# ENVIRONMENTAL ASSESSMENT
# FOR HYDROPOWER LICENSE

Gordon Butte Pumped Storage Project
FERC Project No. 13642-003

Montana

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, D.C.  20426

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| 71 Ranch | 71 Ranch LP |
| Advisory Council | Advisory Council on Historic Preservation |
| AIR | Additional Information Request |
| APE | Area of Potential Effect |
| BMP | best management practice |
| Gordon Butte Project or project | Gordon Butte Pumped Storage Project |
| °C | degrees Celsius |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| CPUE | catch per unit effort |
| Commission or FERC | Federal Energy Regulatory Commission |
| dB | decibels |
| dBA | A-weighted decibels |
| Deadman's Basin WUA | Deadman's Basin Water Users Association |
| District Court MRDP | Fourteenth District Court Musselshell River Distribution Project |
| Dust Plan | Construction Dust Control Plan |
| EA | Environmental Assessment |
| EPA | United States Environmental Protection Agency |
| ESA | Endangered Species Act |
| ESCP | Erosion and Sediment Control Plan |
| °F | degrees Fahrenheit |
| FHWA | Federal Highway Administration |
| FPA | Federal Power Act |
| FWS | United States Fish and Wildlife Service |
| GBEP or applicant | GB Energy Park, LLC |
| Hazardous Materials Plan | Hazardous Materials Containment and Fuel Storage Plan |
| IPaC | Information, Planning, and Conservation system |
| Interior | United States Department of the Interior |
| KOP | key observation point |
| kV | kilovolt |
| kW | kilowatt |
| MAAQS | Montana Ambient Air Quality Standards |
| Montana DEQ | Montana Department of Environmental Quality |
| Montana DNRC | Montana Department of Natural Resources and Conservation |
| Montana DFWP | Montana Department of Fish, Wildlife, and Parks |
| Montana NHP | Montana Natural Heritage Program |
| NAAQS | National Ambient Air Quality Standards |

| | |
|---|---|
| NERC | North American Electric Reliability Corporation |
| NWPP | Northwest Power Pool |
| msl | mean sea level |
| MW | megawatt |
| MWh | megawatt-hours |
| NEPA | National Environmental Policy Act |
| National Register | National Register of Historic Places |
| NHPA | National Historic Preservation Act |
| North Fork | North Fork Musselshell River |
| Montana SHPO | Montana State Historic Preservation Officer |
| SD1 | Scoping Document 1 |
| SD2 | Scoping Document 2 |
| South Fork | South Fork Musselshell River |
| SPCCP | Spill Prevention, Control, and Containment Plan |
| TMDL | Total Maximum Daily Load |
| Upper Musselshell WUA | Upper Musselshell Water Users Association |
| USGS | U.S. Geological Survey |

## EXECUTIVE SUMMARY

### Proposed Action

On October 1, 2015, GB Energy Park, LLC (GBEP or applicant) filed an application for a license to construct and operate its proposed Gordon Butte Pumped Storage Project (Gordon Butte Project or project). The closed-loop 400-megawatt (MW) project would be located approximately 3 miles west of the town of Martinsdale in Meagher County, Montana. The project would not occupy federal land.

### Existing Facilities to be utilized by the Project

The project would utilize several existing facilities currently owned and operated by 71 Ranch LP (71 Ranch) to provide flows or access to the project, but GBEP does not propose to include these features as licensed project facilities. These include: an existing diversion structure on Cottonwood Creek; a 5.5-mile-long, 4-foot-wide, 4-foot-deep earthen irrigation canal; a Parshall flume[1] within the irrigation canal to measure flow diversions from Cottonwood Creek; and a 3.89-mile-long access road.

### Proposed Project Facilities

The Gordon Butte Project would consist of a new upper and lower reservoir, three new dams, a conveyance system between the reservoirs, a powerhouse with generating/pumping facilities, a transmission line and two substations, and an access road to the lower reservoir. The 3,000-foot-long by 1,000-foot-wide upper reservoir[2] would be created by a 90-foot-high, 7,500-foot-long concrete faced rockfill dam built atop Gordon Butte. The upper reservoir would have a normal maximum pool elevation of 6,027 feet mean sea level (msl), an active storage capacity of 4,070 acre-feet, and a surface area of approximately 63 acres. A reinforced concrete combination intake/outlet structure located in the upper reservoir would connect to the powerhouse through a 738-

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[1] A Parshall flume is a fixed hydraulic structure developed to measure surface water flows. The flume contains an hourglass shape throat that creates a bottleneck and accelerates the flow as it enters before decelerating the flow as it exits the narrow throat. Based on the known configuration and dimensions of the flume, an operator can take a single depth reading in the flume inlet upstream of the throat to determine the flow rate through the flume.

[2] The upper reservoir would include a 250-foot-long emergency overflow spillway with a crest elevation of 6,029 feet msl and a maximum hydraulic capacity of 5,200 cfs. The spillway would discharge into a concrete stilling basin and riprap lined channel that would tie into existing natural drainage on the western side of Gordon Butte.

foot-long underground vertical shaft tunnel and a 3,000-foot-long underground concrete and steel-lined penstock tunnel.[3] A partially buried 338-foot-long, 109-foot-wide, 74-foot-high reinforced concrete and steel powerhouse would be constructed adjacent to the lower reservoir and contain four reversible pump-turbine units rated at 100 MW each for a total of 400 MW. Each turbine would discharge into the lower reservoir through 16-foot-wide, 11.54-foot-high closure gates. The 2,300-foot-long by 1,900-foot-wide lower reservoir would be created by a combination of excavation and two 60-foot-high, 500- and 750-foot-long concrete faced rockfill dams. The lower reservoir would have a normal maximum pool elevation of 5,057 feet msl, active storage capacity of 4,070 acre-feet, and surface area of approximately 88 acres. The lower reservoir would be located at the northern foot of Gordon Butte.

Water to initially fill the reservoirs (4,685 acre-feet) and to make-up for evaporative losses (approximately 500 acre-feet per year) would be supplied from Cottonwood Creek via 71-Ranch's existing irrigation system. GBEP proposes to install a trashrack and flow control gate or valve[4] at the terminus of the irrigation canal.[5] The gate or valve would connect to a 150-foot-long, 4-foot-diameter pipe that would carry flows to the lower reservoir.

GBEP proposes to construct a new 0.3-mile long lower reservoir access road from Montana Highway 294 to the lower reservoir. To access the upper reservoir, GBEP would use 71 Ranch's existing 3.89-mile-long access road running between Montana Highway 294 and an existing wind farm on Gordon Butte.

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[3] Both the penstock tunnel and the vertical shaft would be blasted through bedrock.

[4] GBEP states that 71 Ranch intends to replace the existing irrigation canal with a 3-foot-diameter buried pipe sometime in the future. If 71 Ranch does not replace the irrigation canal with a buried pipeline, GBEP would install a trashrack and 4-foot-wide by 4-foot-high slide gate at the connection between the irrigation canal and the new pipe feeding the lower reservoir. If 71 Ranch replaces the existing irrigation canal with a buried pipe, GBEP would install a 4-foot-diameter butterfly valve to control flow into the new pipe.

[5] GBEP also proposes, through an off-license agreement with 71 Ranch, to fund the construction and operation of a fish screen and bypass system on the irrigation canal near the diversion structure. The fish screen would exclude fish from entering the irrigation canal and return them via the bypass to Cottonwood Creek downstream of the diversion structure.

Power generated by the project would be transmitted from the powerhouse substation through a new overhead 5.7-mile-long, 230-kilovolt (kV) transmission line to a new 1,200-foot-wide, 1,450-foot-long substation, where power would be stepped up to 500-kV, and interconnect with an adjacent existing non-project 500-kV transmission line. The project is estimated to generate 1,300,000 megawatt-hours (MWh) annually.

**Proposed Operation**

The Gordon Butte Project would operate as a closed-loop pumped storage system. The project would pump water from the lower reservoir to the upper reservoir at times when energy is in excess or in low demand. When energy is needed, water would be released from the upper reservoir through the power tunnel to the powerhouse to generate electricity. This would occur based on on-peak/off-peak power considerations, the need to augment the production of local renewable wind power generation, or to provide ancillary power services.[6]

The proposed project is described in more detail in section 2.2.2, *Proposed Project Facilities* and section 2.2.4, *Proposed Project Operation*.

**Proposed Environmental Measures**

GBEP proposes the following environmental measures to protect aquatic, terrestrial, recreational, aesthetic, socioeconomic, and cultural resources and air quality:

*Geology and Soils Resources*

- revise, based on the final design of the project, the preliminary Erosion and Sediment Control Plan (ESCP) filed on January 19, 2016, to include site-specific best management practices to control erosion and storm water runoff during project construction;

*Aquatic Resources*

- develop a hazardous materials containment and fuel storage plan (hazardous materials plan) that defines procedures for the proper containment of hazardous substances during project construction and operation;

[6] Ancillary services help balance the transmission system as electricity is moved from generating sources to ultimate consumers, and are necessary for proper grid operation. Ancillary services include: load following, reactive power-voltage regulation, system protective services, loss compensation service, system control, load dispatch services, and energy imbalance services.

- develop a spill prevention, control, and containment plan (SPCCP) that defines procedures for the management and cleanup of hazardous substances during project construction and operation;

- monitor water quality in Cottonwood Creek prior to construction to establish baseline conditions and in the project reservoirs twice per year during project operation to monitor for changes in reservoir water quality over the license term;

- monitor project flow diversions from Cottonwood Creek using 71 Ranch's existing Parshall flume, restrict flow diversions from Cottonwood Creek to 50 cubic feet per second (cfs) or less, only withdraw water during initial fill and evaporation re-fills between April 15 and June 30 when flows are naturally high, and maintain a minimum flow of 16 cfs at the existing stream staff gage in Cottonwood Creek when filling the reservoirs to protect existing water uses and aquatic and riparian habitat downstream in Cottonwood Creek;

- document compliance with the proposed minimum flows in Cottonwood Creek by manually checking the gage once per day when filling the reservoir, adjusting the headgate to increase the flow in Cottonwood Creek or ceasing diversions if minimum flow levels cannot be met, and maintaining daily flow records and annually reporting flow records to Montana Department of Natural Resources and Conservation (Montana DNRC) by July 30 each year;[7]

- coordinate with water management entities administering diversions downstream of Cottonwood Creek[8] and adjust project flow diversions as needed to protect existing water uses in the South Fork and mainstem Musselshell River;

- implement the Box Car Spring Monitoring Program Plan filed on January 19, 2016, that includes monitoring flow and water quality in Box Car Spring prior to and during construction and for one year during initial project operation to monitor for project effects on the town of Martinsdale's water

[7] Records would include flow data for both the Parshall flume and downstream compliance gage.

[8] GBEP would coordinate with the Fourteenth District Court Musselshell Distribution Project, Upper Musselshell Water Users Association, and the Deadman's Basin Dam Water Users Association prior to and during project diversions.

supply,[9] and consulting with the Meagher County Commission to identify appropriate mitigation measures to protect the town's water supply, if warranted, based on the monitoring results;

*Terrestrial Resources*

- develop a vegetation management plan that defines best management practices to minimize disturbance to existing vegetation and wetlands during construction and to promptly revegetate disturbed areas to control erosion and protect wildlife habitat;

- revise, based on the final design of the project, the preliminary Noxious Weed Control Plan filed on February 29, 2016, to include site-specific measures for controlling and preventing the spread of noxious weeds during project construction and operation;

- prohibit grassland vegetation removal from April 15 to July 15 to protect migratory birds nesting in the following areas: reservoirs, lay-down areas, powerhouse, and access road;

- implement the following measures to protect and monitor the effects of construction and initial operation of the transmission line on birds:

    - maintain a 0.5-mile buffer between transmission-line construction activities and a bald eagle nest[10] located near where the transmission line crosses Cottonwood Creek during the February 1 to August 15 nesting period;

    - conduct a pre-construction survey of the transmission-line corridor to determine if eagle or other raptor (e.g., red-tailed hawks) nests are active and whether the juveniles have fledged, and if the surveys indicate that nests are active, then delay construction or implement additional protection measures;

    - design the transmission line to minimize the potential for avian electrocution;

[9] The plan does not specify which entities would receive the monitoring results.

[10] The occupied nest is located 0.4 mile from the transmission line alignment.

- install fixed daytime visual markers on the transmission line a half mile east and west of where the line crosses Cottonwood Creek to minimize collision hazards;

- monitor eagle nesting success and for any project-related effects (e.g., electrocution or collision) on any bald eagles nesting near the transmission line where it crosses Cottonwood Creek for two breeding seasons after completing construction, and report monitoring results to the U.S. Fish and Wildlife Service (FWS); and

- maintain a 0.5-mile buffer between any raptor nest and transmission line operation and maintenance activities, and replace transmission-line visual markers twice per year, as necessary, to protect bald eagles and other birds;

- monitor waterfowl and other migratory bird use of the project reservoirs during the spring and fall migration periods during project operation and report the monitoring results to Montana Department of Fish, Wildlife, and Parks (Montana DFWP) to document the number and species of birds using the reservoirs and any adverse effects due to project operation;

- install fencing around the project reservoirs and substations to prevent wildlife, project personnel, and the public from entering these areas where they could be at risk of drowning or electrocution;

*Cultural Resources*

- fence off culturally sensitive sites to avoid accidentally disturbing the sites during project construction;

- have an archaeologist onsite to monitor construction activities in areas that may yield previously unidentified cultural resources and implement procedures to protect any resources that are discovered during construction;

*Aesthetic Resources*

- construct the lower reservoir using topographic features to minimize visibility from Montana Highway 294 and landscape the lower reservoir saddle dam to blend with the natural terrain;

- utilize existing vegetation to screen views of the upper reservoir from motorists on Montana Highway 294 and avoid disturbing Gordon Butte's outermost ridgeline during construction to minimize visual impacts;

- use low-profile structures whenever possible to reduce visibility and site linear features to follow the edges of clearings where they will be less conspicuous;

- restore disturbed surfaces as closely as possible to their original contour and revegetate disturbed areas so they blend into the natural terrain;

- minimize the amount of construction and ground-disturbance needed for roads, staging areas, and crane pads by using existing roads and disturbed areas as much as possible and locating these structures outside of publicly accessible vantage points and visually sensitive areas;

- use colors and materials to blend project facilities with the surrounding landscape;

- revise, based on the final design of the project, the preliminary Construction Noise Mitigation Plan filed on January 19, 2016, to include site-specific measures for limiting noise during construction;

*Socioeconomic Resources*

- minimize effects on local infrastructure and services by developing a construction workforce management plan that includes provisions for: (1) developing a traffic management plan for Montana Highway 294, (2) providing bus service for project personnel, (3) staggering work shifts (i.e., day shifts between 7:00 AM and 5:30 PM and night shifts between 8PM and 6:30 AM) to ensure all of the crew buses and personnel vehicles are off of the roads prior to morning and afternoon school bus traffic, (4) restricting delivery times to limit truck traffic during school bus traffic times, (5) implementing alcohol and drug testing requirements for project personnel, and (6) providing on-site security;

*Air Quality*

- revise, based on the final design of the project, the preliminary Construction Dust Control Plan (Dust Plan) filed on January 19, 2016, to include site-specific dust control best management practices to maintain good air quality during construction.

**Alternatives Considered**

This environmental assessment (EA) considers the following alternatives: (1) GBEP's proposal, as outlined above; (2) GBEP's proposal with staff modifications (staff alternative); and (3) no action or license denial, meaning the project would not be constructed and there would be no change to the existing environment.

*Staff Alternative*

Under the staff alternative, the project would include GBEP's proposed environmental measures, as outlined above, with the exception of: (1) the water quality monitoring program, (2) coordinating with water management entities administering diversions downstream of Cottonwood Creek and adjusting project flow diversions as needed based on the coordination, (3) monitoring bird use of the project reservoirs over the term of the license; (4) implementing the Box Car Spring Monitoring Program Plan and (5) including drug and alcohol testing of project personnel in the proposed workforce management plan. We do not recommend these measures because their environmental benefits would not be worth their costs or they relate to matters outside of the Commission's jurisdiction.

The staff alternative also includes the following modifications to GBEP's proposal and additional measures:

- modify the proposed project boundary to enclose the existing diversion structure on Cottonwood Creek, irrigation canal leading from the diversion structure to the lower reservoir site, Parshall flume in the irrigation canal, and access road leading to the upper reservoir site;

- develop a detailed spoil disposal plan that includes a map identifying the proposed permanent spoil disposal sites, and measures to stabilize and prevent soil erosion and the spread of noxious weeds;

- develop an operation compliance monitoring plan in consultation with Montana DFWP and Montana DNRC that includes: (a) specific calibration procedures for the Cottonwood Creek minimum-flow compliance gage; (b) procedures for monitoring and documenting compliance with the proposed restrictions on project flow diversions, including a description of monitoring locations, equipment or measuring devices, methods, frequency of recording, quality assurance and quality control, and calibration procedures; and (c) a schedule for reporting to the Commission any deviations from the proposed Cottonwood Creek minimum flows and restrictions on project flow diversions;

- apply the measures included in the proposed vegetation management plan and the Noxious Weed Control Plan to the diversion structure, irrigation canal, and upper reservoir access road, and include in the plans the following additional measures: (a) monitoring protocols, (b) performance criteria to measure the success of revegetation and noxious weed control effort, (c) reporting requirements, and (d) an implementation schedule; and

- install perch deterrents on the crossarms of the transmission towers to prevent increased predation of small mammals and other wildlife by raptors.

*No Action Alternative*

Under the no-action alternative, the project would not be built, environmental resources in the project area would not be affected, and the renewable energy that would be produced by the project would not be developed.

**Public Involvement and Areas of Concern**

Before filing its license application, GBEP conducted pre-filing consultation under the traditional licensing process. The intent of the Commission's pre-filing process is to initiate public involvement early in the project planning process and encourage citizens, governmental entities, tribes, and other interested parties to identify and resolve issues prior to an application being formally filed with the Commission. After the application was filed, we conducted scoping to determine what issues and alternatives should be addressed. We issued an initial scoping document on May 21, 2014; and conducted scoping meetings in Helena and Martinsdale, Montana on June 25, 2014. Based on discussions during the scoping meetings and written comments received during the comment period, we issued a revised scoping document on August 22, 2014.

On February, 4, 2016, we issued a notice that the application was ready for environmental analysis and requested terms and conditions, comments, and recommendations for the project.

The primary issues associated with licensing the Gordon Butte Project are erosion control, minimum instream flows and protecting existing water uses, revegetation of disturbed areas, noxious weed control, protection of avian resources, water quantity and quality of springs feeding the town of Martinsdale's water supply, and socioeconomic effects on Martinsdale residents.

**Environmental Impacts and Measures of the Staff Alternative**

*Geology and Soils*

Project construction would require vegetation clearing and excavation, and would produce up to 12.8 million cubic yards of spoil requiring disposal. Given the relatively dry and windy climate, exposed soils would primarily be subject to windborne erosion although some potential exists for erosion during periodic rain events. Revising GBEP's preliminary ESCP and Dust Plan based on site-specific conditions developed during the final project design would ensure soil stabilization measures are appropriately designed to minimize soil erosion and sedimentation. GBEP has not finalized its plans for spoil disposal. Staff's recommended spoil disposal plan would define the measures needed to ensure that spoil is properly disposed of or stabilized on-site.

*Aquatic Resources*

Construction of the proposed project would require the use of an assortment of heavy equipment. This equipment would require gasoline or diesel fuel, motor oil, and hydraulic fluid. On-site fuel storage facilities for a project of this type commonly are in the range of several hundred to several thousand gallons of fuel. GBEP's proposal to develop a hazardous materials plan and an SPCCP with specific procedures for handling and storing hazardous substances and containing and responding to unintentional spills would minimize the potential for any hazardous substances to enter any existing water bodies, the project reservoirs, or groundwater during project construction and operation.

Under existing conditions, Cottonwood Creek is heavily diverted at times during the irrigation season (i.e., mid-May through September) resulting in severe low flows and occasional dewatering of the creek, particularly during the late summer and early fall months following the peak spring snowmelt period. Project diversions would result in an additional consumptive use of Cottonwood Creek streamflow. However, the effects of project flow diversions on streamflow within Cottonwood Creek would be minimized by GBEP's proposals to restrict diversions to the period of April 15 to June 30 when Cottonwood Creek flows are naturally at their highest levels of the year, and to maintain a 16-cfs minimum flow in lower Cottonwood Creek whenever the project is diverting water for project purposes. These measures would ensure sufficient flows are available to protect existing water uses and aquatic and riparian habitat downstream of the diversion.

GBEP's proposal to monitor minimum flows with an existing staff gage installed in Cottonwood Creek would likely be sufficient for minimum flow compliance monitoring; however, additional flow monitoring equipment may be needed in the irrigation canal to document compliance with the proposed restrictions on flow diversions to fill the project reservoirs. Staff's recommended operation compliance monitoring plan would define the procedures and equipment that would be used to document compliance with these restrictions during reservoir filling to ensure aquatic resources and downstream water uses are protected.

Although unlikely, constructing the power tunnel and powerhouse could result in a short-term decrease or interruption in groundwater flow or degradation in water quality from Box Car Spring. Altering flows and the water quality from the spring would adversely affect one of the two sources of potable water for the town of Martinsdale.

However, once the project is built, groundwater discharge and water quality from the spring is expected to return to levels similar to current conditions.

As currently happens when 71 Ranch diverts Cottonwood Creek flows for livestock watering or irrigation, some fish are likely to be entrained into the irrigation canal during reservoir filling and would be lost from the Cottonwood Creek population.

*Terrestrial Resources*

Approximately 371.7 acres of land would be affected by construction and operation of the project. About 177 acres would be permanently converted to project features. Approximately 194.7 acres would be temporarily affected during project construction. Most of the project facilities would be constructed within grassland habitats, with the exception of the transmission line which would cross the riparian corridor of Cottonwood Creek. Construction of the upper reservoir site would result in the permanent loss of high quality grassland habitats near Gordon Butte; grassland habitats where the lower reservoir, substation, powerhouse, and access roads would be located are much lower quality because they are largely pasture and rangeland, which are less productive. GBEP's proposals to avoid clearing vegetation in grassland habitats from April 15 to July 15 would protect nesting migratory grassland birds.

Developing site-specific vegetation and noxious weed control plans as proposed by GBEP with staff's recommended monitoring and performance criteria would better ensure that the proposed revegetation and noxious weed control measures are successful. Applying the measures to the diversion structure, irrigation canal, and upper reservoir access road as recommended by staff would protect all lands affected by project construction and operation.

The proposed transmission line would cross Cottonwood Creek and its riparian corridor, which provides important nesting habitat for bald eagles and other raptors. GBEP's proposed avian protection measures would minimize disturbance to nesting bald eagles and other raptors, and minimize potential avian electrocution and collision hazards. Staff's recommendation to install perch deterrents reduces the potential for increased predation of small mammals.

*Threatened and Endangered Species*

One federally listed species (Canada lynx) and one species proposed for listing (North American wolverine) may occur in the project area, according to FWS.

Project construction and operation would not affect the federally threatened Canada lynx because the project area does not contain suitable habitat for it or the snowshoe hare, which is its primary prey. Project construction and operation would also not jeopardize the continued existence of the North American wolverine as the project area lacks suitable habitat for this species.

*Recreation and Land Use*

The area within and immediately adjacent to the proposed project site is used primarily for pasture and crop production. Recreational use is primarily limited to outfitter-guided hunters on private lands in the project vicinity. No developed recreational facilities exist close to the project and none are proposed due to the large reservoir fluctuations associated with project operation. Construction activities would temporarily create dust, noise, and traffic that could be noticed by recreationists, outfitters, and local residents. GBEP's proposed Dust Plan and Construction Noise Mitigation Plan would minimize dust and noise impacts, while its proposal to develop a construction workforce management plan would include measures to minimize traffic and congestion during construction. Although construction activities might disturb wildlife and disrupt hunting opportunities during the 3-year construction period, existing hunting opportunities should resume during the operation phase because most project personnel would leave the site, construction noise would be eliminated, and project facilities would only occupy a small area of land that is used by wildlife.

*Cultural Resources*

The project site is located within the traditional territory of the Crow Nation. No known traditional cultural properties are located within the project's Area of Potential Effect. However, GBEP's archeological field survey found eleven new cultural resource properties in addition to an already discovered site, and six new isolated finds. Of these sites, twelve were found to be ineligible for listing on the National Register of Historic Places (National Register) and six have an unresolved status. The six properties with unresolved National Register status could be affected by project construction. GBEP's proposal to follow the Montana State Historic Preservation Officer's (Montana SHPO) recommendation to fence off these areas and avoid them during construction would ensure that these resources are protected. GBEP's proposal to have an on-site archeologist to monitor construction activities in areas where cultural resources are likely to be found along the transmission line route, as recommended by the Montana SHPO, would ensure that any resources that might be discovered in this area during the construction period are adequately identified and appropriate steps are taken to protect them.

*Aesthetic Resources*

Portions of the proposed upper and lower reservoirs would be visible from Montana Highway 294, which runs adjacent to the northern boundary of the project site, and also from Cottonwood Creek Road which runs by part of the proposed transmission line route and switchyard. Because traffic on Montana Highway 294 and recreational use in the immediate project area is light, project-induced changes to the landscape would result in a minor visual impact. GBEP's proposals to construct project facilities so they are either screened by, or blend in with, the surrounding environment, revegetate disturbed areas, locate construction areas and equipment out of public view as much as possible, and limit the amount of construction-related ground disturbance would further minimize visual impacts from project facilities and construction activities. Revising the preliminary Construction Noise Mitigation Plan after final design of the project would enable GBEP to incorporate the final design and construction schedule for the project, thereby maximizing the plan's effectiveness at limiting noise impacts during construction.

*Socioeconomic Resources*

During the 3-year construction period, the labor force would vary from 100 to 300 workers at any given time. Most workers, however, would be local and only about a 5 percent increase in Meagher County's population is expected during the construction period. Therefore, no adverse effect on housing or services in the county is expected. Once operational, the project would result in a 3 percent increase in the population of Meagher County, which is not expected to have an adverse effect on the resident population. Job opportunities created from constructing the project would benefit the local economy by creating an expected $95 million in direct and indirect revenue. Project operation would create an estimated 15 high-paying jobs which would also benefit the local economy. GBEP's workforce management plan, which has specific measures to reduce traffic congestion during construction, including staggering work shifts, encouraging carpooling, providing transportation for employees, and limiting delivery times, would minimize any adverse impact on area roads during this time period.

*Air Quality*

Construction activities would generate emissions from heavy equipment and produce dust. However, GBEP's proposed ESCP and Dust Plan would limit dust production and minimize effects to air quality during construction and operation.

**Conclusions**

Based on our analysis, we recommend licensing the project under the staff alternative.

In section 4.2 of the EA, we estimate the likely cost of alternative power for each of the two action alternatives identified above. Our analysis shows that during the first year of operation under the applicant's proposal, project power would cost $47,299,773, or $36.38/ MWh, less than the likely alternative cost of power. Under the staff alternative, project power would cost $47,310,138, or $36.39/MWh, less than the likely alternative cost of power.

We chose the staff alternative as the preferred alternative because: (1) the project would provide a dependable source of electrical energy for the region (1,300,000 MWh annually); (2) the 400 MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution; and (3) the recommended environmental measures would adequately protect and enhance environmental resources affected by the project. The overall benefits of the staff alternative would be worth the cost of the proposed and recommended environmental measures.

We conclude that issuing an original license for the project with the environmental measures we recommend would not be a major federal action significantly affecting the quality of the human environment.

**ENVIRONMENTAL ASSESSMENT**

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, D.C. 20426

**Gordon Butte Pumped Storage Project**
**FERC No. 13642-003 – Montana**

# 1.0 INTRODUCTION

## 1.1 APPLICATION

On October 1, 2015, GB Energy Park, LLC (GBEP or applicant) filed an application for an original major license to construct and operate its proposed 400-megawatt (MW) Gordon Butte Pumped Storage Project (Gordon Butte Project or project).[11]

The project would be located in Meagher County, Montana, approximately 3 miles west of the town of Martinsdale (figure 1), The closed-loop pumped storage project would utilize an existing diversion structure on Cottonwood Creek, irrigation canal, and Parshall flume owned and operated by 71 Ranch LP (71 Ranch) to provide water for reservoir filling. The proposed project would consist of constructing an upper and lower reservoir, three dams, a powerhouse, power tunnel, two substations, transmission line, access road, and appurtenant facilities. The project would not occupy federal land. The average annual generation of the project would be 1,300,000 megawatt-hours (MWh) of energy annually.

[11] GBEP originally filed their license application on October 1, 2015. However, shortly after filing their license application, GBEP informed the Commission that it wanted to re-characterize certain information contained in Exhibit B as privileged information. The Commission did not object to the applicant's request and thus, GBEP refiled their license application with both a public and privileged version of Exhibit B on October 15, 2015.


Figure 1. Location of the Gordon Butte Pumped Storage Project (Source: staff).

## 1.2 PURPOSE OF ACTION AND NEED FOR POWER

### 1.2.1 Purpose of Action

The purpose of the proposed Gordon Butte Project is to provide a new source of hydroelectric power and provide ancillary services to the electrical grid. Therefore, under the provision of the Federal Power Act (FPA), the Federal Energy Regulatory Commission (Commission or FERC) must decide whether to issue a license to GBEP for the project and what conditions should be placed on any license issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (such as flood control, irrigation, or water supply), the Commission must give equal consideration to the purposes of: (1) energy conservation; (2) the protection of, mitigation of damage to, and enhancement of fish and wildlife resources; (3) the protection of recreational opportunities; and (4) the preservation of other aspects of environmental quality.

Issuing an original license for the Gordon Butte Project would allow GBEP to generate electricity at the project for the term of the license, making electrical power from a renewable resource available to the public.

This environmental assessment (EA) assesses the effects associated with construction and operation of the project and alternatives to the proposed project, and makes recommendations to the Commission on whether to issue a license, and if so, recommends terms and conditions to become a part of any license issued.

In this EA, we assess the environmental and economic effects of construction and operation of the project: (1) as proposed by GBEP; and (2) with our recommended modifications and additional measures. We also consider the effects of the no-action alternative. Important issues that are addressed include the protection of soils, aquatic, terrestrial, recreation, cultural, aesthetic, and socioeconomic resources and air quality during project construction and operation.

### 1.2.2 Need for Power

The Gordon Butte Pumped Storage Project would provide hydroelectric generation to meet part of Montana's power requirements, resource diversity, and capacity needs. The project would have an installed capacity of 400 MW and generate approximately 1,300,000 MWh per year.

The North American Electric Reliability Corporation (NERC) annually forecasts electrical supply and demand nationally and regionally for a 10-year period. The project is located within the jurisdiction of the Northwest Power Pool, United States area (NWPP), a sub-region of the Western Electricity Coordinating Council, a region of the NERC. According to NERC's 2015 forecast, average annual total internal demand requirements for the NWPP sub-region are projected to grow at a rate of 0.8 percent from 2016 through 2025. NERC projects anticipated reserve capacity margins (generating capacity in excess of demand) will range between 34.2 percent and 20.2 percent of firm peak demand during the 10-year forecast period, including estimated new capacity additions. Over the next 10 years, NERC estimates that plant retirements will outpace additional capacity being brought online, resulting in about 2,200 MW less capacity over the analysis period.

We conclude that power from the Gordon Butte Project would help meet a need for power in the NWPP region in both the short and long-term. The project would provide power that would displace non-renewable, fossil-fired generation and contribute to a diversified generation mix. Displacing the operation of non-renewable facilities may avoid some power plant emissions, thus creating an environmental benefit.

## 1.3 STATUTORY AND REGULATORY REQUIREMENTS

### 1.3.1 Federal Power Act

A license for the Gordon Butte Project is subject to requirements under the FPA and other applicable statutes. The major regulatory and statutory requirements are described below.

#### 1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of the U.S. Department of Commerce or the U.S. Department of the Interior (Interior). Interior, by letter filed on April 1, 2016, requests a reservation of authority to prescribe fishways under section 18 of the FPA.

#### 1.3.1.2 Section 10(j) Recommendations

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

No section 10(j) recommendations were filed for the Gordon Butte Project.

### 1.3.2 Clean Water Act

Under section 401 of the Clean Water Act, a license applicant must obtain either water quality certification (certification) from the appropriate state pollution control agency verifying that any discharge from a project would comply with applicable provisions of the Clean Water Act or a waiver of certification by the appropriate state agency. On October 6, 2014, GBEP requested confirmation from Montana Department of Environmental Quality (Montana DEQ) that a section 401 certification would not be needed for the Gordon Butte Project. Montana DEQ concurred with this finding in a letter dated October 15, 2014.[12] GBEP submitted Montana DEQ's letter with its license application as proof that the certification requirement had been waived for the Gordon Butte Project.

### 1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species.

On July 29, 2016, staff accessed the U.S. Fish and Wildlife Service's (FWS) Information, Planning, and Conservation System (IPaC) website to determine federally listed species that occur in the project vicinity. According to the IPaC database, the only federally listed species that may occur in the project area is the threatened Canada lynx (*Lynx canadensis*) The IPaC website also identified one proposed threatened species, North American wolverine (*Gulo gulo luscus*), as potentially occurring in the project area.

There are no proposed or designated critical habitats for either species in the project area.

Our analysis of project impacts on threatened and endangered species is presented in section 3.3.4, *Threatened and Endangered Species*. We conclude that licensing the Gordon Butte Project, as proposed with staff-recommended measures, would have no effect on the Canada lynx, and would not jeopardize the continued existence of the North American wolverine.

### 1.3.4 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

On September 6, 2013, the Commission designated GBEP as a non-federal representative for the purpose of conducting section 106 consultation under the NHPA. Pursuant to section 106, and as the Commission's designated non-federal representative,

[12] *See* Appendix 2 of GBEP's license application (GBEP, 2015b).

GBEP consulted with the Montana State Historic Preservation Officer (Montana SHPO) and affected Indian tribes to locate, determine National Register eligibility, and assess potential adverse effects on historic properties associated with the proposed project. The results of the applicant's cultural resources investigations found that no historic properties would be affected by the project. GBEP and the Commission also consulted with the Crow Nation tribe, and no specific concerns about the projects effects on such sites were identified. In a letter dated January 16, 2015, and filed on October 15, 2015, the Montana SHPO concurred with GBEP's findings and ultimately concluded that no historic properties would be affected by the federal licensing action. Commission staff concurs with this finding; therefore, the section 106 process has been completed.

## 1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 Code of Federal Regulations [CFR], section 4.38) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, ESA, the NHPA, and other federal statutes. Pre-filing consultation must be complete and documented according to the Commission's regulations.

### 1.4.1 Scoping

Before preparing this EA, we conducted scoping to determine what issues and alternatives should be addressed. The Commission issued a scoping document (SD1) on May 21, 2014. The document was noticed in the Federal Register on May 21, 2014. Scoping meetings were held in Helena and Martinsdale, Montana on June 25, 2014, to request oral comments on the project. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of the Commission's public record for the project. In addition to comments provided at the scoping meetings, the following entities provided written comments and letters of support for the project:

| Commenting Entities | Date Filed |
|---|---|
| John E. Walsh, U.S. Senate | March 4, 2014 |
| Montana Governor's Office of Economic Development | March 4, 2014 |
| Errol T. Galt | March 26, 2014 |
| The Commissioners of Meagher County, Montana | March 31, 2014 |
| Kerry LaDuke | March 31, 2014 |
| Sharon LaDuke | March 31, 2014 |
| Montana Department of Fish, Wildlife, and Parks (Montana DFWP) | March 31, 2014 |
| Montana Department of Natural Resources and Conservation (Montana DNRC) | March 31, 2014 |

A revised scoping document (SD2), addressing these comments, was issued on August 22, 2014.

### 1.4.2 Interventions

On November 16, 2015, the Commission issued a notice that GBEP had filed an application for an original license for the Gordon Butte Project. This notice set January 15, 2016, as the deadline for filing protests and motions to intervene.

No entity filed motions to intervene or protests for the proposed Gordon Butte Project.

### 1.4.3 Comments on the License Application

A notice requesting comments, recommendations, terms and conditions, and prescriptions was issued on February 4, 2016. On February 4, 2016, K.G.H Nicholes filed a letter commenting on the application. On February 28, 2016, Rod Gwaltney filed a letter commenting on the application. On April 1, 2016, Interior filed a letter stating its request to reserve authority to prescribe fishways at the project under section 18 of the FPA but did not provide any additional comments or recommendations. GBEP did not file reply comments.

# 2.0 PROPOSED ACTION AND ALTERNATIVES

## 2.1 NO-ACTION ALTERNATIVE

The no-action alternative is license denial. Under the no-action alternative, the project would not be built and environmental resources in the project area would not be affected, and the renewable energy that would be produced by the project would not be developed.

## 2.2 APPLICANT'S PROPOSAL

### 2.2.1 Existing Facilities to be utilized by the Project

The project would utilize several facilities currently owned and operated by 71 Ranch to provide flows or access to the project, but GBEP does not propose to include these features as licensed project facilities. These include: an existing diversion structure on Cottonwood Creek; a 5.5-mile-long,[13] 4-foot-wide, 4-foot-deep earthen irrigation canal; a Parshall flume[14] for monitoring diversion flows within the irrigation canal; and a 3.89-mile-long access road that leads to the proposed upper reservoir site.

### 2.2.2 Proposed Project Facilities

The proposed Gordon Butte Project would consist of a new upper and lower reservoir, three new dams, a conveyance system between the reservoirs, a powerhouse with generating/pumping facilities, a transmission line and two substations, and an access road to the lower reservoir (figure 2). The 3,000-foot-long by 1,000-foot-wide upper reservoir[15] would be created by a 90-foot-high, 7,500-foot-long concrete faced rockfill dam atop Gordon Butte. The upper reservoir would have a normal maximum pool elevation of 6,027 feet mean sea level (msl), active storage capacity of 4,070 acre-feet, and surface area of approximately 63 acres. A reinforced concrete combination intake/outlet structure located in the upper reservoir would connect to the powerhouse through a 738-foot-long underground vertical shaft tunnel and a 3,000-foot-long underground concrete and steel-lined penstock tunnel.[16] A partially buried 338-foot-long, 109-foot-wide, 74-foot-high reinforced concrete and steel powerhouse would be constructed adjacent to the lower reservoir and contain four reversible pump-turbine units rated at 100 MW each for a total of 400 MW. Each turbine would discharge into the lower reservoir through 16-foot-wide, 11.54-foot-high closure gates. The 2,300-foot-long by 1,900-foot-wide lower reservoir would be created by a combination of excavation and two 60-foot-high, 500- and 750-foot-long concrete faced rockfill dams. The lower reservoir would have a normal maximum pool elevation of 5,057 feet msl,

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[13] This length was determined by staff based on publicly available geographic data. GBEP states that the existing canal is approximately 3 to 4 miles long.

[14] A Parshall flume is a fixed hydraulic structure developed to measure surface water flows. The flume contains an hourglass shape throat that creates a bottleneck and accelerates the flow as it enters before decelerating the flow as it exits the narrow throat. Based on the known configuration and dimensions of the flume, an operator can take a single depth reading in the flume inlet upstream of the throat to determine the flow rate through the flume.

[15] The upper reservoir would include a 250-foot-long emergency overflow spillway with a crest elevation of 6,029 feet msl and a maximum hydraulic capacity of 5,200 cfs. The spillway would discharge into a concrete stilling basin and riprap lined channel that would tie into existing natural drainage on the western side of Gordon Butte.

[16] Both the penstock tunnel and the vertical shaft would be blasted through bedrock.

active storage capacity of 4,070 acre-feet, and surface area of approximately 88 acres. The lower reservoir would be located at the northern foot of Gordon Butte.

Water to initially fill the reservoirs (4,685 acre-feet) and make-up for evaporative losses (approximately 500 acre-feet per year) would be supplied from Cottonwood Creek via 71-Ranch's existing irrigation system. GBEP proposes to install a trashrack and flow control gate or valve[17] at the terminus of the irrigation canal.[18] The gate or valve would connect to a 150-foot-long, 4-foot-diameter pipe that would discharge flows to the lower reservoir.

GBEP proposes to construct a new 0.3-mile long lower reservoir access road from Montana Highway 294 to the lower reservoir. To access the upper reservoir, GBEP would use 71 Ranch's existing 3.89-mile-long access road running between Montana Highway 294 and an existing wind farm on Gordon Butte.

Power generated by the project would be transmitted from the powerhouse substation through a new overhead 5.7-mile-long, 230-kilovolt (kV) transmission line to a new 1,200-foot-wide, 1,450-foot-long substation, where power would be stepped up to 500-kV, and interconnect with an adjacent existing non-project 500-kV transmission line. The project is estimated to generate 1,300,000 MWh annually.

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[17] GBEP states that 71 Ranch intends to replace the existing irrigation canal with a 3-foot-diameter buried pipe sometime in the future. If 71 Ranch does not replace the irrigation canal with a buried pipe, GBEP would install a trashrack and 4-foot-wide by 4-foot-high slide gate at the connection between the irrigation canal and the new pipe feeding the lower reservoir. If 71 Ranch replaces the existing irrigation canal with a buried pipe, GBEP would install a 4-foot-diameter butterfly valve to control flow into the new pipe.

[18] GBEP also proposes, through an off-license agreement with 71 Ranch, to fund the construction and operation of a fish screen and bypass system on the irrigation canal near the diversion structure. The fish screen would exclude fish from entering the irrigation canal and return them via the bypass to Cottonwood Creek downstream of the diversion structure.

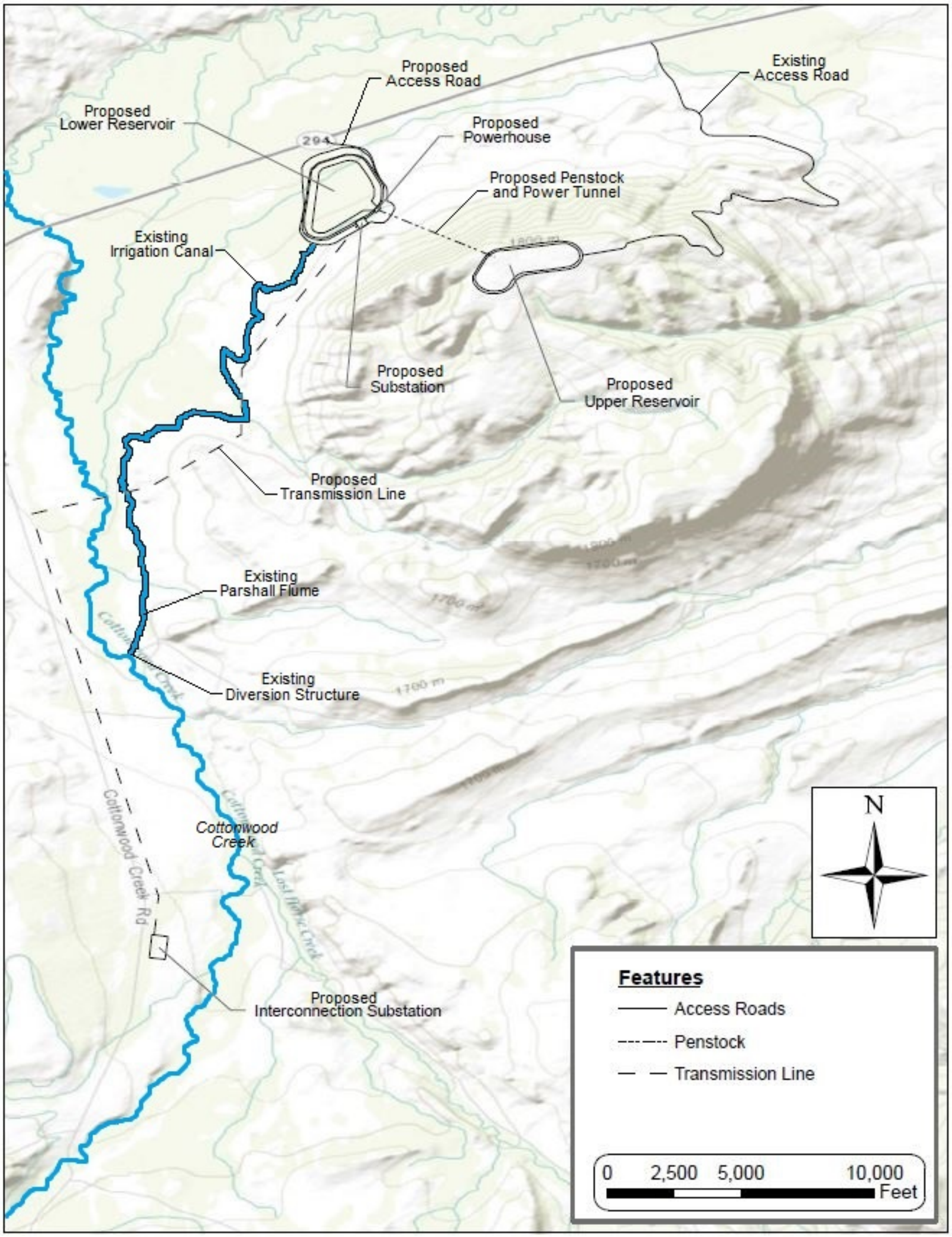


Figure 2. Configuration of Existing Facilities and Proposed Project Facilities for the Gordon Butte Pumped Storage Project (Source: staff).

### 2.2.3 Proposed Project Boundary

The proposed project boundary would encompass 380 acres of private land owned by 71 Ranch and would include the new project facilities listed in section 2.2.2, but would not include the existing facilities currently owned and operated by 71 Ranch listed in section 2.2.1.

### 2.2.3 Project Safety

As part of the licensing process, the Commission would review the adequacy of the proposed project facilities. Special articles would be included in any license issued, as appropriate. Commission staff would inspect the licensed project both during and after construction. Inspection during construction would concentrate on adherence to Commission-approved plans and specifications, special license articles relating to construction, and accepted engineering practices and procedures. Operational inspections would focus on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance.

### 2.2.4 Proposed Project Operation

The Gordon Butte Project would operate as a closed-loop pumped storage system. The project would pump water from the lower reservoir to the upper reservoir at times when energy is in excess or in low demand. When energy is needed, water would be released from the upper reservoir through the power tunnel to the powerhouse to generate electricity. This would occur based on on-peak/off-peak power considerations, the need to augment the production of local renewable wind power generation, or to provide ancillary power services.[19].

The 4,000 acre-feet of water to be cycled back and forth between the reservoirs would allow for an estimated 8.5 hours of energy generation at continuous maximum discharge. During normal operation, the lower reservoir would maintain a minimum pool volume of 442 acre-feet during pumping while the upper reservoir would maintain a minimum pool volume of 243 acre-feet during generation. Therefore, at least 4,685 acre-feet of water would be needed for GBEP to generate at maximum capacity under normal

[19] Ancillary services help balance the transmission system as electricity is moved from generating sources to ultimate consumers, and are necessary for proper grid operation. Ancillary services include: load following, reactive power-voltage regulation, system protective services, loss compensation service, system control, load dispatch services, and energy imbalance services.

operation. Maximum hydraulic capacity ranges from 1,376 to 5,845 cubic feet per second (cfs) for one to four generating turbines, respectively, and 1,230 to 4,640 cfs for one to four operating pumps, respectively.

### 2.2.5 Proposed Environmental Measures

GBEP proposes the following environmental measures to protect aquatic, terrestrial, recreational, aesthetic, socioeconomic, and cultural resources and air quality:

*Geology and Soils Resources*

- revise, based on the final design of the project, the preliminary Erosion and Sediment Control Plan (ESCP) filed on January 19, 2016, to include site-specific best management practices (BMPs) to control erosion and storm water runoff during project construction;

*Aquatic Resources*

- develop a hazardous materials containment and fuel storage plan (hazardous materials plan) that defines procedures for the proper containment of hazardous substances during project construction and operation;

- develop a spill prevention, control, and containment plan (SPCCP) that defines procedures for the management and cleanup of hazardous substances during project construction and operation;

- monitor water quality in Cottonwood Creek prior to construction to establish baseline conditions, and in the project reservoirs twice per year during project operation to monitor for changes in reservoir water quality over the license term;

- monitor project flow diversions from Cottonwood Creek using 71 Ranch's existing Parshall flume, restrict flow diversions from Cottonwood Creek to 50 cfs or less, only withdraw water during the initial fill and evaporation re-fills between April 15 and June 30 when flows are naturally high, and maintain a minimum flow of 16 cfs at the existing stream staff gage in Cottonwood Creek when filling the reservoirs to protect existing water uses and aquatic and riparian habitat downstream in Cottonwood Creek;

- document compliance with the proposed minimum flows in Cottonwood Creek by manually checking the gage once per day when filling the reservoir, adjusting the headgate to increase the flow in Cottonwood Creek or ceasing diversions if minimum flow levels cannot be met, and maintaining daily flow records and annually reporting flow records to Montana DNRC by July 30 each year;[20]

- coordinate with water management entities administering diversions downstream of Cottonwood Creek,[21] maintain minimum flows at one existing United States Geological Survey (USGS) gage on the South Fork Musselshell River (South Fork) and three existing USGS gages on the mainstem Musselshell River, and adjust project flow diversions as needed to protect existing water uses in the South Fork and mainstem Musselshell River;[22]

- implement the Box Car Spring Monitoring Program Plan filed on January 19, 2016, that includes monitoring flow and water quality in Box Car Spring prior to and during construction and for one year during initial project operation to monitor for project effects on the town of Martinsdale's water

[20] Records would include flow data for both the Parshall flume and Cottonwood Creek compliance gage.

[21] The applicant would coordinate with the District Court Musselshell River Distribution Project (District Court MRDP), Upper Musselshell Water User Association (Upper Musselshell WUA), and Deadman's Basin Water User Association (Deadman's Basin WUA) prior to and during diversions.

[22] While diverting water from Cottonwood Creek for project purposes, GBEP proposes to maintain minimum flows in the South Fork and mainstem Musselshell River as specified in their existing water right permit. The water right specifies that GBEP monitor flows in the South Fork at the existing USGS gage (gage 06118500) located upstream of the diversion for Martinsdale Reservoir. When Martinsdale Reservoir is being filled, GBEP would maintain minimum flows in the South Fork at the following levels: 602 cfs from April 15 through April 27, 603 cfs from April 28 through April 30, 660 cfs from May 1 through May 31, and 664 cfs from June 1 through June 30. Alternatively, if GBEP receives confirmation from the Upper Musselshell WUA that Martinsdale Reservoir is not being filled, then GBEP would maintain minimum flows in the South Fork at the following levels: 194 cfs from April 15 through April 27, 195 cfs from April 28 through April 30, 252 cfs from May 1 through May 31, and 256 cfs from June 1 through June 30. The water right also specifies that a minimum flow of 80 cfs be maintained at three different USGS gages located on the mainstem Musselshell River near Martinsdale (gage 06119600), at Harlowton (gage 06120500), and near Shawmut, Montana (gage 06123030). If these minimum flow levels are not met, GBEP would adjust the headgate at the diversion to increase the flow in Cottonwood Creek. *See* Appendix 7 of GBEP's license application for more details.

supply,[23] and consulting with the Meagher County Commission to identify appropriate mitigation measures to protect the town's water supply, if warranted, based on the monitoring results;

*Terrestrial Resources*

- develop a vegetation management plan that defines BMPs to minimize disturbance to existing vegetation and wetlands during construction and to promptly revegetate disturbed areas to control erosion and protect wildlife habitat;

- revise, based on the final design of the project, the preliminary Noxious Weed Control Plan filed on February 29, 2016, to include site-specific measures for controlling and preventing infestations in the project area that are at high-risk for spreading during construction, such as cleaning equipment to remove weed seeds or plant parts prior to entering the project site, training personnel in the identification of noxious weeds, inspecting construction materials at their source to ensure they are weed-free, and revegetating areas disturbed by construction as soon as possible;

- prohibit grassland vegetation removal from April 15 to July 15 to protect migratory birds nesting in the following areas: reservoirs, lay-down areas, powerhouse, and access road;

- implement the following measures to protect and monitor the effects of construction and initial operation of the transmission line on birds:

    - maintain a 0.5-mile buffer between transmission-line construction activities and a bald eagle nest[24] located near where the transmission line crosses Cottonwood Creek during the February 1 to August 15 nesting period;

    - conduct a pre-construction survey of the transmission-line corridor to determine if eagle or other raptor (e.g., red-tailed hawks) nests are active and whether the juveniles have fledged, and if the surveys indicate that nests are active, then delay construction or implement additional protection measures;

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[23] The plan does not specify which entities would receive the monitoring results.

[24] The occupied nest is located 0.4 mile from the transmission line alignment.

- design the transmission line to minimize the potential for avian electrocution;
- install fixed daytime visual markers on the transmission line a half mile east and west of where the line crosses Cottonwood Creek to minimize collision hazards;
- monitor eagle nesting success and for any project-related effects (e.g., electrocution or collision) on any bald eagles nesting near the transmission line where it crosses Cottonwood Creek for two breeding seasons after completing construction, and report monitoring results to FWS; and
- maintain a 0.5-mile buffer between any raptor nest and transmission line operation and maintenance activities, and replace transmission-line visual markers twice per year, as necessary, to protect bald eagles and other birds;

- monitor waterfowl and other migratory bird use of reservoirs during the spring and fall migration periods during project operation and report the monitoring results to Montana DFWP to document the number and species of birds using the reservoirs and any adverse effects due to project operation;

- install fencing around the project reservoirs and substations to prevent wildlife, project personnel, and the public from entering these areas where they could be at risk of drowning or electrocution;

*Cultural Resources*

- fence off culturally sensitive sites to avoid accidentally disturbing these sites during project construction;

- have an archaeologist onsite to monitor construction activities in areas that may yield previously unidentified cultural resources and implement procedures to protect any resources that are discovered during construction;

*Aesthetic Resources*

- construct the lower reservoir using topographic features to minimize visibility from Montana Highway 294 and landscape the lower reservoir saddle dam to blend with the natural terrain;

- utilize existing vegetation to screen views of the upper reservoir from motorists on Montana Highway 294 and avoid disturbance of Gordon Butte's outermost ridgeline during construction to minimize visual impacts;

- use low-profile structures whenever possible to reduce visibility and site linear features to follow the edges of clearings where they will be less conspicuous;

- restore disturbed surfaces as closely as possible to their original contour and revegetate disturbed areas so they blend into the natural terrain;

- minimize the amount of construction and ground-disturbance needed for roads, staging areas, and crane pads by using existing roads and disturbed areas as much as possible and locating these structures outside of publicly accessible vantage points and visually sensitive areas;

- use colors and materials to blend project facilities with the surrounding landscape;

- revise, based on the final design of the project, the preliminary Construction Noise Mitigation Plan filed on January 19, 2016, to include site-specific measures for limiting noise during construction;

*Socioeconomic Resources*

- minimize effects on local infrastructure and services by developing a construction workforce management plan that includes provisions for: (1) developing a traffic management plan for Montana Highway 294, (2) providing bus service for project personnel, (3) staggering work shifts (i.e., day shifts between 7:00 AM and 5:30 PM and night shifts between 8PM and 6:30 AM) to ensure all of the crew buses and personnel vehicles are off of the roads prior to morning and afternoon school bus traffic, (4) restricting delivery times to limit truck traffic during school bus traffic times, (5) implementing alcohol and drug testing requirements for project personnel, and (6) providing on-site security;

*Air Quality*

- revise, based on the final design of the project, the preliminary Construction Dust Control Plan (Dust Plan) filed on January 19, 2016, to include site-specific dust control BMPs to maintain good air quality during construction.

## 2.3 STAFF ALTERNATIVE

Under the staff alternative, the project would include most of GBEP's proposed environmental measures, as outlined above, with the exception of: (1) the water quality monitoring program, (2) coordinating with water management entities administering diversions downstream of Cottonwood Creek, maintaining minimum flows at existing USGS gages in the South Fork and mainstem Musselshell River, and adjusting project flow diversions as needed based on coordination, (3) monitoring bird use of the project reservoirs over the term of the license; (4) implementing the Box Car Spring Monitoring Program Plan; and (5) including drug and alcohol testing of project personnel in the proposed workforce management plan. We do not recommend these measures because their environmental benefits would not be worth their costs or they relate to matters outside of the Commission's jurisdiction.

In addition, staff recommends the following modifications and additional measures: (1) modify the proposed project boundary to enclose the existing diversion structure on Cottonwood Creek, irrigation canal leading from the diversion structure to the lower reservoir site, Parshall flume in the irrigation canal, and access road leading to the upper reservoir site; (2) develop a detailed spoil disposal plan that includes a map showing permanent spoil disposal sites, and measures to stabilize and prevent soil erosion and the spread of noxious weeds; (3) develop an operation compliance monitoring plan in consultation with Montana DFWP and Montana DNRC that includes: (a) specific calibration procedures for the Cottonwood Creek minimum-flow compliance gage; (b) procedures for monitoring and documenting compliance with the proposed restrictions on project flow diversions, including a description of monitoring locations, equipment or measuring devices, methods, frequency of recording, quality assurance and quality control, and calibration procedures; and (c) a schedule for reporting to the Commission any deviations from the proposed Cottonwood Creek minimum flows and restrictions on project flow diversions; (4) apply the measures included in a proposed vegetation management plan and the Noxious Weed Control Plan to the diversion structure, irrigation canal, and upper reservoir access road, and include in the plans the following additional measures: (a) monitoring protocols, (b) performance criteria to ensure success of revegetation and noxious weed control efforts, (c) reporting requirements, and (d) an implementation schedule; and (5) install perch deterrents on the crossarms of the transmission towers to prevent increased predation of small mammals and other wildlife by raptors.

## 2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

We did not identify any other alternatives to GBEP's proposal.

## 3.0 ENVIRONMENTAL ANALYSIS

In this section, we present: (1) a general description of the project vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area (aquatic, recreation, etc.). Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed protection, mitigation, and enhancement measures, and any potential cumulative effects of the proposed action and alternatives. Staff conclusions and recommended measures are discussed in section 5.1, *Comprehensive Development and Recommended Alternative* of this EA.[25]

## 3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The proposed project would be located approximately 3 miles west of the unincorporated town of Martinsdale in Meagher County, Montana on private lands owned and operated by 71 Ranch. The project would utilize Gordon Butte, a prominent landform rising approximately 1,025 feet above the Musselshell River valley. Water for project purposes would be diverted from Cottonwood Creek which is a primary tributary of the South Fork located west of Gordon Butte. The Cottonwood Creek basin drains waters from elevations of 9,100 to 5,036 feet and includes three main tributaries: West Fork Cottonwood Creek, Middle Fork Cottonwood Creek, and Loco Creek Stream. Cottonwood Creek flows north for 13 miles from its headwaters downstream to Cottonwood Creek's confluence with the South Fork. The South Fork then converges with the North Fork Musselshell River (North Fork) near Martinsdale to form the mainstem Musselshell River. The Musselshell River then flows easterly for about 120 miles to Melstone, Montana, where it turns and flows north about 80 miles into Fort Peck Reservoir just north of Mosby, Montana.

The Cottonwood Creek basin drains approximately 141 square miles and represents a small portion of the greater Musselshell River basin which drains approximately 8,550 square miles. After the headwater tributaries converge to form the mainstem Cottonwood Creek, the next 3 miles of Cottonwood Creek flows through a narrow entrenched valley bordered by numerous rock outcroppings. The creek then

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[25] Unless noted otherwise, the sources of our information are the license application (GBEP, 2015b), and additional information filed by GBEP on November 25, 2015 (GBEP, 2015a), December 1, 2015 (GBEP, 2015), January 19, 2016 (GBEP, 2016a), and February 29, 2016 (GBEP, 2016).

flows through a wide valley bottom with substrate consisting of boulders and cobbles with fine gravels before converging with the South Fork.

Predominant land uses in the basin include agriculture, forestry, hunting, fishing, and various other recreation activities. Agricultural practices include dryland and irrigated farming and livestock production. The riparian zone is well developed with dense stands of deciduous woody vegetation in the upper reaches of Cottonwood Creek but shows some signs of impact from cattle grazing in the lower reaches.

Primary water uses in the basin include irrigation, water storage, and municipal and domestic uses which have altered natural stream flow patterns. Diversion structures are common throughout the basin and cause parts of river systems to run completely dry at times. Three existing diversions draw water from the headwater tributaries and six existing diversions draw water from the Cottonwood Creek mainstem, including 71 Ranch's diversion located 5.2 miles upstream of Cottonwood Creek's confluence with the South Fork which is proposed to be utilized by GBEP for filling the project reservoirs. Three major storage reservoirs located downstream of Cottonwood Creek were built to ease water shortages and to supply irrigation water in the greater Musselshell River basin. Bair Reservoir is an off-stream reservoir with an active storage capacity of 7,010 acre-feet and is located on the North Fork. Martinsdale Reservoir is another off-stream storage reservoir with an active storage of 23,110 acre-feet and is located approximately 3 miles east of the project off the South Fork. Both of these reservoirs are operated by the Upper Musselshell WUA. Deadman's Basin Reservoir is located farther downstream on the mainstem Musselshell River and has an active storage capacity of 76,900 acre-feet and is operated by the Deadman's Basin WUA.

Climate in the basin is typical of a semi-arid Great Plains region. It is characterized by abundant sunshine, moderate to strong winds, wide variations in temperature, and a short growing season. Precipitation in the basin generally increases with elevation, ranging from less than 15 inches annually in the plains to over 50 inches annually in some of the mountains. Two thirds of the annual precipitation typically occurs from April through June. In the project area, total annual precipitation ranges from 8.2 to 18.1 inches with a mean total annual precipitation of 13.6 inches. Monthly average temperatures range from a high of 81.0 degrees Fahrenheit (°F) in July to a low of 12.9 °F in January and mean annual snowfall is 57.0 inches (Western Regional Climate Center, 2012).

## 3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA) (40 CFR, section 1508.7), a cumulative effect is the impact on the environment that 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. Cumulative effects can result from individually minor but collectively significant actions taking place over time, including hydropower and other land and water development activities.

Based on our review of the license application and agency and public comments, we identified water resources and terrestrial resources as having the potential to be cumulatively affected by the proposed construction and operation of the project in combination with other past, present, and future activities. Water resources were selected for analysis because construction and operation of the project in combination with the other on-stream and off-stream storage reservoirs and diversions may affect water resources in the drainage basin. Terrestrial resources were selected for analysis because construction and operation of the project in combination with wind farm operation and maintenance activities and agricultural operations may affect terrestrial resources in the drainage basin.

### 3.2.1 Geographic Scope

Our geographic scope of analysis for cumulatively affected resources is defined by the physical limits or boundaries of: (1) the proposed action's effect on the resources, and (2) contributing effects from other hydropower and non-hydropower activities within the drainage basin. Because the proposed action would affect the resources differently, the geographic scope for each resource may vary.

We identified the portion of the upper Musselshell River basin from 71 Ranch's existing diversion structure on Cottonwood Creek downstream to the Deadman's Basin Dam on the mainstem Musselshell River as our geographic scope of analysis for cumulatively affected water resources. We chose this geographic scope because the project's consumptive use of Cottonwood Creek for reservoir filling when combined with other existing diversions would predominantly affect water availability in these free-flowing waterbodies downstream to the impoundment created by Deadman's Basin Dam on the mainstem Musselshell River. Activities within this portion of the basin that may cumulatively affect water resources include: (1) diversions for irrigation and livestock; (2) diversions for private, municipal, and industrial water usage; and (3) construction of on-stream and off-stream storage reservoirs.

We identified the lower Cottonwood Creek watershed from 71 Ranch's existing diversion structure on Cottonwood Creek downstream to the creek's confluence with the South Fork as our geographic scope of analysis for cumulatively affected terrestrial resources. We chose this geographic scope because operation of the proposed project, in combination with other energy developments and agricultural operations in this area, would affect the amount of available habitat for wildlife. Activities within this watershed that may cumulatively affect terrestrial resources include wind farm operation and maintenance activities in the vicinity of the upper reservoir, and agricultural operations in the vicinity of the lower reservoir.

In section 3.3.2, *Aquatic Resources* and section 3.3.3, *Terrestrial Resources* of this EA, we discuss the site-specific as well as cumulative effects of licensing the Gordon Butte Project on water resources and terrestrial resources located within these specific geographic scopes.

### 3.2.2 Temporal Scope

The temporal scope of our cumulative effects analysis in the EA will include a discussion of past, present, and future actions and their effects on each resource that could be cumulatively affected. Based on the potential term of an original license, the temporal scope will look 30-50 years into the future, concentrating on the effect on the resources from reasonably foreseeable future actions. The historical discussion will, by necessity, be limited to the amount of available information for each resource. The quality and quantity of information, however, diminishes as we analyze resources further away in time from the present.

## 3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

In this section, we discuss the effect of the project alternatives on environmental resources. For each resource, we first describe the affected environment, which is the existing condition and baseline against which we measure effects. We then discuss and analyze the site-specific and cumulative environmental issues.

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EA. Based on this, we have determined that geology and soils, aquatic, terrestrial, threatened and endangered species, recreation, cultural, aesthetic, and socioeconomic resources, and air quality may be affected by the proposed action and action alternatives. We present our recommendations in section 5.1, *Comprehensive Development and Recommended Alternatives.*

### 3.3.1 Geology and Soils

#### 3.3.1.1 Affected Environment

**Geology and Soils**

The Gordon Butte Project would be located near the northern edge of the Crazy Mountains in south-central Montana. The area is structurally complex, and is characterized by sedimentary rock thrust faults[26] that occur along bedding planes,[27] and intrusion[28] by igneous rock (figure 3). These intruded igneous rocks have formed many of the geologic features in the project area, including stocks, dikes, dike swarms, sills, and laccoliths.[29]

The igneous intrusions in the project area are formed of shonkinite, which is a hard, granitic mineral. Gordon Butte itself is a laccolith formed of shonkinite. Therefore, shonkinite would underlie the project's upper reservoir, intake shaft, portions of the access roads, and the upper portion of the power tunnel.

Sedimentary formations in the project area are varied, and include the Bearpaw Shale and the Judith River formation. In general, these sedimentary formations consist of shale, siltstone, sandstone, and conglomerate. To a much lesser degree, these rocks may contain thin beds of bentonite or volcanic ash. These sedimentary rocks would underlie both 71 Ranch's existing facilities (e.g., diversion structure, irrigation canal) and the proposed project's lower power tunnel, powerhouse, lower reservoir, transmission line, access road, and substations.

Numerous soil types exist in the project area. Many of them are forms of residuum, which is produced from weathering of the underlying parent rocks. Shonkinite-formed residuum soils are located at the proposed site of the upper reservoir and the upper portion of 71 Ranch's existing access road. Surrounding Gordon Butte is a

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[26] Thrust faults are faults, typically resulting from compressive forces, where rocks of lower stratigraphic position (i.e., older rocks) are forced up and over those of higher stratigraphic position (i.e., younger rocks).

[27] Bedding planes are the contact surfaces between two layers of a sedimentary rock formation.

[28] Intrusion is the movement of molten rock into or through an earlier, overlying geologic formation, resulting in an igneous rock formation.

[29] Stocks are an intrusion having a surface exposure of less than 40 square miles, often appearing as a hill or mountain. Dikes are sheets of rock that have intruded into a fracture of a preexisting rock body. Dike swarms are groups of parallel, linear, or radially oriented dikes. Sills are a planar intrusion of igneous rock between different layers of a geologic formation, such as the bedding planes of a sedimentary rock. Laccoliths are similar to sills, but the intruded rock is forced with such high pressure that it moves overlying rock upwards, forming a dome.

skirt of colluvium[30] and talus,[31] transitioning to predominantly alluvial soil[32] to the north and west of Gordon Butte because of Cottonwood Creek and the South Fork. Colluvial or alluvial soils are found in the vicinity of 71 Ranch's irrigation canal and access road, and the proposed project's lower reservoir, access road, transmission line, and both substations. Regardless of type or location, soils throughout the project area are typically only a thin veneer overlying bedrock, being no more than 10 feet deep.

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[30] Colluvium is soil that has been transported by gravity (NRCS, 1984).

[31] Talus is a sloped soil built up by the accumulation of rock waste at the foot of a cliff or ridge (Iowa, 2015).

[32] Alluvial soil is soil that has been transported to its present location by water (NRCS, 1984).

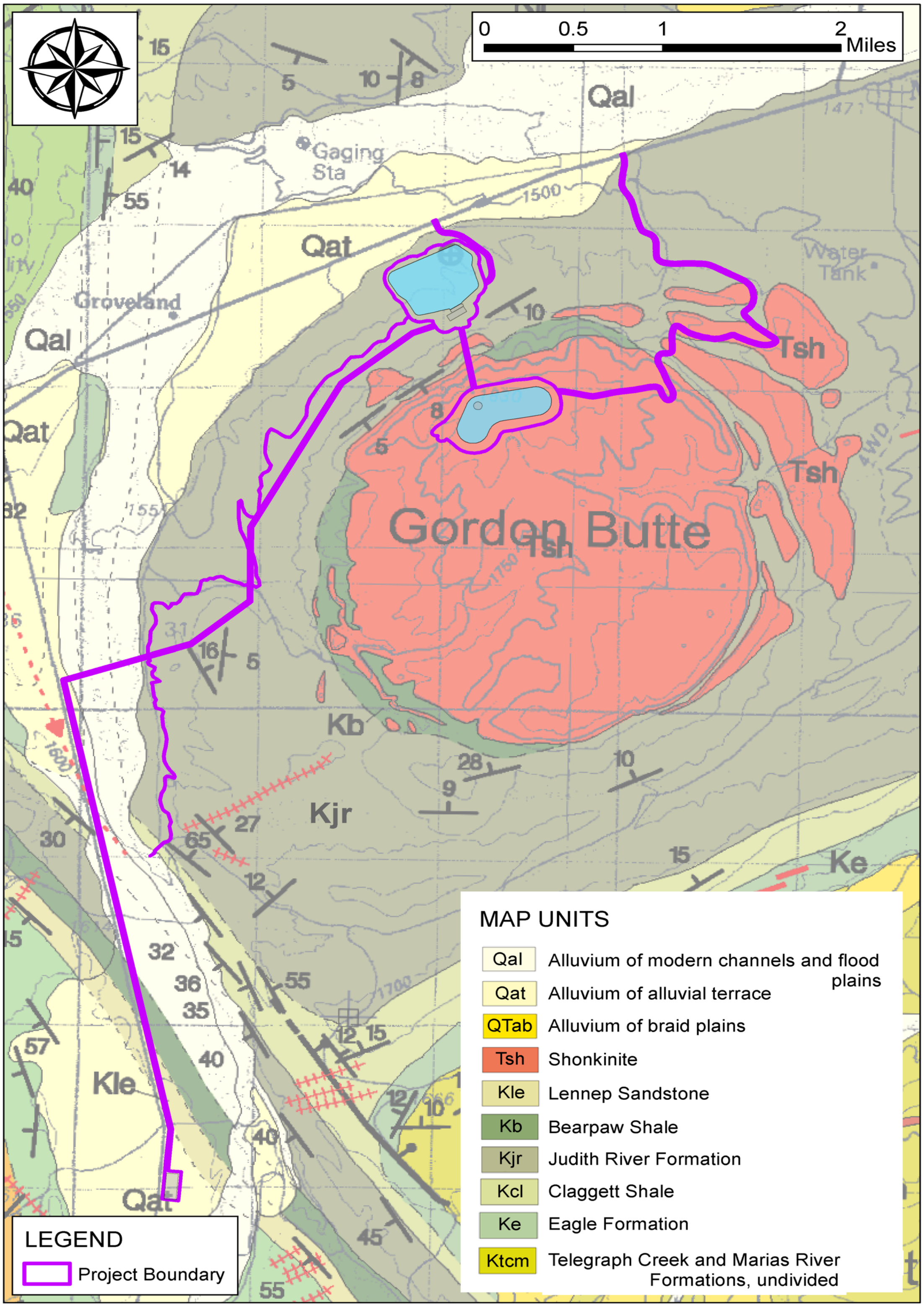


Figure 3. Geology in the vicinity of the Gordon Butte Project (Source: staff).

## Geologic Hazards

*Seismicity*

The proposed project is located along the eastern boundary of the Intermountain Seismic Belt, which is a regional zone of seismic activity that extends from southern Canada, through western Montana, and into southern California. However, no significant seismic activity has been recorded at the site. Between 1925 and 2015, 137 earthquakes that ranged in magnitude from 4.0 to 7.2 on the Richter scale occurred in an area within about 200 miles of the project, including four moderate to large earthquakes during this period. These earthquakes ranged from a magnitude 7.2 event in August 1959 that was approximately 120 miles south of the project site to a magnitude 6.9 event in June 1925 that was about 50 miles west of the project site.

*Landslides and Mass Soil Movement*

While the area around Gordon Butte is seismically active, no landslide deposits have been identified in any published geologic maps of the area. However, Gordon Butte by its nature has high topographic relief, and therefore some potential exists for landslides or soil movement. GBEP proposes to further assess the potential for landslides as part of final project design, pending the results of additional subsurface exploration and analysis.

Seismic events have the potential to damage project features and, to a lesser degree, to create slope stability and landslide issues at the project. However, according to the USGS Simplified 2014 Hazard Map, the project is located in a low to moderate seismic hazard area, and is removed from active fault zones. Regardless, if a license was issued for the project, the Commission's Division of Dam Safety and Inspections would evaluate the stability of the reservoir embankment dams under all probable loading conditions, including seismic loading. The Division of Dam Safety and Inspections would review geotechnical studies provided in support of the project's final design to ensure that project features are designed to safely withstand all credible loading conditions and ensure safe operating conditions. Furthermore, an independent Board of Consultants would perform a peer-review of the final project design. The Board of Consultants consists of qualified professionals with expertise in the design and construction of dams of commensurate size. The Board of Consultants would review the geology of the project site and surroundings, the project design, the plans and specifications, and would oversee construction of the project. The Commission would not allow construction to begin until the project facilities satisfactorily meet the criteria of the Commission's Engineering Guidelines and the designs are shown to be safe and adequate.

#### 3.3.1.2 Environmental Effects

**Construction Effects on Soil Resources**

Vegetation clearing and excavation for the construction of project facilities, including the upper and lower reservoirs, power tunnel, powerhouse, substations, access road, transmission line, and staging and stockpiling areas, has the potential to cause soil erosion after the loss of the soil's protective vegetative cover. Additionally, it may be necessary to widen or otherwise modify the existing upper reservoir access road to accommodate the large vehicle and heavy equipment traffic during construction. Disturbing soils by modifying and increasing construction traffic on the existing access road may cause soil erosion. If protective measures are not put in place, these erosion-causing activities may lead to soil loss.

GBEP filed a preliminary ESCP on January 19, 2016, that outlines measures to reduce erosion and sedimentation during construction. A final plan would be prepared during final project design. The preliminary plan includes the following measures: (1) implement BMPs such as silt fencing, fiber rolls, temporary seeding, sediment traps, and check dams to control and minimize the movement of sediment from stockpiled and disturbed soils; (2) maintain the majority of construction traffic on-site, with only limited transport of construction materials to or from off-site, to minimize sediment transport via vehicles; (3) stabilize access roads, grade construction area exits with rock aggregate to minimize erosion from vehicle traffic and remove excess soil from vehicle tires; (4) define work limits and stage construction to minimize the amount of unstabilized disturbed areas; (5) maintain native vegetation outside of work limits to preserve natural vegetative buffers between construction and water bodies; (6) stabilize disturbed soils by temporary seeding or other alternative means within 14 days of ceasing construction; (7) develop a vegetative management plan to prescribe the restoration of temporarily disturbed soils with vegetation (see section 3.3.3, *Terrestrial Resources* for more details); (8) control runoff by installing silt fencing around disturbed areas (e.g., reservoirs, staging/laydown areas, transmission towers), riprap and desilting basins at the reservoir construction area outflow locations, and checkdams in outflow channels; (9) locate the on-site concrete batch plant away from water courses and drainages to minimize the potential for off-site migration of sediment-laden water; (10) pump any groundwater from dewatered work areas into temporary sediment basins prior to discharge; (11) minimize erosion from wind by watering dry soils during construction; (12) inspect BMPs at least once every two weeks and within 24 hours of a storm generating a half-inch of rainfall or greater and conduct any necessary repairs within 24 hours of the inspection; and (13) implement good housekeeping BMPs for material handling, waste management, and equipment fueling and maintenance practices to prevent spills of contaminants such as oil and gasoline.

*Our Analysis*

GBEP's preliminary ESCP provides a reasonable foundation upon which to build a final plan. Implementing specific BMPs contained in the plan such as silt fencing, check dams, and desilting basins would prevent the overland flow of sediment-laden stormwater from depositing large volumes of sediment onto downslope vegetated areas. Revegetating disturbed areas would stabilize soils and prevent erosion. Installing rock aggregate on access roads, entrances, and exits would prevent erosion from large vehicle and heavy equipment traffic. Finalizing the ESCP during final project design and implementing the measures it prescribes would effectively mitigate the hazard of additional erosion during construction and would alleviate potential impacts to nearby vegetated areas. Further, regular inspections during project construction would allow GBEP to ensure that BMPs are properly implemented.

**Dust**

Fugitive particulate emission or fugitive dust emission refers to small particles of matter, often made predominantly of soil, that are suspended in the air by wind or human activities without first passing through a stack or duct designed to direct or control their flow. These fugitive dust emissions can cause reduced visibility, loss of topsoil, and negative impacts to human health from inhalation (CARB, 2007). Additionally, dust may represent a form of erosion that could impact aquatic and water quality resources if it occurs in sufficient quantities. Potential receiving waters including Cottonwood Creek, the South Fork, and Martinsdale Reservoir could be affected by windborne dust if control measures are not properly implemented. Wind can mobilize soil that has been disturbed or has lost its protective vegetation, as well as from construction material storage areas and stockpiles. Additionally, numerous activities can generate fugitive dust, including: loading of trucks or mixers with construction materials (e.g., sand, rock, aggregate), uncovered construction material transport, dust generation from the ground or road surface because of vehicle traffic on paved and unpaved roads, rock excavation, drilling and blasting activities, and concrete batch plant operation (EPA 2006).

Susceptibility to windborne erosion was evaluated by GBEP using the wind erodibility group rating developed by the Natural Resources Conservation Service, which ranks soils on a scale of 0 to 8 as to how susceptible they are to erosion from wind based on surface soil characteristics such as texture, mineralogy, and content of organic matter, carbonates, and rock fragments (NRCS, 2016a). The susceptibility of a soil to wind-based erosion is inversely related to its rating, meaning that the lower a soil ranks on the index, the greater risk that wind-based erosion poses. Per the Natural Resources Conservation Service's Meagher County Area Soil Survey (2015), soils in the project vicinity have a wind erodibility group rating of between 6 and 7. The only exceptions to this were alluvial soils near some portions of the southern transmission line that have a rating of 5, and soil underlying the lower portion of the upper reservoir access road that has a rating of 4L.[33] For all soils, these ratings indicate a low to moderate susceptibility to wind-driven erosion.

GBEP developed a preliminary Dust Plan, which it proposes to revise after completing the final design of the project and implement during construction in order to minimize or eliminate potential environmental effects from dust generated by project construction. The preliminary Dust Plan includes the following dust control BMPs: (1) cease construction activities when dust emissions cannot be effectively controlled; (2) apply water to dry areas during grading and earthwork, unpaved roads, material handling systems (e.g., conveyors), construction material (e.g., rock, aggregate) processing operations, storage piles, and drilling operations in order to suppress dust generation; (3) seed stockpiles that are unused for at least seven days, staging areas, and laydown areas to stabilize soil lacking vegetative protection; (4) cover stockpiles that are unused for at least seven days as well as rock, aggregate, and cement storage areas; (5) use rock aggregate to stabilize staging and laydown areas, unpaved roadways, and construction area entrances; (6) apply dust suppressants to unpaved roadways, material handling systems, and drilling operations; (7) clean or cover empty haul trucks; (8) use appropriate freeboard (i.e., do not overfill) and cover haul trucks; (9) maintain haul trucks free of holes or openings that may generate fugitive dust emissions; (10) regulate the speed of construction and delivery vehicles; (11) limit traffic to designated on-site routes; (12) use blast blankets to minimize dust generation during blasting activities; and (13) properly control material handling systems.

*Our Analysis*

There is a potential for project construction activities to generate large quantities of dust due to the relatively dry and windy climate of the region, the disturbance of 371.7 acres of vegetation as well as the production of 14 million cubic yards of excavated rock and soil during construction. Specific construction activities that could generate dust include: construction and/or improvement of access roads and internal haul roads; ground surface erosion and road surface dust mobilization from vehicle traffic; material and equipment storage area construction and use; overburden excavation and stockpiling; rock excavation, tunnel drilling, and blasting; rock stockpiling, loading, and transport; rock and aggregate processing (i.e., crushing, mixing); and concrete batch plant operation.

The BMPs in GBEP's preliminary Dust Plan, such as using seeding and covers to stabilize or encapsulate disturbed or loose soils and construction materials, applying water or dust suppressants to prevent dust generation and mobilization, applying rock to

[33] Group 4L falls between groups 4 and 5.

high traffic areas such as access roads to minimize dust generation due to vehicle travel, and limiting vehicle speed and restricting vehicles to designated travel routes to limit soil disturbance, would minimize dust generation during construction. Revising the Dust Plan during the final project design phase would maximize the plan's effectiveness at controlling dust by incorporating site-specific measures for dust control into the plan.

**Spoil Disposal**

Proposed project construction activities including drilling, blasting, and excavation would produce substantial amounts of spoil. Under GBEP's proposed action, some of the spoil rock from excavating the lower reservoir and powerhouse sites would be used as the aggregate for concrete structures, such as the upper and lower reservoirs' embankment dams. Some rock spoil would also be used to stabilize access road surfaces to minimize erosion and dust generation. While these uses would result in the permanent disposal of some of the spoil generated by the project, additional spoil disposal sites would be needed to provide for the permanent disposal of all excavated spoils. GBEP does not identify the permanent disposal sites for excess spoils in its license application, but instead states that it would select sites during final design and in conjunction with local land owners, state and local government agencies, and other interested parties.

*Our Analysis*

Excavation of the lower reservoir would produce approximately 14 million cubic yards of spoil, while the upper reservoir construction would require approximately 1.2 million cubic yards of fill. Thus, the preliminary earthwork balance indicates that the project would produce around 12.8 million cubic yards of spoil not needed on site for construction and requiring a permanent disposal location. While an unspecified quantity of the 12.8 million cubic yards of spoil would be utilized for access road construction and dust control, it is likely that this large quantity of spoils would exceed what would be needed for these purposes, and therefore, the majority of this material would need to be relocated to a permanent disposal site. Any excavated spoils that are not properly stabilized would be prone to erosion during rain events or entrainment into the air by wind in the form of dust, causing potential adverse effects on aesthetic, terrestrial, and aquatic resources in the project vicinity. In addition, permanent spoil disposal sites could adversely affect wildlife habitat if they are located in high-quality wildlife habitats such as the grasslands on the top of Gordon Butte.

GBEP's proposal to solicit stakeholder input prior to selecting disposal sites would allow resource agencies, landowners, and other interested parties to provide input on such sites. However, GBEP does not provide any specific information on how or when such consultation would occur.

### 3.3.2 Aquatic Resources

#### 3.3.2.1 Affected Environment

**Water Resources**

The hydrology in the project vicinity is dominated by the accumulation and melting of annual snowpack as well as diversions for irrigation, municipal, and residential purposes. From November to late March, most streams in the project vicinity typically have low and stable flows supported by groundwater contributions representing a steady winter base flow. In the spring months of April and May, warmer ambient conditions cause limited snowmelt at lower elevations and flows rise and fall in response to the degree of snow melt. Peak streamflows typically occur in late May or the middle of June, with a tempered decrease in flow volume through July and August as the snowpack declines.

*Cottonwood Creek Streamflow*

There is no long-term streamflow data for Cottonwood Creek. During pre-filing, GBEP conducted a streamflow monitoring study in 2014. GBEP measured stream discharge at six sites strategically located in Cottonwood Creek and the South Fork. The locations of GBEP's streamflow monitoring sites are shown in Figure 4.

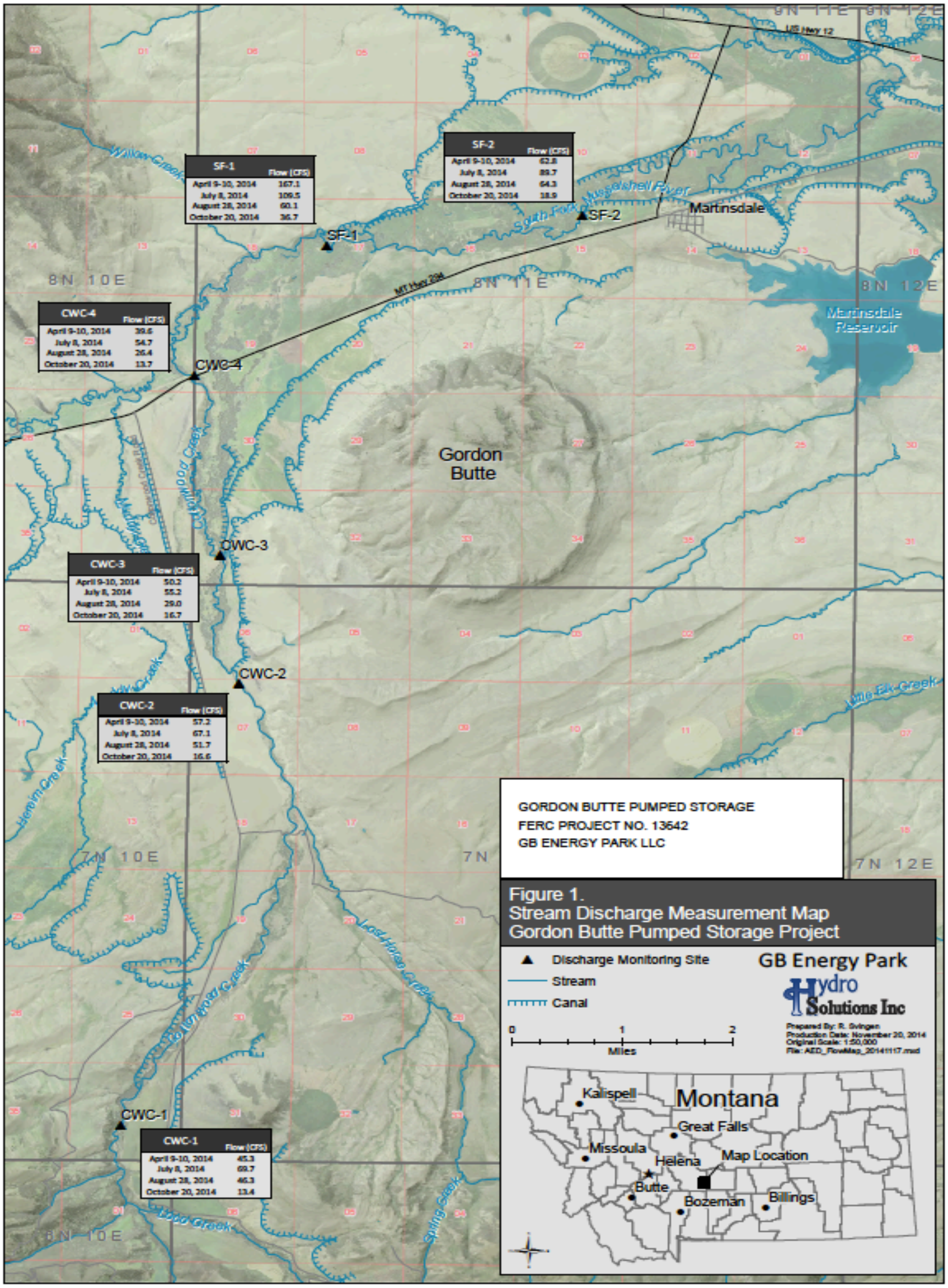


Figure 4. Stream Discharge Measurement Map for the Gordon Butte Pumped Storage Project (Source: GBEP, 2015b).

Site 1 on Cottonwood Creek (CWC-1) was located the farthest upstream above the Voldseth Canal diversion, which diverts water from Cottonwood Creek to a neighboring ranch. Site 2 on Cottonwood Creek (CWC-2) was located just upstream of 71 Ranch's existing irrigation diversion structure that GBEP proposes to use to supply water for the proposed project. Site 3 on Cottonwood Creek (CWC-3) was located just downstream of another diversion structure on Cottonwood Creek that is owned by 71 Ranch and used for irrigation. Site 4 on Cottonwood Creek (CWC-4) was located farther downstream at the Montana Highway 294 bridge crossing near the confluence of Cottonwood Creek with the South Fork. GBEP also measured streamflow at two sites in the South Fork. Site 1 on the South Fork (Site SF-1) was located below the South Fork's confluence with Cottonwood Creek near the headquarters of 71 Ranch above Martinsdale. Site 2 on the South Fork (SF-2) was located on the South Fork below the Martinsdale Reservoir diversion.

GBEP obtained discharge measurements on April 9-10, July 8, August 28, and October 20, 2014. These dates were chosen in order to measure flows once in the spring prior to spring snowmelt runoff, once after the spring runoff period during the descending limb of the hydrograph, once in the late summer during the irrigation season, and once in the fall after the irrigation season typically ends. In addition, GBEP collected additional discharge measurements at sites CWC-1, CWC-4, and SF-2 as part of their fisheries and aquatic habitat study and also collected discharge and stage measurements at CWC-4 on November 9 and 10 to assist in developing a rating curve at the site.[34] Results of the monitoring effort are shown in table 1.

Table 1. Stream discharge measurements taken in Cottonwood Creek and South Fork Musselshell River from April to November, 2014 (source: GBEP, 2015b, as modified by staff).

| **Site Name** | **Apr 9-10th (cfs)** | **Jul 8th (cfs)** | **Aug 28th (cfs)** | **Sept 15-26th (cfs)** | **Oct 20th (cfs)** | **Nov 9 (cfs)** | **Nov 10 (cfs)** |
|---|---|---|---|---|---|---|---|
| CWC-1 | 45.3 | 69.7 | 46.3 | NM | 13.4 | NM | NM |
| CWC-2 | 57.2 | 67.1 | 51.7 | 27.9 | 16.6 | NM | NM |
| CWC-3 | 50.2 | 55.2 | 29.0 | 3.4 | 16.7 | NM | NM |
| CWC-4 | 39.6 | 54.7 | 26.4 | NM | 13.7 | 13.5 | 14.5 |
| SF-1 | 167 | 110 | 60.1 | 25.3 | 36.7 | NM | NM |

[34] GBEP is developing a rating curve at site CWC-4 because it proposes to use this site for minimum flow compliance monitoring during project operation.

| Site Name | Apr 9-10th (cfs) | Jul 8th (cfs) | Aug 28th (cfs) | Sept 15-26th (cfs) | Oct 20th (cfs) | Nov 9 (cfs) | Nov 10 (cfs) |
|---|---|---|---|---|---|---|---|
| SF-2 | 62.8 | 89.7 | 64.3 | NM | 19.9 | NM | NM |

Notes: NM – no measurement taken

The pattern of streamflow in Cottonwood Creek pulses with mountain snowmelt and spring rains similar to the historical pattern for the South Fork shown in figure 5 below. GBEP states that the stream segment below the proposed project's diversion site was not entirely dewatered in 2014 despite regular diversions for irrigation by 71 Ranch during the study period. However, GBEP also states that 2014 produced above average streamflows likely due to a precipitation event that occurred in August. In its July 21, 2014 comments on the applicant's preliminary application document, Montana DFWP states that the lower 3-mile segment of Cottonwood Creek is regularly dewatered as a result of upstream irrigation diversions.

The 2010 Phase 1 Water Rights Assessment (Hydrosolutions, 2010) included in Appendix 5 of GBEP's license application, included an interview with the owner of 71 Ranch who noted that the irrigation season usually begins in mid to late May following the first frost-free night. The landowner also stated that once the center pivots used for irrigation are turned on, they usually stay on 24 hours a day through the rest of the irrigation season (i.e., through September) except for brief periods when they are temporarily shut down to allow for drying, cutting, and harvesting hay. Based on this, the actual start time for irrigation typically occurs in mid to late May at the earliest and that dewatering of Cottonwood Creek likely occurs in the late summer and early fall months following the peak spring snowmelt period when flows return to a lower steady base flow similar to the hydrograph displayed in figure 5 below.

In addition to GBEP's streamflow study, Montana DNRC, in its preliminary determination to grant a water right permit to GBEP, estimated the flow of water physically available in Cottonwood Creek at the project's proposed diversion site using USGS stream discharge measurements from 1988, which were correlated to other streamflow records in the basin in order to report mean and median flow values for the months of April through June. The study reported water availability on a mean basis was 73 cfs in April, 279-303 cfs in May, and 311-335 cfs in June, while water availability on a median basis was 55 cfs in April, 237-261 cfs in May, and 279-303 cfs in June (Montana DNRC, 2014).

*South Fork Musselshell River Streamflow*

USGS gage 06118500 is located in the South Fork, approximately 1.5 miles downstream from the South Fork's confluence with Cottonwood Creek, and 6.7 miles downstream of 71 Ranch's diversion structure on Cottonwood Creek. USGS operated the gage from 1941 to 1979. Montana DNRC then continued to monitor the gage during the spring runoff to the end of irrigation season in the fall from 1980 to 2012, after which the gage was decommissioned. In October 2014, USGS reactivated the gage. Figure 5 shows the annual hydrograph based on the available flow data from 1941 to 2012 at USGS gage 06118500.

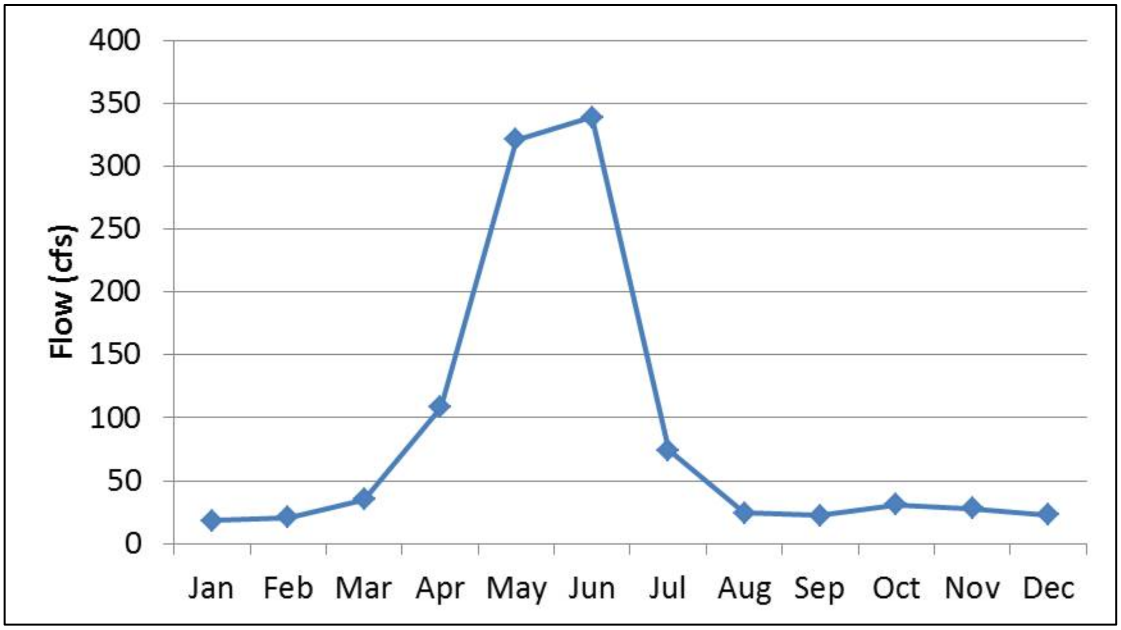


Figure 5. Mean monthly flow in the South Fork Musselshell River near the project site, 1941-2012 (Source: GBEP 2015b, as modified by staff).

From April through June, when GBEP proposes to divert water from Cottonwood Creek, historical mean monthly flows for USGS gage 06118500 located on the South Fork downstream of its confluence with Cottonwood Creek are 113 cfs in April, 331 cfs in May, and 360 cfs in June (USGS, 2016).

GBEP's streamflow study reported that flows in the South Fork upstream of Martinsdale Reservoir (site SF-1) were highest during the April 9-10, 2014, sampling date (167 cfs), which was prior to the start of the irrigation season. Flows then decreased to 25 cfs by September. Flows below Martinsdale Reservoir (site SF-2) were highest during the July 8, 2014 sampling date (90 cfs), which then decreased to 20 cfs by September.

In addition to GBEP's streamflow study, Montana DNRC, in its preliminary determination to grant a water right permit to GBEP, estimated that median physical water availability at the South Fork USGS gage from April through June was an estimated 101 cfs in April, 327 cfs in May, and 297 cfs in June (Montana DNRC, 2014).

No mean values for the South Fork were reported by Montana DNRC in its preliminary determination.

*Mainstem Musselshell River Streamflow*

Mainstem Musselshell River flows commonly cease or become a trickle in late summer and early fall unless off-stream storage is supporting the system, particularly in the lower segments of the river downstream of Deadman's Basin Dam (Boyd et al., 2015). Conditions in the Musselshell River are heavily influenced by the diversion, storage, and release of contract water by Martinsdale Reservoir, Bair Reservoir, and Deadman's Basin Reservoir which are all state-owned projects. Martinsdale and Bair Reservoirs are collectively operated by the Upper Musselshell WUA, while Deadman's Basin Reservoir is operated by the Deadman's Basin WUA.

GBEP did not survey streamflows in the mainstem Musselshell River during its flow study, but staff queried USGS gage data to determine historical mean monthly flows at the gage stations in the mainsteam Musselshell River that GBEP proposes to monitor during project operation. Table 2 displays the mean monthly flow data for the three active USGS gages on the Musselshell River between Martinsdale and Shawmut, Montana (located approximately 40 miles east of Martinsdale).

Table 2. Historical mean monthly flow at USGS gages located on the mainstem Musselshell River near Martinsdale, at Harlowton, and near Shawmut, Montana (Source: USGS, 2016; staff).

| USGS Gage Number | Gage Location | Period of Record | April Mean Monthly Flow (cfs) | May Mean Monthly Flow (cfs) | June Mean Monthly Flow (cfs) |
|---|---|---|---|---|---|
| 06119600 | Near Martinsdale, MT | 2003-2015 | 80 | 308 | 322 |
| 06120500 | At Harlowton, MT | 1907-2015 | 167 | 399 | 499 |
| 06123030 | Near Shawmut, MT | 1998-2015 | 41 | 260 | 376 |

In addition, Montana DNRC estimated that median physical water availability for the months of April through June on the mainstem Musselshell River at Harlowton, Montana, was 82 cfs in April, 459 cfs in May, and 513 cfs in June.[35] Montana DFWP also estimated median physical water availability at USGS gage 06123030 in the mainstem Musselshell River near Shawmut, Montana, was 20 cfs in April, 112 cfs in May, and 153 cfs in June (Montana DNRC, 2014). No mean values for the mainstem Musselshell River were reported by Montana DNRC in its preliminary determination.

*Water Rights*

Multiple surface water diversions exist throughout the upper Musselshell River basin tied to water rights owned by various users. The rate and timing of these diversions have a direct impact on the amount of flow in Cottonwood Creek, the South Fork, and the mainstem Musselshell River. Tables 3 and 4 display the existing water rights and water reservations that currently exist in Cottonwood Creek from the proposed diversion site downstream to the creek's confluence with the South Fork and the South Fork downstream to its confluence with the North Fork.

Table 3. Existing water rights on Cottonwood Creek at or below the proposed diversion site (Source: Montana DNRC, 2014, as modified by staff).

| Water Right/Reservation Number | Name | Flow Rate (cfs) | Period of Use |
|---|---|---|---|
| 40A 30008840 | Montana Department of Fish, Wildlife, and Parks | 16.00 | 1/1-12/31 |
| 40A 205646 00 | 71 Ranch LP | 0.08 | 1/1-12/31 |
| 40A 204230 00 | Chicago Milwaukee St. Paul & Pacific RR CO | 0.06 | 1/1-12/31 |
| 40A 34949 00 | Montana State of Board of Land Commissioners | 6.49 | 4/1-10/19 |
| 40A 205649 00 | 71 Ranch LP | 50.00 | 4/15-9/30 |
| 40A 198331 00 | Richard B. Ingersoll | 3.10 | 5/1-9/19 |
| 40A 198331 00 | Cottonwood Cabins, LLC | 0.97 | 4/15-9/30 |
| 40A 205653 00 | 71 Ranch LP | 12.50 | 4/15-9/30 |
| 40A 205654 00 | 71 Ranch LP | 3.51 | 4/15-9/30 |

[35] The median physical water availability estimate in Montana DNRC's preliminary determination at Harlowton, Montana was reported in acre-feet for each month. Staff converted these units to cfs.

| Water Right/Reservation Number | Name | Flow Rate (cfs) | Period of Use |
|---|---|---|---|
| 40A 205655 00 | 71 Ranch LP | 4.00 | 4/15-9/30 |
| 40A 205652 00 | 71 Ranch LP | 12.50 | 4/15-9/30 |

Table 4. Existing water rights on the South Fork Musselshell River from its confluence with Cottonwood Creek downstream to its confluence with the North Fork (Source: Montana DNRC, 2014, as modified by staff).

| Water Right/Reservation Number | Name | Flow Rate (cfs) | Period of Use |
|---|---|---|---|
| 40A 22960 00 | Carl. E. Rostad | 0.08 | 1/1-12/31 |
| 40A 14289 00 | Michael O. & Donna C. Teig | 5.50 | 5/1-9/30 |
| 40A 22963 00 | Carl. E. Rostad | 14.61 | 4/1-10/19 |
| 40A 22964 00 | Carl. E. Rostad | 25.28 | 4/1-10/19 |
| 40A 22965 00 | Carl. E. Rostad | 25.28 | 4/1-10/19 |
| 40A 22957 00 | Carl. E. Rostad | 5.98 | 4/1-10/19 |
| 40A 105787 00 | Bair CO & Bair Ranch Foundation | 6.75 | 5/1-9/30 |
| 40A 105788 00 | Bair CO & Bair Ranch Foundation | 6.75 | 5/1-9/30 |
| 40A 112905 00 | Nine-F Ranch CO, Inc. | 10.25 | 4/15-10/4 |
| 40A 112907 00 | Nine-F Ranch CO, Inc. | 15.00 | 4/15-10/4 |
| 40A 112908 00 | Nine-F Ranch CO, Inc. | 10.25 | 4/15-10/4 |
| 40A 112909 00 | Nine-F Ranch CO, Inc. | 9.82 | 4/15-10/4 |
| 40A 113097 00 | Nine-F Ranch CO, Inc. | 15.00 | 4/15-10/4 |
| 40A 145842 00 | Nine-F Ranch CO, Inc. | 14.22 | 4/15-10/4 |
| 40A 145843 00 | Nine-F Ranch CO, Inc. | 4.09 | 4/15-10/4 |
| 40A 105786 00 | Bair CO & Bair Ranch Foundation | 6.97 | 5/1-9/30 |
| 40A 119518 00* | Montana Department of Natural Resources and | 408.00 | 1/1-12/31 |

| Water Right/Reservation Number | Name | Flow Rate (cfs) | Period of Use |
|---|---|---|---|
| | Conservation | | |
| 40A 30052612 | Montana Department of Transportation | 1.97 | 4/1-10/19 |
| 40A 30052613 | Montana Department of Transportation | 1.97 | 4/1-10/19 |
| 40A 30008844 | Montana Department of Fish, Wildlife, and Parks | 30.00 | 1/1-12/31 |
| 40A 203370 00 | Bair CO & Bair Ranch Foundation | 4.28 | 6/1-9/30 |
| 40A 34950 00 | 71 Ranch LP | 6.40 | 4/1-10/19 |
| 40A 205647 00 | 71 Ranch LP | 31.10 | 5/1-9/30 |
| 40A 145840 00 | Nine-F Ranch CO, Inc. | 0.08 | 1/1-12/31 |
| 40A 205965 00 | Lauretta M. Berg | 0.54 | 3/1-11/30 |
| 40A 211300 00 | Martinsdale Colony | 1.25 | 4/28-10/4 |
| 40A 211304 00 | Martinsdale Colony | 1.90 | 4/15-10/4 |

*Water right for diversions to Martinsdale Reservoir

Based on existing water rights, irrigation is the largest non-water storage use for water in the basin. In addition to diversions for irrigation, Montana DNRC holds water rights to divert up to 408 cfs year-round from the South Fork into Martinsdale Reservoir, and up to 600 cfs year-round from the mainstem Musselshell River into Deadman's Basin Reservoir for water storage. Montana DFWP also holds water reservations of 16 cfs for Cottonwood Creek, 30 cfs for the South Fork, and 80 cfs for the mainstem Musselshell River for the protection of riparian and aquatic habitat in these waterbodies.

As discussed previously, the irrigation season typically occurs from mid to late May through September. During other periods, filling the storage reservoirs represent the largest demand for water in both the South Fork and mainstem Musselshell River from Martinsdale downstream to Deadman's Basin Dam near Shawmut, Montana.

*Groundwater and Water Supply Springs*

Gordon Butte receives more precipitation than the surrounding lower elevation plains, resulting in recharge to groundwater beneath the butte. A portion of this recharge eventually supplies the groundwater that emerges at springs that are utilized as public water supply sources for the town of Martinsdale, for stock watering, and by wildlife. In

2004, the town of Martinsdale conducted a hydrologic inventory and assessment as a part of the town's plan to expand its water supply sources. Three springs were investigated during this assessment: Galt Spring, Lower Johnson Spring, and Box Car Spring.

Based on the hydrologic assessment, the town chose to develop Box Car Spring as a public water supply source in addition to Galt and Lower Johnson Springs which were already supplying water for Martinsdale residents. Box Car Spring occurs off of the northeast flank of Gordon Butte at an elevation of 5,093 feet. Figure 6 below displays the location of the three water supply springs, Martinsdale's water collection system, and the approximate recharge area in relation to the proposed locations of the project reservoirs and penstock tunnel.

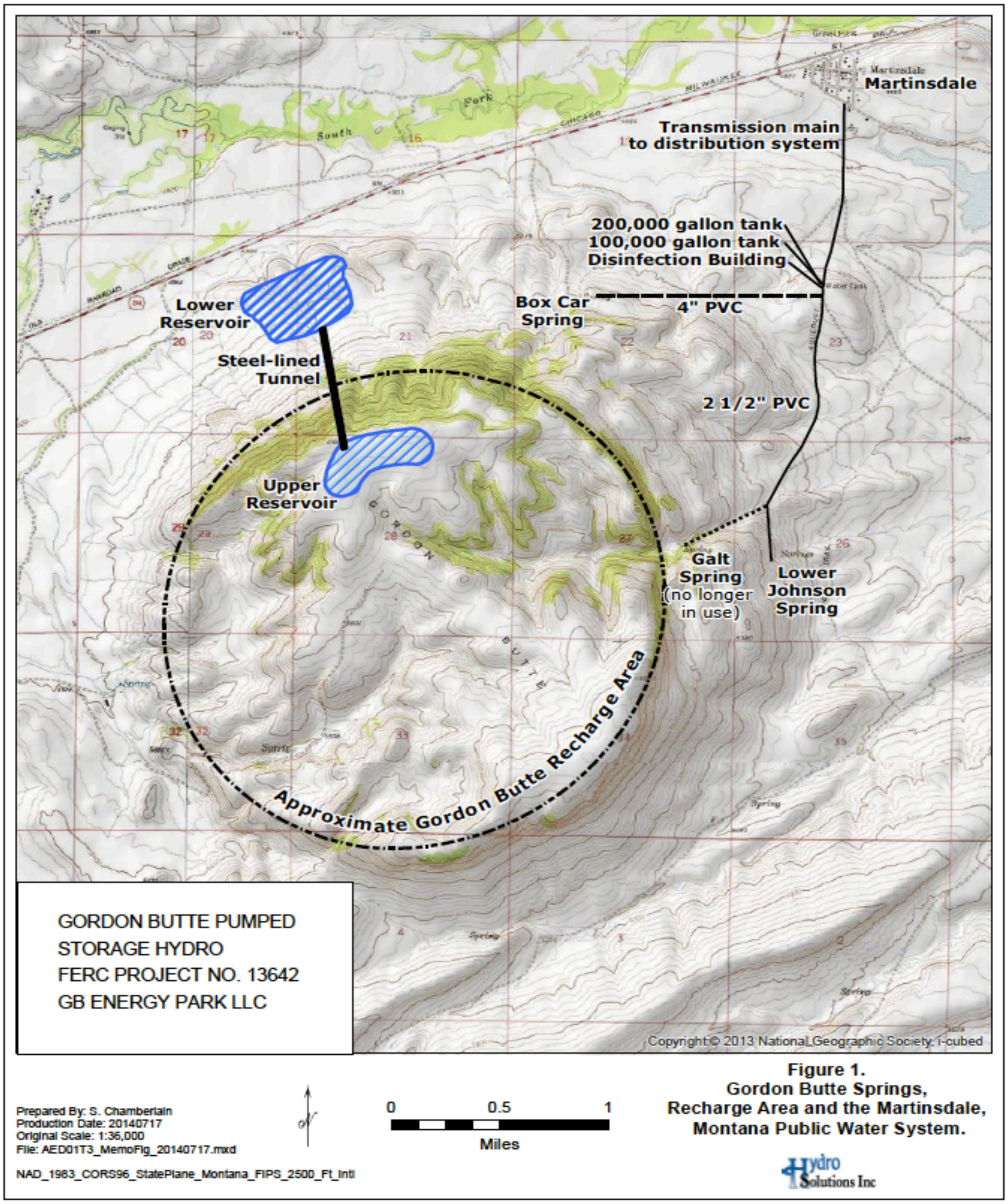


Figure 6. Gordon Butte springs, recharge area, and the Martinsdale public water system (Source: GBEP, 2015b)

Box Car Spring and Lower Johnson Spring are currently used as public water supply sources by the town of Martinsdale. Galt Spring is listed as inactive according to the Montana DEQ Public Water Supply Drinking Water Watch database (Montana DEQ, 2016). Montana DEQ conducts sanitary surveys of public water supply sources approximately every 3 years. The most recent survey of the town of Martinsdale system was performed in November 2013 (Montana DEQ, 2013). Montana DEQ reports there are 72 service connections serving a resident population of 75. The water supply sources are Lower Johnson Spring and Box Car Spring, having average reported flows of 35 gallons per minute and 20 gallons per minute, respectively.

GBEP's field observations during pre-filing studies for the proposed Gordon Butte Project indicated that the three supply springs emerge at different elevations, which is an indication that groundwater movement is controlled by fracture flow rather than a more uniform controlled groundwater flow (URS, 2015).[36] The previous hydrologic assessment found that Box Car Spring is fed principally by groundwater emanating from the west side of the spring's emergence location, and that a gully originating at the top of Gordon Butte is approximately in-line with the lower portion of the channel in which the Box Car Spring is situated, indicating a possible geologic lineament[37] and connection with groundwater feeding the spring (HydroSolutions, 2004). When later excavated by the town's contractor, the apparent fracture source of the spring was found in the hillside along this lineament, and the spring collection facility was constructed at this location (figure 6).

GBEP drilled test boreholes to investigate the depth of groundwater at the proposed locations of the upper reservoir and intake (B-1), power tunnel (B-3), and lower reservoir and powerhouse (B-4).[38] B-1 was drilled to a depth of 215.9 feet and was above the groundwater table for the entire length. Borehole B-3 was drilled only to a shallow depth of 54.9 feet, well above the proposed tunnel location because the drilling reamer shoe that guided the casing was sheared off and repeated attempts to drill through the reamer and continue the hole were unsuccessful. B-4 was drilled to a depth of 299 feet. Based on groundwater data obtained at the borehole, rock in B-4 was considered above the groundwater table to a depth of 101 feet after which "flowing" conditions were noted in open fractures conducting water. Based on the results of B-4, it is expected that

[36] *See* Appendix 6 of GBEP's license application (GBEP, 2015b) for the geotechnical investigation report prepared by URS.

[37] A lineament is a linear feature in a landscape which is an expression of an underlying geological structure such as a fracture or fault.

[38] GBEP's 2015 Geotechnical Investigations Report (URS, 2015) states that borehole B-2, which was to be drilled in the location of the proposed tunnel shaft between boreholes B-1 and B-3 was not drilled because of difficulty in obtaining drill rig access from rugged terrain at its planned location.

similar "flowing conditions" in open fractures may also occur at depths greater than 100 feet at the site of borehole B-3.

Standpipe piezometers[39] were also installed after logging of the boreholes in B-1 and B-4. The objective of the piezometer installation was to determine groundwater conditions at the location of the upper reservoir intake structure and the powerhouse locations. Piezometer results in 2015 showed that B-1 was dry while B-4 showed a groundwater depth of 106.1 feet, which was slightly deeper than the depth measured during the initial subsurface investigation (URS, 2015).

URS (2015) also noted that based on the geology of the area, it is unlikely that groundwater recharge from Gordon Butte has any impact on Cottonwood Creek.

**Water Quality**

The South Fork and mainstem Musselshell River downstream to Deadman's Basin Dam are classified by Montana DEQ as class B-2 waters, which means they are to be maintained suitable for drinking, culinary, and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply. Water quality is at times a concern in the upper Musselshell River basin. Land use is dominated by grazing mixed with hay and cropland, and some riparian areas are severely degraded with loss of willow and cottonwood. Agricultural runoff and irrigation returns can increase salinity, nutrient levels, and sediment load, which increase water temperature and turbidity and decrease dissolved oxygen levels in the Musselshell River (Montana DFWP, 2014; Boyd et al., 2012).

Montana DEQ classified the South Fork and upper Musselshell Rivers as "good" for agricultural and drinking water use but "impaired" for aquatic life and primary contact recreation. The causes for impairment for the 2014 reporting year were alteration in stream-side or littoral vegetative covers, low flow alterations, total nitrogen, total phosphorus, physical substrate habitat alterations, and sediment/siltation caused by agriculture and other hydro modification projects occurring in the basin. Montana DEQ states that no Total Maximum Daily Loads (TMDL) are approved for these waters; however, Montana DEQ also notes that TMDL's are needed for nutrient and sediment/siltation impairments (Montana DEQ, 2014). Water quality standards applicable to project waters are shown in table 5.

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[39] Piezometers are instruments often placed in boreholes to monitor the pressure or depth of groundwater.

Table 5. Numeric water quality criteria for B-2 classified waters in Montana.

| Parameter | Background Condition | Numeric Criteria |
|---|---|---|
| Temperature[a] | 32ºF to 66ºF | 1ºF maximum increase above background |
| | 66ºF to 66.5ºF | Cannot exceed 67ºF |
| | >66.5ºF | The maximum allowable increase in water temperature is 0.5ºF |
| pH | 6.5 to 9.0 range | No more than 0.5 pH change from background. Background pH above 7.0 must be maintained above 7.0 |
| | Other | pH levels outside the range of 6.5-9.0 must be maintained without change |
| DO[b] | NA | 4.0 mg/L from October through February; 8.0 mg/L when early life stages of fish are present |
| Turbidity | NA | 10 NTUs above background |

Notes: DO – dissolved oxygen
ºF – degrees Fahrenheit
mg/L – milligram per liter
NA – not applicable
NTU – nephelometric turbidity unit

[a] Montana does not have absolute standards for water temperature. Temperature regulation is relative and prohibits increases of various amounts above naturally occurring water temperature.

[b] The freshwater aquatic life standard for dissolved oxygen in Montana is contingent on the classification of the waterbody and the presence of early life stages of fish.

During the 2014 study season, GBEP measured water quality parameters at the six flow monitoring sites shown in figure 4. Field water quality parameters included temperature, pH, specific conductivity, and dissolved oxygen. Turbidity was measured twice at site CWC-2 which is located just upstream of the proposed diversion site. GBEP's water quality results are shown in table 6 below.

Table 6. Water quality monitoring results for the Gordon Butte Project (Source: GBEP, 2015b, as modified by staff).

| Site Name | Date of Measurement | Temp (°F) | pH | SC (µS/cm) | DO (mg/L) | Turbidity (NTU) |
|---|---|---|---|---|---|---|
| CWC-1 | 4/10/2014 | 34.7 | 7.7 | 220 | NM | NM |
| | 7/8/2014 | 56.8 | 8.4 | 167 | 8.8 | NM |
| | 8/28/2014 | 53.8 | NM | 186 | 7.5 | NM |
| | 10/20/2014 | 47.7 | 7.6 | 225 | 7.8 | NM |
| | | | | | | |
| CWC-2 | 4/10/2014 | 39.2 | 8.4 | 245 | 9.9 | NM |
| | 7/8/2014 | 63.3 | NM | 176 | 8.6 | 3.4 |
| | 8/28/2014 | 59.2 | NM | 230 | 7.8 | 4.5 |
| | 9/15/2014 | 47.1 | 8.6 | 263 | 10.6 | NM |
| | 10/20/2014 | 50.7 | 8.3 | 301 | 8.0 | NM |
| | | | | | | |
| CWC-3 | 4/10/2014 | 45.5 | 8.4 | 246 | 8.7 | NM |
| | 7/8/2014 | 65.1 | 8.2 | 213 | 8.7 | NM |
| | 8/28/2014 | 62.1 | NM | 240 | 7.2 | NM |
| | 9/25/2014 | 61.0 | 7.8 | 262 | 7.4 | NM |
| | 10/20/2014 | 49.5 | 8.1 | 305 | 8.2 | NM |
| | | | | | | |
| CWC-4 | 4/9/2014 | 45.9 | 8.1 | 254 | NM | NM |
| | 7/8/2014 | 63.7 | 8.4 | 216 | 8.5 | NM |
| | 8/28/2014 | 61.2 | NM | 247 | 8.5 | NM |
| | 10/20/2014 | 47.1 | 8.3 | 310 | 8.4 | NM |
| | | | | | | |
| SF-1 | 4/9/2014 | 39.7 | 7.4 | 301 | NM | NM |
| | 7/8/2014 | 61.7 | 8.3 | 324 | 8.7 | NM |
| | 8/28/2014 | 58.5 | NM | 331 | 9.4 | NM |
| | 9/26/2014 | 55.2 | 8.1 | 364 | 7.1 | NM |
| | 10/20/2014 | 45.0 | 8.0 | 396 | 8.9 | NM |
| | | | | | | |
| SF-2 | 4/9/2014 | 38.8 | 7.4 | 297 | NM | NM |
| | 7/8/2014 | 60.8 | 8.1 | 330 | 9.6 | NM |
| | 8/28/2014 | 58.6 | NM | 384 | 9.0 | NM |

| Site Name | Date of Measurement | Temp (°F) | pH | SC (µS/cm) | DO (mg/L) | Turbidity (NTU) |
|---|---|---|---|---|---|---|
| | 10/20/2014 | 44.4 | 7.7 | 417 | 9.5 | NM |

Notes: ºC – degrees Celsius
SC – specific conductivity
µS/cm – micro Siemens per centimeter
DO – dissolved oxygen
mg/L – milligrams per liter
NTU – nephelometric turbidity unit
NM – no measurement taken

In addition, GBEP obtained a grab sample at site CWC-2 to test for background heavy metal concentrations in Cottonwood Creek. Metal loads tested included arsenic, cadmium, chromium, copper, iron, lead, mercury, selenium, and silver. Laboratory analysis also measured conductivity, total dissolved solids, and total suspended solids. The results of this analysis are shown in table 7.

Table 7. Water chemistry grab sample results from Site CWC-2 (source: GBEP, 2015b, as modified by staff)

| Parameter | Sample CWC-2 | Duplicate Sample CWC-2 |
|---|---|---|
| **Total Metals** | | |
| Arsenic (mg/L) | <0.001 | <0.001 |
| Cadmium (mg/L) | <0.00005 | <0.00005 |
| Chromium (mg/L) | <0.002 | <0.002 |
| Copper (mg/L) | <0.002 | <0.002 |
| Iron (mg/L) | 0.05 | 0.06 |
| Lead (mg/L) | <0.0003 | <0.0003 |
| Mercury (mg/L) | 0.00001 | <0.000005 |
| Selenium (mg/L) | 0.0007 | 0.0005 |
| Silver (mg/L) | <0.0002 | <0.0002 |
| Zinc (mg/L) | 0.001 | 0.002 |
| **Physical Parameters** | | |
| Conductivity (umhos/cm) | 202 | 202 |
| Total Suspended Solids (mg/L) | <10 | <10 |
| Total Dissolved Solids | 121 | 108 |

| Parameter | Sample CWC-2 | Duplicate Sample CWC-2 |
|---|---|---|
| (mg/L) | | |

Notes: mg/L – milligrams per liter
umhos/cm – micromhos per centimeter

The water quality of project waters is typical of a cool-cold water trout stream in Montana with temperature, pH, dissolved oxygen levels, and heavy metal concentrations within the healthy ranges needed to support all trout life stages.

**Fisheries Resources**

*Aquatic Habitat*

Cottonwood Creek Upstream of Proposed Diversion Site

Using the habitat classification system in Stagliano (2005), Cottonwood Creek can be classified as a small foothills river ecosystem in Montana, representing a transition from the high gradient mountain stream communities to the lower gradient prairie rivers. Much of the upper segments of Cottonwood Creek above the proposed diversion site are characterized by stream channels typical of mountainous ecosystems which includes steeper gradients with high velocities, low pool/riffle ratios, narrow deep channels, coarse substrate, and large seasonal flow fluctuations and very low winter flows. The middle and lower reaches of Cottonwood Creek appear to be typical of the cool-cold water stream with wider, more exposed stream channels made up of boulder/cobble riffles, gravel/sand runs and pools with large woody debris (Hunter, 1991).

GBEP surveyed aquatic habitat in Cottonwood Creek in two, 150-meter reaches located upstream of the proposed diversion site near GBEP's CWC-2 flow monitoring site and downstream of the 71 Ranch lower diversion near GBEP's CWC-3 monitoring site shown in figure 4.

The upper survey reach had a fairly wide channel with relatively even flow distributed across the channel. Substrate was predominantly cobble with a thin coating of microalgae and very fine sediments. Looking downstream, the left bank in this reach is steep and has grassy cover with some shrubs. Bankfull widths within this reach varied from 11.3 to 17.4 meters (37 to 56 feet) while wetted widths during the survey ranged from 6.1 to 10.4 meters (20 to 34 feet), with a median width of 9.1 meters (30 feet).

Most of the instream habitat in this survey reach was shallow riffle. During transect establishment, several fish were observed swimming in the riffles or darting from pools on the right bank. GBEP states these were likely rainbow trout based on the observations.

Vegetation on the right bank provides some canopy cover, but much of the channel in this reach receives full sun for a large part of the day. GBEP noted one 50- or 60-meter (165- to 197-foot) long run in the reach where a steep bank provided shading.[40] The shading from this cliff, coupled with the deep pool beneath the cliff, likely provides cool water refuge habitat for fish during the summer months. Additional instream cover for fish is provided by some undercut banks on the right bank and some overhanging vegetation.

Cottonwood Creek Downstream of all 71 Ranch Diversions

The downstream survey reach began just downstream of 71 Ranch's lower diversion near GBEP's CWC-3 flow monitoring site. While scouting the reach, GBEP found several areas where significant return flow was moving overland and in poorly defined channels back to Cottonwood Creek. Flows were significantly lower in this reach during the survey given that 71 Ranch was actively diverting flows at the time (flow at the time was approximately 3.4 cfs versus 28.0 cfs measured in the upper survey reach).

Habitat in this lower reach was characterized by a broad channel with cobble substrate. Thin to moderate algae cover was apparent throughout the reach, and extensive filamentous algae were present in areas with more consistent flow. This thick algal coating is often indicative of either nutrient loading or warmer water temperatures.

Channel widths were more variable along this reach than in the upper survey reach. Bankfull widths varied from 14 meters to 31 meters (45 feet to 102 feet) while wetted widths during the study varied from 4 meters to 12 meters (14 feet to 39 feet), with a median width of 8.5 meters (28 feet).

There were several areas where central cobble bars divided the flow into an active channel and a less active back channel or side channel where interstitial flow came to the surface. GBEP noted an increase in the amount of large woody debris in the channel compared to the upper survey reach. Most of the woody debris was from cottonwood trees that had fallen into the channel because of bank erosion concentrated on the outside bends in the stream. Fallen trees and root wads found along the reach likely provide excellent fish habitat and cover and often lead to the excavation of deeper pools along the edges of the stream provided there is adequate stream flow to sustain aquatic habitat in this lower reach.

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[40] A run is a section of stream where the current is swifter and deeper with little surface turbulence.

South Fork and Mainstem Musselshell Rivers

According to Stagliano (2005), the South Fork can be classified within the intermountain transitional river ecosystem group. The South Fork flows through habitats transitioning from coniferous forests in the headwaters to scrubland and sage, with riparian woody species near its confluence with the North Fork (Stagliano, 2005). Although larger than Cottonwood Creek, it has similar habitat and topographical characteristics as it transitions from its forested headwaters downstream to open grasslands.

In addition to surveying Cottonwood Creek, GBEP surveyed aquatic habitat in a 250-meter (820-foot) long reach in the South Fork just downstream of the South Fork's confluence with Cottonwood Creek near GBEP's SF-1 flow monitoring site. Substrate throughout the entire reach consisted of gravel, cobbles, and silt. The riparian area was in relatively good condition along most of the reach. There was evidence of recent flooding above and beyond the top banks of the river and GBEP states it was not uncommon to find recent flood debris 20 to 30 meters (65 to 100 feet) from the discernible bank edge. Bankfull widths within this reach varied from 22 to 32.3 meters (62 to 106 feet) while wetted widths varied from 9.1 meters to 25.5 meters (30 feet to 84 feet). The median wetted width for this reach in the South Fork was 13.1 meters (43 feet). Instream flow measured in the South Fork during the survey conducted on September 26, 2014, was 25.29 cfs.

GBEP noted there was noticeably less shading of the channel by streamside vegetation despite the presence of tall cottonwood galleries on or near both banks. The entire bottom of the wetted channel was covered with moderate to thick algae and it was nearly impossible to estimate substrate embeddedness because the substrate was not visible through the algal coating. In general, the channel was broad, wide, and shallow, but periodic deep pools (1 meter and deeper) occurred at bends and near root wads and other woody debris.

The mainstem Musselshell River flows eastward from the confluence with the North and South Forks near Martinsdale downstream to Deadman's Basin Diversion Dam, located approximately 40 miles east of Martinsdale. The channel is generally 50-100 feet wide over gravel and sand substrate and intermittent sandstone outcrops (Montana DFWP, 2014). The riparian area is mostly covered with dense cottonwoods and willows and numerous oxbow sloughs and wetlands exist as the result of meander cutoffs. These are both natural and anthropogenic as a result of extensive railroad and highway construction as well as agricultural activities occurring in the basin. The intensive agricultural development of the upper mainstem Musselshell River basin coupled with highway and railroad encroachment has severely degraded the stability of the river channel (Boyd et al., 2015). Water quality at Harlowton is moderately saline and nutrient-enriched as a result of irrigation return flows. Downstream of the diversion for Deadman's Basin Dam and Reservoir, the water quality becomes largely unsuitable for trout due to increased sediment, temperature, and salinity concentrations (Montana DFWP, 2014).

The 2011 flooding along the entire Musselshell River substantially altered the riparian corridor including channel widths in both the South Fork and mainstem Musselshell River (Boyd et al., 2012). The physical alterations to the river from water storage practices and irrigation infrastructure have been both beneficial and detrimental to fish populations in this reach. Some structures prevent upstream passage for fish, and others, while passable, remove large quantities of water, which severely limit aquatic habitat downstream of the diversions. Conversely, storage reservoirs located in the North Fork (Bair Reservoir), South Fork (Martinsdale Reservoir), and the mainstem Musselshell River (Deadman's Basin Reservoir) often deliver water back to the river for irrigation demands in the summer, which can help maintain some fisheries during drought periods.

*Fish Community*

Cottonwood Creek appears to support a traditional Montana trout stream assemblage including native species such as mountain whitefish and Rocky Mountain sculpin as well as stocked trout including brook trout, rainbow trout, brown trout, and westslope cutthroat trout (Montana DFWP, 2012). In addition to these species, the South Fork and the mainstem Musselshell River upstream of Deadman's Basin Dam also support Yellowstone cutthroat trout, longnose dace, northern redbelly dace, longnose sucker, white sucker, minnows, chubs, and stonecat (Montana DFWP, 2014; Stagliano, 2005).

Yellowstone cutthroat trout and westslope cutthroat trout are both listed as S-2 sensitive species by the State of Montana, meaning that they are at risk because of very limited and/or potentially declining population numbers, range, and/or habitat making them vulnerable to extinction or extirpation in the state (Montana NHP, 2016). The U.S. Forest Service also lists these as sensitive species, meaning they are species in which viability is a concern as evidenced by a significant downward trend in population or habitat viability. The northern redbelly dace is listed as an S-3 sensitive species by the State of Montana, meaning that it is potentially at risk because of limited and/or declining population numbers, range, and/or habitat even though it may be abundant in some areas. The northern redbelly dace is known to occur in Meagher County but has not been confirmed in project waters including the South Fork.

Table 8 lists the fish species reported in the immediate project area (including Cottonwood Creek and the South Fork). Currently, no data exists indicating that migratory trout forms or any federally listed threatened or endangered fish species occur in the project vicinity. Therefore, the trout community in project waters likely consists entirely of resident trout that do not undergo long migrations between waterways.

Table 8. Fish species reported in the project vicinity (Source: GBEP, 2015b).

| Common Name | Scientific Name | Distribution | Status |
|---|---|---|---|
| Brook Trout | *Savelinus fontinalis* | CWC, SF | Introduced |
| Westslope cutthroat trout | *Oncorhynchus clarki lewisi* | CWC | Introduced |
| Yellowstone cutthroat trout | *Oncorhynchus clarki bouvieri* | CWC | Introduced |
| Rainbow trout | *Oncorhynchus mykiss* | CWC, SF | Introduced |
| Brown trout | *Salmo trutta* | CWC, SF | Introduced |
| Longnose sucker | *Catostomus catostomus* | SF | Native |
| White sucker | *Catostomus commersoni* | SF | Native |
| Rocky Mountain sculpin | *Cottus bondi* | CWC, SF | Native |
| Longnose dace | *Rhinichthys cataractae* | SF | Native |
| Mountain whitefish | *Prosopium williamsoni* | CWC, SF | Native |

Notes: CWC – Cottonwood Creek
SF – South Fork Musselshell River

Cottonwood Creek was actively stocked with trout from 1931 through 1961 while the South Fork was actively stocked from 1932 through 1970. No trout stocking has occurred in either waterbody since 1980.

2014 Fisheries Survey Results

In the fall of 2014, GBEP fishery biologists, working in conjunction with Montana DFWP, surveyed the fish community in the upper tributaries to Cottonwood Creek (Loco Creek, West Fork Cottonwood Creek, and Middle Fork Cottonwood Creek), in Cottonwood Creek above the proposed project's diversion site, and in the South Fork above the Martinsdale Reservoir diversion. The surveys were designed to assess the existing fisheries and aquatic habitat conditions in Cottonwood Creek. GBEP did not conduct surveys in Cottonwood Creek below the proposed diversion site due to low flow conditions and warm temperatures in late September that would have made capture using electrofishing stressful for the fish.

In the upper tributaries to Cottonwood Creek, surveyors used multi-pass electrofishing techniques to develop population estimates. In Cottonwood Creek and the South Fork, surveyors used single-pass electrofishing techniques to determine presence-absence of fish, rather than multi-pass methods because of the large channel size and habitat complexity, which would have made multi-pass techniques and development of a population estimate difficult. Survey reach lengths varied and were determined according to local site conditions. Reach length was 90-150 meters in the upper tributaries, 520 meters in Cottonwood Creek near the proposed diversion site, and 700 meters in the South Fork. During each survey, surveyors recorded fish species captured, fish count, total length, weight, length of survey reach, and time spent electrofishing. Tables 9 and 10 display the results of the fish surveys GBEP completed in September 2014.

Table 9. Results of fish surveys conducted in three upper tributary streams above Cottonwood Creek (Source: GBEP, 2015b, as modified by staff).

| Site | Count | Fish Per Mile | Length (inches) | | | Weight (grams) | | |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Min | Median | Max |
| **West Fork Cottonwood Creek** | | | | | | | | |
| Brook trout | 60 | --- | 4.6 | 6.6 | 9.7 | 21 | 69 | 164 |
| Brown trout | 1 | --- | --- | 4.6 | --- | --- | --- | --- |
| Rainbow trout | 8 | --- | 4.6 | 4.8 | 9.6 | 38 | 87 | 169 |
| **Middle Fork Cottonwood Creek** | | | | | | | | |
| Brook trout | 64 | --- | 4.3 | 6.4 | 9.9 | 18 | 43.5 | 177 |
| Rainbow trout | 57 | --- | 3.9 | 8.5 | 13.3 | 20 | 121 | 315 |
| Brown trout | 19 | --- | 5.2 | 8.7 | 13.9 | 47 | 112 | 450 |
| Cutthroat trout | 6 | --- | 6.2 | --- | 10.0 | --- | --- | --- |
| **Loco Creek** | | | | | | | | |
| Brook trout | 17 | 35 | 3.5 | 5.7 | 7.0 | 5 | 27 | 56 |
| Brown trout | 3 | 9 | 12.4 | 13.5 | 14.6 | 338 | 426 | 600 |
| Rainbow trout | 7 | 44 | 4.8 | 10.8 | 18.0 | 23 | 199 | 1,006 |

| Site | Count | Fish Per Mile | Length (inches) | | | Weight (grams) | | |
|---|---|---|---|---|---|---|---|---|
| Westslope Cutthroat trout | 1 | 9 | --- | 14.5 | --- | --- | 541 | --- |

Table 10. Results of fish surveys conducted in Cottonwood Creek and the South Fork survey sites (Source: GBEP, 2015b, as modified by staff).

| Site | Count | Fish Per Mile | Length (inches) | | | Weight (grams) | | |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Median | Max | Min | Median | Max |
| **Cottonwood Creek upstream of proposed diversion site** | | | | | | | | |
| Brown trout | 72 | 224 | 8.6 | 14.3 | 17.6 | 115 | 445 | 975 |
| Rainbow trout | 11 | 34 | 6.0 | 11.1 | 17.5 | 140 | 241 | 882 |
| **South Fork Musselshell River upstream of Martinsdale Reservoir** | | | | | | | | |
| Brown trout | 108 | 253 | 6.7 | 13.1 | 20.0 | 55 | 365 | 1,355 |
| Mountain whitefish | 2 | 5 | --- | 15.7 | --- | --- | 624 | --- |

The majority of the fish captured in the upper tributary sites was brook trout followed by rainbow and brown trout. Both sub-adult and larger adult fish were represented although very few fish captured measured in the middle size class range (i.e., between 8.5 to 12.5 inches). The majority (i.e., 68 percent) were less than 8 inches.

A total of 83 fish were collected in Cottonwood Creek, comprising 72 brown trout and 11 rainbow trout. Lengths ranged from 6 to 18 inches although more than half of the captured fish exceeded 12 inches (table 10). In general, fish appeared robust with brown trout median weights at 445 grams and rainbow trout median weights at 241 grams. Catch per unit effort (CPUE) for the Cottonwood Creek survey site near the proposed diversion was 224 brown trout per mile or 176 brown trout per hour. CPUE for rainbow trout was 34 fish per mile or 27 fish per hour.

For the South Fork survey site, a total of 110 fish were collected including 108 brown trout and 2 mountain whitefish. Lengths of fish collected ranged from 6.7 to 19.7 inches (table 10). Nearly 90 percent of the fish collected exceeded 12 inches in length.

Median weight for brown trout was 365 grams with one fish exceeding 1,350 grams. CPUE for the South Fork survey site was 253 brown trout per mile or 164 brown trout per hour. While size classes in both Cottonwood Creek and the South Fork were generally well represented, the population in the South Fork appeared to be more equally distributed among the various size classes than the fish sampled in Cottonwood Creek or in the upper tributaries.

Rainbow and cutthroat throat trout spawn in the spring or early summer, while brook trout and brown trout spawn in the fall. Thus, one possible reason for higher numbers of brown trout in Cottonwood Creek and the South Fork near the project area are that early life stages emerge in the winter following the irrigation season when more consistent base flow exists in the watershed compared to the summer months when portions of Cottonwood Creek are dewatered.

*Benthic Macroinvertebrate Community*

GBEP conducted benthic macroinvertebrate surveys in conjunction with its fish and aquatic habitat surveys in Cottonwood Creek and the South Fork. GBEP used standardized sampling protocols to characterize standard macroinvertebrate community metrics (i.e., species richness, composition tolerance, and functional feeding group measures), and utilized multiple indices to determine whether the community assemblage collected at each site was considered impaired. In general, the benthic macroinvertebrate data collected by GBEP demonstrated that water quality in the survey reaches of Cottonwood Creek and the South Fork are non-impaired. Taxa richness was moderate to high in all samples and the taxa present indicated that habitat diversity and availability are adequate in terms of benthic macroinvertebrate assemblages.

#### 3.3.2.2 Environmental Effects

**Construction Effects on Aquatic Resources**

As discussed in section 3.3.1.2, *Geology and Soils*, *Environmental Effects*, construction of project facilities, including the upper and lower reservoirs, power tunnel, powerhouse, substations, access road, transmission line, and staging and stockpiling areas, has the potential to cause windblown dust that could migrate to waterbodies in the project vicinity. Construction activities would also introduce hazardous substances into the project area which could adversely affect aquatic resources if they are not properly stored or handled.

To control erosion, dust generation, and prevent pollution of hazardous materials during construction, the applicant proposes to revise the preliminary ESCP and preliminary Dust Plan based on final project design; develop a SPCCP; and develop a hazardous materials plan prior to construction. The measures contained in the preliminary ESCP and preliminary Dust Plan are described in detail in section 3.3.1.2.

At a minimum, the proposed SPCCP and hazardous materials plans would include the following preliminary BMPs: establish fueling areas at locations that would avoid or minimize potential spills into nearby waterbodies, inspect vehicles and equipment for leaks, store hazardous materials in protective containers, stop and clean up spills immediately as they occur, and provide employee training to prevent and respond to spills.

*Our Analysis*

The project would be constructed in an upland environment and only the transmission line poles would be situated relatively close (i.e., within about 325 feet) to any major waterbodies. GBEP does not provide the specific location of the transmission line poles in its license application, but does indicate that the transmission line would span Cottonwood Creek (i.e., poles would be sited outside of the stream channel), which would avoid any adverse effects on aquatic habitat. In addition, transmission line pole construction would not require a large amount of ground disturbance and any soil disturbance from such construction would be confined to a brief construction period and a small construction footprint. Besides the transmission line, the next closest project facility to existing surface waters is the lower reservoir access road, which would be about 2,250 feet from the South Fork and across Montana Highway 294 at its closest point. Also, all project features would be located at least one mile away from Martinsdale Reservoir at their closest point.

Locating major project facilities away from existing surface waters such as Cottonwood Creek, the South Fork, and Martinsdale Reservoir would minimize the potential for soil erosion from project construction activities to contribute to sedimentation of aquatic habitats. Given the distances between the location of proposed project facilities and existing waterbodies, the primary mechanism by which exposed soils could enter these waterbodies would be through windblown soil and dust from excavated areas or stockpiled soils. GBEP's preliminary ESCP and Dust Plan include measures to contain excavated soils and control soil erosion and dust pollution, thereby minimizing the potential for windblown soil to enter nearby waterbodies during construction.

Construction of the proposed project would require the use of an assortment of heavy equipment. This equipment would require gasoline or diesel fuel, motor oil, or hydraulic fluid. On-site fuel storage facilities for a project of this type commonly are in the range of several hundred to several thousand gallons of fuel. Although most project features would not be constructed near existing surface waters, any hazardous materials spills could cause contaminants to migrate into the project reservoirs or groundwater.

Developing an SPCCP and hazardous materials plan are standard practices to prevent accidental spills and address any accidental discharges of hazardous substances to ground and surface waters. Overall, developing these plans with specific procedures for handling and storing hazardous substances and containing and responding to unintentional spills would minimize the potential for any hazardous substances to enter any existing water bodies, the project reservoirs, or groundwater during project construction and operation.

**Operation Effects on Cottonwood Creek Streamflow and Surface Water Uses**

Under existing conditions, there are times when Cottonwood Creek flows are insufficient to meet all existing water rights and the creek is dewatered. This is particularly true downstream of the proposed project's diversion site when 71 Ranch is diverting up to 50 cfs during the mid-May through September irrigation season. Additional withdrawals from Cottonwood Creek could adversely affect downstream water users and aquatic resources.

To minimize the effects of project water withdrawals from Cottonwood Creek on existing water uses and aquatic habitat downstream, GBEP proposes to: (1) restrict project flow diversions to a maximum rate of 50 cfs, (2) only divert from April 15 to June 30 when flows are naturally high, and (3) maintain a 16-cfs flow in Cottonwood Creek at the proposed compliance monitoring location about 4 miles downstream whenever the project is diverting water.

*Our Analysis*

The minimum pool volumes of the upper and lower reservoirs during normal operation are 243 and 442 acre-feet, respectively, while the volume of water needed for maximum power generation would be an additional 4,000 acre feet.[41] Therefore, initial filling would require 4,685 acre-feet to account for the minimum pool volumes and enable maximum generation. Because GBEP would only be able to fill up to its maximum annual water right of 3,999 acre feet, it would take at least two years to complete the initial fill. This estimate assumes a total of 40 days of diverting 50 cfs continuously to fill the reservoirs with 3,999 acre feet of water during the first year of operation. Once initial reservoir filling is completed the following year, annual re-fill

[41] GBEP stated in its license application that maximum drawdown would be 4,000 acre-feet. Staff assumes this would be the volume of water that would be cycled back and forth between the reservoirs during normal maximum power generation. Each reservoir must maintain the minimum pool elevation to operate. Therefore, staff estimated the total volume of water for the closed-looped system to operate would be about 4,685 acre-feet.

volumes to account for evaporation or seepage losses would be about 500 acre feet, which would take a little more than 5 days of continuously diverting 50 cfs to re-fill the reservoirs.

Project effects on streamflows and other surface water uses in Cottonwood Creek during the April 15 to June 30 diversion period would vary depending on the available flow and whether or not other users are diverting water. Based on existing water rights for Cottonwood Creek, up to 90.1 cfs can be diverted for irrigation and non-irrigation purposes during the month of April and up to 93.2 cfs can be diverted during May and June for these purposes (see table 3 in section 3.3.2.1 *Water Resources*, *Affected Environment*). In addition, Montana DFWP holds an instream flow water reservation of 16 cfs in Cottonwood Creek for the protection of aquatic and riparian habitat during these months. Therefore, the total existing water demand in Cottonwood Creek during April is 106.1 cfs and total demand in May and June is 109.2. Because the irrigation season typically doesn't start until mid-May at the earliest, staff assumed that it was unlikely that irrigation diversions from 71 Ranch and other users are occurring from April 15 to May 15. Thus, the actual amount of water diverted in April under existing conditions may be less than the total demand based on existing water rights. Nevertheless, we analyzed the potential project effects on streamflow and surface water uses using the total maximum water demand for all three months, including all existing irrigation and non-irrigation uses.

Based on the 60-cfs capacity of the canal, staff estimates that a total of 60 cfs could be withdrawn at the diversion structure whenever the project is diverting water.[42] GBEP's project diversions would replace 71 Ranch's existing 50 cfs diversion normally used for irrigation; thus, the only additional withdrawal that could occur from the proposed diversion structure during GBEP's diversion period relative to existing

[42] In an August 5, 2016 telephone conversation with Commission staff, GBEP stated that the hydraulic capacity of the existing irrigation canal is 60 cfs. During the conversation, GBEP clarified that 71 Ranch would not divert water for irrigation purposes when filling the reservoirs, but that it might need to divert water for livestock watering. Therefore, when GBEP diverts up to its maximum proposed diversion rate of 50 cfs, 71 Ranch would only be able to divert up to an additional 10 cfs into the ranch's existing irrigation canal for livestock watering. This would equate to an additional 10-cfs diversion from Cottonwood Creek during the reservoir filling period when compared to71 Ranch's existing diversions for irrigation and livestock watering purposes. However, it is not clear whether GBEP would coordinate those diversions in a manner that would continue to limit the maximum withdrawal to 50 cfs. Therefore, staff assumed that during the proposed filling period, a maximum of 60 cfs could be withdrawn from the diversion structure.

conditions would be the additional 10 cfs diverted for livestock watering by 71 Ranch at the same time that GBEP diverts water for reservoir filling.

In order for GBEP to divert its maximum 50-cfs flow rate and still maintain flows in Cottonwood Creek downstream of the diversion to protect other surface water uses, flows at the diversion would need to be 116 cfs or more in April and 119 cfs or more in May and June (table 11). These flows account for the 60 cfs to be diverted at the diversion, the additional diversions for irrigation and non-irrigation uses that may occur downstream during these months, and Montana DFWP's 16-cfs instream flow reservation for Cottonwood Creek. Because estimated monthly average streamflows during April at the proposed diversion site are 73 cfs, it is unlikely that GBEP would be able to continuously divert up to its full 50-cfs flow rate and still pass sufficient flows downstream needed to satisfy all other existing users and maintain its proposed 16-cfs minimum flow.[43]

However, monitoring flows on a daily basis and adjusting or ceasing diversions to increase flows in Cottonwood Creek if GBEP cannot maintain its 16-cfs minimum flow at it downstream compliance gage would minimize effects to downstream uses during low flow periods.

Table 11. Expected mean flows available in Cottonwood Creek from May through June and ability to meet anticipated water demands (Source: Montana DNRC, 2014, staff).

| Month | Mean Flow Available at the Proposed Project Diversion Site (cfs) | Anticipated Water Demand in Cottonwood Creek Between Diversion and Downstream Gage Site (cfs)* | Meet Anticipated Water Demand on a Mean Monthly Basis? |
|---|---|---|---|
| April | 73 | 116.1 | No |
| May | 279 to 303 | 119.2 | Yes |
| June | 311 to 335 | 119.2 | Yes |

* Total water demand includes all existing consumptive water rights, the extra 10 cfs diverted by 71 Ranch for non-irrigation purposes when the project is diverting 50 cfs, and GBEP's proposed 16-cfs minimum flow. Actual demand may be less in April because irrigators typically aren't diverting during this month.

[43] GBEP's 16-cfs minimum flow would be maintained in order to meet Montana DFWP's 16-cfs instream flow reservation for Cottonwood Creek even when all other users downstream of the diversions are diverting water up to their full legal amounts.

During May and June, natural flows would likely be substantially higher as snowmelt runoff increases and average monthly flows increase to at least 279 cfs which would exceed the 119 cfs needed at the diversion site to satisfy all uses of Cottonwood Creek flows, including meeting the proposed minimum flow (table 11). Therefore, the indirect effect of the additional 10-cfs withdrawal, if it were to occur during these months, would be minor and project diversions would likely have a negligible effect to other Cottonwood Creek surface water uses during May and June.

**Operation Effects on South Fork and Mainstem Musselshell River Streamflow and Surface Water Uses**

Streamflows in the South Fork from its confluence with Cottonwood Creek downstream to its confluence with the North Fork and in the mainstem Musselshell River from Martinsdale downstream to Shawmut, Montana, are heavily influenced by diversions for irrigation, water storage, municipal uses, and domestic uses. Because Cottonwood Creek flows into the South Fork approximately 5.2 miles downstream of GBEP's proposed diversion site, a reduction in Cottonwood Creek flow during project reservoir filling could also reduce flows entering the South Fork and mainstem Musselshell River farther downstream during the same period.

To ensure that project flow diversions for reservoir filling do not adversely affect existing surface water uses in these downstream waterways, GBEP proposes to: (1) coordinate with the District Court MRDP daily when the project is diverting water and only divert water from Cottonwood Creek when downstream water rights are satisfied within the court's jurisdiction,[44] (2) coordinate with the Upper Musselshell WUA daily when the project is diverting water to determine what minimum flow levels in the South Fork identified in table 12 below must be maintained,[45] and (3) coordinate with Deadman's Basin WUA at least weekly when the project is diverting water and cease

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[44] The District Court MRDP administers a water right enforcement program on the South Fork and mainstem Musselshell River, known as the Musselshell River Distribution Project. During the irrigation season, the District Court MRDP allocates water based on water availability and priority date of water rights within six jurisdiction zones. The South Fork Musselshell River is included in Zone 6.

[45] Upper Musselshell WUA operates Bair Reservoir on the North Fork and Martinsdale Reservoir on the South Fork.

diversions if GBEP receives confirmation that Deadman's Basin Reservoir is actively being filled.[46]

In addition to the coordination measures described previously, GBEP would monitor flow levels at the following locations prior to and while diverting water for project purposes: (1) South Fork at USGS gage 06118500 located approximately 1.5 miles downstream of the South Fork's confluence with Cottonwood Creek; (2) mainstem Musselshell River at USGS gage 06119600 located near Martinsdale, approximately 6 miles downstream of the South Fork gage site; (3) mainstem Musselshell River at USGS gage 06120500 located at Harlowton, approximately 26 miles downstream of the South Fork gage site; and (4) mainstem Musselshell River USGS gage 06123030 located upstream of Shawmut, Montana, approximately 36 miles downstream of the South Fork gage site. When the project is diverting water to fill the reservoirs, GBEP would adjust the headgate to increase flows in Cottonwood Creek or cease diversions if the downstream minimum flows in table 12 cannot be met.

Table 12. Proposed minimum flows at downstream sites when the project is diverting water from Cottonwood Creek (Source: staff)

| Gage Site | April 15-27 (cfs) | April 28-30 (cfs) | May 1-May 30 (cfs) | June 1- June 30 (cfs) |
|---|---|---|---|---|
| **Martinsdale Reservoir Actively Being Filled** | | | | |
| South Fork USGS gage near Martinsdale | 602 | 603 | 660 | 664 |
| Musselshell River USGS gage near Martinsdale | 80 | 80 | 80 | 80 |
| Musselshell River USGS gage at Harlowton | 80 | 80 | 80 | 80 |
| Musselshell River USGS gage near Shawmut | 80 | 80 | 80 | 80 |

[46] Deadman's Basin WUA operates Deadman's Basin Reservoir on the mainstem Musselshell River near Shawmut, Montana, which is approximately 40 miles downstream of the South Fork's confluence with Cottonwood Creek.

| Gage Site | April 15-27 (cfs) | April 28-30 (cfs) | May 1-May 30 (cfs) | June 1- June 30 (cfs) |
|---|---|---|---|---|
| **Martinsdale Reservoir Not Being Filled** | | | | |
| South Fork USGS gage near Martinsdale | 194 | 195 | 252 | 256 |
| Musselshell River USGS gage near Martinsdale | 80 | 80 | 80 | 80 |
| Musselshell River USGS gage at Harlowton | 80 | 80 | 80 | 80 |
| Musselshell River USGS gage near Shawmut | 80 | 80 | 80 | 80 |

*Our Analysis*

As discussed above, there would be little change in Cottonwood Creek flow due to project diversions because project diversions would only occur during periods of high flows and when irrigation demands are usually low. If there were insufficient flow to meet both project diversion and downstream flow needs, the project would adjust or cease diversions as needed. Consequently, Cottonwood Creek contributions to the South Fork and mainstem Musselshell River would not be significantly affected by project diversions.

Regardless, there would likely be sufficient water to meet existing water demands downstream except when Montana DNRC is filling Martinsdale Reservoir and Deadman's Basin Reservoir. Montana DNRC diverts 408 cfs from the South Fork into Martinsdale Reservoir and 600 cfs from the mainstem into Deadman's Basin Reservoir for storage purposes. Average monthly flows in the South Fork during the April 15 to June 30 proposed diversion period range from 113 to 360 cfs (see table 13); therefore, available flows would rarely if ever exceed the minimum flow thresholds of between 602 and 664 cfs that would allow GBEP to fill the project reservoirs at the same time that Montana DNRC is diverting water for storage. GBEP's proposed consultation efforts would define those periods when its withdrawals would prevent adequate filling of Martinsdale Reservoir and Deadman's Basin Reservoir and it would adjust its operations accordingly. However, it is unclear when Montana DNRC typically begins filling these reservoirs; thus it is unclear how GBEP's proposed limitations would affect its ability to fill the project reservoirs.

When Montana DNRC is not diverting water for storage, there would typically be sufficient flow in the South Fork to meet existing demands and allow filling of the project reservoirs. This is particularly true for May and June and occasionally in April (see table 13). Similarly, because sufficient flow would be available in the South Fork to meet existing demands and the fact that storage reservoirs have the greatest influence on streamflows in the mainstem Musselshell River downstream of the confluence of the North and South Forks, the project would have a negligible effect on water uses in the mainstem Musselshell River.

Table 13. Historical mean monthly flow and non-storage water demand at the South Fork USGS gage (source: Montana DNRC, 2014; USGS, 2016; staff).

| Month | Historical Mean Monthly Flow at South Fork USGS Gage Site (cfs)[a] | Non-Storage Water Demand Downstream of South Fork USGS Gage Site (cfs)[b] | Meet Existing Water Demand on a Mean Monthly Basis? |
|---|---|---|---|
| April | 113 | 193.97 | No |
| May | 331 | 198.25 | Yes |
| June | 360 | 255.32 | Yes |

[a] Values derived from historical USGS mean monthly flow data (USGS, 2016).

[b] Demand is based on an assumption that all existing users are diverting up to their full water rights. Actual demand may be less in April because irrigators typically aren't diverting during this month.

Monitoring flows at USGS gages on the South Fork and mainstem Musselshell Rivers, maintaining minimum flows at each of the gages, and coordinating with downstream water management entities during project diversions, as GBEP proposes, would provide a mechanism to confirm that water uses in the South Fork and mainstem Musselshell River are not affected by GBEP's project diversions.

If GBEP were to shut down project diversions during May and June due to insufficient flow levels downstream or when Deadman's Basin Reservoir was being filled, then 71 Ranch may resume its regular 50-cfs diversion for irrigation purposes as it does under existing conditions. Because 71 Ranch has one of the most senior water rights on Cottonwood Creek, it is likely able to divert water even if flows in Cottonwood Creek are not sufficient to meet other demands downstream. Therefore, under this scenario, flow levels downstream may actually be lower than if the project were diverting water because 71 Ranch would not be required to provide any minimum flows in

Cottonwood Creek, which could result in less water available for water storage in both the South Fork and mainstem Musselshell Rivers.

**Operation Effects on Fishery Resources**

During the irrigation season (particularly during the late summer and early fall months), streamflows in Cottonwood Creek, the South Fork, and mainstem Musselshell River are heavily diverted for irrigation which can reduce aquatic habitat for trout, limit their movements, and disrupt essential behaviors such as spawning.

In 1989, Montana DFWP collected instream flow measurements to develop flow recommendations to maintain existing diverse fish and macroinvertebrate populations as well as important rearing and overwintering habitats and riparian habitats in and along Cottonwood Creek, the South Fork, and the mainstem Musselshell River (Montana DFWP, 2014). As a result of this effort, Montana DFWP holds year-round instream flow water reservations of 16 cfs for Cottonwood Creek, 30 cfs for the South Fork, and 80 cfs for the mainstem Musselshell River from the confluence of the North and South Forks downstream to Deadman's Basin Dam, for the protection of aquatic and riparian habitat in these waterbodies. Montana DFWP's current instream flow water reservations were developed using the wetted perimeter method. The wetted perimeter method provides a flow prescription based on a relationship between wetted perimeter and discharge with the point of maximum curvature[47] corresponding to the flow needed to protect aquatic habitat in a stream or river (Parker et al., 2004). In its letter commenting on GBEP's preliminary application document filed on July 21, 2014, Montana DFWP noted that these instream flow reservations do not address connectivity (passage) as well as certain water quality considerations such as temperature, but would at a minimum maintain proper channel and riparian function during typical, low-flow periods of the year.

To protect resident trout and maintain adequate flows to sustain aquatic habitat during project operation, GBEP proposes to restrict flow diversions from Cottonwood Creek to the period of April 15 to June 30 when flows are naturally high during the year and to maintain minimum flows in Cottonwood Creek, the South Fork, and the mainstem Musselshell River that would meet or exceed Montana DFWP's existing water reservations in each of these waterbodies. More details on GBEP's proposed minimum flows and compliance gage locations are included in section 3.3.2.2, *Operation Effects on*

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[47] On plots of wetted perimeter versus discharge, the inflection point in the graph corresponds to a point where rising water levels cause increasingly smaller rates of increase in wetted perimeter for each unit increase of discharge whereas water levels that fall below this inflection point cause larger rates of decrease in wetted perimeter for each unit decrease in discharge (USGS, 2002).

*Cottonwood Creek Streamflow and Surface Water Uses* and section 3.3.2.2, *Operation Effects on South Fork and Mainstem Musselshell River Streamflow and Surface Waters Uses*.

*Our Analysis*

As discussed in section 3.3.2.2. *Operation Effects on Cottonwood Creek Streamflow and Surface Water Uses*, estimated monthly average flows for Cottonwood Creek during May and June at the proposed diversion site are at least 279 cfs, which would exceed the 119 cfs needed to satisfy all downstream consumptive uses, including project diversions and GBEP's proposed 16 cfs minimum flow. Given that sufficient flows are expected to be available in Cottonwood Creek during these months to sustain aquatic habitat for fish at flow levels well above Montana DFWP's minimum instream flow water reservation (i.e., 16 cfs), diverting water for project purposes would have a negligible effect on fish and aquatic habitat in Cottonwood Creek during May and June.

As previously discussed, estimated monthly average streamflows during April at the proposed diversion site are 73 cfs. Thus, GBEP would not likely be able to divert up to its maximum proposed diversion rate of 50 cfs and still maintain Montana DFWP's instream flow reservation, particularly if 71 Ranch or other water users downstream of the proposed diversion site are diverting water for non-irrigation uses (e.g., livestock watering) during this time. However, GBEP's proposal to maintain a minimum flow at its downstream compliance gage that meets Montana DFWP's 16-cfs flow reservation would maintain proper channel and riparian function for the protection of resident trout and aquatic macroinvertebrates.

In addition, GBEP's proposals to monitor flows at existing USGS gages in the South Fork and mainstem Musselshell River and to maintain minimum flows during project diversions that meet or exceed Montana DFWP's instream flow reservations for these two waterbodies (i.e., 30 cfs for the South Fork and 80 cfs for the mainstem Musselshell River) would ensure that project diversions from Cottonwood Creek do not adversely affect aquatic resources in the South Fork and mainstem Musselshell River.

**Fish Entrainment**

As occurs under existing conditions whenever 71 Ranch is diverting flows at the proposed diversion site, project flow diversions would continue to entrain fish into the unscreened irrigation canal.

GBEP does not propose any license requirements for protecting fish from entrainment into the proposed project's reservoirs. However, it proposes through an off-license agreement with 71 Ranch to construct and operate a Farmers Conservation Alliance fish screen at the diversion structure that would prevent entrainment of fish into the irrigation canal and the project. GBEP provided details on the fish screen design in Appendix 9 of its license application. The screen would be designed to limit the maximum approach velocity to 0.20 foot per second (giving a through-hole velocity of 0.40 foot per second), which meets the screening criteria for juvenile and adult salmonids established in NMFS's *Anadromous Salmonid Passage Facility Design* (NMFS, 2011).

*Our Analysis*

Under existing conditions, fish are likely entrained into the unscreened irrigation canal and lost from the Cottonwood Creek population from April through September whenever 71 Ranch is diverting water for agricultural purposes. Entrainment of fish would continue when diverting water to fill the project reservoirs. However, diversion would begin earlier (mid-April) and could be slightly greater (10 cfs) if 71 Ranch diverts flows for livestock watering when the project is diverting water to fill the reservoirs. This would result in a minor increase in the potential for fish entrainment into the canal, predominately during the 30-day period from mid-April to mid-May when 71 Ranch does not typically divert any water for irrigation.

As occurs under existing conditions, any fish entrained into the irrigation canal during project flow diversions for reservoir filling would not be expected to return to Cottonwood Creek, and therefore, would no longer contribute to the fishery of Cottonwood Creek. Some of the entrained fish would likely continue all the way through the 5.5-mile-long irrigation canal and would be injured when they pass through the project's new flow control gate or valve, as these facilities are not typically designed for the safe passage of fish. Any fish that survive passage through the flow control structure would enter the lower reservoir. The project's reservoirs would be lined with concrete and would be designed to limit the availability of shallow water habitat, both of which would contribute to very poor habitat conditions for resident trout. In addition, there are no tributary streams entering the reservoirs which trout would need for successful spawning and reproduction. Any trout in the reservoirs would also be subject to additional injury and mortality if they are entrained into the project powerhouse during pumping or generation. For these reasons, any fish that survive entrainment into the project reservoirs would be unlikely to persist for long periods of time and would not establish a self-sustaining population.

If 71 Ranch were to construct a new fish screen at the diversion structure with a similar design and approach velocities as those described in Appendix 9 of GBEP's license application, all juvenile and adult trout passing downstream at the diversion structure while the project is diverting water would avoid entrainment into the canal system and the project reservoirs and would instead safely pass downstream where they would be able to access available habitat.

With GBEP's proposal to maintain a 16-cfs minimum flow in Cottonwood Creek while diverting water for project purposes, any fish safely passing the diversion structure while the project is diverting water would be ensured that there would be some useable habitat in lower Cottonwood Creek.

**Compliance Gage and Parshall Flume**

To document compliance with the 16-cfs minimum flow in Cottonwood Creek, GBEP proposes to monitor minimum flows at an existing staff gage located approximately 4 miles downstream of the diversion site where Cottonwood Creek passes under the Montana Highway 294 bridge. GBEP began developing a rating curve for the gage site during pre-filing studies and proposes to further refine the rating curve in consultation with Montana DFWP following license issuance. In addition to the proposed compliance gage in Cottonwood Creek, GBEP also proposes to maintain and operate an existing Parshall flume in the irrigation canal to monitor the quantity of flows being diverted from Cottonwood Creek for project purposes.

In its January 19, 2016 Additional Information Request (AIR) response, GBEP provided more information on its proposed compliance monitoring procedures. Specifically, these would include manually checking the stage level at the gage site once per day (likely in the morning). If flow at the compliance gage is less than 16 cfs, GBEP would manually adjust the headgate at the diversion structure to increase flows in Cottonwood Creek. GBEP states that it would take about 30 minutes after reading the gage to adjust the headgate, and that it would take an additional 15 minutes for the additional flow to reach the compliance gage site. Therefore, if GBEP observed a minimum flow deviation, it would take about 45 minutes to correct the deviation. If there is insufficient flow in Cottonwood Creek to maintain minimum flows while the project is diverting water, GBEP would discontinue diverting water for the project until such time when sufficient flows are available.

GBEP also proposes to maintain daily flow records and submit annual reports to Montana DNRC by July 30 of each year following the conclusion of the initial and annual reservoir filling, and to provide flow data to Montana DNRC upon its request.

*Our Analysis*

Although compliance measures do not directly affect environmental resources, they do allow the Commission to ensure that a licensee complies with the environmental requirements of a license; therefore, compliance monitoring and reporting are standard requirements in Commission-issued licenses.

GBEP's proposed compliance gage would be located in a relatively stable location in Cottonwood Creek that would not be dewatered under the proposed minimum flow regime (Hydrosolutions, Inc, 2014). The gage location would also be easily accessible for efficient and timely gage maintenance and data readings.

According to GBEP's 2014 Water Resources Study Report, it collected a good range of stage-discharge data at the gage site (i.e., 13.5 to 54.7 cfs) during pre-filing studies, and the preliminary rating curve generated from the data showed a good fit with the trend line (i.e., R-squared of 0.99) (Hydrosolutions, Inc, 2014).[48] These data suggest that GBEP's proposed gaging site would be sufficient to document compliance with minimum flow requirements to protect aquatic resources in Cottonwood Creek. Continuing to refine the rating curve as it proposes would enable GBEP to account for changes in the stream channel that could affect the stage-discharge relationship. However, GBEP does not provide any specific information on the frequency that it would verify the rating curve during long-term project operation. Such information would be needed to ensure the long-term accuracy of the gage and is typically included in an operation compliance monitoring plan.

All flows diverted at the diversion structure by either 71 Ranch for agricultural purposes or GBEP for hydroelectric project purposes would pass through 71 Ranch's existing Parshall flume. Although GBEP indicates that the flume would be used to measure project flow diversions, it's unclear how the flume would be able to differentiate between flows diverted by 71 Ranch for irrigation purposes or those diverted by GBEP for hydroelectric project purposes. In order for the Commission to be able to ensure that GBEP is complying with its proposed license requirements for restricting flow diversions to no more than 50 cfs and only during the period of April 15 through June 30 when flows are naturally high, it would need additional documentation from GBEP that the flume could be used to differentiate between project and non-project flow diversions. If the flume were unable to differentiate between the two diversion sources, additional gaging devices such as a staff gage, calibrated valve or gate opening, or an additional flume near the location where project flow diversions discharge into the lower reservoir may be necessary for compliance purposes. Such requirements are often included in an operation compliance monitoring plan.

GBEP's proposal to maintain flow records and to submit annual reports to Montana DNRC would provide a mechanism for Montana DNRC to evaluate GBEP's ability to comply with its proposed flow restrictions and minimum flows in Cottonwood Creek on an annual basis. However, because GBEP does not propose to report deviations from its operational measures to the Commission, it is unclear how the Commission

[48] The R-squared value is a statistical measure of how close the data are to the fitted regression line. The closer that an R-squared value is to 1.0, the more accurate the relationship is between stage readings on a gage and actual discharge levels in a stream.

would be able to administer compliance with the proposed license requirements and ensure that GBEP's proposed flow restrictions and minimum flow measures are adequate to protect existing water uses and aquatic and riparian habitat downstream during reservoir filling.

**Box Car Springs Monitoring Program**

Construction of the proposed reservoirs, power tunnel, and powerhouse would require extensive ground excavation which could disrupt the existing flow of groundwater to the water supply springs. Following construction, the concrete-lined and geomembrane-sealed reservoirs would also limit groundwater recharge in the project area by capturing precipitation and limiting infiltration into the ground beneath the reservoirs.

During the scoping process, local residents voiced concerns that project construction would affect groundwater feeding the town's water supply springs on the east side of Gordon Butte.

To monitor effects of construction and initial operation on the town's water supply springs, GBEP proposes to implement its Box Car Spring Monitoring Program Plan filed on January 19, 2016. The monitoring program would include monitoring flow rate, pressure, and water quality from Box Car Spring prior to and during construction, and for one year following initial project operation. If the monitoring results indicate there are adverse effects on Box Car Spring, GBEP would develop mitigation measures to protect the town of Martinsdale's water supply.

The monitoring program would include installing an ultrasonic flow meter, data logger, pressure gauge, and water quality monitoring equipment in the Box Car Spring water supply line. GBEP would test for water quality parameters, including: total coliform bacteria, chlorine, asbestos, disinfection byproducts, lead, copper, arsenic, nitrate/nitrite, inorganics, synthetic organic compounds, and volatile organic compounds. Table 14 displays GBEP's proposed monitoring schedule, including the sampling and reporting frequency before, during, and after construction.

Table 14. Box Car Springs Monitoring Program frequency of sampling and reporting (Source: GBEP, 2016a, as modified by staff)

| Measure | Frequency of Sampling | Frequency of Reporting |
|---|---|---|
| **Before Construction*** | | |
| Flow Rate and Pressure | Over a one-week period | Once |
| Water Quality | Once | Once |
| **During Construction** | | |
| Flow Rate and Pressure | Weekly | Quarterly |

| | | |
|---|---|---|
| Water Quality | Monthly (approximately 36 sampling events total) | Quarterly |
| **Post Construction (one year)** | | |
| Flow Rate and Pressure | Weekly | Annually |
| Water Quality | Monthly (approximately 12 sampling events total) | Annually |

* GBEP states that the flow meter, data logger, and pressure gage would be installed prior to construction. GBEP did not specify if pre-construction flow rate and pressure measurements would be taken for one week after the equipment is installed or would be collected over a one-week period while the equipment is being installed.

GBEP proposes to report monitoring results on a quarterly basis during construction and submit an annual report one year after construction is completed. GBEP did not specify the entities they would provide the reports to but we assume that GBEP intends to send reports to both the Meagher County Commission and Montana DEQ.

If monitoring indicates that the flow rate or water quality in Box Car Spring is adversely affected during construction or first year of project operation, GBEP proposes to consult with the Meagher County Commission and other appropriate agencies or stakeholders as needed to determine what corrective measures would be necessary to correct the problem.[49] Possible temporary mitigation measures identified in the plan include GBEP bringing in water trucks for residents to temporarily use for non-potable water needs and distributing potable bottled water to residents to temporarily use for drinking and cooking needs until the problem is corrected. Possible long-term mitigation measures identified in GBEP's plan include expanding the current water storage system, drilling a replacement well to replace flow provided by Box Car Spring, developing a new spring source, or constructing a new water treatment facility to treat surface water from a nearby water source (e.g., Musselshell River or Martinsdale Reservoir).

*Our Analysis*

As discussed in section 3.3.2.1 *Water Resources*, *Affected Environment*, GBEP drilled test boreholes in the proposed location of the upper reservoir, power tunnel, lower reservoir, and powerhouse to identify the geologic conditions and the depth of groundwater at these locations. The results showed that groundwater is present at a depth of 100 feet at the location of the proposed power tunnel and powerhouse sites (URS, 2015). Construction of the power tunnel and powerhouse would require dewatering of excavated areas which could disrupt groundwater flowing to the water supply springs

[49] GBEP did not specifically name the other entities they would consult with .

located near construction areas. The closest of the three springs serving the town is Box Car Spring, which is located at least one mile to the northeast of the proposed powerhouse and tunnel sites. The other two springs are located over a mile to the southeast of the proposed upper reservoir site. The two springs located to the southeast would not likely be affected by the project because the topography of Gordon Butte likely channels any groundwater at the proposed powerhouse and power tunnel sites away from these two springs. Once construction is completed, groundwater flow should resume unabated around the concrete powerhouse and power tunnel. Therefore, there would be no long term effects of either of these facilities on the town's water supply springs.

In addition to the power tunnel and powerhouse, the project's reservoirs could also potentially affect groundwater. This is because both reservoirs would be sealed with a geomembrane and lined with concrete which would collect any precipitation falling on these sites and prevent it from seeping into groundwater.

The lower reservoir would not affect groundwater flowing to the town's water supply springs because it would be constructed at an elevation that is approximately equal to or lower than the springs and is located over a mile away. While the upper reservoir would be situated within the 2,530-acre groundwater recharge area of Box Car Spring, sealing the reservoir site would not likely affect the long-term recharge of the spring because the reservoir would only occupy an approximately 63-acre footprint which is about 2 to 3 percent of the entire recharge area.

Although there would be a low potential for project construction or operation to adversely affect the flow from the spring, the proposed Box Car Spring Monitoring Program would verify that this is the case and the potential measures to be implemented should there be an adverse effect would protect the town's water supply.

Consulting with the Meagher County Commission, which operates the water supply system, would enable the county commissioners to provide input on the monitoring results as well as any proposed corrective actions to protect the town's water supply.

**Water Quality Monitoring Program**

GBEP anticipates that it would need approximately 500 acre-feet of additional water per year to make up for losses due to evaporation and seepage. The yearly cycles of evaporation and replacement over the term of any license issued could alter water quality conditions in the project reservoirs by concentrating heavy metals and increasing nutrient levels over time.

To evaluate baseline water quality conditions in Cottonwood Creek prior to construction and to monitor changes in water quality in the reservoirs during project operation, GBEP proposes to monitor water quality in Cottonwood Creek every 2 weeks during the proposed April 15 to June 30 diversion period prior to construction, and in the project reservoirs twice per year during project operation for the term of the license.

Water quality monitoring parameters would include: common ions such as calcium, magnesium, sodium, potassium, carbonate, bicarbonate, chloride, sulfate, fluoride; metals such as antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, silver, selenium, strontium, thallium, vanadium, zinc, and aluminum (dissolved); and other parameters such as ammonia, nitrate, nitrite, total Kjeldahl nitrogen, total inorganic nitrogen, orthophosphorus, total phosphorus, total dissolved solids, total suspended solids, turbidity, hardness (as calcium carbonate), acidity, alkalinity (as calcium carbonate), pH, and conductivity. Metals would be analyzed for total recoverable concentrations with the exception of dissolved concentrations for aluminum. Field measurements of specific conductance, pH, dissolved oxygen, and water temperature would also be collected during each sampling event.

*Our Analysis*

The proposed water quality monitoring program would provide a mechanism to track water quality conditions in Cottonwood Creek prior to project construction. However, GBEP already monitored water quality and macroinvertebrate species composition in Cottonwood Creek during pre-filing. The results suggest that temperature, pH, dissolved oxygen levels, and heavy metal concentrations are within the healthy ranges needed to support all trout life stages, and the benthic macroinvertebrate data collected demonstrated that water quality in Cottonwood Creek is not impaired. In addition, no project features would be constructed within the Cottonwood Creek stream channel; therefore, there would likely be no change in water quality conditions in Cottonwood Creek due to project construction. For these reasons, there would be minimal project-related benefits from the proposed water quality monitoring measures in Cottonwood Creek.

During project operation, the project would operate as a self-contained closed-loop system and no reservoir water would discharge to Cottonwood Creek or the South Fork. The reservoirs would be sealed with an impervious geomembrane and lined with concrete, and the power tunnel connecting the upper and lower reservoirs would be sealed off from the surrounding rock with a steel conductor pipe that is surrounded by concrete grout. Thus, no reservoir water would seep into groundwater sources located near the project area.

As discussed in section 3.3.2.2, *Fish Entrainment,* the project reservoirs would not support a self-sustaining trout population; therefore, while monitoring water quality in the project reservoirs over the term of the license would provide a means to track water quality conditions in the project reservoirs over time, it is unclear what tangible benefits, if any, to aquatic resources would accrue from the proposed monitoring.

#### 3.3.2.3 Cumulative Effects

**Water Resources**

Streamflows in the upper Musselshell River basin (including Cottonwood Creek, the South Fork, and mainstem Musselshell River) are heavily influenced by diversions for irrigation, water storage, municipal uses, and domestic uses which have altered natural flow patterns. Total irrigated land within the larger Musselshell River basin totals 108,346 acres (57,816 acres from the mainstem, and 50,530 acres from the tributaries) which has created a high demand for water during the irrigation season (Reclamation et al., 1998). Extensive water diversions throughout the basin coupled with periodic droughts have caused parts of river systems to reduce down to a trickle or run completely dry in the late summer and early fall unless off-stream storage is supporting the system (Boyd et al., 2015). Within the geographic scope, three major reservoirs located along the North Fork (i.e., Bair Reservoir), South Fork (i.e., Martinsdale Reservoir), and mainstem Musselshell River (i.e., Deadman's Basin Reservoir) are operated to ease water shortages and to artificially supply water into the system to meet the high demand during the irrigation season. These current diversion and storage activities would be expected to continue over the term of any license issued for the project.

During the proposed project's reservoir filling operations, GBEP would divert up to its maximum proposed diversion flow of 50 cfs from Cottonwood Creek for reservoir filling from April 15 through June 30 when flows in Cottonwood Creek are naturally high. Under existing conditions, 71 Ranch diverts up to its 50-cfs maximum allowable water right at the proposed project's diversion site throughout the May to September irrigation season. While project diversions would replace 71 Ranch's existing 50-cfs diversions for irrigation from mid-May through June, project diversions would represent an increase during the April 15 through May 15 non-irrigation season. In addition, 71 Ranch could still divert some water for livestock-watering up to the 60-cfs maximum hydraulic capacity of the irrigation canal. Therefore, depending on the ranch's water needs and assuming the project would be utilizing its full 50-cfs diversion flow at times for reservoir filling, there could be an additional consumptive use of from April 15 through May 15 prior to the start of the irrigation season and up to an additional 10 cfs by 71 Ranch from mid-May through June over existing conditions. However, restricting diversions to the high-flow spring runoff months of April through June and maintaining a 16-cfs minimum flow in Cottonwood Creek during reservoir filling operations, as GBEP proposes, would minimize the direct and indirect effects of the project's consumptive use of streamflows and would ensure that some flows are maintained in the stream channel to support downstream water uses and aquatic and riparian habitat while the reservoir is being filled.

GBEP's proposals to also meet minimum flow targets downstream in the South Fork and the mainstem Musselshell River and to coordinate with downstream water management entities prior to and while diverting water would provide further assurance that additional flow diversions for project reservoir filling operations would minimize effects on existing water uses in the larger Musselshell River basin.

### 3.3.3 Terrestrial Resources

#### 3.3.3.1 Affected Environment

**Vegetation**

The proposed project would be located entirely on private lands owned by 71 Ranch. GBEP conducted a botanical study within the approximately 380-acre proposed project boundary in August 2014 to identity the existing vegetation types.

The most common vegetation type, consisting of about 263 acres, was Rocky Mountain lower montane foothill and valley grassland. Plant species identified by GBEP's botanical study within this vegetation type include: blue grama, threadleaf sedge, purple prairie clover, Idaho fescue, curlycup gumweed, broom snakeweed, needle-and-thread, hairy false goldenaster, prairie Junegrass, dotted blazing star, silvery lupine, green needlegrass, hairy evening primrose, plains pricklypear, Bessey's locoweed, bluebunch wheatgrass, and scarlet globemallow. The study also identified patches of well-spaced or isolated shrubs of species such as silver sagebrush, white sagebrush, big sagebrush, yellow rabbitbrush, rubber rabbitbrush, and common juniper.

The second most common vegetation type, consisting of about 96 acres, was Rocky Mountain subalpine–upper montane grassland. In this vegetation type, the most common grasses were bluebunch wheatgrass and Idaho fescue. Other common species included nodding onion, pale madwort, common yarrow, prairie sagewort, white sagebrush, Parry's aster, field chickweed, rubber rabbitbrush, bastard toadflax, tufted fleabane, sulfur-flower buckwheat, blanketflower, sticky purple geranium, broom snakeweed, needle-and-thread, hairy false goldenaster, prairie Junegrass, western stoneseed, silvery lupine, yellow owl's-clover, Bessey's locoweed, phlox, cinquefoil, Wood's rose, and Missouri goldenrod.

All of the remaining vegetation types covered much smaller areas of about 6 acres or less.

**Noxious Weeds and Non-native Plants**

During its botanical survey, GBEP found seven state- or county-listed noxious weeds in the project area: cheatgrass, musk thistle, spotted knapweed, Canada thistle, houndstongue, black henbane, and ox-eye daisy. Musk thistle, Canada thistle, and cheatgrass were observed in the area where the proposed upper reservoir would be sited. Conifer forest habitat above the proposed buried penstock alignment was the only location where houndstongue was observed. Several noxious weed species were observed adjacent to 71 Ranch's existing access road that leads to the top of Gordon Butte. Spotted knapweed and cheatgrass were very common along much of the length of the road. Musk thistle and Canada thistle were less common, but were present in isolated patches. The only patch of black henbane observed within the botanical study area was found along this road. The existing access road is a likely location for the spread of noxious weeds as well as the introduction of new noxious weed species.

The open habitats surrounding the proposed lower reservoir, associated access road, staging area, substation, and powerhouse, and the northern end of the proposed 230-kV transmission line (east to west portion), had moderate noxious weed cover. Common species were spotted knapweed and cheatgrass, which were scattered throughout the grassland in this area. Musk thistle and Canada thistle were also present, typically in isolated patches and often associated with a human disturbance (e.g., the irrigation canal). Ox-eye daisy was observed in only a few locations in limited numbers adjacent to wetland features. The fields east of Cottonwood Creek Road, the proposed location for the 230-kV transmission line and associated substation, had the largest noxious weed populations in the project area. Spotted knapweed was present but not particularly common in this area. However, large stands of Canada thistle and musk thistle were present. A particularly dense stand of cheatgrass and musk thistle (mixed with other non-natives) was present at the proposed substation location east of Cottonwood Creek Road.

In addition to these noxious weeds, established stands of other non-natives were present in the fields immediately east of Cottonwood Creek Road, particularly alfalfa and Timothy. Sweet clover formed thick stands adjacent to the irrigation canal and similar mesic areas. These non-native species may be escapees acting as weeds, or may have been actively planted or managed as pasture cover in these fields.

**Special-status Plants**

There are 10 special-status plant species that are known or expected to occur in Meagher County. None of these 10 species are listed as threatened or endangered under the ESA. Of these 10 species, only the long-styled thistle, a Montana National Heritage Program (Montana NHP) species of concern, has suitable habitat in the project area.

Long-styled thistle is a perennial thistle endemic to central Montana found in Broadwater, Cascade, Judith Basin, Lewis and Clark, Meagher, and Wheatland Counties. The species is found most often in montane to subalpine meadows, but can also be found in other open habitats. Often long-styled thistle is found on calcareous soils, such as those derived from dolomite, shale, or limestone. Its known elevation range is 4,800 to

8,000 feet, with the majority of populations located between 6,000 to 7,500 feet. The project area is located within range and at suitable elevation for long-styled thistle, and has open habitats and calcareous soils. Therefore, portions of the project area are suitable habitat for this species.

In the known occurrences, the population is estimated to be approximately 30,000 plants. In general, known habitats for long-styled thistle are thought to be of high-quality; the majority of occurrences are located on managed national forests, and most of the others are located on moderately-grazed rangelands where they appear stable. Threats from noxious weed species do not appear significant at this time.

While the grassland and meadow habitats in the project area appear suitable for long-styled thistle, no long-styled thistle or other special-status plants were observed during pre-filing botanical surveys.

**Wetlands**

Wetlands account for approximately six acres of land within the project area, of which 0.82 acre is classified as emergent marsh wetland. This wetland type is located adjacent to Cottonwood Creek, along a secondary branch that creates a semi-permanently flooded to saturated backwater. The marsh area is located east of Cottonwood Creek Road, at the approximate location where the proposed transmission line turns from an east–west to a north–south orientation. The emergent marsh appeared to be a recently-flooded area that may have been previously dominated by willow scrub. Dead and unhealthy willow shrubs were present around the edges of the standing water. Herbaceous cover was discontinuous, and consisted of hydrophytic and/or emergent vegetation. Common species encountered include shortawn foxtail, beaked sedge, field horsetail, fowl mannagrass, wild mint, Timothy, white water crowfoot, curly dock, greenfruit bur-reed, western snowberry, white clover, and broad-leaved cattail.

GBEP classified 4.32 acres of wetlands as Rocky Mountain subalpine-montane mesic meadow wetland (mesic meadow wetlands), which includes riverine and palustrine emergent wetlands, seeps, and seasonal wetlands. The majority of these wetland features were linear, and were associated with the irrigation canal and related man-made and/or natural channels. These features were located in the vicinity of the proposed transmission line corridor (east–west orientation), lower reservoir, and associated temporary access routes and a staging area. The mesic meadow wetlands either occurred adjacent to the irrigation canal, or appeared to have been created by intentional and accidental releases from the canal into small ravines and channels (both man-made and natural) that slope downhill to the north toward the cropland adjoining Montana Highway 294. A few features are naturally occurring wetlands, including a natural seep, located topographically above or away from the irrigation canal and associated channels. These features provided additional inputs into the irrigation system.

Woody riparian vegetation in the project area primarily occurs near Cottonwood Creek or along the irrigation canal or associated channels. This riparian habitat contained both upland and wetland habitats, but was categorized as wetland only when it had a combination of hydrophytic vegetation, hydric soils, and wetland hydrology. GBEP characterized the wetlands within riparian areas as Rocky Mountain lower montane–foothill riparian woodland and shrubland ecological system wetlands (riparian wetlands). There were 0.8 acre of riparian wetland habitats within the proposed project boundary. The woody riparian vegetation was intermittently shrub-dominated and tree-dominated forest. Riparian scrub often took the form of a near monoculture of sandbar willow, growing as dense patches associated with the irrigation canal and associated channels, or Cottonwood Creek. Sometimes the sandbar willow was mixed with cattails, hardstem bulrush, or panicled bulrush. The riparian wetlands were typically located immediately adjacent to a flowing channel, in adjacent depressions or at the bases of banks where frequent inundation was likely to occur. Riparian wetland vegetation had a similar overstory composition to its upland forest counterpart in that it was dominated by tall narrowleaf cottonwood, with some plains cottonwood, gray alder, and sandbar willow. Often, little to no herbaceous understory was present under the heavily shaded canopy that experienced frequent flooding. Within gaps in the canopy and along the active channel, vegetation consisted of an understory of shrubs and herbs such as creeping bentgrass, American sloughgrass, field horsetail, fowl mannagrass, Timothy, chokecherry, curvepod yellowcress, panicled bulrush, silver buffaloberry, Canada goldenrod, and western snowberry. A few occurrences of the noxious weed ox-eye daisy were also observed in the riparian wetlands.

**Wildlife**

GBEP conducted wildlife surveys in 2014 which included surveys for species identified during scoping and special status species. Surveys specifically targeted mule deer, breeding birds, and raptor nests. Mammals that were identified during the general wildlife surveys included: coyote, white-tailed deer, moose, Rocky Mountain elk, Richardson's ground squirrel, Least chipmunk, beaver, wolf, mountain lion, and pronghorn antelope.

Twelve groups of mule deer totaling 185 animals were observed during the winter range survey on March 7, 2014. The groups ranged in size from three to 36 animals, with a mean herd size of 15.4 deer. The majority of the larger groups were located on the north and east aspects of Gordon Butte along the access road to the proposed location of the upper reservoir. Several smaller groups were observed on the benches and in the ravines at the base of the northern side of the butte. A total of 10 groups of mule deer totaling 100 animals were observed during the green-up survey in April 2014. The groups ranged in size from four to 22, with a mean size of 10 deer. Most groups were located on the south and west aspects and the top of the butte, and were dispersed over a wide area.

Nine species of bat (big brown bat, little brown bat, pallid bat, fringed myotis, hoary bat, long-legged myotis, spotted bat, silver-haired bat) may occur in the project area but were not detected during the wildlife surveys for the project, likely because bats are nocturnal and the surveys were conducted during the day; however, these species are almost certainly present.

Forty-six breeding bird species were observed, the most common of which were the American robin, western meadowlark, sandhill crane, vesper sparrow, and mountain bluebird.

No reptiles or amphibians were documented during the surveys; however, it was possible that amphibian species such as the tiger salamander, Columbia spotted frog, and northern leopard frog may use the irrigation canal. Prairie rattlesnakes are also likely to occur in the project area despite not being observed during general wildlife surveys.

Special status wildlife (either federal or state species of concern) that were observed during the wildlife surveys include: bald eagle, Clark's nutcracker, ferruginous hawk, golden eagle, and grasshopper sparrow. Due to recovery of the species, bald eagles are no longer listed under the ESA. However, both the bald eagle and golden eagle are federally protected under the Bald and Golden Eagle Protection Act.

Three other wildlife species were specifically identified during NEPA scoping as potentially occurring in the project area and affected by the project, but were not observed during wildlife surveys: greater sage grouse, Sprague's pipit, and North American wolverine.

No sage grouse habitat exists in the project area, likely due to past grassland management practices that removed sagebrush plants in favor of promoting grasslands that were more favorable to cattle foraging. The closest sage-grouse lek documented by Montana DFWP is approximately 9 miles north of Gordon Butte. The proposed project is outside of general habitat identified by the Montana Greater Sage-grouse Conservation Advisory Group.

GBEP lists Sprague's pipit as a candidate for listing under the ESA in its license application. However, the FWS's IPaC database does not identify it as a candidate species. Sprague's pipit was not detected during wildlife surveys, but has the potential to occur in the project area, which is in its summer breeding range, especially in the high-quality grassland habitat at the top of Gordon Butte.

North American wolverine is proposed for listing under the ESA and is discussed in section 3.3.4, *Threatened and Endangered Species*.

#### 3.3.3.2 Environmental Effects

**Effects of Project Construction and Operation on Vegetation and Wetlands Resources**

Project construction and operation would temporarily and permanently affect 371.7 acres of lands. This would include the permanent loss of 173.8 acres of upland habitat, primarily consisting of grasslands, as well as 3.2 acres of wetland habitat. These habitats would be converted to project features, including the upper and lower reservoirs, powerhouse, substations, transmission line poles, and appurtenant facilities.

An additional 192.4 acres of primarily upland grasslands as well as 2.3 acres of wetlands would be temporarily disturbed by project construction. Temporary impacts would occur in two forms: (1) intense disturbance due to vegetation clearing, grading, excavating, large material stockpiling, or heavy equipment parking; and (2) minor disturbance due to occasional vehicle access, small-scale temporary stockpiles or spoil storage that are not expected to clear or alter the existing vegetation.

Areas of intense disturbance would temporarily affect about 108 acres of upland vegetation consisting primarily of grasslands as well as 0.62 acre of wetlands. Areas of minor disturbance would temporarily affect 84.4 acres of upland vegetation consisting primarily of grasslands as well as 1.65 acres of wetlands.

Once construction is completed, some operation and maintenance activities would continue to affect vegetation in the project area. These activities would primarily include regular vegetation management, primarily underneath the transmission line, and periodic vegetation disturbance during maintenance and repair of project facilities.

To minimize the effects of project construction and operation on vegetation and wetlands, the applicant proposes to develop a vegetation management plan. The plan would be filed with the Commission for approval following the completion of the final design of the project. At a minimum, the plan would include the following measures:

- Require construction personnel to attend a pre-construction environmental meeting to review proposed mitigation measures.

- Use existing roads and disturbed areas to the extent practicable to avoid additional surface and vegetation disturbance.

- Minimize ground disturbance to the extent practicable by designating specific access routes and areas of disturbance on the ground with visible markings (e.g., flagging, construction fencing, transmission line-posts and rope, etc.). Confine construction personnel access to these areas.

- Limit the amount of disturbance to wetlands and water features. Only disturb wetlands and other water features (e.g., small wet or dry channels) where permitted.

- When permitted, use plates for crossing wetlands or water features, or otherwise design and implement stable temporary water crossings (e.g. temporarily stabilize with rock).

- Store equipment when not in use in upland areas outside of wetlands and water features. Regularly maintain construction equipment to avoid spills and leaks. Refuel in upland areas well away from wetlands and water features. Utilize secondary containment for fuel, other chemicals, and stationary equipment. Keep spill kits onsite.

- Implement BMPs to control erosion and sedimentation (e.g. straw wattles, silt fence, etc.).

- Where practicable, return disturbed areas to original contours.

- Revegetate disturbed areas as soon as possible as recommended in the Noxious Weed Management Plan for Meagher County (Ohlson, 2011), and revegetate with native vegetation similar to that in the surrounding areas if practicable.

- Whenever bringing erosion control materials or fill onsite, use weed-free materials or materials from clean sources to the extent practicable (e.g., certified weed-free straw wattles, washed rock, etc.).

In its January 19, 2016 AIR response, GBEP also states that it would avoid crossing wetlands and waterbodies to the extent practical during construction, but if crossing is necessary it would use temporary mats and mat bridges to minimize adverse effects.

Construction and operation of the project also has the potential to increase the risk of introducing or spreading noxious weeds that can compete with native vegetation and degrade wildlife habitat quality. GBEP filed a preliminary Noxious Weed Control Plan on January 19, 2016, that includes measures to prevent the introduction and spread of noxious weeds during project construction and operation. The plan would be finalized and filed with the Commission for approval following the completion of the final design of the project, but would include the following general BMPs to control the introduction and spread of noxious weeds:

- Limit the introduction of weed seeds into the construction area.

- Provide for early detection and eradication of small patches of weeds.

- Minimize disturbance of desirable vegetation.

- Manage land to build and maintain healthy communities of native and desirable plants to compete with weeds.

- Monitor high-risk areas such as human and animal transportation corridors and disturbed or bare ground.

- Revegetate disturbed sites with desirable plants.

- Annually evaluate the effectiveness of the prevention plan so appropriate adaptations can be implemented the following year.

The plan also provides for a pre-construction program to inventory and prioritize weed infestations for treatment in construction areas and along access routes, and to begin controlling areas of high risk for the spread of noxious weeds. During construction, the plan includes numerous additional BMPs to prevent the spread of noxious weed seeds from both on-site and off-site sources. These include measures such as: cleaning equipment before entering and leaving the project site; locating and using weed-free staging areas; installing physical barriers to prevent contamination of stockpiled soils and frequently monitoring these sites for early identification of weeds; and inspecting, removing, and disposing of weed seeds and plant parts found on clothing and equipment.

The plan specifies that noxious weeds may be controlled both mechanically and chemically. Mechanical control would include methods such as pulling, girdling (cutting away strips of bark to prevent nutrient flow), chaining (dragging a chain to crush or uproot trees and shrubs), mulching, and soil solarization (covering damp soil to raise temperatures to lethal levels for plants and seeds). In the event that chemical control of noxious weeds is necessary, GBEP would first consult with the Meagher County Weed Coordinator prior to beginning chemical control and then implement numerous BMPs for chemical herbicide application. Examples of these include: use herbicides and application methods that are appropriate for the target species and site conditions; use only U.S. Environmental Protection Agency (EPA)-registered herbicides and use them in accordance with federal and state laws and regulations; abide by label requirements for mixing, loading, transporting, storing, and disposing of herbicides and containers to safeguard human health, fish and wildlife, and prevent soil and water contamination; and ensure that staff using herbicides are trained in all aspects of herbicide applications and appropriate procedures for first aid and spill cleanup.

The preliminary Noxious Weed Control Plan also provides for project personnel training on how to identify noxious weeds and implement the weed prevention and control measures outlined in the plan, as well as a provision to maintain a log of all noxious weed control activities at the project.

Finally, the preliminary Noxious Weed Control Plan specifies revegetation procedures to limit the spread of noxious weeds. Revegetation would commence as soon as possible, in accordance with GBEP's proposed vegetation management plan outlined above. Revegetation methods may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching. Native material would be used where appropriate and feasible. Sites where seed, hay, straw, or mulch are applied would be monitored and any weeds found would be eradicated prior to seed development. Any topsoil that is free of weeds and seeds would be salvaged to replace disturbed areas, where practicable. Local seeding guidelines would be used to determine appropriate seed mixtures and procedures. A certified seed laboratory would be used to test each lot of seed in accordance with the Association of Official Seed Analyst standards. If these standards are not practical, then state or regionally certified weed-free seed mixes would be used.

*Our Analysis*

Most of the project's effects on vegetation resources would occur during construction of the major project facilities, including the reservoirs, powerhouse, access road, and substations, and would primarily affect upland grassland habitats. Effects on these habitats would be addressed through GBEP's proposed vegetation management plan and the preliminary Noxious Weed Control Plan. The measures that GBEP proposes to include in a vegetation management plan and that are described in the preliminary Noxious Weed Control Plan are mostly general BMPs that are intended to minimize the effects of project construction on vegetation resources. This would primarily occur through avoidance, but also through quickly revegetating disturbed areas with native plants following construction and treating noxious weed infestations. If implemented effectively, these measures would minimize erosion of topsoil, prevent the spread of undesirable plants or weeds, and restore wildlife habitat.

The applicant's proposed vegetation management plan and preliminary Noxious Weed Control Plan do not include mechanisms to monitor the effectiveness of the plans, or describe what actions to take if the plans are not successful. Further, the applicant's proposals do not include a schedule for reporting monitoring results to the Commission. To further reduce the project's effects on vegetation resources and limit the introduction and spread of noxious weeds, effective plans would need to include a monitoring program (typically lasting several years) after construction to evaluate the success of revegetation and the noxious weed control efforts, including criteria that define when the measures are successful; a reporting schedule for filing monitoring results with the Commission; and an implementation schedule.

Similar to its proposals for protecting upland vegetation, GBEP would primarily protect wetlands by avoidance. However, there would be some permanent losses to about 3.2 acres of wetland habitat most of which would occur at the mesic meadow wetland at the proposed location of the substation at the terminus of the project's transmission line. These losses would be localized and would represent a minor, long-term adverse effect on wetland habitats in the project area. In addition to the permanent loss of wetland habitat, there would be additional temporary wetland disturbance during construction. If wetlands need to be crossed to access construction areas, GBEP's proposed temporary mats and mat bridges would protect these sensitive habitats from disturbance by construction equipment. In addition, silt fences and straw wattles would prevent sediment from reaching wetlands.

During project operation, riparian habitat underneath the transmission line would be modified by maintenance activities that would limit the height of any trees from growing into the transmission line. However, these effects would mostly be confined to a narrow band of riparian vegetation where the transmission line crosses Cottonwood Creek as the remainder of the transmission line would be located over existing grasslands that would be revegetated, if needed, following any temporary disturbance during construction.

**Effects of Project Construction and Operation on Wildlife**

*Effects of Reservoir, Powerhouse, Access Road, and Substation Construction*

Potential threats to wildlife resulting from construction of the reservoirs, powerhouse, and access road during the 3-year construction period include habitat disturbance and fragmentation, and direct injury or mortality of individual animals. With the exception of the proposed transmission line (discussed below), project facilities would primarily be constructed in grassland habitats. The greatest potential for disturbing nesting or foraging birds within these habitats would be during construction of the upper reservoir within the Rocky Mountain subalpine-montane grassland at the top of Gordon Butte. This habitat is fairly limited in the project area and provides high-quality nesting and foraging habitat for migratory birds such as the Sprague's pipit. There would also be habitat loss and disturbance near the lower elevation areas of Gordon Butte; however, these lower elevation grassland habitats are typically mixed with pasture land, which is less productive habitat overall. Lower elevation grassland habitat is also the most prevalent habitat type in the project area and the surrounding environment.

To reduce the effects of project construction on wildlife in grassland habitats, GBEP proposes to implement the following measures:

- Prohibit vegetation removal for major project facility construction (e.g., reservoirs, powerhouse, lay down areas) in grassland habitats during the April 15 to July 15 nesting season for grassland migratory birds.[50]

- Implement all construction BMPs (including the proposed ESCP, SPCCP, hazardous materials plan, and dust control measures).

- Require project personnel to attend a pre-construction environmental meeting to review proposed mitigation measures.

- Minimize vehicle/human use on top of Gordon Butte in winter to minimize disturbance to wintering mule deer.

- Set and enforce speed limits on roads through the project area to reduce or avoid collisions with wildlife and minimize dust.

- Minimize ground disturbance to the extent feasible by designating specific access routes and areas of disturbance on the ground with visible markings, and limit construction personnel to these areas.

In its January 19, 2016 AIR response filing, GBEP also proposed to install chain link fencing with barbed wire along the top around project features such as the upper and lower reservoirs and the substations to prevent entry by unauthorized personnel. The fencing would be grounded where necessary to prevent electrocution.

No other stakeholders filed any recommendations for wildlife resources. However, in their scoping comments, members of the public were concerned with the potential effects of the project on reptile species such as the prairie rattlesnake and amphibians such as frogs and the tiger salamander.

*Our Analysis*

Major construction activities within grassland habitats would primarily include vehicle traffic, heavy equipment and machinery operation, and blasting. These activities would cause noise, vibration, and dust, which would temporarily disturb wildlife causing them to seek available habitats elsewhere. Construction activities would also increase the risk of vehicle collisions with wildlife which can injure or kill them.

[50] *See* letter filed August 9, 2016.

GBEP's proposals to avoid clearing vegetation for major project facility construction in grassland habitats during the April 15 to July 15 migratory bird nesting period would protect migratory grassland birds, potentially including the Sprague's pipet, during this sensitive life stage. GBEP's proposal to minimize vehicle/human use on top of Gordon Butte during the winter would reduce disturbance effects when deer food supplies are lowest and environmental conditions are most stressful.

Holding a pre-construction meeting with project personnel to review wildlife protection measures, including the proposed traffic and speed limit restrictions, would increase awareness of the proposed measures and should minimize the potential for collisions during the construction period. Designating access routes and areas of disturbance on the ground with visible markings would help to prevent unnecessary disturbance to wildlife habitat and further minimize habitat losses and the potential for vehicle collisions with wildlife.

Once construction is completed, there would be a permanent long-term loss of about 62.7 acres of high quality grassland habitat at the upper reservoir site primarily used by migratory birds and mule deer. There would be an additional permanent loss of about 111 acres of grassland habitat along the lower elevation sites from construction of the lower reservoir, powerhouse, and substations that generally provide low quality habitat and are very prevalent in the project area; therefore, effects on wildlife would be minor and localized. Once the project is put into permanent operation, all construction equipment and personnel would leave the site, substantially reducing disturbance, and migratory grassland birds and other wildlife such as mule deer would return to available habitats as they do under existing conditions.

Fencing the upper and lower reservoirs and substation would protect large wildlife species, such as mule deer and elk, from entering these project features which could pose risks of drowning or electrocution. Grounding fences if necessary would prevent them from becoming electrified and presenting a danger to wildlife. While fencing may disrupt movement patterns, the fenced areas would be small relative to available habitats in the surrounding environment and would not substantially fragment habitat or restrict migration patterns.

No reptiles or amphibians were documented during pre-filing studies; however, amphibian species such as the tiger salamander, Columbia spotted frog, and northern leopard frog may use habitats along the irrigation canal. The proposed project would not directly affect the existing irrigation canal so project effects on these species would be limited to temporary disturbance due to increased vehicle traffic, noise, vibrations, and dust from activities in the surrounding area. However, if 71 Ranch were to replace the earthen irrigation canal with a pipeline, it would convert existing aquatic habitat to a pipeline and likely displace any amphibian species that are associated with the aquatic habitat within the canal.

Prairie rattlesnakes are sensitive to vibration and would likely move to avoid construction activities. They would also lose some foraging and basking sites due to the construction of project facilities. Prairie rattlesnakes are capable swimmers; therefore, if they are displaced by project construction activities, the irrigation canal would not pose a migration barrier to this species if they are attempting to relocate to other habitats outside of construction areas. There is ample habitat in the project area for this species and any adverse effects from construction would be minor.

*Effects of Transmission Line Construction and Operation*

Similar to the effects of construction of the other major project facilities, construction of the proposed transmission line would temporarily disturb and displace wildlife. This would primarily occur during construction of the temporary access road along the transmission line alignment, and during pole installation and wire tensioning activities, all of which would cause noise, vibration, dust, and increase the potential for vehicle collisions with wildlife. However, unlike the other major project facilities that would primarily only be situated in grassland habitats, the transmission line would also traverse important riparian habitats along Cottonwood Creek that provide nesting and roosting habitat for bald eagles and other raptors. In addition, waterfowl are known to use areas that parallel Cottonwood Creek as a migration route, and the transmission line could pose a collision and electrocution hazard to raptors and waterfowl if measures are not implemented to avoid or minimize these effects. GBEP also states that raptors may use the transmission line towers for perching, which would allow them to hunt more easily in grasslands and agricultural areas and prey on other wildlife such as waterfowl and other birds, amphibians, reptiles, and small mammals.

To minimize the effects of transmission line construction and operation on avian resources, GBEP proposes to implement the following measures: (1) maintain a 0.5-mile buffer between transmission-line construction activities and the occupied bald eagle nest located near where the transmission line crosses Cottonwood Creek during the February 1 to August 15 nesting period; (2) conduct a pre-construction survey of the transmission-line corridor to determine if the eagle or any other raptor (e.g., red-tailed hawks) nests are still active and whether the juveniles have fledged and if the surveys indicate that nests are still active, then delay construction or implement additional measures to protect any active nests; (3) design the transmission line and towers to minimize the potential for avian electrocution; (4) install fixed daytime visual markers on the transmission line a half mile east and west of where the line crosses Cottonwood Creek to minimize collision hazards; (5) monitor nesting success and for any project-related effects (e.g., electrocution or collision) any bald eagles nesting near the transmission line where it crosses Cottonwood Creek for two breeding seasons after completing construction, and report monitoring results to FWS; and (6) maintain a 0.5-mile buffer between any raptor nest and transmission line operation and maintenance activities, and replace transmission-line visual markers twice per year, as necessary, to protect bald eagles and other birds.

During project operation, GBEP also proposes to maintain the raptor nest buffers during transmission line maintenance activities, and to inspect the line twice a year and replace transmission-line visual markers, as necessary, to protect bald eagles and other birds.

*Our Analysis*

Maintaining a 0.5-mile buffer between construction activities and the bald eagle nest located 0.4 mile from the proposed transmission alignment during the February 1 to August 15 breeding and nesting season would minimize disturbance to bald eagles. Conducting a pre-construction survey to determine if eagle or other raptor nests along the transmission line alignment are still active prior to conducting any tree clearing would further protect raptors from displacement due to project construction.

Marking the transmission line in areas of high avian use near the location where it crosses Cottonwood Creek and designing the line in accordance with accepted practices would minimize the potential for avian electrocution and collisions. The transmission line would require 47 towers spaced 650 feet apart, most of which would be located in grasslands and agricultural areas that currently lack trees for perching. Although not specifically proposed, including perch deterrents on the transmission line tower crossarms would deter raptors from perching on the towers and reduce the potential for increased predation of wildlife.

Monitoring the occupied bald eagle nest for 2 years following the completion of construction as proposed by GBEP would verify that construction and initial operation of the transmission line are not affecting the nest site.

Maintaining the raptor nest buffers and replacing any missing visual markers during transmission line maintenance would ensure that disturbances to active raptor nests and collision risks with the transmission line near the riparian area would continue to be minimized.

*Waterfowl Monitoring in Project Reservoirs*

The upper and lower reservoirs would create 62.7 and 88.2 acres of new open-water habitat, respectively, which could be used by waterfowl or other migratory birds. In its comments on GBEP's preliminary application document and during scoping, Montana DFWP stated that rapid drawdowns of the reservoirs could entrain birds and recommended that GBEP monitor bird use and behaviors within the project reservoirs to identify the need for protective measures (e.g., using audible alarms or lights at night to deter bird use of the reservoirs).[51]

To monitor the effects of project operation on birds in the project reservoirs, GBEP proposes to record daily counts of migratory birds in the reservoir during the spring and fall migration periods as well as to document any observed adverse effects of project operation on birds. To report on the results, GBEP would maintain a daily log that describes: weather conditions, species, bird numbers, bird activity, water levels, and operational modes. The results would be reported to Montana DFWP on a quarterly basis.

*Our Analysis*

The reservoirs would provide low-quality habitat for waterfowl and other migratory birds as they would be lined with concrete and designed with steep sides to minimize shallow-water habitat and vegetation growth. Therefore, it is unlikely that birds would utilize the reservoirs for long periods of time or establish a permanent residence. Instead, birds would likely only temporarily use the reservoirs to rest, seek refuge from a storm, or as a stopover for overnight migrations. Even if some temporary use were to occur, however, fluctuating water levels during peaking operation would not likely cause the entrainment of waterfowl or other migratory birds. This is because the rate at which the reservoirs would lower during operation would be about two inches per minute, which would not create enough suction that birds would not be able to compensate for and escape before becoming entrained into the pumps or upper reservoir intake structure. Additionally, the noise generated from equipment coming online to pump the water would likely be enough to startle the birds off the reservoir before the pumping begins. Therefore, there would be minimal benefit to bird populations from monitoring and maintaining a log of bird use and project effects on birds over the term of any license issued.

#### 3.3.3.3 Cumulative Effects

**Terrestrial Resources**

Gordon Butte and 71 Ranch's lands are actively managed for agricultural purposes and renewable energy generation in the form of wind power. A wind farm installation consisting of six turbines was installed on the eastern edge of Gordon Butte between 2009 and 2011. These activities altered or permanently removed available habitats for

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[51] *See* Montana DFWP's comment letter dated October 21, 2013, which was filed by GBEP on December 10, 2013.

wildlife, and the additional long-term conversion of approximately 174 acres of upland habitat to project features would further reduce the amount of wildlife habitat in the project vicinity, particularly for grassland birds and large mammals.

Construction of the project reservoirs would create new open-water habitats that could attract birds and bats to these new water sources. If this were to occur, there is a potential that any birds or bats that are attracted to the new open-water habitats could be subject to additional wind turbine blade-strike mortality due to the reservoir's proximity to the existing wind farm on the top of Gordon Butte. However, the Gordon Butte Wind Farm is located on the eastern crest of Gordon Butte at a distance greater than one mile away from the upper reservoir site and two miles from the lower reservoir site. Therefore, given this 1- to 2-mile distance between the proposed reservoir sites and the wind farm, it's unlikely that any bats attracted to the reservoirs would be subject to additional mortality from wind turbine blade strikes.

The proposed transmission line would be an addition to the power lines that have already been installed for the wind farm, and present an additional risk for collision and electrocution.

Construction and operation of the proposed project would create unavoidable effects on terrestrial resources; however, avoidance and mitigation measures, such as designing the transmission line in accordance with accepted practices and implementing the measures in the proposed vegetation management plan and preliminary Noxious Weed Control Plan would ensure that effects are minimized to the extent practicable.

### 3.3.4 Threatened and Endangered Species

#### 3.3.4.1 Affected Environment

Commission staff accessed FWS's IPaC system on July 29, 2016,[52] which generated a list identifying the threatened Canada lynx (*Lynx canadensis*) and the proposed threatened North American wolverine (*Gulo gulo luscus*) as potentially occurring in the project area. There are no proposed or designated critical habitats in the project area for either species. Canada lynx are medium-sized cats that inhabit boreal forests and feed almost exclusively on snowshoe hare. The United States, primarily the Northeast, western Great Lakes, northern and southern Rockies, and northern Cascades, is the southern-most extent of its range. Populations of snowshoe hare have a direct

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[52] Staff originally requested an official species list from IPaC on May 6, 2016, and it was filed the same day. The updated list provided on July 29, 2016, was filed on August 3, 2016.

effect on local lynx populations, which fluctuate in response to its prey. In the United States, Canada lynx prefer conifer-hardwood forests that support snowshoe hare. The Canada lynx was listed under the ESA as threatened on March 24, 2000 (FWS, 2005). Lynx habitat exists in the Little Belt Mountains to the north of the project, and the Crazy Mountains to the south, so it is possible that a transitory lynx may travel through the project area. However, Montana NHP reported that there have been no sightings of the Canada lynx within five miles of the project.

The North American wolverine has the potential to occur within Meagher County. The North American wolverine's diet largely consists of carrion that is scavenged from other predators; however it will also eat small mammals, birds, insects, and fruits and berries (Banci, 1994, *in* Ruggiero et al., 1994). It is a habitat generalist, the only requirement being persistent snowfall as needed for denning (Copeland et al., 2010). The project area is within the range of the wolverine; however, given the climate of the project area (see section 3.1, *General Description of the River Basin*), it does not receive sufficient snowfall required for activities such as denning, nor was the species detected during the surveys conducted in 2014.

#### 3.3.4.2 Environmental Effects

The project does not contain suitable habitat to support the Canada lynx or its main prey, the snowshoe hair. Therefore, Canada lynx is not expected to occur at the project site. Similarly, the project area does not contain suitable habitat for the North American wolverine, nor has it been observed during surveys for the project. Therefore, constructing and operating the project would have no effect on the Canada lynx and would not jeopardize the continued existence of or the North American wolverine, and no further action is warranted.

### 3.3.5 Recreation and Land Use

#### 3.3.5.1 Affected Environment

While there are no developed recreation facilities located adjacent to or within the immediate project area, several recreation areas are located within a 10-mile radius of the proposed project site. These include: (1) two Montana state-owned facilities – a boat launch area with primitive RV and tent camping sites at Martinsdale Reservoir and the Selkirk Fishing Access site about 2 miles northeast of Martinsdale on the Musselshell River which includes areas for RV and tent camping as well as swimming; (2) the Charles M. Bair Family Museum, located one-half mile north of Martinsdale just off of Montana Highway 294; (3) the Crazy Mountains and the Castle Mountains within the Lewis and Clark National Forest which provide numerous opportunities for fishing, hunting, horseback riding and winter-related recreation; and (4) the 187-mile Big Sky

Loop road cycling route that provides a three-day trip for experienced riders and circumvents the project area via highway routes 89, 12, and 191.

Martinsdale Reservoir is the closest public recreational facility to the project, located 2 miles to the east of the proposed project site and just south of Martinsdale. Its isolated location limits its use to primarily local boaters and anglers. The busiest times on the reservoir are summer weekends when water levels are high enough to launch motorboats at the boat ramp. The reservoir is surrounded by open grassland and pastures and users of the reservoir have clear views of Gordon Butte to the west and the Crazy Mountains to the south.

Several working cattle guest ranches are located within 10 to 15 miles of the proposed project site and offer ranch vacations with opportunities for cattle driving, hiking, horseback riding, hunting and fishing. Stream fishing occurs along Cottonwood Creek, including the portion of the creek that would be located within the proposed project's transmission line right-of-way. Outfitter-guided hunting occurs on the 71 Ranch land within the immediate project area, primarily along Cottonwood Creek and the south side of Gordon Butte. Immediately west of the proposed project area and the 71 Ranch is land owned by Cottonwood Cabins, LLC and the Ingersoll Ranch which provide outfitting services for hunting, fishing and horseback riding. Cottonwood Creek Road is a well-maintained dirt road originating at Montana Highway 294 which provides access to the 71 Ranch and ultimately leads further south to the Crazy M Ranch, and to various Forest Service access roads.

The primary non-recreational land use in the project area includes pasture and rangeland use, and hay and crop production. The area immediately adjacent to the project boundary is rural, privately owned land used primarily for grazing and agricultural production. Montana Highway 294 runs along the north side of the project area and an existing private access road (the proposed upper reservoir access road) connects Montana Highway 294 with the top of Gordon Butte, where the proposed project's upper reservoir would be located. This road accesses an existing wind farm operated by the owners of the 71 Ranch.

#### 3.3.5.2 Environmental Effects

*Construction and Operation Effects on Recreation*

Construction activities would temporarily create dust, noise, traffic, and visual impacts that could be noticed by local residents and recreationists visiting the nearby Ingersoll Ranch and Cottonwood Cabins LLC, and by hunters on the areas of 71 Ranch along Cottonwood Creek and the south side of Gordon Butte that are utilized by outfitter-guided hunters.

GBEP does not propose any specific recreational measures as part of its project, but does propose to implement a Dust Plan and Construction Noise Mitigation Plan during construction to minimize dust generation and construction noise. GBEP also proposes to enclose the reservoirs and substations with fencing to ensure the safety of any recreationists in the area.

In a comment letter filed on February 28, 2016, Rod Gwaltney recommends that GBEP stock the project reservoirs with fish, such as cutthroat trout, to provide additional local fishing opportunities.

*Our Analysis*

The primary effect of the project on recreation would be temporary effects on hunting opportunities on 71 Ranch's lands in the immediate project vicinity. Construction activities could displace big game species, which would temporarily affect hunting opportunities in the area, especially in the transmission line corridor near the Cottonwood Creek crossing. The project would not likely affect hunting opportunities on the south side of Gordon Butte, which is the other area within the project vicinity that is utilized by hunters, as this area is located at least 1.5 miles away from the nearest project facilities. Following the completion of project construction, wildlife would be expected to resume their use of the habitat adjacent to the proposed project facilities. Since the majority of hunting in the project area occurs along Cottonwood Creek or on the south side of Gordon Butte, which are all located a substantial distance from project facilities (i.e., reservoirs, powerhouse, and substations), there would be no long-term impacts from project operation on hunting opportunities.

Installing fencing around the reservoirs and substations, as proposed by GBEP, would ensure the safety of hunters and other recreationists in the area.

Stocking the reservoir with fish to create new fishing opportunities for the public, as recommended by Mr. Gwaltney, would serve no recreational purpose as the reservoirs would frequently fluctuate during project operation, which would make angling difficult and dangerous. In addition, GBEP's proposal to install fencing around the reservoirs for safety reasons would make them inaccessible to the public.

GBEP's proposed measures to address effects on aesthetic resources generally would also mitigate potential visual and noise effects on recreation users throughout the project area (*see* section 3.3.7, *Aesthetic Resources*). Overall, construction and operation of the proposed project is expected to have only minor short-term effects on recreation during construction.

### 3.3.6 Cultural Resources

#### 3.3.6.1 Affected Environment

Section 106 of NHPA requires the Commission to evaluate potential effects on properties listed or eligible for listing on the National Register prior to an undertaking. An undertaking means a project, activity, or program funded in whole, or in part, under the direct or indirect jurisdiction of a federal agency, including, among other things, processes requiring a federal permit, license, or approval. In this case, the undertaking is the issuance of an original license for the project. Potential effects associated with this undertaking include project-related effects associated with the day-to-day operation and maintenance of the project.

Historic properties are defined as any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. Traditional cultural properties are a type of historic property eligible for the National Register because of their association with cultural practices or beliefs of a living community that: (1) are rooted in that community's history or (2) are important in maintaining the continuing cultural identity of the community. In this EA, we also use the term cultural resources to include properties that have not been evaluated for eligibility for listing in the National Register. In most cases, cultural resources less than 50 years old are not considered eligible for the National Register.

Section 106 also requires that the Commission seek concurrence with the State Historic Preservation Office on any finding involving effects or no effects on historic properties, and allow the Advisory Council on Historic Preservation (Advisory Council) an opportunity to comment on any finding of effects on historic properties. If Native American properties have been identified, Section 106 also requires that the Commission consult with interested Native American tribes that might attach religious or cultural significance to such properties.

On April 29, 2013, GBEP requested that the Commission grant it the authority to initiate Section 106 consultation with interested parties. On September 6, 2013, the Commission designated GBEP as the Commission's nonfederal representative for carrying out day-to-day consultation in regard to the above licensing efforts pursuant to section 106 of the NHPA; however, the Commission remains ultimately responsible for all findings and determinations regarding the effects of the project on any historic property, pursuant to section 106.

**Area of Potential Effect**

Pursuant to section106, the Commission must take into account whether any historic property could be affected by the issuance of a proposed license within a project's Area of Potential Effect (APE). According to the Advisory Council's regulations, the APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alternations in the character or use of historic properties, if any such properties exist" (36 CFR, Part 800.16[3]).

The APE encompasses the proposed project boundary and the likely extent of project operation and project-related environmental measures that could be undertaken during the term of any license that may be issued for the proposed project. For this undertaking, GBEP defined the APE as including the proposed transmission line corridor, access road and existing irrigation canal corridors; the areas that would be inundated for the upper and lower reservoirs, and areas that would be affected by construction and operation of the turbine and pump facilities and other infrastructure. By letter dated January 16, 2015, the Montana SHPO concurred with this definition of the APE.[53]

**Cultural History Overview**

The background information provided below is adapted from GBEP's November 2014 Historical and Archaeological Resources Report (GCM Services, Inc. 2014).

*Prehistory of the Project Area*

Occupation of the region has been documented as early as 10600 BC at the Anzik site near Wilsall, Montana (approximately 30 miles southwest of the project area); however, this site is the only one in the area known to be of this antiquity. Sites dating back 10,000 years or less are known in the vicinity of Helena and elsewhere within the south central region of Montana but on the whole, Paleoindian occupation, characterized by the use of large, well-made lanceolate projectile points and the hunting of large, now-extinct bison and mammoths, are rare and little is known of these ancient cultures of the Northern Plains. No Paleoindian artifacts are known to exist in the vicinity of the proposed project area.

*Archaic Period*

The Archaic Period (6500 BC to 500 AD) follows the Paleoindian Period. It begins at a time when the climate was becoming generally drier than the present and ends with the climate relatively similar to the climate of today. Few sites are known in the area that date to the Early Archaic. As the climate stabilized around 3500 BC, McKean lanceolate points became popular and the overall number of sites in this area increased

[53] *See* letter dated January 16, 2015, from Jessica Bush, Montana State Historic Preservation Office, to Rhett Hurless, GBEP, which was filed on October 15, 2015.

considerably. This likely reflects an increase in population due to a relatively stable climatic cycle and a subsistence resource base and settlement pattern that changed relatively little over the next 4,000 years. Stone ring features have been dated to this time. The number of sites increase during the late Archaic Period which likely reflects another increase in the human population. These sites are generally located in areas with diverse vegetation and topography such as foothills. During this period, human populations began to rely on bison obtained in sophisticated communal kills.

*Late Prehistoric Period*

The Late Prehistoric Period is associated with the common use of the bow and arrow and the increased occurrence of ceramics, which made their appearance near the end of the Archaic Period. It is also characterized by another increase in the number and size of sites and a wide variety of cultures moving into the area, particularly during the latter part of the period. The Late Prehistoric Period dates from 500 AD to about 1800 AD or upon evidence of Euroamerican contact.

*Protohistoric and Early Historic Contexts*

Ethno-historic and ethnographic information indicates the possible presence of several groups in the general area during the Protohistoric Period, including the Blackfeet, Shoshone, Crow, Northern Cheyenne, Kiowa, and Kiowa-Apache tribes.

*History of the Project Vicinity*

The first agricultural use of the upper Musselshell River watershed was livestock grazing, primarily cattle, associated with large ranches in the late 1870s and 1880s. Locally, the open range cattle boom started about 1880 and was highly profitable for seven years. Railroads played an important part in revitalizing the livestock economy in the late 1890s and early 1900s. The Jawbone Railroad reached Lombard, Montana in 1896 and the White Sulphur Springs and Yellowstone Park Railway Company had branches to Ringling and White Sulphur Springs. The Milwaukee Railroad replaced these railroads and connected the area to the Pacific coast in 1908. The agricultural industry in the area, however, began to decline around 1925 and continued to decline throughout the Great Depression. The most well-known sheep rancher of the area was Charles M. Bair (1857-1943) whose family residence on the South Fork, a couple of miles north of the project area, is now a museum. At one time, he was believed to own over 300,000 sheep on ranges extending between the Crow Reservation and Billings, making his ranch the largest sheep operation in North America.

### Prehistoric and Historic Archeological Resources

GBEP completed a cultural resources study to identify historic properties within the APE that could be adversely affected by project construction and operation. The results of the study are presented in a November 2014 Historical and Archeological Resources Report (GCM Services, Inc. 2014).

Background archival research conducted prior to field work indicated that previous archeological surveys in the project vicinity (Ferguson, 2011) found one cultural resource property within the access road portion of the study area. The site (No. 24ME0051) consists of historic and archeological resources, specifically prehistoric stone rings and a historic delivery truck and lambing shed. At present, this site's eligibility for listing on the Federal Register has not been determined by the Montana SHPO. Research indicates that the APE contains the potential for prehistoric and historic resources.

GBEP's archeological field surveys consisted of a Class III (pedestrian, intensive) baseline cultural resources inventory within the APE and a substantial buffer zone extending a minimum of 50 feet outside of the APE. The surveys covered about 2,700 acres and were completed in May 2014 (Ferguson, 2014).

In addition to the already recorded cultural property, the field surveys identified eleven new cultural properties and six new isolated finds within the APE. The eleven newly discovered properties include three private historic irrigation ditches associated with the Smith Sheep Company and 71 Ranch, a rock blind of probable historic age, and seven rock cairn sites of probable historic age. Table 15 shows the National Register status of the 12 identified cultural properties within the APE. The Montana SHPO determined that six sites were not eligible for the National Register, and has not completed a determination on the remaining six sites.

Table 15. Summary of Cultural Properties in the APE (Source: GCM Services 2014, as modified by staff)

| Resource Number | Description | National Register Status |
|---|---|---|
| 24ME0051 | prehistoric stone rings/historic delivery truck and lambing shed | Unresolved |
| 24ME1080 | rock blind (historic period) | Unresolved |
| 24ME1081 | rock cairn of undetermined age | Unresolved |
| 24ME1082 | rock cairn of historic age | not eligible |
| 24ME1083 | rock cairn of undetermined age | Unresolved |

| | | |
|---|---|---|
| 24ME1084 | rock cairn of undetermined age | Unresolved |
| 24ME1085 | rock cairn of historic age | not eligible |
| 24ME1086 | rock cairn of historic age | not eligible |
| 24ME1087 | rock cairns of undetermined age | Unresolved |
| 24ME1088 | historic irrigation | not eligible |
| 24ME1089 | historic irrigation | not eligible |
| 24ME1090 | historic irrigation | not eligible |

As shown in table 16, the isolated finds include one historic haying implement and five prehistoric activity locales consisting of minimal amounts (1 to 3 pieces) of lithic debitage. All were determined by the Montana SHPO to not be eligible for the National Register.

Table 16. Summary of Isolated Finds in the Study Area (Source: GCM Services 2014, as modified by staff)

| Isolate Number | Description | National Register Eligibility |
|---|---|---|
| 749 | historic hay stacker | not eligible |
| 193 | prehistoric lithic debitage | not eligible |
| 194 | prehistoric lithic debitage | not eligible |
| 195 | prehistoric lithic debitage | not eligible |
| 196 | prehistoric lithic debitage | not eligible |
| D01 | prehistoric lithic debitage | not eligible |

For the cultural properties with unresolved status, the Montana SHPO determined that there would be no effect on these properties if GBEP places snow fencing around, and avoids, these sites during construction. Because of the high number of isolated finds found along the proposed transmission line route, the Montana SHPO also requests the presence of a qualified archaeologist to monitor construction activities in this area.

### Traditional Cultural Properties

On June 26, 2013, Commission staff consulted with the Crow Nation, to determine whether the tribe wanted to participate in the licensing process for the proposed project. The tribe has not reported any known traditional cultural properties located within the proposed project's APE.

### 3.3.6.2 Environmental Effects

The construction, operation, and maintenance of the proposed project has the potential to affect cultural resources. Three cultural resource sites – two historic-age (1880s to 1930s) curvilinear rock cairns (site Nos. 24ME1081 and 24ME1084) and a cylindrical rock cairn (site No. 24ME1086) would be destroyed because they would be completely inundated by the proposed lower reservoir. In addition, although not a proposed project feature, if 71 Ranch were to replace the existing earthen irrigation canal with a buried pipeline, the 1910's-era Smith Sheep Company Upper Ditch (Site No. 24ME1089) currently in use by the 71 Ranch would be substantially modified because it would be converted to a buried pipeline instead of an open ditch, although the irrigation function would remain. All of these sites, however, are not eligible for listing on the National Register.

An additional five sites with unresolved National Register status are located in areas that could be affected by construction of the reservoirs or the lower reservoir access road (i.e., site nos. 24ME1080, 24ME1081, 24ME1083, 24ME1084, and 24ME1087). To protect these five sites GBEP proposes to follow the Montana SHPO's recommendation to fence off these areas and avoid them during project construction. In addition, GBEP proposes to employ an on-site archeologist to monitor construction activities in areas along the transmission line route where the six isolated finds were discovered during field surveys and where cultural resources are likely to be found, as recommended by the Montana SHPO.

On January 16, 2015, the Montana SHPO restated its October 2, 2014, determination that the project would have no effect on cultural resources provided that GBEP implements its recommended measures to fence off and avoid areas with unresolved National Register status during construction, and to employ an archeologist to monitor construction activities in areas where cultural resources are likely to be found along the transmission line route.

*Our Analysis*

With GBEP's proposal to fence off and avoid any of the identified properties with unresolved National Register status that could be affected by project construction, the proposed Gordon Butte Project would not affect any historic properties listed on the

National Register.  Therefore, a Historic Properties Management Plan for the proposed Gordon Butte Project and the drafting of a Programmatic Agreement to resolve adverse effects on historic properties would not be necessary.

Because there are a large number of isolated finds along the proposed transmission line route, there is a potential that additional sites could be uncovered during project construction activities within this area.  Having a qualified archeologist present on-site to monitor construction activities along the transmission line route would ensure that any cultural resources in this area are protected.  It is also possible that unknown sites could be uncovered during construction and maintenance activities throughout the remainder of the project area.  In the event of any such discovery, Commission licenses typically include a requirement to discontinue any ground-clearing, ground-disturbing, or spoil-producing activities and consult with the SHPO to resolve any potential adverse effect to such properties through the development and implementation of a Historic Properties Management Plan.

### 3.3.7 Aesthetic Resources

#### 3.3.7.1 Affected Environment

Gordon Butte is located in a rural setting surrounded by open agricultural lands and is a prominent feature in the landscape when viewed from the town of Martinsdale, Montana Highway 294, and Cottonwood Creek Road which runs parallel to Cottonwood Creek.  The top of Gordon Butte offers scenic views of vast open terrain with mountains in the background; however, there is currently no public access to the top of the butte.  Montana Highway 294 runs in a southwest to northeast direction just north of the proposed lower reservoir location, making the open terrain in this location highly visible to motorists.  The heavily forested northern-facing slopes of Gordon Butte provide a visual contrast to the surrounding open pastureland and crop areas, as does the riparian vegetation that grows along the banks of Cottonwood Creek.  The east side of Gordon Butte is visible from Martinsdale Reservoir.  While most of the view from this area is open grassland, two easily visible white cylindrical water tanks are located about halfway up the butte.  The southeastern edge of the butte can also be seen from this location where six wind turbines located along the ridgeline are highly visible.  The turbines can also be seen from the northeast, including the Bair Family Museum, located off of Montana Highway 294, just north of Martinsdale.

Montana Highway 294 provides the closest public views of the proposed lower reservoir area, but has no designated places to pull over.  There are no scenic overlooks within 5 miles of the proposed project site.

In 2014, GBEP’s contractor, Garcia and Associates, conducted a viewshed analysis to define the geographic area surrounding the proposed project from which portions of the project facilities might be seen (Smith, 2014). A total of eight key observation points (KOPs) were selected to represent various views of areas where proposed project facilities would be located. Five of these KOP sites were used to identify viewpoints where the upper or lower reservoirs could be seen and included the following views: (1) KOP 1 - from Montana Highway 294 approaching from the west, 3.17 miles east of Lennep, Montana; (2) KOP 2 - from the 71 Ranch driveway that leads to the private ranch residence; (3) KOP 3 - from the Bair Family Museum parking lot; (4) KOP 4 - from Montana Highway 294 at the toe of the proposed lower reservoir; and (5) KOP 5 - from the Martinsdale Reservoir boat launch site. Scenic quality at each site was determined using the Bureau of Land Management's Visual Resource Management scenic quality ratings criteria which use 7 key factors: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications. Sites were then given a rating of A (high quality), B (moderate quality), or C (low quality) based on their scenic quality. Sensitivity levels were also taken into account and were rated as high, medium, or low based on the following factors: the type of user, the amount of use, public interest, adjacent land use, and whether the area has a special management designation. Table 17 shows the visibility, the scenic quality, and the visual sensitivity of the landscape unit viewed from KOPs 1 through 5.

Table 17. Visibility, scenic quality, and sensitivity of landscape viewed from KOPs (Source: GBEP, 2015b, as modified by staff)

| KOP | Landscape Unit | Upper Reservoir Visibility | Lower Reservoir Visibility | Scenic Quality | Sensitivity |
|---|---|---|---|---|---|
| 1 | Open space/Rural/ Agric. | None | Partial | B | Low |
| 2 | Rural/Agric. | Partial | Partial | B | Moderate/ Low |
| 3 | Open space/Rural/ Agric. | Partial | None | B | Moderate |
| 4 | Rural/Agric. | Partial | Partial | B | Low |
| 5 | Open space | None | None | B | Moderate |

Three additional KOPs were inventoried in areas where the proposed transmission line would be visible. These included: (1) KOP 1 - the Ranch 71 driveway from

Montana Highway 294 leading to the residence; (2) KOP 2 – along Cottonwood Creek Road, 1.75 miles south of Montana Highway 294; and (3) KOP 3 – along Cottonwood Creek Road, 4.8 miles south of Montana Highway 294.

The area along Montana Highway 294 from which the proposed transmission line would be visible is lined with fencing on both sides and an existing transmission line runs along the northern edge of the highway. The foreground to the north is dominated by the riparian habitat of Cottonwood Creek and the South Fork. Facing south, this site has unobstructed views of Gordon Butte as well as views of a small portion of the Crazy Mountains located 15 miles beyond. At its closest point, the proposed transmission line path is about 0.7 mile from the highway and continues out of view approximately 1.8 miles south of the highway. The landscape in this view of the proposed path is dominated in the middle ground by the butte, and directly below it, in the immediate foreground, by either center pivot irrigation areas or hayfields.

A ranch house, garage, fencing, and other outbuildings as well as farm equipment are visible to the south-southwest from the highway. Portions of Cottonwood Creek Road provide views of the proposed transmission line and new substation. The shallow valley corridor in this area is dominated by rolling grasslands and hayfields with riparian vegetation along the creek. Both sides of the road have maintained ranch fencing with periodic gates for access. The foreground is mostly flat hayfields and pasture.

Cottonwood Creek Road crosses Cottonwood Creek and the associated riparian corridor 1.5 miles south of the proposed substation. When travelling along Cottonwood Creek Road, the riparian corridor continues to provide a dominant horizontal break in the grass/hayfields both in the immediate foreground and extending well beyond the grassland-dominated middle ground and background. The strong horizontal break created by the riparian corridor is punctuated by pairs of large, metal-guyed Y-type structures supporting the existing 500-kV transmission line that runs east-west. The horizon from this southerly view is dominated by the Crazy Mountain Range, approximately 15 miles due south. Table 18 summarizes the scenic quality and sensitivity rating of each KOP where the proposed transmission facilities would be visible.

Table 18. Visibility, scenic quality, and sensitivity of landscape viewed from KOPs where transmission facilities are visible (Source: GBEP, 2015b, as modified by staff)

| KOP | Landscape Unit | Trans. Line Visibility | Substation Visibility | Scenic Quality | Sensitivity |
|---|---|---|---|---|---|
| 1 | Rural/Agric. | Partial | Partial | B | Moderate/ Low |

| | | | | | |
|---|---|---|---|---|---|
| 2 | Open space/Rural/ Agric. | Partial | Partial | B | Low |
| 3 | Open space/Rural/ Agric. | Partial | None | B | Low |

#### 3.3.7.2 Environmental Effects

**Visual**

Project construction and operation would introduce both temporary and permanent changes to the landscape in the proposed project area which would be visible from Montana Highway 294, Cottonwood Creek Road, the 71 Ranch driveway, and Martinsdale Reservoir. To minimize any visual impacts created by the project, GBEP proposes to implement the following measures:

- construct the lower reservoir using topographic features to minimize visibility from Montana Highway 294 and landscape the lower reservoir saddle dam to blend with the natural terrain;

- utilize existing vegetation to screen views of the upper reservoir from motorists on Montana Highway 294 and avoid disturbing Gordon Butte's outermost ridgeline during construction to minimize visual impacts;

- use low-profile structures whenever possible to reduce visibility and site linear features to follow the edges of clearings where they will be less conspicuous;

- restore disturbed surfaces as closely as possible to their original contour and revegetate disturbed areas so that they blend into the natural terrain;

- minimize the amount of construction and ground-disturbance needed for roads, staging areas, and crane pads by using existing roads and disturbed areas as much as possible and locating these structures outside of publicly accessible vantage points and visually sensitive areas; and

- use colors and materials to blend facilities with the surrounding landscape.

*Our Analysis*

Staff reviewed the Aesthetic Resources Study conducted by Garcia and Associates for GBEP in 2014 which included photosimulations of the proposed project facilities superimposed on the landscape as viewed from each KOP. Our analysis of the project's visual impacts for each KOP identified in the study is presented below.

*KOP 1 (approaching west from Montana Highway 294)*

The berms of the upper reservoir would be minimally visible to westbound travelers on Montana Highway 294. Because there are no public overlooks along this section of the highway, visual exposure to the proposed project would be limited to anyone traveling along the highway at the recommended speed. The project site would not be viewed by many, however, because traffic is not heavy along this portion of the highway, receiving an average of about 290 vehicles per day in 2013 (Montana Department of Transportation, 2014). GBEP's proposal to utilize existing vegetation to screen the upper reservoir and avoid disturbing Gordon Butte's outermost ridge during construction would minimize visibility of the upper reservoir from Montana Highway 294.

*KOP 2 (from Ranch 71 driveway to residence)*

Portions of the upper and lower reservoir dam embankments may be visible from the 71 Ranch driveway. The upper reservoir's northern embankment may be visible, depending on the exact location of the viewer; however, the large trees that border the northern rim of Gordon Butte would obscure much of the upper reservoir. The proposed powerhouse access road to the lower reservoir as well as portions of the western embankment of the lower reservoir would also be within the line-of-sight from this location. GBEP's proposal to site the lower reservoir and powerhouse below grade would limit visibility of the northern and western embankments, and any railings or guardrails along the crest of the reservoir. Locating the proposed powerhouse substation so that it's situated mostly behind the western lower reservoir embankment, as proposed by GBEP, would minimize any exposure from this point of view as well. Portions of the new transmission line may be visible running along the base of Gordon Butte. GBEP's proposal to align the transmission line so it runs just above an existing irrigation ditch, close to the pastureland/conifer interface would help it to blend in with these background features and therefore minimize visual impacts.

*KOP 3 (Bair Family Museum Parking lot)*

The proposed lower reservoir would not be visible from the Charles M. Bair Family Museum. Although the northern embankment of the upper reservoir dam could be visible from this location, the forest along the northern edge of Gordon Butte may obscure much of the northern embankment. GBEP's proposal to minimize vegetation removal along Gordon Butte's outermost ridge would further minimize visibility of the upper reservoir dam from this location.

*KOP 4 (Montana Highway 294 at the toe of the lower reservoir)*

From the Montana Highway 294 right-of-way, directly north of the proposed lower reservoir, portions of the lower and upper reservoir dam embankments may be visible. A small portion of the northern embankment of the upper reservoir would be visible just above the tree line on the Gordon Butte ridge. In addition, when a viewer is stationary at this point, the northern embankment of the lower reservoir, especially where it falls within the gullies, would be prominent. GBEP's proposal to construct the lower reservoir using topographic features to minimize visibility would help to obscure some of the reservoir from motorists on Montana Highway 294. Therefore, despite the fact that this site would provide the closest public view of the project, landforms would hide much of the northern side of the lower reservoir embankment from highway motorists approaching the site from either direction. The proposed project access road and western embankment of the lower reservoir would be intermittently visible to motorists approaching from the west, when these features are not screened from view by the gently rolling foreground topography. GBEP's proposal to landscape the lower reservoir dam and revegetate disturbed areas to blend with the natural terrain would lessen any visual impacts of the project to motorists on Montana Highway 294.

*KOP 5 (Martinsdale Reservoir)*

The lower reservoir would not be visible from Martinsdale Reservoir because it is not within the line of sight from this location. Views of the upper reservoir embankments from this location would be very limited due to the distance (4 miles in the background) and screening from trees and other topographical features. The presence of the six existing wind turbines, just to the south of the proposed upper reservoir location, as well as the existing water tanks and transmission line, would dominate any view of the upper reservoir and make the aesthetic impacts of the reservoir negligible. GPEB's proposal to use existing vegetation to screen the upper reservoir from view and minimize landscape disturbance by using the existing access road to the upper reservoir and an already disturbed area for a staging area would further reduce any visual impacts to visitors at Martinsdale Reservoir.

*Transmission line KOP 1 (as seen from Ranch 71 driveway and Montana Highway 294)*

Portions of the new 230-kV transmission line may be visible from Montana Highway 294 and the 71 Ranch driveway. The proposed line would run just above the existing irrigation canal, close to the pastureland/conifer interface and continue west towards Cottonwood Creek. GBEP's proposal to site the transmission line in relation to these background features would minimize visual impacts. The presence of the wooden H-frame transmission line poles would create a very minor visual change from this KOP because GPEB would use colors and materials that would help repeat and blend with the form, line, color, and texture of the surrounding landscape. The transmission line would be accessed for maintenance activities by a two-track informal road that would also have limited visibility because the route sits at a higher elevation than Montana Highway 294. GBEP's proposal to site the access road in a grassland location where removal of vegetation would be less conspicuous would minimize visual impacts from the maintenance road. The denuded ground immediately surrounding each pole may have some visibility, but distance from the road (0.7 mile or greater) would make this impact minimal. Further, since there are no public pull-offs along the highway, any visibility of the transmission line from this site would be limited in duration due to the speed of vehicles traveling on the highway.

*Transmission line KOP 2 (Cottonwood Creek Road 1.75 miles south of Montana Highway 294)*

The proposed transmission line would be fully visible along Cottonwood Creek Road since it would run parallel to the road for about 3 miles. Visual impacts along this route would be most noticeable during the construction period, due to the presence of ground equipment during pole placement and transmission line stringing. Long-term visual impacts would be minimized by GBEP's proposal to route the transmission line so that its H-frame poles would blend in with existing background patterns created by fencing.

*Transmission line KOP 3 (Cottonwood Creek Road 4.8 miles south of Montana Highway 294)*

The proposed interconnection substation would be located in a slightly depressed area adjacent to Cottonwood Creek, where existing 500-kV lines cross both the road and the creek about 4.8 miles south of Montana Highway 294. Because of the topography and slight drop in elevation at the site, the footprint of the proposed substation would not come into view to travelers on Cottonwood Creek Road until they are within a quarter mile of the substation when approaching from the north. Once a viewer travels about three-quarters of a mile from the site, the substation would be hidden from view. The 40-acre footprint required for the proposed substation would provide a significant change in the view from the section of road that provides visibility. GBEP's proposal to locate the substation under and adjacent to existing sets of 500–kV, guyed, Y-type transmission towers would lessen the visual impact by siting it in an area of existing development and minimizing vegetation removal.

**Noise**

Noise would be generated during construction-related activities, especially during blasting, bulldozer operations, and batch plant use. Construction noise would predominately be audible to residents of the nearby 71 Ranch and guests at the Cottonwood Cabins and Ingersoll Ranch, located 2 and 2.5 miles, respectively, from the project site. Noise would also be noticeable as far away as the town of Martinsburg which is located 3 miles away from the project site.

GBEP estimates that maximum noise levels generated by any single piece of equipment or construction activity would be approximately 92 A-weighted decibels (dBA)[54] as measured at the noise source, which is roughly equivalent to the loudness of thunder (CalTrans, 2013). To minimize noise impacts, GBEP proposes to finalize and implement its preliminary Construction Noise Mitigation Plan to limit time periods for high noise levels associated with batch plants and construction blasting. Other noise mitigation measures proposed in the mitigation plan would include using engine exhaust silencers, locating the rock crushing plant in an area that would naturally shield the noise, notifying residents of scheduled blasts, insulating equipment to minimize noise, providing noise-management training to all employees, and addressing any noise complaints.

No other stakeholders provided any recommendations to address noise generated by project construction.

*Our Analysis*

GBEP's noise analysis only takes into account the maximum level of noise that would be expected from operating a single piece of construction equipment at any one time (i.e., 92 dBA). However, it is unlikely that only one piece of equipment would be operating at any given time over the course of the 3-year construction period. Rather, multiple pieces of machinery and construction activities would occur simultaneously (e.g., batch plant operation, bulldozer earthwork, dump truck operation, blasting activities), and the additive effects of multiple activities occurring simultaneously may exceed the 92-dBA maximum levels estimated by GBEP.

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[54] The decibel (dB) scale is a logarithmic scale used to quantify sound pressure into a manageable range. A-weighted decibels are measured on a scale that reflects the response of the human ear by filtering out some noise in the highest and lowest spectrum. The human range of hearing extends from approximately 3 dBA to around 140 dBA.

To determine the maximum noise levels that would be expected during construction, we used noise level information from the construction of a similar pumped storage project, the Eagle Mountain Project, FERC No. 13123 (Eagle Crest Energy Company, 2009). Although the Eagle Mountain Project is larger than the proposed Gordon Butte Project and would therefore require more construction vehicles and activities with greater noise-generating potential, it does not require excavation of the reservoirs that would occur with the Gordon Butte Project, which we expect would generate additional noise due to bulldozer operation. Based on this, it is reasonable to assume that both projects would generate a similar noise level during construction. Using peak construction activity information from Eagle Crest Energy Company (2009) and reported noise levels for various construction activities as published in the Federal Highway Administration (FHWA) Construction Noise Handbook (U.S. Department of Transportation, 2006) we calculated sound pressure levels to estimate noise levels during construction at the Gordon Butte Project. Construction vehicles included concrete and heavy duty trucks. Construction equipment included bulldozers, back hoes, generators, compactors, water and pump trucks, and batch plants. With the exception of D8 bulldozers, all onsite equipment and activities (e.g., heavy duty trucks, batch plant operation) are estimated to have peak sound pressure levels of 85 dB or less per the FHWA handbook. D8 bulldozers produce a sound pressure level of 95 dB. Additionally, our analysis assumes that blasting activities would occur on site at a single location during peak construction, which would represent another single 94 dB source per the FHWA handbook. Assuming all noise sources were to occur at one time, the total sound pressure level at the source would be about 113.4 dB, fading to 66.9 dB 2 miles from the source and 63.4 dB 3 miles from the source.

We then analyzed two isopleths:[55] 85 dB and 65 dB. We selected the 85 dB isopleth because Occupational Safety and Health Administration regulations require an employer to administer a hearing conservation program when employees are exposed to an 8-hour, time-weighted sound level of 85 dB or greater. We also selected the 65 dB isopleth because it is the approximate sound pressure level for a normal conversation. As shown in figure 7, the 85 dB isopleth extends to just beyond the immediate construction area, while the 65 dB isopleth extends to just beyond the town of Martinsdale. Therefore, we expect that the peak sound level produced by the project would fade to a level that is equivalent to that generated by normal conversation at the 71 Ranch, Cottonwood Cabins, and Ingersoll Ranch, located within a 2- to 2.5-mile radius of the project and within the town of Martinsdale located about 3 miles away, which would result in only a minor effect on ambient noise levels.

[55] Isopleths are lines of equal sound pressure level

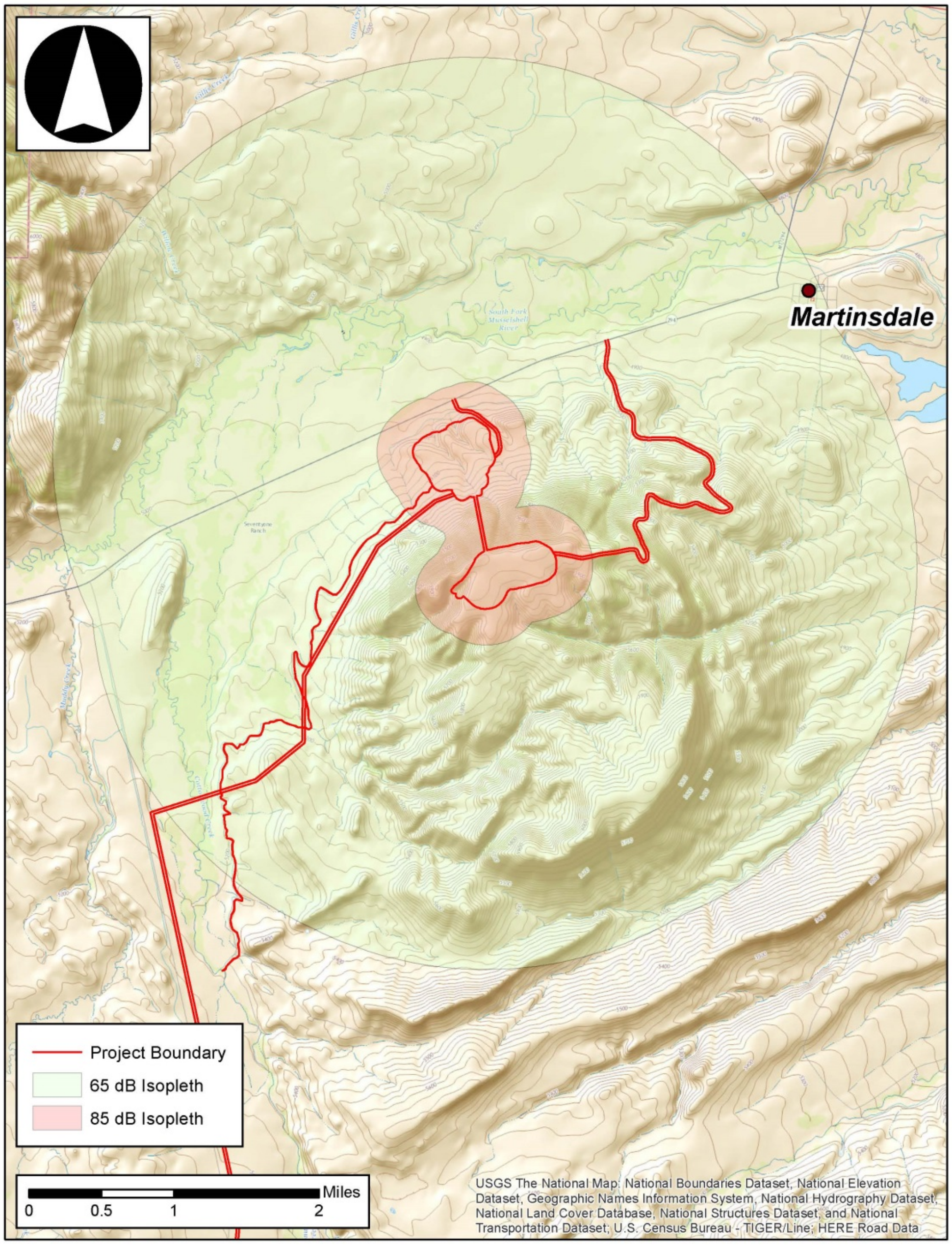


Figure 7. The 65 dB and 85 dB isopleths from the reservoirs and penstock.

GBEP's proposed measures in its preliminary Construction Noise Mitigation Plan, including responding to any noise complaints received due to the project, notifying residents of scheduled blasts, limiting the time period for blasting and batch plant operations, insulating or using engine silencers on construction equipment, locating rock crushing operations in noise-shielding areas, and training employees on noise management would further minimize any adverse effects of noise on nearby residents or visitors.

### 3.3.8 Socioeconomics

#### 3.3.8.1 Affected Environment

The project would be located in a rural area of south-central Montana in Meagher County. Meagher County, with a population of 1,891 as of 2010, has experienced an overall decline in its population since 1910 despite three decades of positive growth through 2010. The primary employment sectors are agriculture, forestry, fishing, and hunting. The largest commercial and population center in Meagher County is White Sulphur Springs, located about 38 miles by road from the project site. The nearest unincorporated communities to the project site are Martinsdale (population 64), located about three miles northeast of the project site, and Ringling (population 45), located about 22 miles southwest. The nearest city with a population greater than 50,000 is Great Falls, Montana, located about 81 miles north of the project site in Cascade County. Other than residences and some agricultural storage facilities, Martinsdale has a post office and a small bed and breakfast inn with a restaurant/bar that is open seasonally. There are no grocery stores or gas stations in the town, although two abandoned gas stations and an old country store still exist. To buy gas or groceries, residents must drive about 20 to 30 miles to White Sulphur Springs or Harlowton.

The median annual household income in Martinsdale is $33,750 compared with $35,645 for Meagher County and $45,456 for Montana. White Sulphur Springs has a median household income of $32,147 (U.S. Census Bureau, 2010). Montana's current unemployment rate is 4.2 percent, while Meagher County has an unemployment rate of 4.5 percent (Montana Department of Labor and Industry, 2014). As of 2015, the unemployment rate in White Sulphur Springs and Martinsdale is 3.3 percent (city-data.com, 2015; 2015a).

According to 2014 data estimates, there are 1,432, housing units[56] within Meagher County (U.S. Census Bureau, 2014). Of these housing units, 806 are occupied and 626 are vacant, which is a 43.7 percent vacancy rate. Although this is an extremely high vacancy rate compared to the State of Montana (15 percent) and the U.S. (13 percent), it should be noted that 77 percent of Meagher County's vacant units are utilized as recreational, seasonal, or occasional use residences (U.S. Census Bureau, 2010).

Martinsdale has 78 housing units (city-data.com, 2015). Of those units, 36 are occupied and 42 are vacant, resulting in a 54 percent vacancy rate. Similar to Meagher County, the majority of vacant units in Martinsdale appear to be used as recreational,

[56] Housing units are defined as a house, apartment, or mobile home or trailer; a group of rooms; or a single room occupied as separate living quarters.

seasonal, or occasional use. There are 563 housing units in White Sulphur Springs. Of those, 443 are occupied and 130 are vacant, resulting in a 24 percent vacancy rate (city-data.com, 2015a). The percentage of vacant housing in White Sulphur Springs is much lower than in Meagher County and Martinsdale and is more comparable to vacancy rates in Montana and the U.S.

Meagher County does not have an abundance of hotel/motel accommodations. As of 2014, White Sulphur Springs had three lodging businesses that provide approximately 77 rooms/units. In Martinsdale, there is one lodging facility (Crazy Mountain Inn) that provides about a dozen rooms. About 15.5 miles northwest of Martinsdale along Highway 12 is the Checkerboard Inn which rents 7 rustic cabins year-round. Therefore, within 36 miles of the project site, between 97 and 300 rooms/units are available at any given time depending on persons per unit.

Education facilities in Meagher County consist of one library and two schools. The Meagher County City Library is located in White Sulphur Springs. The two schools are also located in White Sulphur Springs and include a Kindergarten through 8th grade elementary school with 135 students and a high school with 60 students. There used to be one school in Martinsdale which served pre-kindergarten through 8th grade but it is now temporarily closed due to no enrollment.

The project area is located approximately 80 miles north of Interstate 90 and immediately south and adjacent to County Montana Highway 294, a two-lane paved highway that serves as the main vehicular access to the project area. Several paved highways and roads extend in all directions from Montana Highway 294 and access various commercial and population centers such as Great Falls, Helena, Butte, Bozeman, Livingston, Big Timber, Billings, and Lewistown.

Two railroad lines are located near the project area. The Class I Burlington Northern and Santa Fe Railway is located approximately 45 miles to the northeast of the project area, near Judith Gap, Montana. This section of railway extends southeast/northwest between Billings and Great Falls. The Class II Montana Rail Link is located approximately 80 miles south of the project area near Livingston. This section of railway extends east/west from Laurel, Montana to the western border of Montana (Montana Department of Transportation, 2014).

Several airports are available to serve Central Montana and the project vicinity. Close to the project site is a small public airport located just south of White Sulphur Springs, approximately 36 miles to the northwest (MontanaLinks.com, 2014). This airport is not served by any major commercial airlines, but can be utilized by smaller private aircraft. Major airports nearest to the project site include Bozeman Yellowstone International Airport (90 miles to the southwest), Helena Regional Airport (100 miles to the west), Great Falls International Airport (130 miles to the northwest), and Billings Logan International Airport (115 miles to the southeast).

Law enforcement, fire, and health services are provided in Meagher County and communities surrounding the proposed project area. Law enforcement agencies and personnel serving Meagher County include: Meagher County Sheriff's Department in White Sulphur Springs (four officers); Montana Highway Patrol in White Sulphur Springs (one officer); Montana DFWP in White Sulphur Springs (one officer); and the Lewis and Clark National Forest in White Sulphur Springs (one officer). Meagher County also provides disaster and emergency services based outside of White Sulphur Springs. The Meagher County Ambulance Service provides three ambulances and carries a roster of 18 volunteer Emergency Medical Technicians. The majority of the work shifts are covered by eight of these technicians. There is one hospital in Meagher County, located 28 miles from the proposed project area in White Sulphur Springs, which has 25 beds available and provides inpatient, outpatient, and long-term care, diagnostics, and 24/7 emergency services. Medical staff at the hospital includes one doctor, 10 nurses, and 15 Certified Nursing Assistants. The Bair Medical Clinic is also associated with the hospital and provides primary care as well as other medical services and has one doctor, two Physician Assistants, two Licensed Practical Nurses, and one Nurse's Aide on the staff.

In Fiscal Year 2014-2015, Meagher County tax revenues totaled approximately $1.7 million.

#### 3.3.8.2 Environmental Effects

The influx of workers during project construction would affect the local and regional economies and infrastructures by generating additional tax revenue, increasing traffic, and generating additional demand for local housing and services. Such effects would also occur during project operation but to a lesser degree because operation would require substantially fewer personnel.

GBEP estimates that the proposed project would create approximately $95 million in direct and indirect revenue in the local rural economies during the 3-year construction period.

During the first year of the 3-year construction period, GBEP states the labor workforce would be approximately 100 from month 5 through 12. The maximum number of construction personnel would be needed during the second year, when 270 to 300 workers would be employed from months 20 to 22, with an additional 50 persons including manufacturing, inspection, and management staff. During the third year, a workforce of about 250 in month 25 would decline over the last 12 months of construction. GBEP expects that a 5- or 6-day workweek would be established throughout the construction period, with one or two 10-hour shifts (day and night shift). Day shifts would be from 7:00 AM to 5:30 PM and night shifts would run from 8:00 PM to 6:30 AM. The night shifts would not likely commence until the fifth month of construction. Workforce numbers for the night shifts would be significantly smaller than those of the day shifts during the first and third year of construction. Night shifts during the second year would be comparable to day shift personnel for construction activities associated with the upper reservoir powerhouse structure, and powerhouse mechanical/electrical components.

Due to limited lodging accommodations in the vicinity of the proposed project, GBEP anticipates that most construction personnel would commute to and from the project site from towns and cities such as White Sulfur Springs, Bozeman, Livingston, and Billings. The number of construction personnel that would live within Meagher County during construction is anticipated to be approximately 5 to 10 percent of the total workforce. Assuming some of those moving into the county would bring their spouse or family, Meagher County could expect, at peak construction, an increased county-wide population of about 100 people (a 5 percent population increase). During the off-peak construction periods, GBEP expects a 2- to 3-percent population increase in Meagher County.

Following the completion of project construction, GBEP states that long-term operation of the facility would create 15 full-time permanent jobs. These jobs would include one site manager, one maintenance planner, one administrative position, four electrical maintenance technicians, and four mechanical maintenance technicians. Annual facility inspections would also be carried out in addition to the daily operations and maintenance activities. The annual inspections would require an additional team of temporary personnel to work with the permanent staff and would include one turbine supervisor/specialist, one generator supervisor/specialist, five mechanical maintenance technicians, and two electrical maintenance technicians.

To minimize the effects of project construction on local infrastructure and services, GBEP proposes to develop a construction workforce management plan that includes provisions for: (1) developing a traffic management plan for Montana Highway 294, (2) providing bus service for project personnel, (3) staggering work shifts (i.e., day shifts between 7:00 AM and 5:30 PM and night shifts between 8PM and 6:30 AM) to ensure all of the crew buses and personnel vehicles are off of the roads prior to morning and afternoon school bus traffic, (4) restricting delivery times to limit truck traffic during school bus traffic times, (5) implementing alcohol and drug testing requirements for project personnel, and (6) providing on-site security.

In addition, GBEP proposes to construct an approximately 1.5-mile-long temporary access road that would lead from the proposed lower reservoir east to the existing upper reservoir access road. This temporary road would be utilized during construction activities to alleviate traffic congestion on Montana Highway 294.

In his comment letter filed on February 28, 2016, Rod Gwaltney, a Martinsdale resident, states that an influx of full time employees associated with the project may double the number of people living in the town and therefore overtax the Martinsdale water and sewage system. Mr. Gwaltney therefore recommends that GBEP provide for an expansion of the town's existing water system and develop a new sewage system as part of the project.

*Our Analysis*

Project construction would require a range of between about 100 and 350 personnel over the 3-year construction period, 5 to 10 percent of which would be expected to reside within Meagher County during this period for a total population increase of about 100 individuals during the peak construction period.[57] An increase of this magnitude would not result in a population boom, nor would it generate a substantial number of work opportunities outside of specific project-related jobs. Further, the 5 to 10 percent peak population increase in the county would be spread out over multiple communities such as Martinsdale, Ringling, White Sulphur Springs, and Checkerboard; thereby minimizing the effect of the overall increase on any one community. The remaining workers would commute to larger communities (i.e., Billings, Livingston, Bozeman) in adjacent counties that would be well-equipped to accommodate several hundred additional workers and their families.

Job opportunities from constructing the project would result in a positive effect on the local economy. No existing businesses would be displaced as a result of the project. Due to an existing lack of goods and services offered in Martinsdale, White Sulphur Springs businesses would likely see an increase in demand and subsequent sales. As a result, during construction, there would be potential opportunities for expansion of local goods and services in Martinsdale, including a gas station/convenience store, a grocery store, and/or additional RV parking. This potential expansion of goods and services during construction would also provide economic growth opportunity, which would be another positive effect on the local economy during construction.

Due to the small expected increase in the local population, existing law enforcement, fire protection, emergency services, and health care facilities and services would be sufficient to provide service for the increased personnel during the construction

[57] This estimate assumes that some of the workers would also move their spouse or family to Meagher County during the construction period.

phase. Because the construction workforce would be employed by the project on a temporary basis, few if any children are expected to enroll in Meagher County school districts. In the event that additional enrollment does occur, the minimal number of new students would have a negligible effect on the school system. The small increase in population would primarily occur in communities other than Martinsdale, and therefore, would not affect Martinsdale's existing water and sewage system. There is no evidence to suggest that additional housing would need to be constructed within Martinsdale to accommodate the expected small influx of construction workers. Therefore, no substantial adverse effects on Martinsdale's or any other communities' local government facilities and services are expected during project construction.

During the operation phase, we expect that most of the long-term project personnel would permanently relocate to Meagher County, resulting in a long-term increase of up to 15 additional families. Assuming an average of four family members per family, the operation phase of the project would increase the population by up to 60 additional residents, which equates to a population increase of 3 percent. Given the long-term population decline over the last 30 years within Meagher County (i.e., 10 percent), a long-term population increase of 3 percent would not adversely affect local government facilities and services. The long-term employee's salaries, income taxes, property taxes, other miscellaneous taxes, and purchase of real estate, goods, and services would provide a positive effect on the state and local economies. Due to the availability of vacant housing units in the communities surrounding the project area, primarily in White Sulphur Springs, existing housing is expected to accommodate the increased population.

Some employees may elect to buy land and build new homes. Overall, project operation is not expected to have negative effects on housing in the county or surrounding communities.

Although project construction would have an effect on existing traffic volume and flow, it is not expected to produce any stress on regional railway or airport transportation services. Due to the minimal number of long-term operation employees likely relocating to the project vicinity, no adverse effects are expected on vehicle, railway, or airport transportation resources.

Increased vehicle traffic, however, could present a problem to area motorists during the construction phase. GBEP's proposal to develop a workforce management plan with provisions to provide bus service for employees commuting between local communities and the worksite, and to design work shifts and delivery schedules to avoid school bus traffic times, would minimize impacts on traffic flow and volume on Montana Highway 294 and other local roads within the project area.

Constructing a temporary road to provide access between the project's lower and upper reservoir access roads during construction, as GBEP proposes, would further minimize traffic by reducing the number of construction vehicles using Montana Highway 294 to move between these two construction sites.

Conducting drug and alcohol testing of project personnel may facilitate a more productive workforce. However, the Commission cannot enforce personnel management through its license; such personnel management is a private matter between GBEP and its workers. Therefore, even though these actions may benefit the project as a whole, the Commission may not be able to require them.

### 3.3.9 Air Quality

#### 3.3.8.1 Affected Environment

Air quality can be affected by a number of factors, including local and regional topography and climate (e.g., wind, precipitation), in conjunction with anthropogenic air pollution. Wind can help to disperse air pollution, lowering its concentration, while falling precipitation can remove pollutants from the air through absorption, such as is the case with acid rain. Mountainous terrain can constrain air flow, trapping pollutants in low-lying areas. This is especially true if a temperature inversion forms. Typically, air temperature drops as elevation increases, but with a temperature inversion this situation is reversed because of the differing rate of heat loss between air and the ground. The warmer, higher air acts as a lid, preventing the dispersion of pollutants released into the air and leading to unhealthy concentrations of such compounds (BC, 2016; NWS, 2016).

The proposed project would be located on Gordon Butte, a prominent landform near the boundary between the Rocky Mountains and the Northern Great Plains that rises from an elevation of about 4,900 feet msl to approximately 5,900 feet at the butte's top. It is bordered 5 miles to the north by the Castle Mountain Range, which rises to approximately 8,400 feet msl, and 10 miles to the south by the Crazy Mountain Range, which reaches a height of about 9,800 feet msl. To the west of the butte lies the saddle between these two mountain ranges, which is the headwaters of the South Fork of the Musselshell River. This saddle rises to approximately 5,900 feet msl before beginning the descent into the South Fork of the Smith River valley on its far side; beyond this valley rises the Big Belt Mountain Range about 30 miles to the west. To the east of the project site lies a relatively unobstructed descent to the Great Plains. Climate in the project vicinity is typical of a semi-arid Great Plains region characterized by abundant sunshine, moderate to strong winds, and wide variations in temperature.

The EPA has established National Ambient Air Quality Standards (NAAQS) for criteria pollutants to protect human health and public welfare.[58] Additionally, Montana DEQ, Air Quality Bureau is charged with implementing the Clean Air Act, as Montana has an EPA-approved State Implementation Plan. Montana DEQ also has promulgated Montana Ambient Air Quality Standards (MAAQS), providing for additional protections beyond that required by federal law (table 19).

Table 19. Federal and State of Montana primary air quality standards

| Pollutant | Averaging Period | Federal (NAAQS) | State (MAAQS) |
|---|---|---|---|
| Carbon Monoxide | 1-Hour | 35 ppm | 23 ppm |
| | 8-Hour | 9 ppm | 9 ppm |
| Lead | Rolling 3-Month | 0.15 $\mu g/m^3$ | - |
| Nitrogen Dioxide | 1-Hour | 100 ppb | 300 ppb |
| | Annual | 53 ppb | 50 ppb |
| Ozone | 1-Hour | - | 0.10 ppm |
| | 8-Hour | 0.075 ppm | - |
| Particulate Matter ≤ 10 microns in diameter | 24-Hour | 150 $\mu g/m^3$ | 150 $\mu g/m^3$ |
| | Annual | - | 50 $\mu g/m^3$ |
| Particulate Matter ≤ 2.5 microns in diameter | 24-Hour | 35 $\mu g/m^3$ | - |
| | Annual | 12.0 $\mu g/m^3$ | - |
| Sulfur Dioxide | 1-Hour | 75 ppb | 500 ppb |
| | 3-Hour | 0.5 ppm | - |
| | 24-Hour | 0.14 ppm | 0.10 ppm |
| | Annual | 0.030 ppm | 0.02 ppm |

Notes: NAAQS – National Ambient Air Quality Standards
MAAQS – Montana Ambient Air Quality Standards
ppm – parts per million
ppb – parts per billion
$\mu g/m^3$ – micrograms per cubic meter of air

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[58] Criteria pollutants include nitrogen dioxide, carbon monoxide, ozone, sulfur dioxide, lead, and particulate matter with an aerodynamic diameter less than or equal to 10 microns ($PM_{10}$) and 2.5 microns ($PM_{2.5}$).

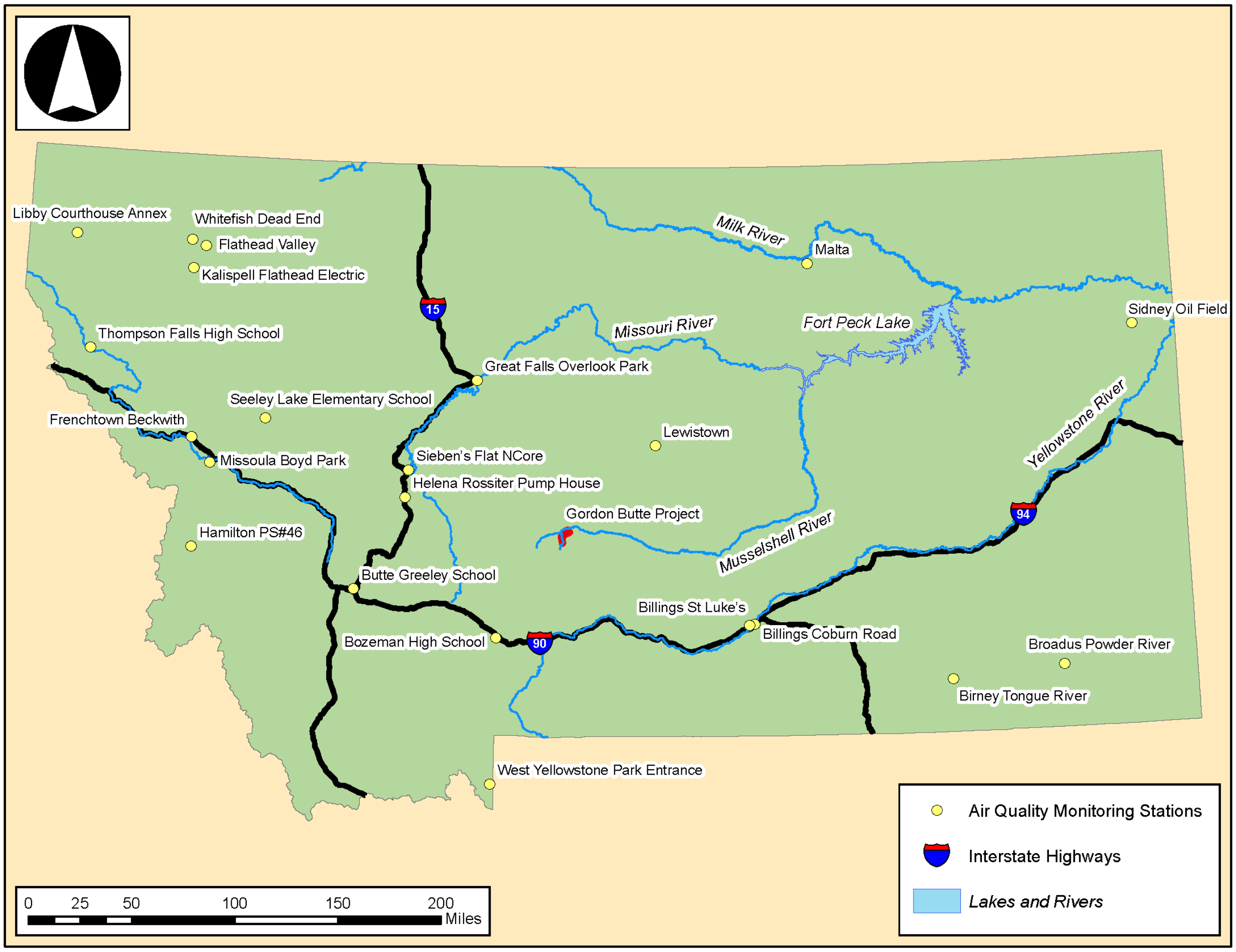


Figure 8. Location of Montana DEQ air quality monitoring stations. (source: Montana DEQ, 2015).

Montana DEQ enforces air quality requirements through a monitoring program comprised of an air quality monitoring network distributed throughout the state (figure 8). Based on the results of air quality monitoring, air quality is designated in specified areas as being in attainment (areas in compliance with the MAAQS) or non-attainment (areas not in compliance with the MAAQS). Meagher County, and the regional area in which the project is located, is currently in attainment with NAAQS and MAAQS. The nearest non-attainment area is near the City of Helena in Lewis and Clark County, Montana, over 80 miles west of the project area. This area is in non-attainment for sulfur dioxide and lead.

Air quality sampling results from Montana DEQ (2015) showed that all monitoring sites met Federal and State standards for carbon monoxide, nitrogen dioxide, ozone, and concentrations of particulate matter less than 10 microns in diameter. The Billings Coburn Road site recorded a maximum 1-hour sulfur dioxide concentration of 130 parts per billion, which exceeds NAAQS and MAAQS standards. This site is approximately 100 miles southeast of Gordon Butte. Additionally, of the 22 monitoring sites throughout the state, 14 had maximum 24-hour concentrations of particulate matter less than 2.5 microns in diameter that did not meet NAAQS standards. The closest of these to Gordon Butte is the Lewistown site, located approximately 60 miles northeast. Of the six sites within a 100-mile radius of the proposed project, four sites (Lewistown, Great Falls, NCore Sieben's Flat, and Helena) had maximum particulate matter concentrations that did not meet NAAQS standards, while two (Billings St. Lukes and Bozeman) did. Lead was not measured at any site for the most recent reporting year because of funding limitations.

#### 3.3.8.2 Environmental Effects

Project construction activities have the potential to affect air quality primarily through machinery exhaust or fugitive dust emissions. The primary emissions sources would include: (1) exhaust emissions from construction vehicles and machinery; (2) fugitive dust emissions associated with construction vehicle movement; and (3) fugitive dust associated with earth-moving excavation, and crushing and mixing of material for concrete. The quantity of exhaust emissions would depend on the equipment used and the horsepower-hours of operation. The quantity of fugitive dust would depend on the moisture content and texture of the soils that would be disturbed and the amount of material that would be crushed. While most dust that is generated is relatively large in diameter, approximately half of fugitive dust emissions are 10 microns in diameter or smaller. Particles of this size can be inhaled and travel to the deep portions of the lungs where they could cause respiratory illness and lung damage (CARB, 2007), which is part of the reason that concentrations of particulate matter less than 10 microns in diameter are categorized as criteria air pollutants.

GBEP proposes to apply for an air quality permit from the Montana DEQ for construction activities, including mineral crushing and dust generation. Additionally, GBEP proposes to apply for an air quality permit for stationary sources for the proposed backup diesel generator,[59] which would be classified as a minor point-source emission source. Furthermore, GBEP proposes to implement an ESCP and a Dust Plan which contain measures to minimize dust formation (*see* section 3.3.1, *Geology and Soils,* for more details).

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[59] The backup diesel generator in considered an appurtenant facility in the project description. *See* section 2.2.1, *Project Description*.

*Our Analysis*

The proposed project would be located in an area of high topographic relief; therefore, it is possible that temperature inversions could form during construction. If such an inversion were to form for a sustained period of time during construction, there is the potential for degradation of local air quality. However, the project area is constrained by high mountain peaks only to the north and south, while it is largely open to the east and, to a slightly lesser degree, to the west. This presents a reduced risk of local landforms causing a temperature inversion to form. Additionally, the area is characterized by sustained moderate to strong winds, with modeled annual average wind speeds on the order of 16 – 23 miles per hour at a height of 100 feet (DOE, 2014). This fact is further evidenced by the proliferation of wind turbine electricity generation facilities in the area (USGS, 2014). Lastly, the area is extremely rural, having few residents and almost no industry (*see* section 3.3.8, *Socioeconomics*). Because of this, the current regional air pollutant load is very low. For these reasons, we do not expect that project construction activities would contribute to a deterioration of local or regional air quality.

Implementing BMPs contained in GBEP's ESCP and Dust Plan would further minimize emissions by controlling wind-borne dust that is generated during construction.

## 3.4 NO-ACTION ALTERNATIVE

Under the no-action alternative, the Gordon Butte Project would not be constructed, and the environmental resources in the project area would not be affected. The power that would have been developed from renewable resources would have to be replaced by nonrenewable fuels.

# 4.0 DEVELOPMENTAL ANALYSIS

In this section, we discuss what effect various environmental measures would have on the proposed project's costs and power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp.*,[60] the Commission compares the current project to an estimate of the cost of obtaining the same amount of energy and capacity using a likely alternative source of power for the region (cost of alternative power). In keeping with Commission policy as described in *Mead Corp.*, our economic analysis is based on current electric power cost conditions and does

[60] See *Mead Corporation, Publishing Paper Division*, 72 FERC ¶ 61,027 (July 13, 1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.

not consider future escalation of fuel prices in valuing the hydropower project's power benefits.

For each of the licensing alternatives, our analysis includes an estimate of: (1) the cost of individual measures considered in the EA for the protection, mitigation and enhancement of environmental resources affected by the project; (2) the cost of alternative power; (3) the total project cost (i.e., for construction, operation, maintenance, and environmental measures); and (4) the difference between the cost of alternative power and total project cost. If the difference between the cost of alternative power and total project cost is positive, the project produces power for less than the cost of alternative power. If the difference between the cost of alternative power and total project cost is negative, the project produces power for more than the cost of alternative power. This estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

## 4.1 POWER AND DEVELOPMENTAL BENEFITS OF THE PROJECT

Table 20 summarizes the assumptions and economic information we use in our analysis. This information was provided by GBEP in its license application. We find that the values provided by GBEP are reasonable for the purposes of our analysis. Cost items common to all alternatives except the no-action alternative would include: taxes and insurance costs, net investment (the total investment in power plant facilities remaining to be depreciated), estimated future capital investment required to maintain and extend the life of plant equipment and facilities, licensing costs, normal operation and maintenance cost, and any Commission fees.

Table 20. Parameters for the economic analysis of the Gordon Butte Hydroelectric Project (Source: GBEP, 2015b, as modified by staff).

| Parameter | Value |
|---|---|
| Period of economic analysis (years) | 30 |
| Federal tax rate (%) | 35 |
| Initial construction cost, $ [a,b] | $986,648,308 |
| Insurance, $ [a] | $1,783,903 |
| Cost to prepare license application, $ [a] | $2,562,321 |
| Annual operation and maintenance cost, $/year[a,c] | $21,477,786 |
| Energy value ($/megawatt-hour) [d] | $43.00 |
| Capacity Rate ($/kilowatt-year) [d] | $360.00 |
| Ancillary services value ($/kilowatt-year) [e] | $51.50 |

| Parameter | Value |
|---|---|
| Pumping ratio (MWh pumping/MWh generating) [f] | 1.11 |
| Pumping energy cost ($/megawatt-hour) [d] | $20.00 |
| Interest rate (%) [g] | 7.5 |
| Escalation rate (%) [h] | 1.0 |

[a] From Tables D-1, D-2 and D-3 of final license application, escalated to 2016 dollars, as modified by staff.

[b] Interest during construction is included in the initial construction cost of the project.

[c] State and local property taxes are included in the annual operation and maintenance costs of the project.

[d] From final license application, Exhibit D, section 4.41(e)(10).

[e] Calculated by staff based on the ancillary service values provided by GBEP in Table D-6 of its final license application, Exhibit D.

[f] This figure assumes continuous operation at peak efficiency (i.e., 400 MW generating and 376 MW pumping).

[g] From final license application, Exhibit D, section 4.41(e)(4).

[h] Based on the Bureau of Labor Statistics' Consumer Price Index.

A pumped storage generating facility includes an upper reservoir, a lower reservoir, and a reversible pump-turbine unit in between the two reservoirs. In generating mode, water from the upper reservoir flows through the reversible unit to the lower reservoir. The water turns the turbine, which is attached to a generator, producing electricity that is transmitted to the electric grid. In pumping mode, power is drawn from the electric grid to "motor" the unit in reverse to act as a pump, pushing water from the lower reservoir back up to the upper reservoir. Therefore, pumped storage facilities are net energy consumers. The amount of energy produced as water passes from the upper reservoir to the lower reservoir through the turbines is less than the amount of energy required to pump water back up to the upper reservoir and provide station service power. However, one of the benefits of a pumped storage project is realized when the price of power for pumping is less than the value of generation. Typically, there are projects that can provide power at lower rates during nighttime or low-demand hours, compared to rates during daytime, high-demand hours. Such facilities can include base-load nuclear, coal, and fossil-fueled facilities, as well as renewable resource facilities powered by solar, wind, biomass, and other sources. Base-load units are typically brought online and remain operational through the course of the day because it is inefficient to bring them online and offline due to the lengthy start-up time required, and because they operate at optimum efficiency at higher loads. Therefore, the pumped storage facility can provide higher priced power during the day when energy demands are high and can use lower cost power from other facilities during the night and other periods when energy demand is low. Pumped storage facilities can also be used to store the energy produced by facilities during low-demand periods by pumping water into the upper reservoir during those periods so that it can be used for generation during higher-demand periods.

In addition to the two existing wind farms located near the proposed Gordon Butte Project, there are a number of wind generation facilities planned or proposed throughout Montana that could be integrated with local energy infrastructure to provide power to pump water to the upper reservoir during nighttime (i.e., low demand) periods including weekends.

The ability of pumped storage facilities to be switched from pumping to generating and back again very quickly, as needed, provides unique benefits to the electric grid. Pumped storage facilities can provide a number of ancillary services to the grid and therefore generate additional revenues in the electric market. Among these services are spinning reserve, non-spinning reserve, frequency regulation, voltage support and regulation, load following capability, peak shaving, and black-start capability. The following discussion provides more detail of these various services.

- Spinning reserve is the extra generating capacity that is available by increasing the power output of generators that are already connected to the power system. Non-spinning reserve or supplemental reserve is the extra generating capacity that is not currently connected to the system but can be brought online after a short delay.

- Grid frequency is a system-wide indicator of overall power imbalance. These imbalances are removed by requesting generators to operate in frequency control mode, altering their output continuously to keep the frequency near the required value.

- System voltage levels vary over the course of a day due to a variety of factors, including: (1) the location of the local distribution line, (2) proximity to large electricity consumers, (3) proximity to utility voltage regulating equipment, (4) seasonal variations in overall system voltage levels, and (5) load factor on local transmission and distribution systems.

- Pumped storage facilities can operate as base load, load following, or peaking power facilities and change operating modes seasonally and daily. Most hydroelectric facilities have the ability to start within minutes, if not seconds, depending upon available water supply. When in load following mode, the output of the pumped storage facility can be adjusted as necessary to meet widely varying load requirements.

- Pumped storage facilities can be operated at a generating level that is much lower than a base load facility and can therefore avoid the need to run a base load unit at low efficiencies below the minimum loading rating of the base load unit.

- A pumped storage facility can generate electricity during peak periods when demand is high and available generating output is near its limits and then pump during off-peak periods when demand is low when available generating output is lower.

- Black-start is the procedure to recover from a total or partial shutdown of the transmission system, which has caused an extensive loss of supplies. This entails isolated power stations being started individually and gradually being reconnected with each other in order to form an interconnected system again.

The national emphasis on the development of renewable resources and the reduction in the use of fossil-fueled facilities has resulted in the planning and development of numerous large wind and solar power facilities across the country.

The variability of the output of these facilities can be problematic to the electric grid because they can create system imbalances by themselves. Such facilities typically work best when they are located close to generating facilities that can provide system balancing capabilities, such as those provided by pumped storage facilities and gas-fired combustion turbines installed specifically to work in concert with solar and wind farms to provide system stability. The pumped storage facilities can provide an added benefit in that power produced by solar and wind facilities in low-demand periods can be "stored" by using it to pump water to the upper reservoir, making it available to produce hydroelectric generation during high-demand periods. Pumped storage facilities are designed to be able to change modes rapidly and can fill gaps due to wind and solar power variability.

We used a value of $51.50 per kilowatt (kW) per year for ancillary services. This represents the revenues that GBEP estimated it would receive for providing ancillary services to the grid based on the values of various services that GBEP provided in the final license application. Ancillary services that the project is expected to provide include regulating reserves (up and down services), spinning reserves, as well as black-start capabilities. At the above rate, ancillary services revenues could contribute $18,800,000 toward offsetting pumping and other costs of the project during each year of the 30-year period.

## 4.2 COMPARISON OF ALTERNATIVES

Table 21 summarizes the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power and total project cost for the applicant's proposal and the staff alternative.

Table 21. Summary of annual cost of alternative power and annual project cost for the action alternatives for the Gordon Butte Hydroelectric Project (Source: staff).

| | **Applicant's Proposal** | **Staff Alternative** |
|---|---|---|
| Installed capacity (MW) | 400 | 400 |
| Annual generation (MWh) | 1,300,000 | 1,300,000 |
| Dependable capacity (MW)[a] | 400 | 400 |
| Annual cost of alternative power[b] | $220,500,000 | $220,500,000 |
| ($/MWh) | 169.62 | 169.62 |
| Annual project cost | $173,200,227 | $173,189,862 |
| ($/MWh) | 133.23 | 133.22 |
| Difference between the cost of alternative power and project cost | $47,299,773 | $47,310,138 |
| ($/MWh) | 36.38 | 36.39 |

[a] Value provided by the applicant.

[b] Calculated based on the "On Peak" value of power provided by the applicant.

### 4.2.1 No-action Alternative

Under the no-action alternative, the project would not be constructed and would not produce any electricity. The only cost associated with this alternative would be the cost to prepare the license application.

### 4.2.2 Applicant's Proposal

GBEP proposes numerous environmental measures, as presented in table 22. Under GBEP's proposal, the project would have an installed capacity of 400 MW, and generate an average of approximately 1,300,000 MWh of electricity annually. The average annual cost of alternative power would be $220,500,000, or $169.62/MWh. The average annual project cost would be $173,200,227, or $133.23/MWh. Overall, the project would produce power at a cost that is $47,299,773, or $36.38/MWh, less than the cost of alternative power.

### 4.2.3 Staff Alternative

The staff alternative includes the same development proposal as GBEP and, therefore, would have the same capacity and energy attributes. Table 22 shows the staff-recommended deletions and modifications to GBEP's proposed environmental protection and enhancement measures, and the estimated cost of each.

Based on a total installed capacity of 400 MW and an average annual generation of 1,300,000 MWh, the average annual cost of alternative power would be $220,500,000, or $169.62/MWh. The average annual project cost would be $173,189,862, or $133.22/MWh. Overall, the project would produce power at a cost that is $47,310,138, or $36.39/MWh, less than the cost of alternative power.

## 4.3 COST OF ENVIRONMENTAL MEASURES

Table 22 gives the cost of each of the environmental enhancement measures considered in our analysis. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 22. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of constructing and operating the proposed Gordon Butte Pumped Storage Hydroelectric Project (Source: staff).

| Enhancement/Mitigation Measures | Entity | Capital Cost[a] (2016$) | Annual Cost[a] (2016$) | Levelized Annual Cost[b] (2016$) |
|---|---|---|---|---|
| **Geology and Soils Resources** | | | | |
| 1. Revise the preliminary Erosion and Sediment Control Plan based on final project design to include site specific measures. | GBEP, Staff | $253,395 | $18,244 | $26,390 |
| 2. Develop a spoil disposal plan. | Staff | $30,000[c] | $0 | $1,720 |
| **Aquatic Resources** | | | | |
| 3. Develop a hazardous materials containment/fuel storage plan. | GBEP, Staff | $15,204 | $10,136 | $7,460 |
| 4. Develop a spill prevention, control, and containment plan. | GBEP, Staff | $27,873 | $10,136 | $8,187 |
| 5. Implement the water quality monitoring program. | GBEP | $50,679 | $5,068 | $6,200 |
| 6. Operate and maintain a Parshall flume to measure flow diversions for reservoir filling. | GBEP, Staff | $12,163[d] | $1,014 | $1,356 |
| 7. Only divert flow from Cottonwood Creek between April 15 and June 30 and restrict project flow diversions to a maximum rate of 50 cfs. | GBEP, Staff | $0[e] | $0 | $0 |
| 8. Monitor downstream USGS gages in the South Fork and mainstem Musselshell Rivers, maintain minimum flows at each gage site, and coordinate with water management entities administering flows downstream of Cottonwood Creek during reservoir filling operation. | GBEP | $0[f] | $8,219 | $5,342 |

| | | | | |
|---|---|---|---|---|
| 9. Maintain a minimum flow of 16 cfs in Cottonwood Creek, operate and maintain the existing stream staff gage for compliance monitoring, and provide monitoring results annually to Montana DNRC. | GBEP, Staff | $15,204[g] | $5,068 | $4,166 |
| 10. Implement the Box Car Spring Monitoring Program Plan. | GBEP | $17,000 | $24,000 each year for years 1 – 3; and $27,000 in year 4 | $4,543[h] |
| 11. Develop an operation compliance monitoring plan that describes procedures for documenting compliance with proposed minimum flows and restrictions on project flow diversions. | Staff | $5,000[c] | $0 | $287 |
| **Terrestrial Resources** | | | | |
| 12. Develop and implement a vegetation management plan, and restore temporary access roads and disturbed areas, such as laydown areas. | GBEP, Staff | $222,000 | $5,000 | $15,866 |
| 13. Additional measures to include in the vegetation management plan (monitoring protocols, performance criteria, reporting requirements, and implementation schedule). | Staff | $0[k] | $0[l] | $0 |
| 14. Revise and implement the preliminary Noxious Weed Control Plan based on final project design. | GBEP, Staff | $80,000 | $17,000 each year for years 4-7 | $3,239 |
| 15. Additional measures to include in the Noxious Weed Control Plan (monitoring protocols, performance criteria, reporting requirements, and implementation schedule). | Staff | $0[k] | $0 | $0 |

| | | | | |
|---|---|---|---|---|
| 16. Design the transmission line to protect avian resources and install visual markers on the line. | GBEP, Staff | $10,136 | $0 | $581 |
| 17. Include the measures in item 16, but also install perch deterrents on the crossarms of the transmission line towers. | Staff | $10,000[c] | $0 | $573 |
| 18. Implement avian protection construction measures (eagle nest buffers, pre-construction raptor nest surveys, no tree removal during raptor nesting season). | GBEP, Staff | $0 | $5,000 each year for years 1-3[f] | $501 |
| 19. Implement avian protection operation measures (eagle nest buffers during transmission line operation and maintenance activities, replace transmission-line visual markers twice per year). | GBEP, Staff | $0 | $14,000 each years for years 4-30[f] | $7,821 |
| 20. Monitor migratory bird use of project reservoirs during long-term project operation, and provide monitoring results to Montana DFWP. | GBEP | $0 | $4,000 each year for years 4-30[f] | $2,235 |
| 21. Install fencing around the reservoirs and substations. | GBEP, Staff | $0[e] | $0 | $0 |
| **Recreation Resources** | | | | |
| 22. Stock the project reservoirs with cutthroat trout. | Rod Gwaltney | $10,000[c] | $0 | $573 |
| **Aesthetic Resources** | | | | |
| 23. Revise the preliminary Construction Noise Mitigation Plan based on final project design | GBEP, Staff | $0[i] | $0 | $0 |
| 24. Use topography, existing vegetation, site-specific landscaping, low-profile and buried facilities, and low contrast materials and colors, to blend the project with its surroundings. | GBEP, Staff | $0[e] | $0 | $0 |
| 25. In disturbed areas, restore the ground contour and vegetation to match original conditions, to the extent possible. | GBEP, Staff | $0[e] | $0 | $0 |

| | | | | |
|---|---|---|---|---|
| 26. Place temporary structures in previously disturbed areas away from public vantage points and outside visually sensitive locations. | GBEP, Staff | $0[e] | $0 | $0 |
| 27. Maintain structures and vegetation coverage during project operation. | GBEP, Staff | $0 | $0[j] | $0 |
| **Cultural Resources** | | | | |
| 28. Fence off culturally sensitive sites to avoid their disturbance during construction. | GBEP, Staff | $5,068 | $1,000 each year for years 1-3 | $391 |
| 29. Employ an archeologist on site during subsurface excavation. | GBEP, Staff | $162,173 | $1,000 each year for years 1-3 | $9,400 |
| **Socioeconomics** | | | | |
| 30. Develop and implement a construction workforce management plan | GBEP, Staff | $152,037 | $0 | $8,719 |
| 31. Remove employee alcohol and drug testing from proposed construction workforce management plan. | Staff | $0[k] | $0 | $0 |
| 32. Expand the capacity of the Martinsdale Water and Sewer District | Rod Gwaltney | $1,500,000[c] | $50,000 | $118,517 |
| **Air Quality** | | | | |
| 33. Revise and implement the preliminary Construction Dust Control Plan based on final project design. | GBEP, Staff | $101,358 | $0 | $5,812 |

[a] Unless otherwise noted, all cost estimates are from GBEP, escalated to 2016 dollars.

[b] All capital and annual costs are converted to equal annual costs over a 30-year period to give a uniform basis for comparing all costs.

[c] Cost estimated by staff.

[d] Because the flume is already installed, cost estimate assumes the capital costs would be for initial calibration of the flume.

[e] The cost of this measure is included in project's capital cost.

[f] Cost modified by staff.

[g] Because the gage is already installed, cost estimate assumes the capital costs would be for initial refinement of the rating curve

[h] Cost estimate is for monitoring only and does not include any costs of potential mitigation measures to protect Martinsdale's water supply.

[i] All costs associated with implementation of the construction noise mitigation plan are standard construction industry practice, and therefore costs are included in capital construction costs.

[j] The cost of this measure is included in project's cost for operation and maintenance.

[k] The cost for this measure is negligible because it includes defining details that can be developed through GBEP's proposal to revise the plan in consultation with agencies based on final design.

[l] Monitoring to be done concurrently with the noxious weed monitoring under the Noxious Weed Control Plan and therefore no additional cost is anticipated.

# 5.0 CONCLUSION AND RECOMMENDATIONS

## 5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment would be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, our recommendations for licensing the Gordon Butte Project. We weigh the costs and benefits of our recommended alternatives against other proposed measures.

### A. Recommended Alternative

Based on our independent review of agency and public comments filed on this project and our review of the environmental and economic effects of the proposed project and its alternatives, we recommend the proposed action (with the exception of GBEP's proposals to implement the water quality monitoring program, coordinate with water users associations and maintain minimum flows at existing USGS gages in the South Fork and mainstem Musselshell River, monitor bird use of the project reservoirs over the term of the license, implement the Box Car Spring Monitoring Program Plan, and include drug and alcohol testing of project personnel in the proposed workforce management plan) with additional staff-recommended measures as the preferred alternative. This alternative includes elements of the applicant's proposal with some modifications and additional measures.

We recommend this alternative because: (1) issuance of an original hydropower license by the Commission would allow GBEP to operate the project as a dependable source of electrical energy, (2) the 400 MW of electric energy generated from the project would come from a renewable resource that does not contribute to atmospheric pollution, (3) the public benefits of this alternative would exceed those of the no-action alternative, and (4) the recommended environmental measures would protect environmental resources affected by the proposed project.

In the following section, we make recommendations as to which environmental measures proposed by GBEP should be included in any license issued for the project. In addition to the applicant's proposed environmental measures listed below, we recommend additional staff-recommended environmental measures be included in any license issued for the project.

**Measures Proposed by GBEP**

Based on our environmental analysis of the applicant's proposals in section 3, and the costs presented in section 4, we recommend the following environmental measures proposed by the applicant to protect environmental resources and believe these measures would be worth their cost:

*Geology and Soils Resources*

- revise, based on the final design of the project, the preliminary ESCP filed on January 19, 2016, to include site-specific BMPs to control erosion and storm water runoff during project construction;

*Aquatic Resources*

- develop a hazardous materials plan that defines procedures for the proper containment of hazardous substances during project construction and operation;

- develop a SPCCP that defines procedures for the management and cleanup of hazardous substances during project construction and operation;

- monitor project flow diversions from Cottonwood Creek using 71 Ranch's existing Parshall flume, restrict flow diversions from Cottonwood Creek to 50 cfs or less, only withdraw water during initial fill and evaporation re-fills between April 15 and June 30 when flows are naturally high, and maintain a minimum flow of 16 cfs at the existing stream staff gage in Cottonwood Creek when filling the reservoirs to protect existing water uses and aquatic and riparian habitat downstream in Cottonwood Creek;

- document compliance with the proposed minimum flows in Cottonwood Creek by manually checking the gage once per day when filling the reservoir, adjusting the headgate to increase the flow in Cottonwood Creek or ceasing diversions if minimum flow levels cannot be met, and maintaining daily flow records and annually reporting flow records to Montana DNRC by July 30 each year;[61]

*Terrestrial Resources*

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[61] Records would include flow data for both the Parshall flume and Cottonwood Creek compliance gage.

- develop a vegetation management plan that defines BMPs to minimize disturbance to existing vegetation and wetlands during construction and to promptly revegetate disturbed areas to control erosion and protect wildlife habitat;

- revise, based on the final design of the project, the preliminary Noxious Weed Control Plan filed on February 29, 2016, to include site-specific measures for controlling and preventing infestations in the project area that are at high-risk for spreading during construction, such as cleaning equipment to remove weed seeds or plant parts prior to entering the project site, training personnel in the identification of noxious weeds, inspecting construction materials at their source to ensure they are weed-free, and revegetating areas disturbed by construction as soon as possible;

- prohibit grassland vegetation removal from April 15 to July 15 to protect migratory birds nesting in the following areas: reservoirs, lay-down areas, powerhouse, and access road;

- implement the following measures to protect and monitor the effects of construction and initial operation of the transmission line on birds:

    - maintain a 0.5-mile buffer between transmission-line construction activities and a bald eagle nest[62] located near where the transmission line crosses Cottonwood Creek during the February 1 to August 15 nesting period;

    - conduct a pre-construction survey of the transmission-line corridor to determine if eagle or other raptor (e.g., red-tailed hawks) nests are active and whether the juveniles have fledged, and if the surveys indicate that nests are active, then delay construction or implement additional protection measures;

    - design the transmission line to minimize the potential for avian electrocution;

    - install fixed daytime visual markers on the transmission line a half mile east and west of where the line crosses Cottonwood Creek to minimize collision hazards;

[62] The occupied nest is located 0.4 mile from the transmission line alignment.

- monitor eagle nesting success and for any project-related effects (e.g., electrocution or collision) on any bald eagles nesting near the transmission line where it crosses Cottonwood Creek for two breeding seasons after completing construction, and report monitoring results to FWS; and

- maintain a 0.5-mile buffer between any raptor nest and transmission line operation and maintenance activities, and replace transmission-line visual markers twice per year, as necessary, to protect bald eagles and other birds;

- install fencing around the project reservoirs and substations to prevent wildlife, project personnel, and the public from entering these areas where they could be at risk of drowning or electrocution;

*Cultural Resources*

- fence off culturally sensitive sites to avoid accidentally disturbing these sites during project construction;

- have an archaeologist onsite to monitor construction activities in areas that may yield previously unidentified cultural resources and implement procedures to protect any resources that are discovered during construction;

*Aesthetic Resources*

- construct the lower reservoir using topographic features to minimize visibility from Montana Highway 294 and landscape the lower reservoir saddle dam to blend with the natural terrain;

- utilize existing vegetation to screen views of the upper reservoir from motorists on Montana Highway 294 and avoid disturbance of Gordon Butte's outermost ridgeline during construction to minimize visual impacts;

- use low-profile structures whenever possible to reduce visibility and site linear features to follow the edges of clearings where they will be less conspicuous;

- restore disturbed surfaces as closely as possible to their original contour and revegetate disturbed areas so they blend into the natural terrain;

- minimize the amount of construction and ground-disturbance needed for roads, staging areas, and crane pads by using existing roads and disturbed areas as much as possible and locating these structures outside of publicly accessible vantage points and visually sensitive areas;

- use colors and materials to blend facilities with the surrounding landscape;

- revise, based on the final design of the project, the preliminary Construction Noise Mitigation Plan filed on January 19, 2016, to include site-specific measures for limiting noise during construction;

*Socioeconomic Resources*

- minimize effects on local infrastructure and services by developing a construction workforce management plan that includes provisions for: (1) developing a traffic management plan for Montana Highway 294, (2) providing bus service for project personnel, (3) staggering work shifts (i.e., day shifts between 7:00 AM and 5:30 PM and night shifts between 8PM and 6:30 AM) to ensure all of the crew buses and personnel vehicles are off of the roads prior to morning and afternoon school bus traffic, (4) restricting delivery times to limit truck traffic during school bus traffic times, and (5) providing on-site security;

*Air Quality*

- revise, based on the final design of the project, the preliminary Dust Plan filed on January 19, 2016, to include site-specific dust control BMPs to maintain good air quality during construction.

**Additional Staff-Recommended Measures**

We recommend the measures described above, and the following modifications and additional staff-recommended measures: (1) modify the proposed project boundary to enclose the existing diversion structure on Cottonwood Creek, irrigation canal leading from the diversion structure to the lower reservoir site, Parshall flume in the irrigation canal, and access road leading to the upper reservoir site; (2) develop a detailed spoil disposal plan that includes a map showing permanent spoil disposal sites, and measures to stabilize and prevent soil erosion and the spread of noxious weeds; (3) develop an operation compliance monitoring plan in consultation with Montana DFWP and Montana DNRC that includes: (a) specific calibration procedures for the Cottonwood Creek minimum-flow compliance gage; (b) procedures for monitoring and documenting compliance with the proposed restrictions on project flow diversions, including a description of monitoring locations, equipment or measuring devices, methods, frequency of recording, quality assurance and quality control, and calibration procedures; and (c) a schedule for reporting to the Commission any deviations from the proposed Cottonwood Creek minimum flows and restrictions on project flow diversions; (4) apply the measures included in a proposed vegetation management plan  and the Noxious Weed Control Plan to the diversion structure, irrigation canal, and upper reservoir access road, and include in the plans the following additional measures:  (a) monitoring protocols, (b) performance criteria to ensure success of revegetation and noxious weed control efforts, (c) reporting requirements, and (d) an implementation schedule; and (5) install perch deterrents on the crossarms of the transmission towers to prevent increased predation of small mammals and other wildlife by raptors.

Below, we discuss the basis for our staff-recommended modifications and additional measures.

*Project Boundary Modifications*

GBEP's proposed project boundary encompasses 380 acres of private land owned by 71 Ranch and encloses all of the new proposed project facilities (e.g., transmission line, substations, powerhouse, upper and lower reservoir, and new access road), but would not include 71 Ranch's existing diversion structure, irrigation canal, and Parshall flume that would convey flows for project operation to the lower reservoir, nor does it include the existing private road that would provide access to the upper reservoir site. However, the diversion structure, irrigation canal, and Parshall flume would all be needed to provide water for project operation; and the existing private road leading from Montana Highway 294 to the top of Gordon Butte would be needed to access the upper reservoir for project operation and maintenance activities.  Because these features would be necessary for operation and maintenance of the project,[63] we recommend that the proposed project boundary be expanded to enclose these features.

*Spoil Disposal Plan*

Project construction activities such as blasting and excavation would produce about 14 million cubic yards of spoils, of which about 1.2 million cubic yards would be used on site for dam construction and 12.8 million cubic yards would be used for either road maintenance and dust suppression during construction, or would require permanent long-term disposal sites.  GBEP does not specify the location of its proposed permanent spoil disposal sites and instead proposes to determine final sites during final project design after consulting with local land owners, state and local government agencies, and other interested parties.

Our analysis in section 3.3.1.2 indicates that road maintenance and dust suppression activities during construction would not likely require such a large volume of

[63] *See* 18 C.F.R. section 4.41(h)(2).

the excess spoils, and therefore, up to 12.8 million cubic yards of spoils may need permanent disposal sites. Our analysis also indicates that disposal of such a large volume of spoils could potentially cause erosion and dust generation or contribute to the spread of noxious weeds. To prevent erosion and protect vegetation resources, we recommend that GBEP develop a spoil disposal plan prior to construction. We envision the plan would include: (1) a map showing the locations of the specific sites for permanent spoil disposal, (2) a description of the measures that would be implemented to stabilize and prevent erosion or the spread of noxious weeds at permanent disposal sites; and (3) a description of the entities that were consulted with during development of the plan, including any written comments received from the consulted entities on the plan. We estimate the levelized annual cost to develop the spoil disposal plan would be $1,720, and conclude that the benefits to soils and terrestrial resources would justify the cost.

*Operation Compliance Monitoring Plan*

GBEP proposes to monitor compliance with its proposed 16-cfs minimum flow by operating and maintaining an existing stream staff gage in Cottonwood Creek at a location about 4 miles downstream of the project's diversion site. GBEP developed a preliminary rating curve for the gage during pre-filing studies but proposes to refine the rating curve prior to diverting flow for project operation and to continue to verify and refine the rating curve over the term of any license issued. GBEP proposes to manually check the gage once per day when filling the reservoir and to adjust the headgate to increase the flow in Cottonwood Creek or cease diversions if minimum flow levels cannot be met. To monitor compliance with its proposed restrictions on flow diversions during reservoir filling (i.e., divert to no more than 50 cfs, restrict flow diversions to April 15 to June 30), GBEP proposes to operate and maintain 71 Ranch's existing Parshall flume in the irrigation canal. For compliance reporting, GBEP proposes to maintain flow records for the minimum flow compliance gage and Parshall flume and submit an annual report to Montana DNRC by July 30 of each year of project operation and at other times upon Montana DNRC's request.

In section 3.3.2.2, our analysis indicates that the existing stream staff gage would likely be sufficient for minimum flow compliance monitoring purposes, but that additional information is needed on the frequency that GBEP would verify the rating curve to ensure the accuracy of the gage over the term of any license issued. Our analysis also indicates that the existing Parshall flume within the irrigation canal may be insufficient to document compliance with the proposed restrictions on flow diversions during reservoir filling. This is because all flows diverted at the diversion structure by either 71 Ranch for agricultural purposes or GBEP for hydroelectric project purposes would pass through the existing Parshall flume. Therefore, it's unclear how flow records obtained from the flume could be used to differentiate between project and non-project flow diversions, which would be needed for project compliance purposes. If the flume cannot differentiate between flows diverted for project and non-project purposes, an additional gaging device such as a staff gage, calibrated valve or gate opening, or an additional flume near the location where project flow diversions discharge into the lower reservoir would be necessary for compliance purposes. Moreover, our analysis indicates that GBEP's proposal to provide flow records to Montana DNRC would not be sufficient to enable the Commission to ensure that GBEP complies with its proposed minimum flow and flow diversion restrictions for the protection of aquatic resources downstream.

Therefore, we recommend that GBEP develop for Commission approval an operation compliance monitoring plan in consultation with Montana DFWP and Montana DNRC that includes: (1) specific calibration procedures for the Cottonwood Creek minimum-flow compliance gage; (2) procedures for monitoring and documenting compliance with the proposed restrictions on project flow diversions, including a description of monitoring locations, equipment or measuring devices, methods, frequency of recording, quality assurance and quality control, and calibration procedures; and (3) a schedule for reporting to the Commission any deviations from the proposed Cottonwood Creek minimum flows and restrictions on project flow diversions.

An operation compliance monitoring plan would enable the Commission to administer compliance with the proposed license requirements for protecting aquatic and riparian habitat downstream of the proposed diversion site. We estimate that the levelized annual cost of developing the plan would be $287, and conclude that the compliance benefits would justify the cost.

*Vegetation Management and Noxious Weed Control*

Project construction would temporarily and permanently affect 371.7 acres of lands. This would include 192.4 acres of primarily upland grassland habitat and 2.3 acres of wetland habitat that would be temporarily disturbed and could be prone to erosion, sedimentation, and the introduction or spread of noxious weeds if measures are not implemented to protect disturbed soils. These temporarily disturbed terrestrial habitats could also be affected during the operation phase of the project as GBEP anticipates that these areas could be periodically disturbed during long-term operation and maintenance activities.

To protect soils and wildlife habitat during project construction and operation, the applicant proposes to develop a vegetation management plan and revise and implement its preliminary Noxious Weed Control Plan filed on February 29, 2016. The plans provide for the revegetation of disturbed areas with native plant species, control of existing infestations of noxious weeds, and BMPs to prevent the spread of noxious weeds and invasive species within the proposed project boundary.

However, the lands surrounding the existing diversion structure, irrigation canal, and upper reservoir access road that we recommend including in the project as licensed project facilities could also require long-term operation and maintenance which may require soil disturbance and vegetation removal. Therefore, we recommend the applicant also apply the weed control measures in its preliminary Noxious Weed Control Plan and the revegetation measures to be included in the proposed vegetation management plan to the diversion structure, irrigation canal, and upper reservoir access road, rather than just the areas within the proposed project boundary.

To further protect soils and wildlife habitat, we also recommend that both plans include a better defined monitoring program to evaluate the success of revegetation and noxious weed control efforts. The monitoring program should include performance criteria that define when the measures are successful; a reporting schedule for filing monitoring results with the Commission; and an implementation schedule.

The cost of applying the noxious weed and revegetation measures to the diversion structure, irrigation canal, and upper reservoir access road should be negligible because disturbances associated with these existing structures would be less, and the amount of area affected is small compared to remaining project facilities. Including detailed monitoring protocols in the noxious weed and revegetation plans would not increase their cost because GBEP already proposes to finalize these plans for Commission approval and including these details would represent a negligible administrative cost.

*Transmission Line Perch Deterrents*

The proposed 5.7-mile-long transmission line would require 47 transmission line towers spaced 650 feet apart, most of which would be situated in grassland habitats or agricultural areas where there are little to no existing trees for raptors to use for perching. As discussed in section 3.3.3.2, our analysis suggests that the transmission line towers would likely attract raptors by providing additional perching opportunities where they can prey on small mammals and other wildlife. Although GBEP proposes to design its transmission line using accepted practices to minimize collisions and electrocutions, it does not specify whether it would include perch deterrents on the towers. To minimize the potential for raptors to utilize the transmission line towers for perching and subsequently increase predation on other wildlife, we recommend that GBEP install perch deterrents on the crossarms of the transmission line towers. In section 4.3, we estimate the levelized annual costs of installing perch deterrents would be $573, and conclude that the benefits to wildlife in the project area would justify the cost.

**Measures Not Recommended**

Some of the measures proposed by GBEP would not result in benefits that would be worth their cost, or they relate to matters outside of the Commission's jurisdiction. The following discusses the basis for staff's conclusion not to recommend such measures.

*Water Quality Monitoring*

GBEP proposes to monitor water quality in Cottonwood Creek prior to construction to establish baseline water quality conditions, and in the project reservoirs twice per year during project operation to monitor for changes in reservoir water quality over the license term. GBEP already monitored water quality and macroinvertebrate species composition in Cottonwood Creek during pre-filing studies which demonstrated that water quality in Cottonwood Creek is not impaired and is sufficient to support all life stages of trout. Therefore, sufficient information already exists to characterize baseline water quality conditions in Cottonwood Creek and there would be minimal project-related benefits from monitoring water quality again prior to construction.

In regard to long-term water quality monitoring in the project reservoirs, the project would operate as a self-contained closed-loop system and the reservoirs and power tunnel would be sealed off from the surrounding rock, thus preventing any discharge of reservoir water from entering Cottonwood Creek, the South Fork, or groundwater during project operation. In addition, our analysis indicates that the reservoirs would provide low-quality habitat for trout and birds and neither would establish a permanent long-term residence in the reservoirs; therefore, water quality conditions in the reservoirs would not affect these resources over the term of any license issued and there would be minimal benefits from long-term water quality monitoring during project operation.

We estimate that the levelized annual cost of the water quality monitoring measures would be $6,200 and conclude that the limited benefits of the monitoring would not justify the cost. Therefore, we do not recommend the proposed water quality monitoring measures.

*Coordinating with Water Management Entities and Maintaining Minimum Flows in the South Fork and Mainstem Musselshell River*

Streamflows in the South Fork and mainstem Musselshell River are influenced by diversions for irrigation, water storage, municipal uses, and domestic uses. Because Cottonwood Creek flows into the South Fork approximately 5.2 miles downstream of GBEP's proposed diversion site, a reduction in Cottonwood Creek flow during project reservoir filling could also reduce flows entering the South Fork and mainstem Musselshell River farther downstream during the same period.

To ensure that project flow diversions for project reservoir filling do not adversely affect existing surface water uses in these downstream waterways, GBEP proposes to coordinate with the District Court MRDP, Upper Musselshell WUA, and Deadman's Basin WUA whenever the project is diverting water from Cottonwood Creek; only divert water when downstream water rights are satisfied within the District Court MRDP's jurisdiction;[64] and adjust or cease its diversions from Cottonwood Creek to maintain minimum flows in the South Fork or mainstem Musselshell River. The proposed minimum flows would range between 194-664 cfs[65] in the South Fork, depending on the date, and 80 cfs in the mainstem Musselshell River. GBEP would monitor compliance with the minimum flows using an existing USGS gage located on the South Fork and three existing USGS gages on the mainstem Musselshell River from Martinsdale downstream to Shawmut, Montana.

In section 3.3.2.2, our analysis indicates that Cottonwood Creek contributions to the South Fork and mainstem Musselshell River would not be significantly affected by project diversions. This is because project diversions would only occur during periods of high flows and when irrigation demands are usually low, and if there were insufficient flow to meet both project diversion and downstream flow needs in Cottonwood Creek, the project would adjust or cease diversions as needed which would maintain sufficient flows entering the South Fork. Our analysis also indicates that there would typically be sufficient flow in the South Fork to meet existing demands and allow diversions for project reservoir filling, particularly in May and June, and project effects on water uses in the mainstem Musselshell River would be negligible. In addition, even if GBEP were to shut down project diversions due to insufficient flow levels at any of the USGS gages or as a result of coordination with the water management entities, our analysis indicates that 71 Ranch may resume its regular 50-cfs diversions for irrigation. This would result in potentially less water available for water storage downstream because 71 Ranch would not be required to provide any minimum flows in Cottonwood Creek.

Therefore, while these additional measures would further ensure that downstream water users are not affected by the project, they would provide minimal benefits overall because GBEP's proposed license requirements to protect Cottonwood Creek flows would already be sufficient to protect water uses and aquatic habitat downstream in the South Fork and mainstem Musselshell River.

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[64] The District Court MRDP administers a water right enforcement program on the South Fork and mainstem Musselshell River, known as the Musselshell River Distribution Project. During the irrigation season, the District Court MRDP allocates water based on water availability and priority date of water rights within six jurisdiction zones. The South Fork Musselshell River is included in Zone 6.

[65] Minimum flows for the South Fork would vary depending on whether Martinsdale Reservoir was being filled. GBEP would coordinate with the Upper Musselshell WUA daily during project reservoir filling operations to determine what minimum flow levels in the South Fork within the 194-664 cfs range should be maintained.

Further, section 27 of the FPA reserves for the states the authority to issue water rights and enforce alleged violations of state water rights. Because the Commission cannot enforce state-run water administration schedules, which can change each year depending on the flow conditions and needs of each zone within the court's jurisdiction, it is unclear how the Commission would be able to enforce license conditions requiring that GBEP adjust or align its operations with this state-run water management system operating downstream. In addition, the Commission does not have authority to adjudicate claims for, or to require payment of damages for, project-induced adverse effects to property of others.[66] Rather, if individuals believe that their water right is being adversely affected by operation of the Gordon Butte Project, they can seek redress with GBEP in state court.[67]

For these reasons, we do not recommend a license requirement that GBEP coordinate with downstream water management entities and monitor and maintain minimum flows at the USGS gages in the South Fork and mainstem Musselshell River while diverting water from Cottonwood Creek for reservoir filling.

*Box Car Spring Monitoring Program*

Gordon Butte receives more precipitation than the surrounding lower elevation plains, resulting in recharge to groundwater beneath the butte. A portion of this recharge eventually supplies the groundwater that emerges at Box Car Spring on the northeast side of Gordon Butte, which contributes to the potable water supply for the town of Martinsdale. During scoping, Martinsdale residents were concerned that groundwater flow or water quality could be adversely affected by construction and operation of project facilities.

During project construction, excavation and installation of the powerhouse and power tunnel liner would require dewatering of work areas where groundwater was encountered during pre-filing subsurface investigations. These activities could interrupt groundwater that may be flowing toward Box Car Spring and contributing to the town of Martinsdale's potable water supply.

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[66] *See, e.g., Ohio Power Co*., 71 FERC ¶ 61,092, at 61,312 (1995) (citing to *South Carolina Public Service Authority v. FERC*, 850 F.2d 788, 795 (D.C. Cir. 1988)).

[67] *See PacifiCorp*, 133 FERC ¶ 61,232, at P 163 (2010), *order on reh'g*, 135 FERC ¶ 61,064 (2011); *Portland General Electric Company*, 107 FERC ¶ 61,158, at PP 27-33 (2004); *FPL Energy Maine Hydro, LLC*, 106 FERC ¶ 61,038, at PP 53-55 (2004).

To monitor the potential effects of project construction and initial operation on groundwater supplying water to Box Car Spring, GBEP proposes to implement its Box Car Spring Monitoring Program Plan. The plan includes provisions for monitoring flow rate, pressure, and water quality from Box Car Spring prior to and during construction, and for one year during initial project operation. If the monitoring results indicate there are adverse effects on Box Car Spring, GBEP would implement mitigation measures specified in the plan in consultation with the Meagher County Commission and other relevant stakeholders to protect the town of Martinsdale's water supply. Potential temporary mitigation measures include GBEP providing water trucks for residents to use for non-potable water needs and distributing potable bottled water to residents to use for drinking and cooking needs until the problem is corrected. Potential long-term mitigation measures include expanding the current water storage system, drilling a replacement well to replace flow provided by Box Car Spring, developing a new spring source, or constructing a new water treatment facility to treat surface water from a nearby water source (e.g., Musselshell River or Martinsdale Reservoir).

In section 3.3.2.2 our analysis indicates that, although there is a low potential for excavation and groundwater dewatering during construction of the power tunnel and powerhouse to affect the flow or water quality of Box Car Spring, it cannot be entirely ruled out. However, once construction is completed, the powerhouse and power tunnel would be sealed off from the surrounding rock, thus allowing groundwater to flow unabated around these facilities. Also, project operation would not be likely to affect flow to Box Car Spring because the upper reservoir would only affect a small percentage of the total recharge basin. Therefore, any effect to the water supply would be temporary and limited to the 3-year construction period.

Although GBEP's proposed measures would help determine if such adverse effects are occurring, as we said previously the Commission does not have authority to adjudicate claims for, or to require payment of damages for, project-induced adverse effects to property of others. Moreover, section 10(c) of the FPA makes clear that a licensee of a hydropower project "shall be liable for all damages occasioned to the property of others by the construction, maintenance, or operation of the project works…" Consequently, if Meagher County, which operates the water supply system for the town of Martinsdale, believes that their potable water supply is being adversely affected by construction or operation of the Gordon Butte Project, they can seek redress with GBEP in state court. For these reasons, we do not recommend a license requirement that GBEP implement its proposed Box Car Spring Monitoring Program Plan.

*Bird Monitoring in Project Reservoirs*

To address Montana DFWP's concerns that rapid drawdowns of the reservoirs could entrain birds, GBEP proposes to monitor and maintain a daily log of waterfowl and other migratory bird use of the project reservoirs during the spring and fall migration periods over the term of any license issued, and report the results to Montana DFWP. As part of this effort, GBEP also proposes to document any adverse effects of project operation on birds in the reservoirs.

Our analysis in section 3.3.3.2 indicates that project operation would not be likely to entrain waterfowl or other migratory birds because the reservoirs would provide low-quality habitat that would not attract large numbers of birds, and even if some birds periodically used the reservoirs for resting habitat, the rate of water withdrawal during project operation coupled with the noise generated by the pumping and generation facilities would prevent birds from being entrained into these facilities. Therefore, there would be minimal project-related benefits to birds from the proposed monitoring measures. We estimate the levelized annual cost of the monitoring program would be $2,235, and conclude that the limited benefits of the monitoring to waterfowl and other migratory birds would not be worth the cost and we do not recommend the monitoring.

*Reservoir Trout Stocking*

Rod Gwaltney recommends that GBEP stock the project reservoirs with cutthroat trout to create new angling opportunities for the local population. Our analysis in section 3.3.6.2 indicates that there would be no recreational benefits from the recommended fish stocking because the reservoirs would frequently fluctuate during project operation and as a result would be fenced off to protect the public from hazards associated with such fluctuations. Therefore, the recreational benefits wouldn't justify the $573 levelized annual cost of the stocking, and we do not recommend any fish stocking in the project reservoirs.

*Expanding Sewage and Water System for the Town of Martinsdale*

Rod Gwaltney recommends that GBEP expand the town of Martinsdale's existing sewage and water treatment system to accommodate what he anticipates would be a doubling of the town's population due to the influx of project construction workers. As indicated in our analysis in section 3.3.8.2, there would be only a 2 to 5 percent increase in the local population during the peak project construction period; therefore, the town of Martinsdale is likely to only gain a maximum of 3 additional residents. Existing sewage and water services in the town would be sufficient to accommodate this small population increase. Therefore, there is no evidence to suggest there is a need for this measure, and we do not recommend expanding the sewage and water treatment system.

*Drug and Alcohol Testing of Project Personnel*

As part of its proposed construction workforce management plan, GBEP proposes to conduct drug and alcohol testing of project personnel. However, enforcing drug and alcohol testing requirements is the applicant's responsibility, and if GBEP chooses to impose such testing requirements for the project, it would be able to do so outside any license issued. Therefore, we do not recommend including any provisions for drug and alcohol testing of project personnel in the proposed construction workforce management plan.

## 5.2 UNAVOIDABLE ADVERSE EFFECTS

Land-disturbing activities associated with project construction would require the removal of vegetation and disturbance of soil. These activities would disrupt the topsoil and result in some temporary erosion in construction areas. However, soil erosion would largely be controlled by implementation of the applicant's proposed ESCP, SPCCP, and vegetation management plan.

Project operation would require a one-time initial fill of 4,685 acre-feet of water and 500 acre-feet of annual make-up water to replace minimal losses due to evaporation and seepage. During initial fill, the project would divert up to 50 cfs from Cottonwood Creek during the spring run-off period of April 15 through June 30 for approximately 40 days during the first year while annual re-fill would likely take about 5 days assuming that flows are continually diverted until re-fill is complete. Because the project would operate as a closed-loop system, these flows would be removed from the hydrologic system and would reduce the amount of flows available for surface water users and fish and other aquatic biota downstream. However, filling the reservoirs in the spring when flows are naturally high, implementing GBEP's proposed minimum flows in Cottonwood Creek, and adjusting or ceasing flows if minimum flow levels cannot be met, would maintain adequate streamflow downstream.

As currently happens when 71 Ranch diverts Cottonwood Creek flows for livestock watering or irrigation, some fish are likely to be entrained into the irrigation canal during reservoir filling and would be lost from the Cottonwood Creek population.

Project construction and operation would permanently convert about 177 acres of mostly upland habitat to project features, including the upper and lower reservoirs, powerhouse, substation, transmission line, and appurtenant facilities. This includes high-quality foraging and nesting habitat for many grassland bird species, possibly including Sprague's pipit. Species such as mule deer, white-tailed deer, moose, pronghorn antelope, and Rocky Mountain elk would also lose foraging sites; however, suitable habitat is plentiful in the surrounding area. Approximately 194.7 acres of primarily upland grassland habitat would be temporarily affected by project construction. These effects would be mitigated by implementing GBEP's Noxious Weed Control Plan and proposed vegetation management plan, with staff recommended modifications. Construction and operation of the proposed 5.7-mile-long, 230-kV transmission line would pose a risk to avian species and other wildlife. GBEP's proposed avian protection measures, combined with staff recommended design modifications, would minimize these effects.

Construction activities would temporarily create dust, noise, and traffic that could be noticed by recreationists, outfitters, and local residents. GBEP's proposed Dust Plan and Construction Noise Mitigation Plan would minimize dust and noise impacts, while its proposal to develop a construction workforce management plan would include measures to minimize traffic and congestion during construction.

Portions of the proposed upper and lower reservoirs, transmission line, and substation near its interconnection point with the grid would be visible from Montana Highway 294 or Cottonwood Creek Road. Traffic on these roads as well as recreational use in the immediate project area is light; therefore, project-induced changes to the landscape would result in a minor visual impact. GBEP's proposed aesthetic measures would further minimize visual impacts from project facilities and construction activities.

## 5.3 FISH AND WILDLIFE AGENCY RECOMMENDATIONS

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by the federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project.

Section 10(j) of the FPA states that whenever the Commission finds that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency shall attempt to resolve such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of the agency.

No recommendations were received by the Commission.

## 5.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA, 16 U.S.C. §803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed eight comprehensive plans that are applicable to the Gordon Butte Project, located in Montana. No inconsistencies were found.

The following is a list of qualifying comprehensive plans relevant to the Gordon Butte Project:

Montana Board of Natural Resources and Conservation. n.d. Order of the Board of Natural Resources establishing water reservations. Helena, Montana.

Montana Department of Environmental Quality. 2004. Montana water quality integrated report for Montana (305(b)/303(d)). Helena, Montana. November 24, 2004.

Montana Department of Environmental Quality. 2001. Montana non-point source management plan. Helena, Montana. November 19, 2001.

Montana Department of Environmental Quality. Montana's State water plan: 1987-1999. Part I: Background and Evaluation. Part II: Plan Sections – Agricultural Water Use Efficiency; Instream Flow Protection; Federal Hydropower Licensing and State Water Rights; Water Information System; Water Storage; Drought Management; Integrated Water Quality and Quantity Management; Clark Fork Basin Watershed Management Plan; Upper Clark Fork River Basin Water Management Plan; and Montana Groundwater Plan. Helena, Montana.

Montana Department of Fish, Wildlife, and Parks. Montana Statewide Comprehensive Outdoor Recreation Plan (SCORP): 2003-2007. Helena, Montana. March 2003.

Montana State Legislature. 1997. House Bill Number 546. Total Maximum Daily Load. Helena, Montana.

U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986.

U.S. Fish and Wildlife Service. n.d. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C.

## 6.0 FINDING OF NO SIGNIFICANT IMPACT

Constructing and operating the Gordon Butte Project, with our recommended measures, would result in temporary, short-term effects including soil erosion and dust and noise generation during construction, temporary dewatering and removal of groundwater during excavation, elevated construction traffic levels, displacement of wildlife from construction areas, initial removal of 4,685 acre-feet and annual removal of about 500 acre-feet of water from Cottonwood Creek, temporary disturbance of 194.7 acres of primarily upland grassland habitat during construction, as well as permanent conversion of about 177 acres of grassland habitat to project features. However, implementing GBEP's proposed and staff's recommended mitigation measures would minimize these effects to the extent practicable.

On the basis of our independent analysis, we find that issuance of a license for the Gordon Butte Pumped Storage Project, with our recommended environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment.

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