National Park Service
U.S. Department of the Interior

Grand Teton National Park
Wyoming

Campus Improvements to the
University of Wyoming - National Park Service Research Center
Environmental Assessment

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U.S. Department of the Interior

National Park Service

Campus Improvements to the University of Wyoming - National Park Service Research Center

Environmental Assessment

Grand Teton National Park, Wyoming

SUMMARY

The University of Wyoming and National Park Service operate the University of Wyoming - National Park Service Research Center at AMK Ranch within Grand Teton National Park under a general agreement. The mission of the research center is to provide opportunities for both management-oriented and basic research on the Greater Yellowstone Ecosystem, especially Grand Teton National Park and the John D. Rockefeller, Jr. Memorial Parkway.

The AMK Ranch is listed as a historic district in the National Register of Historic Places. As such, the park is responsible for maintaining the district in compliance with the National Historic Preservation Act.

The research center provides the park opportunities for public engagement and educational outreach to citizens and visitors, as well as researchers. Workshops, meetings, and weekly seminars are held onsite during the summer, and the public is actively solicited to attend. The facility is generally occupied by researchers from mid-May to late September. The resident summer population is currently limited to approximately 58 researchers and up to seven staff members, based on number of beds available.

This document describes and analyzes three alternatives for the management and maintenance of campus infrastructure at the University of Wyoming-National Park Service research center. The no-action alternative A describes continuation of existing management and serves as a basis of comparison for the two action alternatives. Alternative B describes proposed water, wastewater, fire suppression, and improvements to the breakwater retaining wall near the boathouse, as well as other minor building improvements or updates. Alternative C includes all of the improvements included in alternative B, with the addition of a new dormitory and associated parking area. Alternative C is the preferred alternative.

This Environmental Assessment (EA) has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and its implementing regulations, Council on Environmental Quality (CEQ)(40 Code of Federal Regulations (CFR) 1508.9), Parts 1500 – 1508; and the National Park Service Director's Order No. 12 and Handbook, *Conservation Planning, Environmental Impact Analysis, and Decision-making* (NPS 2001).

The three alternatives are described in chapter 2. Summary tables of the alternatives and impacts are provided at the end of chapter 2. Chapter 3 summarizes the affected environment and environmental consequences of implementing the three alternatives.

Impact topics that were evaluated include water quality, cultural resources, human health and safety, vegetation, wildlife, soils, visitor experience, and operations of the National Park Service and University of Wyoming.

PUBLIC COMMENT

If you wish to comment on the environmental assessment, you may mail comments to the name and address below or post comments online at http://parkplanning.nps.gov/uw-nps, and select *"Open for Comment"* on the left side of the web page. This environmental assessment will be available for public review for 30 days. Before including your address, phone number, email address, or other personal

identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. Although you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Grand Teton National Park
Attn: UW-NPS Research Center EA
Park Planning & Environmental Compliance
P.O. Drawer 170
Moose, WY 83012-0170

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CHAPTER 1: PURPOSE AND NEED

INTRODUCTION

This Environmental Assessment (EA) has been prepared to analyze and disclose the potential environmental consequences associated with a no-action alternative (Figure 3), as well as two action alternatives (Figures 4 and 5), for management and maintenance of campus improvements at the University of Wyoming - National Park Service Research Center at AMK Ranch within Grand Teton National Park (the park). Management and maintenance activities would address the facility water and wastewater systems, housing conditions, fire suppression capabilities, lakeshore erosion, building foundation drainage, and historic and non-historic buildings.

BRIEF HISTORY OF THE PROJECT AREA

The Jackson Hole Wildlife Park, Inc. was established by the Jackson Hole Preserve, Inc. in cooperation with the New York Zoological Society and the Wyoming Game and Fish Commission in 1946. In 1951 the Jackson Hole Research Station was formally created as part of the Jackson Hole Wildlife Park.

In 1952, the Jackson Hole Research Station separated from the Jackson Hole Wildlife Park, under which the station had operated since 1946, and was turned over to Grand Teton National Park. Operation, care, and maintenance expenses for the station were assumed by the University of Wyoming in 1953. In 1954, the Jackson Hole Research Station's name was changed to the Jackson Hole Biological Research Station of the University of Wyoming and the New York Zoological Society. At this time, the station was located west of the Oxbow, east of the original Moran town site. The station operated cooperatively with the New York Zoological Society under a 20-year special use permit with the National Park Service.

In 1977, the University of Wyoming (UW) and the park approved an agreement to combine the Jackson Hole Biological Research Station and the Northern Rocky Mountain Parks Studies Cooperative Program into a single entity to be known as the University of Wyoming - National Park Service Research Center (research center). At this time the National Park Service also issued a 15-year special use permit and Memorandum of Agreement (MOA) for the facilities to operate the research center at the site of the historic AMK Ranch. Since 2010, operations of the research center have been conducted operated under a general agreement between the National Park Service and the University of Wyoming (NPS and UW 2010).

The AMK Ranch is listed as a historic district in the National Register of Historic Places and is an important cultural landscape comprising human settlement on Jackson Lake from 1890 to the modern era, with buildings and cultural landscape features that tell the story of the development and use of the peninsula. As such, maintaining the district must be done in compliance with the National Historic Preservation Act (NHPA).

Brief Description of the Project Area

The mission of the research center is to provide opportunities for both management-oriented and basic research on the Greater Yellowstone Ecosystem, especially Grand Teton National Park and the John D. Rockefeller, Jr. Memorial Parkway. Research projects may include the social, cultural, physical, and biological sciences. The research center provides a rare opportunity for the park to fulfill its science and research support mission as the park has limited capacity to conduct its own scientific research. The research center provides the park opportunities for public engagement and educational outreach to citizens and visitors through conferences, presentations, and workshops.

The research center is now a campus facility that operates out of the historic AMK Ranch buildings. The research center site comprises approximately 50 acres, located on the eastern shore of Jackson Lake, approximately one mile north of Leek’s Marina (Figures 1 and 2).

The research center is generally occupied by researchers, University of Wyoming employees, and interns each year from mid-May to late September. The resident summer population is currently limited to approximately 65 individuals, based on number of beds available. This number often comprises 58 researchers plus up to seven staff members. Workshops, meetings, and weekly seminars are also held during the summer, and the public is actively solicited to attend. Water, power, and sanitation services are available, with parking spaces allocated near most campus buildings. Existing wastewater systems consist of aged septic tank/leach field systems located within the campus. Potable water is supplied from three wells on the campus site. Overhead and buried electrical power and telephone are routed to campus buildings.

A detailed description of the facilities and resources comprising the research center project area can be found below in the purpose and need description.

NAD 1983 StatePlane Wyoming West FIPS 4904 Feet
Bing Maps Aerial Base

1 inch = 1,000 feet
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Feet

Figure 1. Site Location Map
EA - Campus Improvements at UW-NPS Research Center
Teton County, Wyoming 2013

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NAD 1983 StatePlane Wyoming West FIPS 4904 Feet
Bing Maps Aerial Base

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Feet

Figure 2. UW-NPS Research Center at AMK Ranch
EA - Campus Improvements at UW-NPS Research Center
Teton County, Wyoming 2013

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PURPOSE AND NEED FOR THE PROJECT

The purpose of the proposed project is to address essential campus improvements and maintenance of facilities at the research center, whose mission is to promote and provide opportunities to conduct both management-oriented and basic research in all fields of science (including cultural, natural, and social science) on the Greater Yellowstone Ecosystem, especially Grand Teton National Park and the John D. Rockefeller, Jr. Memorial Parkway. This includes addressing water and wastewater systems, fire suppression capabilities, lakeshore erosion controls, housing conditions for researchers, and structural and aesthetic protection of buildings and facilities in the AMK Ranch Historic District.

The project is needed because many campus improvements have been deferred to the point where they will eventually limit or restrict the complete fulfillment of the research center mission. Existing water and wastewater systems have exceeded their design life and/or are too small to meet demand of the research center operations. Research housing is frequently filled to capacity during the height of the summer field season. Arranging separate facilities for male and female researchers is often a scheduling challenge, and over-crowding exists in some rooms, causing concern for safe egress in case of fire or other emergencies. In several cases, the proximity of residential rooms to working or storage spaces provides less than optimal conditions for either primary function.

Existing Water System

The AMK Ranch facility has undergone significant changes in use over the years, from a homestead ranch with guest cabins to an active research center. The existing water system was designed for considerably fewer users than it serves now. The current volume requirements for potable water overwhelm the existing chlorine treatment and delivery system.

Potable water is currently supplied by three wells that produce groundwater from highly permeable glacial till that occurs throughout the region. The newest well was constructed in 1975. The other wells are older.

Each well is equipped with a submersible pump and motor, a pressure switch, a 500-gallon air-cushioned pressure tank, and a chemical feed pump for disinfection. Each chemical feed pump injects a water-and-bleach mixture for disinfection, when the well pump is on. Well motors are driven by single phase, 240-volt power, routed overhead or underground to each well. Water is conveyed to six of the campus buildings via buried, small (approximately 2-inch diameter), galvanized steel water pipes.

The existing water system does not provide sufficient water volume for sustained fire suppression actions. Likewise, the existing steel pipelines are undersized and unable to convey the current required flow rates of 180 gallons over a 2-hour period for fire suppression requirements (UW 2012).

Identified existing water system deficiencies include:

- Some of the existing steel pipelines are corroded and leak. In addition, leaks in the system pose an opportunity to introduce pathogens into the water supply.
- Chlorine levels for disinfection are often uneven due to multiple disinfectant locations (each wellhead has a treatment system).
- The existing water storage and steel pipelines are undersized and unable to convey the current required flow rates for fire suppression requirements.
- The three existing 500-gallon storage tanks lack required and/or recommended safety and security devices.
- The existing well construction details and conditions are largely unknown.

Existing Wastewater System

The research center is currently served by six separate septic/leach field systems. These systems receive wastewater from the Berol and Johnson lodges; Director's, Boise-Cascade, and Sunroom cabins; and the Lawrence house.

Wastewater flows from the building into the respective septic tank. The existing septic tanks are reported to range in volume from 500 to 1,000 gallons. The useful lifespan of a typical leach field is estimated to be 25 to 30 years when used throughout the year. The existing septic tank/leach field systems are assumed to be the same age as the associated buildings, ranging from 24 to 83 years old, at or well beyond the expected lifespan of a leach field.

Except for an additional or replacement septic tank, the current wastewater infrastructure is sized for the earlier site use (e.g. seasonal private residences), when the site population was roughly a third to half of the current population. Therefore, most of the existing septic/leach field systems are undersized for the number of seasonal residents currently using them.

Identified deficiencies in the current water system include:

- Most of the individual septic/leach field systems have exceeded their useful estimated lifespan.
- Most of the existing septic/leach field systems are undersized for the number of residents using them.
- The current leach field system is not as efficient and effective under the regional soil conditions as modern systems.

Existing Fire Suppression Capabilities

The existing water system capacity to support sustained fire suppression actions is described above.

Existing Lakeshore Erosion Controls

The research center is exposed to storms which advance from either the north or south, across Jackson Lake. Breakwater retaining wall structures have been constructed along the lake shoreline, to prevent shoreline erosion near the historic boathouse. The breakwater south of the boat ramp comprises a concrete retaining wall, while the shoreline north of the ramp is reinforced with buried railroad rails and logs. These structures have experienced damage as a result of storm events, and shoreline erosion has resulted. Currently more than half of the log/rail structures have been lost due to storm events, and significant erosion has occurred, leaving the historic boathouse vulnerable to future storms and damage.

Identified deficiencies with the existing lakeshore erosion controls include:

- Breakwater retaining structures have sustained storm damage and no longer adequately function to prevent shoreline erosion and protect the boathouse and boat ramp from storm events.

Existing Housing Conditions

Eight research center buildings provide living space, bedrooms, multiple-use space, and kitchens for up to 58 researchers between May and October. The length of stay varies from two days to over two months. Five buildings with full facilities (water, electricity, kitchen and sanitation) include the Berol Lodge, Johnson Lodge, Lawrence House, Sun Room Cabin and Boise-Cascade Cabin. Limited facility residences (electricity only) are the Shop Cabin, Two Room Cabin and Tack Cabin. Residents in these three buildings share the communal kitchen and communal shower/toilets available in the Johnson Lodge. Three maintenance personnel are housed in apartments above the attached garage to the Johnson Lodge. The research center director and family reside in the Director's Cabin.

A total of 16 bedrooms provide 51 square feet per person with an average of nine residents sharing each bathroom. Storage space in bedrooms at the research center is limited and personal gear must often be accommodated in the commons area of each building. An average college dorm room provides 90 square feet per person. Other research field stations in the United States provide an average of between 70 and 154 square feet of living space per person, and designs for a proposed seasonal dorm in the park will include between 80 and 100 square feet per person, with approximately two people per bathroom.

Existing overnight accommodations result in housing needs above what is presently available. There is also a need to provide overnight accommodation for attendees of workshops and educational field classes that currently cannot be accommodated. With the current bedroom configuration, arranging space for gender compatibility often results in inefficient allocation of bedrooms. Adequate egress from sleeping spaces in the second floor of the Johnson Lodge and from the staff garage apartments is an on-going safety concern. The Berol Lodge houses space for office and administrative functions, including the research center library and laboratory, and is the primary location for public functions, including seminars and workshops. This situation is complicated by also having researcher bedrooms and bathroom spaces in the same building. This places a functional stress on one of the most significant of the historic structures in the AMK Ranch Historic District.

There is currently a single clothes washer and dryer on the research center campus. This is used for bedcovers, linens and towels associated with the overall operations. However, no onsite laundry facilities are available for any center residents other than the director's family.

Architectural Barriers Act (ABA) - and Americans with Disabilities Act (ADA) - compliant living space is presently not available in research center living quarters. ADA guidelines specify one ADA-compliant room for every 25 sleeping rooms. There are no ABA/ADA–compliant facilities in any of the public spaces within the research center, including the Berol Lodge, where most workshops and public presentations are held.

These existing conditions limit the ability of the research center to provide conditions conducive to the visiting public who attend workshops and scientific presentations, and to supporting researchers in providing the best available scientific information, though field studies, educational workshops and courses, for and about the park and the surrounding Greater Yellowstone Ecosystem.

Identified deficiencies in the existing research center housing include:

- Bedrooms in second-floor spaces in the Johnson Lodge and the garage apartments are an egress safety hazard.
- Substandard area of living space per resident.
- Overcrowded bathroom facilities.
- Bedroom configurations to accommodate gender compatibility and researcher family members are challenging at best.
- A concerning mix of multiple uses at the Berol Lodge, which has been providing space for administrative functions, public gatherings, and bedroom/bathroom accomodations for researchers.
- Lack of laundry facilities for residents.
- Lack of ABA/ADA-compliant living and research space.
- Lack of ABA/ADA-compliant facilities for site visitors.

Existing Structural and Aesthetic Protection of Buildings and Facilities in the Historic District

The AMK Ranch is listed as a historic district in the National Register of Historic Places and is an important cultural landscape. As such, the district must be maintained in compliance with the NHPA. Protective actions and plans for structural and aesthetic qualities of the buildings and facilities in the research center are primarily identified in the general agreement between the National Park Service and the University of Wyoming (NPS and UW 2010).

PROJECT OBJECTIVES

The objectives for the proposed campus improvements to the UW-NPS research center are:

- Preserve the AMK Ranch Historic District in accordance with applicable Secretary of the Interior's standards and guidelines and other NPS policies, guidelines, and standards (NPS Management Policies Section 5.3.3).
- Improve existing water system to meet the needs of the UW-NPS Research Center (NPS Management Policies Section 9.1.5.1).
- Improve existing wastewater system to meet the needs of the UW-NPS Research Center (NPS Management Policies Section 9.1.5.2).
- Improve fire suppression capabilities to ensure the research center and historic district receive an appropriate level of fire protection (NPS Management Polices Sections 5.3.1.2 and 9.1.8).
- Ensure housing at the UW-NPS Research Center is safe and sanitary, sited to avoid natural hazards, integrated into the park environment, sufficient to support the mission of the research center, and, to the best extent possible, energy efficient and cost-effective to maintain. (NPS Management Policies Section 9.4.3 and NPS Director's Order #36, Section 6.1).
- Provide access for people with disabilities within the research center and historic district in accordance with the Architectural Barriers Act (ABA) and Americans with Disabilities Act (ADA) (NPS Management Policies Sections 5.3.2, 7.5.2, and 9.1.2).
- Increase sustainability of facilities within the research center and historic district (NPS Management Policies Section 9.1).

SCOPING, ISSUES, AND RELATIONSHIPS TO OTHER PLANS AND POLICIES

Scoping

The National Park Service (NPS) conducted scoping with the public and interested and affected organizations and agencies. Park staff members were also consulted as the plan / environmental assessment was developed. Scoping helped to refine the purpose and need, and determine issues, concerns, and resource impact topics (i.e., resources that could be affected by implementation of a given course of action or alternative).

Scoping for the proposed project began on January 18, 2013, with publication of a scoping announcement. The announcement provided background information on the project and instructions on how to comment. A press release regarding initiation of the planning effort was issued on January 22, 2013. Public input was coordinated through the NPS Planning, Environment, and Public Comment (PEPC) website. The comment period for the scoping newsletter ended on February 20, 2013—five comments, including two from stakeholder organizations, were received during this comment period.

Relationships to Other Selected Laws, Regulations, Policies, and Plans

NPS Organic Act of 1916. In this act Congress directed the National Park Service to manage units of the national park system "to conserve the scenery and the natural and historic objects and wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 United States Code [USC] 1).

National Historic Preservation Act of 1966 (NHPA). Section 106 of this act requires federal agencies to consider the effects of their undertakings on properties listed or potentially eligible for listing in the National Register of Historic Places (NRHP). All actions affecting the park's cultural resources must comply with this legislation (16 USC 470—470x-6) as well as the Secretary of the Interior's Standards for the Treatment of Historic Properties.

Architectural Barriers Act of 1968 (ABA). This act requires access to facilities designed, built, altered, or leased with Federal funds (42 USC 4151—4157). The United States Access Board provides specific standards for the implementation of ABA as it relates to buildings and sites (http://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-aba-standards).

National Environmental Policy Act of 1969 (NEPA). This act is implemented through regulations of the Council on Environmental Quality (40 CFR 1500—1508). The National Park Service has adopted procedures to comply with this act and council regulations, as found in Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision-making, and its accompanying handbook.

Endangered Species Act of 1973 (ESA). This act requires all federal agencies to consult with the Secretary of the Interior on any project or proposal that could impact federally endangered or threatened plants and animals (16 USC 1531—1544).

Redwood National Park Act of 1978. This act states that the National Park Service must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 USC 1a-1).

Americans with Disabilities Act of 1990 (ADA). This act recognizes and protects the civil rights of people with disabilities (42 USC 12101—12213). The United States Access Board provides specific standards for the implementation of ADA as it relates to the built environment (http://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-ada-standards).

Wyoming Department of Environmental Quality (DEQ) Water Quality Division Regulations. Park water supply systems and wastewater treatment systems must comply with all applicable state and federal health standards. Chapter 11 of the regulations applies to wastewater treatment systems. Chapter 12 of the regulations applies to public water supply systems.

In addition to the selected laws and regulations previously described, the NPS has developed management policies and plans that support or otherwise integrate into management of campus improvements at the research center. These plans and actions are identified below with a brief description of their potential relevance to the proposed action. These plans and actions are considered in chapter 3 as the cumulative impact scenario.

NPS Management Policies 2006. The National Park Service has established policies for all national park system units under its stewardship. These are identified and explained in a guidance manual entitled *NPS Management Policies 2006.* The alternatives considered in this document incorporate and comply with the provisions of these mandates and policies.

Foundation for Planning and Management – Grand Teton National Park

This document is a formal statement of the core mission for Grand Teton National Park (NPS 2006a).

Park Purpose: Grand Teton National Park provides educational and scientific opportunities compatible with the park's natural and cultural resources for enjoyment and inspiration.

Park Significance: As part of the Greater Yellowstone Ecosystem, the park offers easily accessible and unparalleled opportunities for scientific research and educational study of temperate zone natural systems and processes in a range of elevations, and human relationships to these systems. The relatively pristine landscape serves as "control" or baseline for scientific study.

Important Resources and Values: Grand Teton National Park provides a base of support for research and education, which includes the UW-NPS Research Center.

Grand Teton National Park Master Plan

The Master Plan, Grand Teton National Park (NPS 1976) is the basis for all planning and management actions in the park.

Land Classification: The UW-NPS Research Center campus is classified as a General Outdoor Recreation area (Class II). Class II areas include residential and operation enclaves. Although these areas will be managed to provide for visitor needs, preservation of the natural setting should be considered.

Visitor Use: The UW-NPS Research Center campus is considered part of the Through-Zone. This zone includes U.S. Routes 89 and 191/287, which provide road access for researchers and visitors to the campus as well as an occasional scenic drive-through experience for those visitors who happen to encounter the campus area. Interpretive communication within the Through-Zone will be brief and general, giving the visitor a basic introduction about the area's natural and cultural history and experiential opportunities.

Master Plan General Management Objectives:

- To manage Grand Teton National Park in a manner that will focus the attention of the visitor upon seeing, feeling, and understanding the park as a total environmental resource.
- To provide sewage-treatment facilities to prevent the discharge of any effluent directly into streams or lakes, as well as to avoid the disruption of the area's ecosystems through the pollution or alteration of ground water.

Master Plan Interpretation Objective:

- To increase environmental awareness through an interpretation program stressing the relevance of the resources of the Tetons and Jackson Hole to modern man. The challenge of the mountains and the floral and faunal ecology are key elements in developing this theme.

IMPACT TOPICS

Specific impact topics were developed to allow comparison of the environmental consequences of each alternative. These impact topics were identified based on federal laws, regulations, and executive orders; *NPS Management Policies* (NPS 2006b); and NPS knowledge of limited or easily impacted resources. Topics that were retained for detailed analyses are discussed in more detail in Chapter 3: Affected Environment and Chapter 4: Environmental Consequences.

Retained Impact Topics

The following impact topics that were retained for detailed analysis in chapters 3 and 4 include:

- Water quality
- Cultural resources – including historic structures
- Health and safety

- Soils and vegetation
- Wildlife - including candidate, threatened, and endangered species
- Visitor use and experience
- National Park and University of Wyoming operations
- Air quality
- Soundscapes
- Visual quality

Note: Impacts to air quality, soundscapes, and visual quality for all alternatives, are considered negligible outside of the historic district. Potential impacts to these resources, in the context of the historic district, are analyzed in detail in the cultural resources section of chapter 3.

Impact Topics Dismissed From Detailed Consideration

This section explains why some impact topics were not carried forward for further analysis. Impact topics were dismissed from further evaluation if the resource does not occur in the area, or if implementing the alternatives would have only a negligible or minor effect on the resource or value and would have little or no contribution to cumulative impacts.

Climate Change

Observable changes to the park as a result of climate change are expected to result from increased temperatures over every season and a general shift from a snow-dominated moisture pattern to a transitional snow-rain system (Running 2009, UW Climate Impacts Group 2012). This may be reflected in numerous changes to physical conditions such as increased temperatures, reduced annual snowpack, mass balance loss in glaciers, and earlier annual snow melt. These changes in turn would affect habitat quality and location for many wildlife and plant species throughout the park (Bartlein et al. 1997).

It is currently not possible to link the greenhouse gas emissions from individual projects to effects on regional or global climatic patterns. While construction of proposed campus improvements at the research center would cause a slight and short-term increase in greenhouse gas emissions, these would be negligible within the project area and would not discernible at a regional scale. Wastewater treatment is known to produce greenhouse gasses; however, the volume of these emissions is not expected to substantially differ between the existing system (no action alternative) and the action alternatives. Likewise, greenhouse gases emitted by operations of the proposed infrastructure improvements, including back-up generators and a new laundry facility (reduced vehicle trips to and from the research center to do laundry), are not expected to change greenhouse gas emissions to any measurable degree from current conditions. Long-term, it is not expected that the existing or improved wastewater management system and water supply actions would measurably alter greenhouse gas emissions, affect regional or global climatic patterns, or increase the risk of flooding of research center buildings.

Concerns raised during internal scoping included the likelihood that boats could continue to be launched from the boat dock if lower lake levels exist at some point in the future due to reduced snowpack, greater dryness, or other factors regarding control of the lake level. Mitigation measures would be expected to be implemented in the event of this contingency, including utilizing other boat launch sites along Jackson Lake and designing and constructing shoreline retaining walls to anticipate future changes in lake levels. Therefore, this impact topic was dismissed from detailed evaluation.

Geology/Geologic Hazards

The research center is underlain by poorly consolidated glacial or alluvial deposits. The near-surface nature of all alternative project components would not be expected to alter any geologic features; neither would site geology affect the proposed improvements. Therefore, geology was dismissed from further consideration.

Night Skies

NPS Management Policies (2006b) state that the National Park Service will preserve, to the greatest extent possible, the natural lightscapes of parks, including natural darkness. The agency strives to minimize the intrusion of artificial light into the night scene by limiting the use of artificial outdoor lighting to meet basic safety requirements, shielding necessary lights when possible, and using minimal impact lighting techniques. Construction of project components would occur during daylight hours; therefore visibility of night skies is not expected to be impacted by implementation of the project. Little or no lighting would be required for the completed project, and any lighting that was necessary would include shielding to minimize light emissions. The actions proposed in the alternatives would require some nighttime lighting. However, the effects of this lighting would be localized and minimized by the mitigation techniques described above. Both action alternatives would therefore have a negligible effect on the visibility of night skies and this impact topic was dismissed from further analysis.

Prime and Unique Agricultural Lands

Federal agencies are required to assess the effect of actions on prime and unique farmlands. Prime farmland has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Unique land is land other than prime farmland that is used for production of specific high-value food and fiber crops. Both categories require that the land is available for farming uses. There are no prime or unique farmlands in the project area and this topic is dismissed from further analysis. Therefore, this impact topic was not evaluated.

Wilderness

In 1978, the park recommended that Congress include approximately 146,355 acres of the backcountry (approximately 47 percent of the park) in the National Wilderness Preservation System. These recommended wilderness areas include most of the Teton Range, which is partially located in the park, as well as several lake basins. NPS manages this area to maintain its eligibility for future wilderness designation. The research center is located approximately three miles east of the park's recommended wilderness and one mile west of the designated Teton Wilderness (managed by Bridger-Teton National Forest). Campus improvements are anticipated to have no effect on these wilderness areas. Therefore, this impact topic was dismissed from further analysis.

Museum Collections

Museum collections are defined as artifacts, natural specimens, and archival and manuscript material. Because neither of the action alternatives would change the location or conservancy of museum collections, alter conservancy demands or requirements, or alter the risk of damage, this topic was dismissed from further consideration.

Sacred Sites and Ethnographic Resources

NPS Director's Order No. 28: Cultural Resource Management Guidelines (1998) defines ethnographic resources any "*…site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system or group traditionally associated with it.*" Sacred sites, a type of ethnographic resource, are defined as any specific, discrete, narrowly delineated location on federal land that is identified by an Indian tribe, or Indian individual

determined to be an appropriately authoritative representative of an Indian religion, sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site (Clinton 1996).

These sites are subsistence and ceremonial locales and sites, structures, objects, and rural and urban landscapes assigned cultural significance by traditional users. A number of tribes traditionally, and currently, value Jackson Hole for hunting, gathering, ceremonial, and other practices. Traditionally associated tribes include the Apache, Northern Arapaho, Blackfoot, Northern Cheyenne, Coeur d'Alene, Comanche, Crow, Gros Ventre, Kiowa, Nez Perce, Northern Paiute, Salish-Kootenai Group, Eastern Shoshone, Shoshone-Bannock, Assiniboine Sioux, Teton Sioux, Umatilla Group, and Yakama Group. Other traditionally associated tribes may be identified in the future.

Currently identified ethnographic resources within the project area are limited to plant and animal species. Potential impacts to these resources are discussed in the soils and vegetation, and wildlife sections of this analysis. Because it is believed the project area lacks other ethnographic resources, including sacred sites, this impact topic was dismissed from detailed analysis.

As part of the scoping process, the NPS sent letters to the tribes regarding the proposed action. The EA will be submitted to each tribe for review and comment during the public review period. If, during this review period, traditionally associated American Indian tribes identify ethnographic resources, including sacred sites, in the project area, the NPS would further consult with them to avoid or mitigate adverse impacts. The NPS would also accommodate, to the extent practicable, access to and ceremonial use of sacred sites by American Indian religious practitioners. The location of ethnographic sites would not be made public. In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction and are determined to be of American Indian origin, guidance for implementing Native American Graves Protection and Repatriation Act would be followed.

Energy Requirements and Conservation Potential

In protecting park resources and values, the National Park Service will demonstrate environmental leadership and a commitment to the principles of sustainability and asset management in all facility developments and operations, including those facilities proposed to be designed, constructed, and maintained by partners and cooperators (NPS 2006b). The general agreement between the National Park Service and the University of Wyoming ((NPS and UW 2010) requires use of sustainable design principles and energy efficiency. Sustainable practices minimize the short- and long-term environmental impacts of developments and other activities through resource conservation, recycling, waste minimization, and the use of energy-efficient and ecologically responsible materials and techniques. Value analysis and value engineering, including life-cycle cost analyses, would be performed to minimize energy, environmental, and economic costs of proposed improvements. Consequently, any adverse impacts relating to energy use, availability, or conservation as a result of the proposed improvements would be negligible. Therefore, energy requirements and conservation potential were dismissed from further consideration.

Environmental Justice

Executive Order 12898 requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. According to the Environmental Protection Agency, environmental justice is the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic

group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies. Teton County, where Grand Teton National Park is located, contains minority and low-income populations; however, environmental justice is dismissed as an impact topic for the following reasons:

- NPS staff and the planning team actively solicited public participation in the planning process and gave equal consideration to input from all persons regardless of age, race, income status, or other socioeconomic or demographic factors.
- Implementation of any of the alternatives would not result in any disproportionate human health or environmental effects on minorities or low-income populations and communities.
- The impacts associated with implementation of the alternatives would not result in any effects that would be specific to any minority or low-income community.

Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts on Indian trust resources from a proposed project or action by US Department of Interior (USDI) agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes. Indian Trust resources will not be impacted by either action alternative; therefore, this topic was dismissed from detailed analysis.

Natural or Depletable Resource Requirements and Conservation Potential

This impact topic addresses quality, recycling, or conservation of petroleum products and other natural resources. The use and conservation of fuels and other energy sources, including petroleum products, was discussed above under energy requirements and conservation potential. The amounts of other materials, such as metals and concrete, that would be required for the construction and operation of the proposed improvements would be small and would not be detectable relative to the regional use of these materials. Therefore, detailed analysis of this impact topic is not provided.

Potential Conflicts between the Proposal and Land Use Plans, Policies, or Controls

Land use plans, policies, or controls for the area outside the park are contained in the Jackson/Teton County Comprehensive Plan (Town of Jackson and Teton County 2002). All proposed improvements would occur entirely within the park. Therefore, they would not conflict with land use plans, policies, or controls for jurisdictions outside the park. For these reasons, the alternatives would not conflict with land use plans, policies, or controls, and this impact topic was dismissed from further analysis.

Socioeconomics

Project proposals within Grand Teton National Park have the potential to affect the social and economic conditions within the Greater Yellowstone Area. The alternatives analyzed in this plan propose no direct changes to any commercial facilities within or near the park. Jobs and purchases associated with construction and long-term operation and maintenance of the proposed campus improvements would not be detectable from normal variations in the labor or retail markets of Jackson and Teton County. Although project alternatives would likely produce indirect socioeconomic impacts, such as the change in the number of researchers using the campus that could result in more demand for food and/or less demand for laundry facilities, these impacts would be negligible. There would not be any changes in the need for services such as schools, fire protection, or street maintenance. Because the project would have a

negligible effect on social and economic conditions in the town of Jackson and Teton County, a more detailed analysis is not included.

Transportation

The proposed improvements would not be expected to affect roads in, or outside, the park. During construction, additional truck traffic could be detectable on AMK Ranch Road, but it would not reduce access to visitor use areas. Construction-related traffic on U.S. Highway 26/89/191 would not be detectable compared to normal traffic variations. Closure of part of AMK Ranch Road might be required during construction of proposed improvements. Because all impacts on transportation during construction and operation would be negligible, a more detailed impact analysis is not required.

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CHAPTER 2: ALTERNATIVES CONSIDERED

This chapter presents three alternatives for addressing campus improvements to the research center. Alternative A, the no-action alternative (Figure 3), comprises a continuation of current management and maintenance of the research center campus. It is included as a baseline for comparing the consequences of implementing the action alternatives – alternatives B and C (Figures 4 and 5).

The two action alternatives would address deferred improvements and maintenance of the research center water and wastewater systems; improved housing conditions for staff and researchers; enhanced fire suppression capabilities; protection against lakeshore erosion; and structural and aesthetic protection of buildings and facilities in the AMK Ranch Historic District. Alternative B would comprise all of these infrastructure updates and improvements, except increased housing capacity and associated parking. Alternative C includes all of the improvements included in alternative B, with the addition of a new dormitory and associated parking area. Each alternative described below includes an overall concept as well as specific proposed campus improvement actions. Mitigation measures that would be integrated to avoid or reduce impacts are included. This chapter also includes a description of the environmentally preferred alternative, identifies the NPS preferred alternative, and discusses alternative actions considered but not carried forward into the analysis. Figure 3 illustrates the non-action alternative, while Figures 4 and 5 illustrate the location and relative extent of proposed actions in both action alternatives; B and C respectively. Table 1 summarizes temporary and permanent ground disturbance area estimates by alternative and includes assumptions integrated into the disturbance estimate calculations. Table 2 provides a summary comparison of the alternative and Table 3 summarizes the anticipated impacts of the three alternatives.

ELEMENT COMMON TO ALL ALTERNATIVES

One element is common to all alternatives; the research center would continue to operate under the general agreement (and appendices, including those related to asset maintenance) between the National Park Service and the University of Wyoming (NPS and UW 2010).

ELEMENTS COMMON TO ALTERNATIVES B AND C

The construction period for all proposed actions under alternatives B and C would occur between late spring and late fall and would depend on snowfall and frozen ground conditions. No campus closures are planned during construction periods. Construction workforce would overnight outside of the research center campus area either within available public facilities within Grand Teton National Park and/or John D. Rockefeller, Jr. Memorial Parkway or in one or more local communities outside of these park units. Construction debris and excess material would be removed and transported to an approved solid waste facility outside of Grand Teton National Park. Trees and other vegetation would either be removed from the park or reused for other projects within the park units.

Construction activities would utilize heavy equipment, including, but not limited to, excavators, loaders, drilling rigs, well service rigs, haul trucks, dump trucks, lifts, bucket trucks, cranes, and concrete trucks. Staging and stockpiling areas would be located in previously disturbed sites, away from researcher and visitor use areas to the extent possible, to minimize the area of ground and vegetation disturbance. All staging and stockpile areas would be returned to pre-construction conditions and/or revegetated following completion of campus improvement activities. Parking areas for construction vehicles would be limited to these staging areas, existing roads and parking areas, and other previously disturbed areas.

ALTERNATIVE A: NO ACTION / CONTINUE CURRENT MANAGEMENT

The no action alternative provides a baseline for evaluating the action alternatives. Under alternative A (Figure 3) current management of the research center facilities would continue, with routine maintenance of existing water and wastewater systems. Critical repairs to campus facilities would be performed as

needed. Overnight accommodations at the research center would continue to be limited to 58 researchers and seven individuals associated with the university for a Total of 65 individuals (e.g. campus director and maintenance staff). Overnight parking would continue to be limited to about 50 spaces scattered throughout the research campus. Reasonable efforts would continue to be made to provide all individuals with access to any of the programs and seminars at the research center.

Estimated Cost

The estimated cost of implementing alternative A is $230,000 for critical repairs and routine maintenance over the 50 year planning period.

ALTERNATIVE B: WATER AND WASTEWATER SYSTEM, FIRE SUPPRESSION, RETAINING WALL, AND OTHER IDENTIFIED IMPROVEMENTS

Alternative B would include the following campus improvements, which would be implemented over the course of up to five total construction seasons, depending on available funding.

- Replace existing water and wastewater infrastructure to meet the existing needs of the research center, incorporating sustainable design features whenever possible.
- Enhance fire suppression capabilities.
- Address lakeshore erosion concerns.
- Provide structural and aesthetic protection of buildings in the historic district, including;
- Mitigation of surface drainage issues at Berol Lodge; and
- Improvements to the façade of Boise-Cascade Cabin.
- Provide ABA/ADA compliant access to some buildings.

These improvements are described in more detail below and are illustrated in Figure 4. The level of temporary and permanent vegetation and soil disturbance are detailed in Table 1.

Researcher Housing

Under alternative B, researchers would continue to seasonally reside in the existing buildings. Overnight accommodations at the research center would continue to be limited to a total of 58 researchers and seven individuals associated with the university (e.g. campus director and maintenance staff) for a total of 65 individuals. Overnight parking would continue to be limited to about 49 vehicles dispersed throughout the research campus.

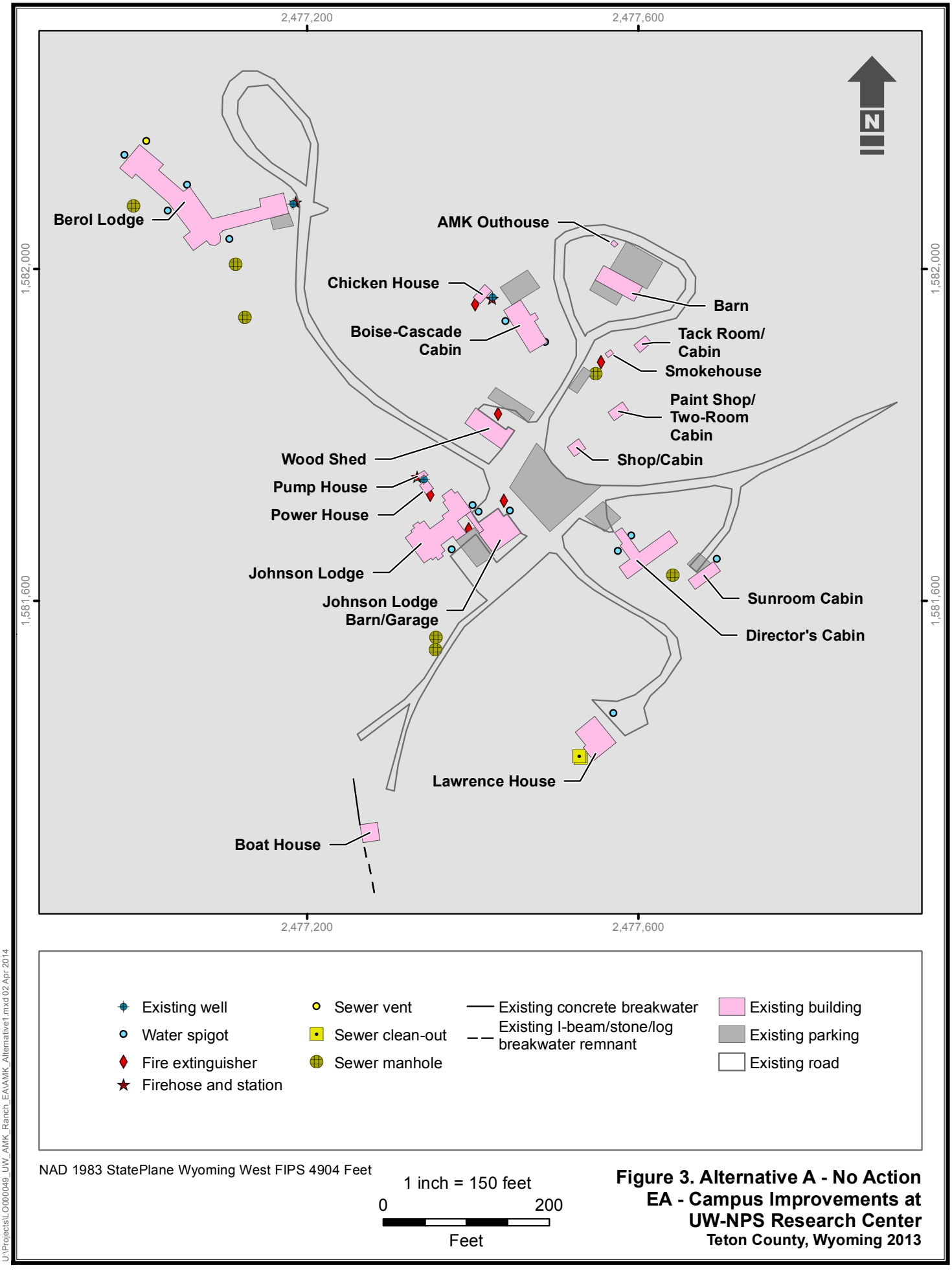

Figure 3. Alternative A - No Action
EA - Campus Improvements at UW-NPS Research Center
Teton County, Wyoming 2013

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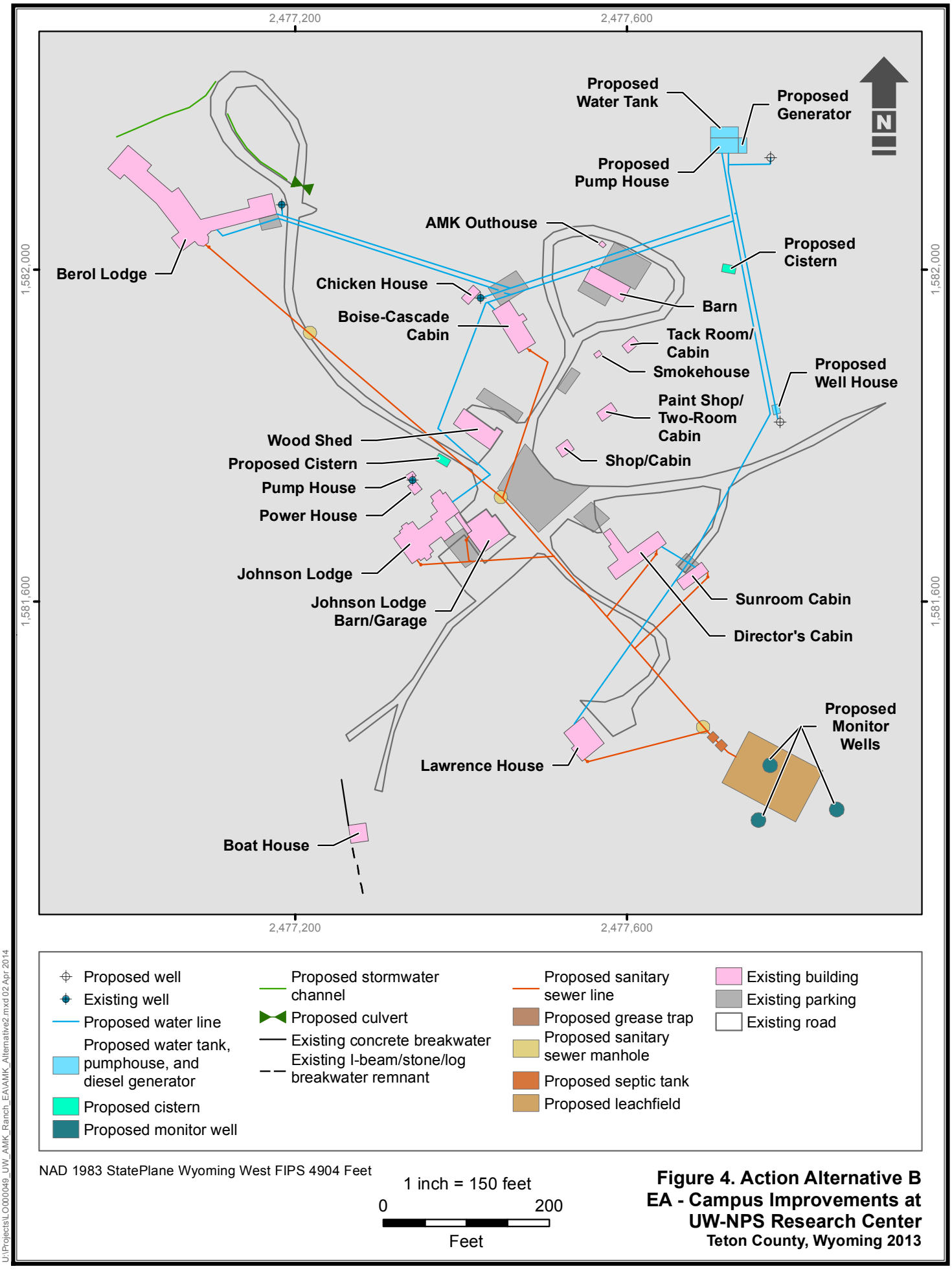

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1 inch = 150 feet

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Figure 4. Action Alternative B EA - Campus Improvements at UW-NPS Research Center
Teton County, Wyoming 2013

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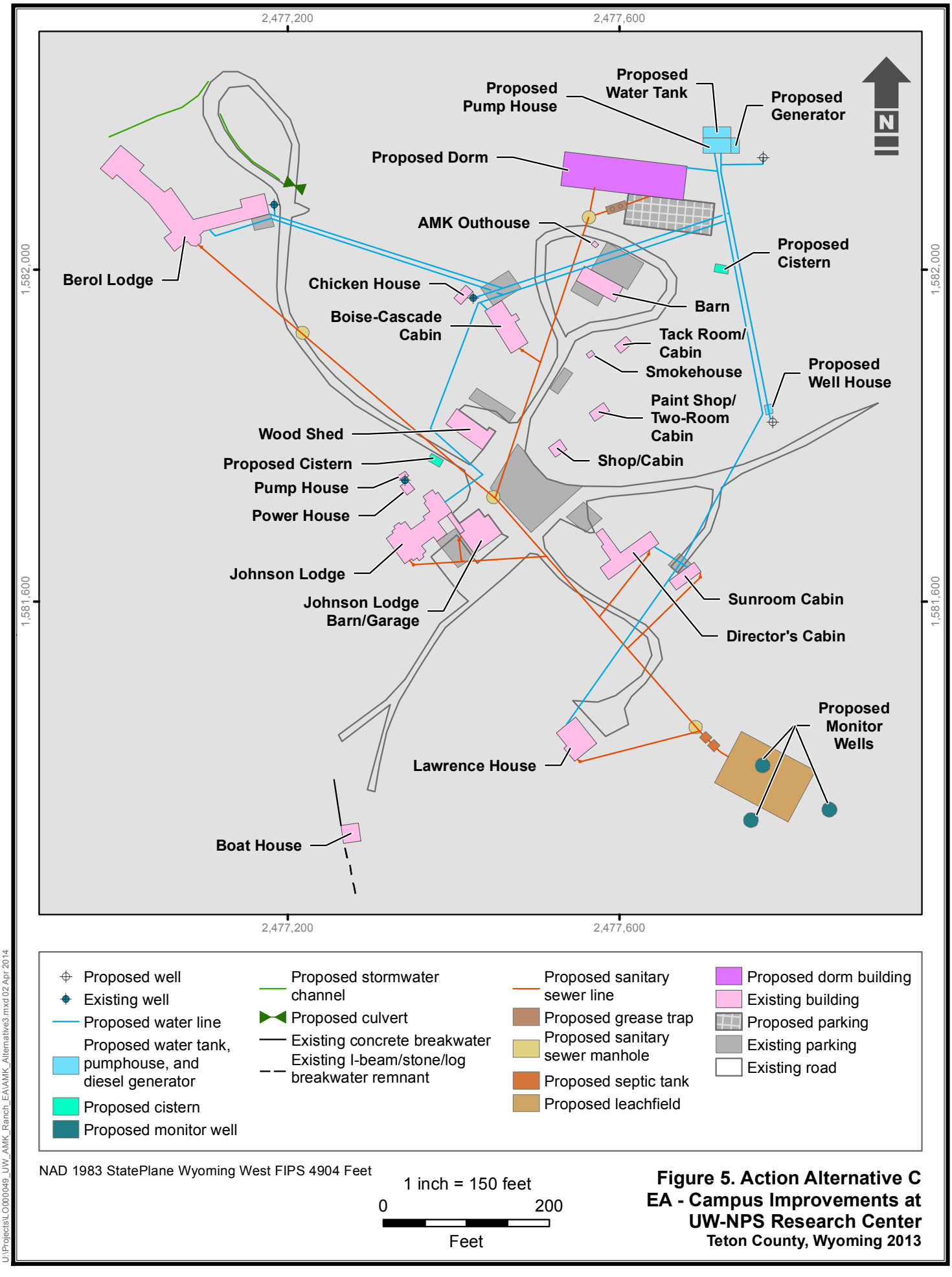

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Figure 5. Action Alternative C
EA - Campus Improvements at UW-NPS Research Center
Teton County, Wyoming 2013

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Water System

Under alternative B, the University of Wyoming would replace most of the existing water system. All water system improvements would be designed and constructed to conserve potable water resources.

Two existing water wells, located at the Berol lodge and chicken house, would be retained and rehabilitated. Well rehabilitation would entail a plumbing and electrical retrofit; including removing the existing pumping equipment and controls and installing new systems in the proposed water tank pump house. Pressure tanks associated with the existing wells would be removed and properly disposed offsite. No drilling equipment would be required for rehabilitating these two wells. The third existing well and pump, in the power house near the Johnson Lodge, would be disconnected from the potable water system but retained for uses such as filling cisterns and irrigation. Two new water wells would also be installed using a drilling rig (Figure 4).

The existing, galvanized potable water pipelines would be replaced throughout the research center site with new, buried water pipelines (approximately 2,000 linear feet). The new piping configuration would improve disinfection throughout the distribution system, provide the capacity to deliver firefighting flows to select buildings, and reduce water consumption due to line leakage.

A new above-ground water storage tank (approximately 12 feet diameter by 20 feet length and capable of storing about 15,000 gallons) would be installed northeast of the barn as described in the Fire Suppression section below. A new centralized water pump station would also be constructed. The proposed pump house (approximately 20 feet by 25 feet in size and no greater than 15 feet in height from top of roofline) would contain water system controls, water treatment equipment, electrical controls, pumping equipment, and the backup diesel generator. The back-up generator would be used to support fire suppression activities and provide smoke and fire detection during a power outage.

It is estimated that the first phase of the potable water system replacement would include completion of geohydrologic study, surveying, well drilling, and testing. Results of testing would inform the final water system configuration, based on the productivity of proposed wells and utility of upgraded existing wells. This is expected to take approximately one month to complete during the first construction season. It is estimated the installation of the water pipelines, storage tank, and new pump system would take approximately six months during the second construction season. Estimated costs for construction of the water system would be approximately $1,500,000.

Table 1: Estimated Ground Disturbance by Alternative[1]

Project Feature	Alternative A No Action (acres)	Alternative B				Alternative C			
		Temporary		Permanent		Temporary		Permanent	
		acres	cubic yards	acres	cubic yards	acres	cubic yards	acres	cubic yards
New water pipelines	NA	4.903	23,731	0	0	4.938	23,900	0	0
Existing water wells rehabilitated (2)	NA	0.004	19	0.001	5	0.004	19	0.001	5
Existing water well retained (1)	NA	0	0	0	0	0	0	0	0
New water wells installed (2)	NA	0.004	19	0.001	5	0.004	19	0.001	5
New above-ground water storage tank installed (1)	NA	0.125	605	0.029	140	0.125	605	0.029	140
New centralized water pump station constructed (1)	NA	0.05	242	0.002	10	0.05	242	0.002	10
New sanitary sewer lines with sewer manholes	NA	1.523	7,371	0.014	68	1.782	8,625	0.019	92
New septic tanks (2)	NA	0.067	324	0.005	24	0.067	324	0.005	24
New monitoring wells installed (3)	NA	0.08	387	0.009	44	0.08	387	0.009	44
New leach field (1)	NA	0.347	1,679	0.162	784	0.347	1,679	0.162	784
New 10,000 gallon concrete vault cisterns installed (2)	NA	0.114	552	0.008	39	0.114	552	0.008	39
Replacement/reinforcement of existing concrete breakwater wall	NA	0.069	334	0.002	10	0.069	334	0.002	10
Reinforcement of existing breakwater structures south of boathouse	NA	0.069	334	0.004	19	0.069	334	0.004	19
Surface water control channels and culvert near Berol Lodge	NA	0.125	605	0.025	121	0.125	605	0.025	121
Construct new dormitory	NA	NA	NA	NA	NA	0.294	1,423	0.133	644
Construct new parking lot adjacent to new dormitory.	NA	NA	NA	NA	NA	0.09	436	0.09	436
Total	**NA**	**7.48**	**36,203**	**0.26**	**1,258**	**8.12**	**39,301**	**0.49**	**2,372**

[1]Ground disturbance calculation assumptions:

1) Water and waste water lines: a 40-feet wide temporary disturbance corridor (centered on line).
2) Rehabilitated and new wells: a 25 feet temporary disturbance area (centered on feature location).
3) Storage tank, pump station, septic tanks, monitoring wells, leach field and cisterns: a 20-feet wide temporary construction buffer (outside of feature boundary).
4) Assumes the existing concrete breakwater wall is two-feet wide. The replacement wall will have a maximum size of existing length (+ 25%) and a maximum width of 3-feet. Permanent impacts of this replacement will be the difference between the old and new wall.
5) Replacement breakwater wall: a 20-feet wide temporary construction buffer on both sides of the wall location.
6) Replacement of the I-beam structure assumes the existing is five pieces, each 2x5-feet (10 square feet). Assumes replacement will be the same size as estimated above.
7) New dorm: a 20-feet wide temporary construction buffer.
8) New parking at the dorm: assume the permanent and temporary construction areas are the same with no temporary construction buffer.

Wastewater System

Under alternative B, the University of Wyoming would replace the existing wastewater system. The proposed improved wastewater system would comprise a single gravity-fed sanitary sewer collection network that would tie in to all occupied research center buildings. This would include new sanitary sewer lines with sewer manholes, septic tanks, and a single leach field to treat and dispose of onsite wastewater. The leach field would be located approximately 200 feet east of the Lawrence house within an area of small conifers (Figure 4). The leach field itself would be approximately 12,500 square feet and placed at a shallow depth of two to three feet below grade in order to maintain necessary aerobic conditions. Improvements to the wastewater system would also include three new monitoring wells, to be installed around the new leach field. Installation of these monitoring wells would require a drilling rig. Temporary and permanent ground disturbance estimates associated with these actions are summarized in Table 1.

Aboveground components of the existing wastewater system would be disconnected and removed. All leach fields would be abandoned in place. Lines to existing septic tanks would be cut and abandoned in place. The caps and lids of the existing seven septic tanks would be removed and the tanks would be filled with material excavated from water and wastewater systems construction activities Topsoil and native reseeding would be placed at each of the seven septic tank areas.

It is estimated the decommissioning of the old wastewater system and installation of the new sanitary sewer system would take approximately six months during the second construction season. Estimated costs for construction of the wastewater system would be approximately $500,000.

Fire Suppression

Under alternative B, the University of Wyoming would improve fire suppression capabilities at the research center. This would be achieved partially through the installation of new, higher flow water pipelines, described above, that could provide appropriate water flow for firefighting capabilities in select buildings. The Berol and Johnson lodges may be retrofitted with automatic sprinkler systems, if needed.

In addition, the new aboveground water tank would provide a larger, immediately available water reserve for firefighting efforts. This would be augmented by construction of two new, 10,000-gallon concrete vault underground cisterns (Figure 4). Temporary and permanent ground disturbance estimates associated with these actions are summarized in Table 1.

The cisterns would be filled manually via a yard hydrant connected to the water system or a nearby well at the beginning of each summer season, making this water immediately available for firefighting efforts. The cisterns would be drained in late September. The Johnson well may remain in service, but disconnected from the water system, to fill cisterns and to provide another non-potable source of water for campus fire suppression.

Installation of water system improvements that would also enhance fire suppression capabilities would be implemented during a six-month period during the second construction season, as described above for water system improvements. The estimated cost of retrofitting the Berol and Johnson lodges with sprinkler systems is $100,000. If it is determined that sprinkler systems are needed in the historic lodges, this would occur when funding is available.

Lakeshore Erosion Controls

Under alternative B, the existing concrete breakwater retaining wall (approximately 100 feet in length and seven feet in height) north of the boathouse/boat ramp would be reinforced or replaced. The existing breakwater structures to the south of the boathouse (approximately 200 feet in length and seven feet in height) would be replaced and extended, where necessary, to prevent erosion and enhance shoreline protection south of the boat ramp (Figure 6). These proposed modifications would prevent or restrict the movement of soil and further erosion of the shoreline in this area, as well as improve the appearance of the boathouse from the lake.

Existing concrete retaining walls would either remain in place and reinforced with stone backfill or replaced with new log walls. New or replacement retaining walls would be constructed of 12- to 15-inch diameter logs backfilled with rip-rap, concrete, and/or cobble. Stone-filled gabion baskets may be placed

Figure 6: Views of concrete breakwater retaining wall north of the boathouse/boat ramp and breakwater structures to the south of the boathouse

as additional backfill reinforcement. All proposed backfill would be hidden from view by the log wall facing the lakeshore and by compacted soil and native plant seeding on top of the back fill behind the log wall. All retaining wall improvements, including types of materials utilized, would be consistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Reconstruction or renovation of these structures would be expected to take approximately one construction season to complete. The estimated cost of replacing and/or reinforcing the existing lakeshore retaining wall is up to $500,000. These improvements would occur when funding is available.

Surface Water Control at Berol Lodge

Under alternative B, drainage issues that are adversely affecting the foundation of the Berol Lodge would be addressed by construction of two earthen stormwater control channels, one draining through a new culvert that would be installed under the existing road to the east of Berol lodge. These features, which consist of galvanized steel or concrete pipe culverts and native vegetation surface channels, would direct surface water drainage away from the lodge foundation as illustrated in Figure 4. Temporary and permanent ground disturbance estimates associated with these actions are summarized in Table 1.

Construction of these stormwater diversion channels and culvert would be expected to take approximately one week to complete. The estimated cost of correcting surface water issues at the Berol lodge is $25,000. These improvements would occur when funding is available.

Facility Access Improvements

Under alternative B, visitors attending seminars, conferences, and workshops at the research center would be accommodated by renovating one of the two existing restrooms in the Berol Lodge to be ABA/ADA compliant, if feasible, as determined by structural engineer and historic architect consultation. It is expected that this renovation would take approximately six weeks to implement. ABA/ADA-accessible researcher living space would be accomplished by modifying the existing Johnson Lodge kitchen apartment. The estimated cost of completing accessibility improvements at the Berol and Johnson Lodges is $30,000. These improvements would occur when funding is available.

Boise-Cascade Cabin Exterior/Cladding/or Re-facing

The visual discontinuity to the AMK Ranch Historic District presented by the current appearance of the Boise-Cascade Cabin would be addressed by installation of a new exterior cladding to the existing building. This building dates from outside the period of significance and is considered “non-contributing” to the historic district (Humstone et al. 2005 and 2014). The cladding would be designed in consultation with cultural resources staff specialists to ensure it would blend with the other historic buildings as part of the MOA (State Historic Preservation Officer (SHPO) and other consulting groups). It is expected that this renovation, designed to be compatible with the historic district, would take approximately three weeks to implement. The estimated cost of re-facing the exterior cladding on the Boise-Cascade cabin is $20,000. These improvements would occur when funding is available.

Total Estimated Cost

The total estimated cost of implementing the actions of alternative B is $2,675,000. The operation and maintenance cost of the water and wastewater facility is anticipated to be a total of $500,000 over a 50-year period.

Maintenance of New and Upgraded Infrastructure

Maintenance activities required for improved facilities and systems would be considered part of the campus improvements under alternative B. The University of Wyoming would be responsible for maintaining the proposed improvements in accordance with the general agreement (NPS and UW 2010).

ALTERNATIVE C: ALL IMPROVEMENTS INCLUDED IN ALTERNATIVE B, IN ADDITION TO A DORMITORY AND ASSOCIATED PARKING AREA

Alternative C includes all of the campus improvements included in alternative B, with the addition of a new dormitory building and associated parking area constructed by the University of Wyoming. The maximum overnight capacity of the research center would increase from a total of 65 individuals (58 researchers plus 7 individuals associated with the university) to up to 73 individuals (66 researchers plus 7 individuals associated with the university). This would enable the research center to increase overnight researcher capacity for up to 8 individuals. The level of temporary and permanent vegetation and soil disturbance are detailed in Table 1.

New Dormitory Facility and Parking

The proposed dormitory would be located northeast of the Boise-Cascade Cabin, within the space allocated to the research center but visually removed from the AMK Ranch structures in the historic district. The dormitory building would incorporate sustainable design and energy conservation features to meet Leadership in Energy & Environmental Design (LEED) standards, when applicable and feasible, if not LEED certification, per Appendix C of the general agreement (NPS and UW 2010). A fire suppression sprinkler system would be installed in the new dormitory.

The proposed dormitory would be no greater than 5,800 square feet (approximately 100 feet by 58 feet and no greater than 18 feet in height), on a single floor, with capacity to house up to 25 individuals. Temporary and permanent ground disturbance estimates associated with these actions are summarized in Table 1. The building would comprise up to 12 sleeping rooms, arranged in separate male and female suites, each consisting of two, double-occupancy rooms separated by common entryway and bathroom. This arrangement will result in approximately 80 square feet of bedroom space per resident campus-wide and a shared bathroom for every four residents. The dorm would include a dining room commons and a laundry facility adjacent to a communal kitchen area. An area of approximately 2,000 square feet, adjacent to the barn would be cleared of all vegetation, except trees, to provide non-paved parking for approximately seven vehicles associated with dorm residents. Under this alternative, proposed upgrades to the water and wastewater systems, as described in alternative B, would be designed to also accommodate the needs of this facility.

Approximately 17 research residents currently assigned living spaces in the existing buildings would be relocated to the proposed dormitory. These 17 research residents in addition to up to 8 new beds would accommodate up to 25 individuals within the new dormitory. The existing campus buildings would accommodate up to 41 researchers plus 7 individuals associated with the university (48 total individuals within the existing buildings). Overnight parking would be limited to approximately 56 vehicles at various locations within the research campus.

An additional single ABA/ADA -compliant sleeping room, with appropriate bathroom facilities, would be included in the new dormitory. This would satisfy ADA requirements for one compliant facility for every 25 sleeping rooms. Additionally, an ADA-accessible work station, approximately 15 square feet, would be included in the dormitory. The space could be used to house computer docking stations, herbarium specimens, and microscopes, among other pieces of small equipment.

It is estimated that construction of the new dormitory and parking lot would take approximately 15 months, distributed over the course of approximately two construction seasons. The dorm construction would occur after completion of water and wastewater improvements, as described in alternative B with associated schedules, to avoid interference among contractors.

Total Estimated Cost

The estimated cost of implementing the actions of alternative C is $4,675,000.

Maintenance of New and Upgraded Infrastructure

Maintenance activities required for improved facilities and systems would be considered part of the campus improvements under alternative C. The University of Wyoming would be responsible for maintaining the proposed improvements in accordance with the general agreement (NPS and UW 2010).

Alternatives Considered and Dismissed

During the planning process, other alternatives and management actions for wastewater and water systems for the research center were considered but eliminated from detailed study (Allen 2010, 2012). These alternatives and management actions, and the reasons for dismissing them, are described below.

Wastewater System Alternatives

Wastewater Alternative – Install Holding Tanks and Transport Wastewater Off-Site

In this dismissed alternative, wastewater would be collected and stored, then pumped out and hauled off-site for disposal. The existing septic tanks would be removed and replaced with watertight holding tanks. The disconnected leach field piping would be abandoned in place. For a few buildings, such as the north wing of the Berol Lodge, building sewer lines would be extended so the holding tank is accessible for the vacuum truck.

This alternative would require an estimated one to three truck trips hauling sewage from the research center holding tanks to the Colter Bay facility every day during the summer season. This would result in a large daily increase in truck emissions dispersed into the atmosphere along the daily truck route between Jackson, the research center, Colter Bay, returning to Jackson. The sight, sound, and possible odor, of the daily pumping at each wastewater holding tank would adversely impact research center visitors, researchers, and the context of the historic district.

Using local haulage service rates, the annual operating expense for this approach would cost more than double the current annual operating budget for the research center. Because of the potential environmental impacts, as well as economic infeasibility, this alternative was dismissed from further consideration.

Wastewater Alternative - Replace Existing Septic Tanks and Leach Fields with Seven Independent Wastewater Systems

This option would include installation of a new, larger, septic tank and leach field at each building. New leach fields would either be installed in new areas away from the existing leach fields, which would be abandoned in place, or the existing leach fields would be removed and new leach fields installed in the same locations. The larger systems at the Johnson Lodge, Berol Lodge, and proposed new dormitory would require individual UIC permits. Each new wastewater system would also require an individual Wyoming Department of Environmental Quality (WDEQ) permit. For these reasons, this alternative was dismissed from further consideration.

Wastewater Alternative – Connect Research Campus Wastewater Infrastructure to the Leek's Marina Wastewater System

Wastewater from the UWNPS Research Center would be pumped to the Leek's Marina wastewater system. This alternative would result in the largest area of surface disturbance to vegetation communities and wildlife habitat from installation of the connecting wastewater pipeline (approximately 3.0 to 4.8 acres). This alternative would require new infrastructure at the research center as well as an expansion of the Leek's Marina (lift station, etc.) system to accommodate additional waste water. Because of the large

potential environmental impact, as well as economic infeasibility, this alternative was dismissed from further consideration.

Water System Alternatives

Water System without Fire Suppression Flows

This dismissed alternative would replace the existing water system, but would not provide the capability for firefighting flow rates. Since this alternative would not allow for enhanced fire suppression, it was not carried forward.

Fire Suppression Water Tank Alternatives

Gravity-Fed System

A review of area topographic maps indicated the nearest sufficient elevation to place the distribution tank is approximately 3,200 feet east to southeast of the research campus. A review of area topographic maps indicates sufficient elevation along Highway 89, approximately 3,200 feet east or southeast of the research center campus. Under this dismissed alternative, groundwater would be pumped once, without the need of a booster pump, from the wells to the tank. Water would then be provided to the campus by gravity flow. Due to the greater distance required to place the well, tank and supply line away from the campus area, this alternative was not carried forward.

Pressurized tank on campus

This dismissed alternative would involve the use of a pressurized water tank, with a pressurized air cushion over the water, situated within the research center campus. This alternative was dismissed because WDEQ, Wyoming Department of Environmental Quality Rules and Regulations (WQRR) for public water systems do not allow consideration of pressure tank storage for fire protection purposes. In addition, this alternative would require water be, in effect, pumped twice because air pressure is maintained via an air compressor. Also a back-up generator would be required to maintain service during a power outage.

Dry Hydrant System

This alternative was dismissed because it would require either pumping of non-potable surface water from Jackson Lake using the local (Colter Bay) firefighting pumper truck or installing permanent pumps and separate larger-diameter non-potable water lines within the AMK Ranch Historic District. A dry hydrant system would be less reliable than a pressurized wet hydrant system due to the extreme differences in water levels within Jackson Lake during the year due to continual water withdraws to meet existing water rights in Idaho and Wyoming.

Dormitory Alternatives

Dormitory Outside of the Research Center Campus

This alternative would involve the construction of a dormitory outside of the research center campus. This alternative was dismissed because one of the project goals is to provide housing within the research center campus area that is cost-effective to maintain. Constructing a dormitory at an alternative developed area in close proximity outside of the existing research center campus would greatly increase the level of operations and maintenance required for the limited number of university staff. In addition, there is no current location within an existing developed area of Grand Teton National Park or the John D. Rockefeller, Jr. Memorial Parkway that is suitable for a dormitory or that is able to accommodate the water and wastewater needs of a new dormitory.

Other Housing Options Outside of the Research Center Campus

This alternative would involve researchers finding accommodations, such as cabins and campsites, outside of the research center campus. During any one summer the center serves as the "base camp" for 30-40 different independently conducted research projects and exploratory studies. This type of centralized setting provides researchers an opportunity to collaborate and build strong connections. Placing researchers in numerous accommodations around the Greater Yellowstone Area would not fulfill the research center's mission and therefore was dismissed.

MITIGATION MEASURES COMMON TO ACTION ALTERNATIVES

Mitigation measures are practicable and appropriate methods that would be implemented under either action alternative, as necessary, to avoid or minimize impacts to park natural and cultural resources. The measures were developed to minimize the degree and/or severity of adverse effects and are specific to the project area and to the resource issues analyzed in this document.

UW and NPS would obtain any required federal and state environmental permits required for this project and conduct all proposed actions in compliance with those permits. This permitting process could result in additional mitigation measures to be implemented, as required by the relevant agencies.

Visual Resources

- The aboveground water tank would be sited to maximize visual screening through design and placement, taking advantage of existing vegetation and topography.

Soils

- Staging and stockpiling areas would be located in previously disturbed sites, away from researcher and visitor use areas, to the extent possible, to minimize the area of ground and vegetation disturbance. All staging and stockpile areas would be returned to pre-construction conditions and/or revegetated following completion of campus improvement activities. Parking areas for construction vehicles would be limited to these staging areas, existing roads and parking areas, and other previously disturbed areas.
- Construction would be scheduled during dry periods and when surface and ground water levels would be low to minimize soil compaction, to the extent possible. Take care to avoid any rutting caused by vehicles or equipment.
- Erosion control best management practices would be implemented to minimize soil erosion. Examples include silt fences, sediment traps, erosion check screens and filters, and hydro mulch. Use materials such as straw bales, fabric barriers, and sandbags to prevent soil from entering waterways.
- Construction zones would be identified and demarcated with construction tape, temporary fencing, or some similar material prior to any construction activity. The fencing would define the construction zone and confine activity to the minimum area required for construction. All protection measures would be clearly stated in the construction plans, and specifications and workers would be instructed to avoid conducting activities, including materials staging and storage, outside the demarcated construction zone.
- Construction debris would be placed in refuse containers at least daily, and refuse would be disposed of at least weekly. No burning or burying of refuse would be allowed inside the park.
- New water pipelines and sanitary sewer pipelines would be sited within existing roadway rights-of-way when feasible, cost effective, and not in conflict with WDEQ regulations.

- Water and sanitary sewer pipelines would be installed using trenching technology. Restoration would be performed quickly and, where possible, sod would be rolled so that topsoil and vegetation would be placed back on top of the filled trench where plants can reestablish and limit the opportunity for exotic invasive species.
- If necessary, topsoil would be removed from construction areas, away from excavations and future work to protect it from mixing with subsoil. Grade and shape stockpiles would allow for unimpeded drainage of surface water. If topsoil is to be stored for more than a short time, use seeding with a fast-growing native species to provide a protective cover and prevent the introduction of exotic invasive plants. The use of previously disturbed areas would be maximized for staging and stockpile areas to minimize ground disturbance.
- Dust control methods such as watering, covering haul loads, and controlling vehicle speeds would be implemented to the extent possible. Where backfilling is required, such as in the water main trench, backfill would not extend above the original ground surface contour level after compaction and settling.
- Fill materials from a source approved by the park ecologist would be obtained and excess excavated soil at other project sites within the park would be maximized to the extent possible.
- Best management practices would be implemented for construction not finished by winter, to protect disturbed areas and soil stockpiles. This could include covering soil piles with impermeable materials. Replace the topsoil as part of site restoration after construction is completed. Distribute topsoil evenly to provide an effective rooting medium over the entire area of disturbance.
- In areas of potential soil disturbance, existing topsoil would be salvaged and stored for reuse to facilitate revegetation in accordance with NPS policies and guidance. Topsoil would be stored for as short a time as possible to prevent loss of seed and root viability, loss of organic matter, and degradation of the soil microbial community.

Vegetation

- A project revegetation plan would be developed prior to beginning construction and ground-disturbing activities. This plan would include:
    - Plans and methods to salvage, temporary storage, and re-plant existing plant material, especially shrubs and turf patches.
    - Use of plant species native to the immediate area. Include natural spacing, abundance, and diversity of native plant species.
    - Obtain native plant material from a local NPS source and use in accordance with NPS policies and guidance.
    - Design for no supplemental irrigation beyond seedling and plant establishment.
    - Use of certified weed-free mulch, erosion control materials, and seeds, and plan to check materials certification before application.
    - Management of exotic invasive species. This would include pre and post-construction treatment of weed species in the project area and weed control measures.
    - Include maintenance to monitor and mitigate impacts for at least three years after construction. Include stipulated additional measures if recovery of a weed-free cover of native species could not be documented at the end of this period.

- Methods to minimize impacts on vegetation by avoiding shrubs and trees, including their root systems, when establishing construction zone boundaries, would be implemented where possible. Damage or removal of vegetation outside authorized construction zones without prior approval in the project documents or from NPS vegetation staff would be prohibited.
- Contractor(s) shall mobilize all vehicles, equipment, and tools to the job site in a condition free of mud, dirt, and plant material. A method such as pressure washing prior to transport will be needed to comply with this requirement. Prior to offloading of any equipment, the contractor(s) shall obtain verbal approval from the contracting officer or his/her designated representative. The spread of noxious, invasive, and other non-native plant species in the park is a serious concern, and no equipment would be allowed to offload nor remain within the park if dirt or other contaminants with the potential to harbor seeds or other plant material is apparent.
- Construction best management practices would be followed for soil preparation and revegetation activities. After site work is completed, compacted soil would be de-compacted to a depth of 12 inches, and scarified to reestablish original contours. Topsoil would be spread in as near to its original location as possible to help preserve microorganisms and seeds of native plants.

Water Resources

- A stormwater pollution prevention plan (SWPPP) would be prepared for the project. It would include site-specific measures to reduce and control erosion, sedimentation, and compaction that can degrade water quality. It will include vegetation buffers between areas of soil disturbance and waterways. Soil erosion best management practices would be utilized, such as sediment traps, erosion check screen filters, and hydro mulch to prevent the entry of sediment into waterways.
- The storage, handling, and disposal of all hazardous materials and waste would comply with applicable federal and state regulations. Provisions would be made for storage, containment, and disposal of hazardous materials used onsite. To minimize possible petrochemical leaks from construction equipment, all equipment would be monitored frequently to identify and repair any leaks and would be staged in designated areas suitable to contain leaking materials. Trained personnel would clean up and dispose of any leakage or spill from construction equipment such as hydraulic fluid, oil, or fuel. Fueling and fuel storage areas would be permitted only at approved locations and comply with park refueling guidelines.
- Onsite fueling and maintenance would be kept to a minimum. If these activities cannot be avoided, fuels and other fluids storage, as well as fueling and maintenance, will occur in designated areas that are bermed and lined to contain spills. Require provisions for the containment of spills and the removal and safe disposal of contaminated materials, including soil.
- Ensure all actions are consistent with state water quality standards and Clean Water Act Section 401 certification requirements.

Wildlife

- Areas of vegetation removal would be surveyed for nesting birds by park biologists if construction is between May 10 and August 1. These surveys would be conducted within a week of commencing construction activities. If nests are found, park staff would work with construction contractors to modify the location or alter the timing of the construction plan to prevent nesting disturbance. Ideally, conduct work after August 1 to avoid any conflicts. Inform construction workers and supervisors that under the Migratory Bird Treaty Act, no migratory bird, nest, or egg can be disturbed, removed, or destroyed. Provide instructions for notification of NPS staff if the potential for disturbance is discovered.

- Protect bald eagle nests from human disturbance between February 1 and August 15. Plan work to ensure that it does not occur within a half mile of any active bald eagle nest from February 1 to August 15 (NPS 2011, USFWS 2007).
- Plan work so that it would not occur within 100 yards of any osprey, trumpeter swan, peregrine falcon, or great blue heron nests from April 1 to September 1 (NPS 2011).
- Construction activities would not take place before 8 a.m. or after 6 p.m.to protect animals whose movements and activities correspond with crepuscular hours. Train all contractors and their employees regarding the NPS bear management plan, safety protocols, and food storage regulations. Require storage and handling of food, fuel, and other attractants to minimize potential conflicts. Ensure that all project crews meet standards for sanitation, attractant storage, and access.
- NPS staff would be notified if bats are located in any project facilities. If bats are found using the site as a roost, delay construction activities until after an NPS survey determines that individuals and/or young have left the structures.

Cultural Resources

All proposed activities will be conducted in compliance with compliance with guidance in Section 106 (36 CFR 800) of the NHPA and conform to Chapter 8, Section C (4a)), of DO-28: The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings (NPS 1998). If necessary, an appropriate mitigation strategy would be developed in consultation with the Wyoming state historic preservation officer (SHPO) prior to implementing any of the action alternatives. Mitigation agreed upon would be outlined in a memorandum of agreement negotiated among the National Park Service and SHPO. This MOA may also involve the Advisory Council on Historic Preservation and consulting parties, if necessary.

a. Design Compatibility

Contemporary additions or development adjacent to historic structures should be designed to complement the structures' visual and physical characteristics. Concern for the compatibility of additions extends to both the exteriors and interiors of historic structures. Special attention should be given to new construction within historic districts.

A new structure or addition will be compatible if it maintains the overall pattern of development in the area and is visually unobtrusive in terms of scale, texture, and continuity of architectural style or tradition. Scale is defined in terms of similar or harmonious proportions, especially height and width. Texture refers to the surface quality of materials, especially reflection of light. Continuity encompasses such characteristics as use of color, internal organization of space, massing, roof forms, architectural details, site relationships, palette of materials, and placement of windows and doors. Unless a new structure is a reconstruction, it should not duplicate or mimic a historic structure.

- All adaptations to meet accessibility needs will conform to Chapter 5 Section C (4b), of DO-28, The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings (NPS 1998).

b. Accessibility

With the exception of prehistoric structures, every historic structure should be made accessible to all visitors and employees to the highest degree feasible. As a general rule, a historic structure is expected to meet all requirements for accessible buildings outlined in section 4.1.6 of the Uniform

Federal Accessibility Standards (UFAS; 49 FR 31528). If the Advisory Council on Historic Preservation finds that compliance with the requirements would threaten or destroy the historical integrity of a historic building, alternative requirements outlined in section 4.1.7(3) of UFAS may be followed.

Alternatives to physical access for public programs may be considered if the Advisory Council determines that measures required for access would unacceptably compromise a building's historical integrity or character.

- Should any archeological remains be uncovered during the implementation of the proposed project, activity will cease and the appropriate state, federal, and tribal agencies will be contacted immediately.
- All proposed work, including potential new dormitory and parking lot construction will meet standards laid-out in DO-28: The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings (NPS 1998).

Visitor Use and Experience

If construction activities occur when the research center is operational and is open to the public:

- The University of Wyoming would develop and enforce an NPS- approved traffic and pedestrian control plan for use during construction. The plan would minimize disruption to visitors and park/university operations and ensure safety of the public, employees, and residents.
- Contractors would be required to coordinate with NPS and university staff to minimize disruption of normal research center campus activities. Construction workers and supervisors would be informed about the special sensitivity of park values, regulations, and appropriate housekeeping.

GENERAL CONSTRUCTION BEST MANAGEMENT PRACTICES

- Clearly state all required mitigation measures and applicable best management practices in the construction specifications.
- In the contract, identify specific provisions to prevent stormwater pollution during construction activities, in accordance with the National Pollutant Discharge Elimination System permit program of the Clean Water Act and all other federal regulations, and in accordance with the stormwater pollution prevention plan to be prepared for this project.
- Provide the contractor with a copy of U.S. Environmental Protection Agency document *EPA832-F-99-003, Stormwater Management Fact Sheet-Dust Control*. Require the contractor to submit a dust control plan prior to construction.
- Backfill excavated areas that are not to be used for structural requirements with appropriate material, and contour them so that, after settling, they will blend with the surrounding terrain.
- Ensure that construction equipment uses the best available technology for sound dampening muffler and exhaust systems.
- To save fuel and reduce noise and emissions, require contractors to develop and implement a plan that prevents excessive idling of all vehicles used in construction.
- Require good housekeeping practices such as placing debris in refuse containers daily, emptying containers regularly, and prohibiting the burning or burying of refuse in the park.

THE PREFERRED ALTERNATIVE AND ENVIRONMENTALLY PREFERABLE ALTERNATIVE

Alternative C is the preferred alternative. It would implement all of the improvements to water, wastewater, fire suppression, and the breakwater retaining wall near the boathouse, as well as other minor building improvements or updates, which were included in alternative B. It would also improve housing conditions for researchers and staff and is the only alternative that would solve the existing egress and over-crowding issues. It would improve operation of the research center better than the no-action alternative and alternative B, and would address the many deficiencies identified in existing research center housing. It would also have a greater beneficial impact by being able to accommodate disabled researchers to a better degree than alternative B would.

The no action alternative, alternative A, would have a greater adverse impact on water quality, human health and safety, soils, and facility operations compared to alternatives B and C because water and wastewater systems would not be replaced, fire suppression systems would not be improved, and lakeshore erosion and surface water drainage issues would not be resolved. Alternative A would continue to have the potential for causing minor impacts to cultural resources within the AMK Ranch Historic District, as explained in the table below, because of ongoing drainage issues at the historic Berol Lodge and erosion on Jackson Lake which threatens the historic boathouse.

According to CEQ regulations implementing NEPA, the environmentally preferable alternative is the alternative "that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources." The environmentally preferable alternative is identified upon consideration and weighing by the responsible official of long-term environmental impacts against short-term impacts in evaluating what is the best protection of these resources. In some situations, such as when different alternatives impact different resources to different degrees, there may be more than one environmentally preferable alternative.

Alternative B is the environmentally preferable alternative because it protects, preserves, and enhances natural and cultural resources within the project area slightly better than alternative C would. Replacement of the water and wastewater systems and improvements to the fire suppression system at the research center would result in beneficial impacts to water quality, human health and safety, visitor use and experience, and facility operations. Repairing or replacing the lakeshore retaining wall and addressing surface water drainage issues near the Berol Lodge would have a beneficial effect on water quality, soils, and vegetation.

Alternative C is only slightly less environmentally preferable than alternative B because construction of a new dormitory would have a slightly greater impact on wildlife, soils, and vegetation due to an increase in the development footprint within the project area. The difference between the two action alternatives is very small. While improvements proposed by both of the action alternatives would result in short-term and long-term areas of impact, in the long term alternative C would only affect an additional 0.24 acres (0.49 acres versus 0.26 acres) compared to alternative B. Constructing the dormitory would also impose an additional non-contributing element into the AMK Ranch Historic District. Resource impacts would be considerably reduced through the implementation of specific mitigations and best management practices before, during, and after implementation of the preferred alternative.

SUMMARY COMPARISON OF THE ALTERNATIVES

Table 1 summarizes the ground disturbance area by alternative. Table 2 summarizes the major components of the alternatives, and Table 3 compares the ability of these alternatives to meet the project objectives (identified in Chapter 1: *Purpose and Need).* Environmental consequences that would result from implementation of each alternative are summarized in Table 4. Please note that impacts to cultural resources are estimated in compliance with NEPA requirements. Additional consultation in compliance with Section 106 of the NHPA is being completed separately. A more detailed explanation of the impacts is presented in Chapter 3: Affected Environment and Environmental Consequences.

The purpose of this project was identified at the beginning of chapter 1, with objectives that could be used to determine if an alternative would be successful in meeting the project purpose. Alternative A would not meet five of the seven objectives that would indicate success. It would only meet the other two (preservation of the historic district according to policies, standards, and guidelines, and efforts to increase sustainability) because of historic preservation requirements and the NPS-UW general agreement specifications to increase sustainability, and at a lesser level than the action alternatives would meet them. Both action alternatives were designed to address the shortcomings of the existing systems and would meet all of the objectives for addressing water system and wastewater deficiencies as well as other miscellaneous improvements considered. Table 3 provides some additional detail about why the action alternatives meet project objectives. None of the alternatives would result in conflicts with any environmental laws or policies.

Table 2. Summary Comparison of Elements within the Alternatives

Alternative Element	Alternative A: No Action	Alternative B: Preferred Campus Improvements	Alternative C: Campus Improvements with New Dormitory
Overall Concept	Continuation of current management; no campus improvements	Campus improvements implemented	Campus improvements implemented plus new dormitory and parking area
Water System	Continuation of routine maintenance of water system. Critical repairs would be performed as needed.	New potable water system: -water pipelines replaced; -two existing water wells rehabilitated and retained in system; -one existing well retained for use, independent of water system; -two new water wells installed; -new above-ground water storage tank installed; and -new centralized water pump station constructed.	Same as alternative B
Wastewater System	Continuation of routine maintenance of wastewater system. Critical repairs would be performed as needed.	New gravity-fed sanitary sewer collection network: -new sanitary sewer lines with sewer manholes; -new septic tanks; -new single leach field; and -three new monitoring wells installed.	Same as alternative B

Table 2. Summary Comparison of Elements within the Alternatives

Alternative Element	Alternative A: No Action	Alternative B: Preferred Campus Improvements	Alternative C: Campus Improvements with New Dormitory
Water System, Fire Suppression	Continuation of current management; no improvements to fire suppression capacities.	New water system would include: -construction of two,10,000 gallon concrete vault cisterns; -new, higher flow water pipelines; -new aboveground water tank; and -some of buildings may be retrofitted with automatic sprinkler systems.	Same as alternative B
Lakeshore Erosion Controls	Continuation of current management; no replacement of reinforcement of existing concrete wall or breakwater structures unless an urgent needs arises.	-Possible replacement and/or reinforcement of the existing concrete breakwater retaining wall; and -Possible reinforcement of existing I-beam/log/stones breakwater structures south of the boathouse.	Same as alternative B
Surface Water Control Structures at Berol Lodge	Continuation of current management; no improvements for surface water flow control.	Construct two earthen stormwater control channels to collect and direct surface water drainage away from the Berol Lodge foundation.	Same as alternative B

Table 2. Summary Comparison of Elements within the Alternatives

Alternative Element	Alternative A: No Action	Alternative B: Preferred Campus Improvements	Alternative C: Campus Improvements with New Dormitory
ABA/ADA Access	Continuation of current management; reasonable efforts would continue to be made to provide all individuals with access to any of the programs and seminars at the research center.	Renovate existing bathroom in the Berol Lodge and the Johnson Lodge kitchen apartment to be compliant with ABA/ADA	-Renovate existing bathroom in the Berol Lodge and the Johnson Lodge kitchen apartment to be compliant with ABA/ADA; and -Single ADA-compliant sleeping room, with appropriate bathroom facilities in new dormitory.
Boise-Cascade Exterior	Continuation of current management; installation of a new cladding to the existing building would not occur.	Installation of a new cladding to the existing building.	Same as alternative B
Maintenance of New and Upgraded Infrastructure	Continuation of current management per the General Agreement.	Maintenance activities required for new or improved facilities and systems.	Same as alternative B
New Dormitory/Parking	Continuation of current management; no new dormitory or parking would be constructed.	Same as alternative A	-Construct new dormitory: approximately 5,800-square-feet, on a single floor; and -Construct new parking lot adjacent to new dormitory.

Table 2. Summary Comparison of Elements within the Alternatives

Alternative Element	Alternative A: No Action	Alternative B: Preferred Campus Improvements	Alternative C: Campus Improvements with New Dormitory
Estimated Project Period	NA	4 construction seasons	4 construction seasons
Estimated Construction Costs	$0	**$2,500,000** *Water System: $1,500,000* *Wastewater System: $500,000* *Other Site Improvements: $500,000*	**$4,500,000** *Dormitory: $2,000,000* *Improvements Listed in alternative B: $2,500,000*
Estimated Annual Site Operations and Maintenance (O&M) Costs	$110,000	$135,000	$145,000
Present Worth of Site O&M Costs (Life Cycle Costs)*	$2,363,000	$2,900,000	$3,115,000
Total (Construction Costs + Life Cycle Costs)	$2,363,000	$5,400,000	$7,615,000
**50-year lifecycle assumed for water and wastewater systems, dormitory, and other site improvements, 25-year lifecycle assumed for the leach field*			

Table 3. Comparison of How Each Alternative Meets Project Objectives

Project Objectives	Alternative A: No Action	Alternative B: Preferred Campus Improvements	Alternative C: Campus Improvements with New Dormitory
	Meets Project Objectives?	**Meets Project Objectives?**	**Meets Project Objectives?**
Preserve the AMK Ranch Historic District in Accordance with Standards, Guidelines, and Policies	Yes, but with continuing concerns. Appropriate preservation maintenance would continue but work to address surface water flow issues and erosion control would only be done as needed. The potential for a breakdown in the water or wastewater systems or markedly greater erosion and drainage issues would remain. Critical work to address these potentially foreseeable events to prevent damage to the historic district would be done in emergencies. Visual discontinuity in the historic district caused by the existing siding on the Boise-Cascade Cabin would continue.	Yes. The historic district would be better preserved by improving lakeshore erosion control measures to proactively protect the boathouse, control surface water drainage and prevent erosion at Berol Lodge, and improve visual continuity within the district by installing new cladding at the Boise-Cascade Cabin.	Yes, alternative C would accomplish the beneficial actions included in Alternative B, but this alternative would add a non-historic element to the district.
Improve Existing Water System to Meet Research Center Needs	No. The existing water system is old, with leaky, corroded, undersized pipelines, and needs rehabilitation.	Yes. Upgrading and replacing infrastructure will assist in ensuring continued safe conditions and would improve water quality, quantity, flow rate, and ability to meet fire suppression needs.	Yes. Same as alternative B.
Improve Wastewater System to meet Research Center Needs	No. The existing wastewater system is old, undersized for current needs, and ineffectively designed compared to modern systems. The potential for	Yes. Upgrading and replacing infrastructure would improve the efficiency and effectiveness of the wastewater system and assist in	Yes. Same as Alternative B.

Project Objectives	Alternative A: No Action	Alternative B: Preferred Campus Improvements	Alternative C: Campus Improvements with New Dormitory
	system failure and water contamination would continue to exist without rehabilitation.	ensuring continued safe conditions.	
Improve Fire Suppression Capabilities to Ensure Appropriate Level of Fire Protection	No. Water lines would continue to be undersized and unable to convey the current required flow rates for fire suppression. Fire suppression capabilities would not be improved without the proposed improvements.	Yes. Upgrading and replacing water system infrastructure and potentially installing automatic sprinkler systems at some buildings would improve fire suppression capabilities and ensure continued safe conditions. The new system would be able to meet current required flow rates for fire suppression.	Yes. Same as alternative B
Ensure Research Center Housing is Safe and Sanitary, Sited to Avoid Natural Hazards, Integrated into the Park Environment, Sufficient to Support the Mission of the Research Center, and to the Best Extent Possible, Energy Efficient and Cost-Effective to Maintain	No. Although the research center has been able to function with existing housing, housing needs exceed the current capacity of the center, which has resulted in safety concerns due to lack of egress from second-story rooms	Yes, but not to the extent that alternative C would. Although alternative B would improve housing conditions and rectify fire and sanitation issues, it would not solve the difficulties in distributing housing assignments and accommodating needs that already exceed the center's capacity. Nor would it correct the lack of second-floor egress from the Johnson Lodge and garage buildings.	Yes. Better than both alternatives A and B. The new dormitory would improve the quality and distribution of research center housing compared to both the no-action and alternative B. Alternative C would best support the mission of the research center, and improve efficiency and cost-effectiveness. The dormitory building would also improve energy efficiency by incorporating incorporate sustainable design and energy conservation features. As in alternative B, it would also rectify fire, sanitation, and egress safety issues.
Provide Access for People with Disabilities	No. None of the center facilities currently meet legal requirements of the Architectural Barriers and Americans with Disabilities Acts.	Yes. Existing facilities in the Berol Lodge and Johnson Lodge will be modified to meet legal requirements of the Architectural Barriers and Americans with Disabilities Acts.	Yes. Better than under alternative B. The new dormitory, as well as upgraded facilities at the Berol Lodge and Johnson Lodge will meet legal requirements of the Architectural Barriers and Americans with Disabilities Acts.
Increase Sustainability of Facilities	Yes. Efforts would be made to increase the sustainability of the facilities when possible. The general agreement between the	Yes, better than under alternative A. Sustainable practices would be implemented when possible, as under the no-action alternative, but the	Yes, better than both alternatives A and B. Alternative C would best improve the research center because, in addition to implementing the improvements also proposed in alternative B,

Project Objectives	Alternative A: No Action	Alternative B: Preferred Campus Improvements	Alternative C: Campus Improvements with New Dormitory
	NPS and the university requires use of sustainable design principles and energy efficiency. Sustainable practices would be implemented when possible.	proposed facility improvements would increase the efficiency of the water and wastewater systems.	the new dormitory would be constructed to the highest environmental standards that reflect sustainability and conservation. Sustainable practices would be implemented when possible, as under the no-action alternative, but the proposed facility improvements would increase the efficiency of the water and wastewater systems.

Table 4. Comparison of the Estimated Impacts from Alternative Implementation

Impact Topic	Alternative		
	Alternative A: No Action	**Alternative B: Campus Improvements**	**Alternative C: Preferred Campus Improvements with New Dormitory**
Surface and ground water quality	Long-term minor to moderate indirect adverse impacts from continued use of existing undersized and aging wastewater systems and the potential for contaminant migration to affect ground or surface water quality.	Long-term minor to moderate indirect beneficial impacts from replacement of existing undersized and aging wastewater system with a new technology system that meets federal and state wastewater management requirements.	Same as alternative B.
Cultural resources	No direct adverse effects on the historic district because critical maintenance and repairs would continue to occur. Long-term potential for minor to moderate indirect adverse impacts from continued surface water drainage issues near the Berol lodge, failure of the breakwater walls adjacent to the historic boat house to control bank erosion, and the lasting visual discontinuity of the Boise-Cascade house exterior cladding. Continued minor direct beneficial impacts from occasional preservation maintenance.	Short-term minor direct and indirect temporary adverse impacts to the cultural landscape from construction and/ or replacement/repair activities to replace water, wastewater, fire suppression systems, and address surface water drainage and lakeshore erosion issues. Minor and direct short term adverse impacts to historic structures during the construction of accessible features at the Berol Lodge and Johnson Lodge. Long-term minor direct and indirect beneficial impacts due to better long-term protection of the historic resources from correcting surface water drainage issues at the Berol Lodge, protecting the boathouse from lakeshore erosion, improving fire suppression capability, and reducing the existing adverse visual impact of the non-historic Boise-Cascade Cabin on the historic district, through consultation with the Wyoming SHPO as required under Section 106 of NHPA.	Same as Alternative B (effects from infrastructure improvements and efforts to address surface water drainage, lakeshore erosion, and the Boise Cascade exterior) but with additional short-term negligible to minor adverse impacts due to slightly expanding the area of construction by building a new dormitory and parking area. To avoid long-term adverse impacts to the historic setting (through consultation with the Wyoming SHPO as required under Section 106 of NHPA), the dormitory would be designed and located so that it is compatible with the historic district and would negligibly impact the historic district in the long term.

Table 4. Comparison of the Estimated Impacts from Alternative Implementation

Impact Topic	Alternative		
	Alternative A: No Action	**Alternative B: Campus Improvements**	**Alternative C: Preferred Campus Improvements with New Dormitory**
Health and safety	Long-term minor to moderate direct and indirect adverse impacts if water and/or wastewater systems fail, fire suppression and emergency egress issues are not addressed, overcrowded housing conditions are not resolved, and/or accessibility standards are not met.	Long-term moderate direct and indirect beneficial impacts from the replacement of water and wastewater systems, installation of fire suppression systems, and the achievement of accessibility standards. Long-term minor direct adverse impacts from the continuation of overcrowded housing conditions and emergency egress issues.	Long-term moderate direct and indirect beneficial impacts similar to alternative B, due to campus improvements, but at a higher level because accessible standards would be better met with the addition of the new dormitory, which would provide additional accessible accommodations as well as resolve the emergency egress and overcrowded housing issues.
Soils and vegetation (including special status species)	Long-term negligible direct and indirect adverse impacts from the continued use and management of the research center. Long-term moderate direct and indirect adverse impacts from loss of soils and vegetation along Jackson Lake shoreline from failure of breakwater retaining walls.	Short-term minor direct and indirect adverse impacts from construction activities to replace water and wastewater systems, resolve surface water drainage issues at the Berol Lodge, and construct new and reinforce existing breakwater retaining walls. Long-term minor direct adverse impacts from the removal of a small amount of native vegetation due to presence of new water and wastewater systems within undisturbed areas. Long-term moderate direct beneficial impacts from replacement of the breakwater retaining walls.	Short-term minor direct and indirect adverse impacts from construction activities to replace water and wastewater systems, construct a new dormitory and associated parking area, resolve surface water drainage issues at the Berol lodge, and construct new and reinforce existing breakwater retaining walls. Long-term minor direct adverse impacts from the removal of a small amount of native vegetation due to presence of new water and wastewater systems and dormitory within undisturbed areas. Long-term moderate direct beneficial impacts from replacement of the breakwater retaining walls.

Table 4. Comparison of the Estimated Impacts from Alternative Implementation

Impact Topic	Alternative		
	Alternative A: No Action	**Alternative B: Campus Improvements**	**Alternative C: Preferred Campus Improvements with New Dormitory**
		Long-term negligible direct and indirect adverse impacts from the continued use and management of the research center.	Long-term negligible direct and indirect adverse impacts from the continued use and management of the research center.
Wildlife and wildlife habitat (including special status species)	**Wildlife and Wildlife Habitat:** Long-term negligible direct and indirect adverse impacts from the continued use and management of the research center. **Threatened and Endangered Species:** Canada lynx, grizzly bear, and wolverine – "M*ay affect, not likely to adversely affect."* Greater sage-grouse, yellow-billed cuckoo – "*No effect."*	**Wildlife and Wildlife Habitat:** Short-term minor direct and indirect adverse impacts from construction activities to replace water and wastewater systems, resolve surface water drainage issues at the Berol lodge, and construct new and reinforce existing breakwater retaining walls. Long-term minor direct adverse impacts from the presence of new water and wastewater systems within undisturbed areas. Long-term negligible direct and indirect adverse impacts from the continued use and management of the research center. **Threatened and Endangered Species:** Canada lynx, grizzly bear, and wolverine – "M*ay affect, not likely to adversely affect."* Greater sage-grouse, yellow-billed cuckoo – "*No effect."*	**Wildlife and Wildlife Habitat:** Short-term minor direct and indirect adverse impacts from construction activities to replace water and wastewater systems, construct a new dormitory and associated parking area, resolve surface water drainage issues at the Berol lodge, and construct new and reinforce existing breakwater retaining walls. Long-term minor direct adverse impacts from the presence of new water and wastewater systems and dormitory within undisturbed areas. Long-term negligible direct and indirect adverse impacts from the continued use and management of the research center. **Threatened and Endangered Species:** Canada lynx, grizzly bear, and wolverine – "M*ay affect, not likely to adversely affect."* Greater sage-grouse, yellow-billed cuckoo

Table 4. Comparison of the Estimated Impacts from Alternative Implementation

Impact Topic	Alternative		
	Alternative A: No Action	**Alternative B: Campus Improvements**	**Alternative C: Preferred Campus Improvements with New Dormitory**
			– "*No effect.*"
Visitor use and experience	Long-term minor to moderate direct and indirect adverse impacts if water and/or wastewater systems fail, fire suppression and emergency egress issues are not addressed, overcrowded housing conditions are not resolved, and/or accessibility standards are not met. Long-term moderate direct and indirect beneficial impacts from the continued use and management of the research center.	Short-term negligible to minor direct and indirect adverse impacts from construction activities to replace water and wastewater systems, resolve surface water drainage issues at the Berol lodge, construct new and reinforce existing breakwater retaining walls, replace Boise-Cascade house exterior cladding, and complete accessibility improvements. Long-term minor direct and indirect beneficial impacts to disabled visitors from project improvements. Long-term moderate direct and indirect beneficial impacts to disabled researchers from project improvements. Long-term moderate direct and indirect beneficial impacts from the continued use and management of the research center.	Short-term negligible to minor direct and indirect adverse impacts from construction activities to replace water and wastewater systems, construct a new dormitory and associated parking area, resolve surface water drainage issues at the Berol lodge, construct new and reinforce existing breakwater retaining walls, replace Boise-Cascade house exterior cladding, and complete accessibility improvements. Long-term minor direct and indirect beneficial impacts to disabled visitors from project improvements. Long-term moderate direct and indirect beneficial impacts to disabled researchers from project improvements. Long-term moderate direct and indirect beneficial impacts from the continued use and management of the research center.
NPS and UW operations	Long-term moderate direct and indirect adverse impacts if water and/or wastewater systems fail, fire suppression and emergency egress	Short-term negligible to minor direct and indirect adverse impacts from construction activities to replace water and wastewater systems, resolve surface	Short-term negligible to minor direct and indirect adverse impacts from construction activities to replace water and wastewater systems, resolve surface water drainage

Table 4. Comparison of the Estimated Impacts from Alternative Implementation

Impact Topic	Alternative		
	Alternative A: No Action	**Alternative B: Campus Improvements**	**Alternative C: Preferred Campus Improvements with New Dormitory**
	issues are not addressed, overcrowded housing conditions are not resolved, and/or accessibility standards are not met.	water drainage issues at the Berol lodge, construct new and reinforce existing breakwater retaining walls, replace Boise-Cascade house exterior cladding, and complete accessibility improvements. Long-term minor to moderate direct and indirect beneficial impacts from project improvements addressing many of the existing issues.	issues at the Berol lodge, construct new and reinforce existing breakwater retaining walls, replace Boise-Cascade house exterior cladding, and complete accessibility improvements. Long-term moderate direct and indirect beneficial impacts from project improvements addressing all of the existing issues.

CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter analyzes the environmental impacts that would result from the alternatives for the proposed project. Topics analyzed in this chapter include:

- Water quality;
- Cultural resources – including archaeological resources and historic structures;
- Health and safety;
- Soils and Vegetation;
- Wildlife - including candidate, threatened, and endangered species;
- Visitor use and experience; and
- Grand Teton National Park and University of Wyoming operations.

METHODS

Effects were evaluated for each retained impact topic in terms of type, context, duration, and intensity. Impact type describes whether impacts are beneficial or adverse, and direct or indirect, as defined:

- *Beneficial*: A beneficial change in the condition or appearance of the resource or change that moves the resource toward a desired condition.
- *Adverse*: A negative change that detracts from the resource appearance or condition or that moves the resource away from a desired condition.
- *Direct*: An effect that is caused by an action and occurs in the same time and place.
- *Indirect*: An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.

Context describes the area or location in which the impact would occur, such as site-specific, local, regional, or even broader geographic area. The term “disturbance area” is used for the area where activities such as clearing and grading occur in association with construction.

Duration describes the length of time an effect would occur, either short-term or long-term:

- *Short-term* impacts generally last only during construction, and the resources resume their pre-construction conditions following construction.
- *Long-term* impacts last beyond the construction period, and the resources may not resume their pre-construction conditions for a longer period of time.

Intensity describes the degree, level, or strength of an impact. For this analysis, intensity has been categorized into negligible, minor, moderate, and major. Intensity definitions are provided for each impact topic analyzed in this environmental assessment.

CUMULATIVE IMPACTS SCENARIO

CEQ regulations state that the cumulative impact analysis should include the anticipated impacts to the environment resulting from “the incremental impacts 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 time (40 CFR 1508.7).” Cumulative impacts are considered for both the no-action and action

alternatives. To determine potential cumulative impacts, past, present and future potential actions and developments within the research center area, as well as within the remainder of the park were considered in the analysis. The planning period incorporated into the analysis is 25 years.

The cumulative impacts analysis includes all past, current, and future projects around the Jackson Lake area of the park. These developed areas include Lizard Creek Campground, Leeks Marina, Colter Bay Village, Jackson Lake Lodge, and Signal Mountain Lodge. These existing developments would all continue to be maintained and improved.

Some infrastructure improvements in this part of the park were completed in the recent past. At Colter Bay Village, improvements completed in 2011 included installing a new water main pipeline in the campground, replacing water and sewer distribution lines, rehabilitating some campsites to be fully accessible, and replacing the water main line. Another future action would entail the selective removal of about 60 trees between the historic Colter Bay Visitor Center and Jackson Lake to restore the lake and mountain views. Hazard removal of pine beetle-killed trees would continue. Aging water and sewer lines at Signal Mountain Campground are planned for replacement beginning in fall 2014 and lines at Jackson Lake Lodge will also need to be replaced in the future.

Also planned for the future are improvements described in the Colter Bay Visitor Services EA (NPS 2013). The selected alternative will remove the existing visitor center due to age, condition, and numerous critical system deficiencies, and construct a new smaller visitor center nearby as well as implement parking and vehicular and pedestrian circulation changes. The visitor center is a contributing historic structure in the Colter Bay Village Developed Area Historic District but it was determined that removal of this structure (one of 188 in the district) would not compromise the overall integrity of the historic district or its eligibility for listing in the National Register.

SURFACE AND GROUND WATER QUALITY

Affected Environment

The information that supports the analysis of impacts on surface and ground water quality was included in the description of the need for the project in chapter 1. Consistent with instructions from the CEQ (1978) to avoid duplication, this section summarizes relevant information that previously was presented.

Grand Teton National Park is entirely contained within the Snake River basin. Jackson Lake Dam was constructed to raise the lake level in 1906 and influences the stream flow regime, bedload transport processes, and channel dynamics within the Snake River. The dam presence results in fluctuating shoreline elevations in Jackson Lake.

Jackson Lake creates the western boundary of the research center. Its elevation above water level fluctuates with the rise and fall of the lake; however, it is at approximately 2,063 meters (6,768 feet) above sea level. In the northeastern portion of the research center, a small ravine lies between the Berol Lodge and Boise-Cascade Cabin. The ravine is approximately 8 meters (26 feet) in depth. State surface water quality standards classify all surface waters in the park as Class 1, Outstanding Waters (WDEQ 2001, 2007). However, there are some concerns regarding water quality related to erosion of exposed soil near the boathouse due to the deterioration of the existing retaining wall near Jackson Lake.

Although the local soils are highly permeable and the existing wastewater system is expected to be functioning less than optimally, there are no known leaks of wastewater contamination into Jackson Lake from the research center site.

Impact Analysis Methods

Impacts on surface and ground water quality resources are evaluated using the process described in the "Methods" section. Impact threshold definitions for water resources are summarized in Table 5. Mitigation measures and BMPs listed in chapter 2 would be implemented as part of the action alternatives.

Table 5. Impact Threshold Definitions for Water Quality

Threshold	Definition
Negligible	Changes would be either undetectable or barely detectable; any effects would be slight.
Minor	Changes in water quality would be measurable, although the changes would be small and may affect a few organisms. The changes could include increased or decreased loads of sediment, debris, chemical or toxic substances, or pathogenic organisms.
Moderate	Changes in water quality would be clearly measurable and potentially affect organisms or natural ecological processes.
Major	Changes in water quality would be readily measurable, result in substantial changes, and significantly affect organisms or natural ecological processes. These changes would be noticed on a park-wide or regional scale.

Alternative A: No Action/Continue Current Management

Impact Analysis

The no action alternative would represent a continuation of current management and deferred improvements for research center facilities and infrastructure. The ongoing use of the existing wastewater system has the potential to result in migration of sewage through the leach fields in highly permeable soils, into the subsurface, potentially affecting groundwater or surface water quality. The water moves rapidly through the soil via gravity and may not remain in the treatment layer long enough to be treated effectively. Contaminants may continue to migrate rapidly into the subsurface, potentially affecting groundwater or surface water quality. In summary, with the current systems, sewage has the potential to travel farther with less treatment. New technology can counter this potential problem. This represents a long-term minor-to-moderate potential adverse impact to local water quality.

Cumulative Impacts

Stormwater runoff from the boat launches and parking lots at several locations on the east side of Jackson Lake (Lizard Creek Campground, Leeks Marina, Colter Bay Village, Signal Mountain Lodge, and overlook pullouts and picnic areas in close proximity) may enter the lake. Likewise, boats docked at these marinas may represent discharges into the lake. Both activities have the potential for small adverse changes to water quality, which would continue. The no action alternative, which would continue current management and maintenance of the existing wastewater system, would represent the potential for a small increment to the overall cumulative impacts to water quality throughout the area.

Alternative B: Water and Wastewater System, Fire Suppression, Retaining Wall, and Other Identified Improvements

Impact Analysis

The proposed improvements to the research center wastewater system under alternative B would be expected to mitigate to a large degree the current potential for adverse impacts to local water quality. Newer septic tanks retain sinking (sludge) and floating (fats and grease) solids via baffles or pipe tees, while allowing wastewater to flow into the leach field. Newer leach fields consist of horizontal perforated piping or infiltration chambers bedded in gravel. A bio-layer forms in the leach field and provides aerobic biological wastewater treatment. Therefore, implementation of alternative B would result in minor to moderate direct beneficial impacts to water quality.

Cumulative Impacts

Stormwater runoff from the boat launches and parking lots at several locations on the east side of Jackson Lake (Lizard Creek Campground, Leeks Marina, Colter Bay Village, Signal Mountain Lodge, and overlook pullouts and picnic areas in close proximity) may enter the lake. Likewise, boats docked at these marinas may represent discharges into the lake. Both activities have the potential for small adverse change to water quality and would continue. By improving the wastewater system, Alternative B would represent the potential for a small increment of beneficial impacts to the overall cumulative impacts to water quality throughout the area.

Alternative C: All Improvements Included in Alternative B, in Addition to a Dormitory and Associated Parking Area

Impact Analysis

The proposed improvements to the research center wastewater system under alternative C would be expected to mitigate to a large degree the current potential for adverse impacts to local water quality. Newer septic tanks retain sinking (sludge) and floating (fats and grease) solids via baffles or pipe tees, while allowing wastewater to flow into the leach field. Newer leach fields consist of horizontal perforated piping or infiltration chambers bedded in gravel. A bio-layer forms in the leach field and provides aerobic biological wastewater treatment. Therefore, implementation of this aspect of alternative C would result in minor to moderate direct beneficial impacts to water quality.

A new dormitory facility is proposed under alternative C. Mitigation measures described in chapter 2 would be implemented during the construction of this dormitory building. These measures would reduce potential effects to surface water quality from erosion runoff during building construction, resulting in no greater than negligible adverse impacts. The new dormitory building would be connected to the improved wastewater system and would not contribute any adverse impacts to water quality through its operation.

Cumulative Impacts

Stormwater runoff from the boat launches and parking lots at several locations on the east side of Jackson Lake (Lizard Creek Campground, Leeks Marina, Colter Bay Village, Signal Mountain Lodge, and overlook pullouts and picnic areas in close proximity) may enter the lake. Likewise, boats docked at these marinas may represent discharges into the lake. Both activities have the potential for small adverse changes to water quality. By improving the wastewater system, Alternative C would represent the potential for a small increment of beneficial impacts to the overall cumulative impacts to water quality throughout the area.

CULTURAL RESOURCES - INCLUDING ARCHAEOLOGICAL RESOURCES, HISTORIC STRUCTURES, AND CULTURAL LANDSCAPES

Affected Environment

Previous Documentation and Evaluation

The AMK Ranch Historic District is the only historic property within the project area. The historic district was listed in the National Register of Historic Places (NRHP) in 1990 (Mehls 1990). The district was listed at the local level of significance for the period of 1927 to 1937, as an excellent example of rustic twentieth-century vacation home architecture at Grand Teton National Park (Mehls 1990). The boundaries of the district were defined as a 26-acre area that included the structures of the district as well as the historic setting (Figure 7).

Sixteen buildings in the historic district are located at the end of AMK Ranch Road and comprise the current research center. Presently, eight are inhabited seasonally while the remaining eight serve as storage and/or lab space. The buildings are predominantly constructed with logs and the more recent frame structures are painted or stained brown to blend in with the campus and the lodge pole pines.

Two archeological sites were documented at the AMK Ranch also in 1990. The archeological remains of John Sargent's cabin were recorded and noted as a slight depression surrounded by historic trash that consisted of whiteware, transferware, and purple and clear glass (Conner 1990). A second archaeological site was also documented as a scatter of prehistoric material north of W.C. Lawrence's house. The remains of the Sargent cabin were recommended as eligible for the NRHP; the prehistoric site was recommended as not eligible due to loss of integrity (Connor 1990).

Two cultural resources inventories were conducted for the AMK Ranch area by the Wyoming State Archaeologist for the National Park Service and the University of Wyoming in 2002 and 2003 (Sanders, 2002; Sanders and Hamilton, 2003). New cultural resources were identified in these inventories. A few additional cultural materials were noted at the second archaeological site although the site continued to be recommended ineligible for NRHP listing due to loss of integrity.

In 2005, the historic district was reevaluated as a cultural landscape by the University of Wyoming American Studies Program. The university recommended expanding the period and areas of significance, as well as the potential boundaries. The resulting revised NRHP nomination was prepared by the American Studies Program, in concert with the park's cultural resources staff. The revised nomination recommends that the district is eligible on the local level under Criteria A, B, C and extends the period of significance from 1927-1937 to 1890-1976 in order to include features associated with John Sargent and Alfred Berol (Humstone et al. 2005). The AMK Ranch Historic District is recommended eligible under Criterion A for the area of significance of Exploration and Settlement and Entertainment and Recreation as the location of an early homestead and vacation home. It is recommended eligible under Criterion B for the its association with the life of AMK Ranch caretaker, W.C. "Slim" Lawrence, a collector of Native American and early pioneering-era artifacts, who has significantly contributed to the history of Jackson Hole, WY. Finally, the AMK Ranch Historic District is recommended eligible under Criterion C for the area of significance of Architecture, with excellent and well-preserved examples of Rustic style vacation homes, designed by prominent architects such as George Kosmak and Paul Colbron, with ancillary structures that conform to the norms of the vernacular rustic style.

In addition, the proposed boundaries of the district are extended to include the entire Sargent's Bay peninsula (Figure 7). While the 1990 nomination concentrated on the Berol and Johnson cluster at the southwestern base of the peninsula, this updated nomination includes features associated with the Sargent homestead and Berol's rifle and skeet shooting ranges. An additional 25 contributing resources were also

identified. The Boise-Cascade Cabin will be considered a non-contributing resource, as it is not related to the areas of significance for the historic district.

The NRHP listing provides a basis for the analysis, augmented by the conclusions of the recent reevaluation of the district from 2005 (Humstone et al. 2005). Those conclusions, including a recommended expansion of the district boundaries and contributing resources, are supported by Grand Teton National Park, who has prepared the nomination (Humstone et al. 2014) for review by the SHPO, before forwarding it to the NRHP.

AMK Ranch Historic District

Originally homesteaded in 1890 by John Sargent, the AMK Ranch later served as a year-round residence and vacation home for both the Johnson and Berol families. The name, AMK, was given to the property by the Berol family, using the first letter of each of their names (Alfred, Madeline, and their son, Kenneth). The district's period of significance extends from the establishment of John Sargent's homestead in 1890 to 1974, the year Alfred Berol died and the ranch stopped being used as a summer vacation home; the property was then acquired by the National Park Service. Significant dates include 1926, when William Lewis Johnson acquired the property and built his own log home at the southern end of the peninsula, and 1936, when Alfred Berol bought the property and began planning an elaborate rusticated log vacation home. In 1976, the Berol family sold AMK Ranch to the National Park Service and the property was transformed into the University of Wyoming-National Park Service Research Station in July 1978. A partnership continues to allow the University of Wyoming to run the research station under a formal agreement with the park.

Grand Teton National Park
Wyoming

AMK Ranch Historic District Site Map

National Park Service
U.S. Department of the Interior

Figure 7. Original and revised AMK Ranch Historic District boundaries, contributing features, and other existing infrastructure.

GRTE GIS Office

0 0.1 0.2 0.4 Miles

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Contributing Resources

All but one of the extant buildings date to the period of significance (1890-1974). Of these, all but one are located within the boundaries of the district and are considered contributing. They are associated with William Lewis Johnson and Alfred Berol and were originally used for residential and agricultural purposes comprise the historic district. The Laurence House and Boise-Cascade Cabin are non-contributing; the former is from within the period of significance but the latter is outside this period.

Of the 15 buildings in the historic district, those associated with Johnson include the Johnson Lodge and barn/garage (1927), shop cabin (c. 1927), power house/well house (c. 1927), boat house (c. 1927, remodeled c. 1938), smokehouse (c. 1928), chicken house (c. 1928), woodshed (c. 1928), two-room cabin (1931), sunroom cabin (c. 1931, remodeled 1940), and the director's cabin (c. 1931, remodeled 1972). Built by Lawrence, the outhouse (c. 1935) was the only building constructed between 1932 and 1936. Buildings associated with Berol include the Berol Lodge (1938), tack cabin (c. 1939), and barn (c.1938).

The historic district contains an additional 18 contributing resources - structures, objects, and sites - including the gravestones and memorials/markers of three former inhabitants, a series of log benches, two boat docks, a disintegrating fence line, the remnants of a riprap device, a step-up bench, honey bucket toilet, a few abandoned two-track roads, the original Sargent homestead site, rifle and trap shooting range sites, and three other archeological sites. Vegetation identified as contributing resources include the native lodgepole pine forest, two small groves of aspen trees making the original Sargent homestead location on a knoll, cleared areas beyond the main campus area marking historic trap shooting and rifle ranges, and a now-dead spruce tree, the "violin tree" where Edith Sargent enjoyed playing her instrument. These listed resources are all on the peninsula to the northwest of the UWNPS Research Center campus, outside the area affected by actions in this plan/EA.

The natural vegetation contributes to integrity of the setting around the buildings. The circulation system of internal roads and trails between buildings on the campus does not contribute to the integrity of the setting, according to the 2014 nomination (Humstone et al. 2014). The views of the mountains and the lakeshore from the campus, especially from the Berol and Johnson Lodges, are described as character-defining in the cultural landscape inventory. All are described as similar to what occurred historically, especially since administrative activity has cleared dead and down vegetation within 200 yards of most structures for fire protection reasons, maintaining the views from the campus to and across Jackson Lake. Views inward from the shore to the campus are not mentioned in the landscape inventory.

Impact Analysis Methods

In this environmental assessment, impacts to cultural resources are described in terms of type, context, duration, and intensity, which is consistent with the regulations of the Council on Environmental Quality that implement the National Environmental Policy Act. The impact analysis is intended to comply with the requirements of the National Environmental Policy Act.

An assessment of effects under section 106 of the National Historic Preservation Act will be addressed separately from this environmental assessment.

An onsite survey was conducted of the project area, including the core of the AMK Ranch Historic District (that area that was officially designated in 1990). During the site visit, locations for the proposed dormitory and water tank were identified. Three alternative widths (50, 100, and 150 feet) for the dormitory's front elevation were identified, marked, and photographed. A visual simulation of the proposed dormitory was also reviewed. Previous research and documentation, including the 1990 NRHP

listing as well as the 2005 draft amended nomination, were reviewed for a clear understanding of how the historic district was developed and how it may be impacted by the project alternatives.

Following fieldwork, the effects of the proposed alternative actions on historic properties were analyzed, using the assumption that the footprint of the dormitory would be approximately 100 feet wide by 58 feet deep, and a single story in height. The assessment of effects was conducted in compliance with Section 106 (36 CFR 800) of the NHPA and guided by the *Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Properties*. Section 106 regulations define an adverse effect as one that occurs when an undertaking directly or indirectly alters the characteristics of a historic property that make it eligible for listing in the NRHP, specifically in terms of the resource's integrity (ACHP 2013). The regulations specify that an adverse effect is constituted by an undertaking that diminishes the integrity of the historic property's location, design, setting, materials, workmanship, feeling, or association. Those seven aspects of integrity are an integral component of any historic property's eligibility for the NRHP. The regulations also state that "consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register" (ACHP 2013). In the case of the AMK Ranch Historic District, the recent evaluation of the district, including the evaluation of its cultural landscape (Humstone et al. 2014), identifies additional contributing resources and/or qualifying characteristics of the historic property, all of which were considered in this analysis.

For purposes of this analysis, the following definitions have been employed:

Historic Property or Historic Resource: a historic site, district, building, structure, or object that is either eligible for inclusion in the NRHP or listed therein.

Adverse Visual Effect: an effect that negatively affects the integrity of the setting or feeling of an historic property, to the extent that significance and eligibility for listing in the NRHP are compromised. In particular, adverse visual effects can be seen as adversely affecting the following characteristics of integrity: setting, feeling, or association.

Obstructive Visual Effects: any visual effect that carries the potential to obstruct any part of the view of a historic property, or the scenic view from such a resource. Adverse obstructive effects can obstruct all or a portion of an historic property and/or its viewshed, in turn adversely affecting the property's historic character.

Scenic Views: any scenic resources or resources that are visually and aesthetically important and that contribute to a historic property's significance.

Viewshed: an area visible from a specified location or locations.

Visual Effects: any aspect of a proposed undertaking that will be seen from or will be in the view of a historic property. A visual effect may be beneficial or adverse and may affect the historic property in an aesthetic or obstructive manner. The determination that a visual effect exists does not automatically imply that the effect is adverse.

Adverse Visual Effects: Adverse visual effects may be created when an undertaking is visible within the viewshed of the historic property, when it blocks a view toward the historic property, or when it introduces an element that is incompatible with the criteria under which the property is eligible.

Simply because an undertaking will be visible from a historic property does not mean it automatically will create an adverse visual effect. Therefore, it is necessary to evaluate the visual changes and alterations the undertaking will introduce to the resource. In assessing adverse visual effects on a historic property it is necessary to identify the criterion or criteria under which the resource is eligible and what qualities or characteristics of the resource contribute to its significance or eligibility. For example, if a resource is

eligible for its innovative engineering qualities, visual effects on the property may not be adverse, whereas if the property is eligible on the basis of its architectural significance, an adverse effect very well may be created.

An adverse effect may be obstructive, which is to say it may block the view to or from a historic property; it may also not be obstructive and still create an adverse effect in that it introduces elements so incompatible with the criterion or criteria under which the property is eligible for listing that it diminishes the property's significance to a substantial degree. A highway proposed to run alongside a historic rural church, while it would not directly obstruct the view to or from the building, might still introduce an element so incompatible with the rural setting of the property that it would have a diminishing effect upon the integrity of the property's setting.

Adverse visual effects should be determined on a case-by-case basis, weighing the following factors:

- **Significance.** A historic built-environment resource's historical significance and its key aspects of integrity must be taken into account in order to evaluate the project's effects on the property's eligibility for listing in the NRHP.
- **Character-Defining Features.** The alteration of character-defining features at the project location (including open space) can affect the view from the historic built-environment resource and possibly the location, feeling, setting, and association of that resource.
- **Compatibility.** Whether in an open space or a developed area, the compatibility of the project with the character of the project's location and surrounding area, including historic properties, is important. The character of the historic property's site and architectural features should be the basis for determining the appropriate characteristics of the proposed project. The compatibility of the project is determined by:
    - Mass – the arrangement of the project's spaces;
    - Scale and proportion – the size and the proportion of the project to the surrounding structures and features;
    - Height – sometimes it may be necessary that a project height extend beyond that of the surrounding buildings and other features within view of the project; it is important that the height of the Project not cause the line of sight to move so far up that the surrounding features are out of view, thereby detracting from the original view;
    - Shadows;
    - Color;
    - The degree to which the project would contribute to the area's aesthetic value;
    - The degree of contrast, or lack thereof, between the project and the background, surrounding scenery, or neighborhood; and
    - The amount of open space.
- **Obstructive Effects.** Whether a project is on or near a historic property, it can block the resource from being viewed, or block a view seen from that resource, thereby possibly diminishing its integrity. Determination of adverse obstructive effects should be made on a case-by-case basis, considering the following factors:

- The historic property's significance. It is necessary to understand the resource's historic significance and its key aspects of integrity in order to evaluate the project's effects on the resource's eligibility for listing in the NRHP.
- Nature and quality of the view from the historic property. This includes such features as natural topography, settings, man-made or natural features of visual interest, and other historic properties seen from the historic built-environment resource, any of which would contribute to its significance and integrity.
- Extent of obstruction. This includes total blockage, partial interruption, or interference with a person's enjoyment and appreciation of a scenic view or historic property viewed from the historic property, to the extent it affects the integrity of the historic property.
- Obstruction of an historic property. The project might obstruct the historic property from being viewed from the project site or other area. If the historic property is visually appreciated from surrounding viewpoints, obstructing its view may affect its feeling, setting, location, or association.

Impacts on historic structures and cultural landscapes are evaluated using the process described in the "Methods" section. This analysis includes impacts analyzed for compliance with NEPA requirements; it does not include a complete analysis of affects for NHPA requirements. Impact threshold definitions for historic structures and cultural landscapes are summarized in Table 6. Mitigation measures and BMPs listed in chapter 2 would be implemented as part of the action alternatives.

Impacts are assessed by alternative in the following sections. An analysis of impacts common to the action alternatives (alternatives B and C) conclude this analysis in the final section.

Table 6. Impact Threshold Definitions for Historic Structures and Landscapes

Threshold	Definition
Negligible	Impact(s) is at the lowest levels of detection; barely measurable with no perceptible consequences.
Minor	Impacts would affect the pattern(s) or feature(s) of the landscape but would not diminish the overall integrity of the historic district.
Moderate	Impacts would alter a character-defining feature(s) of historic structures but would not diminish the overall integrity of the historic district.
Major	Impacts would alter a character-defining feature(s) diminishing the overall integrity of the historic district to the extent that it would no longer be eligible to be listed on the National Register of Historic Places.

Alternative A: No Action/Continue Current Management

Impact Analysis

Alternative A, the no action alternative, would continue current management of the AMK Ranch Historic District. Some types of maintenance activities would continue to be implemented in a more reactive rather than proactively planned way. Repairs would be performed in accordance with the *Secretary of the*

Interior's Standards for the Treatment of Historic Properties. Thus, in the long term, this alternative would have minor, site-specific, beneficial impacts to historic structures.

But because infrastructure repairs are sometimes deferred until there is a critical need, the no action alternative could potentially pose adverse impacts to the historic district and risk damage to the historic fabric of the buildings. For example, without upgrading the water and wastewater systems, aging pipes could break, which could result in water damage to the original wood features of the historic buildings. Without enhanced fire suppression capabilities, the threat of damage to buildings by fire remains high. If lakeshore erosion concerns are not addressed in advance, there could be a threat to the stability of the retaining wall, boat docks, and boat house. Surface drainage issues at Berol Lodge could pose a threat to the historic fabric of one of the primary buildings of the historic district. If no actions are taken under alternative A to address these potential threats, and without an immediate response if the threats become real, the neglect of these critical maintenance and repair projects could cause a direct adverse impact.

In addition, the visual impact of the more modern Boise-Cascade Cabin would continue under alternative A. It is prominently visible as people arrive at the historic district and its exterior does not blend with the historic look of the contributing historic district buildings.

Cumulative Impacts

The AMK Ranch Historic District is the only historic property within or near the project area. Other historic properties within the wider cumulative impacts area (Colter Bay Village, Jackson Lake Lodge) would not be affected by actions at the research center. Therefore, impacts under alternative A would not be cumulative to other actions.

Alternative B: Water and Wastewater System, Fire Suppression, Retaining Wall, and Other Identified Improvements

Impact Analysis

Alternative B includes repairs and upgrades to the existing water and wastewater infrastructure, fire suppression, lakeshore erosion, surface drainage issues at Berol Lodge, ABA/ADA compliant access, and alterations to the Boise-Cascade Cabin exterior. As proposed, these alterations and repairs are consistent with the *Standards*, specifically those that address the *Rehabilitation* approach to *Protect and Maintain* (Weeks et al. 2001). The *Standards* recommend that wood should be protected and maintained by providing proper drainage, and plumbing systems should be maintained through cyclical cleaning or installing new pipes. Direct effects to historic building materials may occur in limited areas on the foundation and ceilings of some buildings to widen the openings to main water lines and add automatic sprinkler systems. However, only minimal loss of historic building fabric is anticipated, and does not appear to impact the character-defining features of the buildings. The repairs and extension of the existing concrete breakwater retaining wall north and south of the boathouse and boat ramp are necessary to prevent erosion, and if done in accordance with the *Standards* would not constitute an adverse effect. Addressing the surface drainage issues at Berol Lodge by constructing two earthen stormwater control channels would not directly impact any historic building materials. Renovation to the Johnson Lodge kitchen apartment and to one of the bathrooms of Berol Lodge to provide ABA/ADA restroom access could impact historic building fabric, and should be conducted in compliance with the *Standards* to avoid adverse effects.

Alterations to the Boise-Cascade Cabin exterior would result in a more appropriate design for the exterior of this building that, unlike its original design, would be consistent with the *Standards* - specifically those that address the *Rehabilitation* approach *for New Additions* (Weeks et al. 2001).

While recent comprehensive cultural resources surveys did not identify new cultural resources, there is a potential for buried resources to be discovered during construction. Should any archeological remains be uncovered during construction, activity would cease and the appropriate state, federal, and tribal agencies would be contacted immediately.

Although the projects of alternative B pose the potential for adverse impacts, the effects would be mitigated to a less-than-significant level by closely adhering to the *Standards*. Overall, the proposed repairs and upgrades would result in better long-term protection of the historic resources of the AMK Historic District. Proposed infrastructure and stormwater modifications under Alternative B would not represent long-term adverse impacts to the cultural landscape of the district. Alternative B does not present any significant visual effects on the AMK Ranch Historic District, and in-depth analysis was not warranted.

Cumulative Impacts

The AMK Ranch Historic District is the only historic property within or near the project area. Other historic properties within the wider cumulative impacts area (Colter Bay Village, Jackson Lake Lodge) would not be affected by actions at the research center. Therefore, impacts under alternative B would not be cumulative to other actions.

Alternative C: All Improvements Included in Alternative B, in Addition to a Dormitory and Associated Parking Area

Impact Analysis

Alternative C includes all projects proposed under alternative B (repairs and upgrades to the existing water and wastewater infrastructure, fire suppression, lakeshore erosion, surface drainage issues at Berol Lodge, ABA/ADA compliant access, and alterations to the Boise-Cascade Cabin exterior) but with the addition of the construction of a new dormitory and parking lot to the north and northeast of the barn (Figure 5). The impacts to cultural resources from the improvements common to both of the action alternatives (alternatives B and C) are detailed above in the alternative B analysis. These impacts would be the same under alternative C. Potential impacts that could stem from the addition of the new dormitory and parking area are detailed below.

The proposed dormitory would be a single-story building, in keeping with the height of the other district buildings, and approximately 5,800 square feet in size, which is slightly larger than the Berol Lodge at 5,200 square feet. The parking lot would be approximately 2,000 square feet in size and provide space for seven vehicles. It would be unpaved and cleared of ground vegetation, but all standing trees would be retained. Although alternative C poses the potential for adverse impacts, these would be mitigated to a less-than-significant level by closely adhering to the *Standards.*

The dormitory and parking lot would be constructed within the boundaries of the AMK Ranch Historic District, and as such would constitute a direct effect. The construction would result in the loss of approximately 8,000 square feet of landscape and would have the potential to adversely affect the integrity of setting of the AMK Ranch Historic District (Figures 5 and 7). This potential impact to the setting of the historic district would be mitigated to a less-than-significant level by closely adhering to the *Standards*, specifically those that address the *Rehabilitation* approach for *New Additions* (Weeks et al. 2001). Scale and mass would be in keeping with other buildings within the district. The new construction would be designed in a way that is compatible with the historic district in terms of proportion, height, shadows, materials, relationship of solids to voids, color, and contrast. The design may be contemporary or reference rustic style design motifs; however, the dormitory would be designed in a manner that it is clearly differentiated from the historic buildings of the district (Weeks et al 2001).

Although visual impacts to the AMK Ranch Historic District could occur because of the new dormitory and parking area, these impacts would be negligible because of several factors. Views to and from the historic district, as well as views to and from several specific contributing resources (the barn, outhouse, chicken house, and tack house), were considered those that could be affected (Figure 5). However, distant views from the core of the historic district looking east are largely obscured by the tall, old-growth evergreen trees that comprise and characterize the landscape of the district (Figure 8). The same is true of views of the district core from points further east, south, and north - where mid-ground and distant views are not possible due to dense vegetation. Although the dormitory would be at least partially visible in distant views (Figures 9 and 10), it would be designed so that it would not adversely impact primary or contributing viewsheds. Locating the new dormitory and parking lot on the northeastern edge of the core of the historic district – far removed from the character-defining scenic views from the district – also minimizes the impact to the historic district's integrity of setting, feeling, or association. There would be a negligible impact to the historic district's integrity of location, design, materials, and workmanship.

The proposed additions would only result in a weak contrast to the setting of the historic district as a whole. They would not dominate the setting or attract the attention of the casual observer because of the proposed design in accordance with the *Standards*. Furthermore, the views to and from the barn, outhouse, chicken house, and tack house are not considered character-defining features of the buildings. As such, the disruption of viewsheds from these ancillary buildings would not constitute an adverse impact, as the disruption would not alter the characteristics that make them eligible for listing in the NRHP, specifically in terms of the resources' integrity of location, design, materials, workmanship, feeling, or association. Although the integrity of the setting would be affected, only a small portion of the setting would be impacted and not to the extent that it would compromise the overall integrity of setting for these contributing resources, resulting in negligible impacts.

The new construction proposed in alternative C would negligibly affect the integrity of setting of the AMK Ranch Historic District and its contributing resources. Possible impacts to the integrity of setting, feeling, and association would be minimized by the compatibility of the design of the dormitory and the location of the new construction. Mitigation measures for the potential direct effect to the historic district would result in a dormitory building that is compatible with the historic district in terms of terms of mass, scale, proportion, height, shadows, color, and contrast. Additionally, the proposed repairs and upgrades under alternative C will result in better long-term protection of the historic resources of the AMK Historic District and the effects to the district will be mitigated to a less-than-significant level by closely adhering to the mitigation measures specified in the *Standards*. Alterations to the Boise-Cascade Cabin would address the current inappropriate design of that building within the historic district.

Vegetation and trees within the district boundary are not identified as contributing resources. Therefore, impacts to these resources are discussed in the soils and vegetation section, below.

Cumulative Impacts

The AMK Ranch Historic District is the only historic property within or near the project area. Other historic properties within the wider cumulative impacts area (Colter Bay Village, Jackson Lake Lodge) would not be affected by actions at the research center. Therefore, impacts under alternative C would not be cumulative to other actions.

Figure 8. View toward the outhouse from the approximate center point of dormitory's rear, illustrating the setting and how the trees obscure distant views.

Figure 9. Visual simulation of southern end of proposed dormitory, represented by red line. View from the rear of the tack house towards proposed dormitory location.

Figure 10. Visual simulation of front of proposed dormitory, represented in red outline, assuming that the building would be approximately 100-feet wide and a single story. View is from the rear façade of the barn.

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Common to Alternatives B and C: Water and Wastewater System, Fire Suppression, Retaining Wall, and Other Identified Improvements, in Addition to a Dormitory and Associated Parking Area

Impact Analysis for Auditory Resources

The only cultural resource located near or within the project area is the AMK Ranch Historic District. In consideration of auditory effects, the effect of the noise generated by the project would be considered in relationship to the current ambient noise levels in the historic district.

The project area includes access drives, parking areas, several buildings, and other facilities with frequent visitor, researcher, and university staff use. The action alternatives would result in a temporary increase in ambient noise at the research center from construction-related activities, including noise from excavation equipment, trucks, and construction worker traffic. This noise would be temporary and seasonal, lasting only as long as the construction activity continued. In addition, best management practices would be employed during construction to minimize noise. During campus occupancy from mid-May to mid-September, the backup generator would be tested weekly. The approximate runtime would be 30 minutes per week or 0.3% of the time. In addition, the park would continue to specify that new replacement generators include quiet technology. Therefore, sound levels could decrease as existing generators would be replaced by newer, quieter models. Adverse construction-related effects on soundscapes would be negligible to minor in intensity and impacts from operations would be negligible or beneficial. The project would not result in adverse indirect auditory impacts.

Impact Analysis for Air Quality

The only cultural resource located near or within the project area is the AMK Ranch Historic District. In consideration of atmospheric effects, the effect of atmospheric intrusions generated by the project must be considered in relationship to the current levels in the historic district.

Air quality at the research center is good, and the area is in attainment for national ambient air quality standards. The action alternatives would not substantially change air quality emissions. Air quality impacts would be associated with new construction and the use of vehicles and existing and proposed facilities in the area by staff and park visitors. Pollutants emitted by construction equipment, such as particulate matter, soot, and nitrogen oxides, would be localized and limited to the construction periods; estimated to total 15 months over approximately two construction seasons. The park would continue to minimize air quality pollution emissions associated with these park operations through the implementation of BMPs. With these mitigation measures and local breezes off of Jackson Lake, which would disperse pollutants, impacts on air quality as a result of the proposed improvements would be negligible. As such, the project would not result in adverse indirect atmospheric impacts.

HEALTH AND SAFETY

Affected Environment

Current conditions at the research center affecting health and safety were included in the description of the need for the project in chapter 1 and are summarized here.

The existing potable water supply system consistently provides potable water that meets state and federal drinking water standards. However, concerns about health and safety relating to water storage and delivery include:

- The existing steel pipelines are corroded and leak. Leaks in the system pose an opportunity to introduce pathogens into the water supply.
- Chlorine treatment systems are scattered throughout the campus at each well site; therefore chlorine levels for disinfection are often uneven.
- The existing steel pipelines are undersized to convey the current required flow rates for potable water and fire suppression requirements.
- Existing water storage/production does not provide volume and flow capacity for sustained fire suppression actions.
- Existing storage tanks lack required and/or recommended safety and security devices.

Existing housing and working conditions limit the ability of the research center to provide conditions conducive to the visiting public who attend workshops and scientific presentations, and to supporting researchers. Conditions identified to affect human health and safety include:

- Bedrooms in second-floor spaces in the Johnson Lodge and the garage apartments are an egress safety concern.
- Inadequate area of living space per resident.
- Overcrowded bathroom facilities.
- Bedroom configurations to accommodate gender compatibility.
- Lack of ABA/ADA-compliant living and research space as well as facilities for site visitors.

Impact Analysis Methods

Impacts on health and safety are evaluated using the process described in the "Methods for Analyzing Impacts" section. Impact threshold definitions for health and safety are summarized in Table 7. Mitigation measures and BMPs listed in chapter 2 would be implemented as part of the action alternatives.

Table 7. Impact Threshold Definitions for Health and Safety

Threshold	Definition
Negligible	Health and safety would not be affected or the effect would be at or below the lower levels of detection, and would not have an appreciable effect on health and safety.
Minor	The effect would be detectable, but would be of a magnitude that would not have an appreciable effect on health and safety. If mitigation was needed to offset adverse effects, it would be relatively simple and likely successful.

Table 7. Impact Threshold Definitions for Health and Safety

Threshold	Definition
Moderate	The effects would be readily apparent and would result in a change in health and safety in a manner noticeable to staff and the public. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.
Major	The effects would be readily apparent and would result in a change in health and safety in a manner noticeable to staff and the public, and would be markedly different. Mitigation measures to offset adverse effects would be needed, would be extensive, and their success could not be guaranteed.

Alternative A: No Action/Continue Current Management

Impact Analysis

The no action alternative would represent a continuation of current management and deferred improvements for research center facilities and infrastructure. The ongoing use of the existing research center potable water system has the potential to result in minor to moderate adverse impacts to health and safety from inadvertent entry of pathogens into, and/or incomplete disinfection of, potable water. In addition, insufficient water storage and pressure would limit the suppression abilities in the event of a building or wildland fire. This could result in minor to moderate adverse impacts to health and safety.

Existing facilities with limited egress, limited researcher living space and limited bathroom areas, and the lack of ABA/ADA-compliant living, research, and visitor facilities spaces under alternative A represent minor adverse impacts to health and safety.

Cumulative Impacts

There are no similar research facilities in the park, therefore negative impacts to researcher and staff health and safety at the research center are not cumulative to any other actions. All visitor facilities within the park are subject to potential impacts from fire. Therefore, potential impacts from insufficient fire suppression capabilities at the research center under alternative A would represent a small increment of negative impacts to health and safety throughout the park.

Alternative B: Water and Wastewater System, Fire Suppression, Retaining Wall, and Other Identified Improvements

Impact Analysis

Under alternative B, improvements to the research center water and wastewater systems would largely eliminate potential adverse impacts from possible water contamination and uneven water chlorination. Proposed improvements to water storage capacity and line pressure would increase to a large degree the fire suppression capacity for the research center, reducing potential impacts health and safety from fire to negligible. In addition, several buildings would be modified to be compliant with ABA/ADA requirements and the center's facilities would be better able to accommodate disabled people. These actions would result in moderate beneficial impacts to health and safety.

Improvements to research center facilities, other than the above, are limited in alternative B. Therefore, existing minor impacts to health and safety from the continuation of overcrowded housing conditions and a lack of egress from some second-story bedrooms would continue.

Cumulative Impacts

There are no similar research facilities in the park, therefore beneficial impacts to researcher and staff health and safety at the research center are not cumulative to any other actions. All visitor facilities within the park are subject to potential impacts from fire. Therefore, beneficial impacts from enhanced fire suppression capabilities at the research center under alternative B would represent a small increment of beneficial impacts to health and safety throughout the park.

Alternative C: All Improvements Included in Alternative B, in Addition to a Dormitory and Associated Parking Area

Impact Analysis

Under alternative C, improvements to the research center water and wastewater systems would largely eliminate potential adverse impacts from possible water contamination and uneven water chlorination. Proposed improvements to water storage capacity and line pressure would increase to a large degree the fire suppression capacity for the research center, reducing potential impacts health and safety from fire to negligible. Both of these actions would result in moderate beneficial impacts to health and safety

Improvements to existing facilities and construction of a new dormitory building would address existing adverse impacts to health and safety, reducing these to negligible, under alternative C.

Cumulative Impacts

There are no similar research facilities in the park, therefore beneficial impacts to researcher and staff health and safety at the research center are not cumulative to any other actions. All visitor facilities within the park are subject to potential impacts from fire. Therefore, beneficial impacts from enhanced fire suppression capabilities at the research center under alternative C would represent a small increment of beneficial impacts to health and safety throughout the park.

SOILS AND VEGETATION

Affected Environment

The soil type found at the research center is known as Taglake-Sebud. The Taglake series consists of deep, well drained soils that formed in glacial till. Taglake soils occur on undulating to steep moraines between 6,000 and 8,000 feet in elevation and dominate all of the terrain features from lowlands to slopes ranging from 0 to 60 percent. The soil is well drained with sand, gravel, and boulders; the texture is very stony sandy loam (NRCS 2013). The permeability is estimated at 2 to 6 inches per hour.

The soil profile is described as:

- 0 to 4 inches depth, very stony sandy loam, with >3 inch fragments 20 to 30 percent; and
- 4 to 60 inch depth, very cobbly sandy loam, very stony sandy loam, >3 inch fragments 35 to 50 percent.

The soil has limitations for shallow excavation due to large stones and is overall not desirable for large structures and sanitary facilities such as septic tanks absorption fields or sewage lagoon areas because of the seepage, rapid migration, and quick filtration.

The research center at AMK Ranch is located on a glacial moraine. As is true for much of the surrounding area in this part of the Greater Yellowstone Ecosystem, the area is dominated by an open lodgepole pine *(Pinus contorta* var. *latifolia)* forest with scattered subalpine fir *(Abies lasiocarpa),* Engelmann spruce *(Picea engelmannii),* Douglas-fir *(Pseudotsuga menziesii),* and aspen *(Populus tremuloides).* The forest understory consists of a variety of low shrubs and herbaceous species. Shrub species include big sagebrush *(Artemisia tridentata),* buffaloberry *(Shepherdia canadensis),* and birch leaf spirea *(Spirea betulifolia).* Interspersed herbaceous species include the common grouse whortleberry *(Vaccinium scoparium),* kinnikinnick *(Arctostaphylos uva-ursi),* wild buckwheat (*Eriogonum* sp.), balsamroot *(Balsamorhiza sagittata),* lupine *(Lupinus argenteus),* scarlet gilia *(Ipomopsis aggregata),* spring beauty *(Claytonia lanceolata),* and elk sedge *(Carex geyeri),* as well as some relatively uncommon species such as the striped and spotted coralroot orchid *(Corallorhiza striata* and *C. maculata*).

Pockets of isolated wetlands are dominated by sedges (*Carex* spp.) and are found primarily in small areas along the shoreline of Jackson Lake. However, most of the shoreline in this area is mixed cobble and sand/gravel with almost no rooted vegetation.

Threatened and Endangered Plant WSpecies

The USFWS has identified the following listed, candidate, or proposed threatened and endangered plant species as potentially occurring in the project area (USFWS 2014). The species, and its status, respectively, include:

- Whitebark pine (*Pinus albicaulis*), candidate;

Whitebark pine does not occur in the project area.

Impact Analysis Methods

Impacts on soils and vegetation resources are evaluated using the process described in the "Methods for Analyzing Impacts" section. Impact threshold definitions for soil and vegetation resources are summarized in Table 8. Mitigation measures and BMPs listed in chapter 2 would be implemented as part of the action alternatives.

Table 8. Impact Threshold Definitions for Soils and Vegetation Resources

Threshold	Definition
Negligible	The action might result in a change in vegetation or wildlife, but the change would not be measurable or would be at the lowest level of detection.
Minor	The action might result in a detectable change, but the change would be slight and have a local effect on a population. This could include changes in the abundance or distribution of individuals in a local area, but not changes that would affect the viability of local populations.
Moderate	The action would result in a clearly detectable change in a population and could have an appreciable effect. This could include changes in the abundance or distribution of local populations, but not changes that would affect the viability of regional populations.

Table 8. Impact Threshold Definitions for Soils and Vegetation Resources

Threshold	Definition
Major	The action would be severely adverse or exceptionally beneficial to a population. The effects would be substantial and highly noticeable, and they could result in widespread change. This could include changes in the abundance or distribution of a local or regional population to the extent that the population would not be likely to recover (adverse) or return to a sustainable level (beneficial).

Alternative A: No Action/Continue Current Management

Impact Analysis

The no action alternative would represent a continuation of current management and deferred improvements for research center facilities and infrastructure. No substantial new construction, excavation, or ground disturbance would occur that would cause direct, adverse impacts to soils and existing vegetation. Potential long-term moderate direct and indirect adverse effects from loss of soils and vegetation along Jackson Lake shoreline would occur if breakwater retaining walls continue to fail. If erosion control structures continue to degrade, capacity to protect the shoreline from erosion would result.

Some negligible impacts would continue to vegetation from research center researchers, staff, and visitors walking off paths and trampling vegetation.

Cumulative Impacts

Planned Colter Bay visitor services improvements include select removal of some existing trees and other actions that would disturb soils and remove native vegetation. In addition, some visitors are known to walk off of paved paths, resulting in trampling of soils and vegetation. The no action alternative would represent a very small increment to the overall cumulative impacts throughout the area.

Alternative B: Water and Wastewater System, Fire Suppression, Retaining Wall, and Other Identified Improvements

Impact Analysis

Implementation of alternative B would result in 7.48 acres of direct temporary impacts to the ground surface (soils) and existing vegetation (Table 1). Direct temporary impacts include removing vegetation and soils for equipment access to the construction sites, transport of construction materials, and construction activities. Application of the soils and vegetation mitigation measures listed in chapter 2 would be expected to result in successful revegetation of all construction and excavation buffers, bringing the permanent area of direct impacts to native vegetation and soils to 0.26 acre. Direct permanent impacts consist of loss of soils and vegetation from the construction of utility systems, retaining walls, and surface water control devices.

Potential adverse indirect impacts to vegetation could include the possibility of introducing noxious or invasive plant species to the research center site. These would be expected to be largely mitigated by application of measures described in chapter 2 for washing construction equipment prior to entering the site and using certified weed-free reclamation materials. Further post-construction mitigation would

include revegetation with local native species as well as monitoring and management of noxious weed species for multiple years post-construction.

Cumulative Impacts

Planned Colter Bay visitor services improvements include select removal of some existing trees and other actions that would disturb soils and remove native vegetation as well as some visitors walking off paved paths and trampling vegetation. Alternative B would represent a minor beneficial increment to the overall cumulative impacts throughout the area.

Alternative C: All Improvements Included in Alternative B, in Addition to a Dormitory and Associated Parking Area

Impact Analysis

Implementation of alternative C would result in 8.12 acres of direct temporary impacts to the ground surface (soils) and existing vegetation (Table 1). Direct temporary impacts include removing vegetation and soils for equipment access to the construction sites, transport of construction materials, and construction activities. Application of the soils and vegetation mitigation measures listed in chapter 2 would be expected to result in successful revegetation of all construction and excavation buffers in the long term. The permanent area of direct impacts to native vegetation would be approximately 0.5 acre. Direct permanent impacts consist of loss of soils and vegetation from the construction of utility systems, dormitory, retaining walls, and surface water control devices.

Potential adverse indirect impacts to vegetation could include the possibility of introducing noxious or invasive plant species to the research center site. These would be expected to be largely mitigated by application of measures described in chapter 2 for washing construction equipment prior to entering the site and using certified weed-free reclamation materials. Further post-construction mitigation would include revegetation with local native species as well as monitoring and management of noxious weed species for multiple years post-construction.

Cumulative Impacts

Planned Colter Bay visitor services improvements include select removal of some existing trees and other actions that would disturb soils and remove native vegetation as well as some visitors walking off paved paths and trampling vegetation (NPS 2012). Alternative C would represent a minor adverse increment to the overall cumulative impacts throughout the area.

WILDLIFE

Affected Environment

While the research center area has been developed with structures and the presence of humans and human related activities, much of the native wildlife still exists throughout the project area. Birds and mammals are the species most frequently found in the vicinity of the research center. Jackson Lake attracts a large variety of waterfowl that migrate through in the summer months. Canada goose *(Branta canadensis),* mallard *(Anas platyrhynchos),* Barrow's goldeneye *(Bucephala islandica),* common merganser *(Mergus merganser),* and sandhill crane *(Gurs canadensis)* are frequently found in the area. In the lodgepole forests, common birds include olive sided flycatcher *(Contropus cooperi),* yellow-rumped warbler *(Dendroica coronate),* ruby-crowned kinglet *(Regulus calendula),* mountain chickadee *(Poecile gambeli),* white-crowned sparrow *(Zonotrichia leucophrys),* chipping sparrow *(Spizella passerine),* dark-eyed junco *(Junco hyemalis),* gray jay *(Perisoreus canadensis),* common raven *(Corvus corax),* barn swallow

(Hirundo rustica), and mountain bluebird *(Sialia currucoides).* Common birds of prey found in the area include red-tailed hawk *(Buteo jamaicensis)* and the Cooper's hawk *(Accipiter cooperii).*

Mammals commonly found in the area include deer mouse *(Peromyscus maniculatus),* Uinta ground squirrel *(Urocitellus armatus),* red squirrel *(Tamiasciurus hudsonicus),* pocket gopher *(Thomomys talpoides),* chipmunk *(Eutamias umbrinus),* vole *(Microtus pennsylvanicus),* snowshoe hare *(Lepus americanus),* porcupine *(Erethizon dorsatum),* and beaver *(Castor canadensis).* Ungulates noted in the area include elk *(Cervus canadensis)* and moose *(Alces alces).* Predators using the area include striped skunk *(Mephitis mephitis),* coyote *(Canis latrans),* red fox *(Vulpes vulpes),* and black bear *(Ursus americanus).*

Three snake species that typically occur near the research center and around Jackson Lake are wandering garter snake *(Thamnophis elegans vagrans),* valley garter snake *(Thamnophis sirtalis fitchi)* and rubber boa *(Charina bottae).* Amphibians present on the lake shore and around wetland areas are the western chorus frog *(Pseudacris triseriata),* northern leopard frog *(Rana pipiens)* and blotched tiger salamander *(Ambystoma tigrinum melanostictum).*

Threatened and Endangered Wildlife Species

The USFWS has identified the following listed, candidate, or proposed threatened and endangered species as potentially occurring in the project area (USFWS 2014). They, and their status, respectively, include:

- Canada lynx (*Lynx canadensis),* threatened;
- Gray wolf (*Canis lupus*), experimental nonessential (treated as threatened in national parks)
- Grizzly bear (*Ursus arctos horribilis*), threatened;
- Yellow-billed cuckoo (*Coccyzus americanus*), west of the Continental Divide, proposed.

Of these, yellow-billed cuckoo is unlikely to be found in the project area. The yellow-billed cuckoo proposed rule (FR 78:61622-61666) describes the historical breeding range and includes historical observations in Wyoming. Neither the historical breeding range nor historical records suggest that yellow-billed cuckoos occurred beyond the southwestern corner of Wyoming. The proposed rule notes that there are few records of the yellow-billed cuckoo in the Rocky Mountain Region; observations are even scarcer above 6,000 feet in elevation, and the species almost never breeds above 7,000 feet (p. 61627). Park wildlife records contain two unverified reports from June 1985 and July 1992 and only one confirmed observation, from 2000, which occurred in the southern part of the park far from the project area. Despite this observation, the historical record and breeding biology of the yellow-billed cuckoo suggest that the riparian habitat within the park, which is all above 6,300 feet, does not constitute suitable breeding habitat for the species.

The following two species are known to occur in the general area.

Grizzly Bear. The grizzly bear is listed as threatened under the Endangered Species Act (ESA). Grizzlies are relatively common in the southern Greater Yellowstone Area, and the northern portion of Grand Teton National Park falls within the grizzly bear primary conservation area. Grizzlies are commonly seen in the area while traveling along the Jackson Lake shoreline; however observations of grizzlies within the research center campus have not been confirmed.

Grizzly bears have large home ranges (50 to 300 square miles for females; 200 to 500 square miles or more for males), encompassing diverse forests interspersed with moist meadows and grasslands in or near mountains (NPS 2006a). The bears feed on a variety of food, depending on seasonal availability. In general, white bark pine nuts, graminoids, and hoofed animals are the most important foods in the grizzly

bear's diet, but fish, small mammals, herbaceous vegetation, tubers, fruit, and insects also comprise a portion of their diet (Mattson and Knight 1991 as cited in NPS 2006a). Ungulate carcasses are an important high quality food source for bears (Mattson 1997 as cited in NPS 2006a) and will often attract and keep bears in localized areas for periods of several days to a week or more.

The greatest threat to grizzly bears is human caused mortality. Grizzly bears can become habituated to humans because of attractants such as garbage, pet foods, and improper camping practices. Park staff has been highly successful in promoting grizzly bear recovery and reducing bear-human conflicts (e.g., property damage, incidents of bears obtaining human food, and bear-inflicted injuries to humans) and human-caused bear mortalities. Recreational and administrative facilities, human activities, and human waste (garbage and sewage) in the park are managed in a manner that results in few human-bear incidents. The number of human-habituated (but not food conditioned) grizzlies in the park has increased (NPS 2010). These bears go about their daily routines in proximity to humans and their developments, particularly roads, and because they are not afraid to approach developments or forage along park roads, may be more vulnerable to being hit by vehicles.

Canada Lynx. The Canada lynx is listed as a federally threatened species (65 Federal Register [FR] 16051). The State of Wyoming classifies the lynx as a Species of Special Concern-Class 1, which indicates that habitat is limited and populations are restricted or declining (WGFD 2005). Lynx are considered rare in the Greater Yellowstone Area and are known to use boreal and montane forests.

Lynx are solitary carnivores generally occurring at low densities in boreal forest habitats (suitable habitat), with their distribution and abundance closely tied to that of the snowshoe hare their primary prey. However, this relationship may be muted or absent in more southern populations (Halfpenny et al. 1982). In Wyoming, lynx occur primarily in spruce/fir and lodgepole pine forests with slopes of 8 to 12 degrees and at elevations from 7,995 feet to 9,636 feet (2,437 meters to 2,937 meters) (Ruediger et al. 2000). However, aspen stands and forest edges may also be important (matrix habitat). Potential Canada lynx habitat areas for Grand Teton National Park have been identified based on these general habitat preferences.

The project area lies within the Steamboat Lynx Analysis Unit (LAU) which is 14,356 acres in size. The entire LAU is mapped as critical habitat for lynx. Of the 14,356 acres of critical habitat in the LAU 2,553 acres are considered matrix habitat and 11,803 acres are considered suitable habitat (i.e. the vegetation types identified and mapped by the park as lynx habitat).

Information on lynx abundance and distribution within Grand Teton National Park is limited. Historical locations of lynx have been documented within the park (Reeve et al. 1986, McKelvey et al. 2000). More recent sightings and DNA detections have confirmed the continued occurrence of lynx in and adjacent to the park (Squires and Laurion 2000; Squires and Oakleaf 2005; Murphy et al. 2006; Holmes and Berg 2009). During the winter of 2007and 2008, researchers documented lynx tracks in the Arizona Creek drainage near the park (N. Berg, pers. comm., 2010) and in the Colter Bay area (S. Patla, Wyoming Game and Fish Dept. biologist, pers. comm., 2010 as cited in Holmes and Berg 2009). Lynx tracks were detected on 10 occasions in the winter of 2008-2009 in the Togwotee Pass area (Holmes and Berg 2009). Identified lynx tracks included an area just south of the park boundary in the Spread Creek drainage. Radio-collared lynx from Colorado have been documented passing through the Teton Range and in the Togwotee Pass area.

Whether any of the lynx recently detected are residents or transients, or if lynx currently reside in the park, is unknown. Based on general habitat preferences and existing vegetative cover types, potential habitat for Canada lynx is present in the park. Forest cover types found in the general project area are within the elevation range and appear to be generally suitable habitat for lynx. However, low habitat quality (e.g., low densities of snowshoe hares) may mean that Canada lynx, if present, would also occur at

very low densities, perhaps only as transients (S. Cain, PS wildlife biologist, pers. comm., 2002). In October 2013, lynx critical habitat was proposed by the USFWS in the Federal Register. The proposed project area is located within proposed critical lynx habitat.

Gray wolf. Gray wolves are native to the greater Yellowstone ecosystem (GYE; Young and Goldman 1944), but human persecution resulted in their extirpation by the 1930's (Phillips and Smith 1996). The subspecies of northern Rocky Mountain wolf was initially listed as endangered in 1973. In 1978, the gray wolf was listed as threatened throughout its range in the lower 48 states. Gray wolves were reintroduced into Yellowstone National Park and central Idaho in 1995 and 1996 as an ''experimental nonessential'' population. This designation allows greater management flexibility, however, in national parks wolves are treated as a threatened species and all provisions of the ESA apply. In Wyoming, wolves were delisted in March 2008, but protections were reinstated in July 2008. They were again removed from the threatened species list in August of 2013, but were placed back under federal protection in late September of 2014.

There is no critical habitat designated for gray wolves (USFWS 1994). Human-caused mortality and availability of prey are the two most limiting factors for wolf populations (Mech 1970). To date, most human-caused mortality of wolves in the GYE has come from management removals (mostly related to livestock depredations), illegal kills (from poaching), legal hunting (when delisted), and by collisions with vehicles.

Gray wolves prey primarily on ungulates. Elk are the principal prey species of wolves in the GYE and are abundant in the park. Wolves travel widely and are relatively tolerant of human presence, except while raising young near den and rendezvous sites. Wolf pups are born in mid-April to May, and packs use rendezvous sites into the fall.

All of Grand Teton National Park serves as suitable habitat for gray wolves. A variety of habitats and vegetation cover types are used. Wolf distribution varies depending on prey abundance. As of December 2013, about 440 gray wolves lived in the Greater Yellowstone Area, with about 50 wolves in 7 packs having territories in and adjacent to the park. The wolf population in the area has been stable the last several years. Territories of the Snake River, Phantom Springs, and Huckleberry packs overlap the project area. Based on GPS collar data, wolves rarely occur in the project area.

Impact Analysis Methods

Impacts on wildlife resources are evaluated using the process described in the "Methods for Analyzing Impacts" section. Impact threshold definitions for wildlife resources are summarized in Table 9. Mitigation measures and BMPs listed in chapter 2 would be implemented as part of the action alternatives.

Table 9. Impact Threshold Definitions for Wildlife Resources

Threshold	Definition
Negligible	The action might result in a change in vegetation or wildlife, but the change would not be measurable or would be at the lowest level of detection.
Minor	The action might result in a detectable change, but the change would be slight and have a local effect on a population. This could include changes in the abundance or distribution of individuals in a local area, but not changes that would affect the viability of local populations. Changes to local ecological processes would be minimal.

Table 9. Impact Threshold Definitions for Wildlife Resources

Threshold	Definition
Moderate	The action would result in a clearly detectable change in a population and could have an appreciable effect. This could include changes in the abundance or distribution of local populations, but not changes that would affect the viability of regional populations. Changes to local ecological processes would be of limited extent.
Major	The action would be severely adverse or exceptionally beneficial to a population. The effects would be substantial and highly noticeable, and they could result in widespread change. This could include changes in the abundance or distribution of a local or regional population to the extent that the population would not be likely to recover (adverse) or return to a sustainable level (beneficial). Key ecological processes would be altered, and "landscape-level" (regional) changes would be expected.

Alternative A: No Action/Continue Current Management

Impact Analysis

The no action alternative would represent a continuation of current management and deferred improvements for research center facilities and infrastructure. No substantial new construction, excavation, or ground disturbance would occur that would cause direct, adverse impacts to wildlife (including special status species) or wildlife habitat. Ongoing negligible impacts to wildlife and wildlife habitat would continue from research center researchers, staff, and visitors moving through the site throughout the summer season, as well as continuation of the noise associated with use of the site.

Alternative A would continue to have a negligible to minor, long-term, adverse impact on grizzly bear, gray wolf, and Canada lynx primarily due to potential displacement or disturbance of individual animals by continued human presence and activities at the research center when it is used from May to October. The NPS determination is that the no-action alternative *"may affect but would not be likely to adversely affect"* grizzly bear, gray wolf, and Canada lynx or Critical lynx habitat. Alternative A would have *"no effect"* on yellow-billed cuckoo because they would not occur in the project area.

Cumulative Impacts

Proposed Colter Bay visitor services improvements will include select removal of some existing trees and other actions that would directly disrupt wildlife habitat. In addition, visitor use of the Colter Bay area generates noise, motion, and artificial light that cause indirect negative impacts to wildlife habitat. Infrastructure improvements at the other developed areas would continue to be implemented but, because these occur within park developments, the increase in disturbance to wildlife compared to what occurs from general operations and visitors would not be substantial. Because of human activity at the research center and occasional removal of standing dead trees that could pose a safety hazard, the no action alternative would represent a very small increment to the overall cumulative impacts throughout the area.

Alternative B: Water and Wastewater System, Fire Suppression, Retaining Wall, and Other Identified Improvements

Impact Analysis

Application of the wildlife mitigation measures listed in chapter 2 would be expected to result in negligible, direct, adverse impacts to wildlife in the long term from construction of infrastructure improvements under alternative B. In the short term, during construction periods and until disturbed areas are again vegetated, adverse impacts would be negligible to minor due to increased human activities and noise and temporary disturbance of 7.48 acres (Table 1). Application of the soils and vegetation mitigation measures listed in chapter 2 would be expected to result in successful revegetation of all construction and excavation buffers, bringing the permanent area of direct impacts to wildlife habitat down to approximately 1.2 acres.

Under alternative B, ongoing negligible adverse impacts to wildlife habitat would continue from research center researchers, staff, and visitors moving through the site throughout the summer season, as well as continuation of the noise associated with use of the site.

Alternative B impacts would be minor for lynx, and gray wolf, as under Alternative A. There would be no population level impacts. There would also be no population level impacts to grizzly bear, but the potential for impacts is somewhat greater for this species. These impacts would be negligible to minor during short-term construction activities. Compared to the no-action alternative, there would be greater human activity and noise, a greater potential for disturbance and displacement of individual animals from the immediate area, and a greater potential for grizzly bears to become food-conditioned if food storage requirements are not followed correctly. The NPS determination is that alternative B *"may affect but would not be likely to adversely affect"* grizzly bear.

The project *may affect* Canada lynx populations because suitable habitat is present, 0.7 acre of which would be removed by construction of new campus improvements. The project is *not likely to adversely* affect Canada lynx because:

- the project would affect less than 0.004% of suitable lynx habitat within the Steamboat LAU,
- the value of the habitat to lynx for foraging, denning, or travel is limited given it is within the footprint of the 50-acre developed site which receives intensive use from May – October

The project *may affect* Canada lynx critical habitat because 1.2 acres of habitat would be permanently removed by construction of campus improvements and an additional 1.4 acres would be temporarily disturbed. Of the 2.6 acres of critical lynx habitat affected, 1.8 acres are considered suitable habitat and 0.8 acre is considered matrix habitat. The project is not likely to adversely affect critical lynx habitat because:

- the project would affect less than 0.014% of the critical habitat within the Steamboat LAU,
- the value of the habitat to lynx for foraging, denning, or travel is limited given it is within the footprint of the 50-acre developed site which receives intensive use from May – October.

Alternative B would have *"no effect"* on greater sage-grouse and yellow-billed cuckoo because they would not occur in the project area.

Cumulative Impacts

Planned Colter Bay visitor services improvements include select removal of some existing trees and other actions that would directly disrupt wildlife habitat. In addition, visitor use of the Colter Bay area generates noise, motion, and artificial light that cause indirect negative impacts to wildlife habitat. Infrastructure improvements at the other developed areas would continue to be implemented but, as these

occur within park developments, the increase in disturbance to wildlife compared to what occurs from general operations and visitors would not be substantial. Because of human activity at the research center and occasional removal of standing dead trees that could pose a safety hazard, Alternative B and its proposed improvements would represent a very small increment to the overall cumulative impacts throughout the area.

Alternative C: All Improvements Included in Alternative B, in Addition to a Dormitory and Associated Parking Area

Impact Analysis

Application of the wildlife mitigation measures listed in chapter 2 would be expected to result in negligible direct adverse impacts to wildlife (including special status species) from construction of infrastructure improvements under alternative C. Implementation of alternative C would result in 8.12 acres of direct temporary impacts to wildlife habitat (Table 1). Application of the soils and vegetation mitigation measures listed in chapter 2 would be expected to result in successful revegetation of all construction and excavation buffers, bringing the permanent area of direct impacts to wildlife habitat down to approximately 0.49 acre.

Indirect impacts to wildlife and wildlife habitat from research center researchers, staff, and visitors moving through the site throughout the summer season, as well as continuation of the noise associated with use of the site, would be expected to be slightly higher under alternative C. This would be caused by the potentially larger number of researchers and visitors at the site due to the new dormitory, but the possible increase in accommodation is only up to eight people. Potential impacts are still estimated to be negligible.

Alternative C impacts would be minor for grizzly bear, gray wolf, and Canada lynx as under alternative A. There would be no population level impacts to these species. The potential for short-term impacts is somewhat greater for grizzly bears. Compared to the no-action alternative, there would be greater human activity and noise, a greater potential for disturbance and displacement of individual animals from the immediate area, and a greater potential for grizzly bears to become food-conditioned if food storage requirements are not followed correctly during construction activities. The NPS determination is that alternative C *"may affect but would not be likely to adversely affect"* grizzly bear.

The project *may affect* Canada lynx populations because suitable habitat is present, 0.7 acre of which would be removed by construction of new campus improvements. The project is *not likely to adversely* affect Canada lynx because:

- the project would affect less than 0.004% of suitable lynx habitat within the Steamboat LAU,
- the value of the habitat to lynx for foraging, denning, or travel is limited given it is within the footprint of the 50-acre developed site which receives intensive use from May – October

The project *may affect* Canada lynx critical habitat because 2.0 acres of habitat would be permanently removed by construction of campus improvements and an additional 1.2 acres would be temporarily disturbed. Of the 3.2 acres of critical lynx habitat affected, 1.8 acres are considered suitable habitat and 1.4 acres are considered matrix habitat. The project is not likely to adversely affect critical lynx habitat because:

- the project would affect less than 0.017% of the critical habitat within the Steamboat LAU,
- the value of the habitat to lynx for foraging, denning, or travel is limited given it is within the footprint of the 50-acre developed site which receives intensive use from May – October.

Alternative C would have *"no effect"* on greater sage-grouse and yellow-billed cuckoo because they would not occur in the project area.

Cumulative Impacts

Planned Colter Bay visitor services improvements include select removal of some existing trees and other actions that would directly disrupt wildlife habitat. In addition, visitor use of the Colter Bay area generates noise, motion, and artificial light that cause indirect negative impacts to wildlife habitat. Infrastructure improvements at the other developed areas would continue to be implemented but, as these occur within park developments, the increase in disturbance to wildlife compared to what occurs from general operations and visitors would not be substantial. Because of human activity at the research center and occasional removal of standing dead trees that could pose a safety hazard, Alternative C and its proposed improvements, including the addition of a dormitory and associated parking area, would represent a very small increment to the overall cumulative impacts throughout the area.

VISITOR USE AND EXPERIENCE

Affected Environment

The majority of visitors to the research center are researchers and NPS and UW staff. The public has access to the Berol Lodge, and is actively encouraged, to attend organized events such as workshops and evening programs. Although reasonable efforts would continue to be made to provide all individuals with access to any of the programs and seminars at the research center, the experience of these visitors is somewhat reduced by the lack of ABA/ADA-compliant facilities in the Berol Lodge.

Impact Analysis Methods

Impacts on visitor use and experience are evaluated using the process described in the "Methods for Analyzing Impacts" section. Impact threshold definitions for visitor use and experience are summarized in Table 10. Mitigation measures and BMPs listed in chapter 2 would be implemented as part of the action alternatives.

Table 10. Impact Threshold Definitions for Visitor Use and Experience

Threshold	Definition
Negligible	Visitors would not be affected or changes in visitor use and/or experience would be below or at the level of detection. The visitor would not likely be aware of the effects associated with the alternative.
Minor	Changes in visitor use and/or experience would be detectable, although the changes would be slight. The visitor would be aware of the effects associated with the alternative, but the effects would be slight.
Moderate	Changes in visitor use and/or experience would be readily apparent. Visitors would be aware of the effects associated with the alternative, and would likely be able to express an opinion about the changes.
Major	Changes in visitor use and/or experience would be readily apparent and have substantial consequences. Visitors would be aware of the effects associated with the alternative, and would likely express a strong opinion about the changes.

Alternative A: No Action/Continue Current Management

Impact Analysis

The no action alternative would represent a continuation of current management and deferred improvements for research center facilities and infrastructure. General visitor and researcher experience would be unchanged. No substantial new construction, excavation, or ground disturbance would occur that would cause adverse impacts to the visitor experience of the AMK Ranch research center.

No improvements would be made to existing facilities at the Berol Lodge to increase ABA/ADA -compliance. Therefore disabled visitors would continue to experience moderate adverse impacts to their ability to access the Berol Lodge facilities. Likewise, limited ABA/ADA -compliant living and research facilities represent moderate adverse impacts to the visitor experience of disabled researchers.

Cumulative Impacts

There would be the potential for a minor adverse change to cumulative impacts on visitor use and experience within the park. There is no similar research facility in the park, therefore negative impacts to researcher experience due to lack of ABA/ADA-compliant facilities are not cumulative to any other actions.

Alternative B: Water and Wastewater System, Fire Suppression, Retaining Wall, and Other Identified Improvements

Impact Analysis

Under alternative B, the transport of materials to the project site and construction activities would result in negligible to minor temporary adverse impacts to general visitors and researchers. These effects would be minimized conducting most of the activities when the facility is not fully operational (e.g. spring and fall months).

Renovation of the existing bathroom in the Berol Lodge for compliance with the ABA/ADA would result in minor beneficial direct impacts to the experience of disabled visitors to programs and seminars at the research center. Renovation of the existing Johnson Lodge kitchen apartment to provide ABA/ADA -accessible researcher living space would result in moderate beneficial direct impacts for the experience of disabled researchers.

Cumulative Impacts

There would be a minor beneficial change to cumulative impacts on visitor use and experience within the park. There is no similar research facility in the park; therefore improvement to researcher experience at the research center is not cumulative to any other actions.

Alternative C: All Improvements Included in Alternative B, in Addition to a Dormitory and Associated Parking Area

Under alternative C, as under alternative B, the transport of materials to the project site and construction activities would result in negligible to minor temporary adverse impacts to general visitors and researchers. These effects would be minimized conducting most of the activities when the facility is not fully operational (e.g. spring and fall months).Renovation of the existing bathroom in the Berol Lodge for compliance with the ABA/ADA would result in minor beneficial impacts to the experience of visitors to programs and seminars at the research center. Constructing an ABA/ADA-compliant sleeping room with appropriate bathroom facilities in the new dormitory, in addition to renovating the existing Johnson Lodge kitchen apartment to provide accessible researcher living space, would result in moderate

beneficial direct impacts for the experience of disabled researchers that are more beneficial than under alternative B.

Cumulative Impacts

There would be a minor beneficial change to cumulative impacts on visitor use and experience within the park. There is no similar research facility in the park; therefore improvement to researcher experience at the research center is not cumulative to any other actions.

NPS AND UW OPERATIONS

Affected Environment

Park operations refer to the adequacy of staffing levels and the quality and effectiveness of park infrastructure in protecting and preserving vital resources and providing for an enjoyable visitor experience. As described in the Visitor Experience section, above, the research center receives limited public visitors; the largest numbers of visitors to the research center are researchers.

Maintenance and upkeep of the historic district, as well as general management and operations of the research center, are conducted under the general agreement between the National Park Service and University of Wyoming (NPS and UW 2010). This directs the UW to conduct the majority of management actions at the site.

Impact Analysis Methods

Impacts on NPS and UW operations are evaluated using the process described in the "Methods for Analyzing Impacts" section. Impact threshold definitions for NPS and UW operations are summarized in Table 11. Mitigation measures and BMPs listed in chapter 2 would be implemented as part of the action alternatives.

Table 11. Impact Threshold Definitions for NPS and UW Operations

Threshold	Definition
Negligible	Park operations would not be affected or the effect would be at or below the lower levels of detection, and would not have an appreciable effect on park operations.
Minor	The effect would be detectable, but would be of a magnitude that would not have an appreciable effect on park operations. If mitigation was needed to offset adverse effects, it would be relatively simple and likely successful.
Moderate	The effects would be readily apparent and would result in a change in park operations in a manner noticeable to staff and the public. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.
Major	The effects would be readily apparent and would result in a change in park operations in a manner noticeable to staff and the public, and would be markedly different from existing operations. Mitigation measures to offset adverse effects would be needed, would be extensive, and their success could not be guaranteed.

Alternative A: No Action/Continue Current Management

Impact Analysis

The no action alternative would represent a continuation of current management and deferred improvements for research center facilities and infrastructure. NPS and UW operations would continue as they are currently conducted. Facility deficiencies identified in chapter 1 would continue. Estimated costs for implementation of the no action alternative would be about $230,000, which represents maintenance and life cycle costs (Table 2). However, this deferred maintenance is expected to eventually result in the need for unplanned, budgeted, or scheduled repair to facilities and infrastructure in an emergency situation. This would result in moderate adverse impacts to NPS and UW operations.

Cumulative Impacts

There are no similar research facilities in the park, and UW has no other operations responsibilities with the park. Therefore negative impacts to NPS and UW operations at the research center are not cumulative to any other actions. Potential negative impacts to NPS operations at the research center would represent an extremely small increment of negative impacts throughout the park.

Alternative B: Water and Wastewater System, Fire Suppression, Retaining Wall, and Other Identified Improvements

Impact Analysis

Under alternative B, improvements to infrastructure would cost approximately $2,000,000, with associated maintenance and life cycle costs of $300,000 (table 1). There would be short-term negligible to minor impacts on NPS and UW operations while construction activities are occurring. The resulting improvements would largely reduce the potential for emergency situations requiring unplanned, budgeted, or scheduled repairs to facilities and infrastructure. The instituted improvements would improve the NPS and UW's ability to provide quality and effective infrastructure. Improvements under alternative B would have long-term minor to moderate beneficial effects on operations.

Cumulative Impacts

There is no similar research facility in the park, and UW has no other operations responsibilities with the park. Therefore negative impacts to NPS and UW operations at the research center are not cumulative to any other actions. Potential negative impacts to NPS operations at the research center would represent an extremely small increment of negative impacts throughout the park.

Alternative C: All Improvements Included in Alternative B, in Addition to a Dormitory and Associated Parking Area

Impact Analysis

Under alternative C, improvements to infrastructure would cost approximately $4,000,000, with associated maintenance and life cycle costs of $500,000 (table 1). There would be short-term negligible to minor impacts on NPS and UW operations while construction activities are occurring. The resulting improvements would largely reduce the potential for emergency situations requiring unplanned, budgeted, or scheduled repairs to facilities and infrastructure. With the construction of the new dormitory as well as the other instituted improvements, alternative C would improve the NPS and UW's ability to provide quality and effective infrastructure. Improvements under alternative C would have long-term moderate beneficial effects on operations.

Cumulative Impacts

There is no similar research facility in the park, and UW has no other operations responsibilities with the park. Therefore negative impacts to NPS and UW operations at the research center are not cumulative to any other actions. Potential negative impacts to NPS operations at the research center would represent an extremely small increment of negative impacts throughout the park.

CHAPTER 4: CONSULTATION AND COORDINATION

The process of consultation and coordination is an important part of this project. The park consulted with various agencies, tribes, organizations, and interested persons in preparing this EA.

SCOPING AND AGENCY CONSULTATION

Scoping is a process to determine the breadth of environmental issues and alternatives to be addressed in an EA. The park conducted both internal scoping with appropriate NPS staff and external scoping with the public and interested groups and agencies.

Internal Scoping

An internal scoping meeting was held in Grand Teton National Park on November 16, 2012. Participants included the project interdisciplinary team and representatives from the consultant preparing the EA. Products included the clarification of the project scope and features, definition of the action alternatives, determination of the relevant impact topics, and identification of issues for each.

External Scoping

The following actions were taken to inform the public about the intent to prepare a NEPA EA for this project. The external scoping was conducted for the period from January 18 to February 20, 2013.

- A news release was published by Jackson Hole News & Guide, on January 30, 2013;
- Approximately 500 scoping notice postcards were mailed on January 18, 2013 to the park's standard planning/compliance mailing list. These included local, state, and federal agencies; organizations, and individuals;
- The scoping notice was made available electronically on the NPS Planning, Environment, and Public Comment website: http://parkplanning.nps.gov/uw-nps
- 29 tribal consultation letters were mailed on January 18, 2013.

Five letters were submitted during the public scoping period. These are summarized as follows.

1) A letter from Alliance for Historic Wyoming that notes the 2005 study identified the entire property as a National Register-eligible cultural landscape and made the following specific comments.
    - Water and wastewater systems: Installation of these systems should take into account the cultural landscape of the campus site, as well as the historic character of individual buildings and should be designed to minimize landscape impacts (grade, trees, specific cultural landscape features) as well as to avoid visual impacts on historic buildings. This may be possible by placing any above ground visible elements so that they are concealed by natural landscape features.
    - New Dormitory: Siting of the new dormitory must take into account the cultural landscape of the campus. Any change to the existing arrangement of buildings, and their relationship to one another, could severely impact the historic character of the campus as a vacation property. The dormitory should be sited so as not to be visible from important view points within the cultural landscape, such as the view from the Berol Lodge and the view toward the lake from any of the existing buildings. In addition, the dormitory should be sited so as to avoid damaging existing cultural landscape features and views.

- As recommended in the Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Properties, the design of the new building should be respectful of the architectural style, materials and scale of existing buildings, without trying to be an exact replica of the historic buildings. The design of the dormitory should not overpower the existing buildings in terms of scale. A design that incorporates several smaller structures, as opposed to one massive elevation, would be preferable. An experienced historic preservation architect who is familiar with the Secretary of the Interior's Standards should be included in the design team for the building.
- The EA must address the impact that construction of a new dormitory will have on the use, and thus future maintenance, of the existing historic buildings. One of the beneficial aspects of the campus at this time is that all of the buildings have been appropriately adapted for new uses. Currently all fifteen of the contributing historic buildings on the campus are used in the operation of the research center. If one or more historic buildings are left unused due to construction of the dormitory, these buildings could be considered surplus and maintenance deferred, thus endangering the buildings.
- The Lawrence House should be considered a contributing historic building. Although not quite 50 years old, this house is in close to original condition, with its original configuration, design and materials intact.
- AHW agrees that certain conditions at AMK Ranch, including water drainage issues around the Berol Lodge, lakeshore erosion, and the condition and appearance of the existing breakwater wall adjacent to the historic boat house, threaten historic resources and should also be addressed. We recommend that a team consisting of engineers, preservation architects and cultural landscape specialists be involved in designing solutions to these problems.

2) A letter from the Jackson Hole Conservation Alliance states that the upgrades at the UW National Park Service Research Center/AMK Ranch should comply with park development guidelines and preserve the historic character of the ranch. The improvements should follow the Secretary's Standards for the Treatment of Historic Properties ensuring not to diminish the property's features that add to its historical significance.

- In the assessment of the water systems, it is important to properly manage the property's surface water drainage guaranteeing no alteration to the water quality of Jackson Lake.
- The new dormitory should be constructed with low-impact development standards and built in a place already impacted to preserve uninterrupted habitat. Therefore, the environmental assessment should evaluate current habitat in and around the property as well as the impacts of the center's improvements on habitat.
- The dormitory should be built with LEED and Energy Star standards similar to the recent construction of the LEED platinum certified employee housing near the Moose entrance of Grand Teton National Park.
- The research center should be improved with the highest environmental standards that reflect sustainability and conservation.

3) A letter from the National Trust for Historic Preservation commented:

- The University of Wyoming/National Park Service Research Center at the AMK Ranch represents an early example of a thriving adaptive use of an important piece of Jackson Hole's history.

- Noted concern about the possible adverse impacts to the historic buildings and landscape of the National Register-listed AMK Historic District due to the proposed site improvements, specifically the dormitory construction. Given the site's significance, the new construction should be compatible with the existing historic character in location, scale and design.

4) An individual submitted two comments:

- Economic: The costs of this are not only the up-front cost, but the continuous cost of maintenance and heating, etc. of such a facility. I expect the burden of the current costs of operating the AMK is a contentious one between the University of Wyoming and the Park Service and this would only serve to exacerbate this.
- Historic: The historic character of this district would only be diminished by the appearance of another building only to accommodate the desire of an additional 15 summer residents. Let the additional "researchers" fend for themselves, not enjoy the summer at the expense of tax payers.

5) An individual submitted the following:

- This project appears fiscally and environmentally sound, well-reasoned, and timely. The mission and goals are achievable and success will benefit the site and public appropriately. The proposed process steps should be approved and implemented.

Wyoming State Historic Preservation Office

National Historic Preservation Act Section 106 consultation was initiated with the Wyoming State Historic Preservation Officer (SHPO) on January 17, 2014.

Threatened and Endangered Species Consultation

In accordance with the Endangered Species Act, the National Park Service checked the U.S. Fish and Wildlife Service (UWFWS) website for federally listed special status species in Teton County. As noted in chapter 1 under impact topics considered and dismissed, with the exception of the grizzly bear, Canada lynx, and wolverine, all federally listed and candidate species in the county were dismissed from further analysis. Consultation letters and copies of this EA have been sent to the USFWS and Wyoming Game and Fish Department their review and response.

American Indian Consultation

A number of tribes traditionally, and currently, value the Jackson Hole area for hunting, gathering, ceremonial, and other practices. Traditionally associated tribes include Apache, Northern Arapaho, Blackfoot, Northern Cheyenne, Coeur d'Alene, Comanche, Crow, Gros Ventre, Kiowa, Nez Perce, Northern Paiute, Salish-Kootenai Group, Eastern Shoshone, Shoshone-Bannock, Assiniboine Sioux, Teton Sioux, Umatilla Group, and Yakama Group.

Twenty-nine (29) consultation letters were mailed to local tribes on January 18, 2013 by NPS. No responses were received. The EA will be sent to all of the associated tribes. Any issues or concerns that are identified by the tribes during their review will be addressed by the NPS.

List of Preparers

The people identified in Table 12 were primarily responsible for preparing this EA.

Table 12. List of Preparers

Preparer	Title
Grand Teton National Park	
Daniel Noon	Chief of Planning
Sue Consolo-Murphy	Chief, Science & Resource Management
Katherine Wonson	Cultural Resource Specialist
Lowham Walsh, LLC	
Maureen O'Shea-Stone	Project Manager
Jennifer Jackson	Permitting Specialist
Carron Meaney	Senior Wildlife Ecologist
Scott Severs	Biologist
Chris Jessen	Geospatial Analyst
Ryan Stage	Biologist
ASM Affiliates	
Shannon Davis	Senior Architectural Historian

CHAPTER 5: REFERENCES

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