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Managing Water in the West

Steinaker Dam Right Abutment Slide Repair Draft Environmental Assessment

PRO-EA-16-010

Upper Colorado Region
Provo Area Office
Provo, Utah

U.S. Department of the Interior
Bureau of Reclamation
Provo Area Office
Provo, Utah

December 2016

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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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Chapter 1 Purpose of and Need for Proposed Action

1.1 Introduction

This Environmental Assessment (EA) was prepared to examine the potential environmental impacts of the Steinaker Dam Right Abutment Slide Repair Project (Project), proposed by the Bureau of Reclamation (Reclamation) in Uintah County, Utah. If approved, the outlet works conduit would be extended approximately 80 feet upstream, a new intake structure would be constructed, the upstream slope of the right abutment would be flattened to improve stability, and a stability berm would be built along the upstream face of the main dam.

This EA evaluates the potential effects of the Proposed Action in order to determine whether it would cause significant impacts to the human or natural environment, as defined by the National Environmental Policy Act (NEPA) of 1969. If the EA shows no significant impacts associated with implementation of the proposed Project, then a Finding of No Significant Impact (FONSI) will be issued by Reclamation. Otherwise, an Environmental Impact Statement will be necessary prior to implementation of the Proposed Action.

1.2 Background

Steinaker Dam is an off-stream structure located 3.5 miles north of Vernal, Utah (Figure 1). Surplus flows of Ashley Creek are diverted at Fort Thornburgh Diversion Dam and conveyed to Steinaker Reservoir through the Steinaker Feeder Canal. Water stored in the reservoir is released into Steinaker Service Canal and delivered to Vernal and Jensen Unit project (project) lands.

The dam was built by Reclamation in 1961, who still maintains ownership; the dam is operated and maintained by the Uintah Water Conservancy District (UWCD). The Upper Colorado Region, Provo Area Office is the responsible Reclamation Area office.

Steinaker Dam is a rolled, zoned earth-fill embankment with a structural height of 162 feet, a hydraulic height of 138 feet, a crest width of 30 feet, and a crest length of 1,997 feet at elevation 5527.0 feet. The reservoir has a total capacity of 40,043 acre-feet at water surface elevation 5520.5 feet. The typical annual reservoir cycle is to fill the reservoir in the winter months and spring and release water during the irrigation season. The maximum reservoir water surface elevation to date is 5521.1 feet, which occurred in June 2005. Typically, the reservoir reaches about elevation 5520.5 feet in a normal water year.

On September 23, 2014 a slope failure was noticed in the upstream face of the right abutment, in close proximity to the outlet works (Figures 2 and 3). Following the slope failure, an inspection of the slide area was completed. The slide is about 375 feet wide, extending from approximate dam station 1+88 to dam station 5+60. The length from the top-most scarp to the lowest visible point on the upstream slope, (the reservoir level at the time was elevation 5475 feet), is about 83 feet. The maximum offset as a result of the slide is about 6 feet; however, the offset ranged from 1 foot to 6 feet.

Currently, Steinaker Dam has an elevated risk of failure under normal operations due to the slide's potential to expand both vertically towards the crest and laterally toward the main embankment. The current slope failure geometry and any expansion of the slope failure have the potential to allow large quantities of seepage through the ungrouted, pervious sandstone that is in contact with the main embankment. The reservoir has been operating under restricted operations since the slide was observed in 2014. This has resulted in diminished carryover storage from one season to the next.

1.3 Purpose of and Need for Proposed Action

The purpose of the Project is (1) risk reduction and (2) restore full project benefits. Reclamation's objective is to reduce the risks of dam failure in the least costly, technically acceptable manner, with no significant environmental impacts and restore project benefits as soon as possible. Risk reduction must proceed as soon as practicable to prevent additional slope movement on the upstream face of the dam, allowing reservoir water to enter the right abutment and initiate erosion, which present high risks to the downstream public. The Project is needed because the community depends on the benefits of Steinaker dam.

The treatment is designed to address the identified potential failure modes associated with the upstream slope as it relates to public risk. The original design and construction of Steinaker Dam did not include the current state-of-the art defensive measures to prevent or arrest these failure modes. The recent slope failure in the right abutment impervious blanket provides a pathway for reservoir water to enter the pervious right abutment and could potentially result in internal erosion of the dam embankment. Reservoir level restrictions are currently enforced, but only provide a temporary solution which is not sufficient for protection against these failure modes.

Current state-of-the art defensive measures would include repairing the failed impervious blanket, complete removal of the entire slope failure plane, flattening the upstream slope of the impervious blanket and the right abutment of the dam, and constructing a new outlet works intake upstream of the existing outlet works intake. State-of-the-art design and construction practices would also include cleaning the right abutment rock and treating it with slush grout, dental concrete, and shotcrete. These defensive measures would provide confidence that future slope failures would not occur, that the impervious blanket material is not eroded into the pervious right abutment rock, and that reservoir seepage into the right abutment rock would be reduced around the main embankment and right abutment.

1.4 Public Scoping and Involvement

A public scoping meeting, with 41 individuals in attendance, was held in Vernal at the Uintah Conference Center on November 3, 2016, to discuss and take questions on the proposed Project. Reclamation mailed 91 scoping letters to land owners, canal companies, public municipalities, organizations and state and Federal agencies, notifying them of the Project and inviting them to the open house. Verbal comments and one written comment were received during the public meeting and are being considered and incorporated into this Environmental Assessment.

1.5 Permits and Authorizations

Implementation of the Proposed Action may require a number of authorizations or permits from state and Federal agencies. The contractor would be responsible for obtaining all permits and authorizations required for the Project. Potential authorizations or permits may include those listed in Table 1-2.

Table 1-2
Permits and Authorizations

Agency/Department	Purpose
Utah Division of Water Quality	Utah Pollution Discharge Elimination System (UPDES) permit for general construction activities in compliance with Section 402 of the Clean Water Act (CWA).
Utah State Historic Preservation Office	Consultation pursuant to Section 106 of the National Historic Preservation Act (NHPA), 16 USC 470 USC 470.
United States Army Corps of Engineers (USACE)	A USACE permit, in compliance with Section 404 of the CWA, would be required prior to the discharge of

Agency/Department	Purpose
	dredged or fill material into “waters of the United States”.
Bureau of Reclamation	A supplemental Operation and Maintenance (O&M) Agreement would be necessary in order for permission to be granted for the UWCD to modify Federal facilities.

1.6 Related Projects and Documents

1.6.1 Final EA Steinaker Reservoir Water Surface Elevation Increase

The 2007 Steinaker Reservoir Water Surface Elevation Increase EA analyzed a proposal to raise the full pool water surface elevation of Steinaker Reservoir from 5517.8 feet above mean sea level (msl) to 5520.5 msl. UWCD requested authorization from Reclamation for this action. The purpose of the proposal was to increase the reservoir’s water storage capacity with no structural or operational modification to the dam or reservoir. The water surface elevation increase and the dam repair are separate projects independent of each other. A FONSI was issued September 2007.

1.6.2 Final EA Steinaker Service Canal Modification Project

The 2014 Steinaker Service Canal Modification Project EA was prepared to allow UWCD to modify the existing 12 mile canal into a pressurized pipeline. The service canal modification and the dam repair are separate projects independent of each other. A FONSI was issued September 2014.

1.6.3 Final EA Steinaker Feeder Canal Dam/Service Canal/Carriage of Non Project Water

The 2015 Steinaker Feeder Canal Dam/Service Canal/Carriage of Non Project Water EA was prepared to allow UWCD the carriage of 35,000 acre-feet of non-project water through the Vernal Unit facilities. The carriage of non-project water through Steinaker facilities and the dam repair are separate projects independent of each other. A FONSI was issued September 2015.

1.7 Scope of Analysis

The purpose of this EA is to determine whether or not Reclamation should authorize, provide funding, and enter into an agreement with UWCD for the dam repair. That determination includes consideration of whether there would be significant impacts to the human environment. In order to repair the dam, this EA must be completed and a FONSI issued.

Chapter 2 Alternatives

2.1 Introduction

This chapter describes the features of the No Action and Proposed Action Alternatives, and presents a comparative analysis. It includes a description of each alternative considered. This section also presents the alternatives in comparative form, defining the differences between each alternative.

2.2 No Action

Under the No Action Alternative, no modifications to the dam would be initiated. The reservoir would continue to be operated at restricted elevations in order to reduce dam safety risks associated with the right abutment slide. Exact restrictions would potentially vary year to year depending on instrumentation readings, monitoring results and dam safety decision making. These reservoir restrictions would continue to have a negative impact on overall project benefits. Restricted reservoir filling and drawdown rates would also be expected to continue, impacting operational flexibility. Dam failure could result in possible death and significant loss of public trust and confidence in Reclamation and the United States Government.

2.3 Proposed Action

The Proposed Action is the preferred alternative. Reclamation intends to repair the slope failure and construct a flatter, stable earthen slope on the upstream face of the dam (Figure 4). In addition to decreasing the slope, treatment of the bedrock at the right abutment would be completed and zone material within the embankment would be reconstructed. This modification would prevent additional slope movement, prevent seepage through the right abutment bedrock, and prevent erosion from initiating. In order to accommodate for the flatter slope in the vicinity of the outlet works conduit and intake structure, the outlet works would need to be extended and a new intake structure built. Modifications for this Project would take place during fiscal years 2017 and 2018.

The Proposed Action consists of the following primary components: removing the existing impervious clay blanket on the right abutment down to bedrock, treating the bedrock with shotcrete, extending the outlet conduit upstream by approximately 80 feet, constructing a new intake structure, reconstructing the clay blanket, and constructing a highly permeable shell upstream of the clay blanket. Constructing the new permeable shell would flatten the slope of the right abutment from the current 2:1 (horizontal to vertical) slope to a much flatter 3.5:1 slope. The lower portion of the shell would be extended from the right abutment across the main dam, creating a berm on the lower reaches of the upstream face of the main dam that would improve stability of the dam under earthquake shaking (Figure 5).

The reservoir would be drained to deadpool to allow for construction of these modifications. Even when drained to deadpool, the reservoir would still cover the area where the extended outlet conduit and new intake structure would be constructed. Therefore, a temporary coffer dam would be constructed around this area and the water pumped out so that these two features could be constructed. The lower portions of the shell and stability berm would be constructed by placing very coarse, granular material underwater (Figure 6).

A portion of a sandstone outcropping located upstream of the right abutment would be excavated in order to create enough room to construct the outlet conduit extension, intake structure, and a new channel leading to the intake structure.

The existing materials removed from the dam during modification (specifically the clay blanket and the riprap) would be stockpiled and reused when the new portions of the embankment are constructed. Additional clay soil and riprap would be imported to the site to supplement the existing materials. Granular fill would be imported to the site to construct the shell and stability berm.

The soil for the clay blanket would be obtained from the Honda Hills area directly to the east of the dam. Riprap would be obtained from either the Wild Mountain pit or from a commercial source. The fill for the shell and stability berm would be obtained from the Ouray Pit.

2.3.1 Construction Schedule

Construction is tentatively scheduled to begin in the fall of 2017, with a completion near the end of 2018.

2.4 Alternatives Considered and Eliminated from Further Study

The following alternatives were evaluated but eliminated because they did not meet the purpose of or need for the Project.

2.4.1 Retaining Wall at Outlet Works and Flatten Embankment Slope

In addition to repairing the slope failure and constructing a flatter, more stable slope, this alternative would include the construction of a retaining wall around the existing outlet works conduit and intake structure. The wall would have a total length of approximately 190 feet and would range in height from 3 to

30 feet. The wall would consist of 3 sides: a headwall oriented perpendicular to the conduit alignment, the left wall oriented parallel to the conduit alignment, and the right wall oriented 45 degrees from the headwall. The upstream slope would be flattened from a 2:1 slope to a 3.5:1 from the right abutment to about station 11+30. A retaining wall around the existing outlet works conduit would be used to stabilize to the slope during rapid, drawdown loading. Utilizing the retaining wall would allow the existing outlet works intake to be maintained at its current location.

This alternative does not meet the purpose of and need for the Project because the structural walls would complicate construction and could potentially overload the existing conduit. Costs were estimated to be higher, and construction would take additional time due to large amounts of special compaction needed adjacent to the concrete walls.

2.4.2 Flatten Embankment and Maintain 2:1 Slope at the Outlet Works Using Soil Cement

This alternative involves repairing the slope failure and constructing a flatter, more stable slope. The only difference is that it would require the use of soil-cement between the right abutment and station 5+50 to stabilize to the slope during rapid, drawdown loading. This would allow the existing intake structure to be maintained, and reduces the riprap quantity needed since the soil-cement also provides upstream slope protection.

This alternative does not meet the purpose of and need for the Project because the use of soil cement has the potential for developing cracks. These cracks could widen during earthquake events, or by freezing and thawing during lower reservoir elevations. These cracks may extend and develop a direct path to the open joints in the rock at the abutment contact. While there is no identified threat to the dam for increased seepage, it is difficult to predict the long-term effects increases in seepage may have on the stability of the abutment, therefore this alternative in not technically preferred.

2.4.3 Construct Downstream Filter Berm

This alternative consists of cleaning off the downstream right abutment rock and the downstream area above/adjacent to the existing seismic berm. A new berm would be constructed on the downstream area of the dam from about station 8+50 to station 19+50 from about elevation 5480 feet to elevation 5400 feet. The downstream berm would include a filter and drainage zone on the right abutment and against the downstream embankment slope. The drainage zone would include a new toe drain pipe. The existing toe drain pipe from the prior seismic modification would be hydraulically connected to the drainage system for this alternative.

This alternative does not meet the purpose of and need for the Project because it does not reduce seepage through the right abutment, upstream slope failures could still continue to occur, and it may also impact culturally sensitive sites.

2.4.4 Retaining Wall at Outlet Works and Flatten Embankment Slope and Construct Downstream Filter Berm

This alternative combines the two alternatives of Extending Existing Outlet Works Conduit Upstream, Flatten Embankment Slope and the alternative of Downstream Filter and Berm.

This alternative does not meet the purpose of and need for the Project because the new filter zone would leave 50 feet of the dam without filter protection and it is the highest cost alternative. It may also impact culturally sensitive sites and require additional environmental work.

2.4.5 Reservoir Restriction Only

This alternative involves restricting the maximum reservoir water surface elevation to be 5470 feet, which is equivalent to a loss in average annual deliveries of about 11,800 acre-feet. The reservoir restriction options include remediation of the reservoir basin exposed as a result of each restricted level. The remediation work includes, removing reservoir sediments and reclaiming the area with topsoil and seed.

This alternative does not meet the purpose of and need for the Project because it does not eliminate the instability of the dam and is more costly that the preferred alternative.

2.4.6 Reservoir Restriction Plus Pumping (Elevation 5470)

In addition to the reservoir restriction described above (water surface elevation 5470 or a loss in average annual deliveries of about 11,800 acre-feet), this alternative is combined with efforts to replace the yield in the Vernal Unit lost as a result of the reservoir restriction. Lost yield would be replaced by pumping water from Red Fleet Reservoir (part of the Jensen Unit of the Central Utah Project) to Steinaker Reservoir. Water pumped from Red Fleet Reservoir would then be replaced by water pumped from the Green River.

This alternative does not meet the purpose of and need for the Project because it results in the loss of habitat for the endangered Ute Ladies' Tresses, (*Spiranthes diluvialis*), loss of benefits, and has complications with legal authority and funding sources, likely requiring special congressional authorization.

2.4.7 Reservoir Restriction with Reduction in Demand (Elevation 5470)

This alternative involves restricting the maximum reservoir water surface elevation to be 5470 feet or a loss in average annual deliveries of about 11,800 acre-feet combined with efforts to reduce the demand for irrigation water within the Vernal Unit. A reservoir restriction would reduce the yield of the Vernal Unit between 2,800 acre-feet and 11,800 acre-feet per year. The intent of this alternative is to reduce the demand for irrigation water until it matches the loss in yield by buying out the contractual right of willing sellers to receive Vernal Unit irrigation water. Under this alternative, Reclamation would compensate irrigators for reducing their use of irrigation water through long-term forbearance agreements or permanent conservation easements.

This alternative does not meet the purpose of and need for the Project because it results in the loss of habitat for the endangered Ute Ladies' Tresses, loss of benefits, and has complications with legal authority and funding sources, likely requiring special congressional authorization.

2.4.8 Dam Breach

This alternative involves breaching the reservoir. A breach would require excavating a notch through the embankment, which would allow the reservoir to drain in a controlled fashion. It would also require removal of the spillway and the outlet works.

This alternative does not meet the purpose of and need for the Project because it would result in complete loss of project benefits and the cost related to the loss of irrigation and recreation benefits is more than double the cost of the preferred alternative.

2.5 Comparison of Alternatives

The suitability of the No Action and Proposed Action Alternatives were compared based on four objectives identified for the Project.

The objectives are:

- Reduce annualized failure probability and annualized life loss;
- Prevent increased seepage through the right abutment;
- Prevent additional movement of the slide;
- Prevent internal erosion of embankment material near the right abutment

As shown in Table 2-1, the No Action Alternative did not meet any of the Project's objectives while the Proposed Action met all four objectives. This alternative is not technically viable because it does nothing to reduce risk, eventually leading to possible death and complete loss of benefits.

Table 2-1
Comparison of Alternatives

Project Objective	Does the No Action Meet the Objective	Does the Proposed Action Meet the Objective
Reduce annualized failure probability and annualized life loss;	No	Yes
Prevent increased seepage through the right abutment;	No	Yes
Prevent additional movement of the slide;	No	Yes
Prevent internal erosion of embankment material near the right abutment	No	Yes

2.6 Minimization Measures Incorporated into the Proposed Action

The minimization measures, along with other measures listed under each resource in Chapter 3 and Chapter 4 have been incorporated into the Proposed Action to lessen the potential adverse effects.

- The proposed Project construction area would be located in previously disturbed sites; rights-of-ways, existing roads, construction sites, staging areas, and would have as small a footprint as possible.

- Staging and stockpiling areas would be cleared and approved in advance and located where they would minimize disturbance.

- The contractor would be responsible during construction for safety measures, noise and dust control, minimizing air and water pollution and complying with all permit requirements.

- The Proposed Action will be located so as to avoid sensitive features such as, but not limited to, riparian areas and significant cultural resources.

Chapter 3 Affected Environment and Environmental Consequences

3.1 Introduction

This chapter describes the environment that could be affected by the Proposed Action. These impacts are discussed under the following resource issues: geology and soils resources; visual resources; cultural resources; paleontological resources; wilderness and wild and scenic rivers; hydrology; water quality; system operations; health, safety, air quality, and noise; prime and unique farmlands; flood plains; wetlands, riparian, noxious weeds and existing vegetation; fish and wildlife resources; threatened, endangered, and sensitive species; recreation; socioeconomics; access and transportation; water rights; Indian Trust Assets (ITAs); environmental justice; and cumulative effects. The present condition or characteristics of each resource are discussed first, followed by a discussion of the predicted impacts caused by the Proposed Action. The environmental effects are summarized in Section 3-7.

Implementing minimization measures would ensure impacts are minimal and short-term. Chapter 3 presents the impact analysis for resources after minimization measures and Standard Reclamation Best Management Practices (BMPs) have been successfully implemented.

3.2 Resources Considered and Eliminated from Further Analysis

The following resources were considered but eliminated from further analysis because they did not occur in the Project area or because their effect is so minor (negligible) that it was discounted.

Table 3-1
Resources Eliminated from Further Analysis

Resource	Rationale for Elimination from Further Analysis
Geology and soils resources	Project activities would occur within the disturbance footprint of the existing dam, staging and construction areas, and access road. Therefore,

Resource	Rationale for Elimination from Further Analysis
	geologic and soil resources would not be impacted.
Visual resources	Construction work would occur on the upstream face of the dam, mostly below the high water elevation. It would not be seen by the local residence or casual observer unless they were on the reservoir. Therefore, significant visual resources would not be adversely impacted.
Wilderness and wild and scenic rivers	There are no designated wilderness and wild and scenic rivers or segments within the Project area. Therefore, there would be no impact to these resources.
Hydrology	Steinaker is an off stream reservoir, therefore, the Proposed Action will not have an impact on the natural hydrology in the area.
Water quality	During construction the dam would be at its lowest level and a coffer dam would be constructed to access the outlet works of the dam. BMPs and adherence to permits would ensure no impact to water quality.
Prime and unique farmlands	There are prime and unique farmlands in the area; however, impacts would be short term with possibly water restrictions one season.
Flood plains	The Proposed Action would have no impact on existing flood plains. Steinaker is an off stream reservoir.
Wetlands, riparian, noxious weeds and existing vegetation	There would be no impacts to wetlands and riparian areas because they do not occur in the construction area. BMPs and environmental commitments would ensure no long term impacts to vegetation and noxious weeds would be controlled.
Fish and wildlife resources	Fish and wildlife Resources have been eliminated from further consideration for the following reason. Steinaker is an off stream reservoir and is draw down to dead pool regularly. Only a

Resource	Rationale for Elimination from Further Analysis
	small portion of the reservoir basin near the outlet works would be dewatered behind a small coffer dam. Only temporary impacts would occur to fish and wildlife in the immediate construction area.
Threatened, endangered, and sensitive species	Four endangered fish exist within Uintah County but none occur in the reservoir or the canals. The black-footed ferret (*Mustela nigripes*), Canada lynx (*Lynx canadensis)*, greater sage-grouse (*Centrocercus urophasianus*), Mexican spotted owl (*Strix occidentalis lucida*), and western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) exist within Uintah County but are not known to occur in the Project area. The Ute ladies'-tresses are known to occur along portions of the canal corridor but not near the dam. No Ute ladies'-tresses were identified during surveys of the project area. The bald eagle (*Haliaeetus leucocephalus*) was delisted as a Federally threatened species in 2007, but is still protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. There are no known nesting pairs at or near the Project area; however, it is a winter resident of the area.
Water rights	Water right operations would not be changed by the Proposed Action. The volume and timing of water storage and deliveries would be the same after the repairs as they were prior to 2014.

3.3 Affected Environment and Environmental Consequences

This chapter describes the affected environment (baseline conditions) and environmental consequences (impacts as a result of the Proposed Action) on the quality of the human environment that could be impacted by construction and operation of the Proposed Action, as described in Chapter 2. The human environment is defined in this study as all of the environmental resources, including social and economic conditions occurring in the impact area of influence.

3.3.1 Cultural Resources

Cultural resources are defined as physical or other expressions of human activity or occupation that are over 50 years in age. Such resources include culturally significant landscapes, prehistoric and historic archaeological sites as well as isolated artifacts or features, traditional cultural properties, Native American and other sacred places, and artifacts and documents of cultural and historic significance.

Section 106 of the National Historic Preservation Act of 1966 (NHPA), mandates that Reclamation take into account the potential effects of a proposed Federal undertaking on historic properties. Historic properties are defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for, inclusion in the National Register of Historic Places (NRHP). Potential effects of the described alternatives on historic properties are the primary focus of this analysis.

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

The Class I records search of the proposed undertaking's APE occurred on September 2, 2015, by Dr. Zachary Nelson, via Preservation Pro (Nelson 2016). The Preservation Pro file search revealed that 31 previously recorded sites have been identified within 0.5 miles of the APE (See Table 3-2). There have been 16 previous surveys within 0.5 miles of the APE. The most important work was done by Gunnerson (1957), Lipe (1959), Norman and Merrill (1983), and the Brigham Young University-Office of Public Archaeology (Baker 1994, Billat 1994, Irvine et al 1995, Richens 1997, Richens and Talbot 1998, Talbot et al 1992 and 1997, and Talbot and Richens 1996 and 1999).

In addition to reports, the General Land Office (GLO) patent maps for 1879, 1880, 1901, 1908, 1922, 1978 were consulted as well as the USGS Ashley 1885 (1:250,000), Marsh Peak 1906 (1:125,000), Marsh Peak 1908 (1:125,000), Vernal 1960 (1:250,000), Steinaker Reservoir 1965 (1:24,000), Vernal 1974 (1:250,000), Dutch John 1981 (1:100,000), and Steinaker Reservoir 2014 (1:24,000) topographic maps. Aerial photography from 1953, 1956, 1963, and 1964 was examined for additional historic features.

Table 3-2

Site No.	Type	Eligibility	Project Effect & Mitigation
42UN75	Rock Art & Bedrock Mortar	Ineligible	None – But will be fenced
42UN128	Destroyed By Dam Construction – Had Two Human Burials	Destroyed	None – But verify
42UN153	Destroyed By Dam Construction –Had Rock Art	Destroyed	None – But verify
42UN1314	Campsite	Ineligible	None
42UN1315	Campsite & Historic Graves	Ineligible	None – But will be fenced
42UN1316	Gibson Coal Prospect – Mine & Kiln	Ineligible	None
42UN1317	Lithic Scatter	Ineligible	None
42UN1318	Rock Shelter & Rock Art	Ineligible	None
42UN2003	Destroyed By Dam Construction –Historic Ranch	Destroyed	Destroyed
42UN2004	Prehistoric Village – Human Burials, Pit-houses, Agriculture	Eligible	None
42UN2190	Campsite	Eligible	None – But will be fenced
42UN2191	Campsite	Ineligible	None
42UN2229	Lithic Scatter	Ineligible	None
42UN5471	Steinaker Service Canal	Eligible	None
42UN8667	Rock Point Canal Segment	Ineligible	None
42UN8668	Steinaker Dam	Ineligible	Complete rebuild

The Class I record search and associative background research indicates that human occupation of the Uintah Basin extends from the Paleo-Indian period (ca. 11,000 BC – 6,000 BC) to the present. The earliest periods are characterized by artifacts associated with Pleistocene megafauna (e.g., Lower-Eskelson 2007). During the Early Archaic Period (ca. 6,000 BC – 3,000 BC), the inhabitants lived a nomadic life-style hunting game with atlatl technology in family units or bands (e.g., Spangler 1995). The Middle Archaic period (ca. 3,000 BC – 500 BC) is characterized by a particular type of projectile points known as the McKean complex. The inhabitants were still mobile foragers subsisting on hunting and gathering. The Late Archaic Period (ca. 500 BC – AD 550) is characterized by a transition to semi-subterranean residential structure, such as pit-houses, agriculture in the form of maize, and bow-and-arrow technology. This trajectory culminates in the Formative Stage (ca. AD 550- AD 1300) with the "Fremont culture". This archaeologically defined cultural complex includes permanent villages, elaborate rock art, ceramics, agricultural production with surpluses, and increased evidence of population (e.g., Spangler 1995).

The Fremont culture disappears with the advent of the Protohistoric Period (AD 1300 – AD 1650). This period is characterized by different types of ceramics, projectile points, rock art, and subsistence strategies. The next major phase is the Historic Ute Period (AD 1650 – Present). This phase is characterized by interaction with European traders and settlers. The introduction of the horse meant that the tribes had increased mobility and access to a wider range of trade contacts. The influx of Euro-American settlers into the area caused the dispossession and relocation of the Ute people onto reservations (see Conetah 1982 for discussion).

The subsequent establishment of U.S. military forts and the official opening of the Uintah and Ouray Reservations to white settlement in 1887, with the Dawes Severalty Act, marked the final dispossession of the Ute peoples. This led to the dispossession of Ute peoples from the reservation lands originally set aside for their exclusive use following their previous dispossession from traditional territories (see Conetah 1982 for discussion). Initially, livestock represented the main industry of white settlers in the Uinta Basin, likely due to the availability of grass and water in the region. Eventually, the sheep industry boomed, contributing to a decline in the cattle industry (Lower-Eskelson 2007). Commercial oil production began in 1948 but was not fully exploited until the 1970s with increases in the price of crude oil. Consequently, private and public ventures began work to develop an inexpensive process for separating oil from oil shale and tar sands, both prevalent in the Uinta Basin.

A long-term difficulty in the Uintah Basin is the lack of water. Native groups frequently settled and hunted near water sources. Euro-American settlers needed a reliable source of water for agriculture. Reclamation engineer Howard Reed first proposed a dam across Steinaker Draw in 1904. The potential of adding additional water supplies garnered enthusiastic support for the Project from Ashley Valley farmers and ranchers. When Congress finally authorized funds to begin the project, the Ashley Valley residents organized the largest parade in the city's history (Eastman 2007). Constructed during the era of big dams, Steinaker is relatively small in comparison. But its size belies the reservoir's importance to the community it supplies. The reservoir provides much needed water for municipal and supplemental irrigation and remains a popular recreational destination.

The Class III inventory occurred on September 17-19, 2015 and April 1-2, 2016 (Nelson 2016). Dr. Zachary Nelson surveyed the APE and survey area for cultural resources. Seven sites were revisited (42UN128, 42UN153, 42UN1317, 42UN2003, 42UN2004, 42UN2229, & 42UN5471), seven sites were updated (42UN75, 42UN1314, 42UN1315, 42UN1316, 42UN1318, 42UN2190, & 42UN2191), and two sites were newly recorded (42UN8667 and 42UN8668).

In accordance with 36 CFR 800.4, these sites were evaluated for significance in terms of NRHP eligibility. The significance criteria applied to evaluate cultural resources are defined in 36 CFR 60.4 as follows:

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and

1. that are associated with events that have made a significant contribution to the broad patterns of our history; or

2. that are associated with the lives of persons significant in our past; or

3. that embody the distinctive characteristics of a t1pe, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

4. that have yielded, or may be likely to yield, information important in prehistory or history.

Based upon these criteria, sites 42UN2004, 42UN2190, and 42UN5471 are considered eligible for inclusion on the NRHP. All other sites within the APE are not eligible or were previously destroyed by dam construction. The Utah State

Historic Preservation Office (SHPO) was sent a letter and a report with Reclamation's findings on November 22, 2016. As eligible resources, any changes made to these structures that are not in keeping with their historic integrity would result in an adverse effect to these historic resources.

3.3.1.1 No Action

Under the No Action Alternative, there would be no adverse effects to cultural resources. There would be no need for ground disturbance associated with construction activities. Existing conditions would continue. There is a potential for the Steinaker Dam (Site 42UN8668) to rupture, but as an ineligible site that would not harm cultural resources.

3.3.1.2 Proposed Action

Under the Proposed Action Alternative, there would be no adverse effects to cultural resources. The proposed project will avoid all eligible sites and most of the ineligible sites by design. Several site elements will be fenced during construction for additional protection. These include possible historic graves, a free-standing bedrock mortar, and a portion of an eligible site which lies along an access road (42UN2190).

The indirect effect of lowering the reservoir is exposure of cultural resources that have not been above water since 1994 during a previous dam repair. At that time, Reclamation fulfilled its Section 106 responsibilities through surveys, site testing, and excavation of eligible sites. This resulted in an excellent understanding of the prehistory around the reservoir. Unfortunately, the wave-action erosion caused by raising and lowering the reservoir had severely damaged many of the sites and their current condition is unknown.

Due to the indirect effects of the project, Reclamation has created an unanticipated discovery plan and a site feature covering plan. Once the reservoir basin is drawn-down, Reclamation will evaluate the exposed sites and determine if intact features within them should be covered to prevent erosion and loss of integrity. This covering will consist on geo-cloth, six inches of sand, and riprap. In addition, Reclamation has asked the Steinaker park ranger for increased patrols of the drained reservoir basin to discourage looting and vandalism.

3.3.2 Paleontological Resources

The Vernal area is known for its dinosaur fossils. Fossils of various types are found around the Steinaker reservoir. However, no known fossils are located in the APE. Sensitive fossil locations are well outside of the proposed project.

3.3.2.1 No Action

The No Action Alternative would have no effect on paleontological resources. No known fossils are located within the project area.

3.3.2.2 Proposed Action
The Proposed Action Alternative would have no effect on paleontological resources. No known fossils are located within the project area.

3.3.3 System Operations
Steinaker Reservoir is an off-stream reservoir located 3.5 miles north of Vernal, Utah. Surplus flows of Ashley Creek are diverted at Fort Thornburgh Diversion Dam and conveyed to Steinaker Reservoir through the 400 cfs capacity Steinaker Feeder Canal. Water stored in the reservoir is released into Steinaker Service Canal and delivered to other project features.

The reservoir has a total capacity of 40,043 acre-feet (34,955 acre-feet active capacity) at water surface elevation 5520.5 feet, which is roughly enough water for two irrigation seasons, allowing for flexibility in dry years. The typical annual reservoir cycle is to fill the reservoir in the winter months and release water during the irrigation season. The maximum reservoir water surface elevation to date is 5521.1 feet, which occurred in June 2005. The reservoir is filled based on the volume of water available for storage from Ashley Creek. If adequate water is available, the reservoir is filled to elevation 5520.5 feet. Currently, the reservoir is being operated under restrictions, including restrictions to the maximum water surface elevation and reservoir filling and drawdown rates.

3.3.3.1 No Action
The No Action Alternative would have no effect on the current operation of Steinaker Reservoir. Restrictions on the reservoir maximum water surface elevation, and reservoir filling and drawdown rates would continue to be enforced, impacting operational flexibility and decreasing the volume of carryover storage. Operating under the no action alternative would have a negative impact to the water supply and project benefits, particularly during dry years. Further slide movement could potentially impact outlet works operations and negatively impact deliveries.

3.3.3.2 Proposed Action
The Proposed Action Alternative would remove the need for the reservoir operation restrictions currently in place for Steinaker Reservoir, returning the system operations back to typical historical operations, and restoring historic project benefits.

3.3.4 Health, Safety, Air Quality, and Noise

3.3.4.1 No Action
The No Action Alternative would have a negative impact to public safety and health. There would be an increase in the risk of dam failure if no action is taken. The No Action Alternative would have no effect on air quality and noise.

3.3.4.2 Proposed Action

The Proposed Action would have a positive impact to public safety and health by decreasing the risk of dam failure. As BMPs and environmental commitments are implemented there would be minor effect to air quality and noise during construction. There would be a temporary increase in noise and dust due to construction activities. There may also be a slight temporary decrease in public safety and health due to the increased construction traffic around and near the dam.

3.3.5 Recreation

Recreation areas are Steinaker State Park, Ashley Nature Trail Park, and Vernal City Park. Steinaker State Park is often informally used as a recreational area for fishing, camping, picnicking, walking, jogging, and bicycling. Estimated yearly visitation at Steinaker has been around 37,500 with the highest visitation in the month of June. And the predominant visitor origination comes from the Vernal area with some coming from outside the local region.

3.3.5.1 No Action

The No Action Alternative could result in long term impacts to recreation. If the reservoir were to be operated at restricted elevations, like it is now, the visitation numbers could remain lower. If the low visitation numbers were to be ongoing the park would not be able to sustain itself and the park may need to be closed.

If the problem on the dam were to remain unchanged, over time the dam could fail and cause the recreation at Steinaker to be left as a campground only.

3.3.5.2 Proposed Action

Under the Proposed Action Alternative with construction for a year there would be some temporary impacts to recreation. The impacts on the recreation of Steinaker Reservoir would result in the reduction of visitors to the park that come solely for fishing, camping, water skiing, and swimming. The work is proposed to be completed through the winter months and through one summer and fall. The water recreation would be minimal during this time frame.

Any visitors that come to Steinaker would be forced to go to nearby Red Fleet Reservoir or on to other places in the region such as Starvation or Flaming Gorge Reservoirs.

3.3.6 Socioeconomics

Vernal, the county seat and largest city in Uintah County, had a population of 9,089 residents as of the 2010 Census. Population estimates as of July 1st 2015 place the resident population at 11,200 which is a 22.9% increase from the 2010 census [1].

[1] http://www.census.gov/quickfacts/table/PST045215/4980090

The estimated median household income, for Vernal, between the years 2010 – 2014 is estimated to be $54,947 (in 2014 dollars), while per capita income in the last 12 months (in 2014 dollars) is estimated to be $24,136 with 17.4% of people in poverty compared to the State of Utah average of 11.3% [2].

[2] http://www.census.gov/quickfacts/table/INC110214/4980090

Mean travel time to work is 15.3 minutes and 64.9% of people 16 years and older are employed in the civilian labor force. The percentage of people 25 years and older with at least a high school degree stands at 88.3% of which 15.5% have a Bachelor's degree or higher [3].

[3] http://www.census.gov/quickfacts/table/EDU635214/4980090

3.3.6.1 No Action

Under the No Action Alternative, there would be significant impact to socioeconomics of the community via lost revenues due to the loss of project purposes and the drop in visitors to Steinaker State Park.

3.3.6.2 Proposed Action

The Proposed Action Alternative would mitigate the loss of project purposes as well as recreational revenue at Steinaker State Park. No significant impact is anticipated during construction of the project.

3.3.7 Access, and Transportation

The Project is located within Uintah County and can be accessed from several cross streets and major roadways within the county. The impact area of influence for transportation includes roads that would be used during construction, operation and maintenance of the facilities.

3.3.7.1 No Action

The No Action Alternative would have no impact on access, and transportation.

3.3.7.2 Proposed Action

During construction, it is estimated that up to about 50 construction vehicles per day would travel to the site. The majority of the vehicle trips would be for transporting construction materials including concrete, excavation and backfill materials. The contractor would be transporting heavy construction equipment to the construction site. Upon completion of construction, vehicle trips are expected to be reduced to no more than 1 per day for O&M purposes.

The Proposed Action Alternative would have minor short-term effects during construction, but no long-term effects on access, and transportation.

3.4 Indian Trust Assets

Indian Trust Assets (ITA) are legal interests in property held in trust by the United States for Federally recognized Indian Tribes or Indian individuals. Assets can be real property, physical assets, or intangible property rights, such as lands, minerals, hunting and fishing rights, and water rights. The United States has an Indian trust responsibility to protect and maintain rights reserved by or granted to such tribes or individuals by treaties, statutes, and executive orders. These rights are sometimes further interpreted through court decisions and regulations. This trust responsibility requires that all Federal agencies take all actions reasonably necessary to protect trust assets. Reclamation carries out its activities in a manner which protects these assets and avoids adverse impacts when possible. When impacts cannot be avoided, Reclamation would provide appropriate mitigation or compensation. Implementation of the Proposed Action would have no foreseeable negative impacts on ITAs (see Section 5.6)

3.5 Environmental Justice

Executive Order 12898, established Environmental Justice as a Federal agency priority to ensure that minority and low-income groups are not disproportionately affected by Federal actions. Implementation of the Proposed Action would not disproportionately (unequally) affect any low-income or minority communities within the Project area. The reason for this is that the proposed Project would not involve population relocation, health hazards, hazardous waste, property takings, or substantial economic impacts. This action would therefore have no adverse human health or environmental effects on minority and low-income populations.

3.6 Cumulative Effects

In addition to Project-specific impacts, Reclamation analyzed the potential for significant cumulative impacts to resources affected by the Project and by other past, present, and reasonably foreseeable activities within the watershed. According to the Council on Environmental Quality's (CEQ) regulations for implementing NEPA (50 CFR §1508.7), a “cumulative impact” is an impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. It focuses on whether the Proposed Action, considered together with any known or reasonably foreseeable actions by Reclamation, other Federal or state agencies, or some other entity combined to cause an effect. There is no defined area for potential cumulative effects.

Based on Reclamation resource specialists' review of the Proposed Action, Reclamation has determined that this action would not have a significant adverse cumulative effect on any resources.

3.7 Summary of Environmental Effects

Table 3-2 summarizes environmental effects under the no action and proposed action alternatives.

Table 3-2
Summary of Environmental Effects

Project Resource	No Action	Proposed Action
Geology and soils resources	Potential Significant Impact	No Effect
Visual resources	No Effect	No Effect
Cultural resources	No Effect	No Adverse Effect
Paleontological resources	No Effect	No Effect
Wilderness and wild and scenic rivers	No Effect	No Effect
Hydrology	No Effect	No Effect
Water quality	No Effect	No Effect
System operations	Potential Significant Impact	Temporary Impact
Health, safety, air quality, and noise	Potential Significant Impact	Temporary Impacts
Prime and unique farmlands	Potential Impact	Temporary Impacts
Flood plains	Potential Impact	No Effect
Wetlands, riparian, noxious weeds and existing vegetation	Potential Impact	Temporary Impacts to vegetation
Fish and wildlife resources	Potential Impact	Temporary Impact
Threatened, endangered, and sensitive species	No Effect	No Effect
Recreation	Potential Impact	Temporary Impact
Socioeconomics	Potential Significant Impact	Temporary Impact
Access and transportation	Potential Impact	Temporary Impact
Water rights	Potential Significant Impact	No Effect

Chapter 4 Environmental Commitments

Environmental commitments, along with minimization measures in section 2.6 have been developed to lessen the potential adverse effects of the Proposed Action.

4.1 Environmental Commitments

The following environmental commitments would be implemented as an integral part of the Proposed Action.

1. Standard Reclamation Best Management Practices - Standard Reclamation BMPs would be applied during construction activities to minimize environmental effects and would be implemented by construction forces, or included in construction specifications. Such practices or specifications include sections in the present EA on geology and soils resources; visual resources; cultural resources; paleontological resources; hydrology; water quality; health, safety, air quality, and noise; waste material disposal; erosion control; flood plains; wetlands, riparian, noxious weeds and existing vegetation; fish and wildlife resources; access and transportation. Excavated material and construction debris may not be wasted in any stream or river channel in flowing waters. This includes material such as grease, oil, joint coating, or any other possible pollutant. Excess materials must be wasted at a Reclamation approved upland site well away from any channel. Construction materials, bedding material, excavation material, etc. may not be stockpiled in riparian, wetland, or water channel areas. Silt fencing would be appropriately installed and left in place until after revegetation becomes established, at which time the silt fence can then be carefully removed. Machinery must be fueled and properly cleaned of dirt, weeds, organisms, or any other possibly contaminating substances offsite prior to construction.

2. Cultural Resources – Any person who knows or has reason to know that he/she has inadvertently discovered possible human remains on Federal land, he/she must provide immediate telephone notification of the discovery to Reclamation's Provo Area Office archaeologist. Work would stop until the proper authorities are able to assess the situation onsite. This action would promptly be followed by written confirmation to the responsible Federal agency official, with respect to Federal lands. The Utah State Historic Preservation Office (SHPO) and interested Native American Tribal representatives would be promptly notified. Consultation

would begin immediately. This requirement is prescribed under the Native American Graves Protection and Repatriation Act (43 CFR Part 10) and the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470).

3. Paleontological Resources - Should vertebrate fossils be encountered by the proponent during ground disturbing actions, construction must be suspended until a qualified paleontologist can be contacted to assess the find.

4. Air Quality – Construction procedures would be followed to mitigate for temporary impact on air quality due to construction-related activities. These may include the application of dust suppressants and watering to control fugitive dust; minimizing the extent of disturbed surface; during times of high wind, restricting earthwork activities; and limiting the use of, and speeds on, unimproved road surfaces.

5. Fugitive Dust Control Permit - The Division of Air Quality regulates fugitive dust from construction sites, requiring compliance with rules for sites disturbing greater than one-quarter of an acre. Utah Administrative Code R307-205-5, requires steps be taken to minimize fugitive dust from construction activities.

6. Flood Plains – The contractor would be compliant with all rules and regulations of the Federal Floodplain Insurance Program as administered by the local city or county floodplain administrator.

7. Vegetation – Design and treatment activities would ensure that vegetation would be protected with no long term adverse effects. Staging areas would be in previously disturbed areas to the extent possible.

8. Invasive Species – Appropriate steps would be taken to prevent the spread of, and to otherwise control, undesirable plants and animals within areas affected by construction activities. Equipment used for the Project would be inspected for reproductive and vegetative parts, foreign soil, mud or other debris that may cause the spread of weeds, invasive species and other pests. Such material would be removed before moving vehicles and equipment. Upon the completion of work, decontamination would be performed within the work area before the vehicle and/or equipment are removed from the Project site if work was conducted in an area infested with noxious weeds.

   The contractor would make periodic inspections following vegetation of disturbed areas to locate and control populations of noxious weeds, if present. All seed used for restoration would be certified “noxious weed free" before use. If needed, the County Weed Control Department could be contacted to provide services to control the spread of noxious weeds.

9. Fish and Wildlife Resources –

   a. Migratory Bird Protection

      i. Perform any ground-disturbing activities or vegetation treatments before migratory birds begin nesting or after all young have fledged.

      ii. If activities must be scheduled to start during the migratory bird breeding season, take appropriate steps to prevent migratory birds from establishing nests in the potential impact area. These steps could include covering equipment and structures and use of various excluders (e.g., noise). Prior to nesting, birds can be harassed to prevent them from nesting on the site.

      iii. If activities must be scheduled during the migratory bird breeding season, a site-specific survey for nesting prior to groundbreaking activities or vegetation treatments. Established nests with eggs or young cannot be moved, and the birds cannot be harassed (see b., above), until all young have fledged and are capable of leaving the nest site.

      iv. If nesting birds are found during the survey, appropriate spatial buffers should be established around nests. Vegetation treatments or ground-disturbing activities within the buffer areas should be postponed until the birds have left the nest. Confirmation that all young have fledged should be made by a qualified biologist.

   b. Raptor Guidelines – The contractor would adhere to the U. S. Fish and Wildlife Service (USFWS) Raptor Guidelines by placing seasonal and spatial "no construction" buffers, along with daily timing restrictions around all active raptor nests or winter roosting bald eagles. If unknown nests are located during construction, the same guidelines would be implemented.

10. Threatened and Endangered Species – Construction activities would avoid Ute Ladies'-tresses habitat.

11. Public Access - Construction sites would be closed to public access. Temporary fencing, along with signs, would be installed to prevent public access.

12. Disturbed Areas - All disturbed areas resulting from the Project would be smoothed, shaped, contoured, and rehabilitated to as near the pre-Project

construction condition as practicable. After completion of the construction and restoration activities, disturbed areas would be seeded at appropriate times with weed-free, native seed mixes having a variety of appropriate species (especially woody species where feasible) to help hold the soil around structures, prevent excessive erosion, and to help maintain other riverine and riparian functions. The composition of seed mixes would be coordinated with wildlife habitat specialists and Reclamation biologists. Weed control on all disturbed areas would be required. Successful revegetation efforts must be monitored and reported to Reclamation, along with photos of the completed Project.

13. Additional Analyses – If the Proposed Action were to change significantly from that described in the EA, because of additional or new information, or if other construction areas are required outside the areas analyzed in this EA, additional environmental analysis including cultural and paleontological analyses would be undertaken, if necessary.

Chapter 5 Consultation and Coordination

5.1 Introduction

This chapter details other consultation and coordination between Reclamation and other Federal, state, and local Government Agencies, Native American Tribes, and the public during the preparation of this EA. Compliance with NEPA, is a Federal responsibility that involves the participation of all of these entities in the planning process. NEPA requires full disclosure about major actions taken by Federal agencies and accompanying alternatives, impacts, and potential mitigation of impacts.

5.2 Public Involvement

On November 3, 2016, Reclamation mailed 91 scoping letters to land owners, canal companies, the public, municipalities, organizations and state and Federal agencies, notifying them of the Project and inviting them to an open house. Approximately 41 individuals were in attendance. Many verbal comments and one written comment were received during the public meeting and were considered and incorporated into this draft EA.

On December 6, 2016, Reclamation mailed 120 notices that the draft EA was available on the internet at www.usbr.gov/uc/envdocs/index.html for review by land owners, canal companies, the public, municipalities, organizations and state and Federal agencies for a 21-day comment period which ends on December 27, 2016. The public was notified that if they want a CD or hard copy of the draft EA it would be provided. All comments will be considered in the Final EA.

5.3 Native American Consultation

Reclamation conducted Native American consultation throughout the public involvement process. An initial proposal letter was mailed on March 7, 2016. A consultation letter and copy of the Class III Cultural Resource Inventory Report were mailed on November 22, 2016 to the Hopi Tribe of Arizona, Navajo Nation, Arizona, New Mexico & Utah, Northwest Band Shoshone Tribe, Santa Clara Pueblo, New Mexico, Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho, Shoshone Tribe of the Wind River Reservation, Southern Ute Tribe of the Southern Ute Reservation, Ute Mountain Tribe of the Ute Mountain Reservation, Ute Tribe of the Uintah and Ouray Reservation, Zuni Tribe of the Zuni

Reservation, New Mexico. This consultation was conducted in compliance with 36 CFR 800.2(c)(2) on a government-to-government basis. Through this effort the tribe is given a reasonable opportunity to identify any concerns about historic properties; to advise on the identification and evaluation of historic properties, including those of traditional religious and cultural importance; to express their views on the effects of the Proposed Action on such properties; and to participate in the resolution of any adverse effects.

The Hopi Tribe of Arizona and the Santa Clara Pueblo, New Mexico, both responded (see Chapter 10 Appendix). These tribes are interested in the project and wish to be kept informed of project activities and determinations. The Santa Clara Pueblo recommend that: "…a site monitor be present during construction activities and construction to be halted if any inadvertent discoveries are made and Santa Clara Pueblo be contacted to provide comment."

5.4 Utah Geological Survey

Reclamation requested a paleontological file search from the UGS to determine the nature and extent of paleontological resources within the APE on November 28, 2016. File search results and recommendations from the UGS were received in a letter dated November 28, 2016 (Chapter 10 Appendix).

5.5 Utah State Historic Preservation Office

A copy of the Class III Cultural Resource Inventory Report and a determination of no adverse effect to historic properties for the Proposed Action were submitted to the SHPO on November 22, 2016.

5.6 Bureau of Indian Affairs

In an email dated November 28, 2016, Reclamation's archeologist, Dr. Zachary Nelson, requested an evaluation of Indian Trust Assets (ITAs) within the APE from the BIA, Uintah and Ouray Agency. Reclamation received no response from the BIA identifying any ITAs impacted by the Proposed Action.

5.7 US Army Corps of Engineers

The Proposed Action would require the discharge of dredged or fill material below the ordinary high water mark of Steinaker Reservoir, which appears to be considered a "waters of the United States". It is anticipated that the Proposed Action would qualify for a nationwide permit that is issued for activities resulting in minimal individual and cumulative adverse effects on the aquatic environment. In compliance with Section 404 of the Clean Water Act of 1977, a formal permit application would be submitted to the USACE to determine the extent of jurisdiction and impacts.

Chapter 6 Preparers

The following is a list of preparers who participated in the development of the EA. They include Reclamation team members and UWCD members.

Table 6-1
Reclamation Team Members

Name	Title	Resource
Mr. Rick Baxter	ESA Coordinator	Bureau of Reclamation
Mr. Scott Blake	Recreation and Visual	Bureau of Reclamation
Mr. Peter Crookston	NEPA Team Leader	Bureau of Reclamation
Mr. Dale Hamilton	Engineer	Bureau of Reclamation
Mr. Jeff Hearty	Economist	Bureau of Reclamation
Mr. Gary Henrie	Engineer	Bureau of Reclamation
Mr. Bart Leeflang	Engineer	Bureau of Reclamation
Mr. Ryan Luke	Engineer	Bureau of Reclamation
Ms. Linda Morrey	Secretary	Bureau of Reclamation
Mr. Zachary Nelson	Archaeologist	Bureau of Reclamation
Mr. Prashant Singh	Economist	Bureau of Reclamation
Mr. Justin Record	Water Rights	Bureau of Reclamation
Mr. David Snyder	CWA Coordinator	Bureau of Reclamation
Mr. Spencer Strand	Engineer	Bureau of Reclamation
Ms. Rachelle Vanderplas	Geologist	Bureau of Reclamation

Table 6-2
Uintah Water Conservancy District Members

Name	Title	Company
Mr. Gawain Snow	General Manager	Uintah Water Conservancy District
Mr. John Hunting	Assistant Manager	Uintah Water Conservancy District

Chapter 7 Acronyms and Abbreviations

Acronym/Abbreviations	Meaning
APE	Area of Potential Effect
BLM	Bureau of Land Management
BA	Biological Assessment
BIA	Bureau of Indian Affairs
BMP	Best Management Practices
BO	Biological Opinion
Canal	Steinaker Service Canal
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Cfs	Cubic Feet Per Second
CWA	Clean Water Act
UWCD	Uintah Water Conservancy District
DEQ	State of Utah Department of Environmental Quality
DWR	State of Utah Division of Wildlife Resources
DWRi	State of Utah Division of Water Rights
EA	Environmental Assessment
EPDM	Ethylene Propylene Diene Monomer
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
HDPE	High Density Polyethylene
ITA	Indian Trust Assets
LUST	Leaking Underground Storage Tank
MSL	Mean Sea Level
NEPA	National Environmental Policy Act
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O&M	Operation and Maintenance
PVC	Polyvinyl Chloride
Reclamation	U.S. Bureau of Reclamation
SHPO	Utah State Historic Preservation Office

Acronym/Abbreviations	Meaning
UDOT	State of Utah Department of Transportation
UGS	Utah Geological Service
ULT	Ute-ladies'-tresses
UPDES	Utah Pollution Discharge Elimination System
USFWS	U.S. Fish and Wildlife Service
U.S.C	United States Code
UST	Underground Storage Tanks
USACE	US Army Corps of Engineers
UWCD	Uintah Water Conservancy District

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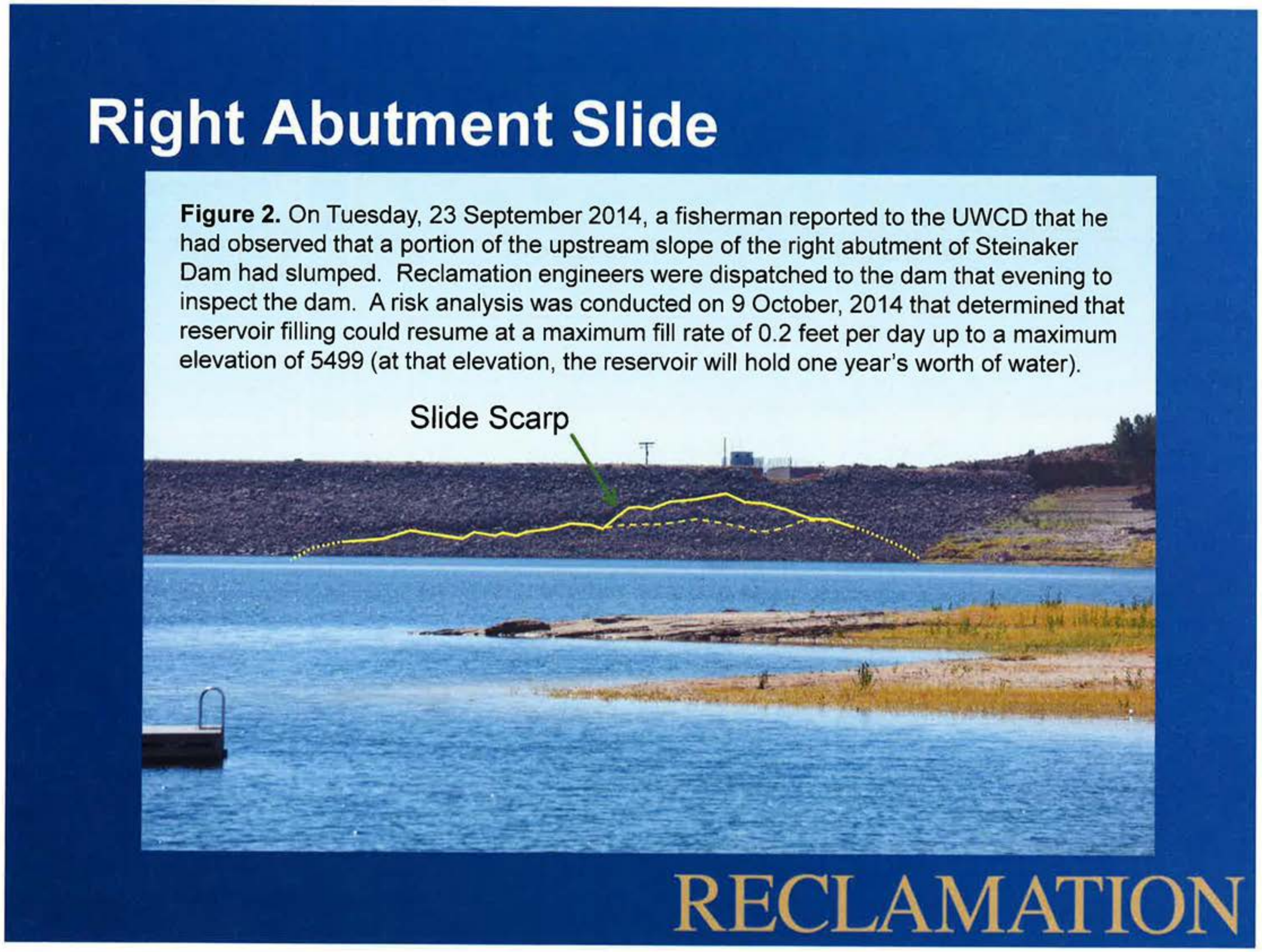
Utah State Parks and Recreation Website
https://stateparks.utah.gov/resources/park-visitation-data/

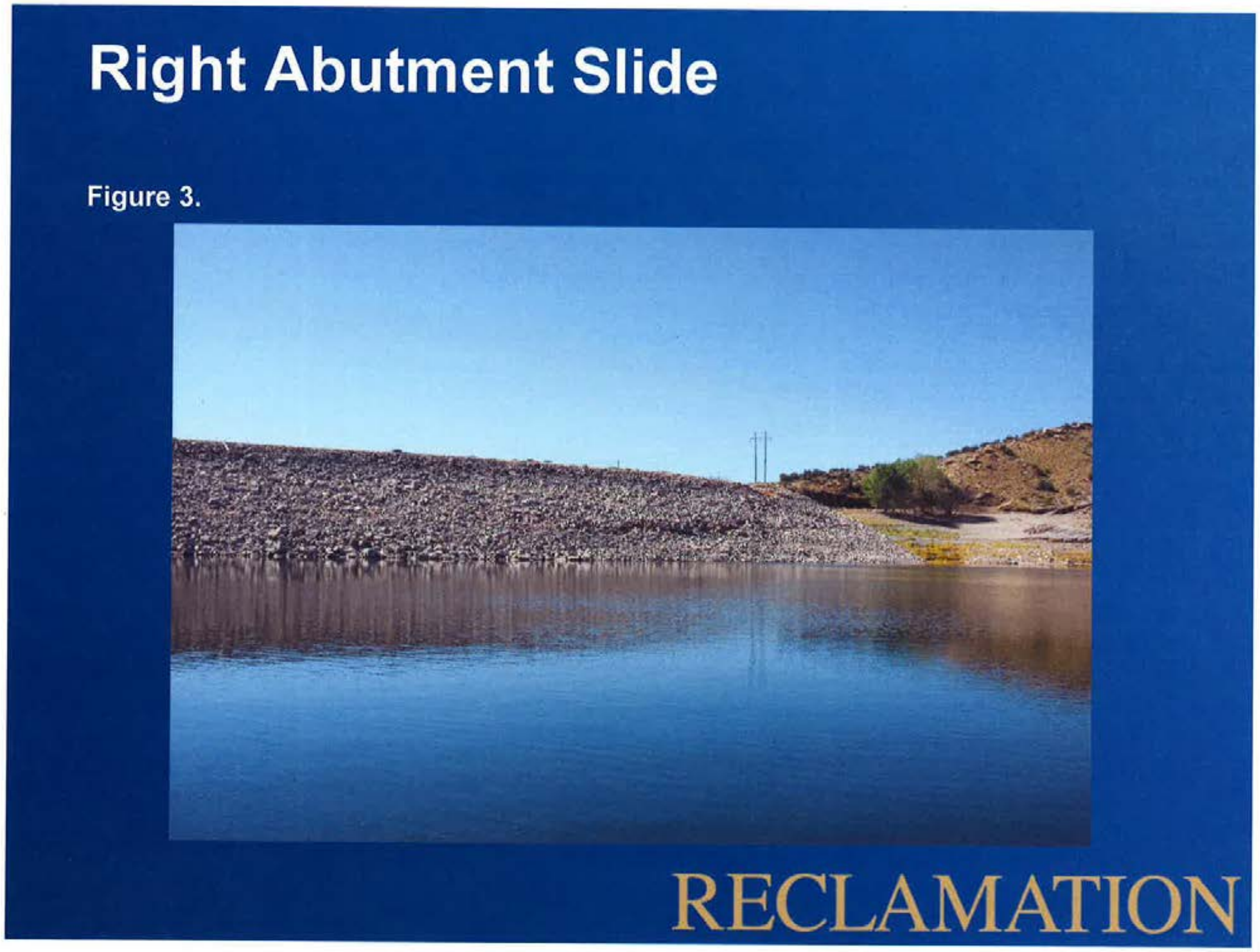
Chapter 9 Figures

Figure 1.

Steinaker Dam is a principal feature of the Vernal Unit of the Central Utah Project. Located approximately 3.5 miles north of Vernal, Utah, Steinaker Dam impounds Steinaker Reservoir, an off-stream reservoir with a total capacity of 40,043 acre-feet at elevation 5520.5 feet., enough to supply two-years' worth of irrigation water.

RECLAMATION


Right Abutment Slide
Figure 2. On Tuesday, 23 September 2014, a fisherman reported to the UWCD that he had observed that a portion of the upstream slope of the right abutment of Steinaker Dam had slumped. Reclamation engineers were dispatched to the dam that evening to inspect the dam. A risk analysis was conducted on 9 October, 2014 that determined that reservoir filling could resume at a maximum fill rate of 0.2 feet per day up to a maximum elevation of 5499 (at that elevation, the reservoir will hold one year's worth of water).
Slide Scarp
RECLAMATION


Right Abutment Slide
Figure 3.
RECLAMATION

Main Dam

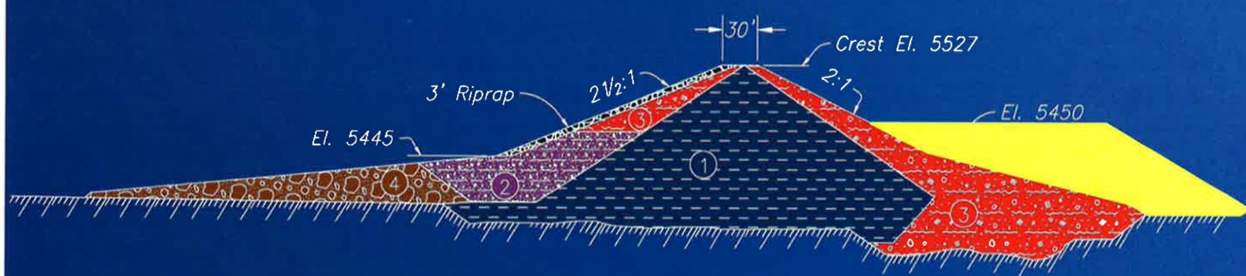


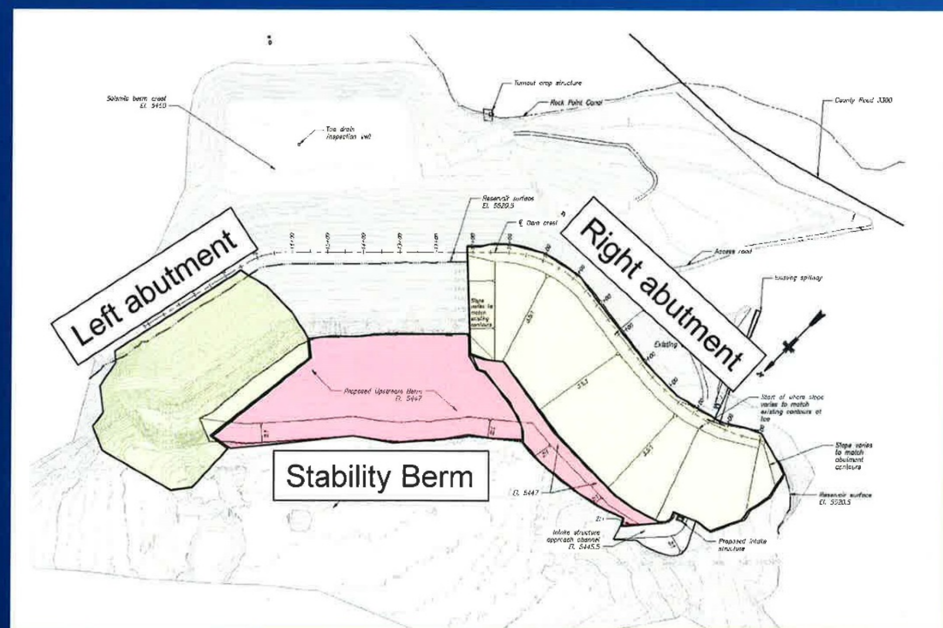
Figure 4.

The dam is a rolled, zoned earthfill embankment with a structural height of 162 feet and a hydraulic height of 138 feet, a crest width of 30 feet and a crest length of 1,997 feet. The upstream face has a 2.5H:1V slope from the crest to elevation 5445 and a 10H:1V slope to the foundation. The upstream face is protected by a 3-ft-thick layer of riprap overlying zone 2 & 3 material.

RECLAMATION

Proposed Action

Figure 5.

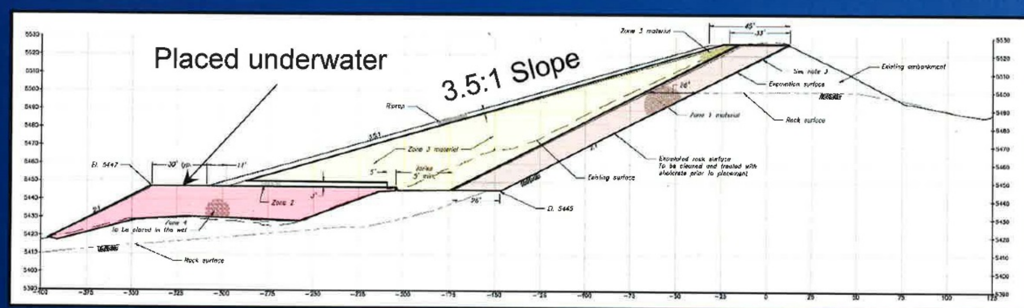


8

RECLAMATION

Proposed Action

Figure 6.



RECLAMATION

Chapter 10 Appendix

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

State of Utah

DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER
Executive Director

Utah Geological Survey

RICHARD G. ALLIS
State Geologist/Division Director

November 28, 2016

Zachary Nelson
U. S. Bureau of Reclamation
Provo Area Office
302 East 1860 South
Provo, UT 84606

RE: Paleontological File Search and Recommendations for the Steinaker Dam Repair Project, Uintah County, Utah
U.C.A. 79-3-508 compliance; literature search for paleontological specimens or sites

Dear Zac:

I have conducted a paleontological file search for the Steinaker Dam Repair Project in response to your request of January 29, 2016.

There are no paleontological localities recorded in our files for this project area. Quaternary and Recent alluvial deposits, artificial fill and the Cretaceous Frontier Formation deposits that are exposed over most of this project area have a low potential for yielding significant fossil localities (PFYC 1- 2). Along the shoreline about 0.5 km north of the project area, there is a significant locality consisting of dinosaur remains from the Cretaceous Dakota Formation. This unit (along with the Mowry Shale that commonly contains fish scales) is also exposed at the western edge of the project area, so please be aware of potential impacts to paleontological resources if these deposits are disturbed (PFYC 3-4). Otherwise, unless vertebrate fossils are discovered as a result of construction activities, this project should have no impact on paleontological resources.

If you have any questions, please call me at (801) 537-3311.

Sincerely,

Martha Hayden
Paleontological Assistant

1594 West North Temple, Suite 3110, PO Box 146100, Salt Lake City, UT 84114-6100
telephone (801) 537-3300 • facsimile (801) 537-3400 • TTY (801) 538-7458 • *geology.utah.gov*

Chapter 11 Cultural History Overview

The following discussion of the cultural history of the project area quotes extensively from the existing Resource Management Plan for Steinaker Reservoir (Reclamation 2013) and is copied from Nelson (2016).

The project area lies on the border between the Uinta Mountains, an east-west trending, 150-mile-long mountain range in northeastern Utah and the distinctly bowl-shaped region known as the Uinta Basin. Both the Uinta Mountains and Uinta Basin are sections of what geologist William Lee Stokes refers to as the Colorado Plateau physiographic province (1986). The general culture history of the Study Area described below is based on the broader cultural chronological sequence of the Uinta Basin.

Archaeological evidence of human occupation in the Uinta Basin extends as far back as about 11,000 years ago, the beginning of what is generally referred to as the Paleo-Indian Period (ca 13,000 BP–6,000 BC). The Paleo-Indian Period is characterized by human adaptation to terminal Pleistocene environments and the exploitation of various extinct and modern megafauna (Lower-Eskelson 2007). A deficiency in evidence of plant procurement as well as repeated or longer-term occupation suggests that Paleo-Indian populations in the Uinta Basin were highly mobile. Although distinctive artifacts typically associated with the hunting of Pleistocene megafauna have been discovered in the Uinta Basin, there remains a lack of stratified sites exhibiting evidence of human occupation prior to about 6,000 BC. Paleo-Indian projectile points from the Uinta Basin (i.e., Clovis, Folsom, Goshen, Agate Basin, Hell Gap, Eden-Scottsbluff, and Alberta-Cody), however, are identical to those from the northwestern plains region of the North America, which have been recovered in chronometrically dated contexts from this period (Spangler 1995). As a result, even though a detailed account of the nature and extent of human occupation in the Uinta Basin during the Paleo-Indian Period remains difficult without sufficient site data, the existence of these projectile points implies that the area was inhabited during the Paleo-Indian Period.

The next period in the cultural chronological sequence of the Uinta Basin is known as the Early Archaic Period (ca 6,000 BC–3,000 BC). According to Jennings (1978), a shift to a “mobile hunting-collecting way of life” marks the transition from the Paleo-Indian to the Early Archaic Period. In addition, new projectile point types also appear during the Early Archaic Period (i.e., Pinto Series, Humboldt, Elko Series, Northern Side-Notched, Hawken Side-Notched, Sudden Side-Notched, and Rocker Base Side-Notched). This change in projectile point production is seen by some as a reflection of the development of the atlatl for the pursuit of smaller, faster game (Holmer 1986). The discovery of projectile points that are characteristic of the Early Archaic Period in association with temporary camps and lithic scatters suggests that human occupations in the region were sporadic. The Early Archaic inhabitants of the Uinta Basin likely practiced nomadic exploitation of local resources in small groups based on seasonal and locational availability (Spangler 1995). Although cultural remains from the Paleo-Indian and Early Archaic Periods remain sparse in the Uinta Basin, dozens of archaeological sites representing the next cultural chronological sequence period, the Middle Archaic, exist in the region.

The shift from the Early Archaic to the Middle Archaic Period in the Uinta Basin is demonstrated by an increase in human populations and the appearance of the distinctive McKean Complex projectile points (Spangler 1995). The Middle Archaic Period (ca 3,000 BC–500 BC) sites illustrate cultural influences from the plains region of North America. The continued production and use of Elko Series projectile points, however, indicates cultural influences from the Great Basin and/or northern Colorado Plateau as well (Spangler 1995). Most researchers agree that Middle Archaic populations in the Uinta Basin were mobile foragers whose subsistence patterns included predominantly hunting, supplemented with gathering. This theory is supported by the fact that no permanent settlements have been discovered in the region, although a few semi-permanent base camps have been noted. Middle Archaic Period subsistence activities were likely conducted within the context of small bands. These small bands hunted game and procured locally available floral resources from one of these semi-permanent base camps (Spangler 1995). As the Middle Archaic Period transitioned into the Late Archaic Period, the subsistence strategies and settlement patterns that are generally associated with the Early and Middle Archaic Periods began to change.

As the Late Archaic Period (ca 500 BC–AD 550) began, McKean Complex projectile points vanish. Semi-subterranean residential structures began to appear regularly at base camps beginning around AD 1. At the same time, the introduction of maize horticulture, the bow and arrow, and Rose Spring arrow points suggest that, in addition to the traditional Archaic mobile hunter-gatherer subsistence strategies prevalent during the Early and Middle Archaic Periods, a new strategy incorporating horticulture and a more sedentary lifestyle emerged (Spangler 1995). The Archaic Periods were followed by a series of Formative Stage cultures, groups that were even more dependent on foods produced through horticulture (Jennings 1978).

The Formative Stage (ca AD 550–AD 1300) and the "Fremont culture," a term generally associated with the people of the Formative Stage, remains the most thoroughly investigated period of the cultural chronological sequence of the Uinta Basin. Even with the breadth of research associated with the Formative Stage, important questions regarding temporal ranges, geographic distribution, settlement patterns, and subsistence strategies, to name a few, remain unanswered. Some broad distinctions, however, can be made between the Late Archaic Period and the Formative Stage. In addition to a greater, perhaps dominant, importance placed on horticulture as a subsistence strategy, one such distinction involves an increase in the complexity of residential architecture. Architectural advancements include prepared clay floors, adobe-rimmed fire pits, and coursed-masonry architecture (Spangler 1995). An increase in the size of food-storage structures, typically associated with food surplus, also demarcates the Formative Stage. The manifestation of small villages and farmsteads, elaborate rock art and figurines, and ceramics suggest an "enhanced social complexity" during this period (Spangler 1995).

In the Uinta Basin, specifically, the Fremont culture is characterized by "shallow, saucer-shaped pithouses or surface structures with randomly placed potholes and off-center fire pits, some of which were adobe-rimmed" (Spangler 1995). Surface storage structures were nearly absent and Uinta Gray ceramics dominated all other types. Uinta Gray ceramics were constructed using a coil-and-scrape method are almost exclusively tempered with crushed calcite (Madsen 1977). Unlike the Fremont cultures in other portions of Utah, the Uinta Basin Fremont did not use the Utah-type metate nor did they produce unfired clay figurines. Gilsonite, a natural asphalt found only in the Uinta Basin, was used to repair broken ceramics (Marwitt 1970). The use of gilsonite marks another distinguishing feature of the Uinta Fremont. Projectile points used in the Uinta Basin during the Formative Stage include Rose Springs, Cottonwood triangular, Eastgate expanding-stem, and Elko corner-notched varieties. By AD 1300, evidence of the Fremont culture in the Uinta Basin disappears, giving way to what is commonly termed the Protohistoric Period (AD 1300–1650).

The reasons for the disappearance of Fremont culture sites in the Uinta Basin remain unclear. Some researchers postulate that climatic changes or the pressures of other cultural groups entering the region caused the Fremont culture abandonment (Jennings 1978). Others believe that the Fremont culture didn't actually abandon the Uinta Basin, but rather, that Fremont culture peoples coexisted with the new groups, such as the ancestral Ute (Uinta-ats) and Shoshone. A sheer lack of archaeological data associated with the Protohistoric Period in the Uinta Basin leaves many questions about the cultural continuity, or lack thereof, unanswered. Whatever the reasons, evidence points to a disappearance of horticulture and subsequent dominance of a more hunter-gatherer-oriented subsistence strategy, traditionally referred to as Shoshonean or Numic. Although earlier Formative Stage Fremont culture remains turn up at some archaeological sites dating to the Protohistoric Period, the Protohistoric Period material culture in the Uinta Basin, unlike earlier Fremont sites, includes Desert side-notched projectile points, Shoshonean ceramics, and occasionally, basketry and Shoshonean knives. Decidedly different rock art styles from those of the Formative Period also appear (Spangler 1995). One distinct aspect of Protohistoric Period rock art in the Uinta Basin is the representation of the horse. The introduction of the horse into the Uinta Basin cultures occurred sometime during the late stages of the Protohistoric Period. Contact between Euro-American peoples and Native American groups to the south eventually led to the animals' dissemination into the basin. The introduction, and subsequent dependency, of the horse in Protohistoric Period cultures marks the shift to the next period in the cultural chronological sequence of the Uinta Basin.

The Historic Ute Period (ca AD 1650–present) follows the Protohistoric Period. According to Spangler (1995), the Historic Ute Period actually consists of three distinct phases, the Antero Phase (ca AD 1650–1861), the Early Reservation Phase (ca AD 1861–1881), and the Late Reservation Phase (ca AD 1881–present). The Antero Phase is generally classified as the time period when those Protohistoric Period groups living in the Uinta Basin first adopted a lifestyle highly dependent on the horse but prior to their confinement to reservations. Subsistence strategies during this time continued to include both hunting and gathering, although the introduction of the horse dramatically changed the dynamics of these strategies. Groups in the Uinta Basin became exceptionally mobile, exploiting floral and faunal resources all over Utah. In addition to buffalo, historical accounts reference seasonal hunting forays into the Uinta Basin for fish, fowl, and lacustrine plant resources (Spangler 1995). Small bands of 10 to 40 individuals, and occasionally larger groups numbering in the hundreds, travelled throughout the region hunting and gathering.

Ute peoples during this period experienced rapid social, political, and economic change (Spangler 1995). The aforementioned use of horses contributed greatly to the changes, as did the arrival of Euro-American explorers into the Uinta Basin. According to historical descriptions, the first Euro-American explorers to enter the Uinta Basin were members of the small Spanish expedition from Santa Fe, New Mexico, headed by Fray Silvestre Velez de Escalante and Fray Francisco Atanasio Dominguez. The Dominguez-Escalante expedition traveled through the Uinta Basin in 1776 searching for a land route to Monterey, California. These explorers opened the Uinta Basin to Spanish, and later Mexican, American, and British fur-trappers and traders.

With the arrival of Euro-American explorers came trade with the Ute groups in the Uinta Basin. Euro-American items such as weaponry, blankets, metal utensils, and glass ornaments were often traded for animal furs during the early nineteenth century. This eventually led the Ute peoples to become increasingly dependent upon these trade goods. Euro-American trade with these Native American groups, along with intermarriage between Euro-Americans and the Native American groups in the Uinta Basin, “irreversibly altered traditional lifeways” (Spangler 1995). The practice of slave trading and exacting tribute from traders also became prevalent by the 1830s. Increased territoriality and warfare were among the results of such practices.

Several important U.S. government expeditions (official and unofficial) also visited the Uinta Basin during the Antero Phase, including the Captain John C. Fremont expedition in the 1840s. The government declared that the intent of these expeditions involved surveying and mapping undiscovered western territories

(Spangler 1995). The Uinta Basin drew little interest during this initial exploration. Many saw the climate and environment as unsuitable for settlement. In 1852 Mormon leader Brigham Young ordered small survey parties to explore the Uinta Basin to determine the suitability for locating settlements there. Upon their return the survey parties reported that the Uinta Basin was one vast contiguity of waste and measurably valueless (Fuller 1994). As a result Young decided not to send Mormon settlers to the region. Mormon leaders did, however, decide that the Uinta Basin was a suitable region for the relocation of Ute peoples. Near the end of the Antero Phase, the social and political attitudes of the Mormon leaders toward the Native American groups led to their dispossession from their traditional territories around Utah Lake.

Violence resulting from the dispossession and relocation of the Ute peoples resulted in the creation of the first reservation in the Uinta Basin in 1861 (see Conetah 1982 for discussion). The creation of the Uintah Reservation marks the beginning of the Early Reservation Phase of the Historic Ute Period. According to Spangler (1995), this phase is defined as the period when Ute peoples throughout Utah were systematically removed from their traditional territories and forced to live in the Uintah Reservation. The reservation originally included western Uintah County, most of modern-day Duchesne County, and the Strawberry Valley (Spangler 1995). Ute peoples participated in government-sponsored agricultural projects, and relations on the reservation were relatively peaceful. The arrival of government surveying parties in 1876 and the subsequent arrival of homesteaders to the reservation in the late 1870s, however, led the Ute peoples to suspect a government plan to open the reservation to white settlers. As the Early Reservation Phase came to an end, the Ute culture was experiencing "tremendous social upheaval precipitated by at least three decades of intensive association with Euro-Americans" (Spangler 1995). The Ute peoples of western Colorado were facing similar issues.

By 1881 violence over the dispossession of traditional territories in the region culminated in the forcible relocation of Ute peoples from western Colorado to a new temporary reservation, the Ouray Reservation, in the Uinta Basin (see Conetah 1982 for discussion). According to Spangler (1995), this marks the beginning of the Late Reservation Phase of the Historic Ute Period. The forced settlement of so many different Ute bands in the Uinta Basin led to serious friction. Increased Mormon settlement in the Uinta Basin continued to promote Ute fears of white settler infiltration of reservation lands. Ute lifeways now included cattle ranching, cultivation of crops, and dairy farming. The Late Reservation Phase was also marked by a decisive plan of enculturation by the U.S. government. Through the use of government-assigned reservation superintendents, Ute peoples were to be made into "carbon-copy white men" (Spangler 1995). The discovery of gilsonite and valuable hydrocarbon resources in the Uinta Basin in the late 1880s led to the withdrawal of 7,000 acres from the Uinta Reservation (Fuller 1994). The subsequent establishment of U.S. military forts and the official opening of the

Uintah and Ouray Reservations to white settlement in 1887, with the Dawes Severalty Act, marked the final dispossession of the Ute peoples (Conetah 1982).

With an influx of white settlers (mostly farmers and ranchers) entering the Uinta Basin, complex irrigation systems and additional rangelands were needed. This led to the dispossession of Ute peoples from the reservation lands originally set aside for their exclusive use following their previous dispossession from traditional territories (see Conetah 1982 for discussion). Initially, livestock represented the main industry of white settlers in the Uinta Basin, likely due to the availability of grass and water in the region. Eventually, the sheep industry boomed, contributing to a decline in the cattle industry (Lower-Eskelson 2007). Commercial oil production began in 1948 but was not fully exploited until the 1970s with increases in the price of crude oil. Consequently, private and public ventures began work to develop an inexpensive process for separating oil from oil shale and tar sands, both prevalent in the Uinta Basin.

Around 1980, international oil prices began to fall and the economic health of the Uinta Basin, based heavily on the oil industry, fell sharply. The development of water resources for other parts of Utah, especially the Wasatch Front, led to another temporary economic stimulus. Today, little evidence of the aforementioned economic flourishes remains (Fuller 1994). What does remain is a fairly small population base of both farmers and ranchers as well as Ute peoples on the Uintah and Ouray Reservation, who are supported by a fragile economy based on petroleum and mining. According to Burton (1996), an estimated 30 percent of jobs in the Uinta Basin were related to mining and petroleum.

The Central Utah Project, Vernal Unit (based on Eastman 2007)

The idea for a dam within the Ashley Valley is credited to Howard S. Reed in 1903 while prospecting for potential dam sites in the Uinta Basin. However, other priorities interfered with his plan for several decades.

The Colorado River Storage Project (CRSP), signed in 1956, became the legislative route for authorization. Basically, the CRSP would dam portions of the Colorado River and its tributaries for hydroelectric power and irrigation purposes. The Vernal Unit was authorized under CRSP and its primary feature is an off stream reservoir in the Steinaker Draw (Figure 3.1). The dam is named after the family which settled the area. During investigations and early project history, the name was rendered "Stanaker," reflecting an error originating on 1906 USGS maps. Reclamation perpetuated this error for several years, but in response to petitions from local citizens Reclamation changed the name to reflect the family spelling of the name, "Steinaker".

Budgetary appropriation for the dam occurred in 1958 with $1 million committed to the enterprise. On April 1, 1959, the contract was awarded to Morrison-Knudsen

(M-K) of Salt Lake City as the low bidder with an apparent low bid of $1,659,428.75 (Figure 3.2). The first contract was for the diversion and conveyance system which delivers water to the off-stream Steinaker Reservoir.

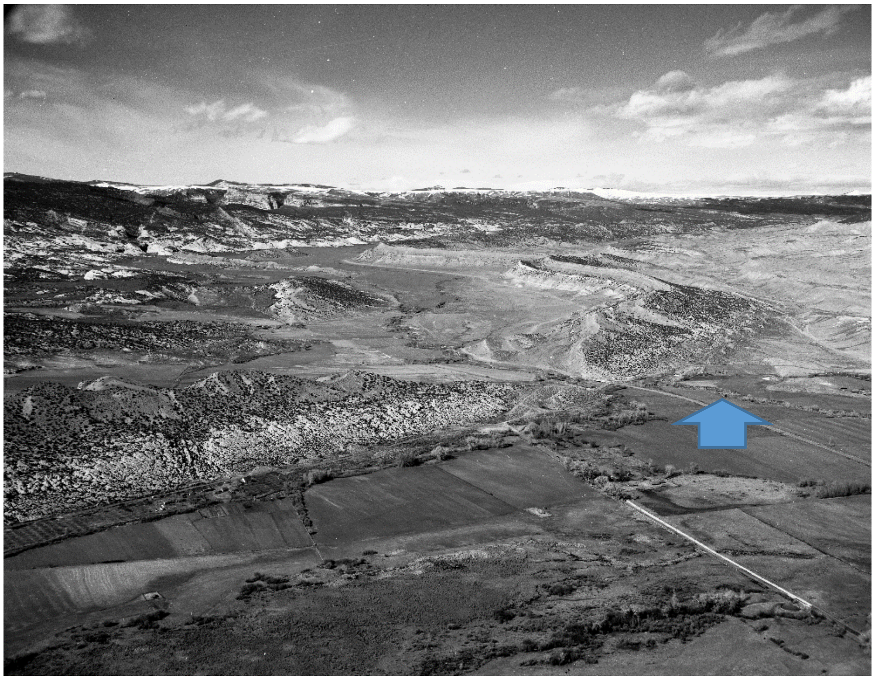


Figure 0.1 Aerial photograph of Steinaker Wash. Blue arrow indicates proposed dam location. Project photograph P325-418-0009b. Photograph taken around April, 1959.

Figure 0.2 Opening the construction bids. From left to right are: Parley Neeley, Project Manager, USBR; C. H. Carter, Asst. Regional Director, USBR; Alton Peterson, Construction Engineer, Stanaker Unit, Vernal Unit; A. L.

Roarck, Area Manager, and Howard J. Bellows, Area Engineer, both of Morrison-Knudsen Company. Project photograph P325-418-0002, Photograph by Stan Rasmussen, 4/1/1959.

The Fort Thornburgh Diversion Dam redirects water from Ashley Creek into the three mile Steinaker Feeder Canal which supplies Ashley Creek water to Steinaker Reservoir. The second contract was for the Steinaker Service Canal. After being released through the six foot outlet works tunnel in the right abutment, the twelve mile canal delivers reservoir water to existing canals in the valley through the Steinaker Service Canal. Additionally, Reclamation issued contracts for three secondary physical features, laterals, drainage, and a municipal waterline. In a few locations, short laterals connect the Steinaker Service Canal to the existing irrigation canals. Following completion of the primary project features, the water district and Reclamation officials determined a drainage program would be needed. Finally, Reclamation partnered with the water district and the local communities in the construction of a 17.3 mile water line to supply culinary water.

As M-K's crews worked on the dam (Figure 3.3), numerous other contractors worked on relocating the highway and utilities from the reservoir area. The Vernal Sand and Gravel Company began relocating the highway in April, and traffic moved off the old section by July 9, 1959. County road crews worked to relocate a half mile section of county road in the same area during June and July. Crews from the Mountain States Telephone and Telegraph Company removed their line from the reservoir area in June while the Wasatch Line Construction Company relocated 3.5 miles of a Forest Service Telephone line in August.

.3

Figure 0.3 Photo is taken during first blasting operation. Looking toward left abutment. Project photograph P325-418-0264, Photograph by Elmer S. Davis, 3/26/60.

The Moon Lake Electric Association also completed the relocation of its lines in August. The Utah Power and Light Company was the only company with remaining power lines in late 1959. The company had awarded a contract, but the work was held up because the government had not completed acquisition of the new right of way.

The Annual History has an important note in the December 7, 1959 report:
On the afternoon of November 20, skeletal remains of a human were exposed in excavation of the left abutment, Station 17+00, 143 feet downstream from the dam axis at elevation 5400 (Figure 3.4). Further excavation in this area revealed fragments of two other humans. Mr. James H. Gunnerson, Curator, Museum of Anthropology, University of Utah, visited the site on November 25 and made a preliminary examination of the bones. His opinion was that the skeletons were those of Indians of undetermined antiquity who had been buried in crevices in the rocks. The bones were turned over the Mr. Gunnerson for the Museum of Anthropology at the University of Utah (See Reclamation 1959:86).
Subsequently, the location was assigned site number 42UN128.

Figure 0.4 Photograph of Skeleton. Project photograph P325-418-0217, photograph by Elmer S. Davis, 11/20/1959.

M-K resumed placement of zone 3 embankment material on April 5, 1960, and zone 1 on April 22, 1960. The contractor used Euclid S-18 and TS-24 scrapers to excavate and transport material from the Reservoir Borrow Area for zone 1. A fleet of twenty trucks hauled material for the zone 3 embankment from the Ashley Creek Borrow area to the dam. The high water table limited the amount of material that could be taken from this area. Water proved problematic throughout construction. During excavation of the foundation, the contractors encountered water pockets at various depths which required exploratory trenches and a dewatering program.

The concrete subcontractor completed its work in June, 1960, meanwhile, M-K changed zone 1 placement operations to two nine-hour shifts working six days a week (Figure 3.5). M-K placed rolling operations on an intermittent twenty-four hour per-day schedule. With the embankment growing daily, M-K began preparing to quarry riprap on July 18. The riprap quarry was located 20 miles north on Forest Service land. After two weeks the contractor increased riprap placement to a two shift, six day per-week operation. The contractor encountered some difficulty with the quarry operations as it proved difficult to get the required rock size without a lot of waste. M-K finished zone 1 placement on October 24, and completed the embankment, except for the riprap, on November 4 (Figure 3.6). On December 22, 1960, the contractor finished riprapping and completed Steinaker Dam on January 4, 1961, one week ahead of schedule (Figures 3.7-3.8).

Figure 0.5 Embankment construction in progress on Zones 1, 2, and 3. View is looking northeast from right abutment. Average elevation for the three zones shown is 5450. Project photograph P325-418-0329, photograph by Elmer S. Davis, 7/18/1960.

Figure 0.6 Nearly completed dam. View towards right abutment. Project photograph P325-418-0398, photograph by Elmer S. Davis, 10/26/1960.

Figure 0.7 Completed Steinaker Dam. Project photograph P325-418-0472, photograph by Stan Rasmussen, 1/18/1961.

Figure 0.8 Looking south at the completed dam at the upstream face. Project photograph P325-418-0477a, photograph by Stan Rasmussen, 1/18/1961.

Completion of the reservoir provided a new and much anticipated recreation venue for the Vernal area. As the reservoir began filling, the Utah Department of Fish and Game planted 25,000 rainbow trout in September 1961. The following spring they reported the fish had grown considerably. In anticipation of the recreation demand, the Uintah Water Conservancy District announced in late April the opening of the reservoir to boating on Saturday, May 19, 1962, using the abandoned portion of State Route 44 as a boat ramp. On May 29, the National Park Service opened bids at their Albuquerque office for the construction of a public use area, which included a boat ramp, parking and picnic areas. Nelson Brothers Construction of Murray, Utah, submitted the low bid. On May 9, 1963, the Bureau of Reclamation and the Utah State Park and Recreation Commission signed a Memorandum of Understanding, allowing the Commission to assume administrative control of the reservoir for recreation and wildlife purposes.

On November 27, 1962, with the reservoir more than half full, a 10 foot diameter hole about 6 feet deep appeared in the downstream face of Steinaker Dam. Fred C. Walker, Head of the Earth Dams Section of the Denver office inspected the dam two days later. Maintenance crews filled the hole on Dec 1. However, the spot on the dam continued to settle. During 1963 the area dropped a total of 8.66 feet and was refilled on June 10 and November 12. On June 30, 1965, the reservoir reached its capacity of 38,194 acre feet. The full water condition resulted in an increase in the seepage through the left abutment. Dirty water, indicating the embankment was being eroded, discharged from the toe drain at rates as high as two cubic feet per second. To solve the problem, Reclamation engineers determined a drilling and grouting program was needed.

In preparation for grouting, Reclamation began drawing down the reservoir levels during the fall of 1965. After lowering the reservoir, maintenance personnel observed water entering the left abutment rock at an elevation of 5497 feet, approximately 50 feet left of the end of the riprap. On October 14, they used Fluorescein dye to test the seepage. The dye introduced into the hole in the abutment showed in the toe drain in an hour and dye introduced in the subsidence area appeared in the toe drain after 30 minutes. Reclamation opened bids for the grouting on November 9, 1965. Continental Drilling Company of Los Angeles, California, submitted the low bid. Reclamation awarded the contract on November 23. Continental Drilling crews began work on the site on December 9. The contractor used a two shift schedule after Christmas of 1965 and then a three shift schedule following the New Year's Holiday. The drill holes accepted more grout than anticipated; resulting in increased costs and time. The contractor completed work on April 20, 1966, three weeks behind schedule (Figure 3.9). They drilled 4,327 linear feet of drill holes and pumped 29,399 sacks of cement grout into them.

Before the contractor completed the repair work, Reclamation began diverting water from Ashley Creek back into Steinaker on January 19, 1966, to test the grouting. With the repair complete, high spring flows were diverted into the reservoir which refilled to capacity at 8:00 a.m. on May 27, 1966. On July 29 a new subsidence area, 12 feet in diameter and 20 feet deep, developed on the downstream face of Steinaker dam. After inspection, the hole was filled August 4-6.

Figure 0.9 View of crack in the left abutment of dam. Workmen are drilling holes for blasting. Project photograph P325-418-1239, photograph by R. H. Felter, April 1966.

In preparation of the transfer of O&M to the Uintah Water Conservancy District, Reclamation and the District jointly made an inspection of the project facilities on October 5 and 6. On January 1, 1967 the Bureau of Reclamation transferred the 'care, operation, and maintenance' of the facilities of the Vernal Unit to the Uintah Water Conservancy District. Reclamation employee Robert Polson, who provided maintenance on the project during the three-year development period voluntarily transferred to the District.

A Safety Evaluation of Existing Dams (SEED) Examination was conducted at Steinaker Dam on June 8, 1981. The evaluation found no significant problems, but the evaluators determined a moderate risk due to the potential for portions of the dam's foundation to experience liquefaction during an earthquake. While the nearest fault is over twenty five miles distant, Reclamation determined the risk merited mediation and undertook an evaluation of potential solutions. The report, completed in 1989, determined the best solution would be to excavate and solidify the foundation at the toe of the dam using dynamic compaction and to construct a berm in that location. The plans called for a trench 150 feet wide, 550 feet long and 30 feet deep immediately downstream from the dam. After compaction, the trench would be refilled with a 10 foot wide filter drain against the dam and zone 3 materials.

Reclamation began the bidding process in the fall of 1992 utilizing a two-step bid process. The first step selected four qualified bidders who each submitted a bid in the second step. On January 19, 1993 Reclamation awarded a contract to Stimpel-Wiebelhaus Associates of Redding, California. The contractor started work on March 1 and subcontracted drilling work to Jensen Drilling Co. To facilitate the work, Jensen Drilling completed a dewatering system. Stimpel-Wiebelhaus crews began excavating the compaction area on April 2, using scrapers and bulldozers.

Figure 0.10 Construction on dam berm. Project photograph CN-325-418-385, photograph by Tom McCarl in August 1993.

During preconstruction, drilling workers found Fremont artifacts. On May 25 the contractor stopped all excavation to allow an archaeological excavation to be made by the Brigham Young University Archaeology Department [comprising Site 42UN2004]. The BYU archeologists completed their study and moved off the jobs site on August 10 allowing the contractor to resume mass excavation the following day (Figure 3.10). Excavation continued until September 1, when crews reached the desired depth of thirty feet.

Three weeks later the subcontractor for dynamic compaction, Lampson Crane Co., began erecting the "thumper" (Figure 3.11). The thumper was a crane which dropped a seven-foot diameter, 30-ton weight from a height of 112 feet. After testing, the first phase of compaction began October 4 and continued through three phases ending on October 20. With compaction complete, the contractor began hauling in zone 3 material on November 1 and continued through November 22, when winter weather forced the contractor to shut down. For safety during construction, the water district allowed the water levels in the reservoir to be drawn down. As the reservoir began to refill the following spring, a large crack was discovered on the upstream face. The crack was one foot wide and up to four feet deep running three hundred feet vertically down the dam's face. To repair the slump, the reservoir was drawn down a second time during the summer of 1994. The contractor completed the downstream stability berm on July 23 and began work on the upstream slump on August 3. Reclamation accepted the project as substantially complete November 23, 1994.

Figure 0.11 The Thumper Crane, Project photograph CN-325-418-340, Photograph by Tom McCarl on 9/24/1993.

The recreation facilities on Steinaker Reservoir remain popular, especially fishing, boating, swimming, water skiing, hiking, and camping. Utah State Parks utilized Reclamation funds and usage fees collected at the parks to upgrade the facilities in 1968. Reclamation funded the construction of a culinary water system and flushing toilets. Park fees funded the addition of the park's camping area. In 1983, Utah State Parks completed a renovation of the recreation areas. Together, Steinaker and nearby Red Fleet State Park (Jensen Unit) attract an average of 60,000 to 65,000 visitors each year. The Utah Division of Wildlife Resources (the successor agency to the Utah Department of Fish and Game) maintains the lake as a trout and bass fishery. In the fall of 1989 they treated the lake to remove bluegill, green sunfish, and white suckers which had been illegally introduced. While the project was not designed to provide flood control benefits, through coordinated operation and filling, the project has helped mitigate severe flooding on Ashley Creek on several occasions during its history.

The Central Utah Project's Vernal Unit has a long history. Reclamation engineer Howard Reed first proposed a dam across Steinaker Draw in 1904. The potential of adding additional water supplies garnered enthusiastic support for the Project from Ashley Valley farmers and ranchers. When Congress finally authorized funds to begin the project, the Ashley Valley residents organized the largest parade in the city's history. Constructed during the era of big dams, Steinaker is relatively small in comparison. But its size belies the reservoir's importance to the community it supplies. The Vernal Unit provides much needed water for municipal and supplemental irrigation and remains a popular recreational destination. The investment to stabilize the dam will insure that it continues to offer benefits for many years.

Steinaker Archaeological Investigations

This section quotes extensively from Talbot and Richens 1999, pages 6-8 and 11-12. Talbot and Richens were the archaeologists in charge of the Steinaker archaeological investigations during the 1994 Steinaker Dam repairs. They surveyed the reservoir basin and surrounding area, excavated at several sites, tested many others, and in general created the baseline data which will be used in the future for assessing sites. Several monographs came out of their investigations. The project history provided here is quoted from *Prehistoric Farmers of the Uinta Basin: The Steinaker Lake Project*.

> The lake initially reached full storage capacity in 1965, and since that time water levels have fluctuated considerably, depending on the availability of and demand for water. In 1993-94, as part of Reclamation Safety of Dams program, reinforcement work was initiated on the dam. After reaching its normal high water level of 1682 m (ca. 5520 ft.) in late spring of 1993, the lake was drained for irrigation use during summer and early fall of that same year, and the water level was then allowed to drop farther so that by November of 1993 the water had reached ca. 1661 m (5450 ft.), just above the conservation pool level of ca 1652 m (5420 ft.). Reinforcement work at the toe of the dam was on-going during this time. Lake refilling began in late winter and continued through the spring of 1994. However, during this refilling effort the need for additional dam work was recognized. The water level was then lowered once again during the summer of 1994. Refilling followed again during the subsequent fall and winter, and by the spring of 1995 the lake had reached ca. 1672 m (5485 ft.). The following year the lake was returned to its high water level.
>
> Prior to the dam reinforcement work, archaeological studies within or near the impoundment area had been sporadic, but at least 16 archaeological sites were known for the area (see Talbot and Richens 1996). In 1992, while conducting soils tests at the toe of the dam, human remains were uncovered. Personnel from the Brigham Young University Office of Public Archaeology (OPA) carried out test excavations at that time, determining that the site (42Un2004) contained significant, intact deposits (Talbot et al. 1992). In late spring of 1993, the testing was expanded and research culminated in the excavation of a large prehistoric use surface and irrigation facilities that became known as the Steinaker Gap site (Talbot and Richens 1996). In January of 1994, a large site located on a knoll in the Steinaker Lake basin (42Un154) was noted by state park personnel to have human remains eroding off the surface. The site was examined by OPA personnel

(Billat 1994), who also located two sites nearby, one (42Un2094) with a human burial eroding from a cutbank. That burial was salvaged the following month (S. Baker 1994).

In July-August of 1994, when the lake water level was reduced to minimum levels, personnel from OP A carried out an intensive inventory of ca. 1500 acres, taking in most of the current Steinaker Lake State Park boundaries (Irvine et al. 1995). Although the water level temporarily reached the conservation pool level of 5420 ft., water level during most of the inventory was between 1661-1663 m (5450-5455 ft.). A total of 44 existing archaeological sites were located at that time, including most of the sites documented in earlier years. It was determined that 24 of the sites met the eligibility criteria for inclusion on the National Register of Historic Places (NRHP).

Talbot and Richens recognized at the time of the initial inventory that these sites represented, as a group, one of the more significant archaeological data sets for Utah to come to light in recent years. While traditional chronologies place the centuries immediately preceding and postdating the time of Christ (up to ca. AD 500) as part of the Late Archaic Period, during which native groups were thought to have been relatively nomadic, the Steinaker Basin sites offered intriguing evidence for corn agriculture and settled pithouse life that was well-established by the third and fourth centuries AD, as demonstrated most impressively by the Steinaker Gap work. The numerous sites within the basin itself seemed to relate to this same time period and shortly thereafter, and promised to provide insight into the earliest appearance of farmers in Utah, and to farmer-forager interaction specifically in the Uinta Basin.

Unfortunately, it was also determined that 14 NRHP-eligible sites, designated as "High Danger Potential" sites, were systematically being destroyed by a combination of fluctuating water levels, exposure of vegetation-barren site surfaces to wind and water erosion, dam reinforcement work, recreational use, and state park development activities. By far the most destructive impacts were in fact directly related to the dam reinforcement work. The lake draining exposed archaeological sites that had been under water for nearly four decades, sites which no longer had the vegetation cover that had protected them for over a thousand years. Wind and rain erosion began to immediately impact the sites. As water levels began to rise again, wave erosion took over. If the lake was permitted to stand at one level for more than a day, waves began creating cutbank terraces all along shorelines where sites were located. Boat wakes exacerbated the problem, and the wave terraces expanded, cutting away at long-protected subsurface cultural features. By the time the lake was refilled the second time, all of the "High Danger Potential" sites had been seriously damaged. The remaining 10 NRHP-eligible sites, designated as "Moderate" or "Low Danger Potential" sites, were not impacted directly by wind-water erosion, but were receiving impacts from secondary recreational activities (e.g., trails, vandalism, state park development, etc.).

Following the 1994 inventory, when it was recognized that so many of the other Steinaker Lake sites were in imminent danger of complete destruction, OPA was directed by Reclamation to conduct site testing at all of the NRHP eligible sites. This was carried out in three phases between 1994 and 1997 (Richens 1997; Talbot et al. 1997; Richens and Talbot 1998), with the sites at or below the water line tested first, while the water level was down for dam reinforcement work. Most of the testing consisted of test trenches and test pits placed in sites where intact features appeared to be present. Beyond the work at the Steinaker Gap site, more extensive salvage work was necessary at two of the sites. A human burial at site 42Un162 had been previously salvaged when it was found to have slumped down from an erosional terrace. A pithouse was noted in that same vertical terrace, and what was left of it was excavated before the shoreline erosion could destroy it entirely. Similarly, a human burial was found eroding out of site 42Un1671 (Hidden Island site). That burial and the pit in which it was located were also excavated. The lake level was rising at the time of the excavation, and numerous eroded features in the general vicinity of the burial were also in danger of complete destruction, and at the direction of Reclamation archaeologist, several of these features were salvaged just before the water level inundated the site (Richens 1997).

The background on prior archaeological work in this next section comes from Talbot and Richens 1999:11-12. Here, they summarize archaeological work in the area and place their excavations into the general framework.
The Claflin-Emerson Expedition (Gunnerson 1969: 118-121; Scott 1931) excavated a large cave site (A6-1) at the junction of Dry Fork and Ashley Creek containing storage cists, and two baskets filled with both shelled and eared com. One was covered with a piece of buffalo hide and also contained squash seeds. Three additional cave sites (A6-2, A6-6, and A6-7) in the same vicinity were investigated. One contained a turtle-backed adobe structure, while the others apparently contained cists and considerable perishable remains, including corncobs, squash, basketry and cordage, hide, and reed tubes. Reports of vandal activity indicated that blankets, dewclaw moccasins, buckskin and bark bags, and a human burial were taken from the caves prior to the Claflin-Emerson work (Spangler 1995:60). Two open sites (A7-1 and A 7 -2), each containing three boulder-lined structures and sparse Uinta Gray sherds, were also reported from the Brush Creek area. Finally, two rockshelter sites (A6-3 and A6-5) were explored in an area "5 miles north of Vernal" (Gunnerson 1969: 120), which would place them in the middle to upper Steinaker Basin, both on the valley floor. One contained an adobe-lined cist with a "thin layer of carbonized seeds" on the bottom, and the other contained a possible unlined pit, several charcoal ash layers, and a bark layer. A single corncob and two com shanks were recovered from the latter rockshelter.

Albert B. Reagan was certainly one of the more prolific Uinta Basin researchers. In the early 1930s (see Spangler 1995:65-72 for an in-depth review of Reagan's work) Reagan visited and described numerous caves, camp sites, and rock art in the Dry Fork/Ashley Creek, Spring Creek, and Steinaker areas. Two of the caves (Caves 34 and 35) were located in the upper part of Steinaker Basin. In one of his better known manuscripts, Reagan (1933) described 40 caves in this immediate area, two in Steinaker Draw: Cave 34 contained much material, including a basket partially filled with com, a buckskin bag with some type of dried food cakes, a buckskin legging, and squash remains; Cave 35 contained a walled structure. Most of the remaining caves in the area contained similar findings, including impressive quantities of com, squash, etc.

Reagan (1931a) also reported pictographs (Panels 99-105) along the hogback ridge ("the Point of Rocks ridge") west of Steinaker Gap. On this same ridge Reagan (1931b) reported on a large campsite containing a large quantity of artifacts as well as at least 17 mortar holes or pot-holes dug into the rock that he speculated were used for various purposes, from cooking pots to grinding holes. Just to the south of this ridge on property owned by William Gibson, ca. 400-500 meters southwest of Steinaker Dam, Reagan (1931c) noted the presence of "several earth lodges, all showing evidence of having been destroyed by fire." Reagan (1931b:126) suggests that a typical earth lodge had "at least four support posts, a post being set at each comer of the squarish or rectangular enclosure." In the Brush Creek area, Reagan found several structures, one containing two ceramic jars, and a cave site with a partial child burial. One of his most interesting observations (Reagan 1931d: 136-137; quoted in Spangler 1995:67) is that of prehistoric irrigation ditches in the Vernal area:

These house builders were also agriculturalists, and their irrigating ditches of those far off days can still be traced ..... On the west side of Brush Creek. .... an ancient ditch can still be traced for a distance of nearly three miles, to where it finally ascends onto the mesa bench. Here it is four steps wide and still shows a depression a foot or so in depth. It then crosses the flats till it is lost, due to the wear of time. However, further down the valley are the remains of a reservoir .... ; the double rock wall fifty feet in length, with walls four feet apart, still shows. The water of the reservoir finally cut an outlet farther down the valley. A similar irrigation system can be traced on the opposite side of the valley, and another in the vicinity of the mouth of the creek, near Jensen. Remains of ancient irrigation ditches can also be traced in the vicinity of Ferndale. Three of these, as with the ditch near Jensen, have been cleared out by the white settlers and are being used at the present time.

Julian Steward (1933) carried out excavations near the Uinta River, just north of Fort Duchesne, at a group of mounds. Two pithouses and a rock-walled structure were excavated.

In 1954, James Gunnerson (1955, 1957) carried out reconnaissance surveys in the general foothill regions of the Uintas, including within the Ashley Creek and Steinaker areas, as part of the Utah Statewide Archaeological Survey. Within the current project area, sites 42Un67 and 42Un75, and probably 42Un2220 (formerly designated as 42Un68) were all recorded as part of this first effort, along with nearby rock art sites 42Un76 and 42Un77 along the Point of Rocks ridge. Five years later, during construction of Steinaker dam in 1959, human skeletal remains were encountered near the northeast dam abutment. The site (42Un128) was examined by Gunnerson and the remains, which had already been removed from the spot by the construction workers, were transported to the University of Utah. No further archaeological work was carried out (Jennings 1959).

A month prior to the discovery of these burials, Lipe (1959) carried out a survey of the proposed reservoir area. A large rock art panel (42Un153) and several campsites (42Un75, 154-166) were found. Sites 42Un153 and 42Un154 were located within the impoundment area of the reservoir, and the remaining sites were found on the eroded finger ridges on the west side of the reservoir basin. The reservoir basin was resurveyed by MESA in 1982 (Norman and Merrill 1983), with several new sites recorded (42Un1308-1319 and 42Un1334), all but two of which were prehistoric. Phillips (Phillips 1990; Phillips and Truesdale 1991) carried out salvage work at two of the sites (42Un162 and 42Un1671), followed by the OPA work reported in this volume.

Regional research has been extensive but primarily of the grey literature type, and much of it is now well-dated. An important synthesis of area research was recently compiled by Spangler (1995), and additional summaries are presented by Jones and MacKay (1980), (Berry and Berry 1976), Sisson (1978), and Phillips (1990; Phillips and Truesdale 1991). Well known excavations have been carried out at Caldwell Village (Ambler 1966) and several sites nearby (Shields 1967), Boundary Village (Leach 1966), in and near Dinosaur National Monument (Lister 1951; Breternitz 1970; Leach 1970a and 1970b; Holmer 1979; Truesdale 1993), at Thorne Cave (Day 1964), and around Flaming Gorge (Day and Dibble 1963; Sharrock 1966), and recently in the Uinta Mountains by Loosle (1997). To the east in northwest Colorado, recent work has been carried out most prominently in the Douglas Creek and Piceance Basin (S.G. Baker 1995, 1996, 1997; Creasman 1981; Grady 1980; La Point 1987; Newkirk and Roper 1983), and generally throughout the area (see Bambrey 1984, and McDonald 1994). In southwest Wyoming, recent work includes Armitage et al. (1982), Reust et al. (1993), Schroedl (1985), Smith and Creasman (1988), and most recently by Thompson and Pastor (1995).

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