3.13 PALEONTOLOGICAL RESOURCES

This section addresses the potential impacts from the Preferred Route, Proposed Route, and Route Alternatives by segment on known paleontological resources during construction, operations, and decommissioning. The Project would pass through areas where paleontological resources are known to exist. The routes, their potential impacts, and mitigation methods to minimize or eliminate impacts are discussed in this section.

The BLM's Preferred Routes for each segment of the Project are listed below. Where applicable, the preferred route identified by another federal agency or a county or state government is also noted.

- **Segment 1W:** The BLM's Preferred Route is the Proposed Route (Figure A-2). This route is also the State of Wyoming's preferred route.
- **Segment 2:** The BLM's Preferred Route is the Proposed Route (Figure A-3). This route is also the State of Wyoming's preferred route.
- **Segment 3:** The BLM's Preferred Route is the Proposed Route, including 3A (Figure A-4). This route is also the State of Wyoming's preferred route.
- **Segment 4:** The BLM's Preferred Route is the Proposed Route (Figures A-5 and A-6) except within the Caribou-Targhee NF. The portion of this route in Wyoming is also the State of Wyoming's preferred route. The Forest Service's preferred route is the Proposed Route within the NF incorporating Alternative 4G (Figure A-6).
- **Segment 5:** The BLM's Preferred Route is the Proposed Route incorporating Alternatives 5B and 5E, assuming that WECC reliability issues associated with 5E are resolved (Figure A-7). Power County's preferred route is the Proposed Route incorporating Alternatives 5C and 5E (Figure A-7).
- **Segment 6:** The BLM's Preferred Route is the proposal to upgrade the line voltage from 345 kV to 500 kV (Figure A-8).
- **Segment 7:** The BLM's Preferred Route is the Proposed Route incorporating Alternatives 7B, 7C, 7D, and 7G (Figure A-9). The Proposed Route in the East Hills and Alternative 7G will be microsited to avoid sage-grouse PPH. Power and Cassia Counties' preferred route is Alternative 7K (Figure A-9).
- **Segment 8:** The BLM's Preferred Route is the Proposed Route incorporating Alternative 8B (Figure A-10). This is also IDANG's preferred route.
- **Segment 9:** The BLM's Preferred Route is the Proposed Route incorporating Alternative 9E, which was revised to avoid PPH and the community of Murphy (Figure A-11). Owyhee County's preferred route is Alternative 9D (Figure A-11).
- **Segment 10:** The BLM's Preferred Route is the Proposed Route (Figure A-12).

3.13.1 Affected Environment

This section describes the mapped geology and known paleontological resources near the Proposed Action. It also describes and compares potential impacts of the Proposed Action and Action Alternatives to paleontological resources. Fossils are important scientific and educational resources because of their use in: 1) documenting the presence and evolutionary history of particular groups of now extinct organisms,

2) reconstructing the environments in which these organisms lived, and 3) determining the relative ages of the strata in which they occur. Fossils also assist in determining the depositional characteristics of the sediments in which they were buried.

3.13.1.1 Analysis Area

The Project area in Wyoming and Idaho[1] consists of predominantly north-south trending mountain ranges separated by structural basins. The eastern portion of the Project (Segments 1 and 2) would be located within the Laramie Mountains and the Shirley Mountains, which consist predominantly of Precambrian granite and gneisses. Moving west in Wyoming, the Project would cross major structural basins created during the Laramide Orogeny, including the Hanna Basin in Carbon County (Segment 2), and the Greater Green River Basin in Sweetwater County (Segments 3 and 4). West of the Green River Basin in western Wyoming, the broad Laramide basins are bounded by the fold and thrust belt of the Sevier Orogeny present along the Idaho-Wyoming border in Segments 4 and 5. In eastern Idaho, the geology transitions from older, compressional thrust fault blocks to the younger, extensional block faulted terrain of the Basin and Range Province. The mountain ranges in southeastern Idaho consist of sedimentary rock. West of Borah Substation (Segments 6 through 10), the routes fall within the Snake River Plain, a broad structural valley which cuts off the Basin and Range Province. The Snake River Plain is dominated by flood basalts, thinly covered with silty, aeolian deposits and interlain with minor clastic sediments. Some of the southern alternatives (Segments 7 and 9) remain within the Basin and Range mountain ranges similar to those in southeast Idaho. The block-faulted ranges of southern and southwestern Idaho have more volcanic features than ranges in the eastern portion of the state. The physiographic areas of Wyoming were obtained from the Wyoming State Geological Survey (WSGS no date). The physiographic areas of Idaho were obtained from Idaho State University (ISU Geology Department no date). Figure 3.14-1 in Section 3.14 – Geologic Hazards displays the locations of the physiographic regions.

For the purposes of paleontological record searches, a 1-mile-wide corridor (0.5 mile on either side of the centerline) was used. This allowed the delineation of important fossil-bearing formations in most areas that could be affected by construction of the Project. There may be some access roads located outside the 1-mile corridor that could also affect fossil-bearing formations. These would be examined on a case-by-case basis as they are identified.

3.13.1.2 Issues Related to Paleontology

Issues raised by members of the public during public scoping (Tetra Tech 2009) and comments on the Draft EIS included the following:

- Whether a full inventory of potentially affected paleontological resources would be carried out,
- Whether fossils would be damaged during construction, and
- Whether fossils would be removed or destroyed by increased access to protected areas.

[1] The Project no longer includes a route in Nevada.

3.13.1.3 Regulatory Framework

Paleontological resources are recognized as nonrenewable scientific resources and are afforded protection by federal statutes and policies. The Paleontological Resources Preservation Act (PRPA) (16 U.S.C. § 470aaa-11) defines paleontological resources as "any fossilized remains, traces, or imprints of organisms preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth. Paleontological resources do not include any materials associated with an archaeological resource or any cultural item."

The definition of a significant paleontological resource can be found in the BLM IM 2009-011 as follows:

> *Significant Paleontological Resource (syn. Significant Fossil Resource) – Any paleontological resource that is considered to be of scientific interest, including most vertebrate fossil remains and traces, and certain rare or unusual invertebrate and plant fossils. A significant paleontological resource is considered to be scientifically important because it is a rare or previously unknown species, it is of high quality and well-preserved, it preserves a previously unknown anatomical or other characteristic, provides new information about the history of life on earth, or has identified educational or recreational value. Paleontological resources that may be considered to not have paleontological significance include those that lack provenience or context, lack physical integrity because of decay or natural erosion, or that are overly redundant or are otherwise not useful for research. Vertebrate fossil remains and traces include bone, scales, scutes, skin impressions, burrows, tracks, tail drag marks, vertebrate coprolites (feces), gastroliths (stomach stones), or other physical evidence of past vertebrate life or activities.*

IM 2009-011 provides guidelines for assessing potential impacts to paleontological resources to determine mitigation steps for federal actions on public lands under the FLPMA and NEPA. These guidelines also apply where a federal action impacts split-estate lands. In addition, this IM provides field survey and monitoring procedures to help minimize impacts to paleontological resources from federal actions in the case where it is determined that significant paleontological resources will be adversely affected by a federal action. For all federal actions, mitigation procedures are required on all federal, state, and private lands impacted.

As a means to provide baseline guidance in evaluating paleontological resources, the BLM uses the Potential Fossil Yield Classification (PFYC; BLM IM 2008-009 [2008e]) system to classify geologic units based on relative abundance of vertebrate fossils, scientifically significant invertebrate or plant fossils, and their sensitivity to adverse impacts. This classification system was originally developed by the Forest Service's Paleontology Center of Excellence and the Region 2 (Forest Service) Paleontology Initiative in 1996. Modifications were made by the BLM's Paleontological Resources staff in subsequent years. For consistency, the BLM PFYC classification system was used to assist in comparing the paleontological risk to the route alternatives. The five PFYC classification levels are:

Class I – Very Low Potential: not likely that a geologic unit has recognizable fossil remains. These include igneous or metamorphic rocks and units that are Precambrian in age or older.

Class 2 – Low Potential: sedimentary rocks not likely to contain vertebrate fossils or scientifically significant non-vertebrate fossils. Geologic units in this class, include rocks where fossils are not present or are very rare, in units less than 10,000 years old, recent Aeolian deposits, or in sediments with significant physical and chemical alteration.

Class 3 – Moderate or Unknown Potential: sedimentary units where fossil content varies in significance, abundance, and predictable occurrence, or sedimentary units with unknown fossil potential. The PFYC divides Class 3 into two subclasses; Class 3A (sedimentary units with moderate potential), and Class 3B (sedimentary units with unknown fossil potential).

Class 4 – High Potential: geologic units containing a high occurrence of significant fossils. Class 4 is also divided into two subclasses; Class 4A contains bedrock with little or no soil or vegetative cover. Class 4B contains rocks with high fossil potential, but they are protected by extensive soil or vegetative cover, are less accessible due to topography, or contain other characteristics that lower the vulnerability of fossils.

Class 5 – Very High Potential: geologic units that produce vertebrate fossil or scientifically significant invertebrate or plant fossils. These units are at risk of human impacts or natural degradation. Class 5 is divided into two subclasses in similar fashion to Class 4. Class 5A contains highly fossiliferous bedrock with little or no soil or vegetative cover. Class 5B contain rocks with very high fossil potential, but are protected by extensive soil or vegetative cover, are less accessible due to topography, or contain other characteristics that lower the vulnerability of fossils.

The PFYC ratings provided by BLM for Class 3, 4, and 5 bedrock units in Wyoming were not subdivided into subclasses. Although the Idaho units were described by subclass, the comparative analyses of the route alternatives made no paleontological distinction based on subclasses.

BLM PFYC ratings for geologic units in Wyoming are shown in Table 3.13-1. PFYC ratings for the geologic units in Idaho are shown in Table 3.13-2.

Table 3.13-1. BLM PFYC Classes for Geologic Units Encountered in Wyoming

Period	Formation	PFYC
Quaternary, Holocene, Pleistocene sediments	Alluvium, colluvium, playa and other lacustrine deposits, dune sand and loess, gravel, pediment, and fan deposits	3[1/]
Holocene to Pleistocene	Glacial Deposits	1
Pleistocene to Pliocene	Terrace gravel	3[2/]
Pliocene to Miocene	Salt Lake Formation	3
Miocene	Miocene Rocks (Tertiary undifferentiated)	3
Oligocene to Eocene	White River Formation or Group	5
Eocene	Bridger Formation	5
	Fowkes Formation	3
	Green River Formation	5
	Wasatch Formation	5
	Wind River Formation	5
Paleocene	Hanna Formation	5
	Fort Union Formation	3
Paleocene to Cretaceous	Evanston Formation	3
	Ferris Formation	5
Cretaceous	Adaville Formation	3
	Almond Formation	3
	Aspen Shale or Formation	3
	Baxter Shale	3
	Blair Formation	3
	Bear River Formation	3
	Cloverly Formation	5
	Cody Shale	3
	Cokeville Formation	3
	Ericson Sandstone	3
	Fox Hills Sandstone	3
	Frontier Formation	3
	Gannett Group	3
	Hilliard Shale	3
	Lance Formation	5
	Lewis Shale	3
	Medicine Bow Formation	3
	Mesaverde Formation or Group	3
	Mowry Shale	3
	Niobrara Formation	5
	Quealy Formation	3
	Rock Springs Formation	3
	Sage Junction Formation	3
	Smiths Formation	3
	Steele Shale	3
	Thermopolis Shale	4
	Thomas Fork Formation	3
Jurassic	Morrison Formation	5
	Sundance Formation	5
	Stump Formation	3
	Twin Creek Limestone	3
	Preuss Sandstone	3
Jurassic to Triassic	Nugget Sandstone	3

Table 3.13-1. BLM PFYC Classes for Geologic Units Encountered in Wyoming (continued)

Period	Formation	PFYC
Triassic	Ankareh Formation	3
	Chugwater Formation	3
	Dinwoody Formation	3
	Thaynes Limestone	3
	Woodside Shale	3
Permian	Goose Egg Formation	2
	Phosphoria Formation	3
Permian to Pennsylvanian	Casper Formation	3
	Tensleep Sandstone	2
	Wells Formation	3
Pennsylvanian	Amsden Formation	3
Mississippian	Madison Limestone	3
Devonian	Darby Formation	2
Ordovician	Bighorn Dolomite	2
Cambrian	Gallatin Group or Limestone	2
Precambrian	Archean Granitic Rocks	1[3/]
	Granite Gneiss	1[3/]

Wyoming PFYC System information provided by Mr. Brent H. Breithaupt, BLM Regional Paleontologist – WY, ID, MT, ND, SD, NE.
Map source: Geologic Map of Wyoming. Compiled by Love and Christiansen, 1985. (scale 1:500,000)
PFYC sources: Northern Great Plains Probable Fossil Yield Classification report, Ross Secord, University of Wyoming, 1996; Fossil Vertebrate Localities of Southwestern Wyoming: A literature search, locality record, and formation evaluation by Peter Robinson, David Daitch, and Jennifer Haessig. University of Colorado Museum (BLM contract KAA 000002, 2002); and PFYC estimates by Dale Hanson, BLM Regional Paleontologist, Wyoming State Office, 2002.
1/ This group did not appear on the Wyoming PFYC list. It includes unconsolidated materials, some less than 10,000 years old which would have qualified as Class 2. However, as a conservative measure, Class 3 was used, predominantly to denote geologic units with unknown fossil potential.
2/ Pleistocene to Pliocene terrace gravel was not on the Wyoming PFYC list. However, Tertiary undifferentiated units were presented as Class 3. The Pleistocene and Pliocene epochs fall within the Tertiary geologic time period, therefore these units were assigned as Class 3.
3/ The Precambrian units were not on the Wyoming PFYC list. They meet the PFYC classification system criteria for Class 1, both in age (Precambrian) and rock type (igneous or metamorphic).

Table 3.13-2. BLM PFYC Classes for Geologic Units Encountered in Idaho

Period	Formation	PFYC
Quaternary to Pleistocene sediments	Alluvium, colluvium, playa and other lacustrine deposits, dune sand and loess, gravel, pediment, and fan deposits	3[1/]
Pleistocene	American Falls Lake Beds, American Falls Formation	5A
	Black Mesa Gravel	3A
	Bonneville Flood deposits (Melon Gravel)-Twin Falls	3A
	Bonneville Flood deposits (Michaud Fm)-Idaho Falls	4A
	Bruneau Formation	4A
	Provo Stage Sediments of Lake Bonneville	3A
	Unnamed Pleistocene Deposits	3A
Pliocene	Glenns Ferry Formation	5A
	Tuana Gravels	3A
Miocene	Chalk Hills Formation	5A
	Kenny Formation	3B
	Sucker Creek Formation	5A
	Poison Creek Formation	5A
Miocene to Oligocene	Renova Formation	5A
	Starlight Formation (Idaho Falls, Twin Falls)	3A,4A[2/]
Miocene to Eocene	Salt Lake Formation	3A
Eocene	Donkey Fanglomerate	3A
Jurassic to Cretaceous	Ephraim Formation (Gannett Group)	3A
Jurassic	Stump Sandstone	3A
	Nugget Sandstone	2
	Twin Creek Limestone	3A
Triassic	Dinwoody Formation	3A
	Thaynes Limestone	5A
	Timothy Sandstone	2
	Woodside Formation or Shale	3A
Permian	Phosphoria Formation	5A
Permian to Pennsylvanian	Wells Formation	3A
	Madison Group or Limestone	3A
Devonian	Jefferson Formation or Dolomite	3A
	Three Forks Formation	3A
Silurian	Laketown Dolomite	3A
Ordovician	Fish Haven Dolomite	3A
	Garden City Formation or Limestone	3A
	Swan Peak Quartzite	3A
Cambrian	Bancroft and Ute Limestones	3A
	St. Charles Limestone	3A
	Langston Dolomite	3A
	Lead Bell Shale	3A
Proterozoic	Brigham Quartzite or Brigham Group	3A
	Granite Gneiss	1[3/]
	Archaen Granitic Rocks	1[3/]

Map source: USGS Geologic Maps of Idaho. (scale 1:250,000)
Idaho PFYC System information provided via confidential BLM reports provided by Mr. Fred (Kirk) Halford, Idaho BLM. Report source: Erathem-Vanir (2009).
1/ This group did not appear in the Idaho PFYC reports. It includes unconsolidated materials, some less than 10,000 years old which would have qualified as Class 2. However, as a conservative measure, Class 3 was used. The subclass 3B may be appropriate to denote geologic units with unknown fossil potential. The Pleistocene deposits of this group would also fit in the Unnamed Pleistocene deposit group (Class 3A) described in Erathem-Vanir (2009), Volume 2.
2/ The Starlight formation was a Class 3A in the Idaho Falls report, and Class 4A in the Twin Falls report. Therefore, it was designated as Class 4 in the Alternatives analyses for this report.
3/ The Precambrian units were not in the Idaho PFYC reports. They meet the PFYC classification system criteria for Class 1, both in age (Precambrian) and rock type (igneous or metamorphic).

Federal protection for paleontological resources applies to federally owned or managed lands. Federal legislative protection for paleontological resources began with the Antiquities Act of 1906 (P.L. 59-209; 16 U.S.C. § 431 *et seq*.; 34 Stat. 225), which requires protection of historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federal land. The Antiquities Act of 1906 forbids disturbance of any object of antiquity on federal land without a permit issued by the responsible managing agency. This act also establishes criminal sanctions for unauthorized appropriation or destruction of antiquities. The Federal Highways Act of 1958 clarified that the Antiquities Act applied to paleontological resources and authorized the use of funds appropriated under the Federal-Aid Highways Act of 1956 to be used for paleontological salvage in compliance with the Antiquities Act and any applicable state laws.

In addition to the Antiquities Act, other federal statutes protect fossils. The Historic Sites Act of 1935 (P.L. 74-292; 49 Stat. 666; 16 U.S.C. § 461 *et seq*.) declares it national policy to preserve objects of historical significance for public use and gives the Secretary of the Interior broad powers to execute this policy, including criminal sanctions. NEPA (P.L. 91-190; 31 Stat. 852; 42 U.S.C. §§ 4321-4327) requires that important natural aspects of the nation's heritage be considered in assessing the environmental consequences of any proposed project. The FLPMA (P.L. 94-579; 90 Stat. 2743; U.S.C. § 1701-1782) requires that public lands be managed in a manner that protects the quality of their scientific values. The PRPA (16 U.S.C. § 470aaa-11) regulates who may collect fossils on public lands and where such fossils must be curated. The PRPA requires appropriate plans for the inventory, monitoring, and mitigation of impacts to paleontological resources in accordance with applicable agency laws, regulations, and policies.

3.13.1.4 Methods

To identify potential effects to paleontological resources, a GIS analysis was completed, documenting the length of each bedrock formation (based on the USGS geologic maps referenced in Tables 3.13-1 and 3.13-2) crossed by the Proposed Route and Route Alternatives. The formations crossed by the routes were then compared to the PFYC tables (3.13-1 and 3.13-2). Results of those comparisons are summarized in Appendix D, Table D.13-1.

To compare the potential to affect paleontological resources by proposed or alternative route, the PFYC for each bedrock unit was multiplied by the miles crossed. This provided a value called the paleontology risk factor. The summation of all of the paleontological sensitivity ratings for each segment yielded a total paleontological sensitivity rating for each route alternative. To compare the relative paleontological risk by alternative, the paleontology risk factor for each alternative was compared to that of the comparison portions of the Route Alternatives by segment. The route with the higher risk factor rating was judged to have greater potential for paleontological risk.

The Route Alternatives were also compared by segment according to the miles of PFYC Classes 3, 4, and 5 crossed. An assessment of surface disturbance in these classes sufficient to determine whether significant paleontological resources occur in the Project area, as well as the effects the Project would have on the paleontological resources, will be required.

Paleontological record searches were commissioned from the primary paleontological repositories in Wyoming and Idaho. For the Wyoming portion, the Scientific Collections in the Department of Geology and Geophysics at the University of Wyoming in Laramie were utilized. The records of the Idaho Museum of Natural History, Pocatello, Idaho, were employed for the Idaho portion. The Proposed Route and Route Alternatives for Gateway West were mapped on segments of USGS 7.5-minute topographic maps. These segments of topographic maps were then compared to the paleontological locality maps in the Idaho and Wyoming repositories. The information obtained from the record searches was supplemented by confidential documents provided by the BLM Idaho State Office, geologic maps, paleontological literature, and by discussions with specialists in the paleontology of those two regions.

On January 22, 2008, the Fossil Butte National Monument was visited and a discussion of fossil resources was provided by Mr. Arvid Aase, museum curator. Staff have also been contacted at the Hagerman Fossil Beds. In addition, Mr. Phil Gensler (Hagerman Fossil Beds), Mr. Kirk Halford, Idaho BLM, and Mr. Brent Breithaupt, BLM Regional Paleontologist, have provided report comments and paleontological information in support of this assessment.

The following references were used to prepare the summaries of known fossil localities by segment, as presented in Section 3.13.1.5. Wyoming geologic maps utilized include Love and Christiansen (1985) and USGS (1994). The state of Idaho does not have equivalent geologic mapping. The information in the digital version of the geology of the state by Johnson and Raines (1996) was supplemented by numerous other maps. These include 30- x 60-minute and similar smaller-scale maps published by Covington and Weaver (1990), Jenks et al. (1998), Long and Link (2007), Link and Stanford (1999), Bonnichsen and Godchaux (2006a), Scott (1982), and Kauffman et al. (2005). Fifteen-minute and 7.5-minute geologic maps employed include Bonnichsen and Godchaux (2006b), Carr and Trimble (1976), DeVecchio et al. (2003), Gillerman and Kauffman (2005), Kauffman and Orthberg (2004, 2005), Malde and Powers (1972), Matthews et al. (2006), Miller et al. (2008), Mytton et al. (1990), Pierce et al. (1983), Orthberg and Breckenridge (2004a, b, c), Orthberg and Kauffman (2005), Pope et al. (2001), Smith (1982), Stearns (1938), and Williams et al. (1990a, 1990b).

3.13.1.5 Existing Conditions

From east to west, the Project begins within the Great Plains Physiographic Province near Glenrock, Wyoming, and immediately passes into the Southern Rocky Mountain Province, represented by the Laramie Range. It traverses the length of the Wyoming Basin and then crosses the Middle Rocky Mountain Province (portions of Segment 4). This province straddles the Wyoming-Idaho border region. Next, the route passes into the Basin and Range Province (Segments 4 and 5) and then into the Snake River Plain, which is part of the Columbia Plateau Province (Segments 7, 8, 9, and 10). The rocks of the Wyoming portion are almost entirely sedimentary, whereas those of the Idaho portion include massive amounts of basalt and other igneous rocks.

The Project proceeds through areas with a long history of paleontological discoveries (especially in Wyoming) with collections preserved in museums and universities from around the country. Therefore, there are many localities associated with these collections that have not been reviewed for the Project. Fossil-bearing formations

crossed by the Wyoming portion of the Project are listed in Table 3.13-1. One of the most important formations, the Green River Formation, has an international reputation for the exquisite animal and plant fossils quarried from its oil shale layers. Fossil Butte National Monument explores the riches of this formation. The Idaho portion of the Project crosses the potentially fossiliferous formations listed in Table 3.13-2. Among these, the Glenns Ferry Formation is especially well known for the numerous vertebrate fossils it has produced. The Hagerman Fossil Beds National Monument is devoted to fossils from this formation. The Hagerman Fossil Beds National Monument has been designated as a National Natural Landmark. It is internationally known for its late Pliocene epoch (3 to 4 million years ago) fossil deposits, and over 220 species of plant and animal fossils have been identified (Grande 1984).

Southwest Idaho contains extensive fossiliferous units of Idaho Group bedrock. The Poison Creek, Chalk Hills, Glenns Ferry, and Bruneau Formations within the Idaho Group are Miocene, Pliocene, and Pleistocene in age. These units have been known to yield important fossil discoveries and they have been classified as PFYC Classes 4 and 5.

Known Localities by Route Alternatives by Segment

Segments 1W(a) and 1W(c), including Alternative 1W(a)-B, are illustrated in Figure A-2 in Appendix A. Three recorded paleontological localities were found within the buffer of the Proposed Route near the Aeolus Substation. These are in the Frontier Formation and have produced teeth of sharks, rays, and crocodiles.

The Proposed Route for Segment 2 and Alternatives 2A and 2B are illustrated in Figure A-3 in Appendix A. A large number of recorded localities (approximately 40) lie within the Analysis Area of the east end of the Proposed Route. These are in the Hanna Formation (Paleocene) and have produced gars and other fish, crocodiles, lizards, turtles, multituberculates, marsupials, primates, pantolestids, oxyclaenids, phenacodontids, mioclaenids, hyopsodontids, cimolestids, leptictids, arctocyonids, periptychids, pantolambdids, viverrarvids, palaeorictids, and a primitive horse as well as reworked Cretaceous shark teeth. Eight more recorded localities were found farther west on the Preferred/Proposed Route. Some are from the Wasatch Formation (Eocene) and produced unidentified reptile and mammal remains. Others are from the Fort Union Formation (Paleocene) and produced fish, amphibian, lizard, crocodile, champsosaur, multituberculate, pantolestid, arctocyonid, oxyclaenid, condylarth, mioclaenid, hyopsodontid, primate, pantolestid, cimolestid, and leptictid remains. No recorded localities were found within the Analysis Area of Alternative 2A.

Figure A-4 in Appendix A illustrates the Segment 3 and 3A Proposed Routes. Three recorded localities were found near the west end of the Proposed Route. One is in the Wasatch Formation (Eocene) and has produced gar teeth. Two more are in the Fort Union Formation (Paleocene) and have produced gar, turtle, crocodile, insectivoran, primate, arctocyonid, oxyclaenid, pantolestid, and phencodontid remains. The Almond Formation (Cretaceous) within this segment has produced dinosaur bones and footprints, oysters, clams, snails, and shark teeth.

The Wyoming portions of the Segment 4 Proposed Route and Alternatives 4B, 4C, 4D, 4E, 4F, and 4G are mapped in Figure A-5 in Appendix A, and the Idaho portion in

Figure A-6. No recorded localities were found along the Proposed Route. In the eastern portion common to Alternatives 4B through 4E (between 4b and 4b.1), a concentration of localities has been recorded. Eleven localities occur within the Analysis Area, and more than 22 occur within a mile of the midline of the ROW. They are from the Bridger Formation and have produced remains of gar, snakes, lizards, turtles, crocodiles, marsupials, insectivorans, rodents, primates, uintatheres, tapiroids, horses, hyaenodonts, and tillodonts.

Figure A-7 in Appendix A illustrates the Segment 5 Proposed Route and Alternatives 5A, 5B, 5C, 5D, and 5E. One recorded locality was found within the 0.5-mile buffer of the Proposed Route near its eastern end. The only records describe gravels producing bone. However, fossiliferous Miocene and Pleistocene gravels have been reported in the immediate area.

Segment 6 is illustrated in Figure A-8 in Appendix A. There are no known fossil localities within the 0.5-mile disturbance areas on Segment 6.

Figure A-9 in Appendix A depicts the Segment 7 Proposed Route and Route Alternatives 7A, 7B, 7C, 7D, 7E, 7F, 7G, and 7K. Only one recorded locality was noted. Pleistocene gravels with bone occur adjacent to the buffer Analysis Area near Rockland.

The Segment 8 Proposed Route and Route Alternatives 8A, 8B, 8C, 8D, and 8E are illustrated in Figure A-10 in Appendix A. No recorded localities were encountered for Segment 8, but one lies within the Alternative 8A Analysis Area. The Glenns Ferry Formation (Pliocene) contains the potential for significant vertebrate fossils in the vicinity of Alternative 8A. The Hagerman Fossil Beds National Monument (see description below), located south of Alternative 8A and north of Alternative 9B, has been established to preserve the fossil richness in this area.

Figure A-11 in Appendix A shows the Segment 9 Proposed Route and Alternatives 9A, 9B, 9C, 9D, 9E (revised), 9F, 9G, and 9H. No recorded localities were encountered for Segment 9 but several lie within the Alternative 9A Analysis Area. One is of Miocene age, but the others are from the Glenns Ferry Formation (Pliocene), and produced unspecified vertebrate fossils.

The Proposed Route for Segment 10 is illustrated in Figure A-12 in Appendix A. No recorded localities occur within the Analysis Area of Segment 10 but fossiliferous gravels are adjacent to that segment.

The Proposed Route and Route Alternatives have been designed to avoid areas designated by the BLM as ACECs. The Proposed Route and Route Alternatives do approach two major federal paleontological preserves, as described below.

Description of Fossil Butte National Monument (including Privately Held Quarry Sites)

Fossil Butte National Monument was authorized in 1972. It is located 9 miles west of Kemmerer in Lincoln County, Wyoming. It is dedicated to the paleontology and geology of the Eocene Green River and Wasatch formations in the area of ancient Fossil Lake. The monument preserves 13 square miles (34 square kilometers) of the 900-square-mile (2,330 square kilometer) Fossil Lake. There are two commercial quarries east of the park, two southeast of the park, and eight south of the park. The definitive book on

the fossils of the Green River Formation is that of Grande (1984). The Green River Formation contains the best preserved and best documented Eocene freshwater ecosystem. Fossils preserved include fish, alligators, bats, turtles, dog-sized horses, insects, and many other plant and animal species. The Proposed Route for Segment 4 passes 5.5 miles north of the monument and Alternatives 4B and 4C pass within a mile of the southern boundary.

Description of Hagerman Fossil Beds National Monument

Hagerman Fossil Beds National Monument was authorized in 1988. It is dedicated to the paleontology and geology of the Glenns Ferry Formation (Pliocene) along the western side of the Snake River just west of Hagerman, Idaho. It occupies approximately 6.8 square miles (17.6 square kilometers). The primary fossil-producing sedimentary unit is the Glenns Ferry Formation. The Monument contains the Hagerman Horse Quarry, a National Natural Landmark, which includes the discovery site for the Hagerman Horse, the oldest known representative of the modern horse genus *Equus*, which includes horses, donkeys, and zebras. The Hagerman Horse is the state fossil of Idaho. In addition, the list of species collected from this formation within the monument includes 36 plants, 4 ostracodes, 37 mollusks, 2 crustaceans, 18 fish, 5 amphibians, 8 reptiles, 28 birds, and 53 mammals. The Glenns Ferry Formation is crossed by many segments of the route, and many of the organisms might be expected to occur within those sediments. Alternative 8A passes within 1,500 feet of the northeastern corner of the monument; it crosses mostly Tuana Gravel with some Glenns Ferry Formation in that area. Alternative 8A passes within 1,500 feet of the northern boundary of the monument and Alternative 9B passes about the same distance from the southern boundary; the geology there is mostly Glenns Ferry Formation with Chalk Hills Formation exposed in one drainage. The closest approach of the Proposed Route (Segment 8) is about 5 miles to the northeast and southwest of the monument in that area.

3.13.2 Direct and Indirect Effects

This section is organized to present effects to paleontology from construction, then operations, followed by decommissioning activities for the proposed Project. Route Alternatives are analyzed in detail below in Section 3.13.2.3.

EPMs are presented in detail within this section only if it is the first time they have been discussed in Chapter 3; all other measures are referenced or summarized. A comprehensive list of all EPMs and the land ownership to which they apply can be found in Table 2.7-1 of Chapter 2.

Plan Amendments

Proposed amendments to BLM RMPs and MFPs are summarized in Table 2.2-1 of Chapter 2, while BLM plan amendments associated with other routes are summarized in Table 2.2-2. BLM plan amendments are discussed in detail in Appendices F-1 and G-1. Proposed amendments to Forest Plans are summarized in Table 2.2-3 of Chapter 2 and discussed in detail in Appendices F-2 and G-2. Amendments are needed to permit the Project to cross various areas of BLM-managed lands and NFS lands. Effects described for areas requiring an amendment in order for the Project to be built would only occur if the amendment were approved. Amendments that alter land

management designations could change future use of these areas. An amendment proposed to the Jarbidge RMP would allow Segment 8 of the Proposed (Preferred) Route in the Utility Avoidance Area in MUA-3, which contains the Glenns Ferry paleontological area. The RMP would be amended to reclassify the area identified as "restricted" in Section 35, Township 4 South, Range 9 East to "avoidance." This reclassification may make it easier for additional utilities to cross this area in the future; however, additional stipulations for protection of the paleontological and historic resources in the area would still apply (see Appendix F-1).

3.13.2.1 No Action Alternative

Under the No Action Alternative, the BLM would not issue a ROW grant to the Proponents of Gateway West and the Project would not be constructed across federal lands. No land management plans would be amended to allow for the construction of this Project. No Project-related impacts to paleontological resources would occur; however, impacts would continue as a result of natural events (such as fire, drought, and severe weather) as well as from existing and planned developments within the Analysis Area and from other projects, including wind farms, mining, agricultural, or other competing land uses. The demand for electricity, especially for renewable energy, would continue to grow in the Proponents' service territories. If the No Action Alternative is implemented, the demand for transmission services, as described in Section 1.3, Proponents' Objectives for the Project, would not be met with this Project and the area would have to turn to other proposals to meet the transmission demand. Under No Action, impacts similar to those described below may occur due to new transmission lines built to meet the increasing demand in place of this Project.

3.13.2.2 Effects Common to All Action Alternatives

Construction

Direct effects due to construction common to the Preferred Route, Proposed Route, and Route Alternatives include possible damage to paleontological specimens and possible loss of associated data. The scientific information provided by fossils is maximized by discovery of fossil specimens preserved in place within the host geologic formations. Construction disturbance activities could result in the discovery of isolated fossil specimens. Further examination in the vicinity of these isolated finds could result in significant fossil discoveries. However, excavation or blasting in fossil-bearing rock formations is more likely to damage intact fossils and reduce the scientific value of the paleontological resource. The likelihood of recovering scientifically important fossil specimens using heavy construction equipment is low. Therefore, use of construction equipment and blasting could have direct negative effects on paleontological resources.

Construction impacts include excavations for the tower foundations and construction of access roads, multipurpose yards, laydown yards, substations, and regeneration sites. Transmission line tower foundations would consist of drilled piers, 4 to 6 feet in diameter and 15 to 20 feet deep. Blasting may be necessary in bedrock areas not suitable for excavation by standard drilled pier augering. The construction impacts from installation of other features would likely be less than the impacts from the tower excavations because other ground-disturbing activities would be much shallower.

Based on the calculated paleontology risk factors, Segments 4, 8, and 9 have the highest risks, with paleontology risk factors of 731, 656, and 537, respectively. Segments 2 and 7 have moderate risk factors of 359 and 271, respectively. The extent of soil cover throughout the Preferred Route, Proposed Route, and Route Alternatives is not known at this time, though estimates to shallow bedrock are found in Table 3.15-1 (Section 3.15 – Soils). Some of the segments with moderate to high paleontology risk factors also contain areas with shallow bedrock. Table 3.15-1 indicates that 40 percent of the Segment 4 Analysis Area contains shallow bedrock. Shallow bedrock underlies about 41 percent of Segment 9. Shallow bedrock is present in Segments 7 and 8 at 15 and 16 percent, respectively. Segment 2 does not contain shallow bedrock within the Analysis Area. Routes with soil cover would protect paleontological resources. Indirect effects due to construction include the unauthorized collecting or destruction of paleontological specimens due to increased access.

Appendix B presents the Proponents' POD. Appendix J of the POD includes a Framework Paleontological Resources Protection Plan that describes the potential for paleontological resources and the methods proposed to protect those resources. The BLM Regional Paleontologist, Brent Breithaupt, reviewed the Framework Plan in 2012 and indicated that the Plan is inadequate and a revised Plan will be required prior to Project construction. BLM requests that the text be revised to note that for PFYC Class 3 units the management concern is moderate or cannot be determined from existing data. Class 3 units include a broad range of paleontological potential. They include geologic units of unknown potential, as well as units of moderate or infrequent occurrence of significant fossils; management considerations cover a broad range of options and could include pre-disturbance surveys, monitoring, or avoidance. Surface-disturbing activities would require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action, and whether that action could affect the paleontological resources. Surveys are generally required for bedrock of PFYC Classes 4 and 5. The guidelines for when and where to conduct paleontological surveys or monitoring will be presented in the revised Paleontological Protection Plan.

To mitigate impacts to paleontological resources, the Proponents intend to cease work where fossil materials are discovered until the appropriate person has been notified. The Proponents have adopted the following EPMs, which will be implemented during all applicable construction activities as well as during operations and maintenance:

PALEO-1 If significant fossil materials are discovered during Project construction, all surface-disturbing activities in the vicinity of the find will cease until notification to proceed is given by the authorized officer. The site will be protected to reduce the risk of damage to fossils and context. Appropriate measures to mitigate adverse effects to significant paleontological resources will be determined by the authorized officer.

PALEO-2 Paleontological resources (as defined by the omnibus Public Land Management Act – Paleontological Resources Preservation Section) on federally managed land shall be managed and protected using scientific principles and expertise. Appropriate plans for inventory, monitoring, and

the scientific and educational use of these resources shall be developed in accordance with applicable agency laws, regulations and policies.

PALEO-3 Where fossil-bearing sediments are exposed by construction, the sediments must be covered with a 4-inch layer of soil where feasible to reduce unauthorized removal or disturbance of resources.

In addition to the EPMs proposed by the Proponents, the Agencies require the following:

PALEO-4 To ensure compliance with the Paleontological Resources Preservation Section of the Public Land Management Act, the Proponents' Paleontological Mitigation Plan for the Project (see PALEO-2) shall specify that:

- Monitoring of excavation and grading in sensitive sediments, especially access roads and tower sites, must occur when construction is near or in those geologic formations.
- Monitoring of excavations in sensitive sediments, screening the excavated spoils, and processing of bulk sediment samples for microinvertebrate fossils must occur where there is a significant potential for data recovery from those spoils.
- Monitoring must be performed by a qualified paleontologist and in consultation with a designated paleontologist in each state, NF, or BLM district. The Authorized Officer will designate the appropriate paleontologist depending on project location.

PALEO-5 Field surveys will be completed prior to surface disturbance in areas with potential fossil yields of Class 3, 4, or 5, in accordance with criteria stated in the Paleontological Protection Plan and as required by the land-management agency.

Operations

No direct effects to paleontological resources due to operations are foreseen. Possible indirect effects would be the unauthorized collecting or destruction of paleontological specimens due to increased access.

Decommissioning

Very limited effects due to decommissioning are foreseen because the activities would occur within the same footprint as construction. Assuming that concrete footings would not be removed from the ground, only exposed outcrops could be affected. It is possible that a few fossils exposed at the surface could be damaged by vehicles involved in decommissioning.

3.13.2.3 Comparison of Alternatives by Segment

Numerous geologic units of moderate to high paleontological sensitivity would be crossed by the centerline of the Project's Preferred Route, Proposed Route, and Route Alternatives. Therefore, construction of this set of transmission lines, along with the associated access roads, has the potential to impact paleontological resources.

The nature of the paleontological resources in a given rock unit is important. For example, augering has different impacts on resources that consist of numerous isolated teeth or small bones in relatively loose alluvium versus resources that consist of complete skeletons in relatively indurated sediments (e.g., parts of the Green River Formation). Much more information and many more intact specimens can be recovered from the auger tailings from the alluvium containing isolated teeth or small bones than in tailing from the Green River Formation. The comparison of alternatives is also complicated by the possibility of making minor adjustments in the siting of given structures to avoid discrete resources. Records searches have indicated a few known areas of locality concentrations within the ROW. Table 3.13-3 presents the paleontological risk factors by Preferred Route, Proposed Route, and Route Alternative.

Table 3.13-3. Paleontology Risk Factors of Alternatives by Segment

Segment	Route	Miles Crossed[1/]	Paleontology Risk Factor[2/]	PFYC Class 3 (miles)	PFYC Class 4 or 5 (miles)
1W(a)	Preferred/Proposed – Total Length	73.8	249.6	17.5	29.1
	Preferred/Proposed – Comparison Portion for Alt. 1W(a)-B	16.5	60.8	10.8	5.6
	Alternative 1W(a)-B	20.9	65.9	12.7	3.8
1W(c)	Preferred/Proposed – Total Length	73.6	256.3	27.3	31.9
2	Preferred/Proposed – Total Length	91.9	358.9	40.8	40.3
	Preferred/Proposed – Comparison Portion for Alternative 2A	16.8	51.0	10.5	3.9
	Alternative 2A	16.0	52.2	10.9	3.9
	Preferred/Proposed – Comparison Portion for Alternative 2B	12.5	41.7	7.4	3.9
	Alternative 2B	12.2	39.1	7.2	3.5
3	Preferred/Proposed – Total Length	45.9	192.8	11.1	29.9
3A	Preferred/Proposed – Total Length	5.1	15.3	5.1	--
4	Preferred/Proposed – Total Length	197.6	731.0	116.6	76.4
	Preferred/Proposed – Comparison Portion for Alts. 4B–F	85.2	339.7	37.0	44.5
	Alternative 4B	100.2	415.5	42.6	57.6
	Alternative 4C	101.6	414.9	46.7	54.9
	Alternative 4D	100.7	421.3	41.1	59.6
	Alternative 4E	102.2	420.5	45.4	56.8
	Alternative 4F	87.5	364.9	33.3	52.4
	Proposed–Comparison Portion for Alternative 4G	2.3	7.2	2.3	--
	Alternative 4G	2.6	7.8	2.6	--
5	Preferred – Total Length	73.3	138.7	59.2	--
	Proposed – Total Length	55.7	116.1	34.5	1.1
	Proposed – Comparison Portion for Alts. 5A,B	22.3	45.2	13.4	1.1
	Alternative 5A	29.7	45.9	15.3	--
	Alternative 5B	40.4	68.4	38.1	--
	Proposed – Comparison Portion for Alternative 5C	32.9	59.7	18.5	1.2
	Alternative 5C	26.0	81.3	22.7	3.3
	Proposed – Comparison Portion for Alternative 5D	19.2	10.6	3.4	0.1
	Alternative 5D	17.0	48.9	16.3	--
	Proposed – Comparison Portion for Alternative 5E	5.8	7.2	2.4	--
	Alternative 5E	5.3	6.6	2.4	--

Table 3.13-3. Paleontology Risk Factor of Alternatives by Segment (continued)

Segment	Route	Miles Crossed[1/]	Paleontology Risk Factor[2/]	PFYC Class 3 (miles)	PFYC Class 4 or 5 (miles)
6	Preferred/Proposed – Total Length	0.5	0.7	--	--
7	Preferred – Total Length	130.2	275.7	76.6	5.6
	Proposed – Total Length	118.2	271.2	74.6	5.4[3/]
	Proposed – Comparison Portion for Alts. 7A,B	35.1	82.6	25.1	1.8
	Alternative 7A	37.7	72.8	21.6	2.0[4/]
	Alternative 7B	46.2	92.6	28.2	2.0[4/]
	Proposed – Comparison Portion for Alternative 7C	20.1	38.2	9.0	--
	Alternative 7C	20.3	28.0	5.9	--
	Proposed – Comparison Portion for Alternative 7D	6.2	11.0	2.4	--
	Alternative 7D	6.8	15.4	4.3	--
	Proposed – Comparison Portion for Alternative 7E	3.8	6.8	1.5	--
	Alternative 7E	4.5	5.9	0.7	--
	Proposed – Comparison Portion for Alternative 7F	10.5	17.9	4.3	--
	Alternative 7F	10.8	20.5	5.5	--
	Proposed – Comparison Portion for Alternative 7G	3.3	9.9	3.3	--
	Alternative 7G	3.4	10.2	3.4	--
	Proposed – Comparison Portion for Alternative 7K	118.2	271.2	74.6	5.4[5/]
	Alternative 7K	148.1	332.0	99.1	5.9[6/]
8	Preferred – Total Length	132.0	644.7	27.1	51.1
	Proposed – Total Length	131.5	656.3	24.6	52.2
	Proposed – Comparison Portion for Alternative 8A	51.9	135.0	3.2	17.2
	Alternative 8A	53.6	143.0	13.4	17.1
	Proposed – Comparison Portion for Alternative 8B	45.3	93.5	11.5	7.4
	Alternative 8B	45.8	81.9	14.0	6.3
	Proposed – Comparison Portion for Alternative 8C	6.5	18.6	6.2	--
	Alternative 8C	6.4	18.6	6.2	--
	Proposed – Comparison Portion for Alternative 8D	6.9	6.9	--	--
	Alternative 8D	8.1	7.9	0.3	--

Table 3.13-3. Paleontology Risk Factor of Alternatives by Segment (continued)

Segment	Route	Miles Crossed[1/]	Paleontology Risk Factor[2/]	PFYC Class 3 (miles)	PFYC Class 4 or 5 (miles)
8	Proposed – Comparison Portion for Alternative 8E	7.0	14.5	1.2	1.3
	Alternative 8E	18.3	22.2	0.2	0.9
9	Preferred – Total Length	171.4	577.7	50.7	80.0
	Proposed – Total Length	162.2	537.2	45.5	77.6
	Proposed – Comparison Portion for Alternative 9A	7.8	24.6	--	4.2
	Alternative 9A	7.7	22.3	2.1	2.6
	Proposed – Comparison Portion for Alternative 9B	49.1	155.1	23.7	16.5
	Alternative 9B	52.3	181.8	20.4	24.2
	Proposed – Comparison Portion for Alternative 9C	14.4	28.4	7.0	--
	Alternative 9C	14.4	29.2	7.0	0.2
	Proposed – Comparison Portion for Alts. 9D,F,G,H	57.2	231.1	12.3	40.6
	Alternative 9D	60.1	211.7	2.3	41.5
	Alternative 9F	63.3	228.0	3.5	43.5
	Alternative 9G	57.8	200.6	2.1	39.4
	Alternative 9H	61.0	216.9	3.3	45.0
	Proposed – Comparison Portion for Alt. 9E (rev.)	61.4	237.1	12.3	41.0
	Alternative 9E (revised)	70.6	277.6	17.5	43.4
10	Proposed – Total Length	34.4	38.0	1.8	--

1/ Mileages are rounded to the nearest tenth of a mile; therefore, rows may not sum exactly due to rounding.
2/ The paleontology risk factor is a product of the length of the segment or alternative multiplied by the BLM PFYC of the individual rock formations crossed.
3/ Proposed Route 7 through Caribou-Targhee NF includes 0.4 mile of PFYC Class 4 land. This area is within the NF boundary but is not on NFS land.
4/ Alternatives 7A and 7B are coincident through Caribou-Targhee NF. The shared Alternatives include 1.2 miles of PFYC Class 4 land. This area is within the NF boundary but is not on NFS land.
5/ Proposed Segment 7, comparison portion to Alternate Route 7K includes 0.4 miles of PFYC Class 4 land. This land is within the Caribou-Targhee NF boundary but is not on NFS land.
6/ Alternative 7K includes 1.7 miles of PFYC Class 4 land. This land is within the NF boundary but is not on NFS land.

Segment 1W

The preferred routes in Segment 1W are as follows:

Segment	Preferred Route	Agency
Segment 1W(a)	Proposed Route (Figure A-2)	BLM and State of Wyoming
Segment 1W(c)	Proposed Route (Figure A-2)	BLM and State of Wyoming

Segment 1W is composed of Segments 1W(a) and 1W(c), both of which consist of single-circuit 230-kV transmission lines. Generally, Segment 1W(a) would be a new 73.8-mile-long transmission line, and 1W(c) would involve reconstruction of a 73.6-mile-long portion of the existing Dave Johnston – Rock Springs 230-kV transmission line. However, in the area approximately 5 miles to the north and to the south of Ice Cave Mountain, the lines shift east to avoid the ice cave. In this area, 1W(a) would be the reconstruction of the existing line and 1W(c) would be the new line. Segment 1W(a) has one alternative, Alternative 1W(a)-B, which is located north and west of the town of Glenrock and was the Proponents' initial proposal. However, the Proposed Route was revised following the Draft EIS public comment period in order to avoid the more populated area around Glenrock. Figure A-2 in Appendix A shows the location of the Segment 1W routes.

Approximately 63 percent of the Segment 1W(a) Preferred/Proposed Route crosses formations with moderate or higher potential for fossils, including the crossing of 29.1 miles of rock in PFYC Class 4 or 5. This includes crossing of the Lance and White River Formations, in PFYC Class 5. It has one alternative, Alternative 1W(a)-B, which would be 4.4 miles longer than the comparison portion of the Preferred/Proposed Route 1W(a). Alternative 1W(a)-B would cross 3.8 miles of bedrock with PFYC Class 5 and have a slightly higher paleontology risk factor. The Preferred/Proposed Route 1W(c) would cross 31.9 miles in PFYC Class 4 and 5.

Segment 2

The preferred route in Segment 2 is as follows:

Preferred Route	Agency
Proposed Route (Figure A-3)	BLM and State of Wyoming

Segment 2 consists of one single-circuit 500-kV transmission line between the proposed Aeolus Substation and the location of the originally planned Creston Substation near Wamsutter, Wyoming (a new substation at Creston is no longer needed due to changes in anticipated demand for oil and gas field electricity). The Preferred/Proposed Route has been revised to incorporate Alternative 2C, as analyzed in the Draft EIS. Segment 2 would be approximately 91.9 miles long. Alternative 2A is being considered by the BLM because this alternative route is within the WWE corridor. Alternative 2B was initially the Proponents' Proposed Route before they responded to local suggestions and relocated the Proposed Route farther to the south. Figure A-3 in Appendix A shows the location of the Segment 2 routes.

Approximately 88 percent of the Segment 2 Preferred/Proposed Route would be located in areas with moderate or higher potential fossil yield. Segment 2 passes through 40.3 miles of bedrock in PFYC Class 4 and 5. The comparison portions of the

Preferred/Proposed Route, and Alternatives 2A and 2B cross nearly the same amount of PFYC Class 4 and 5, and have very similar paleontology risk factors. Therefore, neither alternative provides an advantage from a paleontology perspective. The Preferred/Proposed Route and both alternatives cross the late Cretaceous-age Steele Shale and Niobrara Formations, which, as shown in Table 3.13-1, have PFYC Class 5.

Segment 3

The preferred route in Segment 3 is as follows:

Preferred Route	Agency
Proposed Route, including 3A (Figure A-4)	BLM and State of Wyoming

A single-circuit 500-kV line would link the former location of the Creston Substation, approximately 2.1 miles south of Wamsutter, Wyoming, to the proposed Anticline Substation near the existing Jim Bridger Power Plant. Segment 3 would be approximately 45.9 miles long. This segment also includes a 5.1-mile segment of 345-kV line to connect to the existing Jim Bridger Power Plant Substation (Segment 3A). There are no alternatives proposed along Segment 3. Figure A-4 in Appendix A shows the location of the Segment 3 routes.

Segment 3 would cross 29.9 miles of Green River, Lance, and Wasatch Formation bedrock with PFYC Class 5. Approximately 89 percent of the route is in moderate or higher potential fossil yield. The bedrock units for Segment 3A are in PFYC Class 3.

Segment 4

The preferred routes in Segment 4 are as follows:

Preferred Route	Agency
Proposed Route (Figures A-5 and A-6) except within the Caribou-Targhee NF (see below)	BLM, State of Wyoming, and Lincoln County
Proposed Route within the NF incorporating Alternative 4G (Figure A-6)	Forest Service

Segment 4 would link the proposed Anticline Substation and the existing Populus Substation near Downey, Idaho with a single-circuit 500-kV line. Its proposed length is approximately 197.6 miles. The Segment 4 Preferred/Proposed Route was revised to follow Alternative 4A, as analyzed in the Draft EIS, based on public comments. This segment generally follows an existing transmission line corridor. Segment 4 has five Route Alternatives in the middle portion of its route; however the first 52 miles to the east and the last 61 miles to the west (in Idaho) do not have any route alternatives. The middle section of the Preferred/Proposed Route, for which alternatives are presented, is approximately 85.2 miles long, and its alternatives vary from approximately 87.5 to 102.2 miles long. Alternatives 4B through 4E were proposed by the BLM Kemmerer FO (with input from various cooperating agencies), with the intent to avoid impacts to cultural resources to the extent practical. Alternative 4F was proposed by the Proponents to avoid impacts to cultural resources while still remaining north of the existing Bridger Lines. Alternative 4G was proposed by the Forest Service in order to avoid unstable soils identified along the Proposed Route during the 2012 soil assessment (located within Sections 1 and 2, Township 12 South, Range 41 East).

Figures A-5 and A-6 in Appendix A show the location of the Segment 4 routes in Wyoming and Idaho, respectively.

About 98 percent of Preferred/Proposed Segment 4 would be located in moderate or higher potential fossil yield, including crossing 76.4 miles of bedrock in PFYC Class 4 or 5. The comparison portion of the Preferred/Proposed Route for Alternatives 4B, 4C, 4D, 4E, and 4F would have lower paleontology risk factor scores than the Route Alternatives and would cross fewer miles of rock formations in PFYC Class 4 and 5. Given that the paths of the Preferred/Proposed Route and the five alternatives would pass through from 44 to 60 miles of very fossiliferous Eocene sediments, the potential exists to encounter significant fossil resources.

Caribou-Targhee National Forest Paleontology Risk Factors

The Proposed Route would cross 9.1 miles on the Caribou-Targhee NF. Alternative 4G is also completely contained on the Caribou-Targhee NF. At a length of 2.6 miles, Alternative 4G is 0.3 mile longer than the comparison portion of the Proposed Route. The paleontology risk factor for Alternative 4G is similar to the comparison portion of the Proposed Route: 7.8 for Alternative 4G, compared to 7.2 for the comparison portion of the Proposed Route. No PFYC Class 4 or 5 rock is present in this portion of Segment 4.

Segment 5

The preferred routes in Segment 5 are as follows:

Preferred Route	Agency
Proposed Route incorporating Alternatives 5B and 5E[1/] (Figure A-7)	BLM
Proposed Route incorporating Alternatives 5C and 5E (Figure A-7)	Power County

1/ Assumes that Western Electricity Coordinating Council reliability issues associated with 5E are resolved.

Segment 5 would link the Populus and Borah Substations with a single-circuit 500-kV line that would be approximately 55.7 miles long. There are five Route Alternatives to portions of the Proposed Route in Segment 5. Alternatives 5A and 5B were proposed by the BLM to avoid crossing the Deep Creek Mountains. Alternative 5C, which crosses the Fort Hall Indian Reservation, was proposed as the preferred route by Power County; however, the Fort Hall Business Council has voted not to permit the Project across the Reservation. Alternative 5D was originally the Proponents' Proposed Route. Alternative 5E was proposed by Power County as an alternative approach to the Borah Substation. The BLM has identified a Preferred Route that includes portions of the Proposed Route with Alternatives 5B and 5E (with the assumption that reliability issues associated with 5E can be resolved). The Segment 5 Preferred Route is 73.3 miles long, compared to 55.7 miles for the Proposed Route. Figure A-7 in Appendix A shows the location of the Segment 5 routes.

The Segment 5 Proposed Route would only cross 1.1 miles of Starlight and Salt Lake Formation bedrock with PFYC Class 4. About 64 percent of the Proposed Route would be located in moderate or higher fossil potential. Of the five possible routes, Alternative 5C would have the highest paleontology risk factor score and would cross the most bedrock in Class PFYC Class 4. This is due in part to the fact that it is the longest alternative. The comparison portion of the Proposed Route for Alternatives 5A and 5B is shorter and would have a lower paleontology risk factor (45.2) than either Alternative

5A (45.9) or 5B (68.4). The comparison portion of the Proposed Route for Segment 5 for Alternative 5C is longer, but would have a lower paleontology risk factor (59.7) than Alternative 5C (81.3). Neither the comparison portion of the Proposed Route for Alternative 5D nor Alternative 5D would cross more than 0.1 mile of rock in PFYC Class 4. Their paleontology risk factors are not useful as much of both routes are in rock formations that have not received a PFYC classification. Alternative 5E and the comparison portion of the Proposed Route would also have very similar paleontology risk factor values and no crossings in PFYC Class 4. Overall, neither the Proposed Route nor any of the alternatives would cross more than a few miles of bedrock with PFYC Class 4, and none in PFYC Class 5.

The paleontology risk factor for the Preferred Route is 138.7, compared to 116.1 for the Proposed Route. However, the Preferred Route does not cross rock with PFYC Class 4 or 5, compared to 1.1 miles crossed by the Proposed Route.

Segment 6

The BLM's Preferred Route in Segment 6 is as follows:

Preferred Route	Agency
The proposal to upgrade the line voltage from 345-kV to 500-kV (Figure A-8)	BLM

Segment 6 is an existing transmission line linking the Borah and Midpoint Substations; it is now operated at 345 kV but would be changed to operate at 500 kV. This segment has no Route Alternatives. Existing support structures would be used and impacts would be limited to within approximately 0.25 mile from each substation to allow for moving the entry point into the substation to the new 500-kV bay. Changes at the Borah and Midpoint Substations would allow Segment 6 to be operated at 500 kV. Figure A-8 in Appendix A shows the Proposed Route for Segment 6. The new disturbance for Segment 6 is only 0.5 mile, none of which is located in bedrock with PFYC Class 4 or 5 ratings.

Segment 7

The preferred routes in Segment 7 are as follows:

Preferred Route	Agency
Proposed Route incorporating Alternatives 7B, 7C, 7D, and 7G (Figure A-9). The Proposed Route in the East Hills and Alternative 7G will be microsited to avoid Preliminary Priority Sage-grouse Habitat (PPH).	BLM
Alternative 7K (Figure A-9)	Power and Cassia Counties

Segment 7 would link the Populus Substation and the proposed Cedar Hill Substation with a single-circuit 500-kV line that would be approximately 118.2 miles long. Several alternatives to the Proposed Route are being considered. Route Alternatives 7A and 7B have been proposed by the BLM to avoid crossing the Deep Creek Mountains. Alternatives 7C, 7D, 7E, 7F, and 7G were proposed by local landowners to avoid private agricultural lands. Alternative 7K (also called the Goose Creek Alternative) was identified during the public comment period as a shorter alternative to the Proposed Route than either 7I or 7J (refer to Chapter 2 of the Draft EIS for a description of these routes). The alignment for 7K was developed in cooperation with Cassia County. Alternatives 7H, 7I, and 7J, which were analyzed in the Draft EIS, are no longer under

consideration. The BLM has identified a Preferred Route that includes portions of the Proposed Route with Alternatives 7B, 7C, 7D, and 7G. The Segment 7 Preferred Route is 130.2 miles long, compared to 118.2 miles for the Proposed Route. Figure A-9 in Appendix A shows the location of the Segment 7 routes.

The Segment 7 Proposed Route would cross 5.4 miles of Starlight and Salt Lake Formation bedrock with PFYC Class 4, including 0.4 mile on land within the Caribou-Targhee NF boundary. About 68 percent of the Proposed Route would be located in moderate or higher fossil potential. Alternative 7B would be longer than Alternative 7A, which in turn would be longer than the comparison portion of the Proposed Route. All would cross similar and low (1.8 to 2) mileage of PFYC Class 4 bedrock. Neither the comparison portions of the Proposed Route nor Alternatives 7C, 7D, 7E, 7F, and 7G would cross any rock in PFYC Class 4 or 5. Due to its greater length, Alternative 7K would have a higher paleontology risk factor than the comparison portion of the Proposed Route. However, both routes would cross similar distances of PFYC Class 4 bedrock (5.4 and 5.9 miles, respectively). However, Alternative 7K would cross 1.7 miles of Class 4 rock within the boundary of the Caribou-Targhee NF, while the comparison portion of the Proposed Route crosses only 0.4 mile.

From a paleontology perspective, the Segment 7 Proposed Route and most alternatives are comparable, with crossings of no more than 6 miles of bedrock in PFYC Class 4. Only the considerably longer Alternative 7K would yield a paleontology risk factor much greater than the comparison portions of the Proposed Route or the Preferred Route.

Despite being 12 miles longer, the Preferred Route contains similar risks to fossil resources as the Proposed Route. The paleontology risk factor for the Preferred Route is 275.7, compared to 271.2 for the Proposed Route. The Preferred Route crosses 5.6 miles of rocks with PFYC Class 4 or 5, while the Proposed Route crosses 5.4 miles.

Segment 8

The preferred route in Segment 8 is as follows:

Preferred Route	Agency
Proposed Route incorporating Alternative 8B (Figure A-10)	BLM and IDANG

Segment 8 would link the Midpoint and Hemingway Substations. This 131.5-mile single-circuit 500-kV transmission line would stay north of the Snake River generally parallel to an existing 500-kV transmission line, before ending at the Hemingway Substation. There are five Route Alternatives to the Proposed Route. Alternative 8A follows the WWE corridor but crosses the Snake River and I-84 twice (while the Proposed Route would stay north of this area). Alternatives 8B and 8C were originally proposed by the Proponents as parts of the Proposed Route but were later dropped from the Proposed Route to avoid planned developments near the cities of Kuna and Mayfield, respectively. Alternative 8D would rebuild a portion of an existing 500-kV transmission line to move it away from the National Guard Maneuver Area. Alternative 8D would be constructed within the ROW currently occupied by the existing line. Alternative 8E was proposed by the BLM in order to avoid crossing the Halverson Bar non-motorized portion of a National Register Historic District (see the discussion of 8E under Segment 9). The BLM has identified a Preferred Route that includes portions of the Proposed Route with Alternative 8B and generally avoids the

SRBOP. The Segment 8 Preferred Route is 132.0 miles long, compared to 131.5 miles for the Proposed Route. Figure A-10 in Appendix A shows the location of the Segment 8 routes.

The Segment 8 Proposed Route would cross 52.2 miles of bedrock in PFYC Class 4 and 5. Much of Segment 8 is located within Idaho Group bedrock, a series of volcanic and sedimentary deposits with important fossil potential. In total, approximately 58 percent of the Proposed Route is located in moderate or higher fossil potential. The Glenns Ferry Formation, the host rock for the fossils at Hagerman Fossil Beds National Monument, is an Idaho Group formation present within the segment. The Yahoo Clay Formation, a late-Pleistocene lacustrine sedimentary formation deposited within Lake McKinney, a lake that developed when basalt temporarily dammed the Snake River near Bliss, Idaho, is also present in the Hagerman Valley (Janssen 2010). The Yahoo Clay does not appear on the BLM lists for paleontologically significant units. However, Malde (1982) reports the presence of mollusks (species are modern, but indicative of cooler, wetter climate) and pollen within the Yahoo Clay. The comparison portion of the Proposed Route is somewhat shorter and has a lower risk factor rating than Alternative 8A (135.0 vs. 143.0). In addition, Alternative 8A would pass within less than 1 mile from the northern boundary of Hagerman Fossil Beds National Monument. Among the alternatives, the paleontology risk factors are similar to the comparison portions of the Proposed Segment 8. The slight differences observed appear mainly related to length. The difference in crossing lengths in PFYC Class 4 and 5 bedrock is less than one mile for Alternatives 8A, 8B, and 8E. Neither Alternatives 8C and 8D nor their comparison portions would cross PFYC Class 4 or 5 bedrock. Given the mileage crossed in PFYC Class 4 and 5 bedrock, it appears the majority of crossings are within portions of Segment 8 that do not contain alternatives.

The Preferred Route (which incorporates Alternative 8B) is only 0.5 mile longer than the Proposed Route. The paleontological risk factor for the Preferred Route is lower than the Proposed Route: 644.7 for the Preferred Route, compared to 656.3 for the Proposed Route.

Segment 9

The preferred routes in Segment 9 are as follows:

Preferred Route	Agency
Proposed Route incorporating Alternative 9E, which was revised to avoid PPH and Murphy (Figure A-11)	BLM
Alternative 9D (Figure A-11)	Owyhee County

Segment 9 would link the Cedar Hill and Hemingway Substations with a 162.2-mile single-circuit 500-kV transmission line which skirts the Jarbidge and Owyhee Military Operating Areas to the north, then follows the WWE corridor just north of the Saylor Creek Air Force Range, passing through Owyhee County before entering the Hemingway Substation. There are eight Route Alternatives proposed. Alternative 9A was the Proponents' Proposed Route until that route was revised to avoid the Hollister area. Alternative 9B is being considered by the BLM because it follows the WWE corridor and parallels existing utility corridors. Alternative 9C was the Proponents' Proposed Route until that route was revised to avoid the Castleford area. Alternatives 9D through 9G were proposed by the Owyhee County Task Force in order to reduce impacts to private land. Alternatives 9F and

9H were proposed to avoid crossing the non-motorized area south of C.J. Strike Reservoir and as an alternate route if Alternative 8E is selected. The BLM has identified a Preferred Route that includes portions of the Proposed Route with Alternative 9E. Figure A-11 in Appendix A shows the location of the Segment 9 routes. A portion of Alternatives 9D/F uses the same path as Alternative 8E in Segment 8; therefore, 8E and 9D/F could not both be selected. Alternative 9E has been revised to avoid sage-grouse PPH and to incorporate a recommended route change submitted by Owyhee County that avoids a planned subdivision near Murphy. The Segment 9 Preferred Route is 171.4 miles long, compared to 162.2 miles for the Proposed Route.

About 76 percent of the Segment 9 Proposed Route would be located in moderate or higher fossil potential. The Proposed Route would cross 77.6 miles of Idaho Group Formation bedrock possessing PFYC Classes 4 and 5. The comparison portion of the Proposed Route for Alternative 9A would be essentially the same length as Alternative 9A, and their paleontology risk factor ratings would be the nearly the same. The comparison portion of the Proposed Route would cross 4.2 miles of the PFYC Class 5 Glenns Ferry Formation, while Alternative 9A would cross only 2.6 miles. Alternatives 9B, 9C, 9D, and 9E (revised) would largely follow existing transmission lines and utility corridors. The paleontology risk factor ratings for the comparison portions of the Proposed Route would be lower than for Alternatives 9B and 9E (revised). The comparison portions of the Proposed Route would cross less PFYC Class 4 and 5 bedrock, compared to Alternatives 9B, 9C, 9D, 9F, and 9H. Overall, the route with the lowest paleontology risk factor rating would be the Proposed Route in combination with Alternatives 9A, 9D, 9F, 9G, and 9H. Alternative 9B would also pass near the southern boundary of the Hagerman Fossil Beds National Monument, making it more likely to impact paleontological resources. The Proposed Route in combination with Alternatives 9A and 9G would cross the shortest distance of rock in PFYC Class 4 or 5.

The Preferred Route, including Alternative 9E (revised), is 171.4 miles long, compared to 162.2 miles for the Proposed Route. Due to the extra length and higher paleontology risk factor, the Preferred Route would have a paleontology risk factor of 577.7, compared to 537.2 for the Proposed Route.

Segment 10

The BLM's Preferred Route in Segment 10 is as follows:

Preferred Route	Agency
Proposed Route (Figure A-12)	BLM

Segment 10 would link the Cedar Hill and Midpoint Substations with a 34.4-mile single-circuit 500-kV line. Segment 10 would follow a WWE corridor for most of the route. The Proposed Route would also be adjacent to the existing 345-kV line most of this length and has been sited to follow the same alignment of the planned SWIP. Either the SWIP or Gateway West would be built, but not both. There are no Route Alternatives proposed along this segment. Figure A-12 in Appendix A shows the location of the Proposed Route in Segment 10.

Segment 10 has a low risk factor rating because of extensive basalt flows. Segment 10 does not contain crossings of rock in PFYC Class 4 or 5.