3.2.21.3.2 Regional Fire Management

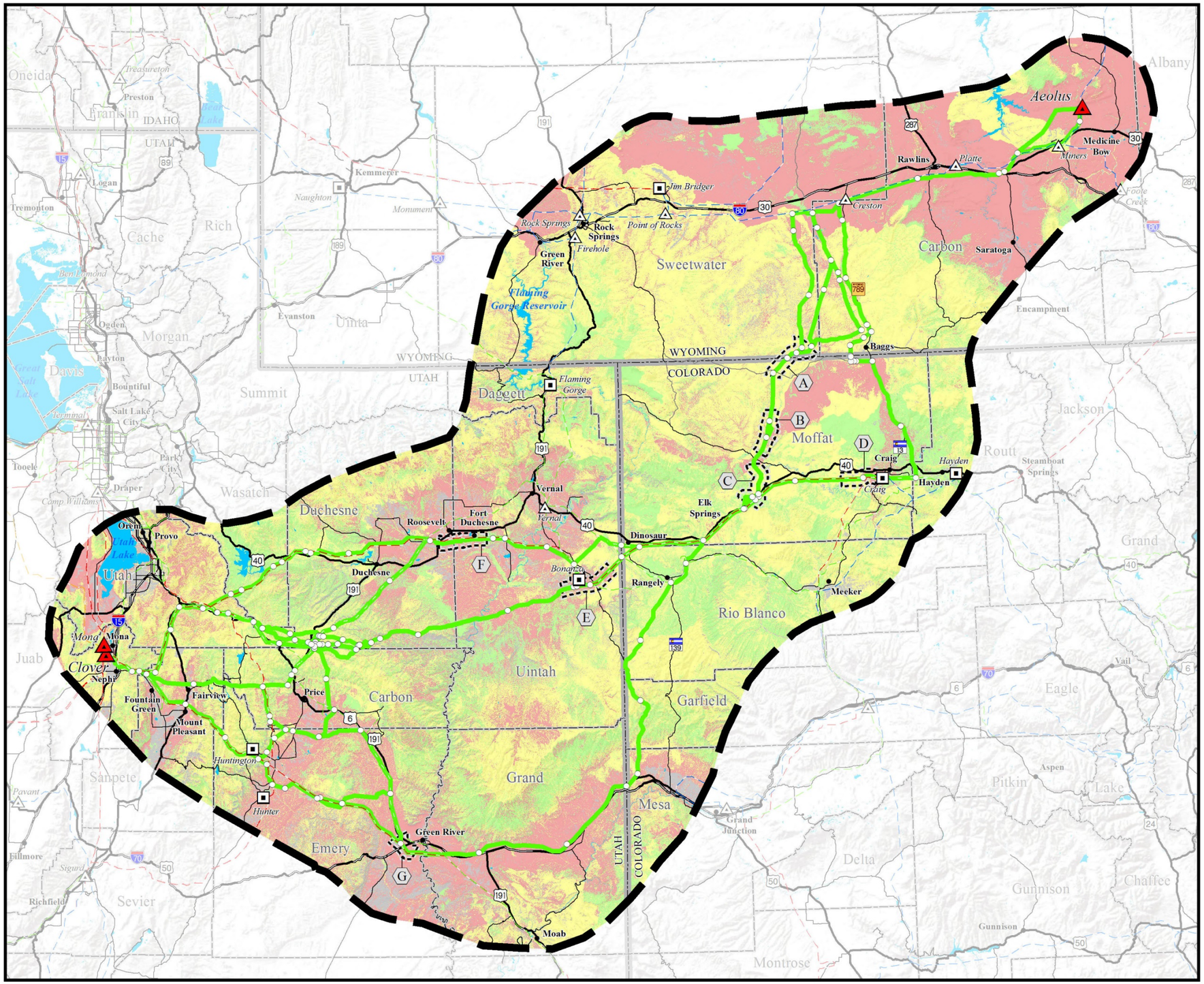
Federal land-management agencies are required to prepare and update FMPs for all areas of burnable vegetation. All FMPs for federal lands crossed by the proposed Project were reviewed. FMPs prepared for federal lands in Colorado and Utah, but not Wyoming, classified lands into the following four categories, according to desired fire management objectives:

- **A: Areas where wildland fire is not desired at all**. These may be areas with high resource sensitivity, or vegetation communities that are not fire-adapted.
- **B: Areas where unplanned wildland fire is not desired because of current conditions.** These may be areas with sensitive resources or areas that perhaps burned naturally but now have excessive fuel loads such that an unplanned fire would risk lives or severely damage resources.
- **C: Areas where wildland fire is desired, but there are significant constraints that must be considered for its use**. Fire may benefit these areas as a management tool but under controlled conditions. Fuels reduction may be required prior to reintroduction of fire.
- **D: Areas where wildland fire is desired, and there are few or no constraints for its use**. Relatively unaltered vegetation communities without lives, property, or sensitive resources at risk, which may benefit from an unmanaged, natural fire regime or from prescribed fire.

Each contiguous area assigned to a single desired objective is designated as a Fire Management Unit (FMU). However, this does not indicate that all areas in any FMU are in a similar condition or require the same fire management. FMPs discuss site-specific variations and resource concerns in individual FMUs, where such information is available. FMPs in Wyoming discuss the desired fire management and values at risk for each FMU without assigning it to a particular category. Similar classification for fire management purposes has not been conducted on state, private, or other lands crossed by the Project.

3.2.21.4 Study Methodology

Fire is a landscape-scale process, and fire ecology is driven by long-term changes in vegetation and climate. However, the frequency, intensity, and extent of a fire at any given location are highly responsive to site-specific conditions at the time the fire occurs; particularly weather and fuel loads. Although fires historically occurred most frequently as a result of lightning during late summer in the Project area, human-caused ignitions now can start fires at any time of year in locations where they would not otherwise occur. Available information to support this discussion of impacts and potential mitigation is based on the landscape-scale data presented previously regarding existing conditions, but the unpredictable nature of site-specific impacts related to fire cannot be quantitatively analyzed in most cases. Available data, such as LANDFIRE, are not intended to be used at site-specific detail. However, the miles of each VCC crossed by each alternative route is presented as an indicator of overall health of native vegetation with regards to fire ecology.


Aeolus
Medicine Bow
Miners
Rawlins
Platte
Creston
Jim Bridger
Rock Springs
Point of Rocks
Firehole
Green River
Flaming Gorge Reservoir
Sweetwater
Carbon
Saratoga
Encampment
Baggs
WYOMING
COLORADO
UTAH
Daggett
Flaming Gorge
Moffat
Craig
Hayden
Elk Springs
Vernal
Fort Duchesne
Roosevelt
Duchesne
Dinosaur
Bonanza
Rangely
Meeker
Rio Blanco
Uintah
Garfield
Grand
Mesa
Emery
Green River
Moab
Price
Fairview
Mount Pleasant
Fountain Green
Huntington
Hunter
Nephi
Mona
Clover
Mong
Juab
Sanpete
Sevier
Richfield
Sigurd
Pavant
Fillmore
Tooele
Draper
Camp Williams
Salt Lake City
Bountiful
Ogden
Layton
Great Salt Lake
Davis
Morgan
Summit
Wasatch
Utah
Utah Lake
Provo
Orem
Cache
Rich
Logan
Tremonton
Franklin
Preston
Oneida
Treasureton
IDAHO
UTAH
Kemmerer
Naughton
Monument
Evanston
Uinta
Albany
Foote Creek
Jackson
Routt
Steamboat Springs
Grand
Eagle
Vail
Pitkin
Aspen
Lake
Chaffee
Gunnison
Delta
Montrose
Grand Junction
Mesa
Garfield
Rio Blanco
Moffat
Sweetwater
Carbon
Uintah
Duchesne
Daggett
Sublette
Lincoln
Uinta
Summit
Morgan
Weber
Cache
Franklin
Bear Lake
Ben Lomond
Tooele
Juab
Sanpete
Sevier
Emery
Wasatch
Davis
Salt Lake
Utah
Duchesne
Uintah
Carbon
Grand
Mesa
Garfield
Rio Blanco
Moffat
Routt
Jackson
Albany
Carbon
Sweetwater
Uinta
Summit
Wasatch
Duchesne
Uintah
Grand
Emery
Sevier
Sanpete
Juab
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Rich
Cache
Franklin
Oneida

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Similarly, fire management categories assigned in BLM and USFS FMPs described the general conditions in each FMU, but site-specific conditions may vary in areas crossed by each alternative route, particularly where existing disturbance is already present and contributing to local changes in desired fire management.

All impacts related to fire ecology and management may be considered long-term. The potential for accidental ignitions would likely be highest during the construction phase, but would continue throughout the life of the Project due to maintenance activities, the potential for failure of any components of the Project, and recreational use of the right-of-way. Vegetation changes in and adjacent to the right-of-way would be the greatest during construction and the first several years of recovery following construction but would likely persist to some degree over the life of the Project. The presence of the transmission line also would affect fire management and suppression for the life of the Project.

Fire was identified as a potential impact to public safety during scoping. Additional issues identified by the BLM and cooperating agencies include the potential risk to firefighters near energized transmission lines, potential constraints on managing wildland fire for land management plan objectives as a vegetation management tool, and the potential for the spread of noxious weeds that may alter fire ecology. However, no quantitative impact analysis needs were identified. This discussion focuses primarily on impacts common to all action alternatives that would be addressed through design features of the Proposed Action for environmental protection and in the Fire Protection Plan of the POD. No selective mitigation measures have been identified to be applied to reduce impacts on fire ecology or management.

3.2.21.5 Results

The construction, operation, and maintenance of the Project would result in both direct and indirect effects on fire ecology and management, which are described in the following sections.

Direct Effects

The construction, operation, and maintenance of the Project would directly increase the risk of fire ignitions in the Project area. Construction activities such as welding, blasting, small-engine use, and blading can all generate sparks that may ignite dry vegetation. Some of these activities would be limited to construction, but others, such as small-engine use, would occur over the life of the Project during routine maintenance and vegetation management. Hazard trees, if allowed to remain in or near the right-of-way, could come into contact with conductors and ignite a fire. Failure of 500kV transmission structures and other components is rare but could cause a fire ignition if an energized conductor falls and comes into contact with vegetation. This could occur as a result of intentional damage (e.g., vandalism, terrorism), natural disasters, vehicle or aircraft collision, or a design or engineering flaw in a system component.

Vegetation management in the right-of-way during and after construction would affect the potential for fire ignitions to spread and also would affect fire behavior in the right-of-way. In forested areas, removing or reducing the tree canopy would increase temperature and decrease humidity at ground level, thereby reducing fuel moisture and increasing the potential for any accidental ignitions to spread relative to existing conditions. However, vegetation management also would reduce the total volume of fuels in the right-of-way, decreasing fire intensity and severity and providing opportunities for safe and effective fire management actions.

Transmission lines can affect fire suppression, both positively and negatively. The Project would represent a value to be protected during a wildland fire, and may cause fire personnel to be diverted from other suppression objectives when feasible and necessary. Energized transmission lines can be hazardous

to firefighters, as the smoke from a fire increases the conductivity of air and can cause arcing from the conductors to the ground. Insulators contaminated with ash, fire retardant, or water may allow some current to travel through the structure, creating an electrocution hazard surrounding the structure. Water from trucks or aircraft also can increase the risk of arcing. Failure of structures or any other components during a fire can cause conductors to fall and create an electrocution risk. This may occur over long distances, for example if an energized conductor falls and comes into contact with a fence wire.

Typically, ground personnel would avoid actively burning areas near energized transmission lines, remaining at a distance at least equal to the height of the structures or greater during adverse conditions. Transmission lines and structures must also be avoided by aircraft as they pose a collision hazard during periods of poor visibility and/or when structures are placed on elevated terrain. Transmission lines may be de-energized during a fire, if necessary, for firefighter safety or system reliability. This would typically be coordinated between the Operator and the Incident Commander of a fire. Once de-energized, a transmission line would not be a significant hazard to ground crews but would remain a potential hazard to air support.

The Project may directly benefit fire suppression efforts in forested vegetation communities, where vegetation clearing in the right-of-way provides a fuel break. Table 3-270 provides an estimate of the miles of each alternative route where vegetation clearing would occur, based on the inventory of vegetation communities. The remainder of the Project would not receive intensive vegetation management in the right-of-way and would not provide a substantial fuel break should a fire occur near the Project.

TABLE 3-270
ALTERNATIVE ROUTE COMPARISON FOR FIRE MANAGEMENT

Alternative Route	Total Miles	Vegetation Communities that May Require Right-of-way Clearing and Slash Disposal (Miles)				
		Aspen	Montane Forest	Mountain Shrub	Pinyon-juniper	Riparian
Wyoming to Colorado – Aeolus to U.S. Highway 40 (WYCO)						
WYCO-B (Agency and Applicant Preferred Alternative)	206.3	0.0	0.0	0.0	7.6	2.6
Wyoming	*141.0*	*0.0*	*0.0*	*0.0*	*0.5*	*2.4*
Colorado	*65.3*	*0.0*	*0.0*	*0.0*	*7.1*	*0.2*
WYCO-C	210.0	0.0	0.0	0.0	7.4	1.9
Wyoming	*144.7*	*0.0*	*0.0*	*0.0*	*0.3*	*1.7*
Colorado	*65.3*	*0.0*	*0.0*	*0.0*	*7.1*	*0.2*
WYCO-D	249.4	0.0	0.0	0.2	4.7	3.2
Wyoming	*134.9*	*0.0*	*0.0*	*0.0*	*0.5*	*2.2*
Colorado	*114.5*	*0.0*	*0.0*	*0.2*	*4.2*	*1.0*
WYCO-F	218.8	0.0	0.0	0.0	7.4	2.2
Wyoming	*153.5*	*0.0*	*0.0*	*0.0*	*0.3*	*2.0*
Colorado	*65.3*	*0.0*	*0.0*	*0.0*	*7.1*	*0.2*
Colorado to Utah – U.S. Highway 40 to Baxter Pass to Clover (COUT BAX)						
COUT BAX-B	279.9	8.3	7.5	12.8	41.8	1.5
Colorado	*87.0*	*1.1*	*0.2*	*5.0*	*22.1*	*0.2*
Utah	*192.9*	*7.2*	*7.3*	*7.8*	*19.7*	*1.3*
COUT BAX-C	290.4	8.3	7.5	12.8	43.5	2.0
Colorado	*87.0*	*1.1*	*0.2*	*5.0*	*22.1*	*0.2*
Utah	203.4	*7.2*	*7.3*	*7.8*	*21.4*	*1.8*

TABLE 3-270 ALTERNATIVE ROUTE COMPARISON FOR FIRE MANAGEMENT						
		Vegetation Communities that May Require Right-of-way Clearing and Slash Disposal (Miles)				
Alternative Route	**Total Miles**	**Aspen**	**Montane Forest**	**Mountain Shrub**	**Pinyon-juniper**	**Riparian**
COUT BAX-E	292.2	10.6	2.8	15.8	39.7	1.9
Colorado	*87.0*	*1.1*	*0.2*	*5.0*	*22.1*	*0.2*
Utah	*205.2*	*9.5*	*2.6*	*10.8*	*17.6*	*1.7*
Colorado to Utah – U.S. Highway 40 to Central Utah to Clover (COUT)						
COUT-A	207.9	6.7	3.0	17.7	27.5	3.4
Colorado	*24.3*	*0.0*	*0.0*	*0.0*	*0.2*	*0.0*
Utah	*183.6*	*6.7*	*3.0*	*17.7*	*27.3*	*3.5*
COUT-B	218.2	4.1	3.5	20.8	34.4	2.6
Colorado	*24.3*	*0.0*	*0.0*	*0.0*	*0.2*	*0.0*
Utah	*193.9*	*4.1*	*3.5*	*20.8*	*34.2*	*2.6*
COUT-C (Agency and Applicant Preferred Alternative)	208.2	11.0	3.5	22.2	35.5	0.7
Colorado	*25.0*	*0.0*	*0.0*	*0.0*	*0.2*	*0.0*
Utah	*183.2*	*11.0*	*3.5*	*22.2*	*35.3*	*0.7*
COUT-H	200.6	16.0	6.4	12.0	30.8	0.5
Colorado	*25.0*	*0.0*	*0.0*	*0.0*	*0.2*	*0.0*
Utah	*175.6*	*16.0*	*6.4*	*12.0*	*30.6*	*0.5*
COUT-I	240.2	13.9	9.4	9.9	33.6	0.5
Colorado	*25.0*	*0.0*	*0.0*	*0.0*	*0.2*	*0.0*
Utah	*215.2*	*13.9*	*9.4*	*9.9*	*33.4*	*0.5*

The BLM's WO-IM 2011-138 (*Sage-grouse Conservation Related to Wildland Fire and Fuels Management*) includes the creation of treated strips (mowed or otherwise thinned) as a potential best management practice to aid in fire suppression in greater sage-grouse habitat. Although sagebrush would not typically be cleared in the Project right-of-way, the presence of an access road and the lowered habitat suitability for greater sage-grouse near transmission lines may allow the right-of-way to serve as an appropriate place to construct a fuel break in the event of a fire near the Project. This could provide a benefit to greater sage-grouse management by facilitating fire suppression, reducing the acres of habitat burned, and limiting vegetation clearing in suitable habitat, thus partially offsetting other negative effects of the Project on the species. Other effects on greater sage-grouse are discussed in Section 3.2.8.

The Project may affect fire management planning by adding constraints to the location or timing of prescribed burns for vegetation treatments or by decreasing the suitability of an area for managing wildland fire for land-management plan objectives where existing linear utilities are not present. Miles of existing linear utilities adjacent to each alternative route are listed in Table 3-179, Table 3-184, and Table 3-189. The remainder of the Project would have the potential to add constraints to wildland fire management.

In some cases, prescribed fire or managing wildland fire for land-management plan objectives near transmission lines may be specifically restricted in planning documents. All USFS FMPs in the Project area require that wildland fires be suppressed when utility corridors are threatened, and prescribed fires would not be permitted in utility corridors. Miles of USFS lands crossed by each alternative route and the miles of new utility corridor that would be created by the Project, where full suppression is required by FMPs, are listed in Table 3-271. Table 3-271 includes private lands in the boundaries of each national forest as fire suppression would often be conducted by the USFS in or near those areas. The total area of each national forest affected (i.e., the portion of a utility corridor threatened by a fire) would be

determined for each fire by the Incident Commander. However, prescribed fire or wildland fire management for land management plan objectives may take place in other jurisdictions if safety concerns can be adequately addressed. This may include greater restrictions on the weather conditions when a prescribed fire takes place or fuels treatments in the right-of-way prior to a prescribed fire. In some cases, planned or unplanned fires that take place outside the normal summer fire season may not benefit native vegetation that is poorly adapted to cool-season fires (Keeley 2006).

TABLE 3-271
ALTERNATIVE ROUTE COMPARISON FOR THE CREATION OF NEW UTILITY CORRIDORS IN NATIONAL FORESTS

Alternative Route	Ashley National Forest		Manti-La Sal National Forest		Uinta National Forest	
	Total Miles	Miles of New Corridor	Total Miles	Miles of New Corridor	Total Miles	Miles of New Corridor
Colorado to Utah – U.S. Highway 40 to Baxter Pass to Clover (COUT BAX)						
COUT BAX-B	0.0	0.0	20.0	13.7	1.5	1.5
COUT BAX-C	0.0	0.0	20.0	13.7	1.5	1.5
COUT BAX-E	0.0	0.0	11.3	11.3	1.5	1.5
Colorado to Utah – U.S. Highway 40 to Central Utah to Clover (COUT)						
COUT-A	0.0	0.0	0.9	0.9	20.0	1.6
COUT-B	12.0	12.0	0.9	0.9	10.2	1.6
COUT-C (Agency and Applicant Preferred Alternative)	0.0	0.0	0.9	0.9	10.2	1.6
COUT-H	0.0	0.0	11.3	11.3	1.5	1.5
COUT-I	0.0	0.0	20.0	13.7	1.5	1.5

NOTE: New utility corridors are defined as areas where no existing utility corridors are within 2,000 feet of the alternative route.

Indirect Effects

Ground disturbance associated with the Project may favor the spread of invasive or native plant species that are disturbance-tolerant and fire-prone. This potentially would increase the risk of fire in those areas or increase the intensity of any naturally occurring fires. Cheatgrass is the primary invasive plant responsible for changing fire regimes in the Project area (Whisenant 1990). Effects related to changes in vegetation in and near the right-of-way would be seen as increases in the VCC, whether fire frequency is increased through the presence of invasive plants or decreased below a natural level through constraints on fire management.

Slash (branches and other small woody debris less than 3 inches in diameter) and coarse woody debris (branches and downed trees more than 3 inches in diameter) created during right-of-way clearing and maintenance contribute to ground fuels. Fire intensity in the right-of-way may be increased as a result, and piled slash can create long-lasting, hot fires that may damage and sterilize soils on a small scale. High loads of coarse woody debris also may create obstacles to fire suppression personnel and vehicles. However, slash and coarse woody debris can be important for nutrient cycling, soils stabilization, and wildlife habitat when properly managed; and land-management agency decisions would balance these benefits against the fire risk. Standards for management of slash are often determined on a site-specific basis to fall within a range appropriate for each vegetation community (typically measured in tons of slash per acre). The final POD would present a detailed plan for slash and coarse woody debris disposal, developed to meet standards required by the appropriate land-management agency for safe fuel loads and potential benefits to wildlife and soils. Table 3-270 provides an estimate of the miles of each alternative

route where slash disposal may require consideration in the POD, based on the inventory of vegetation communities.

New access roads, where not reclaimed or access-restricted, may be used by recreational traffic. Vehicles may ignite fires if parked in dry vegetation, and recreational activities in the right-of-way such as target shooting, smoking, camping, or cooking fires may result in accidental fire ignitions.

Mitigation Planning and Effectiveness

Design Features 2, 5, 14, 15, 16, 18, 25, 26, 27, 29, and 30 (Table 2-8) are applicable to fire ecology and management and are described in this section. These measures will be applied Project-wide, as appropriate, to reduce the risk of accidental ignitions during construction and operation of the Project and to reduce the risk that invasive plants will contribute to an unnatural fire regime as a result of the Project.

- **Design Feature 2 (surface recontouring and reclamation)**. Areas subject to ground disturbance would be recontoured and reclaimed as required by the landowner or land-management agency. This would generally include reseeding with a seed mix (approved by the BLM or USFS) appropriate to the vegetation community in which the disturbance has occurred. This design feature would minimize the temporal scope of disturbance and decrease the likelihood that a disturbed area would be colonized by invasive species and would increase the probability that the recovered vegetation community would not be unnaturally fire-prone.
- **Design Feature 5 (creation of a noxious weed management plan)**. A BLM, USFS, and county weed management officer-approved noxious weed management plan would be developed and incorporated into the POD. This plan would include specific measures to be taken to reduce the spread of noxious weed invasion associated with Project construction activities. Implementation of this design feature would minimize spread of noxious weed species in the Project area and the associated negative ecological effects of invasive species such as increased wildfire risk and the competitive exclusion of native plant species.
- **Design Feature 14 (creation of a Fire Protection Plan)**. A BLM-, USFS-, and state-approved Fire Protection Plan would be developed. The Fire Protection Plan would address workplace safety procedures, worker training, and emergency fire suppression and would list the appropriate emergency contact for each jurisdiction.
- **Design Feature 15 (line patrols)**. The Project would be patrolled regularly, in part to inspect the right-of-way for hazard trees, damage to any component of the Project, and other potentially unsafe conditions that could result in a fire.
- **Design Feature 16 (removal of slash)**. Slash would be removed from the right-of-way or otherwise disposed of in accordance with requirements of the land-management agency or landowner but may be left in place where desired at levels that would not create a hazardous fuel load.
- **Design Feature 18 (overland access)**. Overland access may be used to reduce ground disturbance and the potential for the introduction of invasive plants under conditions where a fire hazard would not occur.
- **Design Feature 25 (line marking)**. Conductors, shield wires, and structures would be marked with high-visibility devices, where needed, to reduce the collision risk for aircraft.
- **Design Feature 26 (vehicle access restriction)**. All construction vehicle movement would be restricted to predesignated access roads. Exceptions would be granted for use of existing roads (e.g., interstate and state highways, well-maintained county roads), where construction traffic would be consistent with existing use and traffic volumes on roadways. This design feature would

minimize disturbance to vegetation communities from excess overland travel and the associated potential spread of noxious weeds and an increase in risk of wildfire.

- **Design Feature 27 (construction activity access restriction)**. All Project-related construction activities would be limited to within a predetermined spatial extent. This design feature would minimize disturbance to vegetation communities from construction activities and the associated potential increased spread of noxious weeds and wildfire risk.
- **Design Feature 29 (air quality and trash burning)**. Open trash burning would typically not take place unless specifically permitted by appropriate authorities. This design feature would reduce the risk of accidental ignitions.
- **Design Feature 30 (hazardous materials restrictions)**. Hazardous materials would be totally contained and removed to a disposal facility and not drained into the ground, streams, or drainages. This design feature would reduce the risk that flammable hazardous materials would be stored or treated in an unsafe manner.

3.2.21.5.1 Series Compensation Stations for the 500-kilovolt Transmission Line

Alternative WYCO-B (Agency and Applicant Preferred Alternative)

Siting Area A – Powder Wash

Affected Environment

Siting Area A is located on the Wyoming/Colorado state line, primarily in sagebrush, grassland, and pinyon-juniper vegetation communities. The majority of this area is classified as VCC 2, and no historic fires that have occurred since 2000 are crossed by this portion of the Project.

Environmental Consequences

Potential impacts on fire management and ecology from the Powder Wash Series Compensation Station would be identical to construction and operation of the Project. Impacts on fire ecology would be proportional to the increased ground disturbance resulting from the series compensation station. Impacts on fire management would not increase as a result of the series compensation station as fire management planning would be affected similarly due to the presence of the Project.

Siting Area B – Nine Mile Basin

Affected Environment

Siting Area B is located where Alternative WYCO-B diverges in Nine Mile Basin in Colorado. Vegetation communities in this siting area include sagebrush, grassland, and pinyon-juniper vegetation communities. The majority of this area is classified as VCC 2, and no historic fires that have occurred since 2000 are crossed by this portion of the Project.

Environmental Consequences

Potential impacts on fire management and ecology from the Nine Mile Basin Series Compensation Station would be identical to construction and operation of the Project. Impacts on fire ecology would be proportional to the increased ground disturbance resulting from the series compensation station. Impacts on fire management would not increase as a result of the series compensation station as fire management planning would be affected similarly due to the presence of the Project.

Siting Area C – Maybell

Affected Environment

In Colorado, Siting Area C would be located where Alternative WYCO-B diverges. Vegetation communities in this siting area include riparian, agricultural, big sagebrush, shrub/shrub steppe, barren/sparsely vegetated, grassland, and pinyon-juniper woodlands. The majority of this area is classified as VCC 2, and no historic fires that have occurred since 2000 are crossed by this portion of the Project.

Environmental Consequences

Potential impacts on fire management and ecology from the Maybell Series Compensation Station would be identical to construction and operation of the Project. Impacts on fire ecology would be proportional to the increased ground disturbance resulting from the series compensation station. Impacts on fire management would not increase as a result of the series compensation station as fire management planning would be affected similarly due to the presence of the Project.

Alternative WYCO-C

Siting Area A – Powder Wash

Affected Environment and Environmental Consequences

Alternative WYCO-C would have the same affected environment and environmental consequences for Siting Area A as Alternative WYCO-B.

Siting Area B – Nine Mile Basin

Affected Environment and Environmental Consequences

Alternative WYCO-C would have the same affected environment and environmental consequences for Siting Area B as Alternative WYCO-B.

Siting Area C – Maybell

Affected Environment and Environmental Consequences

Alternative WYCO-C would have the same affected environment and environmental consequences for Siting Area C as Alternative WYCO-B.

Alternative WYCO-D

Siting Area D – Bell Rock

Affected Environment

In Colorado, Siting Area D would be located in sagebrush, shrub/shrub steppe and pinyon-juniper vegetation communities just south of U.S. Highway 40, west of Craig. The majority of this area is classified as VCC 2, and no historic fires that have occurred since 2000 are crossed by this portion of the Project.

Environmental Consequences

Potential impacts on fire management and ecology from the Bell Rock Series Compensation Station would be identical to construction and operation of the Project. Impacts on fire ecology would be proportional to the increased ground disturbance resulting from the series compensation station. Impacts

on fire management would not increase as a result of the series compensation station as fire management planning would be affected similarly due to the presence of the Project.

Alternative WYCO-F

Siting Area A – Powder Wash

Affected Environment and Environmental Consequences

Alternative WYCO-F would have the same affected environment and environmental consequences for Siting Area A as Alternative WYCO-B.

Siting Area B – Nine Mile Basin

Affected Environment and Environmental Consequences

Alternative WYCO-F would have the same affected environment and environmental consequences for Siting Area B as Alternative WYCO-B.

Siting Area C – Maybell

Affected Environment and Environmental Consequences

Alternative WYCO-F would have the same affected environment and environmental consequences for Siting Area C as Alternative WYCO-B.

Alternatives COUT BAX-B, COUT BAX-C, and COUT BAX-E

Siting Area G – Green River

Affected Environment

In Utah, Siting Area G would be located in an area previously disturbed by the I-70 corridor and U.S. Highway 6, approximately 5 miles west of the Green River. Vegetation is predominantly barren or shrub/shrub-steppe, interspersed with pinyon juniper woodlands. The majority of this area is classified as VCC 3, and no historic fires that have occurred since 2000 are crossed by this portion of the Project.

Environmental Consequences

Potential impacts on fire management and ecology from the Green River Series Compensation Station would be identical to construction and operation of the Project. Impacts on fire ecology would be proportional to the increased ground disturbance resulting from the series compensation station. Impacts on fire management would not increase as a result of the series compensation station as fire management planning would be affected similarly due to the presence of the Project.

Alternative COUT-A

Siting Area F – Roosevelt

Affected Environment

In Utah, Siting Area F would be located in an area previously disturbed by agriculture and U.S. Highway 40 in the vicinity of Roosevelt. Vegetation communities are predominantly agricultural, barren, sagebrush and shrub/shrub-steppe. The majority of this area is classified as VCC 3 or is agricultural, and no historic fires that have occurred since 2000 are crossed by this portion of the Project.

Environmental Consequences

Potential impacts on fire management and ecology from the Roosevelt Series Compensation Station would be identical to construction and operation of the Project. Impacts on fire ecology would be proportional to the increased ground disturbance resulting from the series compensation station. Impacts on fire management would not increase as a result of the series compensation station as fire management planning would be affected similarly due to the presence of the Project.

Alternative COUT-B

Siting Area F – Roosevelt

Affected Environment and Environmental Consequences

Alternative COUT-B would have the same affected environment and environmental consequences for Siting Area F as Alternative COUT-A.

Alternative COUT-C (Agency and Applicant Preferred Alternative)

Siting Area E – Bonanza

Affected Environment

In Utah, Siting Area E would be located in an area previously disturbed by oil and gas development and the Bonanza Power Plant. Vegetation communities are primarily sagebrush and shrub/shrub-steppe. The majority of this area is classified as VCC 3, and no historic fires that have occurred since 2000 are crossed by this portion of the Project.

Environmental Consequences

Potential impacts on fire management and ecology from the Bonanza Series Compensation Station would be identical to construction and operation of the Project. Impacts on fire ecology would be proportional to the increased ground disturbance resulting from the series compensation station. Impacts on fire management would not increase as a result of the series compensation station as fire management planning would be affected similarly due to the presence of the Project.

Alternative COUT-H

Siting Area E – Bonanza

Affected Environment and Environmental Consequences

Alternative COUT-H would have the same affected environment and environmental consequences for Siting Area E as Alternative COUT-C.

Alternative COUT-I

Siting Area E – Bonanza

Affected Environment and Environmental Consequences

Alternative COUT-I would have the same affected environment and environmental consequences for Siting Area E as Alternative COUT-C.

3.2.22 Social and Economic Conditions

Alternative routes for the Project are located in 17 counties in southwestern Wyoming, northwestern Colorado, and central and eastern Utah. Comprising 17,070 square miles, these counties are identified as the study area for the socioeconomic analysis and are included in the regional setting, affected environment, and environmental consequences, unless noted otherwise.

3.2.22.1 Introduction and Regulatory Framework

NEPA or CEQ regulations do not provide specific thresholds of significance for socioeconomic impact assessment because significance is contextual in nature and varies with the setting of the Proposed Action (40 CFR 1508.27(a)).

The BLM, as the lead agency, requires the utilization and evaluation of social science in the preparation of informed, sustainable land-use planning decisions. The FLPMA requires the BLM to integrate physical, biological, economic, and other sciences in developing land-use plans (43 U.S.C. 1712(c)(2)). FLPMA regulations 43 CFR 1610.4-3 and 1610.4-6 also require the BLM to analyze social, economic, and institutional information. In addition, NEPA requires federal agencies to "insure the integrated use of the natural and social sciences . . . in planning and decision making" (42 U.S.C. 4332(2)(A)).

The BLM is required to manage public lands on the basis of multiple use and sustained yield and to meet the needs of present and future generations. As the human population continues to increase and social values evolve, resource conflicts are likely to increase. The American public is increasingly aware of the importance of the public lands to its well-being and is demanding a larger voice in resource management decisions. Given these realities, the planning process can represent a constant balancing of competing needs, interests, and values. The effective use of social science can be critical to understanding and reconciling these differing perspectives.

The BLM Land Use Planning Handbook (BLM Handbook H-1601-1) states that social science information can include the economic, political, cultural, and social structure of communities, regions, and the nation as a whole; social values, beliefs, and attitudes; how people interact with the landscape; and sense-of-place issues. The social sciences integrate a wide variety of disciplines, generally including economics, sociology, demography, anthropology, archaeology, political science, geography, history, and landscape architecture. Though the information appropriate to a given analysis depends on the specific issues being assessed, the social science information usually important to resource planning decisions can be grouped in the following categories (BLM 2005a):

- Demography and social indicators
- Social organization and institutions
- Attitudes and values
- Human geography
- Economic value
- Employment, income, and subsistence
- Public finance and government services
- Environmental justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires each federal agency to make the achievement of environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low income populations. The Executive Order further demands the agencies conduct their programs and activities in a manner that does not exclude persons from participation because of their race, color, or national origin.

3.2.22.2 Issues Identified for Analysis

Issues raised by the public and agencies during Project scoping and EIS preparation related to potentially significant effects on social and economic conditions included the potential effects on personal property values and regional economic development associated with the construction activity and operations of the transmission line. These issues are further described in this section.

3.2.22.2.1 Property Uses and Values

Whenever land uses change, concerns are often raised regarding any potential effects on property values. In general, impacts on property values are influenced by a number of interplaying factors, including (Pitts and Jackson 2007):

- Proximity of residential properties to transmission line structures
- Type and size of high-voltage transmission line structures
- Appearance of easement landscaping
- Surrounding topography

There are potential impacts on property values for residences and private property in communities and areas along the alternative routes.

3.2.22.2.2 Construction Contribution to Jobs and Income

Transmission line construction activity will expand regional economic development through increased employment and income in the region. As construction workers spend their money in the local area, revenues would likely increase for local businesses (e.g., hotels, restaurants, gas stations, and grocery stores), supporting jobs, and incomes for these businesses and their employees.

3.2.22.2.3 Construction Workforce Effects on Housing and Public Services

Transmission line routes may incur impacts from construction workers temporarily residing in the communities along the transmission line routes. Socioeconomic resources potentially affected include the availability of housing and accommodations as well as public and social services to accommodate the temporary workers.

3.2.22.2.4 Property Tax Base

The transmission line would enlarge the property tax base in counties where the line crosses. Additional property taxes would contribute to county government tax receipts, funding public services and infrastructure projects.

3.2.22.2.5 Recreation and Tourism Values to Local Communities

The development and operation of the transmission line could diminish the natural appearance and the undeveloped character of recreation areas, which could have detrimental effects on recreation and other non-market values.[6] Areas that could be affected by the alternative routes include Argyle Canyon, which is an important recreation area for hunters, ATV riders, and rock explorers, and Strawberry River Valley, which is a favorite destination for sportsmen, hikers, bird watchers, and picnickers. Visitors who come from outside of a region spend their money locally, helping to support jobs and income in these regions.

[6]Nonmarket environmental values (or simply nonmarket values) reflect the benefits individuals attribute to experiences of the environment, uses of natural resources, or the existence of particular ecological conditions that do not involve market transactions, and therefore lack prices (BLM 2013d).

If visitation were to decrease due to the presence of the transmission line, this potentially could affect the local economy.

3.2.22.2.6 Future Development of Oil and Gas Resources

The location of the development of new oil and gas wells would be restricted by the right-of-way, which may decrease oil and gas investment in certain locations. In turn, this may affect the local economy.

3.2.22.2.7 Impacts on Agricultural Production and Activities

Rangeland and cropland could be disturbed on private lands and BLM and USFS grazing allotments. Grazing leases on USFS- or BLM-administered lands could be affected by the right-of-way, perhaps requiring modifications to the lease stipulations and locations. Potential temporary impacts in the right-of-way could include crop damage (depending on the time of year for construction across specific fields), soil disturbance, and potential loss of production for a temporary period as a result of construction activities and the transport of construction equipment and vehicles that restrict or prevent the planting of lands in or adjacent to the right-of-way. Typically, after construction is complete, landowners would be able to resume farming activities around the transmission line structures.

3.2.22.2.8 Impacts on Environmental Justice Communities

The EPA defines a community with potential environmental justice populations as one that has a higher proportion or minority of low-income populations than does an identified reference community (EPA 1994). An environmental justice assessment requires an analysis of whether low income or poverty populations would be disproportionately and adversely affected by a proposed project. If potential environmental justice populations of concern are identified as residing in proximity to the transmission line routes, it would be necessary to identify any impacts of the proposed Project as well as to examine the spatial distribution of any impact areas to determine if these impacts are likely to fall disproportionately on the minority populations. Disproportionate impacts on environmental justice populations could include impacts on traffic, air quality, visual resources, cultural resources, property values, and agricultural land uses.

3.2.22.3 Regional Setting

The regional setting describes the demographic and socioeconomic context of the study area, including:

- Regional summary descriptions
- Demographic characteristics, including ethnicity, age, income, historic trends, and projections
- Transportation
- Economic characteristics, including labor force, unemployment, employment trends, average earnings, and assessment of major economic activities in the study area
- Local resources, including property valuation and taxation, housing and construction, schools, and emergency services
- Environmental justice populations

Additional demographic and socioeconomic characteristics are presented in the Gateway South Socioeconomic Baseline Assessment (Louis Berger Group 2012).

Counties with similar economic baseline conditions (such as a shared major industries, geographic proximity to regional markets, and similar population densities) were aggregated into study area regions to provide clarity and organization to the assessment and analysis of the economic conditions.

The study area encompasses 61,571 square miles. These 17 counties have been aggregated into five larger, geographically contiguous regions (study area regions) based on similarities in social and economic indicators, such as income and population density (Table 3-272). For instance, Carbon and Sweetwater counties (Wyoming) both have low population densities of three persons per square mile and a larger share of investment income as a percentage of personal income.[7] These indicators are similar to those of Moffat County (Colorado), which also has a relatively low population density and similar characteristics in income. These study area regions are illustrated on Figure 3-1. This section will provide a discussion of the socioeconomic characteristics of the study area, including the study area regions identified above.

TABLE 3-272
STUDY AREA REGIONS

Study Area Region	Counties
Southwestern Wyoming Region and Moffat County, Colorado	Sweetwater and Carbon counties in Wyoming and Moffat County in Colorado
Northwestern Colorado Region	Routt, Rio Blanco, Garfield, and Mesa counties in Colorado
Eastern Utah Region	Daggett, Duchesne, Uintah, and Grand counties in Utah
Wasatch Front Region	Utah and Wasatch counties in Utah
Central Utah Region	Carbon, Sanpete, Juab, and Emery counties in Utah

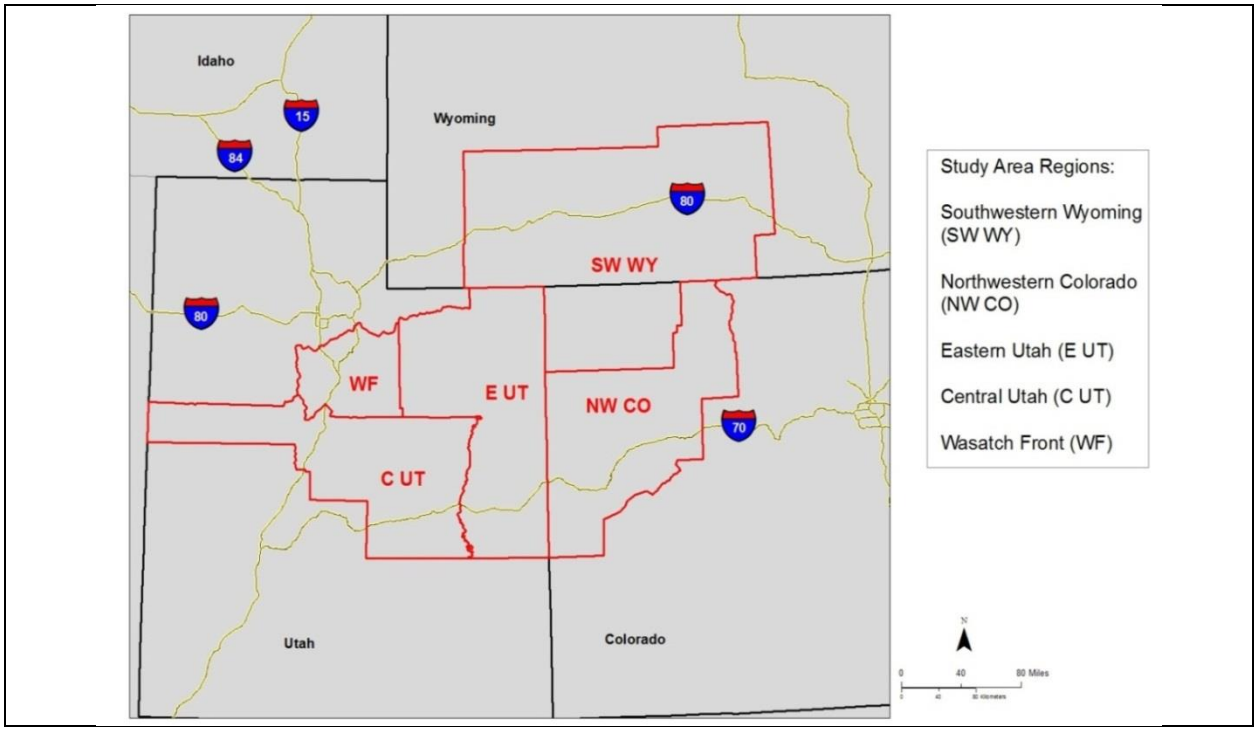


Figure 3-1 Energy Gateway South Transmission Line Study Area Regions

3.2.22.3.1 Geographic and Regional Overview

The study area includes a wide spectrum of geographic characteristics (Table 3-273). The Wasatch Front Region, containing the Utah cities of Provo and Orem, is the most populous region, followed by the Northwestern Colorado Region. The Northwestern Colorado Region is primarily rural but contains the

[7]Personal income comprises three general categories of income: investment, transfer payments, and labor earnings.

larger population centers of Grand Junction and Glenwood Springs. The Central Utah and Southwestern Wyoming and Moffat County, Colorado, regions are all characterized by low population densities, and are generally rural in nature.

TABLE 3-273
GEOGRAPHIC CHARACTERISTICS OF STUDY AREA REGIONS

Area	Land Area (million acres)	Land Area (square miles)	Population (2010 census)	Persons/Square Mile (2010 census)
Region				
Southwestern Wyoming and Moffat County, Colorado	14.8	23,206	73,486	3.17
Northwestern Colorado	7.6	11,887	233,287	19.62
Eastern Utah	7.7	12,172	61,479	5.05
Wasatch Front	7.0	10,955	540,094	49.30
Central Utah	7.0	10,965	70,447	6.42
Total study area	**44.1**	**69,185**	**978,793**	**14.15**
State				
Wyoming	62.0	96,820	563,626	5.82
Colorado	66.3	103,644	5,029,196	48.52
Utah	52.5	82,102	2,763,885	33.66
Nation	2,262.7	3,535,451	308,745,538	87.33

SOURCE: U.S. Census Bureau 2012a

Land ownership patterns for each of the study area regions are summarized in Table 3-274. Overall, the majority of land in the study area is federally owned. The Wasatch Front Region is approximately evenly divided between federal and private/local government lands. By contrast, the Northwestern Colorado Region has a higher percentage of private/local government ownership (25 percent) and less land in federal ownership (44 percent). The Eastern Utah Region has the highest proportion of American Indian Reservation lands (13 percent), comprising the Uintah and Ouray Indian Reservation, and also has the highest portion of federal lands (61 percent).

TABLE 3-274
PERCENT OF LAND OWNERSHIP OF STUDY AREA REGIONS

Region	Federal	State	Private/ Local Government	American Indian Reservation
Southwestern Wyoming and Moffat County, Colorado	54.1	27.9	3.8	Not applicable
Northwestern Colorado	43.9	31.3	24.8	Not applicable
Eastern Utah	60.9	10.2	15.8	13.1
Wasatch Front	47.7	7.7	44.5	0.2
Central Utah	49.2	23.6	26.7	0.5
Total study area	**255.8**	**100.7**	**115.6**	**13.8**

SOURCES: Colorado Ownership Management and Protection Project 2009; Fisher 2009; State of Utah 2012c; U.S. Department of the Interior n.d.; Ward 2000; Young 2004

3.2.22.3.2 Population Centers

Table 3-275 identifies the largest population centers for each of the five study area regions, as well as smaller populations centers located within a 20-mile distance of the transmission line alternative routes. All of the towns and cities in the following table are located within 20 miles of the closest transmission alternative route with the exception of a number of the larger cities and towns. The cities and town that fall farther than 20 miles from the relevant alternative route are noted in the following table with a superscript 1.

The two most populous places in the Southwestern Wyoming and Moffat County, Colorado Region are the towns of Rock Springs and Green River, Wyoming. These places are all located more than 60 miles from the alternative routes. The town of Craig, Colorado, is the most populous place within 20 miles of the corridor. It has a population of 9,189 and is located within 3 miles of the alternative routes.

The three most populous places in the Northwestern Colorado Region are Grand Junction, Clifton, and Steamboat Springs, Colorado. These places are all located more than 25 miles from the alternative routes. The town of Fruita, Colorado, is the most populous place within 20 miles of the alternative routes with a population of 6,478.

The Eastern Utah Region contains several populated places located within 20 miles of the alternative routes. While Moab, with a population of 4779, is located 27 miles from the corridor, the towns of Vernal, Roosevelt and Maeser all lie within 20 miles of the alternative routes and contain populations of 7,714, 4,299, and 2,855, respectively.

The two largest population centers in the Wasatch Front Region, Provo and Orem, Utah, are located 18 and 23 miles from the corridor with populations of 105,166 and 84,324, respectively. The third most populated place in the Wasatch Front study area region is Springville, Utah, which contains a population of 20,424, and is located within 20 miles of the closest alternative route.

The three most populated places in the Central Utah Region are Price, Nephi, and Ephraim with populations of 8,402, 4,733, and 4,505 residents, respectively. They are located at distances from 2 to 15 miles of the closest alternative routes.

TABLE 3-275
POPULATION CENTERS IN THE STUDY AREA REGIONS

Cities and Towns in the Study Area Regions	Census 2000	Census 2010	Census 2013	Change 2000 to 2013 (Percent)
Southwestern Wyoming and Moffat County, Colorado				
Baggs, Wyoming	348	440	427	23
Craig, Colorado	9,189	9,464	9,233	1
Dinosaur, Colorado	319	339	373	17
Dixon, Wyoming	79	97	90	14
Elk Mountain, Wyoming	192	191	133	-31
Green River, Wyoming[1]	11,808	12,515	12,632	7
Hanna, Wyoming	873	841	772	-12
Medicine Bow, Wyoming	274	284	235	-14
Rawlins, Wyoming	8,538	9,259	9,205	8
Rock Springs, Wyoming[1]	18,708	23,036	23,534	26
Saratoga, Wyoming[1]	1,726	1,690	1,916	11
Sinclair, Wyoming	423	433	449	6
Table Rock, Wyoming	82	0	0	-1
Wamsutter, Wyoming	261	451	415	59
Northwestern Colorado				
Clifton, Colorado[1]	17,345	19,889	20,944	21
Fruita, Colorado	6,478	12,646	12,653	95
Grand Junction, Colorado[1]	41,986	58,566	59,442	42
Hayden, Colorado	1,634	1,810	1,864	14
Rangely, Colorado	2,096	2,365	2,238	7
Redlands, Colorado[1]	8,043	8,685	8,692	8
Steamboat Springs, Colorado[1]	9,815	12,088	12,032	23

TABLE 3-275
POPULATION CENTERS IN THE STUDY AREA REGIONS

Cities and Towns in the Study Area Regions	Census 2000	Census 2010	Census 2013	Change 2000 to 2013 (Percent)
Eastern Utah				
Altamont, Utah	178	225	280	57
Ballard, Utah	566	801	697	23
Castle Valley, Utah[1]	349	319	320	-8
Duchesne, Utah	1,408	1,690	2,173	54
Fort Duchesne, Utah	621	714	819	32
Maeser, Utah	2,855	3,601	3,480	22
Moab, Utah[1]	4,779	5,046	5,087	6
Myton, Utah	539	569	579	7
Naples, Utah	1,300	1,755	2,149	65
Neola, Utah	533	461	443	-17
Randlett, Utah	224	220	275	23
Roosevelt, Utah	4,299	6,046	6,282	46
Tabiona, Utah	149	171	224	50
Vernal, Utah	7,714	9,089	9,531	24
Whiterocks, Utah	341	289	285	-16
Wasatch				
Benjamin, Utah	1,029	1,145	1,262	23
Elberta, Utah	278	256	388	40
Elk Ridge, Utah	1,838	2,436	2,581	40
Genola, Utah	965	1,370	1,319	37
Goshen, Utah	874	921	911	4
Lake Shore, Utah	755	817	678	-10
Lehi, Utah[1]	19,028	47,407	49,804	162
Mapleton, Utah	5,809	7,979	8,296	43
Orem, Utah[1]	84,324	88,328	89,724	6
Palmyra, Utah	485	491	563	16
Payson city, Utah	12,716	18,294	18,633	47
Provo, Utah	105,166	112,488	114,179	9
Rocky Ridge, Utah	403	733	1,307	224
Salem, Utah	4,372	6,423	6,594	51
Santaquin, Utah	4,834	9,128	9,423	95
Spanish Fork, Utah	20,246	34,691	35,525	75
Spring Lake, Utah	469	458	555	18
Springville, Utah	20,424	29,466	30,113	47
West Mountain, Utah	838	1,186	921	10
Woodland Hills, Utah	941	1,344	1,486	58
Central Utah				
Castle Dale, Utah	1,657	1,630	1,828	10
Clawson, Utah	153	163	168	10
Cleveland, Utah	508	464	514	1
East Carbon, Utah	1,393	1,301	1,272	-9
Elmo, Utah	368	418	441	20
Ephraim, Utah	4,505	6,135	6,205	38
Eureka, Utah	766	669	596	-22
Fairview, Utah	1,160	1,247	1,794	55
Ferron, Utah	1,623	1,626	1,701	5
Fountain Green, Utah	945	1,071	971	3

TABLE 3-275 POPULATION CENTERS IN THE STUDY AREA REGIONS				
Cities and Towns in the Study Area Regions	**Census 2000**	**Census 2010**	**Census 2013**	**Change 2000 to 2013 (Percent)**
Green River, Utah	973	952	1,091	12
Helper, Utah	2,025	2,201	2,302	14
Huntington, Utah	2,131	2,129	2,188	3
Levan, Utah	688	841	949	38
Manti, Utah[1]	3,040	3,276	3,289	8
Mona, Utah	850	1,547	1,355	59
Moroni, Utah	1,280	1,423	1,383	8
Mount Pleasant, Utah	2,707	3,260	3,269	21
Nephi, Utah	4,733	5,389	5,431	15
Orangeville, Utah	1,398	1,470	1,299	-7
Price, Utah	8,402	8,715	8,617	3
Scofield, Utah	28	24	39	39
Spring City, Utah	956	988	1,072	12
Sunnyside, Utah	404	377	511	26
Wales, Utah	219	302	350	60
Wellington, Utah	1,666	1,676	1,669	1
SOURCE: U.S. Census Bureau Summary File 1 100% Data (2013 NOTE: [1]Indicates the town or city is located more than 20 miles from the closest alternative route.				

3.2.22.3.3 Transportation

Three interstate highways run through the study area: I-80, I-15, and I-70. I-80 runs east-west through western Wyoming, through Sweetwater and Carbon counties in the Southwestern Wyoming Region on its way toward Salt Lake City where it connects with I-15. Connecting Salt Lake City with Las Vegas, I-15 travels generally in a north-south direction as it traverses the Wasatch Front and Central Utah regions. I-70 runs through the city of Grand Junction, Colorado, before heading west through Utah. In the study area, I-70 travels east-west through Green River, Utah, before connecting with I-15 south of the project areas in Millard County, Utah.

Other important roads in the study area include U.S. Highway 40, which links Routt, Moffat, Uintah, Duchesne, and Wasatch counties as it heads west from Steamboat Springs, Colorado, through Vernal, Utah to Heber City, Utah, and then north to its junction with I-80. The 175-mile-long segment of U.S. Highway 40 from the Colorado state line to the junction of I-80 had an annual average daily trip count of 404,870 vehicles per day in 2008 (UDOT 2008). Rural portions of the study area not directly served by these roads are linked to them via numerous minor roads in each county. There also are a number of railroads that link various industries in the study area to other parts of the region and nation.

3.2.22.3.4 Demographics

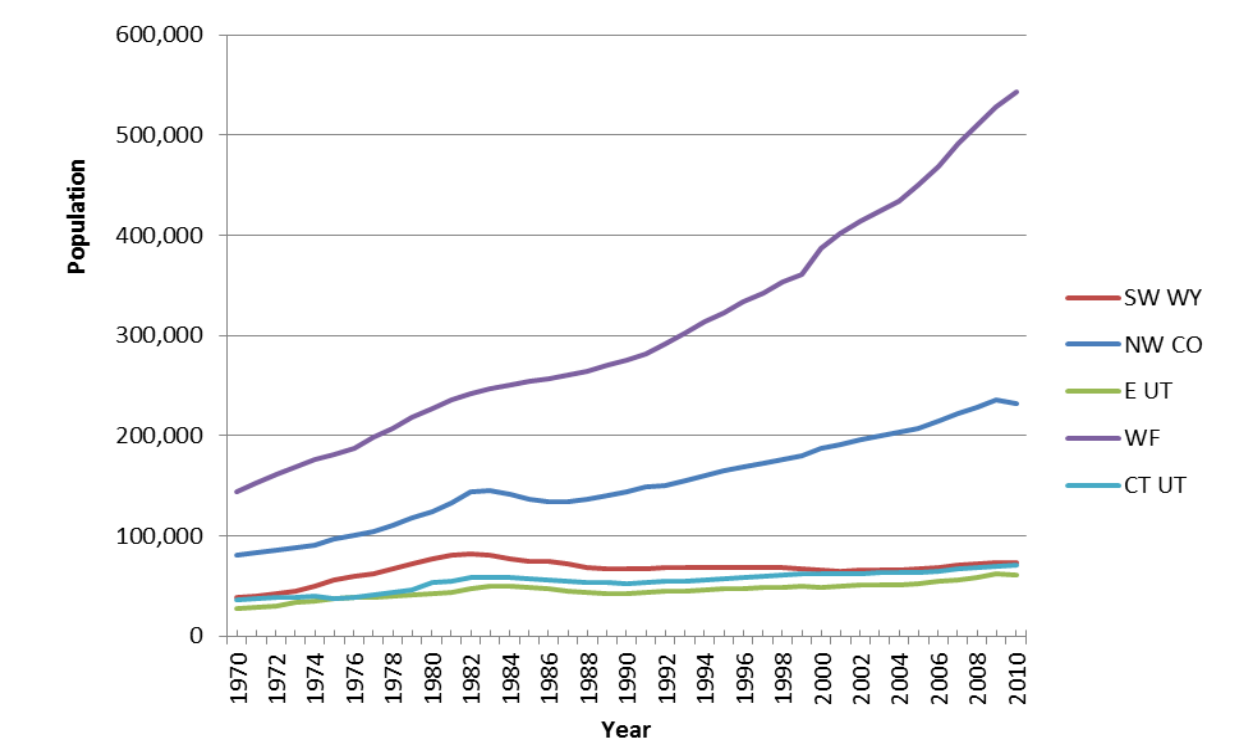
This section describes demographic characteristics for each of the regions in the study area, including population estimates, age distribution of the population, race and ethnicity characteristics, and per capita income.

Population Trends

Population figures and estimates for all of the counties in the study area were obtained from the U.S. Census Bureau for years 1970 through 2010 and are summarized on Figure 3-2. All study area regions experienced population growth over the 40-year period. During the period 1970 to 2010, population increased by more than 300 percent in the study area, increasing from 326,209 in 1970 to 981,571 in

2010, primarily driven by growth in the Wasatch Front and Northwestern Colorado regions. The Wasatch Front Region experienced the highest population growth during this period with particularly high population growth beginning in 1990. Between 1990 and 2000, population increased by 112,469.

The Eastern Utah Region experienced the slowest growth over the 40-year period, gaining only an additional 34,072 residents. The largest losses in this region occurred between 1984 and 1989, when the population declined from 49,755 to 42,032 individuals. This trend reversed in the 1990s, and the region has since experienced steady, albeit slow, growth. The Southwestern Wyoming and Central Utah regions also showed relatively slow population growth during the entire 40-year period. Along with the Eastern Utah Region, the Southwestern Wyoming and Central Utah regions are notably less populated compared to the Northwest Colorado and Wasatch Front regions in the study area.



SOURCES: U.S. Census Bureau 1982, 1992, 2012c, d, e, f

Figure 3-2 Historical Population Estimates for Five Study Area Regions, 1970 to 2010

Age Distribution

Data were obtained for 2000 and 2010 from the U.S. Census for the age distribution of the population in each of the five study area regions (Table 3-276). The Wasatch Front, Central Utah and Eastern Utah Regions demonstrate the highest share of working-age individuals, with the 21 to 44 Years age cohort representing more than a third of the population in those regions. This same age group also indicated very high growth in Northwestern Colorado, growing by over 100 percent during the 10-year period. High growth also occurred among the 55 to 64 Years age cohort for all regions except Southwestern Wyoming. In the Wasatch Front Region, all age groups grew by 35 percent or more. All study area regions also showed moderate growth in the population of older residents (65 Years of Age and Older), with the lowest change occurring in the Southwestern Wyoming Region (16 percent) and the highest occurring in the Wasatch Front Region (43 percent).

TABLE 3-276
POPULATION CHANGE BY AGE GROUP IN THE STUDY AREA

Year	Total Population	Under 20 Years		21 to 44 Years		45 to 54 Years		55 to 64 Years		65 Years and Over		Median Age
		Number	Share (Percent)	Number	Share (Percent)	Number	Share (Percent)	Number	Share (Percent)	Number	Share (Percent)	
Southwestern Wyoming and Moffat County, Colorado												
2010	73,486	21,234	28.9	20,503	27.9	11,140	15.2	3,899	5.3	7,141	9.7	35.8
2000	66,436	20,529	30.9	18,816	28.3	10,533	15.9	4,564	6.8	6,162	9.3	35.4
10-Year Change	7,050	705	–	1,687	–	607	–	-665	–	979	–	–
10-Year Percent Change	11	3	–	9	–	6	–	-15	–	16	–	–
Northwestern Colorado												
2010	233,287	62,803	26.9	81,113	34.7	34,553	14.8	31,587	13.5	29,325	12.6	38.05
2000	185,722	52,544	28.3	39,712	21.3	27,887	15.0	17,115	9.2	23,143	12.5	36.25
10-Year Change	47,565	10,259	–	41,401	–	6,666	–	14,472	–	6,182	–	–
10-Year Percent Change	26	20	–	104	–	24	–	85	–	27	–	–
Eastern Utah												
2010	61,479	21,116	34.4	20,246	32.9	7,534	12.3	6,150	10.0	6,433	10.5	34.8
2000	49,001	18,165	37.1	15,746	32.1	6,033	12.3	4,016	8.2	5,041	10.3	32.95
10-Year Change	12,478	2,951	–	4,500	–	1,501	–	2,134	–	1,392	–	–
10-Year Percent Change	25	16	–	29	–	25	–	53	–	28	–	–
Wasatch Front												
2010	540,094	213,695	39.6	210,742	39.0	46,189	8.6	33,994	6.2	35,474	6.6	28.1
2000	383,751	152,876	39.8	156,397	40.7	31,050	8.1	18,641	4.8	24,787	6.5	26.4
10-Year Change	156,343	60,819	–	54,345	–	15,139	–	15,353	–	10,687	–	–
10-Year Percent Change	41	40	–	35	–	49	–	82	–	43	–	–
Central Utah												
2010	70,447	24,778	35.2	21,447	30.4	8,185	11.6	7,526	10.6	8,511	12.1	31.1
2000	62,283	23,693	38.0	19,472	31.2	7,315	11.7	4,731	7.6	7,072	11.4	31.1
10-Year Change	8,164	1,085	–	1,975	–	870	–	2,795	–	1,439	–	–
10-Year Percent Change	13	5	–	10	–	12	–	59	–	20	–	–

TABLE 3-276
POPULATION CHANGE BY AGE GROUP IN THE STUDY AREA

Year	Total Population	Under 20 Years		21 to 44 Years		45 to 54 Years		55 to 64 Years		65 Years and Over		Median Age
		Number	Share (Percent)	Number	Share (Percent)	Number	Share (Percent)	Number	Share (Percent)	Number	Share (Percent)	
State of Colorado												
2010	5,029,196	1,364,692		1,774,537		742,698		597,644		549,625		36.1
2000	4,301,261	1,224,668		1,707,088		614,125		339,307		416,073		34.3
10-Year Change	727,935	140,024	–	67,449	–	128,573	–	258,337	–	133,552	–	–
10-Year Percent Change	16.9	11.4	–	4.0	–	20.9	–	76.1	–	32.1	–	–
State of Utah												
2010	2,763,885	962,537		1,004,681		306,964		240,241		249,462		29.2
2000	2,233,169	810,977		851,752		237,710		142,508		190,222		27.1
10-Year Change	530,716	151,560	–	152,929	–	69,254	–	97,733	–	59,240	–	–
10-Year Percent Change	23.8	18.7	–	18.0	–	29.1	–	68.6	–	31.1	–	–
State of Wyoming												
2010	563,626	151,513		184,933		83,577		73,513		70,090		36.8
2000	493,782	145,346		172,074		74,079		44,590		57,693		36.2
10-Year Change	69,844	6,167	–	12,859	–	9,498	–	28,923	–	12,397	–	–
10-Year Percent Change	14.1	4.2	–	7.5	–	12.8	–	64.9	–	21.5	–	–
Nation												
2010	308,745,538	83,267,556		103,720,553		45,006,716		36,482,729		40,267,984		37.2
2000	281,421,906	80,473,265		104,004,252		37,677,952		24,274,684		34,991,753		35.3
10-Year Change	27,323,632	2,794,291	–	-283,699	–	7,328,764	–	12,208,045	–	5,276,231	–	–
10-Year Percent Change	9.7	3.5	–	-0.3	–	19.5	–	50.3	–	15.1	–	–

SOURCES: U.S. Census Bureau 2012a, b

Racial and Ethnic Characteristics

Table 3-277 summarizes the racial and ethnicity characteristics for the population in each of the five study area regions with data collected from the 2010 Census. Only the Central Utah Region reported more than 90 percent of the population as White in 2010. All of the other study area regions had populations of White residents that comprised less than 90 but more than 85 percent of the population. Hispanic or Latino residents accounted for more than 15 percent of the population in the Southwestern Wyoming and Northwestern Colorado regions. American Indian or Alaskan Native residents accounted for more than 5 percent of the population in the Eastern Utah Region. A more detailed analysis of minority characteristics in the study area is presented in the Environmental Justice section.

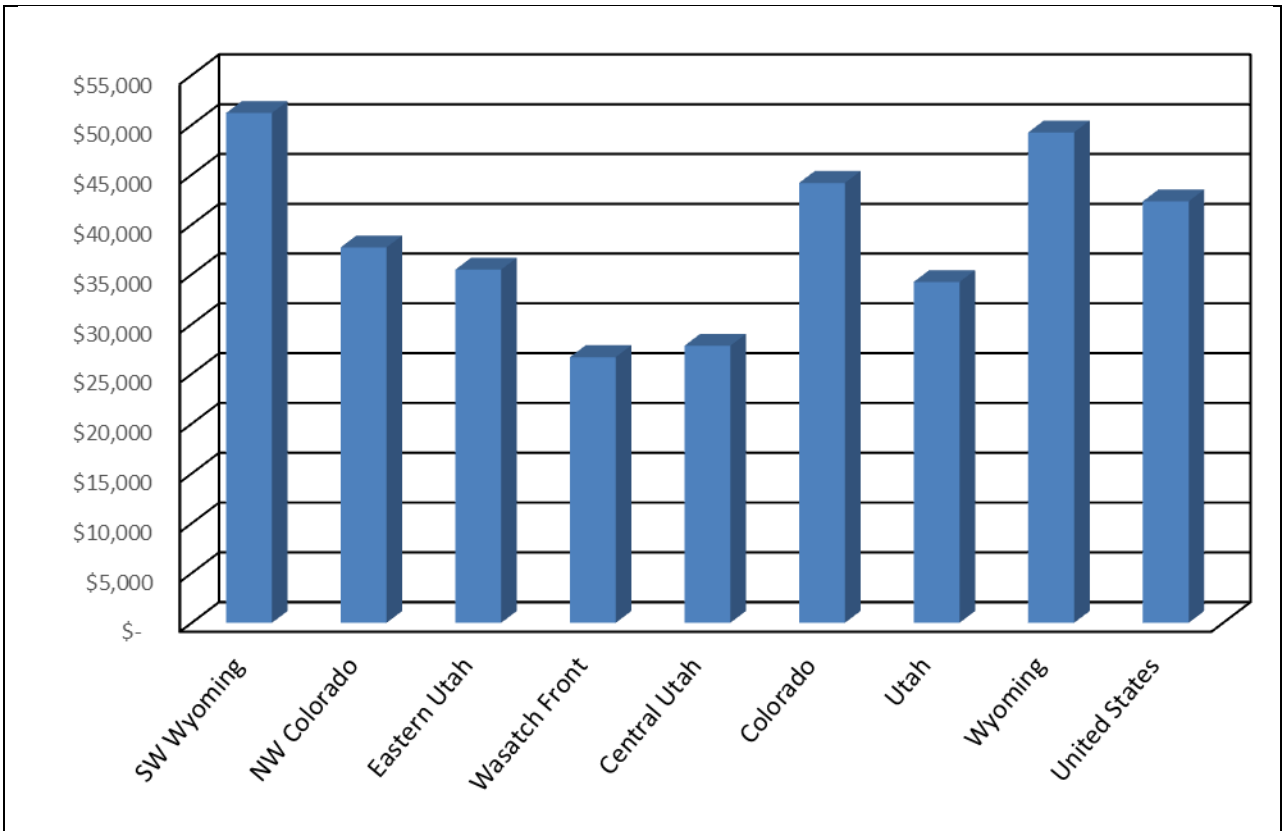
TABLE 3-277
RACE AND ETHNICITY DISTRIBUTION FOR FIVE REGIONS IN THE STUDY AREA

Race and Ethnicity	Southwestern Wyoming and Moffat County, Colorado	Northwestern Colorado	Eastern Utah	Wasatch Front	Central Utah
Total	73,486	233,287	61,479	540,094	70,447
Race					
White	88.8	88.3	87.9	89.4	92.4
Black	0.8	0.6	0.3	0.5	0.5
American Indian or Alaskan Native	1.0	1.0	6.1	0.6	1.0
Asian	0.7	0.7	0.5	1.3	0.5
Native Hawaiian or Pacific Islander	0.1	0.1	0.2	0.7	0.3
Some Other Race	6.3	6.8	2.6	4.7	3.6
Two or More Races	2.3	2.5	2.4	2.7	1.8
Ethnicity					
Hispanic or Latino	15.4	16.2	7.1	10.9	9.0

SOURCE: U.S. Census Bureau 2012a
NOTE: Percentages may not add up to 100 percent because persons comprising the group Hispanic or Latino may fall into one or more racial categories.

Personal Income

Per capita income for each of the five study area regions; the states of Wyoming, Colorado, and Utah; and the U.S. is summarized in Figure 3-3 for 2011 (in 2011 dollars). The Wasatch Front Region had the lowest per capita income of all regions ($26,684). By contrast, the Southwestern Wyoming region had the highest income ($51,203). The Southwestern Wyoming region's per capita personal income for 2011 was 17 percent higher than the nation's per capita personal income of $42,332, while the Northwestern Colorado region's per capita personal income was 11 percent lower than that of the nation.



SOURCES: U.S. Bureau of Economic Analysis 2015a, b, c

Figure 3-3 2011 Per Capita Personal Income for Study Area Regions, States, and the United States (2011 dollars)

3.2.22.3.5 Economic Characteristics

This section discusses the economic characteristics of each of the study area regions and compares them to the economic characteristics of the states of Colorado, Wyoming, and Utah, and the U.S. where relevant. Data in this section comes from the Bureau of Economic Analysis (BEA) (2012a, e, f).

Employment by Industry

Data were obtained from the BEA on total annual employment for all counties in each of the five study area regions from 2001 to 2011 so that employment trends and 2011 snapshots by industry could be examined.[8] County-level data are presented in the Gateway South Socioeconomic Baseline Assessment (Louis Berger Group 2012), and summarized below by region. The following section describes both the employment trends in terms of the proportion of new jobs or jobs gained over the 8-year period by industry, as well as the 2011 proportion of employment by industry in each of the counties.

Southwestern Wyoming and Moffat County, Colorado Region

Annual nonfarm employment from 2001 to 2011 for the three counties in the Southwestern Wyoming and Moffat County, Colorado Region increased by 25.3 percent, from 33,734 nonfarm jobs in 2001 to 42,268 nonfarm jobs in 2011. This was largely driven by job increases in the mining sector in Carbon County, Wyoming, and in the real estate and rental and leasing sector in Sweetwater County, Wyoming.

Industries accounting for the greatest share of jobs in Moffat County during 2011 included state and local government (18.4 percent) and retail trade (15.7 percent). Industries with growth in employment between 2001 and 2011 in Moffat County, Colorado, include mining (33.3 percent of total growth) and administrative and waste management services (16.2 percent of total growth).

Industries comprising the greatest percentage of jobs in Sweetwater County during 2011 included mining (22.2 percent) and state and local government (15.1 percent). Growth in employment between 2001 and 2011 in Sweetwater County occurred in the transportation and warehousing industry (18.6 percent of total growth). The greatest percentage of jobs in Carbon County during 2011 were in state and local government (25.2 percent) and accommodation and food services (13.7 percent). Job growth in Carbon County, Wyoming between 2001 and 2011 was in the mining (64.2 percent of total growth) and finance and insurance (24.4 percent of total growth) industries.

Northwestern Colorado Region

Annual nonfarm employment from 2001 to 2011 for the four counties in the Northwestern Colorado Region increased by 19.1 percent, from 117,917 to 140,467 jobs. Much of this increase was driven by job increases in the mining sectors for Mesa and Garfield Counties.

High employing sectors in Routt County in 2011 included real estate and rental and leasing (11.9 percent), accommodations and food services (11.5 percent), and construction (9.4 percent). Routt County saw growth in employment between 2001 and 2011 in real estate (61.1 percent of total growth); professional, scientific, and technical services (30.1 percent of total growth); and health care and social

[8]BEA estimatesthe impact of federal sequestration and reduced FY 2013 funding levels for the BEA required reductions in the Bureau's local area personal income (LAPI) program. Effective with the November 21, 2013, release of BEA's LAPI statistics, local area employment by industry statistical details were not updated or made available. As a result, the analysis here presents figures only to the most recent data year (year 2011) for local area employment by industry.

BEA LAPI estimates provide annual employment for counties nationwide. These data can be incomplete in some counties due to disclosure problems associated in areas where few firms are operating. Estimates of total employment, however, do include those numbers that are unreported or omitted at the specific industry level.

Total annual employment includes both part-time and full-time jobs. As such, individuals that have more than one job are counted twice in the totals. The employment estimates include those individuals who are employed by businesses and public entities, as well as those who are self-employed. Since 2001, the BEA has employed the North American Industry Classification System to better capture new industries that did not exist under the old Standard Industrial Classification System.

assistance (27.8 percent of total growth). Notably, the construction industry lost 1,477 jobs in Routt County between 2001 and 2011, a loss of 44.4 percent.

Industries comprising the greatest percentage of jobs in Rio Blanco County during 2011 included state and local government (25.2 percent) and mining (22.2 percent). In Rio Blanco County, growth in employment between 2001 and 2011 occurred in the mining industry (53.5 percent of total growth) and in the administrative and waste management services sector (20.3 percent of total growth).

The sectors accounting for the highest proportion of employment in 2011 included construction (11.7 percent) and state and local government (13.5 percent). In Garfield County, industry employment grew between 2001 and 2011 in mining (37.2 percent of total growth) and state and local government (22.8 percent of total growth).

The largest employing sectors in Mesa County during 2011 were health care and social assistance (12.6 percent), retail trade (12.2 percent), and state and local government (10.0 percent). In Mesa County, job growth between 2001 and 2011 occurred in the mining (31.3 percent of total growth), health care and social assistance (16.6 percent of total growth), and real estate (12.1 percent growth) sectors.

Eastern Utah Region

From 2001 to 2011, the total annual nonfarm employment for the four counties in the Eastern Utah Region increased by 47.8 percent, from 23,735 to 35,070 jobs during this time with the largest proportion of increases in Duchesne County as a result of employment growth in the mining sector.

In Daggett County, much of the information on employment by industry was not disclosed in the figures provided by the BEA due to proprietary disclosure issues. Employment figures from 2001 to 2011 show an increase in nonfarm jobs from 398 to only 480, a 24.1 percent change. Not enough information is disclosed to accurately assess which industries grew the most during this period.

Sectors comprising the greatest percentage of jobs in Duchesne County in 2011 included mining (19.1 percent) and state and local government (18.1 percent). In Uintah County, employment growth occurred in mining (36.3 percent of total growth) and the transportation and warehousing industries (16.6 percent of total growth).

The largest employing sectors in Grand County in 2011 were in accommodation and food services (23.9 percent), retail trade (14.6 percent), and state and local government (11.3 percent). Between 2001 and 2011, employment growth occurred in accommodation and food services (16.6 percent of total growth), real estate (14.7 percent of total growth), and retail trade (12.1 percent of total growth).

The largest employing sectors in Uintah County in 2011 were mining (18.7 percent) and state and local government (13.6 percent). Employment growth in Duchesne County occurred in the mining (26.2 percent of total growth) and finance and insurance (13.5 percent of total growth) industries between 2001 and 2011.

Wasatch Front Region

Annual nonfarm employment increased, from 2001 to 2011 for the two counties in the Wasatch Front Region, by 29.6 percent from 205,192 to 265,933 jobs. A majority of these gains were in Utah County.

Sectors comprising the greatest percentage of jobs in Wasatch County in 2011 were state and local government (12.4 percent) and wholesale trade (12.1 percent). Employment growth in Wasatch County

occurred in the real estate (21.5 percent of total growth) and administrative and waste management (13.9 percent of total growth) industries.

The largest employing sectors in Utah County in 2011 were retail trade (11.5 percent) and state and local government (10.4 percent). In Utah County employment growth occurred in the real estate (13.8 percent of total growth) and health care and social assistance (13.6 percent of total growth) industries.

Central Utah Region

Between 2001 and 2011, total annual employment for the four counties in the Central Utah Region increased by 12.6 percent; from 30,711 to 34,581.

Sectors comprising the greatest percentage of jobs in Carbon County during 2011 included state and local government (13.3 percent) and retail trade (10.2 percent). In Carbon County, employment growth occurred in the transportation and warehousing (41.9 percent of total growth) and wholesale trade (23.7 percent of total growth) industries.

Sectors comprising the greatest percentage of jobs in Emery County in 2011 were state and local government (25.5 percent) and retail trade (19.2 percent). In Emery County employment growth occurred in the construction (72.6 percent of total growth) and accommodation and food services (12.6 percent of total growth) industries.

The greatest percentage of jobs in Sanpete County in 2011 were in state and local government (24.1 percent) and retail trade (11.8 percent). Between 2001 and 2011, employment increases in Sanpete County occurred in real estate (55.7 percent of total growth) and other services (10.6 percent of total growth).

The largest employing sectors in 2011 were state and local government (22.0 percent) and construction (20.2 percent) industries. Note that data for many of the industries listed for Juab County were not disclosed. In Juab County, job growth between 2001 and 2011 occurred in manufacturing (38.6 percent of total growth) and state and local government (32.3 percent) industries.

Construction Employment

Table 3-278 shows that the three-state region has experienced a loss of almost 100,000 construction jobs during the national economic downturn between 2008 and 2010. Table 3-278 provides a sample of geographies from which construction workforce could be sourced.

TABLE 3-278
CONSTRUCTION EMPLOYMENT IN STATES AND COUNTIES

Geography	2001	2006	2008	2011	Jobs Lost 2008 to 2011
Wyoming	27,291	33,248	37,977	29,336	8,641
Colorado	237,667	248,267	241,759	181,999	59,760
Utah	94,420	127,546	121,405	91,299	30,106
Sweetwater County, Wyoming (Rock Springs)	1,812	2,665	2,962	2,256	706
Mesa County, Colorado (Grand Junction)	6,738	8,494	8,987	5,638	3,349
Uintah County, Utah (Vernal)	839	1,183	1,599	1,202	397
Carbon County, Utah (Price)	559	604	564	633	69
Wasatch County, Utah (Heber)	967	1,596	1,487	1,047	440
Utah County, Utah (Provo-Orem)	15,206	22,569	21,030	15,794	5,236
Salt Lake City, Utah Metropolitan Area	44,989	54,900	53,616	41,638	11,978

TABLE 3-278 CONSTRUCTION EMPLOYMENT IN STATES AND COUNTIES					
Geography	**2001**	**2006**	**2008**	**2011**	**Jobs Lost 2008 to 2011**
Denver-Aurora-Broomfield, Colorado Metropolitan Area	120,921	120,325	116,118	90,697	25,421
Cheyenne, Wyoming Metropolitan Area	3,202	4,334	4,213	3,732	481
Non-metropolitan Wyoming and Colorado counties (Carbon, Routt, Rio Blanco, Garfield)	10,144	12,126	13,803	8,223	5,580
Non-metropolitan counties in Utah (Carbon, Daggett, Duchesne, Grand, Emery, Juab, Sanpete)	3,041	4,191	4,581	3,567	1,014
SOURCE: U.S. Bureau of Economic Analysis 2013					

Average Earnings

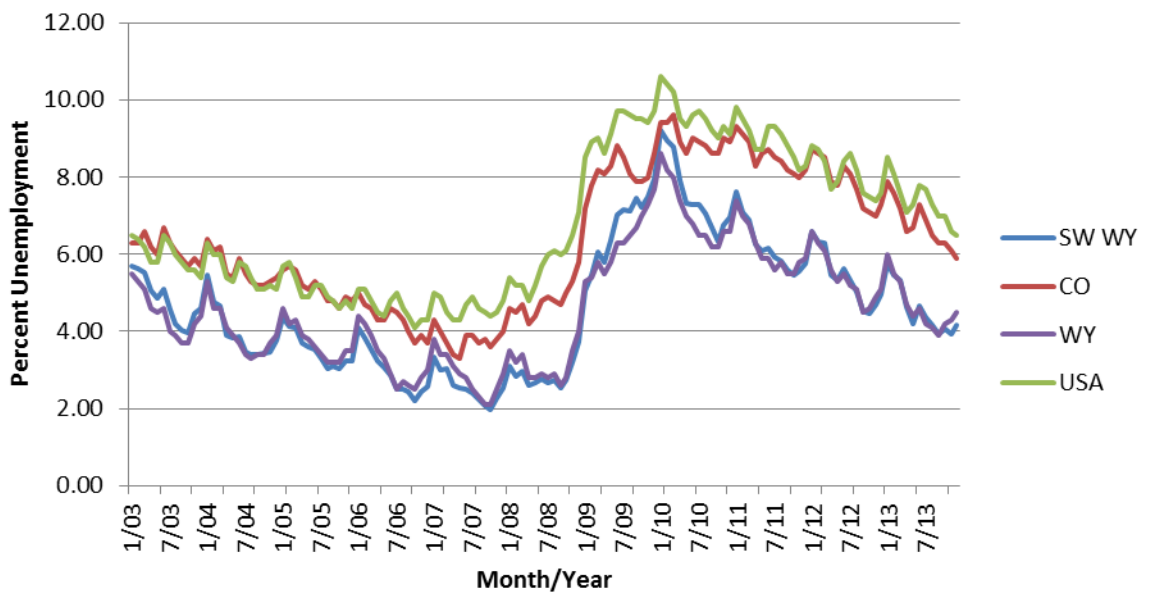
Data on average annual earnings by occupation were obtained from the Bureau of Labor Statistics for the three states and the nation. On average, annual average earnings were higher in Colorado than in Wyoming and Utah. The exception was in the construction, extraction, and production occupations, where average earnings in Wyoming are higher than those in Colorado and Utah. Average earnings by occupation are summarized in Table 3-279.

TABLE 3-279 AVERAGE EARNINGS FOR OCCUPATIONS, 2010 DOLLARS				
Occupations	**Wyoming**	**Colorado**	**Utah**	**United States**
Architecture and engineering occupations	66,640	80,100	70,310	75,550
Arts, design, entertainment, sports, and media occupations	36,080	49,440	41,960	52,290
Building and grounds cleaning and maintenance occupations	25,380	25,200	23,530	25,300
Business and financial operations occupations	59,790	68,410	59,030	67,690
Community and social services occupations	41,740	43,050	36,110	43,180
Computer and mathematical occupations	56,490	81,510	65,680	77,230
Construction and extraction occupations	45,360	42,630	39,160	43,870
Education training and library occupations	47,110	49,110	41,230	50,440
Farming, fishing and forestry occupations	28,480	27,460	26,120	24,330
Food preparation and serving-related occupations	20,630	22,100	20,690	21,240
Healthcare practitioner and technical occupations	68,170	73,100	69,130	71,280
Healthcare support occupations	27,780	29,200	25,250	26,920
Installation maintenance and repair occupations	46,740	44,010	42,260	42,810
Legal occupations	63,470	92,020	87,340	96,940
Life physical and social science occupations	50,900	70,170	54,110	66,390
Management occupations	81,110	107,470	88,080	105,440
Office and administrative support occupations	31,180	35,140	29,860	33,470
Personal care and service occupations	24,380	26,230	24,100	24,590
Production occupations	45,570	34,670	33,060	33,770
Protective service occupations	43,420	43,440	35,770	42,490
Sales and related occupations	30,740	39,780	34,710	36,790
Transportation and material moving occupations	37,800	34,160	32,820	32,660
Sales and related occupations	81,110	80,100	70,310	75,550
Transportation and material moving occupations	31,180	49,440	41,960	52,290
SOURCES: U.S. Bureau of Labor Statistics 2012a,b, c				

Unemployment

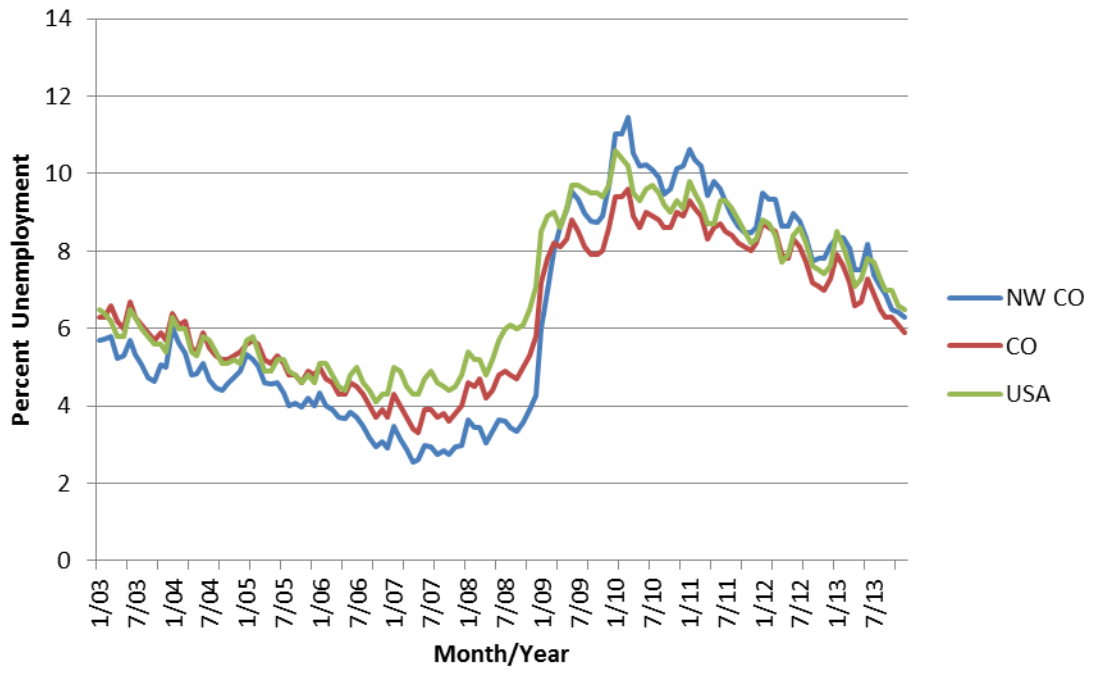
Monthly estimated unemployment rates for each of the five study area regions, the three states, and the nation are shown on Figures 3-4 through 3-8. There is a strong association between unemployment rates in these regions and those reported for their respective states. All of the study area regions experienced a decline in unemployment rates between 2001 and 2008, followed by a rise in unemployment rates from 2008 to 2010. Across all regions, as well as the nation, unemployment rates have peaked in 2009 or 2010, followed by slight decreases from 2011 to 2013. The Northwestern Colorado region shows the highest unemployment rates over this period, peaking at 11.5 percent in March of 2010 since 2008, although this general trend in unemployment follows that of rates similar to those in the other study area regions.

Beginning in 2010 until 2012, the Northwestern Colorado Region saw several periods where its unemployment rate was higher than that of the nation, while the Eastern Utah region's unemployment rate exceeded that of the nation once during that time. The Wasatch Front Region maintained comparably low rates of unemployment during this period, with approximately 6 to 84.5 percent of the population unemployed and seeking work, compared to 8 to 10 percent in the nation. In December 2013 (the most recent data available), the Northwest Colorado Region had the highest unemployment (6.3 percent), followed by the Central Utah Region (4.8 percent), the Southwest Wyoming (and Moffat County, Colorado) Region (4.2 percent), the Eastern Utah Region (4.0 percent), and the Wasatch Front Region (3.5 percent). In contrast, the nation's unemployment rate was 6.5 percent, higher than all of the study area regions. The national unemployment rate was also higher than that of Colorado (5.9 percent), Utah (3.7 percent), and Wyoming (4.5 percent).



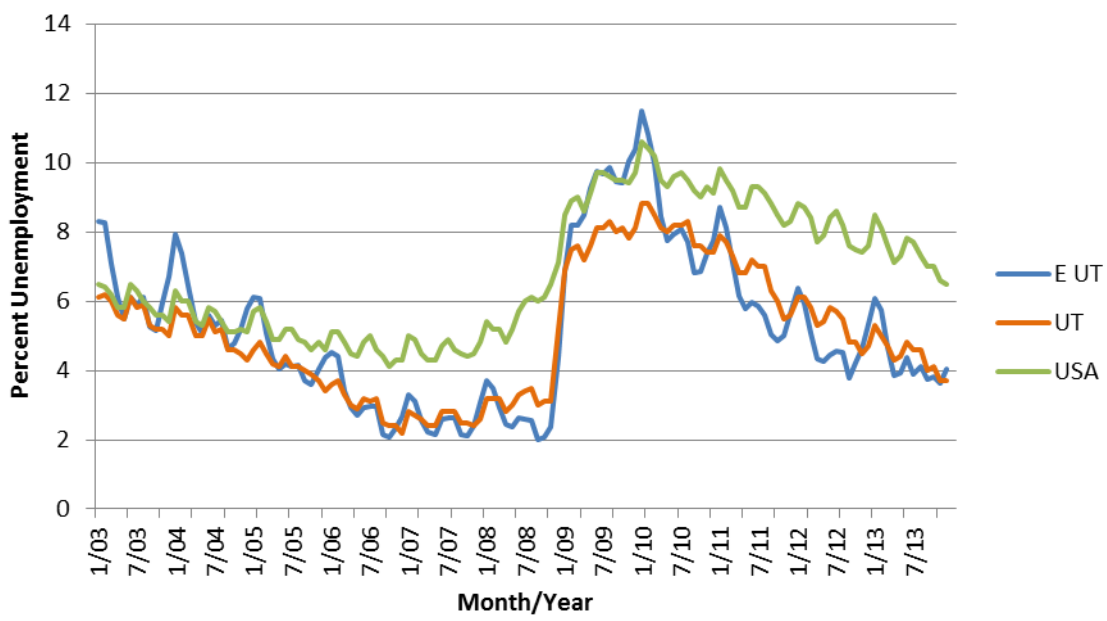
SOURCE: U.S. Bureau of Labor Statistics 2014

Figure 3-4 Southwestern Wyoming and Moffat County, Colorado Region (SW WY), States of Colorado and Wyoming, and the U.S. Unemployment Rates



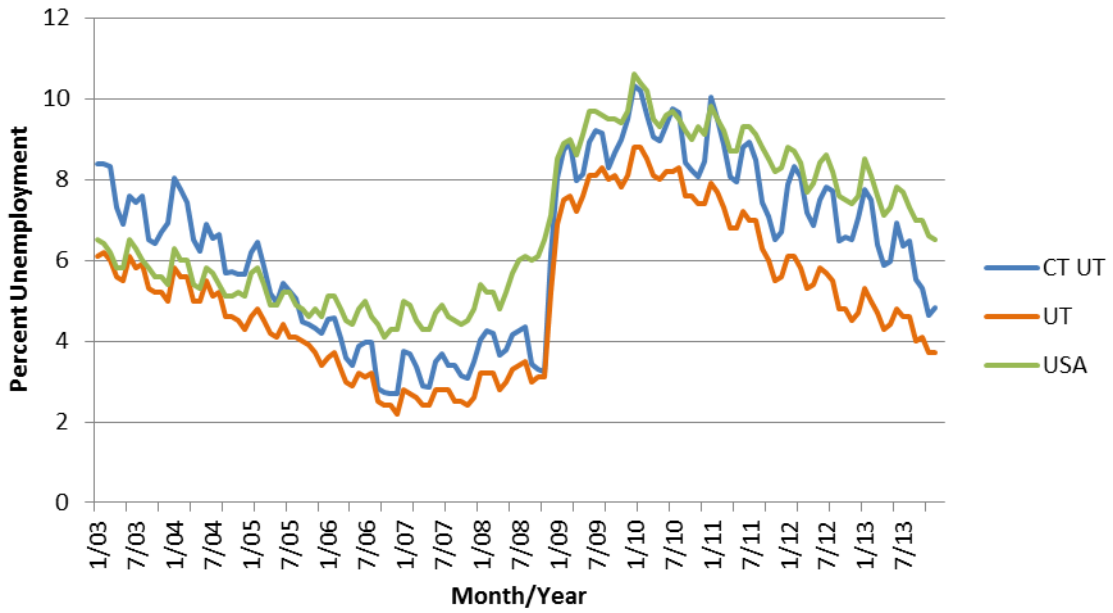
SOURCE: U.S. Bureau of Labor Statistics 2014

Figure 3-5 Northwestern Colorado Region (NW CO), State of Colorado, and the U.S. Unemployment Rates



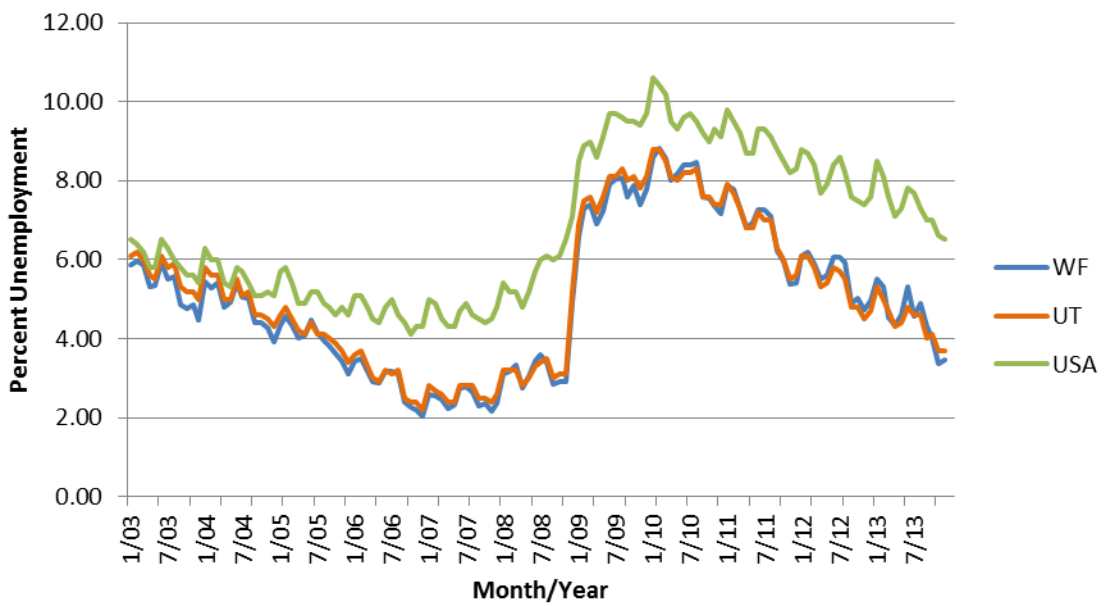
SOURCE: U.S. Bureau of Labor Statistics 2014

Figure 3-6 Eastern Utah Region (E UT), State of Utah, and the U.S. Unemployment Rates



SOURCE: U.S. Bureau of Labor Statistics 2014

Figure 3-7 Central Utah Region (CT UT), State of Utah, and the U.S. Unemployment Rates



SOURCE: U.S. Bureau of Labor Statistics 2014

Figure 3-8 Wasatch Front Region (WF), State of Utah, and the U.S. Unemployment Rates

3.2.22.3.6 Local Resources

This section describes property tax revenue, housing characteristics, construction industry gross domestic product, schools, and police and emergency services.

Property Valuation and Taxation

Local and state government entities generate a portion of their tax revenues by assessing and taxing certain categories of property. Real property is typically categorized by properties that are state assessed; mineral properties; and other classes of personal property, usually assessed at the county-level. Transmission lines and substations are usually termed industrial property and assessed through the state through various approaches— including market, cost and income approaches to value, which are further discussed in this section as well as in Section 3.2.22.5.

Property tax receipts are usually distributed to the county in which the property resides. The majority of the tax receipts fund school districts and can provide funding to cities, counties, and special districts for roads and streets, police, fire protection, and other services.

Wyoming

Property, or ad valorem, taxes are assessed both locally and by the State. County assessor offices establish taxable values for most properties in their borders. Property is valued initially at fair market value, to which an assessment of taxable value is applied. Taxable value or assessment value is determined by applying an assessment rate or percent of the fair market value of property in a particular property class. For example, the current assessment rates for Wyoming are as follows (Wyoming Department of Revenue 2013):

- Gross product of minerals and mine products – 100 percent
- Property used for industrial purposes – 11.5 percent
- All other property, real and personal (commercial and residential) – 9.5 percent

The Wyoming Ad Valorem Tax Division establishes state-assessed taxable values for mineral and non-mineral properties, including airlines, electric and gas distribution, pipelines, railroads and rail car, and telecommunication companies. In 2014 the electric utility, PacifiCorp, was the highest non-mineral state-assessed company with $229.0 million in assessed value.

Table 3-280 summarizes the assessed values and property tax revenues in the relevant counties of Wyoming and in the state. In 2014 Carbon and Sweetwater counties comprised $2.6 billion in state-assessed valuation, accounting for 16 percent of the state's assessed valuation. Mineral (includes oil and gas) valuation comprised more than 89 percent of the state's assessed valuation in the two-county region. Assessed valuation of major, municipal, and rural electric companies in the two-county region in 2014 was $117 million. All state-assessed values represent approximately 66 percent of the total assessed valuation in Wyoming. In 2014 property tax revenue in the two-county region comprised 15.5 percent of the property tax revenue received in the state.

TABLE 3-280
2014 WYOMING ASSESSED VALUATION AND PROPERTY TAX REVENUE

County	Total Assessed Value (dollars)	Total State-Assessed Value (dollars)	Percent of Total State Assessed Value	Total Property Taxes Levied (dollars)	Percent of Total State Property Tax Levied
Carbon	760,910,660	492,536,875	3.1	50,498,233	3.25
Sweetwater	2,829,595,031	2,119,868,631	13.4	190,736,068	12.29
Two-County Region	3,590,505,691	2,612,405,506	16.0	241,234,301	15.54
Wyoming	24,164,467,525	15,868,409,310	100.0	1,552,111,794	100.00

SOURCE: Wyoming Department of Revenue 2014

Colorado

Colorado is one of only 13 states that does not impose a state property tax (Colorado State Government 2014), although the state does assess certain types of properties, such as utilities, and apportions the taxes to the counties. Local governmental units assess property taxes primarily to fund public school operations and local government services. Colorado property taxes have three main components: the actual value of property, the assessment rate, and the mill levy. The local assessor establishes the actual value of the property and the property's classification (residential, commercial, personal, etc.). The Colorado Legislature determines the assessment rate, and local taxing entities determine the mill levy.

Real and personal property is taxable in Colorado unless specifically exempted by law. Real property includes land, buildings, and fixtures that are physically incorporated into a building or affixed to land and also includes possessory interests, which are private property interests or the right to the occupancy and use of an otherwise tax-exempt property. Personal property includes machinery, equipment, furniture, and other articles related to the business of a commercial or industrial operation. Public utilities are assessed property taxes by the state based on an assessment rate of 29 percent. The state also assesses rail transportation companies and airlines doing business in Colorado. The company valuations are then apportioned to the counties for collection of local property tax.

Table 3-281 summarizes the total assessed value in northwestern Colorado. This five-county region accounts for 10 percent of the state's assessed valuation with Moffat County having the greatest valuation in this region. This region accounts for approximately 5 percent of the state's total property taxes levied. State-assessed value comprises 7 percent of all assessed value in the state.

TABLE 3-281
2013 COLORADO ASSESSED VALUATION AND PROPERTY TAX REVENUE

County	Total Assessed Value (dollars)	Total State-Assessed Value (dollars)	Percent of Total State Assessed Value	Total Property Tax Levied (dollars)	Percent of Total State Property Tax Levied
Mesa	1,827,031,060	129,052,600	2.0	111,927,279	1.6
Garfield	2,896,931,830	95,430,300	1.5	132,076,279	1.9
Rio Blanco	1,295,816,610	99,015,500	1.6	52,370,086	0.8
Moffat	464,944,197	209,737,600	3.3	30,738,321	0.4
Routt	1,019,208,260	108,248,300	1.7	53,139,194	0.8
Study Area[1]	7,503,931,957	641,484,300	10.2	380,251,159	5.4
Colorado	88,600,929,755	6,320,491,977	100.0	7,001,474,004	100.0

SOURCE: Colorado Department of Local Affairs 2013
NOTE: [1]Includes the five Colorado counties in the study area

Utah

The state of Utah assesses and taxes utilities and natural resources located anywhere in the state's boundary. The amount of taxes owed to either the county or the state is determined by applying an appropriate tax rate to the taxable value of a category of property. Taxable value is equal to the fair market value of the property, minus any tax exemptions.

In Utah, property classified as real property includes land and buildings, while personal property refers to property that can be geographically moved (Utah State Tax Commission 2013). Local counties in Utah have the authority to assess and tax real and personal property located in county boundaries. Electric

transmission lines are considered unitary energy properties,[9] which include units that cross county lines and are assessed centrally through the state. The state also assesses natural resources, while real and personal property are assessed through county governments.

In 2013 the Utah total taxable value for both state and locally assessed property was approximately $201.3 billion, while total property tax revenue was $2.6 billion, an effective average tax rate of approximately 1.3 percent (Utah State Tax Commission 2013).

Table 3-282 summarizes total property taxes levied as well as utility property taxes levied for the 2013 fiscal year for the counties in the study area in Utah. During 2013 Utah County, located south of the Salt Lake City area in the Wasatch Front Region, generated 12 percent of Utah's property taxes levied, of which utility property taxes levied accounted for approximately 4 percent. Utility taxes levied accounted for $166 million or approximately 6 percent of the state's property taxes levied. PacifiCorp was Utah's second largest centrally assessed property in 2013. Utility taxes levied account for a considerable portion of county taxes levied in Emery, Juab, and Utah counties.

TABLE 3-282
2013 UTAH PROPERTY TAX REVENUE BY COUNTY

County	Property Tax Levied (dollars)	Percent of State Property Tax Levied	Utility Property Tax Levied (dollars)	Utility Tax to Total Tax Levied in the County (Percent)
Carbon	22,851,456	0.88	2,999,802	13.13
Daggett	2,344,817	0.09	980,196	41.80
Duchesne	27,341,496	1.05	1,279,098	4.68
Emery	25,288,058	0.97	19,372,429	76.61
Grand	12,898,295	0.50	1,365,140	10.58
Juab	10,250,793	0.39	4,669,984	45.56
Sanpete	14,920,141	0.57	691,059	4.63
Uintah	54,495,957	2.09	3,993,421	7.33
Utah	318,463,850	12.23	13,811,519	4.34
Wasatch	42,824,944	1.65	722,665	1.69
State of Utah	2,603,159,199	100	165,828,317	6.37

SOURCE: Utah State Tax Commission 2013

Table 3-283 summarizes total property taxes levied, as well as taxes levied by utilities, for each of the study areas in Utah. The Wasatch Front Region has the greatest property taxes levied as compared with the other two study areas, accounting for almost 15 percent of Utah's property taxes generated in 2013. The Central Utah Region is most reliant on utility taxes, which account for 17 percent of the property taxes levied in this region.

TABLE 3-283
2013 PROPERTY TAX REVENUE BY UTAH REGIONAL STUDY AREAS

Study Area in Utah	Property Taxes Levied (dollars)	Percent of Utah's Property Taxes Levied	Utility Property Taxes Levied (dollars)	Percent of Utility Property Taxes Levied to Total Property Taxes Levied in the Study Area
Central Utah	73,471,176	2.82	27,733,274	16.72
Eastern Utah	84,837,811	3.26	7,617,855	4.59
Wasatch Front	380,985,378	14.64	14,534,184	8.76

SOURCE: Utah State Tax Commission 2012a

[9]Energy properties include the operating property of natural gas pipelines, natural gas distribution companies, liquid petroleum products pipelines, and electric corporations, including electric generation, transmission, and distribution companies, and other similar entities (Utah State Tax Commission 2008).

Construction

Gross Domestic Product

Construction values can provide an indicator of the health of an economy. In addition, the construction industry would be an integral part of the development of the transmission line. Construction gross domestic product (GDP) was only available at the state level and for U.S. Census Bureau-designated metropolitan statistical areas. There are two metropolitan statistical areas in the study area: Grand Junction, Colorado, and Provo-Orem, Utah.

In general, both Colorado and Utah construction sectors have begun to come back after the 2008/2009 downturn. Colorado construction GDP dropped more than the other states and metropolitan areas during the recession period and has begun to rebound but is still considerably lower than pre-2008 values and Grand Junction follows this similar pattern. Wyoming's construction GDP was much more stable between 2006 and 2012.

More specifically, in Provo/Orem the construction GDP between 2007 and 2010 declined and then increased between 2010 and 2012. Grand Junction experienced a small decline between 2009 and 2011 and increased slightly in 2012. Colorado and Utah have experienced decreases in construction GDP since 2007, while both increased slightly in 2012. The construction industry GDP values are summarized in Table 3-284 and Figure 3-9.

TABLE 3-284
CONSTRUCTION INDUSTRY GROSS DOMESTIC PRODUCT FOR 2001 TO 2012
(MILLIONS OF 2012 DOLLARS)

Year	Region				
	Grand Junction, Colorado (metropolitan statistical area)	Provo-Orem, Utah (metropolitan statistical area)	Colorado	Wyoming	Utah
2002	293	571	11,889	1,225	4,029
2003	291	592	11,536	1,248	4,148
2004	302	717	12,151	1,275	4,750
2005	346	837	13,257	1,436	5,741
2006	382	1,054	13,863	1,731	7,113
2007	423	1,288	14,270	2,037	8,153
2008	460	1,116	13,370	2,190	7,098
2009	386	843	11,612	1,906	5,954
2010	278	795	10,213	1,883	5,639
2011	268	844	10,067	1,757	5,728
2012	269	1,032	10,738	1,877	6,209

SOURCE: U.S. Bureau of Economic Analysis 2015d
NOTE: Values were adjusted for inflation using the Consumer Price Index published by the Executive Office of the President, Office of Management and Budget and are reported in 2012 dollars.

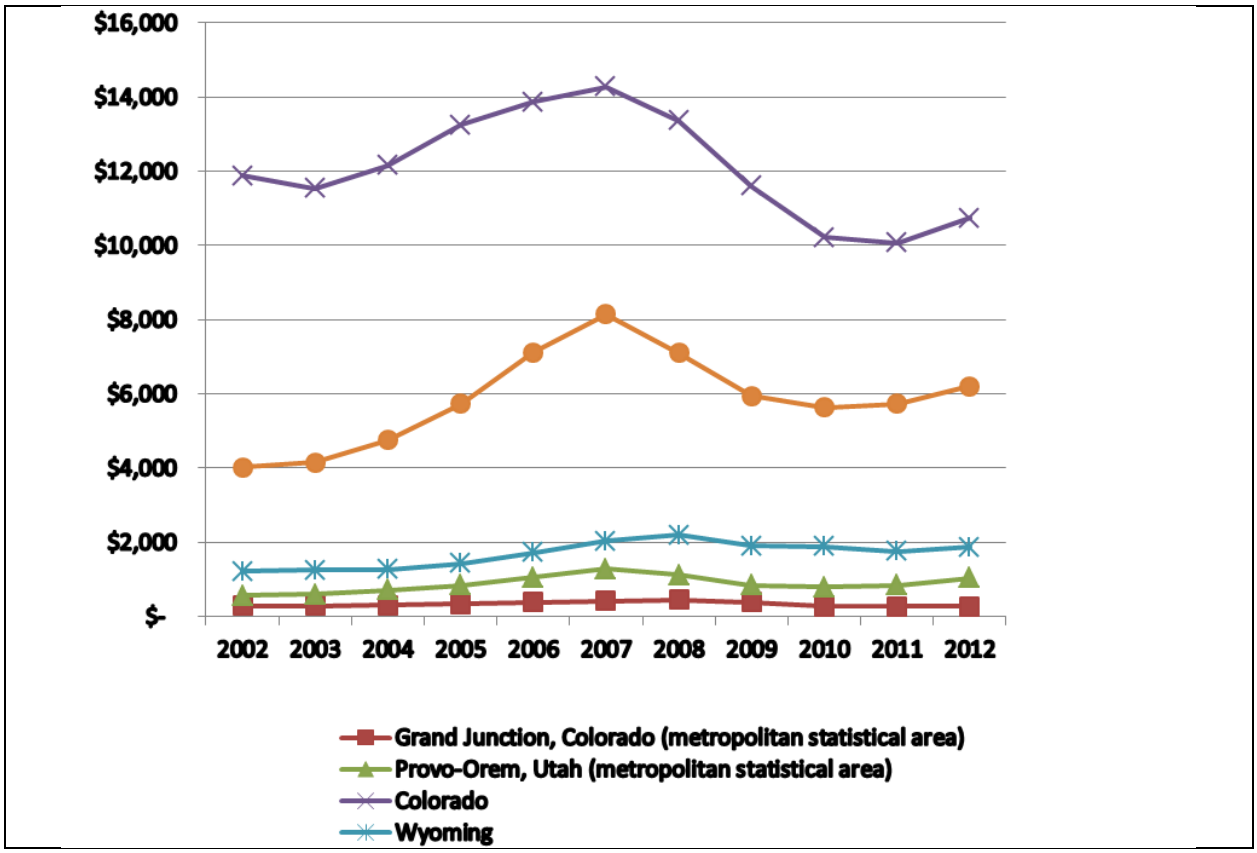


Figure 3-9 Construction GDP in Colorado, Utah, Wyoming, Provo-Orem, and Grand Junction

Housing Resources

This section provides information on the availability of housing in the study area regions, including occupied and vacant housing units, vacant housing units available for rent, and the numbers of hotels, motels, and RV parks. This section provides information on the availability of housing in the study area regions, including occupied and vacant housing units, vacant housing units available for rent, and the numbers of hotels, motels, and RV parks. In addition, occupancy information for hotels, motels, and RV parks is provided, if it was available. Housing data is available from the 2012 U.S. Census American Community Survey and provides detailed information for the counties in each of the study area regions, summarized in the first table in each study area region section. The second table provides housing data, including number of housing units, vacant units, renter occupied units, and rental and homeowner vacancy rates for cities, towns, and census-designated places within 20 miles of the alternative routes in each of the study area regions and the largest population centers in each of the study area regions.

Southwestern Wyoming and Moffat County, Colorado Region

In the Southwestern Wyoming and Moffat County, Colorado Region, there were approximately 34,000 housing units in 2012, 83 percent of which were occupied. The majority of these housing units were in Sweetwater County, Wyoming. It should be noted that many of the vacant housing units are for seasonal,

recreation, or occasional use. There were approximately 5,561 vacant rental units in 2012 in this region, with a vacancy rental rate of almost 10 percent or 838 housing units available for rent.[10] Rental costs were highest in Sweetwater County, Wyoming, with median gross monthly rent of $881. Housing characteristics for the counties in the Southwestern Wyoming and Moffat County, Colorado Region are presented in Table 3-285.

TABLE 3-285
HOUSING CHARACTERISTICS IN SOUTHWESTERN WYOMING AND MOFFAT COUNTY, COLORADO REGION, 2012

Housing Characteristics	Moffat County, Colorado	Carbon County, Wyoming	Sweetwater County, Wyoming	Southwestern Wyoming Region	Relevant Percentage for Southwestern Wyoming Region	Wyoming
Total Housing Units	6,179	8,580	18,624	33,383	–	261,430
Occupied	5,243	6,044	16,535	27,822	83	221,479
Vacant	936	2,536	2,089	5,561	17	39,951
For rent	152	269	417	838	3	5,825
Rented or sold, not occupied	98	47	319	464	1	2,610
For sale only	162	92	170	424	1	2,711
For seasonal, recreational or occasional use	360	1,343	433	2,136	6	18,027
All other vacants	164	785	750	1,699	5	10,778
Owner-Occupied Housing Units	3,922	4,425	11,792	20,139	60	155,659
Renter-Occupied Housing Units	1,321	1,619	4,743	7,683	23	65,820
Rental Vacancy Rate	9.8	14.1	7.8	9.8	–	7.9
Median Gross Rent	$738	$701	$881	$775	–	$733

SOURCES: U.S. Census Bureau 2014a

The housing characteristics for the cities, towns, and places in Southwest Wyoming Region are summarized in Table 3-286. The largest communities with housing resources in proximity to the Project in Southwest Wyoming Region are Craig, Green River, Rawlins, Rock Springs, and Saratoga. Although Craig and Rawlins are within 20 miles of the closest alternative route, Saratoga, Green River, and Rock Springs are located 20, 73, and 60 miles from the closest Wyoming/Colorado alternative route, respectively. These five communities had 2,827 vacant housing units in 2012 with rental vacancy rates ranging from 0 to 19 percent, reflecting the relatively low availability of rental housing units. For example, the town of Rawlins has 966 renter-occupied units with a rental vacancy rate of 19.1 percent, resulting in approximately 185 vacant rental unit available for rent. In addition, the housing annual average data may not reflect the vacant status of housing units in the summer months when there is a higher demand for housing from tourism, construction, and oil and gas activities.

[10]According to the U.S. Census, the rental vacancy rate is the proportion of the rental inventory that is vacant for rent. It is computed by dividing the total number of vacant units for rent by the sum of the renter-occupied units, vacant units for rent, and vacant units that have been rented but not yet occupied and then multiplying by 100.

TABLE 3-286
HOUSING CHARACTERISTICS FOR PLACES IN SOUTHWESTERN WYOMING AND MOFFAT COUNTY, COLORADO REGION, 2012

Populated Place	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Renter Occupied Units	Homeowner Vacancy rate (percent)	Rental vacancy rate (percent)
Baggs, Wyoming	189	149	40	37	2.6	22.0
Craig, Colorado	3,941	3,492	449	1,086	1.8	11.3
Dinosaur, Colorado	179	147	32	13	0.0	23.5
Dixon, Wyoming	85	42	43	0	12.5	–
Elk Mountain, Wyoming	125	86	39	30	11.1	23.1
Green River, Wyoming[1]	4,773	4,474	299	1,191	0.7	7.7
Hanna, Wyoming	536	361	175	95	3.8	10.7
Medicine Bow, Wyoming	193	115	78	17	0.0	13.0
Rawlins, Wyoming	3,828	3,150	678	966	1.8	19.1
Rock Springs, Wyoming[1]	10,125	8,937	1,188	3,082	2.4	6.3
Saratoga, Wyoming[1]	1,052	839	213	97	0.0	0.0
Sinclair, Wyoming	257	221	36	31	5.3	0.0
Table Rock, Wyoming	33	0	33	0	–	–
Wamsutter, Wyoming	198	137	61	56	0.0	28.6

SOURCE: U.S. Census Bureau 2014
Note: A "–" entry in the estimate column indicates that either no sample observations or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest interval or upper interval of an open-ended distribution.
[1]Indicates the town or city is located more than 20 miles from the closest alternative route.

Additionally, according to the Wyoming Office of Tourism (2014), there are at least 12 RV parks in the Southwestern Wyoming Region, not including state and national parks and RV campgrounds, as well as 80 hotels and motels in the area. However, many of these hotels and motels have high occupancy rates during the spring, summer, and fall months. For example, in Rock Springs, over the past 4 years, May and September occupancy rates have ranged from 72 to 83 percent, while occupancy rates in June, July, and August are higher, ranging from 79 to 90 percent (Rock Springs Chamber of Commerce 2015). Craig, Colorado has little available lodging in summer and fall due to temporary workers and hunters, respectively (Oxley 2015).

Northwestern Colorado Region

In the Northwestern Colorado Region, approximately 105,600 housing units existed in 2012, 87 percent of which were occupied. The majority of these housing units were in Mesa County, Colorado, which houses the city of Grand Junction. There were more than 2,000 vacant rental units in 2012 in the region. It should be noted that many of the vacant housing units are for seasonal, recreation, or occasional use. Approximately 7 percent of the rental units were available for rent in 2012. Rental costs are highest in Routt and Garfield counties, ranging from $1,100 to $1,200 per month. Housing characteristics for the Northwestern Colorado Region are summarized in Table 3-287.

Additionally, according to the Colorado Tourism website (2014), there are at least 7 RV parks in northwestern Colorado, not including state and national parks and RV campgrounds, as well as 25 hotels and motels in the communities of Craig, Grand Junction, and Fruita, Colorado.

TABLE 3-287
HOUSING CHARACTERISTICS FOR NORTHWESTERN COLORADO REGION, 2012

Housing Characteristics	Garfield County, Colorado	Mesa County, Colorado	Rio Blanco County, Colorado	Routt County, Colorado	Northwestern Colorado Region	Relevant Percentage for Northwestern Colorado Region	Colorado
Total Housing Units	23,177	62,555	3,164	16,131	105,027	–	2,211,615
Occupied	20,272	58,635	2,540	9,833	91,280	87	1,962,753
Vacant	2,905	3,920	624	6,298	13,747	13	248,862
For rent	910	513	61	568	2,052	2	47,272
Rented or sold, not occupied	175	236	81	193	685	1	17,358
For sale only	115	499	73	201	888	1	29,511
For seasonal, recreational or occasional use	941	1,442	284	4,721	7,388	7	107,034
All other vacants	764	1,230	125	615	2,734	3	47,687
Owner-Occupied Housing Units	13,494	41,993	1,772	6,928	64,187	61	1,293,951
Renter-Occupied Housing Units	6,778	16,642	768	2,905	27,093	26	668,802
Rental Vacancy Rate	11.7	3.0	7.2	15.9	7.0	–	6.5
Median Gross Rent	$1,133	$848	$709	$1,201	$1,064	–	$915
Median Value of Owner Occupied Housing (2010 dollars)	23,177	62,555	3,164	16,131	105,027	–	2,211,615
Median Monthly Owner Mortgage Costs	20,272	58,635	2,540	9,833	91,280	87	1,962,753

SOURCES: U.S. Census Bureau 2014

The housing characteristics for the cities, towns, and places closest to the alternative routes as well as the larger communities in the Northwestern Colorado Region are summarized in Table 3-288. The largest communities with housing resources in proximity to the Project are Clifton, Fruita, Grand Junction, Rangeley, Redlands, and Steamboat Springs. Although Fruita and Rangeley are within 20 miles of the closest alternative route, Clifton, Grand Junction, Redlands, and Steamboat Springs are located 30, 27, 22, and 30 miles from the closest alternative route, respectively. These six communities had 7,160 vacant housing units in 2012. These six communities had rental vacancy rates ranging from 0 to 20 percent, reflecting the relatively low availability of rental housing units. The vast majority of vacant units are located in Steamboat Springs, most of which may not be available for rent (20 percent rental vacancy rate). In addition, the housing annual average data may not reflect the vacant status of housing units in the summer months.

TABLE 3-288
HOUSING CHARACTERISTICS FOR PLACES IN NORTHWESTERN COLORADO REGION, 2012

Populated Place	Total Housing Units	Occupied Housing units	Vacant Housing units	Renter Occupied Units	Homeowner Vacancy Rate (percent)	Rental Vacancy Rate (percent)
Clifton[1]	8,113	7,801	312	2,153	0.0	0.0
Fruita	5,032	4,706	326	1,144	1.9	3.2
Grand Junction[1]	26,115	24,593	1,522	9,280	1.7	3.8
Hayden	915	813	102	327	2.6	6.8
Rangely	1,052	836	216	235	6.3	8.9
Redlands[1]	3,570	3,370	200	547	0.0	0.0
Steamboat Springs[1]	9,678	5,094	4,584	1,807	3.1	20.0

SOURCE: U.S. Census Bureau 2014
NOTE: [1]Indicates the town or city is located more than 20 miles from the closest alternative route.

Additionally, according to the Colorado Tourism website (2014), there are at least 7 RV parks in northwestern Colorado, not including state and national parks and RV campgrounds, as well as 25 hotels and motels in the communities of Craig, Grand Junction, and Fruita, Colorado. However, many of these hotels and motels may have high occupancy rates during the summer and fall months during the construction, tourism, and hunting seasons. In addition, Grand Junction and its suburbs (i.e., Clifton and Redlands) are located approximately 80 miles from Alternative COUT-C and 28 miles from Alternative COUT-BAX-B.

Eastern Utah Region

In the Eastern Utah Region, approximately 27,000 housing units existed in 2012, 80 percent of which were occupied. The majority of these housing units were in Duchesne and Uintah counties. There were 5,400 vacant housing units in the Region, of which 500 were available for rent. It should be noted there are a large number of vacant housing units that are for seasonal, recreation, or occasional use and are not necessarily available for rent. Rental costs were highest in Uintah County, while the lowest rental costs were in Duchesne County. Housing characteristics for Eastern Utah Region in 2012 are summarized in Table 3-289. According to Utah Travel Industry, there are 29 RV parks in the Vernal, Roosevelt, and Duchesne, Utah, region as well as 29 hotels and motels (Utah Travel Industry 2013b).

TABLE 3-289
HOUSING CHARACTERISTICS FOR EASTERN UTAH REGION, 2010

Housing Characteristics	Daggett County, Utah	Duchesne County, Utah	Uintah County, Utah	Grand County, Utah	Eastern Utah Region	Relevant Percentage for Eastern Utah Region	Utah
Total Housing Units	1,140	9,353	11,868	4,850	27,211	–	979,848
Occupied	343	6,827	10,957	3,690	21,817	80	880,873
Vacant	797	2,526	911	1,160	5,394	20	98,975
For rent	4	67	192	256	519	2	16,116
Rented or sold, not occupied	37	158	166	60	421	2	7,032
For sale only	19	165	94	127	405	1	12,251
For seasonal, recreational or occasional use	709	1,814	75	588	3,186	12	45,759
All other vacants	28	322	384	129	863	3	17,817
Owner-Occupied Housing Units	237	5,121	8,178	2,521	16,057	59	620,475

TABLE 3-289
HOUSING CHARACTERISTICS FOR EASTERN UTAH REGION, 2010

Housing Characteristics	Daggett County, Utah	Duchesne County, Utah	Uintah County, Utah	Grand County, Utah	Eastern Utah Region	Relevant Percentage for Eastern Utah Region	Utah
Renter-Occupied Housing Units	106	1,706	2,779	1,169	5,760	21	260,398
Rental Vacancy Rate	3.6	3.8	6.5	17.2	8.3	–	5.8
Median Gross Rent	$900	$771	$921	$861	$835	–	$839

SOURCE: U.S. Census Bureau 2014b

The housing characteristics for the cities, towns, and places within 20 miles of the alternative routes and for larger towns in the Eastern Utah Region are summarized in Table 3-290. The largest communities with housing resources in proximity to the Project are Castle Valley, Moab, Roosevelt, and Vernal. Although Roosevelt and Vernal are located within 20 miles of the closest alternative route, Moab and Castle Valley are located 27 and 21 miles from Alternatives COUT-BAX-B and COUT BAX-C. These four communities had 854 vacant housing units in 2012. However, the housing annual average data may not reflect the vacant status of housing units in the summer months when the majority of construction activity typically occurs. These four communities had rental vacancy rates ranging from 3 to 31 percent, reflecting the relatively low availability of rental housing units. A large number of vacant units are located in Moab, most of which may not be available for rent (14 percent rental vacancy rate). Roosevelt and Vernal, Utah, had 790 and 1,378 occupied rental units and the rental vacancy rates are 3.5 and 12.0 percent, respectively, resulting in 28 and 165 vacant rental units available for rent.

TABLE 3-290
HOUSING CHARACTERISTICS FOR PLACES IN EASTERN UTAH REGION, 2012

Populated Place	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Renter Occupied Units	Homeowner Vacancy Rate (percent)	Rental Vacancy Rate (percent)
Altamont	138	131	7	43	2.2	8.5
Ballard	231	215	16	38	5.3	0.0
Castle Valley	271	159	112	11	2.0	31.3
Duchesne	877	797	80	321	0.0	2.4
Fort Duchesne	226	207	19	91	0.0	4.2
Maeser	1,245	1,147	98	167	0.0	0.0
Moab	2,419	2,083	336	902	3.0	13.9
Myton	273	240	33	106	0.0	9.9
Naples	635	616	19	71	0.0	0.0
Neola	136	126	10	22	0.0	0.0
Randlett	109	76	33	0	0.0	–
Roosevelt	2,337	2,208	129	790	2.0	3.5
Tabiona	140	75	65	5	0.0	0.0
Vernal	3,661	3,384	277	1,378	0.6	12.0

SOURCE: U.S. Census Bureau 2014b
NOTE: A "–" entry in the estimate column indicates that either no sample observations or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest interval or upper interval of an open-ended distribution.

Additionally, according to Utah Travel Industry, there are 29 RV parks in the Vernal, Roosevelt, and Duchesne, Utah, region as well as 29 hotels and motels (Utah Travel Industry 2013b). In the Town of Vernal, seasonal vacancy rates, which account for both hotels and RV parks, reached approximately 62

percent during the spring and summer seasons from recreational and tourism visitation and travel. In the winter months, October through March, vacancy rates for hotels and motels are approximately 50 percent from business and industry activities in the area (Coltharp 2015). In Uintah County, where Vernal is located, occupancy rates range from 50 to 70 percent in the spring, summer, and fall months (University of Utah 2014a).

Wasatch Front Region

In the Wasatch Front Region, approximately 159,000 housing units existed in 2012, 93 percent of which were occupied. The majority of these housing units were in Utah County. There were approximately 1,500 vacant rental units in 2012 in this region, reflecting a rental vacancy rate of 3 percent. A considerable number of the vacant housing units are for seasonal, recreation, or occasional use. Rental costs were slightly higher in Wasatch County than those in Utah County. Housing characteristics for the Wasatch Front Region are summarized in Table 3-291.

TABLE 3-291
HOUSING CHARACTERISTICS FOR WASATCH FRONT REGION, 2010

Housing Characteristics	Utah County	Wasatch County	Wasatch Front Region	Relevant Percentage for Wasatch Front Region	Utah
Total Housing Units	148,683	10,619	159,302	–	979,848
Occupied	141,252	7,372	148,624	93	880,873
Vacant	7,431	3,247	10,678	7	98,975
For rent	1,404	81	1,485	1	16,116
Rented or sold, not occupied	625	73	698	0	7,032
For sale only	1,637	171	1,808	1	12,251
For seasonal, recreational or occasional use	1,366	2,643	4,009	3	45,759
All other vacants	2,399	279	2,678	2	17,817
Owner-Occupied Housing Units	96,751	5,661	102,412	64	620,475
Renter-Occupied Housing Units	44,501	1,711	46,212	29	260,398
Rental Vacancy Rate	3.0	4.5	3.1	–	5.8
Median Gross Rent	$843	$954	$877	–	$839

SOURCES: U.S. Census Bureau 2014b

The housing characteristics for the cities, towns, and places within 20 miles of the alternative routes as well as larger towns and cities in the Wasatch Front Region are summarized in Table 3-292. The largest communities with housing resources in proximity to the Project are Lehi, Orem, Provo, Spanish Fork, and Springville. Of these five communities, Lehi and Orem are located 33 and 23 miles from the closest alternative route. These five communities had 4,335 vacant housing units in 2012. However, the housing annual average data may not reflect the vacant status of housing units in the summer months when the majority of construction and tourism activity typically occurs. These five communities had rental vacancy rates ranging from 1 to 5 percent, reflecting the very low availability of rental housing units. For example, Provo has rental-occupied units of 18,200 with a rental vacancy rate of 18 percent, resulting in approximately 328 rental units available for rent.

TABLE 3-292
HOUSING CHARACTERISTICS FOR PLACES IN WASATCH FRONT REGION, 2012

Populated Place	Total Housing Units	Occupied Housing units	Vacant Housing units	Renter Occupied Units	Homeowner Vacancy Rate (percent)	Rental Vacancy Rate (percent)
Benjamin	398	375	23	43	0.0	0.0
Elberta	64	64	0	34	0.0	0.0
Elk Ridge	627	589	38	24	3.3	0.0
Genola	382	371	11	63	0.0	0.0
Goshen	373	338	35	44	0.0	18.5
Lake Shore	188	188	0	0	0.0	–
Lehi[1]	12,452	12,084	368	2,074	0.5	2.8
Mapleton	2,014	1,921	93	210	2.0	7.9
Orem[1]	27,486	26,310	1,176	9,969	1.3	5.2
Palmyra	218	207	11	54	0.0	0.0
Payson	5,235	5,054	181	1,261	0.7	1.8
Provo	33,633	31,670	1,963	18,204	3.3	1.8
Rocky Ridge	193	191	2	100	0.0	0.0
Salem	1,867	1,829	38	284	0.4	1.4
Santaquin	2,380	2,266	114	375	1.9	12.6
Spanish Fork	9,665	9,165	500	2,040	2.9	1.3
Spring Lake	153	153	0	49	0.0	0.0
Springville	9,127	8,799	328	2,168	1.0	6.0
West Mountain	265	250	15	42	0.0	0.0
Woodland Hills	377	359	18	2	0.0	66.7

SOURCE: U.S. Census Bureau 2014b
NOTES:
A "–" entry in the estimate column indicates that either no sample observations or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest interval or upper interval of an open-ended distribution.
[1]Indicates the town or city is located more than 20 miles from the closest alternative route.

Additionally, there are a considerable number of hotels and motels located in the Wasatch Front in the nearby communities of Nephi, Provo, and Springville, Utah (Utah Travel Industry 2013b). Occupancy rates in Utah County have ranged from 60 to 80 percent in the spring, summer, and fall months (University of Utah 2014b).

Central Utah Region

In the Central Utah Region, almost 28,000 housing units existed in 2012, 80 percent of which were occupied. The majority of these housing units were in Carbon and Sanpete counties. It should be noted that many of the vacant housing units are for seasonal, recreation, or occasional use, although there were more than 500 vacant rental units in 2012 in this region. Rental costs were highest in Juab County, while the lowest rental costs were in Sanpete and Carbon counties. Housing characteristics for Central Utah Region are summarized in Table 3-293.

TABLE 3-293
HOUSING CHARACTERISTICS FOR CENTRAL UTAH REGION, 2012

Housing Characteristics	Carbon County, Utah	Emery County, Utah	Sanpete County, Utah	Juab County, Utah	Central Utah Region	Relevant Percentage for Central Utah	Utah
Total Housing Units	9,528	4,474	10,276	3,498	27,776	–	979,848
Occupied	7,760	3,651	7,777	3,049	22,237	80	880,873
Vacant	1,768	823	2,499	449	5,539	20	98,975
For rent	282	103	93	69	547	2	16,116
Rented or sold, not occupied	258	102	13	6	379	1	7,032
For sale only	189	72	155	59	475	2	12,251
For seasonal, recreational or occasional use	538	268	1,700	130	2,636	9	45,759
All other vacants	501	278	538	185	1,502	5	17,817
Owner-Occupied Housing Units	5,451	2,906	5,912	2,428	16,697	60	620,475
Renter-Occupied Housing Units	2,309	745	1,865	621	5,540	20	260,398
Rental Vacancy Rate	10.5	11.6	4.7	10.0	9.0	–	5.8
Median Gross Rent	$584	$608	$585	$751	$602	–	$839

SOURCES: U.S. Census Bureau 2014b

The housing characteristics for the cities, towns, and places within 20 miles of the alternative routes as well as larger towns and cities in the Central Utah Region are summarized in Table 3-294. The largest communities with housing resources in proximity to the Project are Ephraim, Helper, Manti, Mount Pleasant, Nephi, and Price. Of these six communities, Manti is located 23 miles from the closest alternative route and all other communities are located within 20 mile of the closest alternative route. These six communities had 1,371 vacant housing units in 2012. These six communities had rental vacancy rates ranging from 0 to 25 percent. For example, Price has 1,124 rental-occupied units with a rental vacancy rate of 10.1 percent, resulting in approximately 114 rental units available for rent.

TABLE 3-294
HOUSING CHARACTERISTICS FOR PLACES IN CENTRAL UTAH REGION, 2012

Populated Place	Total Housing Units	Occupied Housing units	Vacant Housing units	Renter Occupied Units	Homeowner Vacancy Rate (percent)	Rental Vacancy Rate (percent)
Castle Dale, Utah	696	634	62	120	1.0	0.0
Clawson, Utah	65	50	15	17	0.0	0.0
Cleveland, Utah	193	169	24	28	4.1	0.0
East Carbon, Utah	763	564	199	108	7.0	4.1
Elmo, Utah	134	103	31	29	0.0	29.3
Ephraim, Utah	1,767	1,542	225	733	6.9	0.0
Eureka, Utah	336	260	76	51	8.3	10.5
Fairview, Utah	650	588	62	91	0.0	5.2
Ferron, Utah	627	540	87	76	3.1	27.5
Fountain Green, Utah	386	309	77	36	3.7	21.7
Green River, Utah	459	369	90	141	10.2	5.8

TABLE 3-294
HOUSING CHARACTERISTICS FOR PLACES IN CENTRAL UTAH REGION, 2012

Populated Place	Total Housing Units	Occupied Housing units	Vacant Housing units	Renter Occupied Units	Homeowner Vacancy Rate (percent)	Rental Vacancy Rate (percent)
Helper, Utah	1,160	904	256	225	2.1	24.9
Huntington, Utah	993	838	155	214	1.5	18.1
Levan, Utah	361	305	56	46	0.0	29.2
Manti, Utah[1]	1,150	1,002	148	163	4.0	9.9
Mona, Utah	402	374	28	55	2.7	0.0
Moroni, Utah	522	490	32	100	0.0	0.0
Mount Pleasant, Utah	1,156	962	194	233	3.4	16.8
Nephi, Utah	1,846	1,650	196	318	2.3	11.7
Orangeville, Utah	457	388	69	69	2.9	0.0
Price, Utah	3,291	2,939	352	1,124	3.5	10.1
Scofield, Utah	63	19	44	5	0.0	0.0
Spring City, Utah	520	351	169	80	0.0	0.0
Sunnyside, Utah	191	164	27	48	7.9	0.0
Wales, Utah	114	96	18	8	0.0	0.0
Wellington, Utah	768	659	109	227	1.9	15.9

SOURCE: U.S. Census Bureau 2014b
NOTES:
A "–" entry in the estimate column indicates that either no sample observations or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest interval or upper interval of an open-ended distribution.
[1]Indicates the town or city is located more than 20 miles from the closest alternative route.

In Central Utah Region, there are approximately 20 RV parks and 7 hotels and motels in the Price and Huntington, Utah area (Utah Travel Industry 2013b). Carbon County has experienced occupancy rates between 60 and 75 percent (University of Utah 2014c).

Schools

In 2012 a total of 389 schools were located in the 17-county study area, attended by approximately 200,448 students (U.S. Department of Education 2015). School information is presented in detail in the Gateway South Socioeconomic Baseline Assessment (Louis Berger Group 2012), including county, school district, number of schools, and enrollment figures for the 2011/2012 school year. Aggregate school information by study area region is presented in Table 3-295.

TABLE 3-295
SCHOOLS IN THE STUDY AREA REGIONS

Region	Number of Schools	Number of Students Served	2012 Population	Number of Schools per Capita
Southwestern Wyoming and Moffat County, Colorado Region	49	12,690	73,486	0.000669234
Northwestern Colorado Region	79	27,832	233,287	0.000339049
Eastern Utah Region	37	13,645	61,479	0.000602351
Wasatch Front Region	176	131,535	540,094	0.000325786
Central Utah Region	48	14,746	70,447	0.000686371
Total	389	200,448	978,793	0.000397826

SOURCE: U.S. Department of Education 2015

Police Protection and Emergency Services

A total of 66 police departments and sheriff's offices provide emergency services throughout the study area (USACOPS 2015). Utah County, Utah and Garfield County, Colorado have the largest numbers of law enforcement establishments. Utah County operations 14 police departments, while Garfield County operates 6. Each of the 17 counties in the study area also has its own sheriff's department. These law enforcement services are detailed in the Gateway South Socioeconomic Baseline Assessment (Louis Berger Group 2012). Each state maintains a fully empowered law enforcement agency with statewide jurisdiction. These state police agencies operate as part of either the Department of Transportation (Wyoming Highway Patrol) or the Department of Public Safety (Utah Highway Patrol and Colorado State Patrol).

Fire-fighting services are located at 156 professional and volunteer-run fire stations throughout the study area with a combined response force of 3,368 personnel (U.S. Fire Administration n.d.). The fire-fighting services are detailed in the Gateway South Socioeconomic Baseline Assessment (Louis Berger Group 2012) and summarized in Table 3-296. Utah County maintains the highest number of such facilities in the study area with a total of 20 individual fire and emergency response departments.

TABLE 3-296
EMERGENCY FIREFIGHTING SERVICES LOCATED IN THE 17-COUNTY STUDY AREA

Region	Number of Fire Stations	Personnel	Regional Population	Population Per Emergency Service Personnel
Southwestern Wyoming and Moffat County, Colorado	38	630	73,486	117
Northwestern Colorado	45	823	233,287	283
Eastern Utah	14	196	61,479	314
Wasatch Front	36	787	540,094	686
Central Utah	23	932	70,447	76

SOURCES: U.S. Fire Administration 2012 n.d.

Numerous hospitals are located throughout the 17-county study area. These are summarized in Table 3-297.

TABLE 3-297
HOSPITALS AND MEDICAL CENTERS LOCATED IN THE 17-COUNTY AREA, 2011

Region	Number of Hospitals	Number of Hospital Beds	2011 Population	Population per Available Patient Bed
Southwestern Wyoming and Moffat County, Colorado	3	108	72,488	671
Northwestern Colorado	8	718	179,635	250
Eastern Utah	3	180	59,904	333
Wasatch Front	8	1,092	525,373	481
Central Utah	4	118	69,166	586
Total	26	2,216	906,566	2,321

SOURCE: U.S. Department of Health and Human Services 2015a

One county in the study area, Carbon County, Wyoming, has been designated as medically underserved area[11] (U.S. Department of Health and Human Services 2015b). Residents of Carbon County who are in need of medical attention must travel to the Memorial Hospital of Carbon County in Rawlins, Wyoming.

3.2.22.3.7 Environmental Justice

Executive Order 12898, issued in 1994, directs federal agencies to incorporate environmental justice as part of their mission by identifying and addressing the effects of programs, policies, and activities on minority and low-income populations. The fundamental principles of Executive Order 12898 are as follows:

- Ensure full and fair participation by potentially affected communities in the decision-making process
- Prevent the denial of, reduction, or significant delay in the receipt of benefits by minority or low-income populations
- Avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations
- Encourage meaningful community representation in the NEPA process through the use of effective public participation strategies and special efforts to reach out to minority and low-income populations
- Identify mitigation measures that address the needs of the affected low-income and minority populations

An environmental justice assessment requires an analysis of whether minority and low-income populations (i.e., populations of concern) would be affected by a proposed federal action and whether they would experience adverse impacts from the Project. If there are negative impacts, the severity and proportion of these impacts on populations of concern must be assessed in comparison to the larger majority population or populations not classified as low-income or minority. At issue is whether such negative impacts fall disproportionately on minority and/or low-income members of the community and, if so, whether they meet the threshold of disproportionately high and adverse. If disproportionately high and adverse effects are evident, EPA guidance advises consideration of alternatives and mitigation actions in coordination with extensive community outreach efforts (EPA 1998b).

The EPA defines a community with potential environmental justice populations as one that has a greater percentage of minority or low-income populations than does an identified reference community. Minority populations are those populations having (1) 50 percent minority population in the affected area or (2) a significantly greater minority population than the reference area (EPA 1994). The EPA has not specified any percentage of the population that can be characterized as significant to define environmental justice populations. Therefore, for the purposes of this analysis, a conservative approach is used to identify potential environmental justice populations. It is assumed that if the affected area minority and/or poverty status populations are more than 10 percentage points higher than those of the reference area, there is likely an environmental justice population of concern. For this analysis, minority includes all racial groups other than white, not Hispanic or Latino. For the year 2010, low income populations were defined as those individuals that are considered living below poverty levels. The U.S. Census Bureau defines poverty level thresholds for individuals and a family of four as income levels below $11,139 and $22,314, respectively (U.S. Census Bureau 2012g).

[11]Medically underserved areas/populations are areas or populations designated by the Health Resources and Services Administration of the U.S. Department of Health and Human Services as having: too few primary care providers, high infant mortality, high poverty, and/or high elderly population.

The minority environmental justice analysis is undertaken at the Census Block level, which allows a granular assessment of only the racial and ethnicity characteristics of the populations. Poverty information is only available at the Census Tract level of analysis for 2010. All Census Blocks (minority) and Census Tracts (poverty) are analyzed within 1 mile of all of the proposed transmission line routes.[12]

The reference areas with which to compare the Census Blocks and Tracts are the county and the state in which the Census Block or Tract is located. Relevant 2010 Census Bureau ethnicity and poverty data for the Census Blocks and Tracts were used to determine whether populations residing in the affected area constitute a potential environmental justice population. This was done by comparing minority and poverty statistics for the Census Blocks and Tracts with those reported for the relevant county or state.

Census Tracts with Potential Low-Income Environmental Justice Populations

Table 3-298 summarizes the county and state poverty populations in the study area. In 2010 there were no Census Tracts of environmental justice concern on the basis of Census Tracts with poverty populations of more than 10 percentage points higher than the county or state in which they are located. In addition, none of the Census Tracts in the study area contain populations having more than 20 percent of residents living below the poverty level, which is how the U.S. Census Bureau has defined a poverty area.

TABLE 3-298
ENVIRONMENTAL JUSTICE INFORMATION FOR LOW INCOME POPULATIONS

Geography	Total Population for Whom Poverty Status is Determined	Percent in Poverty
Wyoming	532,245	9.8
Carbon County, Wyoming	14,153	8.2
Sweetwater County, Wyoming	41,560	8.2
Colorado	4,773,303	12.2
Garfield County, Colorado	53,862	9.2
Mesa County, Colorado	139,868	12.4
Moffat County, Colorado	13,493	13.0
Rio Blanco County, Colorado	6,409	5.3
Routt County, Colorado	22,501	6.9
Utah	2,613,440	10.8
Carbon County, Utah	19,934	12.6
Daggett County, Utah	764	8.4
Duchesne County, Utah	17,089	10.8
Emery County, Utah	10,588	10.0
Grand County, Utah	8,761	12.6
Juab County, Utah	9,804	10.5
Sanpete County, Utah	24,682	17.8
Uintah County, Utah	30,757	11.7
Utah County, Utah	474,860	12.8
Wasatch County, Utah	22,112	6.1

SOURCE: U.S. Census Bureau 2012h

[12]Census Tracts are small statistical subdivisions of a county with 1,200 to 8,000 residents typically. The boundaries are usually delineated by local committees and do not cross county or state lines. Census Tracts are further subdivided into Block Groups and Block Groups are further subdivided into Census Blocks. A Block Group is a collection of one or more Census Blocks and a statistical division of a Census Tract. Census Block Groups do not cross Census Tract, county, or state boundaries. In general, a Block Group is comprised of 600 to 3,000 residents. A Census Block is a component of a Block Group and is small in area, in general, especially in cities. However, Census Blocks in rural or remote areas may cover hundreds of square miles.

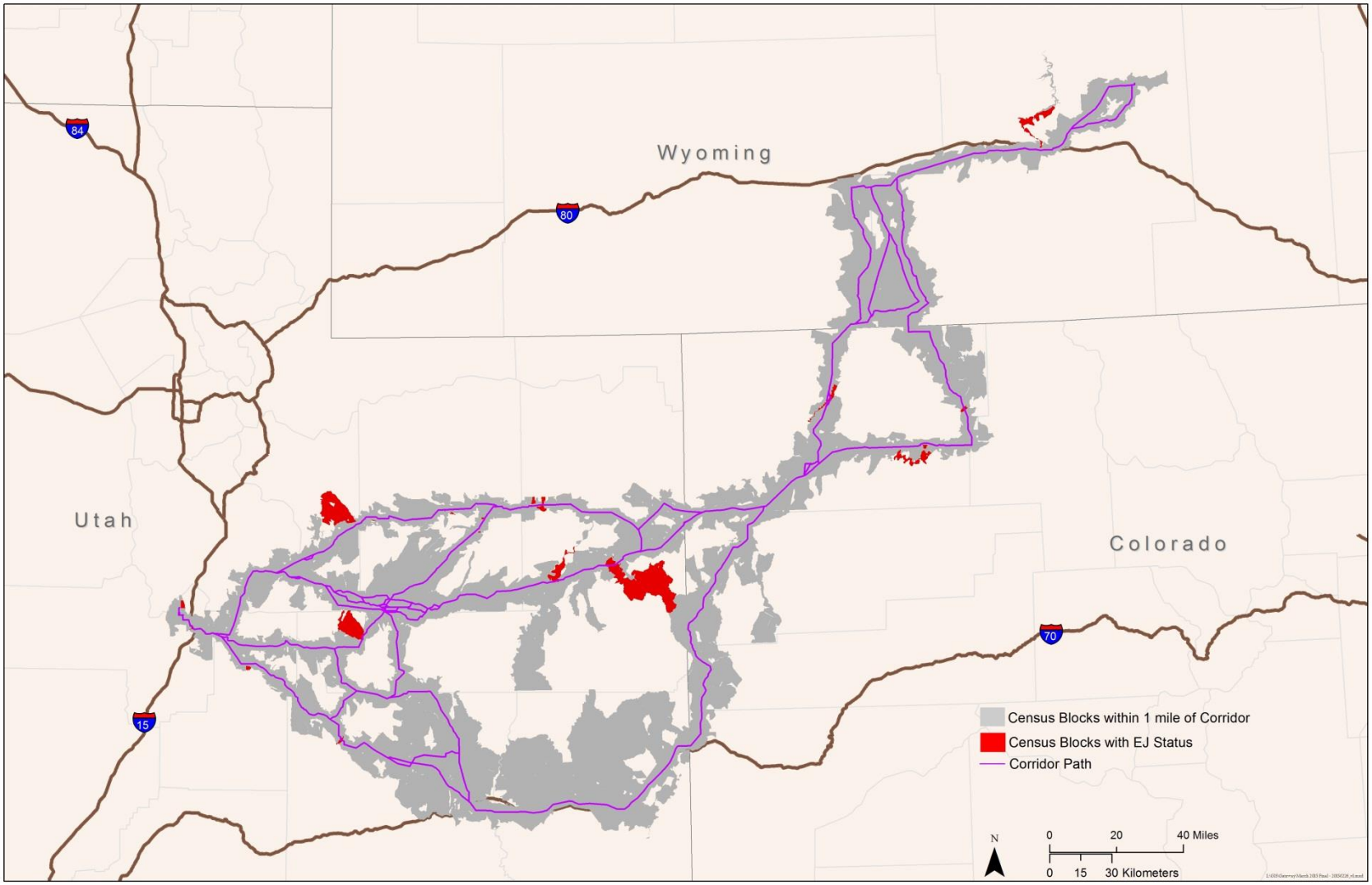
Census Blocks with High Concentrations of Minority Populations

Potential environmental justice minority populations are displayed in Table 3-299. In 2010 there were a total of 3,782 Census Blocks within 1 mile of the transmission line routes. Of those, more than two-thirds of the Census Blocks (84 percent) contained no resident populations. Of the remaining 598 Census Blocks, 561 Census Blocks or 94 percent did not comprise environmental justice populations and 37 Census Blocks were identified as having minority environmental justice populations. The 37 environmental justice Census Blocks have a population of 517 with over half of the potential environmental justice populations in these Blocks located in Blocks in Uintah County, which cross the Uintah and Ouray Indian Reservation. The distribution of the Census Blocks with potential minority environmental justice populations by county is provided in Table 3-299 and depicted on Figure 3-10. State and county ethnicity percentages are provided in Table 3-300.

TABLE 3-299
NUMBER OF CENSUS BLOCKS WITH ENVIRONMENTAL JUSTICE POPULATIONS BY COUNTY WITHIN 1 MILE OF TRANSMISSION LINE ROUTES

Geography	Within 1-mile of Alternative Routes		Potential Minority Environmental Justice Populations	
	Number of Census Blocks	Population of Census Blocks	Number of Census Blocks	Population of Census Blocks
Wyoming				
Carbon County, Wyoming	433	866	3	83
Sweetwater County, Wyoming	43	6	0	–
Total Wyoming Blocks and Population in Study Area	**476**	**872**	**3**	**83**
Colorado				
Garfield County, Colorado	16	0	0	–
Mesa County, Colorado	14	105	0	–
Moffat County, Colorado	373	1,233	4	24
Rio Blanco County, Colorado	172	767	1	3
Routt County, Colorado	13	90	0	–
Total Colorado Blocks and Population in study Area	**588**	**2,195**	**5**	**27**
Utah				
Carbon County, Utah	369	1,868	1	10
Duchesne County, Utah	481	2,533	7	19
Emery County, Utah	526	345	3	27
Grand County, Utah	101	51	0	–
Juab County, Utah	208	1,964	5	46
Sanpete County, Utah	324	1,249	2	5
Uintah County, Utah	333	777	10	296
Utah County, Utah	300	149	0	–
Wasatch County, Utah	76	6	1	4
Total Utah Blocks and Population in Study Area	**2,718**	**8,942**	**29**	**407**
Study Area				
Total Blocks and Population in the Study Area	**3,782**	**12,009**	**37**	**517**

SOURCE: U.S. Census Bureau 2012i



SOURCES: Environmental Systems Research Institute 2012; U.S. Census Bureau 2012j

Figure 3-10 Environmental Justice Census Blocks, Minority Populations

TABLE 3-300
ENVIRONMENTAL JUSTICE INFORMATION FOR MINORITY POPULATIONS IN THE STUDY AREA STATES AND COUNTIES

Geography	Total Population	Minority Percent									
		White, Not Hispanic or Latino[1]	Minority[2]	White, Hispanic or Latino[1]	Black or African American	American Indian or Alaskan Native	Asian	Native Hawaiian or Pacific Islander	Hispanic or Latino[1]	Some Other Race	Two or More Races
State of Wyoming	15,885	94.2	5.8	4.8	10.7	11.0	10.6	10.0	26.8	16.4	12.2
Carbon County	43,806	79.8	20.1	8.9	11.0	10.9	10.7	10.1	25.2	16.9	12.3
Sweetwater County	5,029,196	80.8	19.1	7.5	4.0	1.1	2.7	0.1	7.2	20.6	3.4
State of Colorado	5,029,196	70.0	29.9	11.3	4.0	1.1	2.7	0.1	7.2	20.6	3.4
Garfield County	56,389	68.7	31.2	13.4	10.6	11.1	10.6	10.0	38.3	22.6	12.5
Mesa County	14,6723	83.1	16.8	6.3	10.6	11.0	10.7	10.1	23.3	15.3	12.6
Moffat County	13,795	82.7	17.2	7.3	10.3	10.8	10.5	10.0	24.3	15.9	12.2
Rio Blanco County	6,666	86.3	13.6	5.5	10.7	10.8	10.3	10.1	19.9	13.7	12.2
Routt County	23,509	90.6	9.3	4.1	10.4	10.4	10.6	10.0	16.8	12.0	11.5
State of Utah	2,763,885	80.3	19.6	5.7	1.0	1.1	2.0	0.8	6.0	12.9	2.7
Carbon County	21,403	84.1	15.8	8.1	10.4	11.1	10.5	10.1	22.4	13.0	12.3
Daggett County	1,059	94.4	5.5	1.5	10.3	10.7	10.3	10.0	13.1	11.4	11.0
Duchesne County	18,607	87.1	12.8	2.0	10.2	14.5	10.2	10.2	16.0	12.6	12.8
Emery County	10,976	92.0	7.9	1.8	10.2	10.7	10.3	10.0	15.9	13.8	10.8
Grand County	10,246	84.1	15.8	4.8	10.2	10.8	10.2	10.1	13.7	11.1	11.4
Juab County	27,822	94.0	6.0	1.9	10.8	11.1	10.5	10.5	19.4	14.8	11.7
Sanpete County	32,588	86.6	13.3	3.7	10.3	17.7	10.5	10.2	17.1	12.2	12.3
Uintah County	516,564	82.8	17.1	3.7	10.5	10.6	11.3	10.7	20.8	14.6	12.7
Utah County	23,530	84.1	15.8	5.2	10.3	10.5	10.7	10.1	23.5	16.4	11.3
Wasatch County	563,626	84.2	15.7	6.1	0.8	2.3	0.7	0.0	3.0	8.9	2.1

SOURCE: U.S. Census Bureau 2012j
NOTES:
[1]People of Hispanic origin may be of any race; therefore, these Hispanic percentages are not a mutually exclusive category. Hispanics can choose one or more race categories, including White, Black or African American, American Indian and Alaska Native, Asian, and Native Hawaiian, Other Pacific Islander, some other race or two or more races.
[2]Minority populations include all races and ethnicities except for those that are identified as white, not Hispanic populations.

3.2.22.4 Study Methodology

The environmental consequences analysis evaluates how the social and economic effects of the construction and operations phases of the Project, both beneficial and adverse, are distributed among the communities and counties in the study area. The dimensions of the Project-related impacts are described, as consistent with the BLM Land Use Planning Handbook (BLM 2005a), as follows:

- Space – impacts across multiple scales
- Time – impacts among multiple time scales
- Social identity – who would be affected and in what ways
- Magnitude – the magnitude and significance of projected impacts
- Probability – the likelihood of a project impact occurring
- Causation – the direct, indirect, and cumulative projected impacts
- Acceptability – the anticipated desirability or acceptability of projected impacts

As such, a set of criteria were developed specifically for this analysis on which the alternative routes were evaluated. The criteria are summarized as follows:

- Displace or require relocation of a substantial number of existing residents
- Generate demand for temporary housing of construction workers that exceeds the supply of local housing or hotel/motel facilities
- Have a substantial impact on property values
- Require public service expenditures substantially greater than available approved revenue
- Disproportionately adversely affect minority and/or low-income populations

Socioeconomic impacts are described and quantified where possible. However, where quantification of impacts was not possible, the analysis included a qualitative discussion of possible effects. The analysis includes separate but integrated approaches to addressing economic, demographic, fiscal, and social impacts using the methods and approaches discussed.

A standard regional economic impact method was used to evaluate any economic impacts (employment, income, and economic output) due to the construction and operation of the Project. Estimates of construction and operation workforce were used to describe the impacts on regional employment and population. With estimates associated with employment and population, other local impacts, such as housing, emergency services, schools, and other public and community services can be evaluated. For example with an increase in employment, increases in population, housing, and demand for public services also may occur.

Anticipated changes in property tax revenues associated with development and operations of the Project were estimated through methods consistent with those described and applied at the state level, although the taxes are assumed to primarily accrue to the counties. For example, in Utah utilities are taxed based on applying an average tax rate to the construction cost of each segment of the line. The average tax rate for utilities can be estimated by dividing total taxes charged against utilities in Utah by the total assessed value of utilities in 2010 (Utah State Tax Commission 2012a). It is anticipated tax revenues would fall after the first year of service as assessed values would consider cost of operation. A capitalization rate was applied to cost of construction to estimate the decreasing assessed valuation, to which the annual tax rate was applied. Property tax revenue estimates for Wyoming and Colorado are estimated as consistent with the property tax approaches used in their respective states.

An environmental justice analysis is conducted to determine if any environmental justice populations are present in the study area. The environmental justice analysis is conducted in compliance with Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations* and follows guidance published by the EPA (1994). The environmental justice analysis involves two basic steps:

- Determine if environmental justice populations exist in the relevant study area
- If environmental justice populations exist, determine if they would be disproportionately affected by development and operation of the Project

To identify the presence of potential environmental justice populations residing in proximity to the alternative routes, it is necessary to create an affected area for a smaller geographic area than that of the defined socioeconomic study area. Populations are analyzed at the Census Block and Census Tract level located within 1 mile of all alternative routes. The populations located in these Census Blocks and Census Tracts are compared with those of the reference communities in terms of percentages of minority and low-income populations. Reference communities for the analysis are defined as the county and/or the state in which the Tract or Block was located; if the percentages of low income and/or minority populations in proximity to the alternative routes significantly exceed those of the reference communities, further environmental justice assessment is undertaken. If no environmental justice populations are identified, no further analysis is needed.

Once the locations of the environmental justice populations are identified, all adverse effects are considered to determine if the Project has the potential to have a disproportionately high and adverse impact (human health or environmental effect) to these populations. Impacts of the Proposed Action include cumulative and multiple impacts and are evaluated to determine which, if any, disproportionately and adversely affect these populations.

3.2.22.5 Results

3.2.22.5.1 No Action Alternative

If no action was taken, the Project would not be granted a right-of-way and the transmission lines and substations would not be constructed. The human environment would remain as is and management direction from the current management plans would continue. Under the No Action, none of the social and economic impacts described under the alternative routes would be realized. However, without the Project, the existing system would not be upgraded; and as a result, the Applicant would not be able to ensure sufficient capacity and reliability to meet the electric demands of its current and future customers in the states of California, Idaho, Oregon, Utah, Washington, and Wyoming. The Gateway South Transmission Project is one part of the proposed upgrade to the power transmission system. Without its development, there would be fewer high-voltage transmission lines to provide power from existing and new renewable (e.g., wind, solar) and thermal (e.g., gas, coal) generation sources to meet growing customer needs, ease transmission congestion, and improve the flow of electricity throughout the West (refer to Chapter 1).

3.2.22.5.2 Impacts Common to All Alternatives

Impacts on Employment and Economic Conditions

The construction, operation, and maintenance of the proposed transmission line and related facilities are expected to have beneficial impacts on local employment and economic conditions. The largest potential impact from the Project on employment would occur during the construction phase. Construction of the Project is expected to start in 2018 and conclude by June 2020, taking place year-round as weather and

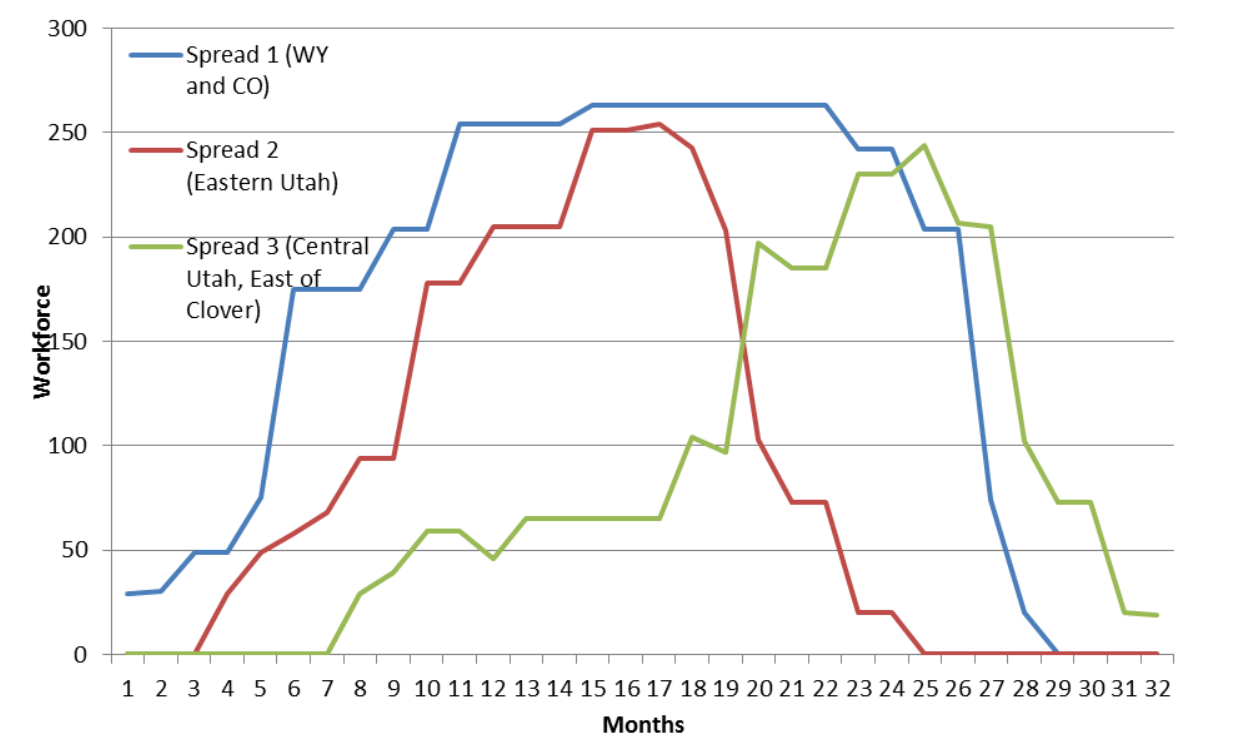
conditions allow. While construction during the summer season may be preferred, there are issues that may require winter construction. Weather conditions typically prohibit construction at higher elevations during winter months. Project schedule, financing, design, and/or material delivery may not fit in the summer season. Environmental issues and soil conditions also may dictate construction of portions of the line during certain times of the year, for example, to avoid or reduce impacts on wildlife.

The construction of the transmission line for the entire Project is expected to employ at maximum 610 workers (Table 3-301) based on an analysis of the Applicant's Preferred Alternative. However, at any point in time, the actual personnel would be fewer as the construction would occur across three regions. Construction is expected to occur over 32 months with three regions or spreads in which construction would occur in a ramp up and down approach, as depicted in Figure 3-11.

TABLE 3-301
CONSTRUCTION WORKFORCE

Months	Spread 1 Wyoming and Colorado	Spread 2 Eastern Utah	Spread 3 Central Utah, East of Clover	Total Manpower
1	29	0	0	29
2	30	0	0	30
3	49	0	0	49
4	49	29	0	78
5	75	49	0	124
6	175	58	0	233
7	175	68	0	243
8	175	94	29	298
9	204	94	39	337
10	204	178	59	441
11	254	178	59	491
12	254	205	46	505
13	254	205	65	524
14	254	205	65	524
15	263	251	65	579
16	263	251	65	579
17	263	254	65	582
18	263	243	104	610
19	263	203	97	563
20	263	103	197	563
21	263	73	185	521
22	263	73	185	521
23	242	20	230	492
24	242	20	230	492
25	204	0	244	448
26	204	0	207	411
27	74	0	205	279
28	20	0	102	122
29	0	0	73	73
30	0	0	73	73
31	0	0	20	20
32	0	0	19	19

SOURCE: POWER Engineers 2013



SOURCE: POWER Engineers 2013

Figure 3-11 Construction Workforce Requirements by Spread (Location)

The first spread is in Wyoming and Colorado and construction would occur during months 1 through 28. The second spread is in Eastern Utah with construction beginning in month 4 for 20 months. The third spread closest to Clover, Utah, would be the final stretch to be constructed, starting in month 8 for 24 months. The first spread in Wyoming and Colorado is expected to have the largest peak number of workers of 263 for 8 months. During the construction periods for spreads 1, 2, and 3, there would be average annual employment of 188, 136, and 109 construction workers, respectively, or approximately 433 average annual construction jobs across the three spreads. Since the COUT BAX alternative routes are longer than the Applicant's Preferred Alternative, it is possible that workforce estimates would be slightly higher for these routes.

Additionally, construction workforce also would be required for the two substations during this period. Each substation would be constructed over approximately 22 months with a peak of 35 construction workers occurring during the initial part of the construction for site development with an average annual workforce of 21 construction workers for each substation. For construction of the two substations and the transmission line, approximately 475 average annual construction jobs would be required during the 22-month substation construction and 433 average annual construction jobs during the remainder of the 32-month transmission line construction.

Operation and maintenance of the transmission line and substations would require three employees. It is expected that work would be performed by current Rocky Mountain Power employees or current contract employees.

The construction of the proposed line and facilities would require a number of tasks and associated specialized skill sets. An estimate of the number of individuals and types of construction workforce positions are shown in Table 3-302.

TABLE 3-302
ESTIMATED CONSTRUCTION TASKS AND WORKFORCE REQUIREMENTS

Tasks	Number of Maximum Workforce Positions			
	Total	Spread 1	Spread 2	Spread 3
Construction management and supervision	45	15	15	15
Inspection	33	12	12	9
Contractor mobilize equipment and prepare yards	27	9	9	9
Project yard layout and make ready for construction	12	4	4	4
Receipts and storage and project materials	24	8	8	8
Survey and stake access roads and work areas	18	6	6	6
Construct access roads and structure pads	36	9	9	18
Tree cleaning	36	0	18	18
Install foundations	105	35	35	35
Haul and assemble structures	294	98	98	98
Erect structures	78	26	26	26
Install overhead optical ground wire and conductors	138	46	46	46
Cleanup and restoration	36	12	12	12

SOURCE: POWER Engineers 2013

It is possible that some construction workers may commute from their residences. This would be the case in spread 3, which is the closest spread to Clover and the urban Wasatch Front. Spread 3 would likely be supported by workforce located in the urban areas of Provo, Orem, and Lehi, Utah, and other nearby communities, such as Price, Utah. It is possible that construction workforce for spread 1 in Wyoming and Colorado and spread 2 in eastern Utah would be partially supported by workforce located in Rawlins, Wyoming; Grand Junction and Craig, Colorado; and Vernal, Roosevelt, and Price, Utah. However, due to the relatively more remote nature of these regions, it also is likely that construction workforce from the Denver, Cheyenne, and Salt Lake City regions also would support the Project.

The majority of the workers would live temporarily at locations and communities near the transmission routes. These workers would be expected to live in RV parks, rental houses and apartments, and in local motels and hotels. Although the exact number and location of these crews is not known, it is anticipated that across Wyoming, Colorado, and Utah workers would operate in multiple crews and would be moved to many communities more than 450 miles away, depending on the location of the current transmission line work.

Earnings of 475 construction workers would be approximately $26.2 million annually, based on average earnings for construction jobs in Utah (BEA 2013).[13] These earnings represent 0.01 percent of the earnings in Wyoming, Colorado and Utah, which were $241.4 billion in 2011 (BEA 2013).

Construction earnings will support economies in the regions where construction workers live as well as economies in communities with proximity to the Project. As construction workers spend their money in the local communities where they are housed, revenues would increase for some local businesses, such as hotels, restaurants, gas stations, and grocery stores, supporting jobs and incomes for these businesses and their employees. Because some of the construction workers are not anticipated to be permanent residents of the study area, induced spending would be less than locally residing employees as construction workers will send a portion of their earnings to their home area. However, all construction workers would be assumed to reside in Wyoming, Colorado, or Utah, and an additional $28 million in induced sales and 95 average annual jobs are assumed to be supported in Wyoming, Colorado, and Utah by construction

[13] Average earnings for construction workers of $55,127 in 2011 were based on BEA average earnings for the construction industry for Utah, which includes both full-time and part-time employment. Utah construction average earnings fell between Wyoming with $59,550 and Colorado, $54,339.

workers spending their money in nearby communities and in their permanent home locations.[14] This employment would occur in retail sales, food and beverage establishments, lodging, medical facilities, and others. Overall, the employment and spending would be short-term and is likely to have low socioeconomic impacts on the overall region since it would be dispersed across 17 counties and a number of metropolitan areas. However, if workers temporarily reside in smaller communities for a period of time, the earnings and employment could be more significant for these relatively smaller economies.

Construction expenditures for the transmission line, as shown in Table 3-303, will support construction jobs in the region, positively impacting this industry in the study area. In addition to construction labor expenditures, these costs include materials, development engineering, and equipment. Typically, the largest portion of the cost of transmission lines is for the conductors and their installation. Approximately 50 percent of these expenditures, including the cost of labor, are likely to be sourced from within the three-state region (Keyser and Lantz 2013). These expenditures would support downstream jobs and income in the region.

TABLE 3-303
ESTIMATED CONSTRUCTION COSTS

Alternative Route	Total Construction Cost
Wyoming to Colorado – Aeolus to U.S. Highway 40 (WYCO)	
WYCO-B (Agency and Applicant Preferred Alternative)	$339,363,500
WYCO-C	$345,450,000
WYCO-D	$399,040,000
WYCO-F	$359,926,000
Colorado to Utah – U.S. Highway 40 to Baxter Pass to Clover (COUT BAX)	
COUT BAX-B	$460,435,500
COUT BAX-C	$477,708,000
COUT BAX-E	$480,669,000
Colorado to Utah – U.S. Highway 40 to Central Utah to Clover (COUT)	
COUT-A	$341,995,500
COUT-B	$358,939,000
COUT-C (Agency and Applicant Preferred Alternative)	$342,489,000
COUT-H	$329,987,000
COUT-I	$395,129,000
Series Compensation Stations (2)	$341,995,500

SOURCE: POWER Engineers 2013

The estimated other project development costs (not including labor costs) that are assumed to be sourced from the three-state region are estimated to be between $390 million and $490 million, depending on the alternative route during the life of the Project.[15] This non-labor construction spending would support an additional $498 million to $622 million in sales for supply chain industries and worker induced spending during the life of the construction activity. On an average annual basis over 3 years, these additional development costs (non-labor) would support 1,325 to 2,785 jobs in engineering, management, planning, manufacturing, and materials suppliers and sectors (Keyser and Lantz 2013). These directly affected

[14]This multiplier of 1.2 (for induced employment effects) is based on analysis by Keyser and Lantz (2013), who estimated the economic impacts of new generation and transmission in Wyoming and Colorado.

[15]To estimate non-labor Project costs, the minimum and maximum costs for the WYCO and COUT alternative routes were included along with the substation costs for a total Project cost ranging from $870 million to $1.095 billion. Since labor earnings account for approximately 10 percent of the installed cost, the Project costs were reduced by 10 percent. These Project costs were then further reduced by 50 percent to account for materials, services, and equipment sourced from in the three-state region (Keyser and Lantz 2013).

sectors would support downstream economic activity, generating supply chain and induced spending employment of between 583 and 1,230.[16] These jobs and sales are more than likely to accrue to companies and employees in the metropolitan areas of the three-state region, including Denver, Cheyenne, and Salt Lake City. Average annual employment, including construction labor, materials, supplies, engineering services, and downstream employment, would range from 2,478 to 4,585, depending on the alternative route. The bulk of these workers would reside in the metropolitan areas and across the three states and reside temporarily in the community in proximity to the Project. In general, these are not jobs that would be sourced from the counties where the Project is located. These figures are summarized in Table 3-304.

TABLE 3-304
ESTIMATED JOBS AND SALES ASSOCIATED WITH THE CONSTRUCTION ACTIVITY

	Total Spending or Gross Sales (millions of dollars)[1]		Average Annual Employment	
	Low	High	Low	High
Total project costs	870	1,095	–	–
Construction labor (approximate)	87	110	475	475
Total non-labor project development costs	783	986	–	–
Non-labor project development costs sourced from within Wyoming, Colorado, and Utah	391	492	1,325	2,785
Supply chain (indirect effects) and worker spending (induced effects) in Wyoming, Colorado, and Utah[2]	526	650	678	1,325
Total sales, spending, or employment in Wyoming, Colorado, and Utah generated by the project	924	1,142	2,478	4,585

SOURCE: Keyser and Lantz 2013; POWER Engineers 2013
NOTES:
[1]The spending or sales is for the total duration of the Project.
[2] Supply chain and worker spending estimates include those associated with construction labor expenditures and non-labor Project expenditures.

Impacts on Population

The proposed Project and alternative routes are expected to create a short-term demand for workers due to construction of the Project. The expected employment might be sourced from the 17-county study area, but the majority of workers are likely to come from nearby metropolitan areas, such as Denver, Cheyenne, and Salt Lake City. However, all of the employment would occur in the 17-county region as the construction workforce supports the Project construction over almost 3 years. A portion of the construction workforce, primarily supporting construction of spreads 1 and 2 in Wyoming, Colorado, and eastern Utah, would be temporarily residing in nearby communities during the 3-year period.

Approximately 188 and 136 average annual jobs would be required for the construction of spreads 1 and 2, respectively, in addition to 42 jobs for the construction of two substations (spreads 3 and 4), or a total of 366 average annual workers. Since this includes two spreads and two substations, there would be at least four crews of 188, 136, 21, and 21 construction workers for each of the spreads and substations.

[16]To estimate the direct and downstream economic impacts, the analysis used ratios and multipliers from the Keyser and Lantz (2013) analysis of transmission line development in Wyoming and Colorado. These ratios and multipliers were as follows: $65,714 economic output per job for construction spending; 2.27 multiplier for sales; and 1.44 multiplier for employment.

Although some of these workers could be sourced from local communities, it is likely the majority would be housed temporarily in nearby communities during construction. The temporary residents, spread over southwestern Wyoming, northwestern Colorado, and eastern Utah, are expected to have temporary and minimal impacts on the region's population.

Impacts could be more noticeable and considerable if temporary workers are housed in relatively smaller towns, although the impacts would be temporary. For example, proximate small towns in Wyoming include Baggs, Dixon, Elk Mountain, Hanna, Medicine Bow, Saratoga, Sinclair, and Wamsutter, with populations ranging from 90 to 1,900. Since the relatively larger communities of Rock Springs, Rawlins, and Green River are often occupied with oil and gas and construction workers and tourism visitors, the Project workforce may need to live temporarily in multiple smaller towns if housing or lodging resources are available. At most, approximately 200 to 250 people would be working in a given location in southwestern Wyoming, northwestern Colorado, or eastern Utah.

There are likely to be similar dynamics in the communities in northwestern Colorado. However, Grand Junction and its suburbs (i.e., Redlands and Clifton) may have additional housing availability, but are located farther away from Alternative COUT-C (Agency and Applicant Preferred Alternative), approximately 80 miles and 28 miles from Alternative COUT-BAX-B. There would not be noticeable impacts on population in the Grand Junction area, Steamboat, or Craig associated with 200 to 250 workers, whereas temporary population increases in Hayden, Dinosaur, Rangely would be noticeable, but would be temporary.

In Eastern Utah, the Project is adjacent to a number of very small towns; the project workforce is likely to live temporarily in some of the region's larger towns, including Roosevelt and Vernal, Utah, with 2013 populations of 6,300 and 9,500, respectively. Approximately 250 workers would represent 1.6 percent of the population in these two towns. Moab, Utah, is the closest relatively large town to the eastern portion of the COUT-BAX alternative routes. However, the availability of housing and lodging is limited in Moab, especially in the spring and fall, when tourism is at a peak in the region. As a result, the workforce is not likely to reside in this community.

The construction for spread 3 would require annual average workforce of 109 with almost 250 in the peak months. The construction workforce supporting the northern part of spread 3 is likely to live temporarily in the numerous cities and towns in the Wasatch Front, including Lehi, Orem, Provo, Spanish Fork, and Springville. Temporary population increases in this area will not be noticeable because of the considerable population in this region. Construction of alternative routes in central Utah southeast of the Mona substation could be supported by the populous communities in the Wasatch Front, although the southern alternative routes are far from these communities. Construction workers can travel very far to sites, for example, up to 2 hours each day to construction sites (EPRI 1982). Price, Utah, with a 2013 population of 8,600, is the largest town in proximity to the southeastern route alignments. Although not all workers would likely live in Price, a temporary peak population of 250 represents 2.9 percent of the population. Price, Utah has a busy summer tourism season, which may limit housing and lodging availability in the region and limit the temporary population effects. In summary, temporary population increases in small towns may be noticeable in the short-run, but would be negligible in larger cities and towns.

The slight increase in employment is not expected to cause any measurable impacts on population trends. Population growth has varied across the study area with the Wasatch Front experiencing high levels of population growth, which is expected to continue in the future. Northwestern Colorado is also experiencing some population growth, although not at a rate as high as growth in the Wasatch Front. Other regions in Wyoming and Utah have been experiencing stagnant population growth. Any changes in population due to the Project would be small and temporary and would not affect these projected trends.

Impacts on Housing

Although some of the workforce may commute from their residences, it is anticipated the majority of construction workers would live temporarily at locations in proximity to the transmission routes. These workers would be expected to live in RV parks, rental houses and apartments, and in local motels and hotels. Spread 1 in Wyoming and Colorado would require peak workers of 263 with an annual average workforce of 188. Spread 2 in eastern Utah would require a peak of 254 workers with an annual average workforce of 136, while spread 3 in central Utah would require a peak workforce of 244 with annual average workforce of 109. In addition, the substation construction in Wyoming and eastern Utah would require an additional 42 construction laborers.

Spread 1 in Wyoming and Colorado would require peak workers of 263 with an annual average workforce of 188. In southwestern Wyoming and northwestern Colorado, there are a large number of housing units in Green River, Rawlins, and Rock Springs, Wyoming and Craig, Fruita, and Grand Junction (includes Clifton and Redlands communities), Steamboat, and Rangeley, Colorado communities. In addition, there are numerous hotels and motels in southwestern Wyoming and northwestern Colorado. However, rental vacancy rates are low and hotels and motels are often occupied during the summer seasons with oil and gas and construction workers and tourism visitors. In Rawlins, which is a relatively larger community within 20 miles from the alternative routes in Wyoming, the rental vacancy rate was 19.1 percent in 2012, indicating approximately 185 rental units available. In addition, the average annual housing data may not reflect the actual vacancy of rental units during the summer months when demand is high. Construction workforce in smaller and larger towns in southwestern Wyoming could likely displace visitors during peak tourism seasons.

Rock Springs and Green River are farther from the WYCO alternative routes in Wyoming, 60 and 73 miles, respectively, but have additional housing resources. However, Rock Springs and Green River have very low rental vacancy rates (6 and 7 percent, respectively) and high occupancy rates in hotels and motels in the summer months. In June, July, and August, occupancy rates have ranged from 79 to 90 percent (Rock Springs Chamber of Commerce 2015). Craig and Steamboat, Colorado, also would provide housing resources for the WYCO alternative routes, although these communities also have low rental vacancy rates, 11.3 and 20.0 percent resulting in approximately 123 and 361 available rental units, respectively. Steamboat is a resort town and therefore has considerable lodging and hotel accommodations, although the occupancy rates can be high during the peak summer season (i.e., July 4, Labor Day weekend, etc.) and relatively more expensive than accommodations in other locations. Steamboat is relatively closer to Alternative WYCO-D, but farther (more than 70 miles) from the other WYCO alternative routes. Craig, Colorado, has little available lodging in summer and fall due to temporary workers and hunters, respectively.

Grand Junction and Fruita in Colorado would provide housing resources for the COUT-BAX alternative routes. Grand Junction and its suburbs have considerable housing and hotel and lodging accommodations. In 2012, Grand Junction had a rental vacancy rate of 3.8 percent, indicating approximately 350 rental units available for rent. However, the city and surrounding communities have considerable RV parks, hotels, and motels. The Grand Junction area also supports a fair amount of oil and gas and construction workforces and tourism visitation in the spring, summer, and fall months, which may constrain the availability of housing and lodging accommodations during these periods.

Spread 2 in eastern Utah would require a peak of 254 workers with an annual average workforce of 136. In Eastern Utah, the Project is adjacent to number of very small towns; the Project workforce is likely to live temporarily in some of the region's larger towns, including Roosevelt and Vernal, Utah. As shown in Table 3-290, there were approximately 28 and 165 rental units available for rent in these towns in 2012, respectively. There may be hotel and lodging availability in these towns as well, although oil and gas workforce and seasonal tourism visitors also stay in these towns, which may limit availability. In Uintah

County, where Vernal is located, occupancy rates range from 50 to 70 percent in the spring, summer, and fall months (University of Utah 2014a). Other towns in eastern Utah have very limited housing resources. Any construction workforce staying in constrained lodging accommodations may displace visitors who would be staying during peak tourism season.

Spread 3 in central Utah and the Wasatch Front would require a peak workforce of 244 with an annual average workforce of 109. The construction workforce supporting the northern part of spread 3 is likely to live temporarily in the numerous cities and towns in the Wasatch Front, including Lehi, Orem, Provo, Spanish Fork, and Springville. There are a considerable number of rental units, although rental vacancy rates are low for these cities and towns, ranging from 2 to 6 percent. In addition, the Wasatch Front region has numerous hotels and motels; occupancy rates in Utah County have ranged from 60 to 80 percent in the spring, summer, and fall months (University of Utah 2014b). Construction of alternative routes in central Utah southeast of the Mona substation could be supported by the communities in the Wasatch Front, although some of these alternative routes are far from these communities. Price, Utah, is the largest town in proximity to the route alignments southeast of Mona, with a rental vacancy rate of 10.1 percent, indicating there are 114 rental units available for rent. In addition, Price, Utah has a busy summer tourism season, which results in high spring and summer occupancy rates. Carbon County has experienced occupancy rates between 60 and 75 percent (University of Utah 2014c).

In summary, available rental housing resources and hotel, lodging, and RV accommodations may not be sufficient in the small towns adjacent to the alternative routes to support a peak construction workforce of approximately 250. Larger cities and towns in southwestern Wyoming have very high occupancy rates and low availability of rental housing units. Grand Junction and its suburbs as well as the cities and towns along the Wasatch Front could support construction workforce, but the length of the alternative routes would necessitate multiple housing locations along the routes. Grand Junction would support the COUT-BAX alternative routes, and the Wasatch Front would support workforce for the routes near Mona and north and east of Mona. Central and eastern Utah have few towns that could support available housing for a workforce of 250. The housing of construction workforce could have considerable adverse impacts in small towns and larger towns and cities with already high occupancy rates and low rental vacancy rates, straining the housing resources in those areas and possibly displacing tourism visitors. Depending on the alternative route constructed, housing and lodging resources in Grand Junction and the communities in the Wasatch Front would be available with minimal adverse impacts on housing resources and availability.

Impacts on Government-Provided Services

The Project and all of its alternative routes are expected to have temporary and minimal impacts on government-provided services across the region. This is due to the fact that changes in employment and population are predicted to be small and mostly temporary with the construction, operation, and maintenance of the Project. Due to the linear nature of the Project, its remote location and remarkable length (400 to 550 miles), workers are expected to stay in multiple locations along the alternative routes and move along the route depending on the location of the work. At a more local level, crews may need to be relatively smaller and housed in a number of communities to find adequate housing resources in the remote and small communities, further mitigating the effects on public services and infrastructure. Workers are not expected to bring their families, and impacts on school enrollment are not expected to occur. Emergency services, law enforcement, and medical facilities would be adequate to address the multiple dispersed crews expected to live in temporary or permanent housing along the alternative routes. Therefore, it is not anticipated there would be a measurable change in supply or demand of relevant government services throughout the study area.

Impacts on Rates and Ratepayers

Capital expenditures for improvements to electric-utility infrastructure are investments made to serve customers. The expenditures are passed on to the customers served in the form of increased rates. However, as a regulated utility, the Applicant can increase rates only on approval by state utility commissions. Such rate-increase requests are subjected to rigorous analysis by regulators and others and to public process. At this time, not all costs for development of the Project are known; therefore, the Applicant cannot project what the rate increase may be as a result of this Project.

Impacts on Agriculture, Oil and Gas, and Recreational Resources

Impacts on agriculture are generally associated with rangeland disturbance on private lands and on BLM and USFS grazing allotments. However, the impacts are expected to be low in the long-term due to the minimal extent of permanent disturbance anticipated on rangelands. Grazing leases on USFS- or BLM-administered lands may be affected by the right-of-way, perhaps requiring slight modifications to the lease stipulations and locations. However, there are negligible economic effects anticipated from these mostly temporary Project impacts on rangelands.

Oil and gas development is occurring in southwestern Wyoming (Green River Basin), northwestern Colorado (Piceance Basin), and in Eastern Utah (Uintah Basin). The location of the development of new wells would be constrained by the right-of-way, although the impacts would be low since the extraction of oil can usually occur from multiple locations within and above the oil reserves.

The impacts on recreational resources have been described in Section 3.2.12. Short- and long-term impacts associated with the development and operation of the transmission line would diminish the natural appearance and the undeveloped character of many areas along the alternative routes affecting vistas and scenery. Also, depending on reclamation and implementation of mitigation measures, vehicle and ATV use could increase over the longer term as a result of new access roads. In total, an influx or outflow of visitors to the study area is not anticipated to occur; therefore, negligible impacts on the study area economies associated with visitor spending would occur due to these changes in recreation resources. However, there may be some adverse impacts on recreational and other non-market values associated with changes to scenery and vistas surrounding non-motorized and motorized trails, semi-primitive non-motorized and motorized areas, and other areas as more access is likely through the construction of roads to build the transmission line and through the possibility of future development. For more information on these effects, refer to Section 3.2.12.

Impacts on Property Taxes

The construction, operation, and maintenance of the transmission line would generate property taxes to counties where the line and substations would be located. The magnitude of these tax revenues for each alternative route was estimated and summarized in Table 3-305. The property taxes for the first years the transmission line would be constructed and in service were estimated for each state with the methods described below. These first years' taxes would occur during the construction period and initial operation and, as such, are likely to occur over the 3-year period of construction. The first year's property tax receipts range from $4.3 million (WYCO-B) to $7.5 million (COUT BAX-B) depending on the alternative route. Costs for specific route variations are not pressented because it is assumed that any differences in construction costs between route variations would not be substantial. It is anticipated that tax revenues would fall after the first year of service as assessed values would consider cost of operation. The annual taxes for the remaining years would range from $432,000 to $754,000 and also are included in Table 3-305. The two substation properties would contribute taxes to two counties, depending on where each is located. Each substation would contribute between $630,000 and $1.8 million in the first year's

taxes, and $52,000 and $209,000 in property taxes for the remaining years that the transmission line is in service, depending on where the substations are located (Table 3-311).

TABLE 3-305
PROPERTY TAX ESTIMATES OF ALTERNATIVE ROUTES

Alternative Route	First Years' Property Taxes	Estimated Annual Cash Flows	Annual Property Taxes for Remaining Years in Service
Wyoming to Colorado – Aeolus to U.S. Highway 40 (WYCO)			
WYCO-B (Agency and Applicant Preferred Alternative)	$4,306,101	$31,136,889	$432,454
WYCO-C	$4,381,408	$31,937,168	$438,630
WYCO-D	$5,926,986	$38,630,080	$618,165
WYCO-F	$4,491,581	$33,091,149	$447,756
Colorado to Utah – U.S. Highway 40 to Baxter Pass to Clover (COUT BAX)			
COUT BAX-B	$7,255,100	$44,854,248	$731,586
COUT BAX-C	$7,472,020	$46,422,591	$751,282
COUT BAX-E	$7,511,272	$46,706,386	$754,846
Colorado to Utah – U.S. Highway 40 to Central Utah to Clover (COUT)			
COUT-A	$6,633,667	$44,271,063	$637,698
COUT-B	$4,878,713	$33,169,385	$463,146
COUT-C (Agency and Applicant Preferred Alternative)	$4,760,236	$32,242,658	$453,060
COUT-H	$4,566,041	$30,838,618	$435,427
COUT-I	$5,386,206	$36,768,448	$509,898

SOURCES: Myer 2013; Patterson 2009; POWER Engineers 2013; Uhrich 2013; Utah State Tax Commission 2012b; Wyoming Department of Revenue 2013 (Analysis by Louis Berger Group)

For Utah, the property taxes for the first years of the transmission line were estimated by applying an average tax rate of 1.27 percent to the construction cost of each segment of the line for Utah counties (Patterson 2009). The average tax rate for utilities was estimated by dividing total taxes charged against utilities in Utah by the total assessed value of utilities in 2010 (Utah State Tax Commission 2012c). To estimate an average cash flow for the Utah segments of the line, a capitalization rate of 9.08 percent (Utah State Tax Commission 2012b) was applied to the cost of construction to estimate the annual cash flows. The annual tax revenue for the remaining years was then estimated by applying the 1.27 percent average tax rate to the annual cash flow.

For Colorado, the property taxes for the first years of the transmission line were estimated by applying an effective tax rate of 2.03 percent to the construction cost of each segment of the line (Myer 2013), which includes the average mill levy and the state assessment ratio for commercial properties of 29 percent. The effective tax rate was applied to the cost of the routes per mile for the routes in Colorado counties. To estimate an average cash flow for the Colorado segments of the line, a capitalization rate of 11.3 percent (Myer 2013) for independent power producers was applied to the cost of construction to estimate the annual cash flows or income. The annual tax revenue for the remaining years was then estimated by applying the effective tax rate of 2.3 percent to the annual cash flow. It should be noted that these annual tax estimates for the remaining years in services are a rough estimate of these property tax receipts since Colorado Department of Local Affairs Property Tax Division would balance the cost-based approach with the income approach during operation of the transmission line (Uhrich 2013).

For Wyoming, the property taxes for the first years of the transmission line were estimated by applying Wyoming's industrial tax rate of 11.5 percent and the average mill levy of 68.088 mills to the construction cost of each segment of the line to which it also was applied (Uhrich 2013). To estimate the annual income or cash flow for the Wyoming segments of the line, a capitalization rate of 8.25 percent

(Wyoming Department of Revenue 2012) was applied to the cost of construction. The annual tax revenue for the remaining years was then estimated by applying the industrial tax rate of 11.5 percent and the average mill levy of 68.088 to the annual cash flow. It should be noted that these annual tax estimates for the remaining years in service are a rough estimate of these property tax receipts since Wyoming Department of Revenue state assessors would reconcile the cost based approach with the income approach during operation of the transmission line (Uhrich 2013).

Table 3-306 presents an estimate of tax revenue by county in the Project area for Wyoming, Tables 3-307 and 3-308 present tax revenue by county for Colorado, and Tables 3-309 and 3-310 present tax revenue by county for Utah. The estimate of tax revenue is based on the assumption that the amount of capital applied to each county would correspond with the length of the transmission line that is constructed in each county.

TABLE 3-306
ESTIMATED PROPERTY TAX REVENUES FOR WYOMING

Alternative Route	First Years'		Annual Receipts for Remaining Years	
	Carbon County	Sweetwater County	Carbon County	Sweetwater County
WYCO-B (Agency and Applicant Preferred Alternative)	$1,447,774	$325,878	$119,441	$26,885
WYCO-C	$1,063,747	$787,713	$87,759	$64,986
WYCO-D	$1,578,552	$112,754	$130,231	$9,302
WYCO-F	$1,707,961	$251,171	$140,907	$20,722

SOURCES: POWER Engineers 2013; Uhrich 2013; Wyoming Department of Revenue 2012 (Analysis by Louis Berger Group)

TABLE 3-307
FIRST YEAR'S PROPERTY TAX REVENUES FOR COLORADO

Alternative Route	Counties				
	Garfield	Mesa	Moffat	Rio Blanco	Routt
Wyoming to Colorado – Aeolus to U.S. Highway 40 (WYCO)					
WYCO-B (Agency and Applicant Preferred Alternative)	$0	$0	$2,531,162	$0	$0
WYCO-C	$0	$0	$2,529,947	$0	$0
WYCO-D	$0	$0	$4,062,720	$0	$172,960
WYCO-F	$0	$0	$2,531,162	$0	$0
Colorado to Utah – U.S. Highway 40 to Baxter Pass to Clover (COUT BAX)					
COUT BAX-B	$923,174	$454,020	$75,670	$1,831,214	$0
COUT BAX-C	$923,174	$454,020	$75,670	$1,831,214	$0
COUT BAX-E	$923,174	$454,020	$75,670	$1,831,214	$0
Colorado to Utah – U.S. Highway 40 to Central Utah to Clover (COUT)					
COUT-A	$0	$0	$1,592,854	$0	$0
COUT-B	$0	$0	$908,040	$0	$0
COUT-C (Agency and Applicant Preferred Alternative)	$0	$0	$805,886	$132,423	$0
COUT-H	$0	$0	$805,886	$132,423	$0
COUT-I	$0	$0	$805,886	$132,423	$0

SOURCES: POWER Engineers 2013; Uhrich 2013; Wyoming Department of Revenue 2012 (Analysis by Louis Berger Group)

TABLE 3-308
ANNUAL PROPERTY TAX REVENUES FOR REMAINING YEARS IN SERVICE FOR COLORADO

Alternative Route	Counties				
	Garfield	Mesa	Moffat	Rio Blanco	Routt
Wyoming to Colorado – Aeolus to U.S. Highway 40 (WYCO)					
WYCO-B (Agency and Applicant Preferred Alternative)	$0	$0	$286,021	$0	$0
WYCO-C	$0	$0	$285,884	$0	$0
WYCO-D	$0	$0	$459,087	$0	$19,544
WYCO-F	$0	$0	$286,021	$0	$0
Colorado to Utah – U.S. Highway 40 to Baxter Pass to Clover (COUT BAX)					
COUT BAX-B	$104,319	$51,304	$8,551	$206,927	$0
COUT BAX-C	$104,319	$51,304	$8,551	$206,927	$0
COUT BAX-E	$104,319	$51,304	$8,551	$206,927	$0
Colorado to Utah – U.S. Highway 40 to Central Utah to Clover (COUT)					
COUT-A	$0	$0	$179,992	$0	$0
COUT-B	$0	$0	$102,609	$0	$0
COUT-C (Agency and Applicant Preferred Alternative)	$0	$0	$91,065	$14,964	$0
COUT-H	$0	$0	$91,065	$14,964	$0
COUT-I	$0	$0	$91,065	$14,964	$0

SOURCES: Myer 2013; POWER Engineers 2013 (Analysis by Louis Berger Group)

TABLE 3-309
FIRST YEAR'S PROPERTY TAX REVENUES FOR UTAH

Alternative Route	Counties								
	Carbon	Duchesne	Emery	Grand	Juab	Sanpete	Uintah	Utah	Wasatch
Colorado to Utah – U.S. Highway 40 to Baxter Pass to Clover (COUT BAX)									
COUT BAX-B	$0	$0	$1,634,133	$1,413,080	$311,952	$615,640	$0	$0	$0
COUT BAX-C	$0	$0	$1,851,053	$1,413,080	$311,952	$615,640	$0	$0	$0
COUT BAX-E	$756,122	$0	$1,227,149	$1,413,080	$311,952	$520,609	$0	$0	$0
Colorado to Utah – U.S. Highway 40 to Central Utah to Clover (COUT)									
COUT-A	$0	$1,373,828	$0	$0	$642,497	$361,534	$1,266,401	$840,824	$553,663
COUT-B		$1,268,467	$0	$0	$433,840	$90,900	$1,109,392	$1,032,954	$33,055
COUT-C (Agency and Applicant Preferred Alternative)	$0	$799,506	$0	$0	$433,840	$90,900	$1,134,183	$1,032,954	$33,055
COUT-H	$935,856	$685,881	$37,186	$0	$311,952	$520,609	$1,134,183	$0	$0
COUT-I	$960,647	$685,881	$739,595	$0	$311,952	$603,245	$1,134,183	$0	$0

SOURCES: Patterson 2009; POWER Engineers 2013; Utah State Tax Commission 2012c (Analysis by Louis Berger Group)

TABLE 3-310
ANNUAL PROPERTY TAX REVENUES FOR REMAINING YEARS IN SERVICE FOR UTAH

Alternative Route	Counties								
	Carbon	Duchesne	Emery	Grand	Juab	Sanpete	Uintah	Utah	Wasatch
Colorado to Utah – U.S. Highway 40 to Baxter Pass to Clover (COUT BAX)									
COUT BAX-B	$0	$0	$148,379	$128,308	$28,325	$55,900	$0	$0	$0
COUT BAX-C	$0	$0	$168,076	$128,308	$28,325	$55,900	$0	$0	$0
COUT BAX-E	$68,656	$0	$111,425	$128,308	$28,325	$47,271	$0	$0	$0
Colorado to Utah – U.S. Highway 40 to Central Utah to Clover (COUT)									
COUT-A	$0	$124,744	$0	$0	$58,339	$32,827	$114,989	$76,347	$50,273
COUT-B	$188	$115,177	$0	$0	$39,393	$8,254	$100,733	$93,792	$3,001
COUT-C (Agency and Applicant Preferred Alternative)	$0	$72,595	$0	$0	$39,393	$8,254	$102,984	$93,792	$3,001
COUT-H	$84,976	$62,278	$3,377	$0	$28,325	$47,271	$102,984	$0	$0
COUT-I	$87,227	$62,278	$67,155	$0	$28,325	$54,775	$102,984	$0	$0

SOURCES: Patterson 2009; POWER Engineers 2013; Utah State Tax Commission 2012c (Analysis by Louis Berger Group)

Additionally, there would be property tax revenue associated with the construction of the two series compensation stations that would accrue to the counties in which they are constructed. Depending on the alternative route, the north series compensation station would be located in either Carbon County, Wyoming or in Moffat County, Colorado. The south series compensation station would be located in either Emery or Uintah counties, Utah. Estimated property tax receipts associated with the substation properties are summarized in Table 3-311.

TABLE 3-311
PROPERTY TAX ESTIMATES OF SERIES COMPENSATION STATIONS

Alternative Route	First years' Property Taxes	Estimated Annual Cash Flows	Annual Property Taxes for Remaining Years in Service
Middle North Series Compensation Station – Carbon County, Wyoming	$630,575	$6,643,890	$52,022
Middle North Series Compensation Station – Moffat County, Colorado	$1,849,936	$9,088,816	$209,043
Middle South Series Compensation Station – Emery or Uintah counties, Utah	$1,011,378	$7,312,306	$91,866

SOURCES: Myer 2013; Patterson 2009; POWER Engineers 2013; Uhrich 2013; Utah State Tax Commission 2012c; Wyoming Department of Revenue 2012 (Analysis by Louis Berger Group)

Impacts on Sales Tax Revenues

The Project is expected to generate additional sales tax revenues for county and state governments. Locally purchased materials, such as concrete, lumber, and other supplies, would contribute sales taxes to local jurisdictions. Additionally, workers residing temporarily in local communities would generate sales and use taxes as well as lodging fees through their spending on retail, food and beverage, accommodations, and other items.

Impacts on Private Property

Short-term impacts on nearby residents and properties as a result of the alternative routes would include short-term disruptions during construction. These would include increased noise from construction activities and equipment, the visual presence of construction equipment, and potential traffic and congestion resulting from construction trucks and equipment accessing the right-of-way, using local roads, and from potential short-term road closures during conductor stringing. Long-term impacts on nearby residents as a result of operation of the alternative routes would include low, infrequent disturbance during any maintenance or repair activities (property values are discussed in the subsequent section).

New rights-of-way for the construction and maintenance of the new transmission line would be required for the Project. Existing access roads would be used where possible, but additional access road easements would also need to be acquired. The Applicant would pay market value to nonfederal landowners, as established through the appraisal process, for any new land rights required for this Project. The appraisal process takes all factors affecting value into consideration, including the impact of transmission lines on property value. The Applicant would also compensate landowners for any lost agricultural values.

The appraisals may reference studies conducted on similar properties to support their conclusions. The strength of any appraisal depends on the individual analysis of the property, using neighborhood-specific market data to determine market value. The easements required may encumber the right-of-way area with land-use limitations. Each transmission line easement will specify the present and future right to clear the

right-of-way and to keep it clear of all trees, whether natural or cultivated, and all structure-supported crops, other structures, trees, brush, vegetation, fire and electrical hazards.

Impacts on Property Values

Whenever land uses change, the concern is often raised about the effect the change may have on property values nearby. The question of whether nearby transmission lines can affect residential property values has been studied extensively in the U.S. and Canada over the last 20 years or so with mixed results. In general, the impacts are difficult to measure, vary among individual properties, and are influenced by a number of interplaying factors, including the following (Pitts and Jackson 2007):

- Proximity of residential properties to transmission line structures
- Type and size of high-voltage transmission line structures
- Appearance of easement landscaping
- Surrounding topography

Jackson and Pitts (2010) and Pitts and Jackson (2007) summarize the following on the impacts of high-voltage transmission lines.

- When negative impacts are present, studies report an average decline of prices from 2 to 9 percent.
- Value diminution is attributable to the visual unattractiveness of the lines, potential health hazards, disturbing sounds, and safety concerns.
- Impacts diminish as the distance between the high-voltage transmission lines and the affected properties increase and disappear completely at a distance of 200 feet from the lines (0.04 miles).
- Where views of transmission lines and towers are completely unobstructed, negative impacts can extend up to 0.25 mile.
- If high-voltage transmission line structures are at least partially screened from view by trees, landscaping, or topography, any negative effects are reduced considerably.
- Value diminution attributed to high-voltage transmission line proximity is temporary and usually decreases over time, disappearing completely in 4 to 10 years.

Another recent study by Chalmers has analyzed nearly 600 miles of a 500kV line that stretches across Montana running from Colstrip in the southeast corner of the state west to the state border near Taft (Chalmers 2012a, b, c). Chalmers' research reports on sales dynamics involving properties within 500 feet (almost 0.1 of a mile) of the centerline of the Colstrip-Bonneville Power Administration (BPA) line that sold between 2000 and 2010. He found that circumstances can affect vulnerability to transmission line impacts in rural settings, including:

- When a property's sole use is residential, its vulnerability to price impacts from a transmission line increases.
- As property size increases, vulnerability to negative market impacts from a transmission line decreases.
- If substitutes are available (additional house in an area), vulnerability to price impacts and marketing delays can increase.

Although extents vary, price impacts and market delays associated with the 500kV line on small rural residential parcels have been noted in the Chalmers study. The same report did not find evidence of transmission line impact on sales involving producing agricultural properties; and based on a small number of case studies, found no impact on the sales of recreationally influenced agricultural lands from the presence of the Colstrip-BPA line.

Studies of impacts during periods of physical change, such as new transmission line construction or structural rebuilds, generally reveal greater short-term impacts than long-term effects. However, most studies have concluded that other factors (e.g., general location, size of property or structure, improvements, irrigation potential, condition, amenities, and supply and demand factors in a specific market area) are far more important criteria than the presence or absence of transmission lines in determining the value of residential real estate.

Some impacts on property values (and salability) might occur on an individual basis as a result of the new transmission line. There would be adverse effects expected to property values associated with the transmission line; however, these impacts would be highly variable, individualized, and unpredictable, and most of these losses are likely to be temporary in nature. It is likely that the siting of transmission lines would have a moderate adverse effect on property values for these residences in the short-term. Landscaping and other natural features that create visual obstructions would mitigate these temporary losses. The general location of the residences within 0.1 and 0.25 mile of the transmission routes are described below.

The residences likely to be most affected are those located within 0.1 mile. Alternatives WYCO-B, WYCO-C, and WYCO-F have 4 residences within 0.25 mile of the routes and 1 residence within 0.1 of a mile of these alternative routes. There are 10 and 53 residences located within 0.1 and 0.25 mile of Alternative WYCO-D, respectively. For Alternatives WYCO-B, WYCO-C, and WYCO-F, there would be minimal adverse impacts, while Alternative WYCO-D would have moderate adverse effects as more residences are located in proximity to this alternative route compared to the other WYCO alternative routes. The bulk of the 53 residences within 0.25 mile of Alternative WYCO-D are located southwest, south, east, and north of Craig, Colorado.

For the Colorado/Utah alternative routes, Alternatives COUT BAX-B, COUT-BAX-C, COUT-BAX-E, COUT-C, COUT-H, and COUT-I have fewer nearby residences than Alternatives COUT-A and COUT-B. Alternative Routes COUT BAX-B, COUT BAX-C, COUT BAX-E, COUT-C, COUT-H, and COUT-I have the fewest nearby residences with from 11 to 16 residences within 0.1 mile, and 100 to 141 residences within 0.25 mile. In contrast, Alternatives COUT-A and COUT-B have from 40 to 56 residences within 0.1 of a mile and 214 to 239 residences within 0.25 mile. All of the Colorado/Utah alternative routes would have adverse impacts on these residences, with more adverse impacts associated with Alternatives COUT-A and COUT-B than the other Colorado/Utah alternative routes due to the relatively larger number of nearby residences. However, it is anticipated the remaining Colorado/Utah routes, including Alternatives COUT BAX-B, COUT BAX-C, COUT-BAX-E, COUT-C, COUT-H, and COUT-I would still have moderate adverse effects due to the proximity of residences to the alternative routes (from 11 to 16 residences within 0.1 of a mile, and 100 to 141 within 0.25 of a mile). These adverse effects are likely to dissipate with time and could be mitigated with changes in landscaping or topography. The locations of these nearby residences are described below.

All Colorado/Utah routes pass through just east of the community of Nephi, Utah, just south of Mona, Utah. A neighborhood in the northeastern part of Nephi is located in proximity of the alternative routes with 86 residences within 0.25 mile of the alternative routes.

There are 12 residences within 0.25 mile of Alternatives COUT BAX-B and COUT BAX-C that are located in the Fairview Canyon area north and east of Mount Pleasant, Utah, and north of Castle Dale, Utah. There are 3 residences north of Fairview, Utah, within 0.25 mile of Alternative COUT BAX-E as well as Alternative COUT-H. There are 3 residences west of Mack, Colorado located within 0.25 mile of Alternatives COUT BAX-B, COUT BAX-C, and COUT BAX-E.

There are a number of residences (37) nearby Alternatives COUT-A and COUT-B south and southwest of Roosevelt, Utah in Duchesne County. In addition, Alternative COUT-A also has the following residences within 0.25 mile:

- 8 residences southeast of Strawberry Reservoir in Wasatch County, Utah
- 33 residences in western Duchesne County, Utah near the community of Fruitland
- 4 residences northwest of Duchesne, Utah in Duchesne County
- 8 residences north of Duchesne, Utah in Duchesne County
- 16 residences near Upalco west of Roosevelt in Duchesne County

There are a number of nearby residences to Alternative COUT-B:

- 11 residences near Ioka, Utah in Duchesne County
- 40 residences in the southwestern part of Duchesne County, Utah

Additionally, there are 28 residences in the far southwestern part of Duchesne County, Utah in proximity to Alternatives COUT-B, COUT-C, COUT-H, and COUT-I. Additionally, there are 6 residences west of Martin, Utah, and 42 residences west of Helper, Utah within 0.25 mile from Alternative COUT-H.

The number of structures and their proximity to each alternative route are summarized in Table 3-312. Additional description of the proximity of residential property for the alternative route variations is provided in Appendix F.

TABLE 3-312
PROXIMITY OF RESIDENTS TO TRANSMISSION LINE

Alternative Route	Residences within 0.1 mile	Residences within 0.25 mile	Residences within 0.5 mile	Residences within 1.0 mile
Wyoming to Colorado – Aeolus to U.S. Highway 40 (WYCO)				
WYCO-B (Agency and Applicant Preferred Alternative)	1	4	9	31
WYCO-C	1	4	9	31
WYCO-D	10	53	206	538
WYCO-F	1	4	9	31
Colorado to Utah – U.S. Highway 40 to Baxter Pass to Clover (COUT BAX)				
COUT BAX-B	11	107	241	749
COUT BAX-C	11	107	241	749
COUT BAX-E	14	100	263	772
Colorado to Utah – U.S. Highway 40 to Central Utah to Clover (COUT)				
COUT-A	45	214	598	1383
COUT-B	56	239	536	1165
COUT-C (Agency and Applicant Preferred Alternative)	16	100	208	629
COUT-H	16	141	455	1149
COUT-I	12	101	227	655

3.2.22.5.3 Environmental Justice

Because potential environmental justice populations exist in the study area, it is necessary to determine if impacts are likely to fall disproportionately on these populations. The following analysis examines the spatial distribution of residences located in potential environmental justice Census Blocks in the study

area. As described in Section 3.2.22.3.7, potential minority populations reside in the Census Blocks through which several of the transmission line alternative routes pass. The number of residential structures and their proximity to each alternative route is summarized in Table 3-313. Additional description of the proximity of residential property for environmental justice populations for the alternative route variations is provided in Appendix F.

TABLE 3-313
PROXIMITY OF ALTERNATIVE ROUTES TO ENVIRONMENTAL JUSTICE CENSUS BLOCKS AND STRUCTURES

Alternative Route	Number of Environmental Justice Census Blocks within 0.25 Mile	Number of Residential Structures within 0.25 Mile (Environmental Justice)	Number of Residential Structures within 0.25 Mile (Total)	Number of Residential Structures within 1 Mile (Environmental Justice)	Number of Residential Structures within 1 Mile (Total)
Wyoming to Colorado – Aeolus to U.S. Highway 40 (WYCO)					
WYCO-B (Agency and Applicant Preferred Alternative)	1	0	4	1	31
WYCO-C	1	0	4	1	31
WYCO-D	1	0	53	39	538
WYCO-F	1	0	4	1	31
Colorado to Utah – U.S. Highway 40 to Baxter Pass to Clover (COUT BAX)					
COUT BAX-B	4	5	107	24	749
COUT BAX-C	4	5	107	24	749
COUT BAX-E	2	3	100	13	772
Colorado to Utah – U.S. Highway 40 to Central Utah to Clover (COUT)					
COUT-A	5	6	214	56	1383
COUT-B	6	6	239	51	1165
COUT-C (Agency and Applicant Preferred Alternative)	4	3	100	13	629
COUT-H	5	5	141	17	1149
COUT-I	5	3	101	13	655

Figure 3-12 depicts the geographic distribution of environmental justice and non-environmental justice residences throughout the study area.

There are an estimated 3,297 residences located within 1 mile of all alternative routes, of which 114 are located in Census Blocks that have been identified as a potential minority environmental justice population. There are an estimated 450 residences located within 0.25 mile of the alternative routes, of which 11 have been identified as located in a Census Block with environmental justice populations.

There are a number of residences located in environmental justice Census Blocks within 1 mile of the alternative routes in western Uintah County, Utah, near Alternatives COUT-A and COUT-B roughly 2 to 4 miles to the south and southwest of the Town of Fort Duchesne. At this location, there are a total of five environmental justice Census Blocks that contain a combined total of 35 residences located on the Uintah and Ouray Indian Reservation. Another cluster is located in the Town of Nephi in Juab County, Utah. It comprises a total of 13 residences contained in four environmental justice Census Blocks adjacent to the proposed Colorado to Utah COUT and COUT-BAX Alternatives. A third cluster consists of 11 residences contained in three environmental justice Census Blocks located 5 miles southwest of the Town of Huntington in Emery County, Utah. Alternatives COUT-BAX-B and COUT-BAX-C potentially would

affect this population. Another cluster is dispersed within a 12-mile distance of the Town of Duchesne and includes six residences contained in six environmental justice Census Blocks. Alternatives COUT-A and COUT-B potentially would affect these populations.

The Project is expected to contribute positively to potential environmental justice communities through additional job and income opportunities and fiscal receipts to counties. However, these populations also could be affected adversely by the Project's impacts on additional resource areas (e.g., traffic, air quality, visual resources, and ranching land uses). Air-quality and traffic impacts are expected to be short-term with air emission dispersion limited to the vicinity of the construction activity, and impacts would not result in violations. Adverse effects associated with visual resources also could occur in the potential environmental justice communities.

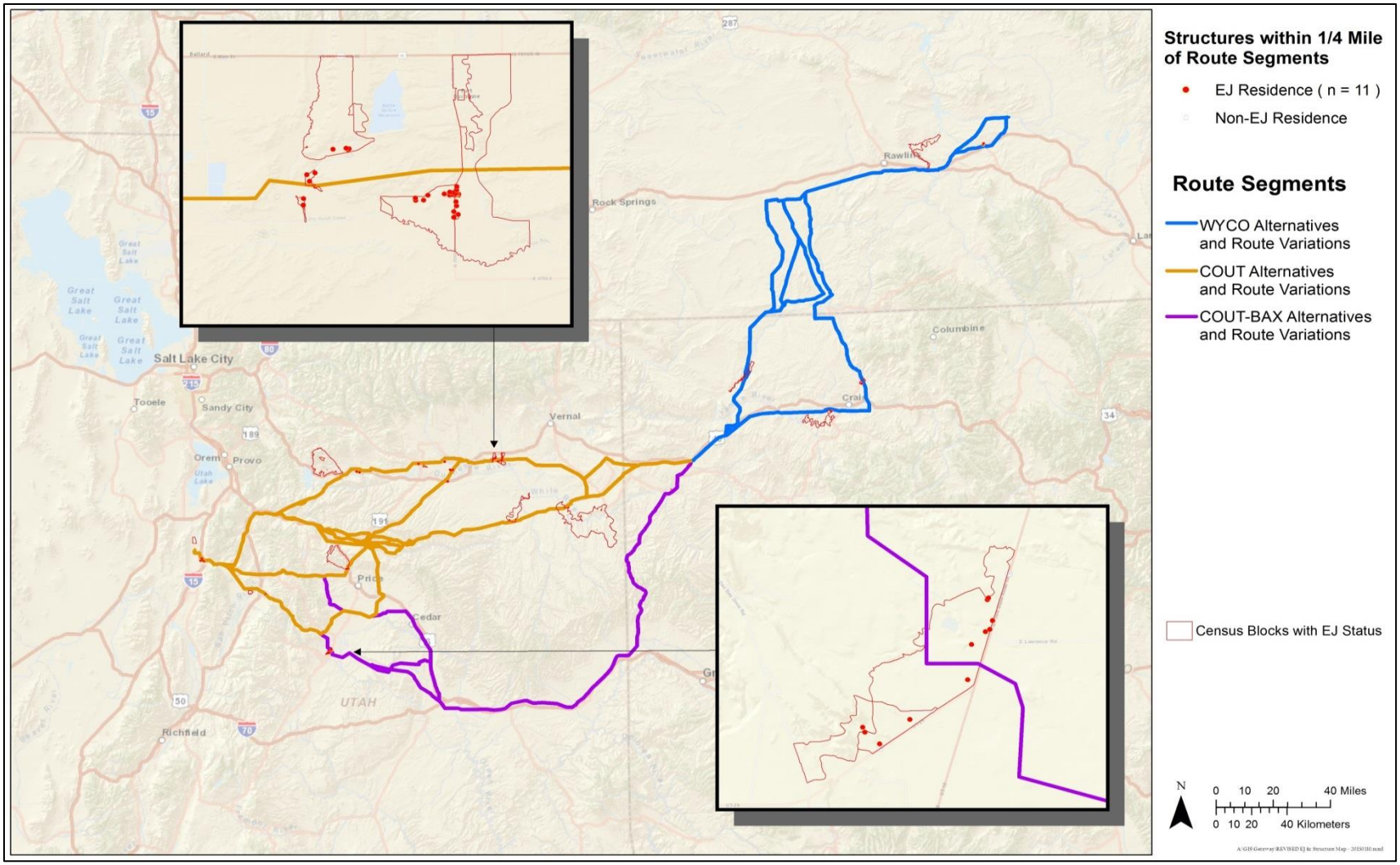


Figure 3-12 Geographic Distribution of Residences and Minority Environmental Justice Census Blocks throughout the Study Area

3.2.23 Public Health and Safety

The Public Health and Safety section responds to issues raised by the public and agencies during Project scoping and preparation of the EIS related to potentially significant effects on public health and safety, including potential effects of EMFs on humans (e.g., pacemaker use) and animals, as well as concerns with spark-gap transmissions.

3.2.23.1 Electromagnetic Fields and Corona Effects

As proposed, the Project includes a new single-circuit 500kV AC transmission line beginning at the Aeolus Substation near Medicine Bow, Wyoming, connecting to two separate proposed series compensation substations and terminating at the existing Clover Substation near Mona, Utah.

The existing and proposed circuits along the route from Aeolus to Clover are sources of 60 Hertz (Hz) EMF, audible noise, and radio noise. To characterize the potential effect of the proposed Project on the existing levels of EMF, audible noise, and radio noise, the levels of these parameters under existing and proposed conditions were modeled for representative configurations (identified as cross sections 1 to 4) accounting for existing and proposed circuits. Conditions where alternative routes parallel existing transmission lines, but are separated by 500 feet or more, were not modeled because there would be no significant effect on levels of EMF, audible noise, or radio noise on the Project right-of-way. Appendix O includes profiles and tables for cross sections 1 to 4.

3.2.23.1.1 Magnetic Fields

The current flowing in the conductors of a transmission line generates a magnetic field near the transmission line. The strength of Project-related magnetic fields is expressed as magnetic flux density in units of milligauss (mG), where 1 Gauss = 1,000 mG[17]. It is important to consider that load current, expressed in units of amperes, generates magnetic fields around transmission line conductors. Measurements of the magnetic field present a snapshot of the load conditions at a point in time. On a given day, throughout a week, or over the course of months and years, the magnetic field level can change depending on the patterns of power demand in the surrounding region.

3.2.23.1.2 Electric Fields

The voltage on the conductors of transmission lines generates an electric field in the space between the conductors and the ground. The strength of Project-related electric fields is expressed in units of kilovolts per meter (kV/m), which is equal to 1,000 volts per meter.[18] Most objects, including fences, shrubbery, and buildings, block electric fields. Around transmission lines, measurable electric fields at ground level typically are highest in outdoor areas on the right-of-way cleared of vegetation.

3.2.23.1.3 Audible Noise

If the Project were implemented, some level of noise would result from construction, maintenance, and operation of the transmission line. During construction, noise would be generated by the equipment used for grading (access roads, tower sites, and series compensation stations), assembly and erection of towers

[17] Scientists more commonly refer to magnetic flux density at these levels in units of microtesla. Magnetic flux density in mG units can be converted to microtesla by dividing by 10 (i.e., 1 mG = 0.1 microtesla).

[18] The strength of an electric field increases with voltage of the source and decreases with distance from the source. Typical electric field levels in the home and at work are less than 0.1 kV/m. Electric fields within 1 foot of small appliances are in the range of 0.02 to 0.2 kV/m, while the electric field immediately adjacent to the heating wires of some electric blankets can be considerably higher.

(including helicopter-assisted construction), wire-pulling and splicing, equipment installation (series compensation stations), and reclamation activities. During maintenance activities, noise could be generated from a vehicle driving along the access roads for tower and line inspection, a helicopter flying along the right-of-way for tower and line inspection, or equipment, and crew conducting maintenance and/or repairs. Calculation of noise from these activities is complicated by the fact that noise levels continuously rise and fall (e.g., the quantity, distribution, and usage of equipment vary with the type of activity).

Also, at the surface of high-voltage transmission line conductors, the electric field may become concentrated on surface irregularities to cause an electrical breakdown of the insulating properties of the air, resulting in power loss at the site of breakdown (a phenomenon called corona). Corona can result in audible noise, particularly when the surrounding air contains numerous water droplets or snowflakes. If there is sufficient corona activity, audible noise can be noticeable within a few hundred feet of the transmission line. The intensity is most pronounced directly underneath the line conductors and decreases with distance from the transmission line.

Corona activity depends on a number of factors: altitude, line voltage, conductor size, conductor geometry, and weather conditions. Corona activity is most likely to occur near transmission lines at higher altitudes and is most pronounced during foul weather. The breakdown strength of air is 30 kilovolts per centimeter at sea level and decreases with increasing altitude. A transmission line is designed so that at a particular altitude, conductor size, and line voltage, the electric field at the conductor surface does not exceed the breakdown potential. Nevertheless, any irregularities on the conductor surface (e.g., nicks, water droplets, or debris) will create points where the electric field is intensified sufficiently to produce corona. In foul weather, raindrops or snowflakes accumulating on the conductor surface also will act as points for corona inception.

When corona occurs on 345kV transmission line conductors, it is accompanied by an audible snapping sound. If there is enough corona activity on the line, many small snaps from corona sources along a conductor may be sufficient, in combination, to produce discernible audible noise (sizzling or crackle) at the edge of the right-of-way.

Sound level is measured in decibels referenced to 20 micropascals, which is approximately the pressure threshold of human hearing at 1 kilohertz (kHz). The range of audible frequencies for the human ear is from approximately 20 Hz to 20 kHz with peak sensitivity near 1 kHz. The change in sensitivity of the human ear with frequency is reflected in measurements by weighting the contribution of sound at different frequencies. Sound at 20 Hz or 20 kHz, where the ear is less sensitive, is given less weight than at frequencies near 1 kHz, where the ear is most sensitive. The weighting of sound over the frequency spectrum to account for the sensitivity of the human ear is called the A-weighted sound level.

When the A-weighted scale is applied to a sound-pressure measurement, the level is often reported as decibels on an A-weighted scale (dBA), referenced to the audible pressure threshold. The sound level of typical human speech is approximately 60 dBA, and background levels of noise in rural and urban environments are about 30 to 40 dBA. Specific identifiable noises such as birdcalls, neighborhood activity, and traffic can produce audible noise levels of 50 to 60 dBA. Table 3-314 lists the sound intensities of common acoustic sources.

TABLE 3-314 COMMONLY ENCOUNTERED ACOUSTIC AND AUDIBLE NOISE LEVELS	
Source	**A-weighted sound level (decibel)**
Auto horn	110
Inside subway	95
Traffic	75
Conversation	65
Office	55
Living room	45
Library	35
Bedroom	24

Corona-generated audible noise varies in time. To account for fluctuating sound levels, statistical descriptors are used to describe environmental noise. Exceedance levels (L levels) refer to the A-weighted sound level that is exceeded for a specified percentage of time. Thus, the L_5 level refers to the noise level that is exceeded only 5 percent of the time. Median sound level (L_{50}) refers to the sound level exceeded 50 percent of the time. Sound-level measurements are expressed in the L_{50} level in fair and foul (steady rain) conditions.

3.2.23.1.4 Radio Noise

Overhead transmission lines can generate radio noise in the bands used for the reception of radio signals. Two potential mechanisms for interference are gap discharges and corona. Corona activity, described previously as a source of audible noise, also induces impulsive currents along a transmission line. These induced currents, in turn, cause wide-band radio frequency noise fields that can affect radio and television reception. Radio noise can produce interference to an amplitude-modulated signal such as a commercial radio audio signal (520 to 1,720 kHz). Frequency-modulated radio stations are generally not affected by electromagnetic noise from a transmission line. In the past, radio noise also could affect the video portion of analog television signals, but this is no longer the case for the majority of television stations. The Digital Television Transition Act authorized by Congress in 1996 determined that full power television stations received an additional broadcast channel to run analog and digital broadcasts simultaneously, and set a deadline of June 12, 2009, for these stations to switch exclusively to digital. The transition date for low power television stations to switch exclusively to digital broadcasting is September 1, 2015.[19] After that date, radio noise from transmission lines would not be expected to affect any television broadcasts.

Gap discharges are an intermittent phenomenon that is more common in distribution lines and low-voltage transmission lines. Electrical discharges on these lines can occur where small gaps develop between metallic line hardware (e.g., insulators, clamps, or brackets). Discharge across these gaps can cause incidental interference to radio-communication services; in this event, the sources of gap-type interference can be located and repaired. Gap discharges occur less frequently on high-voltage transmission lines, and the proposed line will be constructed with modern hardware that eliminates gap-type interference.

Radio noise levels are expressed as decibels above 1 microvolt per meter (dBµV/m) to describe the electric field intensity incident on a reference antenna at 500 kHz, as recommended by the IEEE (1971). Weather has a large influence on corona-generated radio noise, as it does for audible noise. As with audible noise, corona-generated radio noise also varies in time. To account for fluctuating noise levels, statistical descriptors are used to describe radio noise. As with audible noise, radio noise levels are

[19] http://www.fcc.gov/digital-television

expressed as L_{50} values during fair or foul (steady rain) conditions. Radio noise, like audible noise, is more pronounced at higher altitudes.

3.2.23.2 Regulatory Framework

Applicable guidelines or regulations at the federal, state, or local level that may apply to EMF, audible noise, or radio noise of the proposed transmission lines are discussed in this section.

3.2.23.2.1 Electric and Magnetic Fields

Research on the potential influence of EMFs on organisms and human health has been conducted over many decades to understand basic interactions of EMF with biological organisms and cells and to investigate potential therapeutic applications. In the 1970s questions arose about potential adverse health effects because of some epidemiology studies that had suggested statistical associations between exposure to EMF and health conditions including cancer. Over the past 40 years, considerable additional research has been conducted to address uncertainties in those studies and to determine if there was any consistent pattern of results from human, animal, and cell studies that would support such an association. The quantity and complexity of the research has led scientific and government health agencies to assemble multidisciplinary panels of scientists to conduct weight-of-evidence reviews and arrive at conclusions about the possible effects associated with EMF. The listing of these agencies (in ascending, chronological order of their most recent publication) is provided below:

- The National Institute for Environmental Health Sciences assembled a 30-person Working Group to review the cumulative body of epidemiologic and experimental data and provide conclusions and recommendations to the U.S. government (National Institute for Environmental Health Sciences 1998, 1999).
- The International Agency for Research on Cancer completed a full carcinogenic evaluation of EMF in 2002.
- The National Radiological Protection Board of the United Kingdom issued full evaluations of the research in 1992, 2001, and 2004 with supplemental updates and topic-specific reports published in the interim and subsequent to their last full evaluation in 2004 (National Radiological Protection Board 1992, 1994a, 1994b, 2001a, 2001b, 2004; Health Protection Agency 2006).
- The World Health Organization released a review in June 2007 as part of its International EMF Program to assess the scientific evidence of possible health effects of EMF in the frequency range from 0 to 300 gigahertz.
- The Health Council of the Netherlands, using other major scientific reviews as a starting point, evaluated recent studies in several periodic reports (Health Council of the Netherlands 2001, 2004, 2005, 2007, 2009).
- The Scientific Committee on Emerging and Newly Identified Health Risks issued a report to the Health Directorate of the European Commission in March 2007 and March 2009 updating previous conclusions (Scientific Steering Committee of the European Commission1998; Scientific Committee on Toxicity, Ecotoxicity and the Environment 2001; Scientific Committee on Emerging and Newly Identified Health Risks 2007, 2009). Their most recent report was issued in January 2015, which updated their 2009 report (Scientific Committee on Emerging and Newly Identified Health Risks 2015).
- The European Commission also has funded the European Health Risk Assessment Network on Electromagnetic Fields Exposure (EFHRAN), a network of scientists convened to perform health risk assessments and provide scientifically based recommendations to the European Commission.

EFHRAN consulted other major reviews and evaluated epidemiologic and experimental research published after August 2008 to provide an updated health assessment (EFHRAN 2010, 2012).

- The International Commission on Non-Ionizing Radiation Protection (ICNIRP), the formally recognized organization for providing guidance on standards for non-ionizing radiation exposure for the World Health Organization, published a review of the cumulative body of epidemiologic and experimental data on EMF in 2003. The ICNIRP released exposure guidelines in 2010 that updated their 1998 exposure guidelines. For both guidelines, they relied heavily on previous reviews of the literature related to long-term exposure, but provided some relevant conclusions as part of their update process (ICNIRP 1998, 2010).
- The Swedish Radiation Protection Authority (SSI), which became the Swedish Radiation Safety Authority (SSM) in 2009, evaluated current studies in several reports, using other major scientific reviews as a starting point (SSI 2007, 2008; SSM 2009, 2010, 2013, 2014, 2015).

Overall, the published conclusions of these scientific review panels have been consistent. None of the panels concluded that either electric fields or magnetic fields are a known or likely cause of any adverse health effect at the long-term, low exposure levels found in the environment. As a result, no standards or guidelines have been recommended to prevent this type of exposure; however, from all the research that has been conducted, it was confirmed that short-term exposure to higher intensities of EMF (even above exposure levels of electrical and industrial workers) could produce adverse stimulation of nerves and muscles. Hence, several scientific agencies have recommended health-based guidelines to limit high intensity EMF exposure. These guidelines include exposure limits for the general public recommended by the International Committee on Electromagnetic Safety (ICES) and ICNIRP to address health and safety issues (ICES 2002; ICNIRP 2010). These guidelines are explained below.

The federal government, the State of Wyoming, the State of Colorado, and the State of Utah have not enacted standards for EMF from transmission lines or other 60-Hz sources. While the State of Colorado's Public Utilities Commission requires in their "*Rules Regulating Electric Utilities*" that any application for a Certificate of Public Convenience and Necessity "… include the expected maximum level of magnetic fields that could be experienced under design conditions at the edge of the transmission line right-of-way or substation boundary, at a location one meter above the ground," they further state that magnetic field levels that are 150 mG or below are "… deemed reasonable by rule and do not need to be mitigated to a lower level."[20] This requirement is based on a policy of "prudent avoidance," that is utilized by some other states such as Connecticut. Prudent avoidance, in the case of power lines, is defined by the State of Colorado as taking steps to reduce exposure to EMF at reasonable or modest cost. Several other states have statutes or guidelines that apply to electric fields produced by new transmission lines, but these guidelines are to minimize perception of electric fields.The basis for limiting magnetic fields from transmission lines in Florida and New York was to maintain the status quo so fields from new transmission lines would be no higher than those produced by existing transmission lines. Florida and New York, for example, have enacted standards to limit magnetic fields at the edge of the right-of-way from transmission lines (Florida Department of Environmental Regulation 1989, 1996; New York Public Service Commission 1978, 1990). For 345kV transmission lines, these limits are 200 mG at the edges of new rights-of-way.

Recommended Exposure Limits

The only confirmed relationship between electric fields or magnetic fields and an adverse biological or health effect is when electric currents, at very high levels of exposure, are experienced in the body as a shock-like effect. The levels at which these short-term effects occur are typically much higher than levels

[20] https://www.sos.state.co.us/CCR/GenerateRulePdf.do?ruleVersionId=5738&fileName=4%20CCR%20723-3

found under transmission lines and higher than levels found in most homes or commercial establishments. As mentioned, ICES and ICNIRP have recommended exposure limits to protect against the occurrence of these acute adverse effects from short-term exposures. Table 3-315 shows the recommended exposure limits.

TABLE 3-315
REFERENCE LEVELS FOR WHOLE BODY EXPOSURE TO 60-HERTZ FIELDS
GENERAL PUBLIC

Organization Recommending Limit	Magnetic Fields[1]	Electric Fields[1]
International Commission on Non-ionizing Radiation Protection	2,000 milligauss	4.2 kilovolts per meter (kV/m)
International Committee on Electromagnetic Safety	9,000 milligauss	5 kV/m 10 kV/m[2]

NOTES:
[1]Both organizations judged that evidence for effects from long-term exposure was insufficient for setting exposure standards.
[2]Exception in the transmission line right-of-way

Research also has been conducted on the possible effect of EMF on wild and domestic animals in response to concerns about the effects of high-voltage and ultra-high-voltage transmission lines in the vicinity of farms and the natural habitat of wild animals. National agencies and universities have conducted research on an assortment of fauna using a variety of study designs, including observational studies of animals in their natural habitats and highly controlled experimental studies. The research to date does not suggest that AC magnetic or electric fields (or any other aspect of high-voltage transmission lines, such as audible noise) result in adverse effects on the health, behavior, or productivity of fauna, including livestock (e.g., dairy cows, sheep, and pigs) and a variety of other species (e.g., small mammals, deer, elk, birds,[21] and bees).

The well-established exception was reported by Greenberg et al. (1981) who studied the effect of a 765kV transmission line on honeybee hives placed at varying distances from the transmission line's centerline with some hives exposed to EMF from the line and some shielded. Differences between the shielded and unshielded hives were reported at exposures above 4.1 kV/m, including decreases in hive weight, abnormal amounts of propolis at hive entrances, increased mortality and irritability, loss of the queen in some hives, and a decrease in the hive's overwinter survival. These adverse effects were reported only in the unshielded group. Since the shielding only prevented exposure to electric fields, not magnetic fields, the results indicate these adverse effects are attributable to electric field exposure. These results have been replicated by other investigators (Rogers et al. 1980, 1981, 1982).

Further studies indicated the effects were indirect (i.e., the electric fields did not affect the bees directly, and that electric field levels greater than 200 kV/m were required to affect the behavior of free-flying bees). Thus, heating of the hive by induced currents caused some of the adverse effects and the rest were attributed to shocks in the hive (Bindokas et al. 1988a, 1988b, 1989). Prevention is easily accomplished by placing a grounded metal cover on top of the hive. Since the nests of wild bees in the ground or in trees contain no metal or highly conductive materials, there appears to be little relevance of such effects on wild bees. At these locations, wild bees also are naturally shielded from electric fields. Laboratory studies indicate that bees are unable to discriminate 60-Hz magnetic fields reliably at intensities less than 4,300 mG, although they can detect fluctuations in the earth's static geomagnetic field as weak as 0.26 mG (Kirschvink et al. 1997). The difference in the sensitivity of honey bees is an illustration that a

[21]Sage-grouse is a species of interest with respect to the proposed EGS transmission line. No studies have focused specifically on sage-grouse, but are based on research on other avian species. No adverse effects of EMF on grouse would be expected. The effect of transmission line construction on grouse habitat is an issue that is addressed in Section 3.2.8.5 of the EIS.

sensory mechanism has developed to detect static magnetic fields that effectively rejects extraneous signals, in this case AC (60-Hz) magnetic fields.

3.2.23.2.2 Audible Noise

In determining the impact of noise, the important factor is the proximity of the activity to wildlife and persons detecting the sounds. The alternative routes considered for the Project traverse areas that are predominantly rural open space and remote with background noise typical of such settings. In most cases, the closest humans would be construction workers. Where construction would occur near more populated areas, the noise from construction (and subsequent maintenance) might be audible; however, such noise would be temporary and possibly considered only as a nuisance. Wildlife likely would avoid the temporary construction areas (refer to Sections 3.2.7 and 3.2.8).

There are no federal regulatory requirements for the audible noise level from transmission lines. The EPA has audible noise guidelines developed for the protection of public health and welfare that are widely accepted by state and local governments for the long-term exposure to environmental noise (EPA 1974). The EPA employs the equivalent sound level (L_{eq}) and day-night sound level (L_{dn}) metrics in its guidelines. L_{eq} is the energy-averaged sound level over a specified time, whereas the L_{dn} is a 24-hour average sound level that includes a 10 dBA penalty to sound levels during nighttime hours (10:00 pm to 7:00 am). The EPA's guideline lists an L_{dn} of 55 dBA to protect the public from interference to activity or annoyance outdoors in residential areas. Outdoor noise generally does not contribute to indoor levels, which are dominated by activities in a building or residence (EPA 1974).

The predictions of audible noise in Appendix O are presented as median levels (L_{50} exceedance levels) during foul weather. To convert these levels to L_{dn} levels requires information or assumptions regarding ambient noise, percentage of foul weather, and the statistical distribution of foul-weather audible noise. The correction factors used to obtain L_{dn} levels from foul-weather L_{50} levels are shown in Table 3-316 for various frequencies of foul weather and ambient noise level.

TABLE 3-316
CORRECTION FACTORS TO OBTAIN EQUIVALENT SOUND LEVELS AND DAY-NIGHT SOUND LEVEL FROM MEDIAN FOUL WEATHER TRANSMISSION LINE SOUND LEVEL

	L_{eq} to L_{50} Foul		L_{dn} to L_{50} Foul	
Frequency	**40 dBA ambient**	**No ambient**	**40 dBA ambient**	**No ambient**
0	-14.0	-24.0	-7.6	-17.6
1	-13.0	-18.4	-6.6	-12.0
5	-10.4	-12.4	-4.0	-6.0
10	-8.4	-9.6	-2.0	-2.9
100	+0.3	+0.3	+6.7	+6.7

SOURCE: Dietrich 1982
NOTES:
dBA = Decibel (A-weighted)
L_{50} = Median sound level
L_{dn} = Day-night sound level
L_{eq} = Equivalent sound level

The appropriate correction factor from Table 3-316 can be applied to the calculated L_{50} level to yield an L_{dn} level. A correction factor of -2.9 dBA, corresponding to 10 percent occurrence of foul weather, was used in this report.[22]

[22]Refer to NowData - NOAA Online Weather Data. NOAA. Retrieved February 14, 2012. NOAA reports 103 average precipitation days (greather than or equal to 0.01 in) per year for Provo, Utah.

3.2.23.2.3 Radio Noise

Wyoming, Colorado, and Utah have no limits for radio interference. Electromagnetic interference from power transmission systems in the U.S. is governed by the Federal Communication Commission's (FCC) *Rules and Regulations* (FCC 2013). A power transmission line is categorized by the FCC as an incidental radiation device, which is "a device that radiates radio frequency energy during the course of its operation although the device is not intentionally designed to generate radio frequency energy." Such a device "shall be operated so that the radio frequency energy that is emitted does not cause harmful interference. In the event that harmful interference is caused, the operator of the device shall promptly take steps to eliminate the harmful interference." In this case, harmful interference is defined as "any emission, radiation or induction which endangers the functioning of a radio navigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radio communication service operating in accordance with this chapter" (FCC 2013).

Historically, transmission line operators have not had difficulty operating under the present FCC rules since most sources of harmful interference are due to gap-type discharges that can be identified and repaired (Loftness 1980). Residences very near transmission lines, however, may be affected by corona-type radio noise in foul weather. For this reason, the *Radio Noise Design Guide* (IEEE 1971) identifies an acceptable limit of average fair-weather radio noise of 40 dBµV/m at 100 feet (30 meters) from the outside conductor.

3.2.23.2.4 Pacemakers

Implanted cardiac pacemakers are designed to detect abnormal electrical signals from the beating heart and administer therapy in the form of electrical pulses through implanted electrodes to maintain or restore normal heart function. Many sources of EMF at a variety of frequencies have been reported to affect pacemaker function including iPods and other personal MP3 players; cell phones; wireless phones; electric pencil sharpeners; power tools; anti-theft and security devices in stores, libraries, and airports; video games; ordinary magnets (i.e., on refrigerators or kitchen cabinets); escalators; and electric vehicle ignitions and motors among other sources. If pacemaker wearers, however, avoid proximity to these devices, then their pacemakers will not be subject to potential interference from EMF.

Literature suggests pacemakers also can be affected by EMF from utility power sources and may be somewhat more sensitive to 60-Hz electric fields than 60-Hz magnetic fields. Buildings, walls, shrubbery, and vehicles—among other conductive objects—can effectively shield electric fields under most circumstances, thereby lessening this potential for effect on pacemakers. The manufacturers of pacemakers also have designed their devices in various ways to minimize potential interference from endogenous sources (e.g., muscle potentials) and interference by conducted currents from exogenous sources (e.g., touching electrical appliances). These measures also serve to minimize potential interference by electric fields. To protect the patient, most pacemakers (particularly new ones) are designed to filter out external electrical signals and go into an automatic pacing mode when interference is detected.

The expected electric field level at the edge of the proposed right-of-way for the Project is less than 1.4 kV/m without taking into account any shielding provided by objects in the environment; and the magnetic field level is 378 mG (Appendix O, Tables O-2 and O-3). While there is no universal guidance as to acceptable levels of EMF for pacemakers, the American Conference of Governmental Industrial Hygienists has recommended guidelines for various occupational exposures, including EMF. These guidelines are designed to identify levels to which nearly all workers may be repeatedly exposed without adverse effect and, for EMF, suggest patients with pacemakers or similar devices limit their exposure to electric fields to 1 kV/m and magnetic fields to 1,000 mG (American Conference of Governmental Industrial Hygienists 2009). As shown in Appendix O, the field levels diminish quickly with distance

from the conductors (Figures O-1 to O-8). Therefore, the expected levels of EMF just outside the right-of-way would be below the American Conference of Governmental Industrial Hygienists' guideline levels.

3.2.23.2.5 Induction and Field Perception

Short-term effects from transmission line electric fields are associated with perception of induced currents and voltages or perception of the field. Under certain conditions, the electric field can be perceived through hair movement on an upraised hand or arm of a person standing on the ground under high-voltage transmission lines. This perception is most likely to occur at midspan under a high-voltage transmission line and less likely to occur in locations where the electric field is less than 2 kV/m. Therefore, it is unlikely the field would be perceived beyond the edge of the right-of-way. The presence of vegetation may shield the electric field and prevent perception. Persons in the cabs of trucks or other vehicles are shielded by the conductive metal of the vehicle from the electric field and from induced effects such as shocks.

Induced current or spark discharge shocks can be experienced under certain conditions when a person contacts objects in an electric field. Such effects occur in the fields associated with transmission lines that have voltages of 230kV or higher. Shocks of a magnitude that could be harmful from induced currents would not occur under the existing or proposed lines because clearances aboveground required by the NESC preclude such shocks from large vehicles, and grounding practices eliminate large stationary objects as sources of such shocks.

Minor shocks that produce no harm can be annoying or unexpected and can occur under higher voltage transmission lines when making contact with ungrounded conducting objects (e.g., vehicles or equipment). These shocks would be uncommon and mostly perceived as a nuisance when they occur. Shocks from electric field induction on large metal objects next to the right-of-way, or magnetic induction on fences, irrigation pipes, pipelines, electrical distribution lines, or telephone lines that form a conducting loop for long distances parallel to a transmission line, can be prevented by utility policies for routinely grounding such installations located on or near the right-of-way.

Limiting the possibility of induced currents flowing from farm machinery and large vehicles under transmission lines to persons is accomplished by maintaining sufficient conductor clearance above vehicles in the final design. This is so the induced short-circuit current in the largest anticipated vehicle under the line is limited to 5 milliamperes or less per the NESC.

Vehicles should not be refueled under the proposed transmission line unless specific precautions are taken to ground the vehicle and the fueling source.

3.2.23.3 Environmental Setting

3.2.23.3.1 Modeled Cross Sections

The modeled cross sections are longitudinally uniform and located between tangent structures on the Project route. Dead-end or strain structures at points where the proposed 500kV transmission line terminates or changes direction abruptly were not modeled. As with line crossings, regions with abrupt turns alter EMF, audible noise, and radio noise levels in the span of a few hundred feet and are not representative of the EMF and noise levels encountered along the majority of the proposed 400-mile route. Schematic depictions of cross sections 1 to 4 are included in Appendix O.

Existing transmission lines in the vicinity of the Agency and Applicant Preferred Alternatives, modeled in cross sections 1 to 4, include the following:

- Mona to Bonanza 345kV transmission line (cross section 2)
- Spanish Fork to Carbon No. 1 and No. 2 138kV transmission lines (cross section 3)
- Hayden to Artesia 138kV transmission line and Milford to Cove Fort 46kV sub-transmission line (cross section 2)

Cross Section 1

Cross section 1 (refer to Figure O-1) depicts the Project at locations where adjacent lines are located at distances greater than 500 feet from the reference centerline of the 500kV circuit. Cross section 1 is representative of the majority of the Project, including the Agency and Applicant Preferred Alternatives in Wyoming; Links C31, C61, C71, C91 in Colorado; and the Agency and Applicant Preferred Alternatives in Uintah, Carbon, Duchesne, and Wasatch counties in Utah.

In cross section 1, the proposed 500kV transmission line is modeled in the center of a proposed 250-foot right-of-way. Phase conductors of the proposed 500kV circuit were modeled in a delta configuration with triple-bundled 1,272 kcmil (thousand circular mil) Bittern aluminum-conductor steel-reinforced subconductors having 18-inch subconductor spacing. A 27.75-foot horizontal phase spacing and 47-foot midspan conductor height (60 degrees Fahrenheit conductor temperature at average load) were modeled for the proposed circuit. At peak load and maximum sag (239 degrees Fahrenheit conductor temperature), a midspan conductor height of 34.6 feet was included in EMF calculations.

The phasing of the 500kV transmission line proposed as part of the Project has not been designed in cross sections 1 to 4. The profiles in Appendix O were calculated with north-south ABC phasing for the proposed 500kV circuit. In addition, Appendix O summarizes calculated EMF values for all permutations of the existing and proposed transmission line phases.

Cross Section 2

Cross section 2 (refer to Figure O-2) depicts the proposed Project approximately 250 feet from the existing Mona to Bonanza transmission line near Fruitland, Utah, and at portions of the Project route in Links U460, U621, U625, U637, U638, and U639. In cross section 2, the Mona to Bonanza 345kV transmission line is modeled to the north of the Project on an existing 150-foot right-of-way. Phase conductors of the existing 345kV circuit were modeled in a delta configuration with double-bundled 1,590 kcmil Falcon conductors and 18-inch subconductor spacing. A 17-foot horizontal phase spacing and 38-foot midspan conductor height were modeled for the 345kV circuit.

The cross section 2 profiles in Appendix O were calculated with north-south ABC phasing for the existing 345kV circuit. In addition, Appendix O summarizes calculated EMF levels for all permutations of the existing and proposed transmission line phases.

Cross Section 3

Cross section 3 (refer to Figure O-3) depicts the proposed Project approximately 250 feet from the existing Spanish Fork to Carbon transmission lines #1 and #2 near Colton, Utah. In cross section 3, the Spanish Fork to Carbon 138kV transmission lines are modeled to the north of the Project with a centerline separation of 100 feet. Each of the existing 138kV lines is permitted for a 100-foot right-of-way, for a total of 200 feet of existing right-of-way in cross section 3. Phase conductors of the existing 138kV circuits were modeled in a horizontal configuration with 4/0 cable on Spanish Fork to Carbon #1 (north in cross section 3) and 795 kcmil Drake conductors on Spanish Fork to Carbon #2 (south in cross section 3). A 13.5-foot horizontal phase spacing and 32-foot midspan conductor height were modeled for both 138kV circuits.

The cross section 3 profiles in Appendix O were calculated with north-south ABC phasing for the existing 138kV circuits. In addition, Appendix O summarizes calculated EMF values for all permutations of the existing and proposed transmission line phases.

Cross Section 4

Cross section 4 (refer to Figure O-4) depicts the proposed Project approximately 250 feet from the existing Hayden to Artesia transmission near Craig, Colorado, and in portions of Links C101, C105, C106, C170, C171, C172, C173, C174, and C186. In cross section 4, the Hayden-Artesia 138kV transmission line is modeled to the south of the Project on an existing 80-foot right-of-way. Phase conductors of the existing 138kV circuit were modeled in a horizontal configuration with 556 kcmil Parakeet conductors. A 14-foot horizontal phase spacing and 32-foot midspan conductor height were modeled for the 138kV circuit.

The cross section 4 profiles in Appendix O were calculated with north-south ABC phasing for the existing 138kV circuit. In addition, Appendix O summarizes calculated EMF values for all permutations of the existing and proposed transmission line phases.

3.2.23.4 Study Methodology

3.2.23.4.1 Calculations

Before and after construction EMF, audible noise, and radio noise levels were calculated using computer algorithms developed by the BPA (BPA 1991). The inputs to the program include data regarding voltage, current flow, circuit phasing, and conductor configurations. The resultant fields and noise levels associated with transmission lines were estimated along transects perpendicular to the transmission centerline at midspan. These midspan profiles model the transmission lines at the point of greatest conductor sag with a uniform cross section.[23] Existing and proposed lines were modeled with balanced currents on the phase conductors.

3.2.23.4.2 Electric and Magnetic Fields

EMF levels were calculated at a height of 1 meter (3.28 feet) aboveground in accordance with the standard method for measuring EMF near transmission lines (IEEE Standard 1308-1994). EMF levels are expressed as the resultant (root mean square) of magnetic field components measured in the x, y, and z axes.[24] The electric field calculations assumed an overvoltage condition of 5 percent for 345kV transmission lines, and an overvoltage of 10 percent for 500kV transmission lines.

Magnetic fields around the existing and proposed transmission lines depend on current, which increases with increasing loading. Loading on existing and proposed lines were provided by POWER Engineers and are summarized in Table 3-317 as average and peak amperes per phase. Since magnetic field exposures at peak loading would be expected to occur only for a limited number of hours on a limited number of days each year, the calculated magnetic field levels at annual average loading provide a better estimate of typical potential exposures. Magnetic fields calculated at annual average loading are depicted in the graphical profiles in Appendix O.

[23] A uniform cross-section means the BPA algorithms model the transmission conductors at a uniform height above flat terrain for the entire distance between adjacent structures.

[24] Root-mean-square refers to a common method of reporting the effective magnitude of voltage, current, or EMF levels of an AC system. The x, y, and z axes refer to the vertical, transverse, and longitudinal directions relative to the transmission centerline. The BPA algorithms assume a uniform right-of-way cross-section with no longitudinal component of the magnetic field.

The profiles in Appendix O were calculated with north-south ABC phasing for the existing and proposed circuits. Since the phasing of the proposed 500kV transmission line has not been designed in cross sections 1 to 4, Appendix O also summarizes calculated EMF values for permutations of the existing and proposed transmission line phases.

3.2.23.4.3 Audible Noise

Audible noise levels were calculated using methods developed at the High Voltage Transmission Research Center (HVTRC) and implemented in the software application SUBCALC, which is part of the Enertech EMF Workbench Suite. Audible noise levels across the right-of-way, L_{50} fair and L_{50} rain, are reported for the existing and proposed 345kV transmission lines at a height of 5 feet aboveground at 7,500 feet mean sea level. The 5-foot height estimates the sound-pressure level that would be perceived by a standing listener. When computed according to the BPA methods used in this EIS, the median audible noise levels during average fair weather are 25 dBA lower than foul weather (stable rain values).

3.2.23.4.4 Radio Noise

Radio noise levels are expressed as median values for fair or foul weather (steady rain) conditions for a 1-meter high antenna and a signal at 1 megahertz. When computed according to the BPA methods used in this EIS, median radio noise levels during average fair weather values are 17 dBµV/m lower than median radio noise levels calculated during foul weather (stable rain values).

3.2.23.4.5 Loads

The Applicant and POWER Engineers identified existing transmission facilities aligned with the Agency and Applicant Preferred alternatives of the 500kV portions of the Project. Existing transmission lines in cross sections 2 to 4 were modeled using average and peak loading derived from 2012 operational data, also provided by POWER Engineers. The peak load of the proposed 500kV transmission line was based on the design capacity of the Project (1,500 MW). The average load for the 500kV circuit was modeled as 943 megavolt-amperes (MVA), based on the historical relationship between peak and average flows on the Mona to Bonanza transmission line, recorded in 2012.

Modeled loading for average and peak conditions are summarized in Table 3-317. A 10 percent power factor was modeled for all transmission lines except the Hayden to Artesia transmission line, for which monitored real and reactive load flows were provided by POWER Engineers.

TABLE 3-317
AVERAGE AND PEAK LOADING OF TRANSMISSION LINES MODELED IN SECTIONS 1 TO 4

Transmission Line	Voltage (kV)	Average load		Peak load	
		MVA	Current (amperes)	MVA	Current (amperes)
Aeolus[1] to Clover	500	943	1,089	1,500	1,732
Mona to Bonanza[1]	345	396	661	628	1,051
Spanish Fork to Carbon[1] #1	138	38.6	157	80.2	335
Spanish Fork to Carbon[1] #2	138	122	511	188	789
Hayden[1] to Artesia	138	24.1[2]	101	27.5[2]	115

NOTES:
[1]Currents measured from indicated terminal
[2]Average load 23.7 MW, -4.3 MVAR; peak load 27.1 MW, -4.5 MVAR
kV = Kilovolt
MVA = megavolt-amperes
MVAR = megavolt-amperes reactive
MW = megawatt

3.2.23.5 Results

3.2.23.5.1 Magnetic Fields

Figures O-1 to O-4 in Appendix O, depict calculated magnetic field profiles for average load in cross sections 1 to 4. Calculated magnetic field levels are tabulated at the end of Appendix O for the average-load case (Table O-1) and peak-load case (Table O-2). Figures O-1 to O-4 and Tables O-1 to O-2 summarize calculated magnetic field levels with horizontal ABC phasing on all circuits with the A phase located on the north side of the right-of-way.

In cross section 1 (Figure O-1), the calculated magnetic field level at the edge of the right-of-way is 29.9 mG under average-load conditions. Under peak-load conditions with the Project operating at 1,500 MVA design capacity, the highest calculated magnetic field at the right-of-way edge is 51.0 mG (Table O-2).

In cross section 2 (Figure O-2), the magnetic field levels on the proposed right-of-way are dominated by current on the 500kV circuit. Compared to cross section 1, the calculated magnetic fields at the edge of the right-of-way are 1 mG higher on the southern (negative) edge and 2.7 mG higher on the northern (positive) edge (refer to Table O-1). Under modeled loading conditions, little cancellation of fields is realized by phasing selection (refer to Table O-3). For any given phasing of the existing Mona to Bonanza transmission line—and any selected phasing of the proposed 500kV transmission line—the maximum calculated magnetic field on the proposed right-of-way varies between 156 and 161 mG for average-load conditions. On the south side of the proposed right-of-way, farthest from the existing Mona to Bonanza line, phasing selection impacts the calculated magnetic fields by approximately ±1 mG (29.0 to 30.6 mG at the southern right-of-way edge in cross section 2 versus 29.9 mG in cross section 1). Greater cancellation of fields occurs on the north edge of the proposed right-of-way. At this location, the calculated magnetic fields under average-load conditions vary with phasing between 25.3 and 37.5 mG.

In cross section 3 (Figure O-3), the magnetic field levels on the proposed right-of-way are again dominated by current on the 500kV circuit. Compared to cross section 1, the calculated magnetic fields at the edge of the right-of-way are 0.5 mG higher on the southern (negative) edge and 2.4 mG higher on the northern (positive) edge (refer to Table O-1). As with cross section 2, little cancellation of fields is realized by phasing selection (refer to Table O-3). At the southern edge of the proposed right-of-way, calculated magnetic fields vary by approximately ±0.5 mG compared to cross section 1. The greatest cancellation of fields occurs on the north edge of the proposed right-of-way, closest to the existing Spanish Fork to Carbon transmission lines. At this location, the calculated magnetic fields under average-load conditions vary with phasing between 28.3 and 32.3 mG.

In cross section 4 (Figure O-4), the calculated magnetic fields at the edge of the right-of-way are elevated by only 0.1 to 0.4 mG in proximity to the existing Hayden to Artesia transmission line (refer to Table O-1). In this cross section, the greatest cancellation of fields occurs on the southern edge of the proposed right-of-way closest to the existing 138kV circuits. At this location, the calculated magnetic fields under average-load conditions vary with phasing only slightly, between 29.5 and 30.3 mG.

In any modeled condition, the calculated magnetic field levels associated with the operation of the Project are below limits for the general public recommended by ICNIRP and ICES. A portion of the Project study area is in Colorado and Section 4 CCR 723-3102(c), (d) and 723-3206(e) of the Colorado Public Utilities Commission's rules require that calculated levels of magnetic fields from transmission lines not exceed 150 mG at the edge of the right-of-way at the continuous MVA circuit rating. This limit would be met by the proposed transmission line. If the proposed line were to cross over an existing transmission line, the increase in the EMF would be confined mostly to the right-of-way under and around the crossing and mitigated by the increased height of the proposed transmission line aboveground.

3.2.23.5.2 Electric Fields

Figures O-5 to O-8 in Appendix O depict calculated electric field profiles for average line heights in cross sections 1 to 4. Calculated electric field levels are tabulated at the end of Appendix O for average and minimum conductor heights (Tables O-5 and O-6). At peak-load conditions and a minimum ground clearance of 34.6 feet, the highest calculated electric field beneath the conductors of the proposed 500kV transmission line is 9.93 kV/m. This electric field level will be encountered for a few hours each year during periods of peak load and only at the point of lowest conductor sag in some spans. The highest calculated electric field level (0.76 kV/m) at the edge of the right-of-way associated with the operation of the Project is below limits recommended by the ICNIRP and the ICES for the general public.

As for the calculated magnetic fields, the calculated electric fields vary only slightly with phasing selection. Tables O-7 and O-8 summarize the ranges of calculated electric field levels in cross sections 1 to 4 over all permutations of the phasing of existing and proposed transmission lines. Under any modeled condition, the maximum calculated electric field on the proposed right-of-way is 10.02 kV/m. Likewise, at the edges of the proposed right-of-way, the maximum calculated electric field is 1.33 kV/m is below the limits recommended by the ICNIRP and the ICES for the general public.

3.2.23.5.3 Audible Noise

Figures O-9 to O-12 in Appendix O depict calculated audible noise profiles for average line heights in cross sections 1 to 4. Calculated audible noise levels are provided in Table O-9 for average conductor heights. The levels of audible noise from AC transmission lines are higher in foul weather than in fair weather. In fair and foul weather, the existing lines are not significant sources of audible noise. In fair weather, the audible noise from the proposed line would be hard to detect. Assuming 10 percent occurrence of foul weather and no ambient noise, the L_{dn} is 2.9 dBA higher than the L_{50} foul weather values provided in Table O-9. With this addition, the calculated levels of foul-weather audible noise outside the right-of-way are lower than the EPA's L_{dn} guideline of 55 dBA (EPA 1974). A portion of the Project study area is in Colorado and Section 4 CCR 723-3102(c) of the Colorado Public Utilities Commission's rules requires that calculated levels of audible noise from transmission lines in residential areas not exceed 55 dBA during the day and 50 dBA at night. In foul weather, these limits would be met 60 feet outside the right-of-way of the proposed transmission line in accordance with this rule. If the proposed line were to cross over an existing transmission line, the increase in the audible noise level would be confined mostly to the right-of-way under and around the crossing and mitigated by the increased height of the proposed transmission line aboveground.

Public concern about audible noise from wind turbines has stimulated concern about other potential noise sources. One aspect of this concern has focused on low frequency audible noise and infrasound (less than 20 Hz, the accepted threshold for human hearing). While larger wind turbines produce measureable infrasound (Mollera and Pedersen 2011), there are no data supporting a similar claim for high-voltage transmission lines (Leventhall 2003). As for low frequency noise, transmission lines produce little noise below 120 Hz as confirmed by measurements down to 31 Hz around a 765kV transmission line during rain when corona-generated audible noise is greatest (IEEE 1985).

3.2.23.5.4 Radio Noise

Figures O-13 to O-16 in Appendix O depict calculated radio noise profiles for average line heights in cross sections 1 to 4. Calculated radio noise levels are tabulated at the end of Appendix O for average conductor heights (Table O-10). At 100 feet (30 meters) from the outermost conductors in cross sections 1 to 4, the calculated L_{50} fair weather radio noise levels are below 40 dBμV/m and meet the criterion for fair-weather radio noise recommended in the IEEE Radio Noise Design Guide (IEEE 1971).

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