RECLAMATION
Managing Water in the West

Henrys Fork Basin Study
Teton Dam Storage Alternative

Technical Series No. PN-HFS-004

U.S. Department of the Interior
Bureau of Reclamation
Pacific Northwest Regional Office
Snake River Area Office
Boise, Idaho

October 2012

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Photograph on front cover: Aerial view of the Teton Dam site on the Teton River, Idaho.

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1. INTRODUCTION

The Teton Dam Surface Storage Alternative (Alternative) for the Henrys Fork Watershed Basin Study evaluates the reconstruction of a dam at the location of the original Teton Dam on the Teton River. This technical series report provides a brief summary of this alternative which being considered along with the other storage alternatives presented in *Technical Series Report No. PN-HFS-002, Henrys Fork Basin Study - Surface Storage Alternatives*.

A new dam would be constructed on the site of the original Teton Dam to impound water in the Teton River canyon for irrigation, flood control, hydropower generation, recreation, and fish and wildlife purposes as originally authorized by Congress. This alternative analysis is focused on those authorized functions without consideration of water agreements, water rights, or required instream flows for wildlife purposes that have come into play since the original dam's failure. Because of the local trauma associated with the failure of Teton Dam and remaining local concerns about the safe operation of a second dam at the site, any reconstruction plan must focus on functions that meet basin needs as documented in the *Henrys Fork Watershed Basin Study Water Needs Assessment* (Reclamation 2012).

In 1964, Congress authorized the construction of the Lower Teton Division, with Teton Dam and Reservoir as its key features. Phase I of the project included the construction of the dam and reservoir; Phase II of the project included the development of groundwater for new agricultural developments on the Rexburg Bench. In 1976, the Bureau of Reclamation (Reclamation) had almost completed construction of the dam and reservoir at a cost of $70 million and the reservoir had almost filled when Teton Dam failed. The failure of Teton Dam resulted in the loss of 11 lives and approximately $2 billion in property damage.

About 10 years later, upper Snake River water users, local irrigation interests, and the State of Idaho requested that Reclamation consider rebuilding the dam. In 1991, Reclamation released a Reappraisal Report of the project; much of that research and analysis is presented here. The reappraised project included Phase I under which the dam, reservoir, hydroelectric facilities, pumping plant, and new conveyance system would be constructed. Under Phase II in the Reappraisal Report, groundwater would be developed for irrigation water to new agricultural lands on the Rexburg Bench.

For the Henrys Fork Watershed Basin Study, Phase II was not considered. Development of new agricultural lands was not considered and new conveyance systems to those lands would not be necessary. This alternative considers only rebuilding a dam and reservoir, as presented in the 1991 Reclamation Reappraisal Report, and using the existing irrigation water conveyance system to the existing agricultural lands.

HDR Engineering, Inc. conducted a reconnaissance study of rebuilding Teton Dam on a smaller scale to generate hydroelectric power. The report was submitted to the Fremont-Madison Irrigation District (FMID) in their evaluation of potential water storage sites. FMID initiated the study in search for additional water storage to fill their projected needs in their area of operation. HDR Engineering provided preliminary designs and cost estimates for a storage reservoir and hydropower plant on the Teton River at the site of the original dam. Their findings make up two of the alternatives considered in this Technical Series Report.

2. TETON DAM

2.1. Overview

This Alternative includes building Teton Dam and its facilities to the same scale as was proposed in the 1991 Reappraisal Report which included:

- Dam, spillway, and reservoir
- Power generation, switchyard, power substations, and transmission line facilities
- Fish and wildlife mitigation facilities, lands, and improvements
- Recreation lands and facilities
- General property, Government-reserved works

An average annual supplemental water supply of 55,000 acre-feet is expected to be provided by the project; 44,000 acre-feet would be available for irrigation to 111,210 acres and 11,000 acre-feet would be released for wildlife mitigation needs. During the driest years, there would be a supplemental need for 514,000 acre-feet of water, an amount in excess of the project's capacity. The supplemental supply would reduce the critical year shortages to an average of about 10 percent.

1.1. Alternative Variations

In 1995, a Reconnaissance Study was submitted to FMID covering the reconstruction of Teton Dam on a smaller scale (HDR 1995). A proposed roller-compacted concrete gravity dam with a lower dam crest elevation than the original dam was proposed, with the potential for raising the dam crest at a later date.

1.1.1. *Operational Assumptions*

Detailed operations have not been evaluated for any of the alternatives; however, operation of any surface storage alternative would be coordinated with existing storage projects in consideration of downstream water users, senior water rights, and existing water agreements. During below average water years, storage capability would be limited. Water exchanges may be possible when and where needed to meet the demands; however, this water source cannot be guaranteed.

In the Teton Dam Rebuild Alternative, the entire active storage capacity of Teton Reservoir (200,000 acre-feet) would be available on a joint-use basis to store flows excess to the downstream channel capacities. The evacuation and use of space in the reservoir would be based on forecasts of seasonal flood runoff volumes and parameter curves that take into consideration the date, allowable downstream channel capacities, and forecasted seasonal runoff volumes. Part of the reservoir capacity would be reserved for flood control through the winter and for storage of rain floods during early spring months.

Assumptions made for Small Dam A and B alternatives include:

- The minimum instream flow would be 150 cfs
- The stored water was not used to supplement the natural flows during low flow periods, but was set equal to the natural inflow if the natural inflow was less than 150 cfs
- Irrigation releases would occur July through September, with 40 percent of the flow released during July and August and 20 percent during September

Based on reservoir operation studies, the Teton Dam Rebuild Alternative would afford full control of floods up to a 200-year frequency flood. Flood control would be accomplished by jointly using the 200,000 acre-feet of active storage space with irrigation. Of the active storage space, 30,000 acre-feet would be reserved for floods under established flood control rule curves that were developed for the original project.

The maximum probable flood of 79,000 cfs was assumed for both Teton Small Dam A and B. The flood volume would be approximately 285,000 cfs over 15 days. Since this volume is almost six times more than the total storage volume of Small Dam A and almost three times the volume of Small Dam B, the majority of the flood flows would be passed on downstream.

The floodplain below Teton Dam was significantly changed with the failure of the original dam; consequently, an estimate of potential flood control benefits would require a detailed inventory of existing development.

2. KEY FINDINGS AND LIMITATIONS

In the Teton Dam Rebuild Alternative, the Teton Reservoir would provide an active capacity of approximately 200,000 acre-feet per year for release or diversions; however, the active capacity volume is much larger than the yield (Exhibit 1). On average, much of the annual runoff entering the reservoir would be released to meet senior water rights downstream and would not be available for storage or new uses in the Henrys Fork basin. In the 1991 Reappraisal Report, the ratio of active storage capacity to project water supply was stated to be about 2.4 to 1. Existing water rights and the widely varying amount of annual precipitation and runoff constrain the project accomplishment and may be similar in future analyses since those conditions still exist. The ratio between stored water and water supply may also become larger with projected climate changes.

The minimum storage for the Small Dam A would be 10,000 acre-feet and the minimum storage for Small Dam B would be 25,000 acre-feet and would likely be at or near minimum storage on October 1 of each year.

Exhibit 1. Impacts of the alternatives on water budgets and river segments.

	Impact on In-Basin Water Budget	Impact on Out-of-Basin Water Budget	Change in Connectivity of Impacted River Segment
Rockfill embankment dam and rolled concrete dam alternatives	55,000 acre-feet during average or above average water years	Seasonal during high flow periods – Water will first meet senior downstream water rights and obligations; remainder would be used in-basin	Improvement in connectivity of downstream river segments, including the lower Teton River, South Fork Teton River, and the Lower Henrys Fork River through water storage or groundwater recharge from irrigation; large disconnect in river segments above and below dam; very difficult or no fish passage
50,000 acre-foot and 100,000 acre-foot reservoir alternatives	40,000 or 75,000 acre-feet during average or above average years	Seasonal during high flow periods – Water will first meet senior downstream water rights and obligations; remainder would be used in-basin	Improvement in connectivity of downstream river segments, including the lower Teton River, South Fork Teton River, and the Lower Henrys Fork River through water storage or groundwater recharge from irrigation; large disconnect in river segments above and below dam; very difficult or no fish passage

2.1. Engineering Results

2.1.1. *Hydrology*

The Teton River and its tributaries contribute approximately 600,000 acre-feet per year to the Henrys Fork River (Reclamation 2012). These flows are fed largely by snowmelt and generally have regular patterns of low flows during late summer, fall, winter, and early spring months and high flows during the late spring and early summer (Exhibit 2). Runoff volumes caused by snowmelt can be forecast with reasonable accuracy based on seasonal precipitation, water content of the snow on the ground, earlier runoff, and other factors that can be evaluated prior to the spring runoff (Reclamation 1991).

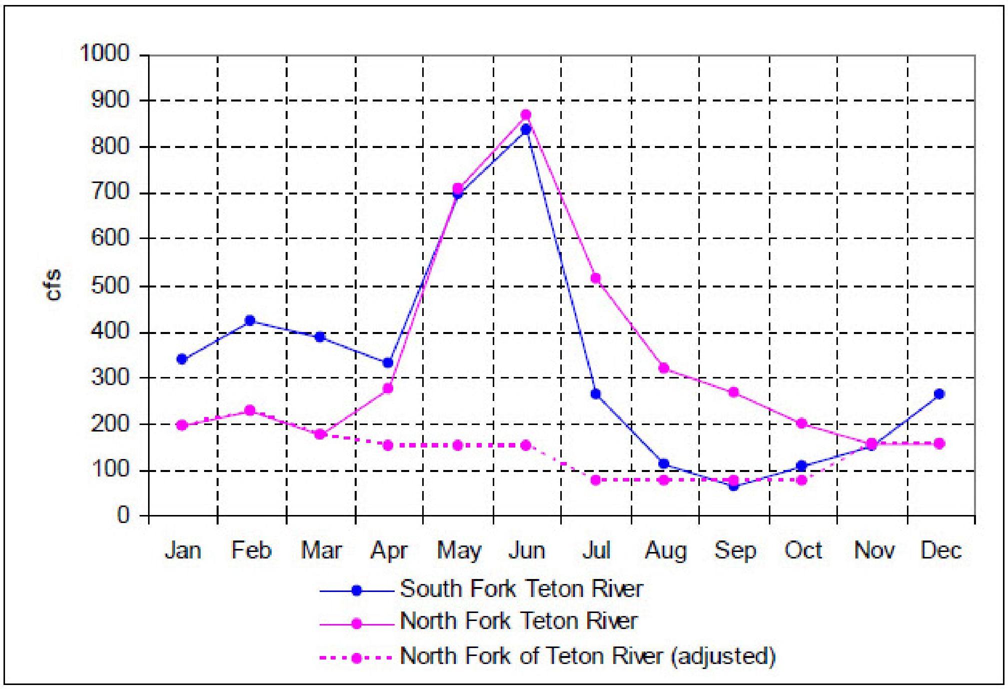

Exhibit 2. Average monthly flow in the Teton River (from gaging stations at Rexburg and Teton, respectively) from 1977 to 2002 (Reclamation 2012).

Water must be stored every year in Teton Reservoir to meet the water needs. The Snake River is fully appropriated during dry years; therefore, Teton Reservoir storage would belong to downstream users during dry years. During wet or average water years, Teton Reservoir would provide additional storage water for the Teton Basin, effectively enhancing water supply by capturing excess peak flows and redistributing that water during periods of higher demand. However, during dry years, the natural stream flows do not meet the existing natural flow and storage water rights and storage capability would be limited.

2.1.2. *Conveyance*

With all of the alternatives, water would be delivered to the existing canal system via the Teton River so there would be no need for additional conveyance system construction.

2.1.3. *Dam Configuration*

Two design options were considered for this alternative: a rockfill embankment dam and a roller-compacted concrete dam. Both designs would accommodate the probable maximum flood having a peak inflow of 79,000 cubic feet per second (cfs) and a 15-day volume of 287,000 acre-feet. The total reservoir capacity would be 288,000 acre-feet, of which 200,000 acre-feet would be active capacity for both options (Exhibit 3).

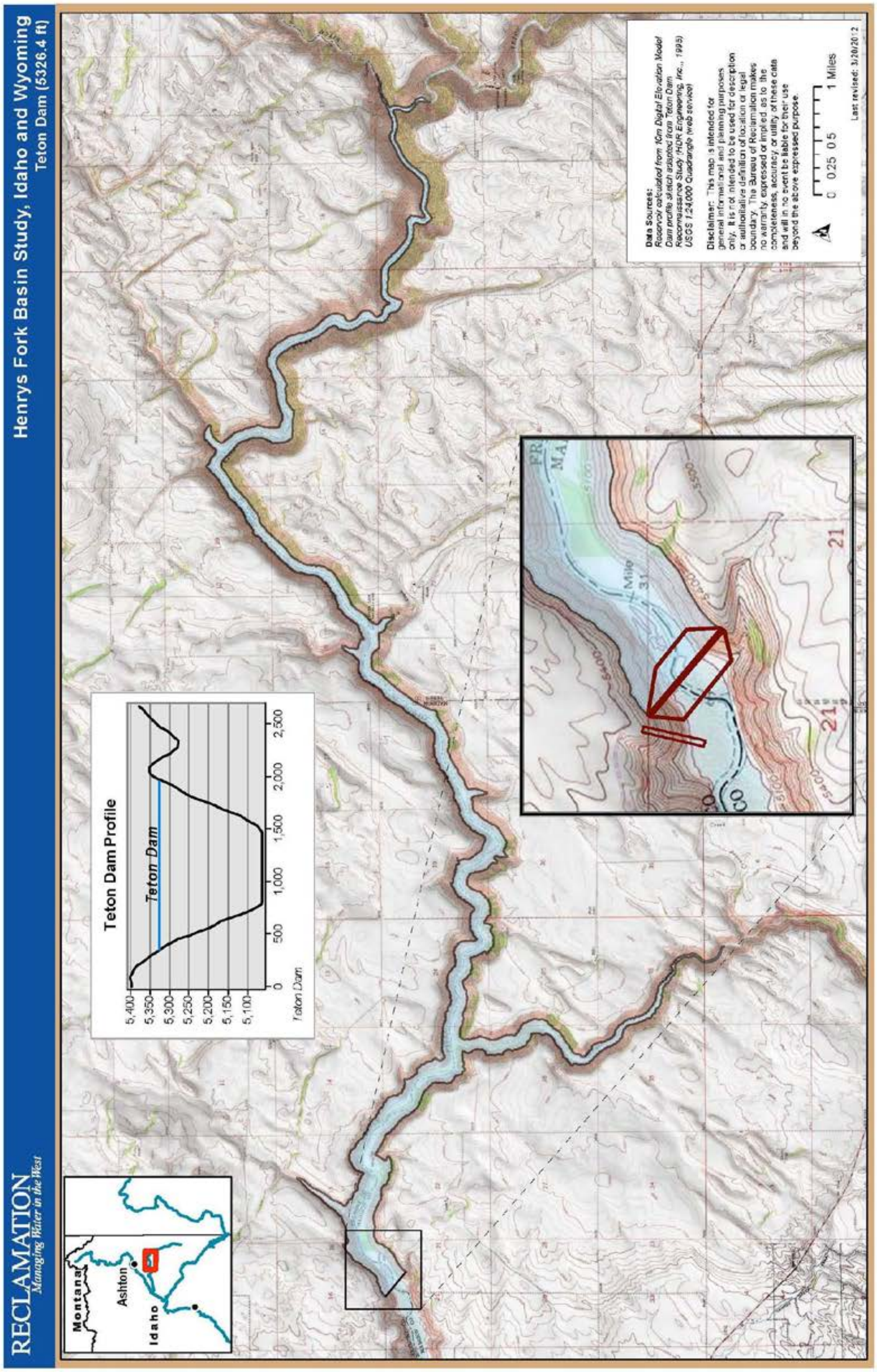

Exhibit 3. Topographic map showing the location of the dam and reservoir of the Teton Dam Rebuild Alternative, both construction options.

The existing gated spillway with a crest length of 72 feet and a crest elevation of 5305.0 feet would be incorporated in both options, and both options would require an auxiliary spillway. Portions of the original embankment on the right and left abutments would also be incorporated into both alternatives and would require removal of the existing dam structure.

The embankment dam would have a crest width of 35 feet, crest length of 1,700 feet, crest elevation of 5332.0 feet above sea level, and structural height of 302 feet. The auxiliary spillway would be constructed in a low area in the reservoir rim approximately 8,500 feet northeast of the existing spillway and discharge into an existing stream that empties into the Teton River approximately 4 miles downstream from the dam. The auxiliary spillway would be a 500-foot-wide excavated trapezoidal channel, containing a reinforced concrete crest structure. The spillway crest elevation would be at elevation 5321 feet, with the unlined excavated channel at elevation 5317.5 feet. The crest elevation was established at 1 foot above the normal reservoir surface elevation to reduce the potential of overtopping by wave action during normal reservoir releases.

Electrical generation would be incidental to the reservoir operations and would not specifically draw on the storage in the reservoir. The Teton Dam Rebuild Alternative would include a powerplant consisting of two 10,000 kilowatt generators, with space for a third 10,000 kilowatt unit, a switchyard, and a substation with the associated lines. Based on the 1962 Teton Project report and the 1969 preconstruction report, the average annual energy generation powerplant would be about 80 gigawatt Hours (GWh). The dependable generating capacity would be about 11 megawatts. These facilities would be constructed at the same location as the original plans and meet the same criteria as the original structures.

Recreational facilities recommended for development include 400 campsites, 200 picnic units, and 6 boat ramps over approximately 122 acres of land for the Teton Dam Rebuild Alternative. A detailed analysis based on current recreation information should be included if the project investigation is initiated. Storage space in the reservoir will not be dedicated to the recreation function.

Facilities are needed to house tools, shop, and garage equipment, communication equipment, and laboratory equipment for government contract inspectors. After the completion of the project, the structures would be used for housing equipment needed by operation and maintenance personnel.

The concrete dam would have a crest width of 30 feet, crest length of 2,250 feet, crest elevation of 5326.4 feet, and structural height of 405 feet. The additional height of the concrete dam in relation to the embankment dam (405 feet compared to 302) includes the below-surface level due to the necessity of excavating down to bedrock for the foundation. The auxiliary spillway would be part of the dam structure and would have a crest elevation

5320.4 feet. The spillway could have a stepped chute which converges to 800 feet of width at the toe of the dam. A spillway crest length of 1,000 feet would establish a maximum reservoir water surface at elevation 5326.4 feet.

1.1.1. *Teton Small Dam A Alternative*

Teton Small Dam A would be a roller-compacted concrete dam about 250 feet high from bedrock and 140 feet above the streambed (Exhibit 4). This proposed dam design would use the existing main outlet works and the original powerplant site and be located to take advantage of the previous foundation grouting and excavation to bedrock. The reservoir would impound 50,000 acre-feet of storage. A 400-foot-wide stepped spillway to help dissipate energy as water passed over would terminate in a stilling basin. The spillway crest would be capable of passing the probable maximum flood without overtopping the dam. The foundation would entail removing the existing structures to the bedrock surface about 110 feet below the existing stream channel.

In the Small Dam A alternative, a new powerplant would be constructed on top of the original powerplant's foundation. The existing intake structure would need to be modified to fit the smaller dam configurations. The average annual energy output of two horizontal turbines would vary between 28.0 and 65.1 GWh, depending on the reservoir capacity and the configuration and size of the generating units. The number of days that the unit(s) would be able to generate energy would decrease during the period of minimal stream flow releases which would be below the turbine design flows. Additional studies would be needed to find the optimal design and configuration of the turbines to maximize the net benefits.

Some facilities may be needed to equipment for government contract inspectors. After the completion of the project, the structures would be used for housing equipment needed by operation and maintenance personnel.

A detailed analysis based on current recreation information should be included if this alternative is initiated. Storage space in the reservoir will not be dedicated to the recreation function.

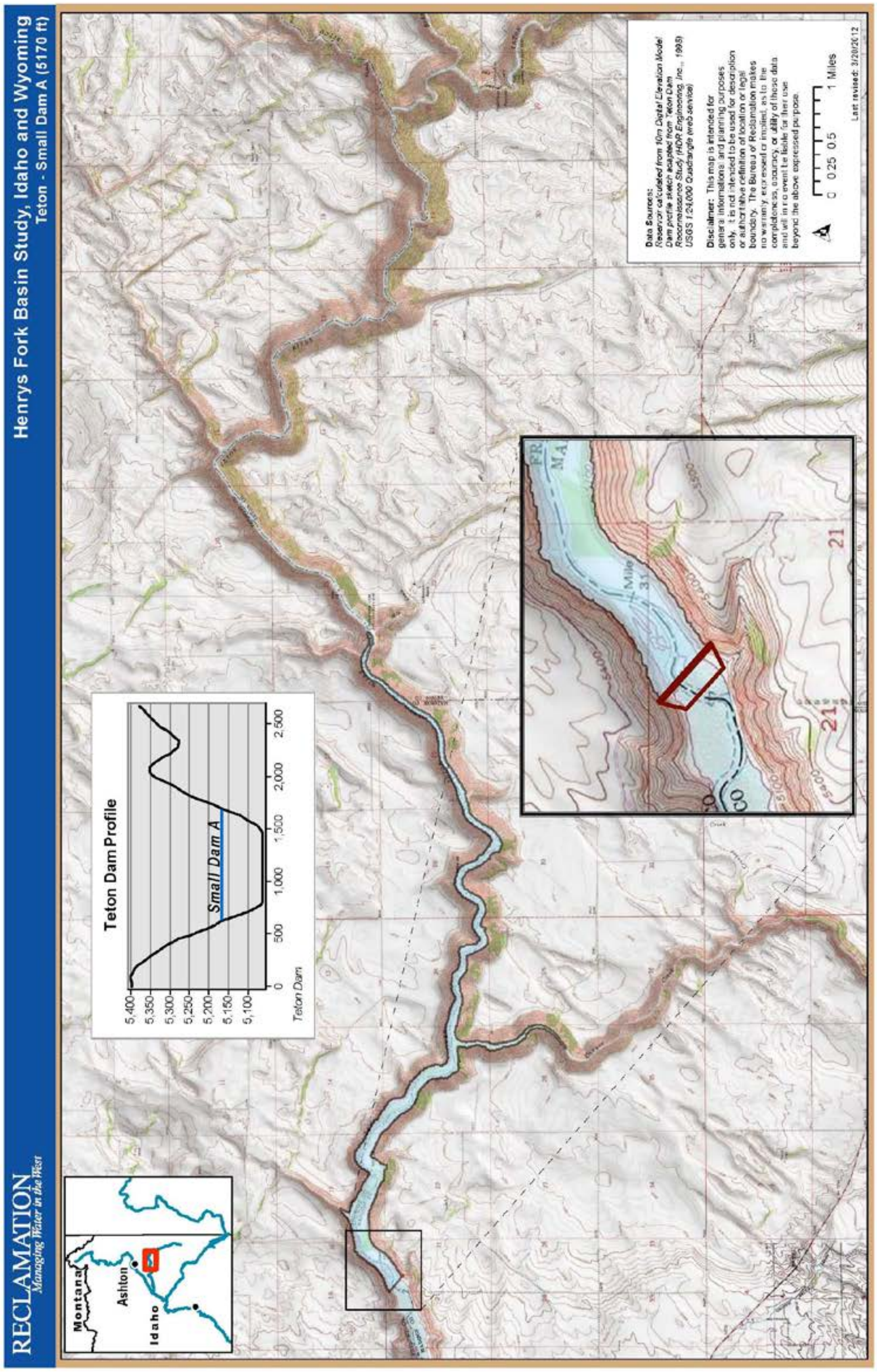

Exhibit 4. Topographic map showing the location of the dam and reservoir of the Teton Small Dam A Alternative.

1.1.2. *Teton Small Dam B Alternative*

Teton Small Dam B would be a roller-compacted concrete dam about 300 feet high from bedrock and 190 feet above the streambed and the reservoir would impound 100,000 acre-feet of storage (Exhibit 5). The foundation of the dam would be placed on the bedrock surface, as in the Teton Small Dam A Alternative.

In the Small Dam B alternative, a new powerplant would be constructed in the same configuration as the Teton Small Dam A Alternative.

Some facilities may be needed to equipment for government contract inspectors. After the completion of the project, the structures would be used for housing equipment needed by operation and maintenance personnel.

A detailed analysis based on current recreation information should be included if this alternative is initiated. Storage space in the reservoir will not be dedicated to the recreation function.

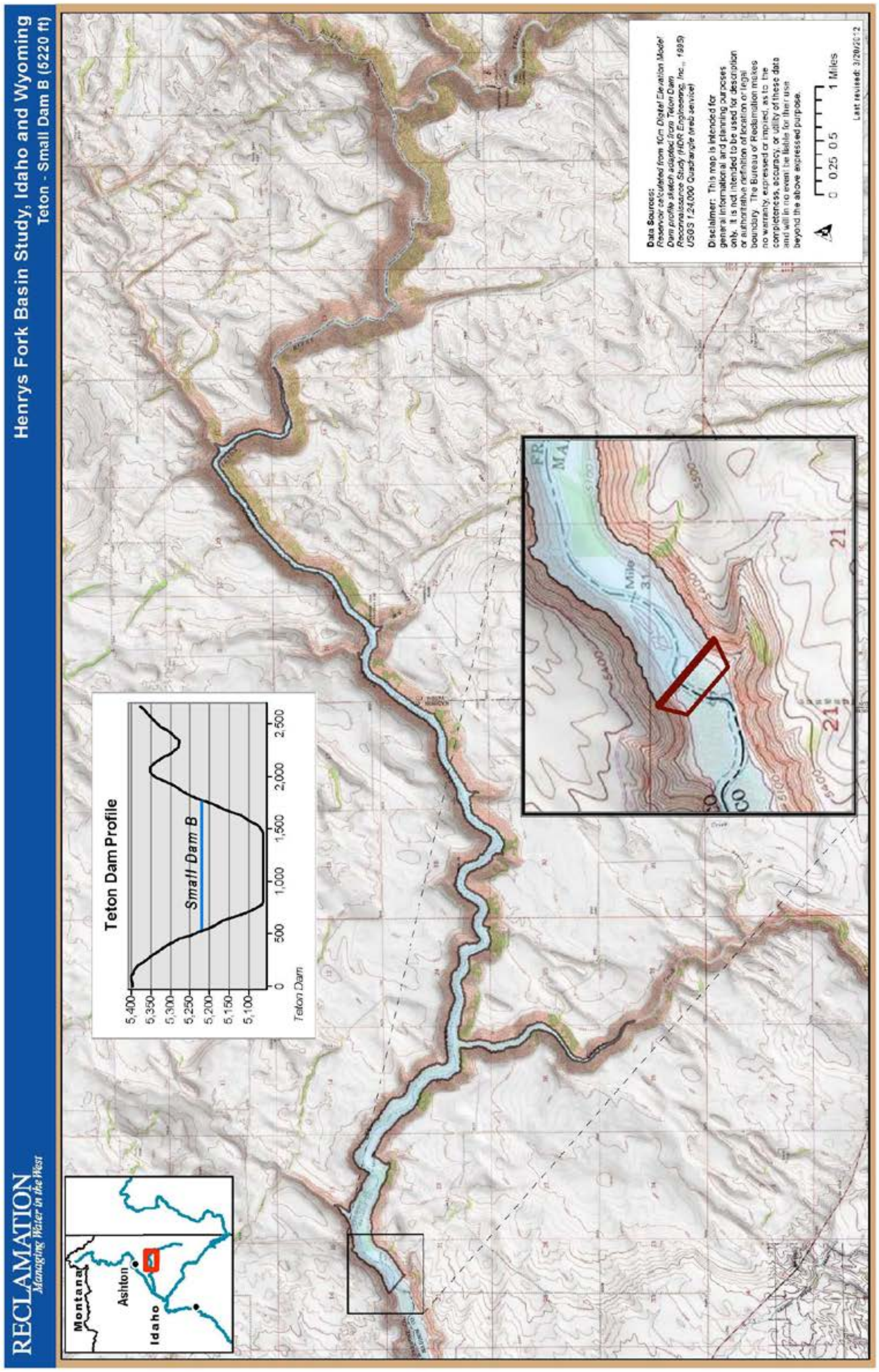

Exhibit 5. Topographic map showing the location of the dam and reservoir of the Teton Small Dam B Alternative.

1.2. Cost Estimation

Relative construction costs were developed for the surface storage alternatives for the sake of comparison (Exhibit 6). Detailed site-specific design information has not been developed; therefore, these costs are based on high-level assumptions that may be significantly modified if the project design progresses beyond this stage.

Exhibit 6. Estimated relative 2012 costs of the Teton Dam Surface Storage Project Alternative as indexed from the 1991 Reappraisal Report and the 1995 Reconnaissance Study. These costs are direct, field costs only and do not reflect indirect costs.

Facilities	Estimated Relative Costs			
	Rockfill Embankment Dam	Roller-Compacted Concrete Dam	Small Dam A	Small Dam B
Teton Dam and Reservoir	$156,789,000	$313,456,000	$63,140,000	$81,334,000
Powerplant, transmission lines, switchyards, and substations	$32,296,000	$32,296,000	$22,125,000	$24,200,000
Fish and wildlife mitigation	$4,175,000	$4,175,000	$4,175,000	$4,175,000
Recreation facilities	$932,000	$932,000	$932,000	$932,000
General property, government reserved works	$2,540,000	$2,540,000	$2,540,000	$2,540,000
Total	**$165,504,000**	**$322,171,000**	**$92,912,000**	**$113,181,000**

A full cost-benefit analysis was not prepared for this study; however, the cost per acre-foot of water found in Exhibit 7 provides a rough estimate of the cost effectiveness of reconstructing Teton Dam. If feasibility level studies are conducted in the future, development of benefits for each function to compare with the costs would be required. Reclamation's criteria for developing irrigation benefits have changed dramatically since the Congressional authorization of the Lower Teton Division and a decision on the criteria to be used for calculating benefits would be needed.

Exhibit 7. Relative alternative cost estimates.

Alternative	Total Storage Volume	Supplemental Water Volume	Total Construction Cost	Cost per Unit Storage (Dollar per acre-foot)	Cost per Unit Supplemental Water (Dollar per acre-foot)
Teton Dam Rebuild – rockfill embankment dam	288,000	55,000	$165,504,000	$575	$3,009
Teton Dam Rebuild – roller-compact concrete dam	288,000	55,000	$322,171,000	$1,119	$5,857
Teton Small Dam A	50,000	50,000	$92,912,000	$1,858	$1,858
Teton Small Dam B	100,000	100,000	$113,181,000	$1,132	$1,132

1.2.1. *Excluded Costs and Benefits*

The total relative construction costs are not intended to represent all costs for the project, which may be misleading if the estimated costs are used as the sole basis for comparing relative costs of this Alternative with the relative costs of the other surface storage alternatives. Some of the known costs that have been excluded include the following:

- Removal of the existing structure
- Preparation of the site for new construction

This cost estimates included in this report do not include potential project benefits of any of the alternatives. Some of the known potential benefits for the alternatives would require further study and may include:

- Hydropower
- Water supply
- Emergency water supply or firm yield
- Recreation
- Supplemental fish flows
- Flood control
- Groundwater recharge

2.2. Basin Needs

In all three alternatives, water would be stored in the reservoirs during high flows and after downstream water rights were met. The release of the stored water would stabilize flows in the Teton River during traditionally low flow periods in late summer and early fall when diversions are greatest. The Teton Dam Rebuild Alternative would supply approximately 55,000 acre-feet to the Lower Watershed region of the Henrys Fork River basin, an area with the greatest water shortages. Teton Small Dams A and B alternatives could also help stabilize the flows in the lower Teton River with the managed release of the 50,000 acre-feet and 100,000 acre-feet, respectively, of water and provide some relief to the irrigation shortages. Reservoir releases from all three alternatives would enhance ecological instream flows.

The out-of-basin water budget would be seasonally decreased when water would be stored during high flow periods, but may be made available later in the year to meet water right demands.

1.3. Environmental Benefits and Impacts

Under the Teton Dam Rebuild Alternative, the average annual amount of project storage available for irrigation could be about 44,000 acre-feet after meeting resident fish mitigation needs. There could be constraints to the release of the water which is needed in April, May, and June. It is unlikely that the entire 44,000 acre-feet could be released in these months without some flooding between Teton Dam and American Falls Reservoir in good water years.

Operating agreements for any of the alternatives would be needed with downstream water users for release of the water from Teton Reservoir for storage and later release from Brownlee Reservoir downstream on the Snake River. Locally, water demands for supplemental irrigation needs and swan and resident fishery flows would nearly fully utilize Teton Reservoir. Any significant increase in demands above those levels would be difficult to meet and could probably be met from the reservoir only in years with above normal water supplies.

With the Teton Dam Rebuild Alternative, the estimated fish and wildlife mitigation construction costs include establishing browse plants in designated areas, land acquisitions for exclusive wildlife habitat, spawning facilities, hatchery ponds, fish screens on major diversions, and a minimum of 300 cfs flow below the dam during average and above average water years. If the reservoir carryover falls below normal, the minimum flow would be reduced to 150 cfs.

The reservoirs of Small Dam A and B inundate smaller areas than the Teton Dam Rebuild Alternative so the area of impact would be proportionally smaller. Minimum fisheries flow would remain at 150 cfs.

1.3.1. *Impacted River Segments*

Hydrologic changes to the water source brought about by the proposed construction would have indirect impacts on a stretch of Teton River that is eligible for Wild and Scenic River status designation. The Teton Small Dams A and B alternatives would impact fewer stream segments than the Teton Dam Rebuild Alternative because of their smaller inundation areas.

1.3.2. *Change in Connectivity*

Potential impacts to river connectivity downstream of the dam would primarily be the reduction stream flows during spring runoff or high flow events and the stability of flows during low flow periods. There would be a large disconnect between the river segments above and below the dam which would make fish passage impossible or difficult. Diversion through the Crosscut Canal would be reduced since water from the reservoir would be used to supplement irrigation in the Lower Watershed region. This would leave more water in Henrys Fork River for the North Fremont and Egin Bench regions. More water in the Lower Watershed and Egin Bench regions would result in additional recharge either back to the rivers or to multiple aquifers.

1.3.3. *Presence of Yellowstone Cutthroat Trout*

The reservoir inundation area for any of the alternatives is not in crucial habitat for Yellowstone cutthroat trout; however, modifications to the hydrology of Teton River downstream of the dam would impact a conservation-and-management designated population of Yellowstone cutthroat trout in an area of concern. The project would need to be operated in a way that benefits the Yellowstone cutthroat trout downstream by providing stability in water flows. The Teton Dam Rebuild Alternative reservoir backs up into the lower reach of Bitch Creek which is home to a core conservation-and-management designated population of the Yellowstone cutthroat trout and is another area of concern. The Teton Small Dam A and B alternatives would not inundate areas of concern for Yellowstone cutthroat trout, but would impact the downstream population about the same as the Teton Dam Rebuild Alternative.

1.3.4. *Other Environmental Factors*

The U.S. Fish and Wildlife Service tracks one ESA-listed threatened species in the Henrys Fork Basin Study area, the grizzly bear, and one candidate species, the wolverine. The trumpeter swan, considered a sensitive species by the Bureau of Land Management and U.S.

Forest Service, also makes its home there. All three alternatives would impact large game winter range and migration corridors proportional to reservoir size.

1.4. Legal, Institutional, or Policy Constraints

There are many administrative considerations, both legal and institutional, that place restrictive limitations on water related issues. All water rights in the Henrys Fork River basin and downstream would be fully protected and remain unchanged. Existing in-basin and out-of-basin water users would retain all their present water rights and entitlements without modifications. New water rights, if available, would be obtained from the State of Idaho and administered under Idaho State laws.

Local, state, and federal laws and policies must be considered when evaluating additional surface water storage in the Henrys Fork River basin. These include regulatory and administrative requirements related to surface and groundwater rights, property rights, public health and safety, environmental concerns, and resource conservation. The following subsections show a partial list of Federal and State regulatory guidelines that may pertain to the implementation of any of the proposed surface water storage alternatives identified through the Henrys Fork Basin Study.

1.4.1. *Federal Laws and Executive Orders*

Following is only a partial listing of Federal laws and Executive Orders (EO) that may pertain to the implementation of any of the proposed alternatives identified by the Henrys Fork Basin Study:

- Antiquities Act of 1906
- American Indian Religious Freedom Act of 1978
- Archaeological Resources Protection Act of 1979, as amended
- Archaeological and Historic Preservation Act of 1974
- Clean Air Act of 1970, as amended
- Endangered Species Act of 1973, amended in 1979, 1982, and 1988
- Federal Water Pollution Control Act (commonly referred to as the Clean Water Act)
- Fish and Wildlife Coordination Act of 1958, as amended
- Historic Sites Act of 1935
- National Environmental Policy Act of 1969
- National Historical Preservation Act of 1966, as amended

- Native American Graves Protection and Repatriation Act of 1990
- Noise Control Act of 1972, amended in 1978
- Occupational Safety and Health Administration
- Hazard Communication Standards
- Resource Conservation and Recovery Act
- Rivers and Harbors Act of 1899
- Safe Drinking Water Act, Title 28, Public Law 89-72, as amended
- EO 11988 - Floodplain Management
- EO 11990 - Protection of Wetlands
- EO 12875 - Enhancing the Intergovernmental Partnership
- EO 12898 - Federal Actions to Address Environmental Justice

1.4.2. *State Laws and Policy*

State regulatory processes should be considered in the evaluation of a new storage project including, but not limited to, the following:

- The necessary water right permits must be obtained. New consumptive use water rights will require evidence that water is available for appropriation and that the new use will not injure other water users. Water rights in the Henrys Fork and on Snake River are administered in accordance with the priority system and Water District 1 reservoir operations requirements.
- A new project must comply with policies set forth in the State Water Plan implemented by the Idaho Water Resource Board (IWRB). Pertinent policies include:
    - State protected river designations: With designating a natural river in accordance with Section 42-1734A, Idaho Code, the IWRB prohibits the following activities:
        - Construction or expansion of dams or impoundments;
        - Construction of hydropower projects;
        - Construction of water diversion works;
        - Dredge or placer mining;
        - Alterations of the stream bed; and
        - Mineral or sand and gravel extraction within the stream bed

  - By designating a recreational river, the IWRB shall determine which of the activities prohibited under a natural designation shall be prohibited in the specified reach and may specify the terms and conditions under which activities that are not prohibited may go forward. Designations and their corresponding recommendations are documented in the *Henrys Fork Basin Plan, Idaho Water Resource Board, 1992*.
  - State minimum stream flow water rights: Management of the Snake River to meet or exceed minimum stream flow water rights established at the Milner, Murphy, Weiser, Johnson Bar and Lime Point gaging stations is fundamental to State policy. In addition, a number of minimum stream flow water rights have been developed in the Henrys Fork River basin. Each minimum stream flow was established to address specific management objectives, and together, the minimum stream flows form an integrated plan for management of the basin and Snake River as a whole. The basis and intention of the minimum stream flows as well as the current management of the system should be included in the evaluation of a new project tributary to the Snake River to ensure consistency with the State Water Plan and State regulatory obligations.
  - Eastern Snake Plain Aquifer Comprehensive Aquifer Management Plan (ESPA CAMP 2009): The long-term goal of the ESPA CAMP is to incrementally achieve a net water budget change of an additional 600,000 acre-feet annually to the aquifer water budget, with a short-term target of between 200,000 acre-feet and 300,000 acre-feet. A new project in the Henrys Fork River basin should support the ESPA CAMP objectives.

- Pursuant to Section 42-1737, Idaho Code, approval by the IWRB is required for all project proposals involving the impoundment of water in a reservoir with an active storage capacity in excess of ten thousand (10,000) acre-feet.
- Water Quality Certification from the Idaho Department of Health and Welfare in connection with the Federal Clean Water Act.
- Obtain approval of engineering designs, operation, and maintenance through the Idaho Safety of Dams program.
- Stream Channel Alteration Permit for improvements made to the channel to accommodate flood flows and routine releases.
- Coordinate with the IDWR floodplain manager to confirm compliance with the National Flood Insurance Program (NFIP) requirements in Idaho.

County and City Planning and Zoning and environmental regulations are not included in this summary.

1.5. Land Management, Recreation, and Infrastructure Impacts and Benefits

According to the U.S. Census Bureau, the average county population of the Teton River area has increased by about 34 percent since 2000. As the population increases, the need for domestic, municipal, and industrial water will increase as well; however, none of the alternatives address those needs. Hydropower generation will benefit the local area's population growth.

As the population grows, the demand for recreation facilities and opportunities is also expected to grow. High priority development needs were identified to be campgrounds, picnic areas, and swimming areas, along with boating and waterskiing. Rafting, canoeing, and kayaking have become popular activities in the area and the increased flows that would be provided downstream from the dam would enhance these activities. The large reservoir created by Teton Dam would reduce rapid water rafting, canoeing and kayaking upstream of the dam.

1.6. Assumptions and Limitations

This assessment of reconstructing Teton Dam is preliminary in scope and cost estimates are comparative and preliminary. If the Alternative was selected to go forward, detailed investigations in several categories would be required:

- Hydrology is uncertain: Legal water available is not known. Physical water availability has been approximated based on regression equations, but actual runoff has not been measured, and firm yield has not been evaluated. Complete water balance and refined operations have not been evaluated.
- A quantitative hazards analysis
- Analysis of the potential impacts along the proposed canal and pipeline routes
- Additional hydrologic data to test the permeability of the reservoir area
- Further study is needed to adequately define the effects of fissures in the right abutment on seepage and bank storage
- Geologic investigations for the auxiliary spillway in the embankment dam option
- Seismic studies

- Investigations to determine the present conditions of all structures
- Investigate the adequacy of existing structures' capacities
- Investigations of the impacts the project would have on groundwater and recharge
- Preparation of final designs

1.7. Evaluation Criteria

1.7.1. *Stakeholder Group Measureable Criteria*

There are four Stakeholder Group Measurable Criteria, with results summarized in Exhibit 8:

1. Water Supply: The net change for in-basin and out-of-basin water budgets is measured in acre-feet.
2. Water Rights: Water rights were not specifically addressed during this level of study, but known legal, institutional, and policy constraints are summarized in Section 1.4.
3. Environmental Considerations: Environmental benefits and impacts are summarized above in Section 1.3.
4. Economics: The estimated reconnaissance-level field cost to construct the project is summarized in Section 1.2.

Exhibit 8. Stakeholder Group measureable criteria summary.

Stakeholder Group Measurable Criteria	Criteria Characterization
Water Supply (in-basin water transfer)	55,000 acre-feet per year*
Water Supply (out-of-basin water transfer)	unknown
Legal, Institutional, or Policy Constraints (yes, no)	Yes
Environmental Considerations (net positive, negative or neutral)	Neutral
Economics (reconnaissance-level field costs for implementation)	$224,900,000 - $459,000,000

1.7.2. *Federal Viability Tests*

There are four federal viability tests. The background to evaluate each of these is summarized in the sections above and in the body of the report. Only qualitative, high-level summaries are provided here and in Exhibit 9:

1. Acceptability: To-be-determined (TBD)
2. Effectiveness: TBD
3. Completeness: TBD
4. Efficiency: TBD

Exhibit 9. Federal viability tests summary.

Stakeholder Group Measurable Criteria	Criteria Characterization
Acceptability (qualitatively low, moderate, high)	TBD
Effectiveness (extent to which basin needs are met: low, moderate, high)	TBD
Completeness (extent to which all needs are met: low, moderate, high)	TBD
Efficiency (relative construction/implementation cost per acre-feet: low, mid-range, high)	TBD

2. DATA SOURCES

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