Environmental Assessment

September 2002

Gibbon River near Norris Junction

NPS Photo

Norris Area Water and Wastewater Treatment Project

YELLOWSTONE

National Park Wyoming / Montana / Idaho

Introduction

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United States Department of the Interior/ National Park Service /Yellowstone National Park

Introduction

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ABSTRACT

The National Park Service is proposing to construct a new water treatment facility and a new wastewater treatment facility in the Norris area of Yellowstone National Park. These facilities would replace existing utility systems that are not functioning properly or have completely failed. This Preferred Alternative would have direct adverse impacts to natural, cultural, and historic resources. These impacts would be negligible to minor, and short-term for the duration of the construction project. Long-term benefits include better protection of natural resources from improved sanitation procedures, increased dependability of utility systems, and improved visitor and employee services. Project cost is estimated at $5.65 million (2001 dollars). The No Action alternative would result in continued operation and maintenance of the existing utility systems.

SUMMARY

The National Park Service proposes to replace portions of the drinking water and wastewater treatment facilities that serve the existing Norris area developments within Yellowstone National Park. The source of drinking water would change from existing ground wells to an aquifer under the Gibbon River. A water treatment building would be added. These actions are needed because the existing water source provides water that is virtually non-potable due to poor taste, strong odor, and distinct coloration.

Leach fields in the Norris area provide wastewater treatment. One leach field failed seven years ago, requiring the closure of a comfort station at the Norris Geyser Basin. Another leach field serving employee housing at Norris is currently on the verge of failure. A new wastewater treatment plant would collect wastewater from these facilities in the Norris area. This facility would provide treatment that meets present requirements of the Water Quality Standards for Wyoming Groundwater, Sections 35-11-101 through 35-11-1104 of the Wyoming statutes.

Under Alternative A (proposed action), a new water treatment plant would be constructed in the Norris government area; two existing water wells would be abandoned. A new infiltration intake would use the Gibbon River as the source of water. A new wastewater treatment plant would be built on an existing service road. The failing leach field at the government area would be abandoned. The comfort station at the Norris Geyser Basin would be reopened. The failed leach field servicing the comfort station would be revegetated along with the abandoned leach field at the government area. Winterized utilities would allow some year-round employee housing at Norris. Approximately 290 meters (950 feet) of new water line and approximately 1,839 meters (6,050 feet) of new sewer line would be installed under this proposal. Approximately 1,768 meters (5,800 feet) of new underground electrical wiring would be installed, in addition to conduit placed along proposed sewage lines, to provide an upgraded power source for the new facilities.

Under Alternative B (No Action), a water treatment plant would not be constructed and the two existing water wells would be retained as the source of water. An existing leach field at the government area would continue to be used for as long as it functions. A previously closed comfort station at the geyser basin would remain closed. Employee housing at Norris would not have the capability for year-round use. There would be no new water lines or new sewer lines installed under this proposal.

The proposed action would affect about 3.43 hectares (8.35 acres) of soils and vegetation. About 2.5 square meters (26.9 square feet) of wetland vegetation would be permanently disturbed. Negligible or no direct adverse effects would occur to hydrothermal resources, air quality, wildlife, birds, fisheries and aquatic resources, cultural resources, or ethnographic resources. There would be minor short-term direct adverse effects to native vegetation, exotic vegetation, rare plants, geology and soils, amphibians and reptiles, and wetlands and waters of the United States. These short-term impacts would last through the construction phase of the project. Construction activities may affect but not likely adversely affect grizzly bears, Canada lynx, bald eagles, and gray wolves, mainly from temporary displacement or minor habitat loss. There would be long-term minor adverse impact to the topography of the area from the hillside grading needed at the wastewater treatment plant site. Socioeconomic resources would experience short- and long-term minor direct and indirect beneficial effects from improved visitor services and facilities. Initial minor short-term direct adverse effects would occur to visitor use and experience from inconveniences during construction, but would be change to minor long-term beneficial effects from improvements in services. No impairment to resources would occur from this action.

Cultural resources within the areas potentially affected by construction have been inventoried, and their eligibility for inclusion on the National Register of Historic Places (National Register) evaluated. The 1993 programmatic agreement (NPS 1993b) between the Wyoming and Montana State Historic Preservation Officers (SHPOs), the Advisory Council on Historic Preservation (ACHP), and the National Park Service (NPS) provides direction for the preservation and protection of these properties. Through project planning and design, impacts on these eligible properties would be avoided. If there is an impact that is unanticipated and unavoidable once the project is underway, then appropriate mitigation strategies would be developed and mitigation plans prepared in consultation with the Wyoming State Historic Preservation Officer and, if necessary, the Advisory Council on Historic Preservation.

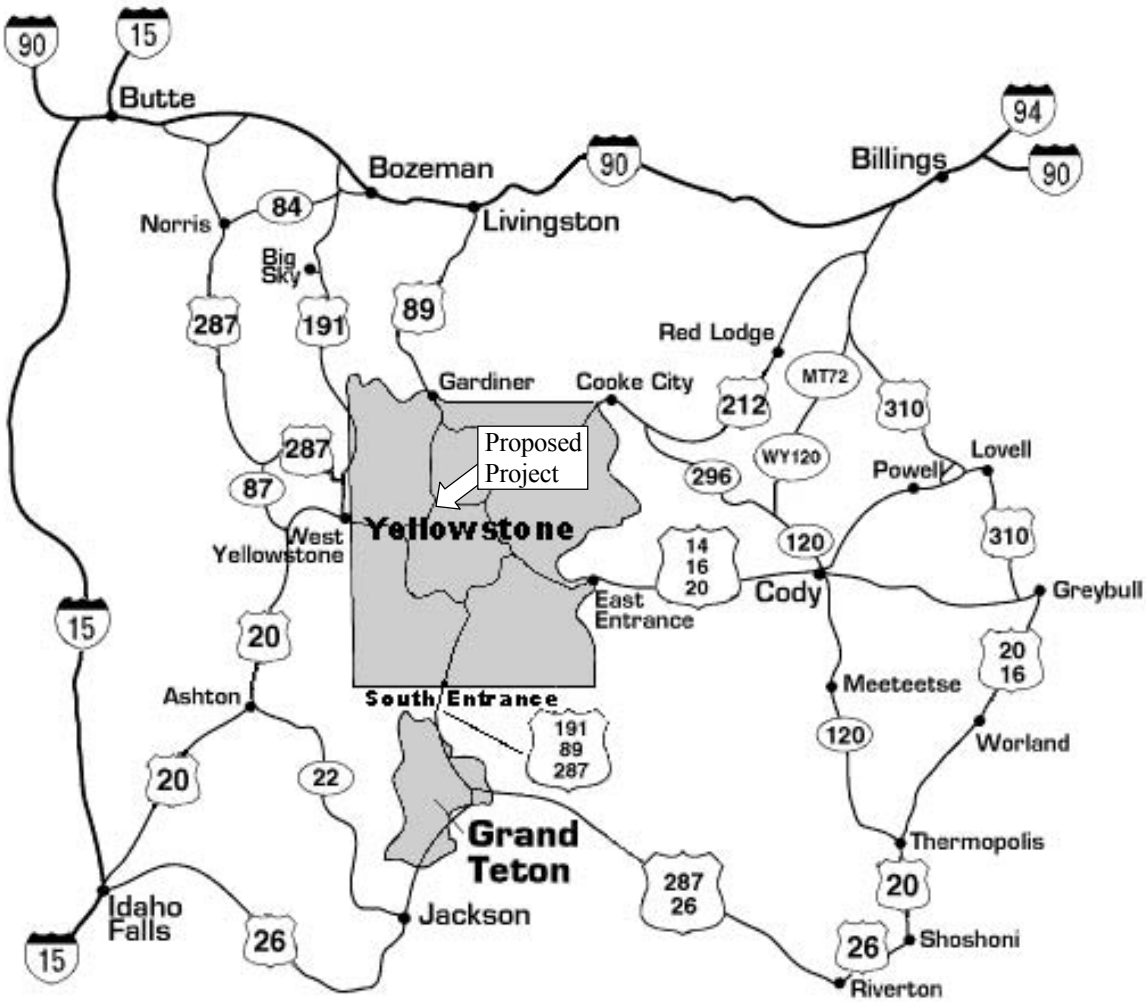
This environmental assessment will be on public review for 30 days.

NOTE TO REVIEWERS AND RESPONDENTS

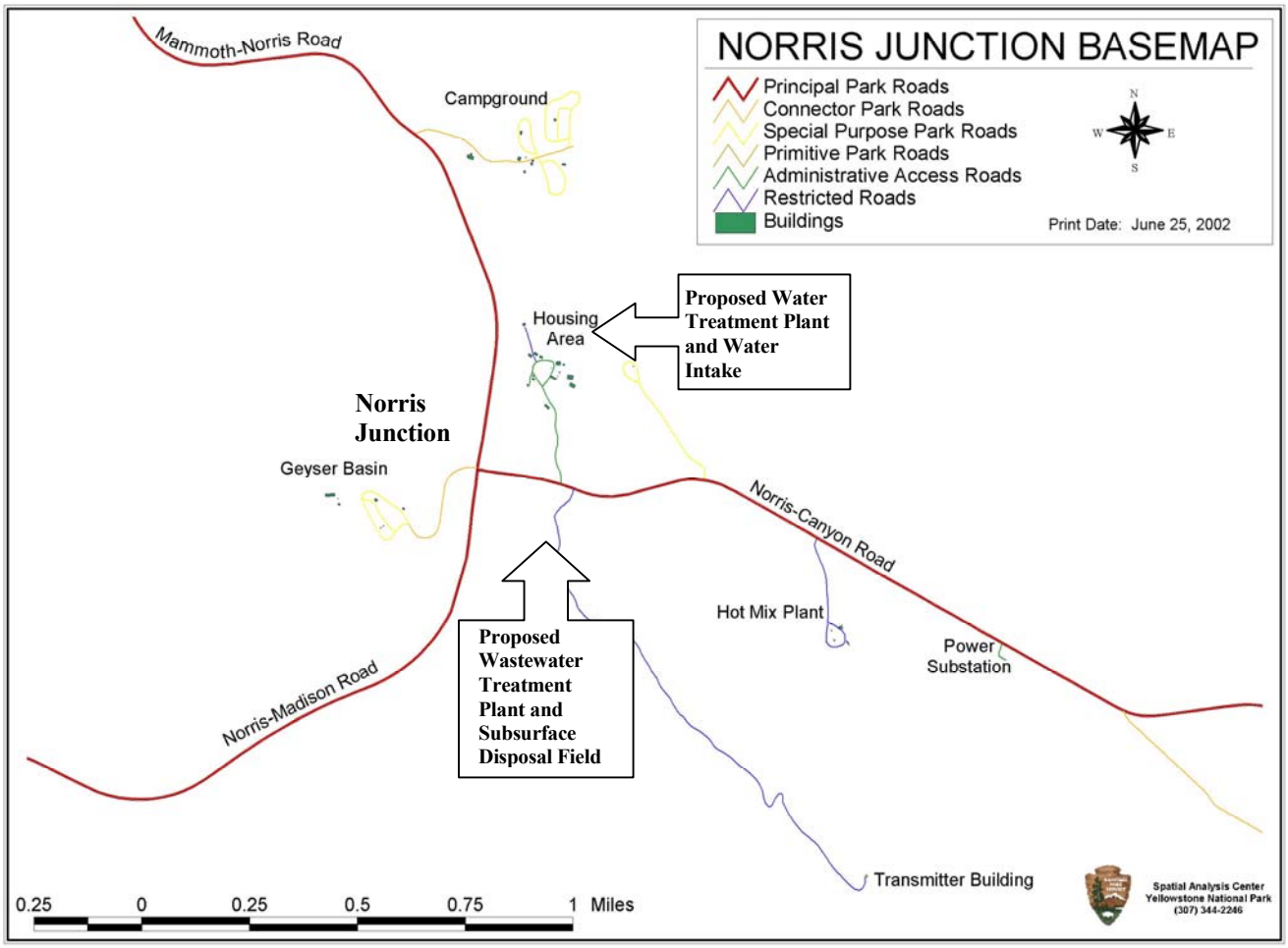
If you wish to comment on the environmental assessment, you may mail comments to the name and address below. Our practice is to make comments, including names and home addresses of respondents, available for public review during regular business hours. Individual respondents may request that we withhold their home address from the record, which we will honor to the extent allowable by law. If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment. We will make all submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, available for public inspection in their entirety.

Comments are due October 4, 2002, and should be addressed to:

Superintendent
Attn: Planning and Compliance
Norris Area Water and Wastewater Treatment Project
P.O. Box 168
Yellowstone National Park, WY 82190



Vicinity Map


NORRIS JUNCTION BASEMAP
Principal Park Roads
Connector Park Roads
Special Purpose Park Roads
Primitive Park Roads
Administrative Access Roads
Restricted Roads
Buildings
Print Date: June 25, 2002
N
W
E
S
Mammoth-Norris Road
Campground
Housing Area
Proposed Water Treatment Plant and Water Intake
Norris Junction
Geyser Basin
Norris-Canyon Road
Hot Mix Plant
Power Substation
Proposed Wastewater Treatment Plant and Subsurface Disposal Field
Norris-Madison Road
Transmitter Building
0.25 0 0.25 0.5 0.75 1 Miles
Spatial Analysis Center
Yellowstone National Park
(307) 344-2246

PURPOSE AND NEED FOR THE ACTION

The National Park Service (NPS) is proposing to replace portions of the water and wastewater treatment systems that serve the Norris Junction area of Yellowstone National Park. In addition to the geyser basin and its adjacent Norris Geyser Basin Museum and bookstore, the area contains the Norris Campground and the Museum of the National Park Ranger, a picnic area, and roadside viewpoints. About 61 percent of the approximately 3.1 million people who visit Yellowstone National Park stop at the Norris Junction area's attractions. This percentage equals about 14,000 visitors on a typical summer day (1989 data). In the winter months, approximately 48 percent of the 120,000 visitors (1995 data) stop at Norris Geyser Basin, with both the Porcelain and Back Basins being popular attractions for visitors arriving by snowmobile or snowcoach.

The source of the Norris area's drinking water currently comes from two wells located in a meadow adjacent to the Gibbon River, near the Norris government area. The Norris government area consists of employee housing and maintenance facilities. Water from the wells is nearly non-potable, as it is very poor tasting and has a distinct odor. Water meets National Primary Drinking Water Standards established by the Environmental Protection Agency, but does not meet National Secondary Drinking Water Standards, which relate to aesthetic characteristics. Most government residents and campers at Norris Campground choose to haul their drinking water from distant locations rather than drink the water. The water treatment system is seasonal, resulting in shutdown and startup costs each year. A small office attached to the Norris Geyser Basin Museum has water for a shower and a sink. However, it is posted as "non-potable" because the chlorine residual reading cannot be maintained at legally acceptable levels. The water is high in mineral concentrations and is influenced by surface and geothermal water. It is highly corrosive, causing rapid deterioration of pumps, pipes, and fixtures. This results in repairs and maintenance that consume valuable work hours each year. Corrosion issues often cause the water system to be inoperative during the spring and leads to the plugging of distribution and pump systems. The flow from the wells is not adequate to fill the reservoir tank in a reasonable amount of time in the event of a fire or power outage, or after routine distribution system maintenance.

The Norris Junction area has five separate septic sewage treatment systems. Two of these are located at the Norris Geyser Basin, one at the Norris government area, and two at Norris Campground.

One of the wastewater systems for the Norris Geyser Basin is proposed for replacement. In 1995 the public flush comfort station building at the Norris Geyser Basin had a failure of the mounded leach field and was closed based on a recommendation from the United States Public Health Service. Vault toilets were installed in the geyser basin's parking area. They require pumping every week in the summer to stay operational. Attached to the historic Norris Geyser Basin Museum is a small office with a toilet. This office has its own septic field that is more than adequately sized and functions correctly. This septic system would be unchanged in this proposal.

A similar mounded leach field system to that at the Norris Geyser Basin serves the employee housing/maintenance area at Norris. This system is starting to fail and is proposed for replacement. The existing wastewater lift station is prone to overflowing during power outages, discharging raw sewage into the Gibbon River. Year-round wastewater treatment operation is not possible because the sewer lines in the government area and at the geyser basin area are buried at a shallow depth and thus exposed to freezing temperatures.

The Norris Campground has an adequate sewage system that would not be altered by this proposal. The Norris Picnic Area does not have flush toilets or drain fields and would not be included in this proposed project.

There are no significant human-caused sources of water pollution in the Norris area aside from unintentional sewage discharges, which happens infrequently and at low volumes.

Management Objectives

The objectives of this project are to provide visitors and staff with drinking water that is palatable and meets all applicable state and federal standards and regulations, and to provide wastewater treatment systems that can adequately meet all demands for proper treatment and disposal. Utility systems that function at full performance standards are required to maintain a positive visitor experience and to protect park resources.

In order to determine the size and scope of future drinking water and wastewater needs, park managers identified possible improvements that would result in changes in water use and wastewater production during the life of these facilities. Some of these changes have been identified in previous documents (see below). The following are some improvement options that were identified by park staff members if implementation of the Preferred Alternative occurred.

There would be the potential for some of the 116 Norris Campground campsites to include water and/or sewer hookups. The addition of a restroom within the Museum of the National Park Ranger would be possible at a future date. There would be potential to reconstruct some or all of the five comfort stations at the campground to include showers, or add additional comfort stations. The addition of a trailer dump station and/or dishwashing stations would also be possible. Additional planning and compliance in accordance with the National Environmental Policy Act (NEPA) would be needed for these projects.

This project does not include expansion of utilities to allow for a previous proposal to expand the Norris Campground as expressed in the *Draft Fishing Bridge Campsite Replacement EIS* (NPS 1994). The proposal is currently not under active consideration. The design objective of the proposed action is to allow for extra water and wastewater treatment capacity for possible future water and sewage demands resulting from improvements of current facilities.

The addition of eight homes, measured in single-family equivalents (SFE), in the Norris government area is an objective stated in the *Housing Management Plan for Yellowstone National Park* (NPS 2001). The capability to station some employees year-round at Norris is also an objective. This would require winterization of water and sewer services to at least some homes. Housing at Norris was addressed in the *Employee Housing Plan* (NPS 1992), also referred to as the HUDAT (Housing Unit and Design Assistance Team) plan.

The potential to provide a warming hut at the Norris Geyser Basin, with winterized water and sewer services for the area, is another management objective. The warming hut was addressed in the *Winter Use Plan* (NPS 2000).

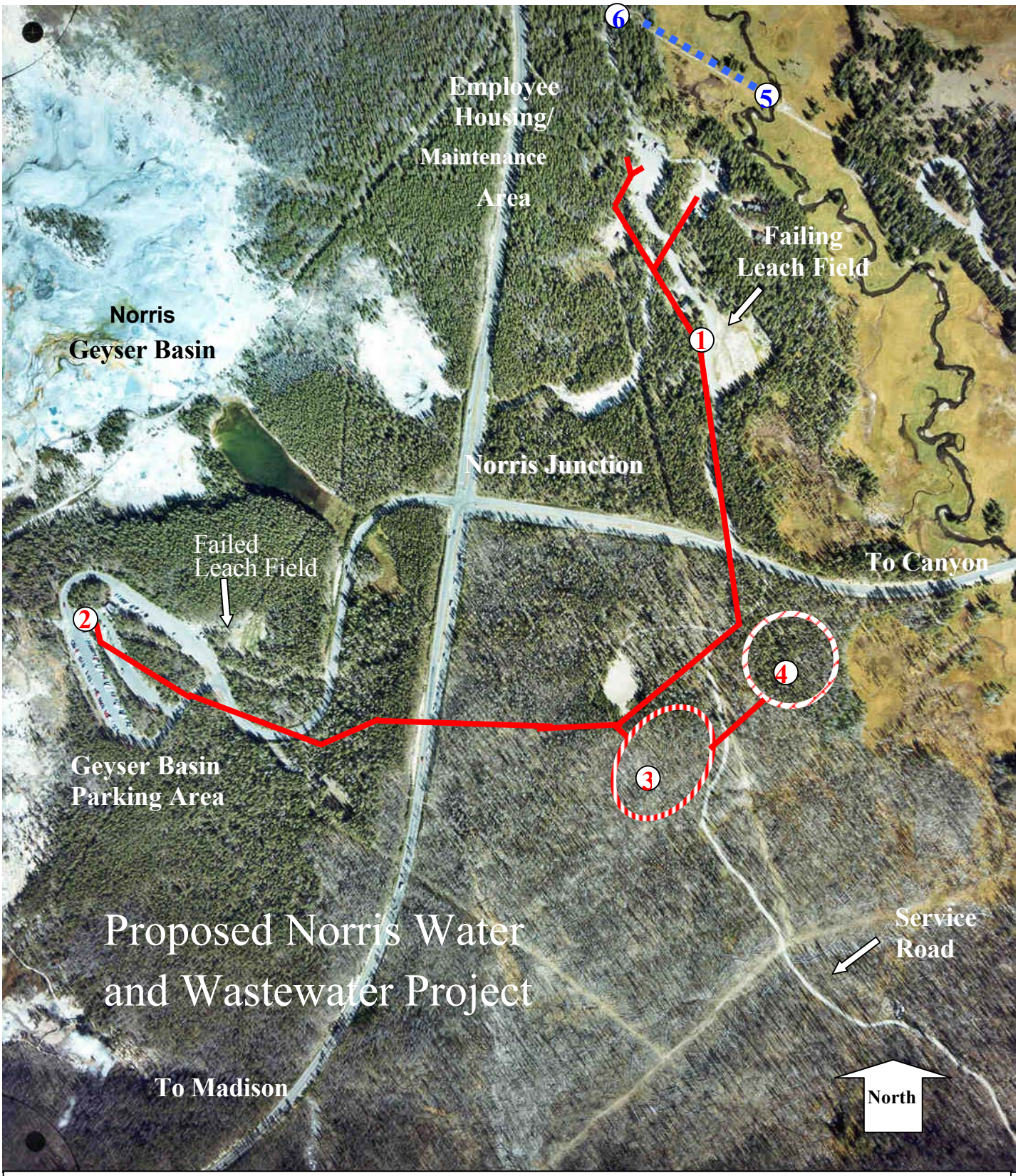
If these future improvements were not implemented there would be no effects on the proposed treatment process. Water and wastewater plants that operate at less than maximum capacity are a benefit to operations.

Relationship of the Proposed Action to Previous Planning Efforts

Numerous previous planning documents have addressed the poor state of repair of Yellowstone's water and wastewater utility systems both at Norris and throughout the park (see Appendix A *Yellowstone National Park Update of Assessment of Water and Sewage Systems*). The *Yellowstone National Park Strategic Plan (FY 2001-2005)* stated that "the park's aging and inadequately maintained water and wastewater infiltration system has become an increasing burden in both dollars and the risk posed to public health and park resources. While progress has been made in improving the park's energy efficiency and reducing its solid waste flow, its water and sewer treatment facilities will require major upgrades in the near future in order to prevent a major calamity" (NPS 2000a, p. 39).

Also relevant to this proposal are the approved plans for the *Yellowstone National Park Master Plan* (NPS 1974), the *Winter Use Plan* (NPS 2000), and the *Employee Housing Plan* (NPS 1992). These plans acknowledged the need for year-round housing at Norris and/or the need to replace failed and failing utilities at Norris. A *Draft Fishing Bridge Campsite Replacement EIS* (NPS 1994) was not approved or implemented, but it contained research that contributed to the Norris area utility system's replacement assessment.

A map of the project area is located on the following page.



Legend

1 - Proposed Sewage Pump Station
2 – Existing Flush Restroom (closed)
3 – Proposed Wastewater Plant
4 – Proposed Subsurface Disposal Field
5 – Proposed Water Intake
6 – Proposed Water Treatment and Generator Buildings

Proposed Sewer Line
Proposed Water Line

SCALE: 1 Inch = 500 Feet

ALTERNATIVES CONSIDERED

Overview

The alternative section describes two alternatives for future management of the Norris water and wastewater systems. A No Action alternative for this project was developed to provide a baseline for comparison to the proposed action. At the end of the alternatives section is a description of alternatives considered and subsequently dismissed.

Alternative A (Proposed Action): Replace Selected Drinking Water and Wastewater Facilities serving the Norris Area

Proposed Construction

A new water treatment plant would be constructed in the Norris government area. A new infiltration water intake would be installed that would use the Gibbon River as the source of water. The two existing water wells would be abandoned. A new wastewater treatment plant would be built, and existing leach fields at the government area and geyser basin would be abandoned. A previously closed comfort station at the geyser basin would be reopened. One result would be that some employee housing at Norris would have the capability for year-round use with newly winterized utilities.

The following description of the proposed operation for this alternative is derived from the *Norris Water and Wastewater Pre-Design* (Rothberg, Tamburini and Windsor, Inc. 2002).

Water System

Service Population and Fire Flow

The existing 378,500-liter (100,000-gallon) storage reservoir tank would provide enough water for structural fire requirements in addition to the required storage. Additional storage at the new water plant includes the existing pump station clearwell (28,388 liters or 7,500 gallons) plus proposed additional clearwell/backwash supply storage of a minimum 28,388 liters (7,500 gallons).

Design needs include improvements that could possibly occur in the near future. For example, a trailer dump station and showers might be added to the existing campground. Winterizing the utility systems would allow for winter use of the Norris Geyser Basin comfort station and would allow two to four permanent employees to be stationed at Norris year round. Winter camping is not proposed in the future. Peak daily flows during the visitor season (late spring to early fall) are estimated to be 256,850 liters (67,860 gallons) per day. Wintertime water and wastewater daily flows would be estimated to be below 18,925 liters (5,000 gallons) per day.

Intake Location and Design

This project proposal is to return the Norris area drinking water source to water from the Gibbon River, which supplied the area prior to the existing wells. In the early 1970s, the Safe Drinking Water Act required surface water to be filtered, but allowed groundwater to be used without filtration. The area's drinking water source was changed to groundwater by drilling two wells next to the Gibbon River. The proposed raw water intake location is adjacent to the river, east of the existing chlorination/pump building at the north end of the government area. This location is approximately 200 meters (660 feet) downstream (north) of an abandoned early-1900s pump station. Historical data indicate this location provided good tasting water in great quantity. This location is approximately 1.21 kilometers (0.75 miles) downstream from Castle Creek and approximately 0.8 kilometers (0.5 miles) upstream from Solfatara Creek. Both of these creeks discharge mineralized water into the Gibbon River, which contributes to poor tasting water. The intake would be down gradient of the tertiary subsurface disposal field of the new wastewater treatment plant. The two locations would be approximately 792 meters (2,600 feet) apart. The separation of the tertiary effluent and the water intake is adequate to prevent any problems with drinking water.

To keep structures out of the actual river channel, the raw water intake would be installed in the crook of one of the river's meanders. The infiltration structure would not protrude into the river. The raw water intake would consist of a perforated concrete intake vault and duplex submersible pump system. The pumps would draw water from the underground aquafer that extends the full width of the meadow adjacent to the Gibbon River. The infiltration system would be a pre-cast manhole measuring about 2.4 meters (8 feet) deep, with four to six stainless steel well screen sections. Each of the well screen sections would radiate approximately 2.4 meters (8 feet) from the manhole. The well screens would be set approximately 2.0 meters (7 feet) below ground surface which would be approximately 1.2 meters (4 feet) below the river bottom. Fish in the stream would not come into contact with the screens. The top of the manhole would sit approximately 10 centimeters (4 inches) above finished grade.

Raw water would be collected in this infiltration structure and pumped to the new treatment plant located approximately 290 meters (950 feet) away. New ductile iron pipe (DIP) would be buried to accomplish this, abandoning the old waterline intact and undisturbed. The water line would be buried about 2.1 meters (7 feet) deep. The width of the disturbance would be approximately 6 meters (20 feet) to allow for excavation, setting the trench box, and storing excavated soils. The utility corridor would be allowed to revegetate, as tree roots would not interfere with pipes at that buried depth.

The alignment of the pipeline and the electrical power conduit follows an abandoned roadbed from the river's edge towards the water treatment plant for about the first 244 meters (800 feet). The remaining approximately 190 meters (150 feet) would travel through a stand of lodgepole pine to connect to an existing service road, where an existing water treatment building is located. The new water treatment plant building, described below, would be built adjacent to this location.

Water Treatment Plant

Location and Design

Under this alternative, the proposed location to construct a new building for water treatment is directly adjacent to the existing water treatment building (pump house) at the far north end of the Norris government area, and about 305 meters (1,000 feet) east of the Gibbon River. With bedrock only a few feet below the ground surface, construction at this location would not require any soil improvement or deep support piers. Mature trees surround the site and provide screening from the Norris Geyser Basin, Norris Campground, and Norris Picnic Area. Approximately 40-50 mature lodgepole pine trees would be cleared for the building. The new water treatment plant would utilize the existing pump house and thus reduce the size of the new plant. The plant would be housed in a block building with locked access. Backwash waste would be discharged into the sewage system. Fencing would not be required, as no external process basins would be located at this plant. The 384,418-liter (100,000-gallon) water tank reservoir, located on the reservoir service road south of the Norris government area, would be retained for use. Existing water distribution piping would also remain in use.

The proposed water treatment building would be two stories, about 6.8 meters high (22 feet 5 inches) at the peak of the roofline, and approximately 12.2 meters long by 12.2 meters wide (40 feet by 40 feet). It would consist of concrete masonry unit double wall— split-face block, closed-cell insulation, and structural block. The exterior would be sealed with waterproofing, but not painted. The building roof, eaves, and soffit are proposed to be factory-finished metal. Other architectural features proposed include a loading dock and garage doors for chemical delivery, an ADA accessible office/laboratory area, and a toilet and sink.

A diesel-powered generator sized to run all plant equipment would provide standby power. The generator would be installed in a separate building. A very small (approximately 2.3-meter or 25-square feet) building would be located adjacent to the proposed water treatment plant in the Norris government area. The building would be a single-story, single gable, wood-frame structure. Two sides of the building would have large air vent louvers. One gable end would have an exhaust thimble extending from it. The area where this building would be placed is similar to the water treatment plant site. Trenching would be necessary between the generator building and the water plant or lift station, and would likely follow proposed utility lines.

Water Treatment Methods

The design flow rate of the water treatment plant would be about 283,875 liters per day (lpd) (75,000 gallons per day (gpd)). The water treatment plant would achieve removal of turbidity, removal/inactivation of cryptosporidium, removal/inactivation of giardia (*Giardia lamblia)* cysts, and removal/inactivation of viruses. The treatment processes would include rapid mix, or initial mix, where raw water is completely mixed with treatment chemicals. Treatment chemicals would include soda ash, alum, polymer, permanganate, and sodium hypochlorite. After chemical mixing coagulation would occur. Coagulation is a medium-energy process that uses a treatment chemical to bind with small particles to create larger aggregates. Coagulation would occur in the flocculation basin. The flocculation and sedimentation basins are operated to form large heavy

floc particles that would settle out of suspension in the sedimentation basin. After flowing from the flocculation basin through the sedimentation basin, mixed media filtration would be the proposed treatment process. Filter media would consist of support gravel, garnet sand, sand, and anthracite. Cleaning would be accomplished by pumping water back through the filter. The sedimentation basin would drain during each backwash. Backwash waste would be discharged to the sewage system. No backwash flows would be returned to the influent of the water treatment plant.

Liquid chlorine in the form of sodium hypochlorite has been and would continue to be used for disinfection. The finished water's chlorine residual would be maintained between 0.5 mg/L and 4.0 mg/L.

The control system would include an alarm system that would be connected to the Communications Center and monitored 24 hours a day to alert for fire, high filter level, high tank level, low filter, low clearwell level, high filter turbidity, and loss of power. The plant would shut off automatically when the storage tank water depth reaches a preset level, and start automatically on falling tank levels.

Improvements in the power distribution system would need to be made to supply power to the water treatment plant. Current single-phase power would be replaced by three-phase power. Three-phase power would be routed from the power substation, located about 1,770 meters (5,880 feet) east of the reservoir service road, west along the Norris to Canyon road to the intersection of the reservoir service road. The power line would be plowed into the borrow pit on the south side of the road, an area of previous soil disturbance. A junction box would be established at the reservoir service road to route power to the water plant and wastewater treatment plant. Conduit would be installed in the proposed sewage pipe trench to avoid any additional ground disturbance.

Wastewater System

The alternative's proposal would design a centralized wastewater treatment system to replace the localized septic tank and leach field systems that serve the Norris Geyser Basin and the government area. Treatment capacities of the proposed wastewater system would allow for inclusion of the Norris Campground if necessary at a future date. However, no line installation or hookup connections for the campground would be included in this project, or in the predictable future. The inclusion of the Norris Campground is based on future improvements that should be considered. The utility upgrades are not being designed for the improvements outlined in the *Draft Fishing Bridge Campground Replacement EIS* (NPS 1994*)*. This does not preclude a future proposal that might increase the size of the existing campground. New additions to the campground could be accommodated by separate systems in the campground, or by not providing some of the improvements in the existing campground. Future planning documents would cover the impacts of any future expansion.

The Norris Picnic Area would not be connected to the proposed water and wastewater systems. The existing vault toilets would remain in use. Park Service crews would renovate the comfort station at the Norris Geyser Basin, closed since 1995.

Wastewater Plant Site

A site adjacent to the reservoir service road would be proposed as the wastewater plant site. The area is about 0.8 kilometers (0.5 miles) from the geyser basin and more than 1.6 kilometers (one mile) from the campground. The reservoir service road is south of the entrance to the government area along the Norris to Canyon road. The treatment site requires approximately 0.63 hectares (1.56 acres) for operations building, aeration basins, sludge storage basin and drying beds, and about 0.93 hectares (2.29 acres) for a subsurface disposal field. The area adjacent to the reservoir service road was heavily burned during the 1988 fires and is currently covered with burnt snags and new growth. The plant would be built at this location with minimal mature tree removal. The wastewater plant would be required to be protected from flooding, as required under Wyoming State Department of Environmental Quality Water Quality Rules and Regulations, Chapter 11, Section 11, subsection c(ii). The site would be truck-accessible during the periods the plant operates. Winter season snowmobile access would provide adequate operations access during the period the plant is storing wastewater.

The soils at the site adjacent to the reservoir service road consist of welded rhyolitic ash covered by 0.6 to 1.5 meters (2 to 5 feet) of granular soils. Construction of the wastewater plant at this site would likely require additional excavation effort or blasting of the welded ash. The plant site is located in a Seismic Zone 4, as defined by the current Uniform Building Code (UBC). The site contains bedrock with no groundwater. Structural design would follow the recommendations from the geotechnical report for foundation design.

The approximate wastewater treatment plant dimensions would be as follows. A graveled area, approximately 6 meters wide by 12 meters long (20 feet by 40 feet) in front of the operations building, would provide parking for four vehicles. The operations building would have the same architectural design as the water treatment plant building and measure approximately 12 meters by 12 meters (40 feet by 40 feet). The aeration basin would be approximately 27 meters by 19 meters (87 feet by 62 feet) and would be an uncovered facility. The adjacent drying beds, also uncovered, measure approximately 38 meters by 11 meters (125 feet by 37 feet). The sludge storage basin would have an interior dimension of about 27 meters by 38 meters (87 feet by 125 feet) and an exterior dimension of about 53 meters by 46 meters (175 feet by 150 feet). A “bear-proof” chain link fence measuring about 457 meters (1,500 feet) would be provided around the aeration basin, sludge storage basin, and drying beds. The operations building and parking area would not be fenced. Equipment gates and a single pedestrian gate would be provided for maintenance access. Routine operations access would be through this operation building. See Appendix C for the proposed site plan.

New three-phase power service would be routed from the power substation, east of the reservoir service road, west along the Norris to Canyon road. At the intersection of the reservoir service road a junction box would be installed. Power would be routed from this junction box along the sewage pipe to the wastewater treatment building. Conduit would be placed in the proposed sewage pipe trench to reduce ground disturbance. An emergency generator similar to the one at the water treatment plant would be installed at the wastewater plant as an emergency power source.

Wastewater Treatment Building Design

The proposed building consists of concrete masonry unit double wall split-face block, closed-cell insulation, and structural block. The exterior would be sealed with waterproofing, but not painted. The building roof, eaves, and soffit are proposed to be factory-finished metal. The general architectural style proposed is a single gable clerestory. Other architectural features would include

a loading dock and garage door for supply delivery, and an ADA accessible office and laboratory. The operations building would include a clarifier room, pump gallery, laboratory and administrative area, and generator room. The aeration basins would be outside.

The plant would operate as an activated sludge treatment plant during the visitor season. Operators would have daily access by pick-up truck to conduct daily process-control lab work, sampling, and minor maintenance tasks. The plant would store wastewater during the winter. No process control or sampling would be required during periods of no discharge. Operator attention during the winter would include periodic checks of blower operation and basin volume. Access by snowmobile would allow completion of these tasks.

Collection System

Sewer lines coming from facilities in each area collect and move the wastewater from the facilities to the disposal/treatment system. The geyser basin facilities consist of a museum with office, bookstore, and comfort station. An existing sewer line runs from the parking lot comfort station to the abandoned mounded leach field at the northeast corner of the parking lot. The government area has a shallow collection system that flows north to the existing government area lift station. The lift station pumps the sewage to a mounded leach field south of the housing area. A central collection system is proposed which uses gravity flow to the maximum extent possible. A minimum of one lift station would be required to transfer wastewater to the treatment plant.

Geyser basin wastewater would gravity flow to the treatment plant. The proposed route from the Norris Geyser Basin to the reservoir service road site would be through the parking area along a portion of the water line utility cut and through the southwest quadrant of the Norris intersection until the line crosses under the Norris to Madison road. The line would be bored under the roadway to minimize disruption of traffic and damage to the pavement. Once in the southeast quadrant, the route travels east toward the proposed plant through burnt deadfall trees until it enters the wastewater plant west of the reservoir service road.

The government area wastewater flows would be collected in a new series of lines and manholes primarily located in the government area roads. Water treatment plant waste flows would be pumped to this same gravity system. The collection system would flow south to a lift station to be located at the south end of the government area, near the existing government leach field. Wastewater would be pumped from the lift station to the wastewater treatment plant located on the reservoir service road. The force main/pump line route would be located on a bench east of the entrance road into the government area. The line would be bored as it crossed the Norris to Canyon road east of Norris Junction. After crossing the road the line would travel through the trees until it reaches the headworks of the wastewater plant. The wastewater would gravity flow through a muffin monster-type grinder (a grinder with interlocking teeth) and Parshall flume flow monitor to the aeration basin.

Rock excavation would likely be required on all collection line routes. Proposed routing has been selected to minimize tree removal. The lines at the start of the collection system would be buried less than 2 meters (7 feet) deep. Insulation would be installed over any lines with less than that depth of cover to prevent freezing.

Wastewater Treatment

The wastewater at the plant would be domestic wastewater collected from facilities at the geyser basin and employee housing. Backwash water generated at the water treatment plant would be discharged to the wastewater plant. This backwash water would provide alkalinity to the wastewater treatment process and dilute the domestic waste.

Septage (waste liquids and solids from vault toilets) would be hauled to the Canyon Village wastewater treatment plant, approximately 19 kilometers (12 miles) away. No industrial wastewater would be generated in the area or would be discharged into the Norris sewer system.

Treatment Process

Groundwater down gradient of the subsurface disposal fields should meet Wyoming State Class 1 Groundwater Standards. Chapter 16, Wyoming State Water Quality Regulations, requires filtration and disinfection in addition to secondary treatment. This requirement can be met through treatment processes, or through treatment provided by the subsurface discharge field.

The selected treatment proposed is called Single Basin Nutrient Removal, which is a modification of the extended aeration activated sludge process. The operations are more complex than a rotating biological contactor, but less than the other activated sludge processes and membrane treatment.

The plant would be operated during the summer visitor season, when utility operators with operations experience to run an activated sludge plant are stationed at Norris. During the winter and shoulder seasons, the aeration basins and sludge storage basins would be used to store wastewater.

The process consists of geo-fabric lined earthen aerated basin, secondary clarifier, blowers, and waste and return sludge pumps. The clarifier, pumps, and blowers are enclosed in a building. A clarifier is provided after the aeration basin to settle the mixed liquor from the treated effluent. Most of the solids are returned to the aeration basin, with the remaining solids discharged from the treatment process to the biosolids storage lagoon. The single basin process is designed for a long solids retention time (sludge age), typically 40 days.

Filtration and disinfection would be required. Recommended disinfection would be provided by sodium hypochlorite and filtration, provided by the subsurface disposal field. Sodium hypochlorite or on-site hypochlorite generation do not pose the same health risks as chlorine gas, and are similar to equipment used in the water plant. The effluent pipe would be sized to provide contact time for disinfection.

The subsurface field's splitter box would provide a sampling point for chlorine residual monitoring. The field would consist of a perforated pipe matrix set in granular soils. A distribution valve box would separate the field into two sections. Disposal field size would be based on the percolation rate of the soils. Percolation tests have been conducted at the leach field site. The maximum percolation rate of the three tests conducted was 3.15 minutes/centimeter or 8 minutes/inch (drop in water level in the test hole). For a design flow rate of 283,875 lpd (75,000 gpd) and a percolation rate of 3.15 minutes/centimeter (8 minutes/inch), the dual field system would require 34,733 square meters (90,000 square feet).

Sludge would be removed from the treatment system to a single sludge storage basin located adjacent to the aeration basins. Should the single basin be taken out of service, sludge could be

moved directly to the sludge drying beds. Sludge would be removed from the basin on an annual basis and processed in drying beds located at the treatment plant site. The plant is estimated to operate six months per year. A 15,140,000-liter (400,000-gallon) sludge storage basin with decant and sludge withdrawal equipment is proposed. The basin could be used for additional winter storage. This would require pumping from the aeration basin. The beds would be loaded at 1.2 meters (4 feet) depth, for each bed, per year. Drying bed volume would be a minimum of 407 cubic meters (14,371 cubic feet) with a minimum 334 square meters (3,593 square feet) surface area.

Alarm conditions in the field would be sent to the plant's control panel alarm. A local horn would be sounded and the alarm condition lit on the panel. The control panel alarm system would send an alarm signal to the park Communications Center in Mammoth, monitored 24 hours a day.

Proposed Removal of Facilities

Water System

Two ground water wells, which currently serve as the source of drinking water at Norris, would be abandoned. The pumps would be removed and the well casings sealed. These wells are in the meadow adjacent to the Gibbon River located on the same side of the river as the Norris Picnic Area and east of the government area across the meadow. The length of waterline pipe that connects the wells to the existing water treatment/pumphouse building at the Norris government area would be abandoned, remaining buried and undisturbed.

Wastewater System

Leach Field Abandonment

Two failing leach fields would be abandoned and those areas would be restored as a result of this alternative. The leach field located about 122 meters (400 feet) northeast of the comfort station at the Norris Geyser Basin consists of two mounds. Each mound is approximately 18 meters by 37 meters (60 feet by 120 feet), with an overall dimension of the two-mound site consisting of approximately 569 square meters (6,120 square feet). This leach field and comfort station have not been in use since 1995. The sewage field was incapable of suitably treating the waste produced by the comfort station.

The other leach field to be abandoned currently serves the Norris government area. Located south of the employee housing, this approximately 46 meters by 30 meters (150 feet by 100 feet)) field consists of mounds and buried perforated pipes. Revegetation of both leach fields is described below under the heading "Reclamation/Revegetation." Total area reclaimed would be about 0.20 hectares (0.48 acre). Existing sewer lines that would no longer be needed would be left in place and abandoned. Manholes, the lift station, and associated tank and overflow line would be removed or demolished in place.

Table 1 –Approximate Disturbance Amounts by Location and Habitat Type

Ditch Lines or Building Locations	Length in Lineal Meters (Lineal Feet)	Width in Lineal Meters (Lineal Feet)	Area in Square Meters (Square Feet)	Habitat: Meadow- Lodgepole- Road Edge-	**Total Hectares (Acres)**
Water Line Intake to Water Treatment Building	290 meters (950 feet)	6 meters (20 feet)	1,740 sq meters (19,000 sq ft)	Meadow- 0.15 hectares (0.37acres) Lodgepole- 0.03 hectares (0.07 acres)	**0.18 Hectares (0.44 Acres)**
Water Treatment Building	12 meters (40 feet)	12 meters (40 feet)	144 sq meters (1,600 sq feet)	Lodgepole/ Disturbed	**0.02 Hectares (0.04 Acres)**
Generator Building	1.5 meters (5 feet)	1.5 meters (5 feet)	2.25 sq meters (25 sq feet)	Previously Disturbed	0.00 Hectare (0.00 Acres)
Sewer Lines, Gov't Area to Wastewater Plant	1,112 meters (3,650 feet)	6 meters (20 feet)	6,775 sq meters (73,000 sq feet)	Lodgepole/ Disturbed	**0.68 Hectares (1.68 Acres)**
*Sewer Lines, Geyser Basin Comfort Station to Wastewater Plant	731 meters (2,400 feet)	6 meters (20 feet)	4,489 sq meters (48,000 sq feet)	Open or Green Lodgepole 0.27 hectares (0.66 acres) Burned Lodgepole 0.18 hectares (0.44 acres)	**0.45 Hectares (1.10 Acres)**
**Wastewater Plant and Parking Area	104 meters (340 feet)	61 meters (200 feet)	6,344 sq meter (68,000 sq feet)	Mixed Live and Burned Lodgepole	**0.63 Hectares (1.56 Acres)**
Subsurface, Dual Disposal Field across from Sewage Plant	113 meters (370 feet)	82 meters (270 feet)	9,266 sq meter (99,900 sq feet)	Mixed Live and Burned Lodgepole	**0.93 Hectares (2.29Acres)**
Power Line	1,768 meters (5,800 feet)	3 meters (10 feet)	5,388 sq meter (58,000 sq feet)	Disturbed Road Edge	**0.54 Hectares (1.33 Acres)**
Approximate Total					**3.43 Hectares (8.35 Acres)**

* Includes approximately 2,250 sq. ft where pipes cross under existing paved parking and roads. Does not include about 500 ft. of pipe at wastewater plant.

** Includes 3-meter (10-foot) clearing limits around fence lines.

Staging, Stockpiling, and Disposal Sites

Staging and stockpiling of construction equipment and materials would be located adjacent to the existing government area leach field mounds, on the service road that leads to employee housing and maintenance office at Norris. Additional equipment and materials would be staged and stockpiled near the adjacent power line utility corridor, located off the reservoir service road, near the proposed wastewater treatment plant. Both locations are removed from the flow of visitor traffic and would not be within view of the Grand Loop road system.

Waste material generated from the project would be disposed of at the Ice Lake pit. Other material generated by the project that would be adequate for future use in roadwork projects would be transported to the Norris hotmix plant.

Material Source

A material source may be necessary for this project depending on contractor's costs. A batch plant may be allowed at one of the above sites or at the Norris hotmix plant site if disturbance can be limited to the existing site, and if operations do not disrupt normal park operations. The excavated material from ditch construction or treatment plant building sites may be crushed on-site and incorporated into the project. The contract would allow for this material to be used or material may be imported from approved weed-free sources outside of the park.

Contractor Housing

No additional houses or offices would be specifically built for this project. Some contractor employee housing and offices could be provided within the park in existing park housing/administrative areas. A contractor camp for multiple construction projects is being constructed at Canyon in the summer of 2002, but would not be available for this project's use. Crews may find housing in Gardiner or West Yellowstone, or within Yellowstone at existing sites, such as Lake and Grant, to be determined by park staff.

Scheduling of Work Activities

Award of a contract is expected in late 2002 for both the water treatment system and the wastewater plants. The existing water and sewer systems would remain operational during construction. The new water plant would use the existing clearwell and pump station. Once the new treatment plant is on-line, the wells would be abandoned. The new wastewater system would be separate from the existing sewer system. The last activity to be accomplished under the construction process would be to swap the service connections from the old sewer lines to the new system. The entire project would take three seasons of work to accomplish, from 2003 through 2005.

Construction would be expected to occur primarily between 7:00 a.m. and 7:00 p.m. Work may be conducted outside these times with contracting officer approval.

Grizzly bears are known to frequent the project area. Use is primarily dependent on the availability of winter-killed carcasses and elk calves in the spring. Because there is no way of

knowing when, if, or where this activity would occur, it would be treated on a case-by-case basis. Limitations on contractor activities would be implemented as necessary.

Permitting

Prior to construction, the project would be required to obtain a "Permit to Construct" from Wyoming DEQ. An application for the permit, pre-design report, and construction documents would be submitted to Wyoming DEQ for review and approval. The administrator would review the application within 60 days, and issue a permit contingent upon successful review for compliance with Wyoming DEQ's design standards for public water supplies.

Treated effluent would be discharged to the waters of the State of Wyoming through a subsurface discharge. The state waters within the borders of Yellowstone National Park are classified as Class 1. Per current Wyoming Department of Environmental Quality (DEQ) Regulation Chapter 1, Section 7.a, no new surface discharges, other than dams, would be permitted to discharge into Class 1 surface water. A subsurface discharge could be allowed contingent upon proper permitting under Wyoming's Underground Injection Control (UIC) Program.

The subsurface discharge would be classified "5E4", and would be in the form of a subsurface fluid distribution system. The effluent would require filtration and disinfection prior to discharge. Additional requirements include submission and approval by Wyoming DEQ of an operational and maintenance manual. The point of compliance would be down gradient of the subsurface discharge and up gradient of the raw water intake.

Permit application information is listed in Wyoming DEQ Regulation Chapter 16, Water Quality Rules, Section 6. In addition to engineering information to demonstrate design compliance with the Wyoming DEQ Regulation Chapter 11, Water Quality Regulations, a background water quality report is required. Some water quality data are available from previous sampling and engineering reports.

A permit is required prior to starting construction. The permitting process requires a minimum of 60 days. The permit application is submitted to Wyoming DEQ. Upon determination of a complete permit submission, DEQ issues a draft permit. DEQ posts public notification of the draft permit and allows at least 30 days for public comment. The DEQ director renders a final decision on the draft permit within 30 days after the completion of the comment period.

The contractor would be required to apply for a 404 permit from the U. S. Army Corps of Engineers and a 401 certification, for temporary turbidity increase, from the Wyoming DEQ.

Mitigation of the Proposed Action

Measures to mitigate the adverse environmental and cultural resource impacts of this alternative have been incorporated into the project design. These measures are intended to avoid, minimize, or rectify impacts as described in 40 CFR 1508.20. Mitigation measures are analyzed as part of the proposed alternative. These actions have been developed to reduce or eliminate both the immediate (construction phase) and extended (use phase) adverse effects of the proposed action.

Construction Stipulations

Construction zones would be identified with construction tape, silt fencing, snow fencing, or some similar and appropriate 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 specifications and workers would be instructed to avoid conducting activities beyond the construction zone as defined by the construction zone fencing.

Construction of new ditch lines that would require disruption of portions of the parking area at the Norris Geyser Basin would occur in the evening hours.

Silt fencing would be inspected weekly or after every major storm. Accumulated sediments would be removed when the fabric is estimated to be 75 percent full. Silt removal and disposal would be accomplished in such a way as to avoid introduction of silt into any wetlands or flowing water bodies. Silt would be disposed of in approved areas.

Although soil side-cast during construction would be susceptible to some erosion, such erosion would be minimized by placing silt fencing around the excavated soil and covering it with tarps. Excavated soil may be used in the construction project; excess soil would be stored in approved areas.

All trenching operations would follow park recommendations. These recommendations would minimize disturbance to soils and vegetation due to construction activities. Should any trenching, excavation, or construction activity encounter any archeological artifacts or bones, work would stop immediately. Contractors would consult with the park's cultural resource specialists before proceeding. Inadvertent discovery procedures would be followed, and if necessary, park staff would consult with the Wyoming SHPO and/or Native American tribes before proceeding.

Areas for construction vehicles and equipment storage and turnarounds in the park would take advantage of previously disturbed areas.

Any use of or association with hazardous materials would require contractor compliance with applicable federal, state, and local laws, codes, ordinances, and regulations. In addition, the *Yellowstone National Park Hazardous Materials Response Plan* (NPS 1993a) would be followed to mitigate potential hazardous material incidents within the park boundary and similar incidents outside the boundary requiring mutual aid.

A stormwater pollution prevention plan would be prepared and incorporated into design and specifications to control sediment on site, so that it would not enter nearby streams and creeks.

The contractor would develop a pollution prevention plan with the Wyoming Department of Environmental Quality under the National Pollution Discharge and Elimination System (NPDES) Stormwater Management Program.

Equipment would not be serviced or refueled near streams; parking and staging areas would be at least 46 meters (150 feet) from streams or riparian areas. Fuel would be stored in fuel trucks or aboveground storage tanks, and all fuel storage would be in staging areas.

Water for construction and dust abatement would be pumped from surface waters at the Gibbon River. Water trucks and equipment used for water pumping would be cleaned according to Yellowstone National Park standards for preventing the spread of whirling disease and mud snails.

A mitigation program designed to minimize fugitive dust from construction activities would be implemented. No chemicals would be used in dust abatement. Dust abatement would include watering of disturbed areas. Vehicle traffic would be managed within the construction zone, and contractor hauling of materials, supplies, and equipment would be controlled.

Reclamation/Revegetation

Reclamation and revegetation following established guidelines set in Appendix B *Vegetation Management for Construction in Yellowstone National Park* would be funded and implemented as part of this proposed project. The park policy is to conserve topsoil and salvage vegetation for reclamation of disturbed areas. About 0.20 hectares (0.48 acres) of abandoned leach fields would be revegetated along with about 211 square meters (2,273square feet) of wetlands.

Project Cost

Implementing this alternative including closing existing water wells, new water intake, water treatment plant, wastewater treatment plant, pump station, wastewater collection system, and required electrical updates would require approximately $5.65 million (2001 dollars).

The approximate annual operating cost of the proposed water and wastewater treatment plants is $75,000. This is based on an estimate from other plants in the park. The majority of the cost would be for the addition of one utility systems operator. Estimated costs include electrical power and chemicals.

Table 2 - Summary of Actions by Location Under the Proposed Alternative A

Norris Government Area- Employee Housing and Maintenance Area	Norris Campground	Norris Geyser Basin	Reservoir Road (Service Road) South of Norris to Canyon Road
Water- Existing water source (groundwater wells) abandoned. New water source, Gibbon River, water-intake installed. New water treatment building built. Up to 50 mature trees removed. Existing distribution lines used, but new connection lines from intake source to treatment building.	**Water**- Campground water system uses the new source, Gibbon River, for drinking water. Existing distribution lines used. No on-site disturbance in campground.	**Water**- The new source, Gibbon River, used for drinking water. Existing distribution lines used. No on-site disturbance near geyser basin for this portion of project.	**Water**- Existing water distribution lines buried adjacent to road would be used without modification. Existing water tank located 1 mile up this service road would be used without modifications.
Wastewater- New sewer lines installed. Waste piped to new treatment plant. Existing leach field closed & revegetated.	**Wastewater**- No changes to existing wastewater system. No on-site disturbance in campground.	**Wastewater**- New sewer lines installed. Previously closed comfort station reopened. Waste piped to new treatment plant. Existing leach field revegetated.	**Wastewater**- New wastewater treatment plant building, new subsurface disposal field, and new sewer collection lines installed.

Overview

The No Action alternative describes the action of continuing the present management operation and condition. It does not imply that water and wastewater systems would be removed or that current treatments would be discontinued. The No Action alternative provides a basis for comparing management direction and environmental consequences of the proposed action with a baseline. Should the No Action alternative be selected, the National Park Service would respond to future needs and conditions associated with the Norris water and wastewater systems without major actions or changes in course.

No modifications to water and wastewater systems at the Norris Junction area would occur. Existing use and maintenance of the wells, water treatment facilities, pumps, and water lines would continue. No trees or vegetation would be removed and no additional structures would be built. Frequent repairs would be expected to deteriorating pipes, sewage lines, lift stations, and pumps. There would probably be increased maintenance required to minimize the potential of catastrophic failures in the future. General routine maintenance and occasional modifications to maintain operations would occur with the existing systems.

There would be no year-round housing for employees at Norris. Additional employee housing would not be built, as there would be a lack of capacity for treatment of wastewater

ALTERNATIVE B: No Action

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Proposed Construction

No new construction is proposed.

Water System Operation

This No Action Alternative would not require any new designs to be implemented. The two existing groundwater wells would continue to provide water. Routine waterline maintenance would continue. The well water at Norris meets Primary Drinking Water Standards, but does not meet Secondary Drinking Water Standards. This means that the water is not harmful to drink, but tastes and smells terrible. As established by the EPA, secondary drinking water regulations are non-mandatory water quality standards. These standards were established as guidelines to assist public water systems in managing their drinking water for aesthetic considerations.

Drinking water would remain unavailable at the Norris Geyser Basin. The small office attached to the museum, with a shower, sink, and kitchen area would not have potable water because the chlorine residual cannot be maintained at levels of established standards using the current water treatment system. Campers and employees at the Norris Campground would continue to have drinking water provided, however it would be poor tasting with a detectable offensive odor. Residents of the Norris government area would also continue to use this water.

Wastewater System Operation

The flush toilet building located at the Norris Geyser Basin would remain closed. The vault toilets there would continue to require weekly pumping throughout the prime visitor use season. The small septic field serving the office at the Norris Geyser Basin Museum would continue to operate.

The Norris maintenance and employee housing area would continue to use the mounded leach field system. When this leach field fails, the NPS would be required to close the sewage system. This would prevent occupancy of the homes, as no restroom or shower facilities could operate.

Future proposals to provide showers or additional comfort stations at Norris Campground would also need to address a wastewater treatment plant or additional acres of leach fields.

Staging, Stockpiling, and Disposal Sites

None would be required.

Scheduling of Work Activities

Ongoing activities that are required for daily operation of the drinking water system would continue. An employee at Norris required over an hour a day to accomplish sampling of chlorine residuals at four points in the system: two sample points in Norris Campground, one sample at the government housing area, and one sample from the water reservoir. Water line repairs would be frequent occurrences, as the corrosive properties of the water would continue to degrade pipes.

Mitigation of the Proposed Action

This No Action Alternative does not alter existing conditions. In general, there are no impacts that would require mitigation efforts beyond what occurs during routine maintenance or repair operations.

Construction Stipulations

None required for this alternative.

Reclamation/Revegetation

There would be no reclamation efforts specific to utility projects in this area. Revegetation would not be required due to lack of disturbance to existing conditions. Abandoned leach fields would not be reclaimed.

Project Cost

Approximate current annual cost to operate the water treatment facility is $10,000. The approximate annual cost for the wastewater system is $2,000.

Alternatives Considered But Dismissed From Further Analysis

Water System Source

Extensive groundwater exploration was conducted before locating the existing wells. It is unlikely that a high quantity and quality groundwater source would be located with further exploration.

Water Treatment Plant Location

Engineers evaluated then rejected an alternative location for the water treatment plant. A potential water treatment plant site was located at the south end of the government area. The site is on a bench at the same elevation as the service road leading to the employee housing and administrative area. Employee housing is located about 60 meters (197 feet) to the north of the site. The existing mounded leach field is adjacent to the site, but would be abandoned upon completion of this Norris Water and Wastewater project. Soils investigation, however, revealed concerns for liquefaction as a problem for building at that site. If this site had been selected, geotechnical recommendations included soil improvements or deep foundations for construction (Rothberg, Tamburini & Winsor, Inc. 2002).

Water Treatment Method

Engineers evaluated then rejected an alternative method of water treatment. Membrane filtration uses banks of hollow-fiber membranes to filter water. This process required high pumping energy. Membrane life is unknown due to lack of empirical data using this type of treatment, but is estimated to be five years. Chemical feed upsets could damage membranes to a point that would require replacement more often. Programmable Logic Controllers are required to operate membrane systems, adding complexity. The annual cost of operating membrane filtration units is higher than mixed media filtration units, due to higher power and equipment replacement costs.

Gas chlorine has the lowest capital cost, but poses a safety threat to the operators and surrounding visitor areas. Therefore, this was rejected as a treatment process (Rothberg, Tamburini & Winsor, Inc. 2002).

Wastewater Treatment Plant Site

A site off of the reservoir service road located near an existing power line right-of-way was investigated in a preliminarily search. Soil percolation tests were conducted. This site failed to pass the "perc-test." Further exploration led to Alternative A's proposed site for the wastewater treatment plant, which is several hundred feet away from the rejected area.

Another potential site was examined in the Norris government area. The soils were evaluated and consisted of loose sands to a depth of ±8.87 meters (± 23 feet), with groundwater at 2 meters (7 feet) below ground surface when the geotechnical investigation was conducted in August 2000. Construction of earthen basins at this location would require soil improvement. This site was not burned in the 1988 fires, and is covered with mature trees. Construction of a wastewater treatment plant would require clearing approximately 0.8 hectare (2 acres) of mature trees. Potential for

noise and odors that might be generated from the treatment plant may have intruded on employees and residents at the government area site.

Wastewater Treatment Alternatives

Treatment alternatives evaluated included rotating biological contactors (RBCs), membrane filtration, and extended aeration activated sludge. RBCs have a relatively low operations complexity, but are not able to produce nitrate levels consistently below 10 mg/L and have a higher life cycle cost than activated sludge processes. Membrane filtration can produce effluent that meets all design goals, but has the highest operations complexity, highest capital, and highest life-cycle cost of the three alternatives evaluated.

The activated sludge process has an acceptable operations complexity and is similar to other treatment plants operated within the park, has the lowest life cycle cost, and can meet the design treatment goals.

Reconstruction of the failed and failing mounded leach fields was not an acceptable option. The failed mounded leach field at the Norris Geyser Basin had been rebuilt several times in the past without success. Failures were due to obstructions in the filtration media caused by wastewater debris or the settling of the filtration media over time. Based on this experience, and the experience with the failing mounded leach field serving the government area, a decision was made that the design and capabilities of the mounded leach fields would not meet current and potential needs of the Norris Geyser Basin and government area. The designed shallow burial depth of sewage pipes near the mounds was also a questionable factor for year-round operation.

Staging, Stockpiling, and Disposal Sites

A capped dumpsite, no longer in use and located near the proposed site of the wastewater treatment plant, was proposed as an equipment staging area. However this location was rejected due to concerns that equipment tires and tracks might churn up or break through the layer of soil that sealed the dump-area closed.

Table 3 – Comparative Summary of Alternatives and Extent To Which Each Alternative Meets Management Objectives

Alternative A (Proposed)	Alternative B (No Action)
Construct new water and wastewater treatment facility in the Norris area.	No new construction would occur.
The new water treatment plant would provide good quality drinking water that meets EPA Primary and Secondary Water Standards to visitors, employees, and residents of the Norris area. The new plant would improve fire protection capabilities by increasing pumping capacity. The construction would also include the installation of an emergency generator to allow the water treatment facility to function during power outages.	The existing water treatment chlorination and pumping system would continue to operate. Poor tasting water that does not meet EPA Secondary Water Standards would continue to be distributed to visitors, employees, and residents of the Norris area. Pumping capabilities would not be able to keep up with fire demands. No service is available during power outages.
The proposed alternative would replace one failed septic/leach field system and one failing septic/leach field system with dependable wastewater treatment system. The public comfort station at the Norris Geyser Basin would reopen. An emergency generator to allow wastewater treatment operations to continue during power outages would be installed.	No new construction would occur. Failed leach field at the Norris Geyser Basin resulted in closure of public flush comfort station. It would remain closed. Existing vault toilets would continue to need frequent servicing due to the high amount of use. Potential exists for sewage lift station in government area to overflow during power outages.
The new utility lines would be protected from freezing so year-round use is possible. Design capabilities in the water and wastewater treatment systems would allow for possible future improvements in the Norris Campground and Norris government area.	Residents would be required to move to other locations when the wastewater system fails. Campers and residents would continue to bring drinking water from distance sources
Meets Management Objectives? Yes. The alternative provides for a utility system that meets full performance standards. Quality of the drinking water and treated wastewater would meet Federal and Wyoming State standards. Visitor experience would be improved over existing conditions. Improved resource protection would occur from a dependable wastewater treatment system. Year-round utility system would allow for the stationing of employees at Norris during winter months, providing an increased presence for visitor and resource protection, and visitor education. Options for future improvements would be available.	**Meets Management Objectives?** No. The visitor experience would continue to be degraded due to the lack of flush restrooms and poor tasting drinking water. Infrequent wastewater spills would continue to occur, contaminating soil and vegetation adjacent to the Gibbon River. Year-round operation of utilities would not be possible due to the potential of freezing utility lines. Continuous presence of staff during winter months would not be possible. Options for future improvements to the Norris Campground would be limited.

TABLE 4 – COMPARATIVE SUMMARY OF POTENTIAL IMPACTS OF ALTERNATIVES*

Impact Topic	Alternative A (Proposed)	Alternative B (No Action)
Geology, Soils, and Topography	About 3.43 hectares (8.35 acres) of disturbance to soil and meadow and forest vegetation would occur. About 54% of disturbance would be from trenching for pipe and electrical installations. Wastewater plant would be grading into hillside. Effects would be direct minor short-term long-term and adverse.	Potential impacts to soil and vegetation if leach field fails. Untreated sewage would cover soils and vegetation. Failed or failing leach fields (0.20 hectare or 0.48 acre) would not be reclaimed or revegetated. Direct minor short-term adverse impacts from spills.
Hydrothermal Resources	Some blasting would occur to install utility lines. Monitoring devices and soft blasting techniques to be used. Negligible direct short-term adverse impacts would occur.	Current utility operations have negligible direct or indirect adverse effects.
Vegetation	Meadow and forest vegetation would be disturbed. About 40-50 lodgepole pines would be removed for the water treatment plant. About 0.63 hectares (1.56 acres) of vegetation would be loss for the wastewater plant. Trenching would result in short-term loss of about 1.85 hectares (4.55 acres) of vegetation. Direct adverse effects would be minor and short-term to native, rare, and exotic vegetation.	Vegetation would be affected by inadvertent infrequent untreated wastewater spills. Failure of the current wastewater system would result in closure of the failing leach field serving the government area. Direct adverse effects would be minor and short-term.
Wetlands and Other Waters of the U.S.	About 2.5 sq. meters (26.9 sq. ft.) of wetlands permanently disturbed. Another approximately 211 sq. meters (2,273 sq. ft.) disturbed from trenching, but expected to re-establish. Direct adverse effects would be minor and short-term.	Possible inflow of untreated sewage if lift station and/or leach field fails. Otherwise no disturbance of wetlands would occur. Minor short-term direct adverse effects would occur due to the possibility of spills.
Air Quality	Negligible direct adverse effects would be short-term and limited to the duration of construction.	Negligible direct adverse effects would occur.
Wildlife	Some localized and short-term displacement of wildlife during construction activities would occur. Minor loss of about 0.63 hectares (1.56 acres) of habitat from construction of fenced wastewater treatment plant. Odors may present an attractant for wildlife. Minor short-term direct adverse effects would occur.	Failure of leach field would allow untreated sewage to run onto meadow and into the Gibbon River. May present an attractant for wildlife. Negligible direct adverse effects from properly functioning utility systems.
Fisheries and Aquatic Resources	Potential for short-term sediment increases, but would be mitigated with erosion control plan. Negligible short-term direct adverse effects.	Flow of untreated sewage into waterways may degrade quality of aquatic habitat. Negligible direct adverse effects.

TABLE 3 – COMPARATIVE SUMMARY OF POTENTIAL IMPACTS OF ALTERNATIVES (CONT)

Impact Topic	Alternative A (Proposed)	Alternative B (No Action)
Amphibians and Reptiles	Minor short-term direct adverse effects would occur to amphibians and reptiles from habitat loss and interruption of travel corridors.	Negligible direct adverse effects from current utility operations and maintenance.
Threatened and Endangered Species	This alternative would affect but not likely to adversely affect grizzly bears, gray wolves, lynx, or bald eagles due to possible short-term displacement and minor habitat loss.	Short-term displacement possible during routine maintenance operations and repairs. This alternative would not affect Threatened and Endangered Species.
Cultural Resources	No known archeological, ethnographic, or historic sites would be affected with the project. Cultural landscape experiences no effect from presence of new building, and no effect from trenching activities.	No known archeological, ethnographic, or historic sites would be affected.
Socioeconomic Resources	Short-term direct local and regional economic gains from construction activities. Regional economy benefits from improved quality of services in the park, which helps promote tourism. Direct and indirect effects would be beneficial and both short- and long-term.	Maintenance and repair costs and service inconveniences would continue to increase as system ages. Minor direct and indirect short- and long-term adverse effects would occur.
Visitor Use and Experience	In the short-term, some visitors and residents would be inconvenienced by construction activities, including noise, and delays. Improved visitor services and resource protection would occur with the proposed alternative. Minor direct short-term adverse effects with minor direct and indirect short- and long-term beneficial effects would occur.	Campers and residents would continue to drink poor tasting water or import water. Quality of visitor experience degraded. Year-round occupancy of residences not possible. Moderate direct and indirect long-term adverse effects would occur.

* For definitions of impact terms see pages 70-79.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969 (NEPA), which is guided by the Council on Environmental Quality (CEQ). The CEQ provides direction that "[the] environmentally preferable [alternative] is the alternative that will promote the national environmental policy as expressed in NEPA's Section 101:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings.
- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
- Preserve important historic, cultural, and natural aspects of our heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.
- Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.
- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Given the above criteria, Alternative A was determined to suitably fit the balance that is required to be met as the environmentally preferred alternative. Alternative A best preserves and enhances cultural and natural resources over the long-term. Replacing failing sewer systems and changing the source of drinking water to improve the quality and potability best meets the national environmental policy expressed in NEPA (Sec. 101(b) to fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.

Alternative B, the No Action Alternative, would not strike the balance between public safety and preservation and repair of features.

AFFECTED ENVIRONMENT

Regional Context

Yellowstone National Park encompasses about 890,312 hectares (2.2 million acres) primarily in northwestern Wyoming (96%) and extending into Montana (3%), and Idaho (1%). Larger than the states of Rhode Island and Delaware combined, approximately five percent of Yellowstone National Park is covered by water; fifteen percent by grasslands; and eighty percent is forested. The park ranges 102 kilometers (63 miles) north to south and 87 kilometers (54 miles) east to west. Yellowstone has a surfaced road system of about 531 kilometers (330 miles). Roads enter the park from the north, northeast, east, south, and west and connect to the historic Grand Loop Road, a figure-eight road system (see the Vicinity map page 12).

Yellowstone National Park is at the heart of the region known as the Greater Yellowstone Area. The area comprises almost 4,856,247 hectares (12 million acres) and is one of the last largely intact ecosystems in the world's temperate zone. In addition to Yellowstone, the area contains two other National Park System units — John D. Rockefeller, Jr., Memorial Parkway and Grand Teton National Park. Portions of seven national forests — Gallatin, Custer, Shoshone, Bridger-Teton, Targhee, Beaverhead-Deerlodge, and Caribou — are within the Greater Yellowstone Area, as are two national wildlife refuges, the National Elk Refuge and Red Rocks Lakes National Wildlife Refuge. Although federal lands make up the majority of the area, state and private lands are also included. The area extends across portions of 17 counties in three states. Yellowstone's size and the number of geopolitical entities at the federal, state, and local level combine to create a complex administrative environment within the Greater Yellowstone Area.

Norris Area Use and Character

Norris is located approximately 35 kilometers (22 miles) south of Mammoth Hot Springs. The Norris Geyser Basin is located to the west, off the Norris to Madison road. Facilities there include a museum, bookstore and comfort station. The Norris Campground is located to the north of the area, east of the Mammoth to Norris road and north of the Gibbon River. The Museum of the National Park Ranger is located at the entrance of the campground. The Norris Picnic Area is located on the Norris to Canyon road, east of the Gibbon River. The government area is centrally located on the northeast corner of the intersection. The geyser basin is a favorite destination for visitors throughout the year. The campground and picnic areas are currently open to visitors from May through September. The government area houses a maintenance crew, law enforcement and interpretive ranger staffs, and other support staff during May through September. No one lives at Norris year-round.

Background

In the early days of Yellowstone National Park, Norris Junction was not a primary visitor destination. However, because it is situated conveniently along the route south to Old Faithful and the route east to Canyon, it served as a perfect lunch site for travelers who had departed by stage from Canyon or Mammoth in the morning. In the 1890s, Larry's Lunch Station, named for the proprietor Lawrence Francis Mathews, was built here. In 1886, the Yellowstone Park Association opened the doors to the Norris Hotel. Despite several fires the hotel was in operation until 1916.

A soldier station was built at Norris Junction in 1886. The soldier station continued to be used as a ranger station until it was damaged by the 1959 earthquake (NPS 1992a). Since restoration in 1991 the soldier station now serves as the Museum of the National Park Ranger.

In the 1930s the Norris Visitor Center, now the Norris Geyser Basin Museum, and the accompanying employee quarters were constructed in a style that was to become synonymous with traditional park architecture. The small quarters attached to one end of the building provided for on-site protection of the fragile geyser basin as well as visitor access to a ranger. Additional facilities were built in the 1930s away from the geyser basin to accommodate the increasing staffing and maintenance demands for this area (NPS 1992a).

Present Day

The Norris Junction area today is, by Yellowstone-standards, a moderate-sized development and a primary destination. Five distinct sites located within less than a mile of the junction, comprise the Norris area's development. Two of these locations are not open to the public, but exist primarily to serve the area's infrastructure and administrative needs. These sites are secluded on "service roads" closed to public access.

Located at the Norris Geyser Basin is the Norris Geyser Basin Museum, a National Historic Landmark, with rustic-style architecture. There is a system of trails through the geyser basin totaling 5.6 kilometers (3.5 miles), some of which have boardwalks. A small office is located within one side of the museum. During the summer months the Yellowstone Association, a non-profit NPS cooperating association, sells interpretive materials from a bookstore located in the converted historic comfort station near the museum. Until about 20 years ago this geyser basin received only moderate use compared with that of the Upper Geyser Basin, Midway Geyser Basin, and Lower Geyser Basin near Old Faithful. Since that time visitor use has increased dramatically as more people have learned of Norris' Echinus and Steamboat geysers.

Norris Campground is a 116-site NPS-operated campground northeast of and across the road from the geyser basin. This campground is one of the most popular in the park, and often fills first, and almost every night, during the summer season. The Gibbon River flows through a large meadow on the edge of the campground. A wide variety of wildlife is often seen in the meadow. Campers and other visitors have the opportunity to view and photograph wildlife, and to fish in the river. Because of the topography many visitors believe the campground offers a more "secluded" camping experience. Also located in the campground area is the historic and rehabilitated Norris Soldier Station, which now houses the Museum of the National Park Ranger.

There is a small housing/administrative area, referred to as the "government area," south of the campground. The Gibbon River and a large meadow separate the housing/administrative area from the campground. The government area is located on a service road and screened by trees from public view. Currently several small homes and mobile homes provide housing for up to 12-14 staff members during the summer months. Employees who live within the Norris Junction area are affiliated with the NPS ranger and maintenance divisions. Most of these employees are temporary seasonal hires. There are usually three permanent employees living at Norris. None of the employee housing can be used in the winter months due to lack of viable water and sewer operations. Employees who must conduct work at Norris during the winter season must commute from Gardiner, Canyon, or Mammoth Hot Springs. Also located in this small compound are maintenance services based out of office and shop buildings, and a fueling station for government vehicles.

The Norris Picnic Area is east of the government area, but separated from it by a meadow and the Gibbon River. This is a day use area with vault toilets and no drinking water. Within a mile east of the Norris Junction, on the south side of the Norris to Canyon road, is a large maintenance storage area and batch plant where road patching and paving material is produced for park maintenance projects. The picnic area and maintenance areas are not involved in this proposal. A power substation is located about 1.6 kilometers (1 mile) east of the government area on the south side of the Norris to Canyon road, and would provide the source of power for the proposed facilities.

The reservoir service road, immediately south of the government area, provides access to the water tank reservoir, a power line corridor, and a telephone relay station.

There are no concessioner-operated facilities located at Norris, except for wood-dispensing machines in the campground, two vending machines selling water and soft drinks in the campground, as well as two vending machines in the geyser basin area. Sale of drinking water is especially successful.

Existing and Future Demands- Water and Wastewater

The engineering report *Norris Water and Wastewater Pre-Design* (Rothberg, Tamburini & Winsor, Inc. 2002) provided the following information:

The Norris area water system serves the geyser basin, campground, and government area. The existing dual well-chlorination/pump house water system is designed for 113,550 lpd (liters per day) or 30,000 gpd (gallons per day). The storage tank has a volume of 378,541 liters (100,000 gallons). Liquid chlorine in the form of sodium hypochlorite has been the method used for disinfection. Growing use at Norris would increase water demand.

Water storage is required to provide daily water demands and fire flow storage. Wastewater flows were estimated to nearly match water demands, excluding fire flows, due to the lack of irrigation, livestock watering, or typical consumptive use that might otherwise occur elsewhere. The current water and wastewater systems that serve the Norris area produce no "wastestream" materials that requires hauling out of the park for final disposal.

Government Area- This employee housing and maintenance area is centrally located on the northeast corner of the intersection at Norris Junction. The government area currently has eight single-family equivalents (SFEs) plumbed into the water and sewer system. Estimating current water and wastewater demands at 1,325 lpd/SFE (350 gpd/SFE) equates to 10,598 lpd (2,800 gpd). Water is supplied through a gravity distribution system. Wastewater is collected at a lift station at the north-end of the area and pumped to a mounded leach field rated at 9,463 lpd (2,500 gpd). The *Employee Housing Plan* (NPS 1992) identified a need for additional employee housing at Norris to accommodate additional NPS staff should visitor services be expanded. Planning documents estimated additional housing to be 8 SFEs. Adding water and sewer service to the Norris maintenance shop was included in the water and wastewater flow estimates. Future water/wastewater demands for the government area were estimated to be 21,764 lpd (5,750 gpd).

Geyser Basin- The Norris Geyser Basin comfort station, closed since 1995, is plumbed into the existing Norris area water system. A gravity-fed 15-centimeter (6-inch) diameter DIP (ductile iron pipe) distribution main branches off the government area water main and runs west along the Norris to Canyon road to the geyser basin. The comfort station sewer collection piping runs from

the parking lot comfort station to a septic/leach field site at the northeast end of the geyser basin parking area. In 1995 the leach field failed causing the closure of the comfort station. The comfort station has a total of eight toilets and four sinks. Traditional visitor use of the comfort station was high. The parking area is often full with passenger cars and tour buses. Vault toilets located in the parking area islands are available for visitor use. Future improvements could include the addition of another comfort station to accommodate needs.

Campground- The Norris Campground and Museum of the National Park Ranger are open during the primary summer visitor season of May through September each year. Facilities currently requiring water and wastewater service include an employee restroom at the campground ranger station and five comfort stations. Current water and wastewater demands are estimated at 189 lpd/campsite (50 gpd/campsite) for 116 campsites, or 21,953 lpd (5,800 gpd). The campground has two leach fields: one sized for a daily flow of 56,775 lpd (15,000 gpd) and a second sized for a daily flow of 7,570 lpd (2,000 gpd).

Campground improvements could include adding water and sewer hookups to the existing 116 sites, adding showers facilities to the existing five comfort stations, addition of two comfort stations without showers, one water filling station for RVs, one dump station, and dishwashing stations throughout the campground. Single campsite wastewater generation was estimated from Wyoming Department of Environmental Quality Chapter 11 to be 568 lpd (150 gpd). Single sites accommodate hard-sided camp trailers, which can have showers and kitchen sinks. Typical comfort stations with showers have six showers, six sinks, and ten toilets. Wastewater flow was estimated at steady shower use for six hours per day and intermittent toilet use for ten hours per day, for a total of 4,996 lpd (1,320 gpd) per comfort station (with shower) building. Wastewater for comfort stations without showers was estimated as intermittent use for ten hours per day, for a total of 1,136 lpd (300 gpd) per comfort station.

The NPS is not proposing, at this time, to add hookups or showers in the campground. However, for water and wastewater estimating purposes over the life of the plant, such facilities were assumed. Additional planning and compliance would be needed prior to implementation.

The design peak-day water demand for the Norris area was estimated with a 2.0 peaking factor to be 256,850 lpd (67,860 gpd). The following table lists estimated potential average flows for the Norris area. Wastewater flows were estimated to match water demand.

Table 5 - Norris Average Water Demand

Area	Quantity	Unit WWTR Flow, lpd/unit (gpd/unit)	Daily Wastewater Flow, lpd (gpd)	Daily Wastewater Flow, lpd (gpd)
Geyser Basin				
Existing Comfort Stations	1	5,829 (1,540)	5,829 (1,540)	
Future Comfort Stations	1	5,829 (1,540)	5,829 (1,540)	
Subtotal				11,658 (3,080)
Government Area				
Single Family Equivalents	8	1,325 (350)	10,598 (2,800)	
Future Single Family Equivalents	8	1,325 (350)	10,598 (2,800)	
Service to Exist Maintenance Shop	1	568 (150)	568 (150)	
Subtotal				21,764 (5,750)
Campground				
Service to Existing Camp Sites	116	568 (150)	6,586 (17,400)	
Ranger Station – existing employee rest room	1	189 (50)	189 (50)	
Ranger Museum –proposed employee rest room	1	189 (50)	189 (50)	
Existing Comfort Stations w/o shower	5	1,136 (300)	5,678 (1,500)	
Upgrade of existing comfort stations with showers	5	4,201 (1,110)	20,818 (5,500)	
Future Comfort Stations W/o shower	2	1,136 (300)	2,271 (600)	
Subtotal				95,004 (25,100)
Total Average Daily Flow				**128,425 (33,930)**

Source: modified (Rothberg, Tamburini and Windsor, Inc. 2002). Metric values added.

Fire Flow Requirements

The engineering report *Norris Water and Wastewater Pre-Design* (Rothberg, Tamburini & Winsor, Inc. 2002) supplied the following information.

Fire flow requirements were evaluated in the report *Norris Junction Domestic Water System* (Wright-McLaughlin 1978). Three areas were considered: structural fire fighting equipment and personnel capabilities; potential fire hazards and flow requirements for containment (defined as prevention of spread from structure to structure); and conventional municipal guidelines set forth in the Insurance Service Office (ISO) publication *Fire Suppression Rating Schedule* (Insurance Service Office 1995). As discussed in the reference report, a volunteer structural-fire brigade whose training is established by Yellowstone National Park protects the Norris area. Fire fighting personnel are available through the ranger staff at Norris and Canyon Village, 19 kilometers (12 miles) away.

The Norris water distribution system was designed with valves to limit inoperative sections due to repairs to 244 meters (800 feet). Fire hydrants were spaced to provide 14,864 square meters (160,000 square feet) coverage per hydrant. NPS minimum design flow is 1,893 lpm (500 gpm) for 2 hours. The reference report recommended the system provide the fire flow in addition to 40% of peak daily water demand. The storage requirement would be 22,710 liters (60,000 gallons) for fire flow and 128425 liters (33,930 gallons) for water demand. Existing storage at Norris is 378,500 liters (100,000 gallons), which meets minimum storage requirement.

Existing Water Treatment System

The existing water system for Norris pumps groundwater from a dual-well system located in a meadow adjacent to the Gibbon River, between the picnic area and government area.
The water is chlorinated and pumped to a storage reservoir tank located almost three kilometers (two miles) away on the reservoir service road. Water flows by gravity to the housing area, campground, and geyser basin. Although the water is potable, high levels of chloride, bicarbonates, and iron, a result of geothermal influences in the area, cause the water to have an unpleasant odor and a poor taste. Because the natural geothermal discharges often make it difficult to treat the water adequately, the water has occasionally failed to meet drinking water standards. The water system is not acceptable as it has a high potential for water contaminated by surface water. The small office with bath, attached to the Norris Geyser Basin Museum, has had its water posted as non-potable. This was due to the repeated failure to read detectable levels of chlorine residual from that water tap. The water is also limited in quantity and is highly corrosive, creating holes in the well piping after three years and necessitating replacement with more durable material. According to maintenance personnel, hot water heaters in the residences last five years or less, even though the heaters are flushed out twice a year. The mineral content also causes the taste and smell to be unacceptable. The employees who live there avoid drinking the water, as do most visitors to the Norris Campground.

The engineering report *Norris Water and Wastewater Pre-Design* (Rothberg, Tamburini & Winsor, Inc. 2002) provided the following information.

Historically, surface water from the Gibbon River was used for drinking water. A concrete foundation of a pump station from the abandoned early 1900s water system can be found along the western edge of the Gibbon River, east of the government area and south of the existing well field.

By the mid-1900s, the raw water source was moved to Castle Creek, south of the government area and near the existing water storage tank. The Castle Creek intake provided a gravity-fed system with an adequate quantity of raw water, but the water was highly mineralized and perceived to be of poor quality. In the early 1970s the Safe Water Drinking Act required surface water to be filtered, but allowed groundwater to be used without filtration. The Norris area drinking water source was changed to the present-day system of groundwater using the two wells adjacent to the Gibbon River.

Sections of the water transmission line are 15-centimeter (6-inch) diameter DIP (ductile iron pipe), installed during the 1980 water system improvements. An approximate 1,158-meter (3,800-foot) section, starting at the Norris to Canyon road and running south to the location of the demolished steel water tank (south of the 50kW power transmission line) is older 15-centimeter (6-inch) CIP (cast iron pipe).

The existing wells have limited capacity and are taxed when refilling the storage tank after routine distribution system maintenance. Any proposed increase in water demand at the Norris area would exceed the existing well capacity.

The Gibbon River surface water is a low turbidity, low alkalinity water. The water contains arsenic and fluoride concentrations below the EPA standards that establish maximum contaminant levels.

Existing Wastewater Treatment Facilities

Five separate sewage systems exist at Norris.

The system at the Norris Geyser Basin has failed and has been out of service since 1995 because sewage was running out of the mounds. This system replaced a system that failed in the 1980s. Vault toilets have been in place since 1995.

The septic tank at the historic Norris Geyser Basin Museum serves one non-public toilet for an attached office. The septic tank is oversized so that no problems have occurred. This was originally the system for a public bathroom. No pumps are used.

The government area's sewage disposal field has leaked on occasion. The housing area lies approximately 91 meters (300 feet) from the Gibbon River. A septic tank, lift station, and mounded leach field comprise the wastewater system for the housing/maintenance area. The existing collection system is buried shallow and slopes towards the north to a lift station. The lift station pumps through a force main to the mounded leach field located at the south end of the government area. The leachate percolates through granular soils and enters the groundwater approximately 183 meters (600 feet) up-slope of the existing drinking water wells. This field is at capacity and could totally fail at any time. It probably survives because it rests all winter and the flow is low. Emergency repairs to the mound system occur on a regular basis. Its design is similar to the failed system in the geyser basin area. The pump station has no backup power or alarms. During power outages or pump failure the sewage backs up to a tank and then overflows to a meadow by the Gibbon River. The system cannot operate in the winter.

The Norris Campground system consists of two septic tanks with serial distribution lines. There have not been problems with this system since it was retrofitted in the mid-1970s. This system is not considered for replacement under this proposal.

Natural Resources

Geology, Topography, and Soils

Yellowstone National Park is mainly a volcanic plateau varying in elevation from about 1,610 meters (5,300 feet) along the Yellowstone River in Montana to 3,460 meters (11,360 feet) at Eagle Peak along the eastern boundary of the park in Wyoming. Mountains surround the plateau except to the southwest, where the plateau descends to the lower Snake River plains of Idaho. The park encompasses mountains, canyons, and valleys cut by streams flowing from the Continental Divide.

Norris sits on the intersection of three major faults. The Norris-Mammoth Corridor is a fault that runs from Norris north through Mammoth to the Gardiner, Montana area. The Hebgen Lake fault runs from northwest of West Yellowstone, Montana, to Norris. This fault experienced a major earthquake in 1959 that measured 7.4 on the Richter scale (sources vary on the exact magnitude between 7.1 and 7.8). These two faults intersect with a third fault, a ring fracture that resulted from the Yellowstone Caldera of 600,000 years ago. These faults are the primary reason that the Norris Geyser Basin is so hot and dynamic. The 1994 Uniform Building Code categorized the Norris area as Seismic Zone 4. It is a zone of potentially major ground shaking ability.

The Ragged Hills that lie between Back Basin and One Hundred Springs Plain are thermally altered glacial moraines. As glaciers receded, the underlying thermal features began to express themselves once again, melting remnants of ice and causing masses of debris to be dumped. Steam and hot water flowing through them then altered these debris piles.

The project area is part of the Central Plateau, which has rugged, rolling plateau terrain. Elevation is 2,300 meters (7,500 feet) near Norris Junction. Norris Junction lies outside the Yellowstone Caldera, the giant crater formed by a magma chamber collapse. Within the caldera, rhyolite flows are the predominant volcanic rock type, whereas rhyolitic welded ash is more prevalent away from the caldera rim.

The proposed site for the Norris wastewater treatment plant lies at the approximate boundary of the rhyolite flow and the rhyolitic welded ash flows. The Norris Geyser Basin and the proposed water treatment plant location are mapped as within rhyolitic welded ash flow.

The Gibbon River and the adjacent meadows is another major feature of the project area. Sedges and rushes dominate the meadow. It is somewhat influenced by the thermal waters that flow into the meadows at various locations.

A soil report (NPS 1992) was conducted at the Norris government area, where the water treatment plant is proposed for construction. There, the majority of the soils are formed from glacial till derived from rhyolitic tuff bedrock. However, some of the level areas are formed from alluvial deposits of sands and gravels. The average soil texture is loam at the surface with subsoil of sandy loam. There are some lenses of clay loam and very fine sandy loam textured soils. Gravels make up approximately 20 to 25 percent of the soil profile. The surface soil is 2.5 to 7.6 centimeters (1 to 3 inches) thick, and depth to bedrock is more than 1.5 meters (5 feet). Slopes in the area range from zero to eight percent. These soils are well drained. A portion of the area has soils that are higher in clay, lower in sand, and lower in gravels. This area has poorer drainage. Radon readings taken during 1989-1990 in surrounding residences ranged from 0.3 to 0.9 picocuries/liter. This suggests that the radon contamination potential in the area is low.

A soil report (NTL Engineering and Geoscience, Inc. 2000) conducted at the proposed site of wastewater treatment plant revealed that shallow welded ash bedrock was encountered, capped by loose to medium dense silty sand deposits. The welded ash was typically moderately to well cemented/welded. Auger refusal was generally encountered at shallow depths into the ash.

Hydrothermal Resources

Norris Geyser Basin is the oldest active geyser basin in the park. It contains the world's tallest geyser, Steamboat Geyser, with eruptions over 91 meters (300 feet) in height. It is also the hottest geyser basin in the park at 237° C (459° F), presumably because magma is closest to the surface here. Norris Geyser basin is also acidic, rather than alkaline, like in the other geyser basins (Harris et al. 1997).

More than 360 thermal water samples have been collected and analyzed at the Norris Geyser Basin (Fournier et al. 1994). The data show some of the temporal and spatial variability that exists in the hydrothermal fluids in the Norris area. Fournier et al. (1994) believed that the water compositions resulted from the underground mixing of neutral-chlorite and acid-sulfate waters reacting with bedrock after mixing.

Norris was also the site of an historic hydrothermal explosion. In September 1989 Porkchop Geyser exploded, scattering the overlying geyserite and flinging pieces 220 feet. This was after Porkchop had evolved from an intermittently flowing spring to a geyser, and then to a perpetually spouting geyser between 1960 and 1989 (Fournier et al. 1994). A hydrothermal explosion occurred in the Porcelain Basin in 1971 (Smith and Siegel, 2000).

Geysers do not have open underground chambers for accumulating water. The tube or vent at the surface leads down to a shallow plumbing system consisting of intricate conduits that connect small openings in the rock and lenses of porous sediment capable of storing water. Normally, several geysers in a geyser basin are supplied by interconnecting fracture system. Most of the world's geyser fields are in areas where rhyolite is abundant. Water from rain and snowfall percolates downward through cracks and fissures and becomes heated, rising to the surface again as a hot spring, geyser, mud pot, or steam vent.

Vegetation

The dominant vegetation of the Norris area is lodgepole pine forest. During the fires of 1988, the North Fork Fire traveled through the Norris area. The burn pattern that resulted created a mosaic of burned and unburned mature trees. The burnt areas are now dominated by young lodgepole pines, with typical forest understory species such as elk sedge (*Carex geyeri)* and Ross' sedge (*Carex rossii)* occurring between the saplings. Understory plants in unburned areas are similar to those in the burned areas, and include species such as elk sedge, grouse whortleberry (*Vaccinium scoparium)*, pussytoes (*Antennaria spp.)*, downy oatgrass (*Trisetum spicatum*), and Wheeler's bluegrass (*Poa nervosa)*.

The forest has a limited number of species in the understory near the Norris Geyser Basin. Thermal activity has contributed to the leaching of minerals out of the underlying rhyolite, leading to a natural depletion of plant nutrients. In some areas immediately adjacent to the thermal features the only vascular plants present are stunted lodgepole pines. Even though the major area of

geothermal activity is within the Norris Geyser Basin, there are low temperature warm springs and other geothermal phenomenon scattered throughout the area. Bisecting the forest is the Gibbon River corridor, with extensive meadows and wetlands. Due to variations in moisture, substrate, and background temperature there is great diversity in the vegetation in the area. Meadows are dominated by such species as tufted hairgrass (*Deschampsia caespitosa*) and sedges (*Carex spp.*) interspersed with areas of bulrushes (*Scirpus spp.)*, arrow-grass (*Triglochin spp.)*, and spike–rushes (*Eleocharis spp*.).

Exotic Vegetation

Nationwide, exotic plants are invading national parks and causing tremendous damage to park resources. Seeds and plant parts are brought into the parks by wildlife, wind, water, stock animals and humans. Fast-growing exotic plants encroach from populations established outside park boundaries. The most aggressive exotic plants are invasive and spread quickly into both disturbed and undisturbed areas within parks.

Exotic plants can cause irreparable damage to natural resources. The ecological balance of plants, animals, soil, and water achieved over many thousands of years is destroyed. As native plants are displaced, animal populations that rely on the plants for food or shelter also decline. Non-native plants may reduce or deplete water levels, or alter runoff patterns and increase soil erosion, thus diminishing both the land and water quality. Exotic plants that interbreed with native species can alter gene pools. The growth and spread of exotic vegetation can also change fire patterns and intensities, resulting in an altered ecosystem.

The National Park Service is required by law to keep the parks as unaltered by human activities as possible. The NPS has a strong and clear policy, NPS Guideline #77 (NPS 1991) on managing exotic species in the park. The NPS defines non-native species as any animal or plant species that occurs in a given location as a result of direct, indirect, deliberate, or accidental actions by humans.

More than 1,200 plant species have been recorded in Yellowstone; at least 190 of these are non-native. Most non-natives are found in disturbed areas such as developments and road corridors. The potential for proliferation of exotic plants is possible with any ground disturbance.

Established exotic plant infestations surveyed and controlled in the Norris area for the 2000 field season include bull thistle (*Cirsium vulgare*) 14,167 square meters (152,500 square feet), field bindweed (*Convolvulus arvensis*) 279 square meters (3,000 square feet), oxeye-daisy (*Leucanthemum vulgare*) 153 square meters (1,650 square feet), spotted knapweed (*Centaurea biebersteinil*) 152 square meters (1,636 square feet), Canada thistle (*Cirsium arvense*) 73 square meters (783 square feet), yellow sweet clover (*Melilotus officinalis*) 9 square meters (98 square feet), common toadflax (*Linaria vulgaris*) 2.7 square meters (29 square feet), and berteroa (*Berteroa incanna)*) 1.7 square meters (18 square feet).

Rare Plants

Plant species of special concern are those species that have been recognized by the state heritage programs as being rarely encountered within the state. Because Yellowstone National Park occurs within the boundaries of three states, Wyoming, Montana, and Idaho, all three state lists were

consulted, through the primary emphasis was on surveying for Wyoming plant species of special concern.

Two Wyoming species of special concern, Tweedy's rush (*Juncus tweedyi*) and warm springs spike-rush (*Eleocharis flavescens* var. *thermalis*) were known to occur in the vicinity of Norris prior to fieldwork associated with this project. Neither was located at the proposed water intake, new water line, water treatment plant, sewage line from the housing area, or sewage treatment facility and leach field.

Tweedy's rush (*Juncus tweedy)* was located along the old waterline cut just north of the proposed route of the sewage line from the Norris Geyser Basin parking lot, and also associated with thermal barrens just south of the current proposed route. The sewage line would miss both sites occupied by the rush as long as the location of the line does not change. If for some reason the proposed sewage line has to be relocated from the proposed route, and as a result passes through a population of the rush, mitigation would be possible by conserving top soil, gathering seed, and reseeding Tweedy's rush in the affected area.

There are no federally listed or candidate (Category I) plant species that occur in the park. However, there are two endemic plant species that occur only in Yellowstone Park, Ross' bentgrass (*Agrostis rossiae)*, which occurs in geothermal areas along the Firehole and in the Shoshone Geyser Basin, and Yellowstone sand verbena (*Abronia ammophila)*, which is restricted to sandy lakeshore around Yellowstone Lake. Neither species was found along the proposed project area.

Ute ladies'-tresses (*Spiranthes diluvialis)* is listed by the U. S. Fish and Wildlife Service as a threatened species. Even though Ute ladies'-tresses is known in Montana, Wyoming, and Idaho, it has not been located within the confines of Yellowstone National Park. The populations in the adjacent states are at lower elevations and somewhat different plant communities than are present within the park, making the occurrence of this species within Yellowstone unlikely. This wetland species was not located during surveys associated with road construction or the proposed water treatment and sewage facility in the vicinity of Norris.

The last rare plant survey was conducted on October 23, 2001. There was 5-10 centimeters (2-4 inches) of snow on the ground during the survey. Due to the poor conditions another survey was scheduled for summer of 2002. After the initial survey there were some minor changes in the alignment of the wastewater pipe from the Norris Geyser Basin to the wastewater plant, which directed impacts further away from a wetland. Until a conclusive survey can be completed, the above information cannot be considered conclusive for the presence or absence of rare plants for the proposed project. If rare plants were found in the project vicinity, project elements would be modified to avoid disturbance**.**

Wetlands and Other Waters of the United States

The project area includes the banks of the Gibbon River near the Norris employee residential and administrative area. From its headwaters at Grebe Lake and Ice Lake, the Gibbon River flows southwest through a combination of large meadows and forested streamside cover segments, many of which were burned in 1988. It contains three natural barriers that further separate the river into distinct reaches: the Gibbon Rapids, the Virginia Cascades 18.3 meters (60 feet) high and the Little Gibbon Falls 7.6 meters (25 feet) high.

The river is fed from a watershed located south of Ice Lake on Yellowstone National Park's Central Plateau. In its headwater reaches, the Gibbon River is a cold subalpine stream formed by natural precipitation. However, the river changes rapidly as it gathers thermal runoff, becoming warm enough to become highly productive year-around while receiving inputs of iron, sulfur and other chemical compounds contributed by the addition of the thermal water. The river receives a substantial amount of flow from adjacent hot springs and geysers, which typically increases alkalinity and ultimately bottom fauna productivity (Armitage 1958).

At Norris Junction the Gibbon River is relatively slow moving and meandering, and is classified as a "riverine, lower perennial, rock bottom" stream. Wetland classification nomenclature follows Cowardin et al. (1979). Aquatic vegetation covers less than five percent of the streambed. Species present include mare's tail (*Hippuris vulgaris*), cut-leaf water parsnip (*Berula erecta var. incisa*), milfoil (*Myriophyllum sp.*), starwort (*Callitriche sp.*) and pondweed (*Potamogeton sp.*).

Significant areas of sedge and hairgrass-dominated wetlands occur on both sides of the Gibbon River in the Norris Junction area. The proposed water intake/infiltration structure would be placed in a "palustrine emergent, seasonally flooded" wetland depression that appears to be part of an old river channel (Cowardin et al. 1979). Beaked sedge (*Carex utriculata)* occupies over 95 percent of the wetland. Baltic rush (*Juncus balticus*), fowl bluegrass (*Poa palustris*), three stamen rush (*Juncus ensifolius*), and ball-head groundsel (*Senecio sphaerocephalus*) make up the remaining five percent vegetative cover.

The proposed water line from the intake to the new water treatment plant would be buried in an abandoned roadbed that bisects the same wetland. The roadbed varies from being level with the surrounding ground near the Gibbon River to being elevated more than 0.9 meter (3 feet) above the wetland. Where the fill is no more than 0.3 meter (1 foot) above the surrounding wetland, on the southern end of the road nearest the river, wetland vegetation typical of slightly drier conditions has become established in scattered patches. Hairgrass (*Deschampsia caespitosa*) predominates the vegetated areas, with fowl bluegrass, baltic rush, and Kentucky bluegrass (*Poa pratensis*) present in small amounts. Approximately 50 percent of the roadbed is unvegetated. Lodgepole pine (*Pinus contorta*) has become established along the road berm in scattered clumps.

There are no wetlands in the proposed wastewater treatment facility area.

Air Quality

Air quality and visibility are generally excellent. Yellowstone is a mandatory Class 1 area where air quality degradation is unacceptable under the Clean Air Act of 1977. Acid precipitation is monitored at Tower, and ozone, sulfur oxides, and fine particulates are monitored at Lake. Carbon monoxide conditions are monitored at the West Entrance. There are seasonally high amounts of carbon monoxide at the West Entrance. Additional information on Yellowstone's air quality can be obtained from the National Park Service's Air Resources Division publication *Assessment of Air Quality and Air Pollutant Impacts in National Parks of the Rocky Mountains and Northern Great Plains* (Peterson and Sullivan 1998).

The National Park Service operates an asphalt batch plant near Norris Junction during the summer season. A smoke plume is visible from the area and is evident during periods of operation. The NPS operates this facility under a permit from the state of Wyoming.

Wildlife

A variety of large mammals are known to use the Norris area, including bison (*Bison bison*), elk (*Cervus elaphus*), moose (*Alces alces*), mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), grizzly bear (*Ursus arctos horribilis*), black bear (*Ursus americanus*), mountain lion (*Puma concolor*), wolves (*Canis lupus*), and coyotes *(Canis latrans*).

Elk, bison, mule deer, and moose make use of the Gibbon River valley. Use by deer and moose is less evident than that by the resident herds of elk and bison.

The interspersed bottomlands, wetlands or swales, and slopes along the Gibbon River provide bison and elk habitat. The thermal influence along the Gibbon River, particularly closer to Norris Geyser Basin, provides some amelioration of severe winter conditions for these wintering ungulates. These ungulates graze in the meadows and under the relatively sparse forest cover. The river also separates the road from higher elevation elk winter range, providing a natural barrier between traffic and wildlife use.

Bison eat mostly grasses and sedges along the riparian corridor of the Gibbon River. Calves are born in the wintering areas between about April 15 and May 31 of each year. As opposed to using traditional "calving grounds," bison seek relatively high ground with some forest cover to give birth.

Elk cows give birth slightly later in the spring than bison, in various places not associated with habitual calving grounds. Some elk calve along meadows and edge areas of the Gibbon Rivers, and in the meadow near Norris Junction. After calving the next most sensitive time of year for elk is during the rut in September and October. At this time bulls seek open meadows and areas of good visibility when procuring and defending harems.

Both bison and elk succumb to winter-kill. Most deaths occur in the winter, but they may take place well into the spring. Although winter-kill does not occur at a consistent rate from year to year, it provides a significant food source for scavengers, including coyotes, bald eagles, wolverines, and black and grizzly bears, in late winter and spring. After their emergence from winter dens, grizzly bears in Yellowstone use carrion and weakened ungulates, including calves, as a primary food source (Knight and Eberhardt, 1985). The reproductive success of female grizzlies is at least partly dependent on the availability of carrion on spring ranges (Mealey 1975; Picton 1978).

Thermal areas of the Norris Geyser Basin have a high ungulate use and habitat value as winter range. Areas where ungulates concentrate are protein-rich habitats that are used by grizzly bears and other predators or scavengers for food.

Black bears are dispersed throughout the park. Although there is some habitat overlap with grizzly bears, black bears are more likely to be found in forested cover than grizzly bears, which dominate the meadows. Black bears mainly eat grasses and sedges, but they would opportunistically feed on fish, insects, roots, and berries. They also scavenge. Historically, black bears have been involved in more bear and human conflicts than grizzlies. Since the park's concerted efforts to remove artificial foods began in the early 1970s, black bears have been seen less frequently along roadsides and in developed areas, and conflicts between black bears and humans have declined. Black bears are known to frequent and use the habitat adjacent to the proposed project area during the spring, summer, and fall seasons. Although black bears are not listed as a special status species, the park’s

Final Environmental Impact Statement for Grizzly Bear Management Program (NPS 1983) applies to both grizzly and black bears.

Grizzly bears and lynx are discussed in the "Threatened and Endangered Species" section below

Small and mid-sized mammals observed in the general Norris area, include bobcat (*Lynx rufus*), badger (*Taxidea taxus*), beaver (*Castor canadensis*), red fox (*Vulpes vulpes*), pine marten (*Martes americana*), porcupine (*Erethizon dorsatum*), river otter (*Lontra canadensis*), long-tail weasel (*Mustela frenata*), snowshoe hare *(Lepus americanus*), red squirrel, (*Tamiasciurus hudsonicus*), field mice (*Peromyscus maniculatus*), voles (*microtus pennsylvanicus*), and pocket gophers (*Thomomys talpoides*).

Red fox are rarely reported but may be present in the meadows near Norris Junction. Mountain lions are infrequently reported in Gibbon Meadows or Gibbon Canyon, approximately 4.8 kilometers (3 miles) from the project area. This area is generally summer range for mountain lions. Resident mountain lion activity is mostly limited to the northern range due to the snow depths in much of the park's interior. Smaller mammals such as weasels, pine marten, and red squirrels are common in the forests of central Yellowstone. Wolverines, which are very wide-ranging and rarely seen scavengers, have been reported more than once in the Elk Park-Gibbon Meadows areas, a few miles from this project area. This is likely due to the presence of ungulates and the potential for winter-kill, which are associated with these thermally influenced habitats. Riparian species such as river otter, muskrats, and mink are found along the Gibbon River. They use the river or nearby banks for denning and escape (NPS 1994a). Beaver are not generally associated with this river corridor.

Birds

A wide variety of birds can be found at Norris Junction, including Canada geese (*Branta canadensis*), ruffed grouse (*Bonasa umbellus*), sandhill cranes (*Grus canadensis*), great horned owls (*Bubo virginianus*), gray jays (*Perisoreus canadensis*), Clark's nutcrackers (*Nucifraga columbiana*), mountain bluebirds (*Sialia curricoides*), cliff swallows (*Hirundo pyrrhonota*), common ravens (*Corvus corax*), dark-eyed juncos *(Junco hyemalis*), hermit thrush (*Catharus guttatus*), robins (*Turdus migratorius*), ruby-crowned kinglet (*Regulus calendula*), killdeers (*Charadrius vociferus*) and red crossbill (*Loxia curvirostra*). Bald eagles (*Haliaeetus leucocephalus*) are discussed in the threatened and endangered species section below.

Data were primarily collected on bird species along the Norris to Madison road segment in 1994 (NPS 1994d). That survey area included portions applicable to the Norris Junction project proposals. Some bird species that are considered rare or sensitive may occur in the project vicinity. The black-backed woodpecker (*Picoides arcticus*) is primarily found in conifers, particularly spruce-fir forests or mixed lodgepole pine/spruce-fir forests. This bird is rarely observed in the Norris area because the habitat is almost exclusively lodgepole pine. It is a species of special concern in Park County, Wyoming. The three-toed woodpecker (*Picoides tridactylus*) is more frequently found near the road segment between Norris and Madison than the black-backed woodpecker. It is also a species of special concern in Park County, Wyoming. The habitat required by this species primarily includes coniferous forests, especially disturbed sites with dead or dying trees. Harlequin ducks (*Histrionicus histrionicus*) are typically found in fast-moving waters lined with boulders or cobbles. They have been found on occasion in the Gibbon River Canyon, primarily during the month of May. The trumpeter swan (*Cygnus buccinator*) is found in

areas of the Gibbon River, primarily from mid-October through February. There is no evidence of swans nesting along this section of river. Harlequin ducks and trumpeter swans are listed as species of special concern in Park County, Wyoming.

Amphibians and Reptiles

A survey of the Madison to Norris Campground segment of the Grand Loop Road was conducted in 1994 (Peterson et al. 1995). Based on historical records and the 1994 survey results, four species of amphibians, the blotched tiger salamander (*Ambystoma tigrinum melanostictum*), western (boreal) chorus frog (*Pseudacris maculata*), Columbia spotted frog (*Rana luteiventris*), and western (boreal) toad (*Bufo boreas boreas*), and three species of reptiles, the (northern) sagebrush lizard (*Scelopus graciosus graciosus*), rubber boa (*Charina bottae*), and western terrestrial (wandering) garter snake (*Thamnophis elegans vagrans*) were known to be in the Madison to Norris Campground segment of the Grand Loop Road. That survey combined with field surveys conducted of the proposed project on July 26 and July 29, 2002 and historical records produced the following information.

Blotched tiger salamanders (*Ambystoma tigrinum melanostictum*) are widespread and common in North America and in portions of Yellowstone National Park. They breed in ponds or lakes in sagebrush flats, meadows, or forests. Adults spend most of their time under the ground surface, in rodent burrows or burrows of their own excavation, which may be hundreds of feet from aquatic habitat (Koch and Peterson 1995).

Western (boreal) toads (*Bufo boreas boreas*) are widespread in North America, but declines in several parts of their range have been noted in the past ten years. Western boreal toads are a species of concern in Wyoming. They breed in lakes, permanent and ephemeral ponds, slow streams and river backwaters. In Yellowstone, high pH and high conductivity generally characterize breeding sites, and many breeding sites are geothermally influenced. They are a candidate species in the Southern Rocky Mountain distinct population segment, which does not include Yellowstone. Individual adult toads have been observed along the reservoir service road in the vicinity of the proposed wastewater plant (Miles personal communication, 2002). A survey of the wastewater plant site of and a possible breeding site, located about 0.4 mile south in a wetland, showed no breeding sites in the wetlands. The waters were measured as being quite acidic (Patla personal communication, 2002).

Columbia spotted frogs (*Rana luteiventris*) range from northwest Wyoming to southern Alaska. They are a species of concern in Wyoming. Throughout much of the Pacific Northwest the spotted frog population of the main portion of the species range, including Yellowstone National Park, appears to be doing well and is no longer considered a candidate under the Endangered Species Act. Spotted frogs breed in a variety of shallow-water habitats, including temporary pools, ponds, and lake edges. Adult and juvenile frogs forage in wet and moist meadows and along the edges of ponds, lakes, and streams. Columbia spotted frogs were observed in the wetland south of the proposed wastewater plant and in a cut-off meander near the proposed water intake structure during the recent survey.

Boreal chorus frogs (*Pseudacris maculata*) are widespread and common throughout much of North America, and are widespread and common-to-abundant in many parts of Yellowstone National Park. Chorus frogs breed in shallow bodies of water with emergent vegetation.

The northern sagebrush lizard (*Scelopus graciosus graciosus*) is the only lizard known to occur within Yellowstone National Park. There are recorded sightings in the Norris Geyser Basin area (Mueller 1967). This lizard is reported to be "associated with areas that are geothermally influenced and have rocky, subterranean crevices or logs on the ground" (Koch and Peterson 1995, p. 95). The microclimate of geothermal areas allows the northern sagebrush lizard to persist beyond their normal upper elevation range. These lizards are generally found on the periphery of geyser basins on rocky hillsides or at the forest edge where there is downed timber (Koch and Peterson 1995).

A single (previous) record documents the wandering garter snake (*Thamnophis elegans vagrans*). These are common-to-abundant throughout their range in western North American and they are the most widespread and common reptiles within Yellowstone National Park. One was observed north of Norris Junction during the 1994 survey. Wandering garter snakes are usually found in the vicinity of water, and communally hibernate, often in rocky areas with a southern aspect.

A single rubber boa (*Charina bottae*) was observed near Artist Paint Pots, south of Norris Junction, during the 1994 survey. Historical records show the possibility of a den near that location because of numerous sightings. They are a species of special concern in Wyoming.

Fisheries and Aquatic Resources

Fish, both native and introduced, are an important component of the park's animal life. When explorers first visited Yellowstone, many of the lakes, and most streams above major waterfalls or cascades, were devoid of fish. As a result of stocking for increased angling opportunities in early park years, the Yellowstone fishery is now comprised of 13 native and five introduced species, including the native west slope and Yellowstone cutthroat trout (*Oncorhyncus clarki lewisi*), long-nose dace (*Rhinichthys cataractae ocella*), arctic grayling (*Thymallus arcticus*), long-nose sucker (*Catostomus catostomus*), and the introduced brown (*Salmo trutta)*, brook (*Salvelinus fontinalis)*, and rainbow trout (*Onchorhynchus mykiss*). This mixture provides high-quality angling opportunities for visitors as well as food for birds, otters, grizzly bears, and other wildlife. The west slope and Yellowstone cutthroat trout is listed as a species of special concern in Park County, Wyoming.

Fishery surveys completed throughout the century have identified eight different fish species in the entire stretch of the Gibbon River. Historically the project area stretch of river did not contain any fish populations. Grayling were stocked back in the 1920s upstream from the project area. Fluvial arctic grayling are now listed as a species of special concern in Park County, Wyoming. Numerous angler reports of Arctic grayling catches indicate the presence of this native species, although it is not known if a reproducing population exists. In addition there were stocking of three non-native fish species. These activities resulted in the establishment of three non-native species of trout. They include brook trout, brown trout, and rainbow trout (Varley 1981). These last three species have become well established throughout the drainage and are currently managed as recreational fisheries.

The recreational fisheries value of the Gibbon River, defined as the amount of annual angler effort, is substantial as compared to other Yellowstone Park waters. In 1997 approximately 5 percent of the total angler effort in hours-spent fishing in the park occurred on the Gibbon River, with slightly less than 4,200 anglers fishing for the year. It ranked 6th as the most popular body of water fished out of approximately 73 streams and lakes fished in the park. An estimated 81 percent of anglers were satisfied with their fishing experience in 1997, and nearly 65 percent were satisfied with the numbers of fish captured.

Benthic productivity of the Gibbon River and aquatic insect ecology has been studied in several environments (Taylor et al. 1994, Vincent 1967). Because the river is affected by geothermal outputs the aquatic environments are highly diverse and change quickly as water temperature and chemistry vary. These aquatic environments become more complex toward the downstream reaches. Throughout the upper reaches the Gibbon River contains a diverse invertebrate fauna, represented by five different orders of insects (Vincent 1967). Thermal and chemical effluents entering the river are more favorable to certain taxa downstream, with an increase in the total number of organisms present. This geothermal effect creates optimal trout habitat where fish and invertebrates are buffered against extremely low temperatures and ice formations, while experiencing a longer growing season (Varley and Schullery 1983).

Threatened and Endangered Species

Grizzly Bears (USFWS threatened species, and species of special concern in Park County, Wyoming)

In 1983 the Interagency Grizzly Bear Committee (IGBC) was formed to ensure that the six ecosystems identified as grizzly bear recovery areas were managed in ways that would help grizzly bear recovery. The *Grizzly Bear Recovery Plan* (USFWS 1993) guides the recovery effort.

The greater Yellowstone grizzly bear population is the second largest of the recovery populations and is estimated to have a minimum of 280-610 bears (Eberhardt and Knight 1996). Grizzlies range over 2.2 million hectares (5.5 million acres) within the greater Yellowstone ecosystem; with nearly 40 percent of this range (0.9 million hectares or 2.2 million acres) within Yellowstone National Park. Yellowstone's bear management program is directed toward preserving and maintaining the grizzly bear population as part of the park's native fauna, while providing for visitor safety. Recovery and management of the grizzly bear is of the highest priority.

At times carcasses from road-killed animals are gathered and disposed of by rangers in remote areas of the Norris Junction area, in locations that are closed to public access. Bears are likely attracted to these sites when food is available. The proposed Norris wastewater treatment plant would be within several miles of these sites.

Grizzly bears in Yellowstone National Park are currently listed as a threatened species under terms of the Endangered Species Act. Grizzly bears are known to frequent and make use of habitat adjacent to the proposed project area during the spring, summer, and fall seasons. The most important grizzly bear foods in the Norris area include winter-killed elk and bison carcasses in spring, elk calves late spring and early summer, and roots during late summer and fall. Danforth and Gunther (NPS 1995) analyzed grizzly bear activity, bear habitat quality, cub production, bear-human conflicts, and bear management actions in the Norris area in comparison to all other developments in the park. The Norris area ranked below many other park developments in habitat quality, grizzly bear activity, and bear-human conflicts (NPS 1995).

Bear sighting reports for a three-mile radius centered at Norris Junction for the last two years, 2000 and 2001, shows that there were 32 grizzly bear sightings with 36 individuals seen, and 13 black bear sightings with 13 individuals seen during the summer months. During the winter months of November through March, 2 grizzly bear sightings were recorded of 2 grizzly bears, and 2 black

bear sightings were recorded of 2 black bears. These were based on both ground and aerial surveys/reports (Gunther personal communication, 2002).

Canada Lynx (USFWS threatened species, and species of special concern in Park County, Wyoming)

There are two Canada lynx (*Lynx canadensis*) sightings of unknown reliability found in historical (1887-1998) records from the greater Norris Junction area. The project area contains habitat suitable for lynx. However, two 6-kilometer (3.7-mile) snow-tracking surveys during the winters 2001 and 2002 found no sign of lynx. Failure to detect lynx during surveys does not necessarily establish with certainty that lynx are not present. Approximately 40 percent of the project area supports mature lodgepole pine with little potential to support Engelmann spruce or subalpine fir at climax. The remaining 60 percent burned in 1988 and is mature lodgepole with regenerating lodgepole saplings that extend above snow pack during winter. The sapling stands currently support some snowshoe hares, a major prey species for lynx. It is expected that increases in sapling densities over the next 5 to 15 years would further improve snowshoe hare habitat.

Evidence of lynx in Yellowstone National Park has come from two winter surveys conducted during the winters of 2000-2001 and 2001-2002. Probable tracks were found south of Hayden Valley, and on the east side of Yellowstone Lake. Possible tracks were found north of Old Faithful. DNA testing of hair found in a hair snare from the east side of the park tested positive as being derived from a lynx.

Bald Eagle (USFWS threatened species, and species of special concern in Park County, Wyoming)

Bald eagles are found on occasion in the Norris Junction area. Habitat types in the area are dominated by lodgepole pine that is too small to offer possible nesting sites (McEneaney personal communication, 2002). In 2001 there were 31 active eagle nests that successfully produced 15 eaglets in Yellowstone. Overall eagles are doing well in the park and surrounding areas.

Whooping Crane (USFWS endangered species, and species of special concern in Park County, Wyoming)

Whooping cranes (*Grus americana*) have been occasional summer residents of Yellowstone. At present there are no whooping crane populations in the park. The single individual from the Gray's Lake experiment currently resides west of the park in Montana, but was not seen during the summer of 2001. This crane is the last of the initial experiments to cross-foster whooping crane eggs under sandhill crane nests at Gray's Lake in Idaho. Whooping cranes were not found during field surveys (NPS 2000b).

Gray Wolf (USFWS threatened species, and species of special concern in Park County, Wyoming)

As of March 2002, 216 wolves comprised of 24 groups or packs inhabit the Greater Yellowstone Area. At this time 53 wolves were radio-collared within Yellowstone National Park; 94 wolves were collared in the Greater Yellowstone Area (includes the 53 in Yellowstone). Wolves travel widely and do not appear to be disturbed by human presence, except during denning. Wolf pups are generally born in late March to May.

Wolves in the Yellowstone area are designated as an experimental population, and therefore no areas are designated as critical habitat for 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 Greater Yellowstone Area has come from management removals (mostly related to livestock depredations), illegal kills (from poaching), and by collisions with vehicles. Within Yellowstone National Park, there has been no mortality of wolves due to either management removals or illegal kills. Nine wolves within the park have been killed in collisions with vehicles. Prey species for wolves are considered abundant in the park, with elk being the primary prey species.

In general, wolf sightings by visitors have been shown to have a high degree of unreliability. Aerial surveys completed weekly during the summer months and as often as weather permits during the winter have provided the most reliable data. The past two winters have not allowed consistent weekly flights. Aerial surveys during the last two years have shown that within a three-mile radius of Norris Junction there were 8 sightings of 73 individuals during the summer months, and 1 sighting of 22 individuals during the winter months of November through March (Gunther personal communication, 2002).

Candidate or Proposed Species

The Yellowstone cutthroat trout is a native fish species present in the Yellowstone River petitioned for listing under the Endangered Species Act (50 CFR Part 17). A status review conducted in 2000 determined that the species was not eligible for listing on either threatened or endangered species lists. National Park Service management goals mandate protection and restoration of native species.

Fluvial arctic grayling meet the criteria to be a candidate species to add to the list of threatened and endangered wildlife and plants. Based on historical information and angler reports there may be some remnant fluvial grayling in the project area.

Another candidate species, Yellow-billed cuckoo (*Coccyzus americanus*) has a range in some riparian areas west of the Continental Divide. However, the specific environmental conditions required for this bird species are not found in Yellowstone, and there have been no recorded sightings within the park.

Cultural Resources

Prehistory

Early humans have occupied and used the Greater Yellowstone area for more than 11,000 years and possibly as long as 13,000 years. The earliest archeological evidence of use of Yellowstone National Park dates back to almost 10,000 years before present. Small groups of Paleoindians are thought to have moved through the area hunting large game animals, and likely fishing, as evidenced by lakeside campsites. By about 7,500 years ago major environmental changes greatly altered the range and quantity of plant and animal species. Archaic groups adapted to these changing conditions by developing new lithic technologies and by hunting small game and increasing their use of gathered wild plants. From around 3000 BC to AD 1600, prehistoric groups such as McKean, Pelican Lake, and Avonlea cultures utilized the areas now within Yellowstone National Park and its resources leaving behind archeological traces of campsites, some with food processing areas, quarries and lithic workshop areas. Once again the climate changed. During the period known as the Little Ice Age (AD 1450 to AD 1850), archeological evidence indicates there was significantly less use of the area than the preceding 1,000 years. Yellowstone has material remains of cultures whose core areas were the Great Plains, the Great Basin, and the Intermountain Plateau.

History

A number of tribes are known to have used this area historically, including the Crow and Blackfeet, both of whom had early treaty interests in the greater Yellowstone River drainage area. Early Euroamerican explorers documented summer occupation of areas within the park by Shoshonean-speaking bands known as "Sheepeaters" and occasioned upon raiding bands of Blackfeet during the early and middle nineteenth century (Haines 1977). By 1840, the great bison herds west of the continental divide had been decimated and some native peoples began traveling through Yellowstone National Park and the surrounding area in search of the bison herds to the north and east. The Hayden survey party, undertaking the first mapping of Yellowstone National Park, found the Bannock and Shoshone traveling through Yellowstone on ancient trails. The Nez Perce, in their flight of 1877, also traveled through Yellowstone National Park on ancient trails. With the creation of reservations around 1868 the remaining Native Americans settled into the Wind River, Shoshone, Lemhi, and other reservations.

Today the tribes who are affiliated with Yellowstone National Park, and with whom consultation occurs on an annual basis, are (listed in alphabetical order): Assiniboine and Sioux Tribes of Ft. Peck; Blackfeet; Cheyenne River Sioux; Confederated Tribes of Salish & Kootenai; Couer d'Alene tribe; Crow; Crow Creek Sioux; Eastern Shoshone; Flandreau Santee Sioux; Gros Ventre & Assiniboine; Kiowa Tribe of Oklahoma; Lower Brule Sioux; Nez Perce of Lapwai, Nespelem, and Colville; Northern Arapaho; Northern Cheyenne; Oglala Sioux, Rosebud Sioux, Shoshone-Bannock; Sisseton-Wahpeton Sioux; Spirit Lake Sioux; Standing Rock Sioux; and Yankton Sioux.

Documentation of Cultural Resources

Previously recorded cultural resources are described in the *Cultural Resource Inventory for the Norris Water and Wastewater Project, Norris Junction, Yellowstone National Park* (NPS 2002). Eleven site inventories have been conducted around the Norris Junction Area.

Archeological Resources

Prehistoric lithic scatters (48YE756, 48YE758-60) were documented along the Norris utility and power corridor (NPS 2002). A prehistoric camp (48YE14) was discovered and documented in Norris Campground during the 1988 post-fire inventories (Johnson and Lippincott 1989). This site has been determined eligible for the National Register of Historic Places. Several other sites (48YE402-407) were documented along the Gibbon River (Taylor et al. 1964). Five large lithic scatters were inventoried in 2000 by Dr. Donald Blakeslee and archeology volunteers from the Wichita State University along the north bank of the Gibbon River.

Historic Resources

Historic resources around the Norris Junction area are primarily associated with the park's military history and include the Norris Soldier Station, now the Museum of the National Park Ranger, the Winter Keeper's Cabin, the Norris Employee Housing Area Messhouse/Quarters, bunkhouse/storage building, and barn. All of the previous buildings are eligible for the National Register of Historic Places. The Norris Geyser Museum historic district has two buildings that are listed as National Historic Landmarks, the museum and a separate restroom structure. The restroom structure currently houses the Yellowstone Association bookstore, and is a different structure than the 1980's restroom structure located in the parking area, which is proposed for reopening. A storage shed and two fire hose houses in the Norris Employee Housing Area have not been evaluated. An historic dump (48YE85) and the wood cutter's historic cabin complex (48YR757) have been found not eligible and not evaluated, respectively. A portion of the old Norris to Canyon Road was recently documented and submitted to the Wyoming State Historical Preservation Office, along with the wood cutter's historic cabin complex, with recommendations as not eligible for the National Register of Historic Places (NPS 2002). Concurrence was obtained.

Cultural Landscapes

According to the National Park Service's Cultural Resource Management Guideline (NPS 1997, p. 87), a cultural landscape is

> "…a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions."

Cultural landscapes provide a visual chronicle of an area's human history. The development could have occurred spontaneously, such as for a vernacular landscape, or formally, such as for an historic designed landscape.

The area of potential effect is mostly linear (due to the nature of utility trenching) with connections at two proposed new facilities. At the west-end of the project area is the restroom in the Mission 66 parking-lot addition at the Norris Geyser Basin Museum. From here, trenching would connect new wastewater lines with the proposed wastewater treatment plant. The trenching would travel in an easterly direction across the Grand Loop Road (Norris Junction to Madison Junction segment, 48YE520) just south of Norris Junction. The wastewater treatment plant would be located about

0.8 kilometers (0.5 mile) east of Norris Junction adjacent to a two-track road that travels south from the Norris to Canyon road. From this proposed facility the wastewater line trenching would extend north across the Grand Loop Road (Norris to Canyon segment, 48YE520), connecting into the employee housing and maintenance area. The water treatment facility is north of the employee housing area, within the vicinity of the former, pre-Mission 66 Norris Junction.

Within the area of potential affect is one identified cultural landscape, the Grand Loop Road. The road has been built as part of the designed, planned road system. Although the road's configuration has changed many times over the years, variations in road alignment adhere to the original purpose or function of the road. The Grand Loop Road is eligible for listing as a historic district. The Grand Loop Road connects the most important scenic features and wonders of Yellowstone National Park. Often the road alignment was altered because of geology, natural features, developments, or sensitive habitats. The road lies gently on the landscape, using architecturally pleasing features constructed of natural materials at a scale compatible with the natural environment. Undisturbed vegetation along the road offers a feeling of a natural setting.

The parking lot adjacent to the Norris Geyser Basin Museum, a National Historic Landmark (48 YE230) was built during the Mission 66 era and is within the area of potential affect of the proposed project. The parking lot, however, is not yet 50 years old and is not part of the existing historic district. It may be eligible for nomination in the future. The trenching associated with this project would have no effect to any potential character-defining features.

Ethnographic Resources

Ethnographic resources are the traditional park sites, structures, objects, landscapes, and natural resources that American Indian tribes and other traditionally associated peoples define as significant to their present way of life. Multiple tribes have identified hydrothermal basins, such as Norris Geyser Basin, as being significant. These areas were used ceremonially, medicinally, and for culinary purposes. Important historical events have occurred in association with them, involving cultural heroes. To date no ethnographic resources have been identified in the proposed project area.

Socioeconomic Environment

Yellowstone plays a prominent role in the social and economic life of the Greater Yellowstone Area. Gateway communities have developed outside the park's five entrances — Cody, Dubois, and Jackson in Wyoming, and Cooke City/Silver Gate, Gardiner, and West Yellowstone in Montana. The Montana gateway communities are on the immediate border of the park or within a few miles. The Wyoming gateway communities are an hour's drive or more from the park's boundary.

The gateway communities provide food, lodging, medical services, groceries, gasoline, other automotive supplies/services, gifts, souvenirs, and other goods and services to the public. The availability of services varies from community to community. Quantity and quality of services depend on the size of the community and the volume of traffic passing through. The gateway communities are relatively small. The link between tourism and all the gateway communities is evident. Remote areas the size of these local communities would not have the types and number of permanent and seasonal businesses if they were not located near Yellowstone National Park, and did not have access to the visitors the park attracts. The economic viability of the gateway

communities depends heavily on the recreation and tourism traffic that is generated by Yellowstone and other public recreation destinations.

The following are population figures for the neighboring gateway communities according to the 2000 census:

1) Cody, WY (pop 8,835);
2) Cooke City/Silver Gate, MT (pop140);
3) Dubois, WY (pop 962);
4) Gardiner, MT (pop 851);
5) Jackson, WY (pop 8,647); and
6) West Yellowstone, MT (pop 1,177).

Populations in these communities increase to provide visitor services during the summer and winter recreation seasons.

Throughout the Greater Yellowstone Area public lands provide the basis for much of the economic activity, such as recreation, mining, forestry, and agriculture that occurs in the region. During the last few years many communities in the area have experienced a structural change in their economies. The communities have become less dependent on extractive industries, such as mining and timber. These extractive industries have often fluctuated through extreme economic trends. Increased economic stability has been obtained by focusing efforts on tourism-related businesses.

The large volume of visits the park receives each year has resulted in Yellowstone National Park being the focus of much of the economic activity in the area. Within the park itself economic activity is concentrated at six locations along the road system: Fishing Bridge, Lake Village, and Bridge Bay; Canyon Village; Tower/Roosevelt; Mammoth Hot Springs; Old Faithful; and Grant Village. Norris is not considered one of these concentrated areas, with only minor concession vending services provided. A wide range of services including campgrounds, food, gas, lodging, transportation, horse and boat rentals, and medical services are provided by the private sector through concession contracts. The park's developed areas are established near popular scenic features of the park. These developed areas evolved because of the need for goods and services within the park by the visiting public, the administrative and operational needs of the park, and the distance and isolation from other goods and services.

Peak summer NPS employment (permanent and seasonal) averages approximately 750 persons (2000 figures). Most of these people and the majority of over 3,600 employees hired by concessioners during the summer season live in the park. Park staff and concessioner employees make up several small communities at the above park locations, and at six other smaller developments.

Visitor Use and Experience

Yellowstone's visitor use and economic activities are highly seasonal. June, July, and August are the months of highest use, with 50 percent of the park's visitation arriving in July and August. The shoulder-season months of May and September receive less use, but the volume is still heavy. Use in the winter months is relatively low, accounting for about six percent of the overall visitation. In the late 1980s and early 1990s winter use grew 10 to 15 percent annually, reaching more than 140,000 recreational visits in 1992-93. During the winter of 1996-97 visitor use dropped to approximately 113,000. The winter of 2000-2001 saw winter use back up to 139,000.

Studies done in 1989 and 1992 estimated that 74 to 81 percent of all park visitors came from outside the surrounding states of Idaho, Montana and Wyoming. The most recent data on international visitors, collected in 1989, showed that international visitors made up seven percent of all park visitors. Almost half of the international visitors were from Canada, with Germany contributing the second largest number. About half of the people coming through Yellowstone's entrances are repeat visitors (NPS 1990a).

In 2000 the park received in excess of 2.8 million recreational visits, and visitation during the past decade has ranged from 2.8 million to 3.14 million. The West Entrance accounted for approximately 37 percent, and the North Entrance provided access for approximately 19 percent of the total vehicles. The Northeast Entrance was the least used, providing for little more than one-twentieth of the total traffic entering the park. The remaining amount was split between the South and East Entrances, with the South Entrance receiving slightly more.

Norris Geyser Basin receives about 14,000 visitors on a typical summer day (1989 data). About 61 percent of all park visitors stop at the Norris area attractions. Two loop trails totaling 3.6 km (2.25 miles) leave from the Norris Geyser Basin Museum. They provide a safe route for viewing the Porcelain Basin and Back Basin. Porcelain Basin is open terrain with hundreds of densely packed geothermal features. In contrast, Back Basin is somewhat forested and its features are more scattered and isolated. Naturalists staff an information station at the entrance to the geyser basin, in addition to performing roving patrols and presenting scheduled guided walks.

There is a 116-site campground north of Norris Junction that is frequently full during most nights during the summer months. Park naturalists provide evening interpretive programs at the campground’s amphitheater. The Museum of the National Park Ranger is at the entrance to the campground and provides historic and present day information on the National Park Ranger through exhibits and audio-visual presentations. Volunteers throughout the summer season staff the museum.

ENVIRONMENTAL CONSEQUENCES

Methodology

The National Environmental Policy Act (NEPA) requires that environmental documents disclose the environmental effects or consequences of a proposed federal action and any adverse effects that cannot be avoided should the proposed action be implemented. In this instance, the proposed federal action involves replacing specified water and wastewater facilities around Norris Junction, as described in this document.

The intent of this section is to provide an analytical basis for comparison of the alternatives and the impacts that would result from implementation of these alternatives. Impact topics have been selected for the analysis based on the potential for effects on significant resources and other key issues identified during planning. This section is based on scientific and analytical review of information collected by the National Park Service and provided by other agencies. Expected impacts are described for each of the alternatives.

Regulatory guidelines for implementation of NEPA require an analysis of the cumulative effects of a proposed action as defined in 40 CFR 1508. These guidelines state that a cumulative effect is the effect on the environment that results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions.

- In addition to determining the environmental consequences of the preferred and other alternatives, National Park Service policy (Management Policies, 2001) requires analysis of potential effects to determine whether or not actions would impair park resources. A discussion on what constitutes impairment follows later in this chapter.

Impact Topics

Issues and concerns affecting the proposed project were identified by specialists in the National Park Service, as well as from the input of other federal, state, and local agencies. Impact topics are the resources of concern that could be affected by the range of alternatives. Specific impact topics were developed for discussion focus to ensure that alternatives were compared on the basis of the most relevant topics. The following impact topics were identified on the basis of federal laws, regulations, orders, and *National Park Service Management Policies* (NPS 2001a). A brief rationale for the selection of each impact topic is given below, as well as the rationale for dismissing specific topics from further consideration.

Geology, Soils, and Vegetation

The National Environmental Policy Act (1969) calls for an examination of the impacts on all components of affected ecosystems. National Park Service policy is to maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and ecological integrity of plants and animals (NPS 2001a). Therefore, geology, soils, and vegetation will be addressed as an impact topic.

Hydrothermal Resources

The National Environmental Policy Act (1969) calls for an examination of the impacts on all components of affected ecosystems. National Park Service policy is to maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and ecological integrity of plants and animals (NPS 2001a). Therefore, hydrothermal resources will be addressed as an impact topic.

Rare Plants

The Endangered Species Act (1973) requires an examination of impacts on all federally listed threatened or endangered species. National Park Service policy also requires examination of the impacts on federal candidate species, as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species. Therefore, threatened, endangered, candidate species and species of special concern will be addressed as an impact topic.

Wetlands and Other Waters of the United States

National Park Service policies require protection of water quality consistent with the Clean Water Act. Section 404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers to prohibit or regulate, through a permitting process, discharge of dredged or fill material into Waters of the United States. National Park Service *Director's Order (D.O.) 77-1, Wetlands Protection* and its accompanying *Procedural Manual #77-1* (NPS 1998), establishes policies, requirements, and standards for implementing Executive Order (E.O.) 11990 "Protection of Wetlands." Wyoming Department of Environmental Quality (DEQ) water quality rules require a 401 certification for temporary increases in turbidity in Class 1 waters.

The Storm Water Rule (40 CFR, Parts 122, 123, 124) requires an Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Notice of Intent to be submitted to the EPA, with a copy sent to the Wyoming DEQ, on construction activities, including clearing and grading, that occur on land in excess of five acres (less than five acres if construction occurs in 2003 or after) or if the proposed action is part of an overall common plan of development. An NPDES notice of intent would be submitted to both the EPA and the Wyoming DEQ, prior to any ground disturbing activities. When construction is complete, a notice of termination would be sent to the EPA and Wyoming DEQ.

In addition, the Environmental Protection Agency's NPDES process requires preparation of a Storm Water Pollution Prevention Plan. The plan would be the guiding tool for the prevention, minimization, and mitigation of soil erosion and water pollution during construction activities. Should the proposed action be implemented, the contractor would be responsible for developing a park-approved plan. The plan would be available for public and agency inspection at the construction site.

Air Quality

Section 118 of the 1963 Clean Air Act (42 U.S.C. 7401 et seq.) requires a park to meet all federal, state, and local air pollution standards. Yellowstone National Park is designated a Class 1 air quality area under the Clean Air Act, as amended. A Class 1 area is subject to the most stringent regulations of any designation. Class 1 areas must not exceed the maximum allowable increment over baseline concentrations of sulfur dioxide and particulate matter as specified in Section 163 of the Clean Air Act. Further, the Clean Air Act provides that the federal land manager has an affirmative responsibility to protect the park's air quality related values, including visibility, plants, animals, soils, water quality, cultural resources, and visitor health, from adverse pollution impacts. Thus, air quality will be addressed as an impact topic in this document.

Wildlife

The National Environmental Policy Act (1969) calls for an examination of the impacts on all components of affected ecosystems. National Park Service policy is to maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and ecological integrity of plants and animals (NPS 2001a). Therefore, wildlife will be addressed as an impact topic.

Fisheries and Aquatic Resources

The National Environmental Policy Act (1969) calls for an examination of the impacts on all components of affected ecosystems. National Park Service policy is to maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and ecological integrity of plants and animals (NPS 2001a). Therefore, fisheries and aquatic resources will be addressed as an impact topic.

Threatened and Endangered Species

The Endangered Species Act (1973) requires an examination of impacts on all federally listed threatened or endangered species. National Park Service policy also requires examination of the impacts on federal candidate species, as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species. Therefore, threatened, endangered and candidate species will be addressed as an impact topic.

Cultural Resources

The National Historic Preservation Act, as amended in 1992 (16 USC 470 et seq.), and the National Environmental Policy Act, as well as the National Park Service's Director's Order #28, *Cultural Resource Management Guideline* (NPS 1997), *Management Policies* (NPS 2001a), and Director's Order #12, *Conservation Planning, Environmental Impact Analysis and Decision-Making* (NPS 2001b), require the consideration of impacts on cultural

resources, especially those listed on or eligible for listing on the National Register of Historic Places.

Socioeconomic Environment

The National Environmental Policy Act (1969) calls for an examination of the impacts on all components of affected ecosystems. National Park Service policy is to maintain all the components and processes of naturally evolving park ecosystems, including creating and maintaining conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans. Therefore, socioeconomic issues will be addressed as an impact topic.

Visitor Use and Experience

The Organic Act (16 USC 1) directs the National Park Service to "conserve the scenery and the natural and historic objects and the 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." Visitor use and experience relates to the enjoyment of the park and is discussed as an impact topic.

Impact Topics Considered and Dismissed

Environmental Justice

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.

Presidential Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations", requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities.

The proposed action would not have disproportionate health or environmental effects on minorities or low-income populations or communities as defined in the Environmental Protection Agency's Draft Environmental Justice Guidance (July 1996). Therefore, environmental justice was dismissed as an impact topic.

Prime and Unique Agricultural Lands

The Norris Water and Wastewater project is within the boundaries of Yellowstone National Park. No land within Yellowstone National Park is classified as agricultural, and no unique agricultural values or prime farmlands are included in this project. Therefore, agricultural lands were dismissed as an impact topic.

Floodplain Management (Executive Order 11988)

Each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impacts of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

Before taking an action, each agency shall determine whether the proposed actions will occur in a floodplain— for major Federal actions significantly affecting the quality of the human environment, an evaluation is require to be prepared under Section 102 (2)(C) of the National Environmental Policy Act.

Actions "which are functionally dependent upon locations in proximity to water for which non-floodplain sites are never a practicable alternative" are excepted from compliance with Executive Order 11988, "Floodplain Management," under NPS final implementation procedures as outlined in Special Directive 93-4, *Floodplain Management Guideline*, July 1, 1993 (NPS 1993). Water intake facilities are specifically mentioned as examples of excepted actions. Therefore floodplains were dismissed as an impact topic.

Seismicity

Yellowstone National Park is prone to seismic events. Seismic activity (earthquakes) can occur at any time, and this region is known for earthquakes. All new facilities would be designed to current standards and codes to include the Uniform Building Code (UBC), ACI Building Code (ACI318), AISC Steel Construction Manual, and AITC Timber Construction Manual. New facilities would be designed for a seismic zone 4 to withstand maximum credible peak acceleration of 0.6-g. Therefore, seismic activity would probably have negligible effects to constructed structures.

Impact Thresholds

Terms used to define effects to each of the impact topics are provided in the following table:

Table 6 - Impact Threshold Definitions
Norris Area Water and Wastewater Treatment Project

	Impact Threshold Definition				
Impact Topic	Negligible	Minor	Moderate	Major	Duration
Geology, Soils, Topography	There would be no effect or if there were an effect the disturbance would be at the lowest levels of detection. Any effects from the action would be short-term. Area affected would be small.	Slight detectable effects would occur. The majority of the impacts would be short-term. Return to pre-disturbance state would occur to most of the disturbance. Area of permanent disturbance would be small.	Impact would be readily apparent. Long-term effects would occur to medium-sized tracts of land. Indirect effects would be apparent.	Impacts would be severe. Long-term effects would occur to large tracts of land. Effects would be out of character for the area. Significant indirect effects to other resources would result.	Short-term - Resource would return to pre-disturbance state in less than 5 years. Long-term – Effects that cause permanent changes in the resource. Resource would not return to pre-disturbance state or take more than 5 years to return to pre-disturbance state.
Hydrothermal Resources	No effect or barely detectable effects on hydrothermal resources from the action. Effects would be short-term with return to pre-disturbance conditions. Area of effect would be localized and small in scale.	Slight detectable effects to hydrothermal resources from the action. Effects would be short-term, localized, and small scale. Simple mitigation measures would be successful.	Readily apparent effects to hydrothermal resources on small scale with long-term effects, or large scale with short-term effects. Mitigation measures would be complex but would be successful.	Obvious effects to hydrothermal resources that are long-term large scale in nature. Mitigation measures complex with some probability of some degree of failure.	Short-term – Lasting for several hours to several days. Long-term – Lasting more than several days.

Table 6 - Impact Threshold Definitions (cont)
Norris Area Water and Wastewater Treatment Project

Impact Topic	Impact Threshold Definition				
	Negligible	Minor	Moderate	Major	Duration
Vegetation Native Plants Rare Plants	No native vegetation would be affected or some individual native plants would be affected by the action. There would be no effect on native plant populations. The effects would be short-term, on a small scale, and no species of special concern would be affected.	The action would affect some individual native plants and would also affect a relatively minor portion of that species' population. Mitigation measures for adverse effects would include special measures to avoid affecting species of special concern. These measures would be required and would be affective.	The action would affect some individual native plants and would also affect a sizeable segment of the species' population in the long-term and over a relatively large area. Mitigation measures for adverse effects would be extensive and successful. Some species of special concern would be affected.	The action would have a significant long-term effect on native plant populations, including species of special concern. A large area would be affected. Extensive mitigation measures would be required, with some possibility of some degree of failure.	Short-term – Vegetation recovers in less than 3 years. Long-term – Vegetation would take more than 3 years to recover.
Exotic Vegetation	There would be no increase or detectable increase in the occurrence of exotic plants as a result of the action. Any effects would be short-term and highly localized.	There would be a slight measurable increase in the occurrence of exotic plants from the action. The increase would be localized and short-term. Mitigation measures would be simple and successful.	The action would cause a readily detectable increase in the occurrence of exotic plants. The increase would be localized. Mitigation would be extensive and successful.	The action would cause an obvious increase in the occurrence of exotic plants. The increases would be localized with high potential for regional dispersal. Mitigation measures would be extensive and long-term with some probability of some degree of failure	Short-term – Exotic vegetation is removed within 5 years. Long-term – Exotic vegetation is removed in longer than 5 years.

Table 6 - Impact Threshold Definitions (cont)
Norris Area Water and Wastewater Treatment Project

Impact Topic	Impact Threshold Definition				
	Negligible	Minor	Moderate	Major	Duration
Wetlands and Other Waters of the United States.	No effect or effect that is at the lowest levels of detections to wetlands or other waters of the United States would occur from the action. Effects would be short-term with influence on a small scale. Class 1 water quality would not be affected.	Effects to wetlands and other waters of the United States would be slight, but detectable. Short-term effects would occur on a small to medium scale, with little or no long-term effects. Class 1 water quality would be affected by short-term minor increases in sedimentation due to construction activities in the river channel. Mitigation measures would be simple and successful in application.	Effects to wetlands and other waters of the United States would be readily apparent. Some long-term effects on small- to medium-sized areas would occur. Degrading of Class 1 water quality would occur. Mitigation measures would be extensive with good success.	Effects to wetlands and other waters of the United States would be apparent. Effects would be severe or exceptionally beneficial, and long-term. Long-term degrading of Class 1 water quality would occur. Mitigation measures would be extensive with some probability of some degree of failure.	Short-term – Wetlands recovers in less than 3 years. Long-term – Wetlands recovers in more than 3 years.

Table 6 - Impact Threshold Definitions
Norris Area Water and Wastewater Treatment Project

Impact Topic	Impact Threshold Definition				
	Negligible	Minor	Moderate	Major	Duration
Air Quality	No effect or effects that are barely at the level of detection would result to air quality. Any effects are short-term. No degrading of the Class 1 airshed would occur.	Slight short-term effects to air quality that could be detected. Class 1 airshed would not be degraded.	Readily apparent degrading of Class 1 airshed. Effects would be long-term and localized. Mitigation measures used would be successful in correcting impact.	Obvious degrading of Class 1 airshed. Effects would be long-term. Adverse effects range from localized to regional and are extensive such that mitigation measures have some probability of not being successful.	Short-term – Effects last for a total of several hours per day. Long-term – Effects last the entire day or occur for several consecutive days.
Wildlife	Wildlife would not be affected or the effects would be at or below the level of detection. Any effects would be short-term with changes so slight as to not be measurable. The consequences would not be perceptible to the wildlife species population.	Effects to wildlife would be detectable, but the effects would be localized and short-term. There would be little consequence to the species population. Mitigation of adverse effects would be simple and successful.	Effects to wildlife would be readily detectable, long-term, and localized. Consequences would occur at the population level. Mitigation measures would be extensive and likely successful.	Effects to wildlife would be obvious, long-term, and regional. Substantial consequences would occur at the population level. Mitigation measures would be extensive with some probability of some degree of failure	Short-term – Recovery within 1 year. Long-term – Recovery to take longer than 1 year.

Table 6 - Impact Threshold Definitions (cont)
Norris Area Water and Wastewater Treatment Project

Impact Topic	Impact Threshold Definition				
	Negligible	Minor	Moderate	Major	Duration
Birds	No effects or barely detectable effects on birds from the action. Effects are short-term and localized on a small scale. No short-or long-term effects occur to the habitat or individuals of birds.	Effects to birds from the action are slight and detectable. Effects are short-term and localized. Loss of perches, potential nesting sites, and burrows localized. Displacement localized with other potential habitat of equal quality in close proximity.	Apparent detectable effects on birds from the action. Effects are long-term small scale. Individuals and populations are displaced, as habitat is loss. Habitat quality was fair to good. Other potential habitats in close proximity with equal quality.	Readily detectable effects on birds from the action. Effects are long-term on large scale. Disruption of active nesting and adverse effects on individuals and populations would occur. Prime habitat is involved with lesser quality habitat serving as potential habitat in close proximity.	Short-term – Recovery less than 1 year. Long-term – Recovery takes more than 1 year.
Amphibians and Reptiles	No effects or barely detectable effects would occur from the action. Small scale short-term effects would occur.	Slight detectable short-term localized effects would occur from the action. Disruption of travel corridors, alteration and small loss of habitat would occur. There would be no loss of breeding habitat.	Apparent detectable short-term regional or long-term localized effects would occur from the action. Small permanent losses of breeding habitat or other prime habitat. Habitat of similar quality and in close proximity. Incidental losses of individuals possible, but local populations are kept intact. Mitigation measures would be successful.	Detectable long-term loss of breeding or other prime habitat whether small or large scale. Losses of populations or loss of habitat without potential habitat of similar quality and quantity within close proximity. Mitigation measures would have some probability and some degree of failure.	Short-term – Recovery less than 1 year. Long-term – Recovery takes more than 1 year.

Table 6 - Impact Threshold Definitions
Norris Area Water and Wastewater Treatment Project

	Impact Threshold Definition				
Impact Topic	Negligible	Minor	Moderate	Major	Duration
Fisheries and Aquatic Resources	Fisheries and aquatic resources would not be affected or the effects would be at or below the level of detection. Changes would be so slight that they would not be measurable or of perceptible consequence to fisheries and aquatic resources.	Effects to fisheries and aquatic resources would be detectable. Effects would be localized and short-term. There would be little consequence to individuals or populations. Mitigation measures would be simple and successful. Changes to habitat would be short-tem and localized.	Effects to fisheries would be readily detectable, localized and long-term, or larger scale for short-term. There would be consequences to populations. Mitigation measures would be extensive and likely successful.	Effects to fisheries would be obvious, long-term, and regional. Substantial consequences to populations would occur. Mitigation measures would be extensive with some probability of some degree of failure.	Short-term – Recovers in less than 1 year. Long-term – Recovers in more than 1 year.

Table 6 - Impact Threshold Definitions (cont)
Norris Area Water and Wastewater Treatment Project

	Impact Threshold Definition				
Impact Topic	Negligible	Minor	Moderate	Major	Duration
Threatened and Endangered Species Grizzly Bear Canada Lynx Whooping Crane Bald Eagle Gray Wolf Candidate Species	No federally listed species would be affected or the action would affect an individual of a listed species or its critical habitat, but the change would be so small that it would not be of any measurable or perceptible consequence to the protected individual or its population. Negligible effect would equate with "no effect" determination used by the U. S. Fish and Wildlife Service.	The action would affect an individual or individuals of a listed species or its critical habitat. The change would be small. Included would be temporary displacement during construction and/or loss of small amounts of non-critical marginal habitat. Minor affect would equate with a "may effect" determination by the U. S. Fish and Wildlife Service and may be accompanied by a statement of "likely…" or "not likely to adversely affect" the species.	An individual or population of a listed species, or its critical habitat would be noticeably affected by the action. The effect would have some long-term consequences to the individual, population, or habitat. Moderate effect would equate to the U. S. Fish and Wildlife Service determination of "may effect" and would be accompanied by a statement of "likely…" or "not likely to adversely affect" the species or habitat.	An individual or population of a listed species, or its critical habitat, would be noticeably affected with long-term, vital consequences to the individual, population, or habitat from the action. Major effect would equate to the determination of "may effect" by the U. S. Fish and Wildlife Service and accompanied by a statement of "likely…" or "not likely to adversely affect" the species or critical habitat.	Short-term – Recovery in less than 1 year. Long-term – Recovery in more than 1 year.

Table 6 - Impact Threshold Definitions
Norris Area Water and Wastewater Treatment Project

	Impact Threshold Definition				
Impact Topic	Negligible	Minor	Moderate	Major	Duration
Cultural Resources	The effect would be at the lowest levels of detection – barely measurable with no perceptible consequences to archeological or historic resources. Negligible effect would equate to Section 106 determination of no adverse effect.	The effect would occur to archeological site(s) with little or no potential to yield information important in prehistory or history. These archeological resources are generally ineligible to be listed in the National Register. The effect would not affect any character defining features of a National Register of Historic Places eligible or listed structure or building. Minor effect would equate to Section 106 determination of no adverse effect.	The effect would occur to archeological site(s) with the potential to yield information important in prehistory or history. The historic context of the affected site(s) would be local or state. The effect would alter a character defining feature(s) of the structure or building but would not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized. Moderate effect would equate to Section 106 determination of no adverse affect.	The effect would occur to archeological sites(s) with the potential to yield important information about human history or prehistory. The historic context of the affected site(s) would be national. The effect would alter character defining feature(s) of the structure or building, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed in the National Register. Major effect would equate to Section 106 determination of adverse affect. Exceptional beneficial effects are included in major effects.	

Table 6 - Impact Threshold Definitions
Norris Area Water and Wastewater Treatment Project

Impact Topic	Impact Threshold Definition				
	Negligible	Minor	Moderate	Major	Duration
Cultural Landscape	The effects would be at the lowest levels of detection to a cultural landscape. They would be barely perceptible and not measurable. Negligible effect would equate to Section 106 determination of no adverse effect.	The effects would not alter character defining feature(s) to a cultural landscape. The effects would be measurable. Minor effect would equate to Section 106 determination of no adverse effect.	The effects would alter character defining feature(s) to cultural landscapes, but would not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized. Moderate effect would equate to Section 106 determination of no adverse effect.	The effects would alter character defining feature(s) of a cultural landscape. The integrity of the resource would be affected to the extent that its National Register eligibility is jeopardized. Major effect would equate to Section 106 determination of adverse effect. Exceptional beneficial effects are included in major effects.	
Ethnographic Resource	The effects would be at the lowest levels of detection to an ethnographic resource. They would be barely perceptible and not measurable.	The effects would be perceptible and measurable. The importance and character defining elements of the ethnographic resource would not be altered.	The effects would be readily apparent. There would be alteration to the character defining elements of the ethnographic resource, but the importance of the ethnographic resource would not be altered.	The effects would be obvious. There would be alteration to the character defining elements of the ethnographic resource to the extent that the importance of the resource is effected.	

Table 5 - Impact Threshold Definitions (cont)
Norris Area Water and Wastewater Treatment Project

Impact Topic	Impact Threshold Definition				
	Negligible	Minor	Moderate	Major	Duration
Socioeconomic Environment	No effects would occur to the socioeconomic environment, or if effects occur they would be at the lowest level detectable. The effects would be slight and short-term. No long-term effects would occur.	Slight effects would occur that would be detectable and short-term to the socioeconomic environment. Any effects would be small and easily mitigated to resolve potential adverse effects.	Effects to the socioeconomic environment would be readily apparent and long-termed, but would only occur on a local scale. Mitigation would be extensive, but would likely resolve the impacts.	Severe adverse or exceptional beneficial effects would occur that would be long-termed and regional in influence. Mitigation measures would be extensive and may not resolve all impacts.	Short-term – Effects last 1 year or less. Long-term – Effects last longer than 1 year.
Visitor Use and Experience	There would be no effects on visitor use and/or experience, or if there are effects they are at the lowest levels of detection. Effects would be short-term. Visitors would not likely be aware of the effects.	Changes in visitor use and/or experience would be detectable, although short-term and slight. The visitor would be aware of the effects. Minor inconveniences would occur that would not significantly change visitor use patterns or degrade visitor experience	Changes in visitor use and/or experience would be readily apparent and likely long-term. The visitor would be aware of the changes and would likely express comments about the changes.	Changes in visitor use and/or experience would be apparent and have significant long-term consequences. Visitor use patterns and behaviors would be altered. Changes would illicit strong opinion from visitors.	Short-term – occurs during the duration of the action. Long-term – continues to occurs after the action is completed.

Impairment

In addition to determining the environmental consequences of the preferred and other alternatives, National Park Service policy Management Policies (NPS 2001a) requires analysis of potential effects to determine whether or not actions would impair park resources.

The fundamental purpose of the National Park System, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute an impairment. An impact would be more likely to constitute an impairment to the extent it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park.

Methods

Information was obtained from the preliminary engineering plans prepared by Rothberg, Tamburini & Winsor, Inc. Pubic scoping was conducted through press releases and letters of notification to interested individuals and organizations. Letters of notification were also sent to the Affiliated Tribes of Yellowstone National Park. Representatives of the Affiliated Tribes were also informed of the proposed project at the annual meeting. An interdisciplinary team composed of park and contract subject matter experts were requested to examine the proposed project area and identify associated resources and potential impacts from the implementation of the proposed project. Their findings were used in the analysis of impacts. Internal review was conducted with the subject matter experts. The subject matter experts are listed in the Consultation and Coordination section.

Cumulative Effects - Background

The Council on Environmental Quality (CEQ) regulations, which implement the National Environmental Policy Act, requires assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for both the no-action and proposed action alternative.

The analysis of the cumulative effects includes a discussion of current development plans within Yellowstone National Park and information about development plans for the lands surrounding the park within the Yellowstone ecosystem. Development plans in the immediate project area, central Yellowstone National Park, are primary factors in the analysis of cumulative impacts.

Although numerous construction and maintenance projects are planned for the Greater Yellowstone Area during the next 20+ years, the emphasis of these projects is to replace, repair, and rehabilitate existing facilities that are approaching the end of their useful service life. Where new facilities are needed, they would be concentrated in and adjacent to existing developed areas to minimize the creation of new, isolated developments. Although some commitment of previously undisturbed resources is inevitable, as are some adverse cumulative effects, many of the project efforts to be undertaken involve the removal of existing development and the revegetation of other human activity scars.

Several hectares of previously undisturbed land are currently identified for commitment in construction projects in the park. In addition, reclamation of past material, spoil sites, and road scarring may become possible through the Abandoned Mine Lands Program, a cooperative effort of the State of Wyoming and the National Park Service, and other restoration efforts (see "Beneficial Development Effects" below).

The time span of development projects is also critical. This analysis primarily covers the period 2002 through 2007 and beyond, as appropriate. The purpose of this discussion is to recognize the cumulative effects on resources, visitors, area residents, and staff of the Norris Water and Wastewater project in concert with the effects of other activities in the vicinity of the project, within the park, and on nearby lands.

Other Projects within the Park

Other actions would be occurring in the park during the course of this action, adding to the overall cumulative impact within the Yellowstone ecosystem.

The Canyon Visitor Center is scheduled for rehabilitation starting as early as 2004 and lasting at least two years. A contractor’s RV area at Canyon is currently under construction to more efficiently house contractor employees working on Federal Lands and Highway Programs and other projects. At Canyon Village, employee housing would be replaced as funds become available. Under the approved Canyon lodging plan some obsolete guest cabins have been replaced, and more would be replaced in the future.

In the Tower/Roosevelt area concessioner cabins have been upgraded and replaced in conjunction with rehabilitation of Roosevelt Lodge. Employee housing would be replaced pending funding.

The Finding of No Significant Impact (FONSI) for the *Yellowstone Employee Housing Plan* (NPS 1992), part of the service-wide housing initiative, was signed in December 1992. Construction of some housing units is proposed each year. In 11 developed areas, approximately 125 year-round and 347 seasonal housing units would be upgraded, replaced, or newly constructed if the plan was fully implemented. Current funding levels allow replacement or rehabilitation of a few housing units annually. Work at East Entrance was completed, and one four-plex unit built at West Entrance. Work began in Lake and in Tower in 1997 and was completed in 1998.

Current and future projects include the completion of a duplex and four-plex at Old Faithful in 2002, and an eight-plex scheduled to begin construction in 2002. Construction of a four-plex at Madison will also begin shortly. The Mammoth Housing Plan will be released in 2002. The concessioner is also upgrading employee housing at several developed areas. At Grant Village and at the South Entrance, housing to replace trailers may be constructed.

Development projects in the Mammoth Hot Springs area include continued housing rehabilitation, interior renovations of several buildings, and the on-going construction of a visitor restroom facility in 2002.

Implementation of the approved *Old Faithful Development Concept Plan* (NPS 1985) has resulted in the scheduling of new projects and the progress towards completion of other projects. Planning has been completed and construction started to replace the aging sewage treatment plant.

Construction of employee housing (two, four-plex units) to replace deteriorated quarters began in 2001 and would continue as funding becomes available. Planning is currently underway for the 3,716 square meter (40,000 square foot) facility to replace the current Old Faithful Visitor Center. If approved following the completion of an EA, the project is currently scheduled for construction in 2004. Upgrading of fire protection for the Old Faithful area is scheduled for 2003.

A number of development projects are planned that would have effects in more than one area of the park:

Construction of a Heritage and Research Center, on park land adjacent to Gardiner, Montana, is proposed to start in late 2002 or early 2003.

Upgrading or replacement of the wastewater system at Madison is scheduled for 2004.

To comply with the 1992 Leaking Underground Storage Tank Act (40 CFR 240, 281) many fuel oil tanks currently in use at residences throughout the park are being replaced after testing as a part of routine maintenance procedures.

Replacement of the West Entrance Station is scheduled for 2004.

Roadway Projects

The *Parkwide Road Improvement Plan* (NPS 1992a) outlines a 20-year program of road reconstruction throughout the park to bring Yellowstone's principle park road system up to current National Park Service standards. Under this action, both the positive and negative impacts on natural, cultural, and socioeconomic resources associated with the original development of all the park roadways would persist. Positive effects include access to the park, enjoyment of its features, and financial expenditures both in and outside the park. Negative effects include the disturbance of bedrock, soils, and vegetation; loss, degradation, and fragmentation of habitat; temporary disturbance and displacement of some wildlife during construction; possible loss of historic and prehistoric resources; and waste production. These projects can also influence which travel routes are open and available for accessing other projects occurring within the same timeframe.

Reconstruction of the East Entrance Road began in summer 1994 and is expected to continue through 2007. The Northeast Entrance Road was resurfaced in 1997 and that is expected to extend the life of the road until it can be reconstructed in 2019. Other future road projects include the Canyon Rim drives to be overlaid beginning in 2005. Reconstruction between Norris and Mammoth would start in 2007. Reconstruction of Mammoth to North Entrance is scheduled to start in 2011. A study would be completed prior to construction to determine if any changes in the location of this road would be needed. Start-up and completion dates for these projects are dependent on available funding.

The reconstruction of 12.4 kilometers (7.7 miles) of the Grand Loop Road between the Madison to Norris Junctions began in spring 2001 and would continue through the fall of 2009. Completion of the first phase is slated for 2003. The start of second phase is scheduled to begin in 2004.

The National Park Service proposes to resurface, restore, rehabilitate, and reconstruct the road and associated pullouts and parking areas, between Canyon Junction and Tower Junction, also known as the "Dunraven Road." This project is proposed to start in the fall of 2002 or spring of 2003 and continue through 2007, depending on funds. The proposal would be to reconstruct the entire 29.3 kilometers (18.4 miles) of road on the existing alignment to a 7.2-meter (24-foot) width. A number of pullouts would be formalized; others would be obliterated.

Yellowstone proposes to resurface the road and associated pullouts and some parking areas between Canyon Junction and Fishing Bridge Junction, also known as the "Hayden Valley Road". This project is proposed to start in the fall of 2002 or spring of 2003 and last three years, depending on funds.

The park is currently reclaiming 8.9 kilometers (5.5 miles) of an abandoned road known as the Turbid Lake Road. The Turbid Lake Road was part of Yellowstone National Park's East Entrance Road from 1902 until the road was reconstructed between 1928-1936. That reconstruction realigned a portion of the road to follow the shoreline of Yellowstone Lake. Reclamation work began in 1997 and will be completed in 2004. Prime grizzly bear habitat and wetlands is being restored.

Projects Outside the Park

A number of projects outside the borders of the park have cumulative effects on the Yellowstone ecosystem.

The Wyoming Highway Department is reconstructing 40 kilometers (24.9 miles) of U.S. Highway 14/20 (Cody Highway) between the East Entrance and the east boundary of Shoshone National Forest.

A Forest Highway project coordinated by the Federal Highway Administration and State of Montana would reconstruct portions of U.S. 212, the Beartooth Highway. An initial portion of the project would be from the Northeast Entrance gate to the Montana/Wyoming state line. The project award date was expected to be in 2002, but has been delayed. Work would extend over an anticipated three seasons. A minor amount of work would also occur inside the park boundary, between the boundary and the entrance gate that is located approximately 0.5 kilometers (0.3 miles) inside the park. An additional project on this road would occur on the Shoshone National Forest in the State of Wyoming between milepost 25.6 and milepost 44.0, and is proposed to begin in 2004.

Grand Teton National Park is currently proposing the reconstruction of approximately 16.9 kilometers (10.5 miles) of the North Park Road from the southern boundary with Yellowstone National Park south through the John D. Rockefeller Jr. Memorial Parkway to the Lizard Creek Campground in Grand Teton National Park. The proposed reconstruction would be done in two separate stages. The first stage would be approximately 4.5 kilometers (2.8 miles) in length from the southern boundary of Yellowstone National Park south to the Snake River picnic grounds. This stage would likely be reconstructed in fall 2002 or spring 2003. The second stage would be approximately 12.4 kilometers (7.7 miles) in length from the Snake River picnic grounds to the Lizard Creek Campground. This stage would likely be reconstructed during the summer-fall 2003 and spring 2004.

Oil and gas leases exist outside the park boundaries, but currently no wells are in production. The only known potential oil or gas exploration near Yellowstone is the proposed Ruby Exploratory oil/gas well on the Line Creek Plateau, south of Red Lodge, Montana, and 53 kilometers (32.9 miles) east of the park.

Beneficial Development Effects

A number of resource restoration and rehabilitation projects have been noted in the above discussions. These include restoration of abandoned quarries, roads, and gravel pits in several locations throughout the park. The park has obtained funds from the Abandoned Mine Lands Program (AML) to begin this work. Pertinent to this project, the Little Thumb and Dry Creeks pits and access roads were restored in 1997. Reclamation of the abandoned Turbid Lake road is underway. AML funds were used to reclaim the Natural Bridge Quarry pit and Lone Star Geyser pit. The Sedge Creek pit would be reclaimed when the Pelican Creek viaduct is constructed. AML funds provided for the reclamation design of the Sedge Creek pit. A segment of the Norris to Madison road would be realigned away from the riparian zone of the Gibbon River.

Power and telephone lines have been buried at Grant Village and from Mammoth to Roosevelt, and new telephone lines have been buried at many developed areas around the

park. Some buried lines have been replaced with microwave systems. Burying lines provides visual benefits because of the removal of overhead lines from scenic areas. Restoration of the utility corridors also becomes possible once the poles and wires are removed.

Conversion of 5 kilometers (3.1 miles) of the Fountain Freight Road and side roads to trails, combined with wetland mitigation projects, has reduced the effects of the Madison to Biscuit Basin road project, particularly on wildlife. The Fishing Bridge campground removal and other rehabilitation projects in the Fishing Bridge/Pelican Creek area are examples of projects that reduce the impacts of existing and proposed developments on grizzly bears. Similar projects would continue to restore areas that are no longer necessary for park management or intensive visitor use. All would certainly disturb nearby wildlife and other resources while they were being implemented, but their long-term goal would be to restore park resources such as wildlife habitat.

Alternative A (Proposed Action) - Replace Selected Drinking Water and Wastewater Facilities Serving the Norris Area.

Natural Resources

Geology, Soils, and Topography

A total of about 3.43 hectares (8.35 acres) of soil and vegetation would be impacted in this proposal. A total of about 1.58 hectares (3.89 acres) would be permanently disturbed by the construction of water and wastewater treatment buildings and the subsurface disposal field. The remaining 1.85 hectares (4.46 acres) would be temporarily disrupted from the installation of utility corridors. The proposed wastewater plant would be graded into a hillside, permanently changing the topography to the landscape.

Silt fencing would be used to protect meadows and wetlands. Snow fencing and construction tape would be used to restrict impacts to construction zones. Erosion would be minimized by the use of silt fencing and covering soil side-casts with tarps.

Conclusion

Direct impacts to the geology, or soils would be minor, short-term and adverse. Direct adverse impacts to the topography would be minor and long-term. Implementation of this proposed project would not impair the geology, topography, or soils.

Hydrothermal Resources

The use of non-explosive blasting agents would be incorporated into the construction techniques. Non-explosive blasting agents consist of using highly expansive chemicals placed in drill holes to fracture rocks. Use of pneumatic and mechanical means to excavate would be encouraged. Traditional blasting techniques, if used, would be subject to limitations, such as location of use and amount of vibration emitted. Geological engineers in consultation with the supervisory park geologist would establish restrictions. Seismic monitoring of blasting would be required and a blasting log maintained. This would minimize the intensity of human-caused seismic vibrations and create negligible effects on the geyser basin.

On-site monitoring of ditch line excavation, prior to re-filling with soil, would determine whether any unexpected changes to thermal activities occurred. A plan would be developed in coordination with the supervisory park geologist on procedures needed to stop unexpected influxes of thermal fluids or steam prior to beginning of excavation. Equipment and materials needed would be readily available. Work in the affected area would be stopped if the inflow of thermal fluid or steam is encountered, and until

mitigation measures can be completed. Priorities would be to protect the Norris Geyser Basin and to stop the influx of thermal fluids so that construction may continue.

Personnel from the National Park Service and the United States Geological Survey conduct monitoring of geothermal activity at the Norris Geyser Basin. Monitoring consists of observations of temperature, pH, water level, eruption time and eruption height of individual thermal features. The overall assessment of the Norris Geyser Basin is determined by measuring fluid discharge and temperature in Tantalus Creek. During construction monitoring would continue with anomalous changes reported to the supervisory park geologist. The supervisory park geologist would determine if the changes were the result of construction activities and what mitigation measures would be developed.

Excavations in the Norris parking area would likely encounter warm ground and minor amounts of thermal fluids. Because of the sensitivity of this area the supervisory park geologist, or his designee, would be available for consultation during construction.

Conclusion

Excavation and construction activities would occur in a direction away from the hydrothermal features at the Norris Geyser Basin, near an existing utility corridor. It is expected that direct impacts to hydrothermal resources would be adverse short-term and negligible. There would be no impairment of hydrothermal resources.

Vegetation

About 40-50 mature lodgepole pines would be removed for the construction of the water treatment plant and intake line, in addition to temporary disturbance of meadow and wetland vegetation for the intake line. There would be some minor permanent loss of wetland vegetation with the construction of the water intake structure.

Trenching for pipe and electrical service would result in temporary loss of vegetation. Permanent loss of vegetation would occur from the construction of the wastewater treatment plant and the subsurface disposal field. The wastewater plant would result in loss of about 0.63 hectares (1.56 acres) of vegetation. Vegetation would be permanently changed from forest to grassland at subsurface disposal field, amounting to approximately 0.93 hectares (2.29 acres). The water treatment plant building would impact about another 0.02 hectares (0.04 acres). Other structures, such as the lift station and generator building would result in a very small permanent loss of vegetation. Revegetation of abandoned leach fields would add approximately 0.20 hectares (0.48 acre) of native forest habitat. Total net permanent loss of vegetation (proposed permanent buildings and structures minus proposed revegetated leach fields) would be about 1.38 hectares (3.41 acres).

Conclusion

Direct adverse impact to vegetation would be minor and short-termed. There would be no impairment to native vegetation.

Exotic Plants

Exotic plant species are found within *Yellowstone* National Park and pose a threat to spread further, especially following ground disturbance from construction. Construction methods themselves may increase the spread. Specific efforts would be implemented to address the potential spread of exotic plant species into areas disturbed by construction. Several issues are addressed in Appendix B *Vegetation Management for Construction in Yellowstone National Park.*

Actions can be taken to reduce the risk of the spread of exotic plants associated with the development of water and wastewater facilities in the Norris area. Prevention would be emphasized with contract language that, if any fill material is imported into Yellowstone National Park for this project, it would be either inspected by park weed managers and determined to be weed free by park standards, or the fill material would be required to heated to 149°C (300°F) prior to entering the park. All ground disturbing equipment entering Yellowstone National Park associated with this project would be require to be pressured cleaned. The equipment would be inspected for transient soil and plant material at park entrance stations before entering the park.

In addition, park weed resource staff would thoroughly survey the area of proposed activity, identify, record, and then control exotic vegetation prior to ground-breaking activity. Control methods may include mechanical or chemical removal of plants. Park resource staff would then subsequently monitor the facilities, identify all exotic plants as they appear, record and control exotic plants on an annual basis. These mitigation measures should occur annually from the time of ground disturbance activity and continue for a period of 5 years after the completion of the facilities.

The proposed preferred alternative for the Norris water and waste facility plants would cause approximately 3.43 hectares (8.35 acres) of permanent and temporary ground disturbance. These disturbances can proliferate the spread of exotic weeds that already occur in this area, as well as potentially introduce new exotic plants in this area.

Conclusion

With proper precautions and follow-up monitoring and control negligible to minor direct adverse impacts would occur. No impairment would result from the spread of exotic plants from the implementation this alternative.

Rare Plants

A population of Tweedy's rush (*Juncus tweedyi)* is located near the proposed sewage pipe east of the Norris Geyser Basin. The proposed location for the sewage pipe would miss affecting any individual plants, or a small portion of the population. If the plans should change, conserving topsoil, gathering seeds, and reseeding Tweedy's rush in the affected area can minimize possible long-term impact.

Conclusion

There may be minor short-term direct adverse impact to Tweedy's rush. No impairment would occur to rare plants.

Wetlands and Other Waters of the United States

Approximately 65 square meters (0.007 hectares) or 700 square feet (0.016 acres) of palustrine emergent, seasonally flooded wetland would be disturbed for the intake structure. Approximately 149 square meters (0.014 hectares) or 1,600 square feet (0.04 acres) would be disturbed in the burial of the water line.

The wetland vegetation and soils would be salvaged prior to construction and then placed back on the site following the installation of the intake structure and water line. The approximately 1.8- meter (6-foot) diameter intake manhole would permanently displace approximately 2.5 square meters (26.9 square feet) of wetland. The remaining approximately 211 square meters (2,273 square feet) of wetland vegetation is expected to re-establish above the buried well screen sections and water line and the direct adverse impacts would be short-term and minor. Statement of Findings for Executive Order 11990 (Protection of Wetlands) can be found in Appendix D.

Conclusion

Minor short and long-term direct adverse impacts to wetlands would occur with the installation of the water intake/infiltration structure and the burial of the water line. Vegetation would be temporarily removed and then replaced after trenching is completed for the water line. This would result in short-term direct adverse impacts to wetland vegetation. Long-term impacts would result from the permanent removal of vegetation for the intake manhole.

The infiltration structure would not protrude into the Gibbon River; therefore no impacts to the river are anticipated. Construction of the intake structure under the river channel would result in temporary increases in sedimentation of the Gibbon River. This would result in direct minor short-term adverse effects to the waters. No wetlands or waters would be impacted by the installation of the wastewater treatment plant. No impairment to wetlands or waters of the United States would result from the proposed action.

Air Quality

Dispersed dust and mobile exhaust emissions would be caused by truck traffic and equipment activity. Dust and hydrocarbons would not be in sufficient quantities to degrade park air quality. All contractor activities would comply with state and federal air quality regulations, and contractors would operate under applicable permits.

Conclusion

There would be no significant short or long-term direct adverse impacts on air quality or visibility in the park or region; effects would be barely detectable, temporary, and limited to the duration of construction. These actions would not constitute impairment to air quality within the park and negligible direct adverse impacts.

Wildlife

Construction employees would be given instruction on safety in areas frequented by bison, elk, and other large mammals found in the area to avoid potential wildlife/human conflicts.

Conclusion

Minor short-term direct adverse impacts to these wildlife resources would occur as a result of implementing this proposal due to minor displacement during construction activities and a small amount of habitat loss. There would be localized long-term benefits in improved sanitation and reduction/isolation of attractive odors. No impairment would result to wildlife.

Birds

The proposed construction areas do not support current nesting sites for large and medium-sized birds, such as sandhill cranes, osprey, or trumpeter swans. Smaller-sized birds may have nesting or feeding activities interrupted by construction activities. Some short-term displacement would occur from human activities associated with construction activities. Removal of trees would eliminate a small number of potential perch and nesting sites, however habitat of equal quality exists in close proximity, and the affected area is small compared to the area of potential available habitat. Displaced bird species using the Norris area are expected to return once construction stops. The creation of a clearing in the forest canopy for the subsurface disposal field may be beneficial to some bird species.

Conclusion

This alternative would result in negligible short-term direct adverse impacts to birds within the Norris area and the park. No impairment would occur to birds as a result of this proposed action.

Amphibians and Reptiles

Construction activity would result in increased traffic and alteration of habitat and potential habitat to amphibians and reptiles. There were no breeding areas identified in the affected area. Over the course of several years individual Western boreal toads have been observed dead on the service road to the water reservoir. Vehicle traffic traveling the service road to access the microwave tower, the underground reservoir, or power line probably inadvertently ran over the toads. Increased traffic from construction activities may potentially cause the loss of more individuals, or simply displace them to other less traveled portions of the service road. It is unknown why Western boreal toads used the road. A change in the time of day vehicles use the service road may reduce toad mortality.

Loss of some habitat would occur from the construction of the wastewater treatment facility. Travel corridors may be disrupted, however, the fenced wastewater plant may not create a formidable barrier for travel to amphibians and reptiles.

Conclusion

There would not be an impairment to amphibian or reptile resources. Minor short-term direct adverse impacts may occur to amphibians and reptiles that inhabit areas proposed for disturbance. Temporary or permanent displacement may occur. Travel corridors may be interrupted, although there would be no barriers to prevent amphibians and reptiles from moving through the chain link fencing and through the wastewater plant.

Fisheries and Aquatic Resources

An exotic species of snail was discovered in Yellowstone in 1995, the New Zealand mud snail (*Potamopyrgus antipodarum*). Subsequent investigations by independent researchers have documented a rapid spread of this non-native and invasive species to the Firehole River, and as far as Gibbon Meadows. Although the mud snail has not been inventoried in the Norris stretch of the Gibbon River, where the proposed water intake would be located, techniques would be in place to prevent its spread. Due to the possible detrimental effects that this snail may have on the health and integrity of Yellowstone's rivers, biologists have expressed a concern over the spread of the exotic New Zealand mud snail from construction equipment and field boots. Prior to construction activities contract companies would be required to consult with the park's Aquatic Resources Center to obtain the most up to date information on removing the mud snail from equipment. Steam cleaning at temperatures greater then 50°C (120°F) appears to be effective in killing the exotic mud snail.

An erosion control plan would be in place for this project. This plan would specify actions and placement of sediment traps to prevent most sediment from reaching any water bodies within the project area. There would be short-term minor increases in sedimentation from the construction of the water intake structure. Measures would be in place to prevent

spread of exotic species or diseases to fisheries resources by the sanitation of water trucks and water intake equipment used for dust abatement. There would be no change to any rivers or creeks that would impede fish passage. The design of the intake structure would prevent fish from entering the intake system. According to the proposal's design engineer the pumping of water from the infiltration structure would not disturb the gravel bed of the river. The raw groundwater would be pumped at a rate of 197 liters per minute (52 gallons per minute). The ratio of raw water pumped versus the volume of water in the ground water system is very small and would not affect the river level.

Conclusion

Negligible short-term adverse direct impacts on fall spawning brown and brook trout may be expected for the duration of installation of the water intake structure. Negligible short-term direct adverse impacts may occur to fluvial Arctic grayling near the water intake during construction. Beneficial effects would occur from reducing the potential for water contamination from inadvertent wastewater spills. The proposed action would not create an impairment to fisheries and aquatic resources.

Threatened and Endangered Species

Grizzly Bears (USFWS threatened species, and species of special concern in Park County, Wyoming)

Grizzly bears require large areas containing a diversity of habitat types. The bears thrives best when its habitat is isolated from humans and their activities. Although grizzly bears can and do adapt to the presence of humans, they not adapted to intensive use and modification of habitat.

Indirect impacts include reduction of habitat effectiveness due to human-caused displacement of bears from high-quality habitat adjacent to road corridors, habituation, and other behavior modifications. Schleyer (1983) reported that grizzly bears generally avoided areas of human activity and reacted to disturbance by moving elsewhere. Schleyer (1983) also reported that following a disturbance by humans, bears moved a minimum of 3.2 kilometers (2 miles) before stopping and remaining in an area. Human-caused displacement of bears from habitat near recreational developments (Mattson and Henry 1987, Reinhart and Mattson 1990), roads (Green and Mattson 1988), backcountry campsites (Gunther 1990), and recreational trails in non-forested areas (Gunther 1990) has been documented. Conversely, some bears may not be displaced by human activity along roads, but rather may become habituated to people in an effort to access quality habitat along road corridors. Although habituation may increase the efficiency of bear habitat use in some instances by reducing displacement and minimizing the frequency of energy demanding responses (Jope 1982), it often results in the bear being removed from a population due to concern for human safety (Gunther 1994).

Direct impacts include loss of habitat that is permanently altered such as by the construction of water and wastewater treatment facilities. The actual loss of habitat to bears from the construction of water and wastewater buildings would be minimal, amounting to approximately 0.65 hectares (1.60 acres) or 19% of the total impacted acreage of this proposed project. The subsurface disposal field would change 0.93 hectares

(2.29 acres) of existing grizzly bear habitat consisting of mixed live and burned lodgepole forest to open meadow available as future grizzly bear habitat. The net loss of habitat would be offset by better sanitation procedures associated with a fully functioning sewage treatment system to reduce human/bear conflicts. The reclamation and revegetation of abandoned leach fields would provide additional habitat amounting to 0.20 hectares or 0.48 acre.

There are two primary bear-related concerns with the proposed project. There is potential for a short-term increase in bear-human conflict in the Norris area if there are sanitation problems associated with contractor employees working on the project. No grizzly bear mortalities or removal actions have occurred from construction-related activities in Yellowstone dating back to 1984. Bear-human conflicts would be reduced or prevented by implementing policies set forth in the park's 1982 Grizzly Bear Management Program and by conducting mandatory "Living in Bear Country" education/orientation sessions for all project related employees, such as contract and government employees. All personnel would be given an orientation on how to avoid disturbing or encountering bears, and how to minimize unavoidable effects or encounters. Orientation would include information about park regulations regarding food storage, disposal of garbage and other bear attractants, and approaching or harassing wildlife. Workers would also be educated on the presence of special status species and measures taken to minimize impacts. During previous large construction projects within the park, pre-construction orientation sessions with contractors have been successful at increasing compliance with bear sanitation regulations and reducing the potential for bear-human conflicts.

At staging areas, no long-term food storage or garbage retention would be permitted. Only bear-proof garbage cans would be used in designated staging or construction-related sites and emptied regularly. No employee contractor camps would be permitted outside of existing park-developed areas. If contractor employee housing were allowed within the park, ranger patrols would be increased to enforce food security regulations.

A second concern is that there is potential for short-term displacement of grizzly bears from habitat adjacent to the project site during the construction phase due to the additional noise and traffic associated with construction activity. Because bears have been known to use winter-killed ungulate carcasses in the nearby geothermal basins during early spring, no construction in the Norris Geyser Basin parking area would occur prior to April 1. If carrion or associated bear activity is documented in the project area, site-specific restrictions on contractor's activities may be imposed. Long-term displacement of bears from the area after construction should be no greater than the present operation of the existing facility and therefore should cause no additional impacts to bears.

Although grizzly bears are known to frequent habitat adjacent to the proposed project site, this project is not expected to jeopardize the park's grizzly bear population. Bear-proof fencing would be provided around the wastewater treatment facility to restrict bear activity from open treatment structures. Potential human-bear conflicts and grizzly bear mortality from the creation of human-caused sanitation problems during construction would be mitigated by providing contractor employee orientation programs, restriction of housing to established residential areas, construction stipulations regarding garbage retention and storage, and providing increased ranger patrols. These measures have a history of success and would render potential effects as discountable.

Conclusion

Under this alternative, there could potentially be some short-term displacement of individual bears near the building and ditching sites during construction. There would be long-term loss of habitat from the construction of new buildings and fencing. This would be small in relationship to the amount of available habitat in Yellowstone. Reclamation of abandoned leach fields would add available habitat. Odors around the wastewater plant may attract bears to the area, however, as shown by other wastewater treatment facilities in Yellowstone, chain link fencing around the facility has successfully prevented any adverse problems from developing. This action would not constitute an impairment to grizzly bears within the park, and may affect but would not likely to adversely affect grizzly bears in Yellowstone.

Lynx (USFWS threatened species, and species of special concern in Park County, Wyoming)

Disturbance from construction activities to lynx would not significantly increase because no lynx have been found in the area in recent history.

There would be negligible loss of habitat and no fragmentation of habitat from the proposed alternative. About 2.74 hectares (6.74 acres) of conifer forest, representing current or future lynx habitat, would be temporarily and permanently impacted by new construction of the treatment plant buildings and associated clearings, and clearing for the subsurface disposal field. The proposed project would not increase fragmentation of lynx habitat because the habitat loss and modification would occur on a small scale relative to the amount of lynx habitat in YNP. The habitat modification would be short-term in duration. There would be 1.16 hectares (2.85 acres) of utility corridors excavated that would be naturally restored and revegetated to forest within 10-15 years. Two abandoned leach fields totaling 0.20 hectares (0.48 acres) would be revegetated to coniferous forest. This temporary affect on lynx habitat may be beneficial because conifer regeneration introduced into this mature lodgepole forest may improve habitat conditions for snowshoe hares, a primary food source for lynx. The construction of new buildings or fences, however, may obstruct lynx movements and would create loss of habitat.

Conclusion

This action may affect but not likely to adversely affect Canada lynx found within the park. Any adverse impacts, such as from new buildings and fences, would be insignificant since the area of impact would be small (0.65 hectares or 1.60 acres) compared to the total available and potential habitat in the park of about 278,377 hectares (687,870 acres). This alternative would not constitute an impairment to lynx found within the park.

Bald Eagles (USFWS threatened species, and species of special concern in Park County, Wyoming)

Lodgepole pines in the Norris area are not substantial enough to support the weight of bald eagle nests. Bald eagles do use dead snags in the area for perches, especially along the

Gibbon River. Minor displacement and impact would occur along the river from construction activities.

Conclusion

The displacement would be short-term in duration. Therefore this alternative may affect but is not likely to adversely affect bald eagles. There would be no impairment to bald eagles.

Whooping Cranes (USFWS endangered species, and species of special concern in Park County, Wyoming)

Whooping cranes are not found in the affected area. Efforts to re-establish populations of whooping cranes to the area have not been successful, although potential habitat exists.

Conclusion

This project would have no effect on whooping cranes and they would not be impaired by this alternative.

Gray Wolves (USFWS threatened species, and species of special concern in Park County, Wyoming)

Direct effects to wolves could be caused by heavy equipment and construction that may cause wolves to avoid the project areas during the period of construction. While some wolves may be temporarily displaced from their habitat by noise and the disturbance of construction activities, wolves travel widely and have not appeared to alter their habits even when being viewed by hundreds of visitors. The project stipulations outlined for grizzly bears would include an orientation on wolves. As with bears, if wolf activity occurs in the project area, restrictions on the contractor's activities may be imposed. The proposed construction is not expected to increase wolf mortality or impact elk or any other species preyed upon by wolves. Wolves in the Yellowstone area are designated as an experimental population. Therefore, no areas are designated as critical habitat for wolves.

Conclusion

The proposed project may affect gray wolves but is not likely to adversely affect gray wolves. There would be no impairment to gray wolves as a result of this proposed action.

Cultural Resources

Archeological Resources, Historic Resources, and Ethnographic Resources

Historic properties (including archeological sites and historic structures and features) that have been determined to be eligible for the National Register of Historic Places would be protected and preserved according to the 1993 programmatic agreement (PA) "*Programmatic Agreement Among NPS, ACHP, Wyoming SHPO, Montana SHPO, for Principal Park Road System Improvement*, Yellowstone National Park" (NPS 1993b). Protective measures and proposed mitigation are discussed below.

A plan for treatment of prehistoric sites was developed by the Midwest Archeological Center. This plan provides general guidance for resource-sensitive treatment and protection strategies. An addendum to the plan, prepared by William J. Hunt, Jr. deals with historic resources (NPS 1993c). The proposed treatment plants, water and sewer lines, and staging areas have been designed to avoid historic properties that are eligible for the National Register, including archeological sites and historic road features. In addition, appropriate stop-work provisions and provisions for borrow sources and stockpile areas would be included in the project specifications to minimize potential impacts on historic and archeological resources discovered during construction activities.

Discovery procedures have been developed and outlining the process to be followed in the event of an inadvertent discovery. Work limits would be defined in areas near historic properties to prevent inadvertent damage to sites. Sensitive design, monitoring of construction, and definition of work limits would prevent any adverse project impacts.

This proposed project was designed to route utilities and facilities away from culturally sensitive areas. A Cultural Resource Inventory was completed for the project in May 2002 (NPS 2002). Two sites were located in the project work area, the old Norris to Canyon roadbed (48YE520) and the site of a possible wood cutter's cabin (48YE757). Both had not eligible recommendations forwarded to Wyoming State Historic Preservation Office. Both sites received concurrence from the Wyoming State Historic Preservation Office as not eligible.

The old Norris to Canyon roadbed (48YE520) would be disturbed by the installation of the water treatment plant intake pipe. This abandoned road segment was submitted to the Wyoming State Historic Preservation Office with a recommendation of not eligible for listing on the National Register. Roads of this type are not unique and there is considerable information in the Yellowstone National Park archives about the existence of this abandoned road segment.

The site of a possible wood cutter's cabin (48YE757) is located adjacent to the reservoir service road and would probably be impacted by construction activities. It is not associated with important persons or events in the history of the park. This site received a not eligible decision from the Wyoming State Historic Preservation Office based on loss of integrity due to structural decay and impacts of the 1988 fire. Further investigation would not lead

to any additional important information (NPS 2002). Limited artifacts have been inventoried and documented.

Documented cultural resources in the Norris area, including archeological sites and historic structures, such as the Norris Soldier Station and the Norris Geyser Basin Museum and Restroom Structure, would not be affected by this proposed action. Procedures have been established in the event of inadvertent discovery of undocumented cultural resources during construction.

Conclusion

There would be no effect on the cultural resources of the Norris area and no impairment would result.

Section 106 Summary

After applying the Advisory Council on Historic Preservation's criteria of adverse effects (36 CFR Part 800.5, Assessment of Adverse (Effects), the National Park Service concludes that implementation of the preferred alternative would have no adverse effect on the archeological or historic resources of Yellowstone National Park.

Cultural Landscape

The proposed water treatment structure would not be visible from the proposed Grand Loop Road historic district. Brief filtered views of the wastewater treatment plant and subsurface disposal field would be possible from the proposed Grand Loop Road historic district. Therefore, there is negligible impact to the cultural landscape as a result of these proposed structures.

The trenching associated with the proposed new water treatment and wastewater treatment facilities project has the potential to create direct minor temporary impacts due to the removal of vegetation along sections of new utility corridors that would cross the Grand Loop Road. Minimizing views down straight stretches of newly excavated utility corridors constructed through previously undisturbed vegetation would be achieved through careful utility line alignments, revegetation, and naturalistic placement of dead tree snags across disturbed corridors that mimic former fire disturbance.

Conclusion

By using vegetative and natural debris buffers to reduce or eliminate visual impacts from construction activities, the proposed project would have no adverse effects to the proposed Grand Loop historic district and the associated cultural landscape. No impairment would result.

Section 106 Summary

After applying the Advisory Council on Historic Preservation's criteria of adverse effects (36 CFR Part 800.5, Assessment of Adverse (Effects), the National Park Service concludes that implementation of the preferred alternative would have no adverse effect on the cultural landscape of Yellowstone National Park.

Ethnographic Resources

No ethnographic resources have been identified within the proposed project area. Due to the project's close proximity to the Norris Geyser Basin, and considering that hydrothermal areas have been identified by a number of affiliated tribes as ethnographic resources, special care was taken to ensure that all affiliated tribes and their contacts had the necessary information to make determinations as to whether the proposed action would adversely affect them. Two letters were sent about the project, one of which included a color map of the area of impact. Two inquiries were received from the Cheyenne River Sioux Tribe and the Shoshone-Bannock Tribes. Neither indicated the presence of ethnographic resources of concern in the proposed project area.

Conclusion

This proposed project has no effect on ethnographic resources and no impairment would occur.

Socioeconomic Environment

For a majority of the construction, traffic flow would be maintained so businesses within the park would not experience significant economic effects. However, traffic may "bunch up" due to possible delays when sewage pipes are routed under existing roadways. These situations may result in surges of customers arriving at some business establishments. Most businesses, residents, and visitors outside the park are so far removed from the construction area that it is not expected that they would be adversely affected by the activities associated with this proposed project. No adverse impact is expected due changes in the level of tourist spending. Roads in the park that would be used for hauling building materials would experience a minor increase in volumes of heavy truck traffic during the project construction period. Visitor traffic would be slightly affected by this use within the park.

Short-term benefits would include economic gains for businesses and individuals within the Greater Yellowstone Area. Direct benefits would flow from construction-related expenditures (the approximate cost of the project is $5.65 million) such as purchase and transport of building materials and employment of construction workers. Some new construction-related temporary jobs may be created within the regional economy due to this project. These benefits would be affected by the location of the contractor's base of operations, sources of materials, and source of the labor supply. Indirect benefits would occur in proportion to the amount of direct expenditures that occur within the region and the degree to which these funds are re-circulated within the regional economy.

Community businesses would benefit from expenditures within the local economy by the contractors and their employees. For instance, many construction employees might stay in local motels. Some new jobs may be created within the local economy due to construction activities. These jobs and other construction-related spending by contractors and their employees would provide benefits to the local communities.

Long-term benefits for visitors would include improved safety for visitors. As a result of this water system project, the ability to meet drinking water standards is greatly improved. The safe function of wastewater treatment and the prevention of sewage spills would decrease the chance for visitors to encounter contamination.

The tourism segment of the regional economy would be made more secure by improvements to the water and wastewater systems within Yellowstone National Park. Park operations would improve because of reduced maintenance costs, better access for winter administration, and a safer, dependable functioning of the water and sewer systems.

Conclusion

Direct and indirect minor effects on the socioeconomic environment would be beneficial and both short- and long-termed.

Visitor Use and Experience

Possible disturbance to park visitors, park staff, park residents, and the Yellowstone Association business at the geyser basin and Norris residential areas from construction activities would be temporary and would only last through the life of the project. Efforts would be made to lessen inconveniences by publicizing construction activities and delays through press releases, signing, and postings at entrance stations and visitor centers. Some minor temporary inconveniences would occur, as some Norris Geyser Basin parking areas would be closed to install wastewater pipes. Construction of ditch lines through parking areas would be limited to periods of low visitor use.

There would be traffic delays when the sewer line installation crosses the access route to the Norris Geyser Basin parking area. Traffic would be disrupted for one day for construction to complete the road excavation and pipe installation of 6 meters (20 feet) width of roadway. Construction activities would be scheduled for low visitor use periods.

Boring underneath the Norris to Canyon and Norris to Madison road segments would occur to place the wastewater line across and under the roadways. This activity would not cut the pavement, but may delay traffic by up to 30 minutes at a time. Scheduling would take advantage of low visitor use periods. In each instance, that part of the construction operation would last no longer than a day. Notification of potential traffic delays would be shared with park staff and entrance stations.

The long-term quality of visitor experiences would also improve. Visitors expect that drinking water provided from taps be palatable and without noxious odors. The reopening

of flush toilets at the Norris Geyser Basin would better meet the expectations of visitors, and decrease the waiting time to use toilet facilities.

Wastewater treatment generates some noise from blowers and creates varying degrees of odor. Employees and visitors to the plant location might notice plant-related noise and odor. It is not expected that odors or noise would travel far enough to reach travelers on the Norris to Canyon road, or to the residents and workers at the government area.

Brief filtered views may be possible of the proposed wastewater treatment plant and the cleared area for the subsurface disposal field by passing traffic on the Norris to Canyon road segment of the Grand Loop Road. The wastewater plant would be located to the south and about 152 meters (500 feet) uphill from the roadway. Use of subdued tones and the focusing of interior and exterior lighting away from the road would detract from its presence. Maturing of post-fire lodgepole seedlings would further decrease visibility, as would transplanting trees where views of the facilities and structures occur. The subsurface disposal field at its nearest point would be about 30 meters (100 feet) from the edge of the Norris to Canyon road. Although visible to passing traffic, the area would appear to be a natural clearing.

The proposed water treatment facility would not be visible to visitors from any of the roads in the Norris area. Portions of the buildings may be visible to foot traffic along the Gibbon River, but appearances would be compatible with existing structures in the Norris government area. The above-ground portion of the water intake would be visible to anglers and hikers along the Gibbon River. This structure, about 1.8-meters (6-foot) in diameter and about 30 centimeters (12 inches) tall would be difficult to conceal. Tall native grasses near the structure during the summer and fall months would provide some relief.

Staging areas for construction equipment and building supplies would not intrude on visitor experiences, as all of these would be located on service roads closed to public travel.

Conclusion

There would be direct minor short-term adverse impacts to visitor use and experience with this proposal. Direct and indirect short- and long-term minor beneficial effects resulting from a fully functional water and wastewater treatment system would mitigate these impacts.

Cumulative Effects Analysis

The cumulative effects on most wildlife species of the various actions occurring or proposed in the park would generally be localized. Although these localized effects appear to be short-term in nature, the long-term effects are unknown. Certain wide-ranging wildlife species, such as the grizzly bear, could be affected by construction projects in widely dispersed locations. However, most construction projects would occur within current development zones and along roadways, areas that bears are aware of and tend to avoid. Stringent proposed mitigating measures should help improve the effects on these species.

Most of the projects are of a maintenance type such as road rehabilitation, housing construction, and sewage treatment facilities, providing appropriate facilities for visitors and employees. The other projects involve rehabilitation and are a result of Yellowstone's commitment to restoring disturbed areas in the park to natural conditions as directed by NPS management policies.

In the reasonably foreseeable future, the potential exists for the projects described in this analysis, when added to the past and present projects occurring in the Greater Yellowstone Area, to cause some cumulative impacts through long-term loss of habitat from construction, wildlife avoidance of developed areas, and from incidental mortality.

Wildlife avoidance affects animals in two ways. There is a displacement effect when animals avoid otherwise suitable habitat because of human activities in the area. This results in a long-term loss of habitat. The other effect is an increase in animal density on the remaining habitat. Increased density can affect the ability of individual animals to survive.

Fixed resources, such as cultural sites, vegetation, and some wildlife, have the highest chance of disturbance from the development of previously undisturbed land. However, park managers are aware of these possibilities and are taking steps to mitigate any negative cumulative impacts. These steps include data recovery plans for cultural resources as well as wetland and other natural habitat restoration on lands that are expected to be rehabilitated. These steps should lessen or completely cancel any negative impacts from this action when considered with the other projects in this analysis that would otherwise add to the cumulative effects on the Yellowstone ecosystem.

Visitors who stay a short time in one area would primarily feel the cumulative effects of the various actions within the park. Their entire visit might be disrupted by construction activities. Employees and area residents could be inconvenienced for a number of days or weeks by local construction projects.

Impairment Determination

Because the actions described in this alternative do not severely affect a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Yellowstone National Park; (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or (3) identified as a goal in the park's master plan or other relevant National Park Service planning documents, there would be no impairment of the park's resources or values with Alternative A (Proposed Action).

Alternative B: NO ACTION

Natural Resources

Geology, Topography, and Soils

Ongoing maintenance activities would continue. No construction would occur. Inadvertent untreated sewage leaks during power failures could cause contamination to soils near the lift station. Failing leach field presents potential for contamination of surface soil. No alteration of geology or topography would occur.

Conclusion

There would be negligible direct adverse impacts on geology, topography, or soils expected due to ongoing maintenance activities. Inadvertent untreated sewage leaks during power failures could cause contamination of soils near lift station. Since these failures are infrequent and volumes low, adverse impacts are minor and have short duration. No impairment to the geology, topography, or soils would result.

Hydrothermal Resources

Current operation and maintenance activities would continue. Current functioning facilities have no effects on the hydrothermal resources of the Norris area.

Conclusion

Negligible direct or indirect adverse effects to hydrothermal resources would occur under this alternative of no action. No impairment to hydrothermal resources would result from routine water and wastewater maintenance.

Vegetation

Routine water and wastewater operations and maintenance would not effect native vegetation in the Norris area. The failing leach field and lift station at the Norris government area have the potential to contaminate soils and vegetation during inadvertent spills.

Conclusion

Minor short-term direct adverse impacts may occur to native vegetation from inadvertent untreated sewage leaks from the government area. Failure of the current wastewater system would result in closure of the system and therefore no further adverse impact. Normal operation would result in negligible direct or indirect adverse effects. No impairment would occur to native vegetation from this No Action alternative.

Exotic Vegetation

Current efforts occur at identification, mapping, and eradication of exotic plant species in the Norris area. These efforts would continue. Maintenance staff would continue to coordinate with the park's resource staff in helping to prevent the spread of existing populations of exotic plants during routine maintenance or during repairs to the existing water and wastewater systems.

Conclusion

This No Action alternative would not create or alter existing environment to encourage the spread of exotic plant species.

Rare Plants

The No Action alternative has no associated ground disturbance activity and would not affect any individual or populations of rare plants occurring in the Norris area.

Conclusion

Routine maintenance would not create any direct adverse impact or impairment to any rare plant sites.

Wetlands and Other Waters of the United States

Operation and maintenance of the functioning Norris water and waste water systems would not cause any direct adverse impacts to wetlands. If the leach field system at the Norris government area failed, the area would be closed. Failure of the leach field would result in untreated sewage rising to the ground surface and contaminating soils and vegetation, and potentially flowing into the Gibbon River, degrading water quality. The amount of impact would be based on the quantity and quality of the discharge, along with how rapid natural dilution and filtration occurs. Increased organic compounds from untreated wastewater introduced into the environment would stimulate increases in biological activity.

Conclusion

The infrequent small volume accidental discharges from the lift station during power failures would continue to cause contamination resulting in minor short-term direct adverse impacts to wetlands and waters. No impairment would occur to the wetlands and waters of the park from this No Action alternative.

Air Quality

No increases in vehicle emissions or dust would occur with this No Action alternative.

Conclusion

There would be negligible direct adverse impacts on air quality and visibility in the park or region from current water and wastewater treatment facilities operations at Norris. No impairment would result from current operations.

Wildlife

Current maintenance activities do not affect wildlife in general. Existing personnel have received and would continue to receive wildlife safety training related to their jobs. Short-term displacement to wildlife occurs from the presence of personnel and equipment during the course of performing routine maintenance. Wildlife may be attracted to odors associated with untreated sewage that overflows during treatment failures. Total failure of the Norris government area leach field would result in minor amounts of untreated sewage flowing onto the ground surface and into the surface waters of the Gibbon River. If failure occurs during the summer high use period, the amount of affected area might be larger. Natural dissipation of the effluent by dilution, percolation, and evaporation may be lengthy depending on the amount of overflow.

Conclusion

Current functioning water and wastewater systems create negligible direct adverse impacts to wildlife and no impairment of wildlife resources.

Birds

Current water and wastewater systems do not create or cause any significant disturbance to the birds that utilitize the Norris area, other than temporary displacement due to the presence of humans.

Conclusion

Routine maintenance actions would not cause any direct adverse impacts to birds found in the Norris Junction area. No impairment to birds would occur from this No Action alternative.

Amphibians and Reptiles

Because this alternative does not propose any new water or wastewater facilities, the shoreline characteristics of the Gibbon River would not be altered. Ditch construction through the lodgepole stands surrounding the geyser basin would not occur.

Conclusion

This alternative would have negligible direct adverse impacts to amphibians and reptiles, and not present an impairment.

Fisheries and Aquatic Resources

Maintenance of existing water and sewer treatment would not cause direct adverse impacts to fisheries or other aquatic resources. Due to the age of the current wastewater system and the inability to provide lift station functions during power outages, the potential exists for the inadvertent release of untreated sewage into waterways. An emergency generator could be placed into service to power the lift station in the event of a lengthy power outage. Closing of the localized septic system would mitigate the failure of the leach field.

Storm water runoff would not change over existing conditions. Potential impact could result from failure of the leach field and the inflow of untreated sewage from the Norris government area.

Conclusion

Normal operations present negligible direct adverse impacts, and no impairment to fisheries and aquatic resources.

Threatened and Endangered Species

Grizzly Bears (USFWS threatened species, and species of special concern in Park County, Wyoming)

Maintenance and use of the existing water and wastewater facilities are not expected to adversely affect grizzly bears. The failing Norris government mounded leach field would allow increasing amounts of untreated sewage to saturate surface soils. Odors would potentially attract grizzly bears to the area. Conflicts between humans and bears would result until the source of the attractant is removed by closing the leach field.

Conclusion

During normal operation and function of existing water and wastewater facilities, the No Action alternative would have no effect on grizzly bears, and would not cause an impairment to grizzly bears.

Lynx (USFWS threatened species, and species of special concern in Park County, Wyoming)

It is not anticipated that this alternative would have any impact on lynx. Although suitable habitat exists, there have been no recent confirmed sightings in the area.

Conclusion

This alternative would not disturb existing and potential lynx habitat in the Norris area, and would have no effect on lynx populations. No impairment to lynx would result from this No Action alternative.

Bald Eagles (USFWS threatened species, and species of special concern in Park County, Wyoming)

Bald eagles are found in the general vicinity, but there are no known affects on these species from the existing maintenance activities.

Conclusion

This No Action alternative would have no effect on bald eagles, or create an impairment to bald eagles.

Whooping Cranes (USFWS endangered species, and species of special concern in Park County, Wyoming)

Whooping cranes do not use the locations of the existing water and wastewater systems as habitat.

Conclusion

There would be no effect on whooping cranes and no impairment to whooping cranes.

Gray Wolves (USFWS threatened species, and species of special concern in Park County, Wyoming)

Gray wolves are found in the general vicinity, but there are no known effects on this species from the existing use of water treatment and wastewater facilities.

Conclusion

Continued maintenance activities would have no effect on gray wolves. No impairments would result to gray wolves from this No Action alternative.

Cultural Resources

Archeological Resources, Historic Resources, and Ethnographic Resources

There would be only sporadic repair work to existing treatment and distribution lines accomplished under this alternative. None of this work would be performed in areas that have not already been disturbed from construction of current water treatment and wastewater facilities. There would be limited potential for disturbance to known or unknown historic, prehistoric, and ethnographic resources. Affiliated tribes have been consulted, and no specific concerns regarding ethnographic resources have been identified. Hydrothermal resources, which affiliated tribes have described as ethnographic resources, would not be disturbed with routine maintenance and operation activities.

Conclusion

There would be no direct adverse effects on known archeological, historic, or ethnographic resources. There would be no impairment of archeological, historic, or ethnographic resources.

Cultural Landscape

The cultural landscape of the Norris Geyser Basin would be maintained.

Conclusion

No direct adverse effects to the cultural landscape would result from this No Action alternative, and no impairment would occur to the cultural landscape.

Socioeconomic Environment

Under this alternative there would be no construction-related disturbance of visitors, vehicle traffic, or of businesses inside and outside the park. However, the positive economic effects from new water and wastewater construction work would not accrue to the regional economy.

Although the cost of water and wastewater facility improvements would be avoided in the short-term, those savings would be achieved at much greater operational expenditures in the long run. Current systems cannot be relied on to provide dependable service for the foreseeable future.

There would be no year-round residences in the Norris Government Area. Winter and shoulder-season coverage would have to occur from the Canyon Area, 12 miles to the east. Summer residents would have to continue using unpalatable water or import water from other locations. The Ranger Station would continue with using non-potable water. The potential for complete failure of the sewage system would continue. This failure would result in the closure of the facilities that currently house employees in the Maintenance and

Ranger Divisions. These employees provide services directly related to the enjoyment of the Norris Area by the visiting public. Services to visitors would be reduced if employees had to commute to their duty station from other locations. Housing employees in surrounding locations would not be a viable option since these locations have no additional summer housing units to support Norris staff.

Conclusion

The No Action alternative would have both a direct and indirect short – and long-term minor adverse impact on the socioeconomic environment of the park.

Visitor Use and Experience

Under the No Action alternative there would only be routine maintenance and emergency repairs of water and wastewater facilities. Pipes would continue to corrode and water would be aesthetically distasteful. Providing minimum facilities, restrooms and drinking water at the Norris Geyser Basin would not be met. The restroom building at the Norris Geyser Basin would continue to be unutilized. Vault toilets would continue to require weekly pumping.

Visitors and staff would continue to be subjected to poor tasting water and limited restroom facilities. They would continue to import water from distant sources. Permanent residents would have to move twice a year, as residences cannot be occupied during the winter. The full range of winter visitor services are lacking because staff cannot be based at Norris. Providing housing for Norris personnel during the winter would impact other areas of the park. Continued, expensive, and yet inadequate maintenance activities would be required to keep the water treatment facilities open. These maintenance activities would negatively affect the visitor experience on an unpredictable basis due to temporary closures for repairs.

Yellowstone National Park staff would be expected to explain to visitors why the water at Norris tastes and smells poorly. They would also have to explain why a popular public attraction, such as the Norris Geyser Basin, does not have public drinking water or flush comfort stations. Facilities that failed to pass daily water drinking water standards, such as the Norris Geyser Basin office site, would have water sources posted as non-potable.

Conclusion

The No Action alternative would have a moderate direct and indirect long-term adverse impact on visitor use and quality of the visitor experience. No impairment would occur to visitor use.

Cumulative Effects Analysis

Alternative B would have less cumulative effect upon park resources and resources of the Greater Yellowstone Ecosystem than those effects described for the Action Alternative A.

Cumulative effects would be generated from those projects listed under Alternative A, along with maintenance actions that would be required under this No Action Alternative B.

Cumulative effects from maintenance of the current water and wastewater treatment functions could include visitor dissatisfaction with the potability of drinking water, possible closure of the Norris government area if the sewage treatment system totally failed, or the inconvenience of residents being required to use portable toilets and the unavailability of having functioning showers in their residences. There would also be a further drain on park operating funds required to be spent on routine repairs to water and sewer lines. Government and personal expenses would increase in order to provide services at Norris from work and home bases from surrounding localities.

Impairment Determination

Because the actions described in this alternative do not severely affect a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Yellowstone National Park; (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or (3) identified as a goal in the park's master plan or other relevant National Park Service planning documents, there would be no impairment of the park's resources or values with Alternative B (No Action).

Compliance Status

If the NPS regional director decides that this project would significantly effect the human environment, a notice of intent (NOI) to prepare an environmental impact statement (EIS) would be issued. Conversely, a finding of no significant impact (FONSI) would be issued if it is determined that there would be no significant impact from this project. The FONSI would be approved by the regional director.

Consultation with the USFWS on threaten and endangered species under 50 CFR Part 402, which implements the Endangered Species Act, would be completed. As part of the consultation process, the NPS would seek USFWS concurrence with the determination of effect on threatened and endangered species.

Drinking water projects that require access to rivers as a source are excepted from compliance with Executive Order 11988, "Floodplain Management," under NPS final implementation procedures as outlined in Special Directive 93-4, "Floodplain Management Guideline," July 1, 1993.

The Storm Water Rule (40 CFR, Parts 122, 123, 124) requires an EPA National Pollution Discharge Elimination System (NPDES) Notice of Intent to be submitted to EPA, with a copy sent to the Wyoming Department of Environmental Quality, on construction activities, including clearing and grading, that occur on land in excess of five acres (less than five acres if construction occurs in 2003 or after) or if the proposed action is part of an overall common plan of development. An NPDES notice of intent would be submitted to both EPA and the Wyoming DEQ, prior to any ground disturbing activities. When construction is complete, a notice of termination would be sent to the EPA and Wyoming DEQ.

A section 404 permit from the Army Corps of Engineers, with concurrence from the United States Fish and Wildlife Service, would be required to comply with the Clean Water Act. This permit is required for discharge/placement of fill material into waters of the United States. A 401 certificate would also be required from the Wyoming DEQ.

In compliance with Executive Order 11990, "Protection of Wetlands," a statement of findings (SOF) issued for impacts on wetlands has been prepared (Appendix D). The SOF would be approved by the regional director of the National Park Service.

Prior to construction, the project would be required to obtain a "Permit to Construct" from Wyoming DEQ. An application for the permit, pre-design report, and construction documents would be submitted to Wyoming DEQ for review and approval. The administrator would review the application within 60 days, and issue a permit contingent upon successful review for compliance with Wyoming DEQ's design standards for public water supplies.

Treated effluent would be discharged to the waters of the State of Wyoming through a subsurface discharge. The state waters within the borders of Yellowstone National Park are classified as Class 1. Per current Wyoming Department of Environmental Quality (DEQ) Regulation Chapter 1, Section 7.a, no new surface discharges, other than dams, would be permitted to discharge into Class 1 surface water. A subsurface discharge could be allowed contingent upon proper permitting under Wyoming's Underground Injection Control (UIC) Program.

The subsurface discharge would be classified "5E4", and would be in the form of a subsurface fluid distribution system. The effluent would require filtration and disinfection prior to discharge. Additional requirements include submission and approval by Wyoming DEQ of an operational and maintenance manual. The point of compliance would be down gradient of the subsurface discharge and up gradient of the raw water intake.

Permit application information is listed in Wyoming DEQ Regulation Chapter 16, Water Quality Rules, Section 6. In addition to engineering information to demonstrate design compliance with the Wyoming DEQ Regulation Chapter 11, Water Quality Regulations, a background water quality report is required. Some water quality data are available from previous sampling and engineering reports.

All contractor activities would comply with state and federal air quality regulations and contractors would operate under applicable permits.

A permit is required prior to starting construction. The permitting process requires a minimum of 60 days. The permit application is submitted to Wyoming DEQ. Upon determination of a completed permit submission, DEQ issues a draft permit. DEQ posts public notification of the draft permit and allows at least 30 days for public comment. The DEQ director renders a final decision on the draft permit within 30 days after the completion of the comment period.

All historic and prehistoric archeological sites within the area of potential impact for ground disturbance have been inventoried, documented, and evaluated. NPS recommendations for National Register (NR) eligibility for all historic structures and

features, and all historic and prehistoric archeological features, were sent to the Wyoming SHPO for concurrence of eligibility or non-eligibility. Concurrence was received; no eligible features would be affected. The historic properties inventory, site documentation, and NR eligibility determination requirements as described in the 1993 programmatic agreement have been completed (NPS 2002).

Sections of this environmental assessment summarize cultural resource inventories. The documentation was completed in support of this undertaking. The environmental assessment would be sent to the Advisory Council on Historic Preservation (ACHP) and the Wyoming State Historic Preservation Officer SHPO) for their review and comment. Project designs and descriptions of the water and wastewater proposals would be submitted to the Wyoming SHPO and the ACHP for review and comment on effect.

Plans and descriptions for the changes in water and wastewater facilities were discussed with the 24 Native American Tribes affiliated with Yellowstone National Park at regularly scheduled consultations in April 2000, October 2000, and April 2001. Requests for comment were sent to all affiliated tribes not attending the consultation. No ethnographic concerns have yet been identified within the area of potential effect of the undertaking.

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Scoping

A scoping letter was mailed to more than 200 individuals, agencies and groups on November 9, 2001, with responses requested by December 14, 2001. Press releases discussing the scoping efforts were sent to various media outlets on that same date. The same scoping letter was posted on Yellowstone's Internet site on November 13, 2001. After a request from a tribal group for more specific details, a follow-up letter was mailed to 24 tribal organizations on December 20, 2001. Responses to that letter were requested by January 22, 2002.

Eight responses were received. Two were from tribes, one from an individual viewing the Internet posting, three from Wyoming state agencies, one from Park County, Wyoming and one letter from an organization.

Persons, Organizations, and Agencies Contacted:

Notice of the availability of this Environmental Assessment is being sent to approximately 240 individuals, agencies and groups soliciting comments on the problems, issues, and alternatives addressed. A press release was issued on September 4, 2002 and the Environmental Assessment is posted on Yellowstone National Park's web page, http://www.nps.gov/yell/technical/planning.

Agencies/Libraries That Will Receive This Environmental Assessment:

EPA Region 8, Denver, CO
U.S. Fish and Wildlife Service, Cheyenne, WY
Wyoming Office of Federal Land Policy
Wyoming State Historic Preservation Office
U.S. Army Corps of Engineers
Montana State University Libraries, Bozeman
Wyoming State Library
University of Wyoming Libraries, Laramie
Teton County Public Library
Billings, MT Public Library
Bozeman, MT Public Library
Livingston, MT Public Library
Renne Library, MSU, Bozeman
Cody, WY Public Library
Jackson, WY Public Library
West Yellowstone Public Library

Tribes, Agencies, and Organizations That Will Be Notified Of This Environmental Assessment:

Assiniboine and Sioux Tribes
Blackfeet Tribe
Cheyenne River Sioux Tribe
Coeur d'Alene Tribe
Comanche Tribe of Oklahoma
Confederated Tribes of the Colville Reservation
Confederated Tribes of the Umatilla Reservation
Confederated Salish and Kootenai Tribes
Crow Tribe
Crow Creek Sioux Tribe
Eastern Shoshone Tribe
Flandreau Santee Sioux Tribe
Gros Ventre and Assiniboine Tribes
Kiowa Tribe of Oklahoma
Lower Brule Sioux Tribe
Nez Perce Tribe
Northern Arapaho Tribe
Northern Cheyenne Tribe
Oglala Sioux Tribe
Rosebud Sioux Tribe
Shoshone-Bannock Tribes
Sisseton-Wahpeton Sioux Tribe
Spirit Lake Sioux Tribe
Standing Rock Sioux Tribe
Turtle Mountain Band of the Chippewa Indians
Yankton Sioux Tribe

AGENCIES

Beaverhead National Forest
Big Hole National Battlefield
Bridger-Teton National Forest
Custer National Forest
Environmental Protection Agency, Region 8 - Denver
Gallatin National Forest
Glacier National Park
Grand Teton National Park
Grant-Kohrs Ranch NHS
Idaho Department of Commerce
Idaho Department of Parks and Recreation
Idaho Fish and Game Department
Little Bighorn Battlefield NM
Montana Department of Commerce
Montana Department of Fish Wildlife and Parks
Montana Intergovernment Review Clearinghouse
Natural Resource Conservation Service - Bozeman and Cody
Shoshone National Forest
Targhee National Forest
Teton County Certified Local Government
Town of West Yellowstone
US Army Corps of Engineers
Western Federal Lands Highway Division
Wyoming Department of Transportation
Wyoming Game and Fish Department
Wyoming State Clearinghouse
Wyoming State Lands and Investments
Wyoming State Library
Wyoming Travel Commission
ACHP Western Office of Project Review

ORGANIZATIONS

Alliance for Wild Rockies
American Fisheries Society
American Wildlands
Bear Creek Council
Beartooth Alliance
Billings Chamber of Commerce
Bozeman Area Chamber of Commerce
Buffalo Bill Historical Center
Cheyenne High Plains Audubon
Citizens for Teton Valley
Cody Chamber of Commerce
Cooke City/Silver Gate Chamber of Commerce
Defenders of the Rockies

Appendix A

Defenders of Wildlife Fremont County Audubon Society Gallatin County Commissioners Gardiner Chamber of Commerce Great Bear Foundation Greater Yellowstone Coalition Hamilton Stores, INC Idaho Falls Chamber of Commerce Idaho Wildlife Federation Jackson Hole Alliance for Responsible Planning Jackson Hole Chamber of Commerce Lander Chamber of Commerce Livingston Chamber of Commerce Montana Audubon Council Montana State University Montana State Preservation Office Montana Wildlife Federation National Audubon Society National Parks and Conservation Association Nature Conservancy - Idaho Chapter Nature Conservancy - Montana Chapter Nature Conservancy - Wyoming Chapter National Wildlife Federation Northern Plains Resource Council Northern Rockies Conservation Cooperative Northwestern University Park County (MT) Commissioners Park County (WY) Commissioners Park County Environmental Council Pinedale Chamber of Commerce Red Lodge Chamber of Commerce Riverton Chamber of Commerce Sacajawea Audubon Society Sierra Club Idaho Chapter Sierra Club Northern Plains Regional Office Sierra Club Teton Group Sierra Club Utah Chapter	Snake River Audubon Society Star Valley Development Association Stone Fly Society Teton County Commissioners Teton County Historic Preservation Board University of Wyoming Upper Missouri Breaks Audubon Society Utah Audubon Society Utah Wilderness Association Utah Wildlife Federation West Yellowstone Chamber of Commerce Wild Forever Wyoming Wildlife Federation Wyoming Association of Professional Historians Wyoming Heritage Society Wyoming Outdoor Council Yellowstone Association Yellowstone Park Foundation Yellowstone Valley Audubon Society Xanterra Parks & Resorts

Appendix A: YELLOWSTONE NATIONAL PARK UPDATE OF ASSESSMENT OF WATER AND SEWAGE SYSTEMS

May 8, 2002

Yellowstone National Park compiled an Assessment of Water and Sewage Systems on February 19, 1999. Many conditions in that assessment remain the same, but there have been some changes. An update of the 1999 document was made in June 2000 and this information will update that document. The majority of the changes are project oriented, but the day-to-day operational and cyclic maintenance problems continue to increase as evidenced by minor spills and blockages that would decrease if the maintenance operational shortfall were funded.

The following list is not a line-by-line update of the Assessment but highlights the current status of the water and sewage systems in each area as of May 2002.

1. MAMMOTH AREA – The sewage lift station does not have backup power and the sewer lines are subject to severe infiltration. Contracts to begin correcting the infiltration were scheduled awarded in 2000. Funding was in order for 2001 for additional infiltration work which, when completed, will significantly decrease the infiltration. The infiltration contract will be finished in 2002. While it corrected the most severe problems, additional work on the manholes and lines will be needed to correct all of the problems. The water system is adequate. Replacement of the liner in the raw water pond and equipment in the water plant needs to be scheduled. The cesspool at Stephens Creek needs to be replaced. A disinfection system needs to be installed on the Stephens Creek water system.
2. INDIAN CREEK – The wooden water tank is inadequate from an operational and sanitary standpoint. The structure is old, leaks badly and is now repaired with roof shingles. The tank was replaced in 2001 with Repair/Rehab funds. The water lines will need to be replaced/upgraded.
3. APOLLINARIS – The cesspool does not meet current standards and needs to be replaced. The system is scheduled to be replaced in the fall of 2002 using Repair/ Rehab funds.
4. NORRIS – The parking area sewage system is still in failure and is now in its sixth year of shutdown. The Government area sewage system leaks sewage onto the ground and may have to be shutdown. There are no alarms or backup power on the sewage lift station. The water wells will not meet the new standards for water quality. The water lines are shallow and leaks are prevalent. New water and sewage systems are currently in the 2001/2002 Line Item construction program. Award is expected in 2002. This project will not correct the waterline leaks.

5. MADISON – The sewage plant is subject to failure at any time due to its age and condition. The lift stations have no alarms or backup power. The sewage plant is funded in the 2004 Line Item Program. The water system needs additional storage.
6. WEST ENTRANCE – The sewage lift station has no alarm or backup power. The pumps were upgraded in 1999, but if the power fails the basement of a multiple housing unit will flood in a short period of time. The lift station is presently listed as a Repair/Rehab project in 2004. The water system is adequate.
7. BECHLER – The sewage system is adequate. The water system cannot operate early or late in the year and needs to be winterized.
8. OLD FAITHFUL – The wastewater treatment plant that was polluting the groundwater was scheduled for replacement beginning in 2000. The contract was awarded in 2000 and the new facility should be operating in 2002. The Inn and Lodge lift stations were upgraded with standby power in 1999 and 2000 and are now up to standard. The old overflow line from the Inn lift stations to the Firehole River was physically blocked off in 1999. Grease traps for the Inn and Lodge were upgraded in 1999 and now meet standards. Some of the sewer lines that went through the thermally influenced ground were replaced in 1999 although more lines remain to be replaced. Additional line work is scheduled in 2002 with Repair/Rehab funds. Two major food services facilities still have no grease traps. Infiltration into old lines remains uncorrected. The water plant continues to have trouble producing water that meets standards for 3 months of the year and lines continue to be eaten up with the corrosive water. A Repair/Rehab project to construct a sedimentation basin to pre-treat the water and help solve these problems is scheduled for 2002/2003. Fire flow is inadequate to a significant portion of the area. A 2003 Line Item Project will solve this problem. The water line that regularly failed due to thermally influenced ground was replaced in 1999.
9. GRANT VILLAGE – Only two of the seven sewage lift stations have backup power. The Marina food facility and the main restaurant had grease traps installed in 1999, but the store has an inadequate grease trap. The sewage lagoons need new liners. The water system is generally adequate.
10. LEWIS LAKE – The campground sewage system consists of vault toilets and one toilet is subject to flooding each spring. The water tank was near failure and was funded for replacement in 2000. The tank was replaced in 2001 and the water system was upgraded using Repair/Rehab funds.
11. SOUTH ENTRANCE – The water system was scheduled for improvements in 2000. The work improved or replaced the water source and provided additional, but not total, fire protection. This project was completed in 2001.
12. LAKE/FISHING BRIDGE/BRIDGE BAY – The sewage infiltration problems were scheduled for improvements in 2000. This portion of the work will be completed in 2002. This should take care of the worst areas but will not totally eliminate the infiltration. The Lake Lodge lift station was upgraded with standby power in 1999/2000 and now meets standards. The Bridge Bay lift stations do not have standby power and facilities have to be closed during a power outage to prevent spills. The lift station needs to be rehabilitated as the piping, equipment and building are in poor condition. The sewage line from Bridge Bay to Lake continues to leak raw sewage into the ground. Some Repair/Rehab design funds will be used to investigate this problem in 2002. The grease traps at the Lake Lodge and Lake Hotel were scheduled for

replacement in 2000, but two major facilities still have no grease traps. The two grease traps were installed in 2000. The spring-fed water distribution system needs repairs. The water line to the Fishing Bridge area needs to be replaced. The line across Fishing Bridge cannot be used during the spring and fall and the area has no fire protection at these times. Many of the water lines leak. The Fishing Bridge water tank is in poor condition and needs to be replaced. The other tanks need cyclic work.

13. EAST ENTRANCE – The entrance lift station needs an alarm. Standby power for the water system is adequate but the pump station does not have backup power. All other portions of the water and sewage systems are adequate.
14. CANYON – Infiltration into the sewage lines remains unabated and requires correction. None of the sewage lift stations have backup power. The lift stations need rehabilitation of the piping, equipment and buildings. Off-season sanitary facilities continue to be inadequate with people using the woods to take care of their needs. The sewage plant, itself, is adequate. Grease traps need to be added and upgraded in this area. The water system is generally adequate. A new liner for the raw water pond is needed.
15. TOWER JUNCTION/TOWER FALL – The Tower Fall sewage system is near failure due to overloading. No grease traps exist for the Tower Fall Facilities. There is no backup power for the Tower Fall lift station. The Tower Junction water system has inadequate flow during a dry year. The Tower Fall water system is adequate.
16. LAMAR – The facilities are generally adequate. The water disinfection facilities need to be moved above ground to solve a safety issue. No fire protection exists due to the remoteness of this site and the more primitive facilities in the area. There is no commercial power so pumping water to a storage tank is not possible.
17. NORTHEAST ENTRANCE – The sewage system is inadequate and subject to failure and overflows into watercourses. It was scheduled for replacement/upgrade in 2000. The sewage system was replaced in 2000/2001. The water wells are inadequate due to the influence of surface water and the fire protection in the area is inadequate.
18. BEARTOOTH ROAD CAMP – The water system is marginal in low flow years.

There are also numerous pit and vault toilets that exist throughout the park which need upgrades or replacements, and sewage lines and manholes need to be regularly inspected and cleaned. The water valves and hydrants need to be exercised so that they work properly. Maintaining facility fencing and security for water and wastewater systems also needs to be addressed. A new Mammoth restroom facility is under construction at this time. This facility will address this problem in Mammoth, but parkwide shortage of comfort station facilities exist. Other comfort stations in developed areas and campgrounds also need to be rehabilitated. Money is available in the Repair/Rehab program to upgrade a few pit toilets. Money from Fee Demonstration funds will upgrade some of the comfort stations and will add a few vault toilets in high use areas.

The park has experienced blocked, overflowing sewage manholes on an almost weekly basis this past season due to the lack of operation or preventive maintenance funding. At the present rate of funding, minimal, but methodical progress can be made in upgrading

the facilities to maintainable state. If the operational and preventative maintenance funding does not match the asset upgrades, the methodical gains will be shortly negated and we will continue to operate in reactive, rather than cost-effective proactive, mode.

It should be noted that these situations have existed for many years even though the Park has repeatedly included the need for operational, maintenance or project funds in their budget requests. As time goes on, the condition of the infrastructure and the ability to maintain it will continue to decrease, especially in light of the fact that the Mission 66 projects are now at or beyond their life expectancy.

Appendix B: Vegetation Management for Construction in Yellowstone National Park

Revegetation efforts within the park have focused on careful management of topsoil as the only available growing medium and seed source. This is based on a park policy that seed obtained from sources outside the park would contaminate the park gene pools. Although it is a conservative method, the topsoil management approach has worked well.

The park has an interagency agreement with the Bridger Plant Material Center to assist in the formation of a park seed bank. The park has also tested mulches and can make this information available upon request.

All construction work within the park involving ground disturbance will meet the following criteria for revegetation accepted by the park.

1. All construction will be limited to that area necessary to complete required work. No activity, including vehicle or material use or storage, will be allowed outside the predetermined zone. If vehicles are to be traveling through an area numerous times, the same tracks will be used to prevent compaction in other areas. Compacted zones will be treated (raking, aerating, and replacement of topsoil) to assist revegetation. Topsoil will not be driven on at any time.

2. Excavation and improvement will be handled in manageable sections that reflect changes in the soil and vegetation. Trenching routes and disturbance zones will be flagged and approved by the park. All flagging and debris will be removed from the area after work is completed.

3. Sections will be rehabilitated as soon as possible. Topsoil will not be stockpiled over the winter or for longer than three months in sagebrush/rabbitbrush zones or longer than six months in grass-dominated zones. Any deviation must be approved by the park.

4. Topsoil refers to the uppermost soil horizon; it is usually found in the top 5 to 15 centimeters (2 to 6 inches). Topsoil will be removed and replaced from the same area. Care will be taken to ensure that topsoil and fill material are not mixed and are stockpiled in separate areas (e.g., topsoil to the right of the trench and fill to the left).

5. Vegetation over 0.9 meters (three feet) in height will be removed before the removal of topsoil and in a manner that least disturbs the topsoil. Topsoil will not be driven on, gouged, or compacted as vegetation is removed. Topsoil will be removed before stumps are pushed. The park must approve any deviation from this process.

6. After large trees are removed, topsoil will be removed from an area in a single cut, including any vegetation that is 0.9 meters (3 feet) tall and under. Grubbing is not permitted.

7. Irregular land surfaces are recommended for a natural effect. Some rock outcropping and boulders may be left in place to create natural pockets for revegetation (see item 11).

Deadfall snags may be stockpiled for later use on slopes that are very steep to provide catch points for soil.

8. Topsoil will not be used as bedding material. Separate bedding material will be obtained from sources approved by the park.

9. Topsoil will be replaced on-site in a mixture of topsoil and vegetation associated with the topsoil and will be reworked over the site in a manner that preserves the seed source while spreading the soil over the area.

10. No topsoil will be imported from outside the park or moved internally within the park unless approved by the park. Any imported fill will be checked for exotic plants.

11. Trees and shrubs will be avoided if possible during trenching or excavation. Any trees removed during construction will be removed from the site unless specified by the park.

12. If replacement seed is required for revegetation in an area, the park will provide seed at cost to the contractor. Advance notice of six months to one year is required on projects exceeding 93 square meters (1,000 square feet).

13. Boulders unearthed during construction may be reburied or left exposed (with lower third buried) depending upon the location and extent of rock naturally occurring in the area.

14. If a trench is required, the surface of the trench will be left mounded to allow for settling along the line.

15. If mulch is required in sensitive areas due to visibility or exotic plant infestation, the park will specify the type and depth of mulch to be used. Nitrogen may be added in small quantities to any wood product used on slopes to balance nitrogen lost through decomposition.

16. No fertilizer will be used in any revegetation work unless requested by the park.

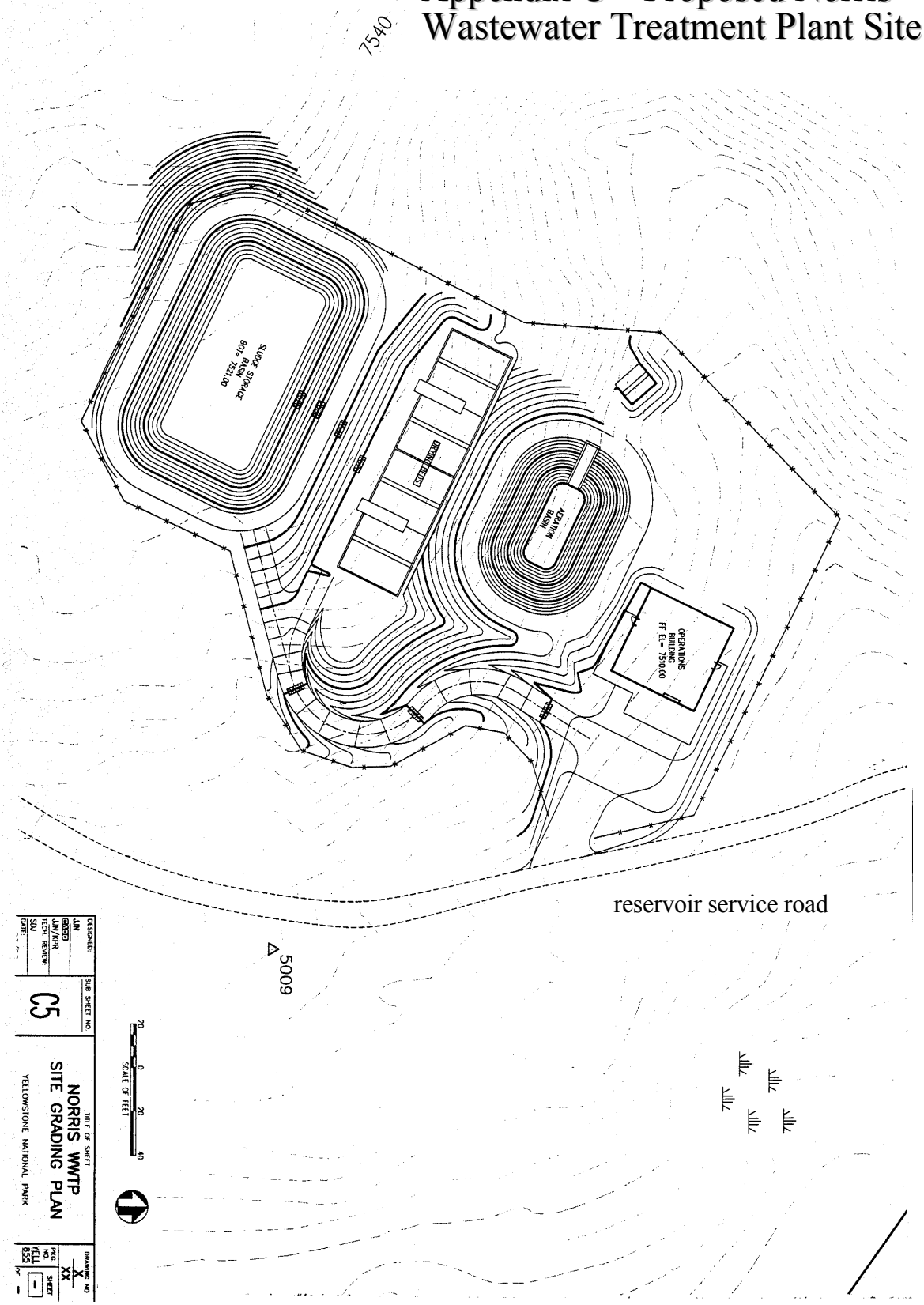
17. If relocated due to road reconstruction, junction boxes or cans will be placed in the field and approved by the park. Locations should be well screened by vegetation, topography, or large boulders.

18. All access to the site and stockpiling or staging areas will be identified by the contractor and approved by the park. These areas will be revegetated using approved techniques upon completion of the project.

19. All debris will be removed from the site to an approved pit or hauled away as approved by the park.

20. Final review and inspection will be made by the park before the work is accepted.

Appendix C – Proposed Norris Wastewater Treatment Plant Site Plan



Appendix D

STATEMENT OF FINDINGS FOR EXECUTIVE ORDER 11990
(PROTECTION OF WETLANDS)

Norris Area Water and Wastewater Treatment Project
Yellowstone National Park

Recommended: _____/s/ Suzanne Lewis_____ __8/5/02__
Superintendent, Yellowstone National Park Date

Certified for Technical Adequacy and Servicewide Consistency:

_____/s/ Dan B. Kimball_____ _8/26/02_
Chief, WASO Water Resources Division Date

Approved: ____/s/ Karen P. Wade_____ __8/16/02_
Regional Director, Intermountain Region Date

Appendix D

STATEMENT OF FINDINGS

INTRODUCTION

The August 2002 *Environmental Assessment, Norris Area Water and Wastewater Treatment Project, Yellowstone National Park* described and analyzed, among other things, the effects of construction of the treatment plants on wetland areas within the park.

Executive Order 11990 "Protection of Wetlands" requires Federal agencies to consider alternatives to disturbing wetlands in order to avoid, to the extent possible, the long and short-term adverse impacts associated with their destruction or modification. *Director's Order #77-1: Wetland Protection* and its accompanying *Procedural Manual #77-1: Wetland Protection* requires the National Park Service to prepare a statement of findings that presents the rationale used to determine that no practical alternatives exist outside the wetland environment to meet the park's management objectives.

PROPOSED ACTION

The preferred alternative calls for a new water treatment plant to be constructed in the Norris government area. Two existing water wells would be abandoned and a new infiltration intake would use the Gibbon River as the source of water. A new wastewater treatment plant would be built on an existing service road, and an existing leach field at the government area would be abandoned. A previously closed comfort station at the geyser basin would reopen. Some employee housing at Norris would have the capability for year-round use with newly winterized utilities. Approximately 950 feet of new water line and 6,050 feet of new sewer line would be installed under this proposal.

Minor short and long-term direct adverse impacts to wetlands would occur with the installation of the water intake/infiltration structure and the burial of the water line. A total of 0.02 hectares (0.049 acres) would be affected. Approximately 65 square meters (0.007 hectares, 700 square feet (0.016 acres)) of palustrine emergent, seasonally flooded wetland would be disturbed for the intake structure. Of this, approximately 2.5 square meters (26.9 square feet) of wetland would be permanently displaced by the 1.8- meter (6-foot) diameter intake manhole. The remaining 62.2 square meters of wetland would be temporarily impacted during construction and would be restored post-installation. Approximately 149 square meters (0.014 hectares) or 1600 square feet (0.04 acres) would also be temporarily disturbed in the burial of the water line.

Because the total impact to wetlands from the project is less than 0.1 acres and the loss of wetland functions is minimal, wetland compensation is not required by either NPS Director's Order #77-1, or by the US Army Corps of Engineers. Post-construction site restoration work would, however, result in an on-site, in-kind restoration of all but 27 square feet of the wetland, where the intake structure extends above ground. The wetland vegetation and soils would be salvaged prior to construction and then placed back on the site following the installation of the intake structure and water line. The temporary impacts would be short-term and minor.

DESCRIPTION OF WETLANDS WITHIN THE PROJECT AREA

The project area includes the banks of the Gibbon River near the Norris employee residential and administrative area. In the Norris Junction area, the Gibbon River is relatively slow-moving and meandering and is classified as a "riverine, lower perennial, rock bottom" stream (wetland classification nomenclature follows Cowardin et al (1979)). Aquatic vegetation covers less than 5 percent of the streambed. Species present include mare's tail (*Hippuris vulgaris*), cut-leaf water parsnip (*Berula erecta* var. *incisa*), milfoil (*Myriophyllum* sp.), starwort (*Callitriche* sp.) and pondweed (*Potamogeton* sp.).

Significant areas of sedge and hairgrass-dominated wetlands occur on both sides of the Gibbon River in the Norris Junction area. The proposed water intake/infiltration structure would be placed in a "palustrine emergent, seasonally flooded" wetland depression that appears to be part of an old river channel (Cowardin et al 1979). Beaked sedge (*Carex utriculata)* occupies over 95 percent of the wetland. Baltic rush (*Juncus balticus*), fowl bluegrass (*Poa palustris*), three stamen rush (*Juncus ensifolius*), and ball-head groundsel (*Senecio sphaerocephalus*) make up the remaining 5 percent vegetative cover.

The proposed water line from the intake to the new water treatment plant would be buried in an abandoned roadbed that bisects the same wetland. The roadbed varies from being level with the surrounding ground near the Gibbon River to being elevated more than 3 feet above the wetland. Where the fill is no more than 1 foot above the surrounding wetland, (on the southern end of the road nearest the river), wetland vegetation typical of slightly drier conditions has become established in scattered patches. Hairgrass (*Deschampsia caespitosa*) predominates the vegetated areas, with fowl bluegrass, baltic rush, and Kentucky bluegrass (*Poa pratensis*) present in small amounts. Approximately 50 percent of the roadbed is unvegetated. Lodgepole pine (*Pinus contorta*) has become established along the road berm in scattered clumps.

There are no wetlands in the proposed wastewater treatment facility area or along the route of the sewage collection lines.

EFFECT ON WETLANDS AND ASSOCIATED RESOURCES

The preliminary engineering designs sought to avoid and minimize impacts to wetlands whenever possible, primarily by locating the facilities to avoid wetlands and placing the water intake line in an abandoned roadbed to minimize the extent of disturbance.

Minor short and long-term direct adverse impacts to wetlands would occur with the installation of the water intake/infiltration structure and the burial of the water line. Approximately 65 square meters (0.007 hectares) or 700 square feet (0.016 acres) of palustrine emergent, seasonally flooded wetland would be disturbed for the intake structure. Approximately 149 square meters (0.014 hectares) or 1600 square feet (0.04 acres) would be disturbed in the burial of the water line.

Post-construction site restoration work would, however, result in an on-site, in-kind restoration of all but 27 square feet of the wetland, where the intake structure extends above ground. The wetland vegetation and soils would be salvaged prior to construction and then placed back on the

site following the installation of the intake structure and water line. The 1.8 meter (6-foot) diameter intake manhole would permanently displace approximately 2.5 square meters (26.9 square feet) of wetland. The remaining 211 square meters (2273 square feet) of wetland vegetation is expected to re-establish above the buried well screen sections and water line and the impacts would be short-term and minor.

The project should have no impact on the Gibbon River. A sediment control plan would be in place to reduce any potential sedimentation to the creek and scheduling and standard erosion control measures and barriers (revegetation, mulch and silt fences) would be implemented to prevent runoff from degrading water quality.

Construction would temporarily displace wildlife and fishermen from the project area. They would not be impacted following completion of the project.

WHY ACTIONS MUST BE LOCATED IN THE WETLAND

The current sources of water for the Norris area are two groundwater wells. The water has high mineral concentrations, is geothermally influenced, and is virtually non-potable due to poor taste, strong odor, and distinct coloration. It is highly corrosive, causing rapid deterioration of pumps, pipes, and fixtures.

The proposed water source would be an intake buried seven feet below ground, adjacent to the Gibbon River. The intake needs to be shallow enough to capture water from the surface water zone while not intercepting the geothermally influenced groundwater.

Extensive wetlands border both sides of the river. It was not possible to locate the intake adjacent to the river without impacting a wetland.

OTHER ALTERNATIVES CONSIDERED

Alternative B: Under Alternative B (no action), no water treatment plant would be constructed and the two existing water wells would be retained as the source of water. An existing leach field at the government area would continue to be used for as long as it functions. A previously closed comfort station at the geyser basin would remain closed. Employee housing at Norris would not have the capability for year-round use. There would be no new water lines or new sewer line installed under this proposal.

This alternative is not the Preferred Alternative because Alternative A better meets the national environmental policy expressed in NEPA (Sec. 101(b) to fulfill the responsibilities of each generation as trustee of the environment for succeeding generations. Alternative B would not strike the balance between public safety and preservation and repair of features.

MODIFICATIONS TO MINIMIZE HARM TO WETLANDS

All wetlands in the project area were mapped and described following the methodology of the U.S. Army Corps of Engineers (1987) wetland delineation manual, so the designer could avoid or minimize impacts to wetlands. Techniques to avoid or minimize wetland impacts included placing the facilities in uplands, placing the water line in an already disturbed abandoned roadbed and locating the water intake structure underground, away from the Gibbon River to avoid impacting the stream.

Construction zones would be identified with construction tape, silt fencing, snow fencing, or some similar and appropriate 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 specifications and workers would be instructed to avoid conducting activities beyond the construction zone as defined by the construction zone fencing.

All trenching operations would follow park recommendations. These recommendations would minimize disturbance to soils and vegetation due to construction activities.

Areas for construction vehicles and equipment storage and turnarounds in the park would take advantage of previously disturbed areas.

During construction, standard erosion control precautions would be implemented. Sediment and other pollution will be controlled on site so that it does not enter nearby streams or creeks.

The park or contractor would develop a pollution prevention plan with the Wyoming Department of Environmental Quality under the National Pollution Discharge and Elimination System (NPDES) stormwater management program.

Equipment would not be serviced or refueled near streams; parking and staging areas would be at least 45 meters (150 feet) from streams or riparian areas. Fuel would be stored in fuel trucks or aboveground storage tanks, and all fuel storage would be in staging areas. Refueling would take place in staging areas. No chemicals would be used in dust abatement. Dust abatement would include watering of disturbed areas.

Water for construction/dust abatement would be pumped from surface waters at the Gibbon River. Water trucks and equipment used for water pumping would be cleaned according to Yellowstone National Park standards for preventing the spread of whirling disease and mud snails.

PROPOSED COMPENSATION

Because the total impact to wetlands from the project is less than 0.1 acres and the loss of wetland functions is minimal, wetland compensation is not required by either NPS Director's Order #77-1, or by the US Army Corps of Engineers. Post-construction site restoration work would, however, result in an on-site, in-kind restoration of all but 27 square feet of the wetland, where the intake structure extends above ground. The wetland vegetation and soils would be salvaged prior to construction and then placed back on the site following the installation of the intake structure and water line. The temporary impacts would be short-term and minor.

CONCLUSION

Although 0.02 hectares (0.049 acres) of wetlands would be impacted, this represents the minimum possible disturbance to carry out the National Park Service's responsibility for providing adequate and safe access within Yellowstone National Park. Because the total impact to wetlands from the project is less than 0.1 acres and the loss of wetland functions is minimal, wetland compensation is not required by either NPS Director's Order #77-1, or by the US Army Corps of Engineers. Post-construction site restoration work would, however, result in an on-site, in-kind restoration of all but 27 square feet of the wetland. We therefore find this project to be consistent with NPS procedures for complying with Executive Order 11990.

REFERENCES CITED

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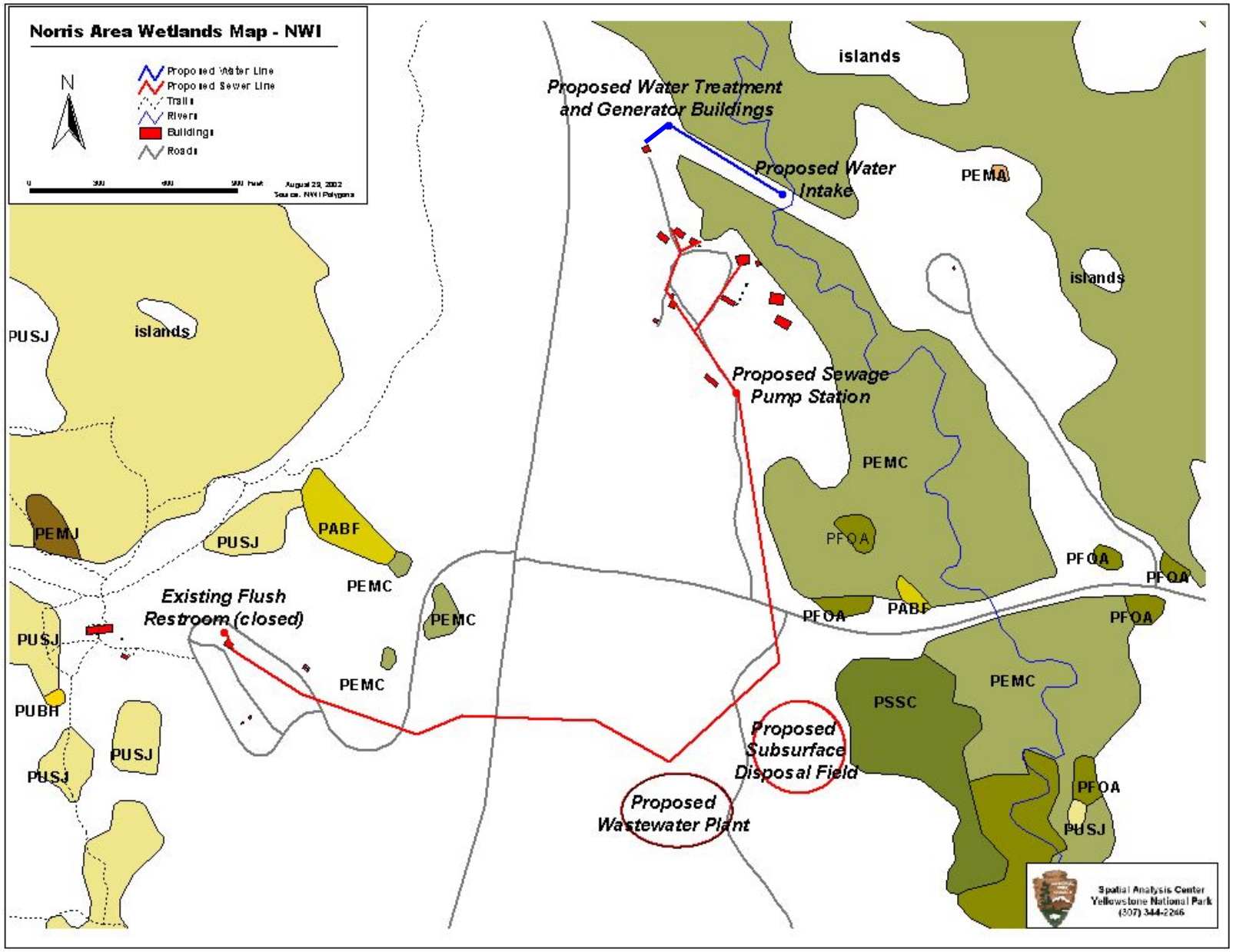
U. S. Army Corps of Engineers. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. U. S. Army Corps of Engineers, Vicksburg, MS.

Appendix D


Norris Area Wetlands Map - NWI
N
Proposed Water Line
Proposed Sewer Line
Trails
Rivers
Buildings
Roads
August 29, 2002
Source: NWI Polygons
Proposed Water Treatment and Generator Buildings
Proposed Water Intake
Proposed Sewage Pump Station
Existing Flush Restroom (closed)
Proposed Subsurface Disposal Field
Proposed Wastewater Plant
islands
PUSJ
PEMJ
PABF
PEMC
PFOA
PSSC
PUBH
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