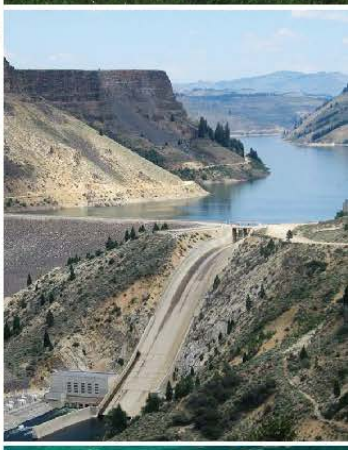
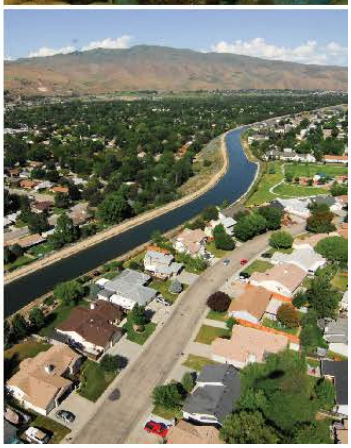
BUREAU OF RECLAMATION

Draft Environmental Impact Statement

Boise River Basin Feasibility Study





Estimated Lead Agency Total Costs Associated with Developing and Producing this EIS: $3,300,000

U.S. Department of the Interior

July 2020

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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.

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Draft Environmental Impact Statement

Boise Project, Idaho

Lead Agency:

U.S. Department of the Interior

Bureau of Reclamation

Interior Region 9: Columbia Pacific Northwest

Cooperating Agencies:

U.S.D.A. Forest Service

U.S. Army Corps of Engineers

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Cover photos: Main photo, Anderson Ranch spillway and powerplant, courtesy Bureau of Reclamation, 2019. Curlew Creek dispersed camping photo, top right, U.S. Forest Service. Bull trout, fourth down, by Joel Sartore -National Geographic Creative taken on behalf of the U.S. Fish and Wildlife Service. All other's courtesy of U.S. Bureau of Reclamation.

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ES 1. Executive Summary

ES 1.1 Introduction

Reclamation, through WIIN Act authority, and the state of Idaho, through a Idaho Water Resource Board (IWRB) resolution, have entered into a partnership to consider additional surface water storage within the Boise River basin. Reclamation is evaluating the technical, economic, and financial feasibility of a dam raise at Anderson Ranch Dam, referred to as Boise River Basin Feasibility Study (Feasibility Study).

The Feasibility Study evaluates increasing storage opportunity within the Boise River basin and provides the basis for making recommendations to Congress about whether a proposed project should be authorized for construction and includes an assessment of the environmental impacts as required by the National Environmental Policy Act of 1969 (NEPA). This Draft EIS is part of that process and evaluates raising Anderson Ranch Dam as the proposed action.

Reclamation will analyze the project and potential impacts of the action in compliance with NEPA and other applicable laws. Reclamation published a Notice of Intent to prepare this environmental impact statement (EIS) in the Federal Register on August 9, 2019. Reclamation sought public comment and involvement during the planning and preparation of this EIS by (1) hosting public scoping meetings, (2) communicating and consulting with a variety of Federal, State and local agencies, Native American tribes and interest groups, and (3) establishing a project website to share information with the pubic. A cooperating agency team comprised of federal and state agencies with jurisdiction or special expertise was established to assist in the preparation of this EIS.

ES 1.2 Background

The Boise Project was authorized on March 27, 1905, under provisions of the Reclamation Act of 1902. The project is a series of water storage, irrigation, and power-generating facilities developed to bring water and energy to previously undeveloped areas of the Boise River basin. For purposes of this analysis we will focus on the Boise River basin that includes three major storage dams, one diversion dam, and one major and one minor off-stream storage reservoirs. The three major storage dams in the Boise River are built in a series, meaning water from Anderson Ranch Reservoir passes through Arrowrock Reservoir and then through Lucky Peak Reservoir (owned by the US Army Corps of Engineers of USACE) to provide water to the Boise River basin. These major reservoirs have a total active capacity of more than 1 million acre-feet and furnish water to approximately 280,000 acres.

There is a long history related to the concerns over water storage capacity requirements and securing a more reliable water supply for current and future needs in the Boise River basin. In the early 2000s many local, state, and Federal entities began discussing the concerns and identifying potential long-term solutions. Over the course of the next several years, various efforts were undertaken by the state and Federal agencies to consider and study possible enhancement of storage in the Boise River basin to address water shortage concerns as well as anticipate future demands. This included a 2016 study by the IWRB focused on water

demand projects. A general investigation study conducted by the USACE evaluating the potential raising of Arrowrock Dam to address flood control and storage needs, resulted in USACE recommending that the proposal not move forward given the flood control benefits that were less than associated project costs. Following the conclusion of the USACE study, Reclamation renewed its earlier focus and partnered with the state of Idaho resulting in this effort to assess the feasibility to increase storage capacity for the Boise River basin.

In 2018, Congress expressly authorized and funded the Boise River Basin Feasibility Study—in accordance with the requirements of the WIIN Act—in the 2018 Consolidated Appropriations Act (Pub. L. 115-141). After initial technical engineering analysis and Reclamation's receipt of WIIN Act authority and funding, IWRB passed a resolution on July 27, 2018, to focus the study on a raise at Anderson Ranch Dam.

In 2019, as part of the Feasibility Study, Reclamation conducted an initial technical review of available information and completed site visits of the Anderson Ranch, Arrowrock, and Lucky Peak dams. The results of these technical reviews concluded that an increase in reservoir storage at Arrowrock and Lucky Peak dams is likely to be significantly more difficult than raising Anderson Ranch Dam along with physical and regulatory complexities associated with the facilities while providing less storage potential. Therefore, Anderson Ranch Reservoir became the focus of additional water storage opportunities.

ES 1.3 Setting

The project area includes the Anderson Ranch Reservoir and entering tributaries (to the point of the new inundation elevation), the South Fork Boise River downstream of Anderson Ranch Reservoir, and Arrowrock Reservoir and entering tributaries (relative to any temporal shift in pool elevation that may occur). It also includes any lands proximate or adjacent to Anderson Ranch Reservoir or in the vicinity that would be impacted as a result of construction activities (e.g., dam, bridges, culverts, roadways, staging), and the farthest extent of impacts anticipated to occur as a result of construction activities (elevated pool and downstream releases). The project area also includes transportation routes, roadwork areas, borrow areas, and detour routes that would be used during construction, as well as the extent of continued operation and maintenance activities.

ES 1.4 Proposed Federal Action

Reclamation, in partnership with IWRB, proposes to raise Anderson Ranch Dam. This raise would capture and store additional water.

This Draft EIS considers two different construction alternatives to accomplish the proposed dam raise and includes many project features around the reservoir. The alternatives and multiple accompanying project features are detailed in the alternative descriptions in Chapter 2 of this Draft EIS.

The Anderson Ranch Dam raise would include the following structural modifications to the dam site.

- Demolish existing spillway crest structure and bridge and construct in place.
- Construct new crest structure (downstream embankment raise or mechanically stabilized earth [MSE] wall raise) in place.

- Remove, rehabilitate, and re-install existing radial gates.
- Restore two-lane road across the dam.
- Widen right abutment (northern side) to improve turning radius for traffic.
- Elevate the raise fixed-wheel gate house windows and electronic controls.

Due to the required closure of the Anderson Ranch Dam Road (Highway District [HD] 134) during construction, Cow Creek Road (HD 131) would be improved to enable continued public access during and after construction and provide a year-round detour route. Developed recreation sites impacted by the increased surface water elevation would be rebuilt above the new full pool elevation. Additionally, multiple minor roadway sections would also be improved to accommodate the new full pool elevation. The culverts at Deer Creek and Fall Creek would be retrofitted to improve habitat connectivity.

Following the direction provided by the WIIN Act to provide a Federal benefit, Reclamation has recognized the opportunity to reserve 10% of the proposed space to provide operational flexibility or for environmental purposes, which could include environmental flows. Coordination with local, State, and Federal entities would allow prioritization of water uses for environmental purposes aligned with existing environmental requirements.

One possible use for this water could be used to meet current Boise System operations environmental requirements from three active ESA consultations including: Bull Trout (USFWS, 2005), Bull Trout Critical Habitat (USFWS, 2014) and Salmon Augmentation flows (NOAA, 2008). Within the Boise System, the Incidental Take Statements associated with the ESA consultations provide protective coverage through ESA to continue operations and include: 10 Terms and Conditions and 14 Conservation Recommendations, based on which 10 operational targets and 9 physical/biological habitat features are monitored. Furthermore, annual coordination with the Services for within season operations, annual monitoring and a summary report of annual operating and monitoring is required.

Finally, a water right would be obtained from the Idaho Department of Water Resources (IDWR) and water contracts would be issued for delivery of the additional water made available by the dam raise in some years. Potential spaceholders include existing Reclamation contractors and IWRB, which could, in turn, contract water to existing Water District 63 water users and/or may offer water through the Idaho Water Supply Bank Water District 63 rental pool—a water exchange market operated by IDWR.

ES 1.5 Purpose and Need for Action

The purpose of the Proposed Action is to address water storage capacity requirements in the Boise River Basin. The proposed action is needed in order to replace existing storage currently provided by the snowpack and to expand options to store precipitation available at different times than typical and in higher runoff years for dry years in order to maintain existing uses served by the present Boise River System and to increase water supply reliability. The proposed action is also needed to help meet future projected demands for new uses of water in the Treasure Valley and surrounding areas when possible. The Proposed Action would provide the flexibility to capture additional water when available based on a junior water right, for later delivery when and where it is needed to meet these existing and evolving demands.

The proposed action is the result of the Feasibility Study, which addresses the needs described here and is undertaken in cooperation with the state of Idaho, pursuant to P.L. 111-11 and WIIN Act Section 4007 (Pub. L. 114-322, section 4007). The WIIN Act section provides for studying, designing, and constructing or expanding any Federally owned storage project upon the request of a partner. The Feasibility Study responds to the state of Idaho request to study options for potentially raising Anderson Ranch Dam to provide additional storage to enhance the long-term water supply in the Boise River basin. A description of the series of resolutions and requests from the state related to the study is in Section 1.2 of this Draft EIS.

ES 1.5.1 U.S. Forest Service Purpose and Need

To accomplish Reclamation's proposed action, the U.S. Forest Service (USFS) would need to modify an easement and two special use permits. Specifically, USFS would need to respond to Reclamation requests to do the following.

- Modify the Forest Roads and Trails Act easement issued to Mountain Home Highway District to allow partial road reconstruction and relocation on Cow Creek Road (HD 131).
- Amend the Idaho Division of Aeronautics special use permit to allow realignment of the Pine Airstrip.
- Amend the Fall Creek Resort and Marina special use permit to mitigate possible impacts associated with the Reclamation proposed action.
- Amend the Idaho Power special use permit to allow relocation of power poles and power lines.

ES 1.5.2 U.S. Army Corps of Engineers Purpose and Need

Pursuant to Section 404 of the Clean Water Act, USACE will review the proposed project and render a decision to either issue, issue with special condition, or deny a permit for the project. For USACE, the basic project purpose is to increase water storage capacity. The overall project purpose is to increase water storage capacity by improving infrastructure within [Reclamation's] Boise Project, as authorized. This overall project purpose will be used to evaluate practicable alternatives under the 404(b)(1) guidelines (40 Code of Federal Regulations [CFR] 230).

ES 1.6 Alternatives

This Draft EIS examines the range of reasonable alternatives developed to meet the project's purpose and need as well as a No-Action Alternative. A No-Action Alternative is required to be considered under NEPA (40 CFR 1502.14[d]) as a basis for comparison of the alternatives. In addition to the No-Action Alternative, two action alternatives have been evaluated in detail, considering potential environmental effects, as well as technical and economic considerations such as reliability and cost. A larger number of other potential alternatives were considered but eliminated.

ES 1.6.1 Alternative A – No Action

Under the No-Action Alternative, there would be no change from current management direction at Anderson Ranch dam and reservoir, and the proposed action would not be implemented. Storage levels within Anderson Ranch Reservoir would remain within the current capacity of 413,100 acre-feet. Reclamation would continue to operate Anderson Ranch Dam under current standard operating procedures. Irrigation water delivery, power generation, and flood control would continue to occur according to existing reservoir operation protocols. Water delivery would still occur at normal times and patterns.

ES 1.6.2 Alternative B – 6-Foot Dam Raise of Anderson Ranch Dam

Alternative B proposes to raise Anderson Ranch Dam 6 feet from the present full pool elevation of 4196 feet to 4202 feet to capture and store approximately 29,000 additional acre-feet of water. Alternative B would inundate an estimated 146 acres of additional land around the reservoir above the current full pool elevation.

The following structural modifications at the dam would accommodate the increased full pool elevation.

- Demolish existing spillway crest structure and bridge and construct in place.
- Construct new dam crest structure in place.
- Remove, rehabilitate, and re-install existing radial gates.
- Restore two-lane road across the dam.
- Widen right abutment (northern side) to improve turning radius for traffic.
- Elevate the fixed-wheel gate house electronic controls.

Additional information regarding dam infrastructure is included in the 6-foot Dam Raise Engineering Summary Report, Appendix C of this Draft EIS.

Two separate but similar, structural construction methods are being considered for the dam raise: downstream embankment raise or MSE wall raise. Project areas and construction durations for each structural construction method are nearly identical, except for a 200-foot difference in approach road length at the right abutment and an approximate 1-month difference in construction duration. Because these differences are negligible, they are not differentiated within the analysis of each alternative.

The Lime Creek Bridge and Pine Bridge over South Fork Boise River were identified as being potentially impacted by the proposed 6-foot surface water elevation increase. Lime Creek Bridge work is limited to repairing the abutment slopes with riprap. Bridge-specific construction activities for Pine Bridge may consist of demolishing abutments, relocating and storing the existing superstructure, installing new piles, constructing taller abutments, reinstalling the superstructure, and installing riprap.

Pine Airstrip would have the runway realigned so the runway is completely above the 4202-foot elevation contour. The existing turf runway would be replaced by a new turf runway located on the existing property with similar dimensions but different orientation.

Six USFS-managed campsites impacted by the increase in water elevation would be rebuilt above the new full pool elevation. This would be accomplished by importing and placing fill material, except for the two campsites at Castle Creek Campground, which would be relocated to the Pine Campground. USFS-developed recreation sites would be replaced in kind. Fall Creek Resort and Marina mitigation is addressed in the Recreation Section 3.16.2.4 of this Draft EIS.

ES 1.6.3 Alternative C – 3-Foot Dam Raise of Anderson Ranch Dam

Alternative C proposes to raise Anderson Ranch Dam 3 feet from the present full-pool elevation of 4196 feet to 4199 feet. The 3-foot raise would capture and store approximately 14,400 additional acre-feet of water. Alternative C would inundate an estimated 73 acres of additional land around the reservoir above the current full pool elevation.

Alternative C is largely similar to Alternative B with the following exceptions.

- Construction at the dam would require less material than Alternative B. For the MSE wall, approximately 30% less fill material would be needed. The downstream embankment raise would require between 50% and 70% less fill material for the various fill zones in the dam. While the quantities for the 3-foot raise would be reduced, all four identified borrow sites would still be used.
- HD 128 (Lester Creek Road) would not require modification.
- Pine Airstrip would not require relocation.
- The Pine Campground would not require as much fill to protect the infrastructure and the number of new picnic shelters, tables, and fire rings; inundated replacements would be reduced from 9 to 3 campsites. The dock sections needed would be reduced from 4 to 3 16-foot sections.
- The Pine Bridge would not be affected and would not need replacement.

Further descriptions regarding the varying design features and difference in quantities are included in the 3-foot Dam Raise Engineering Summary in Appendix D of the Draft EIS.

ES 1.7 Preferred Alternative

Reclamation has chosen Alternative B, the 6-foot dam raise at Anderson Ranch Reservoir, as the preferred alternative. Reclamation compared all alternatives in terms of reliability, environmental impacts and non-environmental issues identified during the EIS process, along with the estimated construction, annual operation, and maintenance and replacement costs.

ES 1.8 Major Conclusions and Areas of Controversy

Chapter 3 summarizes the physical, biological, social, and economic resources (affected environment) and the effects of implementing each alternative on those resources. Under each resource topic is a discussion of impact indicators, methods, and the direct and indirect impacts of implementing each alternative. The consequences of the No-Action Alternative are described and then the potential impacts of each action alternative are evaluated in comparison to the No-Action Alternative. Potential impacts are quantified as appropriate and when supported by existing data or models. Where quantitative data are not available,

impacts are described qualitatively. The duration of impacts is identified as either short term (temporary during construction), or long term (permanent during operations).

Impacts from the preferred alternative are described in detail in Chapter 3. A summary of the impacts to resources of concern and of interest to the public are given below.

ES 1.8.1 Recreation

- USFS-managed campgrounds and boat ramps would experience temporary adverse impacts as facilities are closed to public use for reconstruction.
- Construction at campground and boat ramp facilities would be scheduled outside of peak season and boat ramp access would be maintained throughout construction.
- No permanent loss of access would occur, and recreationists would benefit from improved roadways following construction.

ES 1.8.2 Endangered Species Act Listed Species/Fisheries

- No significant effects would occur to fisheries resources, including threatened bull trout (*Salvelinus confluentus*) because water management practices would remain largely unchanged.
- With best management practices (BMPs) in place, there would be no measurable shift in existing water quality standards or increase in the introduction or spread of aquatic invasive species.
- Over the long term, beneficial effects may be realized as a result of an elevated pool in Anderson Ranch Reservoir, extended temporal connection with entering tributaries, and altered refill regime of waters into Arrowrock Reservoir (via South Fork Boise River), with particular beneficial effects for salmonids and other species as a result of retrofitting of culverts.

ES 1.8.3 Detour

- During public scoping, local residents expressed concern over using the proposed detour as their main thoroughfare.
- The road detour route was adjusted to accommodate large vehicles and road sections will be straightened or widened and will remain open all year.

ES 1.9 Impact Summary

By implementing BMPs, most construction impacts would temporary, although some permanent impacts would result from constructing aboveground features. Environmental commitments listed at the end of Chapter 3 would be implemented to mitigate adverse environmental impacts not avoided by implementing BMPs. Table ES-1 summarizes the action alternative impacts in comparison to the No-Action Alternative.

Table ES-1: Summary of Impacts

Alternative A	Alternative B	Alternative C
Water Operations and Hydrology		
• No new storage capacity for new (junior) water users • No change in operations	During Construction • 42 month restriction • Up to 97,000 ac-ft reservoir restriction • Less flood risk management (FRM) capacity Post-Construction • 710 cfs less downstream flow during fill of space. • 1-7 day reduction in peak flow • Up to 29,000 ac-ft available for use annually • Up to 9.1 days with additional powerplant capacity in late summer	During Construction • 35-month restriction • Same reservoir restriction • Similar FRM decrease to Alt B, but to a lesser degree Post-Construction • 380 cfs less downstream flow during fill of space • 1-5 days reduction in peak flow • Up to 14,500 ac-ft available for use annually • Up to 4.5 days with additional powerplant days in late summer
Geology and Soils		
• Current erosion patterns continue	During Construction • Increased localized erosion Post-Construction • 146 additional inundated acres • New shoreline erosion • Bank and roadway stabilization	During Construction • Same as Alternative B except less in magnitude and reduction in project features Post-Construction • Same as Alternative B except less inundation (73 acres)
Water Resources		
• Current dam standard operating procedures • Reservoir water quality levels	During Construction • Turbidity and sediment issues, but not to exceed Idaho water quality standards Post-Construction • Shoreline to remain stable • Design features to reduce erosion	During Construction • Same as Alternative B, turbidity not to exceed Idaho water quality standards • Shoreline erosion minimized by riprap and other design features • No impacts to surface water temperature Post-Construction

Alternative A	Alternative B	Alternative C
	• No significant changes to water temperature, flow or dissolved oxygen • Idaho water quality standards would continue to be met • No effect on groundwater quality • Fall Creek and Marina OSS impacted • Curlew Creek Campground public drinking water well would be relocated	• Same as described for Alternative B except 1.5% increase in inundation acres above the No Action
Floodplains		
• No decrease in the functionality or change the classification of existing floodplains. • No increase in risk to human health, safety, and welfare due to flooding	During Construction • Placement of a temporary (42 months) structure within reservoir pool Post-Construction • Increase in floodplain area, not impacting function of safety (3% increase in acres)	During Construction • Placement of a temporary (35 months) structure within reservoir pool Post-Construction • Increase in floodplain area, not impacting function or safety (1.5% increase in acres)
Wetlands		
Continue to be affected directly by exposure to varying levels of inundation and indirectly by anthropogenic activities	During Construction Staging and borrow area impacts temporary and returned to preconstruction conditions Pine Bridge construction impacts negligible because riverine wetlands would not change Post-Construction Permanent loss of wetlands, shift in wetland type, or creation of wetlands, in response to the increased inundation (24.5 potential wetland acres) Adverse impacts expected to be offset by creation of wetlands upgradient	During Construction Similar to Alternative B except less in magnitude of disturbance area No Pine Bridge construction, would not impact wetlands Post-Construction Same as Alternative B except less in magnitude (16.0 potential wetland acres)

Alternative A	Alternative B	Alternative C
Vegetation		
• Vegetation would be affected by the same impacts as it has been exposed to throughout the past years	During Construction • Contractor use and borrow areas to be re-seeded with native species • Increased potential for invasive species introduction • Post-Construction • Likely result in a long-term, direct, adverse impact to upland vegetation and riparian vegetation • Adverse impacts to be offset by conversion of upland areas into wetlands and riparian habitat	During Construction • Similar to Alternative B except less in magnitude of disturbance area • Post-Construction • Similar to Alternative B except less in magnitude of disturbance area
Fisheries		
• Future actions could impact fishery and include climate variability, other water development projects, land use changes, or municipal development • Fish barriers at Deer Creek and Fall Creek culverts would continue to limit access to forage habitat • Trends related to invasive species expansion would continue	During Construction • Underwater noise and vibration, releasing sediment into live water, limited habitat access, and other effects have the potential to displace fish, inhibit use of migratory corridors, and limit access to forage habitat Post-Construction • No measurable shift in existing water quality or increase in introduction or spread of aquatic invasive species • Beneficial effects due to extended temporal connection with entering tributaries, and altered refill regime • Beneficial effects for salmonids and other species from improvements at Deer Creek and Fall Creek culverts	During Construction • Similar to Alternative B except less in magnitude of disturbance due to no construction at Pine Bridge and 7 months less construction time Post-Construction • Long-term impacts are the same as Alternative B
Wildlife		
• No project-related loss or degradation of habitat,	During Construction • Actions likely to result in loss of breeding habitat, disruptions during	During Construction • Similar to those described for Alternative B, except that less acres

Alternative A	Alternative B	Alternative C
disturbance to wildlife, or decreased landscape connectivity	breeding and nesting season, and/or direct mortality of species of concern • Moderate adverse impacts to habitat connectivity short term for duration of construction and no permanent interference with the movement of species <u>Post-Construction</u> • Loss or degradation of suitable habitat affecting breeding, rearing, or foraging for any species • Availability of nearby similar suitable habitat during inundation	of shoreline and riparian habitat would experience inundation <u>Post-Construction</u> • Overall long-term impacts are the same as Alternative B
Threatened and Endangered Species		
• Extent and quality of habitat for T&E resources would not change from project activities	<u>During Construction</u> • No short-term impacts would adversely affect listed terrestrial T&E species • Short-term construction impacts to YBCC are negligible due to minimal habitat • In-water construction activities may negatively affect bull trout and their critical habitat <u>Post-Construction</u> • No long-term impacts related to operations and maintenance would have the potential to adversely affect listed terrestrial T&E species • Limited long-term impacts to bull trout and their habitat would persist under Alternative B • Beneficial effects of extended temporal connection with entering tributaries • Beneficial effects for salmonids and other species anticipated at Deer Creek and Fall Creek culverts	<u>During Construction</u> • Impacts would be the same as described for Alternative B except for elimination of potential impacts to bull trout from construction at Pine Bridge <u>Post-Construction</u> • Long-term impacts would be the same as Alternative B
Aesthetics		

Alternative A	Alternative B	Alternative C
• The visual environment would remain like its current state	During Construction • Impacts to the aesthetic environment due to vegetation clearing and construction activity Post-Construction • Visual environment would remain similar to current state	During Construction • Similar to Alternative B; however, the magnitude of the impacts would be less in duration and disturbance area Post-Construction • Long-term impacts would be the same as Alternative B
Air Quality		
• Air quality conditions in the project area Classification as an attainment area for all National Ambient Air Quality Standards would remain unchanged	During Construction • Emissions generated from equipment usage and truck traffic are not expected to violate any of the Federal and state standards Post-Construction • No expected long-term effects to air quality • Operation would not generate new emissions or dust	During Construction • Impacts would be less than Alternative B Post-Construction • Long-term impacts would be the same as Alternative B
Climate Variability		
• Projected future climate variability is expected to increase	• Future climate timing and magnitude of inflows show potential for increased storage, a minor, indirect, and long-term beneficial impact to project operability	• Impacts would be the same as Alternative B
Noise		
• No new direct, indirect, short-term, or long-term adverse effects on noise receptors are expected	During Construction • No exceedance of the construction noise guidelines established in the Federal Transit Administration (FTA) manual would occur Post-Construction • There would be no expected long-term effects to noise levels	During Construction • Impacts would be similar as described for Alternative B, although a reduced duration of noise-related impacts by 7 months • No construction at Pine Airstrip and Pine Bridge • No exceedance of the noise guidelines

Alternative A	Alternative B	Alternative C
		Post-Construction • Long-term impacts would be the same as Alternative B
Land Use		
• Land use would remain unchanged and function as it has in the past.	During Construction • Pine and Featherville, as well as local area ranchers and farmers and those with livestock grazing agreements, would experience disrupted road access Post-Construction • Direct impacts to land use from inundation would be minor due to the 3% increase in inundated acres	During Construction • Impacts are similar to Alternative B other than the duration of construction and road closures being less by 7 months Post-Construction • Direct impacts to land use from inundation would be minor due to the 1.5% increase in inundated acres
Recreation		
• Recreation amenities and activities would remain consistent with current access, opportunities, and experience on and around the reservoir • Existing amenities would continue to see wear due to increasing popularity of the reservoir	During Construction • Temporary reduction in recreational access and opportunity due to construction • Elk Creek boat ramp and Spillway campground closed for 51 months. • Noise and dust impacts to recreationists along the banks of the South Fork Boise River along the haul section of HD 121 Post-Construction • Lack of shade due to tree removal is anticipated to be a short-term major direct impact, but is not permanent • Long-term benefits due to road improvements • All access, opportunity and experience would be restored	During Construction • Similar to Alternative B except for the Elk Creek boat ramp and Spillway campground closed for 44 months and less campsites require modification Post-Construction • Long-term impacts are the same as Alternative B
Water Rights		
• Conditions may result in short-	During Construction	During Construction

Alternative A	Alternative B	Alternative C
and long-term direct and indirect adverse impacts because system shortages may increase during dry water years and increasing climate variability	• Anderson Ranch Reservoir storage account shortfalls would occur • Drafts from the downstream system reservoirs and volume shortfalls would cease with the conclusion of construction <u>Post-Construction</u> • The reservoir would have an increased capacity of approximately 29,000 acre-feet, which would be available to support existing and future beneficial water use in the Boise River basin	• Short term impacts during and post-construction are expected to be the same as described for Alternative B <u>Post-Construction</u> • The reservoir would have an increased capacity of approximately 14,400 acre-feet, which would be available to support existing and future beneficial water use in the Boise River basin
Transportation and Infrastructure		
• Transportation and infrastructure would remain and function as in the past.	<u>During Construction</u> • Short-term public closure of roads and lane closures necessary; temporary impacts to the use of Pine Airstrip; and potential short-term loss of utility service due to relocations • Pine Airstrip closed no longer than 3 months, not to occur during high-use times <u>Post-Construction</u> • Dam roadway segment increased to two lanes, a long-term beneficial improvement to mobility and safety	<u>During Construction</u> • Road closures are the same as Alternative B but 7 months less in duration • Fewer haul trucks and less construction duration • No Lester Creek Road improvements, no closure of Pine Bridge, and no closure of the Pine Airstrip <u>Post-Construction</u> • Same as Alternative B
Socioeconomics		
• The socioeconomics would remain and function as it has in the past.	<u>During Construction</u> • Not likely to result in a significant impact to employment, housing, personal income, total industry earnings, employment, and agricultural resources in analysis area <u>Post-Construction</u>	<u>During Construction</u> • The direct and secondary effects are less than those described for Alternative B because the construction costs for Alternative C are less <u>Post-Construction</u> • Long-term impacts are the similar as Alternative B, although meet less future water demand

Alternative A	Alternative B	Alternative C
	• Actual water amount is unlikely to meet all the DCMI users' water demands in the future • Motorized boating recreation may be enhanced in the long term	
Hazardous and Toxic Materials		
• No change in operations	<u>During Construction</u> • Implementation of safety standards, minimization measures, and BMPs would reduce the potential releases <u>Post-Construction</u> • No long-term impacts identified	<u>During Construction</u> • Same as Alternative B <u>Post-Construction</u> • Same as Alternative B
Safety		
• Current safety conditions would continue, and existing emergency response times to this remote area would remain lengthy	<u>During Construction</u> • Minor increase in emergency service response time <u>Post-Construction</u> • Response times to the north and west sides of the reservoir reduced because dam road segment would be two lanes	<u>During Construction</u> • Same as Alternative B except less in road closure duration (7 months less) <u>Post-Construction</u> • Same as Alternative B.
Cultural Resources		
• Existing Cultural resources would continue to age	• Unavoidable adverse impacts to Anderson Ranch Dam	• Same as Alternative B
Tribal Interests		
• No known ITAs or sacred sites	• May affect Shoshone-Bannock Tribe's treaty rights No direct,	• Same as identified for Alternative B.

Alternative A	Alternative B	Alternative C
• Treaty rights would continue as they have in the past.	indirect, or cumulative impacts to ITAs or sacred sites	
Environmental Justice		
• No change to any minority population group	• No impacts disproportionately affecting a population sector long or short-term	• Same as Alternative B

Acronyms and Abbreviations

ADT	average daily traffic
ANSI	American National Standards Institute
APE	area of potential effect
B.P.	before present
BA	biological assessment
BIA	Bureau of Indian Affairs
BiOp	biological opinion
BLM	Bureau of Land Management
BMP	best management practice
BNF	Boise National Forest
BURP	Beneficial Use Reconnaissance Program
CCE	Cat Creek Energy
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CWA	Clean Water Act
dBA	decibel
DCMI	domestic, commercial, municipal, and industrial
DOI	U.S. Department of the Interior
EIS	Environmental Impact Statement
EMS	emergency medical service
EO	Executive Order

EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FACW	facultative wetland
Feasibility Study	Boise River Basin Feasibility Study
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FR	*Federal Register*
FRM	flood risk management
FTA	Federal Transit Administration
FWCA	Fish and Wildlife Coordination Act
GHG	greenhouse gas
GIS	geographic information system
HD	Highway District
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDWR	Idaho Department of Water Resources
IGS	Idaho Geological Survey
ITA	Indian Trust Asset
ITD	Idaho Transportation Department
IWRB	Idaho Water Resource Board
IWUA	Idaho Water Users Association
KOP	key observation point
kV	kilovolt
LiDAR	light detection and ranging

LOPP	Lease of Power Privilege
LOS	level of service
Master Agreement	Master Interagency Agreement Number 86-SEI-004
MBTA	Migratory Bird Treaty Act
MOA	Memorandum of Agreement
MSE	mechanically stabilized earth
MVUM	Motor Vehicle Use Map
NAAQS	National Ambient Air Quality Standards
NCC	non-contract cost
NEPA	National Environmental Policy Act
NFS	National Forest System
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O&M	operations and maintenance
OHWM	ordinary high-water mark
OSS	on-site septic system
PCB	polychlorinated biphenyl
Pub. L.	Public Law
RCA	riparian conservation area
Reclamation	Bureau of Reclamation
RFP	request for proposal
ROFA	runway object free area

SHPO	State Historic Preservation Office
TES	threatened, endangered, or sensitive
TMDL	total maximum daily load
U.S. 20	U.S. Highway 20
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
VQO	visual quality objective
WIIN	Water Infrastructure Improvements for the Nation
YBCC	yellow-billed cuckoo

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1 Introduction

The Boise River Basin Feasibility Study (Feasibility Study) is a feasibility study that provides an evaluation of increasing storage opportunity within the Boise River basin, specifically Anderson Ranch Reservoir. A feasibility study involves the systematic planning, engineering, environmental, economic, and social analyses of plans for Federal water and energy projects. This Draft Boise River Basin Feasibility Study Environmental Impact Statement (EIS) analyzes the environmental impacts of the project detailed in the Feasibility Study. A companion Boise River Basin Feasibility Report presents the planning, engineering, economic, and social analyses to accomplish the project objectives.

1.1 Boise Project Background and Location

The Boise Project (Figure 1), authorized on March 27, 1905, under provisions of the Reclamation Act of 1902, is a series of water storage, irrigation, and power-generating facilities developed to bring water and energy to previously undeveloped areas of the Boise and Payette River Valleys. The Boise Project, constructed by the Bureau of Reclamation (Reclamation), includes the Payette and Arrowrock divisions. The Arrowrock Division is located within the Boise River basin (designated as Water District 63) and the Payette Division is located in the Payette River basin (designated as Water District 65). Water districts are designated and administered by the Idaho Department of Water Resources (IDWR) and generally encompass watersheds. This Feasibility Study evaluates increasing storage capacity in Anderson Ranch Reservoir.

The Boise River is part of the larger Boise Project and includes three major storage dams, one diversion dam, and one major and one minor off-stream storage reservoirs. The three major storage dams in the Boise River basin are built in a series, meaning water from Anderson Ranch Reservoir passes through Arrowrock Reservoir and then through Lucky Peak Reservoir (Figure 2) to provide water to the Boise River basin.

Construction on Arrowrock Dam, located on the Boise River approximately 22 miles upstream from the city of Boise, began in 1911. As the population and development in the Treasure Valley increased, water demands and the need for flood control grew. Therefore, Anderson Ranch Dam was constructed in 1954 on the South Fork Boise River 42 river miles upstream from Arrowrock Dam. In the 1950s, the U.S. Army Corps of Engineers (USACE) built Lucky Peak Dam, approximately 10 miles upstream from Boise, to provide additional flood protection for the Boise River basin.

The three major reservoirs have a total active capacity of more than 1 million acre-feet and furnish water to approximately 280,000 acres in Water District 63. Reclamation and USACE operate the three storage dams in a coordinated method for its authorized purposes. Individual facility authorizations include Anderson Ranch Reservoir: irrigation water supply, power development, flood control, with dead storage space providing for silt control, conservation of fish, and recreation; Arrowrock Reservoir: irrigation water supply; and Lucky Peak Reservoir: irrigation water supply, flood control and recreation.

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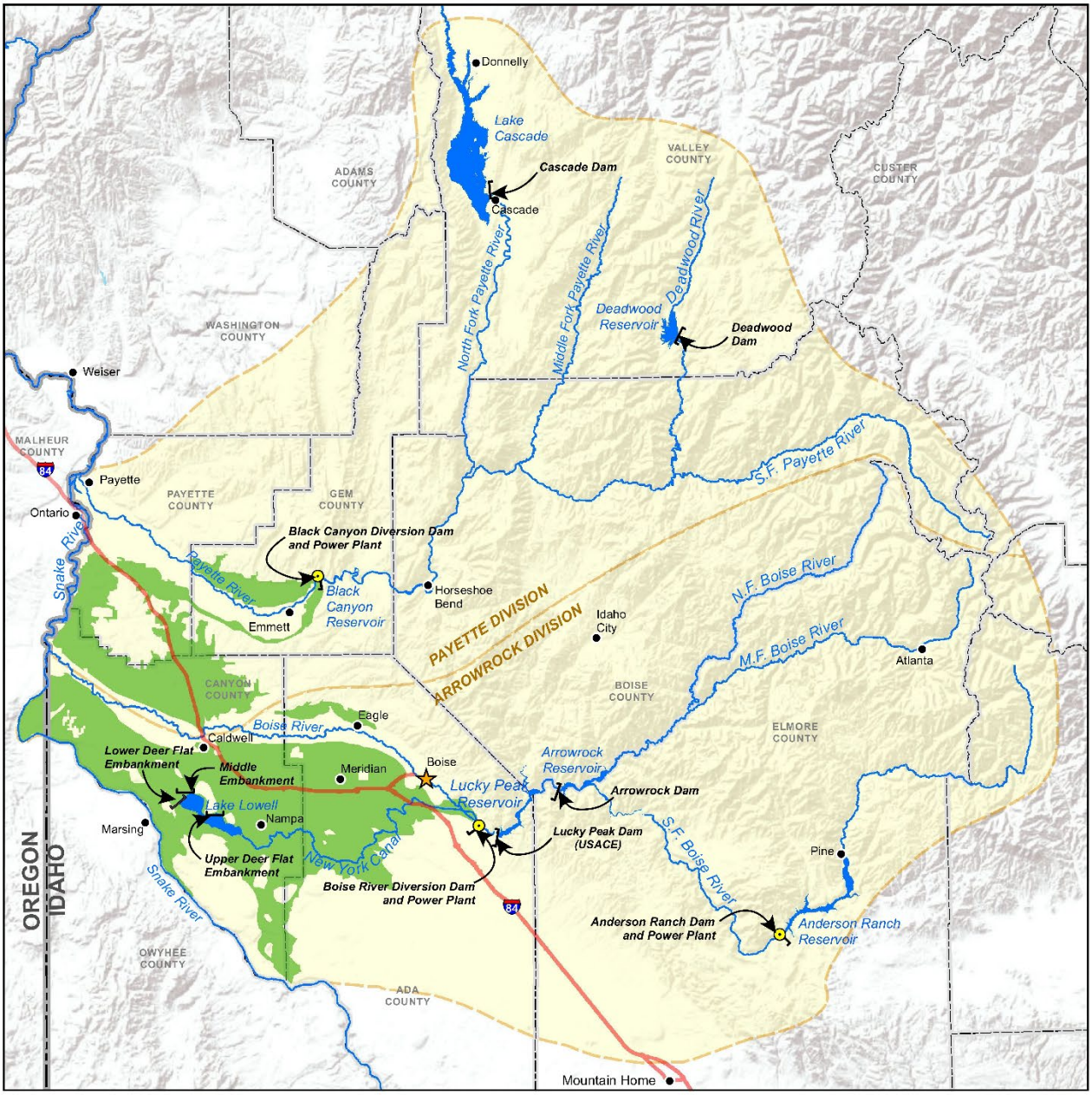

Legend

- Reclamation Power Plant
- Reclamation Dam/Diversion (unless otherwise noted)
- Capital City
- City
- Reclamation Reservoirs
- Areas Benefited by Project
- Project and Division Boundary
- County Boundary
- State Boundary

Notes:
1. This map is provided as-is and may contain representations of property boundaries. It is intended for general references only. None of the parties involved in preparing this map or data contained herein warrant or represent information to be complete and accurate and cannot be held responsible for errors or omissions.
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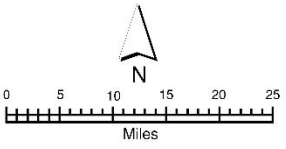

Figure 1. Boise Project
Boise Project - Arrowrock Division
Boise River Basin Feasibility Study

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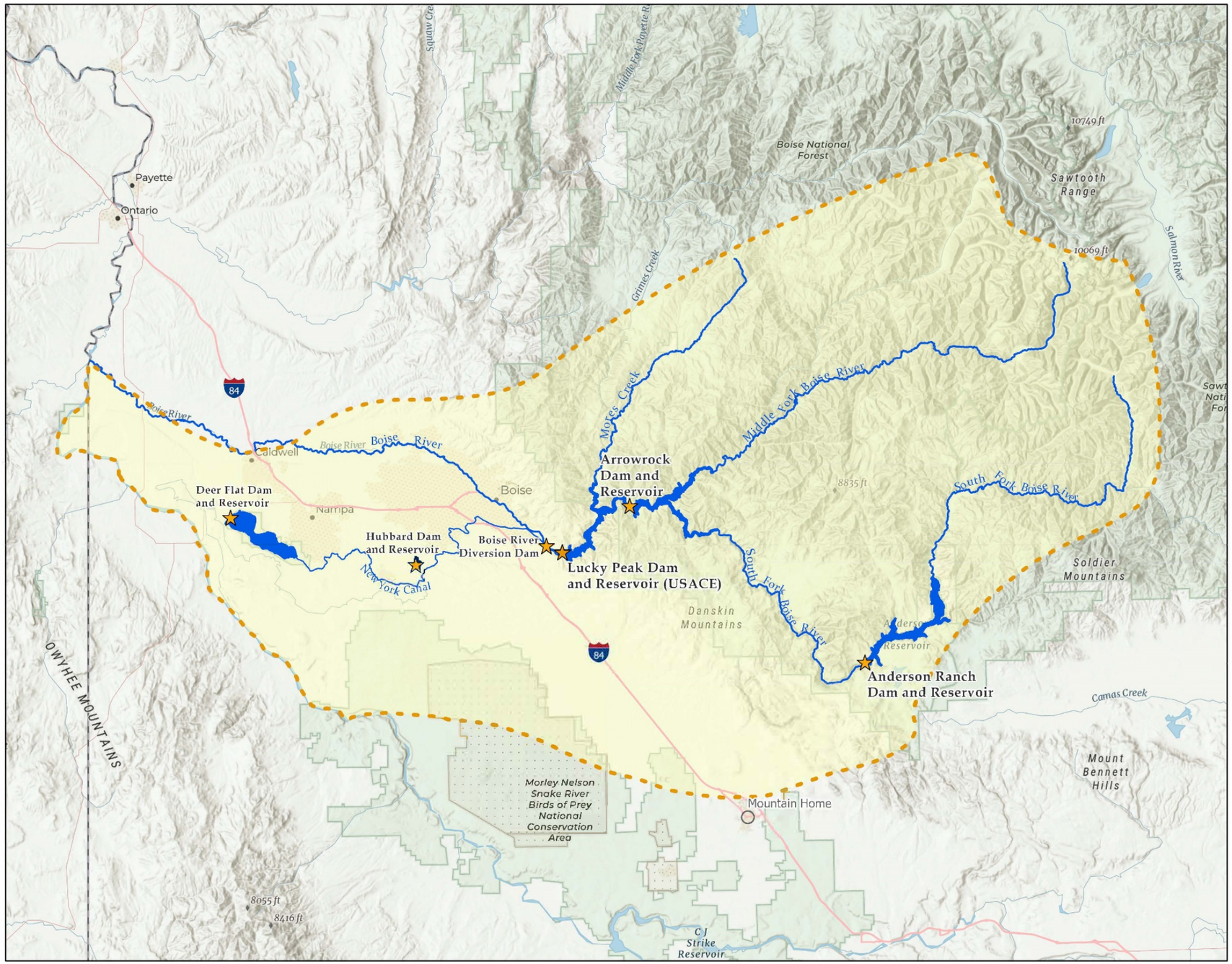

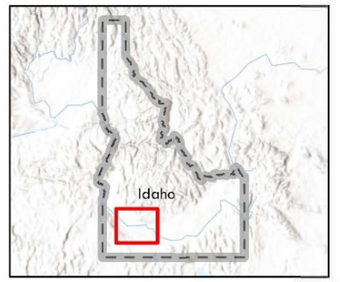

Legend

- **Reclamation Dams (unless otherwise noted)**
- **Boise Project - Arrowrock Division**

N

0 10 20 Miles

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Figure 2. General Location
Boise Project - Arrowrock Division
Boise River Basin Feasibility Study

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1.2 Feasibility Study and Planning Background

There is a long history related to the concerns over water storage capacity requirements and securing a more reliable water supply for current and future needs in the Boise River basin. In the early 2000s many different local, state, and Federal entities began identifying these concerns and potential long-term solutions. For instance, in 2004, the Idaho Congressional delegation assembled a stakeholders' group to discuss the potential need for additional storage in the Boise and Payette river basins area. Participants included local water users, Federal partners, state partners, irrigation interests, flood control districts, and environmental groups. A list of stakeholder agencies and organizations with the individuals representing them can be found in the *Final Boise/Payette Water Storage Assessment Report* (2006 Assessment Report; CH2MHill and John Petrovsky Associates, 2006). These meetings resulted in a confirmed desire by the stakeholders' group to pursue additional water supplies in the Boise and Payette river basins. This group requested that Reclamation conduct a study to determine potential opportunities for new storage projects. The state of Idaho and the Idaho Water Users Association (IWUA) asked Reclamation to identify and conduct appraisal feasibility studies on potential water storage sites in the Boise/Payette river basins.

In response, in 2006, Reclamation completed the 2006 Assessment Report as the first phase of the appraisal-level feasibility process. An appraisal-level feasibility study is an initial planning investigation performed to determine the nature of water and related resource problems and needs in a particular area, formulate and assess preliminary alternatives, determine Reclamation interest, and recommend subsequent actions. In the 2006 Assessment Report, Reclamation identified 56 potential sites in the Payette and Boise river basins.

Following issuance of the 2006 Assessment Report, the Idaho Water Resource Board (IWRB), IWUA, and others supported legislation to provide Reclamation with authority to conduct a full feasibility study to continue this work. In 2009, Public Law (Pub. L.) 111-11 provided Reclamation with authority to conduct feasibility studies of potential projects to address water shortages in the Boise River and Payette River basins consistent with the opportunities identified in the 2006 Assessment Report, one of which was raising Anderson Ranch Dam. The feasibility study authority requires a 50/50 cost share from a non-Federal party. At this time, Reclamation was unable to find a cost share partner to initiate the feasibility study.

Over the course of the next several years, various efforts were undertaken by the state and Federal agencies to consider and study possible enhancement of storage in the Boise River system to address water shortage concerns as well as anticipate future demands. This included a study by the state of Idaho of water demand projects issued in 2016. It also includes a general investigation study by USACE regarding the potential raising of Arrowrock Dam to address flood control and storage needs, which ultimately resulted in USACE recommending that the proposal not move forward as a USACE project given flood control benefits that were less than associated project costs. The USACE study occurred from 2009 to 2016. Following the conclusion of the USACE study, Reclamation renewed its focus on developing a feasibility study for potential storage projects within its authority.

In 2016, as part of Reclamation's feasibility study process, Reclamation and USACE came together to formulate a list of potential alternatives to meet the need for additional water supply and significant flood risk reduction to the Treasure Valley. From May to July of 2016,

USACE and Reclamation formulated a list of preliminary alternatives based on the two agencies' authorities and results of both the appraisal-level feasibility study and general investigation study. After further consideration, Reclamation and USACE agreed it was appropriate for Reclamation to continue further analysis due to the water supply focus of potential alternatives.

After discussions with USACE, Reclamation determined the following as initial alternatives to be considered in the Boise River Basin Feasibility Study (Table 1).

Table 1. Initial alternatives identified in the Boise River Basin Feasibility Study

Initial Alternative	Additional Water Storage Capacity (thousand acre-feet)
6-foot raise at Anderson Ranch Dam	29
10-foot raise at Arrowrock Dam	20
4-foot raise at Lucky Peak Dam	10
Non-structural alternative	Unknown
No action	0

In 2019, as part of the Feasibility Study, Reclamation conducted an initial technical review of available information and completed site visits of the Anderson Ranch, Arrowrock, and Lucky Peak dams. The results of these technical reviews concluded that an increase in reservoir storage at Arrowrock and Lucky Peak dams has significantly more engineering challenges than raising Anderson Ranch Dam along with physical and regulatory complexities associated with the facilities. while providing less storage potential. Therefore, Anderson Ranch Reservoir became the focus of additional water storage opportunities.

1.2.1 Water Infrastructure Improvements for the Nation Act

The Water Infrastructure Improvements for the Nation Act (or the "WIIN Act"; Pub. L. 114-322) of 2016 is intended to provide water relief across the American West, addresses long-standing water agreements for the benefit of taxpayers and Native Americans, increase recreation and conservation, and improve water and other natural resources management. Section 4007 of the WIIN Act supports developing water storage projects. Under Section 4007, the Department of the Interior (DOI) can negotiate and enter into an agreement with requesting non-Federal partners on behalf of the United States for planning, permitting, design, and construction costs up to 50% of the total project cost for Federally owned facilities.

Under the WIIN Act, the Secretary of the Interior must determine whether a proposed Federally led storage project is feasible on or before January 1, 2021, in accordance with Reclamation laws, and secure agreement(s) for providing upfront funding to pay the non-Federal share of the capital costs of the project.

Pursuant to the WIIN Act, the state of Idaho passed a resolution for Reclamation to consider additional surface water storage within the Boise River basin and committed to the non-Federal cost-share, entering into a Memorandum of Agreement on March 13, 2018.

In 2018, Congress expressly authorized and funded the Boise River Basin Feasibility Study—in accordance with the requirements of the WIIN Act—in the 2018 Consolidated Appropriations Act (Pub. L. 115-141), passed on March 23, 2018. After initial technical engineering analysis and Reclamation's receipt of WIIN Act authority and funding, IWRB passed a resolution on July 27, 2018, to focus the study on a raise at Anderson Ranch Dam.

In response to the WIIN Act mandate from Congress, and agreement between the state of Idaho and Reclamation to focus study efforts, Reclamation is evaluating the technical, economic, and financial feasibility of a dam raise at Anderson Ranch Dam. The feasibility study provides the basis for making recommendations to Congress about whether a proposed project should be authorized for construction and includes an assessment of the environmental impacts as required by the National Environmental Policy Act of 1969 (NEPA). This EIS is part of that process and evaluates the environmental impacts of raising Anderson Ranch Dam as the proposed action resulting from the feasibility study. It is being conducted under One Federal Decision (Executive Order 13807) with the US Forest Service, US Army Corp of Engineers, and US Fish and Wildlife Service as cooperating and consulting agencies.

1.3 Anderson Ranch Dam and Reservoir

The proposed action under consideration in this EIS is located at Anderson Ranch Reservoir, the most upstream reservoir within the Boise River system, located 28 miles northeast of the city of Mountain Home in Elmore County, Idaho. Anderson Ranch dam and reservoir were found feasible by the Secretary of the Interior on June 25, 1940; approval was received from the President on July 30, 1940, and the report transmitted to Congress on August 12, 1940, as required by the Reclamation Project Act of 1939. The authorized purposes were irrigation water supply, power development, flood control, with dead storage space providing for silt control, conservation of fish, and recreation. Anderson Ranch Reservoir stores water from the 980-square-mile drainage area above the dam.

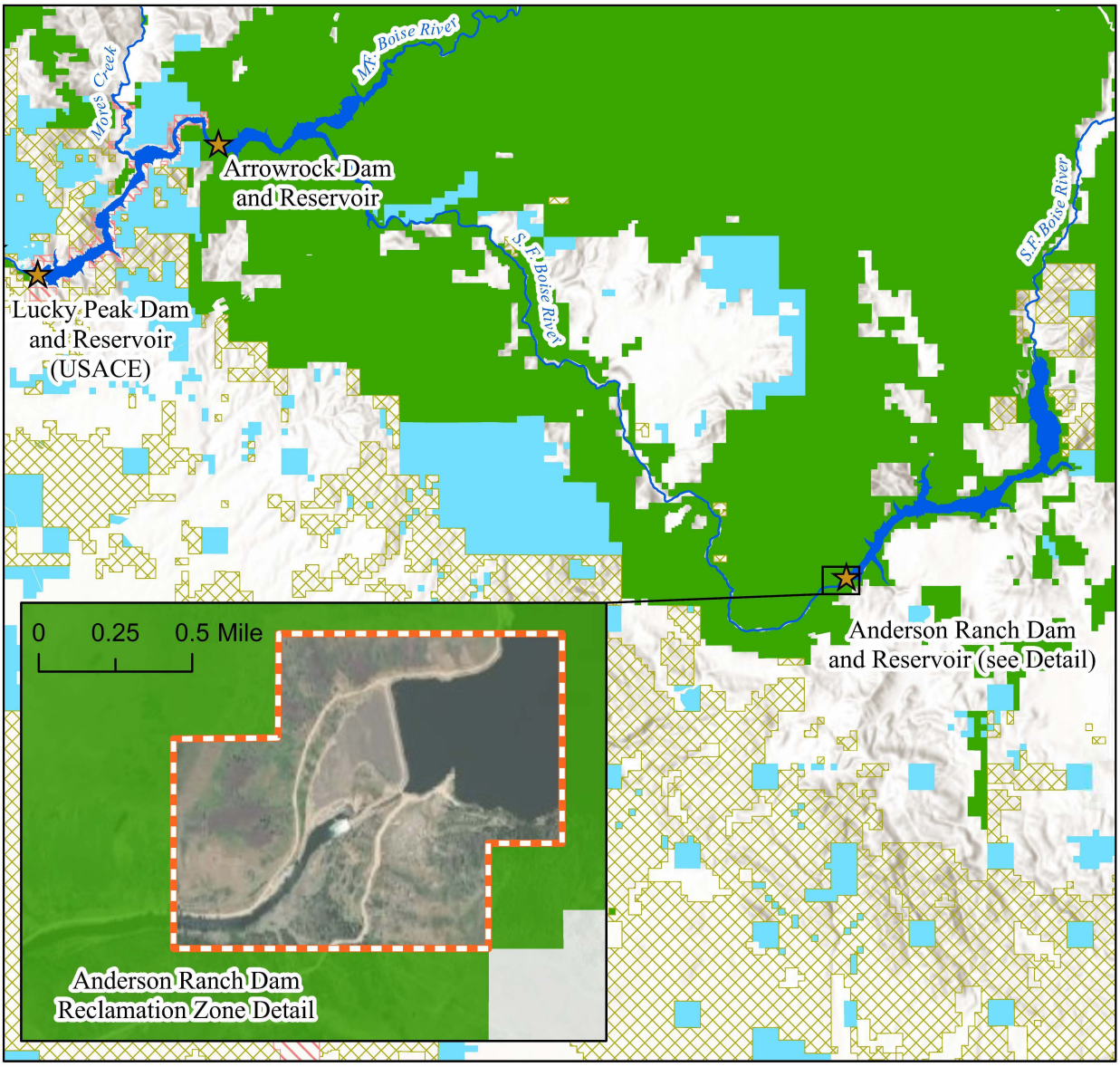
The dam is a zoned earth fill embankment structure with structural and hydraulic heights of 456 feet and 330 feet, respectively, and a crest length of 1,350 feet at 4210 feet above mean sea level. The crest of the dam was raised 4 feet in 2010 as part of a security enhancement action. The crest raise was not designed as a water-retaining feature. The raised crest of the dam is 28 feet wide with a 20-foot-wide roadway and 3-foot-high jersey barriers on each shoulder.

1.3.1 Land Management and Administration

Lands surrounding the Anderson Ranch Reservoir area are largely Federal lands (Figure 3). These Federal lands are managed by Reclamation and the U.S. Department of Agriculture, U.S. Forest Service (USFS) under Master Interagency Agreement Number 86-SEI-004 (Master Agreement). The Master Agreement, dated April 6, 1987, covers Reclamation-authorized projects within or adjacent to National Forest System (NFS) lands. Through the Master Agreement, USFS has management and administration jurisdiction of Federal lands with the exception of the Reclamation Zone, which is the area that Reclamation designates as necessary for the operation of the project.

Roads surrounding the Anderson Ranch Reservoir area are referred to as either Highway District (HD) roads, which include roads under jurisdiction of the Glenns Ferry or Mountain Home highway districts or NFS roads under USFS. HD 134 (Anderson Dam Road) crosses the dam and serves as a main access to the west side of the reservoir and ends once it crosses the dam (Figure 4 and Figure 6).

HD 121 proceeds down the South Fork Boise River and HD 120 proceeds along the reservoir. HD 61,HD 113, HD 120, HD 128, and HD 134 and associated bridge structures (Lime Creek Bridge and Pine Bridge) provide vehicle access to and around the perimeter of Anderson Ranch Reservoir (Figure 5).



Legend

- **Reclamation Dams (unless otherwise noted)**

Managing Agency

- **USFS**
- **Department of Defense**
- **Bureau of Land Management**
- **State of Idaho**
- **Private or Unknown**
- **Reclamation Zone**

N

0 2 4 8
Miles

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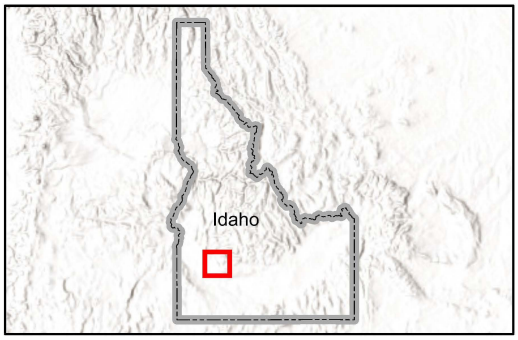

Figure 3. Land Management Boise Project - Arrowrock Division Boise River Basin Feasibility Study

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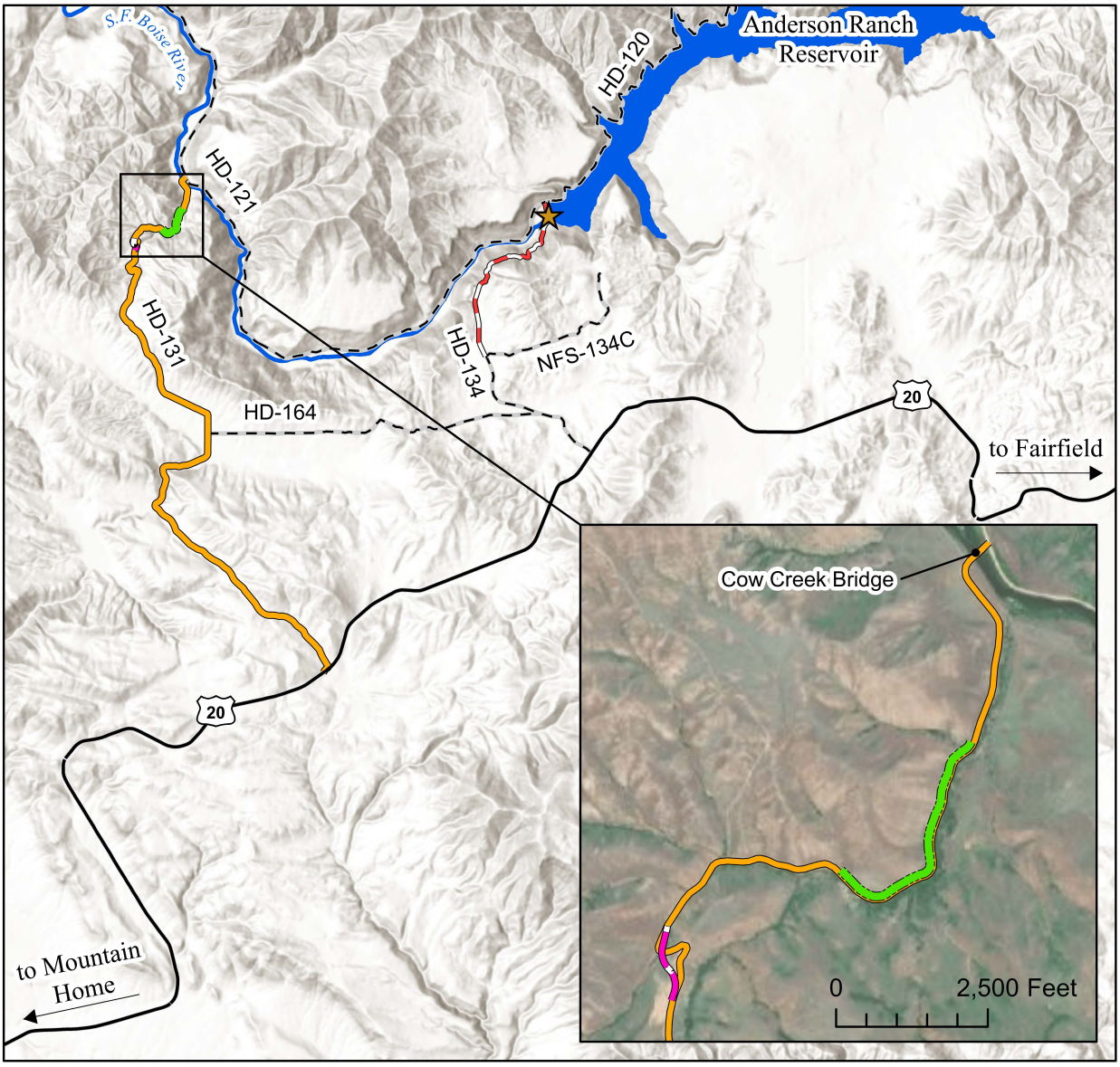

Legend

- Unpaved Road
- State Highway
- Road Closure
- Proposed Detour
- HD-131 Widened
- HD-131 Realignment
- Anderson Ranch Dam

N

0 1.5 3

Miles

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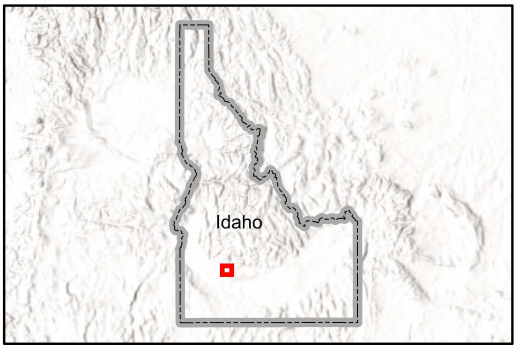

Figure 4. Road Closure and Detour
Boise Project - Arrowrock Division
Boise River Basin Feasibility Study

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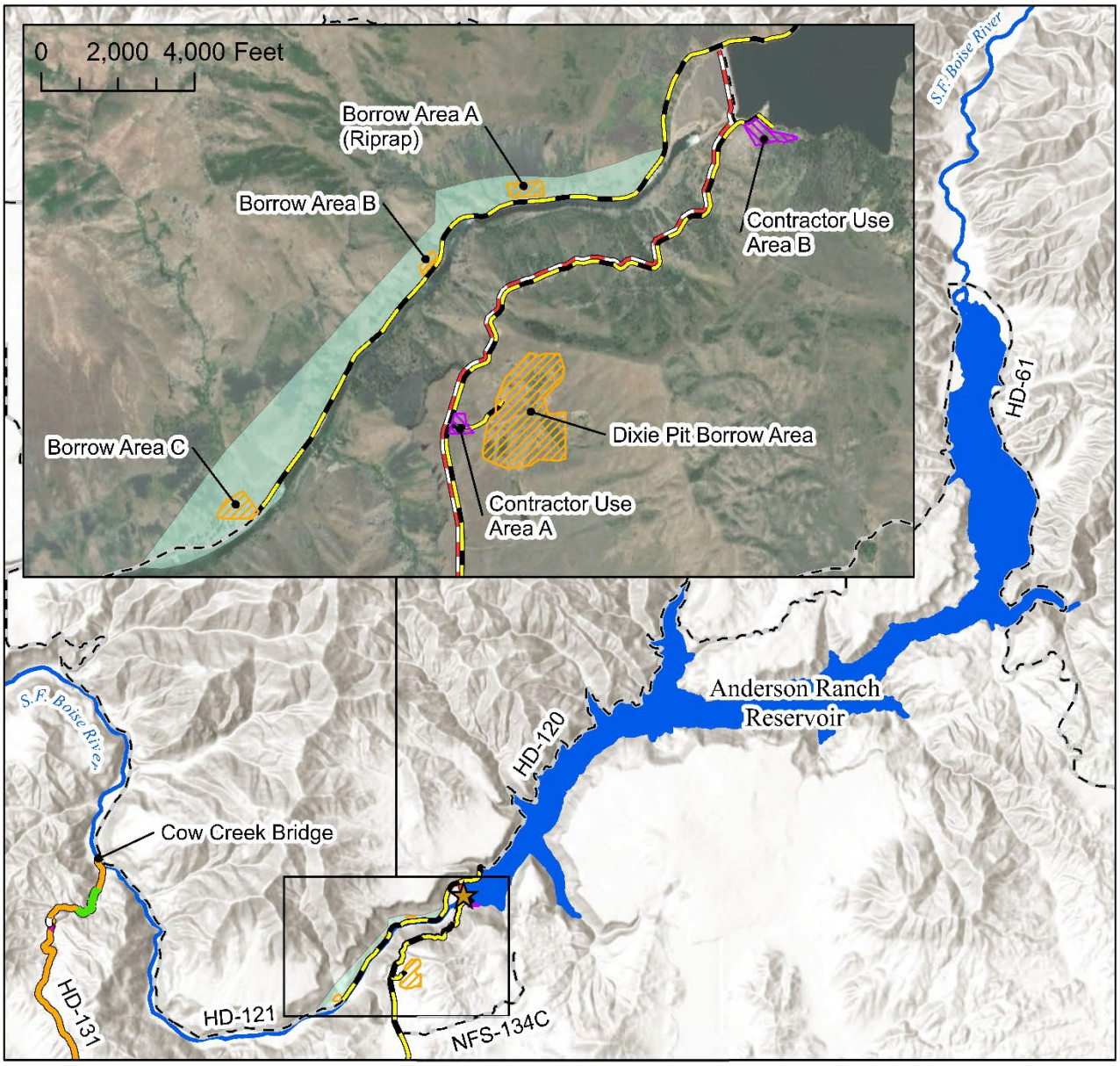

Legend

- Borrow Area
- Contractor Use Area
- Secondary Borrow Area
- Unpaved Road
- Haul Route
- Road Closure
- Proposed Detour
- HD-131 Widened
- HD-131 Realignment
- Anderson Ranch Dam

N

0 1.5 3
Miles

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Figure 5. Borrow Areas and Contractor Use Areas
Boise Project - Arrowrock Division
Boise River Basin Feasibility Study

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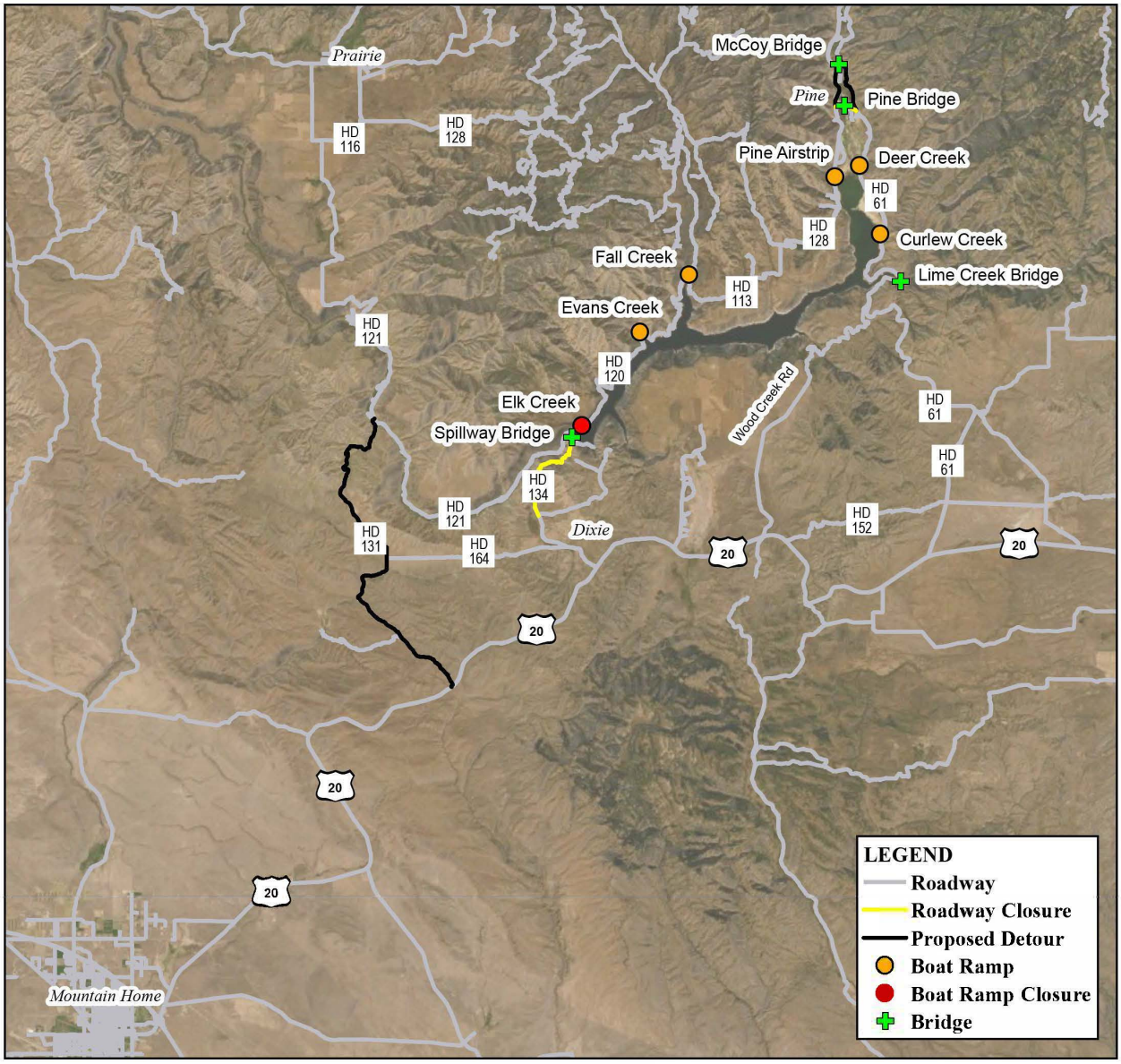

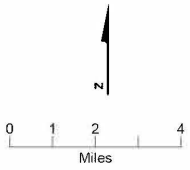

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Figure 6. Transportation System
Boise Project - Arrowrock Division
Boise River Basin Feasibility Study

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1.4 The Proposed Action

Reclamation, in partnership with IWRB, proposes to raise Anderson Ranch Dam. This raise would capture and store additional water.

This Draft EIS considers two different construction alternatives to accomplish the proposed dam raise and includes many project features around the reservoir. The alternatives and multiple accompanying project features are detailed in the alternative descriptions in Chapter 2.

The Anderson Ranch Dam raise would include the following structural modifications to the dam site.

- Demolish existing spillway crest structure and bridge and construct in place.
- Construct new crest structure (downstream embankment raise or mechanically stabilized earth [MSE] wall raise) in place.
- Remove, rehabilitate, and re-install existing radial gates.
- Restore two-lane road across the dam.
- Widen right abutment (northern side) to improve turning radius for traffic.
- Elevate the raise fixed-wheel gate house windows and electronic controls.

Due to the required closure of the Anderson Ranch Dam crest (HD 134) during construction, Cow Creek Road (HD 131) would be improved to enable continued public access during construction and provide a year-round detour route (Figure 4). Developed recreation sites impacted by the increased surface water elevation would be rebuilt above the new full pool elevation. Additionally, multiple minor roadway sections would also be improved to accommodate the new full pool elevation. The culverts at Deer and Fall Creek would be retrofitted to improve habitat connectivity.

Following the direction provided by the WIIN Act to provide a Federal benefit, Reclamation has recognized the opportunity to reserve 10% of the proposed space to provide operational flexibility or for environmental purposes, which could include environmental flows. Coordination with local, State, and Federal entities would allow prioritization of water uses for environmental purposes that would align with existing environmental requirements.

One possible use for this water could be current Boise System operations environmental requirements from three active ESA consultations including: Bull Trout (USFWS, 2005), Bull Trout Critical Habitat (USFWS, 2014) and Salmon Augmentation flows (NOAA, 2008). Within the Boise System, the Incidental Take Statements associated with the ESA consultations provide protective coverage through ESA to continue operations and include: 10 Terms and Conditions and 14 Conservation Recommendations, from these requirements 10 operational targets and 9 physical/biological habitat features are monitored. Furthermore, annual coordination with the Services for within season operations, annual monitoring and a summary report of annual operating and monitoring is also required.

Finally, a water right would be obtained from IDWR and water contracts would be issued for delivery of the additional water made available by the dam raise in some years. Potential spaceholders include existing Reclamation contractors and IWRB, which could in turn

contract water to existing Water District 63 water users and/or may offer water through the Idaho Water Supply Bank's Water District 63 rental pool—a water exchange market operated by IDWR.

1.5 Purpose and Need

The purpose of the Proposed Action is to address water storage capacity requirements in the Boise River Basin. The proposed action is needed in order to replace existing storage currently provided by the snowpack and to expand options to store precipitation available at different times than typical and in higher runoff years for dry years in order to maintain existing uses served by the present Boise River System and to increase water supply reliability. The proposed action is also needed to help meet future projected demands for new uses of water in the Treasure Valley and surrounding areas when possible. The Proposed Action would provide the flexibility to capture additional water when available based on a junior water right, for later delivery when and where it is needed to meet these existing and evolving demands.

Management of the Boise River System is highly dependent upon storage of water in the snowpack in the surrounding mountains. The Columbia River Basin Chapter of the SECURE Water Act Section 9503(c) Report to Congress (Reclamation, 2016), which addresses West-wide water shortage concerns, indicates:

Precipitation projection models generally agree in the potential for drier summers and wetter autumns and winters.

Snowpack accumulation is projected to decline, with earlier snowmelt in many subbasins. In areas where water resource systems have been designed around historical hydrologic patterns, this shift toward earlier snowmelt and runoff has the potential to stress flood control and irrigation supply as more water runs off in the late winter and early spring and less water runs off during the irrigation season.

Decreased snowpack could also result in decreased groundwater infiltration, potentially reducing river base flows during the summer season.

Precipitation falling as rain instead of snow at lower elevations will result in increased winter runoff and decreased summer runoff, potentially reducing the overall water availability during the irrigation season.

The RMJOC II climate variability model that was used as the basis of the SECURE Water Act Report indicates that these weather conditions are likely to occur in the Upper Snake Basin, which includes the Boise River. Projections of potential changes in temperature patterns due to weather and climate variability indicate that the region will experience less snow and more precipitation in the form of rain, with earlier melting of the snowpack (Pytlak et al., 2018). Existing reservoirs within the System do not have adequate capacity to replace the "storage" provided by snowpack or to capture the predicted increase of rainwater supplies during wet years to hold over for use during dry years.

In addition to climate variability and loss of snowpack, significant growth has occurred and is anticipated to continue in the Treasure Valley and surrounding areas. The Treasure Valley population has increased 16% from 2000 to 2017 (USCB, 2018) and projections indicate the Treasure Valley population increasing from approximately 693,000 (current population) to

1.57 million people by 2065. Coinciding with population growth, extensive land use changes are occurring throughout the valley. Row-crop agriculture and pastoral lands are transitioning to residential and urban environments. These changes have increased the demand for DCMI water. The Idaho Water Resource Board's Treasure Valley DCMI water-demand projections (IDWRA, 2016) study estimates an increase of DCMI demand ranging from 109,000 to 188,000 additional acre feet per year by 2065. These estimates include a 20 percent reduction in usage by conservation measures. As a result, future demand for water supply from the Boise River System (including Anderson Ranch, Arrowrock, and Lucky Peak reservoirs) is expected to increase. The combination of growth and climate projections is expected to create challenges in meeting existing water contract obligations and increased demand in the Treasure Valley. The proposed action is the result of the Feasibility Study, which addresses the needs described here and is undertaken in cooperation with the state of Idaho, pursuant to WIIN Act Section 4007 (Pub. L. 114-322, section 4007). That section provides for studying, designing, and constructing or expanding any Federally owned storage project upon the request of a partner. The Feasibility Study responds to the state of Idaho request to study options for potentially raising Anderson Ranch Dam to provide additional storage to enhance the long-term water supply in the Boise basin. A description of the series of resolutions and requests from the state related to the study is in Section 1.2 of this Draft EIS.

The state of Idaho passed a resolution for Reclamation to consider additional surface water storage within the Boise River basin and committed to the non-Federal cost-share, entering into a Memorandum of Agreement on March 13, 2018. Through the 2018 Consolidated Appropriations Act (Pub. L. 115-141), passed on March 23, 2018, Congress expressly authorized and funded the Boise River Basin Feasibility Study in accordance with Pub. L. 114-322, Section 4007. Following WIIN Act authority and funding, through a resolution passed on July 27, 2018, IWRB partnered with Reclamation to focus the study on a raise at Anderson Ranch Dam following technical engineering analysis. This Congressional mandate and the request from the state of Idaho forms the need for the proposed action considered in this EIS.

The Feasibility Study is also supported by authority Reclamation was given to conduct feasibility studies on proposals that address water shortages within the Boise River system and that are considered appropriate for study by the 2006 Assessment Report in the Omnibus Public Land Management Act of 2009, Pub. L. 111-11, Section 9001. The proposed action in this Draft EIS was identified in the 2006 report as appropriate for study.

In addition to the project specific acts discussed above, Reclamation has other legal authority to conduct the Boise River Basin Feasibility Study and undertake the potential augmentation of its Federal storage reservoir pursuant to the proposed action. Reclamation was authorized under the Reclamation Act of 1902 (32 Stat. 388) to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

1.5.1 U.S. Forest Service Purpose and Need

To accomplish Reclamation's proposed action, USFS would need to modify an easement and two special use permits. Specifically, USFS would need to respond to Reclamation's requests to do the following.

- Modify the Forest Roads and Trails Act easement issued to Mountain Home Highway District to allow partial road reconstruction and relocation on Cow Creek Road (HD 131).
- Amend the Idaho Division of Aeronautics special use permit to allow realignment of the Pine airstrip.
- Amend the Fall Creek Resort and Marina special use permit to mitigate possible impacts associated with Reclamation's proposed action.
- Amend the Idaho Power Company special use permit to allow relocation of power poles and power lines.

Anderson Dam Road (HD 134) would be closed during project construction which would leave it inaccessible for public use. Cow Creek Road (HD 131) has been identified as a detour route for continued public access during construction. Most of the detour route selected is acceptable for public access. However, a section (approximately 935 feet) would need to be reconstructed and relocated to realign this steep and sharp turn to allow safer travel along this route (Figure 4). This section currently has grades steeper than 12%, and tight curves that restrict sight distance and limit trailer and large vehicle access. Mountain Home Highway District has an easement from USFS on Cow Creek Road (HD 131) that would need to be modified to make the necessary road improvements. Additionally, toward bottom of the road (near South Fork Boise River), the road would be widened on two or three curves with rock outcrops to improve driver visibility and safety, especially for large trucks. Roadway improvements would be within the existing right of way.

Based on information provided by Idaho Power, some utility relocation would be necessary. Idaho Power holds a special use permit for occupying and maintaining this infrastructure on NFS lands. USFS would need to modify its special use permit with Idaho Power to relocate the infrastructure. Potential impacts are to overhead power and a 35-kilovolt (kV) single-phase underground primary cable in 3-inch conduit. These facilities, pending design decisions by Idaho Power, would either remain on the same side of the road or cross to the other side. It is assumed that this work would be performed by Idaho Power, including any design work required for utility relocation.

The southernmost end of the Pine Airstrip runway would be affected by a raised water surface elevation above 4200 feet. After consultation with Idaho Transportation Department Division of Aeronautics airport staff, the preference is to realign the runway such that the runway object free area (ROFA) is completely above the 4202-foot elevation contour. The existing turf runway would be replaced by another turf runway located on the existing property with similar dimensions but a different orientation. Idaho Transportation Department Division of Aeronautics has a special use permit from USFS that would need to be amended to allow the runway realignment.

Fall Creek Resort and Marina is privately owned and is located on Federal land managed by USFS. It is authorized by USFS through a special use permit. Potential impacts from Reclamation's proposed action to the non-Federal real property would be mitigated during project implementation should the project be determined feasible and the special use permit still be in effect. USFS would need to amend the Fall Creek Resort and Marina Special Use

Permit to accommodate the chosen mitigation activity/activities and future NEPA may be necessary.

Additionally, USFS is a cooperating agency for this project because of its special interest and agency expertise as a stakeholder and manages lands around Anderson Ranch reservoir.

1.5.2 U.S. Army Corps of Engineers Purpose and Need

Pursuant to Section 404 of the Clean Water Act (CWA) USACE will review the proposed project and render a decision to either issue, issue with special condition, or deny a permit for the project. As part of its review, USACE is required by the CWA to independently consider and express the activity's underlying purpose and need from the applicant's and public's perspectives (33 Code of Federal Regulations [CFR] Part 325). For USACE, the basic project purpose is to *increase water storage capacity*. The overall project purpose is to *increase water storage capacity by improving infrastructure within [Reclamation's] Boise Project, as authorized*. This overall project purpose will be used to evaluate practicable alternatives under the 404(b)(1) guidelines (40 CFR 230).

Additionally, USACE is a cooperating agency for this project because of its special interest and agency expertise as a stakeholder and co-manager within the Boise River system (i.e., Lucky Peak Dam and Lucky Peak Lake).

1.6 Legal Study Authorities

The Feasibility Study and resulting proposed action being considered in this Draft EIS are being conducted under the following authorities.

- Boise Project authorization March 27, 1905, under provision of the Reclamation Act of 1902 (32 Stat 388).
- Reclamation Project Act of 1939 (Pub. L. 53 Stat. 1187).
- The Omnibus Public Land Management Act of 2009 (Pub. L. 111-11 Sec. 9001).
- WIIN Act Funding Section 4007 (Pub. L. 114-322, Section 4007), enacted in 2016.

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2 Alternatives

2.1 Alternative Formulation

The alternatives presented in this chapter are developed based on the purpose and need for the proposed action, as described in Chapter 1, and the issues raised during internal, external, and Tribal scoping. The alternatives analyzed in this document include the No-Action Alternative, the proposal to increase storage with a 6-foot raise of Anderson Ranch Dam, and the proposal to increase storage with a 3-foot raise of Anderson Ranch Dam. A No-Action Alternative is evaluated to provide an appropriate basis by which the other alternatives are compared.

During the feasibility study process, Reclamation held three informational open houses for the public, and worked extensively with the state to solicit input and guidance. These discussions identified a range of potential alternatives for analysis in this Draft EIS. Analysis and mitigation of specific concerns raised in scoping have been incorporated into this Draft EIS. Additional scoping information is in Chapter 4 and the Public Scoping Report (Appendix A).

2.2 Alternative A – No Action

Under the No-Action Alternative, there would be no change from current management direction at Anderson Ranch dam and reservoir, and the proposed action would not be implemented. Storage levels within Anderson Ranch Reservoir would remain within the current capacity of 413,100 acre-feet. Reclamation would continue to operate Anderson Ranch Dam under current standard operating procedures. Irrigation water delivery, power generation, and flood control would continue to occur according to existing reservoir operation protocols. Water delivery would still occur at typical times of the year with normal discharge outlined below.

2.2.1 Operations

Anderson Ranch Dam is operated in coordination with the two downstream dams: Arrowrock and Lucky Peak. In fall and during the winter (September 16–March 31), minimum target flows are set at 300 cubic feet per second (cfs) to maintain fisheries below the dam. Once discharge from the dam has been reduced to minimum flows, the reservoir usually maintains its elevation. In some years, the reservoir may draft and, in some years, it may increase in volume during minimum fall/winter flows. Beginning January 1 and then each month after, runoff forecasts are generated for the basin and official flood control operations begin if needed. Water managers use information in the runoff forecasts and flood rule curves to determine if there is a need to increase discharge to create storage space in the reservoir to accommodate estimated spring runoff volumes. During flood control operations (generally in the spring months), the reservoir outflows may be altered often, as seen in Figure 1 of the Water Operations and Hydrology Specialist Report in Appendix B1.

Beginning April 1 of each year, the minimum target discharge from Anderson Ranch Dam is 600 cfs. As shown in Figure 1 of the Water Operations and Hydrology Specialist Report

(Appendix B1), often the discharge is more than 600 cfs due to flood control operations and spring runoff. Once flood control operations have ended, discharges are set to meet downstream demands and provide water contractually obligated to irrigators and other entities. During all operational periods, the use of the spillway is avoided except in the case of flood control or emergencies.

2.2.2 Endangered Species Act Compliance

The range of reservoir operations would remain the same as those identified in the 2005 and 2014 Endangered Species Act (ESA) consultations with the U.S. Fish and Wildlife Service (USFWS) for ongoing operations and maintenance (O&M) in the Snake River basin above Brownlee Reservoir, documented in Reclamation's 2004 Biological Assessment and 2013 Biological Assessment for those consultations. An incidental take statement issued in the 2005 Biological Opinion (BiOp) provides Reclamation with coverage for the effects of ongoing O&M of Anderson Ranch dam and reservoir to bull trout—a threatened fish species that occurs both in Anderson Ranch Reservoir and South Fork Boise River above and below the dam. Critical habitat for bull trout was designated in 2010, and a 2014 BiOp considered the effects of ongoing O&M of Anderson Ranch dam and reservoir on designated critical habitat for the species. Under the No-Action Alternative, Reclamation would continue to fulfill the terms and conditions and reasonable and prudent measures identified by USFWS in both the 2005 BiOp and 2014 BiOp.

2.2.3 Maintenance

Known components of ongoing and future maintenance at Anderson Ranch Dam, spillway, and powerplant under the No-Action Alternative are listed in Table 2.

Table 2. Description of continuing and future maintenance at Anderson Ranch Dam, spillway, and powerplant under the No-Action Alternative

Structure	O&M Action
Dam	Radial gate maintenance on the hoist system
	Periodic re-coating of radial gates
Spillway	Fixed wheel gate inspection
	Penstock inspection (includes hydraulic power unit inspection)
Powerplant	Butterfly valves inspection
	Known repair to rudder in Unit 2 by 2023

Management rights and responsibilities of USFS in the area would continue as current, including managing public use of water surface; financing, installing, and maintaining all signs in the reservoir area; administration of roads and recreation sites; debris and hazards removal; and special use permits. USFS would continue to be responsible for interagency cooperation with USFWS and the Idaho Department of Fish and Game (IDFG).

The existing 19.5-foot-wide single travel lane across the crest of the dam would remain as the connection to HD 120, and would continue to serve as the main access to the west side of the

reservoir, the South Fork Boise River, and to areas north and east of the reservoir including the town of Prairie and the Trinity Mountains. It would continue its designation allowing alternating one-way traffic, controlled by traffic lights at either end of the dam crest, with adequate width for farm and maintenance equipment, trucks, and other oversized vehicles.

2.3 Alternative B – 6-Foot Dam Raise of Anderson Ranch Dam (Preferred Alternative)

Alternative B, the preferred alternative, proposes to raise Anderson Ranch Dam 6 feet from the present elevation of 4196 feet to 4202 feet to capture and store approximately 29,000 additional acre-feet of water. Alternative B would have the potential to inundate an estimated 146 acres of additional land around the reservoir above the current full pool elevation. Alternative B project feature durations are presented in Table 3.

Table 3. Alternative B project development feature durations

Type	Duration
Total Construction Duration	51 months
Detour Construction	43 days
Detour Duration	45 months
Construction Duration	47 months
Reservoir Restriction	42 months

The following structural modifications at the dam would accommodate the increased full pool elevation. All structural dam modifications are within the existing footprint of the current dam infrastructure. Additional information regarding dam infrastructure is included in the 6-foot Dam Raise Engineering Summary Report, Appendix C.

- Demolish existing spillway crest structure and bridge and construct in place.
- Construct new crest structure in place.
- Remove, rehabilitate, and re-install existing radial gates.
- Restore two-lane road across the dam.
- Widen right abutment (northern side) to improve turning radius for traffic.
- Elevate the fixed-wheel gate electronic controls.

Two separate but similar, structural construction methods are being considered for the dam raise: downstream embankment raise or MSE wall raise. Project areas and construction durations for each structural construction method are nearly identical, except for a 200-foot difference in approach road length at the right abutment and an approximate 1-month difference in construction duration. The longer road length is within the dam footprint on previously disturbed ground. Because these differences are negligible, they are not differentiated within the analysis of each alternative. The structural construction methods are discussed in detail in the 6-foot Dam Raise Engineering Summary (Appendix C). The effects

analysis in Chapter 3 of this EIS assumes the longer road length and construction duration would occur. The final construction method would be chosen during later phases of engineering evaluation.

2.3.1 Cofferdam

During crest raise construction, a cofferdam (an enclosure that can be pumped dry to permit construction work below the waterline) would be needed upstream of the spillway to mitigate construction risk and facilitate construction access. The proposed temporary cofferdam would be approximately 20 feet high with a 25-foot-wide crest at elevation 4189. It would extend along the length of the spillway bridge (approximately 1,500 feet) and require a reservoir restriction (decreased surface water elevation) of approximately 12 feet to 22 feet from current full pool surface elevation of 4196 feet. The isolated work area would not exceed 15,000 square feet (0.35 acre).

Coffering for the raise would be constructed during low pool in Anderson Ranch Reservoir. Once the cofferdam is installed, the crest raise work area would be isolated from "live water", referring to the active reservoir pool. Construction of the crest raise is anticipated to last approximately 36 months. Once construction of the crest raise is completed, coffering would be removed.

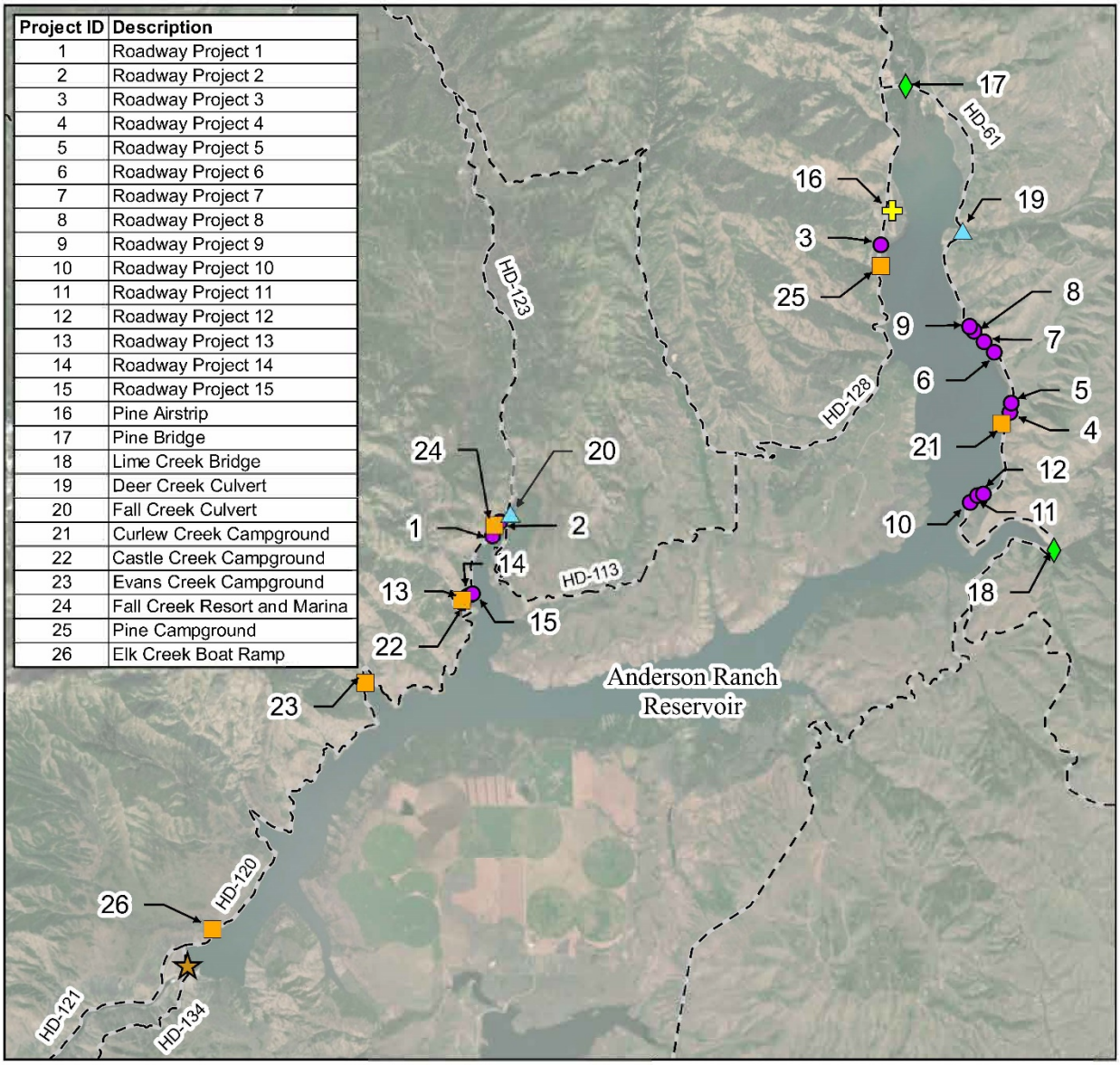
2.3.2 Actions Around the Reservoir and Adjacent Areas

In addition to the structural modifications at the dam, multiple actions are required surrounding the reservoir perimeter (rim) to accommodate the surface water elevation increase (Figure 7). Described below are the areas around the reservoir and downstream utilized for construction purposes, as well as permanent design features proposed for Alternative B. This alternative will be evaluated to ensure compliance with the Idaho State Water Plan.

2.3.3 Contractor Use Areas

Due to the steep topography of the area, limited level ground and cleared space exists near the dam site suitable for contractor use areas. Two suitable sites of which are owned by the Federal government and are under a Reclamation withdrawal (see Figure 5). The first location is adjacent to the Dixie Borrow Pit and is suitable for office trailers, employee parking, borrow development, refueling, and other staging activities. The second location is upstream of the left abutment of the dam facility. This staging area is suitable for stockpiling, water tanks, reinforcing and formwork laydown areas, and other staging activities. As construction is to be completed during low flow and low reservoir conditions, there would generally be sufficient area for staging and stockpiling of construction materials adjacent to some specific project locations. Both locations would require clearing, grubbing, and some level of grading. Both sites are on previously disturbed ground.

Project ID	Description
1	Roadway Project 1
2	Roadway Project 2
3	Roadway Project 3
4	Roadway Project 4
5	Roadway Project 5
6	Roadway Project 6
7	Roadway Project 7
8	Roadway Project 8
9	Roadway Project 9
10	Roadway Project 10
11	Roadway Project 11
12	Roadway Project 12
13	Roadway Project 13
14	Roadway Project 14
15	Roadway Project 15
16	Pine Airstrip
17	Pine Bridge
18	Lime Creek Bridge
19	Deer Creek Culvert
20	Fall Creek Culvert
21	Curlew Creek Campground
22	Castle Creek Campground
23	Evans Creek Campground
24	Fall Creek Resort and Marina
25	Pine Campground
26	Elk Creek Boat Ramp



LEGEND

- Anderson Ranch Dam
- Aviation Project
- Bridge Project
- Culvert Project
- Recreation Project
- Roadway Project
- Road

N

0 1.5 Miles

Notes:
1. This map is provided as-is and may contain representations of property boundaries. It is intended for general references only. None of the parties involved in preparing this map or data contained herein warrant or represent information to be complete and accurate and cannot be held responsible for errors or omissions.

Figure 7. Reservoir Rim Projects
Boise Project - Arrowrock Division
Boise River Basin Feasibility Study

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2.3.4 Alternate Transportation Route

HD 134 would be closed due to dam construction for approximately 45 months leaving it inaccessible for public use. HD 131 is proposed as a detour route to enable continued public access during construction closure (see Figure 4). The Reclamation contractor would be required to operate and maintain the detour route during the construction period to ensure year-round public access. The majority of the detour route selected is acceptable for public access with minimal improvements described below.

A steep and sharp turn, approximately 1.6 miles south of Cow Creek Bridge, would need regrading to provide safe public access. Configuration to realign the turn would allow safer travel along this route. This section currently has grades steeper than 12% and tight curves that restrict visibility and limit trailer and large vehicle access. Road construction would involve cutting into an existing hill to create an approximately 935-foot, S-shaped realignment southwest of the problematic tight turns. The new road would be 24 feet wide, flanked by W-beam guard rails, and topped with 6 inches of gravel surfacing. Realigned sections of the road would be located out of the riparian conservation areas (RCAs) wherever possible. If any of the realigned section must be located in RCAs, it will be developed such that degrading effects to RCAs are mitigated.

Additionally, two curves would require improvement for driver visibility and safety, especially for large trucks, approximately 0.5 mile and 0.8 mile south of Cow Creek Bridge These improvements would include material excavation and would be within the existing right of way. If it is determined during final design that necessary roadwork improvements would be needed outside of the existing right of way, additional environmental compliance would be completed, and the right of way would need to be modified by USFS. Improvements to HD 131 would require the road to be closed for approximately 43 days.

An analysis of Cow Creek Bridge determined it was capable of supporting the anticipated detour traffic loads during construction of the proposed dam improvements. No design modifications for the Cow Creek Bridge are required.

2.3.5 Borrow Areas

Borrow material is proposed to be sourced from the Dixie Borrow Pit and three downstream alluvial and fluvial deposits along the canyon slopes on the north side of HD 121. All proposed borrow sourcing locations are owned by the Federal government and are under a Reclamation withdrawal. Laboratory testing of samples collected from the potential borrow areas or terrestrial surveys have not been completed at this time. Thus, it cannot be determined that the three selected areas would have sufficient volume of appropriate borrow material within the limits of the potential downstream borrow sites. There is a potential that borrow development operations may extend outside of these primary locations. A potential secondary borrow area along the north bank of the South Fork Boise River from the downstream toe of the dam to 2.5 miles downstream has been identified. Any additional material that would be needed would be supplied from commercial sources outside of the project area.

2.3.6 Haul Roads

The proposed haul roads are laid out based on estimated methods for delivery of fill material. The haul routes use existing HD 134, HD 120, and HD 121 (Figure 4). The majority of the haul routes are on unpaved roads and there are two high-grade roads, each on the downstream approaches. The total length of the haul routes is approximately 4 miles (not including the dam crest). There is a proposed turnaround at the Elk Creek boat ramp parking area approximately half a mile upstream of the dam. Some grading work would likely be required to develop a haul route turnaround at this site. Elk Creek boat camp would be closed for the duration of the project.

2.3.7 Bridges

The Lime Creek Bridge and the Pine Bridge over the South Fork Boise River were identified as being potentially impacted by the proposed 6-foot surface water elevation increase. In addition, Cow Creek Bridge was analyzed to determine if it could support the anticipated detour traffic loads for the proposed detour route on HD 131 during construction.

Lime Creek Bridge (Idaho Transportation Department [ITD] Bridge Key 19880)

Located along HD 61, the Lime Creek Bridge is a three-span prestressed concrete bridge that was constructed in 1984. This bridge carries traffic between Mountain Home and Pine, Idaho, over the intersecting waterways Lime Creek, Casey Creek, and the Anderson Ranch Reservoir. Lime Creek Bridge work is limited to repairing the abutment slopes with riprap. Installing new riprap is proposed with a woven geotextile fabric.

Construction would be completed during low flow and low reservoir conditions. Installing and removing any required cofferdams would be subject to the conservation measures discussed in the Biological Assessment for this Study as well as to the provisions of the USACE-administered joint 404 permit, using sediment and erosion-control measures.

Pine Bridge (ITD Bridge Key 19886)

Located along HD 61, the Pine Bridge is a single-span steel girder bridge that was constructed in 2018. This bridge carries traffic between Mountain Home and Pine, Idaho, over the South Fork Boise River. The proposed increase in reservoir water surface elevation could reduce the provided freeboard below the 2-foot minimum required by ITD during a 50-year flood event if the reservoir level is high when flood event occurs. A design standard variance allowing an exceedance of the minimum freeboard under extreme hydrologic conditions is being pursued. This variance, if granted, would negate the need for the proposed abutment modifications described in the remainder of this section.

Bridge-specific construction activities for Pine Bridge may consist of demolishing abutments, relocating and storing the existing superstructure, installing new piles, constructing taller abutments, reinstalling the superstructure, and installing riprap. The superstructure of the existing Pine Bridge would be raised by 1 foot to achieve the 2-foot minimum clearance between the low chord of the superstructure and the high-water surface elevation.

Cow Creek Bridge (ITD Bridge Key 27855)

Located along HD 131, the Cow Creek Bridge over the South Fork Boise River is a four-span, one-lane reinforced concrete slab bridge that was constructed in 1959. A load analysis determined that the bridge is capable of supporting the anticipated detour traffic loads during the construction period.

2.3.8 Pine Airstrip

Pine Airstrip is located 1.3 miles south of Pine, Idaho, and is operated by the state of Idaho through ITD Division of Aeronautics under a special use permit from USFS. It is an airport with one turf runway having a visual approach to each end. The southernmost end of the runway (approximately 50 feet to 70 feet long) as well as the runway protection zone is affected by a raised water surface elevation above 4200 feet. Alternative B includes relocating and reorienting the Pine Airstrip. ITD airport staff were consulted to discuss alternatives for runway relocation and/or realignment. The ITD preferred alternative consists of realigning the runway so the runway is completely above the 4202-foot elevation contour. The existing turf runway would be replaced by a new turf runway located on the existing property with similar dimensions but different orientation. The construction for the realignment is expected to take 1-2 months.

2.3.9 Developed Recreation Facilities

Developed recreation facilities are considered those that have permanent amenities such as fire rings and tables. The developed recreation facilities surrounding Anderson Ranch Reservoir are generally privately owned, privately operated under a USFS special use permit or managed by USFS. Table 4 briefly describes the required action for Alternative B required to accommodate the proposed increase in surface water elevation. A description of all developed recreation facilities and alternative related actions are included in the 6-foot Dam Raise Engineering Summary Report in Appendix C.

In summary, campsites impacted by the water elevation would be rebuilt above the new full pool elevation. This would be accomplished by importing and placing fill material, except for the two campsites at Castle Creek Campground, which would be relocated to the Pine Campground. USFS-developed recreation sites would be replaced in kind. Fall Creek Resort and Marina mitigation is addressed in the Recreation Section 3.16.2.4.

Table 4. USFS recreation amenities and projected adjustments

Recreation Site Name	No. of Sites	Potable Water	Toilet	Projected Adjustments Based on Implementation of Proposed Action
Curlew Creek Campground and Boat Ramp	9	Yes	Vault	2 campsites and 1 drinking water well relocated to higher elevation within the same campground, 6 campsites raise with addition of material to create higher ground. New concrete boat ramp, road loop, and additional docks.
Pine Campground	7	No	Vault	1 campsite relocated to higher elevation within the same campground, 6 campsites raised with addition of material to create higher

Recreation Site Name	No. of Sites	Potable Water	Toilet	Projected Adjustments Based on Implementation of Proposed Action
				ground, 2 new campsites added from Castle Creek Campground. New concrete dock abutment/access ramp and additional docks, boat ramp extended, and additional vault toilet.
Evans Creek Campground	8	No	Vault	8 campsites raised with the addition of material to create higher ground.
Castle Creek Campground	2	No	No	2 campsites abandoned and added to Pine campground.
Spillway Campground	3	No	Vault	Closed for duration of proposed action construction.
Nester's Private Campground and Pine Resort RV Park	34	Yes	Yes	No improvements or modifications proposed.
Fall Creek Resort and Marina	45	Yes	Yes	Mitigation explained within recreation Section 3.16.2.4.

2.3.10 Culverts

Deer Creek and Fall Creek are tributaries of the Boise River that enter Anderson Ranch Reservoir. Two culverts that are located at the point where the tributaries enter the reservoir were identified in a USFS study as having outlet drops that limit fish migration. These migration-limiting conditions occur when low reservoir pool elevation corresponds with low stream flows and may not occur annually. Both culverts would be retrofitted to provide fish passage throughout the year. Adjustments would be made to raise the existing grades at the culvert outlets so that the existing culverts are no longer perched. In-stream step pool weirs would be constructed to increase the pool depths downstream of the culverts and provide grade control. Baffles (a strip installed to reduce velocity and create a resting area for fish) would also be incorporated in the existing culverts to increase the depths inside the existing culverts under low flows and reduce velocities at high flows.

Collectively, the culvert replacement project would meet the target tailwater elevations, provide resting pools for aquatic species, and reduce shear stress on the streambanks. In-water work at both Deer Creek and Fall Creek would be conducted during low flow and low pool elevations at Anderson Ranch Reservoir. Construction would require diverting water around the work areas. Water exiting the existing culverts would be diverted directly downstream of the work area. No upstream coffering is anticipated; however, a downstream cofferdam may be required to isolate the work areas.

2.3.11 Utilities

Utilities include provisions such as water, gas, or power and the infrastructure used to support and deliver each. Based on information provided by Idaho Power, some utility relocation would be necessary (Appendix C). Idaho Power holds a special use permit for occupying and maintaining this infrastructure on NFS lands. USFS would need to modify its special use permit with Idaho Power to relocate the infrastructure. Potential impacts are to overhead power and a 35-kV single-phase underground primary cable in 3-inch conduit. Idaho Power identified the following infrastructure to be relocated for reliability and maintenance purposes.

- 7 poles and associated overhead line immediately south of HD 61 and the Pine Bridge over the South Fork Boise River.
- 5–7 poles and associated overhead line immediately north of Deer Creek between HD 61 and the reservoir.
- Up to 10 poles and associated overhead line immediately north of Curlew Creek between HD 61 and the reservoir.
- An underground powerline and associated underground transformers in the Fall Creek area.

These facilities, pending design decisions by Idaho Power, would either remain on the same side of the road or cross to the other side. It is assumed that this work would be performed by Idaho Power, including any design work required for utility relocation.

Four public wells are identified on the Idaho Department of Environmental Quality (IDEQ) Source Water Assessment and Protection website. Of these, the Curlew Creek Campground well is the only identified well to be affected by the surface water elevation increase. The Curlew Creek Campground includes a drinking water well that would need to be relocated to maintain a minimum 50 feet of separation from surface water as required by the IDEQ. This well would be abandoned per IDWR requirements and reconstructed on site per IDEQ (§58.01.08) and IDWR standards. Based on the 6-foot Dam Raise Engineering Summary Report (Appendix C), it was determined that all of the existing USFS-managed vault style toilets and private septic systems adjacent to the reservoir would continue to meet minimum setback requirements per Idaho Code §58.01.16 with the exception of a public use septic system located at the Fall Creek Resort. The Fall Creek Resort septic system would be mitigated during the project if the project is determined feasible; the special use permit is still in effect.

2.3.12 Roadways

Overall, most existing roadway segments and existing shoreline slopes are anticipated to remain stable and/or maintain the historical existing angles of natural repose. However, in some locations riprap would be considered to armor the existing shoreline and roadway embankment slopes and protect existing roadway infrastructure. Five roadway segments, varying in length from 50 feet to 600 feet, were identified as areas for consideration that could potentially be impacted or require improvement due to the proposed increase in reservoir water surface elevation at Anderson Ranch Reservoir.

Three existing MSE retaining walls between Pine-Featherville Road and the existing reservoir were identified that would be overtopped by the proposed increase in reservoir water. These three walls would need to be demolished and reconstructed to be higher than 4206 feet.

Additionally, there is a location along Anderson Dam Road (HD 134) near Castle Creek where the existing road narrows noticeably between a large rock outcropping and the steep roadway embankment on the reservoir side of the roadway. In addition to shore stabilization with riprap as identified previously, an MSE wall is proposed to widen the roadway and increase stability of the roadway embankment to minimize slope erosion.

2.3.13 Road Improvements

Table 5 is a description of the roads requiring improvements based on completing the proposed action and the 15 associated road-improvement projects, illustrated in Figure 7. The 6-foot Dam Raise Engineering Summary Report (Appendix C) contains site specific maps for each location.

Table 5. Project area roads and proposed improvements

Road	Project Number	Proposed Road Improvement Based on Proposed Action Implementation
Anderson Dam Road HD 120	1-2	Near Fall Creek would be raised to accommodate a raised water surface elevation. The proposed rim project would include riprap slope protection to stabilize the roadway embankment.
Lester Creek Road - HD 128	3	Immediately south of the Pine Airstrip, where ~800 feet of existing roadway would require raising to properly impound the reservoir. This would include earthwork, resurfacing, and embankment stabilization in the form of riprap.
Pine-Featherville Road - HD 61	4-5	North of Curlew Creek Campground, several hundred feet of the existing narrow section of roadway would require riprap slope protection to stabilize the roadway embankment.
Pine-Featherville Road - HD 61	6-9	North of Curlew Creek would require stabilizing riprap slope protection along the existing roadway embankment that is cut into the hillside.
Pine-Featherville Road - HD 61	10-12	South of Curlew Creek, the existing MSE walls constructed between the reservoir and the roadway would be reconstructed at a higher elevation to account for the higher pool.
Anderson Dam Road HD 120	13-15	East of Castle Creek Campground would entail riprap slope protection and construction of a mechanically stabilized earth wall to stabilize the roadway embankment. Raising the water surface elevation of the reservoir could create issues related to roadway embankment stability and protection.

2.3.14 Facility Operations and Maintenance

2.3.14.1 Operations

Operations under Alternative B have two phases: 1) construction and 2) post-construction. As previously described, a cofferdam would be required during construction and this would require a reservoir pool restriction. The exact reservoir pool restriction would be determined during the final project design but is estimated between 12 feet and 22 feet from the current full pool elevation of 4196 feet. The Water Operations and Hydrology Specialist Report (Appendix B1) evaluates the deepest reservoir restriction and provides a detailed description of proposed operations for both the construction period and the post construction. The specialist report evaluates four potential post construction operational scenarios that are based on possible spaceholders of the water.

2.3.14.2 Dam Maintenance

The dam raise would increase the storage capacity of Anderson Ranch Reservoir by approximately 29,000 acre-feet for an active maximum capacity of approximately 442,074 acre-feet. The dam raise equates to a 7% increase in the active capacity of Anderson Ranch Reservoir and a 3% increase in system active capacity. Table 6 shows the schedule of routine maintenance from 2007–2033.

Table 6. Schedule of routine dam maintenance

Year	Typical Spilling Window	Work Description	Duration
2007	May 4 to July 2	Interior visual and ultrasonic testing (UT) Inspection of Penstock. Perform unbalanced fixed wheel gate test.	Completed 2 days May 21 to May 23
2014	May, June, July	Visual interior inspection of Penstock and replacement of the 3-inch fill valves for ring follower gates 2–5.	Completed 2 to 3 days
2018	May, June, July	Interior visual and UT inspection of Penstock. Perform unbalanced fixed wheel gate test.	Completed 1 to 2 days
2023	May, June, July	Visual interior inspection of penstock.	1 day
2028	May, June, July	Interior visual and UT inspection of Penstock. Perform unbalanced fixed wheel gate test.	1 to 2 days
2033	May, June, July	Visual interior inspection of penstock.	1 day

2.3.14.3 Endangered Species Act Compliance

Under Alternative B, Reclamation would continue to fulfill its ESA terms and conditions and reasonable and prudent measures identified by USFWS in both the 2005 BiOps and 2014 BiOps and would conduct a formal consultation for this action.

2.3.15 Water Rights

The Idaho Water Resources Board has filed an application for a new water right permit that contemplates Reclamation, through use of state funding, will raise Anderson Ranch Dam by up to six feet for additional storage up to 29,000 acre-feet. According to the water rights application, this new storage space will be utilized by existing water users after entering into contracts with Reclamation or the State of Idaho for existing places of use within Ada, Canyon, and Elmore Counties. For the purposes of this document, the effects analysis evaluates the proposed action stated in Section 1.4. It is possible that part of the supply may be put into Basin 63's water bank for short-term uses. Overall, this water would be available for storage only in relatively high-water years and only after senior water rights are filled. The water will be integrated within current river operations as explained in Appendix B1, therefore, no negative impacts to existing or senior water users are anticipated.

IWRB sought the permit in 2019 to protect the priority date for the new storage. It is anticipated that the Board will transfer the permit to Reclamation if the agency issues a Final EIS and Record of Decision confirming its plans to undertake a dam raise. This new permit will likely have a standard remark that will conform to the legal requirement issued by the Idaho Supreme Court in *United States v. Pioneer Irr. Dist.et al*., 144 Idaho 106, 157 P3d. 600, 609 (2007)(legal title for irrigation rights may be held by the United States/Reclamation but under Idaho's Constitutional and statutory law, equitable title to use of the water is not exclusively based upon federal contracts as held by beneficial user and appurtenant to the property irrigated).

While this new water right is junior to existing storage, and would be subordinate to Basin 63 refill rights, it would, when available, enhance the basin's water supply for current and future needs for irrigation, domestic, commercial, industrial, municipal, power, and recreation purposes, and would support existing reservoir system operations that provide flood protection, including federal benefits that would enhance environmental, wildlife, fisheries, and public interest values.

Reclamation would release this new water, when in priority, to end users in the Treasure Valley in the same way that Anderson Ranch storage water is currently provided through releases from Anderson Ranch Dam flowing into the South Fork of the Boise River during the usual seasons of use as existing water rights. The water master for District 63 would track and account for the water under existing IDWR accounting procedures and in accordance with contracts that are entered with end users.

The alternative would likely affect the ability to store and deliver water according to existing Anderson Ranch contracts due to the reservoir restriction to 4174 feet required for 42 months during construction. The restriction elevation and duration may be adjusted based on final design, potentially lessening impacts. This EIS evaluates the effects of this restriction on water deliveries. Reclamation and IWRB are developing approaches to address any associated impact to existing spaceholders, including rentals from the water bank or other pre-negotiated financial arrangements. Environmental compliance related to these approaches will be completed in the future if needed.

2.3.16 Water Contracting for New Space

Space assignment from the proposed action has not yet been determined. Potential spaceholders include existing Reclamation contractors and IWRB, which could, in turn, contract water to existing Water District 63 water users and/or may offer water through the Idaho water supply bank's Water District 63 rental pool.

Two potential contract options are being considered for the new space.

1. Option A – Reclamation would enter into a single agreement with IWRB pursuant to WIIN Section 4007 covering construction, use of water, and operations and maintenance for the additional water supply. IWRB would subsequently enter into contract(s) with Water District 63 water users and/or offer water through the Idaho water supply bank's Water District 63 rental pool.
2. Option B – Same as Option A except, in addition to IWRB agreement, Reclamation would enter into agreements directly with existing Reclamation contractors

The proposed action considers both contracting options. Under these water-contracting options, Reclamation contracts would be negotiated, executed, and administered pursuant to Reclamation policy, directives, and standards.

An agreement for construction of the raise, including providing for upfront funding as is necessary to pay the non-Federal share of the costs, will be executed before construction of the raise. Contracts for the right to use the capacity in the increased space are expected to be mainly with IWRB, with IWRB "subcontracting" to delivery entities, rather than individuals, or arrangements may be made whereby Reclamation contracts directly with a water delivery entity. It is anticipated any agreement with Reclamation for the right to use the capacity in the increased space will include the right to carryover unused water to the next year. Agreements for the right to use (or subcontract) for the capacity of the new space will include a requirement to pay an equitable proportion of the operation and maintenance costs of Anderson Ranch. It is anticipated that if the State is subcontracting to the water delivery entities, it will charge the water delivery entities the required O&M due the United States.

As the feasibility study partner, IWRB is determining how space may be allocated; however, it is likely IWRB would use the standard state request for proposal (RFP) process for space assignment. If the RFP process is chosen, IWRB would select the criteria to be used in the RFP through an open public process. IWRB contracts with the selected proposers would be negotiated, executed, and administered pursuant to the authorities provided to the IWRB through Idaho Code §42-1734.

During the contracting process, Reclamation would reevaluate this EIS to determine if it adequately addresses potential impacts. Reclamation would perform additional NEPA or other environmental compliance studies after the Draft EIS is reevaluated.

Following the direction provided by the WIIN Act to provide a Federal benefit, Reclamation has recognized the opportunity to reserve 10% of the proposed space to provide operational flexibility or for environmental purposes, which could include environmental flows. Coordination with local, State, and Federal entities would allow prioritization of water uses for environmental purposes that would align with existing environmental requirements.

Current Boise System operations consider environmental requirements from three active ESA consultations including: Bull Trout (USFWS, 2005), Bull Trout Critical Habitat (USFWS, 2014) and Salmon Augmentation flows (NOAA, 2008). Within the Boise System, the Incidental Take Statements associated with the ESA consultations provide protective coverage through ESA to continue operations and include: 10 Terms and Conditions and 14 Conservation Recommendations, from these requirements 10 operational targets and 9 physical/biological habitat features are monitored. Furthermore, annual coordination with the Services for within season operations, annual monitoring and a summary report of annual operating and monitoring is also required.

2.4 Alternative C – 3-Foot Raise of Anderson Ranch Dam

Alternative C proposes to raise Anderson Ranch Dam 3 feet from the present full pool elevation of 4196 feet to 4199 feet. The 3-foot raise would capture and store approximately 14,400 additional acre-feet of water. Alternative C would inundate an estimated 73 acres of additional land around the reservoir above the current full pool elevation. Alternative C project feature durations are presented in Table 7.

Table 7. Alternative C project development feature durations.

Type	Duration
Total Construction Duration	44 months
Detour Construction	43 days
Detour Duration	38 months
Construction Duration	40 months
Reservoir Restriction	35 months

Alternative C is largely similar to Alternative B with the following exceptions.

- Construction at the dam would require less material than Alternative B. For the MSE wall, approximately 30% less fill material would be needed. The downstream embankment raise would require between 50% and 70% less fill material for the various fill zones in the dam. While the quantities for the 3-foot raise would be reduced, all four identified borrow sites would still be used.
- HD 128 (Lester Creek Road) would not require any modification.
- Pine Airstrip would not require relocation. The increased surface elevation of 4199 feet associated with a 3-foot dam raise would breach existing unpaved roads but would not encroach on the existing runway. Maintaining a consistent 3-foot minimum freeboard design factor, the southeast corner of the runway would be inundated; however, in a maximum surcharge event (less than 2 feet), only a small corner of the runway would be inundated. Reclamation would pursue a waiver to minimally encroach on the existing runway in surcharge events, extend the existing runway to offset the encroachment, or construct a retaining wall to prevent the encroachment, but has not yet conferred with ITD. Reclamation has conservatively included a low-profile

retaining wall with top-of-wall elevation of 4202 feet near the southern end of the runway. This wall would cross existing unpaved roadways but would not prevent vehicle access from nearby alternate unpaved roadways.

- The Pine Campground would not require as much fill to protect the infrastructure and the number of new picnic shelters, tables, and fire rings; inundated replacements would be reduced from 9 to 3 campsites. The dock sections needed would be reduced from 4 to 3 16-foot sections.
- The Pine Bridge would not be affected and would not need to be replaced.
- Operations under Alternative C have two phases: 1) construction and 2) post-construction. During construction, Reclamation would install a cofferdam requiring a reservoir pool restriction. The exact reservoir pool would be determined during the final project design but would be the same as Alternative B. The Water Operations and Hydrology Specialist Report (Appendix B1) evaluates the deepest reservoir restriction and provides a detailed description of proposed operations for both the construction period and the post construction operational scenarios. The specialist report evaluates four potential post construction scenarios that are based on possible water spaceholders.

Further descriptions regarding the varying design features and difference in quantities are included in the 3-foot Dam Raise Engineering Summary in Appendix D. Aside from the list above, project features relating to dam structure construction, actions around the reservoir rim and adjacent areas for Alternative C are as described in Section 2.3. Additionally, ESA compliance, water contracting, dam operations and maintenance all apply to Alternative C as described under Alternative B.

2.5 Alternatives Considered but Not Pursued

NEPA requires Reclamation to consider alternatives developed through internal and external scoping, including public scoping. However, only those alternatives that are considered reasonable and meet the purpose and need of the proposed action must be analyzed in detail.

As part of internal scoping for this Draft EIS, Reclamation evaluated the alternatives considered in the feasibility study process to determine if they met the purpose and need. A public scoping process was conducted in 2019 and multiple comments were received suggesting potential alternatives. Descriptions of the 35 alternatives that resulted from internal and external scoping are given in Appendix E along with the rationale for those that were not carried forward for further analysis. Following thorough vetting, 33 alternatives were found either ineffective, unable to meet the identified purpose and need, technically or economically infeasible, remote or speculative opportunity for implementation, or a combination. Of the field of 35 potential alternatives identified, the two alternatives that meet the purpose and need include a 3-foot dam raise and a 6-foot raise of Anderson Ranch Dam.

2.5.1 Internal Scoping Alternatives Considered

During Reclamation's required NEPA scoping, all of the alternatives considered within the feasibility study process were evaluated for potential inclusion in the EIS. Each of the

alternatives was compared against the purpose and need. Appendix E provides an overview of these alternatives and reasons each was eliminated from analysis in this Draft EIS.

2.5.2 Alternatives Suggested During Public Scoping

Several alternatives were identified through the external and public scoping process (Appendix A) that were given consideration to be carried forward in the NEPA process but were eliminated from analysis. These alternatives are included in Appendix E and summarized below.

Conservation

- **Canal Automation.** A vast majority of the New York and Mora Canal system is currently automated, with only a few minor components not automated. Automating the remainder of these few components would not appreciably increase potential water storage. As a result, additional automation of the canal system, while desirable for efficiency of water delivery, is not expected to accomplish the water savings required to meet the purpose and need of providing additional water supply to meet current and future needs.
- **Water Conservation.** Water conservation has been shown to address water shortages through public and private participation through incentivization. Reclamation awards grants to irrigation districts and other entities through the DOI WaterSMART program for water conservation measures that are usually on a smaller geographic scale compared to the size of Treasure Valley. The state included water conservation as a measure in its 2016 water supply study and even with implementation conservation measures the reliability concerns remain. As a result, water conservation is not a reasonable alternative, nor does it meet the purpose and need of providing additional storage.
- **Water Savings.** One alternative points to water savings resulting from the shift from irrigated crop land to residential use. Water savings could be quantified and made available for DCMI uses through a free-market (willing seller/willing buyer) without the threat of forfeiture. The alternative envisions devising free-market approach for the market to be successful. This alternative is uncertain and speculative because it depends on future events that are uncertain to occur, including among other things, changes to state law together with initiation and completion of a comprehensive multi-year collaborative study involving irrigation entities, stakeholders, and governmental entities to determine the amount of unused water available for DCMI. Further, this proposal does not meet the purpose and need of developing additional storage in a federally owned storage project.

Other

- **Aquifer Recharge.** Managed aquifer recharge has potential to provide additional storage within the Boise River basin. IWRB and other interested stakeholders have conducted preliminary investigations of this concept. However, managed aquifer recharge needs additional analysis to be able to clearly define how people would access the additional water, how the water use would be permitted, and how the water would be used. Idaho water law dictates that once recharge water enters the

groundwater system, it is considered part of the existing water system and is available for appropriation. Therefore, any rights to the recharged water no longer apply once it enters the groundwater system. At this time in the Boise River basin, managed aquifer recharge is too new in its development and analysis to be used to create a dependable water source and is therefore too speculative to be analyzed as an alternative to the proposed action in this Draft EIS.

- **Out of Basin Transfer.** The South Fork Boise River Diversion Project is currently being pursued by the Elmore County Commissioners. The Board of Commissioners of Elmore County have applied for and received, a 10,000 acre-feet water right permit with the intent of pumping this water out of Anderson Ranch Reservoir into Little Camas Reservoir. From Little Camas Reservoir, this water would be used to support groundwater recharge lower in the Long Tom Creek drainage basin. This project intends to transfer water out of the Boise River basin, not into the basin, and therefore would not meet the purpose and need of the project. The Elmore County project is considered in the Cumulative Effects section of this Draft EIS.
- **Moisture Trap and Capture.** The upper watershed water retention alternative entails methods such as forest harvest/manipulation, small retention ponds, and other ecological methods to trap and capture moisture (rain or snow) in the uppermost watershed. That water would then feed the existing stream/river system and could be an overall benefit to the current Boise River basin reservoir system. These are usually small-scale projects and need specific topography within a certain type of location to do so. There would need to be a large number of these specific occurrences within close proximity to accomplish any measurable water saving. Further, this proposal does not meet the purpose and need of developing additional storage in a federally owned storage project.

2.6 Projects Considered in Cumulative Impacts Analysis

Cumulative effects are analyzed for Alternative B and Alternative C. Cumulative effects are those that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. The cumulative effects analysis considers projects, programs, and policies that are not speculative and are based on known or reasonably foreseeable long-range plans, regulations, operating agreements, or other information that establishes them as reasonably foreseeable. No present actions were identified within or near the analysis area. The past and future actions considered for cumulative impacts analysis are included in this section.

2.6.1 Past Actions

2.6.1.1 Pine Bridge Replacement

The Pine Bridge spanning the South Fork of the Boise River near Pine, Idaho may need replacement due to the lack of freeboard clearance due to the proposed 6-foot dam raise (see Section 2.3.7). The alternate route for Pine Bridge is a detour on Old Logging Road and Pine-Featherville Road (HD 61) as shown on Figure 6. The bridge was removed for 18 months and a temporary light installed on the single-lane dirt Old Logging Road. This increased travel times by approximately 15 to 30 minutes and the road was difficult to

maintain in the winter (Pine EMS, 2019). The newly installed bridge was completed in October 2018 and provides 2-way traffic.

2.6.1.2 Anderson Ranch Dam Security Berm

Anderson Ranch Dam crest was raised 4 feet in 2010 as part of a security enhancement project. As described in Section 1.3, the raised crest is 28 feet wide with a 20-foot-wide roadway and 3-foot-high jersey barriers on each shoulder. The crest increase does not provide any water retention and is for security purposed only. The project reduced the road width to only allow single-lane traffic, controlled by a traffic light at each side of the dam.

2.6.2 Future Actions

2.6.2.1 Cat Creek Energy LLC

Cat Creek Energy LLC (CCE) has proposed an energy and water storage renewable power station to be constructed on land to the south, and elevated above, Anderson Ranch Reservoir on Cat Creek (Figure 8). A 20,000 acre-feet water right for power and an 80,000 acre-feet water right for downstream beneficial uses has been applied for by the project proponent, which intends to obtain a license from the Federal Energy Regulatory Commission (FERC) and a Lease of Power Privilege (LOPP) from Reclamation to create a pumped hydroelectric energy storage project. If the proposal is approved, there would be a 100,000 acre-feet reservoir created near the mouth of Cat Creek, above Anderson Ranch Reservoir, to be filled by pumping from Anderson Ranch Reservoir during high runoff. Of the 100,000 acre-feet, CCE has indicated it intends to use 20,000 acre-feet for hydropower generation and up to 80,000 acre-feet for water supply and associated purposes.

This project proposal encompasses surrounding areas and would include wind and solar energy. At this time, USFS manages Federal lands proposed for CCE's project and would continue in this role for the LOPP. FERC would be the lead agency on the NEPA process for this project, with Reclamation acting as a cooperating agency. FERC has 2 years to complete an EIS and CCE has not formally initiated evaluations with FERC or Reclamation.

Project specifics are continuing to be established and the information presented in this cumulative affects analysis is based on information provided to Reclamation to date. For purposes of the cumulative effects analysis in this EIS, the information contained in CCE's water right application was utilized. Although the proponent has not formally submitted a workplan that provides enough details for Reclamation to perform analysis per the terms of the preliminary LOPP agreement, CCE has stated that its proposed project would generate up to 720 megawatts of power generation with 9,996 cfs of pumping capability. It would also intertie into Mountain Home power transmission corridor and interconnect to both 230 kV and 500 kV transmission systems. CCE anticipates that the constructed reservoir is expected to fill via surface water approximately 10 out of 20 years. The developer has indicated that 80,000 acre-feet would be available for potential beneficial use by Water District No.63 spaceholders to be distributed through the existing reservoir system. However, no preliminary design or modeling information is available for potential downstream impacts.

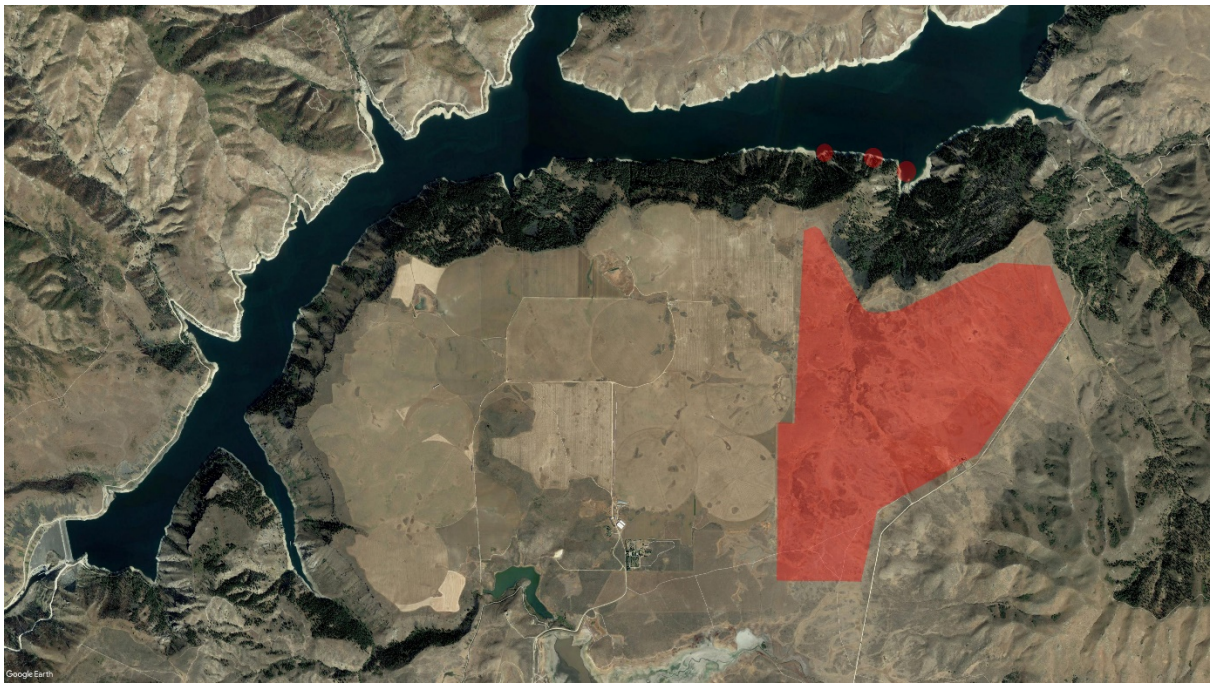

Figure 8. Cat Creek Energy approximate pump station and reservoir disturbance area (identified in red) as shown in the Water Right Application submitted to IDWR on April 16, 2019.

2.6.2.2 South Fork Boise River Diversion Project

The Board of Commissioners of Elmore County was issued a 10,000 acre-feet water right permit from IDWR with the intent of pumping this water out of Anderson Ranch Reservoir into Little Camas Reservoir for storage. From Little Camas Reservoir, this water would be diverted through the existing Mountain Home Irrigation District canal to the divide between the South Fork Boise River drainage and Long Tom Creek drainage to subsequently be used to support groundwater recharge lower in the Long Tom Creek drainage basin. Elmore County has presented the project concept to Reclamation, the Bureau of Land Management, and USFS. To date, no finalized design has been presented. USFS is presumed to be the lead agency for the NEPA process and Reclamation would be a cooperating agency.

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3 Affected Environment and Environmental Consequences

3.1 Introduction

This chapter describes the existing or affected environment, including conditions and trends of the human and natural environment that could be affected by the alternatives described in Chapter 2. This chapter also describes environmental consequences, referred to as "impacts" or "effects" of implementing the alternatives. Impacts are defined as modifications to the environment over existing conditions (the No-Action Alternative) that are caused by a proposed action.

Direct, indirect, and cumulative impacts are described in this chapter. Potential impacts are described in terms of duration, intensity, and context. Definitions of impact terms are can be found in White House Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA), 40 CFR parts 1500–1508.

The information presented in this chapter is derived from resource-level specialist reports (Resource Specialist Reports, Appendix B1 – B22). Specialist reports contain resource-specific information, including regulatory framework, affected environment, methods and assumptions used to evaluate impacts, significance criteria, and environmental consequences. Chapter 3 summarizes the results and conclusions of the resource-specific analyses and discloses impact significance. Refer to the specialist reports for additional information and detailed analysis of the alternatives.

Potential impacts were evaluated based on the assumption that environmental commitments would be implemented as part of the proposed activities. Environmental commitments may include best management practices (BMPs), minimization measures, mitigation measures, conservation measures, project design features, environmental compliance, compensatory mitigation, or other commitments. Reclamation plans to implement these directly or through third-party delegation to avoid, minimize, and mitigate environmental impacts of the project. Mitigation measures used to reduce impacts below significance are often incorporated into the alternatives in Chapter 2 (e.g., designating and improving a detour route due to road closures). These mitigation measures are an integral part of the alternative. Mitigation measures that address impacts not eliminated through avoidance of adverse effects are included in the resource-specific analysis in Chapter 3. These measures are covered in the *Mitigation Measures* section under each resource heading in Chapter 3 and are combined for quick reference in the Environmental Commitments Section, 3.28.

Mitigation measures requiring approval or permits from another entity, or agreement with USACE, USFWS, Bureau of Indian Affairs (BIA), or other responsible federal agencies, are described in Chapter 4, Section 4.2.

3.1.1 Project and Analysis Areas

The project area encompasses all features of a project that are necessary to implement the alternative, including but not limited to construction areas, haul routes, detour routes, roadwork areas, and borrow sites.

The project area includes the Anderson Ranch Reservoir and entering tributaries (to the point of the new inundation elevation), the South Fork Boise River downstream of Anderson Ranch Reservoir, and Arrowrock Reservoir and entering tributaries (relative to any temporal shift in pool elevation that may occur). It also includes any lands proximate, or adjacent to, Anderson Ranch Reservoir or in the vicinity that would be impacted as a result of construction activities (e.g., dam, bridges, culverts, roadways, staging), and the farthest extent of impacts anticipated to occur as a result of construction activities (elevated pool and downstream releases). The project area also includes transportation routes, roadwork areas, borrow areas, and detour routes that would be used during construction, as well as the extent of continued operation and maintenance activities.

The analysis area refers to the general geographical area where direct, indirect, and cumulative impacts of the proposed action are expected to occur. Analysis areas are distinct for each resource because anticipated impacts vary by resource. Some resources share similar analysis areas because their impacts are similar, or they relate to a specific project feature like inundation areas or ground disturbance areas. Analysis areas may include the entire project area or portions of the project area related to the extent of direct and indirect impacts. Analysis areas are described for each resource in the affected environment section.

3.2 Water Operations and Hydrology

This section describes the existing conditions for water operations and hydrology within the project area and anticipated environmental consequences for the alternatives. Additional information, general water operations and hydrology information, and additional methods and analysis are included in the Water Operations and Hydrology Specialist Report (Appendix B1).

3.2.1 Water Operations and Hydrology – Affected Environment

The water operations and hydrology analysis area encompasses Anderson Ranch Reservoir and Dam, South Fork Boise River between Anderson Ranch Dam and Arrowrock Reservoir, Arrowrock Reservoir, Lucky Peak Reservoir and Dam, and downstream of Lucky Peak Dam to the Boise River at Glenwood Bridge stream gauge location.

The Boise River Reservoir system is comprised of Anderson Ranch, Arrowrock, and Lucky Peak reservoirs with a total active storage capacity in the system of 949,700 acre-feet. Anderson Ranch Reservoir is located approximately 124 river miles upstream of the confluence of the Boise River with the Snake River and is the most upstream reservoir within the system. Anderson Ranch Dam is operated in conjunction with Arrowrock and Lucky Peak dams. Anderson Ranch Reservoir has a live capacity of approximately 450,030 acre-feet, consisting of 36,956 acre-feet of inactive capacity and 413,074 acre-feet of active capacity. The facility is a multipurpose project that stores and releases water from the 980-square-mile drainage area above Anderson Ranch Dam. The authorized purposes include irrigation water supply, power development and flood control, with dead storage space

providing for silt control, conservation of fish, and recreation. Anderson Ranch Dam has three methods of discharging water from the reservoir that include discharging water through the hollow jet valves, powerplant, and gated spillway. A 20-foot-diameter, concrete-lined outlet tunnel supplies water to the five hollow jet valves and the powerplant with a combined hydraulic capacity of approximately 10,000 cfs at full pool (elevation 4196 feet). The powerplant is located at the base of Anderson Ranch Dam and consists of two 20-megawatt Francis turbine generating units with a total hydraulic capacity of approximately 1600 cfs (800 cfs per unit). The gated spillway has a crest elevation of 4174 feet and a design capacity of approximately 20,000 cfs. In general, outside of maintenance needs (i.e., of powerplant or jet valves) or flood risk management (FRM) operations, use of the spillway is limited to times when Anderson Ranch Reservoir pool elevations are more than 4174 feet (spillway invert) and required reservoir discharges are greater than approximately 10,000 cfs (combined capacity of the powerplant and outlet works).

The following is a summary of typical water operations at Anderson Ranch dam and reservoir. However, various factors, such as previous year carryover, environmental conditions, maintenance activities, and irrigation demand can affect both the timing and magnitude of discharges (water released from the reservoir).

Starting in the fall and into early spring (September 16 to March 31), the minimum flow target below Anderson Ranch Dam for downstream fish habitat is 300 cfs. Typically, once the minimum flow has been set in the fall, the reservoir maintains a relatively constant elevation through the winter with inflow closely matching outflow. In wet years, the reservoir may fill slightly over the winter, and in dry years, the reservoir may draft slightly. Beginning April 1 and continuing through September 15, the minimum flow target for downstream fish habitat increases to 600 cfs. These minimum flow targets were determined through public meetings and consultation with IDFG. It should be noted, these minimum flow targets may not always be met, and flows lower than the targets described above are possible, particularly in dry water years.

Beginning January 1 and generally continuing each month through July, USACE–Walla Walla District and the Reclamation water management group generate and coordinate seasonal runoff volume forecasts for the Boise River basin. These forecasts are used to determine the reservoir space requirements to meet the FRM objectives in the basin. Reservoir releases from Anderson, Arrowrock, and Lucky Peak reservoirs are adjusted as necessary to meet the FRM objective. During these operations, Anderson Ranch Reservoir discharge varies as the reservoir is operated for FRM and reservoir refill.

Anderson Ranch Reservoir discharge is often much higher than the 600 cfs minimum flow target during the early spring to early summer period due to FRM operations. After FRM operations have ended (usually early summer), reservoir releases typically range from the minimum flow target of 600 cfs up to the powerplant capacity of approximately 1,600 cfs. These flows are used to satisfy lower system objectives including: downstream irrigation demands; keeping Arrowrock Reservoir above its target minimum pool of 50,000 acre-feet at elevation 3110 feet (actual minimum is 37,912 acre-feet at elevation 3100 feet); and to balance storage in Anderson, Arrowrock, and Lucky Peak reservoirs in preparation for the next water year. The target minimum pool at Arrowrock Reservoir provides a real-time operational storage buffer to ensure it stays above the actual minimum as water is moved from one reservoir to another to meet irrigation demand downstream of Lucky Peak Dam.

After sufficient water for lower system objectives has been released, Anderson Ranch Dam discharge is typically reduced to the minimum flow target of 600 cfs until September 16, when discharge is reduced to the minimum flow target of 300 cfs. Historically, Anderson Ranch Dam discharge has been lower than 600 cfs before September 16 when there is a concern that the water supply may not be adequate to maintain a release of 300 cfs throughout the upcoming winter or when the reservoir is near empty. Conversely, discharge has at times been higher than 300 cfs after September 16 when necessary to meet lower system objectives. Discharge from Anderson Ranch Dam in excess of powerplant capacity are seldom made during the irrigation season unless needed for other lower system objectives.

Reclamation has coordinated with the National Oceanic and Atmospheric Administration (NOAA) Fisheries because its proposed action could potentially affect flow conditions downstream of the Boise River System and, as a result, anadromous salmonids. As described in NOAA 2008 Upper Snake River BiOp, and as mandated by the 2004 Snake River Water Rights Act of 2004, Reclamation is required to provide water for downstream ecological needs, specifically to benefit migrating salmon and steelhead, known as “flow augmentation water” or flow augmentation. Based on Reclamation's analyses, no change is anticipated in Reclamation’s ability to meet flow augmentation requirements. Additionally, Reclamation engages in routine coordination with NOAA Fisheries, as part of existing requirements, through which the need for appropriate actions under the Endangered Species Act are determined.

Separate from flow augmentation requirements, Reclamation works with NOAA Fisheries and the Columbia River Technical Management Team (TMT) to coordinate flow releases from the upper Snake River basin with flows across the Columbia River system (NOAA 2008). The TMT, an interagency team with representatives from over 20 organizations, uses flow objectives calculated at Lower Granite Dam (LGD) and water forecasts across the Region to balance seasonal water availability to benefit migrating salmon and steelhead. Flow objectives at LGD vary between 85,000 cfs and 100,000 cfs (depending on water supply forecasts) during the spring period (April 3- June 20), however, currently there is a priority toward more flow during April and May to benefit early migrating salmon that are experiencing lower return rates than later migrating stocks. The flow objective is measured as the season average of the discharge at LGD between the planning dates of April 3 to June 20. These flow objectives are provided as a biological guideline and will likely not be met throughout the entire migration season in all years because the flow in the Snake River primarily depends on the volume and shape of the natural runoff, while the augmentation volumes available are small in comparison to the overall objective. Flow in the Snake River during this period is supported in part by flow augmentation water from the upper Snake River.

3.2.2 Water Operations and Hydrology - Environmental Consequences

3.2.2.1 Methods for Evaluating Impacts and Significance Criteria

Evaluating impacts to water operations and hydrology includes using a combination of experience with historical reservoir system operations and quantitative computer modeling. Impacts to water operations and hydrology may be short term (during construction) or long term (after construction) and may be direct (impacts to actual reservoir operations), indirect

(impact to meeting secondary operational targets) such as keeping Arrowrock Reservoir above its minimum target pool elevation of 3110 feet (actual minimum pool is 3100 feet), and/or cumulative (effects added to other projects' effects). Quantitative modeling results include figures of median, 10th/90th percentiles, and minimum and maximum values for various flow and reservoir conditions of the No-Action Alternative (Alternative A), Alternative B, and Alternative C. Impacts are determined by analyzing the difference in these values among the alternatives to identify the extent or duration (i.e., significance) of an impact to operational criteria.

The evaluation is based on historical hydrology and four different demand scenarios (modeled capture the range of possible release timings and durations of the new storage volume) compared to the No-Action Alternative (continue unchanged from current operations). The model used to simulate the scenarios was the Boise Planning Model, a RiverWare version 7.5-based model (Regents of the University of Colorado, 2019). The model includes logic to simulate competing water demands in the system while adhering to legal water rights and physical constraints. Competing water demands include irrigation, flood control, minimum flow targets, ecological flow releases, and ecological storage constraints.

The following criteria were used to determine whether an impact would qualify as significant.

- Reduction in the ability to provide system FRM for any period of time where the No-Action Alternative would have met FRM objectives. Significance of impact is not a discrete value, rather it is relative to the no-action condition.
- Reduction in the ability to meet water deliveries for any period of time where no action would have met water deliveries. Significance of impact is not a discrete value, rather it is relative to the no-action condition.
- Reduction in the ability to meet ecological constraints at Anderson Ranch reservoir and dam as compared to the no-action condition including:
    - 300 cfs target minimum flow from September 16 to March 31,
    - 600 cfs target minimum flow from April 1 to September 15, and
    - minimum pool elevation of 4039.6 feet (0 acre-feet active content).
- Reduce the ability to meet the minimum pool elevation of 3100 feet (37,912 acre-feet content) at Arrowrock Reservoir for any period of time as compared to the no-action condition.

Lower Granite Dam Flow Objectives

Evaluating impacts to LGD flow objectives was performed by analyzing the change in volume at LGD that could be influenced by the proposed action. Reclamation believes this method allows the most direct analysis because of the multitude of variables influencing flow along the approximate 332 river miles between Anderson Ranch Dam and LGD. For example, releases from Anderson Ranch Dam, after leaving the Boise River system, flow through three other reservoirs that are independently operated before reaching LGD making it unlikely that the entirety of the impacts from the proposed action would be realized at one

time or consistently over time. Additionally, empirical measurements of flow parameters, at the scale of the proposed action, would be within the range of instrument error and not able to provide reliable qualitative comparisons, therefore, Reclamation calculated change in volume at LGD using quantitative modeling over a 50-year simulation period spanning 1958 through 2008.

3.2.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under the No-Action Alternative, no new facilities would be constructed within the project area, and there would be no change to existing water levels of Anderson Ranch Reservoir. There would be no additional storage space added to Anderson Ranch Reservoir and reservoir levels would not be increased. Changes associated with Alternative B and Alternative C would not occur. No changes in existing water operations would occur that would directly or indirectly result in any reduction to provide system FRM, ability to meet existing water deliveries, or ability to meet ecological constraints. However, due to no new storage capacity, there would not be an opportunity for new (junior) water users to utilize new storage in Anderson Ranch Reservoir. No direct or indirect impacts are expected for the No-Action Alternative.

Alternative B

The 6-foot raise increases the storage capacity of Anderson Ranch Reservoir by approximately 29,000 acre-feet to a total active capacity of approximately 442,074 acre-feet. The 6-foot dam raise equates to a 7% increase in the active capacity of Anderson Ranch Reservoir and a 3% increase in the system (Anderson, Arrowrock, and Lucky Peak reservoirs).

Short-Term Impacts – During Construction

Construction activities associated with the 6-foot dam raise would require Anderson Ranch Reservoir to be no higher than the proposed pool restriction elevation and would require the installation of a cofferdam.

For purposes of the impact analysis, a restriction elevation of 4174 feet (restriction) is summarized as an impact since this restriction elevation would have larger impacts than a higher (less restrictive) restriction elevation that may be determined after the Reservoir Frequency Analysis is completed during final design. The current construction schedule requires Anderson Ranch Reservoir to be drafted to the 4174-foot pool restriction elevation by the end of August and for pool elevations to remain below this level for approximately 42 months.

Anderson Ranch Reservoir is operated in conjunction with Arrowrock and Lucky Peak reservoirs to provide FRM operations. A preliminary FRM analysis found that the reduction to Anderson Ranch Reservoir's active space during the construction period would not impact existing FRM operations (Flood Risk Management Analysis, Appendix G). Based on the analysis, the following FRM requirements and mitigation measures were developed for the construction period.

1. Provide the November 1–December 31 space requirement of 300,000 acre-feet (165,000 acre-feet in lower system).

2. Provide the January 1–March 30 minimum space requirement of 300,000 acre-feet to 50,000 acre-feet depending on forecast.
3. Provide the dynamic forecast-based system space requirement (January 1–July 15) or draft system to empty.
4. Develop guidance for the percent of total system space that would be required to be held in Anderson Ranch Reservoir based on a local reservoir runoff volume forecast and maximum target discharge.
5. Identify operational triggers when construction would need to be delayed due to severe hydrologic conditions and develop action plan to identify lead times required to demobilize equipment.

Model results for the restriction found maximum reservoir system content diverging from the No-Action Alternative starting in November and remaining up to approximately 96,000 acre-feet less until the end of August. Minimum system content was similar between the restriction and No-Action Alternative for the modeled period. The maximum volume of shortfall per year under the restriction was calculated as the full-pool volume at Anderson Ranch Reservoir minus the restricted-pool volume, resulting in a maximum shortfall of approximately 97,000 acre-feet per year for each year of construction. Median streamflow at the South Fork Boise River below Anderson Ranch Dam showed that flows are slightly higher than the No-Action Alternative starting in late March when the reservoir begins FRM operations but by late July are similar. The maximum flows indicate higher peak flows (approximate increase of 1,000 cfs as compared to No-Action Alternative) during late April through July due to the reduced storage available for the restriction scenario. Median results at Arrowrock showed a delay in when Arrowrock begins to draft in mid-July. Overall, the restriction would not have a significant impact to system FRM, would have a high likelihood of impacting water deliveries, and may reduce the likelihood of staying below the elk pool at Lucky Peak Reservoir.

Lower Granite Dam Flow Objectives

Under Alternative B, there would be no additional short-term effects to Reclamation's ability to provide flow augmentation water or Lower Granite Dam Flow Objectives other than those that occur under existing conditions.

Long-Term Impacts – After Construction

Four demand scenarios were modeled to portray a range of potential release timings, rates, and durations associated with Alternative B to address the potential contracting options summarized in the description of Alternative B in chapter 2. The scenarios include: 1) no new demand, 2) new early-season demand, 3) new late-season demand, and 4) new municipal and industrial demand.

Results from the model showed Alternative B having system storage values that exceeded the No-Action Alternative for most times of the year by various amounts dependent on the demand scenario.

The median monthly content of Alternative B was found to be anywhere from approximately 9,000 acre-feet (in March) to 28,000 acre-feet (in April) higher when compared to the No-Action Alternative. Due to increased storage values over the No-Action Alternative,

Anderson Ranch Reservoir median pool elevations for Alternative B were found to range anywhere from 3 feet to 10 feet higher depending on the time of year. For Alternative B, up to an additional 9.1 days of flow at the powerplant would be expected in late summer. The largest difference in annual peak flow in the South Fork Boise River below Anderson Ranch Reservoir was found to be 710 cfs less during April when compared to the No-Action Alternative. This reduction in peak outflows occurred for high-volume water years when the additional space provided by the dam raise provided a short duration (1–7 days) reduction in peak flows. This reduction in peak flows occur in 8 years of the 50 years modeled, with a 400 cfs–700 cfs reduction in peak flows occurring for 5 years and a 400 cfs or less reduction occurring for the remaining 3 years. For the 8 years where a reduction in peak flows was identified, the peak flows of Alternative B ranged from approximately 4,400 cfs to 5,900 cfs illustrating that these occurred for large runoff volume water years.

Alternative B impacts at Anderson Ranch Reservoir would not significantly impact system FRM, meeting existing water deliveries, and meeting ecological constraints. The new storage could be used to meet new water deliveries, existing irrigation demand during years of shortage, meeting ecological constraints and may provide more recreational boating (rafting and drift boat) in late summer but this would be at the expense of less wade fisherman days.

Overall, Alternative B had Arrowrock Reservoir storage and pool elevations that were similar to the No-Action Alternative except during October through December when median pool elevation may be up to 8 feet lower. Although this is a change from the No-Action Alternative during the October-through-December period, Alternative B would have no significant to system FRM, meeting existing water deliveries, and meeting ecological requirements.

Overall, Alternative B had very similar Lucky Peak Reservoir content when compared to the No-Action Alternative. There were differences found in the 90th-percentile and late season pool elevations but this would either be a rare occurrence due to very dry water supply conditions or the flexibility of real-time operations would minimize this difference.

Alternative B showed minimal changes in streamflow at the Boise River at Glenwood location. There were changes noted in late July median flows and maximum and 10th-percentile streamflow staying higher longer into August, although these were relatively small compared to the No-Action Alternative. Although there were some changes to streamflow at the Boise River at Glenwood due to Alternative B, the changes were relatively small and would not be a significant impact to system FRM, meeting existing water deliveries, and meeting ecological constraints.

Existing reservoir space, including both uncontracted and contracted space, used to meet flow augmentation requirements would fill prior to any new reservoir space, including that created by a raise at Anderson Ranch Dam. Therefore, no change to the flow augmentation volumes of Alternative B as compared to the No-Action Alternative are anticipated.

As part of this analysis, Reclamation assessed potential changes to flow at Lower Granite Dam on the Lower Snake River for Alternative B. Generally, there is a slight difference in flows ranging from -1.3% to 0.7% at Lower Granite Dam for certain years due to more water being stored in the Boise River system. The largest percent change in modeled flow was -1.3% in 1985 where there is a shift in timing in the delivery from June to July as the system filled earlier and released flow augmentation earlier but flow augmentation is

coordinated in real time and therefore this magnitude of change would not likely occur. The largest change due to filling the new storage space would be no more than 1%, and would likely occur in April, May, or June.

Lower Granite Dam Flow Objectives

Based on Reclamation's analyses, changes in LGD volume under the Alternatives fall within the historical operating range, however, over the long-term the proposed action could result in flows past LGD being a maximum of 29,000 AF less while the additional storage volume fills (typically within the period of April through June). A volume of 29,000 AF equates to a change of 0.24% of the total volume at LGD during that period. The change of 0.24% represents a maximum storage scenario and is expected to occur 62% of the time; the volume of water able to be stored annually would depend on climatic conditions and the actual flow experience of an individual smolt would be closer to the No-Action Alternative. For the purpose of the impact analysis, a change in flow volume could impact the extent of wetted shoreline habitat and velocity of the main channel flow, however, at a scale of up to a change of 0.24% to the No-Action Alternative the difference would be discountable at a biological scale and not be detectable at the level that would jeopardize the continued existence of the species or adversely modify or destroy designated critical habitat at the level of the significance criteria.

Alternative C

Alternative C is a 3-foot Anderson Ranch Dam raise with associated dam construction and reservoir rim projects (Chapter 2). This raise increases the storage capacity of Anderson Ranch Reservoir by approximately 14,400 acre-feet for an active capacity of approximately 427,474 acre-feet. The dam raise equates to a 3% increase in the active capacity of Anderson Ranch Reservoir and a 1% increase in the Anderson Ranch, Arrowrock, and Lucky Peak reservoir system.

Short-Term Impacts – During Construction

Construction activities associated with the 3-foot dam raise would require the same pool restriction (elevation 4174 feet) of Anderson Ranch Reservoir and installing a cofferdam as stated in Alternative B. Although the restriction elevation is the same as Alternative B, the duration of the restriction is less. The current construction schedule requires Anderson Ranch Reservoir to be drafted to the 4174-foot pool restriction elevation by the end of August and for pool elevations to remain below this level for a total of approximately 35 months. For all other short-term impacts associated with the construction phase as well as FRM requirements and mitigation measures, refer to the short-term impacts described for Alternative B.

Lower Granite Dam Flow Objectives

Under Alternative B, there would be no additional short-term effects to Reclamation's ability to provide flow augmentation water or Lower Granite Dam Flow Objectives other than those that occur under existing conditions.

Long-Term Impacts – After Construction

The same four demand scenarios described in Alternative B were also utilized in Alternative C modeling.

Results from the model showed Alternative C having system storage values that exceeded the No-Action Alternative for most times of the year by various amounts dependent on the demand scenario.

The median monthly Anderson Ranch Reservoir content of Alternative C was found to be anywhere from approximately 5,000 acre-feet (in March); 14,000 acre-feet (in April); and approximately 16,000 acre-feet (in September) higher than for the No-Action Alternative. Due to increased storage values over the No-Action Alternative, Anderson Ranch Reservoir median pool elevations for Alternative C were found to range anywhere from 2 feet to 5 feet higher. For Alternative C, up to an additional 4.5 days of flow at the powerplant flow (approximately 1,600 cfs) would be expected below Anderson Ranch Dam in late summer. The largest difference in annual peak flow in the South Fork Boise River below Anderson Ranch Reservoir was found to be 380 cfs less during April than for the No-Action Alternative. This reduction in peak flows occur in 6 years of the 50 years modeled, with a 200 cfs–400 cfs reduction in peak flows occurring for 3 years and a less than 200 cfs reduction occurring for the remaining 3 years. For the 6 years where a reduction in peak flows was identified, the peak flows of Alternative B ranged from approximately 4,900 cfs to 6,000 cfs illustrating that these occurred for heavy runoff volume water years.

Alternative C impacts at Anderson Ranch Reservoir would not have a significant impact to system FRM, meeting existing water deliveries, and meeting ecological constraints. The new storage could be used to meet new water deliveries, existing irrigation demand during years of shortage, meeting ecological constraints, and may provide more recreational boating (rafting and drift boat) flows in late summer but this would be at the expense of less wade fisherman days.

Alternative C had Arrowrock Reservoir storage and pool elevations that were similar to the No-Action Alternative except during October through December when median pool elevation may be up to 3 feet lower.

Alternative C had very similar Lucky Peak Reservoir contents very dimilar to the No-Action Alternative. There were differences found in the 90th-percentile and late-season-pool elevations but this would either be a rare occurrence due to very dry water conditions or real-time flexibility would minimize this difference.

Alternative C had minimal changes in streamflow in the Boise River at Glenwood location. There were changes noted in late July median flows and maximum and 10th-percentile streamflow staying higher longer into August, although these were relatively small compared to the No-Action Alternative. Although there were some changes to streamflow in the Boise River at Glenwood due to Alternative C, the changes were relatively small and would not be a significant impact to system FRM, meeting existing water deliveries, and meeting ecological constraints.

Existing reservoir space, including both uncontracted and contracted space, used to meet flow augmentation requirements would fill before any new reservoir space, including that created by the Anderson Ranch Dam raise. Therefore, no change to the flow augmentation volumes of Alternative C as compared to the No-Action Alternative are anticipated.

Reclamation assessed potential changes to flow at Lower Granite Dam on the Lower Snake River for Alternative C. Generally, there is a slight difference in flows ranging from -0.4% to

0% at Lower Granite Dam for certain years due to more water being stored in the Boise River system. The largest percent change in flow was -0.4% in 1985 where there is a shift in timing in the delivery from June to July as the system filled earlier and released flow augmentation earlier but flow augmentation is coordinated in real time and therefore this magnitude of change would not likely occur. The largest change due to filling the new storage space would be no more than 0.4%, and would likely occur in April, May, or June.

Lower Granite Dam Flow Objectives

Based on Reclamation's analyses, changes in LGD volume under the Alternatives fall within the historical operating range, however, over the long-term the proposed action could result in flows past LGD being up to 14,400 AF less while the additional storage volume fills (April through June annually). A volume of 14,400 AF equates to a change of 0.12% of the total volume at LGD during that period. For the purpose of the impact analysis, a change in flow volume could impact the extent of wetted shoreline habitat and velocity of the main channel flow, however, at a scale of up to a change of 0.12% to the No-Action Alternative the difference would be discountable at a biological scale and not be detectable at the level that would jeopardize the continued existence of the species or adversely modify or destroy designated critical habitat at the level of the significance criteria.

3.2.2.3 Cumulative Impacts

A description of potential projects analyzed for cumulative impacts is included in Chapter 2. The Pine Bridge replacement would not have any direct or indirect effects to water operations or hydrology, therefore no cumulative effects. The 4-foot crest raise was for security enhancement and not water retention, having no direct or indirect effects to water operations or hydrology, therefore not cumulative effects.

Both the CCE and the South Fork Boise River Diversion projects propose to divert water from Anderson Ranch Reservoir. There is no formal proposal by CCE with details of the proposed drafts or potential downstream delivery to Water District No. 63 users, so it is not possible to perform a cumulative affects analysis at this time. To some extent, the same can be said about the South fork Boise River Diversion Project, multiple conditions must exist for project diversions to occur.

- Minimum of 800 cfs below Anderson Ranch Dam
- Minimum of 240 cfs below New York Canal June 16 through February 28 or 29
- Minimum of 1100 cfs below New York Canal March 1 through May 31
- The system is in flood control.

These requirements assume that water would be diverted during the spring. Depending on which project or if all proposed projects are completed, the probability of refill for Alternative B and Alternative C would change. Modeling completed using the 1959 to 2008 historical period determined a refill probability for Alternative B of 38% to 62% depending on if both or neither proposed projects are completed. Results for Alternative C indicate a refill probability of 42% to 64% depending on if both or neither proposed projects are completed. For additional information about the analysis completed refer to the Water Operations Technical Memorandum (Appendix F).

Due to the conditions listed above for both proposed projects, it is assumed that cumulative effects from other currently proposed projects would not be a significant impact to system FRM, meeting existing water deliveries, and meeting ecological constraints but they may impact refill probabilities of Alternative B and Alternative C.

3.2.2.4 Mitigation Measures

Mitigation measures were developed to address impacts determined to be significant or potentially significant and include the following (Environmental Commitments, Water Operations and Hydrology Section 3.28.4)

- Impacts to water deliveries during construction. Potential mitigation activities may include:
    - providing funds to mitigate impacts from reduced water supply and
    - seeking opportunities for water rentals from other spaceholders.
- Impacts to system FRM during construction. Mitigation activities (outlined in Appendix G) may include the following.
    - Providing the November 1– December 31 space requirement of 300,000 acre-feet (165,000 acre-feet in lower system)
    - Providing the January 1–March 30 minimum space requirement of 300,000 acre-feet to 50,000 acre-feet depending on forecast
    - Providing the dynamic forecast-based system space requirement (January 1–July 15) or draft system to empty.
    - Develop guidance for the percent of total system space that would be required to be held in Anderson Ranch Reservoir based on a local reservoir runoff volume forecast and maximum target discharge.
    - Identify operational triggers where construction would need to be delayed due to severe hydrologic conditions and develop lead times required to demobilize equipment.

3.3 Geology and Soils

This section describes existing conditions for soils and geology within the project area and anticipated environmental consequences for the alternatives. Regulatory information, general soils and geology information, and additional methods and analysis are included in the Geology and Soils Specialist Report (Appendix B2).

3.3.1 Geology and Soils – Affected Environment

The analysis area for geology and soils includes the shoreline of Anderson Ranch Reservoir; upstream and downstream of Anderson Ranch Reservoir along the South Fork Boise River; areas of proposed rim projects; and additional areas with proposed ground disturbance (detour routes, borrow areas, staging areas).

Anderson Ranch dam and reservoir is in a narrow, steep-sided valley cut through several hundred feet of igneous extrusive and intrusive rock. The Anderson Ranch and Fall Creek

basalts form rimrock above Anderson Ranch Reservoir and overlie the granitic bedrock of the Idaho Batholith, which forms the canyon walls (Howard et al., 1984). The weathering of these igneous rocks is responsible for the steep slopes around the reservoir and South Fork Boise River.

There is physical evidence of ongoing shoreline erosion at Anderson Ranch Reservoir, although its effects are moderate and do not appear to be causing significant issues. Shoreline erosion can be seen in several places along the perimeter of the reservoir, including HD 120, which is built into the steep-sided canyon walls and follows along the reservoir shore. Areas can be seen where erosion has caused sloughing of rock and soil, resulting in encroachment of the bank toward the road. The occurrence of shoreline erosion is most frequent during the early summer when reservoir water levels are at a maximum and summer storms and waves have the greatest erosive impact. Other factors that partially contribute to shoreline erosion may include large wakes from boats in confined reservoir areas during high water.

Within the last decade there have been several landslides in the South Fork Boise River watershed, leading to permanent road and campground closures. In 2013, wildfires followed by significant precipitation events led to five debris flows in the area between Anderson Ranch Dam and the Danskin Boat Launch downstream (Phillips, 2013). Landslide-prone slopes are also common around the reservoir and present near Anderson Ranch Dam and along HD 120 from the dam to Fall Creek. One previous landslide is along the road at Fall Creek; it appears to have stabilized and vegetation is developing on the slide surface (Bennett, 2018). Landslide-prone slopes also exist along HD 61 north of Lime Creek Bridge.

According to the Elmore County, Idaho, Multi-Hazard Mitigation Plan, Elmore County has not experienced any seriously damaging earthquakes in recorded history and these faults show a low to moderate seismic activity level (Elmore County, 2012).

3.3.2 Geology and Soils – Environmental Consequences

3.3.2.1 Methods for Evaluating Impacts and Significance Criteria

Soils and geology resource issues or concerns include whether the project would affect seismicity, erosion, or slope stability in the project area. Environmental consequences associated with geologic resources that could result from implementing alternatives were evaluated qualitatively based on expected construction methods and the locations and durations of project activities. Evaluation of bedrock geology and seismic hazards included a review of geologic information and geographic information system (GIS) data available from the Idaho Geological Survey (IGS). Scientific journal articles describing the local bedrock geology, local faults, and potential seismic activity were reviewed. Evaluation of soils and erosion potential included review and summary of Natural Resources Conservation Service soil surveys and slope information and Reclamation studies of sedimentation at the reservoir. The Elmore County Multi-Hazard Mitigation Plan (2012) was reviewed to ensure that the proposed action would not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

Table 8 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for soils and geology. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 8. Soils and geology impact indicators and significance criteria

Impact Indicator	Significance Criteria
Soil stability hazards	Catastrophic landslide damage to facilities around the reservoir or catastrophic endangerment to human life The project is located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse
Soil erosion issues	An increase in erosion and sedimentation around the perimeter of the Anderson Ranch Reservoir that affects operations of the dam, or causes damage to the equipment, or reduces stability of infrastructure at the perimeter of the reservoir
Anderson Ranch Reservoir induced seismicity resulting in dangerous conditions around the reservoir or damage to facilities	Rupture of a known earthquake fault, as delineated on the IGS Miocene-Quaternary fault map

3.3.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under Alternative A, Reclamation would not modify Anderson Ranch Dam to increase storage capacity, Reclamation would continue to operate Anderson Ranch Dam under current standard operating procedures, no impacts to geology and soils from the project would occur, and existing geology and soils characteristics would be maintained. Under the No-Action Alternative, the reservoir and associated dam/water operations would continue as it does today. No substantial changes to infrastructure or operations would occur. Current ongoing shoreline erosion at Anderson Ranch Reservoir would continue and landslide prone areas would not be expected to shift from existing conditions over the short or long term. Changes to Reclamation's operation and maintenance activities are not currently planned that would directly or indirectly result in any increase in seismicity, erosion, sedimentation, or decreased slope stability in the project area over existing conditions. The No-Action Alternative would not result in new direct or indirect impacts to soil or geologic resources.

Alternative B

Activities associated with Alternative B are not expected to contribute to increased seismicity. However, there may be potential impacts related to slope stability and erosion. Direct and indirect effects were evaluated where construction would be performed at the dam and as part of projects around the reservoir rim, as well as for the detour route on HD 131.

Overall, under Alternative B, construction activities would cause short-term direct minor effects by increasing erosion potential, but using BMPs described below, impacts to soils from construction activities would not be significant. Long-term, direct, minor effects would occur from shoreline erosion at the new full pool height; however, Reclamation would avoid and minimize impacts through bank stabilization measures and BMPs described below,

therefore, impacts to soils would not be significant. Slope stability would be ensured through project design and BMPs, therefore no significant impacts are expected.

Potential Impacts Related to Slope Stability

Shoreline erosion could be exacerbated by the encroachment of the new shoreline bank towards road segments along the reservoir perimeter. Shoreline erosion would be minimized upon the placement of riprap along existing roadways as part of the proposed action to prevent erosion and protect existing roadway infrastructure.

Stream and riverbank erosion, road building, or other excavation can remove the toe or lateral slope and exacerbate landslides. Road and dam construction activities near slopes between 14° and 30° (25%–60%) are at risk of landslides (Elmore County, 2012). Slopes within this range are common around the reservoir at the dam itself and along HD 120 from Anderson Ranch Dam to Fall Creek. Although there is no construction planned at the location of the 2018 landslide, it occurred within this stretch of road. Ten rim projects are planned along this stretch of road (Figure 7). These slopes also exist along HD 61 north of Lime Creek Bridge where 13 rim projects are planned, and along South Fork Boise River at Cow Creek where the HD 131 detour route realignment is planned.

BMPs to address impacts related to slope instability as described in Environmental Commitments Section 3.28 under Erosion Control, Water Quality and Shoreline Protection section would be further defined in final design and outlined as Reclamation contracting requirements. Landslides are generally associated with large precipitation events. Reclamation and its contractor would follow the specifications in the project's final design for weather and climate, soil classification, depth and slope of cut, water content of soil, and other operations in the vicinity. Reclamation would implement these measures during project construction to minimize potential hazards from geology and soils. Implementation of minimization measures and BMPs would reduce adverse effects on soil erosion due to construction activities and effects would not persist in the long term, therefore, impacts would not be significant.

Potential Impacts Related to Erosion

Increasing the pool elevation at Anderson Ranch Reservoir by 6 feet would increase shoreline erosion in some areas as the new shoreline is established around the entire reservoir. The estimated additional inundated area is approximately 146 acres. The current full pool height is maintained for an average of 14 days a year. Under Alternative B, the shoreline would be inundated above the current full pool elevation of 4196 feet for approximately 18 days under typical spring operations. The majority of the year, the water height would be within the existing shoreline. Shoreline erosion could be exacerbated by the encroachment of the new shoreline bank toward road segments along the reservoir perimeter.

This new shoreline may exacerbate the effects of shoreline erosion at locations around the perimeter of the reservoir. Encroachment of the bank toward the roads could potentially increase in this area. Fifteen roadway improvement projects are proposed along the reservoir (Figure 7). Steps taken to establish proposed feasibility-level design improvements related to shoreline and roadway embankment stability are included in the Soils and Geology Specialist Report in Appendix B2. Where the roadway profile needs to be raised or the shoreline/embankment armored or MSE wall constructed, the current roadway widths and

surface treatments would be maintained. Criteria for the design of roadway or slope improvements were based on guidelines from American Association of State Highway and Transportation Officials Green Book; Low Volume Road Design, Idaho Transportation Department Design Manual and Standard Specifications; and Mountain Home Highway District and Glenns Ferry Highway District standards.

Dam construction (including installing and removing coffering), roadway construction (including bridge and culvert work), and other infrastructure construction activities that disturb soils and vegetation may increase erosion (Figure 7). Adverse effects to soils as a result of ground disturbance would occur for a short duration and would not persist beyond the construction period. BMPs to address erosion, as described in the Environmental Commitments Section 3.28 under Erosion Control, Water Quality and Shoreline Protection measures, would be further defined in final design and implemented as Reclamation contracting requirements. The project's stormwater pollution and prevention plan would include earthmoving-related erosion minimization measures that would reduce adverse effects on soil erosion. These measures would be implemented in association with all activities within the project area, including all waste and source material sites. Implementation of minimization measures and BMPs, such as those listed in Section 3.28 under Erosion Control, Water Quality and Shoreline Protection measures, would reduce adverse effects on soil erosion due to construction activities and effects would not persist in the long term, therefore, impacts would not be significant.

Alternative C

Similar to Alternative B, Alternative C would require clearing vegetation in borrow areas along haul roads, storage or laydown areas, and for the proposed rim projects. Raising the full pool elevation would inundate areas above the current full pool. Activities associated with Alternative C are not expected to contribute to increased seismicity. However, as identified for Alternative B, there may be potential impacts related to slope stability and erosion.

Overall, under Alternative C, construction activities would cause short-term direct minor effects by increasing erosion potential. Long-term, direct, minor effects would occur from shoreline erosion at the new full pool height; however, BMPs to address erosion, as described in the Environmental Commitments Section 3.28 under Erosion Control, Water Quality and Shoreline Protection measures, would be further defined in final design and implemented as Reclamation contracting requirements. Therefore, impacts to soils would not be significant. Slope stability would be ensured through project design and BMPs, therefore no significant impacts are expected.

Potential Impacts Related to Slope Stability

Construction activities for Alternative C are similar to Alternative B and are subject to the same potential slope stability impacts including a soil or geologic unit that is unstable or could become unstable as a result of project activities. Even though Alternative C has a general reduction in fill required for many of the identified rim projects, impacts would be the same as described for Alternative B.

Potential Impacts Related to Erosion

Alternative C requires earthwork and ground-disturbing activities as identified in Alternative B. Appropriate BMPs and techniques to prevent damage caused by stormwater would be implemented according to the project's stormwater pollution and prevention plan. Using BMPs as described for Alternative B, impacts related to construction activities would be minimized and no significant impacts are expected.

Increasing the pool elevation at Anderson Ranch Reservoir by 3 feet would increase shoreline erosion in some areas as the new shoreline is established. The estimated additional inundated area is approximately 73 acres(Appendix C). This would create a new shoreline along the reservoir at the new high-water mark and impacts would be the same as described for Alternative B, although encompassing less inundation area.

Reclamation would address shoreline erosion as part of the final design and impacts due to erosion would not be significant.

3.3.2.3 Cumulative Impacts

The 2018 construction of the Pine Bridge and 2010 crest raise are well removed in time from the proposed 2025 rim projects and dam construction and retained on the same footprint. Any potential soil disturbance from construction of the new Pine Bridge or dam raise would not be additive, no cumulative effects are identified for past actions.

If the South Fork Boise River Diversion and CCE projects were to happen in conjunction with the Anderson Ranch Dam raise, it would be anticipated that the surface water elevation of the reservoir would minimally fluctuate based on pumping operations by one or both of the projects. Using the diversion rates from the water right permits (Table 2 in the Water Rights Specialist Report, Appendix B16), for each project, it can be assumed that diverting water from the reservoir would have minimal impact on the surface water elevation of the reservoir. Because the water drafted by South Fork Boise River Diversion or CCE projects would be flood control water, it would be assumed that in high water years, downstream flows would be closer to average water year flow levels. No actions proposed with either project have plans to increase water levels above the established full pool elevation at Anderson Ranch Reservoir; therefore, cumulative impacts to soils from instability and shoreline erosion would be negligible.

In summary, due to the water right stipulations limiting the diversion rates of each project, and construction activities for each proposed project not thoroughly detailed at this time, any cumulative impacts to soils and geology would be expected to be negligible.

3.3.2.4 Mitigation Measures

Reclamation would implement BMPs (Section 3.28) during project construction to manage potential hazards from geology and soils. For example, Reclamation would ensure a Competent Person, as defined by the Occupational Safety and Health Administration in 29 CFR 1926.32(f), would classify soil and rock deposits prior to construction activities. A construction safety plan would be developed considering all applicable factors including soil classification, depth and slope of cut, water content of soil, weather and climate, and other operations in the vicinity.

Appropriate BMPs and techniques to prevent damage caused by stormwater would be implemented according to the project's stormwater pollution and prevention plan. These measures may include but are not limited to site preparation impacts minimization and earthmoving-related erosion minimization. These measures would be implemented in association with all activities within the project area, including all waste and source material sites. Refer to the Environmental Commitments Section 3.28 for more details.

3.4 Water Resources

This section describes existing water resources, including water quality and groundwater resources, within the project area and anticipated environmental consequences for the alternatives. Regulatory information, general water quality information, groundwater information, and additional methods and analysis are included in the Water Resources Specialist Report (Appendix B3).

3.4.1 Water Resources – Affected Environment

The analysis area for water quality is focused on Anderson Ranch Reservoir and the lower portion of its tributaries, South Fork Boise River immediately upstream of Anderson Ranch Reservoir, and South Fork Boise River between Anderson Ranch Dam and Arrowrock Reservoir. The area of analysis for groundwater impacts is the area around the reservoir where the elevated reservoir pool could impact groundwater elevations, groundwater wells, and on-site septic systems (OSSs).

Water quality standards and designated beneficial uses for Anderson Ranch Reservoir, its tributaries, and the South Fork Boise River between Anderson Ranch Reservoir and Arrowrock Dam are identified in the Idaho Water Quality Standards (Idaho Administrative Code 58.01.02), and the status of attaining water quality standards and supporting designated beneficial uses are reported in *Idaho's 2016 Integrated Report* biannual report (IDEQ, 2018). Anderson Ranch Reservoir does not support cold water aquatic life, and salmonid spawning. It also does not fully support secondary contact recreation beneficial use due to water quality impairment from mercury (IDEQ, 2018). All stream tributaries to Anderson Ranch Reservoir are either fully supporting their designated beneficial uses or have not yet been assessed, with the exception of Lime Creek. Lime Creek does not support cold water aquatic life and salmonid spawning beneficial uses because of water quality impairment from temperature (IDEQ, 2018). A temperature total maximum daily load (TMDL) that specifies specific shade targets for individual reaches of Lime Creek has been approved (IDEQ, 2008). The reach of Lime Creek above Lime Creek Bridge that would be affected by the project is identified in the TMDL as having 30% existing shade, a shade target of 30%, and currently meeting its 30% shade target (IDEQ, 2008). An exception to this shade target goal is the slack water area directly adjacent to the confluence of Lime Creek with Anderson Ranch Reservoir. Based upon aerial photography analysis, this 800-foot length of lower Lime Creek has 0% shade present, has a shade target goal of 30% and is -30% not reaching the shade goal. The reach of the South Fork Boise River between Anderson Ranch and Arrowrock reservoirs is fully supporting cold water aquatic life, salmonid spawning, and primary contact recreation beneficial uses, but has not yet been assessed for aesthetic, agricultural water supply, domestic water supply, industrial water supply, or wildlife habitat beneficial uses (IDEQ, 2019a).

There is no municipal or centralized wastewater service in the project area. Wastewater from homes and businesses is treated using OSSs located on individual property parcels. These individual systems rely on the settling and treatment of wastes in the septic tank to complete primary treatment of waste and the drain field/soil area to complete the secondary treatment of wastes. Because septic systems treat human waste, inundation of these systems at the full pool height could cause waste concerns, including the spread of bacteria and viruses in groundwater. Inundation of these OSSs would make them inoperable and they would be considered out of compliance.

Four public wells in the project area are identified on the IDEQ Source Water Assessment and Protection website: Pine Resort Well No. 1, Deer Creek Lodge Well No. 1, USFS Curlew Creek Campground Well No. 1, and Fall Creek Resort Well No. 1.

Based upon the limited data available from existing sources for water quality in the Anderson Ranch Reservoir area, no groundwater quality problems are known to exist in the Anderson Ranch Reservoir area. Groundwater quality in the area is considered suitable for domestic consumption.

3.4.2 Water Resources – Environmental Consequences

3.4.2.1 Methods for Evaluating Impacts and Significance Criteria

The methods for evaluating impacts to water resources includes a combination of water data and quantitative computer modeling. Impacts to water resources may be short term (1 to 5 years) or long term (more than 5 years), and may be direct (increased pollutant loading), or indirect (changes to streamflow resulting in increased channel erosion). Ammonia, bacteria, and pH water quality parameters are not expected to be affected by the project and are eliminated from further consideration. Temperature criteria for bull trout are not applicable because the project area elevation is lower than the threshold elevation of 4593 feet for applicability to the species.

The impacts to groundwater because of the planned increase in the reservoirs maximum pool were evaluated. These impact indicators were effects to the existing groundwater quality, OSSs, groundwater wells, and possible construction spills or releases. The analysis area includes the drinking water wells and OSSs located near the reservoir where changing reservoir and groundwater levels could be affected.

The newly inundated areas must meet the state of Idaho separation distance of 50 feet for a septic tank from any permanent surface water (Idaho Administrative Code 58.01.03) as mandated to protect surface water quality. The vertical separation distance is a product of seasonal variation in ground water table level and soil type and therefore, the OSS on parcels inundated by the higher reservoir level would need Idaho Department of Health verification of requirements for vertical separation of the OSS and the water table on an individual basis. Seasonal high-water vertical separation distance is established at 2 feet for a septic and 1 foot for a drain field. Impacts to water quality would be significant if the proposed alternatives violate Idaho water quality standards promulgated to protect designated beneficial uses, or otherwise substantially degrade water quality, or result in water quality changes that would adversely affect designated beneficial uses (Table 9). Impacts to groundwater would be significant if the proposed alternatives contributed to exceedance of primary or secondary U.S. Environmental Protection Agency (EPA) drinking water standards, violated Idaho DEQ

drinking water rules or contributed to groundwater contamination. Table 9 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for Water Resources. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 9. Water resources impact indicators and significance criteria

Impact Indicator	Significance Criteria
Surface Water Temperature	22ºC (71.6ºF) or less with a maximum daily average no greater than 19ºC (66.2ºF) for cold water aquatic life.
	13ºC (55.4ºF) or less with a maximum daily average no greater than 9ºC (48.2ºF) for salmonid spawning.
Surface water Turbidity	Shall not exceed background by more than 50 nephelometric turbidity units (NTUs) instantaneously or exceed 25 NTUs for more than 10 consecutive days.
Surface Water Dissolved Oxygen	Shall have Dissolved Oxygen concentrations that exceed six (6) mg/L at all times.
Changes in water quality of groundwater from inundation of native subsurface material	Increases in levels of primary or secondary standards above EPA drinking water standards
Changes in water levels in groundwater wells near reservoir	Inundation of an existing well from the increase in maximum reservoir pool
Effects to OSS from increased groundwater levels	OSS does not meet minimum setback requirements established by IDEQ

3.4.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under Alternative A, Reclamation would not modify Anderson Ranch Dam to increase storage capacity and storage levels would remain at the current capacity. Reclamation would continue to operate Anderson Ranch Dam under current standard operating procedures. There would be no impacts to water resources from the project and existing water resource characteristics would be maintained. Under the No-Action Alternative, the reservoir and associated dam/water operations would continue as it does today. No substantial changes to infrastructure or operations would occur. Current shoreline and slope erosion rates would continue and would not be expected to shift existing conditions over the long term. Any changes to the dam, reservoir, or infrastructure would occur because of management and facility maintenance and operation. All of these management activities could include the use of equipment or tools that could produce a leak, spill, or release of a hazardous or toxic material. Reclamation BMPs planned before the onset of the work would be sufficient to address any minor leaks, spills, or releases. Therefore, any activity planned under the No-Action Alternative is not anticipated to have any impacts to groundwater resources. The No-Action Alternative would not have an anticipated impact to reservoir water quality levels over the long term.

Alternative B

Water Quality

Dam construction (including installing and removing coffering), roadway construction (including bridge and culvert work), and other infrastructure construction below the ordinary high-water mark (OHWM) would release small pulses of sediment into the active reservoir pool. The transport capacity of a flowing stream is defined by discharge rate, channel slope, and channel dimensions while sediment supply is defined by the sediment load and grain size. All characteristic being equal, the stream sediment load and stream bed characteristics are in balance (Fritz, et al., 2018). Any change, such as a pulse release of sediment by the removal of a coffer dam in the river, will change the dynamics of the balance. Stream routing processes transfer sediment in lower gradient streams (channel slopes <10%) by dispersion or wave-like action with annual travel distances of approximately 20 channel stream widths per year (American Fisheries Society, 2005). Fine sediment is transported as suspended loads throughout the water column to lower gradient stream segments and is eventually deposited and stored in low velocity pools or stream bed structures. Suspended sediment load persistence in a stream reach is a function of the sediment transport capacity of the reach, with higher velocity streams flows capable of transporting larger volumes of sediment loads.

Release of sediment during dam construction is anticipated to be primarily contained in isolated areas near the construction activities and be limited in volume due to the installation of project Best Management Practices (BMPs). Discrete sediment pulses released in surface waters are dispersed by a combination of both translation and dispersion forces within the stream (Morgan and Nelson, 2019). According to Morgan and Nelson, sediment spreading rates decrease through time as a power function and smaller total sediment mass pulses have a spreading rate that decays at a faster rate than larger sediment loads. This decreasing spreading rate of sediment from a source reduces adverse effects on water quality over time and distance from the source. Furthermore, sediment or turbidity released during construction activities in Anderson Ranch Reservoir waters would not be expected to exceed background levels beyond 600 feet of the isolated construction areas. Adverse effect as a result of sediment and turbidity would not be anticipated to occur at a level that would measurably shift existing water quality conditions at levels that exceed Idaho water quality standards for turbidity.

No adverse short- or long-term direct or indirect impacts to water temperature would occur as a result of the 3% increase in inundation acres and associated negligible potential tree mortality that could decrease stream shade under Alternative B. No adverse short- or long-term direct or indirect impacts to dissolved oxygen would occur under Alternative B because no significant changes to stream flow or water temperature would occur, and Idaho water quality standards would continue to be met.

Inundation

Under Alternative B, the proposed full pool elevation of Anderson Ranch Reservoir would increase 6 feet and result in an additional 146 acres of inundated land. A 3% increase in inundation acres (Alternative B) is a negligible increase in land area, and new shoreline created by the increased full pool elevation is expected to remain stable and maintain the historical existing angles of natural repose. Shoreline erosion could be exacerbated by the encroachment of the new shoreline bank towards road segments along the reservoir

perimeter. Shoreline erosion would be minimized by placement of rip rap along existing roadways as part of the proposed action to prevent erosion and protect existing roadway infrastructure. This 3% increase in inundation acres is negligible, and would have negligible impacts to erosion and sediment delivery to Anderson Ranch Reservoir and its tributaries, South Fork Boise River immediately above Anderson Ranch Reservoir, and South Fork Boise River between Anderson Ranch Dam and Arrowrock Reservoir; therefore, direct and indirect impacts to water quality from increased sediment delivery would be negligible and short term under Alternative B.

A 3% increase in inundation acres that could result in tree mortality would have a negligible effect on stream shading, and therefore would have a negligible short- and long-term impact to water temperature in Anderson Ranch Reservoir or its tributaries, South Fork Boise River immediately above Anderson Ranch Reservoir, and South Fork Boise River between Anderson Ranch Dam and Arrowrock Reservoir.

A small slack water section (approximately 800 feet) of Lime Creek that is directly adjacent to the confluence of Lime Creek with Anderson Ranch Reservoir has 0% shade, has a shade target goal of 30% and is -30% from reaching the shade goal, identified in the Lime Creek TMDL (IDEQ, 2008). The upstream adjoining segment of Lime Creek that would also be affected by the project is identified in the TMDL document as having 30% existing shade, a shade target of 30%, and currently meeting its 30% shade target. Potential tree inundation could occur during periods of full pool elevation. Some trees that are inundated during this period may have streamside tree mortality in this segment of Lime Creek. Tree mortality would be minimal but loss of shade trees in this segment may not meet the TMDL goal of 30% shade cover. The loss of trees or shade in this section of Lime Creek would not have a significant effect on surface water temperatures as the segment of Lime Creek that would be inundated is short in total stream length with negligible short- and long-term indirect impacts to water temperature. Alternative B could have a negative impact on compliance with the existing TMDL. If tree mortality occurs and shade target drops below TMDL specified levels, mitigation measures such as planting water tolerant species would provide the measures for Lime Creek to continue to meet the TMDL target for shade and all other Idaho water quality standards.

When the reservoir water volume drops below the conservation pool level, temperature increases, causing dissolved oxygen levels to decrease below levels suitable for some aquatic species. The elevated pool that may occur under Alternative B has the potential to reduce the frequency of low dissolved oxygen events as the additional water volume in the reservoir would reduce the potential for a temperature increase. No significant adverse impacts to temperature or dissolved oxygen are expected to occur under Alternative B.

Downstream

As described in the Hydrology and Water Operations Specialist Report (Appendix B1), baseline conditions indicate high streamflow variation, with little difference in average flow, and some difference in the timing of peak flows when the impact scenarios are compared to the baseline. Minimum stream flows of 300 cfs from September 16 through March 31 and 600 cfs after April 1 would continue to be met. The Hydrology and Water Operations Specialist Report also describes the potential for decreased temperatures during the times of year when water temperatures are the highest, and shows temperatures remaining above 2ºC

and below 15ºC over the simulation period. As a result of no significant changes to water temperature or flow from baseline conditions, no adverse impacts to water temperature or dissolved oxygen would occur, channel stability would be maintained, and Idaho water quality standards would continue to be met in the South Fork Boise River between Anderson Ranch Dam and Arrowrock Reservoir under Alternative B.

Construction

Dam construction (including installing and removing coffering), roadway construction (including bridge and culvert work), and other infrastructure construction below the OHWM would release small pulses of sediment into the active reservoir pool. The transport capacity of a flowing stream is defined by discharge rate, channel slope, and channel dimensions while sediment supply is defined by the sediment load and grain size. All characteristic being equal, the stream sediment load and stream bed characteristics are in balance (Fritz, et al., 2018). Any change, such as a pulse release of sediment by the removal of a coffer dam in the river, will change the dynamics of the balance. Stream routing processes transfer sediment in lower gradient streams (channel slopes <10%) by dispersion or wave-like action with annual travel distances of approximately 20 channel stream widths per year (American Fisheries Society 2005). Fine sediment is transported as suspended loads throughout the water column to lower gradient stream segments and is eventually deposited and stored in low velocity pools or stream bed structures. Suspended sediment load persistence in a stream reach is a function of the sediment transport capacity of the reach, with higher velocity streams flows capable of transporting larger volumes of sediment loads.

Release of sediment during dam construction is anticipated to be primarily contained in isolated areas near the construction activities and be limited in volume due to the installation of project Best Management Practices (BMPs). Discrete sediment pulses released in surface waters are dispersed by a combination of both translation and dispersion forces within the stream (Morgan and Nelson, 2019). According to Morgan and Nelson, sediment spreading rates decrease through time as a power function and smaller total sediment mass pulses have a spreading rate that decays at a faster rate than larger sediment loads. This decreasing spreading rate of sediment from a source reduces turbidity in space and time from the source of the sediment. Sediment or turbidity released during construction activities in Anderson Ranch Reservoir waters would not be expected to exceed background levels beyond 600 feet of the isolated construction areas. Adverse effects as a result of sediment and turbidity would occur for a short duration and distance from source and not be anticipated to occur at a level that would exceed Idaho water quality standards for turbidity. Conservation measures would be defined in final design and outlined in Federal permitting requirements. Conservation measures would be defined in final design and outlined in Federal permitting requirements. The project SWPPP would highlight BMPs that would be designed and implemented during and after the proposed construction schedule to protect against sediment releases into surface water resources. The installed BMPs would reduce potential sediment loads to surface waters, through either discrete pulses or continuous sediment releases. The BMPs will be developed to protect water quality which is consistent with the Federal Clean Water Act (CWA) and State water quality programs. Current Reclamation policy directs compliance with required CWA requirements and State regulations and requires the use of BMPs to control nonpoint source pollution to meet applicable water quality standards and other CWA requirements. BMP implementation becomes the primary mechanism for meeting water

quality standards from nonpoint source pollution sources and direct and indirect impacts to water quality from construction activities under Alternative B would not be significant.

Groundwater

Septic Systems and Drain Fields

Fall Creek Resort and Marina operates an OSS under a USFS permit. It would become inundated due to Alternative B. Additional information regarding the facilities and land management status of Fall Creek are included in the Recreation Specialist Report (Appendix B15). Impacts of Alternative B to this non-Federal real property would be mitigated during the project implementation, and subject to future environmental assessment, should the project be determined feasible and the special use permit still be in effect.

Outside of Fall Creek Resort and Marina, Reclamation does not anticipate that higher reservoir levels would have a negative effect on OSS functionality; therefore, the existing OSSs should have no additional effect on groundwater quality. Prior to raising the pool level, Reclamation would identify any OSS that the higher pool level could affect and determine the condition of those systems. If the increased reservoir pool would cause OSS to become noncompliant with horizontal or vertical location requirements, Reclamation would coordinate with the property owner and the Idaho Department of Health to reconstruct, relocate, or modify it.

Groundwater Wells

No private groundwater wells were identified within an area of concern and all existing wells would continue to meet setback requirements. Of the four public wells located in the project area, the USFS Curlew Creek Campground Well No. 1 and the well near the Fall Creek Resort and Marina are the only wells identified to be impacted. At Curlew Creek Campground, the groundwater well would be impacted because the road/parking area would need to be relocated in the area of the well and therefore this well would need to be relocated outside of the road/parking area. The Fall Creek Resort and Marina groundwater well would not meet surface water setback requirements. As stated above, impacts of Alternative B to the non-Federal real property would be mitigated during the project implementation if the special use permit is still in effect.

Alternative C

Water Quality

Inundation

Under Alternative C, the proposed full pool elevation of Anderson Ranch Reservoir would increase 3 feet with a full pool elevation of 4199 feet and result in an additional 73 acres of inundated land (a 1.5% increase over the existing 4,772 acres of full pool elevation inundated land; Appendix C).

A 1.5% increase in inundation acres is a negligible increase in land area. Similar to Alternative B, new shoreline created by the increased full pool elevation is expected to remain stable and maintain the historical existing angles of natural repose. The increase in inundation acres could result in some streamside tree mortality; however, the percentage of streamside tree mortality associated with a 1.5% increase in inundation acres would be

minimal with a negligible effect on stream shading, and therefore would have a negligible short- and long-term impact on water temperature.

As described for Alternative B, the section the segment of Lime Creek above Lime Creek Bridge that would be affected by the project would see negligible short- and long-term indirect impacts on water temperature due to no anticipated streamside tree mortality. Alternative C would be in compliance with the TMDL and Lime Creek would continue to meet all other Idaho water quality standards.

Similar to Alternative B, the increase in reservoir volume may have a beneficial impact to temperature and dissolved oxygen levels and may reduce the anticipated 2% frequency of levels in the reservoir that become unsuitable to bull trout. Temperature and dissolved oxygen are anticipated to meet Idaho water quality standards and no significant adverse impacts to temperature or dissolved oxygen are expected to occur under Alternative C.

Downstream

Current operational objectives of the reservoir system would remain consistent with all current downstream flow requirements continuing to be met as described for Alternative B. As a result of no significant changes to water temperature or flow from baseline conditions, no adverse impacts to water temperature or dissolved oxygen would occur, channel stability would be maintained, and Idaho water quality standards would continue to be met in the South Fork Boise River between Anderson Ranch Dam and Arrowrock Reservoir under Alternative C.

Construction

Impacts due to construction activities for Alternative C are similar to Alternative B. Cofferdam construction is the same as identified for Alternative B but the duration of the restriction period requiring the cofferdam is 35 months, 7 months less than Alternative B. Isolation of in-water work areas in Anderson Ranch Reservoir, in conjunction with standard conservation measures included in Reclamation construction contracts, would limit the release of sediment into the active reservoir pool. Similar to Alternative B, release of sediment during dam construction is anticipated to be primarily contained in isolated areas near the construction activities and be limited in volume due to the installation of project Best Management Practices (BMPs). Discrete sediment pulses are dispersed by a combination of both translation and dispersion forces within the stream and sediment spreading rates decrease through time as a power function. This decreasing spreading rate of sediment from a source reduces adverse effects of turbidity. Adverse effect as a result of sediment and turbidity would not be anticipated to occur at a level that would exceed Idaho water quality standards for turbidity.

Conservation measures would be defined in final design and outlined in Federal permitting requirements. The project SWPPP would highlight BMPs that would be designed and implemented during and after the proposed construction schedule to protect against sediment releases into surface water resources. The BMPs would reduce potential sediment loads to surface waters and will be developed to protect water quality through practices that are consistent with the Federal Clean Water Act (CWA) and State water quality programs. Current Reclamation policy directs compliance with required CWA requirements and State regulations and requires the use of BMPs to control nonpoint source pollution to meet

applicable water quality standards and other CWA requirements. BMP implementation becomes the primary mechanism for meeting water quality standards from nonpoint source pollution sources and direct and indirect impacts to water quality from construction activities under Alternative B would not be significant.

Groundwater

As described for Alternative B, the change in groundwater levels would coincide with the existing and proposed reservoir water elevations. The increase in the reservoir pool elevation level may have some benefits due to local recharge of the aquifer system in the area of the reservoir but that benefit may be limited in areal extent and temporal factor associated with full pool conditions.

Septic Systems and Drain Fields

Potential impacts to septic systems and drain fields are identical to those described for Alternative B and are not repeated here. Prior to raising the pool level, Reclamation would identify any OSS that the higher pool level could affect and determine the condition of those systems. If the increased reservoir pool would cause OSSs to become noncompliant with horizontal or vertical location requirements, Reclamation would coordinate with the property owner and the Idaho Department of Health to reconstruct, relocate, or modify an existing OSS impacted by the increased level of groundwater.

Groundwater Wells

Potential impacts to groundwater wells are identical to those described for Alternative B and are not repeated here. The Curlew Creek public drinking water well would require relocation and the Fall Creek Resort and Marina well would require mitigation at a later phase of the project as stated for Alternative B. Alternative C would not have a negative effect on local aquifers or wells because higher water levels would not decrease aquifer yield or impair well performance.

The effects of construction proposed to occur on the dam as well as all associated activities related to that construction, such as road construction and/or modification, on the hydraulic properties of an aquifer, groundwater flow and discharge are likely to be localized, negligible and temporary and therefore are considered insignificant.

3.4.2.3 Cumulative Impacts

The 2018 construction of the Pine Bridge and 2010 crest raise are well removed in time from the proposed 2025 rim projects and dam construction and retained on the same footprint. Any potential sediment releases from construction of the new Pine Bridge or dam raise would not be additive. No other potential direct or indirect impacts effecting water resources are recognized and no cumulative effects are identified for past actions.

If construction for the action alternatives, CCE and South Fork Boise River Diversion projects were to occur simultaneously, direct and indirect effects to water quality within the analysis area from these projects would also not be significant because Idaho water quality standards would be met for each project through a combination of adherence to federal regulations and project design features. Using the diversion rates from the water right permits (Table 2 in the Water Rights Specialist Report, Appendix B16), for each project, it can be assumed that diverting water from the reservoir would have minimal impact on the surface

water elevation of the reservoir. Fluctuations in surface water elevation would be in saturated areas and not are likely to be large enough in scale or frequency to cause additional significant erosion. Drafting flood flows for the projects would have a potential negative impact to the banks along South Fork Boise River below the dam by reducing episodical flood occurrence to floodplains. The flood flows aid in the reestablishment of vegetation, sediment and delivery of large woody debris for habitat. There would be some groundwater recharge as a result of these projects with multiple geologic properties influencing the rate of recharge and direction of groundwater flow would not be considered significant when combined with these projects due to the spatial distance. In summary, due to the requirement of adherence to Idaho water quality standards for each project during construction, timing and frequency of diversions not likely to cause increased turbidity above baseline, and reduced flood flows in the South Fork Boise River, no short- or long-term cumulative impacts are anticipated.

3.4.2.4 Mitigation Measures

Possible short-term impacts to water quality could occur during construction activities. The impacts associated with small releases of sediment would be limited temporally and spatially by construction design features and BMPs (see Environmental Commitments Section 3.28 for more details). Methods to minimize sedimentation through dewatering and construction activities would be included in all contracts with appropriate provisions to reduce impacts to water resources. All construction activities would be confined to previously disturbed areas, to the extent practicable, for such activities as work, staging, and storage; borrow areas; waste areas; and vehicle and equipment parking areas to preclude sediment delivery to the reservoir and stream channels and minimize impacts to water quality. Shoreline protection measures would be constructed when the reservoir is drawn down to avoid in-water work. Work would be completed before raising the level of the reservoir.

During final design, Reclamation would investigate the exact locations of existing septic systems and water wells which may be located in or near the area of inundation. Once the locations of this infrastructure are identified, Reclamation would identify any infrastructure, such as an OSS or a well, that would be inundated or would not meet the necessary setback requirements established by existing regulations by the dam raise. Upon identification of this infrastructure, Reclamation would make the determination to remove or replace this infrastructure as necessary. Implementation of this mitigation measure would reduce this impact to groundwater to a less-than-significant level.

The Fall Creek Resort and Marina groundwater well would not meet surface water setback requirements. Impacts of this proposed action to the non-Federal real property would be mitigated during project implementation if the special use permit is still in effect.

3.5 Floodplains

This section describes the existing floodplains within the project area and anticipated environmental consequences for the alternatives. Regulatory information and additional methods and analysis are included in the Floodplains Specialist Report (Appendix B4).

3.5.1 Floodplains – Affected Environment

The analysis area refers to the general vicinity in and around Anderson Ranch Reservoir extending downstream to the extent of Arrowrock Dam, via the South Fork Boise River. The existing shoreline of the reservoir and South Fork Boise River below the dam experience controlled annual inundation in accordance with FRM operations (Appendix G).

Federal Emergency Management Agency (FEMA) Digital Flood Insurance Rate Maps (FIRM) for Elmore County, Idaho were used to determine the extents of the 100-year special flood hazard area within the project area (FIRM panels 1602120325B and 1602120425B; June 19, 1989). The 100-year regulatory floodplain in the project area is predominately Zone A (base flood elevations not determined); for a reservoir the floodplain is the water's surface. There is also a Zone AE floodplain (base flood elevations determined with no floodway) beginning at the upstream face of the existing Pine bridge.

3.5.2 Floodplains – Environmental Consequences

3.5.2.1 Methods for Evaluating Impacts and Significance Criteria

The methods used to assess the potential impacts of the alternatives on the regulatory floodplain in the immediate vicinity of Anderson Ranch Reservoir and Arrowrock Reservoir were based on data from FEMA Flood Insurance Study (FIS) for Elmore County, Idaho - Unincorporated Areas, revised on March 15, 1994 (FEMA Flood Map Service Center Online), FEMA Flood Map Service Center Online (FIRM for Elmore County), Water Operations and Hydrology Specialist Report (Appendix B1), and the Water Operations Technical Memorandum (Appendix F).

Impacts to floodplains may be short term (1–5 years) or long term (more than 5 years) and may be direct (change in regulatory floodplain, such as elevation of the reservoir) or indirect (a change in hydrology that effects the floodplain). Table 10 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for floodplains. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed. Impacts to floodplains would be significant if the proposed action resulted in either a decrease in natural and beneficial floodplain function or an increase in flood hazard and risk exposure to a community within the analysis area (Table 10).

Table 10. Floodplains impact indicators and significance criteria

Impact Indicator	Significance Criteria
Alteration of floodplain function, including natural and outstanding floodplain values for ecosystem quality	Substantial adverse effect on floodplain function
Risk of additional flooding	Adverse impacts to human health, safety, and welfare from flooding
Building in a 100-year floodplain unless no other practical alternative exists	Substantial adverse effect on floodplain function

3.5.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under Alternative A, the baseline conditions for floodplains would remain as they currently exist because there would be no increase in the Anderson Ranch Dam height or construction of the associated reservoir rim projects, access roads, or facilities. Operations and maintenance of Anderson Ranch Dam would not change.

Floodplains around the reservoir rim and along the South Fork Boise River would continue to be seasonally inundated as a result of ongoing operational fluctuations in water storage and releases. There would be no project related alteration of existing floodplains. No project related activities would decrease the functionality or change the classification of existing floodplains and there would be no increase in risk to human health, safety, and welfare due to flooding; therefore, Alternative A would not result in direct or indirect impacts to floodplains.

The FIS for Elmore County, Idaho - Unincorporated Areas depicts the 100-year water surface elevation upstream of the bridge at 4209.5 feet, which is approximately 4.5 feet higher than more detailed hydraulic modeling performed more recently indicates (T-O Engineers, 2013) and as illustrated in Appendix C of the EIS. In summary, the hydraulic information informing the regulatory base flood elevation information near the town of Pine (upstream of the Pine Bridge) is overly conservative, and overpredicts the existing 100-year flood elevations. Additional detail is included in the Floodplains Specialist Report in Appendix B4.

Alternative B

Alternative B would increase the storage capacity of Anderson Ranch Reservoir to 442,074 acre-feet, resulting in potential impacts to the regulatory floodplain.

Under Alternative B, the increase of 146 inundated acres would result in a long-term direct impact to the regulatory floodplain due to the increase in the surface water elevation of the reservoir, thus increasing the floodplain area. However, the frequency and duration of reservoir inundation would remain largely unchanged and the natural and beneficial values served by the regulatory floodplain would continue to function. The risk of flood on human safety, health, and welfare would be preserved (in compliance with Executive Order [EO] 11988).

As described in the Water Operations and Hydrology Section, FRM practices would remain consistent with historical operations, resulting in little differences in downstream flows. Therefore, the frequency and duration of inundation would remain largely unchanged. Modeled, impacts were found to be negligible downstream at the Glenwood gauge. Therefore, no direct or indirect impacts to the existing regulatory floodplains from changes to flow under Alternative B would occur downstream of Anderson Ranch Dam.

Construction activities associated with Alternative B would require installation of a cofferdam and the surface water elevation of Anderson Ranch Reservoir would be no higher than the proposed pool restriction elevation of 4174 feet. The reservoir restriction would be in place for approximately 42 months. A preliminary FRM analysis found that the reduction to the Anderson Ranch Reservoir active space during the construction period would not impact existing FRM operations. Based on that analysis, multiple FRM operation

requirements and mitigation measures were developed for the construction period (refer to the Water Operations and Hydrology Section for a list of mitigation measures for FRM).

Installation of a cofferdam would result in short-term direct impacts to the regulatory floodplain due to placement of a temporary (42 months) structure within the floodplain. The cofferdam would temporary displace the floodplain, but since the cofferdam would result in sustained lower reservoir levels, floodplains in the analysis area are expected to continue to serve their function by contributing to ecosystem quality, including but not limited to soils, vegetation, wildlife habitat, dissipation of flood energy, sedimentation processes, and groundwater recharge. Overall, impacts to the floodplains in the project area from installation of a cofferdam would be considered negligible and insignificant.

Alternative C

Although reduced in magnitude, impacts on regulatory floodplains from inundation, downstream flows, and construction are similar to Alternative B. Alternative C would increase the storage capacity of Anderson Ranch Reservoir, resulting in potential impacts to the regulatory floodplain. Alternative C would increase the storage capacity by approximately 14,400 acre-feet for an active capacity of approximately 427,474 acre-feet.

A proposed full pool elevation of Anderson Ranch Reservoir would result in an increase of 73 inundated acres. The frequency and duration of inundation would remain largely unchanged. This would result in a long-term direct impact to the regulatory floodplain due to the increase in the surface water elevation of the reservoir, thus increasing the floodplain area, but the floodplain function would be preserved in compliance with EO 11988.

Similar to Alternative B, construction activities associated with Alternative C would require installation of a cofferdam and the surface water elevation of Anderson Ranch Reservoir would be no higher than the proposed pool restriction elevation of 4174 feet. Installation of a cofferdam would result in short-term direct impacts to the regulatory floodplain due to placement of a temporary (35 months) structure within the floodplain. The cofferdam would temporary displace the floodplain, but since the cofferdam would result in sustained lower reservoir levels, floodplains in the analysis area are expected to continue to serve their function by contributing to ecosystem quality, including but not limited to soils, vegetation, wildlife habitat, dissipation of flood energy, sedimentation processes, and groundwater recharge. Overall, impacts to the floodplains in the project area from installation of a cofferdam would be considered negligible and insignificant. As with Alternative B, it can be reasonably assumed that the regulatory floodplain outside of the normal operating extents of the reservoir would be unaffected.

3.5.2.3 Cumulative Impacts

The Pine Bridge Replacement Project and Anderson Ranch Dam Security Berm Project are past projects that would not contribute to cumulative effects on floodplains since these projects retained the same footprint. The bridge was replaced at the same location and the berm crest was added to the dam for security purposes and does not provide any water retention.

Construction of both the CCE Project and South Fork Boise River Diversion Project would be required to comply with Federal floodplain regulations. Long-term operations of both projects would include minor reservoir fluctuations during the seasonally allowed pumping

of water from Anderson Ranch Reservoir. Water right stipulations for each project stipulate that any water diverted from the reservoir would be flood water required to be spilled from Anderson Ranch Dam and only after multiple other downstream minimum flow requirements are met. Floodplains at the reservoir would continue to function and no increased flood hazard would be realized. Downstream, flows are projected to be reduced in April by up to 710 cfs under Alternative B and 380 cfs under Alternative C. These reductions are short in duration, up to 7 and 5 days respectively, but with potential for the CCE and South Fork Boise River Diversion projects to divert flood flows at the same time, spring flows would likely be reduced to flows typically realized later in the season. This could result in less springtime floodplain inundation; however, floodplains would continue to function and there would be a reduced flood hazard along the South Fork Boise River. No adverse cumulative impacts to floodplains would be added to cumulative impacts from the CCE and South Fork Boise River Diversion projects.

3.5.2.4 Mitigation Measures

No significant impacts to regulatory floodplains would occur under the action alternatives and no mitigation is proposed. The increase to the existing Special Flood Hazard Area that would result from the proposed action is on Federal land, in the Reclamation Zone authorized for inundation; therefore, it would not create a significant burden to participants in the National Flood Insurance Program.

3.6 Wetlands

This section describes existing conditions for wetlands and riparian areas within the project area and environmental consequences on those resources as a result of the proposed alternatives. Regulatory information, detailed wetland and riparian information, and additional methods and analysis are included in the Wetlands Specialist Report (Appendix B5).

3.6.1 Wetlands – Affected Environment

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wetlands are characterized by the presence of three parameters.

1. Hydrophytic Vegetation. Classified by the estimated probability of occurrence in wetland versus non-wetland areas throughout its distribution.
2. Hydric Soils. Soils that are saturated, flooded, or ponded for sufficient periods during the growing season and that develop anaerobic conditions in their upper layers.
3. Hydrological Characteristics. Determined by the frequency of flooding, duration of inundation, and soil saturation.

The project area includes the shoreline of Anderson Ranch Reservoir; upstream and downstream of Anderson Ranch Reservoir; areas of rim projects (areas impacted by the proposed increase in reservoir pool elevation, i.e., roadways, Pine Airstrip, bridges, and recreation areas); and associated areas for proposed ground disturbance (access roads, borrow areas, staging areas). To characterize wetland and riparian areas around the rim of Anderson

Ranch Reservoir, the area was divided into two topographically unique areas: varial zone and the perimeter of the Anderson Ranch Reservoir.

The varial zone is located in the northern portion of the project area where the South Fork Boise River discharges into Anderson Ranch Reservoir. The varial zone is subject to periods of watering and dewatering corresponding to the summer/fall drafting and winter/spring refill of Anderson Ranch Reservoir. This area is characterized by broad, flat valley topography with a braided channel system where silt, sand, and gravel deposit (Appendix H).

In contrast to the varial zone, the perimeter of Anderson Ranch Reservoir is typically characterized by a narrow, steep-sided valley cut through several hundred feet of igneous extrusive and intrusive rock. Due to the steep slopes, wetland formation around the rim is limited. NWI identified potential lacustrine wetlands around the perimeter of Anderson Ranch Reservoir, potential riverine wetlands in areas where streams and rivers discharge into the reservoir, including the South Fork Boise River downstream of Anderson Ranch Dam, and potential palustrine wetlands in areas of more gradual slopes and in depressional areas subject to ponding.

Riparian corridors are areas between a stream or other waterbody and adjacent upland areas with a unique vegetative community influenced by the presence of water. Wetland and riparian area functions include groundwater recharge/discharge, flood/flow alteration, sediment stabilization, sediment and toxicant retention, nutrient removal and transformation, aquatic and terrestrial diversity and abundance, and uniqueness.

Riparian areas found around the rim of Anderson Ranch Reservoir include 15 perennial streams and 32 intermittent streams as identified by the National Hydrography Dataset (NHD; Figure 2 through Figure 4, Wetlands Specialist Report, Appendix B5).

3.6.2 Wetlands – Environmental Consequences

3.6.2.1 Methods for Evaluating Impacts and Significance Criteria

Data were analyzed from several reasonably ascertainable resources to help identify the extent and characteristics of potential wetlands and riparian areas within the project area including the NWI, U.S. Geological Survey (USGS) NHD, the Idaho IDEQ Beneficial Use Reconnaissance Program (BURP), USFS Riparian Conservation Areas, USFS wetlands on the Boise National Forest geospatial database that estimates wetland extents across the Boise National Forest, USGS 7.5-minute series topographic maps, and Google Earth. Estimates of impacts on wetlands are not based on formal wetland delineations as these have not been completed for the project area; therefore, the actual extent of the impacts on wetlands may differ from the analysis in this section.

Impacts were assessed based on potential wetlands and riparian areas that would be gained, lost, and/or altered by construction or inundation as a result of Alternative B and Alternative C. Generally, wetland areas that fell within the boundaries of the project area were characterized and quantified using NWI potential wetland type and acreage. In the varial zone, an analysis of wetland characteristics as provided by the Varial Zone Habitat Survey for Wetlands Determination was used to analyze wetland impacts (Appendix H).

The NWI was developed based on an analysis of vegetation, visible hydrology, and geography as identified in high-altitude aerial imagery. The resulting wetland areas or types

of wetlands described have not been field-verified by USFWS. Therefore, NWI wetland boundaries and types are limited to the characteristics that were evident on the date the aerial image was captured and to the resolution of the image. The NWI and NHD are meant to be used as guidance tools to aid in resource management, they are not meant to delineate the actual extents of wetlands and streams. For this analysis, NWI identified wetlands are considered "potential wetlands" and NHD streams are considered "potential streams."

The NWI utilizes the Cowardin Classification (Cowardin et al., 1979) for wetlands and deepwater habitats. However, it is not expected that all areas defined as lacustrine wetlands would exhibit the three wetland parameters as defined in Section 3.6.1; therefore, it is likely that many of the NWI lacustrine wetlands within the project area are not lacustrine wetlands but open water. However, this has not been confirmed because a wetland delineation defining the lacustrine wetland/open water boundary has not been completed; therefore, NWI lacustrine wetlands have been included in the description of wetlands in the Affected Environment and for consistency have been included in the Environmental Consequences analysis. Before beginning construction activities, Reclamation would work with USACE as well as state and local agencies to obtain all applicable permits.

It is important to note that impacts to wetland and riparian areas resulting from inundation beyond existing conditions would largely be dependent upon the frequency and duration of inundation. Impacts may not occur in a given year or could occur in consecutive years and would likely be of varying duration. Impacts from inundation may not be expressed consistently across the area or may occur over many years.

As a result of the project, the amount of wetland acreage would potentially increase with the increased perimeter of surface water at Anderson Ranch Reservoir. Wetland creation around the perimeter of Anderson Ranch Reservoir was assessed based on topographic information and a review of aerial imagery to identify areas that are relatively flat, are subject to ponding, and/or within proximity to a new hydrology source.

Several of the rim project areas overlap with the boundaries of the new inundation areas. Where this occurred and the NWI indicated the area contained wetlands, potential impacts to wetlands were included in the calculations for the rim project areas only.

The riparian areas that fell within the project area were quantified using linear length of NHD streams and were characterized using BURP information. The BURP habitat assessment, which is a modification of the EPA Region 10 In-Stream Biological Monitoring Handbook habitat assessment, incorporates a combination of quantitative and qualitative measures of habitat variables. BURP habitat assessment data and the Rosgen stream classification technique designated stream type were used to categorize (or classify or assign) riparian health.

Based on the information gathered, wetland and riparian impacts were classified as one or a combination of the following.

- Short term: such as temporary impacts during construction activities.
- Long term: such as a permanent loss or an alteration resulting from the alternative.
- Direct: such as loss due to inundation or fill.

- Indirect: such as a change to characteristics due to a change in surrounding conditions.
- Adverse: such as loss due to inundation or fill.
- Beneficial: such as the creation of a resource due to inundation.
- Negligible: impacts that are expected to be offset by the project, such as inundation resulting in the loss of wetlands that would be offset by the creation of wetlands upgradient.
- Insignificant: such as a change in wetland type or temporarily filled wetland areas during construction that are then returned to pre-construction conditions or the loss of riparian areas of low to moderate quality.
- Significant: such as the permanent loss of wetlands over 0.1 acre, which is the typical threshold for compensatory mitigation under Section 404 of the CWA, or a permanent loss of high quality riparian areas.

Table 11 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for wetlands. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 11. Wetlands and riparian impact indicators and significance criteria.

Impact Indicator	Significance Criteria
Alteration to wetland hydrology, hydrophytic vegetation, or hydric soils such that the area loses wetland characteristics, acreage, or the wetland type is altered.	Long-term or permanent adverse impacts on wetlands through direct removal, filling, hydrological interruption, or other means that exceeds 0.1 acres, which is the typical threshold for mitigation under Section 404 of the CWA.
Loss in riparian linear feet or change to the quality of the riparian corridor.	Long term loss of high-quality riparian corridors.

3.6.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under Alternative A, the baseline conditions as they occur currently would continue, and there would be no increase in the Anderson Ranch Dam height or construction of the associated reservoir rim projects, access roads, or facilities. Reclamation would continue to operate Anderson Ranch Dam as it currently does.

Under Alternative A at Anderson Ranch Reservoir, wetlands and riparian areas found along the shoreline of Anderson Ranch Reservoir would continue to be exposed to varying levels of inundation because of ongoing operational fluctuations in water storage and releases. Anthropogenic activities affecting riparian quality such as roads, forestry, agriculture, recreation, and livestock grazing would also continue. Wetlands downstream of the dam would continue to experience varying levels of inundation based on reservoir capacity and

downstream water supply and irrigation needs. Wetlands that are present in the borrow areas, road realignment area, and rim project areas would not be impacted, as project construction would not occur and there would be no project-related temporary or permanent loss, alteration, or creation of wetlands or riparian areas. Wetlands and riparian areas under Alternative A would continue to be affected directly by exposure to varying levels of inundation and indirectly by anthropogenic activities; however, these impacts are not considered significant.

Alternative B

The proposed 6-foot dam raise would result in activities that have the potential to impact wetlands and riparian areas, including inundation from the dam raise, projects along the rim of Anderson Ranch Reservoir, borrow areas, and access road construction.

Rim Inundation

Wetlands

The increased pool elevation at Anderson Ranch Reservoir would impact approximately 11.031 acres of NWI palustrine wetlands,13.078 acres of NWI lacustrine wetlands, and less than 1 acre (0.385 acre) of NWI riverine wetlands, totaling 24.494 acres of NWI potential wetlands within the inundation area. As mentioned in Affected Environment Section 3.6.1, much of the rim of Anderson Ranch Reservoir is characterized by a narrow valley cut through several hundred feet of igneous extrusive and intrusive rock with slopes too steep to support emergent or submerged aquatic vegetation. As such, it is likely that most of the areas identified as lacustrine wetlands are not wetlands and are actually open water. However, since NWI-mapped wetlands are used for the impact analysis, NWI defined lacustrine wetlands within the inundation area have been included in the analysis for consistency. The NWI lacustrine wetlands would experience increased inundation that may no longer support wetland characteristics; therefore, it is anticipated that these wetlands would be lost and the area would become open water. However, new lacustrine wetlands are expected to be created upgradient in response to the increased inundation.

The existing palustrine wetland fringe is located on flatter slopes around the rim of Anderson Ranch Reservoir and is classified as having emergent vegetation. As the water surface rises, it is anticipated that the lower to middle portions of the existing palustrine wetlands would shift to lacustrine wetlands as surface water depths exceed 8.2 feet. However, it is anticipated that palustrine wetlands would migrate upgradient in response to the increased hydrology. The lower portion of the new palustrine wetland edge may be in water depths not conducive to emergent vegetation growth but may be conducive to submerged and floating leaf aquatic vegetation growth.

Overall, impacts on wetlands around the perimeter of Anderson Ranch Reservoir due to this alternative would be long term and direct because the wetland impacts, whether it be a loss of wetlands, shift in wetland type, or creation of wetlands, would be in response to the increased inundation from the permanent 6-foot increase in the full pool elevation. These impacts are considered both beneficial (creation of wetlands) and adverse (loss of wetlands), but negligible and insignificant as adverse impacts such as wetland loss or alternation as a result of Alternative B is expected to be offset by the creation of wetlands upgradient.

Riparian Areas

The 6-foot dam raise has the potential to impact several intermittent and perennial streams and their associated riparian zone within the project area. The length of inundation based on linear feet of each of the NHD streams ranges from 6 feet to 1,157 feet.

Evaluation of the BURP assessments for the eight streams within the rim inundation area indicates that most have a riparian corridor quality of fair to moderate. Fair to moderate disruptive pressures indicate that human activities have caused impacts, that the riparian vegetation zone is at least as wide to at least twice the width of the stream, and disruption is obvious or evident where 30% to 90% of potential plant biomass remains. Lester Creek, which would experience inundation along approximately 41 linear feet, is the only stream with a riparian corridor determined to be of moderate to high quality. This indicates that the riparian vegetative zone is at least four times the width of the stream and human activities have caused minimal visible impacts. Minimal disruption here is not affecting the community vigor, and 60% to 90% of the potential plant biomass remains.

BURP assessments were not available for seven perennial streams totaling 537 linear feet and approximately 32 intermittent streams totaling 1,263 linear feet within the project area. These perennial streams without BURP assessments include Elk Creek, Little Camas Creek, Rock Creek, Badger Creek, Curlew Creek, Louse Creek, and Wood Creek. It is assumed that the riparian corridors of these streams have been subject to varying levels of impact from similar anthropogenic and natural disturbances as summarized above and are therefore, of similar quality. Based on this similarity, the perennial and intermittent streams lacking BURP assessments are of fair to moderate quality. Overall, impacts on riparian areas would be considered long term, direct, and adverse because the riparian areas around the rim of Anderson Ranch Reservoir would be inundated from the permanent 6-foot increase in the full pool elevation. However, these impacts would be insignificant as the riparian corridors have been determined to not be high-quality habitat. The existing habitat has been subject to varying levels of impact from anthropogenic and natural disturbances.

Varial Zone

Wetlands

Currently, the vegetation composition in the varial zone is typically comprised of facultative wetland (FACW) and facultative vegetation species (Appendix H). With the increased inundation from the 6-foot permanent pool raise it is likely the connection to hydrology would be of sufficient duration during the growing season to shift the plant community composition to be predominantly comprised of FACW species. Due to the watering and dewatering of this area, a transition to a vegetation composition with a dominance of obligate wetland plant species is not expected in the varial zone. It is also anticipated that emergent wetlands would migrate upgradient potentially creating wetlands where they currently do not exist. The lower portion of the new wetland edge may be in water depths not conducive to emergent vegetation growth; however, it may be conducive to submerged aquatic vegetation and floating leaf aquatic vegetation growth.

Overall, impacts on wetlands in the varial zone due to this alternative would be long term and direct because the wetland impacts, whether it be a loss of wetlands, shift in wetland type, or creation of wetlands, would be in response to the increased inundation from the permanent

6-foot increase in the full pool elevation. These impacts are considered both beneficial (creation of wetlands) and adverse (loss of wetlands), but negligible and insignificant as adverse impacts such as wetland loss or alternation as a result of Alternative B is expected to be offset by the creation of wetlands upgradient. The overall ecological function of the wetland/upland mosaic in the varial zone is expected to remain intact as it migrates upgradient in response to the increased full pool elevation.

Riparian Areas

Approximately 1,157 linear feet of the South Fork Boise River, a perennial stream, and 153 linear feet of one intermittent stream are expected to be impacted in the varial zone due to the increased inundation as a result of the 6-foot dam raise. The quality of the riparian corridor is considered fair, indicating that human activities have caused impacts, the riparian vegetation zone is at least as wide to at least twice the width of the stream, and disruption is obvious or evident where 30% to 90% of potential plant biomass remains. Overall, impacts on riparian areas would be considered long term, direct, and adverse because the riparian areas within the varial zone would be inundated from the permanent 6-foot increase in the full pool elevation. However, these impacts would be insignificant because the riparian corridors are subject to periods of watering and dewatering and would likely continue to seasonally function as riparian areas. Additionally, the riparian areas in the varial zone have been determined to be of fair to moderate quality, the existing habitat is not high-quality habitat because it has been subject to varying levels of impact from anthropogenic and natural disturbances.

Rim Projects, Roadway Projects, and Borrow Areas

Wetlands

Construction activities associated with Alternative B would result in adverse impacts on wetlands. NWI potential wetlands are mapped in staging areas, borrow pit areas, and the Cow Creek Road (HD 131) realignment area; any dredging or filling from activities such as excavation for borrow, fill for road construction, and site grading in these areas would alter the characteristics or acreage of those wetlands, constituting a long-term, direct, and adverse impact. In addition, activities associated with the reservoir rim projects, such as developed recreation facility modifications, roadway armoring, culverts, and bridge improvements may occur in areas where wetlands are present. Much of the proposed construction for the dam crest raise, cofferdam, and spillway approach is within previously disturbed areas that do not support wetlands. Construction associated with these features would not be expected to impact wetlands.

Impacts from project construction activities on wetlands would be considered both long term and temporary, direct, and adverse. These impacts would be mostly permanent, except for the staging and borrow areas, where impacts would be temporary, as these areas would be returned to preconstruction conditions and will be revegetated with native species; therefore, these temporary impacts are considered insignificant. Permanent impacts on lacustrine wetlands are also considered insignificant as it is likely that the NWI identified lacustrine wetlands within the project area are actually open water, which does not meet the criteria for a wetland and does not provide the high quality function and value a lacustrine fringe wetland would. Impacts on wetlands at Pine Bridge would be negligible and insignificant because it is anticipated that riverine wetlands at the Pine Bridge would not change as a result

of Alternative B. It is proposed that the height of the structure is increased, therefore, the wetted width of the river would remain the same post construction. The current riprap is performing sufficiently and there would be no net increase in riprap below reservoir pool elevations compared to existing conditions. All new riprap would be placed above reservoir pool elevations to accommodate the increased inundation. The remaining permanent impacts are on freshwater emergent, freshwater forested/shrub, and riverine wetlands, these are considered significant as they would result in the permanent fill of approximately 0.387 acres which is above the typical threshold for compensatory mitigation. Significant impacts would result from roadway riprap placement, mechanically stabilized earth wall construction, and construction of instream step pool weirs and culvert modification at Fall Creek.

Riparian Areas

NHD streams were mapped in the area of impact for the Pine Creek Bridge improvements, the Deer Creek and Fall Creek culvert construction areas, the Pine Airstrip realignment, and the Cow Creek Road (HD 131) realignment. Linear feet of disturbance in these areas range from 39 feet to 206 feet.

Overall, impacts on riparian areas would be considered long term, direct, and adverse because construction would occur within riparian areas and would be permanent. However, impacts would be insignificant due to the minimal extent of impact on riparian corridors and these areas have been determined to be of fair/fair to moderate/low quality.

Downstream

Downstream of the dam, changes in the flow and timing of water would likely have an impact to the riparian shoreline vegetation. However, vegetation communities along riverine systems naturally experience high levels of disturbance from flood and drought conditions. As outlined in the Water Operations and Hydrology Section 3.2, baseline conditions indicate high variation, with little difference in average flow between the impact scenarios are compared to the baseline. Changes in peak flow may result in slightly less disturbance, and more established riparian vegetation, but overall, the change in operations would not differ significantly from the variation that occurs under baseline conditions and impacts on vegetation would be negligible.

Alternative C

Similar to Alternative B, the proposed 3-foot dam raise would result in activities that have the potential to impact wetlands and riparian areas, including inundation from the dam raise, projects along the rim of Anderson Ranch Reservoir, borrow areas, and access road construction.

Rim Inundation

Wetlands

Under Alternative C, the increased pool elevation at Anderson Ranch Reservoir would impact approximately 8.774 acres of NWI palustrine wetlands, 7.098 acres of NWI lacustrine wetlands, and less than 1 acre (0.146 acre) of NWI riverine wetlands, totaling 16.018 acres of NWI potential wetlands within the inundation area. The migration of wetlands upgradient and change of the lower existing wetland edge from emergent to supporting submerged or

floating leaf aquatic is as described for Alternative B but at a lesser extent as less area would be inundated as a result of Alternative C.

Overall, impacts on wetlands around the perimeter of Anderson Ranch Reservoir due to this alternative would be long term and direct because the wetland impacts, whether it be a loss of wetlands, shift in wetland type, or creation of wetlands, would be in response to the increased inundation from the permanent 3-foot increase in the full pool elevation. These impacts are considered both beneficial (creation of wetlands) and adverse (loss of wetlands), but negligible and insignificant as adverse impacts such as wetland loss or alternation as a result of Alternative C is expected to be offset by the creation of wetlands upgradient.

Wetland impacts under Alternative C would be at a lesser extent than under Alternative B as less acres of potential wetlands surrounding the reservoir would be inundated; however, these impacts are considered insignificant as they are expected to be offset by the creation of wetlands upgradient.

Riparian Areas

As with Alternative B, the 3-foot dam raise could potentially impact intermittent and perennial streams and their associated riparian zone within the project area. The length of inundation based on linear feet of each of the NHD streams ranges from 3 feet to 367 feet.

BURP assessments were not available for seven perennial streams totaling 347 linear feet and approximately 31 intermittent streams totaling 532 linear feet within the project area. These perennial streams without BURP assessments include Elk Creek, Little Camas Creek, Rock Creek, Badger Creek, Curlew Creek, Louse Creek, and Wood Creek. The quality of the existing riparian zone based on information from the BURP assessments would be the same as those described above for Alternative B.

Overall, impacts on riparian areas would be considered long term, direct, and adverse because the riparian areas around the rim of Anderson Ranch Reservoir would be inundated from the permanent 3-foot increase in the full pool elevation. However, these impacts would be insignificant as the riparian corridors have been determined to not be high-quality habitat. The existing habitat has been subject to varying levels of impact from anthropogenic and natural disturbances.

Riparian impacts under Alternative C would be at a lesser extent than Alternative B as less linear length of NHD identified streams would be impacted. As with Alternative B, impacts on riparian areas are considered insignificant as impacts are not to high-quality riparian corridors.

Varial Zone

Wetlands

Under Alternative C, wetland characteristics and impacts within the varial zone would be similar to those provided for Alternative B. As such, the increased inundation from the 3-foot permanent pool raise would likely be of sufficient duration during the growing season to shift the plant community composition to be predominantly comprised of FACW species. It is also anticipated that emergent wetlands would migrate upgradient potentially creating wetlands where they currently do not exist. The lower portion of the new wetland edge may be in

water depths not conducive to emergent vegetation growth; however, it may be conducive to submerged aquatic vegetation and floating leaf aquatic vegetation growth.

Under Alternative C impacts on wetlands in the varial zone due to this alternative would be long term and direct because the impacts, whether it be a loss of wetlands, shift in wetland type, or creation of wetlands, would be in response to the increased inundation from the permanent 3-foot increase in the full pool elevation. These impacts are considered both beneficial (creation of wetlands) and adverse (loss of wetlands), but negligible and insignificant as adverse impacts such as wetland loss or alternation as a result of Alternative C is expected to be offset by the creation of wetlands upgradient. The overall ecological function of the wetland/upland mosaic in the varial zone is expected to remain intact as it migrates upgradient in response to the increased full pool elevation. Overall, wetland impacts under Alternative C would be at a lesser extent than under Alternative B as less acres of potential wetlands in the varial zone would be inundated; however, impacts under both alternatives would be insignificant.

Riparian Areas

Riparian impacts under Alternative C are anticipated to be less adverse than under Alternative B, as less linear length of the riparian zone would be inundated. Approximately 367 linear feet of the South Fork Boise River, a perennial stream, and 62 linear feet of one intermittent stream are expected to be impacted in the varial zone due to the increased inundation as a result of the 3-foot dam raise.

Under Alternative C impacts on riparian areas would be considered long term, direct, and adverse because the riparian areas within the varial zone would be inundated from the permanent 3-foot increase in the full pool elevation. However, these impacts would be insignificant because the riparian corridors are subject to periods of watering and dewatering and these areas would likely continue to seasonally function as riparian areas. Additionally, the riparian areas in the varial zone have been determined to be of fair to moderate quality because the existing habitat is not high-quality habitat because it has been subject to varying levels of impact from anthropogenic and natural disturbances. Overall, riparian impacts under Alternative C would be at a lesser extent than Alternative B as less linear length of NHD identified streams would be impacted; however, impacts under both alternatives would be insignificant.

Rim Projects, Roadway Projects, and Borrow Areas

Wetlands

Under Alternative C, construction activities associated with reservoir rim projects, the roadway projects, and borrow/staging areas would be similar in scope to those described above for Alternative B and would constitute long-term, direct, and adverse impacts. In general, rim project footprints would be decreased under Alternative C, and some projects, such as the Pine Airstrip and Pine Bridge and their associated staging areas, would no longer be needed under Alternative C. Borrow areas under Alternative C would be the same as described under Alternative B.

Impacts from project construction activities on wetlands would be considered both long term and temporary, direct, and adverse. Impacts from construction would be mostly permanent, except for the staging and borrow areas, where impacts would be temporary, as these areas

would be returned to preconstruction conditions and do not require mitigation. Given this, temporary impacts are considered insignificant. Permanent impacts on lacustrine wetlands are also considered insignificant as it is likely that the NWI identified lacustrine wetlands within the project area are actually open water, which does not meet the criteria for a wetland and does not provide the high-quality function and value a lacustrine fringe wetland would. The remaining permanent impacts are on freshwater emergent, freshwater forested/shrub, and riverine wetlands and these are considered significant as they would result in the permanent fill of approximately 0.230 acre which is above the typical threshold for compensatory mitigation. Significant impacts would result from roadway riprap placement, mechanically stabilized earth wall construction, and construction of instream step pool weirs and culvert modification at Fall Creek.

The types of impacts on wetlands from rim projects, the Cow Creek Road (HD 131) realignment, roadways, and staging and borrow areas would be similar to those described under Alternative B; however, there would be 0.157 fewer acres of impacts on potential wetlands under Alternative C as project footprints would be smaller and certain projects would no longer be needed under this alternative.

Riparian Areas

NHD streams were mapped in the area of impact for the Deer Creek and Fall Creek culvert construction areas and the Cow Creek Road realignment. Linear feet of disturbance in these areas range from 75 feet to 206 feet.

Overall, riparian zone impacts under Alternative C are anticipated to be less adverse than under Alternative B, as projects such as the Pine Airstrip and Pine Bridge are not needed for the 3-foot raise. Under Alternative C impacts on riparian areas would be considered long term, direct, and adverse because construction activities would occur within the riparian areas and would be permanent. However, impacts would be insignificant due to the minimal extent of impacts on riparian corridors and that these areas have been determined to be of fair/fair to moderate/low quality.

Downstream

Impacts on riparian shoreline vegetation downstream of the dam would be as described under Alternative B. Overall, Alternative C would not result in significant variation in water flow or timing and impacts on riparian vegetation and habitat would be negligible.

3.6.2.3 Cumulative Impacts

The Pine Bridge replacement resulted in one bridge being replaced with another bridge in the same location, and therefore would not have changed the overall wetlands in the area. The Anderson Ranch Dam crest raise was completed on top of the existing dam and would not have impacted wetlands. Therefore, these past projects would not contribute to cumulative effects.

Alternatives B or C would result in permanent loss and/or change in wetland type and riparian areas due to construction and inundation. Information regarding the two future projects is limited but for purpose of this analysis, it can be assumed that the CCE project would also cause loss or change in potential wetlands and riparian areas from installing a pipeline from Anderson Ranch reservoir to CCE reservoir, construction of the CCE reservoir, and installation of the wind and solar energy equipment. The South Fork Boise River

Diversion Project would also cause loss or change in potential wetlands and riparian areas from the installation of a pipeline. Cumulatively, the effects of the CCE project and the South Fork Boise River Diversion Project along with either Alternative B or C would likely contribute to direct adverse effects on wetlands.

3.6.2.4 Mitigation Measures

Impacts on wetlands and riparian resources due to inundation or fill are anticipated to occur around the rim of Anderson Ranch Reservoir, in the varial zone, and in the project footprints for the rim projects. In accordance with EO 11990, impacts from construction activities would be minimized and avoided in wetland and waterway areas to the maximum extent practicable. The location of site clearing, staging areas, access routes, stockpile areas, and material handling areas would be in locations that minimize the overall disturbance to riparian vegetation, and preclude sediment delivery to water resources, including wetlands and riparian areas. Many of the selected locations for the projects previously mentioned would be on formerly disturbed ground. Efforts to reduce the potential for sediment to enter water resources would include the placement of certified weed free silt fences, straw bales, straw wattles, or other sediment barriers around disturbed sites prior to construction and would be kept in place until erosion control is assured. All project operations would be ceased, except efforts to minimize storm or high-flow erosion, during precipitation and high-flow conditions that result in uncontrollable erosion in the construction area. Additionally, all in-water work would be completed during low water/low flow periods. Construction, staging, and borrow areas would be monitored for sediment issues, issues would be addressed as necessary, and a supply of erosion control materials would be kept readily available to quickly respond to sediment emergencies that may arise during construction.

Conservation measures that would be implemented to manage vegetation impacts, including wetland and riparian vegetation, are outlined in the Vegetation Specialist Report (Appendix B6) and described in the Environmental Commitments Section 3.28. In general, temporarily disturbed wetland and/or riparian vegetation would be seeded with native species and monitored for success, infestations of invasive species would be monitored and controlled as directed by Reclamation, and efforts would be taken to reduce the risk of introducing aquatic invasive species into waters within the project area.

Prior to beginning construction activities, Reclamation would work with USACE, as well as state and local agencies, to obtain all applicable permits, including CWA Section 401 and Section 404 permits. Reclamation would direct the development and execution of mitigation measures that offset the permanent wetland impacts of the selected alternative.

3.7 Vegetation

This section describes existing conditions for vegetation within the project area, including sensitive and special status species, noxious weeds, and other invasive species. Anticipated environmental consequences for each alternative are described. Regulatory information, general vegetation information, plants lists, and additional methods and analysis are included in the Vegetation Specialist Report (Appendix B6). Analysis of federally listed threatened and endangered plant species can be found in the Threatened and Endangered Species Section 3.10.

3.7.1 Vegetation – Affected Environment

The project area includes the general vicinity in and around Anderson Ranch Reservoir, upstream and downstream of Anderson Ranch Reservoir along the South Fork Boise River, Arrowrock Reservoir, proposed rim project areas, and other areas where ground disturbance is expected (detour routes, borrow areas, staging areas).

Natural areas are a mix of coniferous forest, mixed coniferous-deciduous forests, shrublands, bare disturbed sites, agricultural fields, and open fields. Riparian vegetation is found along the tributaries to Anderson Ranch and Arrowrock reservoirs and scattered around the edge of both reservoirs. The South Fork Boise River has a well-developed riparian zone interspersed with upland grassland and sagebrush. The natural areas have considerable human activity due to the popularity of both reservoirs and the South Fork Boise River with recreationists. Roads are common throughout the project area. Grazing is also common through the terrestrial area, both on USFS permittee allotments and private property.

Common vegetation found within the project area include shrubs and grasses like bluebunch wheatgrass (*Pseudoroegneria spicata*), mountain big sagebrush (*Artemisia tridentata)*, Wyoming big sagebrush (*Artemisia tridentata* ssp. w*yomingensis)*, bluegrass species, Idaho fescue (*Festuca idahoensis*), bitterbrush (*Purshia* DC. ex Poir.), and mountain snowberry (*Symphoricarpos oreophilus)* (USGS, 2002). In lower elevations, vegetation includes grasslands, shrublands, ponderosa pine (*Pinus ponderosa*), and Douglas fir (*Pseudotsuga menziesii*). In mid- to high elevations, vegetation includes shrubs and forest communities of Douglas fir and subalpine fir (*Abies lasiocarpa*) with scattered seral lodgepole pine (*Pinus contorta*) and quaking aspen (*Populus tremuloides)* (USFS, undated a). Adjacent to the reservoirs, upland vegetation is predominantly sagebrush and grassland communities, which are composed of dense stands of sagebrush species interspersed with a grass understory of Sandberg's bluegrass (*Poa secunda*), Idaho fescue (*Festuca idahoensis*), and non-native cheatgrass (*Bromus tectorum*) (Reclamation, 1982). Table 3 through Table 15 in the Vegetation Specialist Report include various plants lists by vegetation map units (Appendix B6).

A varial zone is in the northern portion of the Anderson Ranch Reservoir where the South Fork Boise River discharges into the reservoir. The varial zone is subject to periods of watering and dewatering corresponding to the summer/fall drafting and winter/spring refill of Anderson Ranch Reservoir. This area is characterized by broad, flat valley topography with a braided channel system where silt, sand, and gravel deposit (Appendix H).

Plant species identified as sensitive species by USFS that occur in Boise National Forest (BNF) were analyzed for their potential to occur in the vicinity of Anderson Ranch Reservoir and Arrowrock Reservoir. These sensitive species and their potential to occur in the project area are provided in Table 16 of the Vegetation Specialist Report (Appendix B6). None of these sensitive species are anticipated to occur in the project area because they are not known to occur in Elmore County or because suitable habitat is not present within the project area.

In some areas, noxious weeds and introduced grasses and forbs are replacing native shrubs and grasses. There are 67 known species of noxious weeds in Idaho. Elmore County is home to 29 state-designated noxious weeds including two species of aquatic noxious plant species. Suitable habitat exists within the project area for all the species that occur in the county (Table 17, Vegetation Specialist Report, Appendix B6). Nine noxious weed species are

known to occur within the project area (Hampton, 2019). Leafy spurge (*Euphorbia esula*) is the highest priority for control by USFS.

3.7.2 Vegetation – Environmental Consequences

3.7.2.1 Methods for Evaluating Impacts and Significance Criteria

Vegetation characterization within the project area was based on limited site-specific information and desktop analyses of available data (refer to the Vegetation Specialist Report, Appendix B6 for more details). For site-specific information, a wetland determination survey of wetland indicators, including hydrophytic vegetation, hydric soil, and wetland hydrology, was conducted at several point locations in the varial zone by Reclamation in October 2019 (Appendix H).

Identification of potential invasive species impacts that may occur as a result of the project focused on areas temporarily or permanently disturbed by construction activities (including upstream and downstream waters directly or indirectly affected), new infrastructure in the project area and/or other areas affected by the increased reservoir footprint, and the extent of vehicular traffic and other activities (including in-stream work) associated with project alternative elements within the project area. Effects anticipated to invasive species were described relative to anticipated shifts from existing conditions as a result of the project, including future operations and maintenance activities after project completion.

Impacts to vegetation were considered substantial when actions resulted in changes that permanently altered the vegetative community, resulted in the loss of a community, or resulted in the fragmentation of a vegetative community. Impacts to vegetation are indicated by effects presented in Table 12 and are classified based on the following.

- Short-term: such as temporary impacts during construction activities that are reseeded following construction and do not result in long-term changes in the vegetative community.
- Long-term: such as a permanent loss or an alteration in a vegetative community resulting from the alternative, including the alteration of a community to a different vegetative community.
- Direct: such as loss due to grading, the placement of fill, or pavement that cannot be reseeded.
- Indirect: such as a change to characteristics or quality of a vegetative community due to a change in surrounding conditions, including the introduction of non-native species.
- Adverse: such as loss or degradation of a vegetated area due to development or fill, or by the introduction or spread of invasive species.
- Beneficial: such as the creation or improvement of a lower quality vegetative community to one that provides higher habitat value.
- Negligible: impacts that are imperceptible or slight such as localized disturbance or clearing of vegetation that would not be permanent.

- Insignificant: disturbance that is limited in scope, including disturbance within already disturbed communities during construction that are returned to pre-construction conditions at the conclusion of the project or permanent clearing of vegetation that represents less than 30 percent (see Vegetation Specialist Report, Appendix B6, for a detailed explanation of this indicator) of a habitat stand of the map unit types found within the project area. Each polygon of a map unit type is considered a habitat stand in this document.
- Significant: such as the permanent development of a formerly undeveloped vegetated area, permanent disturbance representing more than 30% (see Vegetation Specialist Report, Appendix B6, for explanation of this indicator) of a habitats stands of map unit types found within the project area, or permanent degradation of a high value habitat to one of less ecological value.

Table 12 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for vegetation. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 12. Vegetation impact indicators and significance criteria

Impact Indicator	Significance Criteria
Loss or alteration of existing vegetation that results in a decrease in the extent, connectivity, or integrity of a biological community. Alterations to existing vegetation, including a loss of community or change in community type. Acres of disturbance equivalent to a permanent loss of more than 30% of a habitat stand of a map unit type found within the project area. Creating or reducing plant communities (e.g., water inundation, topography, bathymetry).	Substantial adverse effect on any vegetation community, habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the IDFG or USFWS. Substantial adverse effects are those that result in a significant loss or permanent change in a vegetative community to one that is considered of a lower quality for habitat. This would include a shift in vegetation or a loss of habitat function. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.
Potential for introducing or spreading new and/or existing invasive species within the project area is due to implementation of project alternatives.	Increasing invasive species above existing conditions. This includes expansions into new areas and/or increases in diversity (i.e., introduction of a species not currently found in the project area), cover, and density in existing occupied areas.

3.7.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under Alternative A, the baseline conditions for vegetation would remain as they currently exist because there would be no increase in the Anderson Ranch Dam height or construction

of the associated reservoir rim projects, access roads, or facilities. Operations and maintenance of Anderson Ranch Dam would not change.

Vegetation found along the shoreline of the Anderson Ranch Reservoir would continue to be exposed to varying levels of inundation as a result of ongoing operational fluctuations in water storage and releases. New infestations of invasive plants and noxious weeds would continue, and existing infestations would expand if left untreated. Invasive species control and eradication measures as currently practiced by USFS, Idaho Department of Transportation, Idaho Department of Agriculture, and private landowners would continue. There would be no project-related loss or alteration of existing vegetation, or activities that would decrease the extent, connectivity, or integrity of a biological community, including a loss of community or change in community type; therefore, Alternative A would not result in direct or indirect impacts to vegetation resources.

Alternative B

Alternative B would require vegetation clearing in borrow areas along haul roads, storage, or laydown areas, and for the proposed rim projects. Details on project features included in Alternative B are provided in the 6-foot Dam Raise Engineering Summary (Appendix C). Raising the full pool elevation would inundate areas previously above the full pool elevation, including upland and riparian habitats. Impacts to vegetation would result from these activities.

Rim Inundation

Overall, the raised pool elevation would likely result in a long-term, direct, adverse impact to upland vegetation and riparian vegetation, with the predominant effect being a shift of vegetation based on the new hydrology within the area; however, impacts are not considered significant because vegetative communities would re-establish along the new shoreline elevation. Upland communities that converted to riparian or wetland vegetation communities would provide ecological functions and habitat, though it would be different than those provided by the former upland vegetation community. Surrounding upland vegetation and habitat is prevalent in the project area and would continue to provide the functions formerly provided by areas that converted to riparian and wetland habitat.

Varial Zone

Species present within the varial zone of the South Fork Boise River would be anticipated to change in composition toward more hydrophytic species that are more tolerant of the increased inundation (Table 19, Inundation acreage impacts of Alternative B; Vegetation Specialist Report, Appendix B6). Currently, the varial zone is generally dewatered for most of each year, which results in a mix of upland species interspersed with riparian species (Appendix H). Conifer species noted in the varial zone (lodgepole pine, ponderosa pine, firs) and aspen may experience mortality if these species cannot tolerate inundation conditions of the expected duration. Woody vegetation may shift toward a greater dominance of hydrophytic woody species, such as willows, alder, and cottonwood. Alternately, species that are well suited to longer and deeper inundation periods may increase overall in the varial zone, including rushes and sedges.

As noted above for the Anderson Ranch Reservoir rim inundation, the dam raise would likely result in a long-term, direct, adverse impact on upland vegetation and riparian vegetation in

the varial zone. Impacts to vegetation within the varial zone may be greater than those on the rim of the Anderson Ranch Reservoir due to the more broad, flat topography found in the varial zone, which may result in a more widespread impact. Alternative B would impact more than 30% of the ponderosa pine map unit habitat stand in the varial zone. This stand is part of a larger heterogeneous habitat patch of forested upland habitat, with a mix of Douglas fir and ponderosa pine stands. In BNF, ponderosa pine stands are typically a seral stage to Douglas fir stands, consist largely of managed or recently disturbed stands within the Douglas fir map unit, and are ecologically similar (USFS, 2014). The loss of this habitat patch would not be significant in the context of this larger habitat area. The functions and values lost by the inundation of upland vegetation would continue to be provided by the adjacent upland habitat that was not impacted.

Impacts would be negligible and insignificant as the adverse impacts are expected to be offset by the conversion of the upland areas into wetlands and riparian habitat. This converted upgradient vegetation would provide a more beneficial ecological function and habitat. Even though Alternative B would impact more than 30% of the riparian herbland map unit habitat stand in the varial zone, riparian habitat would re-establish in this zone. In addition, the species within the riparian herbland map unit tolerate free or unbound water (USFS, 2014), and may continue to persist despite the increased inundation, depending on the depth, duration, and frequency of inundation. The predominant effect of the increased inundation would be the alteration of vegetation based on the increased frequency, duration, depth, and extent of inundation within the area (Water Operations and Hydrology Specialist Report, Appendix B1).

Rim Projects, Roadway Projects, and Borrow Areas

Overall, impacts from reservoir rim projects and roadway construction and upgrade projects are expected to be short and long term, direct, and adverse on herbaceous and shrubland riparian vegetation and upland shrubland and forested from removing and disturbing vegetation within the project area. Temporary impacts to herbaceous vegetation would be direct, and adverse but are not considered significant because areas disturbed would be reseeded. Reseeding of areas temporarily impacted would establish herbaceous species within a shorter timeframe. Rim projects that are not temporary, such as Pine Airstrip, creation of new developed recreation facilities, roadways, boat docks, and riprap placement would have significant long-term, direct, adverse impacts to vegetation from the permanent conversion to developed land. These areas would no longer provide an ecosystem function or serve as habitat. These impacts would be significant in a localized area; however, they represent minimal acreage in the larger project area and vicinity and would likely not be significant in the context of habitat provided by the larger project area.

Impacts to vegetation from borrow sites and staging areas would be short term, direct, and adverse during construction, and long term, direct, and adverse once construction had ceased, and areas were reseeded with native species. Borrow sites and staging areas would impact more than 30% of a habitat stand of the aspen map unit. The aspen map unit type includes a mosaic of aspen forests, conifer forests, and early seral shrublands (USFS, 2014). This stand is isolated and small, but larger habitat stands of aspen are present within the vicinity of the project area. In addition, aspen are early successional species and are quick to regenerate. Reseeding and natural regeneration would reestablish herbaceous species in these areas within a few years, followed by aspen and early seral shrubs. It would take longer to fully

reestablish shrubland and forested areas and the ecosystem functions and habitat values provided by these areas before clearing. To reduce impacts to vegetation, areas for staging, stockpiling, and contractor use were chosen in areas with minimal vegetation. Reseeding these sites would restore some of the vegetation but using and storing equipment and supplies may compact soils, which would have a long-term, indirect, adverse impact to vegetation. Impacts to vegetation from borrow and contractor use sites are not considered significant, as these areas were chosen in part because they currently provide lower quality habitat and would be re-established with native species, increasing habitat and ecosystem function.

Invasive Species

Soil disturbance from reservoir rim projects and roadway projects would also increase the potential for invasive species introduction. Invasive species can permanently alter habitats and function of ecosystems by changing the species composition and environmental conditions present that can result in potentially adverse impacts. However, the implementation of mitigation and conservation measures including those discussed in the Vegetation Specialist Report (Appendix B6) and included in the Environmental Commitments Section 3.28 under Biological Resources would help to reduce the likelihood of invasive species introduction. Therefore, no significant impacts from terrestrial invasive species from implementing Alternative B are expected.

In-water work under Alternative B has the greatest potential of introducing aquatic invasive species into the project area. Vehicles and construction equipment (including materials used for coffering in some cases) have the potential to harbor and transport aquatic invasive species from waterbody to waterbody. Aquatic invasive species pose a great threat to valued aquatic resources in the project area. In turn, mitigation and conservation measures discussed in the Environmental Commitments Section 3.28 under Biological Resources would be implemented to reduce the risk of introducing aquatic invasive species into the project area as a result of Alternative B. Conservation measures in place would reduce the potential for the introduction of aquatic invasive species into water bodies within the project area and as a result, no significant direct or indirect impacts from aquatic invasive species would be anticipated to occur from implementing Alternative B.

Alternative C

Similar to Alternative B, Alternative C would require vegetation clearing in borrow areas along haul roads, storage or laydown areas, and for the proposed rim projects. Raising the full pool elevation would inundate areas previously above the full pool elevation, including upland and riparian habitats. Impacts to vegetation would result from these activities.

Rim Inundation

Overall, under Alternative C, the 3-foot dam raise pool elevation would likely result in a long-term, direct, adverse impact to upland vegetation and riparian vegetation, but the amount of acreage impacted by Alternative C is lower than under Alternative B and impacts are not considered significant, as vegetation would re-establish. Upland areas converted to riparian or wetland habitat would provide beneficial habitat, and upland habitat would still be present in the areas surrounding the pool elevation raise.

Varial Zone

Impacts from Alternative C would be long-term, direct, adverse impact to upland vegetation and riparian vegetation in the varial zone, but the acreage impacted would be less than under Alternative B. Alternative C would impact more than 30% of individual habitat stands of ponderosa pine and riparian herbland map units. Larger stands of ponderosa pine are present in the project vicinity, and the ecological functions provided by this habitat type would still be provided in adjacent habitat stands even if the stands within the varial zone convert to riparian habitats. Riparian herblands may persist in the varial zone even in areas of increased inundation, depending on the frequency, depth, and duration of the inundation, or may migrate upslope. Overall, impacts to the varial zone are not considered significant, as the conversion of upland areas to riparian or wetland habitat would provide ecosystem function and habitat and upland habitat would still be present in the varial zone. The predominant effect of the increased inundation would be the alteration of vegetation based on the increased frequency, duration, depth, and extent of inundation within the area (Water Operations and Hydrology Specialist Report, Appendix B1).

Rim Projects, Roadway Projects, and Borrow Areas

In general, rim projects would be decreased under Alternative C, and some projects would no longer be needed under Alternative C. Borrow areas under Alternative C would be the same as described under Alternative B.

The types of impacts to vegetation from rim projects, roadway projects, and borrow areas would be similar to those described under Alternative B, but the acreages of habitat impacted would differ. As noted in the methodology section of the specialist report, there are some areas along Anderson Ranch Reservoir where inundation overlaps the rim project footprints. In these cases, impacts were calculated as acreage impacted by the rim projects only and not also in the acreages impacted by the proposed inundation in order to avoid double-counting acreage impacts. Impacts under the 3-foot dam raise are generally similar to or lower than those of Alternative B.

The vegetation map units with the most potential acreage to be affected by the rim projects, roadway projects, and borrow areas are the mountain big sagebrush, bitterbrush, and riparian shrubland/deciduous tree map units. Acreages impacted by roadway construction under Alternative C would be lower for the mountain big sagebrush and bitterbrush map units but impacts under both alternatives were less than one acre. Under Alternative C, no impacts would occur to vegetative communities as a result of activities proposed for the Pine Bridge construction under Alternative B, reducing impacts to ponderosa pine and riparian shrubland/deciduous tree map units. Acres of vegetation impacted would also be reduced for other construction and culvert projects under Alternative C. Campground modifications would impact similar or slightly less acreage under Alternative C than under Alternative B.

Although acreages differ slightly between Alternative B and Alternative C, impacts from reservoir rim projects and roadway construction and upgrade projects under Alternative C are expected to be similar to Alternative B: short term and long term, direct, and adverse as a result of removing and disturbing vegetation. Reseeding of areas temporarily impacted would establish herbaceous species within a shorter timeframe, but shrubs and trees would take longer to reestablish. Permanent impacts from roadways and development would be locally significant, but represent minimal acreage in the project area, and would likely not be

significant in the context of habitat provided by the larger project area. In addition, implementation of mitigation and conservation measures would reduce the potential for the introduction of invasive species into area of disturbance within the project area, minimizing impacts from invasive species.

Acreage impacts to vegetation from staging and borrow areas would be similar under Alternative B and Alternative C, with Alternative B resulting in impacts to slightly more acreage of the mountain big sagebrush ponderosa pine, and riparian shrubland/deciduous tree map units. Borrow sites and staging areas would impact more than 30% of a habitat stand of the aspen map unit, but this habitat is still present in the project area vicinity and is an early successional habitat type that may regenerate after disturbance. Impacts would be short term, direct, and adverse during construction, and long term, direct, and adverse once construction had ceased and areas were reseeded with native species, but the re-establishment of vegetation would be in the long-term.

Invasive Species

Similar to Alternative B, soil disturbance from reservoir rim projects and roadway projects has the potential to increase the likelihood of establishing invasive species in the project area. Invasive species can permanently alter habitats and function of ecosystems by changing the species composition and environmental conditions present that can result in potentially adverse impacts. However, the implementation of mitigation and conservation measures including those discussed in the Vegetation Specialist Report (Appendix B6) and included in the Environmental Commitments Section 3.28 under Biological Resources would help to reduce the likelihood of invasive species introduction. Therefore, no significant impacts from terrestrial invasive species from implementing Alternative C are expected.

In-water work under Alternative C has the greatest potential of introducing aquatic invasive species into the project area, but these impacts would be less pronounced than under Alternative B, as less in-water work is proposed. As described under Alternative B, other potential sources of aquatic invasive species spread and are introduced by vehicles and construction equipment. Mitigation and conservation measures as discussed in the Environmental Commitments Section 3.28 under Biological Resources would be implemented to reduce the risk of spreading aquatic invasive species, and as a result, no significant direct or indirect impacts from aquatic invasive species would be anticipated to occur from implementing Alternative C.

3.7.2.3 Cumulative Impacts

The Pine Bridge replacement resulted in one bridge being replaced with another bridge in the same location, and therefore would not have changed the overall vegetation in the area. The Anderson Ranch Dam crest raise was completed on top of the existing dam and would not have impacted vegetation. Therefore, these past projects would not contribute to cumulative effects.

The CCE project proposes an energy and water storage renewable power station; a 100,000-acre-foot reservoir created near the mouth of Cat Creek above Anderson Ranch Reservoir; a pipeline from Anderson Ranch reservoir to CCE reservoir; and wind and solar energy equipment. The South Fork Boise River Diversion Project is a pipeline and pumping station project proposed to be located on the far southeast side of the reservoir toward the dam. A pipeline would carry water to Elmore County, approximately 28 miles to the southwest of the

reservoir. Alternatives B and C would result in permanent loss and/or change in vegetation due to construction and inundation. It can be assumed that the CCE project would also cause loss or change in vegetation from installing a pipeline from Anderson Ranch reservoir to Cat Creek reservoir, construction of the CCE Reservoir, and installation of the and wind and solar energy equipment. The South Fork Boise River Diversion Project would also cause loss or change in vegetation due to installation of a pipeline. However, the analysis of impacts on vegetation from either Alternative B or C was found to be insignificant. Therefore, Alternative B or C would only contribute slightly to the cumulative effects on vegetation in the local area when added to these future projects.

3.7.2.4 Mitigation Measures

Removing vegetation as a result of construction activities at borrow sites, storage areas, along haul roads, and rim projects would impact vegetation. In many cases, clearing these areas would be necessary; additional areas of vegetation could also be impacted by dust or soil compaction.

The following measures would be implemented to manage impacts to vegetation. Please refer to the Vegetation Specialist Report (Appendix B6) and the Environmental Commitments Section 3.28 for a complete list of mitigation measures for vegetation resources.

- Before removing any vegetation for construction activities, a survey would be conducted on the vegetative communities present in each construction area. Removing mature riparian vegetation and other sensitive vegetation would be minimized to the extent possible.
- Staging of construction equipment would be limited to areas specifically identified for use during construction.
- A revegetation plan would be prepared on a site-specific basis to restore native vegetation in all areas impacted immediately after construction is completed. The objectives of the revegetation plan would be to reestablish native vegetation to provide ground cover, minimize opportunities for invasive species to establish; and provide habitat and opportunities for recreation as the site matured. The revegetation plan would include monitoring requirements, performance standards, and success criteria to ensure the areas successfully revegetated.

Riparian vegetation would be replaced through planting and establishment on site. Sensitive plant communities, if present, may be replaced through restoration of comparable native vegetation at other sites, if necessary. Planting saplings and bare root trees and shrubs would decrease the time required for reestablishment because they can more rapidly adapt to new soil conditions.

The Boise and Sawtooth Forest-wide Integrated Weed Management Prevention Plan incorporates management direction from the Forest Plan including guidelines and standards relative to noxious weeds (USFS, 2019). These are incorporated into conservation measures to avoid noxious weeds becoming established or spreading and are further described in the Vegetation Specialist Report (Appendix B6).

3.8 Fisheries

This section describes the existing conditions for fish and aquatic invasive species within the project area and anticipated environmental consequences for the alternatives. Regulatory information, general fish and aquatic species information, and additional methods and analysis are included in the Fisheries Specialist Report (Appendix B7). Threatened and endangered species, such as bull trout, are addressed in the Threatened and Endangered Species Section 3.10.

3.8.1 Fisheries- Affected Environment

The analysis area for fish and aquatic habitat is the general vicinity in and around Anderson Ranch Reservoir, extending downstream along the South Fork Boise River, and including Arrowrock Reservoir. Habitat analyzed for fish include waters within the project area that provide potential fish habitat and areas that may be affected as a result of either the existing Reclamation activities or by future construction activities and water operations related to either action alternative.

The diversity of habitat within the project area supports abundant cold-water aquatic biota consisting of aquatic macroinvertebrates, and both native and introduced fishes, in both the reservoirs and their tributaries, including the South Fork Boise River. In particular, the project area provides a diversity of suitable habitat for fish. These habitats include deep reservoir habitat that provide cold water refugia for native species during most times of the year, shallow shoreline habitat that promotes increased primary productivity and supports a diversity of native and non-native fishes (IDFG, 2019c), and complex riverine habitats in the South Fork, Middle Fork, and North Fork Boise rivers, and additional tributaries entering the system. Habitat in the project area supports a diverse and abundant fish assemblage throughout the reservoirs and their tributaries. IDFG exclusively manages the fishery, including stocking and regulations, in a manner that favors the presence of individual species (Idaho State Statute 33).

Anderson Ranch Reservoir is well known as a kokanee trout (kokanee) (*Oncorhynchus nerka*) fishery. Native fishes including bull trout (*Salvelinus confluentus*), redband trout (*Oncorhynchus mykiss* subspecies), and mountain whitefish (*Prosopium williamsoni*) as well as non-native fish including yellow perch *(Perca flavescens)* and smallmouth bass *(Micropterus dolomieu)* occur in reservoir waters (IDFG, 2019b).

South Fork Boise River, downstream from Anderson Ranch Dam, is a nationally renowned trout fishery and was the first river section in the IDFG Southwest Region to be managed under “trophy trout” regulations. This fishery remains a prime wild trout fishery and is supported by populations of wild rainbow trout and mountain whitefish. Migratory bull trout are present at very low densities as well as native non-game fish including largescale sucker, bridgelip sucker, northern pikeminnow, and sculpin.

The fishery in Arrowrock Reservoir is supported by a combination of stocking and natural production. It includes all species noted above for Anderson Ranch Reservoir as well as northern pikeminnow (*Ptychocheilus oregonensis*), largescale sucker (*Catostomus macrocheilus*), bridgelip sucker (*Catostomus columbianus*), and chiselmouth (*Acrocheilus alutaceus*) (IDFG, 2019b; Butts, 2019), which also occur in Anderson Ranch Reservoir.

Rainbow trout have been consistently stocked in Arrowrock Reservoir since the late 1960s, and more recently (since 2004) kokanee have been stocked (IDFG, 2019b).

Interior redband trout are an Idaho species of concern and a Bureau of Land Management (BLM) and USFS sensitive species (Western Native Trout Status Report, 2018). They have at least three life history strategies (lake dwelling [adfluvial], stream dwelling, and resident) that allow them to occur in Anderson Ranch Reservoir, Arrowrock Reservoir, and the South Fork Boise River (Western Native Trout Status Report, 2018).

Westslope cutthroat trout are listed as a state of Idaho and Federal species of concern by both BLM and USFS and have been proposed for Federal ESA listing in some areas of its range (USFS, 2016). They are known to have occurred in the BNF and have been documented in recent surveys (IDFG, 2019a and IDFG, 2019b) in South Fork Boise River.

Many water bodies in Idaho have aquatic invasive species that can adversely affect aquatic ecosystems, such as the New Zealand mudsnail (*Potamopyrgus antipodarum*) and parasites causing whirling disease. Equipment used to draft, dip, store, or deploy water can be exposed to aquatic invasive organisms. Many of these species are practically invisible to the naked eye and impossible to detect if attached to heavy equipment, vessels, or even the boots of anglers entering Idaho waters. A variety of aquatic invasive species are already identified as occurring in state waters. Some examples include Asian clam (*Corbicula fluminea*), bull frog *(Lithobates catesbeianus*), oriental weather loach (*Misgurnus anguillicaudatus*), and multiple crayfish species (*Pacifastacus* spp.). Fortunately, other aquatic invasive species are not yet known to occur in Idaho and aggressive measures have been put in place to prevent many of these from entering Idaho. Zebra (*Dreissena rostriformis)* and quagga mussels (*Dreissena polymorpha)* have not yet entered Idaho, but 31 boats with mussels were stopped at the border in 2017 and 50 in 2018 (Carlson, 2019).

Additional fish species information, including aquatic invasive species, is included in the Fisheries Specialist Report (Appendix B7).

3.8.2 Fisheries – Environmental Consequences

3.8.2.1 Methods for Evaluating Impacts and Significance Criteria

Impacts to fish and their aquatic habitat were evaluated based on available data and reports relating to the fish community, fish habitat, species spatial distribution, and fish migratory characteristics (time of year and preferred habitat/spawning area). Additional information used in the analysis included spatial geographic information system files related to fish populations, distribution, and migration from IDFG, relevant to the Anderson Ranch Reservoir and associated tributaries that may be impacted by the proposed projects.

Potential short-term impacts were identified if construction activities would temporarily displace fish. Long-term impacts were identified if project components and operational conditions could cause permanent displacement. Adverse impacts were identified if changes would cause fish mortality. Table 13 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for fisheries. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 13. Fisheries impact indicators and significance criteria

Impact Indicator	Significance Criteria
Increase turbidity via erosion (outside of isolated work areas)	Measurably shift existing conditions over the long term or exceed state water quality standards
Increase nutrient and pollutant levels	Results in fish mortality
Disconnect or limit reservoir and tributary connectivity	Permanent disconnection or limitations post-construction
Change in river flows	Not consistent with existing flows or do not meet instream flow requirements for salmonids
Reduce overall reproductive fitness of established fisheries	Directly or indirectly reducing existing fish populations Increased introduction of invasive species Reduce habitat availability and function (including deleterious impacts to the riparian corridor and in-water structure, decreased bank stability, and/or altered flows).

3.8.2.2 Direct and Indirect Impacts by Alternative

Alternative A

The No-Action Alternative represents the baseline scenario of current system storage capacity, operations, and demand levels. Current water management operations of the system would not change so that fishery resources and habitats, as well as existing seasonal barriers to fish passage, within the project area would remain as they are now.

Conditions under the No-Action Alternative could vary from existing conditions based on future changes that may occur regardless of whether action alternatives are implemented. Future actions could include climate variability, other water development projects, land use changes, or municipal development.

Alternative B

Short-Term Impacts – During Construction

In-water construction activities under Alternative B may affect fisheries in the project area until construction is completed. Underwater noise and vibration, releasing sediment into live water (the active reservoir pool), limited habitat access, and other effects associated with the proposed dam raise and rim projects have the potential to adversely affect fish. Construction activities have the potential to displace fish, inhibit use of migratory corridors, and limit access to forage habitat.

Constructing a cofferdam and replacing the spillway, pier, bridge, and ogee crest structure as well as removing and installing radial gates may adversely affect water quality, specifically an increase in turbidity. Changes in water quality would temporarily impact fish within the immediate area. Fish in the project area would be isolated from all in-water work areas during construction activities, except for coffering and coffer removal. Fish in the vicinity during periods of in-water construction activities would likely be displaced and move outside of the area on their own with the onset of noise-generating activities.

Sound waves generated in the water column (as a result of construction activities such as bridge and culvert work) could affect fish in several ways (e.g., altered behavior, physical injury, or mortality). These effects depend on the intensity and characteristics of the sound, the duration, the distance and location of fish in the water column relative to the sound source, the size and mass of the fish, and the fish's anatomical characteristics (Yelverton et al., 1975).

Pile driving would occur in the dry (which would attenuate noise and vibration considerably) and during the designated in-water work window to reduce the potential effects of noise and vibration to fish. Regardless, fish in the area during pile driving have the potential to be adversely affected. Direct effects as a result of underwater noise generated from construction would be short term only while construction is underway. Passage upstream of Pine Bridge would be maintained during construction, and no in-water construction or pile driving would occur during nighttime hours when salmonids may be migrating through the area. However, migration through the area during daylight may be affected as a result of noise during construction (not to exceed 60 days). Construction of culvert modifications at Deer Creek and Fall Creek culverts would restrict access to fish moving up or downstream in Deer Creek and Fall Creek for a period of approximately 30 days in each instance and the total area of isolation required for each culvert would not exceed 16,000 square feet (0.37 acre). Dewatering and work area isolation would be conducted to reduce or eliminate the need for fish handling/salvage. Restricted passage for fish through these areas would limit access to forage either upstream into the creeks or downstream into the reservoir until construction is completed.

Constructing cofferdams to isolate the work area at Anderson Ranch Dam would also reduce forage habitat for fish. At full pool Anderson Ranch Reservoir provides approximately 4,772 acres of open water habitat. The extent of habitat made inaccessible to fish adjacent to the dam in Anderson Ranch Reservoir during construction would not exceed 3,000 square feet or 0.07 acre (which represents only 0.00144% of available reservoir habitat at full pool) located at the spillway crest, and the area would be inaccessible for approximately 51 months. The timing of in-water construction and extent of other suitable habitat in the project area reduces the likelihood that fisheries would be adversely affected as a result of limited habitat access at the dam. Additionally, in-water work at Pine Bridge would limit access to approximately 1,800 square feet (0.04 acre) of riverine habitat along the fringes of both banks of South Fork Boise River for up to 60 days.

In-water construction activities would also release distinct pulses of sediment-laden water that may result in turbidity above background levels for brief periods of time. Increased sediment levels can adversely affect salmonids and their habitat. Turbidity may increase physiological stress, result in physical injury (such as gill abrasion), and potentially displace fish (Bisson and Bilby, 1993). Salmonid avoidance of turbid waters may be one of the most important effects of suspended sediments (Birtwell et al., 1984; Scannell, 1988). Although adult and larger juvenile salmonids can tolerate higher concentrations of suspended sediments (Bjornn and Reiser, 1991), chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Redding et al., 1987; Lloyd, 1987; Servizi and Martens, 1991).

Water quality proximate to in-water work areas in Anderson Ranch Reservoir would be adversely affected over the short term primarily while installing and removing cofferdams

used to isolate construction areas. Once coffered and dewatered, most of the sediment released from construction activities would be contained within isolated work areas. Isolation of in-water work areas in Anderson Ranch Reservoir, in conjunction with other conservation measures as described in the Environmental Commitments Section 3.28, would limit the release of sediment into live water (waters adjacent to isolated work areas and accessible to fish) during construction. However, spillway construction (including installing and removing coffering), roadway construction (including bridge and culvert work), and other infrastructure construction below OHWM would release small pulses of sediment into live water. Release of sediment is anticipated to be primarily contained in isolated areas and to persist for a short time, only during disturbance activities, reducing adverse effects on fish or other aquatic species (such as prey base for fisheries in the project area). Furthermore, sediment or turbidity released during construction activities in Anderson Ranch Reservoir waters would not be expected to exceed background levels beyond 600 feet of the isolated construction areas.

Effects from new road construction also have the potential to extend to hillslopes downstream of the work area and adjacent to the South Fork Boise River when realigning the road to accommodate traffic that currently uses the existing Cow Creek road. Required road construction, maintenance, and/or increased road activity adjacent to South Fork Boise River is also likely to contribute to fugitive dust and release sediment downslope that could be transferred into live water. Effects to water quality as a result of construction activity along the South Fork Boise River would not be anticipated to occur greater than 600 feet downstream of construction footprints and no effects would extend to Arrowrock Reservoir downstream. Conservation measures (see Environmental Commitments Sections 3.28) implemented to reduce the transfer of sediment into water bodies in the project area would minimize these effects but not eliminate them completely.

The project is anticipated to cause short-term increases in turbidity, for a short distance within the water column. The duration, magnitude, and extent of turbidity and fine sediment that may occur under Alternative B may result in adverse effects to fisheries in the project area, if they are present during construction. Sediment and noise generated as a result of these construction activities is not expected to alter tributary connectivity; however, excess turbidity could potentially limit forage area for fish in the project area or reduce their access to prey while construction is occurring. Adverse effect as a result of sediment and turbidity would occur for a short duration and not be anticipated to occur at a level that would measurably shift existing conditions over the long term.

Hazardous spills would be reduced to the extent practicable. To protect water quality from chemical contamination associated with construction under Alternative B, uncured concrete would be separated from flowing water; vehicles and other equipment would be refueled away from standing or flowing water; and spill containment equipment would be available during refueling. The risk of hazardous material adversely affecting fisheries in the project area during construction is considered negligible.

Construction activities have the potential to introduce aquatic invasive species into waters in the project area could have adverse effects to fish and their aquatic habitat. To reduce the spread of aquatic invasive species from contaminated to uncontaminated sources, equipment proximate to waters in the project area would be sanitized and cleaned. Methods to further reduce the spread of aquatic invasive organisms are described in the Environmental

Commitments Section 3.28, which include prevention, cleaning and sanitation, and disposal. Therefore, introducing aquatic invasive species into the project area as a result of construction activity is not expected to occur.

Despite conservation measures and best management practices, short-term adverse effects are expected from construction of the Anderson Ranch Dam raise and associated projects surrounding Anderson Ranch Reservoir (including entering tributaries) as well as along portions of South Fork Boise River that may be influenced by road work and road use. These effects would occur over the short term, until disturbed hillslopes and other lands have stabilized. Outside of isolated work areas, turbidity would not be expected to exceed state water quality standards. Conservation measures as described in the Fisheries Specialist Report (Appendix B7) and outlined in the Environmental Commitments Section 3.28 would be implemented to reduce the potential for sediment and pollutants to enter waters in the project area, reduce underwater noise, and reduce the potential to introduce aquatic invasive species. Sediment and contaminant releases into live water are not expected, and restricted habitat access would not limit migration or significantly inhibit access to foraging activity or the prey base for fish assemblages in the project area. Furthermore, isolated work areas would be restricted to the minimum footprint required and active construction below the OHWM (including pile driving) would not occur during nighttime hours when bull trout are known to typically migrate. Once in-water work is completed no physical or chemical barriers to fish would persist. No fish mortality from construction activities over the short term is expected. Overall, fisheries in the project area would not be significantly affected as a result of construction activities under Alternative B.

Long-Term Impacts – After Construction

Under Alternative B, a 6-foot raise of Anderson Ranch Dam would have insignificant direct effects on the fisheries resources because water management practices would remain largely unchanged. The 6-foot raise would increase the storage capacity of Anderson Ranch Reservoir by approximately 29,000 acre-feet for an active capacity of approximately 442,074 acre-feet. The dam raise represents a 7% increase in the active capacity of Anderson Ranch Reservoir and a 3% increase in system active capacity.

The 6-foot raise of Anderson Ranch Dam and the relatively small increase in storage capacity compared to the total storage of Anderson Ranch Reservoir and the system would have insignificant direct effects on the fisheries' resources. Modeling results of South Fork Boise River stream flow indicate there would be no changes to the ability of Anderson Ranch Dam to continue meeting the minimum flow targets under Alternative B. Daily average flows are projected to be within +/- 50 cfs from October through February, +/- 100 cfs from March through May, and approximately 125 cfs more in early August, compared to existing conditions. Use of the Anderson Ranch Dam spillway would not increase compared to existing conditions, and there would be little change in the annual operating range of Arrowrock Reservoir. Changes to fish habitat, thermal refugia, food cycle dynamics, water quality, or effects on migration corridors and seasonal habitat use are expected to be insignificant based on operations modeling under Alternative B that show water management practices would remain largely unchanged (Appendix F). Future conditions in Anderson Ranch and Arrowrock reservoirs throughout most of the year would continue to provide conditions important for existing fish assemblages. Yearly and seasonal fluctuations in water supply and irrigation demand would continue. However, an elevated pool in Anderson Ranch

Reservoir and altered refill regime into Arrowrock Reservoir (via South Fork Boise River) may improve temporal access to cold water refugia for salmonids in the system and increase seasonal connectivity to tributaries entering Anderson Ranch and Arrowrock reservoirs. During annual periods of warm summer conditions and extreme drawdowns, migration corridors may provide improved access to more favorable conditions, compared to baseline conditions in unregulated portions of the watershed with limiting habitat conditions throughout the year.

Although some long-term impacts to fisheries and their habitat reflective of a managed system would persist under Alternative B, they would not be anticipated to occur at or be elevated to a level of significance in the project area as a result of this alternative. No increased introduction of aquatic invasive species would be anticipated to occur over the long term as a result of Alternative B. Tributary connectivity would be maintained or improved. In-river flows would not be altered outside of the range that currently exists. Existing habitat availability and function would persist, and existing fish populations would not be expected to be measurably affected. Therefore, no long-term significant impacts to fish or other aquatic species under Alternative B are anticipated to occur.

Over the long term, beneficial effects from Alternative B may be realized as a result of an elevated pool in Anderson Ranch Reservoir, extended temporal connection with entering tributaries, and altered refill regime of waters into Arrowrock Reservoir (via South Fork Boise River). In particular, beneficial effects for salmonids and other species are anticipated as a result of regrading and construction activities at Deer Creek and Fall Creek culverts. Once completed the culverts would provide year-round passage into Deer Creek and Fall Creek that currently does not exist at pool elevations when the culverts are perched. Although this additional access to forage habitat in Deer Creek and Fall Creek, as well as other extended temporal access to tributaries entering Anderson Ranch Reservoir (as a result of higher pool elevations under certain conditions) are anticipated to benefit salmonids and other fish, these benefits would likely not measurably shift baseline conditions.

Alternative C

Short-Term Impacts – During Construction

In-water construction activities under Alternative C would affect fisheries in the project area over the short term, in a similar manner as described under Alternative B, until construction is completed. Underwater noise and vibration, releasing sediment into live water, limited habitat access, and other effects associated with construction of the proposed dam raise and rim projects under Alternative C have the potential to adversely affect fish in a similar manner as described under Alternative B. Construction activities have the potential to displace fish, inhibit use of migratory corridors, and limit access to forage habitat.

Constructing a cofferdam and replacing the spillway, pier, bridge, and ogee crest structure, as well as removing and installing radial gates may adversely affect water quality (i.e., turbidity and release of sediment) in the same manner as described above for Alternative B. Additionally, impacts to water quality and passage, as well as from noise/vibration, coffering/area isolation, and introduction of aquatic invasive species as a result of construction and in-water work under Alternative C would be similar to those described under Alternative B. Effects from new road construction and/or contaminants from roadway or other construction as a result of Alternative C would also be similar to those described

above under Alternative B. Short-term impacts from construction at Deer Creek and Fall Creek culverts would also be similar to those under Alternative B.

In contrast to Alternative B, with Alternative C, no work would be required at Pine Bridge. Therefore, effects described under Alternative B specific to Pine Bridge (including temporary limited access to fringe habitat) would not occur under Alternative C. Additionally, the duration of effects as a result of general construction noise and activities would be reduced as a result of the shorter project duration under Alternative C.

Overall, fisheries in the project area would not be significantly affected as a result of construction activities under Alternative C.

Long-Term Impacts – After Construction

Similar to Alternative B, under Alternative C, a 3-foot raise of Anderson Ranch Dam would have insignificant direct effects on the fisheries resources because water management practices would remain largely unchanged. The 3-foot raise would increase the storage capacity of Anderson Ranch Reservoir by approximately 14,400 acre-feet for an active capacity of approximately 427,474 acre-feet. The dam raise represents a 3% increase in the active capacity of Anderson Ranch Reservoir and a 1% increase in system active capacity.

The operation model for the 3-foot dam raise simulated current operational objectives the same as described under Alternative B. The 3-foot raise of Anderson Ranch Dam and the even smaller increase (when compared to Alternative B) in storage capacity compared to the total storage of Anderson Ranch Reservoir, and the system would have insignificant direct effects on the fisheries' resources. The same as with Alternative B, modeling results of South Fork Boise River stream flow under Alternative C indicate there would be no changes to the ability of Anderson Ranch Dam to continue meeting the minimum flow targets under the No-Action Alternative.

Daily average flows are projected to be within +/- 50 cfs from October through February, +/-100 cfs from March through May, and are approximately 125 cfs more in early August as compared to the No-Action Alternative. Similar to conditions with Alternative B, use of the Anderson Ranch Dam spillway under Alternative C would not increase compared to existing conditions, and there would be little change in the annual operating range of Arrowrock Reservoir.

Similar to conditions with Alternative B, changes to fish habitat, thermal refugia, food cycle dynamics, water quality, or effects on migration corridors and seasonal habitat use under Alternative C are expected to be insignificant based on operations modeling that show water management practices would remain largely unchanged (Appendix F). Future conditions in Anderson Ranch and Arrowrock reservoirs throughout most of the year would continue to provide conditions important for existing fish assemblages. Yearly and seasonal fluctuations in water supply and irrigation demand would continue.

As described under Alternative B, an elevated pool in Anderson Ranch Reservoir and altered refill regime into Arrowrock Reservoir (via South Fork Boise River) that would occur under Alternative C is anticipated to improve temporal access to cold water refugia for salmonids in the system and increase seasonal connectivity to tributaries entering Anderson Ranch and Arrowrock reservoirs. During annual periods of warm summer conditions and extreme drawdowns, migration corridors may provide improved access to more favorable conditions,

compared to baseline conditions in unregulated portions of the watershed that provide limited habitat conditions throughout the year. This would be anticipated to occur to a lesser extent under Alternative C (due to the decrease in realized pool elevation and reservoir capacity), than with Alternative B, but to occur to some extent, nonetheless.

Although limited long-term impacts to fisheries and their habitat reflective of a managed system would persist under Alternative C, they would not be anticipated to occur at or be elevated to a level of significance in the project area. Consistent with Alternative B, no increased introduction of aquatic invasive species would be anticipated, tributary connectivity would be maintained or improved, and in-river flows would not be altered outside of the range that currently exists. With Alternative C, existing habitat availability and function would persist, and existing fish populations would not be expected to be measurably affected. No long-term significant impacts to fish or other aquatic species under Alternative C are anticipated to occur.

Over the long term, beneficial effects from Alternative C may be realized as a result of an elevated pool in Anderson Ranch Reservoir, extended temporal connection with entering tributaries, and altered refill regime of waters into Arrowrock Reservoir (via South Fork Boise River). Long-term impacts from construction at Deer Creek and Fall Creek culverts would be the same as Alternative B.

3.8.2.3 Cumulative Impacts

The 2018 construction of the Pine Bridge and 2010 crest raise are well removed in time from the proposed 2025 rim projects and dam construction and is within the same footprint. Any potential direct or indirect impacts from construction of the new Pine Bridge or dam raise would not be additive. No other potential direct or indirect impacts effecting water resources are recognized and no cumulative effects are identified for past actions.

Native fish populations in the project area have been impacted by decades of land use actions that have resulted in disconnected and degraded habitats and introduced competition from non-native species. Adverse effects such as these would continue as a result of water use and land management in the area from existing activities and those that may occur in the future. The CCE and the South Fork Boise River Diversion Project, if implemented, would be anticipated to further affect native fish populations. There is limited information available about these projects, but is assumed for purposes of this analysis that once completed, the projects may adversely affect water quantity, water quality in the analysis area, or introduce sediment, contaminants, or noise into the aquatic environment during construction or in association with operating and managing these projects. For example, reduced flows during high water years in the South Fork River downstream of Anderson Ranch dam (that could result under either of these future alternatives), when combined with the proposed action, would be anticipated to reduce important ecological benefits such as scour and sediment transport that are important to healthy fisheries and their habitat. Without specific project details it is difficult to ascertain the extent of these effects, however depending on the duration and extent of impacts the potential for significant effects to fisheries resources exists based on this cumulative effects analysis.

Impacts as a result of construction activities from the proposed action are temporary and would not continue after construction is completed. Any cumulative effects on fisheries, although not anticipated to be significant based on the details and analysis of the proposed

action, would be dependent on activities developed for construction and operations of the CCE Project and the South Fork Boise River Diversion Project.

3.8.2.4 Mitigation Measures

Under the proposed action, adverse effects to fisheries and their environment (i.e., water quality) have the potential to occur as a result of construction activities. Conservation measures and environmental commitments would be implemented as necessary to minimize potential significant impacts to fish and aquatic resources in the project area. Such measures for fisheries under Alternative B and Alternative C are described in detail in the Environmental Commitments Section 3.28.

3.9 Wildlife

This section describes existing conditions for wildlife within the project area and anticipated environmental consequences for the alternatives. Regulatory information, general wildlife information, and additional methods and analysis are included in the Wildlife Specialist Report (Appendix B8). Threatened and endangered species are addressed in Section 3.10.

3.9.1 Wildlife – Affected Environment

The wildlife analysis area is focused on Anderson Ranch Reservoir and the lower portion of its tributaries, South Fork Boise River immediately upstream of Anderson Ranch Reservoir, South Fork Boise River between Anderson Ranch Dam and Arrowrock Reservoir. Project features includes Anderson Ranch Reservoir rim projects and the Anderson Ranch Dam construction site, borrow areas, laydown areas, contractor staging areas, transportation corridors, including alternative driving routes and detours, and areas of potential noise and light impacts.

The range of vegetation types in the project area provide a variety of wildlife habitats, including wintering and nesting habitat for bald and golden eagles and peregrine falcon. Much of the lower-elevation grasslands and shrublands are important winter range for elk and mule deer, as well as foraging habitat for mountain quail, greater sage-grouse, and introduced turkey and chukar. Mid-elevation forests provide habitat for several sensitive species, including northern goshawk, flammulated owl, and Lewis's and white-headed woodpeckers. Higher-elevation forests provide nesting and foraging habitat for many migratory birds, as well as summer range for mammals such as elk, black bear, and mountain lion. The reservoir itself is home to several year-round and migratory waterfowl, such as merganser, common loon, and Clark's grebe. For a complete list of species, see the Wildlife Specialist Report (Appendix B8).

3.9.2 Wildlife – Environmental Consequences

3.9.2.1 Methods for Evaluating Impacts and Significance Criteria

Impacts to wildlife and wildlife habitat were identified by evaluating habitat that would be inundated or disturbed by the increase in water surface elevation or change in downstream flows in the South Fork Boise River. Additionally, construction activities were identified that might disturb wildlife within the project area. The analysis of impacts to wildlife resources resulting from implementation of the project alternative(s) under consideration is based on review of existing documentation and GIS data that addresses biological resources in or near

the project area. In addition to an on-site visit, Federal and state documentation and both IDFG and USFS species observations were reviewed to determine species likely to be located within the project area and subjected to project actions. USFS and IDFG biologists were consulted for access to pertinent available data sources from recent wildlife surveys performed in the project area. Federal, state, and local agency regulations for species-specific management and protection were reviewed. Impacts are classified as either short term or long term. Short-term impacts are those that would be limited to the duration of project activities (0 to 4 years) and long-term impacts are those that would last past project completion. Mitigation measures were identified that would decrease impacts to wildlife affected by implementing the project alternative(s).

Impacts to wildlife, including mammals, migratory birds, and eagles are indicated by significance criteria that include loss or degradation of habitat due to inundation, decrease in landscape connectivity, altered river flows resulting in loss of habitat access, construction-related disturbances and increase in human activity, and an increase in human activity that would hinder the habitability of the area for wildlife. Significance criteria used to analyze the potential impacts of the project on wildlife resources include factual and scientific information and regulatory standards of federal and state agencies. Table 14 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for wildlife. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 14. Wildlife impact indicators and significance criteria

Impact Indicator	Significance Criteria
Permanent loss or degradation of suitable habitat	Reduction of habitat quality or quantity substantial enough to impact breeding, rearing and/or foraging of species identified as a candidate, sensitive or special status species in local or regional plans, policies, or regulations by the IDFG, USFS, and/or USFWS
Decreased landscape connectivity	Habitat alterations that permanently interfere with the movement of any native resident or migratory wildlife species, disruption of established native resident or migratory wildlife corridors, or impediment of the use of native wildlife nursery sites
Altered river flows resulting in loss of habitat access	Inundation or degradation of riparian habitat as a result of higher water flows; significant reduction in ability for wildlife to access or cross water due to dangerous, high flow conditions
Construction-related disturbance due to noise and human activity	Disturbance, injury, or death of wildlife that could permanently reduce populations of species identified as a candidate, sensitive or special status species in local or regional plans, policies, or regulations by IDFG, USFS, and/or USFWS

Impact Indicator	Significance Criteria
Increase in human activity or disturbance due to project implementation that would hinder the habitability of the area for wildlife	Long-term increase in human activity due to project implementation deterring wildlife from inhabiting the area

3.9.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under Alternative A, the conditions for wildlife populations and habitat would remain as they currently exist because there would be no increase in the Anderson Ranch Dam height or construction of the associated reservoir rim projects, access roads, or facilities. No construction would occur at the dam site and no facilities around the reservoir rim would be relocated to accommodate higher water levels; thus, there would be no construction-related impacts. In addition, operations and maintenance of Anderson Ranch Dam would not change and downstream releases from Anderson Ranch Dam would not change.

Alternative A would not result in significant impacts to wildlife because there would be no project-related loss or degradation of habitat, disturbance to wildlife, or decreased landscape connectivity. Wildlife patterns and trends for habitation would continue as they currently occur. Impacts to wildlife in the area would continue under current habitat stressors, such as invasive species (see Vegetation Specialist Report, Appendix B6) and human activity. Ongoing dispersed camping and day use activities along the reservoir and South Fork Boise River would continue to cause degradation of wildlife habitat and disturbance to wildlife in those areas.

Alternative B

A 6-foot dam raise would include short-term construction-related activities that include an increase in human and vehicular activity and vegetation/tree removal along the reservoir rim. Long-term, the 6-foot surface water elevation increase would inundate an additional 146 acres of land around the reservoir rim at full pool. This would only occur in years with sufficient runoff. The additional area of inundation is approximately a 7% increase in active capacity at Anderson Ranch Reservoir and would last for an estimated 14 additional days (Water Operations and Hydrology Specialist Report, Appendix B1).

Inundation

In years full pool is achieved, both short-term and long-term impacts to wildlife habitat would be expected due to increased inundation. The additional acres that would experience inundation are exclusive to areas along the edge of the reservoir, and along the lower part of tributary streams that enter upstream of the dam. Vegetation would be submerged along the shoreline that provides forage, shelter, and breeding habitat for bird and mammal species. Long term, these areas would be converted from upland areas to wetland areas that provide different functions and habitat. The larger shrub and woody vegetation such as willows and cottonwoods are highly likely to survive the additional 14 days of inundation, during years full pool is achieved (Vegetation Specialist Report, Appendix B6). Herbaceous riparian vegetation would also likely be able to withstand short periods of increased inundation. Other

less flood-tolerant species, particularly conifers, would eventually die with prolonged exposure to water and be replaced with flood-tolerant riparian and wetland vegetation. Shifts in vegetation would occur gradually over time as high-water years are achieved.

Conifer mortality could result in some loss of breeding habitat over the long term for certain bird species that use those trees for nests, such as eagles and northern goshawks. Suitable nearby habitat would be unaffected by inundation and remain available for use by these species. Large tree mortality could, however, benefit other species in the area by creating additional snags available for nesting. Special status species in the project area that nest in tree cavities include the flammulated owl, Lewis's woodpecker, and white-headed woodpecker (National Audubon Society, 2019; USFS, 2020). Fishers also den in hollows of large snags (Schwartz et al., 2013). Townsends big-eared bats and little brown bats roost in snags, although no observations of these species have been documented along the reservoir (IDFG, 2019b; Montana Field Guide). The density of tree species more tolerant of inundation, such as most willow species and cottonwood, could increase in the future and improve breeding conditions for other bird species, as well as foraging for ungulates such as moose. These beneficial impacts would be long term because tree mortality and shifts in vegetation from inundation usually occurs over many years. Long-term adverse impacts to wildlife from inundation would be minor because significant changes in tree species are not expected due to the small area affected.

Adverse impacts to wildlife could occur where foraging habitat or nesting sites for waterfowl or burrowing wildlife are present along currently undisturbed portions of the shoreline. Several sensitive ground-nesting bird species are known to breed adjacent to Anderson Ranch Reservoir shoreline, including Clark's and western grebes, long-billed curlew, sandhill crane, and willet (IDFG, 2019b). These species are listed as a species of greatest conservation need, USFS sensitive, and/or are protected under the Migratory Bird Treaty Act (MBTA). Their nesting seasons are described in Table 5 of the Wildlife Specialist Report (Appendix B8). Common loon has been observed in the area during the spring migration but has not been observed to nest there (USFS, 2020). During the years that achieve full pool elevation following completion of the project, increased reservoir levels would inundate ground nests along the shoreline, causing direct loss of eggs and requiring breeding individuals to expend energy to establish a new nest site. The period of additional inundation would overlap most of the incubation periods for the species identified in the area. Although these impacts are adverse and considered long term per analysis criteria, they are considered minor because nearby suitable habitat is available for foraging and relocation, although competition for food and other resources would increase between displaced individuals and wildlife already using those habitats. Species that nest, burrow, and forage along the shoreline are likely adapt to slight shifts in habitat over time because reservoir fluctuations already occur. Because these species would be able to use nearby habitat, no permanent loss of habitat for waterfowl or burrowing wildlife is expected and impacts are not considered significant.

In summary, increased inundation would not result in a significant impact to the loss or degradation of suitable habitat affecting breeding, rearing, or foraging for any species due to the small spatial extent of habitat effected, the brief period of time habitat would be inundated, and the availability of nearby similar suitable habitat. Impacts would occur along

a relatively narrow strip of shoreline, and some of the affected areas do not contain vegetation or provide wildlife habitat currently.

Construction

Several USFS R4 sensitive wildlife species have been observed in the project vicinity or have the potential to occur (see Wildlife Specialist Report, Appendix B8). Wildlife species that inhabit the area would be impacted by construction and associated activities generally involving heavy equipment and increased traffic. Areas of impacted habitat and wildlife are in the vicinity of the dam and haul roads, borrow and laydown areas, project sites around the rim of the reservoir, and along Cow Creek Road (HD 131) at the proposed alignment. Disturbance from noise, light, and human activity during construction could disrupt foraging, breeding, and nesting activities of wildlife in the project area. Construction activities could also result in injury or death of wildlife that inhabit impacted areas.

Vegetation clearing associated with construction could have direct adverse impacts to nesting of multiple sensitive bird species, particularly those that nest on the ground. Greater sage-grouse and sage thrashers have been observed in upland areas of the project vicinity consisting of sage-steppe habitat, such as HD 131 (IDFG, 2020a; USFS, 2020). Other ground-nesting species of concern are common along the shoreline and tributaries where rim construction projects would occur, including protected resident and migratory birds (see species listed in inundation impacts, above). Direct impacts to ground nesting birds would be short term for the duration of each construction phase; however, it takes some time for habitat recovery following restoration efforts once the project is complete and resulting indirect impacts could be long term. Disturbance could cause abandonment or destruction of nests and the death of offspring, which could result in reduced populations, as well as injury or mortality to breeding individuals. Because of this, impacts to breeding habitat could be potentially significant; however, impacts would be reduced by requiring that vegetation removal and other disturbances take place outside of the breeding and nesting season. It could be reasonably assumed that birds would avoid the newly cleared area and utilize other suitable habitat nearby. Surveys would be needed ahead of any construction activity to confirm there are no active nests or leks that would be disturbed, and to apply appropriate mitigation measures if they are found active in areas of impact (which includes 2-mile buffer zones for greater sage-grouse leks). Compliance with the Boise Forest Plan, USFS 2015 Greater Sage-grouse Final EIS, and MBTA would be required to minimize impacts (see Wildlife Specialist Report, Regulatory Framework, Appendix B8).

Columbia spotted frogs occur below the dam along the South Fork Boise River. Breeding occurs within ponds at borrow pits proposed for use as a part of this project. Populations also occur along several of the tributaries that feed into Anderson Ranch reservoir where road or facilities modifications are proposed, including Fall Creek, Evans creek, and Wood Creek (USFS, 2020). The proposed project would have direct adverse impacts to Columbia spotted frogs by either removing breeding habitat or direct mortality possibly during the breeding period causing loss of all age classes. This could result in reduced populations; therefore, these impacts could be potentially significant for this species. As stated in the Boise Forest Plan, mitigation measures are necessary if actions would disrupt reproductive success for this species. Impacts would be reduced by either a seasonal restriction for construction activities, or by clearing the site all through the breeding season with surveys.

Spotted bats have been observed in the South Fork Boise River canyon near Danskin Bridge (USFS, 2020). Although formal surveys have not occurred yet for this area, they are believed by BNF biologists to have a high likelihood for presence throughout the canyon. Damage to roosting habitat could occur if any removal of rock outcrops is required for construction projects or staging areas, some of which is proposed for realignment of HD 131. Due to the limited areas where this activity is proposed, potential impacts to spotted bats would be relatively minor so are not considered significant; however, these impacts could be reduced even further or eliminated by performing surveys for presence of roosting bats at any areas requiring rock removal or blasting.

Large tree removal is required at Curlew Creek, Evans Creek, and Fall Creek Boat Ramp to facilitate improvements required to accommodate the increased reservoir elevation (see Recreation Section 3.16). The trees would be replaced in number and type; however, habitat for bird species reliant on the higher canopy would be adversely impacted while the new saplings grow over many decades. Sensitive and/or protected species frequently observed in these areas that utilize this habitat include bald and golden eagles, flammulated owls, Lewis' and white-headed woodpeckers, among many other resident and migratory birds (USFS, 2020). Areas to be cleared have no reported eagle nesting sites (IDFG, 2020a), but surveys would be needed verify that these large trees are not occupied nest sites of other protected bird species. As long as there are no active nesting sites present, removal of these trees is not anticipated to be a significant long-term impact because suitable large tree canopy habitat would remain within the immediate vicinity.

Around the reservoir rim, construction at the various sites is staggered, which would reduce impacts to wildlife. Additionally, the average length of construction at each site is projected to be approximately 30 days, with exception of a few sites requiring more intensive work (6-foot Dam Raise Engineering Summary, Appendix C). The longest duration is expected at Pine Bridge, which is estimated around 90 days. During these periods of construction wildlife is likely to avoid these areas; however, alternate nearby habitat would be available and many of these sites are recreation facilities where human activity already deters sensitive wildlife presence. Due to the staggered timing and short duration of rim construction projects, these impacts would be short term and are not expected to reduce populations of sensitive species in the area.

The longer duration of construction activity at the dam site would have an adverse impact on wildlife by deterring them from occupying the area for approximately 47 months. This area is not generally considered high-quality habitat for many sensitive wildlife species, although some do occur in the area. Moose, bears, wolves, and bats have all been observed in the vicinity of the dam, as well as several protected bird species (IDFG, 2020a; USFS, 2020). These animals are likely to avoid areas under construction with higher levels of human activity. Many of these species have ample range outside the project area, and there would be suitable habitat available downstream or further from the dam along the shoreline and tributaries. Impacts to these species would be short term and would not be expected to result in population declines, and therefore not significant. There is, however, a large amount of eagle activity in the area, with an occupied bald eagle nest documented about a quarter mile from the dam that could be impacted by construction activities (USFS, 2020). With the availability of nearby large trees for alternative nesting sites, this disturbance would not likely impact their ability to maintain their territory or result in overall population reduction,

so impacts would not be considered significant. However, since they are protected under the Bald and Golden Eagle Protection Act, any activity causing disturbance to nesting eagles requires consultation with USWFS and an application for an incidental take permit.

While construction-related disturbances would be sustained for the duration of the project, Alternative B includes no increase in facility capacity that would encourage an overall increase in human activity in or around the reservoir or the South Fork Boise River. However, recreation use has been increasing at Anderson Ranch Reservoir and along the South Fork Boise River. Restrictions to recreation facilities or other activities as a result of temporary access closures, including day use and dispersed camping, could concentrate human activity in previously less-disturbed areas or lead to new unauthorized use (see Recreation Special Report, Appendix B15). This could result in unanticipated adverse impacts to wildlife in the project area. Disturbance directly related to Alternative B is associated with construction, and human activity levels would be expected to return to normal use trends after project implementation.

In summary, construction associated with Alternative B would have short-term and long-term adverse impacts to wildlife. These adverse impacts could be potentially significant for certain species, including greater sage-grouse and Columbia spotted frogs; without mitigation, there is a likelihood that actions would result in loss of breeding habitat, disruptions during breeding and nesting season, and/or direct mortality of individuals. Impacts to these species would be addressed through compliance with USFS and USFWS regulations, as well as mitigation measures implemented prior to and during construction. Mitigation would reduce these impacts to less than significant so long as disruptions to breeding and direct mortality are avoided.

Habitat Connectivity

Alternative B would not modify the landscape such that it would permanently disrupt wildlife movement within the project area. Project design features are all associated with current developed facilities and roads around the reservoir rim and at the existing dam. Areas cleared of vegetation would be restored after construction is completed, so would not result in permanent disruptions in habitat connectivity. There would, however, be short-term adverse impacts to wildlife movement for the duration of the project.

During the approximate 47-month construction period, reservoir levels would be lowered for 42 months due to operational restrictions associated with the required cofferdam. This may cause a short-term moderate adverse effect on wildlife breeding, rearing, or foraging on or near the shoreline. Mammals such as elk, mule deer, moose, and black bear maintain ample upland browsing and foraging habitat away from the edges of the reservoir and in tributaries where additional water sources are available. Downstream minimum flows would be met, maintaining habitat along the South Fork Boise River during construction, and riparian habitat upstream of the reservoir would remain unaffected. Post-construction, water operations would be restored to historical regimes with no change to existing habitat expected.

Riparian areas along the South Fork Boise River serve as an important movement corridor for wildlife. Riparian habitat provides cover for migration, breeding, and foraging, and a place to escape predators. Construction activities for approximately 47 months at the dam site, and nearby borrow areas on HD 121 along the river, have the potential to disrupt

movement from the lower South Fork Boise River to upstream of the reservoir through these riparian areas or across the dam. Also, construction projects around the reservoir could also disrupt movement along the shoreline, as well as to and from tributary streams and the upper South Fork Boise River.

The South Fork Boise River is important winter range for many species of concern, including mule deer, elk, and eagles (USFS, 2020). Migrating deer and elk utilize these areas from roughly November to May when deeper snowpack pushes them down from higher elevations. There are seasonal closures to protect wintering wildlife, including motor vehicle restrictions on the lower South Fork Boise River near the proposed detour across Cow Creek Bridge, and along the northeast portion of the reservoir along HD 61 (IDFG, 2020b). Construction-related activities and traffic below the dam, as well as increased vehicle traffic using the detour to Cow Creek Bridge, could adversely impact these species during the sensitive winter months when foraging becomes more difficult and access and suitable habitat becomes crucial for survival (IDFG, 2019c; Lendrum et al., 2013). Providing year-round maintenance of the proposed detour would also increase the risk of more vehicle collisions from higher than average traffic along HD 131, which isn't normally maintained during the winter. Construction proposed in the late fall and winter months to avoid disruptions to recreation at Curlew Creek, Fall Creek, and Elk Creek, could also adversely impact wildlife that is moving through those areas during the winter. Snow levels during some of the critical winter months would be expected to limit construction and related vehicle travel; therefore, no impacts would occur during those months. Impacts to winter range would be short term for the duration of the project, and activity levels during the winter would be expected to return to normal use under current seasonal restrictions.

In summary, these moderate adverse impacts would be short term for the duration of construction phases and would not permanently interfere with the movement of any native resident or migratory wildlife species; therefore, impacts to habitat connectivity from Alternative B are not considered significant.

Alternative C

Wildlife impacts are similar for Alternative B as Alternative C, but with 50% less acreage of additional inundation and a shorter duration of construction. The overall project duration, including detour route use and reservoir restriction, would be approximately 7 months less under Alternative C compared to Alternative B.

Inundation

Impacts from inundation under Alternative C would be similar to those described for Alternative B, except that less acres of shoreline and riparian habitat would experience an increase during years full pool is achieved. Increased inundation would not result in substantial loss or degradation of suitable habitat affecting breeding, rearing, or foraging for any species due to the small spatial extent of habitat effected, the brief period of time habitat would be inundated, and the availability of nearby similar suitable habitat. Impacts from inundation are not considered significant.

Construction

Impacts to wildlife from construction disturbance would be similar for Alternative C as described for Alternative B, but with a shorter duration of project construction and fewer

road modifications required to accommodate a full pool elevation of 4199 feet. Still, Alternative C could also result in potentially significant impacts. Habitat loss as a direct result of construction would occur where ground disturbance is required, including borrow pits that are currently used as breeding areas for amphibians during the wet season. Disturbance from noise, light, and human activity during construction could disrupt foraging, breeding, and nesting activities of sensitive wildlife in the project area. Construction activities could also result in injury or death to wildlife that inhabit impacted areas through vegetation clearing and tree removal, or vehicle collisions from increased traffic. Compliance with management regulations for sensitive and/or other species of concern would be required to mitigate impacts to these species and their habitat. Suitable habitat would remain within the immediate vicinity, and restoration of native plants would occur after completion. Alternative C does not propose to modify the landscape such that it would permanently disrupt wildlife movement within the project area, and downstream riparian habitat would not be altered through adherence to minimum flow requirements.

In summary, Alternative C would have short-term and long-term direct adverse impacts to wildlife. These adverse impacts could be potentially significant; without mitigation, there is a likelihood that actions would result in loss of breeding habitat, disruptions during breeding and nesting season, and/or direct mortality of species of concern. Compliance with USFS and USFWS regulations, as well as minimization measures implemented prior to and during construction, would reduce these impacts.

Habitat Connectivity

Impacts to habitat connectivity would be similar for Alternative C as described for Alternative B, but with a shorter duration of project construction and fewer road modifications required. Like Alternative B, Alternative C would not modify the landscape such that it would permanently disrupt wildlife movement within the project area. During the approximate 40-month construction period, reservoir levels would be lowered for 35 months due to operational restrictions associated with the required cofferdam. This would have the potential to disrupt movement from the lower South Fork Boise River to upstream of the reservoir through these riparian areas, as well as seasonal migrations to winter range. Construction projects around the reservoir would also disrupt movement along the shoreline, and to and from tributary streams and the upper South Fork Boise River; however, a raise of Pine Bridge is not required for Alternative C, removing this impact from disturbance to movement along the South Fork Boise River north of the reservoir. These moderate adverse impacts would be short term for the duration of construction phases and would not permanently interfere with the movement of any native resident or migratory wildlife species; therefore, impacts to habitat connectivity from Alternative C are not considered significant.

3.9.2.3 Cumulative Impacts

The proposed 2025 dam construction date is well removed in time from the 2018 installation of the newly replaced Pine Bridge and the 2010 construction of the security berm along the dam crest. Any potential direct or indirect impacts to wildlife from the proposed Pine Bridge construction or dam raise would not be additive; therefore, no cumulative impacts to wildlife are identified for these past actions.

It can be assumed that the CCE project would cause disturbance to wildlife and habitat loss as a result from construction of a pipeline from Anderson Ranch reservoir to Cat Creek reservoir, construction of the reservoir, and installation of the wind and solar energy equipment and related facilities. The South Fork Boise River Diversion Project would also cause disruptions to wildlife due to installation of a pipeline. These projects would impact wildlife through the removal of additional vegetation, displacement, breeding interference and/or direct mortality from construction activities. Wind turbines could result in injury or mortality of migratory and other sensitive resident birds discussed for the proposed Alternatives.

Minor disturbances to wildlife would occur during construction of the proposed Alternatives at Anderson Ranch and would cause minor losses of habitat along the shoreline area from inundation and vegetation clearing. Impacts to most species are not considered significant, although would contribute to an overall trend of reduced habitat within the region. There are, however, impacts to certain species, namely greater sage-grouse and Columbia spotted frogs, that have been identified as being potentially significant unless mitigation measures are properly implemented. If greater sage-grouse or spotted frogs that occupy habitat near or within the construction zones of CCE or South Fork Boise River Diversion were to be disturbed during breeding or suffer direct mortality from either or both projects, these impacts could contribute to the overall decline of this species in the region. In combination with impacts on wildlife from CCE and South Fork Boise River Diversion projects, the proposed Alternatives would cumulatively impact wildlife in the Boise River basin. All future projects would be expected to require compliance with the same federal and state laws and wildlife management regulations as are required for the proposed Alternatives, with similar mitigation to prevent significant impacts to sensitive species such as greater sage-grouse. Any cumulative effects on wildlife, although not anticipated to be significant, would be dependent on activities developed for construction and operations of the CCE Project and the South Fork Boise River Diversion Project.

3.9.2.4 Mitigation Measures

Potentially significant impacts as a result of the proposed alternatives are identified for several species of concern because actions could disrupt breeding populations and therefore conflict with USFS regulatory standards and guidelines. Compliance with Boise Forest Plan and USFS 2015 Greater Sage-grouse Final EIS would require mitigative actions prior to and during construction to minimize impacts to these species. Pre-construction surveys would confirm presence or absence of sensitive species prior to ground disturbance and tree removal. Seasonal restrictions during breeding and nesting seasons would be required, as well as spatial buffers. For greater sage-grouse, restrictions for disturbance are during breeding and nesting season (March 1 to June 15), and within 2 miles from the perimeter of active leks during lekking (from March 1 to April 30) from 6 p.m. to 9 a.m. Columbia spotted frogs breed during a short, 2-week window anywhere from early April to early June, so survey efforts would need to be ongoing during construction if it takes place during those months within known breeding habitat. Minimization measures would be applied during construction to reduce impacts to sensitive species and other species of conservation concern. Consultation with USFWS would occur to obtain an incidental take permit for disturbance to the eagles nesting near the dam. Additional mitigation measures and information is included

in the Wildlife Specialist Report (Appendix B8) and the Environmental Commitments Section 3.28.

3.10 Threatened and Endangered Species

This section describes existing threatened and endangered (T&E) resources that occur, or could potentially occur, within the project area and anticipated environmental consequences for the alternatives. Regulatory information, general species information, life history and habitat requirements, and species status information is included in the Threatened and Endangered Species Specialist Report (Appendix B9).

3.10.1 Threatened and Endangered Species – Affected Environment

The project area relating to both action alternatives refers to the general vicinity in and around Anderson Ranch Reservoir extending downstream to the extent of Arrowrock Dam, via the South Fork Boise River. T&E resources analyzed include all lands and/or waters within the project area that provide potential habitat for listed species, and their designated critical habitat that may be affected as a result of either the existing operation of Reclamation activities or by future construction activities and water operations related to the action alternatives.

T&E species identified by USFWS that are known or expected to occur in Elmore County, Idaho, and may be affected under Alternative B and Alternative C include three federally listed species, one species proposed for listing, and one candidate species (Table 15). Critical habitat for bull trout occurs in the project area.

Table 15. USFWS federally listed species potentially occurring in the project area

Species (DPS)	Listing Status	Critical Habitat in Project Area
Yellow-billed Cuckoo (YBCC)	Threatened: October 2014 (79 FR 59991)	No
Canada Lynx (*Lynx canadensis*)	Threatened: March 24, 2000 (65 FR 16052)	No
North American Wolverine	Proposed Threatened: August 2016 (81 FR 71670)	No
Whitebark Pine	Candidate: July 19, 2011 (76 FR 42631)	No
Bull Trout	Threatened: June 10, 1998 (63 FR 31647)	Yes

DPS = distinct population segment
FR = *Federal Register*

Habitat descriptions for each species are described in detail within the Threatened and Endangered Species Specialist Report in Appendix B9. The terrestrial environment in the project area is a mix of developed and un-developed areas at an elevation ranging from 4100

to 5000 feet above sea level (asl). Habitats include coniferous forest, mixed coniferous-deciduous forests, shrublands, open sagebrush steppe, and semiarid uplands. Riparian vegetation is found along the tributaries to Anderson Ranch and Arrowrock reservoirs and scattered around the edge of both reservoirs. South Fork Boise River below Anderson Ranch Dam has a well-developed, but not contiguous, riparian zone interspersed with upland grassland and sagebrush. The project area elevation ranges from 4100 feet to 5000 feet, well below the 7300 feet typically associated with whitebark pine, therefore, this species is not expected to occur in an ecologically functional density within the project area.

Aquatic habitat includes Anderson Ranch Reservoir, the South Fork Boise River, and Arrowrock Reservoir as well as their associated tributaries. A description of Anderson Ranch Reservoir, its operations (as guided by applicable Biological Opinions) and subsequent seasonal flow regime in the South Fork Boise River are described in the Threatened and Endangered Species Specialist Report in Appendix B9. In general, the project area provides a diversity of suitable habitat for bull trout to forage, migrate, and overwinter. Habitats include deep reservoir habitat that provides cold water refugia for bull trout during most times of the year, shallow shoreline habitat that promotes increased primary productivity and supports a diversity of prey fishes (IDFG, 2019a), and complex riverine habitats in the South Fork, Middle Fork, and Nork Fork Boise rivers, and additional tributaries entering the system. This diversity of habitat supports an abundant food base consisting of terrestrial organisms, aquatic macroinvertebrates, and forage fish in both the reservoirs and their tributaries, including the South Fork Boise River.

Anderson Ranch Dam does not have fish passage capability; however, bull trout above and below the dam have access to spawning habitat. Downstream of Anderson Ranch Dam, bull trout populations can move freely from Arrowrock Reservoir up into the Middle and North Fork Boise rivers to spawn, as well as the South Fork Boise River (to the extent of the Anderson Ranch Dam) to forage and overwinter (Salow and Hostetler, 2004). Connectivity to tributaries entering the reservoirs is maintained under most conditions.

Reclamation has coordinated with the NOAA Fisheries because its proposed action could potentially affect flow conditions downstream of the Boise River System and, as a result, anadromous salmonids. As described in NOAA 2008 Upper Snake River BiOp, and as mandated by the 2004 Snake River Water Rights Act of 2004, Reclamation is required to provide water for downstream ecological needs, specifically to benefit migrating salmon and steelhead, known as “flow augmentation water” or flow augmentation. Based on Reclamation's analyses, no change is anticipated in Reclamation’s ability to meet flow augmentation requirements. Additionally, Reclamation engages in routine coordination with NOAA Fisheries, as part of existing requirements, through which the need for appropriate actions under the Endangered Species Act are determined.

Separate from flow augmentation requirements, Reclamation works with NOAA Fisheries and the Columbia River TMT to coordinate flow releases from the upper Snake River basin with flows across the Columbia River system (NOAA, 2008). The TMT, an interagency team with representatives from over 20 organizations, uses flow objectives calculated at LGD and water forecasts across the Region to balance seasonal water availability to benefit migrating salmon and steelhead. Flow objectives at LGD vary between 85,000 cfs and 100,000 cfs (depending on water supply forecasts) during the spring period (April 3 – June 20); however, currently there is a priority toward more flow during April and May to benefit early

migrating salmon that are experiencing lower return rates than later migrating stocks. The flow objective is measured as the season average of the discharge at LGD between the planning dates of April 3 to June 20. These flow objectives are provided as a biological guideline and will likely not be met throughout the entire migration season in all years because the flow in the Snake River primarily depends on the volume and shape of the natural runoff, while the augmentation volumes available are small in comparison to the overall objective. Flow in the Snake River during this period is supported in part by flow augmentation water from the upper Snake River.

3.10.2 Threatened and Endangered Species – Environmental Consequences

3.10.2.1 Methods for Evaluating Impacts and Significance Criteria

Potential habitat for listed T&E species and their critical habitat within the project area were analyzed. Expected presence of listed T&E species was based on habitat suitability, known or anticipated occurrence of individuals, and available literature. Identification of potential impacts to listed T&E species that may occur as a result of the action alternatives, and/or the no action alternative, focuses on areas temporarily or permanently disturbed by construction activities. These include new infrastructure both at the dam site or peripheral areas such as new bridges or campgrounds, and all upstream and downstream waters, to and including Arrowrock Reservoir, that would be directly or indirectly affected, to the extent to which noise and other activities associated with construction would occur.

Any identified shift from existing conditions to anticipated conditions as a result of project alternatives, and O&M activities that would be required once project construction is completed forms the basis of analyses. This includes all areas that would be affected by either the existing operation, proposed construction activities, or by future water operations and anticipated conditions related to any of the action alternatives.

Impacts to listed T&E species were determined relative to the following.

1. Potential suitable habitat is directly or indirectly removed, modified, disturbed, or destroyed due to implementation of project alternatives.
2. Designated critical habitat as identified by USFWS is directly or indirectly removed, modified, disturbed, or destroyed due to implementation of project alternatives.

Implementation of project alternatives would be anticipated to directly or indirectly impact individual listed T&E species. Potential short-term impacts were identified if construction activities would temporarily displace T&E species. Long-term impacts were identified if project components and operational conditions could cause permanent displacement. Adverse impacts were identified if changes would cause T&E species mortality. Table 16 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for threatened and endangered species. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 16. Threatened and endangered species impact indicators and significance criteria

Impact Indicator	Significance Criteria
Population reduction	Result in the "take"[1] of any listed T&E species to the extent that it would reduce existing populations to the extent that it would "jeopardize the continued existence"[2] of that species.
Modify or destroy designated critical habitat	"Adversely modify or destroy designated critical habitat"[3] (i.e., migration, breeding, rearing, forage, refuge, or other important life history stage or habitat requirement).

1 As defined under ESA, to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct; may include significant habitat modification or degradation if it kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering.
2 As defined under ESA, to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species.
3 As defined under ESA, a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species.

Reclamation evaluated impacts of the proposed action to anadromous salmonids using two methods: 1) Change in flow volume at LGD and 2) Potential impacts to salmon survival caused by changes to flow.

Evaluating impacts to LGD flow objectives was performed by analyzing the change in volume at LGD that could be influenced by the proposed action. Reclamation believes this method allows the most direct analysis because of the multitude of variables influencing flow along the approximate 332 river miles between Anderson Ranch Dam and LGD. For example, releases from Anderson Ranch Dam, after leaving the Boise River system, flow through three other reservoirs that are independently operated before reaching LGD making it unlikely that the entirety of the impacts from the proposed action would be realized at one time or consistently over time. Additionally, empirical measurements of flow parameters, at the scale of the proposed action, would be within the range of instrument error and not able to provide reliable qualitative comparisons, therefore, Reclamation calculated change in volume at LGD using quantitative modeling over a 50-year simulation period spanning 1958 through 2008.

Evaluating potential impacts of flow on salmon survival was performed by analyzing relationships between flow and commonly used metrics for salmon survival. Quantitative modeled data was used to identify potential correlative effects from changes in flow at LGD to smolt survival from LGD downstream to the confluence of the Snake and Columbia rivers (approximately 107 river miles). Relationships between flow and salmon survival rates were developed using data provided by NOAA Fisheries for the Columbia River System Operations EIS (unpublished data), these data were derived from the Comprehensive Passage (COMPASS) model to predict the effects of Snake and Columbia River dams on salmon survival rates. Migration speed was chosen as the metric to evaluate because it was most directly affected by flow and showed a strong correlation in the analyses. A secondary metric, travel time, was correlated with flow but not as strong as migration speed. Travel time estimates were summarized to provide insight to changes in how fast a smolt would move through the system. Data from the preferred alternative was used to define relationships between flow and migration speed to simulate expected migration speeds at various flow experience levels.

For purposes of comparison, the full volume of additional storage (29,000 AF Alternative B or 14,400 AF Alternative C) was calculated as if it were all retained over a ten-day period upstream of LGD, and thus lowering flows. The period of ten-days was chosen because it is approximately the mean travel time of Spring Chinook salmon smolts from LGD to the confluence of the Columbia River under the No-Action Alternative. This calculation led to the assumption that river flows would be about 1,462 cfs (Alternative B) or 726 cfs (Alternative C) lower per day than under the No-Action Alternative for the duration of an individual smolt's migration time. This is a worst-case scenario; more likely the volume of water would be stored over a much longer time period and the actual flow experience of an individual smolt would be closer to the No-Action Alternative, making the effect undetectable.

3.10.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Current conditions would continue under Alternative A. There would be no additional short-term or long-term adverse effects to T&E resources resulting from Alternative A other than those that occur under existing conditions. No effect on yellow-billed cuckoo (YBCC), Canada lynx, North American wolverine, and whitebark pine would occur under the No-Action Alternative.

Current and ongoing effects related to habitat, water temperature, and passage would largely persist. However, the extent of these effects may be slightly exacerbated as a result of shifting hydrologic regimes due to climate change (Climate Variability Section 3.13).

Overall, the extent and quality of habitat for T&E resources would not change under Alternative A. There would continue to be effects (consistent with existing conditions) on bull trout because baseline conditions would be for the most part maintained. No significant impacts to listed T&E species under the No-Action Alternative would be anticipated to occur. See the Threatened and Endangered Species Specialist Report (Appendix B9) for additional information regarding existing Biological Opinion criteria implementation.

Alternative B

Short-Term Impacts – During Construction

Under Alternative B, short-term effects would occur from construction required to raise the dam 6 feet and from construction of other required infrastructure.

Canada Lynx, Whitebark Pine, Yellow-billed Cuckoo, and North American Wolverine

Construction activities under Alternative B would have negligible effects on Canada lynx and whitebark pine.

No records of Canada lynx sightings are known for the project area (IDFG, 2019b). The project area does not provide habitat suitable for Canada lynx to use as core or denning habitat. No habitat exists for its main prey species (snowshoe hare and red squirrel). There is no suitable dispersal corridor habitat. No Canada lynx are expected to occur in the project area.

No ecologically functional density of whitebark pine has been identified within the project area. Furthermore, no whitebark pine are expected to occur in the project area, and there would be no effect to whitebark pine as a result of Alternative B.

Although YBCCs have been seen near the project area and may fly through it, they are unlikely to breed and nest there. Based on Google Earth imagery, there are approximately 75 acres of suitable habitat upstream and downstream of the Pine Bridge. The area provides habitat for foraging and may provide resting habitat during migration. Noise associated with construction has the potential to displace YBCC that may be using the area for forage or resting habitat during active construction periods or hinder use of the area by any individuals that may fly through the area. This however would not be anticipated to occur at a level that would significantly affect YBCC in the project area, and displacement of individuals or hinderance of use would not persist after construction is completed. The potential for short-term adverse effects to YBCC from construction activities is considered negligible, and effects that may occur would be anticipated to be short-term and minor. YBCC would not be significantly affected as a result of construction activities under Alternative B.

North American wolverine are known to occasionally occupy habitat near the project area (IDFG, 2019d). Although not common, when North American wolverines are present in or near the project area, they may be disturbed by the noise and lights of construction activity. The project area does not support denning or rearing habitat. The project area may include migration corridors and dispersing juveniles or migrating adults would likely avoid construction areas during periods when activities are occurring or may pass through at night. Individuals that may move through the project area could encounter construction activity but not at a level that would be anticipated to result in adverse effects. Affects to North American wolverine as a result of construction activities under Alternative B would be negligible.

Bull Trout and their Critical Habitat

In-water construction activities under Alternative B may adversely affect bull trout and their critical habitat over the short term until construction is completed.

Underwater noise and vibration, release of sediment into live water, limited habitat access, and other effects associated with construction of the proposed dam raise and infrastructure (such as staging areas, roads, bridges, culverts and campgrounds) have the potential to adversely affect bull trout. Construction activities have the potential to displace fish, inhibit use of migratory corridors, limit access to forage habitat, and, although considered unlikely, result in direct mortality to bull trout that may occur in the construction area during certain construction activities.

Conservation measures in place to reduce the potential for sediments and contaminants to enter live water, as well as mitigate underwater noise, would reduce the potential for significant adverse effects to life stages of bull trout or their critical habitat which may occur during the short term as a result of construction activities under Alternative B (Threatened and Endangered Specialist Report, Appendix B9; Environmental Commitments Section 3.28). Furthermore, isolated work areas would be restricted to the minimum footprint required and active construction below the ordinary high-water mark (including pile driving) would not occur during nighttime hours when bull trout are known to typically migrate.

Direct effects as a result of underwater noise generated from construction would persist over the short term while construction is underway. Passage upstream of Pine Bridge would be maintained during construction, and no in-water construction or pile driving would occur during nighttime hours when bull trout may be migrating through the area. Movement through the area during daylight hours may be affected as a result of noise during construction (not to exceed 60 days).

At full pool Anderson Ranch Reservoir provides approximately 4,772 acres of open water habitat. The extent of habitat made inaccessible to bull trout adjacent to the dam in Anderson Ranch Reservoir during construction would not exceed 3,000 square feet or 0.07 acre (which represents only 0.00144% of available reservoir habitat at full pool) located at the spillway crest, and the area would be inaccessible to bull trout for approximately 42 months. The timing of in-water construction and extent of other suitable habitat in the project area reduces the likelihood that bull trout would be adversely affected as a result of limited habitat access at the dam. Additionally, in-water work (anticipated to be 60 days of the total 4-month construction period) at the Pine Bridge would temporarily limit access to approximately 1,800 square feet (.041 acre) of riverine habitat along the fringes of both banks of South Fork Boise River. Passage through the area would be maintained throughout the 60 day in-water work period. Construction at Deer Creek and Fall Creek culverts would restrict access to bull trout moving up or downstream in Deer Creek and Fall Creek for a period of approximately 30 days in each instance and the total area of isolation required for each culvert would not exceed 16,000 square feet (0.37 acre). Dewatering and work area isolation would be conducted to reduce or eliminate the need for fish handling/salvage. Although neither of these tributaries provide suitable habitat for spawning, restricted passage for bull trout through the areas would limit access to forage either upstream into the creeks or downstream into the reservoir until construction is completed.

Overall, the release of sediment and contaminants into live water would be minor, and restricted habitat access would not limit migration or significantly inhibit access to foraging activity or the prey base for bull trout. In turn, impacts as a result of construction activities under Alternative B would be anticipated to be short-term and minor and not significantly affect bull trout or their critical habitat in the project area.

Anadromous salmonids

Under Alternative B, there would be no additional short-term effects to either the population or critical habitat other than those that occur under existing conditions.

Long-Term Impacts – After Construction

No long-term effects to listed T&E species related to construction activities under Alternative B are anticipated.

Canada Lynx, Whitebark Pine, and North American Wolverine

No long-term impacts related to O&M under Alternative B have the potential to adversely affect listed terrestrial T&E species in the project area. Furthermore, no long-term significant impacts to listed terrestrial T&E species under Alternative B are anticipated to occur.

Yellow-billed Cuckoo

The primary cause for the decline of YBCC populations in the western United States is riparian habitat loss, degradation, and fragmentation. Western YBCC breed in large blocks of riparian habitat (larger than 212 acres and at least 328 feet wide), particularly woodlands with cottonwoods and willows (78 *Federal Register* [FR] 61621). There are no riparian areas of this size in the project area. Of the approximate 75 acres of suitable foraging and migratory habitat, up to 30 acres of this habitat would be seasonally inundated at the proposed full pool elevation of 4202 feet. The loss of riparian habitat (as a result of inundation under future conditions), although expected to be small, has the potential to further degrade existing terrestrial habitat conditions over the long term and reduce available habitat to YBCC that may be migrating through the area. Lost habitat over the long term as a result of Alternative B is considered minor would not be anticipated to occur at a level that would significantly affect YBCC in the project area, and similar proximate habitat farther up in the South Fork Boise River drainage would continue to be available to YBCC moving through the general vicinity.

Bull Trout and their Critical Habitat

Over the long term, O&M activities would remain consistent with current strategies (Reclamation, 2004; Reclamation, 2013) and continue to have persistent long-term adverse effects on bull trout and their critical habitat as covered under the current incidental take statement granted by USFWS in 2005 and 2014 (USFWS, 2005; USFWS, 2014). Additional long-term adverse effects outside of these O&M activities covered in previous consultations would not be anticipated to occur to the extent that they would significantly affect bull trout or their critical habitat. Continued adherence to required criteria in the BiOps (USFWS, 2005; USFWS, 2014) would occur under Alternative B, reducing the potential for long-term, adverse effects to bull trout or their critical habitat in the future.

Although limited long-term negative impacts to bull trout and their habitat would persist under Alternative B, they would not be anticipated to occur at or be elevated to a level of significance in the project area under Alternative B. Therefore, no long-term significant impacts to bull trout under Alternative B are anticipated.

Over the long term, beneficial effects from Alternative B may be realized as a result of an elevated pool in Anderson Ranch Reservoir and extended temporal connection with entering tributaries. In particular, beneficial effects for bull trout are anticipated as a result of regrading and construction activities at Deer Creek and Fall Creek culverts. Once completed the culverts would provide year-round passage into Deer Creek and Fall Creek that currently does not exist at pool elevations when the culverts are perched. Although this additional access to forage habitat in Deer Creek and Fall Creek, as well as other extended temporal access to tributaries entering Anderson Ranch Reservoir (as a result of higher pool elevations under certain conditions) are anticipated to benefit bull trout and other fishes by providing year-round passage.

Under the proposed action impacts to Threatened and Endangered Species and their habitat was analyzed through the Section 7 process. Species whose distribution may overlap with the project area and are protected under the Endangered Species Act include: Bull Trout, Canada Lynx, North American Wolverine, and Whitebark Pine. Only bull trout and bull trout protected habitat may be affected. The biological assessment concludes that construction

associated with the proposed dam raise may have isolated, short term adverse effects to aspects of bull trout critical habitat including migration corridors, forage and water quality. Future conditions in Anderson Ranch and Arrowrock reservoirs throughout most of the year would continue to provide conditions important for the survival of bull trout, however, depending on climate patterns and water needs, there would also continue to be a potential seasonal limitation on the availability of bull trout habitat. Yearly and seasonal fluctuations in water supply and irrigation demand would continue. However, a raised pool elevation in Anderson Ranch Reservoir and altered refill regime into Arrowrock Reservoir (via South Fork Boise River) is anticipated to improve temporal access to cold water refugia in the system and increase seasonal connectivity to tributaries entering Anderson Ranch and Arrowrock reservoirs. During periods of warm summer conditions and extreme drawdowns, migration corridors may provide improved access to more favorable conditions, compared to baseline conditions in unregulated portions of the watershed that do not provide ideal habitat conditions throughout the year.

Anadromous salmonids

Based on Reclamation's analyses, changes in LGD volume under the Alternatives fall within the historical operating range, however, over the long-term the proposed action could result in flows past LGD being a maximum of 29,000 AF less while the additional storage volume fills (typically within the period of April through June). A volume of 29,000 AF equates to a change of 0.24% of the total volume at LGD during that period. The change of 0.24% represents a maximum storage scenario and is expected to occur 62% of the time; the volume of water able to be stored annually would depend on climatic conditions and the actual flow experience of an individual smolt would be closer to the No-Action Alternative. For the purpose of the impact analysis, a change in flow volume could impact the extent of wetted shoreline habitat and velocity of the main channel flow, however, at a scale of up to a change of 0.24% to the No-Action Alternative the difference would be discountable at a biological scale and not be detectable at the level that would jeopardize the continued existence of the species or adversely modify or destroy designated critical habitat at the level of the significance criteria.

Using the correlative analysis based on the relationship between flow and migration speed as described in methods, if a salmon smolt experiences flows 1,462 cfs lower than what would be experienced under the No-Action Alternative, migration rate could be slightly lower, but likely within the confidence limits of the data. At a No-Action Alternative flow rate of 85,000 cfs, the migration rate is about 13.16 miles per day; if this were reduced by 1,462 cfs the rate would be expected to be 13.05 miles per day. This would be a decrease of 0.11 miles per day, or about 0.86% decrease. At a higher target flow of 100,000 cfs, a reduction of 1,462 cfs would still be about 0.11 miles per day slower, but the percent change would be slightly lower at 0.79%. For discussion purposes, travel time under the No-Action Alternative flows of 85,000 cfs would be expected to be 9.66 days, where under this alternative the flows could be up to 1,462 cfc lower. At 83,538 cfs the travel time would be expected to be 9.73 days; at this worst-case scenario, this is approximately ninety-nine minutes longer travel time or about 0.71% longer. Based on these correlative analyses, the reduction in migration speed would be discountable at a biological scale and not detectable at the level that would jeopardize the continued existence of the species or adversely modify or destroy designated critical habitat at the level of the significance criteria.

Overall, the differences identified in the flow volume and salmon survival correlative effects analyses would not be at a duration or intensity to have measurable impacts on migrating fishes or critical habitat.

Alternative C

Short-Term Impacts – During Construction

Under Alternative C, similar short-term effects as described under Alternative B would occur from construction required to raise the dam 3 feet and from construction of other required infrastructure. Potential impacts to Canada lynx, whitebark pine, YBCC, and North American wolverine would be the same as described for Alternative B.

The primary difference in short-term effects under Alternative C, compared to Alternative B, is the absence of construction work at Pine Bridge under Alternative C. Bull trout would not experience hindered movement or be potentially displaced by noise or construction activity related to work on Pine Bridge as described under Alternative B. Additionally, under Alternative C, bull trout would not experience limited access to habitat along the fringes of South Fork Boise River banks related to Pine Bridge work described under Alternative B.

Except for the difference in effects related to Pine Bridge construction, and a reduced duration of general effects from noise and construction as a result of a shorter construction period, other short-term negative effects to bull trout and their critical habitat under Alternative C would be the same as described under Alternative B. However, no short-term impacts as a result of Alternative C would be anticipated to occur to the extent that they would significantly affect bull trout or their critical habitat in the project area.

Anadromous salmonids

Under Alternative C, there would be no additional short-term effects to either the population or critical habitat other than those that occur under existing conditions.

Long-Term Impacts – After Construction

Similar to Alternative B, no long-term effects to listed T&E species related to construction activities under Alternative C are anticipated. All long-term impacts to T&E species for Alternative C are the same as described for Alternative B. Impacts to YBCC habitat would remain minimal with even less inundated acres potentially impacting available habitat (approximately 21 acres of this habitat seasonally inundated). For bull trout, continued adherence to required criteria in the BiOps (USFWS, 2005; USFWS, 2014) would occur under Alternative C, similar to Alternative B, reducing the potential for long-term, adverse effects to bull trout or their critical habitat in the future. Other beneficial long-term impacts for bull trout would be the same as described under Alternative B.

Anadromous salmonids

Based on Reclamation's analyses, changes in LGD volume under the Alternatives fall within the historical operating range, however, over the long-term the proposed action could result in flows past LGD being up to 14,400 AF less while the additional storage volume fills (April through June annually). A volume of 14,400 AF equates to a change of 0.12% of the total volume at LGD during that period. For the purpose of the impact analysis, a change in flow volume could impact the extent of wetted shoreline habitat and velocity of the main channel flow, however, at a scale of up to a change of 0.12% to the No-Action Alternative

the difference would be discountable at a biological scale and not be detectable at the level that would jeopardize the continued existence of the species or adversely modify or destroy designated critical habitat at the level of the significance criteria.

Using the correlative analysis based on the relationship between flow and migration speed as described in methods, if a salmon smolt experiences flows 726 cfs lower than what would be experienced under the No-Action Alternative, migration rate could be slightly lower, but likely within the confidence limits of the data. At a No-Action Alternative flow rate of 85,000 cfs, the migration rate is about 13.16 miles per day; if this were reduced by 726 cfs the rate would be expected to be 13.10 miles per day. This would be a decrease of 0.06 miles per day, or about 0.43% decrease. At a higher target flow of 100,000 cfs, a reduction of 726 cfs would still be about 0.06 miles per day slower, but the percent change would be slightly lower at 0.39%. For discussion purposes, travel time under the No-Action Alternative flows of 85,000 cfs would be expected to be 9.66 days, where under this alternative the flows could be up to 726 cfs lower. At 84,269 cfs the travel time would be expected to be 9.70 days; at this worst-case scenario, this is approximately forty-nine minutes longer travel time or about 0.35% longer. Based on these correlative analyses, the reduction in migration speed would be discountable at a biological scale and not detectable at a level that would jeopardize the continued existence of the species or adversely modify or destroy designated critical habitat at the level of the significance criteria.

Overall, the differences identified in the flow volume and salmon survival correlative effects analyses would not be at a duration or intensity to have measurable impacts on migrating fishes or critical habitat.

3.10.2.3 Cumulative Impacts

The proposed 2025 dam construction date is well removed in time from the 2018 installation of the newly replaced Pine Bridge and the 2010 construction of the security berm along the dam crest. Any potential direct or indirect impacts to threatened and endangered species from the proposed Pine Bridge construction or dam raise would not be additive; therefore, no cumulative impacts to threatened and endangered species are identified for these past actions.

The analysis boundary for effects is the Boise River system. The increase in inundation due to the dam raise would increase aquatic habitat and reduce terrestrial habitat in the shoreline area under certain conditions. An elevated pool in Anderson Ranch Reservoir would essentially shift access to aquatic and terrestrial habitat along the shoreline, which would likely result in altered access to habitats that occur along the fringe of the shoreline and may be used by bull trout. Beneficial impacts to bull trout are anticipated to occur with increased habitat and extended temporal connectivity with some tributaries entering Anderson Ranch Reservoir. Some adverse effects to listed terrestrial T&E-listed species, however, may occur from reduced or altered habitat quality during the inundation period. These impacts, while not expected to be significant, contribute to an overall trend of altered habitat within the region, and could exacerbate stresses on species using shoreline habitats.

The proposed action would have no effect on Canada lynx and whitebark pine, and therefore there would be no cumulative effects. The proposed action may affect but is not anticipated to significantly affect North American wolverine and YBCC. Past and present actions may also affect both species.

Past and present actions, such as land use, have reduced available YBCC nesting and foraging habitat through agricultural practices and loss of riparian habitat by providing water that supports grazing activity and removes water from the Boise River system for agricultural purposes. These activities would continue to affect the YBCC in the future. The CCE Project and the South Fork Boise River Diversion Project may also affect YBCC if construction takes place near or removes YBCC habitat. Those projects are not yet designed to the point where impacts can be predicted. However, it is anticipated that either of those future projects could result in impacts to YBCC during the period of construction as a result of noise and activity. Neither of those projects though would be anticipated to result in a loss of habitat for YBCC over the long-term. Any impacts to YBCC as a result of the proposed action would be temporary and would cease following construction activities. Therefore, cumulative effects are not predicted for YBCC beyond those already occurring from past, and present actions.

Given the location of past and present actions, impacts to North American wolverines would not be anticipated and therefore not contribute to cumulative effects. Construction of both future actions could have similar construction related impacts as the proposed action. As with the proposed action alternatives, those impacts would likely be temporary and would not persist after completion of the alternative selected. There would be no cumulative effects on North American wolverine.

Bull trout in the analysis area have been impacted by decades of land use actions that have resulted in disconnected and degraded habitats and introduced competition from nonnative species. Adverse effects such as these would continue as a result of water use and land management in the area from existing activities and those that may occur in the future. The CCE Project and the South Fork Boise River Diversion Project, if implemented, would be anticipated to further affect bull trout if they adversely affect water quantity or quality in the analysis area or introduce sediment, contaminants, or noise into the aquatic environment during construction or in association with operation and management of these projects once completed. For example, reduced flows during high water years in the South Fork Boise River downstream of Anderson Ranch dam (that could result under either of these future alternatives) would be anticipated to reduce important ecological benefits such as scour and sediment transport that are important to healthy fisheries and bull trout habitat. Without specific project details it is difficult to ascertain the extent of these effects, however depending on the duration and extent of impacts the potential for significant effects to bull trout does exist.

Impacts as a result of construction activities from the proposed action alternatives are temporary and would not persist after construction is completed. Potential long-term benefits to water quality and quantity as a result of the dam raise would be anticipated after construction is completed. Any cumulative effects on bull trout, although not anticipated to be significant based on the details and analysis of the proposed action, would be dependent on activities developed for construction and operations of the CCE Project and the South Fork Boise River Diversion Project.

3.10.2.4 Mitigation Measures

Under the proposed action, adverse effects to biological resources and the environment (i.e., water quality) have the potential to occur as a result of construction activities. Conservation measures and environmental commitments would be implemented as necessary to minimize

potential significant impacts to listed T&E species in the project area. Such measures for listed T&E species under Alternative B and Alternative C are described in the Environmental Commitments Section 3.28, under the Erosion Control, Water Quality, and Shoreline Protection Section 3.28.9 and the Biological Resources Section 3.28.10.

3.11 Aesthetics

This section describes the aesthetic resources within the project area and anticipated environmental consequences for the alternatives. Aesthetic or visual resources are the natural and cultural features of the landscape that can be seen and that contribute to the public's appreciative enjoyment of the environment. Aesthetic impacts are generally defined in terms of a project's physical characteristics and potential visibility and the extent to which the project's presence would change the perceived visual character and quality of the environment in which it would be located.

Regulatory information, existing aesthetic environment, visual quality objectives (VQOs), and detailed descriptions and photographs of the key observation points used in the analysis are included in the Aesthetics Specialist Report (Appendix B10).

3.11.1 Aesthetics – Affected Environment

Key observation points (KOPs) are specific viewing locations that surround the project area used to evaluate visual resources (Figure 1, Aesthetics Specialist Report, Appendix B10). Because the land surrounding Anderson Ranch Reservoir is predominately managed by USFS, the USFS Scenery Management System framework methodology including scenery definitions was used as the basis for describing the affected environment for aesthetic resources. Detailed descriptions and photographs are included in the Aesthetics Specialist Report (Appendix B10).

The project area encompasses Anderson Ranch Reservoir and surrounding shore and valley slopes, and a portion of the South Fork Boise River below the Anderson Ranch Dam. The initial construction of Anderson Ranch Dam inundated the South Fork Boise River valley, as well as numerous tributaries. The diversity of visual experiences at Anderson Ranch Reservoir and the surrounding slopes is influenced by the natural setting and man-made features such as the Anderson Ranch Dam, boat ramps, roads, campgrounds, and electrical transmission facilities. Seasonal variations include fluctuating water levels and vegetation color that is intensely green during the wetter seasons and changes to tan in color in the drier seasons. A variety of commercial, agricultural, and residential uses occur on or near the reservoir. Special use authorizations include a designated utility corridor containing the Anderson Ranch-Mountain Home power transmission line, operations along Anderson Ranch Road, and utility corridors to private inholdings.

The land is characterized by gentle to steep slopes that are weakly to strongly dissected by streams. Slopes vary from 5 degrees to 60 degrees. The surface geology is primarily volcanic basalts south of the South Fork Boise River, and Idaho batholith granitics to the north. Mid and upper elevations are dominated by shrubs and forest communities of Douglas fir and subalpine fir, with pockets of seral lodgepole pine and aspen. Arid shrublands wrap around the reservoir, but the camping areas are forested and lush with vegetation. One eligible Wild

and Scenic River—the South Fork Boise River—falls within the impact area of the proposed action.

Eight KOPs were selected to describe the aesthetic environment for the project area (Figure 1, Aesthetics Specialist Report, Appendix B10). These KOPs represent different geographic locations along the shoreline as well as places that attract visitors and include the following.

- Below Dam on South Fork Boise River (KOP 1).
- On top of the Anderson Ranch Dam (KOP 2).
- A predominant view of the dam and spillway (KOP 3).
- A narrow portion of the reservoir near the dam (KOP 4).
- Fall Creek Lodge and Marina (KOP 5).
- Pine Campground (KOP 6).
- Curlew Creek Campground (KOP 7).
- Lime Creek Bridge on HD 61 (KOP 8).

3.11.2 Aesthetics – Environmental Consequences

3.11.2.1 Methods for Evaluating Impacts and Significance Criteria

The methodology for assessing impacts to aesthetics is the same for Alternative B and Alternative C. The impacts assessment is derived from the magnitude of the change from the baseline of the scenic attractiveness and the scenic integrity for the distance zones from the KOPs.

The direct and indirect analysis area for aesthetic resources is the visible landscape within the project area. The KOPs are analyzed to determine the short- and long-term impacts to scenery within the project area. For the analysis of direct short-term impacts, any area where new project features would be constructed, or ground disturbance would occur, would have direct short-term visual impacts. The KOPs that overlap this area represent viewpoints that would be impacted by short-term surface disturbance from construction activities. For analysis of direct long-term impacts, the permanent features from the proposed action were used to assess long-term impacts, as well as changes to forest vegetation and water levels. The cumulative effects analysis area includes the project area and areas where the cumulative project scenarios would occur that may be seen from the reservoir.

The impacts assessment is derived from the magnitude of the change from the baseline for the KOPs. The degree of effect depends on both the magnitude of change to the visual resource and the potential viewer response to and concern for those changes. The levels of effect are identified as high, moderate, low, and no effect. These levels of effects are defined in the Aesthetics Specialist Report (Appendix B10).

Table 17 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for aesthetic. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 17. Impact indicators and significance criteria for aesthetic resources

Impact Indicators	Significance Criteria
Conflict with existing scenic resource management goals, guidelines, and policies Irreversible changes Change in size, area and type of landform, vegetation, vegetative patterns and density, water characteristics, cultural features, and man-made structures Duration of change	Would there be a substantial adverse effect on a Class A or unique scenic vista, including degradation or obstruction? Would there be substantial damage to scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings? Would there be substantial degradation of the existing scenic attractiveness or integrity of the project area and its surroundings? Have an adverse effect on Wild and Scenic eligibility status, or any other protective legislation, for rivers or streams in the project area? Would the alternative result in a loss of scenic value for either visitors and/or residents?

3.11.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Visual resources are important to the visitor's enjoyment of Anderson Ranch Reservoir, and conserving visual resources is an important component of federal management activities for the area around the reservoir. As described previously, views around the reservoir consist of steep and gentle sloping valley sides, dense to sparse vegetation, and distance settings with little or no evidence of man to rural settings with recreation facilities or agricultural establishments.

Effects on visual resources include the calcium carbonate "bathtub ring" surrounding the reservoir and associated changes in landscape form, color, textures, vegetation, and soil. Calcium carbonate deposits form at the water line and are typically visible when lake elevations fall below full pool, creating a bathtub ring effect. They are generally lighter in color than the reservoir walls without calcium carbonate deposits. This creates visual contrast that may result in a change to the aesthetics noticeable to visitors. The calcium carbonate deposits around the reservoir would be exposed as reservoir water levels rise and fall.

Under the No-Action Alternative, there would be no new facility construction or raising the dam. Seasonal water management operations would continue resulting in low water levels during the fall and winter months, and water levels may change from year to year as more or less precipitation occurs. The low water levels reveal a bathtub ring along the steeper shorelines and expose the lake bottom in flat areas toward the northern end of the reservoir. There would continue to be seasonal or longer fluctuations to the reservoir and, therefore, changes to the existing impacts on the current visual landscape and on views from any of the KOPs would continue.

The visual environment would remain like its current state, offering rural and primitive mountainous vistas with seasonal fluctuating water levels. Therefore, the impacts on the aesthetic environmental would not be significant under the No-Action Alternative.

Alternative B

Construction activities under this alternative would cause surface disturbance in the form of soil, talus, and vegetation removal. Heavy equipment used to excavate and transport material to the dam location would be a visual intrusion on KOP 1, KOP 2, KOP 3, and KOP 4 during construction. However, there would be no direct views of the construction activities associated with the dam at KOP 5, KOP 6, KOP 7, and KOP 8. In addition, the construction/relocation of boat ramps, installation of riprap, and relocation and installation of the new campgrounds would modernize recreation facilities, and would not change the overall visual landscape of campgrounds. Any night lighting would be downward directed to minimize overall atmospheric lighting during night-hours construction.

Short-term, direct and indirect, adverse impacts would occur on the aesthetic environment during construction. These impacts would be greatest at the dam and borrow areas (KOP 1, KOP 2, KOP 3, and KOP 4) and would be greatly reduced with distance from the construction sites (KOP 5, KOP 6, KOP 7, and KOP 8). After construction is completed, the shoreline would have greater change to colors, form, line, and textures within the high-water inundation area (up to an additional 6 vertical feet) that could be visible at lower water levels. However, the magnitude of change is minimal and only during the fall and winter months when the water level is at its lowest. The overall characteristics of the aesthetic environment would not be degraded and the difference in visual impacts from the No-Action Alternative would be minor. The calcium carbonate deposits, bathtub ring, produce a visual contrast regardless of their height and size. The ring makes up only a portion of the views in the reservoir area. The visual environment would remain similar to its current state, offering rural and primitive mountainous vistas with seasonal fluctuating water levels. Therefore, the impacts to the aesthetic environmental would not be significant.

Once construction is complete and the project area naturalizes from revegetation, the overall scenic integrity and USFS management of VQOs would be similar to the pre-construction setting. There would be no significant effect associated with Alternative B.

Alternative C

The types of impacts resulting from construction and implementation of Alternative C would be similar to Alternative B; however, the magnitude of the impacts would be less.

Short-term, direct and indirect, adverse impacts would occur to the aesthetic environment during construction. These impacts would be greatest at the dam and borrow areas (KOP 1, KOP 2, KOP 3, and KOP 4) and would be greatly reduced with distance from the construction sites (KOP 5, KOP 6, KOP 7, and KOP 8). After construction is complete, the shoreline would have change to colors, form, line, and textures within the high-water inundation area (up to an additional 3 vertical feet) that could be visible at lower water levels. However, the magnitude of change is minimal, about half of that resulting from Alternative B, and would only occur during the fall and winter months when the water level is at its lowest. The bridge in KOP 8 would not be replaced. The overall characteristics of the aesthetic environment would not be degraded and the difference in visual impacts from the No-Action Alternative would be negligible. The calcium carbonate deposits (bathtub ring) produce a visual contrast regardless of their height and size. The ring makes up only a portion of the views in the reservoir area. The visual environment would remain similar to its

current state, offering rural and primitive mountainous vistas with seasonal fluctuating water levels. Therefore, the impacts to the aesthetic environmental would not be significant.

Once construction is complete and the project area naturalizes from revegetation, the overall scenic integrity and USFS management of VQOs would be similar to the pre-construction setting. There would be no significant effect on aesthetics associated with Alternative C.

3.11.2.3 Cumulative Impacts

The Pine Bridge replacement resulted in one bridge being replaced with another bridge in the same location, and therefore would not have changed the overall aesthetics of the landscape. The increase in height of the dam crest by four feet would be visible only from the KOPs 2, 3 and 4. From KOPs 3 and 4, the change would be barely visible due to the distance. From KOP 2, the addition of more concrete and rail would not alter the overall look of the dam, nor would it effect the views from the dam. Therefore, the berm would not have changed the overall aesthetics of the landscape. These past projects would not contribute to cumulative effects.

The Cat Creek Energy project proposes an energy and water storage renewable power station; a 100,000-acre-foot reservoir created near the mouth of Cat Creek above Anderson Ranch Reservoir; a pipeline from Anderson Ranch reservoir to Cat Creek reservoir; and wind and solar energy equipment. Although the CCE project would have substantial impacts to the aesthetic environment in areas outside of Anderson Ranch Reservoir project area, only the proposal Cat Creek proposed pipeline would affect the Anderson Ranch Reservoir. The Cat Creek proposed pipeline involves periodically pumping water out of Anderson Ranch Reservoir. This could result in increased daily fluctuations in the reservoir water levels. Due to the terrain, the additional dam, power station and solar generation equipment would not be visible from Anderson Ranch Reservoir. However, the pipeline would likely be visible where it ties into Anderson Ranch Reservoir. The wind generators would likely be sited on the ridge tops and have lights for nighttime illumination. The addition of the pipeline would add man-made infrastructure on the reservoir. The wind generators would add additional man-made structures into the distant views and night sky. However, the overall characteristics of the aesthetic environment would be like the current fluctuating state and the scenic integrity would not be noticeably degraded in the immediate area of the reservoir. Views would remain consistent with the rural nature of the area.

The South Fork Boise River Diversion Project is a pipeline and pumping station project proposed to be located on the far southeast side of the reservoir toward the dam. A pipeline would carry water to Elmore County, approximately 28 miles to the southwest of the reservoir. Due to the topography, the pumping station would likely not be visible from Anderson Ranch Reservoir; however, the pipeline would be visible where it ties into Anderson Ranch Reservoir. The aquifer recharge project involves periodically pumping water out of Anderson Ranch Reservoir, however, only in spring and in years when there is excess water to be spilled from the reservoir as stipulated in Elmore County's water right associated with this project. This would not result in additional draw down of reservoir water levels as the water would be spilled if not pumped away. The overall characteristics of the aesthetic environment would be like the current fluctuating state and the scenic integrity would not be noticeably degraded in the immediate area of the reservoir. Views would remain consistent with the rural nature of the area.

Cumulatively, the effects of these future projects along with either Alternative B or C may contribute to slight, but insignificant, changes to the aesthetics of the local area.

In addition, if construction for either of these projects overlaps, temporary visual impacts could be greater than for a single project. However, because construction for both Alternative B and C is limited in scale and duration, it is unlikely that there would be significant cumulative impacts to the aesthetic experience.

3.11.2.4 Mitigation Measures

Multiple conservation measures and best management practices are identified and would be implemented as part of the proposed action (see Environmental Commitments Section 3.28). Rehabilitation measures would be implemented immediately upon completion of the dam work and roadway improvements. Measures include: recontouring and reseeding disturbed areas in a natural appearing way with native vegetation species, controlling the spread of noxious weeds, cleaning up trash, excess rock, and construction debris and disposing of them in designated areas away from view of recreation visitors. Site restoration to disturbed vegetation areas are identified and would be required by the contractor post-construction. These measures for reducing impacts to vegetation would also benefit the overall scenic integrity and setting. Any night lighting would be downward directed to minimize overall atmospheric lighting.

3.12 Air Quality

This section describes the existing air quality conditions within the project area and anticipated environmental consequences for the alternatives. Regulatory information and additional methods and analysis are included in the Air Quality Specialist Report (Appendix B11).

EPA regulates air quality under the Clean Air Act. In accordance with Clean Air Act (42 U.S. Code 7409) requirements, the air quality in a given air quality control region is measured by the ambient concentration of criteria pollutants in comparison with established standards the National Ambient Air Quality Standards (NAAQS). The air quality in a region is a result of not only the types and quantities of atmospheric pollutants and pollutant sources in an area, but also surface topography, the size of the topological "air basin," and the prevailing meteorological conditions. Criteria pollutants include carbon monoxide, lead, nitrogen dioxide, ozone, particle pollution, and sulfur dioxide. When monitored ambient concentrations of criteria pollutants do not exceed the NAAQS, the area is classified as "attainment." If monitored concentrations exceed the NAAQS, the area is classified as "nonattainment." Areas transitioning from nonattainment to attainment status are classified as "maintenance." Regulation of air pollution in nonattainment and maintenance areas is more stringent because new sources of emissions can have more significant impacts to air quality.

3.12.1 Air Quality – Affected Environment

The analysis area is the area around the reservoir and downwind locations potentially affected by increased criteria pollutant emissions or fugitive dust expected during the construction period. The analysis area lies within Elmore County, Idaho, which is classified as attainment for all NAAQS. As a result, the proposed action for Alternative B and

Alternative C is not subject to the General Conformity Rule and its air quality impacts can be compared with the less stringent indices applicable to attainment areas.

3.12.2 Air Quality – Environmental Consequences

3.12.2.1 Methods for Evaluating Impacts and Significance Criteria

Impacts to air quality were determined by estimating anticipated emissions of criteria and greenhouse gases from construction equipment usage and fugitive dust emissions from the truck traffic. Impacts to air quality may be short term (i.e., impacts occurring during construction activities), or long term (i.e., a permanent impact from emissions of installed equipment as part of the alternative), and may also be considered direct (i.e., emissions resulting directly from the alternatives and occurring at the same time and place) or indirect (i.e., emissions that would be caused by the alternatives but may be removed from it in time and/or place).

The Air Force Air Conformity Applicability Model, an air-emissions estimating model used to performs analyses to assess potential air quality impacts associated with U.S. Air Force actions, was used to estimate anticipated emissions of criteria pollutants and greenhouse gases.

Alternative B consists of the 6-foot dam raise construction projects and the reservoir rim construction projects. Emissions for both projects were calculated separately based on the data provided in the 6-foot Dam Raise Engineering Summary (Appendix C). The dam raise projects are scheduled from 2025–2029. The reservoir rim projects are scheduled for a 2-year period from 2025–2026.

Alternative C consists of the 3-foot dam raise construction projects and the reservoir rim construction projects. Construction activities involved with Alternative C would be similar to Alternative B but shorter duration and less scale of earthwork involved.

The project activities would be considered to impact air quality if construction activities add significant new emissions of criteria pollutants and their precursors, and greenhouse gases to existing conditions where the construction sites are located (Table 18). Significance of air quality impacts were determined by exceedance of EPA General Conformity *de minimis* thresholds or the EPA Mandatory Reporting Rule of Greenhouse Gases reporting thresholds.

Table 18 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for air quality. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 18. Air quality impact indicators and significance criteria

Impact Indicator	Significance Criteria
Increased vehicle and equipment criteria pollutants emissions and generation of fugitive dust during construction	Exceedance of EPA General Conformity *de minimis* thresholds

Impact Indicator	Significance Criteria
Increased vehicle and equipment greenhouse gases emissions during construction	Exceedance of EPA Mandatory Reporting Rule of greenhouse gases reporting threshold of 25,000 metric tons per year (or 27,500 tons per year)

3.12.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Existing air quality conditions would continue under Alternative A, the No-Action Alternative. Under Alternative A, the baseline conditions for air quality would remain as they currently exist because there would be no increase in the Anderson Ranch Dam height or construction of the associated reservoir rim projects, access roads, or facilities. Operations and maintenance of Anderson Ranch Dam would not change. There would be no additional direct or indirect air emissions impacting existing air quality conditions. No additional fugitive dust would be produced, and no change would be made in visibility as a result. Air quality conditions in the project area would remain unchanged. Thus, operations under the No Action Alternative would not result in any direct or indirect air quality impacts.

Alternative B

The emissions were calculated for the construction activities involved with the dam raise and the rim projects and are provided in Table 19. The analysis conducted was a conservative estimate of emissions, intended to capture the greatest potential for impacts. The model input data and all relevant emissions calculation information is provided in Attachment A of the Air Quality Specialist Report (Appendix B11).

Table 19. Total estimated emissions for Alternative B

Year	Projects	NOx	VOC	CO	PM_{10}	$PM_{2.5}$	SO_2	CO_{2e}[1]
		tpy	tpy	tpy	tpy	tpy	tpy	tpy
2025	Rim	7.63	1.37	7.55	19.43	0.30	0.02	2,401.6
	Dam Raise	1.39	0.23	1.63	6.89	0.05	0.02	431.5
	Total	9.02	1.6	9.18	26.32	0.35	0.04	2833.1
2026	Rim	7.34	1.34	9.68	90.68	0.29	0.02	2,364.7
	Dam Raise	1.39	0.23	1.63	6.89	0.05	0.02	431.5
	Total	8.73	1.57	11.31	97.57	0.34	0.04	2796.2
2027	Dam Raise	1.39	0.23	1.63	6.89	0.05	0.02	431.5
2028	Dam Raise	1.39	0.23	1.63	6.89	0.05	0.02	431.5
2029	Dam Raise	1.39	0.23	1.63	6.89	0.05	0.02	431.5
Reference Threshold[2]		100	100	100	100	100	100	27,500[3]

CO – carbon monoxide
NOx – nitrogen oxides

PM10 – particulate matter less than 10 microns in diameter
PM2.5 – particulate matter less than 2.5 microns in diameter
SO2 – sulfur dioxide
TPY – tons per year
VOC – volatile organic compound
1CO2e – carbon dioxide equivalent
2 40 CFR 93.153 and 40 CFR 98
3 27,500 short tpy is equivalent to 25,000 metric tpy

Results indicate that short-term impacts are not expected to violate any of the Federal and state standards, as their estimated emissions of criteria air pollutants are below the reference thresholds for each construction year. In addition, projected greenhouse gas (GHG) emissions are considered insignificant because estimated emissions of GHGs are below the reference thresholds for each construction year. There would be no expected long-term effects to air quality due to this alternative.

Anderson Ranch Dam is not located near sensitive receptors such as residential properties or developed recreation facilities, so no significant impact analysis to sensitive receptors is required.

Operation of the raised dam would use electricity similar to the existing dam and would not generate new emissions or dust.

Alternative C

Similar to Alternative B, Alternative C consists of reservoir rim construction projects and 3-foot dam raise construction projects. The amount of earthwork involved with Alternative C would be less than under Alternative B as some projects are no longer required under Alternative C. Based on the data provided in the 3-foot Dam Raise Engineering Summary (Appendix D), scale and duration of the construction is lower for Alternative C than Alternative B. Thus, emissions generated from construction equipment usage and truck traffic for Alternative C would be less than under Alternative B. Therefore, no exceedance of General Conformity *de minimis* thresholds is anticipated for this alternative. These temporary impacts are not expected to violate any of the Federal and state standards and there would be no expected short-term, direct and indirect, impacts on air quality due to Alternative C. In addition, projected GHG emissions are considered insignificant.

The Anderson Ranch Dam is not located near sensitive receptors such as residential properties or developed recreation facilities, so no significant impact analysis to sensitive receptors is required.

Operation of the 3-foot raised dam would use electricity similar to the existing dam and would not generate new, additional emissions or dust. Thus, operations would not result in significant long-term, direct and indirect, air quality impacts.

3.12.2.3 Cumulative Impacts

The 2018 construction of the Pine Bridge and 2010 crest raise are well removed in time from the proposed 2025 rim projects and dam construction and retained on the same footprint. Any potential air quality emissions due to construction of the new Pine Bridge or dam raise would not be additive. No other potential direct or indirect impacts effecting air quality are recognized and no cumulative effects are identified for past actions.

The CCE Project and South Fork Boise River Diversion Project were found to not contribute to cumulative impacts on air quality when added to either Alternative B or Alternative C. However, if construction for the projects identified in Chapter 2 overlapped, air quality impacts could be greater than for a single project. There would then be increased vehicle emissions and fugitive dust due to increased construction traffic for overlapping projects. However, because construction for the Anderson Ranch dam raise and associated rim projects are limited in scale and duration, it is unlikely that there would be noticeable cumulative impacts to air quality.

3.12.2.4 Mitigation Measures

Emissions from construction sites for both alternatives would be exempt from air quality permitting requirements under Idaho regulations. However, contractors would be required to comply with Idaho Administrative Code 58.01.01.650 and Idaho Administrative Code 58.01.01.651, using reasonable precautions established as BMPs to minimize fugitive dust emissions (see Environmental Commitments Section 3.28). BMPs would include developing and following a dust prevention and control plan which would identify potential fugitive dust emission sources, assign dust control methods, determine frequency of dust treatment applications, record dust control activities, and monitor dust control efforts. The dust prevention and control plan would include precautions for working on windy days, establishing speed limits on unpaved roads (10–15 miles per hour), identifying dust suppression measures for construction traffic, and addressing other measures to control fugitive dust emission during construction activities.

3.13 Climate Variability

Climate variability is defined as variation in the mean (average) state and other statistics describing climate on all temporal and spatial scales, beyond individual weather events. The term “climate variability” is often used to denote deviations of climate statistics over a given period when compared to long-term statistics for the same calendar period. Variations may be due to natural or anthropogenic external factors. Climate variability presents challenges to water management, reservoir management, infrastructure construction, long-term infrastructure operations, and infrastructure maintenance. This section describes the impacts of climate variability on the project. Regulatory information, general climate information, and additional modeling, methods, and analysis are included in the Climate Variability Specialist Report (Appendix B12). Greenhouse gas emissions are addressed in the Air Quality Section 3.12.

3.13.1 Climate Variability – Affected Environment

The analysis area considered for climate variability includes the vicinity of Anderson Ranch Reservoir as well as the hydrology of the South Fork Boise River and associated climate of the South Fork Boise River watershed. The assessment of the climate variability resource is unique in that the impact is assessed as both an effect of the action on the resource (the traditional NEPA approach) as well as the effect of the resource (climate variability) on the action. In this case, the overall environmental impact of the action on climate variability is a consequence of both the action itself and the environmental conditions where the project is located. Therefore, the extent that climate variability may influence the baseline as well as projected future conditions should factor into the environmental review process. This

assessment incorporates conditions in a projected future climate as relative to conditions in a baseline (existing) climate and describes how the severity of this potential change can impact the proposed action.

Average monthly minimum temperatures at Anderson Ranch Dam range from 19°F in January to 56°F in July. Average monthly maximum temperatures at Anderson Ranch Dam range from 35°F in January to 91°F in July. Mean annual precipitation at Anderson Ranch Dam during 37 years between 1942 and 1997 is 19.8 inches. During this time, annual precipitation has varied between a high of 35.5 inches in 1970 to a low of 12.8 inches in 1949. The wettest recorded months are December and January. The driest recorded months are July, August, and September, which all receive less than 1 inch per month on average. Average annual snowfall at Anderson Ranch Dam is 55 inches. More than half of this falls in December and January. Maximum daily snowfall for a given day frequently exceeds 10 inches, with at least eight instances of daily snowfall exceeding 20 inches.

Future climate annual average temperature is projected to increase by 5°F to 9°F from the historical baseline (1980–2009) to modeled future period (2050–2079). Annual temperature variability may increase or decrease. Winter and spring seasons have the highest increase in average temperature.

Future precipitation is projected to increase between 9% and 37% from the historical baseline (1980–2009) to modeled future period (2050–2079). Annual precipitation variability may increase or decrease. Late summer precipitation is projected to have the greatest increase.

Spring snowpack, measured on April 1, is projected to decrease between 30% and 67% from the historical baseline (1980–2009) to modeled future period (2050–2079).

Future average annual streamflow on the South Fork Boise River is projected to increase by 12% to 47% from the historical baseline (1980–2009) to modeled future period (2050–2079). While the climate models project moderate changes to average annual streamflow, the largest change in stream flow is observed as a shift in the timing of the hydrograph. Peak flows would occur up to one month earlier, resulting in an increase in January to April stream flows of 50% to 400%, and a decrease of nearly 40% in June. Overall, the spring runoff is projected to occur earlier, with the peak of the hydrograph shifting approximately one month earlier. Wintertime runoff is also projected to increase due to higher temperatures, more precipitation falling as rain rather than snow, and earlier snowmelt. Consequently, less water is projected to store in snowpack. This together with the increase in evapotranspiration due to elevated temperature would lead to the decrease in summer runoff, especially in June and July.

3.13.2 Climate Variability – Environmental Consequences

3.13.2.1 Methods for Evaluating Impacts and Significance Criteria

An understanding of site-specific historical climate and future climate projections is an important factor in a project's overall environmental impact. Baseline (existing) climate conditions were evaluated based on existing data for temperature and precipitation. Projected future climate variability was analyzed and characterized from temperature and precipitation data, including snow water equivalent, climate model projections, projected seasonal changes to streamflow for the South Fork Boise River, and other hydrologic modeling. Impacts of climate variability on hydrology were analyzed, including summary plots of inflows to Anderson Ranch Reservoir based on historical and future climate projections. Impacts of

climate variability on the project and on resources other than hydrology were qualitatively described.

Within the context of the climate variability resource, *impacts* refer to the impact of climate variability on the project *as well as* exacerbation of project impacts to other resources due to climate variability. The following criteria were used to determine whether an impact would qualify as a significant impact.

- Projected future climate variability makes the project inoperable. Significance of impact is not a discrete value, rather it is relative to the baseline climate condition.
- Projected future climate variability, such as changes to timing and magnitude of reservoir inflows, reduce the effectiveness of the project. Significance of impact is not a discrete value, rather it is relative to the baseline climate condition.
- Projected future climate variability exacerbates project impacts on other resources such that the impact severity changes from one intensity category to another (for example, impact on biological resources is increased from minor to moderate, or from moderate to major impact).

In coordination with the water operations and hydrology resource, impact indicators of the climate variability on hydrology were analyzed, including summary plots of inflows to Anderson Ranch Reservoir based on historical and future climate projections (Table 20). Impacts of climate variability on the project and on resources other than water operations and hydrology were qualitatively described. Table 20 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for climate variability. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 20. Climate variability impact indicators and significance criteria

Impact Indicators	Significance Criteria
Project becomes inoperable	Relative to baseline climate
Reduced project effectiveness	Relative to baseline climate
Other resource impacts exacerbated	Other resource impact intensity category changes

3.13.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under Alternative A, historical trends and future climate projections showing increasing temperatures, changes in seasonal precipitation patterns and runoff, and the resulting effects on the overall water cycle would continue. Projected future climate variability is expected to increase, with higher temperatures, a greater range between dry and wet years, and more frequent and extreme climate events (hot, wet, or dry). These changes would impact the timing and volume of flows entering Anderson Ranch Reservoir.

Changes in temperature are projected to cause changes in the magnitude and timing of snowmelt, annual and seasonal streamflow patterns, and evapotranspiration rates, potentially increasing agricultural water needs and overall energy demands. Increased temperatures and more frequent freeze/thaw cycles may impact infrastructure strength and reliability, requiring more frequent maintenance. Wetter winters and increased frequency of extreme precipitation events may increase future flooding. Increased frequency of extreme precipitation events may increase local stormwater runoff and cause increased erosion affecting infrastructure and ecosystems. Collectively, changes to streamflow magnitude and timing may impact stream ecosystems, reservoir operations, and recreational use of water resources.

With Alternative A, downstream hydrology and current reservoir operations under baseline and future climate conditions would continue, but additional storage created by the action alternatives would not occur. Without additional storage, Alternative A would provide less flexibility with reservoir operations to manage uncertainty caused by future climate variability.

Alternative B

Existing (baseline) climate conditions and future climate characterizations for Alternative B are the same as described for Alternative A. Future climate variability is not expected to make the project inoperable, and may instead make the project more effective than in baseline climate conditions. Future climate timing and magnitude of inflows showed the potential for increased storage for Alternative B compared to Alternative A (Water Operations Section 3.2), a minor, indirect and long-term beneficial impact to project operability.

While future climate variability may exacerbate project impacts to other resources, as described below, it is not expected to change other resource impact severity from one category to another. In addition to impacts of climate variability on the project, increased climate variability is expected to potentially increase (exacerbate) impacts of the project on other resources.

Other resource impacts most susceptible to exacerbation by climate variability include the following.

- Increased long-term erosion potential caused by increased precipitation depths and intensity during some seasons (Soils and Geology Specialist Report, Appendix B2)
- Increased long-term water temperature both in the reservoir and river, caused by increased atmospheric temperature (Water Resources Specialist Report, Appendix B3)
- Adverse impacts to vegetation may be exacerbated by increased atmospheric temperatures, changing precipitation patterns, and changing snowmelt patterns (Vegetation Specialist Report, Appendix B6)
- Increased water temperature caused by increased atmospheric temperature may adversely affect fish and aquatic species (Fisheries Specialist Report, Appendix B7)
- Changes to atmospheric temperature, amount and timing of precipitation and their associated effects on natural ecosystems may exacerbate impacts to wildlife (Wildlife Specialist Report, Appendix B8)

Alternative C

Existing (baseline) climate and future climate characterizations for Alternative C are the same as described for Alternative A and Alternative B. Future climate variability is not expected to make the project inoperable, and may instead make the project more effective than in baseline climate conditions. Future climate timing and magnitude of inflows showed the potential for increased storage for Alternative C compared to Alternative A (Water Operations Section 3.2), a minor, indirect and long-term beneficial impact to project operability.

To the extent that increased climate variability is expected to exacerbate impacts of the project on other resources, impacts associated with those other resources may differ between Alternative B and Alternative C.

3.13.2.3 Cumulative Impacts

No direct or indirect impacts to climate variability as a result of the past or proposed construction at Pine Bridge or the dam crest are identified, therefore no cumulative impacts for past actions are identified.

The CCE Project and South Fork Boise River Diversion Project both propose to draft water from the reservoir with separate pump stations located along the reservoir rim. Analysis of these projects in the Water Operations Technical Memorandum (Appendix F) using both baseline and future climate scenarios shows that, while the addition of these two projects reduces the refill probability compared to Anderson Only, the increased storage (Alternative B and Alternative C) has a38% probability of being filled with all three projects (Elmore>CCE>Anderson Ranch Reservoir). Also, that refill probability increases in both future climate scenarios.

3.13.2.4 Mitigation Measures

There are no proposed mitigation measures for climate variability. Note that the term "mitigation" is often used in climate documents to refer to mitigation of greenhouse gas emissions. Analysis and discussion of greenhouse gas emissions and emissions mitigation is included in the Air Quality Section 3.12.

3.14 Noise

This section describes existing noise conditions within the project area, expected noise levels from likely construction equipment, and anticipated environmental consequences for the alternatives. Regulatory information and additional methods and analysis are included in the Noise Specialist Report (Appendix B13).

The American National Standards Institute (ANSI) standard 12.9-2013/part 3 provides approximate background sound levels based on land use and population density (ANSI, 2013). The ANSI standard estimation divides land uses into six distinct categories.

1. Noisy commercial and industrial areas and very noisy residential areas
2. Moderate commercial and industrial areas and noisy residential areas
3. Quiet commercial, industrial areas, and normal urban and noisy suburban residential areas

4. Quiet, urban, and normal suburban residential areas
5. Quiet residential areas
6. Very quiet, sparse suburban, or rural residential areas.

3.14.1 Noise – Affected Environment

The analysis area for noise is the general vicinity in and around Anderson Ranch Reservoir. The analysis area includes sensitive noise receptor areas, primarily residences or other areas where people sleep around Anderson Ranch Reservoir that may be potentially impacted by increased noise. Sensitive noise areas near Anderson Ranch Reservoir include a few parcels of private land with houses or cabins and campgrounds. The closest residential areas are the unincorporated communities of Pine and Featherville located on the South Fork Boise River, 11 miles and 20 miles respectively, upstream of the Anderson Ranch Dam. These communities include various residential and commercial developments. Of the six ANSI categories, the potential noise sensitive areas for within the project area (e.g., residences and campgrounds) predominantly comprise category 5 (quiet residential areas) or category 6 (very quiet, sparse suburban, or rural residential areas) where sound levels are expected to range between 34 decibels (dBA) and 45 dBA.

Anderson Ranch Reservoir is in a remote forested area that is sparsely populated. Recreational boaters, fishers, campers, and hunters frequent the project area. Multiple managed overnight campgrounds and boat launches surround the reservoir. During low water, shorelines are popular for camping and off-road, all-terrain vehicle use. The South Fork Boise River is also frequented by recreational users. Many developed and undeveloped access sites are present upstream and downstream of the reservoir. Existing sources of noise include traffic on local roads and recreational uses of the reservoir, including motor boating and jet skis. Boating and recreational users represent both a noise source and a receiver.

3.14.2 Noise – Environmental Consequences

3.14.2.1 Methods for Evaluating Impacts and Significance Criteria

No modifications that change operational noise levels of the dam are proposed. Because the project would not change (future) operational sound levels, operational noise was considered not significant. Therefore, this evaluation focused on temporary (short-term) construction noise.

Noise levels from construction activities were estimated based on data and methods derived from the Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment Manual* (FTA, 2018). The typical construction equipment noise emission levels used for the analysis are included in Table 3 of the Noise Specialist Report (Appendix B13). Noise emissions would be temporary and attenuate with distance from the activity area as indicated in Table 21 through Table 24.

As described in the Noise Specialist Report (Appendix B13), the expected average noise levels from general construction activities at various distance are presented in Table 21.

Table 21. Average construction noise levels versus distance

Distance from Construction Boundary (feet)	Anticipated Construction Activities L_{eq} Noise Level (dBA)
50	87
100	83
200	78
400	73
800	67
1600	62
3200	56
6400	50

Table 22 presents the anticipated typical construction sound levels for average and maximum equipment scenarios at various distances from the dam.

Table 22. Dam raise construction equipment noise levels versus distance, L_{eq} Noise Level (dBA)

Distance from Dam (miles)	Average Condition (21 pieces of equipment)	Maximum Condition (39 pieces of equipment)
0.5	64	66
1	58	60
2	52	54
3	48	51
4	46	48
5	44	46
6	42	45
7	41	44
8	40	42
9	39	41
10	38	40
11	37	40

Table 23 presents the anticipated average construction sound levels associated with Pine Airstrip construction activities for average and maximum equipment scenarios.

Table 23. Pine Airstrip construction equipment noise levels versus distance, L_{eq} Noise Level (dBA)

Distance (feet)	Average Condition (10 pieces of equipment)	Maximum Condition (16 pieces of equipment)
300	79	81
500	75	77
750	71	74
1,000	69	71
1,250	67	69
1,500	65	67
1,750	64	66
2,000	63	65
2,250	62	64
2,500	61	63
2,750	60	62
3,000	59	61

Pile drivers may result in a noise level of 101 dBA at 50 feet. Pile driving sound levels would be expected to decrease at a rate of 6 dBA per doubling of distance. Table 24 presents the predicted sound level from impact pile driving at various distances. Sonic piling would be anticipated to be 6 dBA quieter than impact pile driving. Pile driving is conducted for a limited portion of the overall construction period.

Table 24. Pine Bridge impact pile driving noise levels versus distance

Distance (feet)	L_{eq} Noise Level (dBA)
50	101
100	95
200	89
400	83
800	77
1600	71
3200	65

Distance (feet)	L_{eq} Noise Level (dBA)
6400	59

Temporary construction noise was considered significant if it exceeded the construction noise guidelines established in the Transit Noise and Vibration Impact Assessment Manual (FTA, 2018). FTA general guidelines are 90 dBA during the day and 80 dBA at night for residential land uses and 100 dBA during the day or night at commercial or industrial land uses. The more detailed guidelines establish lower sound levels and are used as the impact indicators and significance criteria in this assessment (Table 25).

Table 25. Impact Significance criteria

Land Use	8-hour L_{eq}, dBA		L_{dn}, 30-day Average
	Day	Night	
Residential	80	70	75[a]
Commercial	85	85	80[b]
Industrial	90	90	85[b]

aWithout nighttime construction, 75 Ldn is achieved with 77 dBA during daytime hours.
bUse a 24-hour Leq(24hr) instead of Ldn (30day).
Source: Table 7-3 (FTA, 2018)

3.14.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under Alternative A, current noise sources would continue to be present including noise from cars, trucks, motorcycles, and all-terrain vehicles traveling on roads and off roads as well as boats and jet skis on the reservoir. Alternative A would not create project-related increases in haul trucks, blasting, pile driving, or earthwork. Therefore, no new direct, indirect, short-term, or long-term adverse effects on noise receptors are expected with Alternative A.

Alternative B

For Alternative B, direct and indirect noise impacts from construction activities would be of similar magnitude. Noise from construction activities for Alternative B would be minor, and no exceedance of the construction noise guidelines established in the FTA manual would occur. There would be no expected long-term effects to noise levels due to Alternative B.

The closest residential area, the unincorporated community of Pine, is 11 miles from the dam. As indicated in Table 22, at this distance, the construction sound levels would be well below the construction noise significance criteria. Additionally, potential impacts to recreation are expected to be limited to receptors within 0.5 mile of the dam construction, specifically recreational boaters close to the dam construction exclusion area. There would be

no noise related impacts to recreation users at Elk Creek Boat Ramp or Spillway Campground because those sites would be closed to the public throughout the duration of dam construction.

The Pine Airstrip and associated roadway construction projects are anticipated to last 1 to 2 months and use up to 16 pieces of construction equipment. All but a small segment of the roadway construction project is more than 500 feet from the closest residences. At this distance, construction sound levels would be below the construction noise significance criteria (Table 24). Ten or fewer pieces of construction equipment are anticipated to be used for the small segment of roadway construction that is approximately 300 feet from the residences. This scenario also results in sound levels below the construction noise significance criteria.

As described in the 6-foot Dam Raise Engineering Summary (Appendix C), the Pine Bridge construction may not be required if Reclamation obtains a variance on the required minimum freeboard. If the minimum freeboard waiver is not obtained, residents of Pine would hear noise associated with raising the Pine Bridge over the South Fork Boise River, specifically pile driving, one of the louder potential construction activities. Pile driving would be limited to daytime hours and last approximately 1 week for each side of the bridge (2 weeks total duration; however, active hammering occurs only during a portion of the overall duration). The closest structures in Pine are approximately 700 feet from where pile driving would occur. The expected sound level at this location is 78 dBA (Table 25). Pile driving is a short term, daytime-only activity, and the predicted sound level of 78 dBA is less than the 80 dBA daytime significance criteria.

As described in the Transportation and Infrastructure Specialist Report (Appendix B17) up to 34 round trips per day are estimated to haul locally excavated material along HD 121 between the existing borrow pits and Anderson Ranch Dam. These existing borrow pits are within 0.5 mile of reaches of the South Fork Boise River used by wading anglers and within approximately 1 mile of the Tailwaters boat launch. Assuming up to five haul trucks are operating in proximity, consistent with Table 23, the sound level at anglers 400 feet away would be 73 dBA. Table 24 summarizes the anticipated noise at receptors for the three loudest construction activities. Boat ramps and campgrounds were used as surrogates for (mobile) boaters. Anticipated sound levels do not exceed the significance criteria detailed in Table 26.

Also, as described in the Transportation and Infrastructure Specialist Report (Appendix B17), improvements to Cow Creek Road (HD 131) involve some new alignments, road improvements, and winter snow removal resulting in brief traffic delays during the approximately 43 days of construction along HD 131. However, because additional temporary noise from construction and increased traffic using the HD 131 detour is farther from noise receptors than other construction activities, no impacts from noise are expected from HD 131 construction and traffic.

Table 26. Summary of anticipated noise by receptor and construction activity

Receptor[a]	Noise from Dam Construction (dBA)	Noise from Pine Airstrip Construction (dBA)	Noise from Pine Bridge Pile Driving (dBA)
Community of Pine residences closest to construction activity	40	77	78
Pine Campground	<50	Campground closed during airstrip construction.	<70
Curlew Creek Campground and Boat Ramp	<50	<60	<60
Fall Creek Resort and Marina and Boat Ramp	<50	<60	<60
Castle Creek Campground	<50	<60	<60
Evans Creek Campground and Boat Ramp	<50	<60	<60
Anglers and boaters along HD 121 and South Fork Boise River	73	<60	<60

[a]Elk Creek Boat Ramp and Spillway Campground are excluded because both would be closed for the duration of dam construction.

In summary, noise from construction activities for Alternative B would result in short-term minor effects, no exceedance of the construction noise guidelines established in the FTA manual would occur, and no significant impacts are expected. There would be no expected long-term effects to noise levels due to Alternative B.

Alternative C

Alternative C is the same as Alternative B, except for two important differences: no construction activities required at Pine Airstrip or Pine Bridge. The duration of noise generating construction activities for Alternative C is 7 months shorter than Alternative B. All other conditions would be similar to noise impacts associated with Alternative B. The same construction equipment and methods would be used, resulting in the same sound levels.

In summary, noise from construction activities for Alternative C result in short-term minor effects, no exceedance of the construction noise guidelines established in the FTA manual would occur, and no significant impacts are expected. There would be no expected long-term effects to noise levels due to Alternative C.

3.14.2.3 Cumulative Impacts

The 2018 construction of the Pine Bridge and 2010 crest raise are well removed in time from the proposed 2025 rim projects and dam construction. Any potential direct or indirect

impacts from construction of the new Pine Bridge or dam raise would not be additive. No other potential direct or indirect impacts to noise are recognized and no cumulative effects are identified for past actions.

The CCE Project and South Fork Boise River Diversion Project both propose to draft water from the reservoir with separate pump stations located along the reservoir rim. In the unlikely scenario two or more of the projects would be constructed simultaneously, construction-related noise may increase. The overall sound level is most strongly dependent on the closest noise source. Thus, the precise level of the increase would depend on the how far the CCE and South Fork Boise River Diversion projects were from receptors. In the unlikely event all three projects are constructed simultaneously, the maximum increase is 5 dBA, which would be considered noticeable.

The only receptors within 5 dBA of the identified significant threshold are the residents in the community of Pine who are close to the Pine Airstrip or Pine Bridge construction activities. The CCE Project and South Fork Boise River Diversion Project would be located along the reservoir rim, so they are far away from residences and their contribution to the sound level is reduced substantially be distance, thus the resulting increase would be less than 5 dBA (further description of the 5dBA basis is given in the Noise Specialist Report in Appendix B13, Section 3.4. Thus, the potential for significant cumulative short-term impacts is low.

3.14.2.4 Mitigation Measures

No significant impacts are identified; therefore, no mitigation would be required. Minimization measures for consideration include establishing communication methods to inform residences and recreational users about upcoming construction activity and establishing a noise complaint resolution process.

3.15 Land Use

This section describes existing conditions for land use within the project area and anticipated environmental consequences for the alternatives. Regulatory information and additional methods and analysis are included in the Land Use Specialist Report (Appendix B14).

3.15.1 Land Use – Affected Environment

The analysis area relating to Alternative B and Alternative C refers to the general vicinity in and around Anderson Ranch Reservoir extending downstream to the extent of Arrowrock Dam on South Fork Boise River. Land use and access is often limited by heavily forested and steep mountainous terrain. Anderson Ranch Reservoir has three major tributary arms more than 1 mile long. These are located at the mouths of Little Camas, Fall, and Lime creeks. The unincorporated communities of Pine and Featherville are located on the South Fork Boise River upstream of the reservoir and include various residential and commercial developments. These communities are both accessed via Pine-Featherville Road (HD 61) that travels up the east side of the reservoir and uses the bridge over South Fork Boise River at the north end.

Recreation is a major land use in the area. Other land use in the area consists of agricultural/livestock grazing, timber management, protected rivers and streams, utilities, and

residential and commercial developments. Residential and commercial land uses are low density and rural.

Management activities at Anderson Ranch dam and reservoir are coordinated between BNF and Reclamation under the 1987 Master Agreement, as well as the applicable policies for each agency. This national interagency agreement provides the general framework for these types of projects (Reclamation and USFS, 1987a). The majority of NFS lands surrounding the reservoir are managed as a combination of undeveloped and developed recreation.

3.15.2 Land Use – Environmental Consequences

3.15.2.1 Methods for Evaluating Impacts and Significance Criteria

To determine existing land uses in the project area, pertinent planning documents were reviewed to identify the goals and objectives of land management and to determine whether Alternative B or Alternative C would conflict with current plans and policies. These include Federal, state, and county land use plans and agreements. Current land ownership, management, and special uses were derived from existing GIS data and public records.

Table 27 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for land use. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 27. Land use impact indicators and significance criteria

Impact Indicator	Significance Criteria
Change or disruption of existing land use	Result in conversion, limitation, or elimination of current land use types, including: a change in forest resources to non-forest use; conversion of rangeland to use other than grazing; private property loss.
Compatibility with applicable federal, state, and local land use plans and regulations	Create conflict with any applicable land use plan, policy, ordinance, or regulation of an agency with jurisdiction over the impacted area (including general plans, specific plans, and zoning ordinances).
Compatibility with current land use agreements, easements, and/or permits	Disruption of land use agreements between private entities and public agencies; conflict with interagency management of resources.
Disruption, restriction, or relocation of public access	Change or limit access to land, resulting in a land use change.
Disruption of local communities	Introduce substantial disturbance to sensitive land uses that would disrupt use over time.

3.15.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under the No-Action Alternative, Reclamation would not modify Anderson Ranch Dam to increase storage capacity. Storage levels would remain at the current capacity of 413,100 acre-feet. Reclamation would continue to operate Anderson Ranch Dam under current standard operating procedures. Water delivery, power generation, and flood control would continue to occur according to existing reservoir operation protocols. There would be no increase in Anderson Ranch Dam height or construction of the associated reservoir rim projects, access roads, or facilities. No additional lands above the current full pool elevation of 4196 feet would be inundated, and there would be no road closures or access disruptions associated with Alternative A.

Under Alternative A, existing land use patterns and development trends would continue and could result in future land use changes in the project area as a result of reduced water reliability to meet projected Treasure Valley DCMI water needs. There would be no changes or disruptions in existing land uses or agreements in the project area, nor conflicts with agency land use plans, policies, or interagency management of resources; therefore, Alternative A would not result in direct or indirect impacts to land use.

Alternative B

The proposed 6-foot dam raise would inundate an estimated 146 acres of additional land around the reservoir above the current full pool elevation of 4196 feet. The area includes undeveloped NFS and Reclamation land, as well as developed roads, campground areas, boat ramps, and other USFS facilities. Alternative B would result in the closure of public road access across Anderson Ranch Dam (HD 134) for the duration of construction (an estimated 45-month detour). It would also result in the short-term public closure of sections of HD 61, HD 120, and HD 128 and various temporary roadway lane closures for work on roads and bridges.

Forest Resources

Forest resources most inundated by the dam raise are in the major arms of Fall and Lime creeks, as well as the northern end of the reservoir near the town of Pine. Due to the steep topography and limited acreage lost to increased water levels, inundation would not convert or eliminate current forest use. Access to certain areas of forest would be temporarily limited from closures during the construction phase of this alternative; however, these actions would not result in a change in forest resources. All direct and indirect effects to non-recreational forest use are expected to be minor and, therefore, not significant.

Land Use Plans and Regulations

No conflicts with applicable land use plans, policies, ordinances, or regulations within Reclamation, USFS, state of Idaho, or Elmore County were identified. No disruptions of agreements on interagency management of resources were identified. Therefore, no significant impacts to land use within those jurisdictions are expected to occur.

Special Use Permits

Glenns Ferry and Mountain Home highway districts operate special use permits under Forest Road and Trail Act Easements with BNF for road use and maintenance in the project area.

These permits would have short-term, direct impacts from road closures and/or restricted access during construction activities and road modification projects associated with Alternative B. Existing rights of way acreage would not be changed. These effects would be minor in scale and duration, therefore no significant impacts to the operations of either district are identified.

Elmore County has a special use permit for a transfer station in Pine and another for a stockpile site near Danskin Bridge on the South Fork Boise River. Access to these areas would remain consistent with current operations and maintained with alternative routes. USGS has a special use permit to maintain a stream gauging station just downstream of Anderson Ranch Dam on the South Fork Boise River. Alternative B would not limit access to or alter location of this station. Alternative B would not result in conflict within these permit agreements; therefore, no significant impacts are identified.

Agriculture

There are four easements reserved for agriculture on Reclamation land in the project area. The increased full pool elevation from 4196 feet to 4202 feet would result in an additional inundation of approximately 3 acres combined for all easements (Esri and Reclamation, 2019). This is a very small percentage of operating acreage and access to water would remain the same. Access to these easements would be temporarily restricted and/or relocated by road closures due to construction activities. There are also four USFS grazing permits in the project area that would be affected by the same construction-related road closures, temporarily limiting access to allotment units (USFS, 2019). The longest restriction would be for any travel or livestock transport necessary on HD 134 over Anderson Ranch Dam, which would undergo closure for approximately 45 months. Other closures would be shorter in duration as necessary to complete modifications on HD 120, HD 128, and HD 61. HD 131 (Cow Creek Road) is proposed for realignment to eliminate a switchback curve that was identified as problematic for ranchers and farmers for hauling hay and livestock. The permanent realignment would allow local hay and livestock haulers continued access during the construction period and HD 134 closure. The detour route would be in effect for approximately 45 months. During this time, the road would be maintained year-round to provide access.

HD 131 (Cow Creek Road) is proposed for realignment to eliminate a switchback curve that was identified as problematic for ranchers and farmers for hauling hay and livestock. The permanent realignment would allow local hay and livestock haulers continued access during the construction period and HD 134 closure. The detour route would be in effect for approximately 45 months. During this time, the road would be maintained year-round to provide access. A small percentage of operating acreage would be impacted, access to water would remain the same, and alternative access routes would be able to provide similar road conditions and capacity for transporting livestock, equipment, and/or hay. Because of these reasons, no conversion of rangeland to use other than grazing is expected and no conflicts within those land use agreements were identified. Therefore, no significant impacts to grazing are expected.

There are also several private farmers and ranchers in the project area, mostly in the vicinity of Prairie, that have expressed concern over closures of transportation routes that they currently depend on for operations that would be impacted by either of these alternatives.

These direct and indirect adverse impacts to publics lands grazing and private agriculture would be short term for the duration of the project and would not result in a permanent change in land use. Alternative transportation routes will be provided for the duration of the project to maintain access to agricultural easements and grazing allotments. Due to proposed realignment of the detour on HD 131 and contractor provided winter maintenance throughout the approximate 45 months of detour restrictions, alternative access routes would be able to provide the same gradient and capacity for transporting livestock, equipment, and/or hay; therefore, no significant impacts to private agricultural land use are expected to occur.

Private Property

Inundation of private parcels is not expected to cause substantial changes to current land use. The increased inundation would not change the ability of private property owners to use their land because it would only occur on a very small portion of land for an estimated two weeks out of the year, and only in the years with sufficient runoff. Less than 1 acre total for all combined private parcels would be affected by inundation at full pool elevation of 4202 feet (Esri and Reclamation, 2019). Direct impacts to these affected parcels would be minor in scale and duration; therefore, no significant impacts are identified under Alternative B.

Residential and Commercial

Residents near construction sites would experience disturbances taking place near their homes, mainly in the form of dust, noise, and increased volume of equipment related to construction activities. These disturbances would also be felt by local business owners and visitors. These adverse impacts have the potential to be substantial for individuals, depending on sensitivity and proximity to construction. Overall, these impacts would be short term, as all construction in the vicinity of residential areas is estimated to last 90 days or less, and minor in scale because residential density in the project area is low. Therefore, these direct adverse impacts are not expected to result in long-term disruption to sensitive residential land use in the area, and no significant impacts were identified.

Alternative C

Some impacts to land use would be the same as for Alternative B. Conflicts with applicable land use plans, policies, ordinances, or regulations within Reclamation, USFS, state of Idaho, or Elmore County were not identified. All current interagency management of resources would continue unaffected. No conflicts with current land use agreements, easements, or permits were also not identified for Alternative C.

Some impacts would be similar to Alternative B, but with Alternative C there would be 50% less acreage of additional inundation during years full pool is reached, and fewer road modification projects needed to accommodate the new full pool elevation of 4199 feet. Like Alternative B, no substantial changes in land use from inundation, including forest resources, rangeland, or private property were identified. Direct impacts to land use from inundation would be minor, and therefore not significant. Impacts to all land use requiring access over Anderson Ranch Dam (HD 134) would be shorter than Alternative B, with the HD 131 detour estimated at 38 months for Alternative C. The communities of Pine and Featherville, as well as local area ranchers and farmers and those with livestock grazing agreements in the area, would still experience short-term, direct adverse effects from disrupted road access caused by the various modifications needed on HD 61 and HD 120 to accommodate the increased full pool elevation of 4199 feet. However, the raise of Pine Bridge or construction

on HD 128 would not be required for Alternative C, so impacts related to access as well as disruption to communities from construction projects would be more minor in scale and shorter in duration than for Alternative B. Agricultural, residential, and commercial business access would be sustained throughout construction; therefore, no significant impacts are identified.

3.15.2.3 Cumulative Impacts

The proposed 2025 dam construction date is well removed in time from the 2018 installation of the newly replaced Pine Bridge and the 2010 construction of the security berm along the dam crest. Any potential direct or indirect impacts to land use from the proposed Pine Bridge construction or dam raise would not be additive; therefore, no cumulative impacts to land use are identified for these past actions.

If the proposed Alternative B or Alternative C were to occur simultaneously as construction for CCE and South Fork Boise River Diversion projects, cumulative impacts to land use within the analysis area from these projects would be expected to be higher in severity and duration than individual project impacts. Land ownership in the area surrounding Cat Creek and Little Camas Reservoir is a combination of large private farms and ranches, and public lands managed by USFS, BLM, and IDL. Owners of private lands that would be affected by CCE are in consultation with the company for use and/or access of land, so additional impacts to use of private lands would not be expected. The main uses occurring on public lands includes recreation (see Recreation, Section 3.16) and livestock grazing, and would primarily be impacted by restricted access if construction activities would require additional road closures in the area. If these projects were to be implemented at the same time and access was restricted at once, impacts to land use would be greater. Although these potential impacts are not expected to be severe enough to cause significant cumulative impacts to land use in the area, final project plans and schedules for CCE and South Fork Boise River Diversion projects would be needed to make these determinations.

3.15.2.4 Mitigation Measures

No significant impacts to land use from the action alternatives are identified; therefore, no mitigation measures are recommended.

3.16 Recreation

This section describes the recreation amenities and activities within the project area and anticipated environmental consequences for the alternatives. Regulatory information, detailed developed recreation facility descriptions, maps, and drawings, and additional methods and analysis are included in the Recreation Specialist Report (Appendix B15).

3.16.1 Recreation – Affected Environment

The analysis area for recreation refers to the general vicinity in and around Anderson Ranch Reservoir extending downstream to the extent of Arrowrock Dam, via South Fork Boise River.

3.16.1.1 Anderson Ranch Reservoir

The reservoir is popular year-round for fishing, however, most of the recreational use occurs from Memorial Day (last weekend of May) through Labor Day (first weekend of September)

as the warmer/dryer weather encourages overnight camping. There are seven developed campgrounds along the reservoir rim (Table 28). Each are described in detail within the Recreation Specialist Report (Table 1 and Figure 1, Recreation Specialist Report, Appendix B15). Nester's Private Campground is privately owned and operated. Fall Creek Resort and Marina is authorized by USFS through a special use permit.

Table 28. Developed campgrounds and amenities at Anderson Ranch Reservoir

Campground *(Figure 1)*	No. of Sites	Potable Water	Toilet	Comments
Curlew Creek Campground	9	Yes	Vault	Has a well with hand pump for water. 18-day use parking spaces for vehicles and trailers are also located here. Concrete boat ramp access. USFS provided trash bins.
Pine Campground	7	No	Vault	Ramadas are provided for shade at each campsite. Concrete boat ramp access. USFS provided trash bins.
Evans Creek Campground	8	No	Vault	Unmaintained dirt boat launch access.
Castle Creek Campground	2	No	No	Sites are located on a small bench and accessed by a short, steep road. Unmaintained dirt boat launch access.
Spillway Campground	3	No	Vault	
Nester's Private Campground and Pine Resort RV Park	34	Yes	Yes	13 sites at Nester's Private Campground. Lower elevation sites are at Nester's Campground.
Fall Creek Resort and Marina Campground	45	Yes	Yes	Most sites have hook-ups. 12 are tent sites. Nearby concrete boat ramp access.

All developed campsites are located near the full pool surface water elevation of 4202 feet. Maximum pool for any given year is typically achieved in the spring, between March and April, with drawdowns to satisfy downstream water obligations beginning in May. When full pool is achieved, on average it is maintained for 14 days. As the water depletes over the summer months, the shoreline surface area greatly increases along the reservoir rim. The increase in shoreline invites dispersed camping activities in the exposed undeveloped areas around the rim, more heavily concentrated near Curlew Creek Campground and upstream towards the Pine Bridge (Figure 1, Recreation Specialist Report, Appendix B15). In addition to RV camping, the undeveloped shoreline areas are popular for recreational all-terrain and utility vehicles.

The four main undeveloped recreation areas identified on Figure 1 in the Recreation Specialist Report (Appendix B15), depicting areas where dispersed camping activity occurs

along the reservoir. These areas become increasingly exposed, providing hundreds of acres for group camping recreation as the reservoir is drafted throughout the summer months.

At full pool, Anderson Ranch Reservoir provides 4,772 acres of surface water recreation opportunity. Fishing from watercraft is popular year-round on the water's surface. Summer watersports, including pleasure boats and jet skis, are also popular. Access for watercraft is provided by five public boat ramps (Table 29; Figure 1, Recreation Specialist Report, Appendix B15). All boat ramps are concrete, four of the five are accompanied by a floating dock and vary in length and elevation.

Under current operations, the median baseline low water elevation is 4130 feet. An elevation of 4039.5 feet is the lowest surface water elevation that can occur under current operational restrictions and if reached would either be due to extremely low carryover from the previous year or an extremely large water year that required FRM drafting. The baseline median low water surface water elevation of 4130 feet. maintains the Fall Creek, Curlew Creek and Elk Creek Boat Ramps for year-round reservoir access in most years. The reservoir reached elevations below 4130 feet. in 4 of the last 20 years with 4067 feet. being the lowest in 2002.

Table 29. Developed boat ramps at Anderson Ranch Reservoir

Boat Ramp Name	Total Ramp Length (feet)	End of Ramp Elevation (feet)	Dock Length (feet)
Deer Creek Boat Ramp	480	4159	No dock
Pine Campground Boat Ramp	364	4151	352
Fall Creek Boat Ramp	187	4133	160
Curlew Creek Boat Ramp	503	4103	256
Elk Creek Boat Ramp	510	4078	160

3.16.1.2 South Fork Boise River

The South Fork Boise River, known for its renowned blue-ribbon trout fishery, is popular for shoreline fishing and, as conditions accommodate, wading and float boat fishing as well. The river is also popular for whitewater rafting, accessed by three formal boat launches: Tailwaters, Village, and Danskin. Vault toilets and a parking area are provided at each of these access points. Additional vault toilets are available at Indian Point and Cow Creek. Twelve camping areas are identified along the approximate 11 mile stretch of river from the Tailwaters boat launch to the Danskin launch. From Danskin, it is approximately 18 river miles to the Neal Bridge takeout. This section of the river is commonly referred to as the Canyon Section due to the narrow and steep 600-foot high canyon cliffs. This section is popular for white water rafting with more than 10 class II and III rapids identified. Four additional camping areas are identified within this section, accessed from the river by

floaters. This area is not easily accessed by road and few formal roads exist (IDFG, 2011a; IDFG, 2011b).

Access to the upstream portion of the river, from the dam to the general area of Danskin Bridge, is provided by HD 121 and includes a system of short road/trail spurs that typically reach the river and offer fishing and dispersed camping opportunities. Most of these roads/trails lack a gravel surface and drainage. In many areas these roads/trails are only a few feet vertically above the river's high-water line. Past flood events have damaged these roads and facilities have been exposed to flood waters.

3.16.1.3 Hiking and ATV/Motorcycle Trails

Multiple popular hiking trails are accessed immediately adjacent to the roads surrounding the reservoir. All trails head away from the reservoir, into the surrounding hills and mountains. One managed trailhead is identified on the US Forest Service Motor Vehicle Use Map (MVUM), the Wilson Flats Trailhead located at the junction of Wilson Creek and HD 120.

3.16.2 Recreation – Environmental Consequences

3.16.2.1 Methods for Evaluating Impacts and Significance Criteria

Issues for evaluation were identified based on-site visits, multiple discussions with USFS staff and input from public comments submitted during the scoping period. Additionally, Google Earth satellite imagery, light detection and ranging (LiDAR) data collected by Reclamation, and MVUMs were used for evaluation. The project includes no improvements to undeveloped areas used for dispersed camping.

Potential short-term impacts were identified if construction activities would temporarily limit, disrupt, or displace recreation facilities or activities in the project area (Table 30). Long-term impacts were identified if project components and operational conditions could permanently limit, disrupt, or displace recreation facilities or activities. Adverse impacts were identified if changes would diminish public or private recreational use of or access to developed recreation sites and undeveloped recreation areas in the project area. Table 30 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for recreation. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 30. Recreation impact indicators and significance criteria

Impact Indicator	Significance Criteria
Reduction in, or loss of access to, developed recreation facilities	Permanent loss of developed campsites and boat ramps not accommodated elsewhere at Anderson Ranch Reservoir or on the South Fork Boise River Permanent loss of access to reservoir rim trailheads Permanent loss of South Fork Boise River boat ramp access not accommodated with similar availability elsewhere Temporary closure of South Fork Boise River boat ramp access during peak season, Memorial Day to Labor Day

Impact Indicator	Significance Criteria
Reduction in recreational opportunity	Temporary reduction of recreational opportunity at developed campsites and boat ramps during peak season, Memorial Day to Labor Day Temporary loss of recreational opportunity at developed campsites and boat ramps not accommodated with similar availability elsewhere Increase in peak flows of South Fork Boise River permanently reducing recreational opportunity Permanent loss of undeveloped areas used for dispersed recreation.
Reduction in recreational experience	Increase of noise, dust and traffic levels during construction such that users avoid areas during peak season, Memorial Day to Labor Day Increase in developed campsite or boat ramp recreational density

3.16.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under the No-Action Alterative, Anderson Ranch Dam would not be modified to increase storage capacity. The recreation amenities and activities would remain consistent with current access, opportunities, and experience on and around the reservoir and South Fork Boise River due to the existing current operations remaining consistent. Access to recreation amenities and activities would not be disrupted, and public access would remain consistent with current availability. As the Treasure Valley population continues to grow, increasing demands on Anderson Ranch Reservoir and South Fork Boise River recreation facilities would continue to put stress on the capacity of the reservoir and downstream fishery. Opportunity and experience are likely to continue to degrade as the developed facilities and undeveloped areas see an increase in demand and the higher use increases facility wear-and-tear.

Alternative B

Overview of Recreation Facilities Proposed Projects

Recreation facility projects included in Alternative B are described for each developed campground and boat ramp in Table 31 through Table 36. Campsite amenities and project features specific to each site are described in further detail within the Recreation Specialist Report (Appendix B15). Projects affecting general access to recreation activities and facilities within the project area are further described in the 6-foot Dam Raise Engineering Summary (Appendix C) and in the Transportation and Infrastructure Specialist Report (Appendix B17).

A description of developed recreation facilities and their design features required for Alternative B is described below.

Curlew Creek Campground and Boat Ramp

Table 31. Curlew Creek Campground and Boat Ramp existing infrastructure and proposed features under Alternative B (see Exhibit 1, Recreation Specialist Report, Appendix B15).

Feature	Existing	Alternative B Proposed
Campsites	9	9; 6 elevated, 2 relocated onsite
Tables	10	10
Fire Rings	8	8
Day Use Area	2	2; 1 to be elevated
Shade Structures	0	0
Trees	Cottonwood and pine trees	Remove and replace with 60, 2-in. caliper trees
Potable Water	Public hand-pump well	Abandon existing and replace onsite
Restroom	Vault Style	Not Impacted
Dock and Launch	16 – 16-foot sections	Add 2 – 16-foot sections
Access	Loop road for boat dock access	New alignment accommodating dock realignment

Castle Creek Campground

Table 32. Castle Creek Campground existing infrastructure and proposed features under Alternative B (see Exhibit 3, Recreation Specialist Report, Appendix B15).

Feature	Existing	Alternative B Proposed
Campsites	2	0
Tables	2	0
Fire Rings	2	0
Day Use Area	0	0
Shade Structures	0	0

Note: Castle Creek Campground will be decommissioned as part of Alternative B.

Pine Campground and Boat Ramp

Table 33. Pine Campground and Boat Ramp existing infrastructure and proposed features under Alternative B (see Exhibit 3, Recreation Specialist Report, Appendix B15).

Feature	Existing	Alternative B Proposed
Campsites	7	9; elevate 6, relocate 1 and add 2
Tables	7	9
Fire Rings	7	9
Day Use Area	None	None
Shade Structures	6	6
Trees	Cottonwood and pine trees	No changes
Potable Water	None	None

Feature	Existing	Alternative B Proposed
Restroom	1; Vault style	2; Vault style
Dock and Launch	352-foot long floating dock and concrete pavement ramp	Extend concrete ramp, add dock sections for 416-foot total length
Access	Parking area at boat ramp and dirt, loop access road	Not Impacted

Evans Creek Campground

Table 34. Evans Creek Campground existing infrastructure and proposed features under Alternative B (see Exhibit 4, Recreation Specialist Report, Appendix B15).

Feature	Existing	Alternative B Proposed
Campsites	8	8; 6 elevated
Tables	8	8
Fire Rings	6	6
Day Use Area	0	0
Shade Structures	0	6
Trees	Cottonwood and pine trees	Remove approximately 25, >6-in. diameter and replace with 25, 2-in. caliper trees
Potable Water	None	None
Restroom	Vault Style	Not Impacted
Dock and Launch	Compact dirt	Not Impacted
Access	Dirt access roads	Not Impacted

Fall Creek Boat Ramp

Table 35. Fall Creek Boat Ramp existing infrastructure and proposed features under Alternative B (see Exhibit 5, Recreation Specialist Report, Appendix B15).

Feature	Existing	Alternative B Proposed
Trees	Cottonwood trees	Remove several >6-in. diameter and replace with several 2-in. caliper trees
Potable Water	None	None
Restroom	Vault Style	Not Impacted
Dock and Launch	10 – 16-foot long floating dock sections	Demolish existing dock abutment, reorient, reattach existing dock and add new sections for 250-foot total length. Rip rap ramp perimeter for scour protection
Access	Parking area at boat ramp	Elevate parking area around boat ramp and ramp approach.

Fall Creek Resort and Marina

Analysis of Alternative B identifies an impact to five existing campsites at the outlet of Fall Creek, three campsites near the Fall Creek Boat Ramp, and the Fall Creek Marina as a result of the increased water surface elevation. The Fall Creek Resort building would not be impacted.

A description of facility management is included in the Recreation Specialist Report (Appendix B15). Impacts of Alternative B to the non-Federal real property would be mitigated during project implementation, the special use permit still be in effect. Potential mitigation activities may include the following.

- Rebuild existing features to their existing condition
- Relocate existing features to a suitable location
- Compensate.

Additional environmental compliance of the chosen measure will be conducted as needed.

Elk Creek Boat Ramp

Table 36. Elk Creek Boat Ramp existing infrastructure and proposed features under Alternative B (see Exhibit 6, Recreation Specialist Report, Appendix B15).

Feature	Existing	Alternative B Proposed
Trees	None	None
Potable Water	None	None
Restroom	Vault Style	Not Impacted
Dock and Boat Launch	160-foot long floating dock and ramp	Demolish existing dock abutment, reorient, reattach existing dock and add new sections for 208 feet total length. Riprap ramp perimeter for scour protection
Access	Parking area at boat ramp	Minor grading to accommodate truck traffic. Closed for 51 months

Spillway Campground

The Spillway Campground would be closed for the duration of construction. The proposed road closures for construction described in the Transportation and Infrastructure Specialist Report (Appendix B17) would temporarily eliminate access to this site. Additionally, it would be used as a staging area for the contractor. Post-construction, the access and site would be restored, and the three campsites would remain in their existing condition.

Direct and Indirect Impacts

Reduction in access to recreation facilities or activities.

During construction, minor adverse effects would be expected to recreation facilities and activities due to the construction schedule of the accompanying road and facility construction activities within the project area. Construction duration and timing is described in Table 37, summarized from the 6-foot Dam Raise Engineering Summary (Appendix C). Analysis of general access to the project area and developed recreation facilities is included the Transportation and Infrastructure Specialist Report (Appendix B17). At Anderson Ranch

Reservoir, multiple rim projects affecting access to roadways, campgrounds, and boat ramps would be required to accommodate an increased full pool elevation. Elk Creek Boat Ramp and the Spillway Campground would be closed for the duration of dam construction due to the road closures required for construction at the dam. The temporary closure at the Elk Creek Boat Ramp is for public safety as heavy equipment and trucks would utilize the parking area as a turn-around. Due to the road closure across the dam and HD 121, the Elk Creek Boat Ramp would be the furthest, and most difficult for recreationists to access during construction. All other developed campground and boat ramp projects would be scheduled to avoid the peak season of Memorial Day through Labor Day, maintaining access to developed campsites and boat ramps as seasonal reservoir inundation allows. Single-lane traffic would be open during construction of all roadway improvements, allowing continued access to undeveloped areas as well. It would also be expected that the time it takes for the undeveloped areas to adequately dry, and higher water levels recede, in order to be suitable for driving recreational vehicles on the ground surface would be extended, delaying access to undeveloped areas. No road closures are proposed along the South Fork Boise River; however, HD 121 is identified as a haul route during construction. Access to all facilities and activities along the South Fork Boise River would be accessible to the public during construction.

The cofferdam required during construction would restrict the maximum surface water level between 12 feet and 22 feet below the current full pool of 4196 feet for approximately 42 months. Model results indicate that Reclamation developed model results indicated that the median draft, the lowest likely surface water elevation, would be approximately 4112 feet. This would allow the Curlew Creek boat ramp to remain open year-round during construction. Seasonal reservoir depletion during construction would be similar to existing conditions as shown in Figure 9.

Table 37. Construction duration and timing by project type

Project	Project IDs	Timing	Duration (days)
Roadway MSE Wall Projects	10, 11, 12, 14	August – October	9 *(average for each)*
Roadway Riprap Projects	4, 5, 6, 7, 8, 9, 1, 2, 13, 15	July – October[1]	9 *(average for each)*
Pine Bridge (only if necessary)	17	July – November[1]	87
Lime Creek Bridge	18	July – August[1]	16
Lester Creek Roadway Project	3	March – April	25
Pine Airstrip	16	March – April	32
Curlew Creek Campground & Boat Ramp	21	October – December	45
Pine Campground & Boat Ramp	25	March – April	30

Project	Project IDs	Timing	Duration (days)
Evans Creek Campground	23	April – May[1]	29
Castle Creek Campground	22	May – June[2]	13
Elk Creek Boat Ramp[3]	26	September – October[1]	19
Fall Creek Boat Ramp	24	October – December	57

[1] Would commence pre- or post-holidays of Memorial Day, 4th of July and Labor Day.
[2] Castle Creek sites would be decommissioned and moved to Pine Campground prior to this construction timing. No ground disturbance is required at the site.
[3] Elk Creek Boat Ramp would be closed for the duration of the dam construction for public safety. Improvements are scheduled within that closure.

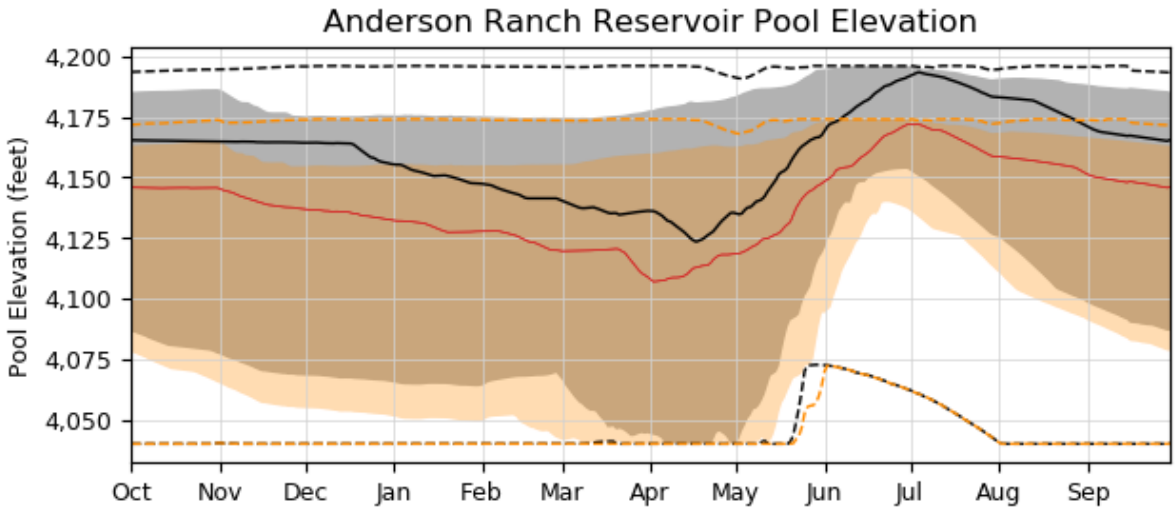

Figure 9. Anderson Ranch Reservoir pool elevation plot depicting the daily median pool elevation range for the restriction (red line) and No-Action Alternative (black line). The shaded orange region and shaded gray region represent the 10th-percentile to 90th-percentile range while the dashed lines represent the maximum and minimum values modeled for Alternative B with the restriction and the No-Action Alternative, respectively.

Except for Castle Creek Campground campsites, post-construction, access to all facilities and activities within the project area would be restored to existing, and in some places, improved conditions. The two Castle Creek campsites would be moved to the Pine Campground ahead of peak season camping and all access to the Pine Campground would be open during and post-construction. The rim projects that are included in Alternative B provide elevated, permanent access to all developed recreation facilities, above the proposed new full pool inundation elevation of 4202 feet.

Considering duration and timing of construction, the reduction in recreational access to facilities or activities is considered a short-term minor direct impact. However, because there is not a permanent loss of access to developed recreation facilities or activities, the impact is not considered significant. Long-term, recreationists would benefit from improved roadways

where sections are widened, allowing for safer passage. The dam crest road will be restored to 2-lane traffic, a long-term beneficial impact to recreationalists. Additionally, improved boat ramp access at Fall Creek and Curlew Creek would also be a long-term beneficial impact as the angled approach for trailers is improved. Trailhead access would not be affected by the Alternative B.

Reduction in recreational opportunity.

During peak season (Memorial Day through Labor Day) within the first year of construction, 26 of the existing 29 USFS-managed developed campsites would remain open. After the first summer season and post-construction, 29 of 29 developed campsites would be available. Of the five USFS-managed boat ramps, four of the five would remain accessible during the entire 51-month project duration. Post-construction, all five USFS-managed boat ramps would be open. Seasonal reservoir inundation fluctuations would continue to limit boat ramp use during construction fall and winter months, similar to existing conditions. Modeling results indicate that Curlew Creek boat ramp would be anticipated to remain open year-round during construction to provide continued recreational opportunity.

Post-construction, all five USFS-managed boat ramps would be seasonally inundated and available for use. The increased inundation above existing full pool would be for approximately 18 days based on hydrologic conditions from 1958–2008. Boat ramps may see extended inundation times for those 18 days as the additional 29,000 acre-feet of water is depleted. Reservoir operations would remain consistent with current operational objectives. Seasonal inundation would persist, providing recreational opportunities on the reservoir similar to what exists now. Curlew Creek and Elk Creek boat ramps would continue to provide late season recreational opportunity.

Developed campground and boat ramp facilities and amenities affected by Alternative B, as described above in this section, are summarized in Exhibit 1 through Exhibit 6 in the Recreation Specialist Report (Appendix B15), which shows the approximate disturbance areas and identifies project features for each proposed campsite and boat ramp.

Undeveloped areas would continue to provide dispersed recreational opportunities during construction. Due to the cofferdam and required decrease in water surface elevation during construction, these undeveloped areas would likely be available earlier in the summer season providing for increased dispersed recreational opportunity. Post-construction, the additional 29,000 acre-feet of water would inundate approximately an additional 146 acres of land area around the reservoir rim at full pool. This equates approximately 3% of increased inundation acreage. Inundation above the existing full pool elevation would be expected for up to 18 days. Due to the extended inundation, opportunity to use the undeveloped areas for dispersed recreation would typically be delayed later into the peak season due to higher water levels and wetter ground surface conditions unsuitable for driving recreational vehicles on. The timing of the delay would depend on the individual water year, however, in a full pool year would be expected to shift the modeled trend lines in Figure 9 by approximately 18 days. Total increased acres across the four undeveloped recreation areas is shown in Table 38.

Table 38. Additional increased inundation acres for surface water elevation of 4202 feet.

Undeveloped Recreation Area	Acres at Full Pool (4196 feet)	Additional Inundated Acres at New Full Pool (4202 feet)
Pine Bridge Area	243	7.29
Pine Airstrip Campground Area	54	1.62
Curlew Creek Area	41	1.23
Deer Creek Area	14	0.42
Total	**352**	**10.56**

Existing operations of the reservoir system would remain in place post-construction and shoreline would continue to be exposed in the late summer and early fall.

Considering temporary closure of developed campground and boat ramp facilities at the reservoir during construction, and construction on developed recreation facilities being scheduled outside of peak season, the reduction in developed recreation facilities is considered a short-term minor direct impact. However, because there is not a permanent reduction of developed recreation facilities or activities, and similar developed recreation facilities provide continued opportunity for recreational activities during construction around the reservoir and along the South Fork Boise River, the impact is not considered significant. Trailhead opportunities are not impacted by Alternative B.

Recreation activities on the South Fork Boise River, including whitewater rafting, kayaking, float boat fishing, and bank or wader fishing may experience minor indirect effects from changes in annual peak flow. Water modeling predicts the flow below Anderson Ranch Dam to be 710 cfs less during April when compared to the No-Action Alternative. In large runoff years that would equate to a 1- to 7-day reduction in peak flow due to additional capacity to store the water within the reservoir rather than discharging it. The South Fork Boise River is closed annually to fishing from April 1 to the start of Memorial Day weekend at the end of May. April is also the when the reservoir begins drafting for downstream uses, increasing flows, until September 15 when flows are ramped back down. Under Alternative B, timing of releases may change at the end of the irrigation season (September), when the flows are typically held near powerplant capacity (1,600 cfs) until they are reduced to the minimum flow targets. With the proposed dam raise and additional water demands, the releases at Anderson Ranch Dam may be held at the powerplant flow of 1,600 cfs for up to 10 days longer. After this time, flows would decrease to either 600 cfs or 300 cfs depending on the target minimum flow at that time. (Water Operations and Hydrology Specialist Report, Appendix B1)

The lower flows in April would not affect fishing opportunity due to the seasonal closure. Late season irrigation flows being held near 1,600 cfs for an additional 10 days would delay the transition from float boat fishing to bank and wader fishing. There would be no increase in peak flows and the flow operations are not expected to deviate from historical operations (Water Operations and Hydrology Report, Appendix B1; FRM Operation Analysis Appendix

G). Due to peak flows not increasing and no reduction in recreational opportunity to whitewater rafting, kayaking, float boat fishing, and bank or wader fishing, these impacts are considered negligible.

Reduction in recreational experience.

Noise, dust, and traffic levels associated with construction would cause minor temporary adverse impacts to recreation users that are recreating near construction activity around the reservoir. These impacts would not be significant because they would be short term and localized, typically lasting a few weeks or less in any one location (Table 37) and would not likely cause users to avoid recreation areas during peak season. Impacts to the recreational experience during construction activities are anticipated to be most noticeable along the one to two mile stretch of HD 121, between the proposed borrow pit locations and the dam due to an increase in heavy truck traffic during the 42-month construction period. These impacts would be moderately adverse to recreationists along the banks of the river during construction; however, it is not anticipated that users would avoid using the river for the popular uses of fishing and whitewater rafting so the impact is not considered significant.

Construction along the reservoir rim is not scheduled to happen near all areas available for recreation at the same time, so recreation areas (both developed and undeveloped) would be available for use away from construction activity and recreational activities would not be condensed. Recreationists in the vicinity of construction may hear elevated noise, but noise increases would be minor as work would occur in previously developed areas. Increased dust at reservoir campsites due to rim construction traffic and activity would be minor due to construction being scheduled outside of peak season. Because public access would be restricted near the dam, construction noise is not likely to affect the quality of user experience in that vicinity. In addition, public information regarding timing of construction would reduce recreational use of these areas and reduce the potential for conflict. Post-construction, minor beneficial effects would be expected to the recreational experience in some locations due to new campsite appurtenances (fire rings, tables, and shade structures) and improved boat ramp facilities. However, the removal of numerous large trees would be a direct adverse impact due to the loss of shade at Curlew Creek, Castle Creek, Pine, and Evans campgrounds. The loss of shade is not considered significant because it is not permanent with new trees being planted.

Alternative C

Overview of Recreation Facilities Proposed Projects

The 3-foot Dam Raise Engineering Summary (Appendix D) provides an overview of the conceptual design completed by Reclamation for this alternative. While multiple rim projects affecting recreation are reduced in footprint from Alternative B, Pine Campground is the only site with a reduced impact to existing recreation amenities.

The developed campground and boat launch infrastructure project features for Alternative C are similar to Alternative B. The project feature descriptions are not repeated here but rather compared in tabular format. Further detailed descriptions of developed recreation facilities and design features required for Alternative C are described in the Recreation Specialist Report (Appendix B15).

Alternative C includes the same project features as Alternative B for Curlew Creek, Castle Creek, Evans Creek.

Pine Campground and Boat Ramp

At Pine Campground, six of the seven existing campsites would not be impacted. One campsite, currently south of the boat ramp, would be relocated to the upper loop as described in Alternative B. This relocated campsite would be next to the two new campsites relocated from the Castle Creek Campground abandonment as described in Section 3.3.2 and as shown in Exhibit 3 in the Recreation Specialist Report (Appendix B15). The concrete boat ramp would be extended by 48 feet for a total length of 400 feet, 16 feet less than Alternative B.

Fall Creek Boat Ramp

The Fall Creek boat ramp under Alternative C would include the same design features as Alternative B except the boat ramp would be extended by 74 feet for a total length of 234 feet, 16 feet less than Alternative B.

Elk Creek Boat Ramp

The Elk Creek Boat ramp would be closed for approximately 44 months and undergo the same minor grading to accommodate heavy truck traffic as described for Alternative B. The dock would not require any extension and remain at 160 feet in total length.

Spillway Campground

The Spillway Campground would remain closed for duration of construction, approximately 44 months. Other than duration of closure, there are no changes to the Spillway campground use during construction as a staging area, access, or post-construction availability and condition as described for Alternative B.

Direct and Indirect Impacts

Reduction in access to recreation facilities or activities.

Impacts during and post-construction are expected to be similar to those described for Alternative B. Access impacts at Pine Campground due to construction would be lessened because 6 out of the 7 existing sites are likely to remain open during construction on the new 3 campsites. As described in Appendix D, the Lester Creek Roadway Project (Project ID No. 3) and the reorientation of the Pine Airstrip are not required for the 3-foot raise. This would remove two projects scheduled for construction for approximately 30 days each in March–April (Table 37). No changes in access to recreation facilities or activities are expected. Elk Creek Boat Ramp and the Spillway Campground would be closed for the entire project duration of approximately 44 months, 7 months less than Alternative B. The Elk Creek Boat Ramp would remain closed for the 44-month construction duration due to public safety concerns. The road across the dam and HD 121would be closed for approximately 38 months under Alternative C, making the Elk Creek Boat Ramp the furthest and most difficult for recreationists to access during construction. Similar to Alternative B, access to other boat ramps and camping sites around the reservoir would be available seasonally during construction. Reservoir restriction due to the cofferdam is similar to Alternative B and would be required for approximately 35 months, 7 months less than Alternative B. Model results indicated that the median draft, the lowest likely surface water elevation, would be

approximately 4112 feet. This would allow Curlew Creek boat ramp to remain open year-round during construction. Seasonal reservoir depletion during construction would be similar to existing conditions. Due to construction activities requiring the use of HD 121 similar to Alternative B, no change to access along the South Fork Boise River is anticipated.

As described for Alternative B, access to all recreation amenities within the project area would be restored post-construction. The rim projects that are included in Alternative C provide elevated, permanent access to all developed recreation facilities, above the proposed Alternative C full pool inundation elevation of 4199 feet.

Similar to Alternative B, the reduction in recreational access to facilities or activities during construction is considered a short-term minor direct impact. However, because there is no permanent loss of access to recreation facilities or activities, the impact is not considered significant under Alternative C. Long term, recreationists would benefit from improved roadways where sections are widened, allowing for safer passage. The dam crest road will be restored to 2-lane traffic, a long-term beneficial impact to recreationalists. Additionally, improved boat ramp access at Fall Creek and Curlew Creek would also be a long-term beneficial impact because the angled approach for trailers is improved. Trailhead access would not be affected by the Alternative B.

Reduction in recreational opportunity.

Similar to Alternative B, the identified rim projects would be completed in approximately 23 months. During peak season (Memorial Day through Labor Day) within the first year of construction, 26 of the existing 29 USFS-managed developed campsites would remain open. After the first summer season and post-construction, all 29 developed campsites would be available. Four of the five USFS-managed boat ramps would remain accessible during the 44-month total project duration. Seasonal reservoir inundation fluctuations would continue to limit boat ramp use during construction fall and winter months, similar to existing conditions as described for Alternative B.

Post-construction, all five USFS-managed boat ramps would be seasonally inundated and available for use. The increased inundation above existing full pool would be for approximately 9 days based on hydrologic conditions from 1958–2008. Boat ramps may see extended inundation times for those 9 days as the additional 14,400 acre-feet of water is depleted. Developed campground and boat ramp facilities and amenities affected by Alternative C are similar to Alternative B, and are described below. Disturbance areas for Alternative C would be similar to those shown in Exhibit 1 through Exhibit 6 of the Recreation Specialist Report (Appendix B15) for Alternative B and are described further in Section 3.3.3 of the Recreation Specialist Report.

Similar to Alternative B, undeveloped areas would continue to provide dispersed recreational opportunities during construction. Due to the cofferdam and required decrease in water surface elevation during construction, these undeveloped areas would likely be available earlier in the summer season providing for increased dispersed recreational opportunity. Post-construction, the additional 14,400 acre-feet of water would inundate approximately an additional 73 acres of land area around the reservoir rim at full pool. This equates to approximately 1.5% of increased inundation acreage. Inundation above the existing full pool elevation would be expected for up to 9 days. Due to the extended inundation, opportunity to use the undeveloped areas for dispersed recreation would typically be delayed later into the

peak season due to higher water levels and wetter ground surface conditions unsuitable for driving recreational vehicles on. The timing of the delay would depend on the individual water year, however, in a full pool year would be expected to shift the modeled trend lines in Figure 9 by approximately 9 days, considered a minor direct impact.

Total increased acres across the four undeveloped recreation areas is shown in Table 39.

Table 39. Additional increased inundation acres for surface water elevation of 4199 feet

Undeveloped Recreation Area	Acres at Full Pool (4196 feet)	Additional Inundated Acres at New Full Pool (4199 feet)
Pine Bridge Area	243	3.645
Pine Airstrip Campground Area	54	0.81
Curlew Creek Area	41	0.62
Deer Creek Area	14	0.21
Total	**352**	**5.28**

Reservoir operational regimes similar to those existing, would remain in place post-construction and shoreline would continue to be exposed in the late summer and early fall. Because there is not a permanent reduction of developed recreation facilities or activities, and similar developed recreation facilities provide continued opportunity for recreational activities during construction around the reservoir, the impact is not considered significant. Trailhead opportunities are not impacted by Alternative C.

Water modeling predicts the flow below Anderson Ranch Dam to be 380 cfs less during April when compared to the No-Action Alternative. In large runoff volume years that would equate to a 1- to 5-day reduction in peak flow due to additional capacity to store the water within the reservoir rather than discharging it.

Similar to Alternative B, the lower flows in April would not affect fishing opportunity due to the seasonal closure. Late season irrigation flows being held near 1,600 cfs for an additional 4.5 days would delay the transition from float boat fishing to bank and wader fishing. There would be no increase in peak flows and the flow regime is not expected to deviate from historical operations (Water Operations and Hydrology Report, Appendix B1, FRM Operation Analysis Appendix G). Due to peak flows not increasing and no reduction in recreational opportunity to whitewater rafting, kayaking, float boat fishing, and bank or wader fishing, these impacts are considered negligible.

Reduction in recreational experience.

Similar to Alternative B, noise, dust, and traffic levels associated with construction are not anticipated not be significant because they would be short term and localized, typically lasting a few weeks or less in any one location (Table 37) and would not likely cause users to avoid recreation areas during peak season. Impacts would be moderately adverse to recreationists along the banks of the river during construction; however, it is not anticipated

that users would avoid using the river for the popular uses of fishing and whitewater rafting so the impact is not considered significant.

Similar to Alternative B, post-construction, minor beneficial effects would be expected to the recreational experience in some locations due to new campsite appurtenances (fire rings, tables, and shade structures) and improved boat ramp facilities. However, the removal of numerous large trees would be a direct adverse impact due to the loss of shade at Curlew Creek, Pine, and Evans Creek campgrounds. The loss of shade is not considered significant because it is not permanent with new trees being planted.

3.16.2.3 Cumulative Impacts

The construction of the Pine Bridge in 2018 and dam crest raise in 2010 both caused direct impacts to recreational access due to traffic delays and, for the Pine Bridge, road conditions limited large vehicle and trailer to access to recreation sites and amenities near Pine. The potential construction of the Pine Bridge and dam crest improvements in 2025 as proposed would cause those same impacts, however, would not be cumulative impact due to separation in time of the two projects. The dam crest will be widened to re-introduce 2-lane traffic and is considered a beneficial long-term impact.

The proposed CCE and South Fork Boise River Diversion projects would both extract water from Anderson Ranch Reservoir, potentially effecting surface water levels and downstream flow rates. The water right permits for both projects prescribe that water may only be drafted in years where there is excess water not committed to senior water rights and when minimum downstream flow obligations are met. Any water drafted from the reservoir by the CCE South Fork Boise River Diversion projects would have been released for flood control and not be committed to other, more senior, uses. Excess water is typically only available in the spring during watershed runoff.

If the CCE and South Fork Boise River Diversion projects were to happen in conjunction with the Anderson Ranch Dam raise, it would be anticipated that the surface water elevation of the reservoir would minimally fluctuate based on pumping operations by one or both of the projects. Using the diversion rates from the water right permits (Table 1 in the Water Rights Specialist Report, Appendix B16), for each project, it can be assumed that diverting water from the reservoir would have minimal impact on the surface water elevation of the reservoir. Timing of the diversion would coincide with spring inflows into the reservoir would allow for boat ramps to continue to be functional. Undeveloped areas would continue to be saturated in the spring and exposed in the late summer.

Because the water drafted by CCE and South Fork Boise River Diversion projects would be flood control water, it would be assumed that in high water years, downstream flows would be closer to average water year flow levels. This may provide the opportunity for bank and wader fisherman to fish earlier in high-water years.

In summary, due to the water right permit stipulations limiting the diversion rates of each project, water only being drafted in years flood control water would be spilled, and timing of drafting likely being limited to spring and early summer, any cumulative impacts to recreation would be negligible.

3.16.2.4 Mitigation Measures

The Fall Creek Marina and campsites would be affected by inundation. Impacts of the proposed action to the non-Federal real property would be mitigated during project implementation, should the project be determined feasible and the special use permit still be in effect. Potential mitigation could include: rebuild existing features to their existing condition, relocate existing features to a suitable location, or compensatory mitigation. For more details on mitigation measures related to Recreation, please refer to the Environmental Commitments Section, Recreation Resources, 3.28.6. Additional NEPA will be conducted prior to any action being selected for this site consistent with the special use permit.

3.17 Water Rights

This section describes existing water rights within the project area and anticipated environmental consequences for the alternatives. Regulatory information, detailed water rights information, and additional methods and analysis are included in the Water Rights Specialist Report (Appendix B16).

3.17.1 Water Rights – Affected Environment

The geographic focus of the water rights impact analysis includes the Boise River Basin including the Basin's Reservoir system comprised of Anderson Ranch, Arrowrock, and Lucky Peak reservoirs.

A water right is established when a private right to the use of public waters is established through an appropriation by the state of Idaho. In Idaho, surface water is managed through the doctrine of prior appropriation, which determines who gets water when there is a shortage, where senior (older) water rights are satisfied first, followed by junior (newer) water rights. In the Boise River basin, competing demands include irrigation, domestic, aesthetic, commercial, municipal, industrial, mining, power, recreation, flood control, minimum flow targets, ecological flow releases, and ecological storage constraints. Thus, affected demands must be considered in the context of the Boise River system cumulatively.

3.17.2 Water Rights – Environmental Consequences

3.17.2.1 Methods for Evaluating Impacts and Significance Criteria

The methods for assessing impacts to water rights from Alternative B and Alternative C include the following.

- Data collection. Collect cumulative and quantitative data on the proposed and existing water rights in the Boise River basin, as well as hydrologic technical documents that have been completed to evaluate potential impacts to water rights.
- Evaluation and peer review. Evaluate the Water Operations Technical Memorandum (Appendix F); Engineering Summaries for Alternative B and Alternative C (Appendix C and Appendix D); and the Boise Feasibility Study – Preliminary Hydrologic Evaluation Technical Memorandum (Reclamation, 2017) to determine the impact to water rights in the project area.
- Water rights impact analysis. Determine the impact to existing water rights in the Boise River basin.

There are approximately 27,460 active point of use water rights within the Boise River Basin. These represent areas where water can be used from a live flow, either surface water or groundwater (springs, stream or well) and put to beneficial use under a water right. Active existing water rights are expected to be senior to any new (junior) water right applied for in the basin according to the prior appropriation doctrine administered by priority date. Water use for these active rights includes aesthetic, commercial, cooling, diversion to storage, domestic, fire protection, fish habitat, fish propagation, ground water recharge, heating, industrial, irrigation, mining, mitigation, municipal, power, recreation, stockwater, water quality improvement, and wildlife. Municipal water rights make up approximately 20 of these 27,460 active water rights and include the general service area of the place of use for organizations with water rights who qualify as municipalities or municipal providers under Idaho Code Title 42 and who have a municipal water right on file at the IDWR.

The storage in each of the three system reservoirs (Anderson Ranch, Arrowrock, and Lucky Peak) accrues water daily according to the reservoirs water right priority and the natural flow available at the point of diversion. The Anderson Ranch Dam has an established priority date of December 9, 1940 by the United States of America Acting through the Bureau of Reclamation. Aside from its secondary purpose of hydroelectric power generation at the Anderson Ranch Dam, the beneficial uses of the Anderson Ranch Reservoir include the storage and release of water for irrigation, industrial, and municipal purposes pursuant to contracts between Reclamation and various entities.

The Boise River project Alternative B, Alternative C, CCE project, and the South Fork Boise River Diversion Project will all be limited to storing water only when it would otherwise be released due to flood control. Further, project impacts and cumulative effects evaluation of past, present, and foreseeable future projects in the basin were analyzed with priority data water rights modeling scenarios and assumptions utilized in the Water Operations Technical Memorandum, Appendix F. Due to the uncertainty during the analysis, around if and when these new water rights proposals for diversion from, and storage in, Anderson Ranch Reservoir, were being considered, the analysis considered three different diversion configurations of the potential new water rights which resulted in six possible scenarios of priority order. Potential new water rights for Alternative B and Alternative C, and both the South Fork Boise River Diversion Project and CCE storage project were evaluated using the associated maximum diversion rate and annual volume limit summarized in Table 40, and were assumed to only be in priority when:

- there is a minimum of 800 cfs below Anderson Ranch Dam,
- there is a minimum of 240 cfs below New York Canal June 16th through February 29th,
- there is a minimum of 1,100 cfs below New York Canal March 1st through May 31st,
- and the system is making releases for FRM.

Table 40. Diversion rate and volume limits.

Entity	Diversion Rate Limit	Diversion Volume Limit
Anderson Ranch New Storage (63-34753)	No Limit	29,000 acre-feet

Entity	Diversion Rate Limit	Diversion Volume Limit
The South Fork Boise River Diversion Project (63-34348)	200 cfs 100 cfs	10,000 acre-feet No Limit
Cat Creek Energy (63-34652)	3,000 cfs	30,000 acre-feet*

*consumptive use of water right. The initial CCE fill will divert up to 100,000 acre-feet at a rate of 9,996 cfs which was not considered in the modeling assessment because it is expected to be junior in priority to the Anderson Ranch New Storage.

The modeling analysis (Appendix F) utilized both the full 50-year simulation period and a shorter 28-year period. The three different diversion configurations of the potential new accounts result in a total of six scenarios considered in the analysis with entities listed in the priority order in which they were modeled:

1. Anderson Six feet
2. South Fork Boise River Diversion Project > Anderson Six feet > Subordinated Cat Creek Energy
3. South Fork Boise River Diversion Project > Cat Creek Energy > Anderson Six feet
4. Anderson Three feet
5. South Fork Boise River Diversion Project > Anderson Three feet > Subordinated Cat Creek Energy
6. South Fork Boise River Diversion Project > Cat Creek Energy > Anderson Three feet

The proposed alternatives would impact water rights when construction activities and implementation of the project would result in individual and/or cumulative impacts, such as alteration or disturbance, to existing, priority Idaho water rights appropriations in the Boise River basin and/or priority contracted space in the system reservoirs of the Boise River Basin.

Table 41 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for water rights. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 41. Water rights impact indicators and significance criteria

Impact Indicator	Significance Criteria
Disruption to existing priority Idaho water rights appropriations in the Boise River basin.	Construction activities and/or the resulting project result in individual alterations, disturbance, or shortage to the existing priority water rights appropriations. These priority water rights may be used for a variety of beneficial uses such as aesthetic, irrigation, domestic, municipal, industrial uses, etc. and are expected to be senior to the new water right of the storage space in accordance with the prior appropriation doctrine.
Reduced volume of reservoir contracted space.	Construction activities and/or the resulting project results in shortfalls to the contracted space holders of the system reservoirs in effect reducing the owner's ability to obtain their full contracted water volume.

3.17.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Through the No-Action Alternative, there would be no construction at the dam or related facilities, and current water-management operations would continue. This represents the baseline scenario of current system storage capacity, operations, and demand levels.

Even though there would be no change to the current system under the No-Action Alternative, water demands cannot always be met under the current system. Conditions—particularly in dry water years—may result in short- and long-term direct and indirect adverse impacts under the No-Action Alternative because system shortages may increase during dry water years and increasing climate variability. The 2060s climate change hydrologic conditions modeling completed under the Water Operations Technical Memorandum (Appendix F), showed the potential for increased storage though the simulations assumed perfect forecasts and current operational objectives. The proposed Alternative B and Alternative C would equate to either a 7% or 3% increase in active capacity and a 3% or 1% increase in system active capacity of Anderson Ranch Reservoir, respectively, which would have long-term beneficial direct and indirect impacts because more supply of storage water may be available to support existing and future beneficial water appropriations in the Boise River basin.

Alternative B

The project area relating to Alternative B for water rights is the Anderson Ranch reservoir and dam, and the downstream water rights that are affected by the project and associated acquisition of a water right for the new storage space within the Boise River basin during and after the construction phase of the proposed alternatives.

The action of Alternative B is a 6-foot raise of Anderson Ranch Dam. This raise would increase the storage capacity of Anderson Ranch Reservoir by approximately 29,000 acre-feet for an active capacity of approximately 442,074 acre-feet. The dam raise equates to a 7% increase in the active capacity of Anderson Ranch Reservoir and a 3% increase in system active capacity.

The model results presented in the Water Operations Technical Memorandum (Appendix F) suggest that the new storage account created by a 6-foot raise results in a refill probability ranging from 29% to 62% of years depending on the dam raise scenario and analysis period. The highest refill probability was associated with the refilling of Anderson Ranch Reservoir only scenario for the 50 year period, while the lowest refill probability was associated with the scenario where Anderson Ranch Reservoir fills last behind flow augmentation, the South Fork Boise River Diversion Project, and Cat Creek for the 28 year period.

Water availability in Anderson Ranch Reservoir will be affected by Alternative B during construction, which may impact reservoir contracted space holders, or storage water rights, and cumulatively impact downstream demands. Construction activities associated with the dam raise will require drawdown of Anderson Ranch Reservoir to protect against flood events for a range of return intervals and potential coffer dam configurations. According to the Water Operations Technical Memorandum (Appendix F), the proposed construction schedules call for Anderson Ranch Reservoir to be drafted to the restricted pool elevation, of 4,174 ft or 4,184 ft, during the construction period. While it is anticipated that normal

operations for downstream water supply will be sufficient to reduce the pool elevation below the designated restricted elevation for construction by the end of August 2022, summer operations may be adjusted to maintain required pool elevations. The Water Operations Technical Memorandum (Appendix F) analyzed the most restrictive pool elevation of 4174 ft. Once installation of the coffer dam is complete, operations for FRM and water supply will continue as normal under the restricted pool elevation, resulting in deeper drafts of Anderson Ranch Reservoir than would have occurred without the pool elevation restriction. These deeper drafts will, however, be limited by the powerhead elevation of 4,036 ft. As pool elevations in Anderson Ranch Reservoir approach this lower limit, operations may need to be adjusted to maintain pool elevations above 4036 ft while still meeting downstream targets including minimum flows in the South Fork Boise River and minimum pool elevation in Arrowrock Reservoir.

According to the Water Operations Technical Memorandum (Appendix F), the drawdown of Anderson Ranch Reservoir during the construction period could result in reduced fill to reservoir contracted storage accounts, which would be dependent on runoff conditions. The 17 contracted space holders and one uncontracted space that may experience volume shortfalls are typically individual system canal owners/operators who hold the contracted storage space to supplement canal demands when there are natural flow shortages. The Water Operations Technical Memorandum (Appendix F) focused on the maximum potential shortfall and assumed that the ability to fill downstream reservoirs would not be impacted by the restriction. Analyzing two different restriction elevations, the maximum volume of shortfall per year was calculated as the full-pool volume minus the restricted-pool volume, resulting in a shortfall of 55,074 acre-feet per year (acre-feet/yr) for a 4,184-foot restriction; and a shortfall of 96,074 acre-feet/yr for a 4,174-foot restriction. The Water Operations Technical Memorandum (Appendix F) assumed that this shortfall volume would be shared proportionally among current Anderson Ranch Reservoir contracted space holders, calculated as the total space contracted by each space holder multiplied by the total shortfall volume. The shortfall volumes for 17 contracted space holders, and one uncontracted space, range from approximately 0.80 acre-foot/yr to 16,292 acre-feet/yr for a 4,184-foot restriction; and from approximately 1.4 acre-feet/yr to 28,420 acre-feet/yr for a 4,174-foot restriction in Anderson Ranch Reservoir. Adapted from the Water Operations Technical Memorandum (Appendix F), Table 42 provides a summary of these contracted space holders, the amount of space contracted, percent of space contracted (excluding power head), and the potential maximum shortfall volumes under the two pool elevation restrictions.

Table 42. Anderson Ranch Reservoir Contracted Space Holder Shortfalls

Contracted Space Holder	Space Contracted (acre-feet)	Percent of Total Space (%)	Shortfall Volume for 4184-foot Restriction (acre-feet/year)	Shortfall Volume for 4174-foot Restriction (acre-feet/year)
Ballentyne	367	0.09%	48.93	85.36
Big Bend Irrigation District	3,797	0.92%	506.24	883.12

Contracted Space Holder	Space Contracted (acre-feet)	Percent of Total Space (%)	Shortfall Volume for 4184-foot Restriction (acre-feet/year)	Shortfall Volume for 4174-foot Restriction (acre-feet/year)
Boise-Kuna Irrigation District	109,538	26.52%	14,604.39	25,476.68
Nampa & Meridian Irrigation District	90,758	21.97%	12,100.51	21,108.77
New York Irrigation District	40,051	9.70%	5,339.89	9,315.18
Wilder Irrigation District	122,195	29.58%	16,291.92	28,420.48
Boise Valley	939	0.23%	125.19	218.40
Capitol View	449	0.11%	59.86	104.43
Farmers Union	5,593	1.35%	745.70	1,300.84
New Dry Creek	1,266	0.31%	168.79	294.45
Pioneer Ditch Company	2,123	0.51%	283.05	493.77
Pioneer Irrigation District	24,986	6.05%	3,331.31	5,811.32
Settlers Irrigation District	5,675	1.37%	756.63	1,319.91
South Boise Mutual Irrigation Company	531	0.13%	70.80	123.50
J.R. Simplot Co. & Micron Technology, Inc.	3,000	0.73%	399.98	697.75
Trinity Acquisitions, LLC	800	0.19%	106.66	186.07
United Water Idaho	1,000	0.24%	133.33	232.58
Uncontracted	6	0.00%	756.63	1,319.91
TOTAL	**413,074**	**100%**	**55,074**	**96,074**

For both Alternatives B and C, the alternative would likely affect the ability to store and deliver water according to existing Anderson Ranch contracts due to the reservoir restriction to 4174 feet required for 42 months during construction. The restriction elevation and duration may be adjusted based on final design, potentially lessening impacts. This EIS evaluates the effects of this restriction on water deliveries. Reclamation and IWRB are developing approaches to address any associated impact to existing spaceholders, including rentals from the water bank or other pre-negotiated financial arrangements. Environmental compliance related to these approaches will be completed in the future if needed.

Short-term, direct and indirect, significant adverse impacts would occur to the contracted storage space during construction of Alternative B. Notably, these impacts would be to Anderson Ranch Reservoir contracted space holders due to volume shortfalls as a result of drawdown of Anderson Ranch Reservoir to meet restricted pool elevations during the construction period. Current estimated volume shortfalls were calculated based on analyzing two different restriction elevations, resulting in estimated shortfall volumes to each of 17 contracted space holders and one uncontracted space. The estimated shortfalls to storage water rights may affect the space holders' ability to use storage water from their accounts to meet downstream priority canal demands during natural flow shortages, resulting in direct significant adverse impacts to contracted storage space by Alternative B for the short-term duration of construction. Following construction, Anderson Ranch Dam operations would return to normal and the volume shortfalls would cease. Following construction of Alternative B, the reservoir would have an increased capacity of approximately 29,000 acre-feet, which would have long-term beneficial direct and indirect impacts as more supply of storage water may be available to support existing and future beneficial water appropriations in the Boise River basin.

Alternative C

The primary project area relating to Alternative C for water rights is the same as Alternative B.

The action of Alternative C is a 3-foot raise of Anderson Ranch Dam. This raise would increase the storage capacity of Anderson Ranch Reservoir by approximately 14,400 acre-feet for an active capacity of approximately 427,474 acre-feet. The dam raise equates to a 3% increase in the active capacity of Anderson Ranch Reservoir and a 1% increase in system active capacity.

Water availability and refill probability modeling considered three potential new water rights which included the Anderson Ranch Storage achieved through Alternative C; the South Fork Boise River Diversion Project, and the CCE. Using the same approach, simulation periods and six scenarios detailed above for Alternative B, modeling suggests that the new storage account created by a 3-foot raise results in a refill probability ranging from 36% to 64% of years depending on the dam raise scenario and analysis period. The highest refill probability was associated with the refilling of Anderson Ranch Reservoir only scenario for the 50 year period, while the lowest refill probability was associated with the scenario where Anderson Ranch Reservoir fills last behind flow augmentation, the South Fork Boise River Diversion Project, and Cat Creek for the 28 year period (Appendix F).

According to the Water Operations Technical Memorandum (Appendix F), the drawdown of Anderson Ranch Reservoir during the construction period could result in reduced fill to

reservoir contracted space holders, which would be dependent on runoff conditions. As summarized for Alternative B, the 17 contracted space owners and one uncontracted space that may experience volume shortfalls are typically individual system canal owners/operators who hold the contracted water right to supplement canal demands when there are natural flow shortages. The Water Operations Technical Memorandum (Appendix F) focused on the maximum potential shortfall and assumed that the ability to fill downstream reservoirs would not be impacted by the restriction. The two different restriction elevations would be the same for both Alternative B and Alternative C; thus, the calculated shortfalls to storage accounts is anticipated to be the same under both alternatives during construction. Analyzing two different restriction elevations, the maximum volume of shortfall per year was calculated as the full-pool volume minus the restricted-pool volume, resulting in a shortfall of 55,074 acre-feet per year (acre-feet/yr) for a 4184-foot restriction; and a shortfall of 96,074 acre-feet/yr for a 4174-foot restriction. The Water Operations Technical Memorandum (Appendix F) assumed that this shortfall volume would be shared proportionally among current Anderson Ranch Reservoir contracted space holders, calculated as the total space contracted by each space holder multiplied by the total shortfall volume. The shortfall volumes for 17 contracted space owners, and one uncontracted space, range from approximately 0.80 acre-foot/yr to 16,292 acre-feet/yr for a 4,184-foot restriction: and from approximately 1.4 acre-feet/yr to 28,420 acre-feet/yr for a 4,174-foot restriction in Anderson Ranch Reservoir. These shortfalls are presented in Table 42.

Short-term, direct and indirect, significant adverse impacts would occur on contract storage space s during construction of Alternative C. Notably, these impacts would be to Anderson Ranch Reservoir contracted space holders due to volume shortfalls as a result of drawdown of Anderson Ranch Reservoir to meet restricted pool elevations during the construction period. These volume shortfall impacts and duration are the same as Alternative B as summarized above. Following construction of Alternative C, the reservoir would have an increased capacity of approximately 14,400 acre-feet, which would have long-term beneficial direct and indirect impacts as more supply of storage water would be available to support existing and future beneficial water appropriations in the Boise River basin.

3.17.2.3 Cumulative Impacts

Past actions include the Pine Bridge replacement and the Anderson Ranch Dam Security Berm. These past projects are not anticipated to contribute to any cumulative impacts to water rights associated with the proposed Anderson Ranch Dam through Alternative B or Alternative C.

The water right for the CCE project has been applied for but has not yet been approved. Pursuant to Title 43, Chapter 2 of the Idaho Code, the CCE water right, if permitted, is expected to be senior in priority to the proposed Anderson Ranch Reservoir water right and the non-consumptive hydropower water right would be last to fill. The CCE project would be limited to diverting water only when it would otherwise be released due to flood control; therefore, this project is not anticipated to contribute to any cumulative impacts to water rights associated with the proposed Anderson Ranch Dam through Alternative B or Alternative C.

The South Fork Boise River Diversion Project's water right application has been approved for a 10,000-acre-feet water right with the intent of pumping this water from Anderson

Ranch Reservoir through a pipeline into the Little Camas Reservoir to support groundwater recharge and irrigation. The South Fork Boise River Diversion Project water right would be senior to the new new (junior) water right for the storage space of the Anderson Ranch Reservoir achieved through the dam raise of Alternative B. The South Fork Boise River Diversion Project water right would be limited to diverting water that would otherwise be released for flood control; thus, as with the CEE project, this project is not anticipated to contribute to any cumulative impacts to water rights associated with the proposed raise of Anderson Ranch Dam through Alternative B or Alternative C.

3.17.2.4 Mitigation Measures

The drawdown of Anderson Ranch Reservoir during the construction period for Alternative B and Alternative C would result in estimated shortfall volumes to Anderson Ranch Reservoir contracted space holders totaling an estimated 55,074 acre-feet/year to 96,074 acre-feet/year depending on restricted-pool volume. This impact would cease at the conclusion of construction activities. Mitigation for the adverse short-term impacts to contracted space holders would be in compliance with applicable state and federal laws.

3.18 Transportation and Infrastructure

This section describes existing conditions for transportation and infrastructure within the project area and anticipated environmental consequences for the alternatives. Regulatory information, transportation and access information, detailed haul truck count estimates, descriptions of infrastructure, and additional methods and analysis are included in the Transportation and Infrastructure Specialist Report (Appendix B17).

3.18.1 Transportation and Infrastructure – Affected Environment

The transportation and infrastructure analysis area is the road system around Anderson Ranch Reservoir, including roads used to access residential or recreation sites along the reservoir and South Fork Boise River, and proposed road closures and detours (Figure 1, Transportation and Infrastructure Specialist Report, Appendix B17). The analysis area also includes other infrastructure in the project area, including bridges, Pine Airstrip, and utilities as described in Chapter 2.

Roads considered in this analysis were taken from the USFS MVUMs as the most comprehensive data source (USFS, 2019). Several NFS roads are used to access reservoir recreation sites and provide shoreline access. Roads are referred to as either Highway District roads under Highway District jurisdiction or NFS roads under USFS jurisdiction. The closest major highway to the Anderson Ranch Reservoir area is U.S. Highway 20 (U.S. 20).

Four primary roads provide vehicle access around the reservoir (Figure 1, Transportation and Infrastructure Specialist Report, Appendix B17).

- HD 61 extends north from its intersection with U.S. 20, follows the northeast shore of the reservoir, and crosses Pine Bridge to the communities of Pine and Featherville.
- HD 128 provides access from Pine south to Sloans Gulch. The road is inaccessible past the Pine Airstrip during winter months.

- HD 120 from Fall Creek Campground to Anderson Ranch Dam provides access to the northwest shore.
- HD 134 extends north from its junction with U.S. 20 to Anderson Ranch Dam, providing the most direct access to the dam and alternate access to the northwest reservoir shore.

In addition, numerous short NFS roads provide reservoir access along the shoreline. Some of the longer roads include NFS Road 128BC at Pine Airstrip and NFS Road 134A near Spillway Campground.

HD 121 provides access from Anderson Ranch Dam south along the northern bank of the South Fork Boise River.

The Federal Highway Administration (FHWA) uses level of service (LOS) indicators to describe changes to baseline traffic information (FHWA, 2017). Using these guidelines, baseline traffic movement based on current roadways in the project area is defined as LOS B. LOS B indicates stable traffic flow with a high degree of freedom to select speed but with some influence from other users during peak times.

Three bridges—Lime Creek Bridge, Pine Bridge, and Spillway Bridge—are included in the transportation and infrastructure analysis area (Figure 1, Transportation and Infrastructure Specialist Report, Appendix B17). Located on HD 61, the Lime Creek Bridge is a 154-foot long, prestressed concrete bridge maintained year-round by Glenns Ferry Highway District. Located on HD 61, the Pine Bridge over the South Fork Boise River is a 183-foot long steel girder/concrete bridge that was replaced in October 2018 over a period of 18 months. Pine Bridge is maintained year-round by Glenns Ferry Highway District and Mountain Home Highway District. The Spillway Bridge, over the Anderson Ranch Dam crest on HD 134, is 65 feet long.

Located on the west shore of Anderson Ranch Reservoir, the Pine Airstrip is operated by ITD Division of Aeronautics under a special use permit by USFS (Figure 1, Transportation and Infrastructure Specialist Report, Appendix B17). The turf airstrip is approximately 2,300 feet long and 125 feet wide and suitable for small airplanes. Aircraft operations average 20 takeoff and landings per week (for a 12-month period ending June 30, 2017) consisting of 98% transient general aviation and 2% military. There are more operations in the summer due to increased recreation activity. The airstrip is not maintained in winter (Air Nav, 2020).

CenturyLink owns a buried fiber optic cable that crosses Anderson Ranch Dam at the dam road as well as nearby manholes and other connection points. According to coverage maps of major telecommunication providers, wireless service is available throughout the project area. Areas north of the project area and remote recreation areas may have inconsistent or no cellular service.

Idaho Power operates overhead and underground power lines, power poles, and some transformers in the project area.

3.18.2 Transportation and Infrastructure – Environmental Consequences

3.18.2.1 Methods for Evaluating Impacts and Significance Criteria

Methods to evaluate impacts and the associated significance criteria were developed using a combination of FHWA traffic movement indicators, desktop analysis with GIS, and telephone calls or in-person meetings with highway districts, utilities, and agencies to develop the impact indicators and associated significance criteria. For comparison to existing average daily traffic (ADT) estimates and measurements, construction traffic (worker and haul truck) daily round trips by construction season, year, and location were estimated for each road (or haul route) based on material types and quantities associated with the two dam raise alternatives and reservoir rim projects associated with each proposed action as described in the 6-foot Dam Raise Engineering Summary (Appendix C). The direct and indirect effects for transportation and infrastructure are based on the intensity (magnitude), duration, extent, and context of the impacts. Table 43 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for transportation and infrastructure. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 43. Transportation and infrastructure impact indicators and significance criteria

Impact Indicator	Significance Criteria
Decrease in existing traffic LOS	Shift from current LOS to a lower LOS based on criteria from FHWA (2017) More than a temporary interruption to, or potential conflict with, other means of transportation (pedestrians, bicycles)
Inundation of roads	Permanent road closures as the result of inundation
Reduced use of Pine Airstrip	Interruption in airstrip use lasting more than 3 months or during high-use periods
Reduced recreational access as a result of road closures or delays	Permanent loss of access to recreation sites
Condition of roadways causing increased maintenance requirements	More than a minor deterioration of local roadways
Disruption in utility service	More than temporary outage or loss of utility service

For potential impacts to traffic volumes, generalized LOS indicators from FHWA were used as the baseline (FHWA, 2017). LOS defines traffic movement in context of mobility and roadway design, and are generally defined by the following.

- LOS A = free-flow traffic with users unaffected by the presence of other users.
- LOS B = Stable traffic flow with a high degree of freedom to select speed but with some influence from other users.

- LOS C = Restricted flow that remains stable but with significant interactions with others in the traffic stream. General level of comfort and convenience declines noticeably at this level.
- LOS D = High-density flow in which speed and freedom to maneuver are severely restricted and comfort and convenience have declined even through flow remains stable.
- LOS E = Unstable flow at or near capacity levels with poor levels of comfort and convenience.
- LOS F = Stop and go waves, poor travel times, low comfort and convenience, and increased accident exposure.

LOS B was assumed as the baseline condition in the analysis area for the mountainous rural two-lane highways with a 45 mile-per-hour speed limit (HD roads) and with a 55 mile-per-hour speed limit (U.S. 20). For both speed limits, LOS B assumed 10% truck traffic. To remain within LOS B for roadways with a 45 mile-per-hour speed limit, the ADT volume should remain below 2,200 vehicles (FHWA, 2017). For this analysis, any change in LOS to a lower service level (from LOS B to LOS C) represents a potentially significant impact to users. Therefore, this volume (ADT=2,200 vehicles) was defined as the significance criteria for the following roads: HD 61, HD 120, HD 121, HD 128, HD 131, and HD 134.

Similarly, to remain within LOS B for the 55 mile-per-hour speed limit roadways, the ADT volume should remain below 8,500 vehicles (FHWA, 2017). Therefore, this volume (ADT=8,500 vehicles) was defined as the significance criteria for the following road: U.S. 20. In summary, for construction-related traffic volumes to be considered potentially significant, volumes would have to cause an ADT increase to more than 2,200 vehicles (220 trucks) on the HD routes and more than 8,500 vehicles (850 trucks) on U.S. 20, representing a change from LOS B to LOS C.

Project-specific GIS data and information were used to describe existing transportation and infrastructure conditions in the project area. This included road information from BNF MVUMs and associated GIS data; utility information provided by CenturyLink, Idaho Power Company, and RTI-Rural Telecom; shoreline inundation contour data; and aerial imagery from on-line sources. Attributes within the road dataset were used to describe jurisdiction and road segment lengths. In addition, shoreline inundation data were used to identify potential road impact areas. The alternatives were reviewed to determine the proposed maximum water surface elevation and potential impacts to existing transportation or infrastructure features due to higher water levels.

Meetings were conducted with the Glenns Ferry Highway District and Mountain Home Highway District to discuss design standards for county roads. These meetings indicated set design standards do not exist, but new transportation facilities should retain existing structural and traffic capacity standards. In addition, communication between Reclamation and USFS provided direction on road realignment design considerations for NFS roads. Phone discussions with utilities provided the basis for determining potential service interruptions associated with construction of the proposed action.

Cumulative effects analysis is based on identifying impacts that arise through interaction of the proposed action with other past, present, and foreseeable future projects interconnected to the proposed action in space or time.

3.18.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under Alternative A, current transportation and infrastructure conditions would continue. Population growth in the surrounding area would continue trends for increased vehicle traffic levels near and around the project area. Specifically, relative to the proposed action, Alternative A would not increase vehicle traffic levels, disrupt traffic flow, or deteriorate roadway conditions above existing conditions. Road closures and construction delays associated with the proposed action would not occur, thereby not impacting recreation and safety access or use of the Pine Airstrip. Utility service would not be temporarily interrupted by Alternative A. However, under Alternative A, road improvements associated with the proposed action would not be implemented, resulting in no widening of the Anderson Dam Road (HD 134) across the dam or improvements to HD 131. Therefore, no new short-term or long-term direct or indirect effects to transportation and infrastructure would occur under Alternative A.

Alternative B

Alternative B would result in the short-term public closure of sections of HD 131, HD 134, HD 61, and all of NFS Road 134A (closed as a result of HD 134 being closed); various temporary roadway lane closures necessary for work on MSE walls and bridges; temporary impacts to the use of Pine Airstrip; and potential short-term loss of utility service due to relocations.

Level of Service

Trucks hauling material from Mountain Home would share approximately 22 miles of U.S. 20 with the public. The public would not share the roadway with construction traffic around the Dixie Borrow Pit and Staging Area and closed portions of HD 134, but the public would share roads with construction vehicles for approximately 11 miles on the haul routes using existing roads HD 121, HD 120, and approximately 2 miles of the open portions of HD 134. Most of the haul routes are on unpaved roads, and two of the haul routes are steep. The total length of the haul routes is approximately 14 miles (not including the dam crest). A turnaround is proposed at the Elk Creek Boat Ramp parking area approximately 0.5 mile upstream of the dam on HD 120 (Figure 1, Transportation and Infrastructure Specialist Report, Appendix B17).

As summarized in Table 3 and Figure 2 in the Transportation and Infrastructure Specialist Report (Appendix B17), the additional construction (haul truck) round trips per day on public-accessible roadways would range from a low of 1 trip (on HD 120 in summer 2026) to a high of 114 trips (on U.S. 20 in fall 2025, with 36 trips turning off onto HD 131, 15 trips turning off onto HD 134, and 63 trips continuing to the HD 61 turnoff). Construction traffic on the closed section of HD 134 is not included in the effects to traffic analysis because this road would be closed to the public for the duration of construction.

Together, construction worker trips and delivery of materials would result in an estimated 174 (60 worker and 114 haul truck) additional trips per day during peak travel hours and

peak construction season, representing the worst case (U.S. 20 in fall 2025). These roundtrips would equate to a maximum increase in ADT of 348 (228 trucks) vehicles. During the nonpeak hours, such as the middle of the day, and off-season construction days, traffic would be much lower due to less construction and worker commute traffic.

During peak hours and construction season, an increase of 348 vehicles (228 trucks) to the baseline LOS volumes would not represent a significant impact because the increase in vehicle traffic would not exceed the baseline LOS for any road segment. For example, with U.S. 20, during the peak construction (fall 2025), the additional 348 daily round trips is still below the significance criteria for all vehicles (8,500) and trucks (850) (Figure 2, Transportation and Infrastructure Specialist Report, Appendix B17). ADT values are less available for HD roads, but, for the two locations available, the increase would be 63 daily round trips at Pine Bridge and 36 daily round trips at Cow Creek Bridge (Figure 2, Transportation and Infrastructure Specialist Report, Appendix B17), which would still be below the significance criteria for all vehicles (2,200) and trucks (220). Reclamation expects that construction would not be concurrent on all routes and all projects, which would reduce the frequency and duration of the maximum number of truck and worker trips. Construction may require oversized vehicles and weight or height limitations, but Reclamation would upgrade existing roadways as needed so construction equipment access would not be restricted.

Reclamation expects that the overall increase in vehicle traffic would cause minor deterioration of local roads, and Reclamation would require contractors to repair damage and restore roadways to conditions similar to those before construction. Increased traffic delays are not expected to impact the ability of emergency personnel to respond to an incident because delays would be short term and intermittent. The effects of road closures on safety are described in the Safety Specialist Report (Appendix B20).

Roads and Bridges

Alternative B would result in a collection of roadway travel delays that increase the time of travel. Road repairs on HD 120, HD 61, and HD 128 would result in one-lane closures. Duration of traffic delays depends on the length of the segment and signaling technique. The community of Pine would be affected because both western and eastern access points would experience road repairs and delay.

HD 134, from the junction of NFS Road 134C to HD 120, would be closed for approximately 45 months during construction. This closure would necessitate a detour route using HD 131 and result in longer travel times to the southern end of the reservoir and to residences north and northwest of the reservoir, including those near Prairie. HD 131 would require roadwork to enable continued public access during dam construction and provide a year-round detour route. Improvements to HD 131 involve some new alignments, road improvements, and winter snow removal resulting in brief traffic delays during the approximately 43 days of construction along HD 131.

If the minimum freeboard waiver is not obtained, residents of Pine would face travel delays associated with construction on HD 61 and the Pine Bridge lasting approximately 4 months. The alternate route for Pine Bridge is a detour on HD 61 and HD 114. The detour over McCoy Bridge requires signaling—delaying traffic approximately 15 minutes each way.

Construction on Lime Creek Bridge is limited to repairing the abutment slopes, which may only cause a brief traffic slowing across the bridge.

No traffic delays are expected from in-channel work for fish passage at Fall Creek and Deer Creek culverts.

Reclamation expects that the overall increase in vehicle traffic would not cause more than a minor deterioration of local roads, with no significant impacts from deterioration of local roadways. Reclamation would require contractors to repair damage and restore roadways to conditions similar to those before construction.

There are no permanent road closures from inundation expected as a result of this alternative.

Potential impacts due to increased traffic delays on public safety are described in the Safety Section 3.21.

Pine Airstrip

Alternative B would elevate the reservoir, inundating a portion of the Pine Airstrip runway and runway protection zone. The runway would be replaced with another turf runway with similar dimensions and a different orientation. Realignment of NFS Road 128BC would be required (Appendix C). General aviation use of the airstrip would be limited or closed for approximately 1.5 months, in March and April. During this time, recreation use is lower than in summer months and outside the typical fire season. This short duration closure during this time of year minimizes impacts to users of the airstrip; therefore, significant impacts would not occur because the interruption in airstrip use would not last longer than 3 months or occur during high-use periods.

Utilities

Based on utility information from CenturyLink, buried fiber optic cables would not be inundated by an increase in reservoir levels. At locations where roadway and bridge projects may impact utilities, no extended service interruptions are anticipated to telecommunications, and delays to traffic would be brief.

At several locations, individual power poles or short lengths of buried powerline may require relocation, including approximately 24 poles and associated single-phase overhead line along HD 61 and two transformers and approximately 200 feet of 35-kV single-phase underground primary cable in a 3-inch conduit near Fall Creek. Reclamation would coordinate with Idaho Power to relocate impacted power poles, associated overhead lines, and underground powerlines and transformers. Infrastructure identified for removal or relocation is described in the 6-foot Dam Raise Engineering Summary (Appendix C). In general, the facilities would remain on the same side or cross to the other side of the road during project construction. No extended service interruptions are anticipated to power, and delays to traffic would be brief. Relocation of utility service is not expected to cause more than a temporary outage or loss of service, and impacts are anticipated to be minor and not significant.

Recreational Access

Recreational access would be impacted during the approximate 47-month construction period in the areas around the reservoir and immediately downstream of the dam along the South Fork Boise River. Because of the construction-related activities in the vicinity of the dam, impacts to recreation would be more notable along the South Fork Boise River below the

dam and along the western shoreline of reservoir from the dam north to Fall Creek. The effects to recreation access would be less noticeable to recreation users along the north end of the reservoir, from Curlew Creek north and west to Pine Campground.

In the upper portion of the reservoir, access to developed campgrounds, boat ramps, and dispersed areas would be maintained, but roadway and bridge projects would cause temporary traffic delays. Both the Curlew Creek Campground and Boat Ramp would likely need to be closed for the construction work to elevate affected campsites, extend the boat ramp, and realign the road to the ramp. Similar work and impacts to users would occur at Pine Campground. Conducting this work later in the season would reduce the impact on users.

Impacts to recreation access near the south end of the reservoir would be greater given the intensity of construction work and traffic rerouting. Two developed sites would be most directly affected. Specifically, Spillway Campground and Elk Creek Boat Ramp would be closed to the public for the duration of construction. There would be reduced recreation access as a result of closures, however, impacts would not be considered significant because they are short term and not permanent.

Roadway improvements along HD 131 are expected to cause brief traffic delays during the approximately 43 days of construction. Following the improvements along HD 131 and closure of HD 134, traffic would be detoured onto HD 131 along Cow Creek and HD 121 along the South Fork Boise River. The additional traffic on HD 131 and HD 121 would likely adversely affect fisherman, campers, and others recreating in various sites along the river, particularly during busy summer periods, due to slight delays merging into traffic and increased dust and noise.

Construction closure of HD 134 would affect visitors whose destination is Elk Creek and Fall Creek boat ramps, Evan's Creek Campground, and Fall Creek Resort and Marina. For comparison purposes using Evan's Creek Campground as a destination, the detour route would add about 14 miles of additional travel on gravel roads compared to HD 134. For those who choose a more northerly route through Pine, the additional distance would be 22 miles, though much of this would be on paved roads. The additional travel times and distances would adversely impact those recreating in these areas, especially for those with larger RVs and vehicles pulling boats. In some cases, this may cause some to choose to recreate elsewhere during construction.

Considering the duration of construction and the access challenges for those who recreate along the southwestern portion of the reservoir and along the South Fork Boise River between Anderson Ranch Reservoir and Cow Creek, reduced recreation access as a result of road closures or delays is considered a short-term moderate direct impact. However, because there is no permanent loss to recreation site access, the impact is not considered significant.

The transportation system and infrastructure in the Anderson Ranch Reservoir area would return to original condition after construction, except for the roadway crossing the dam. Currently, the road across the dam is one-way, controlled by an alternating stop light. This roadway segment would be two lanes following construction. This would create a long-term beneficial improvement to mobility and safety of general recreation use of the area. There would be no permanent loss of access to recreation sites as a result of Alternative B.

Alternative C

The direct and indirect impacts for Alternative C are similar to those for Alternative B, with several key differences. Alternative C would require fewer haul trucks and less construction duration (approximately 7 months less) due to less material being required for the 3-foot dam raise and rim project modifications. Additionally, due to less inundation, the Lester Creek Road improvements would not be needed, there would be no modification or closure of the Pine Bridge, and no realignment, relocation or closure of the Pine Airstrip. All other impacts would remain the same as described for Alternative B.

Level of Service

The same haul routes would be used for Alternative C as described for Alternative B. As summarized in Table 5 and Figure 3 in the Transportation and Infrastructure Specialist Report (Appendix B17), the additional construction (haul truck) round trips per day on public-accessible roadways would range from a low of 1 trip (on HD 120 in summer 2026) to a high of 98 trips (on U.S. 20 in fall 2025, with 31 trips turning off onto HD 131, 15 trips turning off onto HD 134, and 52 trips continuing to the HD 61 turnoff). This is approximately an 18% reduction compared to Alternative B. Construction traffic on the closed section of HD 134 is not included in the effects to traffic analysis because this road would be closed to the public for the duration of construction, identical to Alternative B.

Together, construction worker trips and delivery of materials would result in an estimated 158 (60 worker and 98 haul truck) additional trips per day during peak travel hours and peak construction season, representing the worst case (U.S. 20 in fall 2025). These roundtrips would equate to a maximum increase in ADT of 316 vehicles (196 trucks), approximately 9% less than Alternative B. During the nonpeak hours, such as the middle of the day, and off-season construction days, traffic would be much lower due to less construction and worker commute traffic.

During peak hours and construction season, an increase of 316 vehicles to the baseline LOS volumes would not represent a significant impact because the increase in vehicle traffic would not exceed the baseline LOS for any road segment. For example, with U.S. 20, during the peak construction (fall 2025), the additional 316 daily round trips is still below the significance criteria for all vehicles (8,500) and trucks (850) (Figure 3, Transportation and Infrastructure Specialist Report, Appendix B17). ADT values are less available for HD roads, but, for the two locations available, the increase would be 52 daily round trips at Pine Bridge and 31 daily round trips at Cow Creek Bridge (Figure 3, Transportation and Infrastructure Specialist Report, Appendix B17), which is still below the significance criteria for all vehicles (2,200) and trucks (220). Reclamation expects that construction would not be concurrent on all routes and all projects, which would reduce the frequency and duration of the maximum number of truck and worker trips. Construction may require oversized vehicles and weight or height limitations, but Reclamation would upgrade existing roadways as needed so construction equipment access would not be restricted.

Similar to Alternative B, Reclamation expects that the overall increase in vehicle traffic would cause minor deterioration of local roads, and Reclamation would require contractors to repair damage and restore roadways to conditions similar to those before construction. Increased traffic delays are not expected to impact the ability of emergency personnel to

respond to an incident because delays would be short term and intermittent. The effects of road closures on safety are described in the Safety Specialist Report (Appendix B20).

Similar to Alternative B, road repairs on HD 61, HD 120, and HD 128 would result in one-lane closures. Duration of traffic delays depends on the length of the segment and signaling technique. The community of Pine would be affected because both western and eastern access points would experience road repairs and delay.

Roads and Bridges

Alternative C would result in the short-term public closure of sections of HD 134, HD 61, and all of NFS Road 134A (closed as a result of HD 134 being closed). The closure of HD 134 from the junction of NFS Road 134C to HD 120 would last for approximately 38 months. Implementation of the detour route along HD 131 would increase travel time compared to the use of HD 134 to access the reservoir. However, the detour includes snow removal, moderate road improvements, and new alignment construction on HD 131 which would improve travel time to areas north of the reservoir in summer and make the route passable in winter.

No delays as a result of project activities would occur at Pine Bridge under this alternative. Construction on Lime Creek Bridge is limited to repairing the abutment slopes, which may only cause a brief traffic slowing across the bridge.

No traffic delays are expected from in-channel work for fish passage at Fall Creek and Deer Creek culverts.

Reclamation expects that the overall increase in vehicle traffic would not cause more than a minor deterioration of local roads, therefore, not resulting in significant impacts from deterioration of local roadways. Reclamation would require contractors to repair damage and restore roadways to conditions similar to those before construction.

There are no permanent road closures from inundation expected as a result of this alternative.

Potential impacts due to increased traffic delays on public safety are described in the Safety Section 3.17.

Pine Airstrip

Alternative C would elevate the reservoir water surface elevation, but not enough to inundate the Pine Airstrip runway and runway protection zone to the point an airstrip relocation is required; therefore, there are no significant impacts from an interruption in airstrip use. Construction of a proposed MSE wall to protect the airstrip is not expected to impact transportation.

Utilities

Impacts from utility relocations would be the same as described for Alternative B.

Recreational Access

Aside from the shorter project and construction durations, the effects to recreation access would be the same as described for Alternative B.

3.18.2.3 Cumulative Impacts

The construction of the Pine Bridge in 2018 and dam crest raise in 2010 both caused direct impacts due to traffic delays and, for the Pine Bridge, road conditions limited large vehicle and trailer to access to recreation sites and amenities near Pine. The potential construction of the Pine Bridge and dam crest improvements in 2025 as proposed would cause those same impacts, however, would not be cumulative impact due to separation in time of the two projects. The dam crest will be widened to re-introduce 2-lane traffic and is considered a beneficial long-term impact.

The CCE Project and South Fork Boise River Diversion Project both propose to draft water from the reservoir with separate pump stations located along the reservoir rim. In the unlikely scenario two or more of the projects would be constructed simultaneously, depending on the specific locations of the CCE and South Fork Boise River Diversion projects, roads within the project area may see increased traffic during construction. For example, U.S. 20, HD 134, and HD 61 would experience increased baseline levels of construction traffic that may or may not represent a temporary change in LOS.

3.18.2.4 Mitigation Measures

The following measures would be implemented to help reduce impacts related to transportation and infrastructure for Alternative B and Alternative C (Environmental Commitments Section 3.28.5).

- Develop and follow a transportation management plan to communicate closures and delays with the public.
- Develop and follow a dust prevention and control plan to identify potential fugitive dust emission sources, assign dust control methods, determine frequency of dust treatment applications, record dust control activities, and monitor dust control efforts. The dust prevention and control plan would include precautions for working on windy days, establish speed limits on unpaved roads (10–15 miles per hour), identify dust suppression measures for construction traffic, and address other measures to control fugitive dust emission during construction activities (Section 3.28.8).
- Use high-tech road signaling or increased use of flaggers to reduce vehicle wait time at single-lane road and bridge sections.
- Coordinate winter maintenance so that detours and single-lane roads are cleared adequately during both weekdays and weekends.
- Ensure utility relocation plans are in place to minimize or eliminate service disruption.
- For NFS roads, meet USFS standards and guidelines (including BMPs) regarding location and design in future road construction.
- For HD roads, meet Highway District standards and guidelines (including BMPs) regarding location and design in future road construction.

3.19 Socioeconomics

This section describes existing socioeconomic conditions within the project area and anticipated environmental consequences for the alternatives. Regulatory information, detailed

social and economic information, construction costs, and additional methods and analysis are included in the Socioeconomics Specialist Report (Appendix B18).

3.19.1 Socioeconomics – Affected Environment

The analysis area, as defined in this section, encompasses the four-county region of Ada, Camas, Canyon, and Elmore counties that include the entire Anderson Ranch Reservoir project area (Figure 1, Socioeconomics Specialist Report, Appendix B18).

3.19.1.1 Population

The population of the analysis area has been increasing since 2000, with most of the population growth occurring in Ada and Canyon counties. Between 2010 and 2017, the population of Ada and Canyon counties grew by about 1% combined, but the population of Camas and Elmore counties declined by about 3% and 0.4%, respectively. During this same period, the population of the state of Idaho grew by about 1%. Additional population data is described in the Socioeconomic Specialist Report included in Appendix B18, Table 1.

3.19.1.2 Housing

Total housing units in the analysis area increased from 2000 to 2017 for all counties except in Camas County where total housing units declined from 2010 to 2017. On average, housing vacancy rates within the analysis area were higher than the federal housing shortage threshold of 5%, but they were lower than the state average vacancy rate for 2000, 2010, and 2017. Camas County had the smallest housing stock among the four counties, and it also had the highest vacancy rates.

3.19.1.3 Income

Compared to the state and nation which experienced a small positive growth in per capita personal income between 2000 and 2010, the analysis area's real per capita personal income (in 2018 dollars) declined during this period. Negative growth rates in Ada and Elmore counties were the drivers for the declining per capita income growth rate in the analysis area. The lower rates during the 2000 to 2010 period are most likely due to the combined effects of the early 2000 recession and the Great Recession (Federal Reserve Bank, 2013). While the analysis area appears to have recovered from the Great Recession, income growth within the state and nationally declined slightly.

Real median household income (in 2018 dollars) within the analysis area declined between 2000 and 2010 and again at a slightly higher rate between 2010 and 2017.

Real earnings by industry (in 2018 dollars) grew at a faster rate after 2010, primarily driven by earnings growth in the construction; services; finance, insurance, and real estate; and manufacturing sectors. These four sectors accounted for almost 60% of the total industry earnings in 2001, 2010, and 2017.

3.19.1.4 Employment

Two estimates of employment are typically used to describe employment in an area: total civilian labor force and employment by industry. Civilian labor force data reflect the employment status of individuals by "place of residence" and include the following: self-employed, employees on unpaid leave of absence, unpaid family workers, and household workers. Employment by industry data reflect jobs by "place of work" and exclude the self-

employed, unpaid family workers, employees on leave of absence, and household workers. Individuals with more than one job are counted only once in civilian labor force data, and they are counted in each job in the employment by industry data. It is recognized that the COVID-19 pandemic drastically impacted unemployment numbers in 2020, however, it does not impact the data set used for this analysis. Refer to the Socioeconomics Specialist Report in Appendix B18 for methodology and assumptions used for this analysis.

The civilian labor force (composed of civilian employment and civilian unemployment) in the analysis area grew from 2000 to 2017, except in Elmore County where it declined slightly between 2010 and 2017. Within the analysis area, the average unemployment rate in the civilian labor force increased from 3.8% in 2000 to 9.2% in 2010 before declining again to 3.1% in 2017.

The trend in analysis area unemployment rates has been similar to the state and generally lower than the national average. From 2000 to 2007, the analysis area unemployment rates trended closely, though slightly lower, to the state unemployment rates. Between 2007 and 2009, unemployment rates in the analysis area, the state of Idaho, and the United States increased dramatically because of the slowdown in the regional and national economy due to the Great Recession (Federal Reserve Bank, 2013). Since 2010, the unemployment rate for the analysis area has declined each year from a high of 9.2% in 2010 to 3.1% in 2017.

In 2001, an estimated 313,190 people were employed in the analysis area. Between 2001 and 2017, annual employment increased by approximately 110,310 jobs (or 35%). The 2010 to 2017 average annual growth rate was double the 2000 to 2010 rate, from 1.3% to 2.7%. Employment in the analysis area is concentrated in the services, retail trade, and government sectors. These three sectors account for about two-thirds of all jobs in the analysis area.

3.19.1.5 Agricultural Resources

Information on agricultural resources in the affected environment was collected in 2012 and 2017 by the National Agricultural Statistics Service Census of Agriculture. Overall, the value of agricultural production in the analysis area increased between 2012 and 2017, but overall acreage decreased. In 2017, Canyon County had the highest value of production, and Elmore County had the largest acreage.

3.19.1.6 Domestic, Commercial, Municipal, and Industrial Water Resources

Existing DCMI water use is characterized in the Treasure Valley DCMI water-demand projections (SPF Water Engineering, 2016). The report covers Ada, Canyon, and Elmore counties. The DCMI water use in Ada and Canyon counties was 79,500 acre-feet of demand in 2010 and 110,200 acre-feet in 2015. The DCMI water use in Elmore County was 5,440 acre-feet of demand in 2010 and 4,870 acre-feet in 2015.

3.19.1.7 Recreation Resources

While various types of recreational activities are described under Recreation (Section 3.16), none of these activities have data on visitor use. Additionally, no visitor use data have been developed for the replacement recreation facilities, but the replacement facilities are expected to maintain current recreation capacity and opportunities.

3.19.2 Socioeconomics – Environmental Consequences

3.19.2.1 Methods for Evaluating Impacts and Significance Criteria

In addition to evaluating population, housing, income, and employment, economic effects of potential changes to agriculture, DCMI, and recreational activity were evaluated.

Where possible, changes in socioeconomic conditions were quantitatively evaluated. The evaluation was completed for both short-term socioeconomic changes following construction and long-term changes assumed to occur during the operational phase of the proposed action and alternatives.

The potential impacts to population and housing were evaluated based on the direct construction and operational expenditures. The direct construction and operation expenditures were used to evaluate the secondary (indirect and induced) impacts associated with the local portion of the construction and operational expenditures using an IMPLAN regional economic model of the analysis area. This model was also used to evaluate and quantify the secondary impacts associated with the quantifiable changes in recreational opportunities as well as those associated with changes in agricultural revenues. The total (direct plus secondary employment and income outputs) from the IMPLAN model were compared to the analysis area's existing employment and income to determine the temporary and permanent changes.

Changes to agricultural resources through changes in water supply were qualitatively evaluated for each alternative.

Changes to DCMI water resources were qualitatively evaluated for each alternative.

Changes in recreation resources were qualitatively evaluated for each alternative.

Table 44 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for socioeconomics. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 44. Socioeconomic impact indicators and significance criteria

Impact Indicator	Significance Criteria
Regional (analysis area) industry sector output (or the value of production)	Increase or decrease of at least 1% of regional activity
Regional (analysis area) sectoral personal income	Increase or decrease of at least 1% of regional activity
Regional (analysis area) sectoral employment	Increase or decrease of at least 1% of regional activity
Change to existing businesses	Displacement of an existing business or combination of businesses

3.19.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under Alternative A, current socioeconomic conditions associated with reservoir operations would continue. Alternative A would not result in project-related construction and employment changes from existing conditions, and current water management operations would continue. Reclamation would continue to operate Anderson Ranch Dam under current standard operating procedures. Water delivery, power generation, and flood control would continue to occur according to existing reservoir operation protocols. Therefore, no new short-term or long-term direct or indirect effects to socioeconomic conditions, associated with the dam raise, would occur under Alternative A.

Under Alternative A, except for DCMI water resources, future socioeconomic conditions (population, employment, income, and housing) are expected to remain the same as those documented in and planned for in the adopted comprehensive plans of each of the four individual counties included in the analysis area. These comprehensive plans include specific elements such as population and growth, economic development, agriculture, housing, and transportation (Ada County, 2016; Camas County, 2018; Canyon County, 2020; Elmore County, 2014). Each of the comprehensive plans includes county specific goals with respect to each of the elements as they relate to the future socioeconomics conditions. However, under Alternative A, DCMI water resources may be insufficient to meet anticipated future demand (SPF Water Engineering, LLC,2016).

Alternative B

Alternative B would have direct and indirect effects on the socioeconomic conditions in the analysis area in the short term and long term. Table 45 shows the estimated total construction costs associated with construction of Alternative B, for both construction methods: B1 (downstream embankment raise) and B2 (MSE), including costs for the reservoir rim projects. Alternative B total design and construction cost, including non-contract costs (NCC), is estimated to be between $83.3 million and $87.3 million (in 2025 dollars) (Appendix C).

Table 45. Estimated construction costs (in 2025$) for Alternative B

Component	Total Construction	Local Total	Local Nonlabor[b]	Local Labor[c]
Dam Raise Constr. Costs - Alt B1	$44,000,000	$39,600,000	$27,720,000	$11,880,000
Dam Raise NCC - Alt B1	$22,500,000	$20,250,000	$14,175,000	$6,075,000
Dam Raise Constr. Costs - Alt B2	$48,000,000	$43,200,000	$30,240,000	$12,960,000
Dam Raise NCC - Alt B2	$22,500,000	$20,250,000	$14,175,000	$6,075,000
Airstrip Constr. Costs	$1,766,110	$1,677,804	$1,103,020	$574,784
Airstrip NCC	$706,000	$670,700	$440,931	$229,769
Recreation Facility Constr. Costs	$3,723,150	$3,536,993	$2,475,895	$1,061,098

Component	Total Construction	Local Total	Local Nonlabor[b]	Local Labor[c]
Recreation Facility NCC	$1,489,000	$1,414,550	$990,185	$424,365
Bridge Constr. Costs	$1,766,110	$1,677,804	$1,309,292	$368,512
Bridge NCC	$706,000	$670,700	$523,388	$147,312
Culvert Constr. Costs	$668,258	$601,432	$401,085	$200,347
Culvert NCC	$267,000	$240,300	$160,252	$80,048
Power Utilities Constr. Costs	$735,084	$735,084	$514,558	$220,525
Power Utilities NCC	$294,000	$294,000	$205,800	$88,200
Roadway Constr. Costs	$3,341,289	$2,673,031	$2,218,616	$454,415
Roadway NCC	$1,337,000	$1,069,600	$887,768	$181,832
TOTAL B1, including NCC	**$83,300,000**	**$75,111,998**	**$53,125,789**	**$21,986,209**
TOTAL B2, including NCC	**$87,300,000**	**$78,711,998**	**$55,645,789**	**$23,066,209**

Source: Appendix C. B1 construction method uses downstream embankment raise; B2 construction method uses MSE (Appendix C). Cost estimates are in 2025 dollars.
a Local (within the analysis area) cost based on a percentage split between local and nonlocal which is different for each construction component.
b Non-labor local (within the analysis area) costs based on different percentages for different construction components.
c Labor (within the analysis area) costs based on different percentages for different construction components.

For purposes of this analysis, 90% of the construction costs under both construction methods (B1 and B2) are assumed to be spent locally, and 10% is spent outside the analysis area. Similarly, of the locally spent expenditures, 70% are estimated to be on non-labor/material costs, and 30% are labor costs. For the reservoir rim projects, the split between local and non-local is assumed to be, on average, 92% local and 8% non-local. The split between expenditures on local materials and local labor is estimated to be, on average, about 75% and 25%, respectively.

The project durations for Alternative B are estimated for downstream embankment raise (B1), MSE (B2) and reservoir rim projects to be 51 months, 50 months, and 24 months, respectively. These durations were used to develop the corresponding annual estimates for input into the IMPLAN model. Table 46 summarizes these annual inputs separately for Alternative B projects (downstream embankment raise [B1] and reservoir rim projects and MSE [B2] and reservoir rim projects).

Table 46. Annual project construction costs (in 2025$) for Alternative B

	Total	Annual[a]
Dam Raise - B1 + Reservoir Rim		
Construction Costs	$83,300,000	$41,649,500
Local	$75,111,998	$37,556,000
Non-Labor	$53,125,789	$26,562,900
Labor	$21,986,209	$10,993,100
Dam Raise - B2 + Reservoir Rim		
Construction Costs	$87,300,000	$43,649,500
Local	$78,711,998	$39,356,000
Non-Labor	$55,645,789	$27,822,900
Labor	$23,066,209	$11,533,100

Source: Appendix C.
B1 construction method uses downstream embankment raise; B2 construction method uses MSE (Appendix C). Cost estimates are in 2025 dollars.
a Based on the assumed project duration of 51 months for B1, 50 months for B2 and 24 months for reservoir rim projects.

The construction activities associated with Alternative B are expected to create employment opportunities within and outside the analysis area. Most construction workers would likely live within the analysis area, and non-local construction workers would use temporary housing in the analysis area including motels, RV parks, and campgrounds. Construction workers are not expected to relocate their families to this temporary job location.

Table 47 summarizes the regional economic impacts associated with Alternative B. All values shown represent a range with the lower value for the impacts associated with downstream embankment raise (B1) and reservoir rim projects combined and the higher value for MSE (B2) and reservoir rim projects combined. The total annual construction employment in the analysis area is estimated to be between 387 and 4054 full-time equivalents (FTEs), including direct, indirect, and induced impacts (Table 47).

Table 47. Regional economic impacts in analysis area from construction of Alternative B

Impact	Employment (FTEs)[a]	Labor Income[a]	Total Industry Output[a]
Direct	227-238	$8,807,800 - $10,000,400	$34,164,500 - $35,801,900
Indirect	61-64	$2,685,100 - $2,930,200	$10,022,800 - $10,493,000
Induced	99-103	$3,617,000 - $4,113,400	$14,776,700 - $15,499,900

Impact	Employment (FTEs)[a]	Labor Income[a]	Total Industry Output[a]
Total	387-405	$15,109,900 - $17,044,000	$58,964,000 - $61,794,800

Labor income and total industry output estimates are in 2020 dollars.
Source: IMPLAN
a First value in range corresponds to downstream embankment raise (B1) construction method and second value corresponds to MSE (B2) construction method (Appendix C).

As expected, the increase in regional employment would be accompanied by increased levels of income and total industry output within the analysis area (Table 47). Construction of Alternative B is expected to result in an increase of about $8.8 to $10 million (in 2018 dollars) in annual direct labor income and $34.2 to $35.8 million (in 2018 dollars) in annual direct total industry output, respectively, within the analysis area.

Population, Housing, Income, and Employment

Assuming approximately 10% of construction workers would come from outside the analysis area, the resulting temporary increase in population would be about 22 to 24 construction workers. Based on an average family size of 3.23 (USCB, 2019o) for the analysis area, the potential increase in population would be between 73 and 77. This increase represents about 0.01% of the analysis area's population of 669,262 in 2017 and of the projected population of 736,188 in 2018. (Projected population in 2018 was determined using an assumed 1.1% annual population growth rate). This small change due to construction employment is unlikely to result in a significant increase in the population of the analysis area.

No significant impacts to housing are anticipated as a result of the small influx of non-local construction workers, who are expected to use of temporary housing in the analysis area including motels, RV parks, and campgrounds instead of relocating their families to temporary job locations.

The increase in total regional labor income, estimated between $15.1 and $17 million (Table 47), represents less than 0.1% of the total personal income in the analysis area of $20.8 billion. This estimate is derived from the $28,300 in average per capita income for the analysis area multiplied by the projected population in the analysis area in 2018. Therefore, construction of Alternative B does not result in significant impacts to total personal income in the analysis area.

The increase in total industry output (or industry income or earnings), estimated between about $59. and $61.8 million (Table 47), represents less than 0.3% of the total industry output of the analysis area of $22.74 billion. Therefore, construction of Alternative B does not result in significant impacts to total industry earnings in the analysis area.

The increase in employment from the construction of Alternative B is negligible compared to the analysis area's total employment. Specifically, total annual construction employment associated with Alternative B represents less than 0.1% of total employment in the analysis area in 2017, and the increase in direct construction workforce of 227 to 238 FTEs represents less than 1% of the total 2017 construction employment in the analysis area. Therefore, the

increase in employment is not significant, and the construction of Alternative B does not result in significant impact to total sectoral employment in the analysis area.

Some farmers and ranchers in the analysis area have expressed concern over the road closures for construction. The farmers and ranchers use these transportation routes for their operations. However, because the construction-related impacts are short term and alternative access routes are available with the same capacity for transporting livestock, equipment, and/or hay (Transportation and Infrastructure Section 3.14), no significant impacts to local businesses are expected from Alternative B.

Agricultural Resources

The increase in surface water supplies with Alternative B may result in irrigators changing from groundwater to surface water where conditions may favor a change. Factors likely to contribute to a conversion to surface water include the types of crops grown (high versus low value), the difference in the per acre-foot cost between surface water and groundwater, and the ease with which such a switch could be achieved. Although the proportion allocated to agriculture of the total 29,000 acre-feet of new surface water supply generated by Alternative B has not been finalized at this time, the potential impacts to agricultural resources and thus socioeconomics are likely to be insignificant when compared to the 1.6 million acre-feet of existing irrigation delivery in the region.

DCMI Water Resources

Although the proportion allocated to DCMI of the total 29,000 acre-feet of surface water supplies under the proposed action has not been finalized at this time, the potential new volume available to DCMI is not expected to be sufficient compared to the 116,900 acre-feet of projected DCMI demand in the region (SPF Water Engineering, LLC, 2016). Additionally, based on the 38% refill probability under the 50-year historical hydrology (Water Operations Technical Memorandum, Appendix F), the actual total average annual delivery is 11,020 acre-feet. Assuming that half of the 9,918 acre-feet (the 90% of the water that is available to agriculture and DCMI users) goes to the DCMI users, that would translate to about 4% of the projected DCMI demand. This conclusion assumes the 116,900 acre-feet is the same as the available total DCMI water supplies (including both groundwater and surface water), which may be not be the case. Additionally, the 116,990 acre-feet estimate is based on an assumed projected population in 2020 of 674,500 (SPF, 2016). This projected population estimate is about 75% smaller than the projected population of 890,800 in 2020. The 890,800 estimate is derived by applying the 1.1% annual population growth rate (Bureau of Labor Statistics, 2019b) to the 2017 population estimate of 669,262 (Socioeconomics Specialist Report, Appendix B18, Table 1). Therefore, while the additional water supplies would help to meet some of the projected shortages to DCMI users, the actual amount is unlikely to meet all the DCMI users' water demands in the future.

Recreation

Impacts to recreation are considered minor, and, for motorized boating recreation, they may be enhanced in the long term. Therefore, the socioeconomic impacts are likely to be beneficial and minor in the long term.

Alternative C

Similar to the proposed action (Alternative B), Alternative C would have direct and indirect effects on socioeconomic conditions in the analysis area in the short term and long term. The primary difference between Alternative C and Alternative B is a lower dam raise. Alternative C would increase the elevation of Anderson Ranch Dam by 3 feet, also resulting in fewer changes to reservoir rim projects, no replacement of Pine Bridge and no airport realignment and reduction of work at Lester Creek Road (project number 3, Figure 7).

The direct and secondary (indirect and induced) effects are less than those described in Section 3.2.2 because the preliminary construction costs estimates for Alternative C are lower than the construction costs for Alternative B. At the time of this report, costing information for Alternative C was limited to what is provided in Appendix D, the 3-foot Dam Raise Engineering Summary.

The preliminary cost estimate and construction schedule for the 3-foot downstream embankment raise (C1) is $31 million and for the 3-foot MSE Raise (C2), $37 million. As stated in Appendix D, in order to develop a cost estimate for the Rim Projects for Alternative C, Reclamation prepared revised estimate work sheets for all affected rim projects greater than $50,000 (25 of 28 projects). Alternative C reflects a 31% savings, and the average reduction of costs associated with any given project is only 19%.

The construction durations for the proposed action are estimated for, MSE (C2), and reservoir rim projects to be 44 months, 43 months, respectively. Non-construction costs are not available and the IMPLAN model was not developed for Alternative C. Similar to Alternative B, the construction activities associated with the proposed action are expected to create employment opportunities within and outside the analysis area, however to a slightly lesser extent due to the decrease in overall project size and costs.

The regional economic impacts associated with Alternative C would be similar to that represented in Table 47 but slightly less as reflected by the 31% cost decrease of Alternative C.

Population, Housing, Income, and Employment

The population analysis for Alternative B is the same for Alternative C. This small change due to construction employment is unlikely to result in a significant increase in the population of the analysis area.

No significant impacts to housing are anticipated as a result of the small influx of non-local construction workers, who are expected to use of temporary housing in the analysis area including motels, RV parks, and campgrounds instead of relocating their families to temporary job locations.

The increase in total regional labor income would be similar to, though less than, what is described in Table 47 for Alternative B, and represents less than 0.1% of the total personal income in the analysis area of $20.8 billion. Therefore, construction of the proposed action does not result in significant impacts to total personal income in the analysis area.

The increase in total industry output (or industry income or earnings), would be similar to Alternative B (Table 47), however less due to the 31% cost savings for Alternative C.

Construction of the proposed action does not result in significant impacts to total industry earnings in the analysis area.

The increase in employment from the construction of Alternative C is similar to, though less than, Alternative B and would be negligible compared to the analysis area's total employment. Similar to B, the total annual construction employment associated with Alternative C would represents less than 0.1% of total employment in the analysis area in 2017, and an increase in direct construction workforce FTEs represents would be less than 1% of the total 2017 construction employment in the analysis area. Therefore, the increase in employment is not significant, and the construction of the proposed action does not result in significant impact to total sectoral employment in the analysis area.

Some farmers and ranchers in the analysis area have expressed concern over the road closures for construction. Transportation impacts are similar to those for Alternative B but roads would not be closed for as long for Alternative C (Transportation Specialist Report in Appendix B17). The farmers and ranchers use these transportation routes for their operations. However, because the construction-related impacts are short term and alternative access routes are available with the same capacity for transporting livestock, equipment, and/or hay, no significant impacts to local businesses are expected from the proposed action.

Agricultural Resources

As identified for Alternative B, the proportion allocated to agricultural resources of the total 14,400 acre-feet of surface water supplies under Alternative C is unknown at this time. Using the same assumptions as provided for Alternative B, and assuming half of the available water for Alternative C is allocated to agricultural resources, the conclusion would be the same as Alternative B. Potential socioeconomic impacts to agricultural resources would be insignificant, as described for Alternative B, however even less when comparing the 14,400 acre-feet to the 1.6 million acre-feet of existing irrigation delivery in the region.

DCMI Water Resources

As identified for Alternative B, the proportion allocated to DCMI of the total 14,400 acre-feet of surface water supplies under Alternative C is unknown at this time. Using the same assumptions as provided for Alternative B, and assuming half of the available water for Alternative C is allocated to DCMI, the conclusion would be the same as Alternative B. While the additional water supplies will help to meet some of the projected shortages to DCMI users, the actual amount would not meet all the DCMI users' water demands in the future.

Recreational Resources

As reported in the Recreation Specialist Report (Appendix B15), with the proposed action, impacts to recreation are considered minor, and, for motorized boating recreation, they may be enhanced in the long run. Therefore, the socioeconomic impacts are likely to be beneficial and minor in the long run.

3.19.2.3 Cumulative Impacts

The proposed 2025 dam construction date is well removed in time from the 2018 installation date of the newly replaced bridge and 2010 construction of the security berm along the dam crest. No cumulative impacts to socioeconomics are identified for these past actions.

The CCE Project and South Fork Boise River Diversion Project both propose to draft water from the reservoir with separate pump stations located along the reservoir rim. In the unlikely scenario two or more of the projects would be constructed simultaneously, there could be competition for construction labor which could attract additional construction workers from outside the analysis area. This could result in an increase in the population of the area and thus an increase in demand for housing and services. However, to date, Reclamation has not been provided with formal proposals and designs from either entity to which more specific information can be derived. At this time, there are no known specific reasonably foreseeable future projects that would have a direct or indirect cumulative impact to socioeconomics.

3.19.2.4 Mitigation Measures

No mitigation measures are necessary for Alternative B and Alternative C because the socioeconomic effects, though minor, are positive.

3.20 Hazardous Materials and Waste

This section describes existing conditions for hazardous materials and waste in the project area and anticipated environmental consequences of the alternatives. Regulatory information, hazardous material descriptions and expected occurrence information, and additional methods and analysis are included in the Hazardous Materials and Waste Specialist Report (Appendix B19).

IDEQ governs the management of hazardous materials and waste in Idaho. IDEQ, through rules and standards, defines hazardous waste as having properties that make it dangerous or potentially harmful to human health or the environment. Hazardous wastes can be liquids, solids, contained gases, or sludges. They can be by-products of manufacturing processes or simply discarded commercial products, such as cleaning fluids or pesticides.

3.20.1 Hazardous Materials and Waste - Affected Environment

The analysis area is the general vicinity in and around Anderson Ranch Reservoir and extent of construction activities, including haul routes, borrow areas, staging areas, and other areas that construction-related activities would occur. Potential sources of hazardous materials and wastes may exist in the project area or may be introduced by project activities. For example, hazardous materials may be present in a variety of common contexts including, but not limited to, construction and demolition debris; landfills or solid waste disposal sites; fill, dirt, depressions, mounds, and contaminated aggregate; underground and aboveground storage tanks; septic systems and drainfields; and transformers that may contain polychlorinated biphenyls (PCBs).

Construction and demolition debris can contain hazardous materials or waste such as treated wood, paint, and solvent wastes. If construction materials are not properly managed or disposed of, they can leach these materials into the environment or come in contact with people through construction dust, or particles. Construction wastes cannot be disposed of in Pine, and must be taken to approved Elmore County locations (Elmore County, 2018).

An underground storage tank (UST) is defined as one or any combination of tanks and connective underground pipes used to contain regulated substances beneath ground surface. USTs and aboveground storage tanks that store petroleum products or certain other hazardous liquids can harm the environment and human health if released into the

environment. The IDEQ waste remediation facility mapper database identified six UST sites in the project area (IDEQ, 2019b). The USTs at five of the sites are documented as permanently out of use and removed from the ground through the IDEQ closure process. The sixth UST is identified on the IDEQ underground storage tank database at Fall Creek Resort and Marina. The 3,000-gallon storage tank was used as recently as 2016 to store gasoline for boats and RVs. This UST is listed as "temporarily out of use" in IDEQ records (IDEQ, 2019b). Verbal communication with the manager of Fall Creek Resort and Marina revealed that the tank is located adjacent to the road and was in use as recently as 2018. However, the marina no longer provides gasoline for boats or RVs.

There is no municipal wastewater service in the project area. Wastewater from homes and businesses is treated through septic systems located on individual property parcels. Because septic systems treat human waste, inundation of these systems at the full pool height could cause waste concerns, including the spread of bacteria and viruses in groundwater. Exact locations and addresses of existing septic systems are unknown; however, for the purposes of analysis, it was assumed that a septic system would exist where any improved structure is located. Septic systems are addressed in Water Resources, Section 3.4.

PCBs are man-made organic chemicals that pose a risk to human health. PCBs were domestically manufactured from 1929 until manufacturing was banned in 1979 (EPA, 2019). Electrical transformers and other electrical equipment manufactured before 1979 may contain PCBs. The analysis identified several underground structures and transformers owned by Idaho Power near Fall Creek. The exact age, nature, and depths of these structures is unknown. Wooden utility poles may also be treated with preservatives that contain heavy metals or chemicals. There are several individual power poles that would be impacted by an increase in reservoir water surface elevation, as well as a run of powerline approximately 2,580 feet long that may be impacted by an increase in reservoir water surface elevation (Transportation and Infrastructure Section 3.18).

The original town site of Pine was in the current reservoir area and was a historic mining camp located on the South Fork Boise River. This area of Idaho saw a large amount of mining activity in the late 19th and early 20th centuries. IGS maintains records of mine claims made in Idaho (IGS, 2019). Twelve historic mine sites/claims are documented near the reservoir. Only one, the Gertrude #1-#4 is within the area that may be inundated, near the Pine Airstrip. During a visual inspection of the area, no tailings or debris from the mine were visible. There is very little information about the mine claim.

More information on the presence or absence of hazardous materials and wastes within the project area are further described in the Hazardous Materials and Waste Specialist Report (Appendix B19).

3.20.2 Hazardous Materials and Waste - Environmental Consequences

3.20.2.1 Methods for Evaluating Impacts and Significance Criteria

This analysis addresses potential impacts with respect to hazardous or toxic materials and project implementation. This analysis is based on a review of planning documents applicable to the project area, consultation with appropriate agencies, access of agency databases, and review of field reconnaissance reports. IGS mine records were reviewed to determine whether historical mines or tailings are present within the project area. IGS oil/gas well

location maps were reviewed to determine whether local oil and gas wells are within the area of the dam raise. Septic tank, transformer, and utility pole records were reviewed to evaluate potential impacts. IDEQ records of documented waste sites were reviewed to determine whether sites exist in the project area. The EPA National Priorities List and Superfund sites list was reviewed to determine if federally identified hazardous waste sites exist in the dam raise area.

Table 48 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for hazardous materials and waste. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 48. Hazardous materials and waste impact indicators and significance criteria

Impact Indicator	Significance Criteria
The disturbance of an existing hazardous material site resulting in a health risk to the public or environment	Cause a release of hazardous materials, substances or waste in excess of local, state, or federal regulations (e.g., EPA maximum contaminant levels, EPA regional screening levels, or applicable Idaho state screening levels)
The release of hazardous materials into the environment during construction activities, resulting in a health risk to the public or the environment	Cause a release of hazardous materials, substances or waste in excess of local, state, or federal regulations (e.g., EPA maximum contaminant levels, EPA regional screening levels, or applicable Idaho state screening levels)

3.20.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under Alternative A, Reclamation would not modify Anderson Ranch Dam to increase storage capacity, storage levels would remain at the current capacity, Reclamation would continue to operate Anderson Ranch Dam under current standard operating procedures, and no impacts from hazardous or toxic materials from the project would occur. No changes in existing Reclamation facilities, operations or maintenance are planned to occur that would directly or indirectly result in any increase in hazards, hazardous materials, or hazardous waste in the project area.

Environmental impacts from the current use, transport, and storage of hazardous materials associated with Reclamation operations and maintenance at Anderson Ranch dam and reservoir would be expected to continue. Hazards and toxic materials associated with landfills and other solid waste disposal sites, USTs, septic systems, and utilities would be expected to increase under current population and development trends in the project area.

Alternative B

Project construction and operation would involve transporting, using, and storing hazardous materials such as fuels, oils, and solvents for equipment. In addition, fuels, oils, and solvents would be used to operate earthmoving equipment during construction. Constructing,

operating, and maintaining project facilities and infrastructure would require using potentially hazardous materials such as paint, concrete, and wood preservatives. Construction staging, and equipment and materials storage, including storing possible contaminants, and equipment maintenance in the project area would occur in two areas specified by Reclamation as contractor use areas. The first contractor use area is proposed to be located adjacent to the Dixie Borrow Pit and is proposed to be an appropriate location for office trailers, employee parking, borrow development, refueling, and other staging activities. The second location is along the left abutment of the dam facility. This location is proposed for its moderate grades and relatively low density of vegetation. This staging area may be suitable for stockpiling, water tanks, reinforcing and formwork laydown areas, and other staging activities. Both locations are estimated to require clearing, grubbing and some level of grading.

Aggregate extraction could also require operating heavy equipment. Borrow areas are proposed to be located along tributary drainages of the South Fork Boise River along the north side of HD 121. Excavation and extraction of aggregate from these sources would require using construction equipment, which would involve using various hazardous materials such as fuel, oils, grease, and other petroleum products. These contaminants have the potential to be introduced into water systems if released or spilled, either directly or through surface runoff.

Bridge demolition or modification, as well as the demolition of other structures and facilities that would be inundated, could require handling hazardous waste including asbestos, lead paint, and wood preservatives. There is the potential for infrastructure inundation due to the dam raise. These include septic systems, electrical transformers, utility poles, and one potential UST. Each of these types of infrastructure may contain hazardous or toxic materials, which could be released into the environment if the infrastructure were to be inundated. Septic systems, which contain human waste, could release bacteria into groundwater if the water table were to inundate the system. Power utility infrastructure may contain chemicals such as metals or preservatives that pose a risk to human health. A release could occur if buried infrastructure became inundated by the rising water table. A UST that contains gasoline could potentially release petroleum hydrocarbons due to inundation of the tank.

The exact locations of existing septic systems and power utility infrastructure would be identified in final design. The design of Alternative B includes an in-depth study of the locations of existing septic systems and power utility infrastructure. Any existing infrastructure that is determined to be negatively impacted by the new full pool elevation would be removed or replaced as part of Alternative B. Removing and replacing infrastructure removes the potential safety hazards due to inundation.

A preliminary review of the location of the existing UST at Fall Creek Resort and Marina indicates that the new full pool elevation for Alternative B would place the UST below the increased seasonal high groundwater elevation. Removal and decommissioning of the tank would be addressed during final design. For more information on Fall Creek Resort and Marina, see the Recreation Specialist Report (Appendix B15).

BMPs related to hazardous materials, as described in Environmental Commitments Section 3.28 under Public Health and Safety, Hazardous Materials, and Waste section would be

further defined in final design and outlined as Reclamation contracting requirements. All contracts or agreements for work on Reclamation facilities would incorporate provisions for compliance Reclamation's safety and health standards. Implementation of these standards, minimization measures and BMPs would reduce the potential release or disturbance of hazardous materials due to construction activities, therefore, no significant impacts are identified.

Alternative C

Project construction and operation activities are similar to Alternative B and therefore the risk of accidental release of hazardous or toxic materials from construction and operation of Alternative C would be the same. While inundation is less for Alternative C, all infrastructure inundation effects remain the same as identified for Alternative B. Any existing infrastructure that is determined to be negatively impacted by the new full pool elevation would be removed or replaced as part of Alternative C. Identical for both alternatives, local, state, and federal safety codes and procedures related to hazardous material transport, handling, and disposal would be followed for project construction and operation to minimize the risk of a hazardous materials release. No significant impacts due to construction or inundation are expected for Alternative C.

3.20.2.3 Cumulative Impacts

The 2018 construction of the Pine Bridge and 2010 crest raise are well removed in time from the proposed 2025 rim projects and dam construction and retained on the same footprint. Any potential hazardous materials or waste effects from construction of the new Pine Bridge or dam raise would not be additive, no cumulative effects are identified for past actions.

Implementation of Alternative B or Alternative C is not expected to cause a release of hazardous materials, substances or waste in excess of local, state, or Federal regulations so it is not expected to contribute to cumulative impacts in conjunction with implementation of other projects. The risk of accidental release poses a potential direct impact during construction of any project, including the CCE and South Fork Boise River Diversion projects; however, USFS, Reclamation and FERC would be included as part of each project's environmental and permitting process and all projects would have to comply with similar, if not the same, standards, minimization measures and BMPs outlined for the action alternatives.

3.20.2.4 Mitigation Measures

The risk of accidental release poses a potential direct impact during construction, however, as part of the action alternatives, Reclamation would manage hazardous materials and wastes from construction using and implementing construction BMPs (Environmental Commitments Section 3.28). All contracts or agreements for work on Reclamation facilities would incorporate provisions for compliance with Reclamation's safety and health standards. The health and safety plan would address standards for handling, storing, and disposing of construction and other materials. In addition, Federal and Idaho state regulations regarding spills would be followed.

Because potential effects from inundation of infrastructure are addressed in the design of Alternative B and Alternative C, the effects from these factors would not be significant as they are eliminated by removal, replacement, or abandonment.

3.21 Safety

This section describes existing conditions for safety in the project area and evaluates potential impacts from project implementation. Regulatory information, transportation and access information in relation to emergency response times, and additional methods and analysis are included in the Safety Specialist Report (Appendix B20).

3.21.1 Safety – Affected Environment

The analysis area is the general vicinity in and around Anderson Ranch Reservoir, including access roads, and detour routes (Figure 1, Safety Specialist Report, Appendix B20). The crest of Anderson Ranch Dam serves as a bridge linking the north and south sides of the reservoir. On the south side of the Anderson Ranch Dam Road, HD 134 links the dam to U.S. 20 and Mountain Home, Idaho, approximately 28 miles from the dam. Mountain Home is the closest community with a full suite of emergency services including fire, ambulance, and law enforcement. On the north side, the dam connects to HD 121 heading downstream along the South Fork Boise River approximately 55 miles to Interstate 84 north of Boise. The dam connects HD 120 heading northeast upstream along the reservoir approximately 19 miles to Pine, site of a volunteer emergency medical service (EMS).

Emergency response capabilities in the project area are provided by the city of Mountain Home, Elmore County, and the unincorporated communities of Pine, Featherville, and Prairie (Table 49. Emergency medical and other services are provided via salaried, on-call, and volunteer staff. Some services are limited in winter due to lack of infrastructure. Prairie has an ambulance but no storage building so local winter response is unavailable. Emergency (911) calls in the project area are coordinated so the nearest ambulance or appropriate service is dispatched. Medivac helicopter service is available out of Boise. The communities of Mountain Home, Prairie, Pine, and Featherville organize extraction teams for on- and off-road accidents (Table 50). The volume of emergency response requests per year tracks with recreation use on the South Fork Boise River and Anderson Ranch Reservoir. Mountain Home is the main EMS provider, with Pine Featherville EMS capable of responding to incidents north of the reservoir. Table 49 provides annual call estimates. Call volumes are higher in summer. For example, Pine EMS responded to 23 calls in July 2019, while annual call volume is 80 to 100 per year.

Table 49. Emergency medical services capacity

Service	Staff	Equipment	Notes
Mountain Home EMS	35 employees	4 ambulances	Full suite of year-round emergency services
Mountain Home Search and Rescue	30 volunteers	1 command trailer 3 trailers 4 vehicles 2 snowmobiles	Full suite of year-round emergency services
Elmore County Sheriff	~50-60 employees	10 patrol cars 4 admin cars 2 boats 2 vans	Full suite of year-round emergency services

Service	Staff	Equipment	Notes
Fire Protection (Mountain Home and Rural Fire)	1 Chief 1 Marshall 30 paid on-call staff	14 engines	Mountain Home city only; no project area structural fire service; 10-mile radius around city, USFS provides forest fire response, BLM provides brush fire response
Prairie	All volunteer	1 ambulance	Summer-only response
Pine Featherville	1 full-time staff ~4-5 volunteers	2 ambulances	3 bay building
Pine Sheriff Department	2 employees assigned	1 rescue boat	Staffed year-round by on- and off-site officers

Sources: Pine EMS, 2019, personal communication; Elmore County, 2019, personal communication; Elmore County Sheriff's Office, 2019, personal communication

Table 50. Extraction capacity

	Staff	Equipment
Mountain Home	10 paid on-call staff	4 trucks, Battery-powered tools
Prairie	~10 volunteers	1 truck, Tools requiring generator
Pine Featherville	2 volunteers	1 truck, Tools requiring generator

Source: Elmore County, 2019, personal communication

Table 51. Average call volume

	Average Calls	Notes
Mountain Home EMS	3800/year	Includes outlying areas; may assist other calls.
Mountain Home Extraction	300/year	Call volume for other extraction teams unavailable.
Mountain Home Fire	175/year; 90/year	City, rural
Pine EMS	80-100/year	A lot of recreational accidents.
Prairie	10/year	
Boise Helicopter	3/week; 150/year	Can land remotely or in Prairie and Pine parking lots, weather permitting.

Source: Pine EMS, 2019; County Commissioner, 2019

Response times for an ambulance to reach an incident in the project area varies due to the mix of paved and dirt roads (Table 52). Mountain Home is approximately 28 miles southwest of Anderson Ranch Dam, and most of the route is on paved U.S. 20 and therefore the fastest

route for EMS depending on the location of the incident. Using alternate dirt roads reduces the response time. Water rescue response is deployed from the nearest boat launch to the incident.

Table 52. Average response times

Ambulance Source	Current Response Time (Destinations)		
	Prairie	Trinity Mountain Lakes area	Pine
Mountain Home EMS	90 min.	Varies	70 min.
Pine Featherville EMS	Fall Creek 20–30 min.	45 min.	Water's edge – 5 min.
Prairie[a]	River area 40–60 min.	Varies	75–90 min.

a. Pine EMS, 2019, personal communication; Elmore County, 2019, personal communication (summer only)

The alternate route for Pine Bridge (replaced in October 2018) is a detour on Old Logging Road and Pine-Featherville Road (HD 61). When the Pine Bridge was removed in 2017 for 18 months, a timed temporary light was installed on the single-lane dirt Old Logging Road. Residents reported this slowed travel and added 15 to 30 minutes of travel time; Old Logging Road was difficult to maintain in winter (Pine EMS, 2019). A wide ambulance could not easily pass traffic waiting for the timing light, but the sheriff's vehicle was able to respond more readily (Elmore County Sheriff's Office, 2019).

The alternate route for HD 134 across the Anderson Ranch Dam is HD 131 (Cow Creek Road) to reach areas north of the reservoir. Currently, HD 131 is impassible in winter due to soft road conditions, not just snow cover.

3.21.2 Safety – Environmental Consequences

3.21.2.1 Methods for Evaluating Impacts and Significance Criteria

Determination of impact to response time was conducted by comparing target response times for various emergency responders with the assumed delayed response time due to potential detours or other factors, such as boat launch closures or general traffic delays. The estimated emergency response times relative to potential detour routes are preliminary and assume good road conditions. The direct and indirect effects for safety are based on the intensity (magnitude), duration, extent, and context of the impacts. Table 53 describes the impact indicators and significance criteria against which effects of the alternatives were evaluated.

The change in emergency response ability or timing was determined by comparing current response times provided by local EMS providers to estimated response access methods and times associated with the proposed action based on vehicle type (e.g., ambulance or helicopter) and detour route distances and estimated travel speeds or to reported conditions associated with previous similar construction projects (e.g., 2018 repairs to Pine Bridge and associated delays due to lane closures). The potential impact to safety of roadway users was determined by considering increases in construction vehicle traffic and changes in road conditions (e.g., lane closures, road widths) associated with the proposed action.

Cumulative effects analysis was based on identifying impacts that arise through interaction of the proposed action with other past, present, and foreseeable future projects interconnected to the proposed action in space or time. Table 53 describes conditions that indicate a potential impact (impact indicators) and criteria for evaluating whether the impact is significant (significance criteria) for safety. Not all impacts will meet the criteria for being identified as a significant impact, however all foreseeable potential impacts are disclosed.

Table 53. Impact indicators and significance criteria for safety

Impact Indicator	Significance Criteria
Change in emergency response ability or timing	Interruption of emergency service vehicle access or more than a minor increase in emergency service response time.
Change in roadway user safety	More than a minor increase in safety risk to motorists or other users of roadways.

3.21.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under Alternative A, current condition and use of the area would remain the same, indicating current safety conditions would continue, and existing emergency response times to this remote area would remain lengthy. This is fully understood by local residents, but this duration may not be understood by new (out-of-area) recreationists. Specifically, relative to the proposed action, Alternative A would not require road closures and construction delays associated with the proposed action, thereby not impacting recreation and safety access or use of the Pine Airstrip. However, under Alternative A, road improvements associated with the proposed action would not be implemented, resulting in no widening of the Anderson Dam Road (HD 134) across the dam or improvements to HD 131. Therefore, no new short-term or long-term direct or indirect effects to safety would occur under Alternative A.

Alternative B

Alternative B would result in the temporary public closure of Anderson Ranch Dam Road (HD 134) and sections of HD 131, HD 61, and all of NFS Road 134A; temporary roadway lane closures necessary for work on MSE walls and bridges; temporary impacts to the use of Pine Airstrip; several temporary boat ramp closures; and brief loss of utility service due to relocations. As described in the 6-foot Dam Raise Engineering Summary (Appendix C), the Pine Bridge closure (4 months) may not be required if Reclamation can obtain a variance on the required minimum freeboard.

The direct effect of Alternative B is delayed response times as a result of roadway travel delays or access closures, which would increase the time of local response to safety incidences (Table 54). The temporary closure of the Pine Airstrip would preclude its use for fire response if a fire occurred. The duration of Alternative B is estimated at approximately 51 months with traffic detour restrictions in place for 45 months. The direct effects (e.g., delayed emergency response times) would stop when construction is complete. There are no anticipated indirect effects.

Table 54. Summary of proposed road closures, road repairs, and boat ramp closures affecting emergency vehicle response times during construction

Road Closures	Alternate Route	Effect of Alternate Route on Emergency Vehicle Response Times[b]
Anderson Ranch Dam and HD 134 closure (Projects 13-15[a])	Cow Creek Road (HD 131)	Up to 32 min. of additional travel time
Pine Bridge (Project 17) on HD 61	Old logging road (HD 114) to single-lane McCoy Bridge (same route used during recent construction of Pine Bridge)	Up to 15 min. of delay and additional travel time
Road Repairs	**Alternate Route**	**Effect of Alternate Route**
HD 120 east of Castle Creek Campground and near Fall Creek Campground	None required, lane closure with signaling or flaggers	Up to 10 min. of delay, although this is not anticipated with flaggers who would prioritize emergency vehicles
Pine-Featherville Road (HD 61) north of Curlew Creek Campground and Boat Ramp (Projects 4-12)		
Lester Creek Road (HD 128) south of Pine Airstrip (Project 3)		
Various repairs: wall construction, shoreline armoring, culvert rehabilitation		
Boat Ramp Closures	**Alternate Route**	**Effect of Alternate Route**
Curlew Creek Boat Ramp (Project 21)	Nearest alternate boat ramp	Up to 35 min. of additional travel time for water-based rescue if a more distant boat ramp is needed.
Elk Creek Boat Ramp (Project 27)		
Fall Creek Boat Ramp (Project 25)		

Source: 6-foot Dam Raise Engineering Summary, Appendix C
a. Project numbers correspond to Figure 5 in Appendix C.
b. Based on conservative driving time of 25–35 miles per hour

Construction Traffic

The increase in vehicle traffic during construction would contribute to a minor increase in safety risk to motorists or other users of local roads. The presence of additional construction traffic on local roadways could temporarily increase the accident risk. The increase in construction-related equipment and vehicles on road shoulders increases the potential conflicts between roadway users. This could include potential conflicts with pedestrians and

bicycles on road shoulders near high-use recreation areas. Increased gravel and debris on the road surface from construction and equipment would further impact pedestrians, bicyclists, and motorcycles. A traffic management plan would be developed before construction begins to reduce the potential safety risks. Strategies include installing signs, marking detour routes, providing flaggers, providing information to the public, school district, and emergency service providers.

Construction vehicles transporting materials from Mountain Home to Anderson Ranch Dam would add truck traffic on U.S. 20. Most construction traffic associated with the dam raise would be limited to roadways closed to the public (north segment of HD 134). Construction vehicle traffic on reservoir rim roads like HD 61, HD 128, HD 120, and HD 121 would be an increase in truck traffic for approximately 305 working days. Construction vehicles would yield to emergency service vehicles.

The short-term interruption of emergency service vehicle access is not expected to result in more than a minor increase in emergency service response time, or safety risk to motorists or other users of roadways; therefore, significant impacts to safety are not expected due to increased construction traffic. When construction is complete, safety response times would return to original condition. Also, after construction, a beneficial effect is that response times to the north and west sides of the reservoir would be reduced because HD 134 over the dam would be two lanes.

Temporary Road Closures and Associated Detours

Temporary road closures could result in potentially significant impacts to safety as a result of increased emergency service response time, especially for ambulances required to travel longer detour route distances and/or on gravel or dirt instead of paved roads. Required detours onto gravel surfaces or less-maintained roadways may impact user safety. A traffic management plan would be developed before construction begins to reduce the potential safety risks. Strategies include installing signs, marking detour routes, providing flaggers, providing information to the public, school district, and emergency service providers.

The Pine Bridge closure may not be required if Reclamation can obtain a variance on the required minimum freeboard. If the minimum freeboard waiver is not obtained, residents of Pine would face travel delays associated with construction on Pine Bridge (Table 54). For the initial response, a 70-minute drive from Mountain Home to Pine would increase by approximately 15 minutes, to 85 minutes (21% increase). If the initial response also required transport back to the hospital in Mountain Home, the additional 15 minutes added to the return (a round trip addition of 30 minutes) would create a 140-minute round trip (21% increase). With the Pine Bridge closure expected to last about 4 months and an annual emergency call volume of 80 to 100 calls per year from Pine, more than 30 emergency calls would be expected and result in delays during in that construction period.

Mountain Home resources support incidents north and west of the reservoir, but, because of the HD 131 detour associated with the HD 134 and Anderson Ranch Dam Road closure, the Pine emergency response resources may be required more frequently. Pine responders also face brief delays on segments of HD 120 as they travel southwest around the reservoir perimeter.

The HD 131 road would be improved and realigned as described in the 6-foot Dam Raise Engineering Summary (Appendix C). HD 134 and HD 121 are the designated detour route during the estimated 43-day construction period of HD 131. Residents of Prairie would be affected by these changes. The current drive time from Mountain Home to Prairie is approximately 90 minutes. After the HD 131 improvements, the travel time may be slightly reduced due to fewer curves and an improved road surface.

Temporary road closures and associated detours would increase emergency service response time for ambulances but not helicopters, and detours may change roadway user safety; therefore, based on the stated significance criteria, there is the potential for significant impacts to user safety due to temporary road closures.

Delays Due to Road Repairs

A total of 15 roadway improvement projects are planned around the reservoir (Figure 7). These projects range from wall construction to shoreline armoring. Construction vehicles may cause impacts to local roads, but contractors would be required to maintain the roads to conditions similar to or better than those before construction. Brief (up to 10 minutes), intermittent traffic delays are not expected to impact emergency personnel responding to incidents (Table 54).

The duration of the delays would depend on traffic control methods and traffic volumes. Because construction of the projects would not occur simultaneously and are scheduled to avoid high peak use volumes (e.g., Memorial Day, 4th of July, and Labor Day holidays), the delays would not interrupt emergency service vehicle access or result in more than a minor increase in emergency service response time. The community of Pine would be most affected because both western and eastern access points would experience road repairs and delay. These delays would be short term and temporary. Significant impacts to safety are not expected as a result of delays due to road repairs.

Boat Launch and Campground Reconstruction

Boat ramps managed by USFS would need to be built on higher ground at Curlew Creek, Fall Creek, and Elk Creek. Water rescue launches from the boat ramp closest to the incident, and emergency responses may be delayed by boat ramp closures (Table 54). The Elk Creek Boat Ramp would be closed for the duration of the dam construction. The temporary closure at the Elk Creek Boat Ramp is for public safety as heavy equipment and trucks would utilize the parking area as a turn-around. Due to the road closure across the dam (HD 134), the Elk Creek Boat Ramp would be the furthest, and most difficult for recreationists to access during construction. The existing Fall Creek Boat Ramp and dock would be demolished and replaced, and a portion of the Curlew Creek boat dock would need to be replaced along with the concrete access ramp. Construction activities at each of the boat ramp locations are not expected to last longer than 2 months. The construction schedule is such that boat ramps would not be closed at the same time, and not during peak season when the likelihood would be highest for needing a water rescue (Table 37). While the change in response time varies depending on the location of the incident, the window of boat ramp closure for each is short and temporary. Significant impacts to safety are not expected as a result of boat ramp and campground reconstruction.

The effects of campground reconstruction projects on recreationists are described in the Recreation Section 3.12. The campground projects are not anticipated to affect emergency response access.

Alternative C

The direct and indirect impacts for Alternative C are similar to Alternative B with three main differences. Alternative C would require 7 months less construction duration (44 months), not require closure of the Pine Bridge, and not require realignment or relocation of the Pine Airstrip. Therefore, no delays to fire response would occur because Pine Airstrip would remain open, and no delays would occur waiting for the traffic signal at Pine Bridge. Of the 44-month construction duration, traffic detour restrictions would be in place for 38 months. The direct effects (e.g., delayed emergency response times) would stop when construction is complete. All other impacts would remain the same as Alternative B and are not repeated here.

Construction Traffic

Similar to Alterative B, the increase in vehicle traffic during construction would contribute to a minor increased safety risk to motorists or other users of local roads. The overall volume of construction vehicles is less under Alternative C. The short-term interruption of emergency service vehicle access is not expected to result in more than a minor increase in emergency service response time, or safety risk to motorists or other users of roadways; therefore, significant impacts to safety are not expected due to increased construction traffic.

Temporary Road Closures and Associated Detours

Similar to Alternative B, the longest roadway closure is HD 134 which would last for approximately 38 months under Alternative C. Response times and detour delay times from Mountain Home to Pine would remain the same as described in Alternative B, although the detour route restrictions are expected to end 7 months earlier under Alternative C.

Alternative C would require no closure of roads or detours associated with construction at Pine Bridge. Residents of Pine would not face travel delays associated with construction on Pine Bridge nor would emergency response times be affected by its closure.

Similar to Alternative B, temporary road closures and associated detours would increase emergency service response time for ambulances but not helicopters, and detours may change roadway user safety; therefore, based on the stated significance criteria, there is the potential for significant impacts to user safety due to temporary road closures.

Delays Due to Road Repairs

Significant impacts to safety are not expected as a result of delays due to road repairs for Alternative C.

Boat Launch and Campground Reconstruction

Significant impacts to safety are not expected as a result of boat launch and campground reconstruction for Alternative C.

3.21.2.3 Cumulative Impacts

The construction of the Pine Bridge in 2018 and dam crest raise in 2010 both caused direct impacts to safety due to traffic delays and, for the Pine Bridge, road conditions limited large vehicle access, including ambulance passage, near Pine. The potential construction of the Pine Bridge and dam crest improvements in 2025 as proposed would cause those same impacts, however, would not be cumulative impact due to separation in time of the two projects.

The CCE Project and South Fork Boise River Diversion Project both propose to draft water from the reservoir with separate pump stations located along the reservoir rim. In the unlikely scenario two or more of the projects would be constructed simultaneously, depending on the specific locations of the CCE and South Fork Boise River Diversion projects, roads within the project area may see increased traffic during construction and associated delays in emergency response. For example, communities served by U.S. 20, HD 134, and HD 61 may experience emergency response times that may or may not exceed the significance criteria established for Alternative B and Alternative C.

3.21.2.4 Mitigation Measures

Reclamation safety and health standards would be used to guide work safety, maintain safe working conditions, identify safety hazards, and reduce accident potential. Contracts or agreements for work on Reclamation facilities would incorporate provisions for compliance with Reclamation's safety and health standards (Environmental Commitments Section 3.28.2). These standards are consistent with health and safety standards prevalent in the industry, the Occupational Safety and Health Act of 1970, Pub. L. 91-596, and DOI regulations.

Under Alternative B and Alternative C, increased emergency response times to Pine and Prairie would result in potentially significant impacts to safety without mitigation measures. As listed below, these measures include staging emergency service resources locally during construction (and associated road closures) to reduce response times to Pine and areas north of the reservoir, specifically those areas currently serviced from Mountain Home via HD 134 and HD 120. Also, building an ambulance shelter and improving lighting at the landing pad in Prairie would improve winter response time and allow for nighttime helicopter rescue operations. Specifically, potential mitigation plans to reduce negative safety outcomes for both Alternative B and Alternative C would be similar and include the following.

- Develop traffic management plan before construction to identify and address potential safety risks.
- Use high-tech road signaling or additional flaggers to reduce vehicle wait time at single-lane road and bridge sections.
- Coordinate winter maintenance so detours and single-lane roads are cleared adequately.
- In Pine, stage additional emergency service resources during closures and provide helicopter lighting.

- In Prairie, create a covered ambulance shelter to reduce response times for winter EMS and a parking area and lighting suitable for helicopter landing to reduce response times year-round.

3.22 Cultural Resources

This section includes an evaluation of the potential impacts to cultural resources that could result from project implementation. Cultural resources may include archaeological traces, such as Native American occupation sites and artifacts; historic-era buildings and structures; and places used for traditional Native American observances or places with special cultural significance. Regulatory information and additional methods and analysis are included in the Cultural Resources Specialist Report (Appendix B21).

3.22.1 Cultural Resources – Affected Environment

Cultural resources were investigated within the project area, which is equivalent to the area of potential effects defined by the Section 106 process of the National Historic Preservation Act (NHPA). The project area boundaries include: the land areas around the reservoir perimeter above the current high water mark (4196 feet) plus 6 feet to the new full pool line (4202 feet) and additionally to four feet above the new full pool line (4206 feet) that would be subject to new erosion and not too steep for human use or occupation; the dam and spillway and related features; culvert and pool improvements at Fall Creek and Deer Creek road crossings; proposed borrow areas; proposed contractor use areas; and proposed road realignment portion of HD 131. The Section 106 process is required only for the preferred alternative, Alternative B. Section 106 does not deal with impacts on all types of cultural resources, or all cultural aspects of the environment; it deals only with impacts on properties included in or eligible for the National Register of Historic Places (NRHP). This section addresses all cultural resources, regardless of eligibility, as required by NEPA.

Evidence of Native American occupation in southwestern Idaho dates as early as 14,500 years B.P. (before present). Archaeologists have defined three prehistoric cultural periods in southwest Idaho. These are the Paleo-Indian period (14,500 to 7,000 B.P.), the Archaic period (7,000 to 300 B.P.), and the Protohistoric period (300 B.P. to European contact). Archaeological investigations in the area indicate a prolonged seasonal use through the Early, Middle, and Late Archaic periods (7,000 to 250 B.P.) (Plew and Osgood, 2017).

Shoshone and Bannock peoples and Northern Paiute groups occupied the Boise River and Payette River Basins at the time of European movement into the area that is now Idaho. Early explorers reported the Boise River and vicinity was an important seasonal meeting and trading location for nonresident groups from the Columbia River, northern Idaho, the Oregon deserts, and Wyoming. The subsistence strategy observed by the early 1800s included exploitation of plant, animal, and raw material resources obtained by traveling seasonally. Multiple family groups spent winters in small villages along the lower and middle areas of the Payette and Boise Rivers. Refer to the Cultural Resources Specialist Report for a detailed description of the pre-contact and post-contact cultural setting (Appendix B21).

3.22.1.1 Cultural Resource Investigations

Cultural resource investigations for the project consisted of a phased approach that included Native American consultation, pre-field research, field surveys, and resource documentation.

All aspects of the cultural resource study were conducted in accordance with the *Secretary of the Interior's Guidelines for Identification of Cultural Resources* (48 CFR 44720-44723).

As outlined in more detail in Tribal Interests (Section 3.23) Reclamation identified two federally recognized tribes with which to consult for this project—the Shoshone-Bannock Tribes of the Fort Hall Reservation and the Shoshone-Paiute Tribes of the Duck Valley Reservation. Several forms of outreach to both tribes resulted in no specific cultural resources being identified to the agency, although concerns were raised by the Shoshone-Bannock Tribes regarding certain use of the area for fishing pre-reservoir and potential burial sites on Federal lands.

Pre-field research included two cultural resource record searches from the Idaho State Historic Preservation Office (SHPO), in-house documents and maps reviews, and archival research. Much of the information found regarding Anderson Ranch Dam was gleaned from the Boise Project Histories on file at the Snake River Area Office. In addition, the USFS office provided information from its files about permit holdings adjacent to the reservoir shoreline.

Pedestrian surveys were conducted by Reclamation in seven instances between July 28, 2018, and April 7, 2020. Around the perimeter of the reservoir, areas to be newly inundated by a 6-foot raise in water level were the focus of intensive survey, as well as possible future recreation areas and fish passage improvement areas. Borrow pits, contractor use areas, a road realignment, and the dam and its features were also investigated.

Record searches revealed that nine cultural resources have been documented in or immediately adjacent to the project area prior to the current work (Table 55). Site types include a historic camp site, historic government camp, a historic building, a stage road route, a relocated town, a historic relocated cemetery, a recently replaced bridge, and a dam and powerplant and associated features. Additionally, six cultural resources were identified and documented as part of the cultural resource investigations for this project (including Pine Airstrip, Fall Creek Resort and Marina, Old Lester Road, and three county roads) (Table 55). No archaeological resources have been documented in the project area.

Table 55. Cultural resources documented in the project area

Site Number	Site Type	Site Description	NRHP Evaluation (date SHPO concurred)
10EL745	Pine Cemetery	Historic cemetery	Undetermined
10EL826	Unknown	None given on site form	Undetermined
10EL2485	Historic Camp Site	Root cellar, stone walls, 1940s food cans, lantern parts, box springs, steel drums	Undetermined
39-339	Town of Pine	Buildings, old mine shaft	Undetermined
39-930	South Boise Stage Road	Road	Eligible (1/6/14)
39-8319	Historic Building	Log building	Undetermined
39-18218	Pine Road Bridge	Bridge (replaced in 2018)	Ineligible (2/17/11)

Site Number	Site Type	Site Description	NRHP Evaluation (date SHPO concurred)
39-18222	Reclamation Village	Location of the old government camp in use during construction of Anderson Ranch Dam	Ineligible (3/6/15)
39-1202	Anderson Ranch Dam and Powerplant	Earthen dam, associated features, and powerplant facility	Eligible (1/5/99)
39-18309 (BS-2520)	Pine Airstrip	Back country dirt airstrip	Ineligible (1/16/20)
39-18310 (BS-2521)	Fall Creek Resort and Marina	Complex of buildings for lodging and recreation	Ineligible (1/16/20)
BS-2539	HD 131	Also called Cow Creek Road	Ineligible (5/16/20)
BS-2545	HD 113	Also called Lake Creek Road	Determined ineligible
BS-2546	HD 61	Also called Louse Creek Road	Determined ineligible
39-18311 (MSF-19-07)	Old Lester Road	Abandoned roadbed that once connected a group of buildings called Lester near the mouth of Lester Creek to the “main” road above the river valley	Ineligible (1/16/20)

3.22.2 Cultural Resources – Environmental Consequences

3.22.2.1 Methods for Evaluating Impacts and Significance Criteria

Impacts from potential project activities to cultural resources were identified in two categories: inundation and reduction or elimination of historical significance. For this analysis, topographical LiDAR data were used to project the new water level elevation with a six-foot increase. Cultural resource locations within the proposed inundation area of 4206 feet were evaluated. Documentation of the cultural resources included identification of significance criteria. These criteria comprise the historical importance and integrity of the resource, and a reduction or loss of these criteria would be considered adverse to the cultural resource. For this analysis, the evaluation performed during the Section 106 process to identify adverse effects were used as an equivalent method for evaluating adverse impacts. These impacts are evaluated in terms of their context and the intensity of their effects to the cultural resource.

The following indicators, consistent with federal regulations for the protection of historic properties (36 CFR 800) and treatment of historic properties (36 CFR 68) were used to assess impacts to cultural resources for this analysis.

- Physical destruction of or damage to all or part of the resource
- Alteration of a resource, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access,

that is not consistent with the Secretary of the Interior's standards for the treatment of historic properties (36 CFR 68) and applicable guidelines

- Removal of the property from its historic location
- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features.

3.22.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under the No-Action Alternative, physical conditions regarding the reservoir water level would not change, the dam crest would not be elevated, and no borrow areas or contractor use areas would be utilized. None of the cultural resources in Table 55 would be impacted directly or indirectly by either of the two categories defined in this study (i.e., inundation and reduction or elimination of historic significance).

Alternative B

Under Alternative B, physical conditions regarding the reservoir water level would change in some areas of new inundation, the dam crest would be elevated 6 feet, affecting a number of contributing features, and the identified borrow areas and contractor use areas would be utilized. Six of the cultural resources in Table 55 would be impacted by activities and/or results of this alternative action, including Anderson Ranch Dam (39-1202), South Boise Stage Road (39-930), Pine Airstrip (39-18309/BS-2520), Fall Creek Resort and Marina (39-18310/BS-2521), Old Lester Road (39-18311/MSF-19-07), and HD 131 (BS-2539).

Anderson Ranch Dam (39-1202) would see the greatest direct effects under this alternative action. The top portion of the dam itself would be removed, redesigned, and essentially rebuilt to the new specifications. As a historic property eligible for listing in the NRHP, the dam's significance is two-fold. First, it is significant for its association with and contribution to the Boise Project and the agricultural advancements that have resulted from that effort. Second, the dam is significant for its original design and engineering that led it to become the highest earthen dam in the world at the time of its completion. Raising the dam, even if following original design and engineering outlines, would physically alter the cultural resource to such a degree that it would effectively become a different structure. In addition, contributing features of the dam such as the spillway, radial gates housing, parapet wall and curb, and the hoist house would all see significant changes that would reduce or remove their original historic integrity. The actions involved with Alternative B, when assessed in their context and intensity, would adversely impact Anderson Ranch Dam and several of its contributing features.

A possible indirect effect to the dam could be a re-evaluation of the eligibility of the structure under Criterion C for its significant original design and construction. After the new construction is completed, it may be decided that too much of the original dam was removed and rebuilt, eliminating its engineering significance and removing that aspect of importance from its NRHP eligibility.

South Boise Stage Road (39-930) route emerges from beneath the existing reservoir water level near the mouth of Lime Creek in T1N, R10E, SW ¼ SW ¼ and SE ¼ SW ¼ of Section 17. Projected inundation data show that a direct effect of the project would be an increase in the water level that would cover about eight additional feet of land where the existing road bed may be (this was not verified during pedestrian surveys due to inaccessibility). However, the road is significant not for its physical nature but for the role it played in providing access to mining districts along the South Fork Boise River. The actions involved with Alternative B, when assessed in their context and intensity, would not adversely impact the involved segment of the South Boise Stage Road. No indirect effects to this resource are foreseen.

Pine Airstrip (39-18309/BS-2520) is located on a flat projection adjacent to the reservoir shoreline south of the town of Pine in T2N, R10E, W ½ NE ¼ and NW ¼ SE ¼ of Section 31. Evaluation of the Pine Airstrip for NRHP eligibility found that it does not meet any of the main criteria for historical significance, and Reclamation has determined it to be ineligible for listing. However, as a cultural resource under NEPA, a raise in elevation of the reservoir water level would directly and adversely impact the resource through an alteration (e.g., inundation) that would render it unusable. The function of the airstrip is its current cultural significance.

Possible indirect effects to the airstrip may be the relocation of the airstrip in order to continue service. If the airstrip remains in this location, additional erosion control considerations that occur at the south end of the airstrip complex. Regular maintenance efforts for the airstrip may need to include monitoring of the new shoreline and/or retaining walls to assess their integrity and ability to safeguard the pilots and aircraft that utilize the airstrip. These indirect effects would not impact the significance of the resource; the Pine Airstrip would still be considered ineligible for listing in the NRHP.

Fall Creek Resort and Marina (39-18310/BS-2521) is located at the mouth of Fall Creek in T1N, R9E, Section 16. Projected inundation data show that the water level would increase along the shoreline and at the base of the marina building. The marina would be the only component of the cultural resource that was documented during this effort to be impacted. Evaluation of the Fall Creek Resort and Marina for NRHP eligibility found that it does not meet any of the main criteria for historical significance, and Reclamation has determined it to be ineligible for listing. However, as a cultural resource under NEPA, a raise in elevation of the reservoir water level would directly and adversely impact the marina building by at least partially inundating the ground level at four feet above the proposed new full pool elevation. The usability of the marina building is its current cultural significance.

The possible indirect effects of the rise in water level in the marina area of this cultural resource complex may necessitate a redesign of the new shoreline area to relocate recreational activities, potentially impacting usability during construction. The existing use permit may need to be rewritten and reissued by USFS to reflect the updated recreational offerings and locations. These indirect effects would not impact the significance of the resource; the Fall Creek Resort and Marina would still be considered ineligible for listing in the NRHP.

Old Lester Road (39-18311/MSF-19-07) (MSF-19-07) is located adjacent to Lester Creek in T1N, R9E Section 23. Projected inundation data show that the water level would increase along the shoreline and further cover small sections of the roadbed in three places where it

dips and rises along the shoreline hills. Evaluation of the Old Lester Road for NRHP eligibility found that it does not meet any of the main criteria for historical significance, and Reclamation has determined it to be ineligible for listing. As a cultural resource under NEPA, a raise in elevation of the reservoir water level would not impact the roadbed adversely as it has been abandoned for human use and is mostly utilized as a game trail today. No indirect effects are foreseen.

HD 131 (BS-2539)—also known as Cow Creek Road—is proposed for use as a haul route for trucks involved with construction of the dam raise. A hairpin turn at Cow Creek would preclude haul truck travel, necessitating construction of an approximately 1,000-foot realignment of the road that shortcuts the inaccessible curve. A design created by Reclamation's Technical Service Center was used to define the area of potential effect (APE) in T1S R7E Section 12. The Elmore County Highway District that operates and maintains the road plans to put the hairpin curve out of commission and all traffic would use the realignment. Evaluation of the HD 131 road for NRHP eligibility found that it does not meet any of the main criteria for historical significance, and Reclamation has determined it to be ineligible for listing. As a cultural resource under NEPA, a realignment would not adversely impact the resource as the portion of road to be realigned is not the original route and the road would continue to be used for its intended function. The usability of the road for vehicular transportation is its current cultural significance. No indirect effects other than temporary road construction inconveniences for road users are foreseen for the realignment of a portion of this road because ownership, maintenance, function, and seasonal usability would not change.

Alternative C

Under Alternative C, physical conditions regarding the reservoir water level would change in some areas of new inundation, the dam crest would be elevated three feet, affecting a number of contributing features, and the identified borrow areas and contractor use areas would be utilized. Six of the cultural resources in Table 55 would be impacted by activities and/or results of this alternative action, including Anderson Ranch Dam (39-1202), South Boise Stage Road (39-930), Pine Airstrip (39-18309/BS-2520), Fall Creek Resort and Marina (39-18310/BS-2521), Old Lester Road (39-18311/MSF-19-07) , and HD 131 (BS-2539). Direct and indirect impacts to all of the sites under Alternative C would be the same as Alternative B except for Pine Airstrip.

Pine Airstrip (39-18309/BS-2520) is located on a flat projection adjacent to the reservoir shoreline south of the town of Pine in T2N, R10E, W ½ NE ¼ and NW ¼ SE ¼ of Section 31. Evaluation of the Pine Airstrip for NRHP eligibility found that it does not meet any of the main criteria for historical significance, and Reclamation has determined it to be ineligible for listing. However, as a cultural resource under NEPA, a raise in elevation of the reservoir water level would directly and adversely impact the southern portion of the resource within its site boundary through an alteration (e.g., inundation). The function of the airstrip is its current cultural significance. An indirect impact may be the construction of retaining walls to hold the water levels back and would preserve the usability of the airstrip but slightly change the feeling of that area.

3.22.2.3 Cumulative Impacts

The newly replaced Pine Bridge is not an NRHP eligible structure. Replacing the bridge as part of this project will not have any cumulative impacts to cultural resources. Multiple parts of the dam are NRHP eligible as discussed in this report. The 4-foot crest raise of Anderson Ranch Dam will be removed and replaced as part of the proposed action and not have cumulative effects.

The cultural resources identified for Alternatives B and C are located outside what is understood to be the CCE project area, and no cumulative impacts to these resources from that project are foreseen. Similarly, the proposed South Fork Boise River Diversion project area, as it is currently understood, would largely be outside the dam raise project area. Cultural resources identified for Alternatives B and C would not be impacted by the proposed diversion project.

3.22.2.4 Mitigation Measures

The mitigation measures listed below apply to Alternative B and Alternative C. Please refer to the Environmental Commitments, Cultural and Historic Resources Section 3.28.3 for more information.

Anderson Ranch Dam (39-1202): Mitigation for the adverse impacts to this historically significant structure may involve compensating for the impact through education or documentation measures that would benefit the public. This form of mitigation would be negotiated through the Section 106 process as Reclamation has recommended a Finding of Adverse Effect to this historic property. A mitigation memorandum of agreement (MOA) would be developed that outlines measure to resolve the unavoidable adverse effects from this project. Mitigation would be appropriate and commensurate to the size of the adverse effects.

South Boise Stage Road (39-930): No mitigation is necessary.

Pine Airstrip (39-18309/BS-2520): Under Alternative B, mitigation for the impact of making the south acre of the landing strip unusable may involve compensating for the impact by shortening, relocating, or realigning the airstrip. Under Alternative C, mitigation for the impact of slightly inundating the southern end of the cultural resource site is outlined in the alternative as constructing retaining walls to keep the water out. Additional mitigation of maintaining and repairing the walls over time may be appropriate.

Fall Creek Resort and Marina (39-18310/BS-2521): Fall Creek Resort and Marina operates an OSS under a USFS permit that would become inundated due to Alternative B. Additional information regarding the facilities and land management status of Fall Creek are included in the Recreation Specialist Report (Appendix B15). Impacts to the non-Federal real property would be mitigated during the project implementation, should the project be determined feasible and the special use permit still be in effect.

Old Lester Road (39-18311/MSF-19-07): No mitigation is necessary.

HD 131 (BS-2539): No mitigation is necessary.

3.23 Tribal Interests

Reclamation has identified two federally recognized tribes to consult with to determine the potential impacts to tribal interests: the Shoshone-Bannock Tribes of the Fort Hall Reservation and the Shoshone-Paiute Tribes of Duck Valley Reservation. Coordination of consultation and information sharing with the tribes is conducted through the cultural resources staff and the Native American Affairs Advisor. More information is included in Chapter 4.

3.23.1 Tribal Interests – Affected Environment

The general area of analysis is considered federal lands surrounding and including Anderson Ranch Reservoir and South Fork Boise River.

3.23.2 Tribal Interests – Environmental Consequences

3.23.2.1 Methods for Evaluating Impacts

The following process identifies tribal interests and evaluates impacts from the alternatives.

- Initial scoping letter to tribes requesting information.
- Query Reclamation's geospatial database.
- Coordinate with the Bureau of Indian Affairs on identified trust lands.
- Prepare affected environment and environmental consequences sections of the draft EIS.
- Share these sections with tribes who provided input.
- Finalize draft EIS sections.

Tribal Outreach

On July 31, 2019, Reclamation sent scoping letters to the Shoshone-Bannock Tribes and Shoshone-Paiute Tribes requesting tribal comment on the Boise River Basin Feasibility Study. The following section details the information received during the outreach effort and subsequent follow-up with both tribal and federal points of contact. Information was received from the Shoshone-Bannock Tribes.

Shoshone-Bannock Tribes of the Fort Hall Reservation

On September 13, 2019, the Shoshone-Bannock Tribes provided Reclamation with formal scoping comments on the Boise River Feasibility Study draft EIS. On October 3, 2019, a staff-to-staff meeting took place at the Fort Hall Water Resources Building. During this meeting, the Tribal Environmental and Cultural Resources staff discussed the tribe's concerns, particularly the potential for increased downstream water flow and the potential to disturb areas of significant cultural importance below the reservoir. These specific comments are addressed in the Cultural Resources Section 3.22. The tribes intend to continue discussion with Reclamation on concerns regarding this proposed action during the formal consultation process.

Shoshone-Paiute Tribes of the Duck Valley Reservation

The Shoshone-Paiute Tribes did not provide Reclamation with formal scoping comments or request additional information. On September 17, 2019, the Reclamation Area Manager, Deputy Area Manager, and Native American Affairs Advisor met with three tribal council members and two tribal staff members. During this meeting, Reclamation provided a second copy of the July 31, 2019, scoping letter to the council members and offered to provide the tribes with a presentation on the project. On September 27, 2019, Reclamation continued to communicate with the tribes with a letter to the business council, noting the July 31, 2019, scoping letter.

Indian Trust Assets

Indian Trust Assets (ITAs) are legal interests in property held in trust by the United States for Indian tribes or individuals. ITAs include trust lands, natural resources, trust funds, or other assets held by the federal government in trust. An Indian trust asset has three components: 1) the trustee, 2) the beneficiary, and 3) the trust asset. Treaty-reserved rights, for instance, fishing, hunting, and gathering rights on and off reservation, are usufructuary rights that do not meet the DOI definition of an ITA. A usufruct is the legal right to use and derive profit or benefit from property that belongs to another person. The United States does not own or otherwise hold these resources in trust. ITAs do not normally include usufructuary rights alone (i.e., rights to access for hunting or fishing). Rather, it requires first a possessory interest; that is, the asset must be held or owned by the Federal government as trustee.

DOI requires that all impacts to trust assets, even those considered nonsignificant, must be discussed in a trust analysis in NEPA documents and appropriate compensation and/or mitigation implemented. Additionally, Reclamation's NEPA Handbook (2012) recommends a separate ITA section in all NEPA documents including a Record of Decision. These sections should be prepared in consultation with potentially affected tribal and other trust beneficiaries.

Reclamation queried its geospatial database that identifies "Native American lands," meaning reservation and trust land, within the project area. No trust land was indicated for either the Shoshone-Bannock Tribes or the Shoshone-Paiute Tribes in the project area.

Reclamation coordinated with the Fort Hall and Eastern Nevada Bureau of Indian Affairs agencies. The Eastern Nevada Agency, which administers trust assets for the Shoshone-Paiute, confirmed there are no ITAs indicated in the project area. The Fort Hall Agency, which administers trust assets for the Shoshone-Bannock, did not respond.

Treaty Rights

The United States has a fiduciary responsibility to protect and maintain rights reserved by or granted to Indian tribes or Indian individuals by treaties, statues, and Executive Orders. These are sometimes further interpreted through court decisions and regulations.

The Fort Bridger Treaty was signed and agreed to by the Bannock and Shoshone headman on July 3, 1868. Article IV of the treaty states that members of the Shoshone-Bannock Tribes "…shall have the right to hunt on the unoccupied lands of the United States…" This has been interpreted to mean unoccupied Federal lands. The Fort Bridger Treaty for the Shoshone-Bannock has been interpreted in the case of State of Idaho v. Tinno, an off-reservation fishing case in Idaho. The Idaho Supreme Court determined that the Shoshone word for

"hunt" also included to "fish." Under Tinno, the court affirmed the tribal members' right to take fish off-reservation pursuant to the Fort Bridger Treaty. The court also recognized "that treaty Indians have subsistence and cultural interests in hunting and fishing…" and "The Fort Bridger Treaty … contains a unified hunting and fishing right, which…is unequivocal." The treaty did not grant a hunting, fishing, or gathering right, it reserved a right the Shoshone-Bannock Tribes have always exercised. The Shoshone-Paiute Tribes of the Duck Valley Reservation, located on the Idaho/Nevada border, do not have off-reservation rights outside its Executive Order Reservation. These tribes may have cultural and religious interests in the area of Anderson Ranch Reservoir. These interests of the tribes may be protected under the historic preservation laws and Native American Graves Protection and Repatriation Act. Refer to the Cultural Resources Section 3.22 and Sacred Sites subsections for a discussion of other tribal interests.

The evaluation of treaty rights assumes that the rights of the tribes to hunt, fish, or gather would not be altered by the proposed action; however, the availability of fish and game might be impacted. Potential changes in this availability would be limited to the Anderson Ranch Reservoir and upper portion of the South Fork Boise River. This analysis is confined to that geographic region. Access to the area for hunting and fishing is the primary impact indicator. Indirect impacts to resources associated with the treaty rights would be indicated by changes in fish, waterfowl, and game populations.

Shoshone-Bannock Tribes of the Fort Hall Reservation

Reclamation received a letter from the Shoshone-Bannock Tribal Chairman on September 13, 2019. The letter lists seven areas of concern regarding the proposed project at Anderson Ranch Dam. Many of these concerns are addressed in the Cultural Resources Section 3.22 and Sacred Sites subsections.

The tribes listed two concerns that are congruent with each other. First, the 2006 *Final Boise/Payette Water Storage Assessment Report* (Reclamation, 2006), of which Reclamation was identified as narrowly focused on water storage rather than utilizing information in this report to explore other conceptual solutions to water shortage. Second, NEPA alternatives where it was identified that Reclamation limited the range of NEPA alternatives to a single action or no action. Reclamation received these comments from the tribes and from other interested parties. In response, Reclamation evaluated other alternatives, some of which were considered but ultimately eliminated from further analysis (Appendix E).

The remaining three concerns are directly related to Treaty rights and are addressed, below.

- Protection of Native Fish and Wildlife. The tribes recommend Reclamation engage USFWS for Endangered Species Section 7 consultations to fully evaluate the effects of a change in pool elevation at Anderson Ranch Dam, such as the bull trout and/or snails.
- Wildlife Mitigation. The tribes recommend Reclamation recognize the Northwest Power and Conservation Council's Fish and Wildlife Mitigation Plan, which is mitigating wildlife losses associated with the construction and inundation of the Anderson Ranch Dam. The tribes would like Reclamation to add impacts from the change in pool elevation for the proposed project and to consider the need to develop a resident fish loss assessment associated with the proposed project.

- Other Wildlife Impacts. The tribes recommend Reclamation assess potential impacts such as wildlife migratory routes and disease transmission. In addition, to consider the potential for elk herds to fall through reservoir ice, the potential for avian populations to see an increase in disease outbreaks, and the potential for expansive mud flats to create conditions that may spread disease, such as avian botulism.

Sacred Sites

A sacred site, as defined in EO 13007, means any specific, discrete, narrowly delineated location on federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site. During consultation efforts, no sacred sites were identified, discussed, or delineated within the defined project area by the associated tribes. If such sites exist near the project area, but were not divulged specifically, it is assumed that project activities as described during scoping would not be sufficient to deny or limit access for Native American religious practitioners.

3.23.2.2 Direct, Indirect, and Cumulative Impacts by Alternative

Alternative A

Indian Trust Assets

Reclamation holds no ITAs and no ITAs were identified during the scoping process. Under the No-Action Alternative, the proposed water storage increase would not occur, and the reservoir would remain in its current condition. There would be no direct, indirect, or cumulative impacts to ITAs.

Treaty Rights

There would be no direct, indirect, or cumulative effects to treaty rights. The proposed water storage increase would not occur, and the reservoir would remain in its current condition. No known treaty rights would be affected.

Sacred Sites

Reclamation has no information of any sacred sites and no sacred sites were identified during the scoping process. Under the No-Action Alternative, the proposed water storage increase would not occur, and the reservoir would remain in its current condition. There would be no direct, indirect, or cumulative impacts to sacred sites.

Alternative B

Indian Trust Assets

Impacts associated with this alternative are the same as those identified in Alternative A; no direct, indirect, or cumulative impacts.

Treaty Rights

Reclamation is aware of the Shoshone-Bannock Tribes' treaty rights to hunt, fish, and gather in the area in and around Anderson Ranch Reservoir. As part of the scoping process, Reclamation requested information from tribes that traditionally and currently use the area

and the Shoshone-Bannock Tribes provided comments. Although none of the alternatives would hinder access to treaty rights-based hunting, fishing, and gathering, Alternative B may affect treaty rights such as hunting, fishing, and gathering rights in the direct vicinity of the project. Reclamation commits to further consultation with the affected tribes on a government-to-government basis to avoid, minimize, or mitigate adverse effects on fish and wildlife that may negatively affect the availability or sustainability of fish and game in the direct vicinity of the project.

Sacred Sites

Reclamation has no information of any sacred sites and no sacred sites were identified during the scoping process. Under Alternative B, the proposed water storage increase would occur, however, there would be no direct, indirect, or cumulative impacts to sacred sites.

Alternative C

Indian Trust Assets

Impacts associated with this alternative are the same as those identified in Alternative B, that is, no direct, indirect, or cumulative impacts.

Treaty Rights

Impacts associated with this alternative are the same as those identified in Alternative B, that is no direct, indirect or cumulative impacts. Although this alternative would not hinder access to treaty rights-based hunting, fishing, and gathering, Alternative C may affect treaty rights such as hunting, fishing, and gathering rights in the direct vicinity of the project.

Sacred Sites

Reclamation has no information of any sacred sites and no sacred sites were identified during the scoping process. Under Alternative C, the proposed water storage increase would occur, however, there would be no direct, indirect, or cumulative impacts to sacred sites.

3.24 Environmental Justice

EO 12898 (Environmental Justice, 59 FR 7629 [1994]) requires federal agencies assess environmental justice by addressing 'disproportionately high and adverse human health and environmental effects on minority and low-income populations.' To determine if environmental justice populations are present, the federal agency examines the demographics of the affected area to determine if minority (including Native Americans) and/or low-income populations are present. If present, the agency must determine if the action would cause disproportionately high and adverse human health or environmental effects on the populations.

This section describes existing conditions for environmental justice within the project area and anticipated environmental consequences for the alternatives. Regulatory information, general demographic information, and additional methods and analysis are included in the Environmental Justice Specialist Report (Appendix B22).

3.24.1 Environmental Justice – Affected Environment

3.24.1.1 Project Construction Area

The closest private residence to the project area is approximately 19 miles to the east of the dam site in the town of Pine, Idaho. There are also private residences several miles beyond the upper south rim of the canyon along HD 134 which extends north from its intersection with U.S. 20 to Anderson Ranch Dam. There are no private residences immediately adjacent to Anderson Ranch Dam. The town of Prairie, Idaho, is approximately 22 miles northwest of the dam. The farmers and ranchers of this town currently utilize HD 134 across Anderson Ranch Dam to transport primarily hay and cattle from Prairie to the Mountain Home area. This is also the route used by buses to transport children to public schools in Mountain Home. The more gradually angled turns and less steep grade of this route allow for safe and efficient transport. These activities contribute largely to the livelihood and economic wellbeing of the individuals in Prairie.

Racial Minorities

The project construction area is located in Elmore County, a remote and sparsely populated area, where much of the land is owned by the Federal government. Near the project construction area, there are only scattered residential dwellings around the reservoir, and along the South Fork Boise River downstream from the dam. The general proportions of race and ethnicity in Elmore County are similar to Idaho as a whole, with a white population of more than 86% in Elmore County and 91% in Idaho according to the Census Bureau's 2013–2017 American Community Survey (Table 1, Environmental Justice Specialist Report, Appendix B22).

Low-Income Populations

Low-income populations are identified by several socioeconomic characteristics. As categorized by the 2000 Census, specific characteristics include income (median family and per capita), percentage of population below poverty (individuals), and unemployment rates. The Census Bureau's 2013–2017 American Community Survey shows a slightly lower median household income of $45,154 for Elmore County than $50,985 for Idaho (U.S. Census Bureau, 2017). The Census Bureau reported that about 12.9% of the population of Elmore County and 11.8% of the state of Idaho's population were living in poverty in 2017 (U.S. Census Bureau, 2017).

Other measures of low-income, such as unemployment, characterize demographic data in relation to environmental justice. The 3.7% unemployed in Elmore County is only slightly higher than the state of Idaho's 2.8% of unemployed (Bureau of Labor Statistics, 2019b). Figure 1 in the Environmental Justice Specialist Report (Appendix B22) shows the boundaries for unemployment rates geographically throughout the project area and the majority of Elmore County, Idaho, according to the EPA EJSCREEN tool (U.S. Census Bureau, 2017).

3.24.1.2 End Users

Racial Minorities

The end user would be existing water users within Idaho Water District 63. The area of concern for end users is located in Ada County and portions of Canyon County, Idaho. The

general proportions of race and ethnicity in Ada and Canyon counties are similar to Idaho as a whole, with a white population of more than 91% and more than 93% respectively, according to the Census Bureau's 2013–2017 American Community Survey (Table 2 and Table 3 in Appendix B-Environmental Justice Specialist Report). Based on this review, Hispanics or Latinos represent the largest minority population in Canyon County at 25.6%. This is double the population percentage of Hispanics or Latinos in Idaho as a whole.

Low-Income Populations

Low-income populations are identified by several socioeconomic characteristics. As categorized by the 2000 Census, specific characteristics include income (median family and per capita), percentage of population below poverty (individuals), and unemployment rates. The Census Bureau's 2013–2017 American Community Survey shows a slightly higher median household income of $60,151 for Ada County than $50,985 for Idaho (U.S. Census Bureau, 2017). The Census Bureau's 2013–2017 American Community Survey shows a slightly lower median household income of $46,426 for Canyon County than $50,985 for Idaho (U.S. Census Bureau, 2017). The Census Bureau reported that about 10.8% of the population of Ada County and 11.8% of the state of Idaho's population were living in poverty in 2017 (U.S. Census Bureau, 2017). The Census Bureau reported that about 15.5% of the population of Canyon County and 11.8% of the state of Idaho's population were living in poverty in 2017 (U.S. Census Bureau, 2017).

Other measures of low income, such as unemployment, characterize demographic data in relation to environmental justice. The 2.6% unemployed in Ada County is only slightly lower than the state of Idaho's 2.8% of unemployed (IDL, 2019). The 3.3% unemployed in Elmore County is only slightly higher than the state of Idaho's 2.8% of unemployed (IDL, 2019).

3.24.2 Environmental Justice – Environmental Consequences

3.24.2.1 Methods for Evaluating Impacts

Methods used to evaluate impacts are described are in the Environmental Justice Specialist Report (Appendix B22). If any potential impacts to minority or low-income populations are determined to exist, they were evaluated by comparing the action's potential effect on minority and low-income populations relative to its overall effects to determine whether any potential adverse impacts to those populations would be disproportionate, and thus disproportionately high. There are no specific significance criteria for environmental justice.

3.24.2.2 Direct and Indirect Impacts by Alternative

Alternative A

Under the No-Action Alternative, Reclamation would not modify Anderson Ranch Dam to increase storage capacity. This alternative would not alter the current regional environmental justice status based on there being no change to Anderson Ranch Dam, irrigation water delivery, or existing reservoir operation protocols. Therefore, no change would occur to any low-income or minority populations from the project. Farmers, ranchers, and other transportation such as buses and emergency services in the area would continue to use HD 134 for transportation across Anderson Ranch Dam and Anderson Ranch Reservoir would continue to provide water to end users within Water District 63 as is the case currently.

Alternative B

Project Construction Area

Environmental resources potentially used by low income and minority groups that could exist in the project area are primarily aquatic related resources. These groups currently use these resources and would be expected to do so in the future. Access to these resources should not change based on this alternative. While much of the fishing occurs in the dam and reservoir area, as noted in the Recreation Section 3.12, it is not a defined subsistence fishery.

Construction activities with Alternative B could most directly impact those utilizing HD 134 to cross Anderson Ranch Dam for transportation purposes. Due to the closure of the HD 134 for approximately 45 months during construction, a detour would be designated through HD 131 or Cow Creek Road to allow for school buses, agricultural and stock trucks to access a safe route. This is important because these trucking activities are a large portion of the livelihood of the residents within the town of Prairie and surrounding areas. These individuals usually utilize HD 134 for transportation based on the more gradual turns and less steep grade when compared to other routes. However, the detour route through HD 131 would have modifications to realign the road to allow more gradually angled turns and less steep grade than the current condition which would not be safe transportation routes for large trucks and semis due to these factors. This would also be the main route for access in terms of public-school district buses, emergency response services (police, fire, medical, etc.), mail, and local residents.

End Users

For the end user, Alternative B could increase the available water supply. This water would likely be distributed throughout Water District 63 and would not cause any impacts to low-income or minority populations when considering the quantity of water and the wide distribution within established water delivery areas.

Other than minor construction impacts that are short-term in duration, no adverse impacts to aquatic related resources have been identified. No Council on Economic Quality defined subsistence level use of renewable natural resources by any population has been identified in the area. No adverse human health impacts for any human population have been identified. Therefore, this alternative would not have an adverse environmental justice impact to any low-income or minority populations end users.

Alternative C

Project Construction Area

Environmental resources potentially used by low income and minority groups that could exist in the project area are the same as in Alternative B. These groups currently use these resources and would be expected to do so in the future. Access to these resources should not change based on this alternative. Construction activities with Alternative C would be the same as Alternative B.

End Users

Alternative C would be the same for end users as in Alternative B except the available water would be a maximum of 14,400 additional acre-feet of water. This water would likely be distributed throughout Water District 63 and would not cause any impacts to low-income or

minority populations when considering the quantity of water and the wide distribution within established water delivery areas.

Other than minor construction impacts that are temporary in duration, no adverse impacts to aquatic related resources have been identified. No Council on Economic Quality defined subsistence level use of renewable natural resources by any population has been identified in the area. No adverse human health impacts for any human population have been identified. Therefore, this alternative would not have an adverse environmental justice impact to any low-income or minority populations end users.

3.24.2.3 Cumulative Impacts

The proposed 2025 dam construction date is well removed in time from the 2018 installation date of the newly replaced bridge and 2010 construction of the security berm along the dam crest. No cumulative impacts to socioeconomics are identified for these past actions.

Cumulatively, the effects of future projects would be the same for Alternative B and Alternative C which may contribute to slight, but insignificant, economic gains to the local area. Due to the incomplete nature of the CCE proposal, it is difficult to foresee specific effects to the area. However, there would be no work done at Anderson Ranch Dam and therefore no road closures across the dam would be triggered which require a detour to ensure economic based transportation have a through route. Anderson Ranch Reservoir would still not be considered a subsistence reservoir. There would still be no minority or low-income populations in the surrounding areas affected if this action takes place in the near future. If many years pass prior to the completion of the project, then the terms of 'foreseeable future' would not apply and new analysis would be done to consider changes in the populations in this area. Based on known details, it seems there may be expected minor ongoing positive effects to the local economy and labor force through the contracting process for construction and other general and specialized labor. Cumulatively, the effects of this individual future project may contribute to slight, but insignificant, economic gains to the local area.

The South Fork Boise River Diversion Project installation of pipeline would require no closures across Anderson Ranch Dam and therefore would not need detour consideration. Again, there would be no subsistence designation to consider and there are no effects to minority or low-income populations in the area based on the data presented above. Based on known details, it seems there may be expected minor ongoing positive effects to the local economy and labor force through the contracting process for construction and other general and specialized labor. Cumulatively, the effects of this individual future project may contribute to slight, but insignificant, economic gains to the local area.

3.24.2.4 Mitigation Measures

No significant adverse effects to environmental justice are anticipated, so no formal mitigation measures are recommended for Alternative B or Alternative C.

3.25 Unavoidable Adverse Effects

Unavoidable adverse impacts are defined as environmental consequences of an action that cannot be avoided, either by changing the nature of the action or through mitigation if the action were undertaken. The proposed project design features, BMPs, and mitigation would

avoid or minimize many of the potential adverse effects associated with the proposed alternatives. However, it would not be possible to avoid all adverse effects, nor would mitigation be 100% effective in remediating all impacts. There would be a minimal amount of unavoidable impact to most resources in the Anderson Ranch Reservoir area for during construction, due to the presence of equipment and humans in the area and the time necessary for revegetation to be effective.

Unavoidable adverse impacts associated with Alternative B and/or Alternative C include the following.

- Estimated maximum volume shortfall of approximately 97,000 acre-feet per year during construction (47 months under Alternative B and 40 months under Alternative C) and no available reservoir space to mitigate volume shortfalls affecting spaceholders ability to use storage water.
- Long-term increase in erosion along unprotected shoreline during higher water as the new shoreline is established. Increased inundation of approximately 146 acres under Alternative B and 73 acres under Alternative C.
- Short-term increase in erosion potential from surface disturbing construction activities.
- Short-term impacts from sediment and turbidity during construction and coffering.
- Short-term construction related underwater noise and vibration, sediment release, and habitat access restrictions.
- Short-term construction related noise, dust, and emissions from construction equipment and increased construction traffic.
- Short-term construction related impacts on the aesthetic environment.
- Potential long-term loss of wetlands in areas of the rim projects and roadway projects (1.468 acres under Alternative B and 1.100 acres under Alternative C).
- Potential long-term loss of riparian areas including perennial and intermittent streams around the rim of Anderson Ranch Reservoir, areas of the rim projects, and roadway projects (2,198 linear feet under Alternative B and 963 linear feet under Alternative C).
- Long-term loss of upland vegetation and riparian vegetation around the rim of Anderson Ranch Reservoir due to inundation (125.96 acres under Alternative B and 63.27 acres under Alternative C).
- Long-term loss of vegetation associated with construction of the rim projects, roadway projects, and borrow areas (86.98 acres under Alternative B and 79.41 acres under Alternative C)
- Short-term and potentially long-term loss of more than 85 trees around the rim of Anderson Ranch Reservoir associated with developed recreation facility/ campground reconstruction.
- Short-term transportation delays, including emergency service response delays, due to road closure(s), detour route restrictions, and lane restrictions during construction.

- Short-term loss in public use of HD 131 during detour route reconstruction (43 days).
- Short-term loss in public use of HD 134 during construction (45 months under Alternative B and 38 months under Alternative C).
- Short-term loss in public use of NFSR 134A during construction (47 months under Alternative B and 40 months under Alternative C).
- Short-term disruptions to recreation use during construction. Short-term public closures of developed recreation facilities, including some USFS campgrounds and boat ramps.
- Short-term loss in public use of Elk Creek Boat Ramp and parking lot during construction (47 months under Alternative B and 40 months under Alternative C).
- Short-term loss in public use of Spillway Campground during construction (47 months under Alternative B and 40 months under Alternative C).
- Potential long-term or permanent loss of the Fall Creek Marina and campsites.
- Permanent loss to the historic features of Anderson Ranch Dam, constituting an "Adverse Effect."

3.26 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments are decisions affecting resources, such as wetlands and vegetation, where the resource is lost and replacement can only occur over a long period of time, or at great expense, or cannot be replaced at all. Irretrievable commitments refer to loss of production or use of resources because of a decision, such as removal of trees, filling of wetlands, or conversion of one vegetative community to another where opportunities are lost for the period of time that a resource is not usable.

While there would be some short term and permanent removal of vegetation (e.g., more than 85 trees would be removed to accommodate campground reconstruction) under both alternatives, overall, the irreversible and irretrievable resources associated with that removal are minor relative to the amount of resources available in the project area. However, the physical alteration of Anderson Ranch Dam would have an irreversible effect on the historic integrity of that structure.

The action alternatives would require expenditures of energy, including natural and depletable resources, during construction; however, the energy use would be short term and have negligible impacts to energy resources. Both action alternatives do not require additional energy for long term operations.

3.27 Relationship Between Short-term Uses and Long-Term Productivity

Construction of the proposed projects would result in short-term construction-related impacts such as delays with local traffic, road closures, detour route restrictions, disturbance of vegetation in borrow sites, staging areas, and areas adjacent to roadway projects, limited air emissions, increase in ambient noise levels, dust generation, disturbance to wildlife, potential for increased storm runoff, and disturbance of developed campgrounds. These impacts would

be short term and would occur only during construction and are therefore not expected to alter the long-term productivity of the natural environment. The proposed alternatives would assist in the long-term productivity of the basin's water storage capabilities and aid with water management flexibility. These long-term beneficial effects of the proposed action would potentially outweigh the potentially significant, but mitigable short-term impacts to the environment resulting from project construction.

3.28 Environmental Commitments

Any environmental mitigation or enhancement measures that Reclamation plans to implement as part of the proposed activities are termed "environmental commitments." Environmental commitments include any action that is intended to avoid, minimize, and mitigate environmental impacts of a project and is required to be implemented as a condition of project approval.

The implementation of environmental commitments can be delegated to a third-party contractor or required as a condition for a permittee, lessee, or loan recipient for individual projects or actions. However, compliance with any environmental commitments program remains the responsibility of the appropriate Reclamation manager.

Reclamation would develop an environmental inspection and mitigation monitoring program to ensure that all environmental commitments would be met. Reclamation would coordinate development and implementation of this program with USFS, USFWS, USACE, and other state and Federal agencies, as appropriate.

Mitigation measures needed to reduce impacts below significance are incorporated into the alternatives in Chapter 2, where appropriate. These mitigation measures are an integral part of the alternative. Mitigation measures that address impacts not eliminated through avoidance of adverse effects are included in the resource-specific analysis in Chapter 3. Mitigation measures requiring approval or permits from another entity, agreement with USACE, USFWS, BIA, and other responsible federal agencies are described in Chapter 4.

3.28.1 Environmental Commitment Plan and Checklist

An Environmental Commitment Plan and an Environmental Commitment Checklist would be prepared and used by the Snake River Area Office to ensure compliance with the environmental commitments and the environmental quality protection requirements. A post-construction environmental summary would be completed within one year after project completion to assess the effectiveness of the mitigation measures.

3.28.2 Public Health and Safety, Hazardous Materials, and Waste

Reclamation safety and health standards would be used to guide work safety, maintain safe working conditions, identify safety hazards, and reduce accident potential. Contracts or agreements for work on Reclamation facilities would incorporate provisions for compliance with Reclamation's safety and health standards. These standards are consistent with health and safety standards prevalent in the industry, the Occupational Safety and Health Act of 1970, Pub. L. 91-596, and DOI regulations.

Under Alternative B and Alternative C, increased emergency response times to Pine and Prairie would result in potentially significant impacts to safety without mitigation measures.

As listed below, these measures include staging emergency service resources locally during construction (and associated road closures) to reduce response times to Pine and areas north of the reservoir, specifically those areas currently serviced from Mountain Home via HD 134 and HD 120. Also, building an ambulance shelter and improving lighting at the landing pad in Prairie would improve winter response time and allow for nighttime helicopter rescue operations. Specifically, potential mitigation plans to reduce negative safety outcomes for both Alternative B and Alternative C would be similar and include the following.

- Develop traffic management plan before construction to identify and address potential safety risks.
- Use high-tech road signaling or additional flaggers to reduce vehicle wait time at single-lane road and bridge sections.
- Coordinate winter maintenance so detours and single-lane roads are cleared adequately.
- In Pine, stage additional emergency service resources during closures and provide helicopter lighting.
- In Prairie, create a covered ambulance shelter to reduce response times for winter EMS and a parking area and lighting suitable for helicopter landing to reduce response times year-round.

3.28.3 Cultural and Historic Resources

For all cultural resources directly impacted by the project, Reclamation would implement mitigation measures and treatment plans and as required through Section 106 consultation with the SHPO, tribes, and USFS.

Reclamation would develop a Cultural Resource Management Plan to address ongoing and future operational and land management implications of the proposed project. Project-specific mitigation would include the following.

Anderson Ranch Dam (39-1202): Mitigation for the adverse impacts to this historically significant structure may involve compensating for the impact through education or documentation measures that would benefit the public. This form of mitigation would be negotiated through the Section 106 process as Reclamation has recommended a Finding of Adverse Effect to this historic property. A mitigation MOA would be developed that outlines measure to resolve the unavoidable adverse effects from this project. Mitigation would be appropriate and commensurate to the size of the adverse effects.

Pine Airstrip (39-18309/BS-2520): Under Alternative B, mitigation for the impact of making the south acre of the landing strip unusable may involve compensating for the impact by shortening, relocating, or realigning the airstrip. Under Alternative C, mitigation for the impact of slightly inundating the southern end of the cultural resource site is outlined in the alternative as constructing retaining walls to keep the water out. Additional mitigation of maintaining and repairing the walls over time may be appropriate.

Fall Creek Resort and Marina (39-18310/BS-2521): Fall Creek Resort and Marina operates an OSS under a USFS permit that would become inundated due to Alternative B. Additional information regarding the facilities and land management status of Fall Creek are included in

the Recreation Specialist Report (Appendix B15). Impacts to the non-Federal real property would be mitigated during the project implementation, should the project be determined feasible and the special use permit still be in effect.

3.28.4 Water Operations and Hydrology

Mitigation measures were developed to address impacts to water deliveries and system FRM during construction.

The drawdown of Anderson Ranch Reservoir during the construction period for Alternative B and Alternative C would result in estimated shortfall volumes to Anderson Ranch Reservoir spaceholders totaling an estimated 55,074 acre-feet/year to 96,074 acre-feet/year depending on restricted-pool volume. The Boise River basin is fully appropriated, and during this drawdown there would be no available reservoir space to mitigate these short-term volume shortfalls. This impact would cease at the conclusion of construction activities. Mitigation for the adverse short-term impacts to storage spaceholders would be in compliance with applicable state and Federal laws. Potential mitigation activities may include providing funds to mitigate impacts from reduced water supply and seeking opportunities for water rentals from other spaceholders.

Mitigation measures to address impacts to system FRM during construction (Appendix G) may include the following.

- Providing the November 1–December 31 space requirement of 300,000 acre-feet (165,000 acre-feet in lower system)
- Providing the January 1–March 30 minimum space requirement of 300,000 acre-feet to 50,000 acre-feet depending on forecast
- Providing the dynamic forecast-based system space requirement (January 1–July 15) or draft system to empty.
- Develop guidance for the percent of total system space that would be required to be held in Anderson Ranch Reservoir based on a local reservoir runoff volume forecast and maximum target discharge.
- Identify operational triggers where construction would need to be delayed due to severe hydrologic conditions and develop lead times required to demobilize equipment.

3.28.5 Transportation and Infrastructure

The following measures would be implemented to help reduce potential impacts related to roadwork, increases in vehicle traffic, and other transportation related issues.

- Develop and follow a transportation management plan to communicate closures and delays with the public.
- Develop and follow a dust prevention and control plan (see Section 3.28.8).
- Use high-tech road signaling or increased use of flaggers to reduce vehicle wait time at single-lane road and bridge sections.

- Coordinate winter maintenance so that detours and single-lane roads are cleared adequately during both weekdays and weekends.
- Ensure utility relocation plans are in place to minimize or eliminate service disruption.
- For HD roads, meet HD standards and guidelines (including BMPs) regarding location and design in future road construction.
- Construction, operation, and maintenance of NFS roads would follow appropriate USFS road management activities and BMPs to avoid, minimize, or mitigate adverse effects to soils, water quality, and riparian resources in *National Best Management Practices for Water Quality Management on National Forest System Lands* (BMPs for Water Quality Management; USFS, 2012).
- Activities would consider the Forest Plan Guideline FRGU06 that states that new/realigned roads should be located out of riparian conservation areas wherever possible. When new/realigned roads must be located within riparian conservation areas, they should be developed such that degrading effects to riparian conservation areas are mitigated.

3.28.6 Recreation Resources

Developed recreation facilities impacted by the proposed action would be rebuilt above the new full pool elevation. Site-specific USFS BMPs would be developed and include land management plan direction and BMP monitoring information in *National Best Management Practices for Water Quality Management on National Forest System Lands* (USFS, 2012).

The project would consider aquatic management zone planning (riparian conservation areas), site location planning to avoid or minimize potential adverse impacts to water quality and riparian resources, address consistency with recreation site layout, and land management plan desired conditions, goals, and objectives for soil, water quality, and riparian resources. Implementation of other BMPs to address erosion and stormwater controls, access roads, water, sanitation, and solid waste systems at recreation sites would also be addressed.

The Fall Creek Marina and campsites would be affected by inundation. Impacts of the proposed action to the non-Federal real property would be mitigated during project implementation, should the project be determined feasible and the special use permit still be in effect. Potential mitigation could include: rebuild existing features to their existing condition, relocate existing features to a suitable location, or compensatory mitigation. Additional NEPA will be conducted prior to any action being selected for this site consistent with the special use permit.

3.28.7 Visual Resources

Rehabilitation measures would be implemented immediately upon completion of the dam work and roadway improvements. Measures include: recontouring and reseeding disturbed areas in a natural appearing way with native vegetation species, controlling the spread of noxious weeds, cleaning up trash, excess rock, and construction debris and disposing of them in designated areas away from view of recreation visitors. Site restoration to disturbed vegetation areas are identified and would be required by the contractor post-construction. These measures for reducing impacts to vegetation would also benefit the overall scenic

integrity and setting. Any night lighting would be downward directed to minimize overall atmospheric lighting.

3.28.8 Air Quality

Contractors would be required to comply with IDAPA Administrative Code 58.01.01.650 and IDAPA Administrative Code 58.01.01.651, using reasonable precautions established as BMPs to minimize fugitive dust emissions. BMPs would include developing and following a dust prevention and control plan which would identify potential fugitive dust emission sources, assign dust control methods, determine frequency of dust treatment applications, record dust control activities, and monitor dust control efforts. The dust prevention and control plan would include precautions for working on windy days, establish speed limits on unpaved roads (10–15 miles per hour), identify dust suppression measures for construction traffic, and address other measures to control fugitive dust emission during construction activities.

3.28.9 Erosion Control, Water Quality, and Shoreline Protection

Core BMPs designed to reduce impacts on soils, water quality, and riparian resources on NFS lands would be considered and site-specific BMPs would be identified and implemented (USFS 2012 *National Best Management Practices for Water Quality Management on National Forest System Lands* [BMPs for Water Quality Management]).

All construction activities would be confined to previously disturbed areas, to the extent practicable, for such activities as work, staging, and storage; borrow areas; waste areas; and vehicle and equipment parking areas to preclude sediment delivery to the reservoir and stream channels and minimize impacts on riparian vegetation.

Shoreline protection measures would be constructed in the dry when the reservoir is drawn down to avoid in-water work. Work would be completed before raising the level of the reservoir. Reclamation would identify and monitor erosion control problems and implement appropriate control measures.

Methods to minimize earthmoving-related erosion would include the following.

- Apply appropriate stormwater prevention techniques according to the Stormwater Pollution Prevention Plan.
- Install sediment control measures before construction activities and have them remain in place until erosion control is assured. Once assured, remove all sediment control measures within 30 days and dispose of captured sediment and other materials of in accordance with all Federal, state, and local laws and regulations.
- Place silt fences, straw bales, straw wattles, or other sediment barriers around disturbed sites to reduce the potential for sediment to enter a stream directly or indirectly, including from roads and ditches.
- Keep a supply of erosion control materials on hand (e.g., silt fence and wattles) to respond to sediment emergencies.

- Use methods of excavation and stockpiling earth and rock materials that include prevention measures to control erosion and intercept and settle runoff of sediment laden waters.
- Perform construction activities using methods that would prevent or control the discharge of sediments.
- Cease all project operations, except efforts to minimize storm or high-flow erosion, during precipitation and high-flow conditions that result in uncontrollable erosion in the construction area.
- Monitor and inspect erosion controls and repair, replace, or install new erosion control measures as necessary to control erosion.

Methods to minimize sedimentation through dewatering and construction activities would include the following.

- Use methods of dewatering to include prevention measures to control erosion and intercept and settle runoff of sediment laden waters.
- Place cofferdams to isolate the in-reservoir work areas prior to any in-reservoir construction activity taking place.
- Construct cofferdams (to the extent feasible) of non-erodible material, such as bladder bags or other materials that divert water. If appropriate material is available on site, this may be used for constructing cofferdams (if necessary).
- Use temporary sumps (if required to keep the dewatered area dry during construction).
- When necessary, pump water from the dewatered work area to a temporary settling pond prior to water reentering the reservoir.
- If noticeable sediment plumes occur in the South Fork Boise River as a result of construction, turbidity measurements would be obtained on a regular basis (e.g., every 15 minutes) to monitor turbidity increases over background levels. Should turbidity levels increase greater than 50 nephelometric turbidity units above background levels approximately 600 feet downstream, construction would be adjusted and/or halted, until levels drop close to the background levels. If persistent turbidity issues arise, USFS and USFWS would be notified.

3.28.10 Biological Resources

Two environmental enhancement projects are proposed under Alternative B and Alternative C. Deer Creek and Fall Creek culvert rehabilitation projects would involve regrading and construction activities that would provide year-round fish passage into Deer Creek and Fall Creek that currently does not exist at pool elevations when the culverts are perched.

The following noxious weed and invasive species control measures, vegetation conservation measures, and revegetation practices would be implemented.

- Staging of construction equipment would be limited to areas specifically identified for use during construction.

- Pre-construction surveys for noxious weeds within the project area would be completed. Monitoring for infestations of noxious weeds associated with project-related ground disturbance would occur. The entire project area would be monitored at least once each year for two years following project completion and any noxious weeds identified in the project area would be removed.
- Before removing any vegetation for construction activities, a survey would be conducted on the vegetative communities present in each construction area. Removing mature riparian vegetation and other sensitive vegetation would be minimized to the extent possible.
- A revegetation plan would be prepared on a site-specific basis to restore native vegetation in all areas impacted immediately after construction is completed. The objectives of the revegetation plan would be to reestablish native vegetation to provide ground cover, minimize opportunities for invasive species to establish; and provide habitat and opportunities for recreation as the site matured. The revegetation plan would include monitoring requirements, performance standards, and success criteria to ensure the areas successfully revegetated.
- Weed control and revegetation plans would incorporate management direction from the Boise and Sawtooth Forest-wide Integrated Weed Management Prevention Plan and Forest Plans including guidelines and standards relative to noxious weeds. This would incorporate conservation measures to avoid noxious weeds from becoming established or spreading.
- Riparian vegetation would be replaced through planting and establishment on site. Sensitive plant communities, if present, may be replaced through restoration of comparable native vegetation at other sites, if necessary. Planting saplings and bare root trees and shrubs would decrease the time required for reestablishment because they can more rapidly adapt to new soil conditions.
- Disturbed areas would be seeded and planted with a mixture of native species that are present in the project area or that historically occurred there. Seed sources would be from the project area or sources acclimated to the region. The composition of seed mixes would be coordinated with wildlife habitat specialists.
- Before entering the work area, all equipment and vehicles would be washed with a high-pressure washer at an off-site location to remove material that may contain noxious weeds or noxious weed seeds.
- All erosion control materials would be certified weed free, including straw bales, wattles, straw, and seed mixes.
- Any rock, gravel, or soil that is transported to the project area from outside the project area would come from sources that do not contain noxious weeds.

The following aquatic invasive species control measures would be implemented.

- Water would not be dumped from water tenders directly from one stream or lake into another.

- Any equipment being used below the high-water line would need both high pressure and hot (>140°F) water for the wash.
- Cleaning activities would comply with Idaho Aquatic Nuisance Species Plan and follow proposed cleaning methods for aquatic invasive organisms.
- All equipment would be disinfected prior to use. Areas would be designated for cleaning and sanitation of heavy equipment to reduce the spread of noxious weeds and unwanted organisms.

The following wetlands and sensitive and/or special status species protective measures would be implemented.

- Reclamation would coordinate with USACE, state, and local agencies to determine whether the proposed additional inundation would result in a loss of wetlands that requires permit approval. Mitigation measures would be developed and implemented, if necessary, to meet agency permit conditions for any wetland impacts caused by increased inundation.
- Pre-construction wetland surveys would be completed using current wetland delineation methodology; projects would be designed to avoid wetland impacts. If wetland impacts occur, compliance with mitigation measures established in permit conditions to ensure no net loss would be adhered to.
- Prior to construction, Reclamation would coordinate with USFS to determine the presence of any sensitive or special status species and take steps to minimize impacts on those species.
- Region 4 sensitive plant locations found before or during project implementation, except where protection would create safety or project feasibility concerns, would be protected. Protection measures could include relocation of project activities, seasonal restrictions, or other measures. Protection measures for new Region 4 sensitive plant occurrences on a site-specific basis would be evaluated.

The following fisheries protective measures would be implemented.

- All work in "live water" (i.e., placement and removal of coffering) in and around Anderson Ranch Reservoir would be conducted during low-pool conditions and migration corridors used for spawning would not be restricted during any period of in-stream work. To the extent feasible, in-water work at the Pine Bridge would be conducted between July 15 and September 7 to minimize effects to migrating bull trout. All pile driving at the Pine Bridge (even though it would be conducted in the "dry") would occur within the in-water work window. Outside of the spillway construction, all in-water construction activities would be completed within one work season. Isolating the spillway construction area would persist for 35 to 42 months depending on alternative.
- All in-water construction activities are anticipated to occur during low flows. In addition, all pile driving would occur during low flows and be conducted in dry conditions. With the exception of constructing and removing cofferdams, all construction activities for the proposed action would be isolated from live and/or moving water. Any isolation of in-water work areas would be conducted in a manner

to minimize impacts to bull trout. No fish salvage or fish handling is anticipated. If fish salvage is required, it would be conducted by a qualified fisheries biologist in a manner considered most likely to minimize impacts to bull trout. Any fish captured would be removed and released directly into Anderson Ranch Reservoir, downstream of the isolated in-water work area. Fish salvage efforts would be conducted using the following guidelines and permit.

- National Marine Fisheries Service (NMFS) Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act (NMFS, 2000)
- IDFG Scientific Collection Permit.

The following wildlife conservation and protection measures, including seasonal and spatial restrictions, would be implemented.

- Appropriate provisions to provide protective measures for known or suspected threatened, endangered, proposed, and candidate species and habitats during project implementation would be considered. Compliance with the ESA and implementation of species-specific federal and state conservation measures would be completed. Protective measures would include modification of construction activities to protect habitat integrity and function and/or timing or area restrictions for implementation to prevent habitat modification, disturbance effects and reproductive effort failure.
- Project implementation would comply with the 2015 USFS Greater Sage-grouse Record of Decision and Land Management Plan Amendments. This includes, but is not limited to, seasonal restrictions to avoid disturbance or disruption to sage-grouse during breeding and nesting season (March 1 to June 15), and spatial restrictions of 2 miles from the perimeter of active leks during lekking (from March 1 to April 30) from 6 p.m. to 9 a.m. Surveys would be included to determine the presence and location of active nests and lek sites prior to construction activities.
- Contracts would include appropriate provisions to provide protective measures for known or suspected Region 4 USFS Sensitive Species and habitats during project implementation, as listed in standards provided in Boise Forest Plan. Protective measures would be developed and implemented for species on a case-by-case basis, including, but not limited to, modifications to construction activities to protect habitat integrity and function of habitat features or occupancy, and timing and area restrictions to prevent habitat modification, disturbance effects and reproductive effort failure. Surveys would be included to determine the presence of breeding populations prior to construction activities and would need to be ongoing if construction were to take place during the breeding season.
- Live trees with evidence of cavities and large stick nests would be retained to the maximum extent possible. Protective measures may include timing restrictions, no-treatment buffers, or modifications to implemented construction activities.
- Conservation measures would be implemented to reduce impacts to migratory birds including nationwide conservation measures outlined by USFWS.

- Ground-disturbing activities or vegetation treatments would occur before migratory birds begin nesting or after all young have fledged. If activities must be scheduled to start during the migratory bird breeding season, appropriate steps would be taken to prevent migratory birds from establishing nests in the potential impact area.
- Raptor surveys would be developed to ensure that the proposed project would avoid adverse impacts to raptors, including bald and golden eagles. Locations of existing raptor nests and eagle roosting areas would be identified prior to the initiation of project activities and appropriate spatial buffer zones of inactivity would be established during breeding, nesting, and roosting periods.
- USFWS recommendations for managing eagle habitat, including maintaining the availability of potential and active nesting/perching sites would be adhered to. Under the Bald and Golden Eagle Protection Act, any activity causing disturbance to nesting eagles would require consultation with USWFS. Incidental take permits would be acquired for any impacts to nesting eagles determined to be unavoidable.
- Conservation measures for protecting wildlife, including those to reduce the risk of vehicular collision and installation of wildlife friendly culverts would be implemented.

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4 Coordination and Consultation

4.1 Public Involvement

4.1.1 Scoping

Reclamation published a "Notice of Intent to Prepare an Environmental Impact Statement" in the *Federal Register* on August 9, 2019 (84 FR 39369), this initiated the formal public scoping period for the EIS. A press release was also distributed on the same date titled "Reclamation seeks public comment on the potential changes to water storage in the Boise River system" to media outlets in and around the project area. The press release provided the date and venues for the public scoping open house meetings, briefly described the project and explained the various methods for submitting comments.

Reclamation also mailed or emailed a scoping letter to 253 individuals, organizations, agencies, and congressional delegates. The letter discussed the project and served as notification of the public scoping open house meetings. A similar letter was sent to two tribal governments.

Public scoping open house meetings were held in Pine, Boise and Mountain Home, Idaho on August 27, 28, and 29, 2019, respectively. These meetings provided information to the public and solicited input on the alternatives developed to address the proposal to raise Anderson Ranch Dam 6 feet from present elevation (4196 feet) to 4202 feet, allowing for the ability to capture and store approximately 29,000 additional acre-feet of water.

Reclamation received 51 submissions of comments as a result of the public scoping period and open house meetings. There was one letter containing multiple comments received from the Shoshone-Bannock Tribes. Written comments were accepted through September 9, 2019. A Scoping Report was furnished to those providing comments (Appendix A). It was also posted to the website found at www.usbr.gov/pn/studies/boisefeasibility/index.html.

4.1.1.1 Comments Received at the Open Houses

Based on the number of attendees on the sign-in sheets, it is estimated that 70 people attended the Pine open house. Three written comments were submitted at the Pine open house, and five verbal comments were transcribed by the Certified Stenotype Reporter. It is estimated that approximately 55 people attended the Boise open house. Two written comments were submitted at the Boise open house, and four verbal comments were transcribed by the Certified Stenotype Reporter. It is estimated that approximately 50 people attended the Mountain Home open house. Three written comments were submitted at the Mountain Home open house, and two verbal comments were transcribed by the Certified Stenotype Reporter.

Comments were reviewed and categorized by resource area to be addressed in the EIS. Each submission was broken down into individual comments, which were then categorized by resource area. In total, more than 100 individual comments were received. Figure 10 shows the breakdown of comments by primary resource concern.

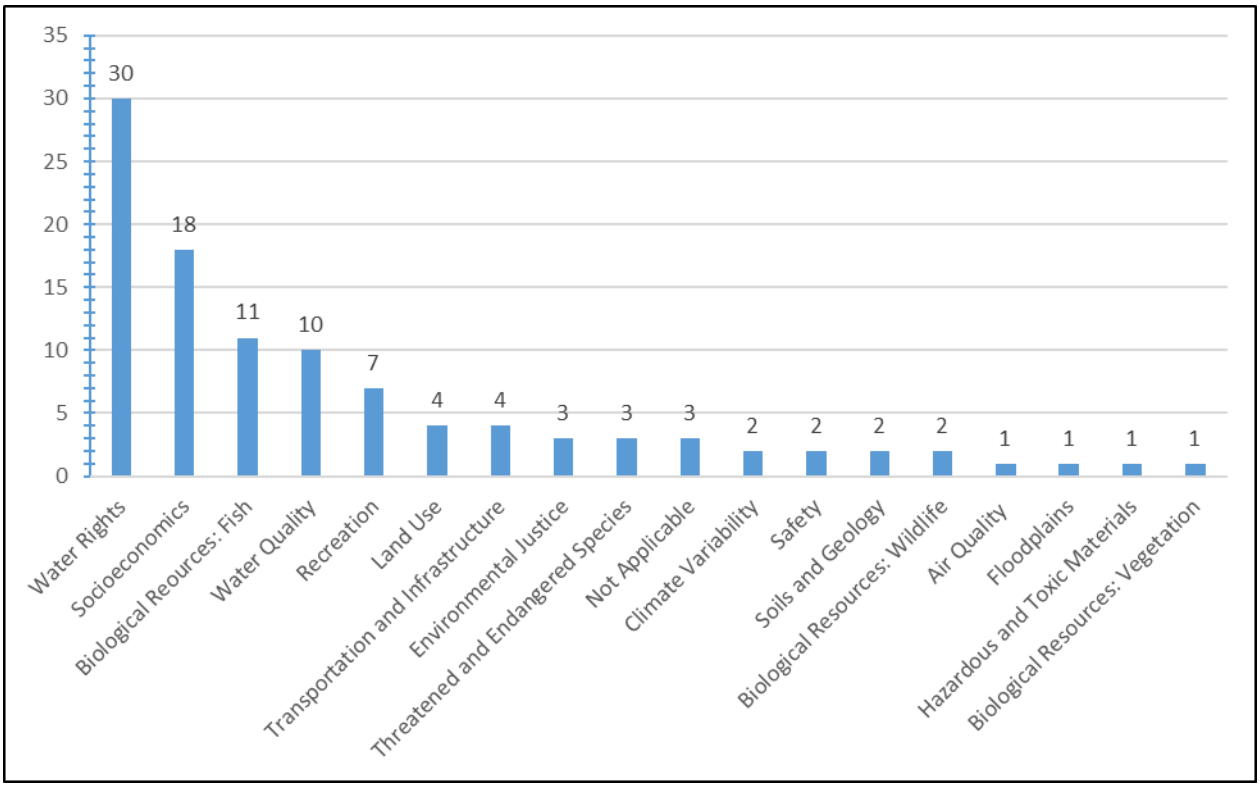

Figure 10. Primary resource concerns

Water rights was the most common primary resource concern. Comments about water rights were typically concerned with what groups, organizations, agencies, or citizens would have access to the additional water storage at Anderson Ranch Dam, and how that would be decided. Similar to water rights, comments on socioeconomics were concerned with which groups, or citizens, would have access to the additional storage, and how that would be decided. However, these comments also had an added component concerned with how access to the additional water storage, or lack of access, would help, or hinder, economic development. Fish habitat was a concern both for private citizens who participate in, or have business related to, the recreational fishing industry in the area, as well as organizations such as Trout Unlimited, Idaho Conservation League, EPA, and IDFG who submitted comments on fish as a biological resource. The listed concerns for each resource concern can be found in the Scoping Report in Appendix A.

4.2 Coordination with Federal and State Agencies

4.2.1 Cooperating Agencies

The Council on Environmental Quality regulations (40 CFR 1501.6) emphasize agency cooperation early in the NEPA process and allows a lead agency (in this instance, DOI) to request the assistance of other agencies that either have jurisdiction by law or have special expertise regarding issues considered in an EIS. It also allows an agency to request that the lead agency designate it as a cooperating agency.

Reclamation formally requested that the USFS, USFWS, BLM, and USACE participate as cooperating agencies. USFS responded that it would participate as a cooperating agency due

to its jurisdictional responsibility over land within the project area. USFWS responded that it would not participate as a cooperating agency because it does not have jurisdictional responsibilities. Along with USFS, USACE would also be a cooperating agency and would have involvement through the 404 permit issuance.

4.2.2 Related Laws, Rules, Regulations, and Executive Orders

4.2.2.1 Endangered Species Act

Section 7 (a)(2) of the ESA of 1973 requires Federal agencies to consult with USFWS and NOAA Fisheries when a Federal action may affect listed threatened or endangered species or their critical habitat. This is to ensure that any action authorized, funded, or carried out by a Federal agency is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of its critical habitat.

Reclamation requested a species list from USFWS through the IPaC online tool, that is part of the Environmental Online Conservation System, to identify species with potential to occur in the Alternative C "action area" as defined in the ESA Consultation Handbook (USFWS and NMFS, 1998). Reclamation has prepared a Biological Assessment (BA) to address the impacts to three Federally listed species and two species proposed for listing under the jurisdiction of the USFWS, specifically: YBCC (*Coccycus americanus*), Canada lynx *(Lynx canadensis*), North American wolverine (*Gulo gulo luscus*), whitebark pine (*Pinus albicaulis*), and bull trout (*Salvelinus confluentus*) and their designated critical habitat within the action area. These are all of the species under the jurisdiction of USFWS identified through the IPAC request.

Reclamation believes the proposed project would have no effect on Canada lynx and whitebark pine, may affect but is not likely to adversely affect YBCC and North American wolverine, and may affect and is likely to adversely affect bull trout and their critical habitat. Therefore, Reclamation will initiate formal consultation and will be submitting a BA analyzing the effects of construction from the proposed project on federally listed and candidate species to USFWS. USFWS will review the BA and prepare a BiOp for the proposed action. Depending upon USFWS determinations and associated requirements, if Reclamation proceeds with the proposed project, it will be in compliance with Terms and Conditions and Reasonable and Prudent Measures outlined in the BiOp.

4.2.2.2 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act of 1934, as amended 1946, 1977 (16 U.S.C. 661-667e), requires Federal agencies to coordinate with USFWS and state wildlife agencies when planning new projects or modifying existing projects so that wildlife resources receive equal consideration and are coordinated with other project objectives and features.

4.2.2.3 National Historic Preservation Act

The NHPA of 1966, as amended (16 U.S.C. 470) only requires only requires that the Section 106 process be completed for the preferred alternative, which is identified as Alternative B. Consultation was initiated November 8, 2019, formally notifying SHPO that Reclamation would be complying with the requirements of Section 106 of the NHPA as part of this draft EIS. To inform future consultation and Section 106 compliance, in July 2018, Reclamation met with SHPO personnel and determined the best locations around the perimeter of

Anderson Ranch Reservoir to identify possible cultural resources. Strong consideration was given to areas in which the slope of the shoreline would allow new areas of inundation due to an increased surface water elevation.

Through pedestrian surveys, three new historic-era cultural resources were identified and documented within the APE. The APE generally consists of a 4206-foot elevation boundary and includes the borrow pits and contractor use areas downstream. A map of the APE is included in the Cultural Resources Specialist Report (Appendix B21). Two existing eligible historic properties were found to be at least partially within the project's APE. No pre-contact resources were found during the surveys. The two existing eligible historic properties included the South Boise Stage Road and Anderson Ranch Dam and powerplant. No characteristics of the road make it eligible for listing in the NRHP under NHPA Criterion A (would be diminished or eliminated by project activities) and Reclamation recommends a finding of No Adverse Effect to this historic property. Anderson Ranch Dam and powerplant would see many changes with project activities. Aspects of integrity of the eligible resource including design, workmanship, and materials would be adversely affected by the project activities. Reclamation recommends a finding of Adverse Effect to this historic property and would work with SHPO to determine the appropriate mitigation.

4.2.2.4 Clean Water Act

EO 11990, Protection of Wetlands and Section 404 of the CWA regulates the discharge of dredge and fill materials into waters of the United States, including wetlands. USACE evaluates applications for Section 404 permits and requires mitigation for unavoidable impacts to the aquatic environment.

Wetlands were assessed by Reclamation staff within the varial zone at Anderson Ranch Reservoir. These efforts identified variable (upland/wetland) vegetation composition, topography and soil type within the assessment area. These findings support preliminary boundaries identified in the USFWS NWI; however, a formal delineation of wetland/upland boundaries are being coordinated with USACE to determine extents and jurisdictional status of wetlands within the area.

In conjunction with the Section 404 permit, Reclamation would pursue Idaho State 401 certification. Idaho State 401 certifications are required for any permit or license issued by a Federal agency for an activity that may result in a discharge into waters of the United States. This requirement allows the state of Idaho to have input into Federally approved projects that may affect its waters (rivers, streams, lakes, and wetlands) and to ensure the projects would comply with state water quality standards and any other water quality requirements of state law.

4.3 Tribal Government to Government Consultation

The following summarizes the contacts Reclamation has made to tribes during the scoping period and development of this draft EIS. See Section 3.23 for further consultation determinations.

- *July 31, 2019:* Reclamation sent a letter and informational package to the Shoshone-Bannock and Shoshone-Paiute Tribal councils. This package requested comments, included the dates and times for public open houses and invited the Tribes to engage in

a government-to-government consultation or informational presentation concerning the project.

- *September 13, 2019:* The Shoshone-Bannock Tribes provided Reclamation with formal scoping comments.
- *September 17, 2019:* Reclamation Area Manager, Deputy Area Manager, and Native American Affairs Advisor met with three Shoshone-Paiute Tribal Council Members and two tribal staff members.
- *October 3, 2019:* A staff-to-staff meeting took place between Reclamation and the Shoshone-Bannock Tribes at the Fort Hall Water Resources Building.

4.3.1 U.S. Forest Service Administrative Review Opportunities (Pre-decisional Objection Process)

For those aspects of the proposed actions that require a decision to be made by USFS, the pre-decisional objection process in 36 CFR 218 Subparts A and B will apply. Objections will be accepted only from those who have previously submitted specific written comments regarding the project during scoping or other designated opportunities for public comment in accordance with §218.5(a). Issues raised in objections must be based on previously submitted timely, specific written comments regarding the project unless based on new information arising after designated opportunities. Comments received on behalf of an organization are considered those of the organization only. If comments are submitted on behalf of a number of individuals or organizations, each individual or organization must be listed. Individual members of an organization must have submitted their own comments to meet the requirements of eligibility as an individual.

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Attachment 1

References

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Ada County, 2016. https://adacounty.id.gov/developmentservices/strategic-planning-division/comprehensive-plans/

AirNav, 2020. http://www.airnav.com/airport/1U9, FAA information effective January 2, 2020.

American Fisheries Society, 2005. Monitoring Stream and Watershed Restoration. Edited by Philip Roni. Northwest Fisheries Science Center, National Marine Fisheries Service. Bethesda, Maryland.

American National Standards Institute (ANSI), 2013. American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound – S12.9 Part 3: Short-Term Measurements with an Observer Present.

Bennett, D., 2018. "Landslide Inspection Report, Fall Creek Landslide, Boise Project, Idaho, Pacific Northwest Region," Bureau of Reclamation, Denver, Colorado, August.

Birtwell, I.K., G.F. Hartman, B. Anderson, D.J. McLeay, and J.G. Malick, 1984. A Brief Investigation of Arctic Grayling (Thymallus arcticus) and Aquatic Invertebrates in the Minto Creek Drainage, Mayo, Yukon Territory: An Area Subjected to Placer Mining. Canadian Technical Report 1287. Fisheries and Aquatic Sciences.

Bisson, P.A. and R.E. Bilby, 1993. "Avoidance of Suspended Sediment by Juvenile Coho Salmon." North American Journal Fisheries Management. Vol. 4. pp. 371-374.

Bjornn, T.C. and D.W. Reiser, 1991. "Habitat Requirements of Anadromous Salmonids." In W.R. Meehan (editor), Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats, pages 83-138. American Fisheries Society Special Publication 19. American Fisheries Society, Bethesda, Maryland.

Bureau of Labor Statistics, 2019b. Local Area Unemployment Statistics. Available at: https://www.ls.gov/lau/. Accessed October 2, 2019.

Butts, A.E., 2019. Idaho Department of Fish and Game email communication 09/18/2019.

Camas County, 2018. Comprehensive Land Use Plan, revised July 2018. http://camascounty.id.gov/planning-and-zoning/

Canyon County, 2020. Canyon County Comprehensive Plan. https://www.canyonco.org/elected-officials/commissioners/development-services/growingtogether/

Carlson, B., 2019. Idaho continues battle against invasive mussels. Capital Press. April 3. https://www.capitalpress.com/ag_sectors/water/idaho-continues-battle-against-invasive-mussels/article_f81aed20-5661-11e9-a862-37256fd9c7d4.html. Accessed October 5.

Cowardin, L.M., V. Carter, F. Golet and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. United States Department of the Interior, USFWS, Washington, D.C.

Davison, Clay, 2019. Public comment submitted on behalf of Prairie, ID ranchers.

Elmore County 2019. Lieutenant Moore, Elmore County Sheriff's Office. Personal communication with Kristy Cottini, Sundance Consulting, Inc. September 20, 2019.

Elmore County Sheriff's Office, 2019. Personal communication with Greg Berry, Chief of Operations. November 21.

Elmore County, 2014. Elmore County 2014 Comprehensive Plan. http://elmorecounty.org/wp-content/uploads/2018/05/comp-plan-2014.pdf

Elmore County, 2018. County Landfill Information. https://elmorecounty.org/county-landfill-information

Elmore County, Idaho, 2012. Elmore County Multi-Hazard Mitigation Plan, 2012. http://mitigationguide.org/wp-content/uploads/2013/05/Elmore-County-ID-MHMP.pdf

EPA, 2019. Learn about Polychlorinated Biphenyls (PCBs). https://www.epa.gov/pcbs/learn-about-polychlorinated-biphenyls-pcbs

Esri and Bureau of Reclamation, 2019. ArcGIS Online. "Impacted Parcels at 4202' (PN, MSFO, 2019);" "Impacted Parcels at 4206' (PN, MSFO, 2019);" Accessed October 2019.

Federal Highway Administration, 2017. Simplified highway capacity calculation method for the highway performance monitoring system. October. 35 p. https://www.fhwa.dot.gov/policyinformation/pubs/pl18003/hpms_cap.pdf

Federal Reserve Bank. 2013. The Great Recession. Available at https://www.federalreservehistory.org/essays/great_recession_of_200709

Federal Transit Administration, 2018. *Transit Noise and Vibration Impact Assessment Manual*. FTA Report No. 0123. September.

Fritz, K.M., K.A. Schofield, L.C. Alexander, M.G. McManus, H.E. Golden, C.R. Lane, W.G. Kepner, S.D. LeDuc, J.E. DeMeester, and A.I. Pollard. 2018. Physical and Chemical Connectivity of Streams and Riparian Wetlands to Downstream Waters: A Synthesis. Journal of American Resource Associates 54(2): 323-345.

Hampton, H., 2019. Personal communication by phone with Holly Hampton (range and weed specialist), USFS. October 4.

Howard, Keith, John W. Shervais, and E. H. McKee, 1984. Canyon-Filling Lavas and Lava Dams on the Boise River, Idaho, and their Significance for Evaluation Downcutting During the last 2 Million Years. Cenozoic Geology of Idaho: Idaho Bureau of Mines and Geology Bulletin 26, p. 629–641.

IDEQ, 2008. South Fork Boise River Sub-basin Assessment, Total Maximum Daily Load, and Five-Year Review. Boise, ID.

IDEQ, 2018. *Idaho's 2016 Integrated Report*. A. Steimke, Water Quality Division, Boise, ID. July.

IDEQ, 2019a. Boise River (South Fork) Subbasin. Webpage at https://www.deq.idaho.gov/water-quality/surface-water/tmdls/table-of-sbas-tmdls/boise-river-south-fork-subbasin/ Accessed 8/21/2019.

IDEQ, 2019b. IDEQ Underground Storage Tank Database Facility Description http://www2.deq.idaho.gov/waste/ustlust/Pages/FacilityInfo.aspx?idNum=7238

IDFG, 2019a. Idaho Species: Westslope Cutthroat Trout Oncorhynchus clarkii lewisi. https://idfg.idaho.gov/species/taxa/80442. Accessed: 11/21/2019.

IDFG, 2019b. "View Fish Species Presence" from IDFG website: https://idfg.idaho.gov/ifwis/fishingplanner/water/1153993433934

IDFG, 2019c. "View Fish Species Presence" from IDFG website: https://idfg.idaho.gov/ifwis/fishingplanner/water/1153993433934

IDFG, 2019d. "View Wolverine presence: from IDFG website. https://idfg.idaho.gov/species/observations/list?species_id=17557

IDFG, 2020a. Anderson Ranch Species Observations. Data Requested January 6, 2020.

IDFG, 2020b. Winter Range Maps. Available https://idfg.idaho.gov/data/gis

Idaho Geological Survey, 2019. Interactive Webmap. https://www.idahogeology.org/webmap

Lendrum, P. E., C.R. Anderson Jr., K.L. Monteith, J.A. Jenks, and R.T. Bowyer, 2013. Migrating mule deer: effects of anthropogenically altered landscapes. PloS one, 8(5), e64548. doi:10.1371/journal.pone.0064548

Lloyd, D.S., 1987. Turbidity as a Water Quality Standard for Salmonid Habitats in Alaska. North American Journal of Fisheries Management. Vol. 7. pp. 34-45.

Montana Field Guide. Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. Available http://fieldguide.mt.gov

Morgan, J.A. and P.A. Nelson, 2019. Morphodynamic Modeling of Sediment Pulse Dynamics. American Geophysical Union, Volume 55, Issue 11 pp. 8691-8707.

National Audubon Society, 2019. North American Field Guide. Available: https://www.audubon.org/bird-guide

National Marine Fisheries Service, 2000. Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act.

NOAA Fisheries, 2008. National Oceanic and Atmospheric Administration (NOAA) Fisheries. 2008 Upper Snake Biological Opinion, Consultation for the Operation and Maintenance of 10 Bureau of Reclamation Projects and 2 Related Actions in the Upper Snake River above Brownlee Reservoir.

Phillips, R., 2013. Fire, Mudslide Transform South Fork of Boise River. MagicValley.com October 10, 2013. https://magicvalley.com/news/local/fire-mudslide-transform-south-fork-of-boise-river/article_50a2c0b0-313f-11e3-af0a-001a4bcf887a.html

Pine EMS, 2019. Personal communication with Brian Chevalier, Pine EMS Supervisor. September 6.

Plew, Mark and Susanna Osgood, 2017. Report on Excavations at Danskin Rockshelter (10-EL-01), Southwest Idaho. Boise State University Monographs in Archaeology No. 6. Boise, ID.

Pytlak, Erik; Chris Frans, Keith Duffy, Jennifer Johnson, Bart Nijssen, and Oriana Chegwidden, 2018. *Climate and Hydrology Datasets for RMJOC Long-Term Planning Studies:*

Reclamation, 1982. *Final Environmental Impact Statement and Feasibility Report: Anderson Ranch Powerplant Third Unit, Boise Project, Idaho*. Pacific Northwest Unit. FES-82-19. June 2.

Reclamation and USFS, 1987a. Master Interagency Agreement Between the Bureau of Reclamation, U.S. Department of the Interior and the Forest Service, U.S. Department of Agriculture Concerning Water Resource Related Projects of the Bureau of Reclamation Within or Adjacent to National Forest System Lands. Washington, DC.

Reclamation, 2004. *Biological Assessment for Bureau of Reclamation Operations and Maintenance in the Snake River Basin Above Brownlee Reservoir*. U.S. Department of the Interior, Bureau of Reclamation, Boise, Idaho. November.

Reclamation, 2006. *Final Boise/Payette Water Storage Assessment Report*. July.

Reclamation, 2012. Reclamation's NEPA Handbook. February.

Reclamation, 2013. *Biological Assessment for Bull Trout Critical Habitat in the Upper Snake River Basin*. Pacific Northwest Regional Office Snake River Area Office Boise, Idaho.

Reclamation, 2016. *Report to Congress SECURE Water Act Section 9503(c) — Reclamation Climate Change and Water 2016*. March.

Reclamation, 2017. Boise Feasibility Study – Preliminary Hydrologic Evaluation, Technical Memorandum, U.S. Bureau of Reclamation, Pacific Northwest Region, Snake River Area Office. February.

Reclamation, 2019. *Boise River Basin (Storage) Feasibility Study Draft Environmental Impact Statement*. Pacific Northwest Region. Boise, ID.

Redding, J.M., C.B. Schreck, and F.H. Everest, 1987. Physiological Effects on Coho Salmon and Steelhead of Exposure to Suspended Solids. Transactions of the American Fisheries Society. Vol. 116. pp. 737-744.

Regents of the University of Colorado, 2019. RiverWare version 7.5. Boulder, Colorado 80301.

Salow, T. and L. Hostettler, 2004. Movement and Mortality Patterns of Adult Adfluvial Bull Trout (Salvelinus confluentus) in the Boise River Basin, Idaho. Summary report submitted to the Arrowrock Bull Trout Advisory Group. Bureau of Reclamation, Snake River Area Office, Boise, Idaho.

Scannell, P.O., 1988. Effects of Elevated Sediment Levels from Placer Mining on Survival and Behavior of Immature Arctic Grayling. Unit Contribution 27. Alaska Cooperative Fishery Unit, University of Alaska.

Schwartz, M., N. DeCesare, B. Jimenez, J. Copeland, W. Melquist, 2013. Stand- and landscape-scale selection of large trees by fishers in the Rocky Mountains of Montana and Idaho. Forest Ecology and Management. 305: 103-111.

Second Edition, (RMJOC-II); Part I: Hydroclimate Projections and Analyses. June

Servizi, J.A. and D.W. Martens, 1991. Effects of Temperature, Season, and Fish Size on Acute Lethality of Suspended Sediments to Coho Salmon. Canadian Journal of Fisheries and Aquatic Sciences. Vol. 49. pp. 1389-1395.

SPF Water Engineering, LLC, 2016. Treasure Valley DCMI Water-Demand Projections (2015–2065). Prepared for the Idaho Water Resource Board and Idaho Department of Water Resources. August.

U.S. Census Bureau, 2019. 2000 Census of Population, American Fact Finder - Summary File 1 (SF 1), Total Population (P001). Available at: http://factfinder2.census.gov/. Accessed September 25, 2019.

U.S. Census Bureau, 2017. 2012-2016 American Community Survey 5-Year Estimates, Idaho. Available [online]: https://www.census.gov/programs-surveys/acs. Accessed: 9/26/2019.

USGS, 2002. Ecoregions of Idaho. Available [online]: https://www.nrc.gov/docs/ML1018/ML101800248.pdf Accessed: September 15, 2019.

USCB, 2019o. 2013-2017 American Community Survey - 5-Year Estimates, American Fact Finder Households and Families (S1101). Available at: http://factfinder2.census.gov/. Accessed October 4.

USFS, undated a. Lower South Fork Boise River Management Area 1. Available [online]: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5394209.pdf. Accessed: 9/15/2019.

USFS, 2012. *National Best Management Practices for Water Quality Management on National Forest System Lands*. FS-990a. April.

USFS, 2014. Boise National Forest Mid-Level Vegetation Map Unit Descriptions. Vegetation Classification Mapping and Quantitative Inventory. February.

USFS, 2016. Intermountain Region (R4) Threatened, Endangered, Proposed, and, Sensitive Species, Known / Suspected Distribution by Forest. June.

USFS, 2019. *Sawtooth and Boise National Forests Invasive Species Project Final Environmental Impact Statement*. March.

USFS, 2020. Data request from Scott Bodle, BNF Supervisory Wildlife Biologist and Forest Resource Advisor Coordinator, Mountain Home Ranger District; and Steven Kovach, GIS Program Manager, BNF. "Documented sensitive species presence in Anderson Ranch Reservoir and South Fork Boise River, from Natural Resources Manager (NRM) database and District observations."

USFWS and NMFS, 1998. Consultation Handbook Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act. March.

USFWS, 2014. 50 CFR Part 17. (Docket No. FWS–R6–ES–2013–0101; 4500030114). RIN 1018-AZ77. Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx and Revised Distinct Population Segment Boundary. AGENCY: Fish and Wildlife Service, Interior. ACTION: Final rule.

USFWS, 2005. Decision Document Concerning U.S. Fish and Wildlife Service Biological Opinion and Incidental Take Statement, Consultation for the Operation and Maintenance of 12 Bureau of Reclamation Projects in the Snake River Basin above Brownlee Reservoir. U.S. Department of the Interior, Fish and Wildlife Service. November 29, 2005.

Western Native Trout Status Report, 2018. https://westernnativetrout.org/wp-content/uploads/2018/08/InteriorRedband_WesternNativeTroutStatusReport_UpdatedAugust2018.pdf. Accessed: 9/26/2019. This publication was funded (or partially funded) by Federal Aid to Sportfish Restoration Funds through the Multistate Conservation Grant Program (Grant WY M-8-P), a program supported with funds from the Wildlife and Sport Fish Restoration Program of the U.S. Fish and Wildlife Service and jointly managed with the Association of Fish and Wildlife Agencies, 2006-9.

Yelverton, J.T., D.R. Richmond, W. Hicks, K. Saunders, and R. Fletcher, 1975. *The Relationship between Fish Size and Their Response to Underwater Blast*. Topical Report DNA 3677T. Defense Nuclear Agency, Department of Defense, Washington, D.C.

Attachment 2

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