4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

This chapter discusses the anticipated direct and indirect environmental effects (Environmental Consequences) of the alternatives presented in Chapter 2.0.

Alternative A, the no action alternative, describes anticipated future conditions if none of the action alternatives are implemented. (Cumulative effects are addressed in Chapter 5.0.)

The analysis of the potentially affected resources is based on the professional judgment and experience of Western, Forest Service, BLM, and contractor resource specialists; discussions with other agency resource experts and professionals; literature reviews; and field trips to the study area by resource personnel. The level of analysis is commensurate with the expected level of potential effects.

The goal of this chapter is to disclose, to the greatest extent possible, the effects of each alternative on the affected resources. If quantitative estimates are not possible, qualitative estimates are provided to facilitate the comparison of alternatives by the public and decision makers.

4.1.1 Impact Thresholds

4.1.1.1 Impact Type

Classifies the effect as direct, indirect, or cumulative, and then determines whether the effect would result in beneficial or adverse effects.

Direct: Effect caused by the alternative and occurs in the same time and place (e.g., removal of vegetation, use of machinery, etc.).

Indirect: Effect caused by the alternative but is later in time or farther removed in distance, but is still reasonably foreseeable (e.g., increased development in the area, accelerated erosion).

Cumulative: Incremental effect caused by the alternative when added to other past, present, and reasonably foreseeable future actions (e.g., combined effect of project and other nonproject actions). Cumulative effects are addressed in Chapter 5.0.

For each impact type – direct, indirect, or cumulative – a determination of whether the effect is anticipated to be beneficial or adverse is provided.

Beneficial: Positive change in the condition or appearance of the resource.

Adverse: Negative change that detracts from the condition or appearance of the resource.

4.1.1.2 Impact Duration

Describes the length of time an effect would occur as short or long term.

Short Term: Lasting no longer than the immediate 1-2-year project implementation period (e.g., construction period, build-out period).

Long Term: Lasting beyond the implementation period (beyond 5 years), typically extending beyond a decade or indefinitely.

4.1.1.3 Impact Intensity

Describes the degree, level, or significance of an effect as no effect, negligible, minor, moderate, or significant.

No effect: No discernable effect.

Negligible: Effect is at the lowest level of detection and causes very little or no disturbance or improvement.

Minor: Effect that is slight but detectable, with some perceptible effects of disturbance or improvement.

Moderate: Effect is readily apparent and has measurable effects of disturbance or improvement.

Significant: Effect is readily apparent and has measurable effects of disturbance or improvement that are of local, regional, or global importance; or sets a precedent for future project undertakings by federal agencies. The significance criteria or threshold is determined on an individual resource basis; significance criteria are provided in each resource section.

4.1.2 Key Assumptions

4.1.2.1 Final Structure and Facility Siting

Final engineering and design have not been completed for all project facilities at this time. Final structure locations, in particular, have not been fully defined in terms of their exact locations, although reasonable estimations can be made. Construction impacts have been calculated on the basis of a planned ROW width of 100 feet with the assumption that construction activities may occur anywhere within the ROW. Because of this, some impacts may be overstated.

Transmission Line Spacing and Disturbances

The impact analyses are based on typical structure spacing of 600 feet between single-pole steel structures, compared to an average 500 feet between the existing H-frame structures that would be replaced. Actual spacing may vary, with maximum spacing reaching 800 feet; although on a site-by-site basis, structures can be designed and constructed to span longer distances. Direct ground disturbances at each structure site are estimated based on the assumption that 900 square feet per structure could be impacted. A direct ground disturbance is defined to include compaction, auguring, grading, and similar activities.

4.1.2.2 Western's Standard Construction, Operation and Maintenance Practices, and Adopted Project-Specific Environmental Protection Measures

The impact analysis assumes that Western's SCPs and project-specific design criteria are (Table 2-5 and Table 2-6) fully incorporated into the proposed project and routing alternatives. The SCPs and project-specific environmental protection measures should be regarded as components or elements of the proposed action and alternatives.

4.2 Air Quality, Climate, and Global Climate Change

4.2.1 Significance Criteria

Significant air quality and climate impacts would result if the effects resulting from implementation of the proposed action and alternatives would cause a permanent or detrimental increase in criteria air pollutant concentrations or greenhouse gas emissions. Additionally, significant effects would result if project construction or operation would result in pollutant concentrations that permanently exceed the NAAQS or CAAQS and expose sensitive receptors to substantial pollutant concentrations (Table 3-2).

4.2.2 Methodology

The air quality effects discussion includes an analysis of emissions during construction, operation, and maintenance for all alternatives. This evaluation discusses potential air emissions that could occur during construction of each alternative from fugitive dust and construction equipment exhaust. Potential operational and maintenance activities are also discussed. Measures to avoid potential nuisance dust conditions and minimize construction equipment effects are also described.

4.2.3 Direct and Indirect Impacts

4.2.3.1 Alternative A

Under Alternative A (no action), Western would not upgrade or rebuild the existing transmission line system between the Windy Gap Substation and the Granby Pumping Plant Switchyard. Repairs and other maintenance activities would be necessary, with increasing frequency as the transmission line ages. Alternative A would have a negligible effect on air quality in the project region and would not cause or contribute to existing or projected ambient air quality standards violations. Future operational emissions may increase slightly due to increased needs for maintenance of the aging line. However, these emissions would not cause or contribute to existing or projected ambient air quality standards violations. Emissions associated with routine maintenance on the transmission line include direct short-term intermittent generation of dust from vehicle traffic and auguring if poles need to be replaced; short-term intermittent emissions of particulates associated with the use of diesel-powered equipment traveling along the ROW and access roads during line inspections or to get to the line for repairs; and short-term intermittent emissions of ozone, especially associated with hardware conditions and wet weather.

Diesel engine emissions would be sporadic and short term and cause direct impacts to local air quality, but dissipate quickly. The effects on air quality or human health would be expected to be negligible. For routine maintenance, approximately 1-6 diesel-powered vehicles would be expected to be used depending on the type of work that would be performed. Vehicles vary from pickup trucks to pole trucks, backhoes, and truck-mounted cranes. Routine maintenance jobs

are typically of short duration (2 weeks or less), and the equipment does not typically operate in a small area for more than a day or two since it moves along the ROW to sites needing maintenance attention (e.g., vegetation management, structure replacements, hardware replacement, erosion control work).

Alternative A would have no measurable effect on global climate change nor would it be affected in a measurable way by global climate change.

If global climate changes result in more dramatic weather patterns in the Project Area, either in the form of wetter or drier seasons or more severe winter storms, the existing wooden H-frame structures would be at increased risk of damage, such as rotting and ice or wind damage. Subsequently, Western's maintenance and operations demands would also increase and service to the Project Area may be adversely affected as a result of more frequent outages. The existing wooden H-frame structures therefore represent a minor to moderate disadvantage in light of uncertain future global climate conditions.

4.2.3.2 Alternative B1

Construction

Alternative B1 would rebuild and upgrade the existing transmission line from the Windy Gap Substation to the Granby Pumping Plant Switchyard. Alternative B1 would result in short-term construction-related fugitive dust and exhaust emissions. Fugitive dust emissions would be associated with ground disturbance activities, such as site clearing, grading, excavation, and vehicle travel on unpaved roads. Exhaust emissions would occur due to fuel combustion associated with heavy construction equipment, haul trucks, and construction workers traveling to and from the construction sites. The transmission line rebuild is anticipated to take 1-2 years to construct. Construction emissions associated with the rebuild and upgrade would be temporary and minor, and would not lead to an exceedance of NAAQS and CAAQS.

Project construction activities would also include vegetation clearing from the structure location and along the ROW, as necessary. Western would dispose of slash piles and woody debris in a manner acceptable to the county and landowner, but may dispose of the debris by hauling, burning, chipping, or windrowing at the edge of the ROW for stormwater control. If slash burning is required, Western shall comply with the Grand County Burning Management Plan. This includes complying with open burning permit stipulations and complying with the slash piling and burning guidelines.

Private buildings, including residences and unoccupied outbuildings, are located immediately adjacent to or directly under the existing transmission line. A limited number of residents in the ROW may be affected by a temporary increase in fugitive dust. Total construction time at each transmission structure location would be approximately 1-2 weeks spread over a period of 18 months. Therefore, a particular receptor would not be exposed to construction emissions for more than this duration. Thus, project generated emissions of criteria air pollutants and ozone precursors would not expose sensitive receptors to substantial pollutant concentrations.

Fugitive dust emissions during construction are anticipated to occur in minor quantities and would be associated with activities such as site clearing, grading, and excavation. Incorporation of Western's adopted SCPs would ensure that fugitive dust emissions are minimized. These measures are presented in detail in Section 2.4. Additionally, construction generated dust would rapidly settle out of the air, thus avoiding visibility impacts at the RMNP Class I area. Given that

the construction would be temporary, no significant effects to Class I areas are expected to occur from construction.

A principal Hazardous Air Pollutant (HAP) of concern for the proposed action is diesel particulate matter, which would be associated with the use of off-road diesel equipment required for construction activities, in addition to diesel-fueled on-road haul trucks used for hauling debris and construction material. The dose to which sensitive receptors are exposed (a function of concentration and duration of exposure) is the primary factor used to determine health risk (i.e., potential exposure to HAP emission levels that exceed applicable standards). Health risk assessments, which determine the exposure of sensitive receptors to HAP emissions, are usually based on a 70-year exposure period; however, such assessments are limited to the period/duration of activities associated with the project. Construction of the proposed action would be short term (less than 2 years), and the diesel particulate matter emissions would cease after completion of construction. In addition, total construction time at each transmission structure location would be limited to approximately 1-2 weeks. Construction of the proposed action would represent less than 3 percent of the 70-year exposure period for a nearby sensitive receptor in the area. In addition, diesel particulate matter is highly dispersive, and studies have shown measured concentrations of vehicle-related pollutants, including ultra-fine particles, decrease dramatically within approximately 300 feet of the source (Zhu et al 2002).

Therefore, because the use of mobilized equipment would be temporary in combination with the dispersive properties of diesel particulate matter, construction-related HAP emissions would not be anticipated to expose sensitive receptors to substantial pollutant concentrations.

Operations

No adverse air effects are expected from ongoing operation and maintenance associated with Alternative B1. Routine maintenance activities would include ground inspections of the transmission lines once per year, and as needed after weather events, to identify repair or routine maintenance needs. Maintenance activities would include repairing damaged conductors, insulators, or structure components. An occasional maintenance vehicle would be required to perform maintenance activities. Other possible activities include maintenance of permanent access roads and vegetation clearing. Air emissions from these activities are anticipated to be minor.

The potential would exist for trace amounts of ozone production resulting from corona effects, the electrical breakdown of air into charged particles around the conductors, as explained in Section 3.6, Electric and Magnetic Fields. During damp or rainy weather (the peak conditions for corona effects), the 1-hour average ozone concentration produced from similar transmission lines is less than 1 part per billion (ppb) (DOE 2001). Background ozone measurements in Rocky Mountain National Park showed a maximum 1-hour average ozone level of 89 ppb in 2007, considerably higher than levels generated by corona effects (NPS 2008). Maximum generation of ozone from corona effects would be during damp or rainy weather. Therefore, ozone generation associated with corona would be intermittent and minor compared to background levels and fluctuation in background levels. Thus, no adverse effects to air quality would be associated with the operation of Alternative B1.

Alternative B1 would have a minor effect on air quality due to construction and operation, and would not lead to an exceedance of NAAQS and CAAQS.

4.2.3.3 Alternative C1

Alternative C1 would reroute and upgrade the transmission line between the Windy Gap Substation and the Granby Pumping Plant Switchyard. The majority of the rebuild and upgrade would occur on a new 100-foot ROW; the remainder of the upgrade would occur on the existing alignment. The short and long-term effects of Alternative C1 would be similar to Alternative B1, as the alignment difference would not result in a measurable difference in air emissions. The duration, intensity, and nature of construction activities would be very similar across all alternatives. Given the temporary nature of construction and the limited effects during operation, Alternative C1 would have a minor effect on air quality due to construction and operation, and would not lead to an exceedance of NAAQS and CAAQS.

4.2.3.4 Alternative C2

Alternative C2 would reroute and upgrade the transmission line between the Windy Gap Substation and the Granby Pumping Plant Switchyard, with options to use the existing ROW or parallel the Windy Gap Pipeline in a segment just east of the Windy Gap Substation. The short and long-term effects of Alternative C2 would be similar to the other alternatives. Alternative C2 would have a minor effect on air quality due to construction and operation, and would not lead to an exceedance of NAAQS and CAAQS.

4.2.3.5 Alternative D

Alternative D would rebuild and upgrade the existing transmission line from the Windy Gap Substation to the Granby Pumping Plant Switchyard, with options to use the existing ROW or parallel the Windy Gap Pipeline in a segment just east of the Windy Gap Substation. The short and long-term effects of Alternative D would be similar to the other alternatives. Alternative D would have a minor effect on air quality due to construction and operation, and would not lead to an exceedance of NAAQS and CAAQS.

4.2.3.6 Effects Common to All Action Alternatives

For the purposes of this analysis, each of the action alternatives is expected to have similar effects on or as a result of global climate change and is therefore analyzed collectively.

Trees or woody shrubs, which would otherwise eliminate CO_2 from the atmosphere, would be cleared from existing and new ROWs. Western would dispose of cleared vegetation by chipping, lopping, and scattering branches on the ROW. This vegetation would then gradually degrade, releasing small quantities of carbon to the atmosphere over an extended period of time. The effects of ROW clearing under any of the action alternatives is expected to result in negligible effects to or influences on climate change at both the local and global scales.

Given that this project is driven by system reliability concerns, there is no direct connection to increased generation emissions. Due to the relatively low-voltage and small service area, it is likely that the action alternatives would have locally or regionally negligible effects on generation emissions; these effects would be infinitesimal at the global scale. Moreover, the primary generation source of electricity for the service area is hydroelectric, which has minimal air emissions to begin with.

It is highly unlikely that this project would be affected by global climate change. Unlike projects located in coastal, Arctic, or Antarctic environments where sea level fluctuations may threaten infrastructure investments, this project is located in a very stable area.

If global climate change results in more dramatic weather patterns in the Project Area, either in the form of wetter or drier seasons or more severe winter storms, the single-pole steel structures proposed for each of the action alternatives would be better suited to withstand these conditions without damage. The use of single-pole steel structures represents a minor beneficial advantage for the project in light of uncertain future global climate conditions.

4.2.4 Mitigation Measures

Appropriate fugitive dust and exhaust emission control measures would be implemented during construction. Western's adopted SCPs include measures that would minimize air emissions. These measures would be implemented for the construction of any action alternative. No further special mitigation measures are recommended.

4.3 Soil Resources

4.3.1 Significance Criteria

A significant impact on soils would result if any of the following were to occur from construction or operation of the proposed project:

- Long-term loss or reduction in soil productivity and quality resulting from detrimental compaction or rutting, severe erosion, soil mixing, or contamination.
- Increased soil instability and the potential for mass wasting events.
- Impacts to sensitive soils found in wetlands and riparian areas.

4.3.1.1 Overview

The analysis of the impacts to soil resources is based on the assumption that Western's SCPs and project-specific design criteria would be implemented as part of the project. These proposed measures address the compensation for damage to ditches, terraces, and other land features; erosion control correction of rutting and compaction; recontouring; and other practices that would minimize soil resource impacts when implemented. To minimize construction related impacts to soil resources, reclamation would be conducted as soon as practical following surface disturbance.

Appendix E provides a table listing the soils occurring in the analysis area and their relative extent based on each alignment and proposed and alternative routes. Baseline information used to characterize soils was derived from SSURGO database review and Soil Data Viewer for ArcGIS 9.2 analyses. Table 4-1 provides an assessment of the soil characteristics located within the ROW for each alternative. Wind erodible and low reclamation potential soils (soils high in salts or sodium) are not present and will not be discussed further. The calculation of area is based on a ROW width of 100 feet, which reflects the area of potential disturbance but it is not anticipated that all areas within the ROW would be disturbed.

Table 4-1. Soil Characteristics for each Alternative (acres).

Alternative	Water Erosion-Prone	Compaction-Prone	Farmland of Statewide Importance	All Soil Components Hydric	Partially Hydric	Shallow Depth to Bedrock
Alternative A-Existing	6.0	19.8	22. 5	5.0	22.2	4.4
Alternative B1	18.2	64.7	31.3	12.4	16.4	10.8
Alternative C1	8.2	59.2	36.5	10.3	20.2	6.6
AlternativeC2-Option 1	8.2	61.2	35.5	10.3	20.2	6.6
Alternative C2-Option 2	8.2	60.4	40.0	10.3	20.4	9.8
Alternative D-Option 1	20.7	60.9	30.4	10.3	16.9	6.5
Alternative D-Option 2	20.7	59.8	35.0	10.3	17.1	9.7

4.3.2 Direct and Indirect Impacts

Impact assessments were based on a wide range of physical and chemical soil characteristics. The primary impacts that would occur during construction activities are discussed in further detail in subsequent paragraphs. These impacts would apply to all action alternatives.

4.3.2.1 Effects Common to All Alternatives

Erosion by Water and Wind

Susceptibility to erosion is a complex function of characteristics such as soil texture and structure, topography, surface roughness, soil cover (made up of vegetation, duff/litter, rock, and woody debris), and climate. Erosion may also be influenced by the length of time the soils are bare and by disruption of drainage and erosion control structures. Erosion resulting from water occurs primarily on loose, noncohesive soils on moderate to steep slopes, particularly during high intensity storm events. Map 4-1 displays the soils in the Project Area that are prone to water erosion. Soils with steep slopes (slopes greater than 30) area also depicted due to the increased potential for erosion when disturbed.

Although accelerated erosion due to construction related soil disturbance could occur at any stage of construction, the maximum potential for erosion within the construction ROW would be expected when soils are disturbed or loose, in spoil piles, or where there is a lack of soil cover protecting the surface of the soil. Protecting soil from wind and water erosion is essential in areas near waterways.

SCPs and design criteria would be applied to reduce erosion and sedimentation to nearby waterways. Particular attention would be given to erosion and sedimentation controls along steeper slopes.

Soil Productivity

The removal of surface organic matter may limit the soil's ability to function. Surface soil organic matter is essential for nutrient cycling, long-term productivity, and ecosystem function. The majority of soil nutrients and organic matter is located on the surface and, in particular, the A-horizon. In addition, the fine surface litter provides organic matter and ground cover, and reduces raindrop impact and subsequent erosion. Displacement and loss of the A-horizon could

result in a reduction in long-term productivity until soil horizons form and recover, which might take decades or centuries. The mixing of soil horizons would lower soil productivity of agricultural and rangeland by diluting the physical, biological, and chemical properties of the topsoil with less productive subsoil. This could affect reclamation. If topsoil is lost or diluted, mitigation can be difficult because it may take hundreds to thousands of years for a topsoil horizon to form naturally.

Erosion of the topsoil could occur during construction. This could affect nutrient cycling and soil productivity. Rutting may also mix the subsoil and topsoil horizon, thereby diluting the productivity of the soil. Rutting restrictions mitigate this impact.

Soil Compaction and Rutting

Soil compaction occurs when soil particles are pressed together and the pore spaces between them are reduced and bulk density is increased. Moist fine textured soils are most susceptible to severe compaction. However, compaction may occur on loamy to coarse textured soils and under drier conditions due to multiple passes by heavy mechanical equipment. Compaction prone soils in the project vicinity are displayed on Map 4-2.

Rutting occurs when the soil strength is not sufficient to support the applied load from vehicle traffic. Rutting affects the surface hydrology of a site as well as the rooting environment. The process of rutting physically severs roots and reduces the aeration and infiltration of the soil, thereby degrading the rooting environment. Rutting also disrupts natural surface water hydrology by damming surface water flows, creating increased soil saturation upgradient from ruts, or by diverting and concentrating water flows creating accelerated erosion. Rutting is most likely to occur on moist or wet fine textured soils, but may also occur on dry sandy soils due to low soil strength. Soil rutting is an important indication that other physical soil impacts may be occurring on a site.

Soil compaction and rutting could result from the movement of heavy construction vehicles along the construction ROW and on temporary access roads. The degree of compaction would depend on the moisture content and texture of the soil at the time of construction. Compaction would be most severe where heavy equipment operates on moist to wet soils with high clay contents. Detrimental compaction can also occur on soils of various textures and moisture contents if multiple passes are made by high ground-weight equipment. If soils are moist or wet, topsoil may also adhere to tires or tracked vehicles and be carried away. Rutting restrictions help to mitigate these concerns.

Soil that is excessively compacted is limited in its ability to function. Compaction damages soil structure and reduces pore space, which impedes the movement of air and water to plant roots, and can result in lower growth rates and hinder revegetation. Compaction reduces infiltration and results in excessive surface runoff, erosion, nutrient loss, and potential water quality problems. Detrimental soil compaction, when extreme and unmitigated, can result in a loss in soil productivity.

Hydric Soils

A hydric soil is defined by the U.S. Department of Agriculture as soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. These soils, under natural conditions, are either saturated or inundated long enough during the growing season to support the growth and reproduction of

hydrophytic vegetation. Hydric soils are sensitive to vehicle traffic due to frequent saturation. Map 4-3 displays hydric soils crossed by the proposed alternatives.

Soil Contamination

Soil contamination along the proposed routes could result from material spills during construction. If large spills occur, it could result in the removal and disposal of large amounts of soil. Back-filling with clean soil may be required, depending on the volume of excavated material.

Saturated soils may have the potential to diffuse contaminants. Design criteria that buffers wetlands and water bodies from refueling or fuel storage would help prevent spills in saturated areas.

Roads

The direct effect of roads is removal of land from the growing base. Indirect effects may include landslides, gullies, and generation of side cast materials (sediment); and disruption and interception of subsurface flow of water could alter soil moisture regimes upslope and downslope from the road. Other indirect effects may be trespass and off-road use.

Road closure, which involves barricading the road to inhibit vehicular use, helps reduce effects. However, erosion, compaction, and flow diversion may persist until roads revegetate and pore space is increased. Decompaction is essential for infiltration and acceleration of revegetation.

4.3.2.2 Alternative A

Alternative A would not upgrade or rebuild the existing transmission line system, resulting in no new temporary or permanent removal of soils for the transmission line components or substations. Alternative A would result in minimal direct, indirect, or cumulative effects to soils in the Project Area. Activities associated with the maintenance and repairs of the existing line, including soil compaction and other disturbances, would result in minor short-term effects in localized areas. Maintenance frequency is expected to increase as the line ages.

4.3.2.3 Alternative B1

Alternative B1 would upgrade and rebuild the existing transmission line within the existing ROW. Much of the soil disturbance would occur within the existing ROW. Minor adverse temporary impacts from construction activities would occur within the ROW due to construction traffic along the ROW, temporary staging areas, and work areas around each structure. Permanent structures would impact approximately 0.05 acre of soils.

Since the specific locations of each structure or access road cannot be defined at this time, soil conditions are characterized for the entire ROW.

Within the ROW for Alternative B1, soil inventories indicate that fine textured soils are common. These soils are prone to rutting and compaction when wet or moist. There is a potential for encountering localized areas of hydric soils on approximately 29 acres of the ROW. Approximately 11 acres of soils have hard bedrock within 60 inches of the surface. Rock drilling may be necessary in these areas; blasting will not be allowed. Map 4-4 displays the locations where soils with shallow bedrock may occur. Approximately 18 acres of soils within the ROW are highly erodible. Runoff and erosion controls would be implemented within the ROW in

accordance with National Pollutant Discharge Elimination System (NPDES) and stormwater construction permit requirements for construction. Particular attention would be given to erosion and sedimentation controls at or near stream banks and along steeper slopes.

4.3.2.4 Alternative C1

Alternative C1 would reroute and upgrade the transmission line. Most of the soil disturbance would occur on a new length of ROW. Minor adverse temporary impacts would occur within the ROW due to construction traffic along the ROW, temporary staging areas, and work areas around each structure.

Within the ROW for Alternative C1, soil inventories indicate that fine textured soils are common. These soils are prone to rutting and compaction when wet or moist. There is a potential for encountering localized areas of hydric soils on approximately 31 acres of the ROW. Approximately 7 acres of soils have hard bedrock within 60 inches of the surface. Rock drilling may be necessary in these areas; blasting will not be allowed. Approximately 8 acres of soils within the ROW are highly erodible. NPDES and stormwater permit requirements would be the same as described for Alternative B1.

4.3.2.5 Alternative C2

Alternative C2 would reroute and upgrade the transmission line with options to use the existing ROW. Chapter 2.0 provides further detail on the routing for Alternative C2 and Options 1 and 2. Temporary impacts would occur within the ROW due to construction traffic along the ROW, temporary staging areas, and work areas around each structure.

Within the ROW for Alternative C2, soil inventories indicate that fine textured soils are common. These soils are prone to rutting and compaction when wet or moist. There is a potential for encountering localized areas of hydric soils on approximately 31 acres of the ROW. The acreage of soils that are potentially highly erodible would be the same as described for Alternative C1. The primary difference between soil characteristics for Alternative C2-Option 2 is approximately 10 acres of soils have hard bedrock within 60 inches of the surface compared to 7 for Alternative C1. NPDES and stormwater permit requirements would also be the same as described for Alternative B1.

4.3.2.6 Alternative D

Alternative D would upgrade and rebuild the existing transmission line with options to use the existing ROW. Chapter 2.0 provides further detail on the routing for Alternative D and Options 1 and 2. Temporary impacts would occur within the ROW due to construction traffic along the ROW, temporary staging areas, and work areas around each structure.

Within the ROW for Alternative D, soil inventories indicate that fine textured soils are common. These soils are prone to rutting and compaction when wet or moist. There is a potential for encountering localized areas of hydric soils on approximately 27 acres of the ROW. Approximately 7 acres of soils have hard bedrock within 60 inches of the surface. Rock drilling may be necessary in these areas; blasting will not be allowed. The soil characteristics for Option 2 are similar, with the exception of approximately 10 acres of soils that have hard bedrock within 60 inches of the surface. Approximately 20 acres of soils within the ROW are highly erodible. NPDES and stormwater permit requirements also would be the same as described for Alternative B1.

4.3.3 Mitigation Measures

Western's adopted SCPs and project-specific design criteria include measures that would minimize soil impacts. These measures would be implemented for the construction of any action alternative. No further special mitigation measures are recommended.

4.4 Paleontological Resources

FLPMA mandates the treatment of paleontological resources as a scientific value (FLPMA section 102[8]). The Paleontological Resources Preservation Act (section 6302[a]) requires that paleontological resources on public lands (or affected by federal actions) be managed using scientific principles and expertise. For the purpose of this analysis, scientifically significant paleontological resources are defined as vertebrate fossils that are identifiable to taxon or element, noteworthy occurrences of invertebrate and plant fossils, and vertebrate trackways.

Paleontological resources within the study area may be classified in one of two categories: 1) those which have already eroded onto the ground surface and are thus visible (surface fossils); and 2) those that are still buried within rock strata and are thus not visible (subsurface fossils). Surface fossils may be located during a field survey, evaluated, and salvaged by paleontologists prior to a surface disturbing action. Because they are not visible, subsurface fossils cannot be located and evaluated prior to ground disturbance. Rather, the likelihood of adverse effects on subsurface fossils can only be estimated by determining the number and types of fossils that have been previously discovered within the study area and elsewhere within the same fossil-bearing geologic units (formations, members, submembers, and individual strata). The existence of subsurface fossils can only be ascertained by monitoring excavations during a surface-disturbing action. Thus, it is not possible to precisely quantify impacts on subsurface fossils prior to their discovery because their locations are unknown.

It is important to point out that subsequent to the location and removal of surface fossils during a paleontological field survey and issuance of a surface clearance recommendation, additional subsurface fossils will continue to erode onto the ground surface over time. This effect is particularly prevalent in areas that are prone to high rates of erosion.

The potential for adverse impacts to both surface and subsurface paleontological resources is directly proportional to the amount of ground disturbance associated with a proposed action. Thus, the higher amount of surface disturbance associated with development, the greater the potential for adverse impacts to paleontological resources.

4.4.1 Significance Criteria

Significance criteria and impact thresholds have not been formalized for NEPA analyses of paleontological resources. However, in keeping with established professional standards, and because of the fact that paleontological resources are nonrenewable, the threshold for significant impacts to paleontological resources may be considered to be reached with the damage or destruction of fossils that are scientifically significant and the loss of associated scientific information. This includes destruction as the result of surface and subsurface disturbance as well as unlawful vandalism and unauthorized collection of fossil remains.

4.4.2 Methodology

Because no scientifically significant surface fossils were identified within any of the ROWs of the proposed alternatives, surface fossils are irrelevant to this analysis. Because the locations of subsurface fossils are unknown, the first step in the analysis was to determine the paleontological sensitivity of the geologic units within the study area based on published scientific literature and museum records (see Section 3.4). The results of the sensitivity analysis indicate that the Troublesome Formation is the only geologic unit within the study area with a high potential to contain subsurface vertebrate fossils. Three museum fossil localities in this unit have been previously recorded within the study area. Because the potential for impacts to subsurface fossils is directly proportional to the amount of ground disturbance in paleontologically sensitive geologic units, the anticipated amount of ground disturbance under each alternative was used to analyze the potential for impacts on subsurface fossils.

4.4.3 Paleontology-Specific Impact Definitions

The following are definitions of types of direct and indirect impacts and related effects on paleontological resources, followed by an analysis of impacts anticipated under each alternative. Because paleontological resources are nonrenewable, direct and indirect effects that result in their loss are considered to be long term.

4.4.3.1 Direct Impacts

Direct impacts on nonrenewable surface or subsurface paleontological resources are the result of destruction by breakage and crushing during surface disturbing actions. Surface disturbance has the potential to impact an unknown quantity of fossils that may occur on or underneath the surface in areas containing paleontologically sensitive geologic units. Without mitigation, these fossils, as well as the paleontological data they could provide if properly salvaged and documented, could be destroyed, rendering them permanently unavailable. Direct impacts can typically be mitigated to below a level of significance through implementation of paleontological mitigation. Mitigation also results in the salvage of fossils that may never have been unearthed as the result of natural processes, thus creating a beneficial impact. With mitigation, these newly exposed fossils become available for scientific research, education, display, and preservation at a public museum.

Direct impacts on surface fossils associated with the proposed transmission line rebuild are anticipated to be negligible because no scientifically significant fossil localities were identified within the ROW of the proposed alternatives during the field survey. Direct impacts on subsurface fossils are likely if these resources are present at the locations of any project-related excavations.

4.4.3.2 Indirect Impacts

Indirect impacts typically include those effects that result from the continuing implementation of management decisions and associated activities. For paleontological resources, they most commonly occur as the result of management actions that increase the accessibility of public lands, increasing the potential for loss of paleontological resources by vandalism and unlawful collecting (poaching). Indirect impacts are difficult to mitigate to below the level of significance, but they can be greatly reduced by increasing public awareness about the scientific importance of paleontological resources through education, community partnerships, and interpretive displays,

as well informing the public about penalties for unlawful destruction or unlawful collection of these resources from public lands.

Indirect impacts associated with the proposed transmission line rebuild are anticipated to be negligible.

4.4.4 Direct and Indirect Impacts

As indicated in Section 4.4.3, direct impacts on subsurface (buried) paleontological resources are the only impacts that are anticipated to be possible given the results of the field survey and combined with the nature of the ground disturbance associated with the proposed project. Therefore, the following impacts analysis is focused on potential direct impacts on subsurface fossils only.

Under each action alternative, installation of steel power poles constitutes the only significant ground disturbance. The ROW width, average span of poles, maximum span of poles, and pole diameters are identical (5 feet) under all action alternatives. Installation of power poles would involve significant bedrock disturbance by auguring and possibly other excavation equipment. Construction staging areas are not anticipated to have a significant effect on fossiliferous bedrock Troublesome Formation. However, in portions of the study area underlain by high sensitivity Troublesome Formation strata, impacts on paleontological resources are possible wherever excavations for each power pole occur, and in the surrounding areas of surface disturbance (temporary and permanent) at each pole location.

4.4.4.1 Alternative A – No Action

No new impacts on paleontological resources are anticipated under the no action alternative.

4.4.4.2 All Action Alternatives

Each of the action alternatives would have a similar amount of temporary and permanent land disturbance. The potential for impacts to paleontological resources would also be similar for each alternative and difficult to quantify (see discussion of mitigation measures that follows).

4.4.5 Mitigation Measures

In addition to project-specific design criteria described in Chapter 2.0, the following resource-specific mitigation measures are recommended.

The Troublesome Formation is the only geologic unit for which paleontological mitigation is recommended. The development and implementation of a project-specific mitigation strategy for paleontological resources is appropriate because 1) the Troublesome Formation is considered to have high paleontological sensitivity; and 2) although no new significant surface fossils were documented during the field survey undertaken for this analysis, three previously recorded vertebrate fossil localities occur within or immediately adjacent to one of the proposed alternatives. This indicates that the Troublesome Formation is fossiliferous in the study area vicinity, and that bedrock disturbance has the potential to adversely impact scientifically significant paleontological resources.

Prior to construction, a qualified and permitted paleontologist should examine the construction design plans and develop an appropriate mitigation monitoring program. Monitoring of

numerous prior excavations in fossiliferous rock performed with augers has demonstrated that the auguring process is highly destructive to fossils because the rock and fossils preserved therein are pulverized during excavation. The smaller the auger, the more likely the destruction of fossils. Small mammal fossils have been salvaged from rock excavated using larger diameter augers, depending upon the degree to which the rock fractures during the auguring process. Because it is not known how Troublesome Formation rock will respond to auguring and whether fossils will remain intact given the size of the auger to be used, it is recommended that testing (including screenwashing of excavated matrix at one or two power pole installation sites) take place as an initial step to determine whether intact fossils can be salvaged from the auguring locations. If intact fossil are recovered, or are likely to be recoverable given the condition of the augured rock, additional monitoring of power pole installation sites is recommended with the goal of fossil salvage. If project excavations are conducted using other types of digging equipment, monitoring of these sites is recommended since they are likely to produce larger fragments of rock that are more suitable to fossil recovery. If it is determined that, for whatever reason, intact identifiable fossil remains would be unlikely to be recovered from any project excavations, the monitoring program should be suspended.

In the absence of a paleontological monitor, if subsurface fossils or other potential bones are encountered within the study area during construction, excavations within a 50-foot radius of the site should cease immediately, and a qualified and permitted paleontologist should be called to assess the discovery and make additional recommendations.

4.5 Cultural Resources

4.5.1 Significance Criteria

The following significance criteria were used to assess potential impacts to cultural resources as a result of project alternatives.

Disturbance to a cultural resource that is eligible for or is listed on the NRHP would be considered a significant impact. Sites are evaluated for the NRHP with regard to their research value and tangible links to important persons or historical events. Direct impacts to cultural resources could occur from ground-disturbing activities associated with the proposed transmission line rebuild (i.e., earth moving activities needed for construction of the new proposed transmission line and substation expansions, and dismantling of the existing transmission line), as well as the upgrade and use of existing access roads and the construction of new roads to structure sites within the ROW. Cultural resources may also be subject to indirect impacts that may result from increased access due to new or upgraded access roads or vandalism to sites by the general public.

4.5.2 Methodology

The analysis area for cultural resource investigations includes a corridor width of 200 feet centered on the proposed alignments and a corridor width of 50 feet centered on access roads. The analysis focuses on sites within the analysis area that are considered potentially eligible, that may be impacted by the project, or sites on the NRHP. These sites fall into three categories: sites needing additional data to formulate a NRHP recommendation, sites recommended as eligible, and sites officially eligible.

4.5.3 Impacts Common to All Alternatives

All alternatives would potentially impact the sites shown in Table 4-2. Note that alternatives following a different alignment than the existing transmission line would still affect resources along the alignment of the existing line through removal of the existing structures. Also, though the level of disturbance at any point in time may be less, over time the no action alternative and the more intensive maintenance required to keep the existing line in operation could also adversely affect these sites. For each site shown in Table 4-2, specific recommendations are provided to avoid disturbance or conduct additional testing if avoidance is not practical. The final treatment of sites in the alternative ROWs, and mitigations for adverse effects, will be determined in consultation with the SHPO under Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. Consultation with the SHPO is on-going (correspondence is included in Appendix K).The application of Western's SCPs (Table 2-5) would avoid significant impacts to known cultural resources and minimize the risk of adverse effects to previously unrecorded sites.

4.5.3.1 Sites Recommended as Needing Additional Data

Seven (7) sites have been recommended or have been officially determined to need additional data in order to formulate a NRHP evaluation recommendation. These sites may be associated with significant persons or events in the history of the area, or may be able to provide additional important information on the prehistory of the area. Although each of these sites requires further information to make a NRHP eligibility evaluation, not all of these sites would be impacted by the proposed activities. Recommendations for the need data sites include avoidance or test excavations, and the conduct of historic research.

For sites needing additional data before a NRHP eligibility recommendation can be made, avoidance or test excavations are recommended. These sites have the potential to yield important information on the prehistory of the area (Criterion D), including information on chronology, lithic technology, and settlement/subsistence. All of the sites are located in deposits that have a high probability of yielding intact, buried cultural materials. It is recommended that these sites be avoided or test excavations be conducted in the areas of potential effect to determine if significant deposits are present.

Table 4-2. Sites Potentially Affected by All Alternatives.

Site Type	Recorded By	Ownership	NRHP	Project Impacts/ Project Effects	Management Recommendations
Open Camp	RMC 2005 (this report); RMC 2001; WCRM 1978, 1981, 1982	Private	Recommend Eligible	Removal of existing structures; placement of new metal tower within site Boundary/Unknown Effect	Avoid site or test within ROW to determine potential project effects
Prehistoric Lithic Scatter	RMC 2005 (this report); WCRM 1981	USDA Forest Service – Arapaho National Recreation Area	Recommend Needs Data	Removal of structure and placement of new metal towers; upgrading of unimproved access road /Unknown Effect	Avoid impacts to site or test for eligibility and project effects
Prehistoric Open Camp	RMC 2005 (this report); RMC 2001; WCRM 1981	Private	Recommend Needs Data	Removal of existing structure; placement of new metal tower within site boundary /Unknown Effect	Avoid impacts to site or test for eligibility and project effects
Prehistoric Open Camp/Lithic Procurement	RMC 2005 (this report); WCRM 1981, 1982	BLM-Kremmling Field Office	Officially Eligible	Possible visual impacts to potential TCP /Adverse Effect	Native American consultation on visual impacts to stone cairn (Feature 1)
Prehistoric Open Camp	RMC 2005 (this report); RMC 2001; Forest Service 1998	Arapaho and Roosevelt National Forest	Officially Needs Data	Continued vehicle usage and potential upgrading of unimproved access roads /Unknown Effect	Restrict vehicle travel across site or test to determine eligibility and project effects
Historic Transmission Line	RMC 2005 (this report); RMC 2001; ACRE 1998	Western Area Power Administration	Recommend Eligible	Removal of existing structures/Adverse Effect	Avoid or assess integrity of pole structures. If contributing follow recommendations of Schweigert (1998:5-117)

Site Type	Recorded By	Ownership	NRHP	Project Impacts/ Project Effects	Management Recommendations
Granby-Windy Gap Transmission Line	RMC 2005 (this report); ACRE 1998	Western Area Power Administration	Recommend Eligible	All wooden structures on line to be replaced with metal ones /Adverse Effect	Avoid or assess integrity of pole structures. If contributing follow recommendations of Schweigert (1998:5-117)
Historic Irrigation Ditch	RMC 2005 (this report); RMC 2001	Private/ BLM-Kremmling Field Office	Recommend Needs Data	Removal of existing structures, placement of metal towers; stringing of conduit and groundwire; vehicle travel along ROW; reseeding and reclamation /No Adverse Effect	Monitor construction
Historic Irrigation Ditch	RMC 2005 (this report); RMC 2001	Private	Recommend Needs Data	Removal of existing structures; placement of metal towers; stringing of conduit and groundwire ; vehicle travel along ROW; reseeding and reclamation /No Adverse Effect	Monitor Construction
Prehistoric Lithic Scatter	RMC 2005	Forest Service, Arapaho-Roosevelt National Forest	Recommend Needs Data	Upgrading of unimproved access road and vehicular travel in ROW /Unknown Effects	Avoid impacts to site or test site to determine eligibility and project effects
Historic Ditch	RMC 2005	Private	Recommend Needs Data	Removal of existing structures ; placement of new metal towers ; stringing of conduit and groundwire; vehicle travel along ROW; reseeding and reclamation /No Adverse Effect	Monitor Construction

Table 4-3. Additional Sites Potentially Affected by Alternatives C1 and C2.

Site Type	Recorded By	Ownership	NRHP	Project Impacts/ Project Effects	Management Recommendations
Prehistoric Lithic Procurement/Open Camp/Architectural Site	RMC 2005 (this report); BLM- Kremmling 1994; WCRM 1981, 1982; U of Colorado 1976	BLM-Kremmling Field Office/Private	Officially Eligible	Potential new tower structure in northern saddle locality; upgrading of unimproved access road; upgrading of unimproved access road	Avoid or test tower location in northern saddle area and within ROW of unimproved access roads where they cross northern saddle area and lower terrace to determine project effects
Prehistoric Lithic Procurement/Open Camp	RMC 2005 (this report); BLM Kremmling 1995; WCRM 1982, 1981; U of Colorado 1977; U of Colorado 1976	Private	Officially Eligible	Only noncontributing portions impacted/No Adverse Effect	No further work
Prehistoric Habitation Site	RMC 2007 (this report); WCRM 1982, 1981, 1978; U of Colorado 1976	Northern Colorado Water Conservancy District	Officially Eligible	Only noncontributing portions impacted/No Adverse Effect	No further work
Prehistoric Open Camp/Historic Artifact Scatter	RMC 2005 (this report); Gordon & Kranzush 1977; BLM-Craig District Office 1976	Private	Recommend Eligible	None- site is outside current project ROW/No effect	No further work
Historic Ditch	RMC 2005	Private-unknown	Recommend Needs Data	Placement of metal tower structures; stringing of conduit and groundwire ; vehicle travel along ROW; reclamation and reseeding /No Adverse Effect	Monitor Construction

Site Type	Recorded By	Ownership	NRHP	Project Impacts/ Project Effects	Management Recommendations
Prehistoric Lithic Procurement/Open Camp & Historic Artifact Scatter	RMC 2005	Northern Colorado Water Conservancy District	Recommend Needs Data	Placement of new metal tower within site boundary (Alt. C); upgrading of unimproved access road (Alt. C)/Unknown Effect	Avoid impacts to site or test site to determine eligibility and project effects
Prehistoric Lithic Scatter	RMC 2005	Northern Colorado Water Conservancy District	Recommend Eligible	Vehicular travel on access road and upgrading of the access road/Adverse Effect	Avoid site
Prehistoric Lithic Procurement/Open Camp & Historic Artifact Scatter	RMC 2005	Northern Colorado Water Conservancy District	Recommend Needs Data	Upgrading of unimproved access road /Unknown Effect	Avoid impacts to site or test site to determine eligibility and project effects

Source: RMC 2007; RMC 2008

4.5.3.2 Sites Recommended as Eligible

Four sites are either recommended as eligible or have been officially determined to be eligible for nomination to the NRHP. These sites have either demonstrated their potential to yield additional important information on the prehistory of the area (Criterion D), or are associated with significant historic events (Criterion A) and represent a unique method of construction (Criterion C). Two of the recommended eligible sites are existing, wooden line structures, which would be replaced by new steel structures. The integrity of the wood structures would be further evaluated and other mitigation applied (Schweigert 1988) before these structures would be removed. The third recommended eligible site, an open campsite, would be avoided or further tested prior to disturbance. One additional site has been determined to be officially eligible. This site, a prehistoric open camp/lithic procurement site, would not be directly affected but would have a visual effect. Consultation would occur with Native Americans to determine if impacts to a TCP would occur, as shown in Table 4-3.

4.5.3.3 Alternatives A

Alternative A would have the same effects described for Impacts Common to All Alternatives.

4.5.3.4 Alternative B1

Alternative B1 would have the same effects described for Impacts Common to All Alternatives. In addition, Alternative B1 may affect one additional site, a prehistoric lithic scatter that has been identified as needing additional data. This site would be avoided or further tested if avoidance was not practical.

4.5.3.5 Alternatives C1, C2

In addition to the sites previously discussed, Alternative C1 and C2 (both options) would also potentially affect five additional sites that are either recommended as eligible or have been officially determined to be eligible for nomination to the NRHP. One of these sites, a prehistoric lithic procurement/open camp/architectural site that is officially eligible, would be avoided or further tested to avoid disturbance of any important resources. A second site, a prehistoric lithic scatter, would be avoided to prevent any disturbance. The remaining three sites are outside the area of disturbance and require no further work.

4.5.3.6 Alternative D

Alternative D (both options) would have the same effects described for Impacts Common to All Alternatives.

4.5.4 Mitigation Measures

Western's adopted SCPs and project-specific design criteria include measures that would minimize impacts to cultural resources. These measures would be implemented for the construction of any action alternative. No further special mitigation measures are recommended.

4.6 Electric and Magnetic Fields

4.6.1 Significance Criteria

Since there are no state or federal guidelines regarding EMF, there is no standard by which to evaluate significance, positive, negative, or cumulative.

4.6.2 Methodology

4.6.2.1 Computer Modeling of Electric and Magnetic Fields

Computer modeling was used to evaluate the EMF levels for both the existing and proposed transmission line design. The software program "EMF Workstation," which is an EPRI EMF computer modeling program, was used to perform these field calculations (EPRI 1989). The EMF Workstation software can model the EMF from transmission and distribution lines. EMF Workstation can also model substation equipment, such as power transformers, buswork, circuit breakers, and capacitor banks. The software can also produce two-dimensional magnetic field contour maps of the calculation results, as well as calculation values along a predefined route. For this evaluation, field calculations were performed as profiles extending perpendicularly away from the transmission line center. The magnetic field was calculated as the "maximum value" (semi-major axis of the magnetic field ellipse).

AECOM provided the transmission line geometry information (such as loading, phasing, conductor information, and minimum ground clearance) used to create an EMF Workstation computer model for EMF calculation purposes. Table 4-4 presents a summary of the loading conditions used for the magnetic field calculations as provided by AECOM. A 5 percent overvoltage condition was applied for the electric field and corona-related calculations as a worst case assumption. EMF calculations were performed at 1 meter (3.28 feet) above ground level in accordance with IEEE Standards (IEEE 1994).

Table 4-4. Summary of Loading Conditions for Magnetic Field Calculations.

	Load Condition	
Transmission Line	Normal Load (Amps)	Maximum Load (Amps)
Existing 69-kV	113	394
Proposed 69/138-kV	57/29	293/147

Figure 4-1 and Figure 4-2 present the calculated electric field for the existing 69-kV transmission line and for the proposed 69/138-kV transmission line, respectively. As shown in Figure 4-1, the calculated electric field for the existing transmission line configuration is about 0.956 kV/m at the ROW edges (which is also the maximum electric field within the ROW).

Figure 4-2 presents the calculated electric field for the proposed 69/138-kV transmission line. The calculated electric field for the proposed transmission line configuration is about 0.052 kV/m at the 69-kV ROW edge, about 1.406 kV/m for a maximum electric field within the ROW, and about 0.031 kV/m at the 138-kV ROW edge.

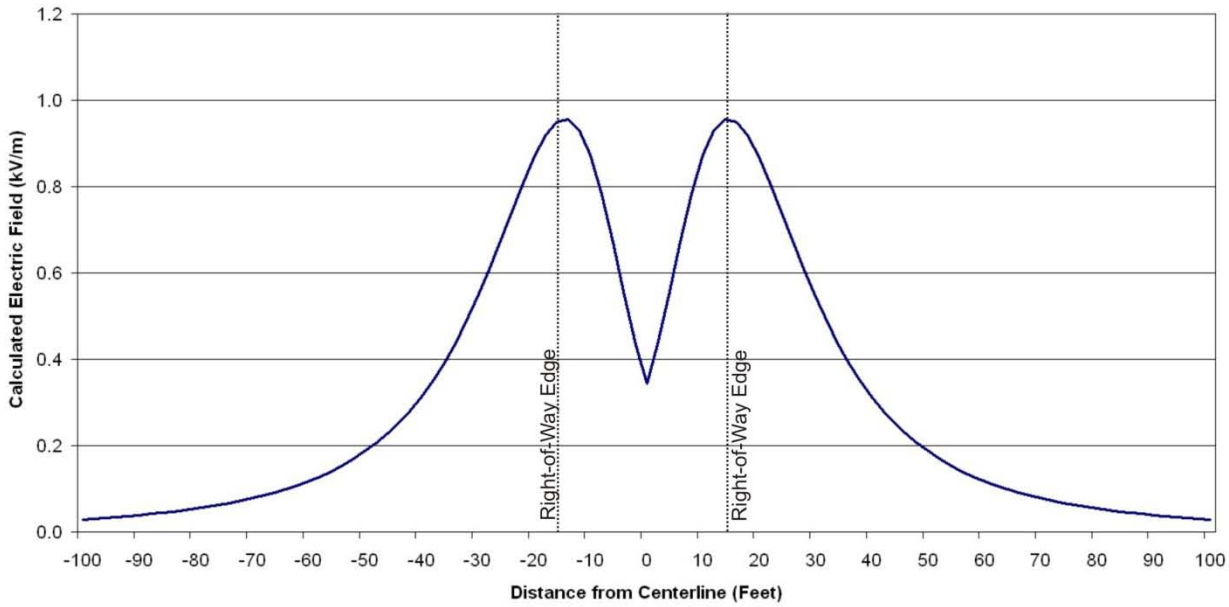


Figure 4-1. Calculated Electric Field for Existing 69-kV Transmission Line.

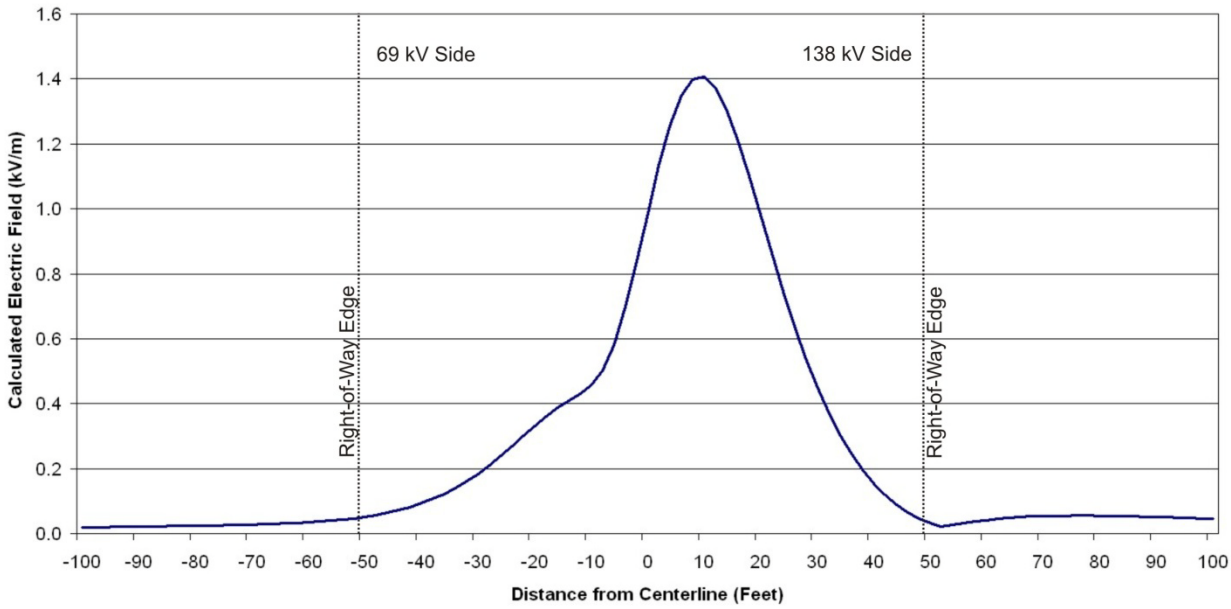


Figure 4-2. Calculated Electric Field for Proposed 69/138-kV Transmission Line.

Calculated electric field levels are lower at the ROW edge for the proposed 69/138-kV transmission line configuration due to the wider ROW width, additional ground clearance, and use of optimum phasing. The maximum electric field level within the ROW increases from an existing field level of 0.956 kV/m-1.406 kV/m for the proposed configuration due to the increased voltage rating of the 138-kV circuit.

Figure 4-3 and Figure 4-4 present the calculated magnetic field for the existing 69-kV transmission line and for the proposed 69/138-kV transmission line, respectively. As shown in Figure 4-3, the calculated magnetic field for the existing transmission line configuration under normal loading conditions is about 23.1 mG at the ROW edges, with a maximum magnetic field within the ROW of 31.0 mG. For maximum loading conditions, the calculated magnetic field for the existing transmission line configuration is about 80.4 mG at the ROW edges, with a maximum magnetic field within the ROW of 108.2 mG.

As shown in Figure 4-4, the calculated magnetic field for the proposed transmission line configuration under normal loading conditions is about 1.6 mG at the 69-kV ROW edge, about 6.5 mG for a maximum magnetic field within the ROW, and about 0.5 mG at the 138-kV ROW edge. For maximum loading conditions, the calculated magnetic field for the proposed transmission line configuration is about 8.0 mG at the 69-kV ROW edge, about 33.3 mG for a maximum magnetic field within the ROW, and about 2.8 mG at the 138-kV ROW edge.

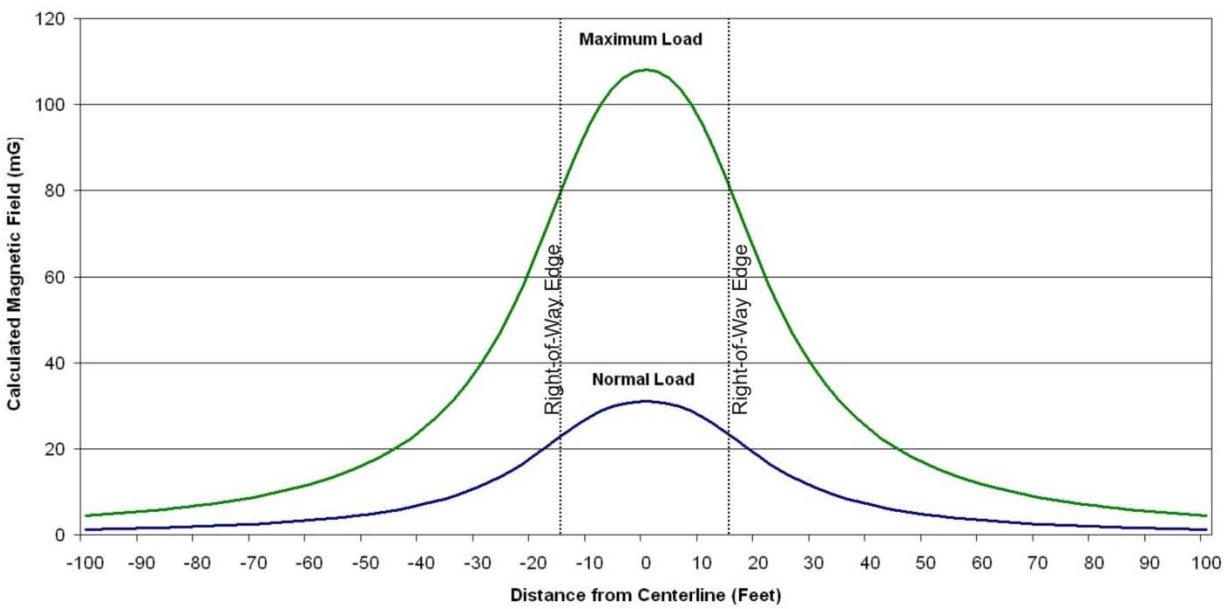


Figure 4-3. Calculated Magnetic Field for Existing 69-kV Transmission Line.

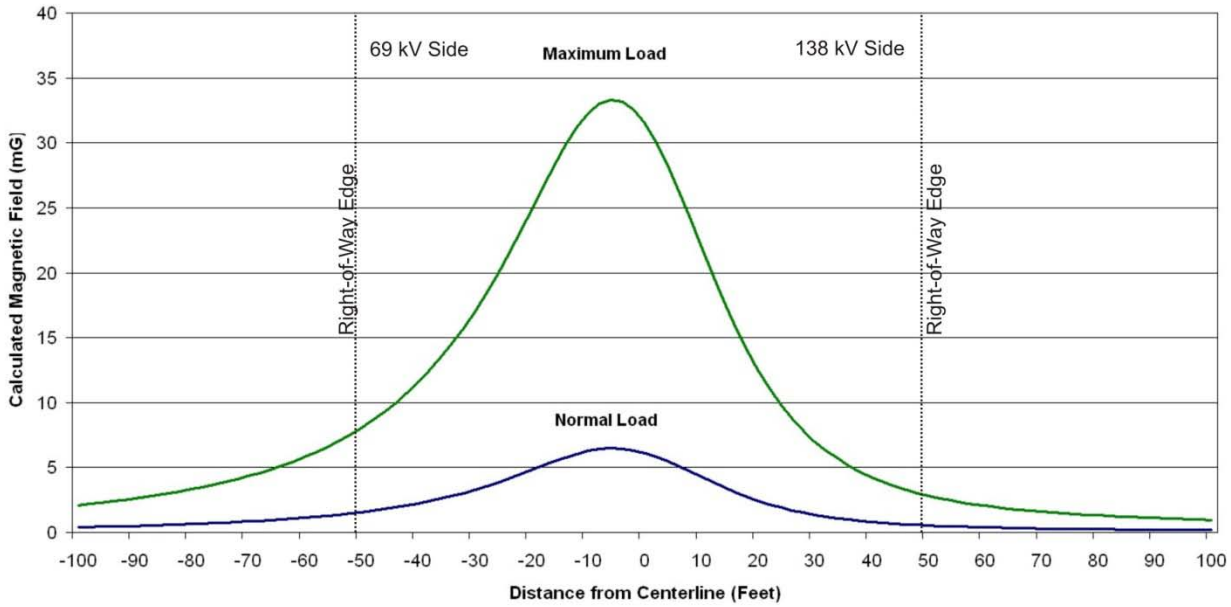


Figure 4-4. Calculated Magnetic Field for Proposed 69/138-kV Transmission Line.

Calculated magnetic field levels are lower at the ROW edge for the proposed 69/138-kV transmission line configuration due to wider ROW width, additional ground clearance, and use of optimum phasing. The maximum magnetic field level within the ROW decreases from an existing field level of 31.0 mG under normal loading to 6.5 mG for the proposed configuration due to the vertical configuration used for each of the proposed circuits, additional ground clearance, optimum phasing arrangement, and lower loading (less amperes).

Table 4-5 and Table 4-6 summarize the calculated EMF levels, respectively, for both the existing 69-kV and the proposed 69/138-kV transmission line configurations. Detailed EMF calculation results are presented in Appendix I.

Table 4-5. Summary of Electric Field Calculation Results.

	Calculated Electric Field (kV/m)		
Transmission Line	ROW Edge	Max on ROW	ROW Edge
Existing 69-kV	0.956	0.956	0.956
Proposed 69/138- kV	0.052	1.406	0.031

Table 4-6. Summary of Magnetic Field Calculation Results.

	Calculated Magnetic Field (mG)					
	Normal Load			Maximum Load		
Transmission Line	ROW Edge	Max on ROW	ROW Edge	ROW Edge	Max on ROW	ROW Edge
Existing 69-kV	23.1	31.0	23.1	80.4	108.2	80.4
Proposed 69/138-kV	1.6	6.5	0.5	8.0	33.3	2.8

4.6.2.2 Computer Modeling of Audible Noise

Computer modeling of the existing 69-kV transmission line and the proposed 69/138-kV transmission line were performed to calculate potential audible noise levels due to the operation of the lines. The EMF Workstation software (EPRI 1989) was used to perform these audible noise calculations. For this evaluation, field calculations were performed as profiles extending perpendicularly away from the transmission line center. Transmission line geometry information used for the computer calculations was provided by AECOM. A 5 percent over-voltage condition was modeled with average conductor heights at an altitude of 8,500 feet.

Figure 4-5 and Figure 4-6 present the calculated audible noise levels for the existing 69-kV transmission line and for the proposed 69/138-kV transmission line, respectively. As shown in Figure 4-5, there is no fair weather noise from the existing 69-kV transmission line and very little noise during rainy conditions (maximum calculated audible noise of 5.9 dBA for L50 rain within the ROW).

Figure 4-6 presents the calculated audible noise levels for the proposed 69/138-kV transmission line. The calculated audible noise levels during fair weather (L50 fair) for the proposed transmission line configuration are about 29.4 dBA at the 69-kV ROW edge, about 32.2 dBA for a maximum noise level within the ROW, and about 30.2 dBA at the 138-kV ROW edge. During foul weather (L50 rain), calculated audible noise levels for the proposed transmission line configuration is about 39.1 dBA at the 69-kV ROW edge, about 41.9 dBA for a maximum noise level within the ROW, and about 39.9 dBA at the 138-kV ROW edge.

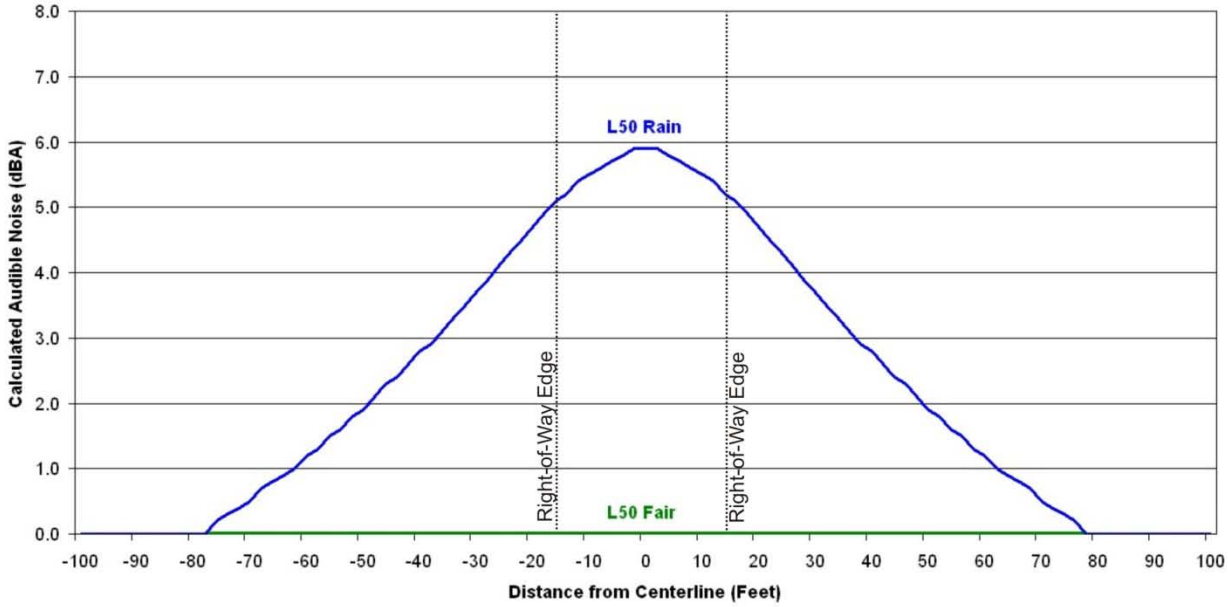


Figure 4-5. Calculated Audible Noise Levels for Existing 69-kV Transmission Line.

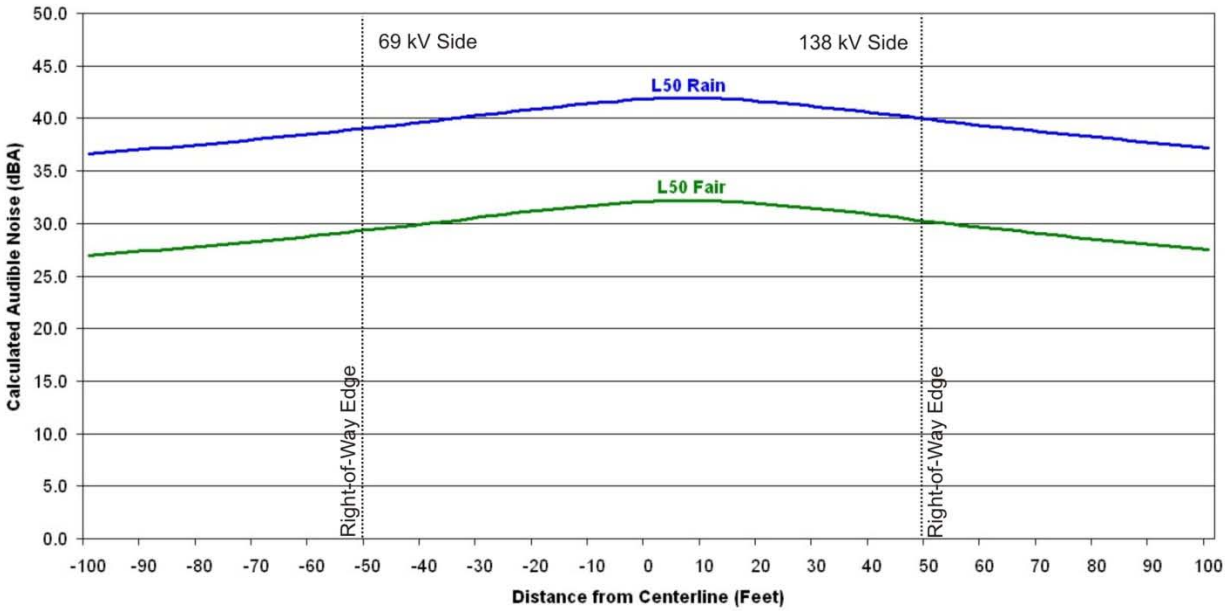


Figure 4-6. Calculated Audible Noise Levels for Proposed 69/138-kV Transmission Line.

Table 4-7 presents a summary of the calculated audible noise levels for the project. Calculated audible noise levels are higher at the ROW edges for the proposed 69/138-kV transmission line configuration due to the addition of the higher voltage 138-kV circuit and circuit configuration. The noise levels are also a result of the higher elevation (8,500 feet). At higher elevations, the effect of changing air density lowers the corona inception point and there is more corona activity, which produces higher audible noise. Nevertheless, these are very low levels, and it is likely that corona-related audible noise would not be heard under most practical conditions for this transmission line.

Table 4-7. Summary of Audible Noise Calculation Results.

	Calculated Audible Noise (dBA)					
	L50 Fair			L50 Rain		
Transmission Line	ROW Edge	Max on ROW	ROW Edge	ROW Edge	Max on ROW	ROW Edge
Existing 69-kV	0.0	0.0	0.0	5.1	5.9	5.1
Proposed 69/138-kV	29.4	32.2	30.2	39.1	41.9	39.9

4.6.2.3 Calculated Radio and Television Noise Levels

The Bonneville Power Administration (BPA) Corona and Field Effects (BPA 1977) program was used to calculate interference levels for radio and TV signals. The calculated fair weather radio noise level at either edge of the existing 69-kV transmission line ROW (15 feet from centerline) is 22.8 dBµV/m at 1 MHz (center of the AM radio band), while the calculated fair weather radio noise level for the proposed 69/138-kV transmission line is 37.7 dBµV/m on the 69-kV side and 40.6 dBµV/m on the 138-kV side at the proposed ROW edge (50 feet from centerline). For foul weather, the calculated radio noise level at either edge of the existing 69-kV transmission line ROW is 39.8 dBµV/m, while the calculated foul weather radio noise level for the proposed 69/138-kV transmission line is 54.7 dBµV/m on the 69-kV side and 57.6 dBµV/m on the 138-kV side at the proposed ROW edge. These noise levels are more than other typical 69/138-kV lines, primarily due to the assumed 8,500-foot elevation.

For AM radio stations, there are three types of service areas: (1) primary service area, (2) secondary service area, and (3) intermittent service area (FCC 2008). **Primary service** areas are defined as “areas of a broadcast station in which the ground wave is not subject to objectionable interference or objectionable fading.” The ground wave signal strength required to render primary service is 66 dB for communities with populations of 2,500 or more, and 54 dB for communities with populations of less than 2,500. **Secondary service** areas are defined as “areas of a broadcast station served by the sky wave and not subject to objectionable interference, and in which the signal is subject to intermittent variations in strength.” Secondary service is provided during nighttime hours in areas where the sky wave field strength, 50 percent or more of the time, is 54 dB or greater. Satisfactory secondary service to cities is not considered possible unless the field strength of the sky wave signal approaches or exceeds the value of the ground wave field strength that is required for primary service. Secondary service is subject to some interference and extensive fading, whereas primary service areas of a station are subject to no objectionable interference or fading. **Intermittent service** areas are defined as “areas receiving service from the ground wave of a broadcast station but beyond the primary service area, and subject to some interference and fading.” Intermittent service is rendered by the ground

wave, and begins at the outer boundary of the primary service area and extends to a distance where the signal strength decreases to a value that is too low to provide any service.

The EPRI AC Transmission Line Reference Book (EPRI 1982) provides radio noise design guide curves for assessing AM radio interference. A signal-to-noise ratio of 24 dB (grade B4) provides very good reception with no intrusive background noise, and a signal-to-noise ratio of 20 dB (grade C3) provides fairly satisfactory reception with plainly evident background noise. Calculated AM radio noise levels due to corona were compared to signal strength maps from public sites on the internet (many provide the signal strength data/maps from their FCC license submission) for the Granby area. There are approximately eight AM station signal coverage areas with primary coverage in the Granby area (66 dB or greater), five secondary signal coverage areas (54 dB or greater), and a couple of intermittent AM station signal coverage areas. Evaluation of the signal strengths reveals that AM stations would typically have good signal-to-noise ratios (20+ dB) for fair weather. This is not true for some stations with weaker signals. In rain, the radio noise is estimated by the BPA software program to be 17 dB microV/m higher than fair weather, and many AM stations may experience interference if an AM radio is used on or close to the ROW in rain.

Radio noise due to corona quickly attenuates with increasing frequency, so noise levels are much lower at FM radio and TV frequencies (over 30 dB less at 100 MHz based on curves from the EPRI AC Transmission Line Reference Book). More importantly, FM radio uses a modulation scheme that provides a high degree of immunity to corona type impulse noise. A survey of FM radio station signal strengths from public sites on the internet reveals that the area near Granby has strong city coverage of FM signal strengths (60-120 dB) for four stations. Therefore, FM radio interference is not anticipated from the proposed transmission line project due to robust signals and the strong immunity to noise inherent in FM radio design.

A survey of 19 TV station signal strengths from public sites on the internet reveals that the area near Granby has no DTV signals that meet the FCC minimum threshold coverage level (28 dB for channels 2-6, 36 dB for channels 7-13, and approximately 41 dB for higher channels) (FCC 2004). TV stations in the local area are generally based near Denver, and the direction of service provided by their broadcast beam is highly directional and focused on the commercial market and population of Denver rather than to mountain areas where Granby (and the proposed transmission line project) is located. Figure 4-7 presents a diagram of the service area coverage for a local TV station, which demonstrates the TV broadcast beam focus towards the Denver metropolitan area and away from the mountain areas with lower population bases. In addition, topography will also cause TV signal degradation as Granby is located in mountainous terrain. Over-the-air TV signals are therefore problematic with or without the transmission line project, and adequate TV service would require cable or satellite TV service. It is probable that cable or satellite service is required for good reception of TV signals, and a transmission line does not interfere with either of these signals. The only potential problem would be a situation where a steel transmission line tower was directly blocking the line-of-sight between a terrestrial microwave dish antenna and the geosynchronous satellite (or land-based antenna) that provides the signal. In this exceptionally unlikely situation, the antenna could be relocated a short distance.

Certain assumptions were made in the course of performing radio noise and TV interference calculations. The transmission line geometry information (including subconductor size, number, spacing, and type; phase spacing; circuit-to-circuit spacing; ROW widths; and average ground clearance) used for the computer calculations was provided by AECOM. A 5 percent over-voltage condition was modeled for the existing 69-kV transmission line and for the proposed

69/138-kV transmission line. Average conductor heights were used for the radio noise and TV interference calculations, as provided by AECOM. All modeling of radio and TV noise was conducted with the BPA calculation software (BPA 1977) assuming 8,500 feet elevation.

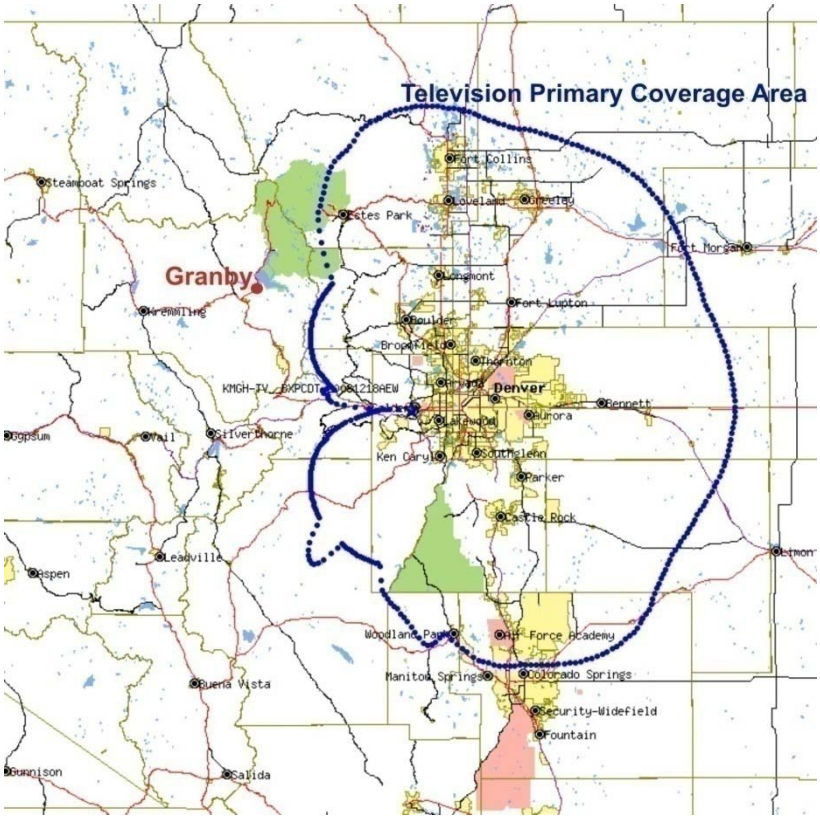


Figure 4-7. Sample TV Service Coverage Near Granby.

(The TV Broadcast Beam is Directional to Serve the Denver Market)

4.6.2.4 GPS Interference

A concern that GPS devices may be unable to receive a signal from the GPS satellites because of the proximity to a proposed transmission line is sometimes raised. Because of the nature and microwave frequency of GPS signals and the very different nature of EMFs around high voltage power lines, there is no reason to expect that interference would occur (Silva & Olsen 2002). As a practical matter, power lines produce little to no noise at the microwave frequencies used by GPS. The results of studies indicate it is unlikely that high voltage transmission lines will interfere with the GPS satellite signals. Therefore, it is likely that GPS would not be affected by the proposed 69/138-kV transmission line. However, operating a GPS receiver very close to a transmission line steel pole, building, or tree could potentially block a satellite signal, depending on the relative instantaneous satellite positions.

4.6.2.5 Contact Current Calculations

The amount of induced contact current can be used to evaluate the potential for harmful or other effects. Previous work on appliance leakage current can provide some insight into this issue. Leakage (and induced) current is commonly measured in units of milliamperes (mA) (i.e., one mA

is 0.001 amperes of electric current). Many appliances have a small amount of leakage current that flows through the body of the user. Usually, the amount of current is very small and below the threshold of perception. Many factors affect the magnitude of current flows. In addition to appliance design and age, contact resistance and insulation from ground affect the magnitude of current that flows through the user. Appliance leakage currents have been measured for a variety of appliances, and levels ranged from 0.002 mA to tens of mA (Kahn & Murray 1966; Stevenson 1973).

There is a United States standard for the leakage current from appliances that was developed to minimize the potential for electric shock hazards and sudden involuntary movements that might result in an accident (ANSI 1992). The standard limits appliance leakage current to 0.5 mA for portable appliances and 0.75 mA for stationary or fixed appliances. The standard was developed with consideration of the variable threshold of human perception of electric current. Different people and different situations produce a range of contact current perception values. As an example, when an average person grips an energized conductor, the median (50-percentile) threshold for perception of an AC electric current is 0.7 mA for women and 1.1 mA for men (Dalziel 1972; EPRI 1982). If the current is gradually increased beyond a person's perception threshold, it becomes bothersome and possibly startling. With sufficiently large currents, the muscles of the hand and arm involuntarily contract and a person cannot release the gripped object. The reasonably safe value at which 99.5 percent can let go (0.5 percent cannot) is 9 mA for men and 6 mA for women (Bridges et. al. 1985:10). An equivalent let-go value of 5 mA has been estimated for children (EPRI 1982:377). However, before the current flows in a shock situation, contact must be made; and in the process of establishing contact, a small arc occurs. This causes a withdrawal reaction that, in some cases, may be a hazard if the involuntary nature of the reaction causes a fall or other accident. Consideration of let-go currents was the basis for the NESC to set an induced current limit of 5 mA for objects under transmission lines in the code section #23 on clearances (ANSI 2007).

The proposed 69/138-kV transmission line would have the highest electric field within the ROW of approximately 1.4 kV/m in the region under the conductors at the lowest point of sag. Other locations on the ROW would be less. The calculated electric field is approximately 0.050 kV/m or less at the ROW edge.

Induced currents can be calculated for common objects for a set of theoretical (worst-case) assumptions: the object is perfectly insulated from ground, located in the highest field, and touched by a perfectly grounded person. Calculations can be made using experimentally determined induction coefficients and the calculated electric field (EPRI 1982). Calculated induced current for common vehicles placed on the ROW for the theoretical conditions for the proposed 69/138-kV line, with minimum ground clearance of 24 feet at midspan, was conducted and are presented in Table 4-8.

The maximum electric field only occurs on a small portion of the ROW, with calculated electric field levels above 1 kV/m occupying only 16 feet of the ROW. In addition, perfect insulation and grounding states are not common. For these assumptions, however, the calculated induced current values shown in Table 4-8 for the pickup truck, farm tractor pulling crop wagon, school bus, and tractor-trailer are well below hazardous levels where a person could not let go of an object (9 mA for men and 6 mA for women). At the ROW edge, the induced current values are below the threshold of perception. However, under the proposed 69/138-kV line near midspan, the calculated induced currents on one of these objects are above the threshold of perception and for certain conditions may be perceived. Typically induced currents and contact voltage can be an issue with higher voltage transmission lines (for example, 345-kV or 500-kV lines) and are

usually not an issue with lower voltage transmission lines, such as the project voltages (69 and 138-kV).

Table 4-8. Summary of Calculated Induced Current for Vehicles Under the Proposed 69/138-kV Transmission Line for Theoretical Conditions.

Vehicle	Length (feet)	Induced Current Coefficient (mA/kV/m)	Induced Current (mA) Near Midspan	Induced Current (mA) At ROW Edge
Pickup Truck	17	0.10	0.14	0.005
Farm Tractor & Wagon	31	0.30	0.42	0.015
Combine	30	0.38	0.53	0.019
School Bus	34	0.39	0.55	0.020
Tractor-Trailer Parallel to Transmission Line*	52	0.64	0.90	0.032

* If tractor-trailer is located perpendicular to the transmission line, then induced currents would be lower.

4.6.3 Direct and Indirect Impacts

4.6.3.1 Alternative A

For power-frequency electric fields, calculated field levels for the existing transmission line configuration are about 0.956 kV/m at the ROW edges (which is also the maximum electric field within the ROW).

For power-frequency magnetic fields, calculated field levels for the existing transmission line configuration are about 23.1 mG at the ROW edges under normal loading, with a maximum field within the ROW of 31.0 mG. For maximum loading conditions, the calculated magnetic field for the existing transmission line configuration is about 80.4 mG at the ROW edges, with a maximum magnetic field within the ROW of 108.2 mG.

For radio noise, calculated fair weather levels at either edge of the existing 69-kV transmission line ROW are low (22.8 dBµV/m at 1 MHz - the center of the AM radio band). For foul weather, the calculated radio noise level at either edge of the existing ROW is 39.8 dBµV/m. Calculated audible noise levels show that there is no fair weather noise from the existing 69-kV transmission line and very little noise during rainy conditions (maximum calculated audible noise of 5.9 dBA for L50 rain within the ROW).

4.6.3.2 All Action Alternatives – B1, C1, C2, and D

For the proposed transmission line, calculated power-frequency electric field levels are about 0.052 kV/m at the 69-kV ROW edge, about 1.406 kV/m for a maximum electric field within the ROW, and about 0.031 kV/m at the 138-kV ROW edge. Field levels are lower at the ROW edge for the proposed line due to a wider ROW width, increased ground clearance, and use of optimum phasing. The maximum electric field level within the ROW increases for the proposed line due to the additional 138-kV circuit. Calculated EMF levels at the ROW edges decrease from existing levels to the proposed levels. So the proposed line would have less impact than the existing line, since field levels are lower outside of the ROW.

The calculated magnetic field for the proposed transmission line configuration under normal loading conditions is about 1.6 mG at the 69-kV ROW edge, about 6.5 mG for a maximum magnetic field within the ROW, and about 0.5 mG at the 138-kV ROW edge. For maximum loading conditions, the calculated magnetic field for the proposed transmission line configuration is about 8.0 mG at the 69-kV ROW edge, about 33.3 mG for a maximum magnetic field within the ROW, and about 2.8 mG at the 138-kV ROW edge. Calculated field levels are lower at the ROW edge for the proposed line due to the wider ROW width. The maximum magnetic field level within the ROW also decreases for the proposed line due to the vertical circuit configuration, optimum or opposite phasing arrangement, increased ground clearance, and associated lower loading conditions.

High voltage transmission lines can have some corona activity, especially in foul or rainy weather (corona is tiny electrical discharges at the conductor surface). This can create audible noise and radio noise, but is only a major consideration for much larger transmission lines rated at 345-kV and above. For the proposed 69/138-kV transmission line, calculated audible noise levels during fair weather (L50 fair) are about 29.4 dBA at the 69-kV ROW edge, about 32.2 dBA for a maximum noise level within the ROW, and about 30.2 dBA at the 138-kV ROW edge. During foul weather (L50 rain), calculated audible noise levels for the proposed transmission line configuration are about 39.1 dBA at the 69-kV ROW edge, about 41.9 dBA for a maximum noise level within the ROW, and about 39.9 dBA at the 138-kV ROW edge. Calculated audible noise levels are higher at the ROW edges for the proposed line due to the additional 138-kV circuit and a result of the high elevation (at higher elevations, the effect of changing air density lowers the corona inception point and there is more corona activity, which produces higher audible noise). However, these calculated noise values are below the EPA outdoor activity Ldn noise guideline of 55 dBA. For audible noise, calculated levels will be higher due to the increased voltage of the line. However, these calculated levels (about 30 dBA in fair weather) are comparable to or less than a library environment and should not be a significant impact. In foul weather, the calculated noise levels (about 40 dBA) will be masked by the sound of the wind and rain (41-63 dBA).

A survey of FM radio station signal strengths reveal that the Granby area generally has relatively good FM signal strengths for four stations. FM radio interference is not anticipated from the proposed transmission line project due to robust signals and the immunity to corona-type impulse noise inherent in FM radio design.

For radio noise, calculated fair weather radio noise level for the proposed line is 37.7 dBµV/m on the 69-kV side and 40.6 dBµV/m on the 138-kV side. Calculated foul weather radio noise level for the proposed line is 54.7 dBµV/m on the 69-kV side and 57.6 dBµV/m on the 138-kV side at the proposed ROW edge. These noise levels are a bit more than other typical 69/138-kV lines, primarily due to the assumed 8,500-foot elevation – at higher elevations, the effect of changing air density lowers the corona inception point and there is more corona activity.

For TV and radio interference, the effect is dependent upon the existing strength of the TV and radio station signals in the area. If the signal strength is already weak, then thresholds for interference are lower. If the signal strength is strong, then the threshold is higher. Calculated interference levels are higher for the proposed line than for the existing line at the ROW edges. There are approximately eight AM radio stations with primary coverage in the Granby area, five secondary stations, and a couple of intermittent stations. Many AM radio stations may experience interference if an AM radio is used on or close to the ROW in rain. In fair weather, the AM interference would be less. FM radio stations should not experience interference from the proposed line. A survey of 19 TV station signal strengths in the Granby area indicate that none of them meet the FCC minimum threshold coverage level, so TV already has very weak signal

strength. TV reception near the proposed line would only add to an existing poor reception environment.

The proposed 69/138-kV transmission line would not affect GPS satellite-based navigation systems signals. Corona noise does not significantly extend up to the much higher microwave frequencies used by GPS equipment. However, operating a GPS receiver very close to a transmission line steel pole, building, or tree could potentially block one or more satellite signals, depending on the relative instantaneous satellite positions.

Transmission lines can induce currents on objects very close to or within the ROW. For evaluation of induced currents, the highest electric field of 1.4 kV/m was considered; this level only occurs within a small portion of the ROW in the region under the conductors at the lowest point of sag. At other locations on the ROW, the electric field will be less. Calculations were made of the induced current on common vehicles placed on the ROW. In addition to the maximum field, perfect insulation for the object and grounding for a person are assumed for these calculations (these conditions are not common). Calculated induced currents range from about 0.14 mA for a pickup truck to 0.90 mA for a tractor-trailer based upon these theoretical conditions. These calculated induced current values are well below hazardous levels and easily comply with the NESC limit of 5 mA. At the ROW edge, the induced current values are below the threshold of perception.

For induced currents, the proposed 69/138-kV transmission line would have the highest electric field (1.4 kV/m) within a small portion of the ROW in the region under the conductors at the lowest point of sag. Other locations on the ROW will be less. Calculations were made using experimentally determined induction coefficients, and the calculated electric field for induced current on common vehicles placed on the ROW. In addition, perfect insulation and grounding states, as are assumed for these calculations, are not common. Calculated induced currents range from about 0.14 mA for a pickup truck to 0.90 mA for a tractor-trailer based upon these theoretical conditions. These calculated induced current values are well below hazardous levels where a person could not let go of an object (9 mA for men and 6 mA for women). At the ROW edge, the induced current values are below the threshold of perception. However, under the proposed line near midspan, the calculated induced currents on larger objects are above the threshold of perception and for certain conditions may be perceived. Typically induced currents and contact voltage can be an issue with higher voltage transmission lines (for example, 345-kV or 500-kV lines) and are usually not an issue with lower voltage transmission lines, such as the project voltages (69 and 138-kV). For permanent objects (such as long fences parallel to the power line or metallic sheds), the possibility of nuisance shocks can be eliminated by having permanent grounding connections for these objects.

Although there are no federal health standards in the United States specifically for 60 Hz EMF, two organizations have developed guidelines: the ICNIRP and the IEEE (ICNIRP 1998; IEEE 2002). Both of these guidelines are much higher than the calculated EMF levels for the proposed transmission line project.

Overall, the proposed line design has benefits over the existing line design. EMF would significantly decrease at the ROW edges, audible noise would increase but probably not be noticeable, AM radio interference may increase near the ROW edges, FM radio would remain unaffected, over-the-air TV reception would remain poor as it presently is, and induced currents and contact currents are not anticipated to be an issue.

4.6.4 Mitigation Measures

4.6.4.1 Common to All Action Alternatives

Contact Current Mitigation

The strength of a contact current is based upon many factors, including object characteristics (size and shape), degree of grounding, and the electric field strength that is present. For the proposed project, increasing the transmission line height above ground would reduce the electric field at locations where large conductive objects may be present. Typically, induced currents and contact voltage can be an issue with higher voltage transmission lines (for example, 345-kV or 500-kV lines) and are usually not an issue with lower voltage transmission lines, such as the project voltages (69 and 138-kV). For permanent objects (such as long fences parallel to the power line or metallic sheds), the possibility of nuisance shocks can be eliminated by having permanent grounding connections for these objects. If grounding were to be required, electric company engineers typically provide guidance. As described in SCP 20 (Section 2.4), Western would develop and apply necessary mitigation, including grounding connections, to eliminate problems of induced currents and voltages on conductive objects sharing the ROW.

4.7 Land Use

Land use topics described in this section are related to land jurisdictions and ownership, existing and planned land uses, and local land use plans and policies. The Project Area for land use encompasses the proposed and alternative transmission line ROWs, existing access roads, substation sites, construction areas, and surrounding land uses within the project vicinity. Impact issues include direct changes or disruptions to existing and planned land uses that may occur during the construction and operation of the proposed project and alternatives, impacts to farmlands, and temporary increases in noise levels that would result during project construction. While this section addresses the physical impacts of land use change, other related issues are discussed in Section 4.8 Visual Resources, Section 4.9 Socioeconomics and Environmental Justice, and Section 4.10 Recreation and Wilderness.

4.7.1 Significance Criteria

Impacts to land use would be considered significant if effects substantially deviated from existing land use regulations and guidelines, precluded certain future land use types, and resulted in diminished economic viability or “uneconomic remnants.” Impacts may also include:

- Unresolved conflict with existing utility ROWs.
- Conflict with state or federally established, designated, or reasonably foreseeable planned special use areas (e.g., recreation, wildlife management area, game management areas, waterfowl production areas, scientific and natural areas, wilderness areas, etc.).
- Substantial loss of prime or unique farmlands in the region.

4.7.1.1 Transportation

The following significance criteria were used to assess potential impacts to transportation as a result of project alternatives:

- Impacts to transportation would be significant if use of public highways and roads was restricted, resulting in adverse impacts to emergency response capability or economic hardships to local businesses.

4.7.2 Methodology

The analysis considered impacts to land use resources that intersect the proposed transmission line and each of the alternatives. The analysis used Grand County Assessor's Office datasets to determine the number of improved residential or vacant residential lots that would be within 100 feet or 300 feet of the centerlines of any of the alternative alignments. For the purpose of this analysis, parcels assigned a usage of "Improved Metes and Bounds" by the Assessor's Office were included in the count of "Improved Residential."

4.7.3 Direct and Indirect Impacts

4.7.3.1 Impacts Common to All Action Alternatives

Land use impacts would primarily consist of localized direct effects to existing land uses within and adjacent to the proposed and alternative ROWs. Direct impacts would mainly entail short-term disruptions to existing agricultural lands and irrigation systems during construction, resulting from the periodic presence of construction equipment, crews, and vehicles within the ROW. These types of construction impacts would be short-term and minor to moderate.

Other short-term impacts to land uses would include construction-related noise that is produced by machinery and vehicles. Noise levels would be typical of diesel powered machinery and gasoline or diesel powered vehicles. Cement trucks, cranes, and auguring equipment would produce noise during their operation; and increased noise would be noticeable to local residents and others in the vicinity of construction activities. Overall, noise levels would be similar in type and degree to noise currently produced by farm machinery, trucking, highway noise, and other construction projects. Due to the temporary and intermittent nature of noise effects, and the presence of similar noise sources within the Project Area, impacts from noise would be moderate and short term.

Long-term impacts would result from the need for additional ROW since the Proposed Action and other action alternatives would result in widening the existing 30-foot ROWs to a width of 60 to 100 foot ROW along much of the project. No occupied structures would need to be removed from the widened or new ROW easements; however, long-term impacts would result from the inability to build new structures within the expanded ROWs. Such impacts would be most likely to occur in areas that are adjacent to existing neighborhoods or other existing or planned developments.

Other long-term impacts would include the direct loss of farmland to accommodate new transmission line structures, as well as complications to agricultural activities that result from having to work around those structures. Although cultivation could continue within the ROW, irrigation, hay cutting, and other activities would require additional efforts to work around the transmission structures, resulting in a minor loss of productivity and increased costs. All Action Alternatives would cross through a similar distance of cultivated lands as the existing transmission line. Long-term impacts to agricultural lands would be mostly off-set by the removal of the existing wood pole H-frame structures and replacement with single pole steel structures, which have a longer average distance between structures. Given the small amount of land affected, overall impacts to agriculture would be minor.

Impacts of each alternative are discussed separately in the remainder of this section.

No residential structures or buildings would be removed.

None of the alternatives would have any effect on operations of the Grand County/Granby Airport. Although the average height range of the new structures would be 20-40 feet greater than the existing transmission line structures, none of the alternatives would result in an alignment closer than the approximately 2 miles that separate the airport from the existing line at the closest point. This distance, combined with the elevated position of the airport, is sufficient to minimize conflicts with the airport.

Transportation-Impacts to All

Impacts to transportation would be associated with short term construction related traffic on the major and local transportation systems within the Project Area. Large truck traffic and traffic associated with employees traveling to and from the job site would occur on a daily basis during project construction. There are no anticipated impacts to local businesses or the emergency response capabilities. Since the proposed project is located in a rural area, work force activities would occur intermittently by relatively small crews.

Unlike pipeline projects that can cause traffic and access disruptions along the entire ROW, transmission construction activities primarily occur at structure sites, which limit where access and traffic impacts occur. Consequently, while construction of the proposed action or alternatives could result in short, temporary interruptions of traffic on roads near structure sites along the ROW. Construction and existing line removal activities would occur at some locations adjacent to U.S. Highway 34, especially along the 2-mile segment north of Granby Substation. However, lane closures would be minimized and delays would be largely limited to drivers slowing to observe the construction or removal activities. These impacts would not obstruct access to businesses or impede emergency response capabilities in the region.

Permitted uses of smaller roads in the area include the maintenance of electrical power lines, substations, pipelines, communication towers and other utilities. Traffic volumes to these facilities are low and access to these facilities are infrequent Construction and existing line removal activities will result in short, temporary interruptions to these permitted authorized uses.

Two construction staging areas would be needed along any action alternative. These temporary use areas would require approximately 1.4 acres each and would be used to store construction materials, which would be hauled to the staging areas using existing roads and streets. Generally the contractor negotiates staging areas with a private landowner. At this time the location of the staging areas are not known, however, they would be located on private land easily accessible from a major transportation route and would not impact public property or public access routes.

4.7.3.2 Alternative A

Land use impacts would remain similar to current levels (negligible or low). However, maintenance activities would be likely to increase over time as the transmission structures continue to age and require an increasing level of repair or replacement. These activities would affect residences and other commercial, industrial, or agricultural land uses. The total number of homes located within 100 feet of the centerline of the existing transmission line is 20. These more proximate homes would be most likely to notice the increased activity and resulting

disturbance associated with vehicle movement and equipment operations. A total of 60 improved residential lots and two lots with mobile homes are located within 100 feet of the existing alignment. An additional 60 improved residential lots and six condominiums are located within 100-300 feet of the centerline, a distance at which impacts level diminish. A 1,500-acre mixed-use development planned north of the intersection of U.S. Highway 40 and 34, is proposing large lot residential development in areas through which the current alignment crosses. Development plans are being refined, and the exact number of vacant lots that would be impacted is unknown at this time. With proper coordination and planning, the impacts to future residential development at this site would likely be limited to visual effects rather than limits on the level of development.

4.7.3.3 Alternative B1

Approximately 13 homes within 43 improved residential lots are located within 100 feet of the proposed alignment of Alternative B1. All of these homes are located along that portion of the route that follows the existing transmission line alignment between Stillwater Tap and the Granby Pumping Plant Switchyard. These homes would experience moderate short-term impacts from construction activities. An expanded ROW and its associated restrictions on buildings would result in a low level long-term impact to these properties. No existing residences would be located within 100 feet of the centerline of a new ROW alignment, i.e., locations where a transmission line does not currently exist.

An additional 51 improved residential lots and six condominiums are located within 100-300 feet of the proposed alignment. At this distance, effects on these properties would be largely limited to visual; direct effects associated with an expanded ROW, and associated restrictions on the use of these properties, would be negligible. Short-term effects from construction activities would be minor to moderate.

Approximately 18 vacant residential lots lie within 100 feet of the centerline along Alternative B1. Most of these are located along the existing transmission line where the line would be re-built on an expanded ROW. An expanded or new ROW acquisition would result in a minor to moderate long-term effect on the future use of these parcels. Effects on land values are discussed in Section 4.9.

A 1,500-acre mixed-use development planned north of the intersection of U.S. Highway 40 and 34, is proposing large lot residential development in areas through which Alternative B1 would cross. Development plans are being refined, and the exact number of vacant lots that would be impacted is unknown at this time. With proper coordination and planning, the impacts to future residential development at this site would likely be limited to visual effects rather than limits on the level of development. However, with an increased ROW width (100 feet), a somewhat higher level of conflict may exist with planned development at this location compared to Alternative A.

On the east side of Table Mountain, Alternative B1 would be routed just inside the ANRA immediately adjacent to the western boundary of the Scanloch Subdivision. Alternative B1 would locate the transmission line out of the Scanloch Subdivision, farther west of US 34, and at a higher elevation. Impacts to recreation and visual resources are discussed in Sections 4.8 and 4.10.

Alternative B1 would consolidate the two existing lines onto an alignment paralleling the east side of County Road 64 through the Lake Forest Subdivision to the Granby Pumping Plant Switchyard. Removal of the existing circuit through the campground would result in disruptions or closures to

all or portions of the facility. These disruptions or closures would be temporary and short-term, only for several hours. Removal of the existing line would result in a long-term beneficial impact to the campground. See Section 4.10 for more information on the impacts of the project to recreational resources.

Alternative B1 would cross through agricultural lands for a distance of approximately 1.3 miles, all of which would occur as a rebuild along the alignment of the existing transmission line. Depending upon the timing of construction, a moderate level of adverse short-term effects may occur on these lands as a result of construction disturbance and interruption of farming activities. The landowner would be compensated for any losses in production. Long-term adverse effects would be associated with the placement of transmission structures within agricultural areas. However, these effects would be negligible, since the project would replace the existing H-frame structures with single pole steel structures.

4.7.3.4 Alternative C1

The alignment of Alternative C1 departs from the existing transmission line ROW and avoids residential development near Lake Granby. Approximately 13 homes within 35 improved residential lots are located within 100 feet of the proposed alignment. These homes are located along the existing transmission line, where a new line would be built on an expanded ROW. These homes would experience moderate short-term impacts from construction activities. An expanded ROW and its associated restrictions on buildings would result in a low level long-term impact to these properties.

An additional 30 improved residential lots, two lots with mobile homes, and six condominiums are located within 100-300 feet on either side of the centerline. At this distance, effects on these properties would be largely limited to visual and direct effects associated with an expanded ROW, and associated restrictions on the use of these properties would be negligible. Short-term effects from construction activities would be minor to moderate.

Approximately 10 vacant residential lots lie within 100 feet of the centerline. Most of these are located along the existing transmission line. An expanded or new ROW acquisition would result in a minor to moderate long-term effect on the future development of these parcels. Effects on land values are discussed in Section 4.9.

A 1,500-acre mixed-use development planned north of the intersection of U.S. Highway 40 and 34, is proposing large lot residential development in areas through which Alternative B1 would cross. Development plans are being refined, and the exact number of vacant lots that would be impacted is unknown at this time. With proper coordination and planning, the impacts to future residential development at this site would likely be limited to visual effects rather than limits on the level of development. The C1 alignment is located at the northern edge of this planned development, a location that reduces the level of potential conflict with future development.

Alternative C1 would cross through agricultural lands for a distance of approximately 1.8 miles, most of which would occur as a rebuild along the alignment of the existing transmission line. Depending upon the timing of construction, a moderate level of adverse short-term effects may occur on these lands as a result of construction disturbance and interruption of farming activities. The landowner would be compensated for any losses in production. Long-term adverse effects would be associated with the placement of transmission structures within agricultural areas. However, these effects would be negligible, since the project would replace the existing H-frame structure with a single pole structure that has a longer average distance between structures.

A portion of the C Lazy U Preserves, including an area with a conservation easement in place, would be crossed by Alternative C1. The total length through the Preserve would be approximately 0.1 mile, and this location is not currently crossed by a transmission line. Although the direct, physical effect to land use would be minor, the construction of a transmission line is in conflict with the conservation intent of the easement. The project would also be visible from other locations on the Ranch. See Section 4.8 for a discussion of visual effects.

Alternative C1 skirts behind Table Mountain, hiding it from the viewsheds along Lake Granby, U.S. Highway 34, and adjacent neighborhoods.

4.7.3.5 Alternative C2

Alternative C2-Option 1

This alternative would have similar effects on land use as those described for Alternative C1, except that Alternative C2-Option 1 would follow the water pipeline easement through the proposed 1,500-acre mixed-use development planned north of the intersection of U.S. Highway 40 and 34. With proper coordination and planning, the impacts to future residential development at this site would likely be limited to visual effects rather than limits on the level of development. Development plans are being refined, and the exact number of vacant lots that would be impacted is unknown at this time.

Alternative C2-Option 2

This alternative would have similar effects on land use as those described for Alternative C1, except that Alternative C2-Option 2 would follow the existing transmission line alignment through the proposed 1,500-acre mixed-use development planned north of the intersection of U.S. Highway 40 and 34. With proper coordination and planning, the impacts to future residential development at this site would likely be limited to visual effects rather than limits on the level of development. Development plans are being refined, and the exact number of vacant lots that would be impacted is unknown at this time.

4.7.3.6 Alternative D-Options 1 and 2

The land use effects of this alternative would be very similar to those described for Alternative B1. Impacts on improved and vacant residential lots would be near identical to Alternative B1 except that Alternative D would have two fewer improved residential lots located within 100 feet of the centerline and three fewer improved residential lots within 300 feet of the centerline. There would also be some minor differences with respect to agricultural lands. Both options would have a distance through agricultural land of approximately 1.3 miles.

4.7.4 Mitigation Measures

Western’s adopted SCPs and project-specific design criteria include measures that would minimize impacts to land use. These measures would be implemented for the construction of any action alternative. No further special mitigation measures are recommended.

However, additional efforts to specifically address the impacts to recreation and visual resources may also be effective in the avoidance of identified land use impacts.

4.8 Visual Resources

The section describes the potential impacts on visual resources from physical changes associated with the alternatives.

4.8.1 Significance Criteria

Impacts to visual resources were determined on the basis of whether the predicted visual change caused by the proposed action and alternatives would be within the management guidelines for that area. Visual impacts are changes to the existing form, line, color, and texture of landforms, vegetation, and structures. The degree of change (referred to as a contrast rating) affects viewers and the scenic integrity of the setting. The degree of contrast is compared to management guidelines that are designed to maintain a specific visual experience to determine whether it is within or exceeds the allowable degree of visual contrast for the area.

The following significance criteria assume that all action alternatives would result in some degree of visual change because they all have a component that would be visible from some location, however remote. A significant impact on visual resources may result if any of the following were to occur from construction or operation of the proposed project:

- Unresolved conflict with visual standards identified by the BLM, Forest Service, or Grand County.
- Substantial, dominant visual changes in the landscape that are seen from highly sensitive viewer locations, such as community enhancement areas (community gateways, viewpoints, scenic byways, and historic markers); or locations with special scenic, historic, recreational, cultural, archaeological, or natural qualities that have been recognized as such through legislation or some other official declaration.

4.8.2 Methodology

Potential impacts were evaluated through viewshed analyses, contrast ratings, and photographic simulations for all alternatives.

Viewshed analyses for each alternative were conducted using GIS to quantify the number of poles that are visible within the analysis area (Map 4-1 through Map 4-7). To aid with the comparison, all of these maps are located at the end of this subsection. The GIS analyses do not take into account the screening effect of vegetation; they are a “bare-ground” scenario of views limited solely by terrain. Nor do they take into account viewer distances; field observations indicate that poles beyond 2 miles in distance were typically imperceptible to viewers. Each alternative viewshed analysis shows the number of poles that would be visible from a particular location. Alternative A was modeled at 65 feet high. All action alternatives were modeled at 105 feet high. These heights are the maximum heights anticipated; the average height range is anticipated to be 75-105 feet for the action alternatives. By comparison, the average height range of the existing line is 55-65 feet.

The BLM’s Visual Contrast Rating Worksheet (Form 8400-4) was customized to account for Forest Service methods, documenting the VAC, existing scenic integrity, existing landscape character, and degree of contrast of proposed facilities. As seen from KOPs, the difference between the existing visual condition and future visual condition after construction of the project is referred to as the degree of contrast. Contrast rating worksheets found in Appendix J, Visual Resource Contrast Rating Worksheets and Photographic Simulations, document the extent of

visual effects as negligible, minor, moderate, or strong, and identify measures to mitigate these effects.

Photographic simulations were prepared for 14 KOPs to inform the contrast ratings. Grand County, Forest Service, and BLM assisted in selecting which KOPs to simulate. The simulations were based on preliminary engineering information, and were prepared by collecting GPS points of each KOP, existing photography using a 50mm digital SLR camera, locating poles in GIS (ArcINFO 9.1), rendering poles in 3DMax, and adding the rendered poles to photographs from each KOP. Photographic simulations of the alternatives can be found in Appendix J, Visual Resource Contrast Rating Worksheets and Photographic Simulations.

Analysis findings were then compared to Grand County, Forest Service, and BLM Visual Resource Objectives to determine compliance.

4.8.3 Direct and Indirect Impacts

4.8.3.1 Alternative A – No Action

Under the no action alternative, the existing adverse effects from the existing 69-kV transmission line would continue. Since its construction approximately 70 years ago, viewers have become accustomed to the adverse effects of the existing transmission line, lessening its visual impact. However, views from existing commercial and residential buildings and Cutthroat Trout Bay Campground facilities, located directly under the existing transmission line or immediately adjacent to the ROW, would continue to be significantly affected. Foreground views from existing commercial and residential buildings, the scenic byway, Lake Granby, and use areas within the ANRA would continue to be adversely affected, though to a lesser degree than what would occur under the action alternatives (see Map 4-1, Alternative A Viewshed Analysis).

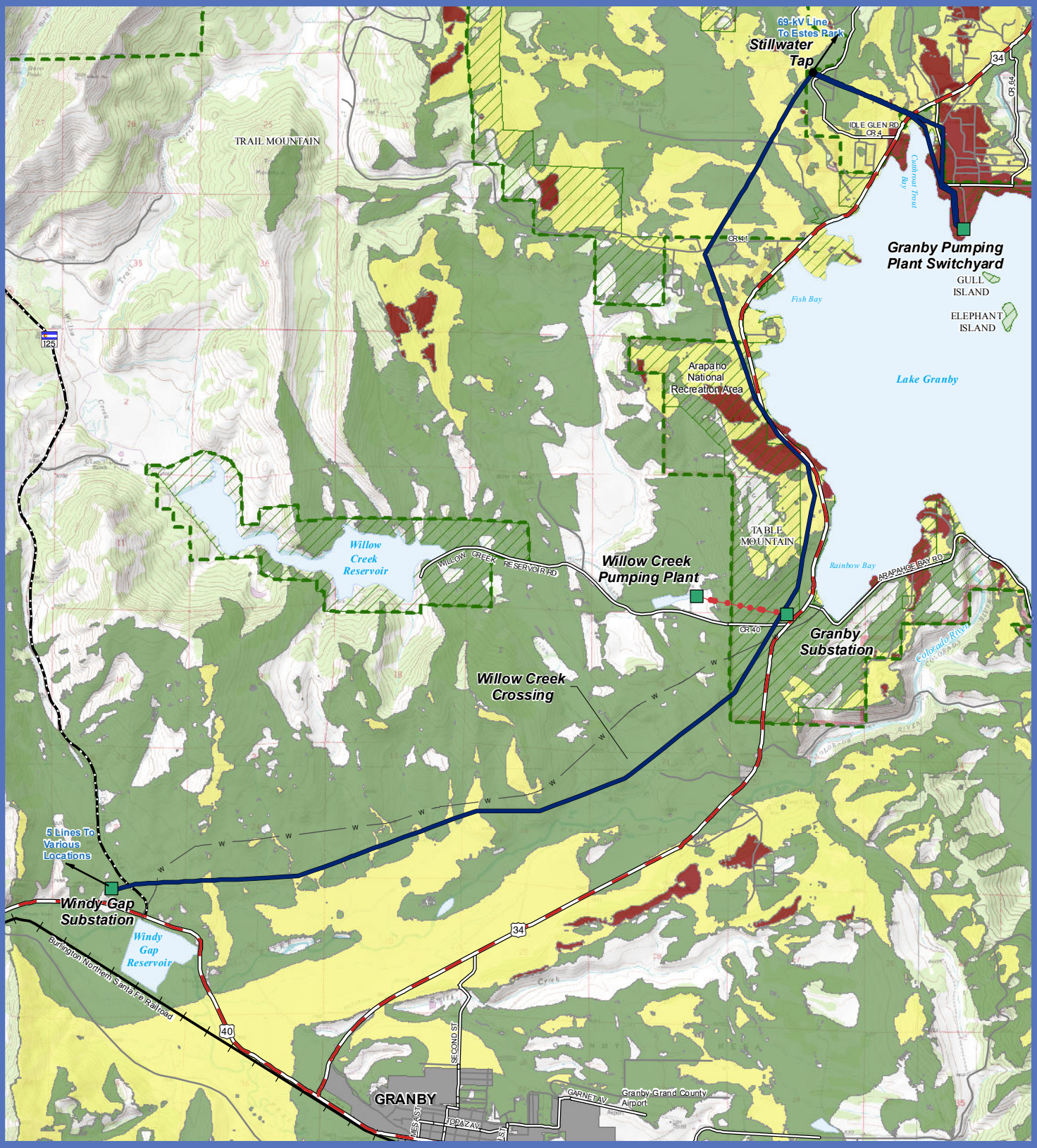
Over time, structures would require repairs or replacement, and may be replaced with newer materials that are inconsistent with the existing transmission line, such as laminate wood poles or steel poles. The mix-matched materials would result in an additional minor degree of contrast when accounting for the existing adverse effects.

Maintenance operations would include aerial and ground patrols for monitoring, tree trimming, and equipment repair. Residents or visitors in the vicinity of the route would be able to see ground inspections. Given the nature of the vegetation communities in the Project Area and the existing 30-foot ROW, visual effects from long-term tree removal maintenance are anticipated to be negligible. These annual maintenance activities would result in no change or a minor change to the visual environment.

Effects on Visual Resource Objectives

The existing transmission line is located within an area of Forest Service SIO of High, from one-half mile southwest of the Granby substation to a point north that is opposite the Stillwater Recreation Area, because of the adjacent Scenic Byway; and again where Alternative A crosses the Scenic Byway at the junction of County Road 64, as shown on Map 3-7.

As seen from KOP 12 at the Granby Substation (intersection of the scenic byway and Willow Creek Road), the existing H-frames are highly visible from the scenic byway north-south and connecting to the Granby Substation. The substation and multiple visible lines (both Western and MPEI) dominate the recreational and natural-appearing landscape character, resulting in strong form and line contrasts that are not compatible with the Forest Service SIO of High.



Map 4-1

Legend

Base Data

- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Land Status

- Forest Service Land within Arapaho National Recreation Area
- Private or Other Land Ownership
- U.S. Forest Service Boundary

Transmission Line Alternatives

- Alternative A - Existing
- *No Action Alternative*

Transmission Line Visibility

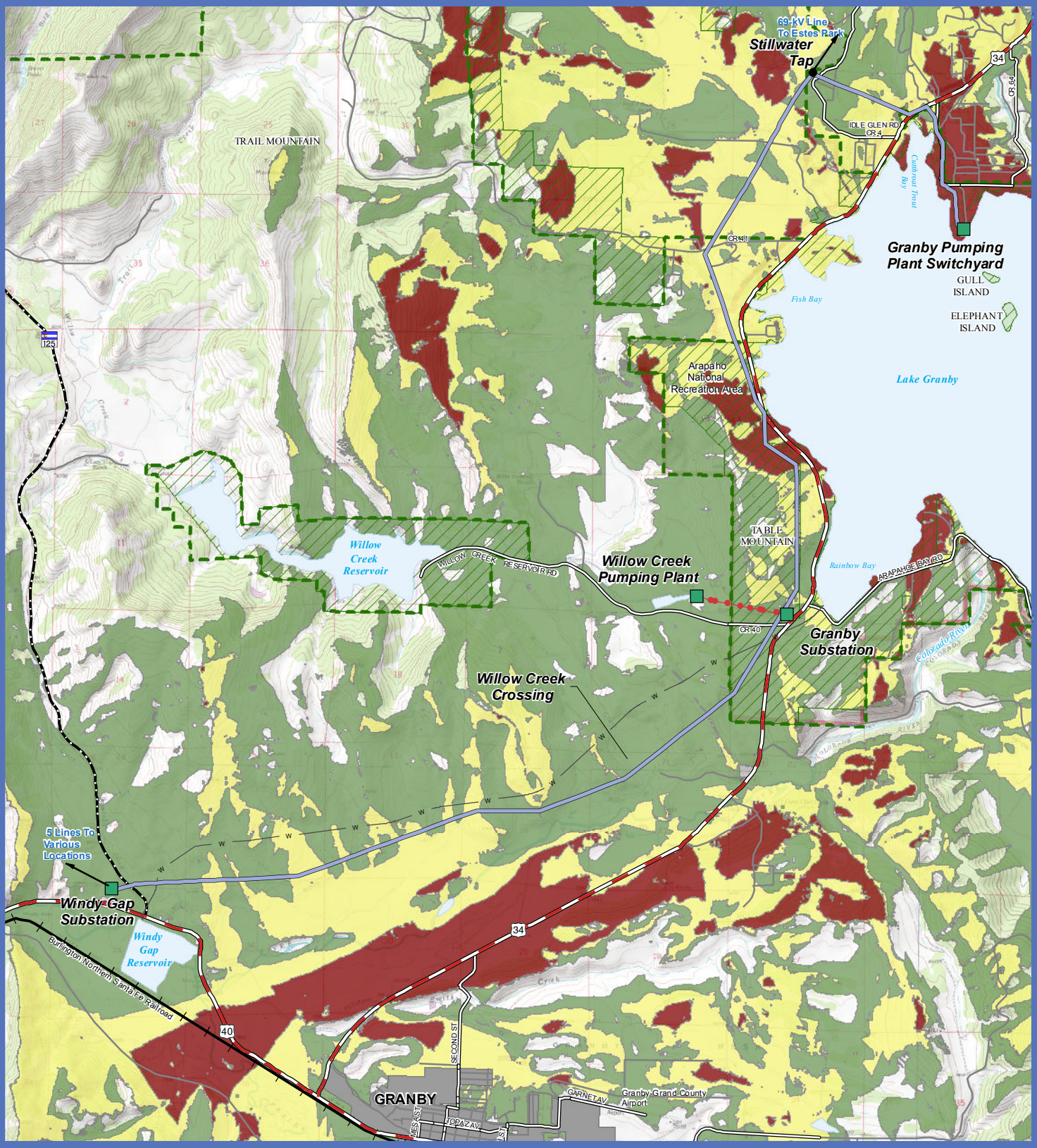
- Low (Up to 1.5 miles of project Visible)
- Moderate (Up to 3.5 miles of project visible)
- High (More than 3.5 miles of project visible)

Viewshed-Alternative A

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), Grand County, and Colorado State University

GRANBY PUMPING PLANT - WINDY GAP TRANSMISSION LINE REBUILD PROJECT



Map 4-2

Legend

Base Data

- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Land Status

- Forest Service Land within Arapaho National Recreation Area
- Private or Other Land Ownership
- U.S. Forest Service Boundary

Transmission Line Alternatives

- Alternative B1

Transmission Line Visibility

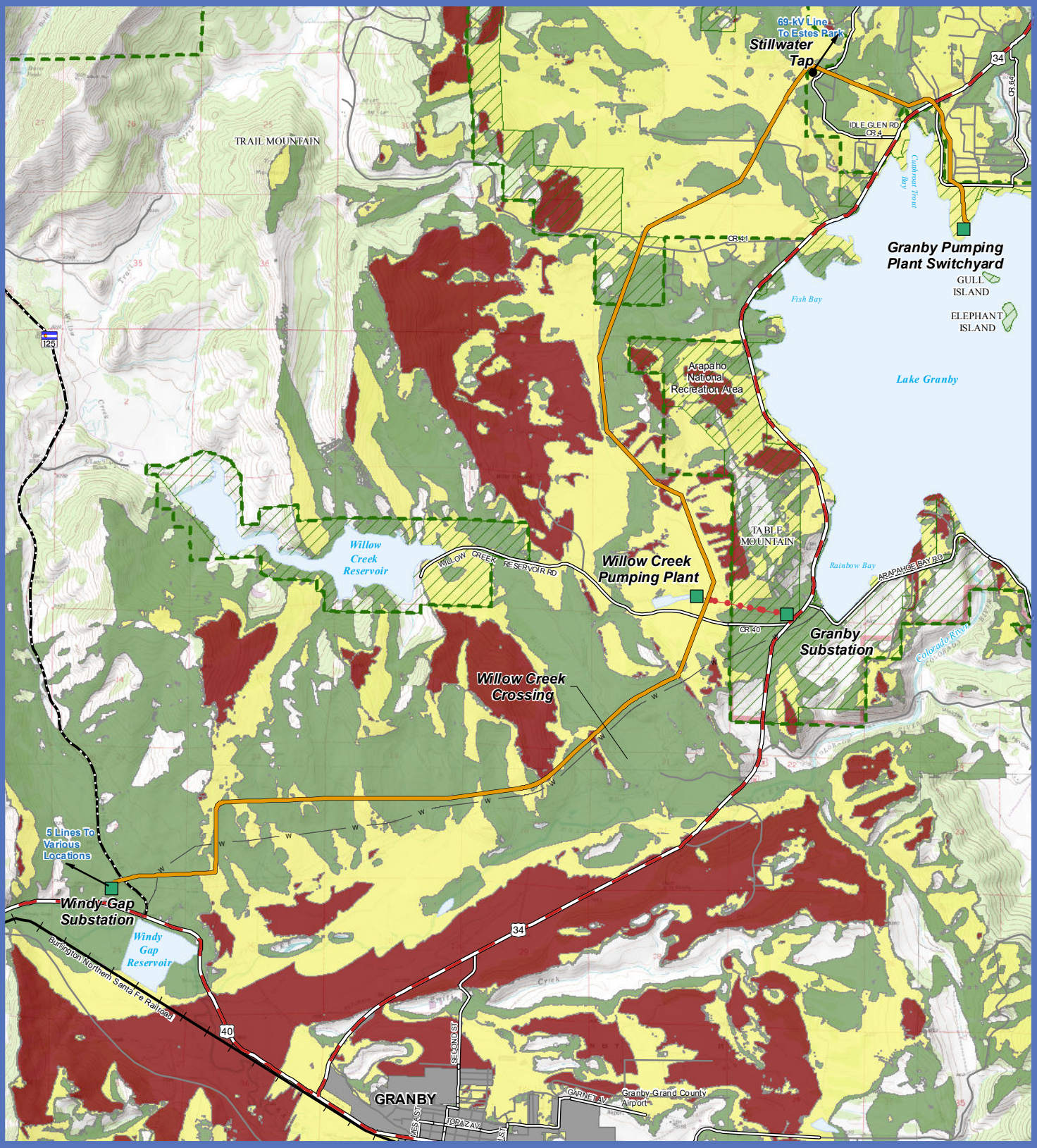
- Low (Up to 1.5 miles of project Visible)
- Moderate (Up to 3.5 miles of project visible)
- High (More than 3.5 miles of project visible)

Viewshed-Alt B1

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), and Grand County

GRANBY PUMPING PLANT - WINDY GAP TRANSMISSION LINE REBUILD PROJECT



Map 4-3

Legend

Base Data

- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Land Status

- Forest Service Land within Arapaho National Recreation Area
- Private or Other Land Ownership
- U.S. Forest Service Boundary

Transmission Line Alternatives

- Alternative C1

Transmission Line Visibility

- Low (Up to 1.5 miles of project Visible)
- Moderate (Up to 3.5 miles of project visible)
- High (More than 3.5 miles of project visible)

Viewshed-Alt C1

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), and Grand County

GRANBY PUMPING PLANT - WINDY GAP TRANSMISSION LINE REBUILD PROJECT

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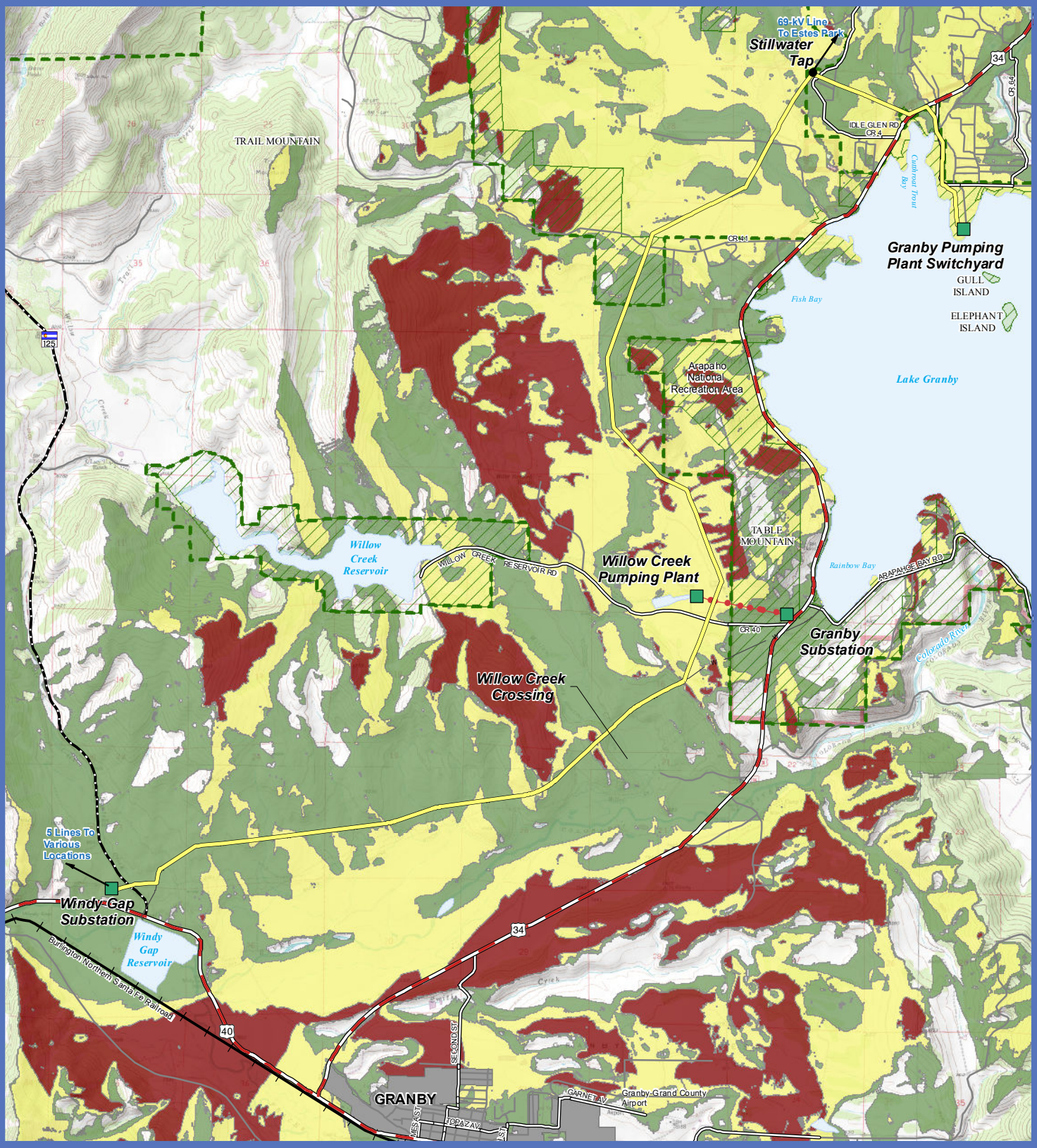

Map 4-4

Legend

Base Data

- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Land Status

- Forest Service Land within Arapaho National Recreation Area
- Private or Other Land Ownership
- U.S. Forest Service Boundary

Transmission Line Alternatives

- Alternative C2 - Option 1

Transmission Line Visibility

- Low (Up to 1.5 miles of project Visible)
- Moderate (Up to 3.5 miles of project visible)
- High (More than 3.5 miles of project visible)

Viewshed-Alt C2 (Option 1)

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), Grand County, and Colorado State University

GRANBY PUMPING PLANT - WINDY GAP TRANSMISSION LINE REBUILD PROJECT

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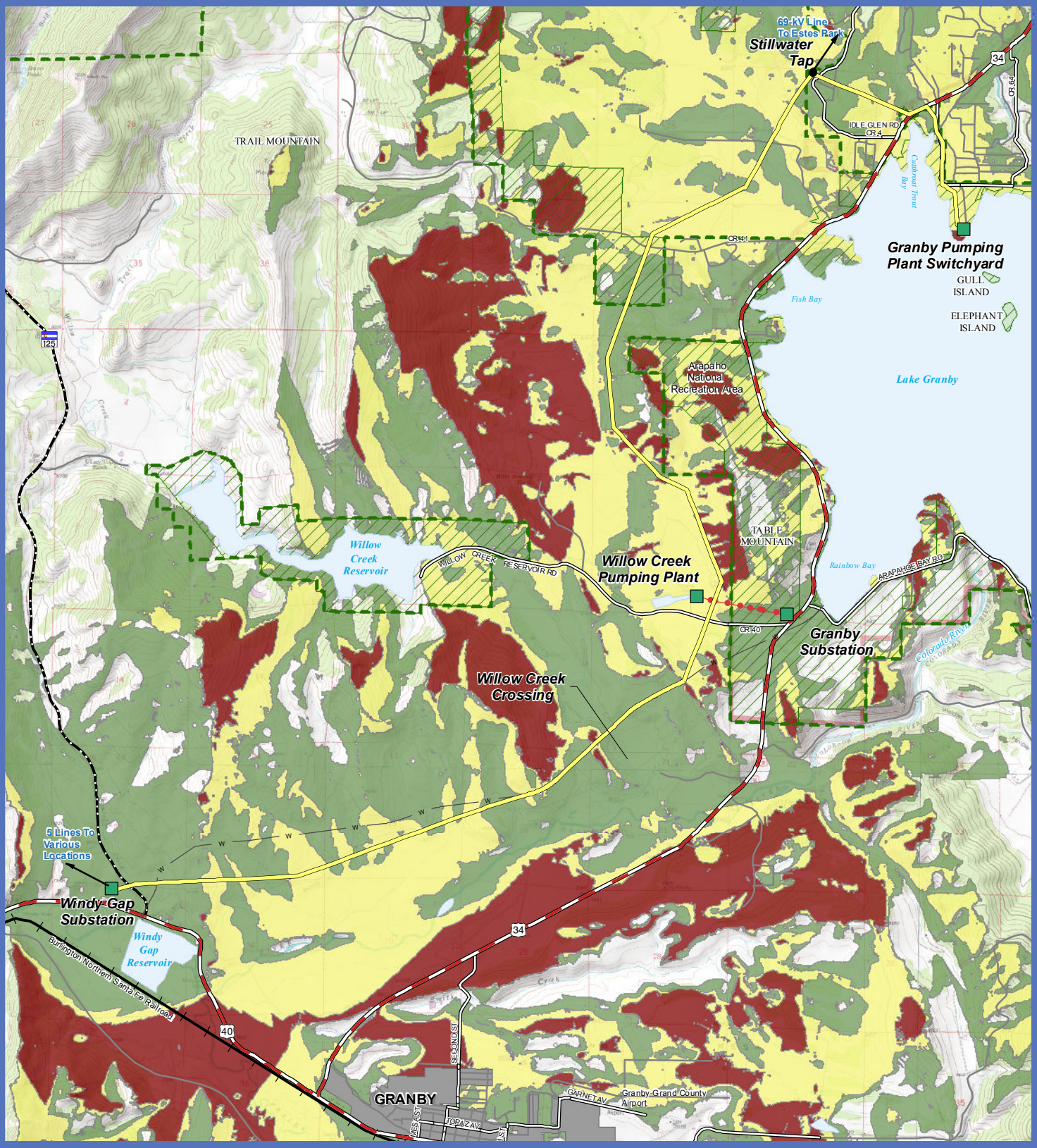

Map 4-5

Legend

Base Data

- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Land Status

- Forest Service Land within Arapaho National Recreation Area
- Private or Other Land Ownership
- U.S. Forest Service Boundary

Transmission Line Alternatives

- Alternative C2 - Option 2

Transmission Line Visibility

- Low (Up to 1.5 miles of project Visible)
- Moderate (Up to 3.5 miles of project visible)
- High (More than 3.5 miles of project visible)

Viewshed-Alt C2 (Option 2)

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), Grand County, and Colorado State University

GRANBY PUMPING PLANT - WINDY GAP TRANSMISSION LINE REBUILD PROJECT

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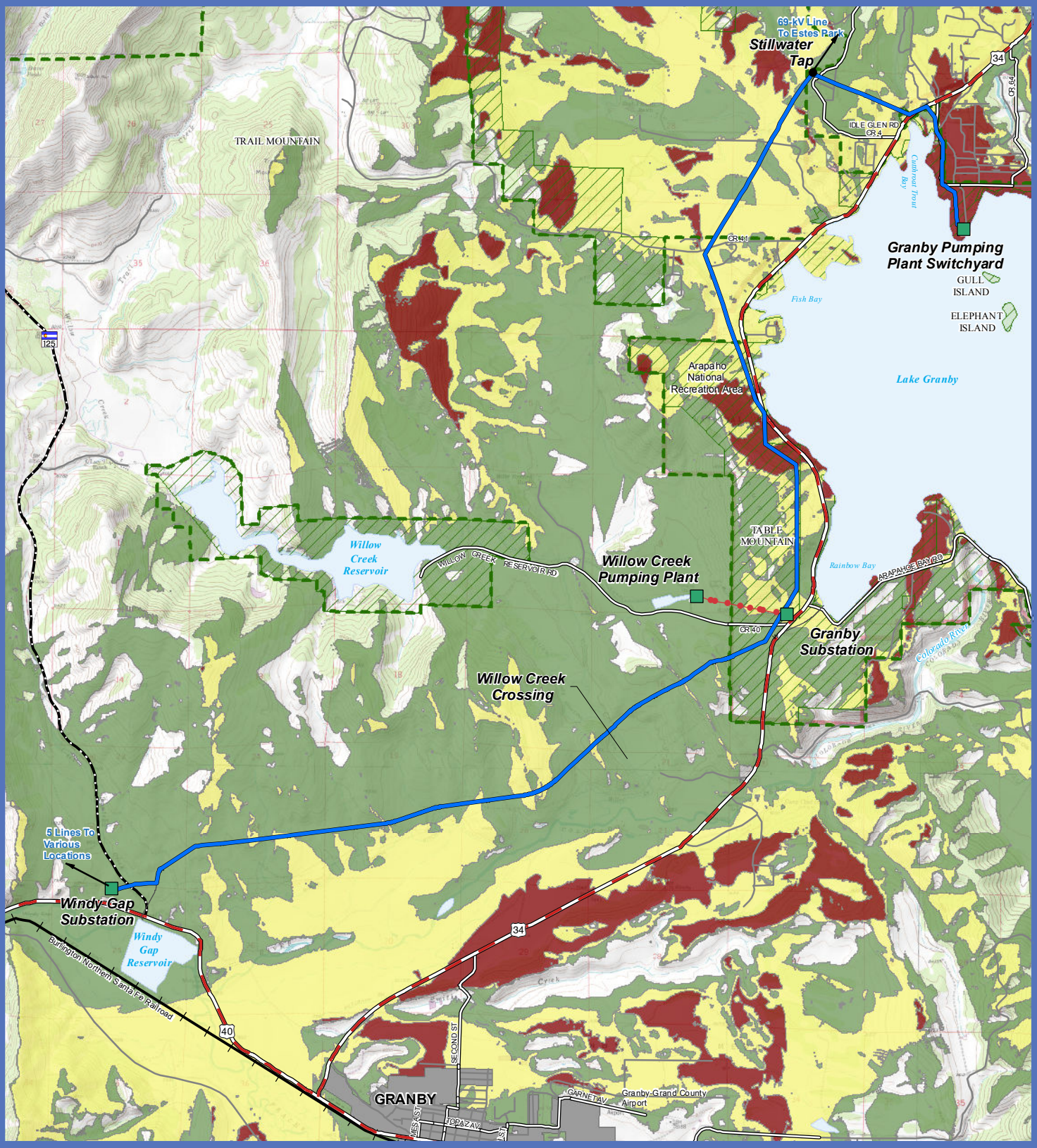

Map 4-6

Legend

Base Data

- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Land Status

- Forest Service Land within Arapaho National Recreation Area
- Private or Other Land Ownership
- U.S. Forest Service Boundary

Transmission Line Alternatives

- Alternative D - Option 1

Transmission Line Visibility

- Low (Up to 1.5 miles of project Visible)
- Moderate (Up to 3.5 miles of project visible)
- High (More than 3.5 miles of project visible)

Viewshed-Alt D (Option 1)

November 7, 2011

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), Grand County, and Colorado State University

GRANBY PUMPING PLANT - WINDY GAP TRANSMISSION LINE REBUILD PROJECT

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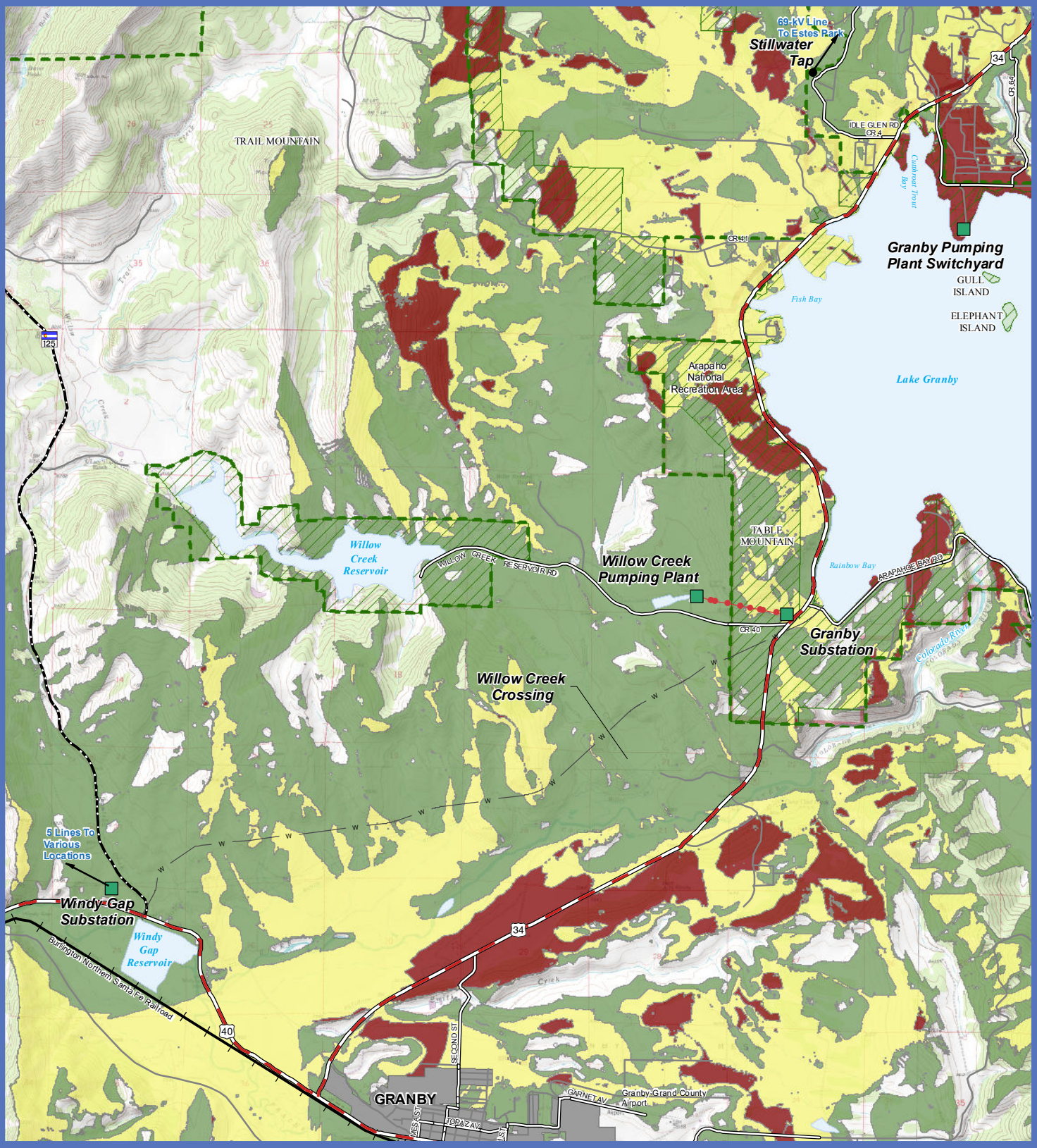

0 0.5 1 2 Miles

Map 4-7

Viewshed-Alt D (Option 2)

November 7, 2011

Legend

Base Data

- Existing Willow Creek Tap (69-kV)
- Windy Gap Water Pipeline (NCWCD)

Land Status

- Forest Service Land within Arapaho National Recreation Area
- Private or Other Land Ownership
- U.S. Forest Service Boundary

Transmission Line Alternatives

- Alternative D - Option 2

Transmission Line Visibility

- Low (Up to 1.5 miles of project Visible)
- Moderate (Up to 3.5 miles of project visible)
- High (More than 3.5 miles of project visible)

Source: Source: Bureau of Land Management (BLM), Northern Colorado Water Conservancy District (NCWCD), U.S. Forest Service (USFS), Grand County, Colorado State University

GRANBY PUMPING PLANT - WINDY GAP TRANSMISSION LINE REBUILD PROJECT

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As seen from KOPs 1, 2, 3, and 5 (from the Stillwater Tap to the Granby Pumping Plant Substation), the existing single-circuit transmission lines cross the scenic byway and cross Cutthroat Trout Bay Campground directly above campground facilities. The existing condition of this area is best described as "heavily altered" because of extensive private development, some of which is unsightly. Most private development is low profile. The southwestern circuit is skylined on a hill north of the campground and crosses above the lake surface, which is a major destination for campground users. The existing single-circuit transmission lines are highly visible from the scenic byway, lake, and Cutthroat Trout Bay Campground, where viewer sensitivity is high and viewing duration is long. Due to the multiple single-circuit H-frame structures (including one bright laminate angle structure) and urban development and infrastructure in the foreground scenic byway, lake, and Cutthroat Trout Bay Campground, the Forest Service SIO of High is not currently achieved.

In the long term, the Forest Service Predominant SIO of High for the scenic byway and Moderate for the remaining lands within the ANRA would continue to not be met by Alternative A, multiple other electrical distribution lines and ROWs, and extensive private development seen in the foreground of the scenic byway, lake, and Cutthroat Trout Bay Campground. The Secondary SIO of Low would be met. Therefore, Alternative A still complies with Forest Plan Standards and Guidelines.

Under Alternative A, Tri-State would still need to expand their transmission system in the valley with a new transmission line in order to serve increasing load demands without the participation of Western. Due to topographic and environmental constraints, their expansion would likely occur in the same general vicinity of Western's line and would require a new ROW.

4.8.3.2 Effects Common to All Action Alternatives

Short and long-term direct impacts to visual resources would occur from all action alternatives. As large-scale forms and lines, transmission lines create long-term changes to the visual setting and can be visible from many locations to great distances. Effects common to all action alternatives would result from the following components, as described in Chapter 2.0, Activities Common to All Action Alternatives, and Chapter 2.0, Design Criteria and Environmental Protection Measures:

- Construction Activities, Clearing, Grading, and New or Expanded ROWs
- Construction Staging Areas
- New Access Roads
- New Transmission Line
- Upgraded Existing Tap and Substation Facilities
- Operations and Maintenance Activities

Construction Activities, Clearing, Grading, and New or Expanded ROWs

Short-term surveying, demolition, clearing, staging, and construction activities would occur continuously along the ROW for all action alternatives. Trucks and cranes would be used for structure and conductor installation. Construction impacts on visual resources include the presence of equipment, materials, and associated dust, as well as a workforce along the alternatives. Residents or visitors in the vicinity of the route would be able to see construction equipment and activities. Construction activities would be most visible along those portions of

the analysis areas adjacent to the scenic byway, the ANRA, or in proximity to Granby. Direct and indirect short-term adverse visual impacts would occur in these locations.

The typical ROW would be up to 100 feet wide. Trees and shrubs along the ROW would be cleared, consistent with Western's 2008 Transmission Vegetation Management Program guidelines. Transmission segments located in areas with low vegetation would require clearing at the base of structures and along new access roads. Where crossing evergreen or riparian forests, trees within the ROW would be removed if they are capable of growing within 22 feet of the transmission line conductors. This would result in the removal of most tree species, resulting in the ROW having a mix of shrub, herbaceous, and low growing tree species. The edges of clearings and cuts through trees, shrubbery, or other vegetation would be irregularly shaped to soften the undesirable visual impact of straight lines. In densely forested areas, this would result in an open, linear feature in an area currently characterized by a closed canopy. Short-term soil disturbance in the ROW would be visible until the areas have been successfully revegetated. Short-term significant effects would occur on Forest Service lands within the foreground of the scenic byway and recreational use areas during construction.

Construction Staging Areas

Existing substations and their immediate surroundings would be used to the extent possible for temporary equipment staging, material laydown, and storage facilities. These areas have lower scenic quality than their surroundings due to the existing facilities; however, each substation is highly visible from a major road or use area. Short-term soil disturbance in the ROW would be visible until the areas have been successfully revegetated. Direct short-term minor adverse impacts on visual resources include the presence of equipment, materials, and associated dust, as well as a workforce at staging areas along the routes.

New Access Roads

Where existing roads are not available and overland access is not feasible, new access roads would be created. New access roads would create a new line and color on the landscape.

New Transmission Line

All action alternatives remove the existing H-frame wood poles, resulting in a beneficial long-term effect.

All action alternatives use the existing ROW for a portion of their route. Where utilizing the existing ROW, effects to visual resources would have lower effects than areas where a new line would be located for several reasons. Access roads exist along the existing ROW, vegetation has been cleared in the existing ROW, and viewers are accustomed to seeing the existing transmission line and therefore have a lower viewer sensitivity.

One 138-kV double-circuit transmission line would be constructed with single-column steel poles in the existing ROW. Structures would consist of steel monopoles and would range from 75-105 feet tall, constructed of rust-colored COR-TEN steel. The typical span between poles would be approximately 600 feet, with a maximum span of 800 feet. Nonreflective conductors and insulators would be used.

The form, lines, colors, and textures of these vertical structures would be discernible to the viewer, particularly within the foreground and middleground viewshed distances. Visual

contrasts increase during periods of snow cover as the COR-TEN finish would not blend with the ground. The upgraded lines would incrementally modify the high country ranch and recreational character of the region. Negligible effects would occur for viewpoints located more than 2 miles from the transmission line as a result of the distance and the ability of the landscape to absorb visual change as distance increases.

The project is generally located in a rural setting away from populated areas; however, it would sometimes traverse areas with occupied residences. Although alternatives were sited to avoid residential subdivisions whenever possible, the new transmission lines would create high contrasts in the immediate foreground of residences. Section 4.7, Land Use, describes the number of occupied residences within 300 feet of each alternative. Within this distance, viewers could distinguish the details of transmission line components, including the texture and color of a pole, and residents may perceive the project as permanently degrading the scenic quality of the existing landscape.

Upgraded Existing Tap and Substation Facilities

New equipment would be installed at existing tap and substations. Visual contrasts to KOP 13, the scenic byway, and State Highway 125 would be negligible due to upgraded equipment at Windy Gap Substation for all action alternatives. Visual contrasts to KOP 12 and the scenic byway would be negligible due to upgraded equipment at the Granby Substation.

Maintenance Activities

Long-term routine activities include aerial inspections, ground inspections, maintenance and repair of project components, and vegetation management. Maintenance operations would include aerial and ground patrols for monitoring, tree trimming, and equipment repair. Residents or visitors in the vicinity of the route would be able to see ground inspections. These annual maintenance activities would result in a negligible change to the visual environment.

Effects on Visual Resource Objectives

In the short term, visual resource objectives would not be met during construction of the new or expanded ROW, construction staging areas, new access roads, new transmission line, and tap and substation facilities, as described above. Vegetation clearing, grading, occupancy, facility construction, and revegetation of the project phases would result in areas of disturbed soil surface, human activity, and dust resulting in strong color, line, and texture contrast, which would be prominent from the scenic byway, residential areas, recreational use areas, and KOPs. Though temporary, anticipated strong visual changes from construction would be inconsistent with the applicable BLM VRM Class II and III areas and Forest Service High or Moderate SIO areas until revegetation occurred.

In the long term, visual contrasts and compliance with visual resource objectives were determined qualitatively through contrast ratings, viewshed analyses, and photographic simulations. Table 4-9, Visual Resource Objective Consistency by KOP, shows that the degree of contrast ranges from none to strong, depending on scenic quality, viewer sensitivity, distance, the nature of the proposed facility, and other considerations. The degree of contrast was compared to visual resource objectives to determine compliance. Table 4-10, Linear Impacts to Visual Resource Objectives, summarizes the length of management areas crossed by the action alternatives.

As seen from KOPs 1, 2, and 3 (from Stillwater Tap to the Granby Pumping Plant Substation), all action alternatives use the existing ROWs to cross the scenic byway and Cutthroat Trout Bay Campground. The action alternatives would cross U.S. Highway 34 north of the intersection with Idle Glen Road; two or more poles would be highly visible in the immediate foreground in new locations than the existing transmission line. The action alternatives would remove the existing southwestern circuit, which currently crosses Cutthroat Trout Bay Campground, resulting in a long-term beneficial effect to views from the lake and campground. Simulations of KOPs 2, 3, and 5 (Appendix J) simulate the scenic byway crossing, the view along CR 64 near the Cutthroat Trout Bay Campground, and a representative view from the lake towards Cutthroat Trout Bay Campground. The new structures would follow existing linear features (the existing ROW and CR 64) and share portions of these existing ROWs. However, despite these beneficial effects, the action alternatives would result in moderate to strong form and line contrasts due to the width of the new ROW, scale of new poles immediately adjacent to a pedestrian recreational setting, and height of structures above the existing forest canopy. The introduction of new transmission structures adds another element that is out of scale with existing low profile private development and recreational facilities, and thus highly contrasting.

As seen from KOP 5 (Stillwater Campground) looking north towards the intersection of the scenic byway and CR 64, all action alternatives would meet the Forest Service SIO of High and/or Moderate due to distance, screening of the lower two-thirds of the new transmission poles by the tree canopy, and color compatibility with the brown-grey green evergreen trees. As seen from KOP 5 looking towards the Granby Pumping Plan Substation, all action alternatives would continue to not meet the Forest Service SIO of High and/or Moderate, as the new transmission poles and expanded substation would not be screened (although backdropped) by evergreens, resulting in moderate form and line contrasts.

There are Predominant and Secondary SIOs listed in the Final EIS of the Forest Plan (Table 3.136, p. 402). The Predominant SIO, high, is defined as “Areas in which changes in the landscape are not visually evident to the average person unless pointed out. They appear not to have occurred” (p. 400). Because all action Alternatives rebuild the existing wooden pole transmission line using metal monopole structures approximately twice as high with twice as many conductors, in some areas the Predominant SIO would continue to not be achieved. Secondary SIOs are meant to be transitory and subordinate with the Predominant SIOs prevailing in the management area (p. 401). While the transitory nature of the Secondary SIOs is not defined in the Plan, the useful life of all action Alternatives is many decades and would not meet the Desired Future Visual Condition as listed in the Forest Plan EIS (p. 402) in some areas. While not requiring an amendment to the Plan, all action Alternatives are considered to be in contrast with the intent of the Forest Plan where they cross Forest Service lands (between 1.5 and 3.8 miles).

All action alternatives cross US 34 near the intersection of Country Road 64. On Forest Service lands within 0.5 mile of the crossing, the predominant Forest Service SIO of High would continue to not to be achieved in the long term. The secondary SIO of Low would be achieved. Therefore, the Predominant SIO within 0.5 mile of the US 34 and CR 64 intersection would be changed to an SIO of Low as per Standard 154 of the Forest Plan (p. 38).

In the long term, all action alternatives would achieve BLM VRM Class II and III objectives.

Table 4-9. Visual Resource Objective Consistency by KOP.

Location	Management Objective	Photo-Simulation	Alternative Contrast Rating[2]							Management Objective Met for Each Alternative						
			Alt A	B1	C1	C2-O1	C2-O2	D-O1	D-O2	Alt A	B1	C1	C2-O1	C2-O2	D-O1	D-O2
1: US 34 – Transmission line crossing looking north	Grand County Three Lakes Design Review Area, Forest Service (Predominant SIO of High)		Moderate	Strong	Strong	Strong	Strong	Strong	Strong	No	No	No	No	No	No	No
2: US 34 / CR 64 looking southwest	Grand County Three Lakes Design Review Area, Forest Service (Predominant SIO of High)	X	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	No	No	No	No	No	No	No
3: CR 64 at Cutthroat Trout Bay Campground looking northwest	Grand County Three Lakes Design Review Area, Forest Service (Predominant SIO of High)	X	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	No	No	No	No	No	No	No
4: CR 41 – 2 miles west of US 34 looking southeast	Grand County Three Lakes Design Review Area, Forest Service (Predominant SIO of Moderate)	X	None	None	Minor	Minor	Minor	None	None	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5: Stillwater Campground	Grand County Three Lakes Design Review Area, Forest Service (Predominant SIO of High)	X	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Partial	Partial	Partial	Partial	Partial	Partial	Partial

Location	Management Objective	Photo-Simulation	Alternative Contrast Rating[2]							Management Objective Met for Each Alternative						
			Alt A	B1	C1	C2-O1	C2-O2	D-O1	D-O2	Alt A	B1	C1	C2-O1	C2-O2	D-O1	D-O2
6: US 34 / CR 41 looking northwest	Grand County Three Lakes Design Review Area	X	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7: CR 41 – 1 mile west of US 34 looking north	Grand County Three Lakes Design Review Area	X	Negligible	Minor	Moderate	Moderate	Moderate	Minor	Minor	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8: CR 4106 – East of Three Lakes wastewater facility looking west	Grand County Three Lakes Design Review Area, Forest Service (Predominant SIO of Moderate)		None	None	Minor	Minor	Minor	None	None	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9: Sunset Point Campground looking west	Grand County Three Lakes Design Review Area, Forest Service (Predominant SIO of High)	TBD pending KOP 15, B1 Re-alignment	Negligible	Minor	None	None	None	Minor	Minor	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10: Willow Creek Road – 1 mile east of Willow Creek Campground looking east	None	X	None	None	Minor	Minor	Minor	None	None	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11: Willow Creek Pumping Plant looking east	None	X	None	None	Strong	Strong	Strong	None	None	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12: Granby Substation – US 34 / Willow Creek Road looking southwest to north	Grand County Three Lakes Design Review Area, Forest Service (Predominant SIO of High)	X	Moderate	Strong	None	None	None	Moderate	Moderate	No	No	Yes	Yes	Yes	No	No

Location	Management Objective	Photo-Simulation	Alternative Contrast Rating[2]							Management Objective Met for Each Alternative						
			Alt A	B1	C1	C2-O1	C2-O2	D-O1	D-O2	Alt A	B1	C1	C2-O1	C2-O2	D-O1	D-O2
13: Windy Gap Watchable Wildlife Area (SWA) looking north	BLM (Class II)	X	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Yes	Yes	Yes	Yes	Yes	Yes	Yes
14: US 34 – 1.5 miles north of US 34 / 40 looking north	BLM (Class III)		Negligible	Minor	Moderate	Moderate	Moderate	Minor	Minor	Yes	Yes	Yes	Yes	Yes	Yes	Yes
15: Lake Granby (Norton) Marina looking southwest	Grand County Three Lakes Design Review Area, Forest Service (Predominant SIO of High)	X	Minor	pending Western routing	None	None	None	Moderate	Moderate	Yes	Yes	Yes	Yes	Yes	Yes	Yes
16: US 34 / Colorado River crossing near CR 620 looking northwest	BLM (Class III)	X	Minor	Moderate	Minor	Minor	Minor	Minor	Minor	Yes	Yes	Yes	Yes	Yes	Yes	Yes
17: US 34 at the former Shorefox Development looking northwest	BLM (Class III)	X	Minor	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Yes	Yes	Yes	Yes	Yes	Yes	Yes
18: US 34 – 1 mile south of CR 41 looking west	Grand County Tree Lakes Design Review Area, Forest Service (Predominant SIO of High)		Negligible	Minor	None	None	None	Minor	Minor	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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Table 4-10. Linear Impacts to Visual Resource Objectives.

Management Direction	Alt A	Alt B1	Alt C1	Alt C2-O1	Alt C2-O2	Alt D-O1	Alt D-O2
	Length Affected (miles)						
Forest Service – Predominant SIO of High SIO, ANRA Lands	3.3	3.8	1.5	1.5	1.5	3.3	3.3
BLM – VRM Class II Lands	0.5	0.5	0.5	0.0	0.5	0.0	0.5
BLM – VRM Class III Lands	0.3	0.3	0.3	0.0	0.0	0.0	0.0
Grand County Three Lakes Design Review Area	2.3	1.3	2.9	1.7	1.0	1.9	1.1

Effects on the Colorado River Headwaters National Scenic and Historic Byway

Effects to visual resources would be more pronounced where the action alternatives would be visible within the foreground of high volumes of viewers, such as along the scenic byway. Table 4-11, Effects to U.S. Highway 34, shows the length (in miles) of the scenic byway that may be within view of new transmission poles (depicted as a range from low to high). Map 4-1 through Map 4-7 show the degree of visibility by alternative. All action alternatives would be highly visible from the Colorado River Valley (at varying degrees) and from the intersection of the scenic byway and CR 64. While viewer duration is briefer for motorists than residents and recreationists, long-term adverse visual impacts would occur along segments of the scenic byway where the alternatives are moderately to highly visible.

Table 4-11. Effects to U.S. Highway 34.

Degree of Visibility	Alt A	Alt B1	Alt C1	Alt C2-O1	Alt C2-O2	Alt D-O1	Alt D-O2
	Length Affected (miles)						
Miles of Byway where poles are **highly** visible[1]	0.8	3.2	3.6	2.8	3.1	2.0	2.4
Miles of Byway where poles are **moderately** visible	6.1	5.3	3.5	3.9	3.5	6.4	6.1
Miles of Byway where poles have **low** visibility	7.1	5.5	6.9	7.2	7.3	5.5	5.5

[1] A visibility rating of "highly visible" indicates that more than 3.5 miles of transmission line would be visible from a given location if vegetation and viewing distance were not considered. "Moderately visible" indicates that up to 3.5 miles of transmission line would be visible, and a rating of "low visibility" indicates that less than 1.5 miles of transmission line would be visible.

4.8.3.3 Alternative B1

In addition to the effects common to all action alternatives, Alternative B1 would result in long-term moderate to significant adverse effects to residences, the scenic byway, and visual resource objectives, depending on the angle of view. Alternative B1 follows the existing ROW and crosses several residential areas where an expanded ROW would be required, potentially resulting in strong form and line contrasts to residential areas, depending on the angle of view.

As seen from KOP 12 (Granby Tap Substation) and KOP 15 (Lake Granby Marina), Alternative B1 would continue to not meet the Forest Service SIO of High. New steel monopoles would replace the existing H-frames in the view, making them more visible from the scenic byway. Alternative B1 would remove the existing transmission line from the Scanloch Subdivision and place it higher on Table Mountain decreasing impacts to the residential areas but potentially skyline new structures above the Table Mountain ridgeline as seen from the scenic byway.

Alternatives B1 and D would require fewer new access roads relative to other action alternatives, resulting in fewer line and color soil contrasts.

The existing substation and multiple lines (both Western and MPEI) would continue to dominate the existing recreational and natural-appearing landscape character, resulting in strong form and line contrasts that are not compatible with the Forest Service SIO of High.

In the long term, the Forest Service Predominant SIO of High for the scenic byway and Moderate for the remaining lands within the ANRA would continue to not be met by Alternative B1. The Secondary SIO of Low would be met. Therefore, Alternative B1 is consistent with the Forest Plan.

Additional descriptions of Alternative B1 by KOP can be found in Appendix J, Visual Resource Contrast Rating Worksheets and Photographic Simulations.

4.8.3.4 Alternative C1

In addition to the effects common to all action alternatives, Alternative C1 would result in long-term adverse minor to moderate effects to residences and the scenic byway, with localized areas of significant effects. Alternative C1 creates a new ROW north of the residential and commercial mixed use project formerly known as the Shorefox Development, and from south of the Willow Creek Reservoir Road to north of CR 41.

In the Colorado River Valley, Alternative C1 would result in the following effects:

- As seen from KOP 14 (U.S. Highway 34, 1.5 miles north of U.S. Highway 40), the new ROW along the north boundary of the former Shorefox property would be located at a higher elevation than the other action alternatives and more visible on the hillside. The 90° angle would not appear to follow the natural forms and lines of the landscape.
- As seen from KOP 16 (U.S. Highway 34 at the Colorado River crossing near CR 620), Alternative C1 is located 0.25-0.5 mile farther from the scenic byway than Alternative B1. It may be skylined in several locations. Line and color contrasts are reduced as it follows the existing band of disturbance from the Windy Gap Pipeline, although this is not apparent in winter.
- As seen from KOP 17 (U.S. Highway 34 at the former Shorefox Development), the new ROW north of the former Shorefox property would be located at a higher elevation than the other action alternatives and more visible on the hillside. The 90° angle would not appear to follow the natural forms and lines of the landscape.

From south of the Willow Creek Reservoir Road to north of CR 41, Alternative C1 would result in the following effects:

- As seen from KOP 4 (CR 41, 2 miles west of U.S. Highway 34 looking southeast), Alternative C1 would create a new line on the toe of Table Mountain from a new access road and timber clearing in an area with moderate scenic integrity, resulting in minor contrasts.
- As seen from KOP 10 (Willow Creek Road, 1 mile east of Willow Creek Campground), Alternative C1 creates new lines north-south from the transmission line and access road that would be highly visible to recreationists in a middleground setting. The new line follows the toe of Table Mountain in area with little infrastructure and high scenic integrity, resulting in minor contrasts.
- As seen from KOP 11 (Willow Creek Pumping Plant), Alternative C1 creates new forms and lines north-south from the transmission line and access road that would be highly visible to day use recreational area users in the foreground. The new line follows the toe of Table Mountain in an area with moderate scenic integrity, resulting in moderate to strong contrasts.

South of the wastewater treatment plant, Alternative C1 crosses approximately 0.5 mile of land owned by C Lazy U Preserves held under a conservation easement. The natural qualities of this northwestern toe of Table Mountain include timbered ridges and sagebrush grasslands, above a pasture, canal, and dirt road that parallel Alternative C1. The new transmission line would create moderate to major contrasts from new forms and lines above the canal and dirt road, with linear clearings in forested areas in a viewshed currently void of similar facilities.

Alternative C1 would be most highly visible from the scenic byway relative to the other action alternatives.

In the long term, the Forest Service Predominant SIO of High for the scenic byway and Moderate for the remaining lands within the ANRA would continue to not be met by Alternative C1. This alternative lowers the SIO less over the entire length of the project than Alternatives A, B1, and D. The Secondary SIO of Low would be met. Therefore, Alternative C1 is consistent with the Forest Plan.

Additional descriptions of Alternative C1 by KOP can be found in Appendix J, Visual Resource Contrast Rating Worksheets and Photographic Simulations.

4.8.3.5 Alternative C2-Option 1

Effects from Alternative C2-Option 1 would be the same as Alternative C1, except as seen from the Colorado River Valley, where it would follow the existing Windy Gap Pipeline.

- As seen from KOP 14 (U.S. Highway 34, 1.5 miles north of U.S. Highway 40), Alternative C2-Option 1 would follow the existing line of disturbance from Windy Gap Pipeline. In winter when the pipeline ROW is not visible, this option would create a higher degree of contrast than Alternative C2-Option 2 due to its elevated location. If new residential and commercial mixed use development occurred on the former Shorefox property, Option 1 would traverse through a developed area with limited visibility from the scenic byway.
- As seen from KOP 17 (U.S. Highway 34 at the former Shorefox Development), Alternative C1-Option 1 would be highly visible from this KOP as a new line. If new residential and commercial mixed use development occurred on the former Shorefox

property, Option 1 would traverse through a developed area with limited visibility from the scenic byway.

In the long term, the Forest Service Predominant SIO of High for the scenic byway and Moderate for the remaining lands within the ANRA would continue to not be met by Alternative C2-Option 1. This alternative lowers the SIO less over the entire length of the project than Alternatives A, B1, and D. The Secondary SIO of Low would be met. Therefore, Alternative C2-Option 1 is consistent with the Forest Plan.

Additional descriptions of Alternative C2-Option 1 by KOP can be found in Appendix J, Visual Resource Contrast Rating Worksheets and Photographic Simulations.

4.8.3.6 Alternative C2-Option 2

Effects from Alternative C2-Option 2 would be the same as Alternative C1, except as seen from the Colorado River Valley, where it would follow the existing transmission line.

- As seen from KOP 14 (U.S. Highway 34, 1.5 miles north of U.S. Highway 40), Alternative C2-Option 2 would traverse through a developed area with limited visibility from the scenic byway if the former Shorefox Development occurred.
- As seen from KOP 17 (U.S. Highway 34 at Shorefox Development), Alternative C1-Option 2 would be highly visible from this KOP as a new line. If new residential and commercial mixed use development occurred on the former Shorefox property, Option 2 would traverse through a developed area with limited visibility from the scenic byway.

In the long term, the Forest Service Predominant SIO of High for the scenic byway and Moderate for the remaining lands within the ANRA would continue to not be met by Alternative C2-Option 2. This alternative lowers the SIO less over the entire length of the project than Alternatives A, B1, and D. The Secondary SIO of Low would be met. Therefore, Alternative C2-Option 2 is consistent with the Forest Plan.

Additional descriptions of Alternative C2-Option 2 by KOP can be found in Appendix J, Visual Resource Contrast Rating Worksheets and Photographic Simulations.

4.8.3.7 Alternative D-Option 1

Effects from Alternative D-Option 1 would be the same as Alternative B1, except as seen from the Colorado River Valley. In the Colorado River Valley, effects would be the same as Alternative C2-Option 1.

Alternative D-Option 1 would be the least highly visible action alternative as seen from the scenic byway.

Alternative D-Option 1 and Alternative B1 would require fewer new access roads relative to other action alternatives, resulting in fewer line and color soil contrasts.

In the long term, the Forest Service Predominant SIO of High for the scenic byway and Moderate for the remaining lands within the ANRA would continue to not be met by Alternative D-Option 1. The Secondary SIO of Low would be met. Therefore, Alternative D-Option 1 is consistent with the Forest Plan.

Additional descriptions of Alternative D-Option 1 by KOP can be found in Appendix J, Visual Resource Contrast Rating Worksheets and Photographic Simulations.

4.8.3.8 Alternative D-Option 2

Effects from Alternative D-Option 2 would be the same as Alternative B1, except as seen from the Colorado River Valley. In the Colorado River Valley, effects would be the same as Alternative C2-Option 2.

Alternative D-Option 2 and Alternative B1 would require fewer new access roads relative to other action alternatives, resulting in fewer line and color soil contrasts.

In the long term, the Forest Service Predominant SIO of High for the scenic byway and Moderate for the remaining lands within the ANRA would continue to not be met by Alternative D-Option 2. The Secondary SIO of Low would be met. Therefore, Alternative D-Option 2 is consistent with the Forest Plan.

Additional descriptions of Alternative D-Option 2 by KOP can be found in Appendix J, Visual Resource Contrast Rating Worksheets and Photographic Simulations.

4.8.4 Mitigation Measures

4.8.4.1 Mitigation Common to All Action Alternatives

The primary mitigating feature for a transmission line for visual resources is proper siting and structure design. As a result, visual considerations were a major factor in refinement of the alternatives and selection of a transmission structure during the EA and EIS process. Beyond siting and structure, the design criteria in Chapter 2.0 were assumed as standard practices in the process of assessing impacts.

The following mitigation measures, when combined with the SCPs and project-specific design criteria, would further reduce the visual contrast created by the action alternatives:

- At the scenic byway crossing, underground MPEI distribution lines (similar to the existing conditions of the MPEI distribution line) in order to keep the height of new poles to a minimum and limit visual clutter.
- At the scenic byway crossing, reroute the line directly east-west to cross immediately south of the tennis courts (northwest of byway).
- Along CR 64, overlap the CR 64 ROW with the new ROW in order to place new poles as close to CR 64 as feasible, and away from campground facilities.

Additionally, measures taken to specifically address the impacts to recreation, land use, and vegetation may be effective in the avoidance of visual resource impacts.

4.9 Socioeconomics and Environmental Justice

4.9.1 Issues and Significance Criteria

Potential issues of the project include impacts to property values, unwanted changes to regional character, and disproportionate impacts to minority or low income populations. The project could

result in beneficial impacts, such as short-term economic gains primarily related to construction workforces and expenditures, or long-term economic gains related to power source reliability.

It is difficult to establish definitive figures and costs associated with each impact topic. Therefore, a more general discussion of the impacts on socioeconomic resources is included in the environmental consequences section based on the following impact levels.

4.9.1.1 Impact Level

Significant impacts would result if the effects on socioeconomic conditions would be readily apparent, long term, and would cause substantial adverse or beneficial changes to socioeconomic conditions in the region. Minority or low income populations would be disproportionately affected by the project. If mitigation measures were required to offset potential adverse effects, they would be expensive and their success could not be guaranteed. Significant socioeconomic impacts would include:

- If changes in regional character results in lasting changes to lifestyles or social behaviors.
- Demand for temporary housing exceeds the existing supply when project-related needs are combined with recent occupancy rates during the scheduled construction season.
- Permanent demand on other infrastructure is greater than 10 percent of the current level of demand; construction or operations demand exhausts the carrying capacity in areas where workforce would live.
- Change in local tax bases of greater than 10 percent (positive).
- The change in area population is 10 percent or more.
- Long-term employment increases of more than 10 percent for the study area (positive).
- Property values are impacted from transmission line location within 50-300 feet of property. Key scenic views are altered.

4.9.2 Methodology

The socioeconomic environmental consequences section will determine whether employment and population from the proposed project alternatives would positively or negatively impact governmental or private conditions in the area. In addition, the socioeconomic section briefly addresses some of the concerns related to cumulative impacts from past, present, or foreseeable future events in the area.

Primary areas of concern are impacts to property values, cumulative related impacts related to the mountain pine beetle infestation, energy usage, reliability of electrical system, and short-term construction impacts.

4.9.3 Direct and Indirect Impacts

Socioeconomic impacts of the project may be divided into direct and indirect impacts. Direct impacts result from the construction of the project and consist of fiscal impacts from the construction and related expenditures, increased short-term employment and income, and impacts on the local housing market due to temporary housing of construction labor. Direct project effects during operations include the potential impacts on property values and electricity

rates. Indirect impacts include potential growth inducing impacts related to the increased reliability and increased capacity of the electrical system in the region.

Generally, socioeconomic impacts are associated with the entirety of the project; therefore, impacts related to population, employment, income, housing, financial, or growth induced elements would not change dramatically for different alternatives. However, the alternative locations would affect property values and social values differently. Differences in impacts among project components or alternatives are identified where there are discernable differences.

4.9.3.1 Impacts of Alternative A

The existing transmission line and ROW has been established in the Project Area for approximately 70 years. Alternative A would result in no impacts to the socioeconomic, housing, or community service needs within the Project Area or region. Alternative A would not provide employment opportunities for an estimated construction workforce of 10-12 for the proposed transmission line rebuild. Income generated in the form of direct wages to employees and direct expenditures by the transmission line contractor and Western would not be filtered into the local economies adjacent to the route. However, maintenance workers would actively be maintaining the line and maintenance expenditures in the area would occur as is the current situation.

Over time, Alternative A may result in impacts to local socioeconomic factors because of decreasing reliability of electric service delivery and the associated adverse effects to local businesses and industry. Ultimately, if a second source of electrical power is not forthcoming once the Adams Tunnel cable is no longer operational; a reliable electrical power supply could be jeopardized and could indirectly affect economic activities in the service area.

The current transmission line alignment relative to the existing housing subdivisions would not change for this alternative; therefore property values would not be affected.

No new upgrade or modifications to the existing tap and substation facilities would occur.

4.9.3.2 Impacts of Alternative B1

Alternative B may result in a small short-term increase in population in the Project Area from the employment of contract construction workers from outside the county. However, this construction force would represent a negligible increase in population.

The construction phase of the project is anticipated to begin in summer 2011 and end in the latter part of 2013 on the segments of the line. The workforce would average 5-6 people per crew with 1-2 crews working 10-hour days (Trujillo 2009). It is anticipated that the workforce would be mostly local if a local contractor (Colorado) is hired, and 60-70 percent nonlocal if an out-of-state contractor is hired. Construction workers would likely stay in RV campers or short-term rental units. If local, some workers would commute to and from their permanent residence on a daily basis if within 1 hour of the show-up area.

One staging area of 5 acres would be designated for the transmission line. The approved contractor would negotiate the location of the staging area. The staging area is typically on private land and would not affect transportation or use of public lands.

Wage rates for the skilled and unskilled construction workers range from $13.95 and $26.61 per hour for laborers to $30.74 per hour for electric line installers and repairers, including benefits in

the Colorado labor market. A portion of this income would be spent in the local area of the transmission line construction for goods and services. Minor short-term beneficial effects to the economy of the Project Area may occur from an increased consumer base as a result of the employment of these contract construction workers. Expenditures during project-related construction activities for equipment, energy, fuel, operating supplies, worker lodging and meals, and other consumer goods, products, and services would benefit local businesses and result in direct short-term positive economic impacts in Grand County.

The most recent total project cost estimate (9-10-08) is $11.6 million. Of this, $7.9 million is for the transmission line, and $3.7 million for the modifications at the Granby Pumping Plant Substation (Western 2009). A portion of this would be spent in the local area for diesel fuel, fuel oil, and miscellaneous supplies and repairs (Trujillo 2009). This would be considered a positive impact to the local economy. Private landowners would be reimbursed for the increase in ROW and also for any crop losses from construction activities.

Temporary housing accommodations provided in the Project Area are more than adequate for the estimated 10-12 short-term employees. Most of the temporary workers for construction of Alternative B1 are expected to be housed in local short-term accommodations, such as motels or inns. The project would have a minor short-term beneficial effect on temporary housing in Grand County. Alternative B1 would not result in effects to housing availability or additional community service needs.

Emergency services, including fire, police, ambulance, and hospital services, would not be impacted by increases in population or employment during the construction phase of the proposed project. The only impacts that would affect the provision of emergency services within the Project Area would be a construction accident or possibly traffic impedance for short periods of time. Basic medical and emergency services, which may be required in the event of an accident, are available throughout the Project Area as described in Section 3.9.

Overall, impacts on the local area population, employment, housing, or infrastructure would be considered indirect, negligible, mostly beneficial, and short term.

According to Western, the purpose of the proposed project would be to provide a reliable, second source of power to improve electrical reliability in the region, improve regional operating efficiency, and improve quality of service. MPEI's customer base has grown 8.6 percent, from 17,581 customers in 2005 to 19,096 customers in 2009 (Ransom 2009, pers. comm.). The economic effect of completing the project would be the greater reliability of electrical power to sustain the existing and growing population in the Grand County, Granby, Grand Lake, and the greater service area currently supplied with power through the Adams Tunnel.

The operations phase of the project would have little or no impact on population, employment, housing, or local infrastructure. The same number of operations workers would maintain the rebuilt line. Maintenance activity could actually be less, considering the improved reliability of the rebuilt line.

Indirect long-term beneficial economic effects would occur as a result of Alternative B1 by providing a reliable source of power for the area. The increased capability to supply energy to residential, commercial, and industrial users may contribute to economic growth and additional tax revenues in Grand County. The rebuild and upgrade of the transmission line, upgrades to the existing Stillwater Tap, and modifications to the Granby Pumping Plant Switchyard would help facilitate this objective.

Property Values

There are two aspects of the proposed transmission line upgrade that would potentially impact property values: visual encumbrances, and health and safety effects. Through literature review, the more significant of the two is the visual effects. EMF-induced health hazards have not statistically proven to have a significant effect on property values (Kinnard et al 1997). To date, research on the impacts of EMFs to human health have been contradictory. Conclusions about the negative effects of exposure to EMFs from high voltage transmission lines have not been substantiated by all researchers to date (see Section 3.6 Electric and Magnetic Fields).

Most of the research reviewed on the impact of transmission lines on property values focused on urban environments. The studies reviewed included assessments of various types of high voltage transmission lines, including a 138-kV, 230-kV, 315-kV, and 345-kV. The overall conclusion for all of the studies reviewed was that urban properties located adjacent to or within 325 feet of the transmission line would experience some property value impacts. In all studies, the transmission line tower was typically a four-legged steel tower or a tower on a pylon; more detracting visually than a single-pole steel structure with conductors. In all studies, the results suggested that the initial impact from the line would be the greatest; after a period of time, the transmission line would become a part of the landscape and have less of an impact on property values (Hamilton and Schwann 1995). Another common conclusion was that no impact to property values occurred after a certain distance (between 200 and 325 feet) because the negative visual impacts diminished rapidly. In some cases, homes located along the easement typically had larger yards to compensate for the adjacent transmission line. Sometimes, these homes had more open space surrounding the home, providing more privacy and an enlarged visual field. These properties were actually valued higher than other properties not visually encumbered by the transmission line.

The resulting quantitative impact to property values was difficult to generalize in the studies. The range of impacts varied from a positive impact to a 20 percent decline in value. The range most commonly identified for properties located within 165-325 feet of the centerline was, on average, 5-10 percent decrease in overall mean house value. Again, these studies were conducted in urban settings, generally in higher density subdivisions. No impact research was found on rural properties.

Local real estate representatives and the Grand County Assessor were also contacted to get their perspective on the local effect of transmission lines on adjacent properties. It was generally agreed that the effect on property values depends on many factors, including whether the property (home site) faces the line or whether the line is located behind the home site, whether the location of the line detracts from the views of the property or use of the property (agriculture), what natural vegetation or topography buffers the impact, how far away the line is located, the size of the parcel affected, whether the property is residential or agricultural, etc. The actual impact on property values would depend on the characteristics of each individual property, but it is generally agreed that some impact to value would occur or the property would take longer to sell. Properties never impacted by a transmission line would be, perceptually, more impacted than properties already affected by a view of a line from the standpoint of sales price (Brosh 2009, pers. comm.). In the case of the proposed project, the existing residential subdivisions located adjacent to the transmission lines were built after the transmission line was in service; therefore, the impact to property values had already occurred when each parcel was originally sold or built.

Future impacts to established residential property values from Alternative B1 are not anticipated. These properties were constructed along the ROW and their market value in this location has

been established over the years. Since this alternative follows the existing 69-kV line, the level of impact may be less than in areas in which no transmission line exists. Other factors in the market affect the overall value of these properties more than the transmission line itself, including current economic conditions, housing demand/supply, location, availability of affordable or desirable housing, etc. However, the properties within 300 feet of the ROW would likely be more difficult to sell than properties farther than 300 feet from the ROW.

The transmission line alignment of Alternative B1 would avoid the Scanloch Subdivision by relocating the new 138-kV line onto a new ROW located just inside the ANRA boundary. Property values would likely improve, which in turn would increase the assessed valuation of the property and increase property tax revenues to Grand County. Removal of the existing 69-kV transmission line through this subdivision would have a direct beneficial long-term impact on property values within this subdivision.

Approximately 13 homes within 43 improved residential lots currently lie within 100 feet of the proposed alignment for Alternative B1, along that portion of the route that follows the alignment of the existing transmission line. An additional 51 improved residential lots lie within 300 feet. Approximately 18 vacant residential lots lie within 100 feet of the proposed alignment for Alternative B1, and an additional 55 vacant residential lots are located within a distance of 100-300 feet. Lot sizes range from less than 35 acres to over 35 acres. No effects on property values are anticipated in situations involving a rebuild along the existing alignment.

Approximately 1.3 miles of agricultural land is located along the existing alignment where one set of structures would be replaced by another. No additional impacts to property values would occur at these locations. Alternative B1 does not result in the placement of any structures on agricultural lands that are not crossed by the existing transmission line.

4.9.3.3 Impacts of Alternative C1

Impacts of Alternative C1 would be similar to those described for Alternative B1.

Property Values

Alternative C1 would circumvent the residential and commercial mixed use project formerly known as Shorefox.

The transmission line alignment of Alternative C1 would avoid the Scanloch and Stillwater Estates residential subdivisions altogether. Removal of the existing 69-kV transmission line would have a direct beneficial long-term impact on property values within these subdivisions.

A total of 13 homes within 35 improved residential lots currently lie within 100 feet on either side of the centerline of the ROW of Alternative C1, along that portion of the route that follows the alignment of the existing transmission line. An additional 30 improved residential lots, two residential lots with mobile homes, and six condominiums lie within 300 feet on either side of the centerline. Approximately 10 vacant residential lots lie within 100 feet of the proposed alignment for Alternative C1, and an additional nine vacant residential lots are located within a distance of 100-300 feet on either side of the centerline of this alternative. Lot sizes range from less than 35 acres to over 35 acres.

Approximately 1.8 miles of agricultural land is located along the existing alignment where one set of structures would be replaced by another. No additional impacts to property values would occur at these locations.

Alternative C1 would traverse a portion of the C Lazy U Preserves property. This property has a conservation easement in place. This alternative would visually impact the preserve.

4.9.3.4 Impacts of Alternative C2 and Option 1 and 2

Impacts of Alternative C2 would be similar to those described for Alternative C1.

Property Values

The transmission line alignment of Alternative C2 would avoid the Scanloch and Stillwater Estates residential subdivisions altogether. Removal of the existing 69-kV transmission line would have a direct beneficial long-term impact on property values within these subdivisions.

Both options would have the same effects on residential property. Approximately 13 homes within 35 improved residential lots are within 100 feet of the proposed alignment of Alternative C2. These homes are along the portion of the route that follows the alignment of the existing transmission line between Stillwater Tap and the Granby Pumping Plant Switchyard. An additional 30 improved residential lots and six condominiums are within 300 feet on either side of the centerline. Approximately 10 vacant residential lots lie within 100 feet of the proposed alignment, and an additional nine vacant residential lots are located within a distance of 100-300 feet on either side of the centerline of this alternative. Lot sizes range from less than 35 acres to over 35 acres.

There are no differences with respect to agricultural lands for the two options. Both would cross approximately 1.8 miles of agricultural land located along the existing alignment where one set of structures would be replaced by another. No additional impacts to property values would occur at these locations.

Alternative C2 would traverse a portion of the C Lazy U Preserves property. This property has a conservation easement in place. This alternative would visually impact the preserve.

4.9.3.5 Impacts of Alternative D-Option 1 and 2

Impacts of Alternative D, both options, would be similar to those described for Alternative B1.

Property Values

The transmission line alignment of Alternative D, both options, would avoid the Scanloch Subdivision by relocating the new 138-kV line onto a new ROW located just inside the ANRA boundary. Property values would likely improve, which in turn would increase the assessed valuation of the property and increase property tax revenues to Grand County. Removal of the existing 69-kV transmission line through this subdivision would have a direct beneficial long-term impact on property values within this subdivision.

Both options would have similar effects on residential property. Approximately 13 homes within 41 improved residential lots are within 100 feet of the proposed alignment for Alternative D. These homes are along that portion of the route that follows the existing transmission line

between Stillwater Tap and the Granby Pumping Plant Switchyard. An additional 50 improved residential lots and six condominiums are within 300 feet on either side of the centerline.

Approximately 18 vacant residential lots lie within 100 feet of the proposed alignment for this alternative, and an additional 55 vacant residential lots are located within a distance of 100-300 feet. Lot sizes range from less than 35 acres to over 35 acres.

With respect to agricultural lands, both options would cross approximately 1.3 miles of agricultural land located along the existing alignment where one set of structures would be replaced by another. No additional impacts to property values would occur at these locations.

4.9.3.6 Environmental Justice

Under E.O. 12898 (published in the *Federal Register* February 11, 1994), federal agencies are required to identify and address disproportionately high or adverse human health or environmental effects of their programs, policies, and activities on minority populations and low income populations. Within the area potentially affected by the proposed project, no minority populations are affected. The existing line currently runs through several residential areas, which would be considered moderate (Lakeridge Mountain Valley, Lake Forest, Scanloch) to higher income (Stillwater Estates). During the EIS process, particular efforts were made to ensure that property owners within the affected areas were informed of the proposed project, the EIS procedures, and the opportunity to provide comments.

Neither low income (poverty status) nor minority populations would be disproportionately impacted by the proposed project. As described in the Environmental Justice section (3.6), the economic base of the area is predominately agriculture or tourism. Segments of the population are lower income, but are not disproportionately located along the transmission line routes. Families within the defined poverty status represent an estimated 7.1 percent of the Grand County population (1,053) and are dispersed throughout the county, not just in the analysis area. The project is located in an area where no poverty status population would be directly affected by the rebuild. No new populated areas would be impacted by the proposed project.

The proposed project alternatives would not have a disproportionately high or adverse long-term effect on minority or low income populations, or corresponding property values of minority or low income populations.

4.9.4 Mitigation Measures

No project-specific mitigation measures are recommended.

4.10 Recreation and Wilderness

4.10.1 Significance Criteria

The following significance criteria were used to assess potential impacts to recreational resources as a result of project alternatives:

- Changes in visitor use or experience would be readily apparent and have important long-term consequences. The visitor would be aware of the effects associated with the project and likely would express a strong opinion about the changes.

4.10.2 Methodology

The analysis considered recreational resources within 0.5 mile on either side of the proposed transmission line centerlines and associated substations, regardless of whether a transmission line would physically cross or intersect with a recreational resource. Although a transmission line might not cross or intersect with a recreational resource, the existence of the proposed transmission line and transmission structures within the line of sight of a visitor might have an effect on their recreational experience, because visual quality is one factor influencing a recreational experience. Visual effects beyond the 1-mile wide analysis area are described separately in the visual resources section of this chapter.

The analysis considered the recreational resources potentially affected by the proposed action and alternatives, as well as the potential effects on recreational experiences in the analysis area.

Because the closest designated wilderness area is located approximately 5 miles away, this project does not have the potential to affect, either directly or indirectly, any wilderness resources. Wilderness resources are therefore not described in the following direct and indirect effects discussion.

4.10.3 Direct and Indirect Impacts

4.10.3.1 Alternative A

Direct effects to recreational opportunities or facilities within the Project Area or region from Alternative A would be those resulting from normal operational and maintenance activities of the existing transmission line within ANRA, BLM, or general Forest Service lands. The only developed recreation facility crossed by Alternative A is the Cutthroat Trout Bay Campground within the ANRA on the north shore of Lake Granby. Normal operational and maintenance activities to the existing line within the campground may cause temporary disruptions or closures to portions of the facility. These disruptions or closures would likely be temporary and short term and would most likely occur outside of the peak use season, therefore not disrupting current visitor use. Any direct effects from Alternative A are anticipated to be negligible.

Other direct effects from Alternative A may occur as a result of normal operational and maintenance activities to the existing transmission line. These impacts would most likely be limited to impacts to the visitor experience in the form of visual disturbance while crews work on the existing lines.

4.10.3.2 Alternative B1

The construction of Alternative B1 would have a direct effect on recreation at the Cutthroat Trout Bay Campground. Alternative B1 would remove the existing southwestern circuit currently routed through the campground and consolidate the two existing lines onto the northeastern alignment, paralleling the east side of CR 64 through the Lake Forest Subdivision to the Granby Pumping Plant Switchyard. Removal of the existing southwestern circuit would result in short-term disruptions or closures to all or portions of the facility. These disruptions or closures would most likely occur outside of the peak use season. No other direct effects to developed recreation sites are anticipated as there are no other developed recreational facilities crossed by Alternative B1.

Direct effects to recreation as a result of Alternative B1 may also include temporary disruptions to dispersed recreation on BLM, Forest Service, and ANRA lands as a result of expanding the existing 30-foot ROW to 100 feet to accommodate safety requirements for construction, operation, and maintenance. These disruptions or closures would likely be temporary and short term and would most likely occur outside of the peak use season, and therefore would be negligible. If these disruptions were to occur during the peak use season, they would be a significant short-term impact.

Other direct effects to current recreational opportunities or facilities within the Project Area or region as a result of Alternative B1 would be minor. Direct effects to recreational opportunities within the Project Area or region from Alternative B1 would be those resulting from normal operational and maintenance activities to the existing transmission line within ANRA, BLM, or general Forest Service lands. Normal operational and maintenance activities may cause temporary disruptions to dispersed recreation. These disruptions would likely be temporary and short term and would most likely occur outside of the peak use season, therefore not disrupting current visitor use. These impacts would most likely be limited to impacts to the visitor experience in the form of visual disturbance while crews work on the existing lines; they would therefore be considered negligible.

Another direct effect as a result of Alternative B1 includes a moderate beneficial effect to the recreational visitor experience as a result of the removal of the existing southwestern circuit that is currently routed through Cutthroat Trout Bay Campground. The removal of the transmission line and pole structures would be permanent and readily apparent to visitors. Removing the transmission line and poles would return the campground to a more natural state, providing less visual interference between the campground and Lake Granby. Removing the line and poles would also allow the trees currently located in the transmission line ROW to grow to maturity without being topped, therefore providing a denser and more natural appearing tree canopy.

The widening of the existing 30-foot ROWs to a width of 100 feet under Alternative B1 may result in negligible indirect effects to the recreation experience due to the potential loss of tree density in recreation areas. Indirect effects as a result of visual impacts to the recreational experience may occur as a result the taller, steel monopoles. These impacts are discussed in detail in Section 4.8, Visual Resources.

Negligible direct effects to recreation are anticipated as a result of the placement of the transmission line within the ANRA boundary on the east side of Table Mountain for 1.3 miles. This alignment is at the outer limits of the ANRA and receives little, if any, regular dispersed recreational or hunting use. No developed recreational facilities or trails exist in this area. Public access along the transmission line ROW would be controlled via a locked gate, thereby prohibiting any unauthorized motorized use in the ANRA.

4.10.3.3 Alternative C1

Direct and indirect effects as a result of Alternative C1 from the Stillwater Tap to the Granby Pumping Plant Switchyard would be the same as those in Alternative B1. As with Alternative B1, from the Stillwater Tap, the existing southwestern circuit currently routed through the campground would be removed and the two existing lines consolidated onto the northeastern alignment, paralleling the east side of CR 64 through the Lake Forest Subdivision to the Granby Pumping Plant Switchyard.

Other direct effects to recreation as a result of Alternative C1 would be the same as those with Alternative B1. These include potential direct effects that may include temporary disruptions to dispersed recreation on BLM, Forest Service, and ANRA lands as a result of the construction, operation, and maintenance of the transmission line and associated 100-foot ROW.

Other direct effects to current recreational opportunities or facilities within the Project Area or region from Alternative C1 would be negligible. Alternative C1 would avoid all other developed recreational facilities. Alternative C1 would also only traverse one other small portion of ANRA lands and two sections of BLM lands; however, there are no developed recreational facilities in these areas. Recreation in these areas is dispersed and no impacts to such recreational opportunities are expected to occur. Indirect effects would likely only occur as a result of the visual presence of transmission lines to dispersed recreational users in areas where they once did not exist. Public access along the transmission line ROW would be controlled via a locked gate, thereby prohibiting any unauthorized motorized use in the ANRA. Indirect effects associated with expanding the existing 30-foot ROWs to a width of 100-foot ROWs would be the same as those under Alternative B1.

Other negligible direct effects from Alternative C1 may occur as a result of normal operational and maintenance activities to the new transmission line. These impacts would most likely be limited to impacts to the visitor experience in the form of visual disturbance while crews work on the existing lines.

4.10.3.4 Alternative C2

Direct and indirect effects from Alternative C2, both Options 1 and 2, would be similar to those described for Alternative C1.

4.10.3.5 Alternative D-Options 1 and 2

From the Windy Gap Substation to the Granby Substation, direct and indirect effects from this alternative would be the same as those under Alternative C2. From the Granby Substation to the Granby Pumping Plant Switchyard, direct and indirect effects from this alternative would be the same as those under Alternative B1.

4.10.4 Mitigation Measures

4.10.4.1 Common to All Action Alternatives

The removal of the existing southwestern circuit in Cutthroat Trout Bay Campground should avoid the peak recreational use season, which is approximately Memorial Day through Labor Day. This would allow for full campground use during the peak season and not adversely affect the user experience. Any impacts or degradation to campground facilities or amenities that might occur as a result of the removal of the circuit should be mitigated through redesign and reconstruction. Any removal of vegetation and trees, as a result of the removal of the circuit, should be mitigated through new plantings where necessary.

Any operation and maintenance activities to existing or future transmission lines in ROWs on ANRA, Forest Service, or BLM lands should occur outside of the peak recreational visitor use season, approximately Memorial Day through Labor Day, if possible.

Mitigation measures for effects to the recreational experience as a result of visual impacts are discussed in detail in Section 4.8, Visual Resources.

4.11 Aquatic Resources

4.11.1 Significance Criteria

Impacts to aquatic resources were compared to significance criteria to determine impact concerns that should be considered for mitigation. These criteria were developed based on the types of aquatic communities present within the project study area, combined with direct and indirect impacts that could affect water bodies. Impacts would be considered significant if the following effects resulted from project activities:

- Habitat for fish and invertebrate communities is affected by increased sedimentation or other water quality change on a long-term basis (greater than 1 year).
- Surface disturbance activities permanently alter spawning habitat, migration routes, or critical life stages for game fish and special status aquatic species.

4.11.2 Methodology

The methodology for evaluating impacts on aquatic biology resources involved a comparison of project activities within the project study area to habitat that supports aquatic species. Specifically, the focus of the evaluation was on activities that could affect water bodies that provide habitat on a consistent basis (perennial streams and Lake Granby). As defined in Section 4.1.1, direct and indirect impacts were described based on the technical knowledge of resource specialists and experience with similar types of projects. Impacts are discussed in qualitative terms involving types of habitat that could be affected, as well as the duration and level of effects.

4.11.3 Direct and Indirect Impacts

4.11.3.1 Alternative A – No Action

The existing transmission line crosses three perennial streams, four intermittent streams, and ten canals or ditches. The perennial streams (Willow Creek, Stillwater Creek, and Soda Creek/Cutthroat Trout Bay) provide habitat for fish, invertebrate, and vegetation communities (i.e., attached algae and macrophytes) throughout the year. In contrast, the intermittent streams and canals/ditches provide habitat for only a portion of the year when water is present. Invertebrates and aquatic vegetation are the only groups that likely occur in these habitats.

No new alignments would be required for Alternative A. Therefore, construction activities would not affect aquatic species and their habitat.

Operation activities associated with Alternative A would include routine maintenance and repairs of transmission line facilities. Maintenance checks are typically conducted annually, with repairs completed on an as needed basis. It is anticipated that maintenance and repairs would be required on an increased frequency as the transmission line ages. If repairs occurred near a stream crossing, soil disturbance from equipment could result in adverse impacts to aquatic habitat due to localized erosion. This impact would be considered to be short term in duration with a minor level of impact intensity. Streamside vegetation removal is likely minimal because removal of herbaceous species and shrubs is not required, and existing tree shading is minimal

because mountain pine beetle epidemic has likely minimized any canopy cover. Fuel or lubricant leaks also could occur at work areas or along access areas, but none of the sites would be located next to streams.

One structure is currently located in a wetland, but not in proximity to surface waters that support habitat for aquatic species, including fish. Construction and maintenance activities may create minor, short-term impacts to water quality within the wetland, including increased turbidity or changes to dissolved gases. Structure placement is more than 300 feet from the nearest surface water, an intermittent unnamed tributary to Stillwater Creek. Considering the minor extent of impacts and distance to surface waters, it is not anticipated that construction or operations at this structure location would impact aquatic habitats.

In summary, operation and maintenance activities for Alternative A would result in minor effects on aquatic habitat. However, these effects would be considered insignificant due to the short-term duration and relatively small area of disturbance in relation to water bodies.

4.11.3.2 Alternative B1

Alternative B1 would rebuild and upgrade the transmission line from the Windy Gap Substation to the Granby Pumping Station. The rebuild would involve construction of approximately 11.8 miles of circuit lines along the existing alignment. The existing 30-foot ROWs would be expanded to a width of 100-foot ROWs. The Alternative B1 alignment would cross the same number of streams and ditches/canals as listed for Alternative A. The three perennial streams (Willow Creek, Stillwater Creek, and Soda Creek/Cutthroat Trout Bay) contain the most diverse aquatic communities, including game and nongame fish species, invertebrates, and aquatic vegetation. Alternative B1 and all associated access would avoid all surface waters. One structure would be located in a wetland, but not in proximity to surface waters that support habitat for aquatic species.

Construction and maintenance activities may create minor, short term impacts to water quality within the wetland, including increased turbidity or changes to dissolved gases. Structure placement would be more than 350 feet from the nearest surface water, an intermittent unnamed tributary to Stillwater Creek.

Design standards would minimize soil disturbance in proximity to water bodies. Design criteria would minimize risks to water bodies from fuel of lubricant leaks or fuel spills. Soils would be replaced if a spill occurred.

The effects of completing routine maintenance and repairs for the transmission line under Alternative B1 would be less than impacts (i.e., potential sedimentation and spills/leaks) described for Alternative A. The reason for this difference is that new and upgraded equipment would require less repair work on a long-term basis.

Considering the minor extent of impacts to surface waters that provide habitat for aquatic species, it is not anticipated that construction or operations at this structure location would impact aquatic habitats.

4.11.3.3 Alternative C1

Alternative C1 would upgrade and reroute the transmission line from the Windy Gap Substation to the Granby Pumping Plant Switchyard. The reroute would involve construction of approximately

12.3 miles of circuit lines along the existing alignment. The construction would expand the existing 30-foot ROWs to a width of 100 feet along the existing ROW. The Alternative C1 route would cross the same perennial streams (Willow Creek, Stillwater Creek, and Soda Creek/Cutthroat Trout Bay) that were discussed for Alternative B1. Willow Creek would be crossed at a different location, while Stillwater and Soda creeks would be crossed at the same locations. These streams support game and nongame fish species, invertebrates, and aquatic vegetation. Alternative C1 would also cross eight unnamed intermittent streams and two canals. As previously discussed for Alternatives A and B1, these streams do not provide aquatic habitat throughout the year. Alternative C1 and all associated access would avoid all surface waters.

Construction and maintenance activities may create minor, short term impacts to water quality within the wetland, including increased turbidity or changes to dissolved gases. Structure placement would be more than 400 feet from the nearest surface water, an intermittent unnamed tributary to Stillwater Creek.

The effects of constructing the Alternative C1 facilities on aquatic biology resources would be the same as described the other alternatives. Impacts would be minimized with the design criteria described in Chapter 2.

The effects of repairs and maintenance activities for Alternative C1 would be the same as described for Alternative B1.

Considering the minor extent of impacts to nearby wetlands and distance to surface waters that provide habitat for aquatic species, it is not anticipated that construction or operations at this structure location would impact aquatic habitats.

4.11.3.4 Alternative C2

Alternative C2 would reroute and upgrade the transmission line between the Windy Gap Substation and the Granby Pumping Plant Switchyard. This alternative would cross the same three perennial streams (Willow Creek, Stillwater Creek, and Soda Creek/Cutthroat Trout Bay), as discussed for Alternatives A, B1, and C1. Alternative C2 and all associated access would avoid all surface waters.

Construction and maintenance activities may create minor, short term impacts to water quality within the wetland, including increased turbidity or changes to dissolved gases. Structure placement would be more than 400 feet from the nearest surface water, an intermittent unnamed tributary to Stillwater Creek.

Considering the minor extent of impacts to surface waters that provide habitat for aquatic species, it is not anticipated that construction or operations at this structure location would impact aquatic habitats.

4.11.3.5 Alternative D-Options 1 and 2

This alternative would cross the same three perennial streams (Willow Creek, Stillwater Creek, and Soda Creek/Cutthroat Trout Bay), as discussed for Alternatives A, B1, C1, and C2. Intermittent and canal crossings would vary depending on the two options being considered, but they are the same segments being considered as part of Alternative C2. Alternative D, both options, and all associated access would avoid all surface waters.

Construction and maintenance activities may create minor, short term impacts to water quality within the wetland, including increased turbidity or changes to dissolved gases. Structure placement would be more than 400 feet from the nearest surface water, an intermittent unnamed tributary to Stillwater Creek.

Considering the minor extent of impacts to surface waters that provide habitat for aquatic species, it is not anticipated that construction or operations at this structure location would impact aquatic habitats.

4.11.4 Mitigation Measures

With adherence to project-specific design criteria, no significant impacts on aquatic biology resources would result from any of the action alternatives. No further mitigation is recommended.

4.12 Vegetation Resources

In general, the impacts to vegetation resources associated with project alternatives may result from five basic processes: (1) establishment of staging areas for the construction process, (2) clearing of the alternative route's ROW and construction of access road in specific locations, (3) construction of support poles and stringing of cable, (4) removal of old H-frame support structures, and (5) routine maintenance and operation of the electric transmission line.

This assessment of impacts to vegetation resources includes a separate discussion for noxious weeds for each project alternative.

4.12.1 Significance Criteria

The assessment of impacts on vegetation resources is based on the following significance criteria:

- Effect is readily apparent and has measurable effects of disturbance or improvement that are of local or regional importance; or sets a precedent for future undertakings by federal agencies. Project construction would require the topping or removal of mature trees, or the ROW would cross old growth forest or riparian woodlands.

The assessment of impacts from noxious weeds is based on the following significance criteria:

- Effect is readily apparent and has measurable effects of disturbance or improvement that are of local or regional importance; or sets a precedent for future undertakings by federal agencies. If weeds are introduced by equipment or other construction related sources, and are allowed to spread uncontrolled.

4.12.2 Methodology

Impacts to vegetation will first be judged based on type, i.e., direct and indirect. Direct impacts are those caused by the alternative and which occur at the same time and place as the causative action. Indirect impacts will be judged to be those caused by the alternative, but which may be later in time or farther removed in distance from the causative action. Indirect impacts are still reasonably foreseeable. Direct and indirect impacts can result in beneficial change or adverse change to the vegetation resources. Next, the impacts will be judged on duration. Duration will

be considered short term if it lasts no longer than the 1-2 year implementation period for construction and buildout. Long-term effects will be those lasting beyond the project implementation period. Typically, these effects may extend beyond a decade or even indefinitely. Impact intensity on vegetation resources will be judged based on the significance criteria described in the section immediately preceding this methodology section.

4.12.3 Direct and Indirect Impacts

The area (in acres) of vegetation community types crossed by each of the alternative ROWs are presented in Table 4-12.

Table 4-12. Area of Vegetative Cover Types Crossed by Each of the Alternatives (acres)*.

Community Type	Alternative A-Existing	Alternative B1	Alternative C1	Alternative C2-O1	Alternative C2-O2	Alternative D-O1	Alternative D-O2
Aspen	0	4.8	0	0	0	4.8	4.8
Disturbed	10.1	9.6	6.3	6.3	6.3	9.6	9.6
Grassland	8.6	11.4	8.9	8.9	8.9	9.4	9.4
Highway	0.3	0.8	0.8	0.8	0.8	0.8	0.8
Lodgepole	12.1	17.7	14.4	14.4	14.4	17.3	17.3
Man-Made Pond	0.9	0.8	0.1	0.1	0.4	0.2	0.5
Sagebrush	31.9	75.0	95.4	92.4	87.2	80.1	78.1
Weedy Shoreline	2.0	0	0	0	0	0	0
Wetland	8.4	23.2	22.8	21.6	21.8	20.7	21.7
Total	74.3	143.3	148.7	144.5	139.8	142.9	142.2

*With the exception of Alternative A, all calculations were completed using a 100-foot ROW. Alternative A used 30- and 100-foot ROWs.

4.12.3.1 Alternative A – No Action

Vegetation Resources

Direct Impacts

Alternative A would use the existing route and existing hardware. Routine maintenance would be relied upon to keep the system operational.

Short-term impacts to vegetation include physical damage to individual plants during routine maintenance operations. Vegetation that is trampled or crushed may suffer a loss of vigor or a decreased reproductive capacity. Soils may also be compacted in areas where temporary vehicle travel is required. This soil compaction may limit plant recruitment to the disturbed site. Short-term impacts to vegetation for Alternative A are judged to be negligible to minor in intensity, with the understanding that the frequency and intensity of maintenance would increase as the current infrastructure continues to age.

Long-term impacts to vegetation resources primarily focus on plant removal. Vegetation removal would likely be initiated and be most intense as the frequency and intensity of

maintenance on the existing system increases over time. Long-term impacts also would include the removal or topping of danger trees (trees taller than 20-22 feet, generally depending on terrain, tree species and line sag), trees that may fall within proximity to existing structures, and removal of tree species that at mature height would pose a risk to the transmission line. Tree removal may be conducted by a number of methods, including hand crews on steep or difficult terrain, and larger machinery in flat or more gently sloping terrain. Long-term impacts to vegetation for Alternative A are judged to be negligible to minor in terms of intensity, depending on the vegetation cover type with most impacts occurring on forested areas of the ROW. This is based on the fact that Alternative A follows the route of the existing transmission line for its whole length, and structures are not planned for replacement.

Indirect Impacts

With time, there would be an increase in the frequency and intensity of maintenance for Alternative A. Potential indirect impacts resulting from this shift in maintenance intensity might include changes in vegetation cover, pattern, or dominance in a given plant community. There may also be an increase in sedimentation downgradient from the ROW and the spread of noxious weeds. Sheet flow of precipitation could increase with increased travel and compaction on access roads below the existing transmission lines. This would lead to minor sediment transport away from the Alternative A ROW into surrounding downgradient habitat. The spread of weeds is simply a factor of increasing the number of trips and duration of travel by vehicles along the maintenance access route for Alternative A. There is also the possibility of positive indirect impacts for those special status species and species of local concern that tend to take advantage of habitat disturbance, such as *Botrychium* species (moonworts). They may often be found in areas of stabilized areas of previous disturbance. Indirect impacts to vegetation resources from Alternative A would be negligible to minor in intensity.

Noxious Weeds

All project alternatives have the potential to result in an adverse increase in noxious weeds. Alternative A would only have the potential to increase weeds in areas subject to maintenance activities. Maintenance activities may have an impact if vehicles bring in weed seeds or if there is additional soil disturbance during maintenance. Site reconnaissance during the summer of 2007 through the spring of 2009 documented noxious weed infestations along or immediately adjacent to the existing transmission line (Alternative A). These populations have been mapped and should receive treatments for control prior to construction. Noxious weeds are listed in Table 3-25. The intensity of adverse impact from noxious weeds on this alternative is judged to be moderate based on the documented presence of existing noxious weed populations in the Alternative A ROW. Adequate weed control measures should be implemented and the ROW should be monitored regularly.

4.12.3.2 Alternative B1

Vegetation Resources

Direct Impacts

Alternative B1 would include 1.34 miles of new ROW, and would require the placement of construction staging areas, clearing of vegetation in the new ROW, placement of steel pole support structures, demolition of existing H-frame support structures, stringing of new conductor line, and routine maintenance of the system.

Short-term impacts to vegetation would include physical damage to individual plants. Vegetation that is trampled or crushed may suffer a loss of vigor or a decreased reproductive capacity. Soils may also be compacted in areas where temporary vehicle travel is required. This soil compaction may limit plant recruitment to the disturbed site. Short-term impacts to vegetation for Alternative B1 are judged to be moderate in intensity. This is due to the need for a construction staging area and the clearing of 1.34 miles of new ROW in lodgepole pine and aspen forest community types.

Long-term impacts to vegetation resources include removal of mature trees. Vegetation removal would likely be initiated and be most intense during the construction process, but would be continued into the future as the line receives periodic maintenance. There would be removal of vegetation in areas of new single-pole steel support structures. The permanent footprint for these impacts includes less than 1 acre overall for the placement of new structures.

The ROW is planned to have a width of 100 feet with required limits on vegetation height. This would translate to long-term direct impacts (removal or topping) to trees taller than 20-22 feet (depending on terrain, tree species and line sag). Tree removal may be conducted by a number of methods, including hand crews on steep or difficult terrain, and larger machinery in flat or more gently sloping terrain. Long-term impacts to vegetation for Alternative B1 are judged to be minor to moderate in terms of intensity. This is based on the fact that Alternative B1 contains 1.34 miles of new ROW, which would require clearing of vegetation from lodgepole pine and aspen communities.

Indirect Impacts

Indirect impacts might include changes in vegetation cover, pattern, or dominance in a given plant community. Habitat fragmentation resulting in decreased gene flow between some plant populations could occur. The fragmentation would be induced from the clearing of vegetation in the new segment of ROW. The cleared ROW would be 100 feet wide by 1.34 miles in length. There may also be increased sheet flow of precipitation across the landscape from removal of vegetation. This could result in minor sediment transport away from the Alternative B1 ROW into surrounding downgradient habitat. There is also the possibility of positive indirect impact for those special status species and species of local concern that tend to take advantage of habitat disturbance, such as *Botrychium* species (moonworts). Indirect impacts to vegetation resources from Alternative B1 would be moderate.

Noxious Weeds

All project alternatives have the potential to result in an adverse increase in noxious weeds. Alternative B1 would have the potential to increase weeds in areas subject to maintenance activities, but more importantly, there is a threat of weed increase in new ROW, new steel pole support structure locations, and construction staging areas. Construction activities would have an impact if vehicles bring in weed seeds to the construction area and as soils are disturbed. Soil disturbance removes competition from established native plants and produces a new substrate with new parameters of light, soil moisture, and nutrient availability. In these new conditions, noxious weeds can frequently outcompete natives in the revegetation process. Site reconnaissance conducted from 2007 through spring of 2009 documented noxious weed infestations along or immediately adjacent to the existing transmission line (Alternative A route) and along other alternative routes. These populations have been mapped and should receive treatments for control prior to construction. Noxious weeds are listed in Table 3-25. The intensity of adverse impact from noxious weeds on this alternative is moderate based on mapped

state-listed noxious weed infestations along parts of the ROW for this alternative. Adequate weed control measures should be implemented and the ROW monitored regularly.

4.12.3.3 Alternative C1

Vegetation Resources

Direct Impacts

Alternative C1 would include 6.83 miles of new ROW, and would require the placement of construction staging areas, clearing of vegetation in the new ROW, placement of steel pole support structures, demolition of existing H-frame support structures, stringing of new conductor line, and routine maintenance of the system. The new ROW would affect sagebrush, grasslands, wetlands/wet meadows, lodgepole, aspen, and mixed conifer plant communities. It would also affect lands designated in this EIS as Developed/Disturbed lands, including residential properties.

Short-term impacts to vegetation would include physical damage to individual plants. Vegetation that is trampled or crushed may suffer a loss of vigor or a decreased reproductive capacity. Soils may also be compacted in areas where temporary vehicle travel is required. This soil compaction may limit plant recruitment to the disturbed site. Short-term impacts to vegetation for Alternative C1 are judged to be moderate in intensity. Clearing of trees and dense shrubs may be necessary along the 6.83 miles of new ROW to construct this alternative.

Long-term impacts to vegetation resources primarily focus on plant removal. Vegetation removal would likely be initiated and be most intense during the construction process, but would be continued into the future as the line receives periodic maintenance. There would be removal of vegetation in areas of new single-pole steel support structures.

The ROW is planned to have a width of 100 feet with required limits on vegetation height. This would translate to long-term direct impacts (removal or topping) to any trees taller than 20-22 feet generally (depending on terrain, tree species and line sag). Tree removal may be conducted by a number of methods, including hand crews on steep or difficult terrain, and larger machinery in flat or more gently sloping terrain. Long-term impacts to vegetation for Alternative C1 are judged to be minor to moderate in terms of intensity. This is based on the fact that Alternative C1 contains 6.83 miles of new ROW, which would require clearing of vegetation from sagebrush, grasslands, wetlands/wet meadows, lodgepole, aspen, and mixed conifer plant communities.

Indirect Impacts

Indirect impacts might include changes in vegetation cover, pattern, or dominance in a given plant community. Habitat fragmentation resulting in decreased gene flow between some plant populations could occur. The fragmentation would be induced from the clearing of vegetation in the new segment of ROW. The cleared ROW would be 100 feet wide by 6.83 miles in length. There may also be increased sheet flow of precipitation across the landscape from removal of vegetation. This could result in minor sediment transport away from the Alternative C1 ROW into surrounding downgradient habitat. There is also the possibility of positive indirect impact for those special status species and species of local concern that tend to take advantage of habitat disturbance, such as *Botrychium* species (moonworts). Indirect impacts to vegetation resources from Alternative C1 would be moderate.

Noxious Weeds

Alternative C1 would have the potential to increase weeds in areas subject to maintenance activities, but more importantly, there is a threat of weed increase in new ROW, new steel pole support structure locations, and construction staging areas. Construction activities would have an impact if vehicles bring in weed seeds to the construction area and as soils are disturbed. Soil disturbance removes competition from established native plants and produces a new substrate with new parameters of light, soil moisture, and nutrient availability. In these new conditions, noxious weeds can frequently outcompete natives in the revegetation process. Site reconnaissance conducted from 2007 through spring of 2009 documented noxious weed infestations along or immediately adjacent to the existing transmission line (Alternative A route) and along other alternative routes. These populations have been mapped and should receive treatments for control prior to construction. Noxious weeds are listed in Table 3-25. The intensity of adverse impact from noxious weeds on this alternative should be minor assuming adequate control measures are implemented and the ROW is monitored periodically.

4.12.3.4 Alternative C2

Vegetation Resources

Direct Impacts

Alternative C2 would include 4.77-5.38 miles of new ROW depending on the option chosen, and would require the placement of construction staging areas, clearing of vegetation in the new ROW, placement of steel pole support structures, demolition of existing H-frame support structures, stringing of new conductor line, and routine maintenance of the system. The new ROW would affect sagebrush, grasslands, wetlands/wet meadows, lodgepole, aspen, and mixed conifer plant communities. It would also affect lands designated in this EIS as Developed/Disturbed lands, including residential properties.

Short-term impacts to vegetation would include physical damage to individual plants. Vegetation that is trampled or crushed may suffer a loss of vigor or a decreased reproductive capacity. Soils may also be compacted in areas where temporary vehicle travel is required. This soil compaction may limit plant recruitment to the disturbed site. Short-term impacts to vegetation for Alternative C2 are judged to be moderate in intensity. This is due to the need for a construction staging area and the clearing of 4.77-5.38 miles of new ROW in sagebrush, grasslands, wetlands/wet meadows, lodgepole, aspen, and mixed conifer plant communities.

Long-term impacts to vegetation resources primarily focus on plant removal. Vegetation removal would likely be initiated and be most intense during the construction process, but would be continued into the future as the line receives periodic maintenance. There would be removal of vegetation in areas of new single-pole steel support structures, in areas where access road construction would be required, and in the construction staging areas.

The ROW is planned to have a width of 100 feet with required limits on vegetation height. This would translate to long-term direct impacts (removal or topping) to any trees taller than 20-22 feet (depending on terrain, tree species and line sag). Tree removal may be conducted by a number of methods, including hand crews on steep or difficult terrain, and larger machinery in flat or more gently sloping terrain. Long-term impacts to vegetation for Alternative C2 are judged to be minor to moderate in terms of intensity. This is based on the fact that Alternative C2 contains 4.77-5.38 miles of new ROW, which would require initial clearing of vegetation from sagebrush, grasslands, wetlands/wet meadows, lodgepole, aspen, and mixed conifer plant communities.

Indirect Impacts

Indirect impacts might include changes in vegetation cover, pattern, or dominance in a given plant community. Habitat fragmentation resulting in decreased gene flow between some plant populations could occur. The fragmentation would be induced from the clearing of vegetation in the new segment of ROW. The cleared ROW would be 100 feet wide by 4.77-5.38 miles in length. There may also be increased sheet flow of precipitation across the landscape from removal of vegetation. This could result in minor sediment transport away from the Alternative C2 ROW into surrounding downgradient habitat. There is also the possibility of positive indirect impact for those special status species and species of local concern that tend to take advantage of habitat disturbance, such as *Botrychium* species (moonworts). Indirect impacts to vegetation resources from Alternative C2 would be moderate.

Noxious Weeds

Alternative C2 would have the potential to increase weeds in areas subject to maintenance activities, but more importantly, there is a threat of weed increase in new ROW, new steel pole support structure locations, and construction staging areas. Construction activities would have an impact if vehicles bring in weed seeds to the construction area and as soils are disturbed. Soil disturbance removes competition from established native plants and produces a new substrate with new parameters of light, soil moisture, and nutrient availability. In these new conditions, noxious weeds can frequently outcompete natives in the revegetation process. Site reconnaissance conducted from 2007 through spring of 2009 documented noxious weed infestations along or immediately adjacent to the existing transmission line (Alternative A route) and along other alternative routes. These populations have been mapped and should receive treatments for control prior to construction. Noxious weeds are listed in Table 3-25. The intensity of adverse impact from noxious weeds on this alternative should be minor assuming adequate controls measures are implemented and the ROW is monitored periodically.

4.12.3.5 Alternative D-Options 1 and 2

Vegetation Resources

Direct Impacts

This alternative would include 1.34-1.65 miles of new ROW, and would require the placement of construction staging areas, clearing of vegetation in the new ROW, placement of steel pole support structures, demolition of existing H-frame support structures, stringing of new conductor line, and routine maintenance of the system. The new ROW would primarily affect lodgepole and aspen plant communities.

Short-term impacts to vegetation would include physical damage to individual plants. Vegetation that is trampled or crushed may suffer a loss of vigor or a decreased reproductive capacity. Soils may also be compacted in areas where temporary vehicle travel is required. This soil compaction may limit plant recruitment to the disturbed site. Short-term impacts to vegetation for Alternative D, both options, are judged to be moderate in intensity. This is due to the need for a construction staging area and the clearing of 1.34-1.65 miles of new ROW in lodgepole and aspen plant communities.

Long-term direct impacts to vegetation resources primarily focus on plant removal. Vegetation removal would likely be initiated and be most intense during the construction process, but would

be continued into the future as the line receives periodic maintenance. There would be removal of vegetation in areas of new single-pole steel support structures.

The ROW is planned to have a width of 100 feet with required limits on vegetation height. This would translate to long-term direct impacts (removal or topping) to any trees taller than 20-22 feet generally (depending on terrain, tree species and line sag). Tree removal may be conducted by a number of methods, including hand crews on steep or difficult terrain, and larger machinery in flat, or more gently sloping terrain. Long-term impacts to vegetation for Alternative D-Options 1 and 2 are judged to be minor to moderate in terms of intensity. This is based on the fact that this alternative contains 1.34-1.65 miles of new ROW, which would require clearing of vegetation from lodgepole and aspen plant communities.

Indirect Impacts

Indirect impacts might include changes in vegetation cover, pattern, or dominance in a given plant community. Habitat fragmentation resulting in decreased gene flow between some plant populations could occur. The fragmentation would be induced from the clearing of vegetation in the new segment of ROW. The cleared ROW would be 100 feet wide by 1.34-1.65 miles in length (depending on the option). There may also be increased sheet flow of precipitation across the landscape from removal of vegetation. This could result in minor sediment transport away from the ROW into surrounding downgradient habitat. There is also the possibility of positive indirect impact for those special status species and species of local concern that tend to take advantage of habitat disturbance, such as *Botrychium* species (moonworts). Indirect impacts to vegetation resources from Alternative D, both options, would be moderate.

Noxious Weeds

Alternative D, would have the potential to increase weeds in areas subject to maintenance activities, but more importantly, there is a threat of weed increase in new ROW, new steel pole support structure locations, and construction staging areas. Construction activities would have an impact if vehicles bring in weed seeds to the construction area and as soils are disturbed. Soil disturbance removes competition from established native plants and produces a new substrate with new parameters of light, soil moisture and nutrient availability. In these new conditions, noxious weeds can frequently outcompete natives in the revegetation process. Site reconnaissance conducted from 2007 through spring of 2009 documented noxious weed infestations along or immediately adjacent to the existing transmission line (Alternative A route) and along other alternative routes. These populations have been mapped and should receive treatments for control prior to construction. Noxious weeds are listed in Table 3-25. The intensity of adverse impact from noxious weeds on this alternative should be minor assuming adequate controls measures are implemented and the ROW is monitored periodically.

4.12.4 Mitigation Measures

The following mitigation recommendations apply to all alternatives.

- The Forest Service may conduct timber sales along the ROW or include the ROW in existing and future sales. Christmas tree, firewood sales, and chip sales (for use as mulch) are other possibilities for using wood materials resulting from tree cutting along the ROW. The alternatives selected may be a combination of techniques to meet current market and economic conditions. These actions would not be included under the actions proposed in this EIS.

4.12.4.1 Alternative A

Immediate revegetation work would not be needed as this alternative would only involve routine maintenance.

4.12.4.2 Alternative B1

Revegetation would be needed for a minimum of 1.34 miles of new ROW for this alternative. Noxious weed management and reclamation would be implemented on temporary access areas used during construction as mitigation for all alternatives. Restoration of sagebrush habitat would be implemented in areas where sagebrush is disturbed. Refer to the Environmental Protection Measures described in Section 2.4.2, Vegetation.

4.12.4.3 Alternative C1

Revegetation would be needed for a minimum of 6.83 miles of new ROW for this alternative. Noxious weed management and reclamation would be implemented on temporary access areas used during construction as mitigation for all alternatives. Restoration of sagebrush habitat would be implemented in areas where sagebrush is disturbed. Refer to the Environmental Protection Measures described in Section 2.4.2, Vegetation.

4.12.4.4 Alternative C2

Revegetation would be needed for a minimum of 4.77-5.38 miles of new ROW for this alternative. Noxious weed management and reclamation would be implemented on temporary access areas used during construction as mitigation for all alternatives. Restoration of sagebrush habitat would be implemented in areas where sagebrush is disturbed. Refer to the Environmental Protection Measures described in Section 2.4.2, Vegetation.

4.12.4.5 Alternative D-Options 1 and 2

Revegetation would be needed for a minimum of 1.34-1.65 miles of new ROW for this alternative. Noxious weed management and reclamation would be implemented on temporary access areas used during construction as mitigation for all alternatives. Restoration of sagebrush habitat would be implemented in areas where sagebrush is disturbed. Refer to the Environmental Protection Measures described in Section 2.4.2, Vegetation.

4.13 Special Status Plant Species

The impacts to special status plant resources result from the same basic processes as those described for general vegetation, namely (1) establishment of staging areas for the construction process, (2) clearing of the alternative route's ROW and construction of access road in some locations, (3) construction of poles and stringing of cable, (4) removal of old H-frame support structures, and (5) routine maintenance and operation of the new electric transmission line.

4.13.1 Significance Criteria

The assessment of impacts to special status plants is based on the following significance criteria:

- If individuals of federally listed threatened and endangered species or a population(s) of Forest Service or BLM sensitive plant species were lost or jeopardized, through direct mortality or loss of critical habitat.

4.13.2 Methodology

A list of special status plants that may occur within the Project Area was developed in consultation with the USFWS and Forest Service. The list was further narrowed down with agency input for consideration in this EIS. Review of the BLM Sensitive Species list for the Kremmling Field Office, indicated that only one species (Harrington's penstemon) might occur on the habitat types found on the BLM parcels of the Project Area. The list of special status plant species is provided in Section 3.13. The informal consultation with the Forest Service botanist for ARNF confirmed the need to evaluate all plant species listed on the Region 2 FSS list, as well as Forest Service species of local concern in this Project Area.

All project alternatives were assessed for the presence of potentially suitable habitat for the two federally listed species (*Osterhout's milk vetch* and *Penland beardtongue*). Surveys for both of these federally listed species were conducted in suitable habitats in spring of 2009 using a USFWS approved protocol. The FSS plant species that were also surveyed for in spring of 2009 were coordinated with the ARNF botanist. A subset of the overall species found on the ANRA/ARNF list was surveyed for based on their likelihood of occurring in the Project Area. Those that the ARNF botanist determined to have a moderate to high likelihood of occurring in the Project Area on Forest Service lands were the focus of the surveys. This subset of species included both FSS and Forest Service species of local concern as described in Section 3.13.

Results of the special status species plant surveys are discussed in greater detail in the BR prepared for the Forest Service (AECOM 2011). The following impact assessment for special status species for each project alternative takes into consideration results of both the background assessment for special status plants in the project study area and the specific results of field survey work.

4.13.3 Direct and Indirect Impacts

Rare plant field surveys in spring 2009 did not detect the occurrence of threatened and endangered, FSS, or BLM sensitive plant species in any of the alternative ROWs. Suitable habitat for threatened and endangered species was not observed along any of the alternative alignments; however, suitable habitat was observed for several FSS species within the project study area.

Field surveys conducted by AECOM in 2009, and the Forest Botanist between 2007 and 2011, documented the presence of five Forest Service species of local concern within or at the edge of the ROW of Alternatives A, B1, and D, both options: *Botrychium hesperium* (western moonwort), *Botrychium minganense* (mingan moonwort), *Pediocactus simpsonii* (Simpson's hedgehog cactus), *Dermatocarpon reticulatum* "vagrant form" (reticulate earth lichen), and *Penstemon cyathophorus* (cupped penstemon).

The *Botrychium* species were found in one isolated location in a former irrigation ditch almost directly underneath the existing transmission line (within ROWs for Alternative A, B1, and D1). This site was on the lower edge of a lodgepole pine stand and the ditch provided a previously disturbed site that still maintains more hydric conditions than the surrounding uplands. These plants were limited to very small numbers. Appoximately 30 individuals of Simpson's hedgehog

cactus and several hundred individuals of reticulate earth lichen "vagrant form" occur in an approximately 30-foot by 40-foot area on the west side of the ROW edge (Alternative A, B1, and D1), near where the current ROW crosses the intersection of County Road 40 (Willow Creek Reservoir Road) and U.S. Highway 34. With implementation of Design Criterion 19 (Section 2.4.2), impacts to these individuals should be avoided.

Cupped penstemon was detected in several locations throughout the overall project area, including at the same location where the Simpson's hedgehog cactus was found. The densest populations were on the north end of the project near the Granby Pumping Plant. An estimate of population density was made during the rare plant survey. The population was estimated to be approximately 152 plants per 2,000 square feet, or 3,311 plants per acre. All five project alternatives would require some structures (poles) to be erected in this population north of the Granby Pumping Plant. The project would result in direct and possibly indirect impacts to this species, due to construction activities, structure placement, and access through the project ROW. Maintenance activities for any of the proposed alternatives would also likely result in the loss or damage of some number of individuals of this species. Adverse impacts are expected to be of a degree insufficient to lead to a loss of viability for this species overall on the Arapaho National Forest.

4.13.3.1 Alternative A – No Action

Alternative A would use the existing route and existing hardware. Routine maintenance would be relied upon to keep the system operational.

Direct Impacts

The physical impact of trampling during maintenance activities may result in loss of plant vigor and mortality of special status plant species individuals. Individuals of Forest Service species of local concern (western moonwort, mingan moonwort, Simpson's hedgehog cactus, reticulate earth lichen, and cupped penstemon) were documented in or at the edge of the ROW of Alternative A. Furthermore, suitable habitat for many FSS was documented in the ROW for Alternative A. Direct impacts for Alternative A are determined to be minor to moderate. No loss of species viability is envisioned as a result of implementation of this alternative nor would it cause a trend toward listing of species.

Indirect Impacts

There may be a potential for several indirect impacts to special status species or their habitat under Alternative A. A selection of these potential indirect impacts includes:

- Changes in vegetation composition, structure, and cover value.
- Creating a thick layer of wood chips on the soil surface.
- Removal or disruption of duff layer in forested habitat, thereby impacting soil mycorrhizae.
- Vectoring and creating habitat for competitive invasive plant species.
- Changing local hydrologic pattern in special status plant habitat.
- Changing localized fire regime.
- Changing soil characteristics of the habitat.

- Changing foraging behavior of livestock or wildlife within and adjacent to transmission line ROWs.
- Incidental impact to potential pollinator species.
- Disturbance may benefit certain species, such as *Botrychium*, that thrive in these habitat conditions.
- Noxious weed introduction can indirectly impact special status plants through alleopathy (release of compounds that inhibit the growth of other plants), changing the fire regime, and through direct competition for light, water, and soil nutrients.
- Weed treatment can also indirectly impact threatened and endangered plants by uprooting, clipping, or otherwise causing mortality.

Indirect impacts are determined to be minor to moderate in terms of their effects on suitable habitat for special status species.

4.13.3.2 Alternative B1

Alternative B1 would include 1.34 miles of new ROW, and would require the placement of construction staging areas, clearing of vegetation in the new ROW, placement of steel pole support structures, demolition of existing H-frame support structures, stringing of new conductor line, and routine maintenance of the system.

Direct Impacts

Direct impacts resulting from Alternative B1 include plant removal due to construction-related activity at staging areas, new ROW clearing, placement of new steel poles and removal of old wood H-frames, stringing of conductors and routine maintenance. The physical impact of trampling during maintenance activities could also result in loss of plant vigor and mortality of special status plant species individuals. Individuals of Forest Service species of local concern (western moonwort, mingan moonwort, Simpson's hedgehog cactus, reticulate earth lichen, and cupped penstemon) were documented in or at the edge of the ROW of Alternative B1. Furthermore, suitable habitat for many FSS was documented in the ROW for Alternative B1. Direct impacts for Alternative B1 are determined to be minor to moderate due to new ROW required for this alternative. No loss of species viability is envisioned as a result of implementation of this alternative, nor would it cause a trend toward listing of species.

Indirect Impacts

There may be a potential for several indirect impacts to special status species or their habitat under Alternative B1. A selection of these potential indirect impacts includes:

- Changes in vegetation composition, structure, and cover value.
- Creating a thick layer of wood chips on the soil surface.
- Removal or disruption of duff layer in forested habitat, thereby impacting soil mycorrhizae.
- Vectoring and creating habitat for competitive invasive plant species.
- Changing local hydrologic pattern in special status plant habitat.
- Changing localized fire regime.

- Changing soil characteristics of the habitat.
- Changing foraging behavior of livestock or wildlife within and adjacent to transmission line ROWs.
- Incidental impact to potential pollinator species.
- Disturbance may benefit certain species, such as *Botrychium,* that thrive in these habitat conditions.
- Noxious weed introduction can indirectly impact special status plants through alleopathy (release of compounds that inhibit the growth of other plants), changing the fire regime, and through direct competition for light, water, and soil nutrients.
- Weed treatment can also indirectly impact threatened and endangered plants by uprooting, clipping, or otherwise causing mortality.

Indirect impacts are determined to be minor to moderate in terms of their effects on suitable habitat for special status species.

4.13.3.3 Alternative C1

Alternative C1 would include 6.83 miles of new ROW, and would require the placement of construction staging areas, clearing of vegetation in the new ROW, placement of steel pole support structures, demolition of existing H-frame support structures, stringing of new conductor line, and routine maintenance of the system. The new ROW would affect sagebrush, grasslands, wetlands/wet meadows, lodgepole, aspen, and mixed conifer plant communities. It would also affect lands designated in this EIS as Developed/Disturbed lands, including residential properties.

Direct Impacts

Direct impacts resulting from Alternative C1 include plant removal due to construction-related activity at staging areas, new ROW clearing, placement of new steel poles and removal of old wood H-frames, stringing of conductors and routine maintenance. The physical impact of trampling during maintenance activities could also result in loss of plant vigor and mortality of special status plant species individuals. Individuals of Forest Service species of local concern (cupped penstemon) were documented in the ROW of Alternative C1. Furthermore, suitable habitat for many FSS was documented in the ROW for Alternative C1. Direct impacts for Alternative C1 are determined to be moderate due to the length of new ROW required for this alternative. No loss of species viability is envisioned as a result of implementation of this alternative, nor would it cause a trend toward listing of species.

Indirect Impacts

There may be a potential for several indirect impacts to special status species or their habitat under Alternative C1. A selection of these potential indirect impacts includes:

- Changes in vegetation composition, structure, and cover value.
- Creating a thick layer of wood chips on the soil surface.
- Removal or disruption of duff layer in forested habitat, thereby impacting soil mycorrhizae.
- Vectoring and creating habitat for competitive invasive plant species.

- Changing local hydrologic pattern in special status plant habitat.
- Changing localized fire regime.
- Changing soil characteristics of the habitat.
- Changing foraging behavior of livestock or wildlife within and adjacent to transmission line ROWs.
- Incidental impact to potential pollinator species.
- Disturbance may benefit certain species, such as *Botrychium,* that thrive in these habitat conditions.
- Noxious weed introduction can indirectly impact special status plants through alleopathy (release of compounds that inhibit the growth of other plants), changing the fire regime, and through direct competition for light, water, and soil nutrients.
- Weed treatment can also indirectly impact threatened and endangered plants by uprooting, clipping, or otherwise causing mortality.

Indirect impacts are determined to be minor to moderate in terms of their effects on suitable habitat for special status species.

4.13.3.4 Alternative C2

Alternative C2 would include 4.77-5.38 miles of new ROW, and would require the placement of construction staging areas, clearing of vegetation in the new ROW, placement of steel pole support structures, demolition of existing H-frame support structures, stringing of new conductor line, and routine maintenance of the system. The new ROW would affect sagebrush, grasslands, wetlands/wet meadows, lodgepole, aspen, and mixed conifer plant communities. It would also affect lands designated in this EIS as Developed/Disturbed lands, including residential properties.

Direct Impacts

Direct impacts resulting from Alternative C2 include plant removal due to construction-related activity at staging areas, new ROW clearing, placement of new steel poles and removal of old wood H-frames, stringing of conductors and routine maintenance. The physical impact of trampling during maintenance activities could also result in loss of plant vigor and mortality of special status plant species individuals. Individuals of Forest Service species of local concern (cupped penstemon) were documented in the ROW of Alternative C2. Furthermore, suitable habitat for many FSS was documented in the ROW for Alternative C2. Direct impacts for Alternative C2 are determined to be moderate based on the length of new ROW required for this alternative. No loss of species viability is envisioned as a result of implementation of this alternative, nor would it cause a trend toward listing of species.

Indirect Impacts

There may be a potential for several indirect impacts to special status species or their habitat under Alternative C2. A selection of these potential indirect impacts includes:

- Changes in vegetation composition, structure, and cover value.
- Creating a thick layer of wood chips on the soil surface.

- Removal or disruption of duff layer in forested habitat, thereby impacting soil mycorrhizae.
- Vectoring and creating habitat for competitive invasive plant species.
- Changing local hydrologic pattern in special status plant habitat.
- Changing localized fire regime.
- Changing soil characteristics of the habitat.
- Changing foraging behavior of livestock or wildlife within and adjacent to transmission line ROWs.
- Incidental impact to potential pollinator species.
- Disturbance may benefit certain species, such as *Botrychium,* that thrive in these habitat conditions.
- Noxious weed introduction can indirectly impact special status plants through alleopathy (release of compounds that inhibit the growth of other plants), changing the fire regime, and through direct competition for light, water, and soil nutrients.
- Weed treatment can also indirectly impact threatened and endangered plants by uprooting, clipping, or otherwise causing mortality.

Indirect impacts are determined to be minor to moderate in terms of their effects on suitable habitat for special status species.

4.13.3.5 Alternative D-Options 1 and 2

This alternative would include 1.34-1.65 miles of new ROW, and would require the placement of construction staging areas, clearing of vegetation in the new ROW, placement of steel pole support structures, demolition of existing H-frame support structures, stringing of new conductor line, and routine maintenance of the system. The new ROW would primarily affect lodgepole and aspen plant communities.

Direct Impacts

Direct impacts resulting from Alternative D, both options, include plant removal due to construction-related activity at staging areas, new ROW clearing, placement of new steel poles and removal of old wood H-frames, stringing of conductors and routine maintenance. The physical impact of trampling during maintenance activities could also result in loss of plant vigor and mortality of special status plant species individuals. Individuals of Forest Service species of local concern (western moonwort, mingan moonwort, Simpson's hedgehog cactus, reticulate earth lichen, and cupped penstemon) were documented in or at the edge of the ROW of this alternative. Furthermore, suitable habitat for many FSS species was documented in the ROW for this alternative. Direct impacts for Alternative D, both options, are determined to be minor to moderate due to new ROW required for this alternative. No loss of species viability is envisioned as a result of implementation of this alternative nor would it cause a trend toward listing of species.

Indirect Impacts

There may be a potential for several indirect impacts to special status species or their habitat under Alternative D, both options. A selection of these potential indirect impacts includes:

- Changes in vegetation composition, structure and cover value.
- Creating a thick layer of wood chips on the soil surface.
- Removal or disruption of duff layer in forested habitat thereby impacting soil mycorrhizae.
- Vectoring and creating habitat for competitive invasive plant species.
- Changing local hydrologic pattern in special status plant habitat.
- Changing localized fire regime.
- Changing soil characteristics of the habitat.
- Changing foraging behavior of livestock or wildlife within and adjacent to transmission line ROWs.
- Incidental impact to potential pollinator species.
- Disturbance may benefit certain species, such as *Botrychium* that thrive in these habitat conditions.
- Noxious weed introduction can indirectly impact special status plants through alleopathy (release of compounds that inhibit the growth of other plants, changing the fire regime and through direct competition for light, water and soil nutrients.
- Weed treatment can also indirectly impact threatened and endangered plants by uprooting, clipping, or otherwise causing mortality.

Indirect impacts are determined to be minor to moderate in terms of their effects on suitable habitat for special status species.

A summary of the determination of effects for federally listed species and impacts to FSS for each alternative is presented in Table 4-13.

Table 4-13. Summary of Effects Determinations for Federally Listed and FSS Species.

Scientific Name	Common Name	Alternative A (No Action)	Alternative B1	Alternative C1	Alternative C2 Opt.1/Opt. 2	Alternative D Opt.1/Opt. 2	Relative Effects Between Alternatives[1]
Federally Listed							
Astragalus osterhoutii	Osterhout milk-vetch	NE	NE	NE	NE	NE	-
Penstemon penlandii	Penland's beardtongue	NE	NE	NE	NE	NE	-
FSS							
FERNS AND ALLIES							
Botrychium ascendens	Upswept moonwort	NI	MAII	MAII	MAII	MAII	B1 > D-Options 1 and 2 > C1 and C2-Options 1 and 2 > A
Botrychium lineare	Narrow-leaved moonwort	NI	MAII	MAII	MAII	MAII	B1 > D-Option 2 > D-Option 1 > C1 > C2-Option 2 > C2-Option 1 > A

Scientific Name	Common Name	Alternative A (No Action)	Alternative B1	Alternative C1	Alternative C2 Opt.1/Opt. 2	Alternative D Opt.1/Opt. 2	Relative Effects Between Alternatives[1]
MONOCOTS							
Carex diandra	Lesser panicled sedge	NI	MAII	MAII	MAII	MAII	B1 > C1 > D-Option 2 > C2-Option 2 > C2-Option 1 > D-Option 1 > A
Carex livida	Livid sedge	NI	MAII	MAII	MAII	MAII	B1 > C1 > C2-Option 2 > D-Option 2 > C2-Option 1 > D-Option 1> A
Cypripedium parviflorum (=C. calceolus spp. parviflorum)	Yellow lady's slipper	NI	MAII	MAII	MAII	MAII	B1 and D1-Options 1 and 2 > C1, and C2-Options 1 and 2 > A
DICOTS							
Astragalus leptaleus	Park milk vetch	NI	MAII	MAII	MAII	MAII	B1 > C1 > C2-Option 2 > D-Option 2 > C2-Option 1 > D-Option 1> A
Drosera rotundifolia	Roundleaf sundew	NI	MAII	MAII	MAII	MAII	B1 > C1 > C2-Option 2 > D-Option 2 > C2-Option 1 > D-Option 1> A
Eriogonum exilifolium	Dropleaf buckwheat	NI	MAII	MAII	MAII	MAII	C1 > C2-Options 1 > C2-Option 2 > D-Option 1 > D-Option 2 > B1 > A
Ipomopsis aggregata ssp. *weberi*	Weber's scarlet gilia	NI	MAII	MAII	MAII	MAII	C1 > C2-Options 1 > C2-Option 2 > D-Option 1 > D-Option 2 > B1 > A
Machaeranthera coloradoensis	Colorado tansy-aster	NI	MAII	MAII	MAII	MAII	B1 > D-Options 1 and 2 > C1 and C2-Options 1 and 2 > A
Penstemon harringtonii	Harrington beardtongue	NI	MAII	MAII	MAII	MAII	C1 > C2-Options 1 > C2-Option 2 > D-Option 1 > D-Option 2 > B1 > A
Rubus arcticus var. acaulis (Cylactis arctica ssp. acaulis)	Dwarf raspberry	NI	MAII	MAII	MAII	MAII	B1 > C1 > D-Option 2 > C2-Option 2 > C2-Option 1 > D-Option 1 > A

Scientific Name	Common Name	Alternative A (No Action)	Alternative B1	Alternative C1	Alternative C2 Opt.1/Opt. 2	Alternative D Opt.1/Opt. 2	Relative Effects Between Alternatives[1]
Salix candida	Hoary willow	NI	MAII	MAII	MAII	MAII	B1 > C1 > D-Option 2 > C2-Option 2 > C2-Option 1 > D-Option 1 > A
Salix serisissma	Autumn willow	NI	MAII	MAII	MAII	MAII	B1 > C1 > D-Option 2 > C2-Option 2 > C2-Option 1 > D-Option 1 > A
Utricularia minor	Lesser bladderpod	NI	MAII	MAII	MAII	MAII	B1> C1 > D-Option 2 > C2-Option 2 > C2-Option 1 > D-Option 1 > A
Viola selkirkii	Selkirk violet	NI	MAII	MAII	MAII	MAII	B1 > D-Options 1 and 2 > C1 and C2-Options 1 and 2 >A

[1]Relative effects between alternatives are assessed by comparing the acres of suitable habitat for FSS species within alternative ROWs. Refer to the Biological Report prepared for this project (AECOM 2011) for a more detailed discussion of impacts to FSS species.

NE: No effect to federally listed species

MAII: May adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing. For plants, this determination is based on presumed presence for species in suitable habitat where some or all of the Project Area was not surveyed, or which are difficult to find and may be missed during surveys.

NI: No Impact. The appropriate determination when the proposed action would have no impact on listed species or designated critical habitat. For this determination, the impact of the action should be temporally or spatially separated from the listed species.

4.13.4 Mitigation Measures

Western's adopted SCPs and DC include measures that would minimize impacts to special status plants. These measures would be implemented for the construction of any action alternative. No further special mitigation measures are recommended.

4.14 Wetland Resources

The project would generally seek to avoid work in and around wetlands and riparian areas. There is minor potential to impact wetlands and riparian areas in the following ways:

- Increased erosion and sedimentation in wetlands from exposed, disturbed ground at staging areas, new pole structures, and access areas.
- Placement of fill directly into wetlands for road crossings or pole placement.
- Clearing or physical damage to wetland vegetative cover from work at new pole structures and temporary access to pole locations.
- Altering drainage patterns, resulting in either draining or flooding wetlands.
- Altering the functions and values of wetlands.

- Altering drainage patterns, resulting in either draining or flooding wetlands.

Routine operation and maintenance should not adversely affect wetlands or riparian areas.

4.14.1 Significance Criteria

The significance criteria used in assessing wetlands impacts are as follows:

- Significant impacts may occur where there would be ground disturbance to fens, jurisdictional wetlands, or perennial water courses that would require a USACE Section 404 individual permit.

4.14.2 Methodology

Wetland data were obtained from three sources: (1) national wetland inventory, (2) topographic mapping of the area that indicates stream, lake, and wetland features, and (3) field reconnaissance for wetlands and riparian areas associated with this project conducted over three field seasons (2007, 2008, and 2009).

4.14.3 Direct and Indirect Impacts

4.14.3.1 Alternative A – No Action

Alternative A would use the existing route and existing hardware. Routine maintenance would be relied upon to keep the system operational.

Direct Impacts

Alternative A would have direct impact on wetlands associated with continued transmission line maintenance and replacement of existing pole structures at the end of their lifespan. Every effort would be made to avoid all access into wetland and riparian ecosystems.

Indirect Impacts

Indirect impacts to wetlands and riparian areas is a possibility if more serious maintenance is necessary as the current transmission line continues to age and potentially suffers more major problems. Indirect effects would involve an increase in use of the access area in the ROW for more line repairs. This increased traffic could result in compaction of soils and crushing of existing vegetation in the ROW. The result of this disturbance could be an increase in runoff and entrainment of sediment, which could ultimately make its way in Project Area wetlands and riparian areas. Alternative A does traverse a shoreline of Lake Granby at Cutthroat Trout Bay; crosses wetlands just west of U.S. Highway 34 northwest of the lake; traverses the large wetland complex north of CR 41 stretching as far north as Stillwater Tap; crosses the wet meadows south of CR 40; and crosses several creeks and canals, including Willow and Stillwater creeks. SCPs and design criteria should be capable of adequately preventing sediment transport during any intensive maintenance operations. Indirect impacts to wetlands and riparian areas from Alternative A are judged to be negligible to minor.

4.14.3.2 Alternative B1

Alternative B1 would include 1.34 miles of new ROW, and would require the placement of construction staging areas, clearing of vegetation in the new ROW, placement of steel pole support structures, demolition of existing H-frame support structures, stringing of new conductor line, and routine maintenance of the system.

Direct Impacts

Short-term impacts to wetlands may result from the need to access new pole locations in areas near wetlands and wet meadows between Stillwater Tap and CR 41. The short-term impacts in this area would include trampling and crushing of wetland vegetation, compaction of wetland soils, and the potential of short-term changes in surface and groundwater flow regimes. Other areas of wetlands and riparian areas are substantially shorter in length inside the ROW, and should be easy to span and work around in terms of access. These short-term effects are likely to be minor to moderate depending on access and engineering constraints. An existing H-frame structure in the fen wetland would be cut at the base using hand-held chainsaws and removed by a crane during removal of the existing transmission line. No impacts are anticipated to occur to the fen wetland.

It is not anticipated that Alternative B1 would require placement of new structures in wetland areas. Every effort would be made to avoid wetland and riparian features, and where that is not possible, to minimize the impact footprint to the greatest extent possible. Anticipated quantity of vegetation removal and disturbance in wetlands is less than 0.1 acre. Any impacts in excess of 0.1 acre of fill would require notification of the USACE through a pre-construction notification under nationwide permit no. 12 or through an individual permit, if fill exceeds 0.5 acre of into waters of the U.S. Long-term impacts to wetlands and riparian systems would be negligible to minor.

Indirect Impacts

Indirect impacts would be minor due to the design criteria. Indirect impacts include some of the following items:

- Causing changes in vegetation composition, structure, and cover value.
- Vectoring and creating habitat for competitive invasive plant species.
- Changing local hydrologic pattern in wetlands or riparian areas.
- Changing soil characteristics of the habitat.
- Alteration of wetland functional properties, including food chain support, sediment retention, ground water discharge and recharge, wildlife habitat, flood attenuation, and nutrient retention.

4.14.3.3 Alternative C1

Alternative C1 would include 6.83 miles of new ROW, and would require the placement of construction staging areas, clearing of vegetation in the new ROW, placement of steel pole support structures, demolition of existing H-frame support structures, stringing of new conductor line, and routine maintenance of the system. The new ROW would affect sagebrush, grasslands, wetlands/wet meadows, lodgepole, aspen, and mixed conifer plant communities. It

would also affect lands designated in this EIS as Developed/Disturbed lands, including residential properties.

Direct Impacts

Short-term impacts to wetlands may result from the need to access new pole locations in areas of wetlands and wet meadows between Stillwater Tap and CR 41. The short-term impacts in this area would include trampling and crushing of wetland vegetation, compaction of soils, and the potential of short-term changes in surface and groundwater flow regimes. Other areas of wetlands and riparian areas are substantially shorter in length inside the ROW, and should be easy to span and work around in terms of access. These short-term effects are likely to be minor to moderate, depending on access and engineering constraints. An existing H-frame structure in the fen wetland would be cut at the base using hand-held chainsaws and removed by a crane during removal of the existing transmission line. No impacts are anticipated to occur to the fen wetland.

Long-term impacts to wetlands and riparian areas for Alternative C1 would include a corner pole in a wetland area, where the alignment turns to the northeast. The span from the corner pole would need to be increased to approximately 1,500 feet to avoid a second pole placement in wetland along Alternative C1. To minimize impacts, construction could be limited to the dry periods of the year. As with Alternative B1, every effort would be made to avoid wetland and riparian features, and where that is not possible, to minimize the impact footprint to the greatest extent possible. Anticipated quantity of vegetation removal and disturbance in wetlands is less than 0.1 acre. Any impacts in excess of 0.1 acre of fill would require notification of the USACE, and may require a nationwide permit no. 12 or individual permit, depending on acreage of fill anticipated. Long-term impacts to wetlands and riparian systems would be relatively minor.

Indirect Impacts

Indirect impacts would be minor due to the design criteria. Indirect impacts include some of the following items:

- Causing changes in vegetation composition, structure, and cover value.
- Vectoring and creating habitat for competitive invasive plant species.
- Changing local hydrologic pattern in wetlands or riparian areas.
- Changing soil characteristics of the habitat.
- Alteration of wetland functional properties, including food chain support, sediment retention, ground water discharge and recharge, wildlife habitat, flood attenuation, and nutrient retention.

4.14.3.4 Alternative C2

Alternative C2 would include 4.77-5.38 miles of new ROW, and would require the placement of construction staging areas, clearing of vegetation in the new ROW, placement of steel pole support structures, demolition of existing H-frame support structures, stringing of new conductor line, and routine maintenance of the system. The new ROW would affect sagebrush, grasslands, wetlands/wet meadows, lodgepole, aspen, and mixed conifer plant communities. It would also affect lands designated in this EIS as Developed/Disturbed lands, including residential properties.

Direct Impacts

Short-term impacts to wetlands may result from the need to access new pole locations in areas of wetlands and wet meadows between Stillwater Tap and CR 41. The short-term impacts in this area would include trampling and crushing of wetland vegetation and the potential of short-term changes in surface and groundwater flow regimes. Other areas of wetlands and riparian areas are substantially shorter in length inside the ROW, and should be easy to span and work around in terms of access. These short-term effects are likely to be minor to moderate, depending on access and engineering constraints. An existing H-frame structure in the fen wetland would be cut at the base using hand-held chainsaws and removed by a crane during removal of the existing transmission line. No impacts are anticipated to occur to the fen wetland.

Long-term impacts to wetlands and riparian areas for Alternative C2 would include a corner pole in a wetland area, where the alignment turns to the northeast. The span from the corner pole would need to be increased to approximately 1,500 feet to avoid a second pole placement in wetland along Alternative C2. To minimize impacts, construction could be limited to the dry periods of the year. As with Alternative C1, every effort would be made to avoid wetland and riparian features, and where that is not possible, to minimize the impact footprint to the greatest extent possible. Anticipated quantity of vegetation removal and disturbance in wetlands is less than 0.1 acre. Any impacts in excess of 0.1 acre of fill would require notification of the USACE, and may require a nationwide permit no. 12 or individual permit, depending on acreage of fill anticipated. Long-term impacts to wetlands and riparian systems would be negligible to minor.

Indirect Impacts

Indirect impacts would be minor due to the design criteria. Indirect impacts include some of the following items:

- Causing changes in vegetation composition, structure, and cover value.
- Vectoring and creating habitat for competitive invasive plant species.
- Changing local hydrologic pattern in wetlands or riparian areas.
- Changing soil characteristics of the habitat.
- Alteration of wetland functional properties, including food chain support, sediment retention, ground water discharge and recharge, wildlife habitat, flood attenuation, and nutrient retention.

4.14.3.5 Alternative D-Options 1 and 2

This alternative would include 1.34-1.65 miles of new ROW, and would require the placement of construction staging areas, clearing of vegetation in the new ROW, placement of steel pole support structures, demolition of existing H-frame support structures, stringing of new conductor line, and routine maintenance of the system. The new ROW would primarily affect lodgepole and aspen plant communities.

Direct Impacts

Short-term impacts to wetlands may result from the need to access new pole locations in areas near wetlands and wet meadows between Stillwater Tap and CR 41. The short-term impacts in this area would include trampling and crushing of wetland vegetation, and the potential of

short-term changes in surface and groundwater flow regimes. Other areas of wetlands and riparian areas are substantially shorter in length inside the ROW, and should be easy to span and work around in terms of access. These short-term effects are likely to be minor to moderate, depending on access and engineering constraints. An existing H-frame structure in the fen wetland would be cut at the base using hand-held chainsaws and removed by a crane during removal of the existing transmission line. No impacts are anticipated to occur to the fen wetland.

It is not anticipated that Alternative D, both options, would require placement of new structures in wetland areas. As with Alternative B1, every effort would be made to avoid wetland and riparian features, and where that is not possible, to minimize the impact footprint to the greatest extent possible. Anticipated quantity of vegetation removal and disturbance in wetlands is less than 0.1 acre. Any impacts in excess of 0.1 acre of fill would require notification of the USACE, and may require a nationwide permit no. 12 or individual permit, depending on acreage of fill anticipated. Long-term impacts to wetlands and riparian systems would be negligible to minor.

Indirect Impacts

Indirect impacts would be minor due to the design criteria. Indirect impacts include some of the following items:

- Causing changes in vegetation composition, structure, and cover value.
- Vectoring and creating habitat for competitive invasive plant species.
- Changing local hydrologic pattern in wetlands or riparian areas.
- Changing soil characteristics of the habitat.
- Alteration of wetland functional properties, including food chain support, sediment retention, ground water discharge and recharge, wildlife habitat, flood attenuation, and nutrient retention.

4.14.4 Mitigation Measures

Western's adopted SCPs and project-specific design criteria include measures that would minimize impacts to wetland resources. These measures would be implemented for the construction of any action alternative. The following mitigation measures are also recommended.

- If construction of the transmission line or associated access areas cannot avoid wetlands, Western would submit a wetland delineation report to the USACE and apply for the necessary permit. It is assumed the project would be covered under a nationwide no. 12 permit. Western would abide by all mitigation measures and permit conditions.

4.15 Terrestrial and Avian Wildlife Resources

4.15.1 Significance Criteria

A significant impact on terrestrial and avian wildlife species would result if any of the following were to occur as a result of the proposed project:

- Loss of individuals or a population of a terrestrial species that would result in the species being listed or proposed for listing as threatened and endangered.

- Adversely modifying designated critical habitat to the degree it would no longer support the species for which it was designated.
- Permanent destruction of crucial wildlife habitat, such as breeding, production, and nesting grounds, primary migration corridors, and permanent loss of vegetation communities that provide habitat for special status species, including wetland, riparian, and aquatic species.
- Loss of individuals of a population of a species that would result in a negative change in species status.
- Violation of any state or federal statutes and regulations pertaining to fisheries, wildlife, or special status species.
- Introduction of constituents in any water body (such as evaporation or sludge ponds) in concentrations that exceed state and federal discharge limits for water quality or quantity.
- Unmitigated drainage or dewatering of, or discharge of dredged or fill material into jurisdictional waters of the United States under Section 404 of the Clean Water Act (CWA) or in violation of a Section 404 permit or applicable state wetland regulations. Wetlands are important habitats for a variety of wildlife in Grand County and the State of Colorado.
- Introduction or increase in the spread of noxious weeds to the extent that would increase the percentage of noxious weeds within the ROW by 10 percent or more, thereby substantially altering the composition and abundance of native habitat within the Project Area.

4.15.2 Methodology

Impacts analysis for terrestrial and avian wildlife resources considers the type of impact (direct, indirect, and cumulative), duration (short term or long term), and impact intensity (no effect, negligible, minor, moderate, or significant). Impacts analysis will also consider the amount of suitable habitats adjacent to the project alternatives and the areas' ability to provide wildlife habitat requirements for existing residents, as well as those that would be displaced as a result of project construction and operation. Impacts analysis will determine if the construction and operation of the proposed project would result in the loss of wildlife populations within the proposed Project Area, within Grand County, the State of Colorado, nationally, or globally. Cumulative effects are also considered for each alternative. Impacts to terrestrial wildlife are also described in greater detail in the BR.

4.15.3 Direct and Indirect Impacts

4.15.3.1 Alternative A – No Action

Alternative A would result in continued impacts to wildlife associated with operation and maintenance of the existing transmission line, including avian collision hazards and habitat fragmentation.

4.15.3.2 Alternative B1

The habitat types within the ROW for Alternative B1 were discussed in detail under the Vegetation Resources section. Lodgepole pine forests, aspen stands, sagebrush shrubland, grassland, wet meadows, wetlands, and water features are all found in the ROW for Alternative B1. With the exception of the transmission line reroutes, Alternative B1 would be constructed entirely within the existing transmission line alignment. Minor permanent impacts to wildlife habitat are expected

as the result of the widening of the existing 30-foot ROW to a 100-foot ROW and increasing the structure diameter from 2 feet to 3 feet. Because this alternative occurs predominately in an existing transmission corridor, it is likely wildlife are used to the altered vegetation within the transmission ROW, maintained for compliance with the Federal Energy Regulatory Commission's standards for vegetation management. However, wildlife in the area would need to adapt to the new structure height. The 1.8-mile reroute on the east side of Table Mountain on Forest Service managed lands would result in new disturbance and removal of aspen and sagebrush shrubland habitats. The impacts would be limited to the 100-foot ROW. Clearing of vegetation in this area would benefit some wildlife species that prefer edge habitats or open habitats, such as mountain bluebirds. Loss of aspen may result in minor adverse impacts to species associated with these habitats, such as warbling vireos and golden-crowned kinglets. Impacts to sagebrush and shrubland habitat in the new alignment would be restricted to the footprints of the transmission structures as well as any necessary overland travel required to access structure locations. Impacts from roads or overland travel cannot be determined at this time until final design is completed.

Alternative B1 occurs in areas mapped as severe winter range for mule deer and elk. With the exception of the 1.8-mile Table Mountain reroutes, Alternative B1 would keep the transmission line adjacent to a previously disturbed ROW, and would result in fewer impacts to big game habitats relative to the other action alternatives. In addition, the Forest Service maintains a closure on Table Mountain effective November 15 to April 30 to protect big game crucial winter range. Western would abide by this closure and would construct outside of this time period. Routine maintenance activities that would be required during the operation of the transmission line would also be scheduled outside of the severe winter range closure. It is possible, however, that some emergency maintenance may be required during the closure and within other areas outside of Forest Service managed lands. Mule deer and elk may temporarily move out of these areas during emergency maintenance activities. The severity of this impact would depend on the snow pack and available forage in any given year. Big game habitat has been impacted by planned and existing recreational and residential developments in the Project Area. The general operation of the transmission line, however, is not expected to result in any long-term adverse effects to big game in the Project Area.

General construction impacts, such as increased noise and human disturbance in the construction zone, would result in some wildlife temporarily avoiding the transmission ROW. Movement corridors and foraging areas would be temporarily altered during construction. Construction and operation of the transmission line would result in habitat fragmentation within the Project Area. Habitat fragmentation is defined as the process by which a natural landscape is broken up into small parcels of natural ecosystems, isolated from one another in a matrix of lands dominated by human activities (Saunders and Hobbs 1991). Operation of the proposed transmission lines could create aerial habitat fragmentation for avian species. Transmission towers may provide increased perching opportunities for raptors, which can result in increased predation on local prey species such as the greater sage grouse, other avian species, small mammals, reptiles, and amphibians.

The transmission line, once constructed, is not expected to result in impacts to wildlife movement and migration corridors for terrestrial species. Construction may result in mortality of smaller, less mobile species, including small mammals, insects, or reptiles that may inhabit the ROW. These impacts are not expected to result in long-term impacts to local, state, or regional populations.

Indirect impacts may include the propagation of noxious weeds in the transmission ROWs and adjacent habitats. These impacts would be mitigated through the implementation of a noxious weed management plan and through the restoration of the transmission ROW upon completion of construction.

4.15.3.3 Alternative C1

The majority of Alternative C1 would be constructed along a previously undisturbed alignment on the west side of Table Mountain. Habitats that would be impacted during project construction include lodgepole pine, sagebrush shrubland, and wetlands. This alternative would span the highest percentage of sagebrush habitats relative to the other action alternatives. General construction impacts and associated mitigation measures discussed above under Alternative B1 also apply to Alternative C. The severity of these impacts, however, is expected to be higher because the transmission line would be constructed along a previously undisturbed alignment. Construction of Alternative C1 would result in direct loss and fragmentation of sagebrush habitats found on the western end of the project that occur from the Windy Gap Substation to Willow Creek. A variety of wildlife species are associated with sagebrush habitats. Sagebrush provides breeding and nesting habitats for the greater sage grouse and severe winter range for mule deer and elk. Construction in this area could result in long-term or permanent impacts to sage grouse populations, which is discussed in greater detail under Special Status Species in Section 4.16.

Big game severe winter range has been and would continue to be compromised by existing and planned residential developments in the area. Construction of Alternative C1 would result in new impacts to big game severe winter range. Permanent habitat loss, however, would be restricted to the footprints of the transmission structures. Temporary impacts would be mitigated through restoration of the site post-construction. Operational impacts to big game are expected to be limited to emergency maintenance activities; however, the severity of the impact is expected to be higher for this alternative because the area has been previously undisturbed. Based on field studies conducted for the project from 2006 through 2008, the area has a higher concentration of big game use relative to Alternatives A and B. The same seasonal closures would apply to Alternative C1.

4.15.3.4 Alternative C2

Habitats that might be impacted by construction of the transmission line in the ROW for Alternative C2 include lodgepole pine, sagebrush shrublands, grassland, water features, and wetlands. This alternative spans the second highest percentage of sagebrush habitats in the Project Area. General construction and operational impacts discussed above for Alternatives B and C1 also apply to C2. Alternative C2-Options 1 and 2 would place the segment of the transmission line running east from Windy Gap Substation along previously disturbed ROWs. Option 1 would follow the Windy Gap Pipeline ROW and Option 2 would follow the existing transmission line. The segment of Alternative C1-Option 1 that spans portions of township-range sections 24 and 19 would span intact sagebrush habitats and would be less than 0.25 mile from an active greater sage grouse lek site. Construction of the transmission line in this ROW would result in minimal impacts to sagebrush habitat, but may result in increased predation on sage grouse and lek abandonment. Impacts to greater sage grouse and other special status species would be discussed in greater detail in Section 4.16.

Option 2 would keep the transmission line adjacent to the existing transmission line between Windy Gap Substation and the Granby Substation, and because there is an existing line, would result in fewer impacts to avian species, big game, and terrestrial wildlife.

The remainder of the C2 alternative would result in impacts to wildlife habitats along a previously undisturbed alignment. Impacts and associated mitigation measures are similar to those described for Alternative C1.

4.15.3.5 Alternative D-Options 1 and 2

Habitats that may be impacted by construction of the transmission line within the ROW for this alternative include lodgepole pine, sagebrush shrublands, grasslands, water features, and wetlands. Alternatives B1 and D, both options, would span the highest percentage of lodgepole pine forests in the Project Area. Impacts discussed for Alternative C2-Options 1 and 2 also apply to the segment of Alternative D-Options 1 and 2. Alternative D, both options, would include the expansion of previously disturbed ROWs and require new ROW for the 1.8-mile reroute on Forest Service managed lands on the east side of Table Mountain. Constructing along previously disturbed ROW minimizes impacts to wildlife habitats compared to previously undisturbed sites. The use of existing ROW would have fewer impacts to habitat, wildlife behavior, and migration paths than previously undisturbed sites because an existing transmission line has been present in the same area for a long period of time and adult resident wildlife species have become habituated to its presence. Construction would result in long-term impacts associated with the loss of forest habitat and plant community conversion to grassland or shrubland. Although the increased pole height may increase the risk of collision for migrant and juvenile raptors, adult resident raptors would likely adapt to these conditions long-term.

Alternative D, both options, occurs in areas mapped as severe winter range for mule deer and elk. With the exception of the 1.8-mile Table Mountain reroute, this alternative would keep the transmission line in a previously disturbed corridor, and would result in fewer impacts to big game habitats relative to the other action alternatives.

4.15.4 Mitigation Measures

Alternative A would result in no new construction or changes within the existing transmission line. The existing transmission line has some existing impacts including collision and habitat fragmentation. Alternative A is a no action alternative; therefore, no additional mitigation is proposed. Additional mitigation for the action alternatives includes the following:

- Project design and construction in conformance with the Suggested Practices for Protection of Raptors on Powerlines (APLIC 2006)
- Cons Construction will not occur within pronghorn, mule deer, or elk winter concentration areas or severe winter range between November 15 and April 30 on public and private lands, unless an exception is granted by the BLM or CDOW

4.16 Special Status Terrestrial and Avian Wildlife Species

4.16.1 Significance Criteria

A significant impact on terrestrial and avian wildlife species would result if any of the following were to occur as a result of the proposed project:

- Jeopardized the recovery of federal- or state-listed species.
- Adversely modifying designated critical habitat to the degree it would no longer support the species for which it was designated.
- Permanent destruction of crucial wildlife habitat, such as breeding, production, and nesting grounds, primary migration corridors, and permanent loss of vegetation communities that provide habitat for special status species, including wetland, riparian, and aquatic species.
- Loss of individuals of a population of a species that would result in a negative change in species status.
- Violation of any state or federal statutes and regulations pertaining to fisheries, wildlife, or special status species.
- Introduction of constituents in any water body (such as evaporation or sludge ponds) in concentrations that exceed state and federal discharge limits for water quality or quantity.
- Unmitigated drainage or dewatering of, or discharge of dredged or fill material into jurisdictional waters of the United States under Section 404 of the Clean Water Act (CWA) or in violation of a Section 404 permit or applicable state wetland regulations. Wetlands are important habitats for a variety of wildlife in Grand County and the State of Colorado.

4.16.2 Methodology

The impacts analysis considers the amount of suitable habitats for special status species adjacent to the project alternatives and these areas' ability to provide these species habitat requirements following implementation of any action alternative. The impacts analysis determines if the construction and operation of the proposed project would result in the loss of wildlife populations within the proposed Project Area, within Grand County, the State of Colorado, or nationally.

The primary impacts to special status species resulting from the construction and/or operation of the transmission line are habitat alteration and fragmentation, avian electrocution and collision, and increased predation on sage grouse and other wildlife from transmission structures. The Project Area is located approximately 0.5 mile from the Colorado River. The portion of the Colorado River located to the south of both action alternative transmission alignments contains bald eagle roosting and winter foraging habitat, a major migratory stopover for sandhill cranes and wintering range for rough-legged hawks near Coffey Divide. A more detailed account of the life history, environmental baseline, and detailed impact analysis for federally listed, FSS, and state and other species of concern can be found in the BR for the project. The BR provides detailed justification supporting the impact determinations shown in Table 4-16.

4.16.3 Direct and Indirect Impacts

4.16.3.1 Alternative A – No Action

Alternative A would result in no new construction or changes within the existing transmission line. Disturbance to special status species resulting from on-going maintenance activities would continue. Alternative A would result in no significant impacts to special status species in the Project Area.

4.16.3.2 Alternative B1

Federally Listed Species

Alternative B1 would have no direct or indirect effect on the lynx or its habitat. The ROW does not occur in lynx habitat. The Project Area is below 9,000 feet in elevation and is outside of the closest Lynx Analysis Unit (LAU). The majority of the Project Area exists within sagebrush shrublands and irrigated hay meadows with small areas of forest cover. These forested areas do not contain the understory structure necessary to sustain snowshoe hare populations or the downed woody material necessary for denning habitat. Lynx may move through portions of the Project Area, but the Project Area does not contain habitat suitable to sustain resident populations.

Forest Service Sensitive Species

General construction and operation impacts discussed above under Section 4.15, Terrestrial and Avian Wildlife Resources, also apply to FSS and state-listed species. A more detailed account of the life history, environmental baseline, and detailed impact analysis for FSS species can be found in the BE for the project.

With the exception of one segment of the transmission line, Alternative B1 would be constructed entirely along the existing transmission line. Minor, permanent impacts to FSS wildlife habitat are expected as the result of widening the existing 30-foot ROW to a 100-foot width and from increasing the structure diameter from 2 feet to 3 feet. Because this alternative occurs predominately in an existing transmission corridor, it is likely that adult resident FSS wildlife are used to the presence of the transmission line, and vegetation within a portion of the transmission line ROW has already been altered and maintained to ensure compliance with the Federal Energy Regulatory Commission's standards for vegetation management. Clearing of vegetation in this area would benefit some wildlife species that prefer edge habitats or open habitats, such as mountain bluebirds. Loss of aspen and may result in minor adverse impacts to species associated with these habitats, such as Brewer's sparrow and olive-sided flycatcher (sagebrush and mixed shrublands).

The rebuild of Alternative B1, north of CR 41, would require the removal and replacement of a structure within a fen wetland. Removal of the existing pole would be done by hand, by cutting the pole off at the base and then into pieces, minimizing disturbance from removal activities. Some minor short-term impacts to wildlife, such as amphibians that may inhabit this wetland, may occur. The long-term result would be beneficial as the fen would be restored over time and the transmission line would be moved out of these sensitive habitats. No boreal toads or wood frogs were observed during surveys conducted in the summer of 2007. These species are not expected to occur in the Project Area. The existing transmission line spans wetlands and riparian communities associated with Willow and Stillwater creeks, which were surveyed as potentially having suitable habitat for boreal toads and wood frogs.

Construction of Alternative B1 is expected to result in the minor impacts to FSS species relative to the other action alternatives because it would upgrade the transmission line in the expanded existing ROW, with the exception of the 1.8-mile reroute on the east side of Table Mountain.

State-Listed Species and Other Species of Concern

The state-listed species that may have suitable habitat in the Project Area are also described in detail within the BR prepared for the project. This discussion also includes raptors and migratory birds.

The primary wildlife impact associated with the operation of the action alternatives is the potential collision and electrocution of avian species with overhead lines (particularly static lines), and increased predation on greater sage grouse, small mammals, and birds. Portions of Alternative B1 are located less than 0.5 mile from the Colorado River. The portion of the Colorado River located to the south of Alternative B1 contains bald eagle roosting and winter foraging habitat, a major migratory stopover for sandhill cranes, and wintering range for rough-legged hawks near Coffey Divide (Sumerlin 2006, pers. comm.).

Mature resident raptors are habituated to the presence of the transmission line in the area and would likely adapt to the taller structure heights. However, juveniles and migratory raptors would be exposed to increased risk of collision due to the new height of structure. Because there is an existing transmission line in the corridor, it is expected that collision risk for Alternative B1 would be lower than alternatives that require substantially new ROW. Transmission towers in new locations may provide increased perching opportunities for raptors, which can result in increased predation on local prey species such as the greater sage grouse, other avian species, small mammals, reptiles, and amphibians. This is more likely in the non-forested habitats where perching opportunities are less abundant. Western would coordinate with the Forest Service to monitor the osprey nests that are currently adjacent to the existing transmission corridor, to ensure the change in structure heights does not result in osprey collision with the transmission line.

The increase in structure heights (ranging from 20-40 feet increase) may temporarily result in increased risk for avian collisions with Alternative B1. Some individual raptors currently found nesting within (or in close proximity to) the existing transmission line ROW would likely become habituated to the presence of the transmission line in the area, and would likely adapt to the taller structure heights. However, some individuals, including juvenile or migrant individuals, would not be habituated to the presence of the line. Because there is an existing transmission line in the corridor, it is expected that collision risk for Alternative B1 would be lower than other alternatives that would be constructed primarily along new ROW.

Construction of Alternative B1 could result in the removal of nesting and foraging habitats for FSS avian species that are known to occur or have suitable habitat within the ROW. In addition, the greater pole height may increase the risk of collision, especially to migratory and juvenile birds.

4.16.3.3 Alternative C1

Federally Listed Species

The only federally listed wildlife species that is known to occur in Grand County is the Canada lynx. The Project Area does not contain suitable habitat for the Canada lynx; and based on the criteria outlined in the Forest Service Lynx Amendment (that includes the ARNF), the lynx is not carried forward for analysis.

Forest Service Sensitive Species

General construction and operation impacts discussed under Section 4.15, Terrestrial and Avian Wildlife Resources, also apply to FSS and state-listed species. A more detailed account of the life history, environmental baseline, and detailed impact analysis for FSS species can be found in the BE for the project.

Impacts to FSS avian species associated with sagebrush habitats within the ROW of Alternative C1 are expected to be higher than the other project alternatives because it would require the transmission line to be constructed in a previously undisturbed area. The Brewer's sparrow and olive-sided flycatcher were observed in these habitats. Impacts to forest dwelling species, such as the boreal owl and northern goshawk, are expected to be minor because the ARNF has been heavily affected by the mountain pine beetle epidemic. Alternatives C1 and C2 would span fewer forested communities relative to the other action alternatives; however, these alternatives would span a higher percentage of sagebrush shrubland habitats. If construction should occur during the avian breeding season, surveys would be conducted by qualified specialists no sooner than 72 hours prior to any ground-disturbing activities to ensure the project does not result in the "take" of an active nest or FSS bird species.

The reroute on the east side of Table Mountain on Forest Service managed lands (Alternatives C1 and C2) would result in additional disturbance and removal of aspen, mixed conifer, sagebrush, and mixed shrubland habitats. The impacts would be limited to the 100-foot ROW.

Species such as the peregrine falcon, bald eagle, and the American bittern are not known to breed in the Project Area. The transmission line would be constructed using APLIC and USFWS guidelines for mitigating electrocution risks to sensitive and common avian species. Flight diverters would be placed on the transmission lines that are deemed to be of high risk for avian collision (i.e., Cutthroat Trout Bay).

The pygmy shrew has not been documented in the Project Area, but information is lacking on the presence of this species in Colorado. Habitat is limited due to the mountain pine beetle epidemic. If this species should occur, the biggest impact would be incidental mortality as a result of project construction. The project is not expected, however, to impact pygmy shrew populations on the Forest, region, or state level.

The transmission line would span riparian and wetland communities within the ROW for Alternative C1. No wood frogs or boreal toads were recorded during surveys conducted in 2007; neither of these species is expected to occur in the Project Area.

The two special status species of concern for Alternatives C1 and C2 are the greater sage grouse and the golden eagle. The golden eagle is further discussed under State and Other Species of Concern.

Signs of sage grouse concentration and breeding areas were found within the southwestern alignment of Alternative C1. The Horn lek is located 0.25 mile or less to the north of the ROW for Alternative C1. There is a second lek, known as the Horn West lek, on the C Lazy U property, which Alternative C1 spans on the southern end of the Project Area. Construction of the proposed transmission line would result in a temporary increase in human presence in the ROW, noise disturbance, permanent removal and fragmentation of sagebrush, and thus, sage grouse breeding, nesting and foraging habitats, temporary displacement of individuals, and temporary removal of sagebrush habitats within construction areas. The primary permanent direct impact

to the greater sage grouse habitat associated with construction of Alternative C1 is the potential for further fragmentation and loss of sagebrush habitats. Habitat fragmentation is defined as a process that divides large expanses of habitat, resulting in a number of smaller patches (Fahrig 2003). Habitat fragmentation is commonly caused by fences, power lines, roads, sagebrush treatments, and the presence of other habitat loss factors (Holloran et al. 2005). The southwestern end of Alternative C1 would result in impacts to undisturbed sagebrush habitats. Planned and existing residential developments in the area have already resulted in decreased habitat for the greater sage grouse.

Studies have shown the amount and frequency of noise associated with development has negative impacts on greater sage grouse. The majority of research on sage grouse reaction to noise, development, and human disturbance has been conducted in Wyoming and has focused coal bed methane development. "Sage grouse numbers on leks within 1 mile of coal bed methane compressor stations in Campbell County, Wyoming were consistently lower than on leks not affected by this disturbance" (Braun et al. 2002). Road noise may also lead to adverse impacts to the greater sage grouse. Connelly et al. (2004) showed there were no active sage grouse leks within 1.24 miles of Interstate 80 (I-80) across southern Wyoming, and only 9 leks were known to occur between 1.24 miles and 2.49 miles of I-80. Holloran et al (2005) showed that traffic during the strutting period, when males are on a lek, results in declines in male attendance when road-related disturbance is within 0.8 mile (Holloran et al 2005). Noise and access impacts are expected to be higher with Alternative C1 because there is not an existing access or utility ROW that the transmission line would traverse.

Construction of Alternative C1 would require access through sagebrush habitats. Road construction would result in impacts to sagebrush habitat and the increased potential for propagation of noxious weeds. Noxious weeds can reduce the quality of foraging and breeding habitats for sage grouse. This impact would be mitigated through the implementation of a noxious weed management plan and restoration of habitat in the ROW.

Operation of the proposed transmission line could result in increased mortality as a result of an increase in raptor perches in the ROW. Increased perching opportunities for raptors leads to increased predation rates on breeding sage grouse. Studies have documented displacement of sage grouse within areas where transmission lines are present. Sage grouse use of areas near power lines, as measured by pellet transects, increases as distance from the power line increases for up to 600 meters (C.E. Braun, unpubl. data in Braun 1998). Power lines fragment habitats for sage grouse and reduce their security in linear strips greater than 0.6 mile in width. Sage grouse are particularly vulnerable when strutting for female grouse on leks. Braun (1998) indicated that "it is possible to markedly reduce the impact of power lines upon sage grouse through elimination of raptor perch sites."

Studies have shown that sage grouse are negatively impacted by power lines through accidental contact while in flight and through predation by raptors that use power line poles as perches (Graul 1980, Ellis 1984, 1987). Sage grouse are at risk for collision with transmission lines, primarily associated with guy wires. Because Alternative C1 occurs in a new ROW and the documented lek site sits above the ROW of Alternative C1, collision is of concern in this area.

Increased predation on sage grouse may result in the permanent abandonment of the active lek sites located less than 0.25 mile from the ROW for Alternative C1. The 2008 Colorado GSGCP recommends a 0.6-mile no surface occupancy or avoidance areas for sage grouse leks. This distance was identified in the GSGCP as the average distance a male grouse will travel from the lek during the breeding season. Sage grouse will often nest and brood within 1-4 miles of the lek

site. The conservation plan also recommends a seasonal buffer of 4 miles for greater sage grouse breeding habitats (nesting, early brood-rearing, and summer) from mid-March through September 1.

The greater sage grouse may also be adversely affected by operation of the transmission line within wintering habitats; however, given the option, it is preferred to construct during the fall and winter when development occurs within greater sage grouse habitats.

In order to mitigate potential impacts to greater sage grouse, transmission structures should be placed a minimum of 0.60 mile away from active lek sites (GSGCP 2008). If it is not feasible to move the line this distance, it is preferred that construction should be limited to winter months to avoid breeding season, which begins in March and lasts through mid-July. In addition, if power lines cannot be constructed outside of the 0.6-mile avoidance area, it is highly recommended that perch deterrents are placed within lek areas and those areas that cross greater sage grouse wintering, summer, spring, nesting, and brooding habitats.

Alternative C1 would result in major long-term impacts to the greater sage grouse and associated sagebrush habitats. With proper mitigation, impacts to greater sage grouse are expected to be moderate to major. Without mitigation, impacts could result in major impacts, including the permanent abandonment and loss of crucial breeding grounds (leks).

State-Listed Species and Other Species of Concern

The state-listed species that may have suitable habitat in the Project Area are also FSS species, and therefore have been discussed above and within the BR prepared for the project.

Golden eagles are protected under the MBTA of 1918, as amended, and the Bald and Golden Eagle Protection Act of 1940. There are two golden eagle nests (one being, the alternative) located on Table Mountain, approximately 0.25 mile above the ROW of Alternatives C1 and C2. The juxtaposition of the nest sites and variation in the topographic elevation relative to the transmission line ROW are such that fledgling and adult golden eagles may depart the nest and collide with the transmission line. Based on the Forest Service's ongoing monitoring of these nest sites, these golden eagles are known to forage and fledge their young to the valley west of the ROW for Alternative C1. Fledgling golden eagles are not able to control their flight pattern to avoid structures, such as transmission lines. A juvenile bald eagle was observed perching on the ROW for Alternative C1 on the west side of Table Mountain during habitat assessment surveys conducted in July of 2005 and again in 2007.

In order to avoid disturbance to nesting golden eagles, no surface occupancy (beyond that which historically occurred in the area) would occur within 0.25-mile radius of the nest site and associated alternate nests. Western would also implement a seasonal restriction to human encroachment within 0.25 mile of the nest and any alternate nests from December 15-July 15.

Flight diverters would be required if this alternative was selected. The potential for a golden eagle colliding with the transmission line, even with the use of flight diverters, would be increased. Mitigation may not be effective given the location of the transmission ROW relative to the nest sites.

There are three raptor nests within proximity to Alternative C1, one of which is an active golden eagle nest. A Swainson's hawk nest (previously discussed under Alternative B1) and a red-tailed hawk nest were found in proximity to the proposed ROW. The presence of a new transmission line near active raptor nest sites would increase collision and electrocution risk for these nesting raptors.

Collision risk is of concern for all avian species on the segment of the line that occurs on the west side of Table Mountain. This area provides foraging habitat for a variety of avian species, and collision risk is expected to be higher for this alternative relative to Alternatives A and B1. Similar mitigation measures outlined under Alternative B1 for avian protection and nesting sites would apply to Alternative C1.

The presence of a transmission line near active raptor nest sites would increase collision and electrocution risk for these nesting raptors, particularly for juveniles who may not be used to the transmission corridor. Collision risk is of concern for avian species on the segment of the line that would be located in new ROW on the west side of Table Mountain. This area provides foraging habitat for a variety of avian species, and collision risk is expected to be higher for this alternative relative to Alternatives A and B1.

The operation of the transmission line would also increase perch sites for raptors that occur in the area, particularly in non-forested areas where there is limited opportunity for perching. Increased perching sites could result in higher predation of other wildlife, particularly greater sage grouse, within the area. Perch deterrents would be placed on all structures that occur in sagebrush habitats to mitigate the potential for increased predation on this state-listed species and other avian and terrestrial species found in the Project Area.

4.16.3.4 Alternative C2

Federally Listed Species

The only federally listed wildlife species that is known to occur in Grand County is the Canada lynx. The Project Area does not contain suitable habitat for the Canada lynx; and based on the criteria outlined in the Forest Service Lynx Amendment (that includes the ARNF), the lynx is not carried forward for analysis.

Forest Service Sensitive Species

Impacts discussed under Alternative C1 are similar to those that would occur with the construction and operation of Alternative C2, with the exception of the route options at the southwestern end of the Project Area. Options 1 and 2 would construct the transmission line in expanded existing ROWs. Option 1 would follow NCWCD water pipeline (which has been heavily disturbed) and an existing access road. Option 2 would follow the existing transmission line until it joins with the water pipeline ROW further to the northeast (see Map 2-6).

Option 2 would result in fewer impacts than other alternatives related to greater sage grouse populations and other FSS species found in sagebrush habitats, because it would rebuild the line in the existing transmission ROW, which is located further south of the Horn lek site. Both options would increase risk of collision due to the increased pole height, although collision impacts associated with Option 2 may be slightly less for resident adult birds because of the existing line.

Option 1 would use an existing access road and ROW, which would minimize direct impacts to sagebrush habitats and further habitat fragmentation relative to Alternative C1. Sage grouse are habituated to noise and human presence within this area and are frequently observed during the summer by NCWCD maintenance specialists. NCWCD crews have observed as many as 17 sage grouse along the water pipeline ROW (Cowardin 2009). Sage grouse were flushed in proximity to the water pipeline ROW during field surveys conducted in 2008. Sagebrush habitats

would be preserved to the greatest extent feasible if this option was selected to minimize impacts to adjoining habitats. Option 1 would minimize impacts to sage grouse habitats and the project's distance to the active lek site relative to Option 2. Construction of a transmission line in proximity to the water pipeline ROW may result in increased predation to sage grouse due to an increase in perch sites for raptors, which may result in lek abandonment. Mitigation in the form of perch deterrents would be used to mitigate predation impacts. The presence of the transmission line in the water pipeline ROW could result in the permanent displacement of sage grouse in the area.

The same seasonal restrictions and construction buffers would apply to both of these options in order to minimize impacts to sage grouse breeding areas.

Impacts for the remainder of Alternative C2 would be similar to those discussed in detail under Alternative C1, including those discussed for the golden eagle.

State-Listed Species and Other Species of Concern

Impacts to state-listed species and other species of concern are similar to impacts of Alternative C1. This alternative is in proximity to the same raptor nests including the golden eagle nest.

Similar to C1, this alternative provides foraging habitat for a variety of avian species, and collision risk is expected to be greater relative to Alternatives A and B1.

4.16.3.5 Alternative D-Options 1 and 2

Federally Listed Species

The only federally listed wildlife species that is known to occur in Grand County is the Canada lynx. The Project Area does not contain suitable habitat for the Canada lynx; and based on the criteria outlined in the Forest Service Lynx Amendment (that includes the ARNF), the lynx is not carried forward for analysis.

Forest Service Sensitive Species

General construction and operation impacts discussed under Section 4.15, Terrestrial and Avian Wildlife Resources, also apply to FSS and state-listed species. A more detailed account of the life history, environmental baseline, and detailed impact analysis for FSS species can be found in the BR prepared for the project.

Impacts discussed under Alternative C2 for Options 1 and 2 also apply to the southwestern segments of this alternative. Impacts along the remainder of this alternative would be similar to those described for Alternative B1. Alternative D, both options, would also follow and expand existing ROWs for the majority of the alignment, with the exception of the 1.8-mile reroute on the east side of Table Mountain.

State-Listed Species and Other Species of Concern

Mature resident raptors are habituated to the presence of the transmission line in the area and would likely adapt to the taller structure heights. However, juveniles and migratory raptors would be exposed to increased risk of collision due to the new height of structure. Because there is an existing transmission line in the corridor, it is expected that collision risk for Alternative D, both

options, would be lower than other action alternatives, which would be constructed almost entirely in new corridors. Transmission towers in new locations may provide increased perching opportunities for raptors, which can result in increased predation on local prey species

4.16.3.6 Determinations of Impacts and Effects

A determination of impacts and effects is presented in Table 4-14 for all federally listed species, FSS, and MIS species with potential to occur in the analysis area(s).

Table 4-14. Determination for Federally Listed, FSS, and MIS Wildlife by Project Alternatives.

Common Name	Species	Determination*				
		Alternative A (No Action)	Alternative B1	Alternative C1	Alternative C2-Opt.1/Opt. 2	Alternative D-Opt.1/Opt. 2
Federally Listed Species						
Canada lynx	*Lynx canadensis*	NE	NE	NE	NE	NE
FSS						
American bittern	*Botaurus lentiginosus*	MAII	MAII	MAII	MAII	MAII
American marten	*Martes americana*	NI	MAII	NI	NI	MAII
Bald eagle	*Haliaeetus leucocephalus*	MAII	MAII	MAII	MAII	MAII
Black tern	*Chlidonias niger*	MAII	MAII	MAII	MAII	MAII
Boreal owl	*Aegolius funereus*	MAII	MAII	MAII	MAII	MAII
Boreal toad	*Anaxyrus boreas boreas*	NI	NI	NI	NI	NI
Brewer's sparrow	*Spizella breweri*	NI	MAII	MAII	MAII	MAII
Greater sage grouse	*Centrocercus urophasianus*	NI	MAII	MAII	MAII	MAII
Loggerhead Shrike	*Lanius lukovicianus*	MAII	MAII	MAII	MAII	MAII
Wolverine	*Gulo gulo luscus*	NI	NI	NI	NI	NI

Common Name	Species	Determination*				
		Alternative A (No Action)	Alternative B1	Alternative C1	Alternative C2-Opt.1/Opt. 2	Alternative D-Opt.1/Opt. 2
North American River Otter	*Lontra canadensis*	NI	NI	NI	NI	NI
Northern goshawk	*Accipiter gentilis*	NI	MAII	MAII	MAII	MAII
Northern harrier	*Circus cyaneus*	NI	MAII	MAII	MAII	MAII
Northern leopard frog	*Lithobates pipiens*	NI	NI	NI	NI	NI
Olive-sided flycatcher	*Contopus borealis*	NI	MAII	MAII	MAII	MAII
Peregrine falcon	*Falco peregrinus*	MAII	MAII	MAII	MAII	MAII
Pygmy shrew	*Sorex hoyi montanus*	NI	NI	NI	NI	NI
Wood frog	*Lithobates sylvatica*	NI	NI	NI	NI	NI
MIS						
Elk	*Cervus elaphus*	No Change	No Change	No Change	No Change	No Change
Boreal toad	*Anaxyrus boreas boreas*	No Change	No Change	No Change	No Change	No Change
Golden-crowned kinglet	*Regulus satrapa*	No Change	No Change	No Change	No Change	No Change
Hairy woodpecker	*Picoides villosus*	No Change	No Change	No Change	No Change	No Change
Mountain bluebird	*Sialia currucoides*	No Change	No Change	No Change	No Change	No Change
Mule deer	*Odocoileus hemionus*	No Change	No Change	No Change	No Change	No Change

Common Name	Species	Determination*				
		Alternative A (No Action)	Alternative B1	Alternative C1	Alternative C2-Opt.1/Opt. 2	Alternative D-Opt.1/Opt. 2
Pygmy nuthatch	*Sitta pygmaea*	No Change	No Change	No Change	No Change	No Change
Warbling vireo	*Vireo gilvus*	No Change	No Change	No Change	No Change	No Change
Wilson's warbler	*Wilsonia pusilla*	No Change	No Change	No Change	No Change	No Change

NE: No Effect to federally listed species

MAII: May adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing.

NI: No Impact. The appropriate determination when the proposed action would have no impact on listed species or designated critical habitat. For this determination, the impact of the action should be temporally or spatially separated from the listed species.

4.16.4 Mitigation Measures

4.16.4.1 Alternative A

Alternative A would result in no new construction or changes within the existing transmission line. No further mitigation is recommended.

4.16.4.2 All Action Alternatives

Environmental Protection Measures for action alternatives is provided in Section 2.4.2, Wildlife Resources and Special Status Wildlife. Specifically, additional mitigation would be required to minimize impacts to the golden eagle, greater sage grouse, nesting raptors, and migratory birds.

- Sagebrush habitat restoration, perch deterrents, and a monitoring program would be implemented to minimize impacts to sage grouse and their breeding habitats that occur in the area. A sagebrush restoration plan will be developed during final design for areas where sagebrush would be impacted. It is possible that operation of the transmission line in this area may result in permanent displacement of this sage grouse population, even with the implementation of project-specific design criteria. Compensatory mitigation in the form of habitat restoration for greater sage grouse in Grand County may be an option to mitigate for the loss of sagebrush habitats and the potential displacement of sage grouse in the Project Area.
- In order to mitigate impacts to nesting golden eagles, the transmission line would not be constructed within 0.25 mile of an active golden eagle nest and no construction would occur within 0.5 mile of the nests from December 15-July 15. In addition, construction would occur outside of the nesting season (December 15-July 15) within 0.25 mile of the nest and any alternate nest sites. Flight diverters would be placed on the transmission line up to 0.50 mile from the nest sites to minimize some of the collision risk. Western would assist the Forest Service with monitoring of the golden eagle nest and report any mortality to the USFWS office within 24 hours of the event.

- In order to mitigate potential impacts to greater sage grouse, transmission structures should be placed a minimum of 0.60 mile away from active lek sites (GSGCP 2008). If it is not feasible to move the line this distance, it is preferred that construction should be limited to winter months to avoid breeding season, which begins in March and lasts through mid-July. In addition, if power lines cannot be constructed outside of the 0.6-mile avoidance area, it is highly recommended that perch deterrents are placed within lek areas and those areas that cross greater sage grouse wintering, summer, spring, nesting, and brooding habitats.
- If construction occurs during the avian breeding season (roughly between March 15 and September 1), surveys would be conducted no earlier than 72 hours prior to any ground-disturbing activities to ensure the project complies with the MBTA. Some raptor species in Colorado, including the bald and golden eagles, will initiate nesting much earlier in the year.
- To mitigate impacts to raptors nesting in the Project Area, raptor surveys would be conducted within 0.25 mile of the transmission line if construction occurs during the nesting season of any of the raptors that are known to occur or have the suitable habitat in the Project Area.
- The project would be constructed following APLIC and USFWS guidelines (2006) for mitigating electrocution impacts to raptors and other avian species that may occur or migrate through the Project Area. Western would also implement their avian protection plan to mitigate impacts to avian species in the Project Area.
- Western would coordinate with the Forest Service to identify areas where collision risk is highest and use flight diverters to mitigate collision risk in these areas. The areas preliminarily identified by the Forest Service, CDOW, and USFWS as highest priority for Alternative B1 are near Coffey Divide, Willow Creek, and at the northern end of the Project Area near Cutthroat Trout Bay.
- The northern end route where the transmission lines would be merged and double-circuited is the same for all action alternatives. Consolidating lines and adding flight diverters as necessary would mitigate collision risk in this area where the lines span Cutthroat Trout Bay. The line would also be constructed in the road ROW to minimize disturbance to habitats.

Mitigation in the form of perch deterrents would be used to mitigate predation impacts.

4.17 Other Impact Considerations

4.17.1 Pipeline Corrosion Study

A corrosion study was conducted to determine the potential impact of the proposed transmission line with respect to the continued service of the Windy Gap water pipeline (Schiff 2009). Through this evaluation, it was concluded that pipeline voltages would not exceed acceptable levels during either worst-case load conditions or during short-circuit conditions on the transmission lines, so that no corrective measures are required. Without supplemental grounding, pipelines are expected to remain at or near cathodically protected levels, uninfluenced by EMF effects from high voltage transmission lines crossing the alignment at the four locations listed. The intended design limit voltage of 15-V will not be exceeded due to a lack of possible AC interference sources capable of coupling with the pipeline to produce such voltages, either during construction or

during operation of the pipeline. The pipeline is well grounded from its own coating system and with the existing corrosion protection system.

The final study report did not foresee any potential harmful effect to the Windy Gap Pipeline as a result of routing the transmission line in a 200-foot proximity. The study did not identify any advisable or preferred routes for the transmission line alignment. No further mitigation measures, additional maintenance, or inspections were recommended in the final study report; however, at the Subdistrict's request, Western would measure pipeline AC voltages and currents to create a baseline reference for future testing and to ensure that AC voltage levels are within acceptable limits when the new transmission line is completed. If impacts from transmission line are identified, Western would seek appropriate mitigation.

The complete 2009 corrosion study is available as a Technical Support Document to this EIS.

4.18 Accidents and Intentional Acts of Destruction

The DOE Office of NEPA Policy and Compliance has released final and interim guidance on the need to consider accidents and intentional acts of destruction (terrorism), respectively, in NEPA documents (DOE 2002 and DOE 2006). Given this guidance, two possible scenarios are analyzed in this section: catastrophic wildfire and intentional acts of destruction.

4.18.1 Wildfire

The Project Area is naturally susceptible to wildfire as a result of the dominant vegetation types and climatic conditions. However, the recent mountain pine beetle epidemic has resulted in widespread pine stand mortality through Grand County, including the Project Area. Widespread stand mortality has greatly increased short-term wildfire risk, and in the event of a fire start, would likely exacerbate fire intensities. The remaining dead trees equate to an enormous amount of dry hazardous fuel on the ground. In the event of a wildfire start in these conditions, even the most robust fire suppression responses would have little or no effect on fire spread, intensities, or level of destruction.

4.18.2 Intentional Acts of Destruction

Power transmission facilities, such as the Proposed Project, are part of America's critical infrastructure and are considered to be possible targets of intentional acts of destruction. Potential aggressors include terrorists hoping to cause fatalistic and disruptive events, or activists protesting energy consumption or other resource issues related to the target facilities. This section describes the likelihood of a threat and possible types of threats to this transmission facility, common security measures for protection, and the impact of such an event.

If targeted in an intentional act of destruction, potential threats to the substation or pumping plant facilities located in the Project Area could include bombs delivered via ground vehicle or carried into the facility by an employee or intruder, aircraft collisions, sabotage of electrical systems or other machinery, attacks on plant personnel, or cyber attack of the facilities' control system causing machinery failure or theft of information. Acts may also be targeted at transmission towers and lines in an attempt to disrupt the regional grid.

4.18.3 Uncertainty Regarding the Analysis

Both of these events are dependent on many complex variables and entirely unpredictable. The degree of uncertainty in this analysis is therefore high. However, the following impacts analysis attempts to disclose the primary risks to life, property, and environmental values.

4.18.4 Potential Impacts

4.18.4.1 Alternative A

Wildfire: The single ROW configuration and the wooden H-frame structures represent significant vulnerabilities for the Alternative A alignment and structures in the event of wildfire in the Project Area. With a narrow ROW, antiquated and flammable structures, and lower overall structure height, this alternative has a greater potential of being affected by lightning strikes that may produce sparks or ignitions. Electrical interruptions as a result of wildfire could result in loss of power service to customers, including residential and water customers.

Intentional Acts of Destruction: The single ROW configuration and the wooden H-frame structures represent significant vulnerabilities for the Alternative A alignment and structures in the event of intentional acts of destruction. The low voltage and remote location of this transmission line make it a relatively undesirable target for aggressors. Short-term or prolonged outages would have no measurable effects on the national electric grid. Electrical interruptions as a result of intentional acts of destruction could result in loss of power service to customers, including residential and water customers.

Overall, the risk to workers (e.g., maintenance crews, linesmen) would be low. However, the risk may be slightly higher on a line of this configuration of wooden poles than on a more robust system. It is conceivable that, with the antiquated line configuration and structure type, maintenance and repair crews may be on the line more often.

4.18.4.2 All Action Alternatives

Wildfire: As noted above, the single ROW is still a vulnerability under all action alternatives. However, risk of short-term outages and long-term damage to steel structures, as well as the duration of outages, would be significantly reduced under any of the action alternatives.

Intentional Acts of Destruction: The small physical size of the project, relatively low voltage (138-kV as opposed to 345- or 500-kV), and remote location make this transmission line a relatively undesirable target for aggressors. Short-term or prolonged outages would have no measurable effects on the national electric grid. Electrical interruptions as a result of intentional acts of destruction could result in loss of power service to customers, including residential and water customers.

If the transmission line facility was attacked and destroyed, fatalities would likely be low given the limited number of employees normally on site at any one time. Collateral destruction of the transmission line facility could interrupt power to local residents as well as impact the regional water supply, including service to the Front Range.

Power interruption would be inconvenient and costly, but would rarely have large-scale adverse health impacts.

4.18.5 Security Considerations and Mitigation

Any institution's specific program or implementation of security considerations must reflect that organization's individual assessment of its own threats, vulnerabilities, and problem consequences, as well as its local customer and community expectations, needs, and tolerance for risk (North American Electric Reliability Corporation 2001). To determine the appropriate level of physical security, potential aggressor intent should be considered. Intent may be to destroy property or equipment; steal equipment, materials, or information; threaten the safety of personnel or customers; or create adverse publicity and induce panic. To ensure effectiveness of security measures and procedures, they should be reviewed regularly. Additionally, potential threats should be proactively monitored and anticipated through intelligence gathering.

Fences, gates, or barriers coupled with the use of keying systems, access card systems, or security personnel at entry points restrict access to the facility. Use of these physical obstructions and warning signage effectively deter and delay intruders.

Personnel identification and control measures, such as photo IDs, visitor passes, and contractor IDs, help quickly identify unauthorized persons within the facility.

Alarm systems and monitoring through closed-circuit television systems or roving security patrols can warn personnel of intrusion or impending intrusion to initiate appropriate response. Adequate lighting is required to provide visibility and closed-circuit television system effectiveness.

All facilities should have a comprehensive security awareness program developed and all personnel should be trained in accordance with that program. This enables quick and certain responses to security breach situations.

In addition to physical security, facilities must consider protection against cyber threats (i.e., hackers attacking computer control systems and information). Access to control systems would be managed to protect critical assets and information, as well as maintain the reliability of the electric infrastructure. This includes logical access (user password protection) to computers and networks and physical access to computer rooms. Policies and procedures would be established to manage authorization and authentication, as well as monitor both logical and physical access. Firewalls would be implemented and proactively maintained. Intrusion detection systems would be implemented and cyber risks regularly evaluated.

Emergency action plans would be developed in the event that an intrusion or attack occurs. These plans may include assistance agreements with local and federal law enforcement, up-to-date training for key responders, quick restoration of service (if possible), and notification to the local community and energy sector.

4.19 Unavoidable Adverse Impacts

Unavoidable adverse effects are those environmental consequences of an action that cannot be avoided, either because modifying the action would change the nature of the project or effective mitigation through project design is not feasible. Pursuant to NEPA Sec. 102 [42 U.S.C. § 4332] (2)(C)(ii), this analysis must identify those alternative actions that would result in unavoidable adverse effects.

The adverse effects of implementing the proposed project would be minimized through the use of SCPs and project-specific design criteria (Chapter 2.0). However, some adverse effects cannot be avoided and are disclosed here.

Adverse effects that cannot be avoided in the proposed project are discussed below. See also the previous individual resource impact analyses for a more comprehensive discussion of adverse effects.

Air quality impacts from construction would include fugitive dust emissions generated by the operation of construction vehicles. Fugitive dust would be concentrated in the immediate vicinity of the transmission lines and would be of short duration. It is not expected to materially affect ambient PM_{10} levels in the project's region. There would also be exhaust emissions from construction vehicles. Given the small number of vehicles involved, the short duration of construction, and the distance of the construction sites from populated areas, no substantial effect on air quality is expected.

The operation and maintenance of the transmission lines would likewise result in the emission of small quantities of dust and exhaust emissions. Corona effects from the operation of the transmission lines could result in small amounts of O_3 and would be a minor contributor to ambient air pollution.

The transmission line construction process would unavoidably have some effects on soil resources. Soils would be disturbed during the construction of towers, monopoles, and equipment access. The construction of footings for towers and monopoles would result in the permanent displacement of soils. Removal of vegetation and compaction would occur in the work areas, with potential impacts on erosion. Soil displacement and compaction would occur during the grading and movement of construction equipment. These impacts would occur on each of the alternative routes. However, construction of Alternatives C1 and C2 would result in more disturbance as these would require more new access routes.

Areas of sensitive soils or low reclamation potential areas may be adversely impacted by project related activities. If project related topsoil erosion occurs, soil productivity may be adversely impacted for an extended period of time. Topsoil formation is a slow process.

Depending upon the nature of ground disturbance, unavoidable adverse impacts on paleontological resources are likely. For example, depending upon the diameter of the hole and type of auger used, power pole excavations that are augered would crush excavated rock and contained fossils during the excavation process. In such cases, it is impossible to mitigate adverse effects on paleontological resources and the impacts are unavoidable. On the other hand, with larger augers and other types of digging equipment, more intact blocks of rock are excavated, and sidewalls are usually accessible and can be inspected for fossils. In these cases, mitigation is possible, and unavoidable adverse effects are minimized.

During construction, daytime noise would increase in areas located near the ROWs. There are no residences in these areas, and recreational use is limited. Since this impact is associated with the construction phase only, it would be temporary and short term. During dry weather conditions (which is almost always the case in the study area), noise associated with corona effects would not be audible beyond the ROWs. During very infrequent rainfall events, the noise level at the edge of the ROWs would be less than 39 dBA. This is a low level (typical of the noise level in a library), which would not be expected to create a disturbance.

Short-term significant effects from construction activities would occur on Forest Service lands with a SIO of High within the immediate foreground of the scenic byway and recreation use areas.

An increase in the amount of land with ROW easement restrictions, which limits future uses and building development, would be unavoidable under all project action alternatives.

Unavoidable adverse impacts to socioeconomic considerations relate to the location of the power line on private property. Since the existing 69-kV line would be rebuilt, these unavoidable adverse impacts have already occurred on the existing ROW. Alternatives C1 and C2 would have unavoidable and adverse impacts on properties that do not currently have a transmission line located on the property. The impacts could have potentially adverse impacts on property values.

By restricting disturbance within 100 feet of streams, the removal of riparian vegetation can be avoided for all alternatives. Other SCPs would minimize adverse water quality effects on aquatic habitat. Although these measures would reduce the impact level to minor levels, this adverse effect would not be completely avoided.

The project alternatives are not expected to result in long-term unavoidable adverse effects to common wildlife resources. However, the operation of a transmission line for Alternatives C1 and C2 may result in permanent, unavoidable impacts to nesting golden eagles. The presence and juxtaposition of a transmission line in proximity to the golden eagles nests may result in the incidental take of a golden eagle. Alternatives C1, C2, and D-Option 1 may also result in permanent, unavoidable impacts to sage grouse and sage grouse breeding habitat on the southwestern end of the Project Area.

The proposed transmission line routes would require the installation of structures within the boundaries of four archaeological sites deemed eligible for inclusion in the NRHP by the Colorado SHPO, resulting in the unavoidable removal of portions of these sites from the archaeological record. However, the SHPO has approved plans for the mitigation of any adverse effects resulting from this action.

4.20 Relationship between Short-Term Uses and Long-Term Productivity

Pursuant to NEPA Sec. 102 [42 U.S.C. § 4332] (2)(C)(iv), this analysis must identify alternative actions that would result in trade-offs between short-term uses and long-term productivity.

For this federal action, “short-term” is defined as within the 1-2-year implementation period. Long-term is defined as any time period beyond the implementation period.

The alternatives under consideration do not pose impacts that would significantly alter the long-term productivity of the affected environment. A good example of this is the existing lines in the study area. They were built in the 1940s through the 1960s. The affected environment has recovered since then, and while there is never complete recovery, the long-term productivity of the affected environment has not been significantly altered. Likewise, if the proposed project was built and then removed and the affected areas restored, little change in long-term environmental productivity would occur.

Where surface disturbance occurs, short-term impacts are anticipated due to construction activities and would be limited to the temporary ROW, staging areas, structure and pad placement, pulling and tensioning areas, and turnarounds. Where multiple passes by heavy

mechanical equipment occur, detrimental compaction may occur. If soil mitigation measures (described above) are adopted and implemented immediately following completion of construction, the impacts should be temporary.

Long-term to permanent impacts would be associated with structure footprints. Continued traffic and other surface disturbance associated with operation and maintenance activities would also be considered a long-term impact.

The short-term use of the ROW for the transmission line rebuild would have no long-term effect on surface fossils because none were identified during the field survey. However, because auguring for transmission line pole installation is known to pulverize rock and contained subsurface fossils, it is possible that mitigation of adverse effects on paleontological resources at locations of augured excavations would not be possible, resulting in a permanent loss of productivity of this resource. For other types of excavation in which more complete fragments of bedrock are removed and excavation sidewalls are accessible, implementation of paleontological mitigation measures can reduce adverse impacts to below the level of significance because fossils are not destroyed during the process of excavation. In such cases, mitigation can result in a beneficial impact by salvaging and preserving fossils that otherwise may have never been discovered, and curating them in a public museum where they would be permanently available for scientific research, education, and display. Therefore, depending upon the nature of the excavation equipment, construction-related impacts may or may not result in a diminishment of the long-term productivity of this resource within the study area.

The long-term productivity effects on socioeconomics includes providing the Project Area, the MPEI, Western, and Tri-State service area in Grand County a reliable source of back-up power and improve regional operating efficiency. The proposed project would ensure a back-up source of power for residential, commercial, industrial, public communications, medical, and other critical societal functions. The project would therefore contribute directly to the long-term stability and economic growth of the region.

All alternatives would result in short-term impacts to aquatic biology resources. However, there would be no long-term effects on aquatic resources that would affect the long-term productivity for this resource.

Through the implementation of SCPs, design criteria, and mitigation measures, the project alternatives are not expected to result in long-term impacts to common wildlife resources.

In regards to special status species, particularly the greater sage grouse and the golden eagle, construction of the transmission line is expected to result in short-term impacts to species viability and productivity. It is possible that the operation of the transmission line may result in long-term impacts to sage grouse and golden eagle viability and productivity that cannot be mitigated.

4.21 Irreversible and Irretrievable Commitments of Resources

Pursuant to NEPA Sec. 102 [42 U.S.C. § 4332] (2)(C)(v), this analysis must identify actions that would result in the irreversible or irretrievable commitments of resources. Irreversible and irretrievable commitments of resources occur when implementation of an action would cause the resource to be destroyed or removed, or would affect a resource such that its useful renewal could occur only over an extraordinarily long period of time or at exorbitant expense. An irreversible and irretrievable commitment of a resource precludes other beneficial uses of that resource in the future.

Construction of the proposed project would not result in the irreversible or irretrievable commitment of resources, except for the financial resources, fuel, and other consumable materials required for construction and maintenance.

Construction and maintenance of the transmission line would consume aluminum, steel, wood, gravel, sand, and other nonrenewable materials to construct steel structures, conductors, insulators, access, and other facilities. Small quantities of diesel fuel and gasoline would also be consumed by construction and maintenance equipment. These activities would require the consumption of a relatively small amount of fuel that would not constitute a long-term drain on local resources.