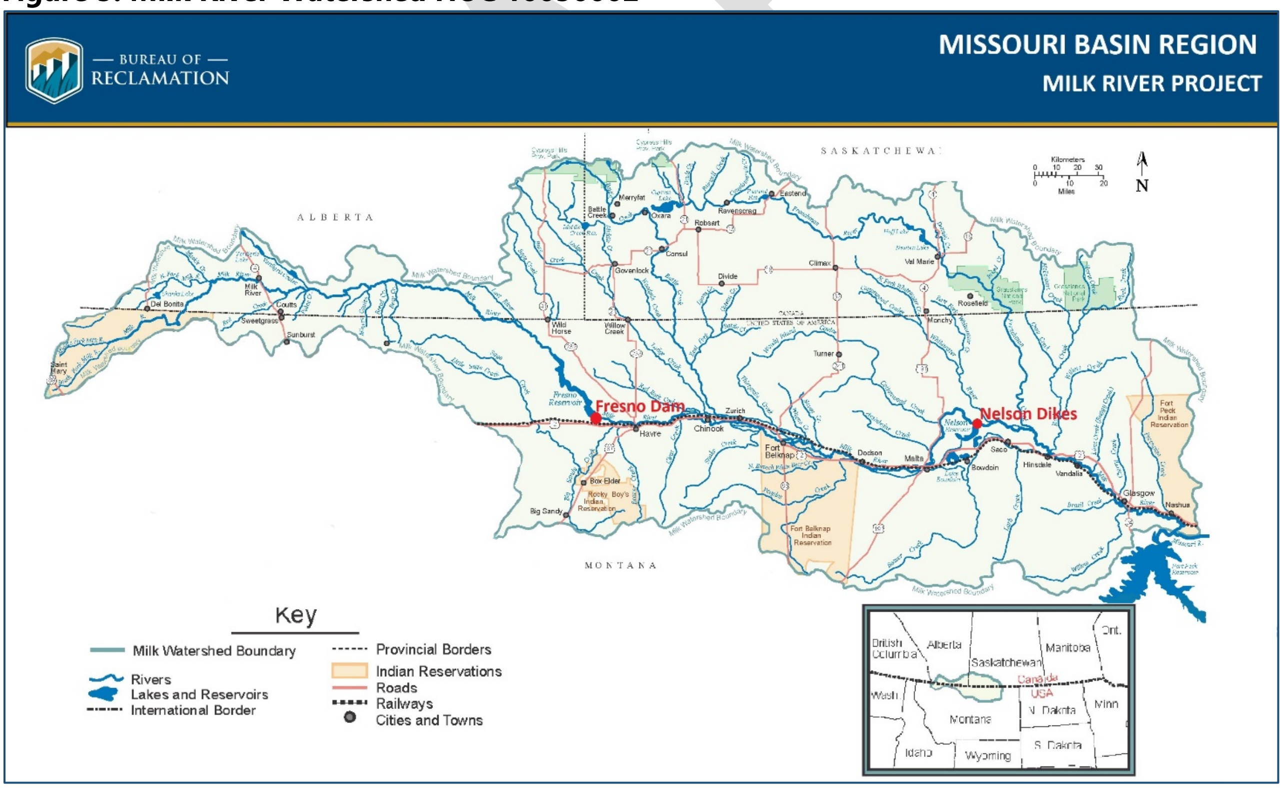
Hydrology

The Fresno Dam and Reservoir are within Hydrologic Unit 10050002 (Upper Milk sub-basin), Milk River watershed, Lower Missouri basin. Inflows into Fresno Reservoir consist of natural runoff that occurs in the Milk River Basin upstream of Fresno Reservoir and the trans-basin diversion of water from the St. Mary River Basin through the St. Mary Canal.

The Milk River originates in the foothills of the Rocky Mountains on the Blackfeet Reservation, flowing northeasterly into Alberta for about 200 river miles before crossing the international border again into Hill County, Montana. Then, the river flows in an easterly direction for 490 river miles until joining the Missouri River near Fort Peck, Montana

Milk River water is stored in Fresno Reservoir, 14 miles west of Havre, Montana. The eastern boundary of the Upper Milk River is located at Fresno Dam. Below the dam the Milk River flows through Hydrologic Unit 100500004 (Middle Milk sub-basin) to Nelson Reservoir, 19 miles northeast of Malta, Montana. Flow in the Milk River is augmented by a diversion from the St. Mary River (project water) and by tributaries flowing from the Sweet Grass Hills, Cypress Hills, and the Bears Paw Mountains (natural flow). Figure 5 is a map of the Milk River Watershed.

Figure 5: Milk River Watershed HUC 10050002



The combination of mountain snowmelt, tributary inflows, and precipitation are the main sources of natural surface water flows in the Milk River. The runoff from the Milk River drainage basin above Fresno Dam and Reservoir follows a characteristic seasonal hydrologic pattern:

- Winter is characterized by frozen streams, progressive accumulation of snow in the mountain areas, and intermittent snowfall and thaws in the plains area. The season usually ends with a "spotty" snowpack of relatively low water content and a considerable amount of water in ice storage in the stream channels. Runoff during this period, which usually extends from late November into early March, is very low.

- Spring is marked by a rapid melting of snow on the plains and ice on frozen ground, usually in March or April as temperatures rise rapidly, accompanied by rainfall. This causes the spring ice break-up and increases in tributary streamflow. The rapid release of water from melting snow results in a flashy rise in flow usually in March, along with ice jams. Annual maximum peak stages and flows usually occur during this time along tributary streams. This results in the characteristic spring thaw over a period of four to six weeks. Heavy spring rains can contribute to flooding in the Milk River basin. Flooding in the Milk River Basin often occurs in the spring because of rapid snowmelt on frozen soil, accelerated by chinook winds.

- Summer and fall are generally characterized by little rainfall, widely scattered local rainstorms, and occasional severe storms. Thunderstorms can produce flash floods typically from May through September. Flow in the rivers decreases after the June rise, thereafter, decreasing to the low flows which prevail in winter.

Water Quality

Under the Clean Water Act (33 U.S.C. §§1251-1387., as amended), all surface waters are designated with specific beneficial uses. In Montana, beneficial use is defined as: use of water for the benefit of the appropriator, other persons, or the public, including but not limited to agricultural (stock water), domestic, fish and wildlife, industrial, irrigation, mining, municipal, power, and recreational uses (MCA 85-2-102). The DEQ has primary authority over the regulation of water quality in Montana.

The quality of water in the Milk River watershed varies considerably, mostly because of differences in geology, erosion rate, land uses, and the quality of groundwater inflow. To date no Total Maximum Daily Load (TMDL) has been developed for much of the watershed above Fresno Reservoir. Fresno Reservoir, however, is listed because of impairment of drinking water uses.

According to the 2018 water quality assessment, the upper reach of the Milk River at the international boundary (Monitoring Station M33MILKR04, Assessment Unit MT40F003_010) is considered impaired for aquatic life. The cause of impairment is copper, iron, lead, and flow alteration. The source of metals contamination is unknown and most likely attributed to natural conditions associated with the geology. The local geology is part of the Judith Formation with lignite beds and sandstone/siltstone. The primary sediment sources in the U.S. portion of the watershed are the surrounding landscape which provide a natural sediment supply to the Milk River.

The State of Montana has assigned Fresno Reservoir a B-3 classification in the state's water quality standards (Assessment Unit MT40F005_010). As such, the reservoir is maintained for drinking, culinary and food processing purposes; bathing, swimming, and recreation; growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl, furbearers; and agricultural and industrial water supply.

Minimum releases from Fresno Reservoir are not anticipated to increase in the future. The communities of Havre, Chinook, and Harlem have Montana Pollutant Discharge Elimination System (MPDES) permits to discharge wastewater. During the non-irrigation season a minimum release of 25 cfs from Fresno Reservoir is provided under contract by Reclamation to provide mixing flows for treated wastewater into the Milk River (Reclamation & DNRC 2012). This allows the communities downstream to have water of suitable quality to divert from the Milk River. The minimum flow rate in the winter is typically exceeded because the outlet works at Fresno Dam would be damaged by cavitation at river outlet gate openings. Current operation procedures are that the flow from Fresno Reservoir during the non-irrigation season is not reduced below approximately 40 to 50 cfs (see below) depending on reservoir elevation. If releases from Fresno Dam were reduced, downstream water quality could degrade due to inadequate mixing flows.

Water Quantity

Water supply across Montana is controlled by the variability in seasonal temperature and precipitation. While the demand for water continues to grow, water availability varies from year to year and often changes dramatically within a given year. As a result, managing supply and demand imbalance is a constant feature of water management in Montana. The amount of water transferred from the St. Mary to the Milk River Basins is dependent on water supply in each basin, as well as weather, maintenance issues, and the Boundary Water Treaty of 1909 between United States and Canada. The 1921 Order of the International Joint Commission established the division of flows between Canada and the U.S. for the St. Mary and Milk Rivers.

The Project provides for storage of water from Swift Current Creek in Lake Sherburne behind Lake Sherburne Dam. Water is diverted at the St. Mary Diversion Dam to the 29-mile St. Mary Canal, through a series of siphons and drop structures discharging into the North Fork Milk River. The water then flows through Canada before reentry into Montana. Once back in Montana, water is stored in Fresno Reservoir; from Fresno Reservoir water is conveyed through the Dodson South Canal for irrigated lands south of the Milk River. Leftover water in the Dodson South Canal is then conveyed to Nelson Reservoir for storage as follows:

- Following irrigation season (usually September), Fresno storage is evaluated. Water in excess of 50,000 AF may be transferred to Nelson Reservoir.
- If water cannot be transferred to Nelson, then water released from Fresno is planned so storage does not exceed elevation 2567 ft (~ 60,000 acre-feet) by March 1, allowing for storage for flood control.
- Minimum release required to meet contractual obligations is 25 cfs.
- Gate configuration allows a minimum release of 40-50 cfs.
- Releases are either increased above this rate for flood control or when the Joint Board elects to begin irrigation deliveries or move water to Nelson.
- Releases are increased as necessary based on actual or forecasted hydrologic conditions.

Water users diverting from Milk River tributaries generally have limited irrigation opportunities because of tributary runoff patterns. The tributary streams usually have water available during peak snowmelt runoff, which is usually during March and April. Although crop demands are very low during this period, irrigators still apply water to fill the soil profile for later use by crops. Tributaries may also flow and have water available from spring and early summer rains in May and June. During the irrigation season (when crop demands are high and flows are typically low), very little flow reaches the Milk River. The water supply from the tributaries below Fresno Dam is less reliable than the storage supply in Fresno Reservoir and transferred water from the St. Mary River Basin. During dry years, there is very little water that can be captured by the Project from these tributaries.

Wetlands

The 29-acre wetland study area is adjacent to Fresno Dam (west), Milk River (north), rock outcrop (south), with a gravel road traversing the east perimeter. This study area is in the Northern Great Plains Land Resource Region (LRR-F) and is comprised of vegetation typical of this LRR. Common indicators of wetland hydrology include soil saturation within 12-inches of the surface and hydrogen sulfide odors. The study area meets both hydrologic indicators. There is no obvious outflow from the study area; therefore, it is likely that water collects through runoff or seepage and evaporates over the warm summer months.

The site is considered "atypical" due to the alteration of soils, hydrology, and vegetation during construction of the dam (human modification). Both geologic modifications and human modifications of hydrology may change the hydric status of a soil.

One wetland, totaling approximately .52 acres, was delineated within the study area. Under the Cowardin classification system, this wetland is considered palustrine, emergent, seasonally saturated (PEMB). Seasonally saturated wetlands generally lack indications of surface flow or inundation, are relatively drier, and occur in minor drainages.

Floodplains/Flood Management

A floodplain is comprised of the floodway and the floodway fringe. The floodway is defined as the channel of a river or other watercourse and the adjacent land areas (floodplain) reserved in order to discharge the 1- percent-annual-chance flood without cumulatively increasing the water surface elevation by more than the designed height (usually 1-foot).

The purpose of flood control is to prevent flood damage through flood-flow regulation and other means. The Flood Control Act of 1944 provided that "flood control" shall include major drainage of land. As a result of this Act, the USACE authority for flood control was extended across the entire U.S. Under a 1957 letter of agreement between Reclamation and USACE, the reservoir water surface elevation, at the beginning of the spring runoff shall not be higher than elevation 2,567-feet, and that releases from the reservoir during seasons of ice cover on the Milk River downstream from the dam shall be maintained at a relatively constant rate.

The Havre Local Protection Project (approved in 1944; completed in 1957) consists of the Milk River Unit system of levees along the Milk River and the Bull Hook Unit, which includes two dams south of the city. The Milk River Unit consists of a north levee which extends about 5,150 feet from a high bluff northwest of Havre to a high bluff northeast of the city. This levee protects an area that is almost entirely residential. The south levee extends about 15,430 feet along the right bank of the Milk River at the west edge of the city to a levee on the Bull Hook Unit. This levee also protects a major portion of the city of Havre. The Bull Hook Unit includes two diversion dams with facilities for release of low flows. This unit provides protection to business establishments, residences, public buildings, road infrastructure, railways, and public utilities (USACE 1991).

The Federal Emergency Management Agency, Flood Insurance Rate (FIRM) panels provide information on areas subject to flooding. Base flood elevations (BFEs-100-year) are designated areas or zones identified and mapped according to potential flood hazard, then recorded on associated FIRM map panels. Fresno Reservoir and downstream Milk River to Havre are located on FIRM panel 30041C0470B (effective date June 3, 1988) within Zone A (no BFE determined), areas surrounding the reservoir and Milk River are in Zone X (areas outside of the 500-year floodplain). The City of Havre is located within FIRM Panel 30041C0490B (effective date June 3, 1988) and is largely located in Zone X. The BFEs designations are as follows:

- Zone A – Areas inundated by the 1-percent-annual-chance flood, also known as base flood elevations.
- Zone X- Areas outside the 0.2-percent-annual-chance flood.
- Areas inundated by the 0.2-percent-annual-chance flood, areas of the 1-percent-annual-chance flood with average depths of less than 1 foot or with drainage areas less than 1-square mile, and areas protected by levees from the 1- percent-annual-chance flood.

Hydrologic Loading

To meet Reclamation's PPGs the dam must be able to safely pass floodwaters ranging between a 77,600-year flood event and the Inflow Design Flood (IDF) without failing. The IDF for Fresno Dam is the probable maximum flood (PMF), defined as the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions reasonably possible in a particular drainage area. At Fresno Dam, the PMF is estimated to be a 250,000-year flood event.

No Action Alternative

Under the No Action Alternative, no construction would occur at Fresno Dam and corrective actions would not be implemented. Without the proposed structural modifications dam failure could occur

Dam failure would affect a large amount of land upstream of the dam, leaving a large sediment covered landscape. Large volumes of sediments would accumulate in the reservoir. Sediment would need removed to restore the river channel, side gullies, and small creeks to normal functioning condition.

The Milk River Unit and the Bull Hook Unit levees and dams south of the city would provide some protection in the event of complete dam failure. The Milk River Unit north levee would provide protection to residential areas, while the south levee would provide protection for the City of Havre. The Bull Hook Unit would provide some protection to business establishments, residences, public buildings, road infrastructure, railways, and public utilities. Areas inundated by floods would exceed the limitations of the BFEs for potential flood hazards.

Both water quality and water quantity would be affected. Water quality would be exposed to potential contaminants from runoff, sediment, hazardous materials, raw sewage, and other sources. Water quantity would decrease, likely limiting future irrigation, M&I, and flood control. Water users would need to find alternate sources or abandon current practices. Dam failure would result in long-term consequences to both water quality and quantity.

Proposed Action Alternative

Under the Proposed Action Alternative, construction of the downstream filter, drain, and buttresses would connect the filter drain to the right spillway wall to protect against seepage and erosion paths adjacent to the wall. This would work to prevent episodic loading that could result in seepage erosion through cracks.

The Proposed Action Alternative has a three-year construction period requiring a reservoir restriction to elevation 2555 for a 1.5-month period spanning August 15 to October 1 in the first year of construction. This restriction would have a negligible impact on irrigation deliveries in the first year of construction but would create an average expected loss of 3,200 AF of irrigation deliveries in the second year of construction, due to decreased carryover from year one. This restriction would have a short-term effect on quantity and/or timing of providing water supply for irrigation and municipal use. Minimum releases to the river downstream of the dam would continue during the construction phase.

This alternative would not result in long-term changes in the normal operation of the dam and reservoir. Overall, the Proposed Action Alternative would correct safety deficiencies at Fresno Dam, provide an exit for seepage through the dam, promote water use and storage efficiency, and allow for continued reliable use of Project water.

Implementation of the proposed minimization measures would provide insurance that the project does not contribute to Section 303(d) sources of contamination in either Fresno Reservoir or the Milk River downstream of the dam. Protection would ensure no direct impacts to the .52-acre wetland area. Additionally, there would be no impacts to the wetland area as a result of construction. No work is proposed in the floodplains; however, those areas would be protected from airborne particles and potential runoff by implementation of the minimization measures outlined below.

Minimization Measures

- Construction activities (vegetation clearing, topsoil stripping, excavation from borrow areas, construction of temporary haul routes) could result in the introduction of pollutants (sediment) into stormwater runoff.
- Due to the potential for introduction of pollutants into waters of the U.S., an NPDES permit would be required.
- Implementation of a SWPPP, would provide measures to control water discharge, runoff, erosion, and sediment. Sediment control measures may include silt fences, certified weed-free fiber rolls, sediment traps, and other sediment filters as needed to protect the Milk River as it exits the dam.

- Hazardous materials would be stored at least 100 feet away from waters, and vehicle fueling, and maintenance would be performed at least 100 feet from receiving waters.
- The wetland area would be protected from disturbance during construction. Reclamation would identify locations, mark their limits on the ground, and the contractor would install and maintain protective barriers at this location. The .52 -acre delineated wetland would be avoided during construction.

Climate

Climate information influences Reclamation management strategies through assumptions of future potential temperature, precipitation, runoff conditions, and other weather information. Water supply estimates are made by determining what wet, dry, and normal periods may be like in the future and include the potential for hydrologic extremes that can create flood risks and droughts (Reclamation 2011). The climate in the Milk River basin is considered semi-arid with cold winters and warm to hot summers. The historic climate of the region is typical of the northern Great Plains, with wide variations in temperature from season to season.

Winter temperatures are typically between -25 and -35° F, with lows near -50° F on record. Winter Chinooks, or rapid warm-ups with strong west winds, are common. Chinooks occur during the winter and early spring and can lead to significant snow melt and flooding of streams and rivers and/or ice jam floods.

Average winter snowfall ranges from 25 to 38 inches. The heaviest snowstorms often occur from late March through May or mid-October to mid-November. These storms can produce more than 12 inches of snow and are often accompanied by high winds resulting in blizzard conditions. At low elevations, mid-winter snowstorms in general produce less than 6-inches of snow, but heavier amounts up to 10-inches do occur.

Precipitation can vary significantly from year to year, and location to location within a given year. November through March on average are quite dry with average monthly precipitation of 0.50 inches or less. The heaviest precipitation often occurs with localized downpours associated with thunderstorms in June through August. Widespread heavy precipitation events of 1 to 2 inches can occur every few years and is most common from April through June and September through early November.

Average high temperatures in July are in the upper '70s to mid-80°s F with average lows in the '50°s. Brief spells of temperatures above 100° F can occur but are often short lived. Annual average precipitation is 10 to 13 inches. Over 65 percent of the annual precipitation total falls from May through September. Severe thunderstorms are common from June into early September; typically, the greatest hazards associated with these thunderstorms are very highs winds and large hail.

An important element of the climate in the Project Area is the often-windy conditions. Average wind speeds range from 10 to 15 miles per hour (mph), depending on the exposure of the location. The highest wind gusts often occur with thunderstorms during the summer, with gusts over 60 mph.

Climate Change

Reclamation's mission is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public. Climate change could impact water supplies, water demands, and other environmental conditions that affect Reclamation's ability to fulfill its mission (Reclamation CMP P16, in accordance with 523 DM 1).

Climate change is a long-term shift in climate patterns and is thought to be both natural and man caused. It is important to acknowledge the uncertainties that are inherent in climate change and how it contributes to making climate adaptation a difficult challenge. Projections of future climate change contain uncertainties that vary geographically and depend on the weather variable of interest (temperature, precipitation, and wind).

The 2012 St. Mary and Milk River Basins Study Report (Reclamation and the Montana Department of Natural Resources and Conservation) concluded that due to climate change the overall water supply available for Milk River uses would be similar to past years but with an earlier shift in the runoff peak. Changes in precipitation and temperature should produce modest stream flow increases in the basins, but with generally lower stream flow during the driest years. Snow melt is expected to peak 3 to 5 days earlier than historical records. In summary the temperatures in the Milk River basin is likely to follow a warming trend in the future. However, the rate of warming projected varies among the different modeling scenarios. Projections for precipitation ranged from drier to wetter, but most of the predications were for overall wetter conditions in the basins, with increasing year-to-year variability.

Reclamation operators and planners rely on information about precipitation, snowpack, streamflow, temperatures, water demands, and groundwater to make informed decisions. Reclamation's 2021 West-Wide Climate and Hydrology Assessment uses several approaches to support reliable water deliveries. Findings indicate that the influence of irrigation on the climate generally leads to cooling (evaporative cooling), but the effect is local and usually very small. This cooling occurs because solar energy arriving on an irrigated field evaporates the water rather than heating up the air above that field; the effects during hot and dry periods would be greater. Evapotranspiration from irrigation is the difference between the potential evapotranspiration from crops and the evapotranspiration that would occur without irrigation.

No Action

Under the No Action Alternative climate change would continue to fluctuate over time. This alternative would have no effect on local climate conditions. In addition; there would be no change in current trends of greenhouse gas emission in the project area. Dam failure would result in decreased water storage in the face of growing water demands and climate variability.

Proposed Action

For this climate change analysis two indicators are used to measure potential effects:

1. What effects climate change may have upon the Proposed Action
2. Whether Reclamation's Proposed Action would contribute to climate change.

Over time climate change could affect the supply of water available in the Milk River Basin. Changes in precipitation, temperature, and wind patterns could increase evapotranspiration from crops and increase demand for irrigation. A changing climate could increase moisture deficit, or decrease it, depending on the relative change in temperatures and precipitation. Demand for irrigation depends on the crop grown, as well as the prevailing climate. Water storage is an important component of building resiliency.

The Proposed Action Alternative would correct SOD deficiencies at Fresno Dam, allowing this facility to better respond to future climate change. The filter and drain system would provide an exit for seepage through the dam and promote water use and storage efficiency.

The construction activities associated with the Proposed Action, such as operation of heavy machinery, would result in short-term emissions of greenhouse gases. While this alternative would result in greenhouse gas emissions, these emissions would not measurably impact the local climate. Greenhouse gas emissions associated with construction equipment would be minimal and temporary for the 36-month construction period. With the implementation of minimization measures there would be no measurable emission-related impacts on climate change.

Minimization Measures

- To minimize potential greenhouse gas emissions, only equipment and vehicles that meet state and federal emissions guidelines would be used during construction activities.
- If equipment or vehicles show signs of excessive emissions, they would not be operated until corrective measures are taken to reduce emissions.

Lands and Vegetation

The Western Great Plains Badlands ecological system occurs within the mixed grass and sand prairie regions where the land lies well above or below its local base level, shaped by the carving action of streams, erosion, and erosible parent material. It is recognized by its rugged, eroded, colorful land formations, and the relative absence of vegetative cover.

Agriculture, the mainstay of the Hi-Line, is built upon the loamy foundations of its soil, which consists of deep, well-drained soils that formed in the plains, hills, and moraines from glacial till (see above Geology and Soils).

Much of the land adjacent to Fresno Reservoir is in cultivated crop production. The top crops grown in the project area include wheat, lentils, forage (alfalfa/haylage), peas, and barley (NASS 2017). Although much of the cropland is in dryland farming, irrigation is necessary to make up the difference between available water and crop water demand.

Livestock production is the major use of rangelands (mixed grass prairie) directly surrounding the reservoir, with much of the land being publicly leased for grazing. Grasses in the great plains mixed grass prairie comprise the greatest canopy cover, where western wheatgrass is dominant. Other species include thickspike wheatgrass, green needlegrass, blue grama, and needle and thread. The great plains mixed grass prairie historically covered all vegetated lands now converted to cultivated crops.

Noxious Weeds

Recently disturbed or modified areas where land cover is altered by introduced plant species can be found in isolated areas, such as drainage swales near the reservoir. Typical noxious weed species that dominate these areas are knapweed, oxeye daisy, Canada thistle, leafy spurge, pepperweed, and yellow sweet clover.

In Montana noxious weeds are divided into five categories and prioritized by their presence based on their potential to invade and spread. In addition, each county has the authority to designate species of concern and management direction for those species. According to the Montana Natural Heritage Program (MTNHP) the following weeds can be found in Hill County:

Priority 1A - There are six mapped locations of common weed. All known locations are outside of project boundary.

Priority 1B - There is one mapped location of giant knotweed, located outside of the project boundary.

Priority 2A - There is one mapped location of common buckthorn, located outside of the project boundary.

Priority 2B - There are several mapped locations of Priority 2B weeds in Hill County (350+), 19 of which can be found in or near the project area. These include Russian knapweed, spotted knapweed, Canada thistle, field bindweed, and leafy spurge.

Priority 3 - Are introduced species that have the potential to cause significant negative impacts in the state. There are known locations of Russian olive, a Priority 3 regulated plant, in the project area.

No Action

Under the No Action Alternative Reclamation would continue operating the dam and reservoir to meet water supply and delivery commitments. There would be no disturbance to lands or vegetation. However, the No Action alternative is not acceptable because the risk of dam failure would remain above Reclamation's PPGs.

In the event of dam failure extensive turbidity, siltation, debris flow and destruction of vegetation would occur along the flood pathway. With potential flooding, water is known to function as a "transport habitat" for the dispersal of plant materials. Flood flows act to transport seeds and plant parts from existing infestations into previously weed-free areas.

Existing cropland would no longer have access to Project water. It is likely that most farm operations would no longer produce crops; previously broken ground would be subject to weed infestations rather than reverting to native pastureland. In addition, noxious weeds are not often tolerated or sought out by domestic animals or wildlife. Dam failure would result in long-term consequences to lands and vegetation in the immediate area, while producing wide-ranging effects over areas that are reliant on Project water for crops.

Proposed Action

The Proposed Action Alternative would remove topsoil and vegetation from the face of the dam, aside from that no excavation would be needed. Topsoil would be stockpiled for re-use following construction.

Borrow, stockpile, and waste areas would be located within or near the construction to reduce overall impacts. The borrow area would be stripped to approximately 1-foot below the surface. The buttress material would come from the north or south borrow area located less than a mile from the dam. The rockfill excavations would require stockpiling of materials. Reclamation owned land at the downstream toe of the dam would likely accommodate the amount of area needed for stockpiling rock.

Short term impacts include removing topsoil and vegetation, and construction equipment and vehicle traffic use.

Minimization Measures

- All off-road equipment and vehicles used for project implementation would be required to be weed-free.
- Reclamation requires that all earth-moving equipment, gravel, road base, fill, or other materials to be noxious weed-free.
- Certified weed-free seed sources would be used for all post-construction rehabilitation activities. All activities that require seeding or planting would use a mixture of native or adapted seeds and plants.
- Certified weed-free straw or hay would be used for mulch.
- Post-construction monitoring and treatment of noxious or invasive weeds on Reclamation-owned lands or facilities would be conducted in accordance with Reclamation's policy on integrated pest management.

Air Quality and Noise

Air

The Clean Air Act, as amended, requires the Environmental Protection Agency (EPA) to establish air quality standards for pollutants considered harmful to public health and the environment by setting limits on emission levels of various types of air pollutants. Criteria pollutants tracked under EPA's National Ambient Air Quality Standards (NAAQS) include SO2 (sulfur dioxide), PM (particulate matter), NO2 (nitrogen dioxide), O3 (ozone), Pb (lead), and CO (carbon monoxide).

Air quality in the project area is consistent with typical background levels for northcentral Montana. According to EPA's AirData interactive map, there are no monitoring stations for the six criteria pollutants within the project area (EPA, 2021). The nearest monitoring station is in Malta, Montana.

The principal sources of Montana's Greenhouse Gas (GHG) emissions are electricity use (excluding electricity exports) and agriculture, each accounting for about 27% of Montana's gross GHG emissions (CCS 2007). The next largest contributor to emissions is the transportation sector. According to the Montana GHG Inventory and Reference Case Projections (1990-2020) report Montana's gross GHG emissions are rising at about the same rate as the nation.

The project area has minor sources of air pollution that include vehicular traffic, home heating, agriculture, and dust storms. On occasion, exposed areas with erodible soils, such as roads, and plowed fields can produce dust pollution.

Noise

The environment within the project area can best be described as a rural area with minor noise pollution coming from sources such as O&M at the dam, transportation in the area, agricultural work, boating traffic on the reservoir, and camping and recreation noise.

No Action Alternative

Under the No Action Alternative impacts to air quality and noise would remain consistent with current conditions. The project area has minor sources of air pollution from transportation and agricultural activities. These same activities would produce noise.

Proposed Action Alternative

Under the Proposed Action Alternative air quality affects are primarily centered on particulate matter generation from emissions to the air from heavy equipment operation during construction. Noise from heavy equipment such as excavators, dozers, site grading equipment, large hauling trucks, concrete trucks, general construction vehicles, etc., would increase during the 36-month construction period.

There would be minimal impacts during construction from particulate matter generation and noise from construction activities. Overall noise levels are expected to increase for the duration of the project (36-months), which may negatively impact the enjoyment of quiet spaces. Disturbances to air quality and noise are anticipated to be short term, for the duration of the construction period. Once construction activities are completed, the project area would return to preexisting levels of air quality and noise production.

Minimization Measures

- During construction, water trucks would be used for dust abatement when needed.
- All construction related ground-disturbing activities would be limited to the smallest possible construction footprint to minimize particulate generation.

Recreation

The physical setting of Fresno Reservoir offers unique scenic and visual features that offer a primitive/semi-primitive type of recreation opportunity. Examples of natural resource attributes that lend to the recreation opportunity include aquatic and terrestrial vegetation, topography, shoreline curvature, fish and wildlife habitat, natural soundscape, and water and air quality. Recreation opportunities change during the year because of weather, water uses, type and pattern of visitation, access, water operations, and other factors.

Reclamation administers the reservoir for limited and basic recreational purposes in accordance with general Reclamation Policy and Directives. The reservoir provides opportunities such as boating, camping, fishing, picnicking, water skiing, hunting, and wildlife viewing. Facilities provided at the reservoir contain campgrounds with handicap accessible restrooms, concrete boat ramps, picnic shelters, and swimming beaches. In addition, there are 24 privately owned cabins on federal land administered under Use Authorizations issued by Reclamation (LND 08-01).

The Montana Department of Fish, Wildlife & Parks (FWP) manages the fishery within the reservoir and a wildlife management area at the west end of the reservoir. There are six recreation sites along the 65 miles of shoreline along the reservoir, and the Fresno Tailwater Fishing Site on the Milk River as it exits the dam.

Public Access

Fresno Reservoir and Dam are most easily reached from Havre by travelling west on US Highway 2 for approximately 12 miles, then north on an asphalt county road approximately 2.5 miles from the highway. The crest of the dam serves as an access road (Fresno Reservoir Road/Fresno Road N / County Road 395 N) and provides access from US Highway 2 to Montana State Highway 232. Montana State Highway 232 (Wild Horse Trail) provides an alternate route from Havre by travelling north for approximately 7.0 miles to Supenau Road (gravel), then approximately 11.5 miles to Fresno Dam. Access roads to the dam are maintained year-round.

Public campsites are located on both sides of the reservoir, while the private cabins are located on the northeastern side of the reservoir. The spillway bridge is a one lane bridge, which limits the use multiple vehicles crossing at the same time.

No Action

Under the No Action Alternative planned construction would not occur and corrective actions would not be implemented. However, in the event of dam failure from not acting, recreation activities, opportunities, and visual quality would be negatively affected. Fresno Dam and a portion of Fresno Reservoir Road and the bridge crossing would be washed away by flood waters. Fresno Reservoir would be reduced to the natural flow of the Milk River, consequently creating large sediment laden beaches. As a result, there would be no boat access, limited fishing access, and lost enjoyment of animal watching as most terrestrial species would leave the area. Recreational quality and opportunities would be greatly diminished. Dam failure would result in long-term consequences to recreation in the area.

Proposed Action

Under the Proposed Action Alternative, the reservoir would be at elevation 2555 for approximately 1.5 months to allow for work on the spillway. This elevation restriction would allow more flexibility to mitigate dam safety risk during this critical construction component.

A full road closure across the spillway bridge would be needed during the spillway excavation (1.5 months). Thereafter the road would be reduced to one-lane traffic for the duration of construction and project restoration. Additional temporary restrictions may apply if weather conditions, traffic, or other issues arise during construction.

Public campsites located on the south side of the reservoir would not be impacted by construction if entering from US Highway 2 and following Fresno Reservoir Road to the desired campsite. Access to the north side of the reservoir requires crossing the bridge over the crest of the dam on Fresno Reservoir Road/Fresno Road N—this road would be closed to traffic during excavation of the spillway, then limited to one lane traffic for the duration of construction and restoration activities. Impacts would include limited public access across the spillway bridge to camping areas and privately owned cabins, alternate routes will need to be used. The alternate route from Havre via Supenau Road to Fresno Dam is over 18 miles, on mostly gravel road. Construction delays could increase travel times to all locations. The Fresno Tailwater Fishing Site on the Milk River would be closed throughout the duration of the project (3 years).

Fish, Wildlife, Aquatic Invasive, and Avian Species

Fish

Fresno Reservoir (5,700 acres) and the Milk River support several fish species. Montana FWP developed the reservoir as a rainbow trout fishery in the 1940s and '50s, however an illegal introduction of northern pike resulted in a decline to the trout fishery. In turn, Fresno was developed into a warm-water fishery supporting walleye, yellow perch, crappie, largemouth bass, smallmouth bass, Lake Superior whitefish, emerald shiner, and spottail shiners. The FWP continues to stock the fishery on a yearly basis.

Throughout the Upper Milk River Drainage, angling opportunities occur year-round, with anglers targeting the rivers and streams during the spring, shifting to the ponds and reservoirs from late spring through the winter months. Shore, boat, and ice fishing opportunities exist throughout the area, with anglers using a variety of methods to catch species.

Aquatic Invasive Species

Aquatic invasive species (AIS) are those that impact water bodies and wetlands. Whether they come on the trailers or hulls of recreational boats, or from the water of an angler's bait bucket, several non-native invasive species have found their way into Montana's water bodies. Their presence can cause severe damage to local ecosystems, industry, and tourism.

According to the MTNHP, there are two known aquatic invasive species that reside within Fresno Reservoir; these include common carp, and virile crayfish. In Montana, common carp are widespread in eastern drainages. The common carp is regarded as a pest fish because of its widespread abundance and tendency to destroy vegetation, increase water turbidity, and cause deterioration of habitat. Virile crayfish are moving across Montana and upstream into drainages where they did not exist before. Although native to eastern Montana their spread has affected other watersheds and native species (MT Field Guide).

Terrestrial Wildlife Species

Reclamation owned lands surrounding Fresno Reservoir and Dam provide hunting opportunities for waterfowl, antelope, whitetail deer, mule deer, upland game birds, and occasionally moose and elk. The diverse lands surrounding the Reservoir provide habitat for many wildlife species. All hunting and fishing activities are governed by FWP laws and regulations.

The Fresno Wildlife Management Area (WMA), administered by the FWP, includes approximately 2,700 acres at the upper end of the reservoir. The area provides for viewing of whitetail deer, mule deer, antelope, waterfowl and upland game birds, and numerous other wildlife species. The Rookery WMA located about ten-miles downstream of Fresno Reservoir provides roughly 2,293 acres and is also managed by the FWP. This WMA is open to the public for hunting and wildlife viewing and offers access to the Milk River

Both white-tailed deer and mule deer inhabit the area surrounding the Reservoir. White-tailed deer primarily exist along the floodplain of the Milk River and its tributaries, while mule deer can be found in the uplands and brushy bottoms. Pronghorn antelope can be found on the prairies surrounding the reservoir. Beaver, mink, muskrats, and racoon can be found near main waterways. Cottontail rabbits, badgers, ground squirrels, coyotes, red fox, and a wide variety of small mammals, reptiles, and amphibians inhabit the area.

Avian Species

Fresno Reservoir, located on the eastern edge of the Pacific Flyway and adjacent to the Central Flyway, provides important habitat during fall and spring migrations. Numerous migratory bird species are known to occur in the area. Many of these migratory species are available for hunting at and around Fresno Reservoir. These include certain species of ducks, geese, swans, coots, sandhill cranes, mourning doves, and snipe. Other migratory birds, such as avocet, bittern, crow, robin, pelican, bald and golden eagles, cliff swallow, sandpiper, Bullock's oriole, numerous hawk species, sparrow species, owl species, lark bunting, and numerous other species can be found near the reservoir. Cottonwood trees along the Milk River provide nesting habitat for birds of prey, such as hawks and eagles.

Threatened and Endangered Species

The Endangered Species Act of 1973 (ESA) was enacted to protect endangered and threatened species and provide a means to conserve their ecosystems. The evaluation of federally listed species focuses on the aquatic and terrestrial environments that may be influenced by the activities of the proposed project.

According to the US Fish and Wildlife Service's January 25, 2021 list of threatened (T) and endangered (E) species for Montana Counties, there are no listed species for Hill County, Montana. In addition, the US Fish and Wildlife Service's Information for Planning and Consultation (IPaC) online system was referenced. According to IPaC, there are no endangered species expected to occur at this location.

No Action

Under the No Action Alternative planned construction would not occur and corrective actions would not be implemented. Without corrective actions dam failure could occur. Dam failure would have a huge impact on the fishery within the reservoir. Most of the fish would not sustain the rapid release of water or the consequences of water depletion. The failure would result in a decrease in food and habitat availability, as well as concentration of fish into a smaller area, and increases in predation. Overall, dam failure would have a negative effect on wildlife that depend on the reservoir:

- Fish population and habitat would be impacted because Fresno Reservoir would not have the capacity to store water or the ability to maintain the current fish population.
- Terrestrial wildlife would remain in upland areas surrounding the reservoir but would likely avoid areas with increased sediment until those areas become revegetated.
- Migratory aquatic avian species such as ducks and geese would be impacted from the loss of the reservoir water, forage, and habitat. Birds of prey would temporarily benefit from fish concentrated in smaller areas and upon increased carrion resulting from abrupt depletion of water.
- There would be no effects to threatened and endangered species from the No Action or Proposed Action alternatives.

Proposed Action

Under the Proposed Action, the temporary drawdown in reservoir elevation to control seepage during construction would temporarily impact the fishery. It is estimated that the reservoir restriction to below 2,555 feet would be for 1.5 months during excavation of the spillway wall. Impacts could include a slight temporary decrease in food and habitat availability as well as concentration of fish into a smaller area, with potential increases in predation.

Displaced wildlife would likely find suitable habitat in surrounding areas where similar vegetation is present. Species such as small mammals and nesting ground birds are expected to return to reclaimed areas after construction. Temporary, minor loss of habitat would occur where vegetation is removed during construction activities.

Construction noise would temporarily displace terrestrial wildlife in the construction areas. Small animals and birds are the most susceptible to this type of displacement. Larger animals such as deer are expected to avoid construction areas. These impacts would be short-term and temporary in nature, and overall unlikely to have a noticeable impact. There would be no effects to threatened and endangered species from the Proposed Action Alternative.

Minimization Measures

- All necessary vegetation removal shall be completed before nesting season begins (April 1) or after nesting season is completed (August 31) to reduce potential nest losses.

Cultural and Paleontological Resources

Section 106 of the National Historic Preservation Act of 1966 (NHPA) (PL 89-665; 80 Stat. 915; 16 USC 470) mandates that Reclamation consider the potential effects of a proposed Federal undertaking on historic properties. Historic properties are defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for, the National Register of Historic Places (NRHP). Potential effects of the described alternatives on historic properties are the primary focus of this analysis.

In compliance with the regulations specified in Section 106 of the NHPA (36 CFR 800.16), the affected environment for cultural resources is identified as the area of potential effects. The area of potential effects is the geographic area within which Federal actions may directly or indirectly cause alterations in the character or use of historic properties. The area of potential effects for this proposed action includes the area that could be physically affected by any of the proposed project alternatives (the maximum limit of disturbance).

Cultural resource inventories have been conducted that covered the proposed undertaking Area of Potential Effects (APE). Reclamation sent consultation on this undertaking to the Montana State Historic Preservation Office (SHPO), Blackfeet Nation Tribal Historic Preservation Office (THPO), the Chippewa Cree Tribe of the Rocky Boy's Reservation THPO, and the Fort Belknap Indian Community THPO. Reclamation received no responses from the Blackfeet Nation THPO, the Chippewa Cree Tribe of the Rocky Boy's Reservation THPO, and the Fort Belknap Indian Community THPO.

An adverse effect was determined by Reclamation to the site 24HL0860, Fresno Dam, a site eligible for inclusion in the NRHP. Reclamation proposes to mitigate the adverse effect by conducting a Historic American Engineering Record (HAER). The HAER program documents American engineering artifacts to create an archive of historic industrial design. Reclamation continues to work with the SHPO and the Advisory Council on Historic Preservation regarding the adverse effect.

Paleontological Resources

In accordance with the Paleontological Resources Preservation Act of 2009 (16 USC 470aaa-aaa-11), paleontological resources are being taken into consideration. Reclamation is working with the Museum of the Rockies and the FWP.

No Action

Reclamation would continue operating the dam and reservoir to meet water supply and delivery commitments. However, in the event of dam failure large amounts of displaced water would cause erosion and sedimentation and the reservoir level would drop potentially exposing paleontological resources. In addition, abrupt dispersal of water could displace archaeological resources. Exposure of paleontological, archaeological, and cultural resources could promote illegal collection of artifacts.

The No Action alternative is not acceptable because the risk of dam failure would remain above Reclamation's PPGs.

Proposed Action

Under the Proposed Action alternative, an adverse effect to the existing Fresno Dam would occur. Reclamation continues to work with the SHPO and the Advisory Council on Historic Preservation regarding the adverse effect. In addition, the temporary drawdown in reservoir elevation could expose paleontological resources.

Minimization Measures

- Reclamation would mitigate the adverse effect to the Fresno Dam by conducting an HAER.
- Should any cultural or palaeontologic resources be found during construction, work would be halted, and Reclamation and other appropriate agencies would be contacted.

Indian Trust Assets

Indian Trust Assets (ITAs) are legal interests in property held in trust by the U.S. (with the Secretary of the Interior acting as trustee) for Indian Tribes or Indian individuals. This trust responsibility requires that Federal agencies take all actions protect and maintain rights reserved by or granted to Native American tribes or Native American individuals by treaties, statues, and executive orders. reasonably necessary to protect trust assets. Reclamation's policy is to protect Indian trust assets from adverse impacts of Reclamation programs and activities. ITAs include, but are not limited to, lands, minerals, hunting and fishing rights, and water rights.

The Fort Belknap-Montana water compact, pursuant to the Treaty of 1855 provides water for agricultural uses on the Fort Belknap Indian Reservation. The Fort Belknap Indian Irrigation Project has senior water rights on the Milk River, as follows:

- 125 cfs of the natural flow of the Milk River
- 1/7 of the Milk River stored in Fresno Reservoir.

No Action

Reclamation would continue operating the dam and reservoir to meet water supply and delivery commitments. In the event of a dam failure water delivery would be temporarily interrupted. No impacts to ITAs would be expected.

Proposed Action

The proposed action does not involve the acquisition of water rights or change of use for Fresno Reservoir or the Milk River. Reclamation would continue to operate the dam and reservoir to meet water supply and delivery requirements during and after construction of the Proposed Action Alternative. No adverse impacts to ITAs have been identified.

Cumulative Impacts

Cumulative effects are the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions (40 CFR § 1508.7). As required by NEPA, Reclamation has prepared this assessment in consideration of cumulative impacts related to the alternatives considered in the EA.

Reclamation has examined the potential for significant environmental effects to water resources, wildlife, wetlands, threatened and endangered species, cultural resources, socioeconomics, Indian trust assets. Federal, State, and Tribal regulations designed to protect fish and wildlife resources, important habitats and sensitive areas, cultural and paleontological resources, human health and safety, and the public interest provide the legal basis for evaluations.

Authorization of the Project was for a single purpose—to impound Milk River water for irrigation in northcentral Montana. As stated previously, Fresno Dam was completed in 1939. Cumulatively, these past actions and associated activities have altered the landscape within the project area. In 1939, transverse cracks were observed in the downstream slope near the dam abutments. The dam crest was modified after construction to compensate for the settlement and raising the crest to the design elevation. Other past actions within the Project boundaries includes the 2020 failure of the Drop 5 hydraulic structure, and subsequent replacement of Drop 5 and Drop 2. Ongoing activities that may occur within the study area include recreation, livestock grazing, agricultural production, and routine road maintenance. Future actions in the area include continued operation and maintenance to Fresno Dam and appurtenant structures. In addition, it is anticipated that other features of the Milk River Project would be replaced or repaired in the future.

No Action Alternative

Under the No Action Alternative, there would be no changes to the dam or how it is operated. Consequences of taking No Action could result in continued internal erosion and increased settlement of the foundation, ultimately increasing the risk of dam failure.

Consequences of dam failure can include loss of life, property damage, lost benefits, ripple effects through the economy, and environmental damages. Existing contractual obligations to supply water would not be met. Cumulatively, over time northcentral Montana would feel a loss of agricultural production. Reductions in water would result in lost benefits to municipalities and irrigators in northcentral Montana.

Proposed Action Alternative

The proposed state-of-the-practice embankment overlay on Fresno Dam that would include a vertical sand filter and new toe drainage system. The purpose is to maintain the authorized Project purposes while correcting safety deficiencies. Taking corrective actions would provide long-term benefits by:

- Downgrading the DSPR 2 rating at Fresno Dam to an acceptable level to meet PPGs, the SOD Act, and other Federal Guidelines.
- Correcting the existing deficiencies of the 80+ year old dam through modern engineering design and techniques would increase longevity.
- Maintaining a secure water supply delivery to the Milk River valley in northcentral Montana.

Under this Alternative, temporary direct impacts would include construction traffic, noise, dust, and vehicle emissions in the project area. Land disturbing impacts associated with corrective actions to Fresno Dam could cause short term erosion and sedimentation. Construction noises may temporarily displace wildlife that inhabit the area, but they would return to favorable conditions upon completion of construction activities.

The three-year construction period and reservoir restriction to elevation 2,555 for a 1.5-month period during the first year of construction would have short-term, minor impacts to recreation and wildlife. The temporary road closures across the spillway bridge would cause minor inconveniences to transportation to the north side of the reservoir. There is an alternate route that would still allow access, although travel time would be longer. Once work on the spillway is completed one lane traffic would resume for the duration of the construction and project restoration. Additional temporary restrictions may apply if weather conditions, traffic, or other issues arise during construction. A traffic control plan would be in place for the duration of the project to ensure traffic safety.

The Proposed Action would provide long-term improvements for public safety and water delivery. The long-term benefits of the Proposed Action are far reaching and would offset short-term impacts. The proposed repairs are essential to meet PPGs and provide municipal water supply demands in the U.S. and in to ensure full agricultural production in the future for the water users in the project area.

Cumulatively, the Proposed Federal Action would meet Reclamation's duty under the SOD Act to ensure that Fresno Dam does not present unreasonable risks to people, property, and the environment.

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