5.0 Residual and Cumulative Impacts

5.1 Commitment of Resources

Some resources may be adversely affected for the short term (less than 3 to 5 years), and others may be adversely affected for the long term (greater than 20 years). Many of the impacts associated with the Project would cease to be adverse after the disturbed ROW is reclaimed. No significant decrease in resource productivity would be expected as a result of construction-related impacts. Operation of the EOR program at the Bell Creek oil field would result in increased incremental production of oil that would not be recoverable by existing operations; recovered oil would be consumed and lost for future use, representing an irreversible impact. **Table 5-1** summarizes the long-term and short-term effects of the Project and indicates whether a resource would be irreversibly or irretrievably affected.

Table 5-1 Resource Commitments Identified for the Greencore Project

Resource	Impacts		Commitment of Resources	
	Short-term	Long-term	Irreversible	Irretrievable
Air Quality	x			
Geology and Soils	x[1]			
Minerals and Paleontological Resources	x	x[2]	x[2]	x[2]
Cultural Resources	x	x[2]	x[2]	x[2]
Water Resources	x[3]			
Vegetation and Agriculture	x[4]	x[4]		
Wildlife	x	x[5]		
Aquatic Resources	x			
Land Use and Recreation	x	x[6]		
Wilderness	None			
Visual Resources and Noise	x	x[7]		
Socioeconomics	x	x		
Transportation	x			

[1] Accelerated erosion would occur during construction and continue until the ground is stabilized. Understory vegetation is expected to return to preconstruction conditions within 3 to 5 years.

[2] There would be some gain in information for both cultural and paleontological resources as a result of the Project; however, there could also be some long-term inadvertent irreversible and irretrievable commitment of resources.

[3] Increased sedimentation would occur downstream of perennial stream crossings during construction. Preconstruction conditions would be established upon completion of the crossing and stabilization of any disturbed banks.

[4] Vegetation community structure and forage production would be lost on disturbed land for 3 to 5 growing seasons until grasses and forbs were re-established. Re-establishment of shrubs may take greater than 20 years, and trees would not be allowed to grow within 15 feet of the pipeline centerline. This would result in long-term impacts to shrub and woody vegetation.

[5] Loss of potentially suitable greater sage-grouse habitat as sagebrush communities may take greater than 20 years to re-establish.

[6] Long-term impacts may include use of the disturbed ROW by hunters and all terrain vehicle users.

[7] Visual effects of block valves/metering stations would be of long-term duration, but visual objectives would still be met at these locations.

Construction and operation of the Project could irreversibly or irretrievably commit certain environmental or energy resources. An irreversible commitment of resources relates to the loss of future options for those resources; an irreversible impact primarily applies to the effect on the use of nonrenewable resources, such as minerals. The irretrievable commitment of resources means a loss of production, harvest, or use of natural resources for a finite period. Potential irreversible and irretrievable resource commitments for the Project could include paleontological and cultural resources.

5.2 Short-term, Long-term, and Residual Impacts

The residual impacts of the Project are expected to be minimal and primarily short-term, assuming the applicable environmental protection measures (as described in Chapter 2.0, Chapter 4.0, and throughout the POD) are effectively implemented. Some of the residual adverse impacts associated with the Project are considered unavoidable due to the nature of pipeline construction. Most of these impacts are short-term; however, some small surface areas are required during the life of the project for support structures (e.g., block valves). These structures are required for the safe operation of the system.

Unavoidable short-term impacts from the Project would include land surface disturbance resulting in vegetation cover loss and, consequently, loss of wildlife and livestock forage, and an increased potential for erosion. Although grasses and forbs would become re-established in the ROW within 3 to 5 years, shrubs (e.g., sagebrush) may take up to 20 years to become established in the construction ROW. This would result in long-term effects to habitats that contain shrubs and/or woody species. Approximately 0.8 mile (0.3 percent) of the proposed route would traverse the upland forest/woodland vegetation type; therefore long-term impacts to forested areas are considered minimal when compared to the available habitat surrounding the project area. Wildlife also would be temporarily disturbed along the project route during construction, but this is not considered a residual or long-term impact due to the fact that wildlife will return to the project area after construction is completed.

Minor short-term air quality degradation is expected from fugitive dust and construction equipment emissions along the Project ROW. Most traffic effects of the Project would be unavoidable, including increased traffic, the potential for increased accidents, and increased road maintenance requirements. These are not considered long-term or residual impacts.

Construction of the Project is not expected to impact mining operations. The principal impact to mineral resources would be the positive impact on the enhanced recovery of oil in the Bell Creek oil field. Overall, socioeconomic impacts also are expected to be positive.

Long- and short-term impacts to visual resources are expected due to construction-related activities and the visibility of the reclaimed ROW. Short-term visual contrast in excess of the VRM Class II management objectives would be unavoidable. Minor visual contrast caused by noticeably different vegetation patterns and textures in reclaimed areas would be an unavoidable effect. Similar impacts to cultural resources (e.g., historic trails) would result from construction. Potential long-term impacts to cultural sites should be minor and partially offset by the gain in information as a result of the committed protection measures established for the Project.

Greencore has been proactive in regards to implementing reroutes and protective measures to avoid certain resources such as cultural sites, biological resources (e.g., greater sage grouse NSOs), and paleaontological resources. Through consultation with the appropriate regulatory agency, avoidance strategies have been implemented whenever possible in order to reduce, minimize, or completely avoid impacts to known resources. Also, since the Project will be collocated with existing ROWs for greater than 91 percent of its length, separate NEPA analyses for each of these resources have already been conducted for the existing ROWs in these areas, and the results of these analyses have been included in their respective Final EIS/EA documents.

5.3 Cumulative Impacts

Cumulative impacts are defined as "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR Part 1508.7). Where impacts are not fully mitigated or compensated, cumulative impacts can result.

Principal past actions that were considered in the evaluation of the cumulative impacts are those that have affected similar resources and for which the effect is still residual in the environment. For example, land disturbing projects that have adversely affected productivity for wildlife or livestock must be considered in the cumulative impact evaluation, if reclamation or off-site habitat enhancement have not compensated for that lost productivity.

Past actions in the vicinity of the Project that may have affected resources for which the effect is still residual include oil and gas development, ranching activities, installation of pipelines and other utilities (including powerlines), and mining. Most cumulative impacts would be to vegetation productivity, visual resources, and any irreversible impacts to resources such as cultural and paleontological sites. Due to the fact that the Project would be constructed to the maximum extent practical within existing utility ROWs and/or previously disturbed corridors (greater than 91 percent of the Project ROW is collocated), cumulative impacts would be minimal. In general, the centerline of the Greencore pipeline would be offset 50 feet from existing utility centerlines, which enables the Project to be built within previously disturbed ROW for the vast majority of the route.

It is difficult to quantify the cumulative impacts for each resource due to uncertainties regarding the location, scale, and/or rate of changes on public and private lands within the vicinity of the Project. Cumulative impacts were evaluated for various resources in the Powder River Basin (PRB) Oil and Gas Final Environmental Impact Statement (BLM 2003b), which encompasses the majority of the Project area. Because the Greencore Project is small (3,228 acres) in comparison to the Powder River Basin (8 million acres) (approximately 0.04 percent), cumulative impacts from the Project would be very small in comparison to the PRB impacts. Cumulative impacts to the following resources were evaluated for the Project, but were determined to be negligible or none based on past and future (planned) actions in the Project area and/or due to the temporary nature of disturbance for the Project:

- Air Quality
- Soils
- Minerals and Paleontological Resources
- Cultural Resources
- Water Resources
- Wetlands
- Agriculture and Range
- Aquatic Resources
- Land Use and Recreation
- Wilderness
- Socioeconomics
- Transportation

Future cumulative actions that are associated with the Project are EOR in the Bell Creek oil field. Construction activities in the Bell Creek oil field would mostly occur within previously disturbed land that is used for oil development. Operation activities would involve the production of oil from the CO_2 injection process. Very few

new roads or maintenance activities would be required for the EOR process. Details regarding resource-specific cumulative impacts are presented below.

5.3.1 Cumulative Impacts for Vegetation and Sensitive Plants

Construction of the Project could have temporary to long-term impacts on vegetation. For example, removal of vegetation and the disturbance of soils during construction would create optimal conditions for the invasion and establishment of invasive, non-native species that could continue for many years after the initial disturbance. However, the amount of vegetation that would be disturbed by the Project is very small compared to the vegetative disturbance projected for oil and gas developments in the Lander, Casper, Buffalo, and Miles City ROD/RMPs and EISs (BLM 2010a,b,c, 2007a, 2001a, 2000a, 1987, 1985a).

There are no known occurrences of threatened, endangered, candidate, or sensitive plant species within the Project area. Construction activities would result in temporary impacts to suitable habitat. An Integrated Pest Management (IPM) approach would be used to control any future noxious weed infestations which could degrade these habitats. Reclamation plans outlined in the Project POD (Appendix J) would ensure that suitable habitat would be reclaimed to pre-construction conditions. These procedures include, but are not limited to, the following: recontouring, topsoil segregation and distribution, seedbed preparation, seed mix application, and follow-up monitoring. Therefore, no cumulative impacts to sensitive plant species and their associated suitable habitats are anticipated.

Cumulative impacts to vegetation caused by the Project would be minimized by implementing protection measures for proper handling of topsoil and spoil, preventative and remedial noxious weed management (pre- and post-construction treatments), collocation with existing disturbed ROW, and reclamation techniques described in Chapter 2.0, Chapter 4.0, and throughout the POD. Implementation of these measures would result in negligible to no cumulative impacts to vegetation.

5.3.2 Cumulative Impacts for Wildlife

Cumulative impacts to wildlife resources would be directly related to habitat loss, habitat fragmentation, animal displacement, and direct mortalities. Long-term surface disturbance incrementally adds to wildlife habitat losses, overall habitat fragmentation, and animal displacement. In areas where development has occurred, habitat fragmentation may have resulted in the disruption of seasonal patterns or migration routes. Historic, current, and future developments in the vicinity of the Project have resulted, or would result, in the reduction of carrying capacities as characterized by the amount of available cover, forage, and breeding areas for wildlife species. Surface disturbance in the Project region primarily results from oil and gas development, including pipelines and seismic exploration, and mining. However, other activities such as livestock grazing, development of recreational facilities, and growth of Wyoming communities also contribute to cumulative impacts on wildlife and their habitats. Big game, especially pronghorn, would be most susceptible to these impacts since encroaching human activities associated with development activities have resulted, or would result, in habitat loss and fragmentation and animal displacement. These impacts may be more pronounced in areas designated as crucial habitat (e.g., crucial winter habitat, parturition areas), which may lead to declines in local big game populations. Other wildlife species, such as raptor species, also would be susceptible to these cumulative impacts since encroaching human activities in the Project region resulted, or would result, in habitat loss and fragmentation and animal displacement in areas that may be at their relative carrying capacity for these resident species. Many of the local wildlife populations (e.g., small game, migratory birds) that occur in the Project region likely would continue to occupy their respective ranges and breed successfully, although population numbers may decrease relative to the amount of cumulative habitat loss and disturbance from incremental development.

Details of the methodology used to assess cumulative impacts to greater sage-grouse are presented below. Based on Instruction Memorandum (IM) WY-2010-012, the following parameters were used to calculate greater sage-grouse habitat disturbance and road/energy development density within greater sage-grouse core population areas crossed by the Project. The analysis area encompassed all known occupied and undetermined leks (buffered by 4 miles) within a 4-mile radius around the Project, clipped to core areas.

All of the area within designated greater sage-grouse core areas was considered greater sage-grouse habitat. Therefore, approximately 465,425 acres of greater sage-grouse habitat occurs within the analysis area. Once all greater sage-grouse habitat within core population areas was mapped within the 4-mile buffer, all leks located with the 4-mile buffer were buffered individually with a 4-mile buffer. This area was then clipped to include only core area habitat. Existing and proposed disturbances resulting in direct habitat loss were then overlaid, and the amount of greater sage-grouse habitat loss was calculated. A variety of data sources were used to determine existing disturbance within the analysis area. Data was gathered primarily from BLM GIS layers, Wyoming State Geologic Survey data, Mineral Resources data, Wyoming Oil and Gas Commission data, and several other online sources. Disturbances considered for this analysis included: 1) highways and improved roads (greater than 10 feet in width); 2) well pads; 3) wind turbines; 4) cities, rest/recreation areas, campgrounds; 5) designated energy corridors; 6) gas plants, compressor stations and substations; 7) gravel pits and mines; and 8) agricultural lands. Features not included in the direct impact analysis because they were determined not to impact greater sage-grouse or had little ground disturbance associated with them included 1) unimproved roads (less than 10 feet in width); 2) reservoirs; 3) met towers; 5) successfully reclaimed disturbances; and 5) distribution lines. Results of this analysis are presented in **Table 5-2**.

Next, existing and proposed energy production and transmission structures were overlaid on the same analysis area (465,425 acres), and the number of energy production and transmission structures per 640 acres was calculated for core population areas. Energy and transmission structures used in this analysis included the following: 1) wind turbines; 2) gas plants; 3) compressor stations and substations; 4) oil and gas wells and associated access roads; 5) power lines; and 6) pipelines. Results of this analysis are presented in **Table 5-3**.

Based on the cumulative disturbance calculations presented in **Tables 5-2** and **5-3**, the Project fulfills the requirements as described in BLM IM WY-2010-012.

Table 5-2 Existing and Proposed Long-term Disturbance Calculations within the Greater Sage-grouse Cumulative Impacts Analysis Area

Feature	Long-Term Disturbance		
Include in 5% Disturbance Calculation	Existing Disturbance within Core Area (acres)	Proposed Action Disturbance within Core Area (acres)	Notes
Highways, improved roads (crown and ditched; greater than 10 feet in width)	6,612	0	Used TIGER data, minus 2-tracks and 4WD trails.
Well pads	113	0	Digitized from wells in 2010 WYOGCC database.
Wind turbines	0	0	
Cities, rest/recreation areas, etc.	80	0	Town of Powder River, developed area.
Linear energy facilities(including facilities within designated utility corridors)	1,633	923	Digitized from 2009 NAIP imagery with assistance from WYGS dataset.
Gas plants, compressor stations, substations	0	10	Natrona Hub Compressor Station.
Gravel pits, mines	6	0	
Agricultural Lands	4,517	0	Consists of agricultural lands that were converted from sagebrush shrublands/grassland.
Farmsteads	135	0	
Combined Footprint	11,448[1,2]	931[1,2,3]	
Existing Disturbance + Proposed Disturbance		12,381[1]	
Maximum Allowed Disturbance (Total Greater Sage-grouse Habitat * 5%)		23,271[4]	

Table 5-2 Existing and Proposed Long-term Disturbance Calculations within the Greater Sage-grouse Cumulative Impacts Analysis Area

Feature	Long-Term Disturbance		
Include in 5% Disturbance Calculation	Existing Disturbance within Core Area (acres)	Proposed Action Disturbance within Core Area (acres)	Notes
Cumulative Disturbance (Proposed and Existing Facilities) to Greater Sage-grouse Habitat (%)		2.66[4]	
Meets WY IM-2010-012 Requirements?		Yes	BLM WY IM 2010-012 (Pg. 4) states that cumulative disturbance must not exceed 5% of greater sage-grouse habitat within the same 640 acres.

[1] For disturbance calculations, disturbances in core area habitat do not always sum to the total (i.e., combined footprint). This is due to overlapping disturbances not being counted twice.

[2] These cumulative totals include disturbance to all greater sage-grouse habitat types (i.e., entire core area is considered habitat). **Table 4-8** focuses specifically on impacts to breeding habitat.

[3] This acreage was calculated by subtracting the total non-core area Project disturbance (2,247 acres) from the total Project disturbance (3,178 acres).

[4] Based on a total of 465,425 acres of greater sage-grouse habitat within the analysis area.

Table 5-3 Number of Energy Production and Transmission Structures within the Greater Sage-grouse Cumulative Impacts Analysis Area

Feature	Feature Density Calculation	Long-Term Disturbance		Notes
		Existing Facilities within Core Areas	Proposed Action Facilities within Core Area	
Included in Energy Production and Transmission Structures Analysis[1]				
Oil and gas wells	Each well pad location counts as 1.	87	0	Each well pad and associated structure counts as one (e.g., tanks, collection pipeline, etc.).
Power lines	Each power line counts as 1.	9	0	
Pipelines	Each pipeline counts as 1.	11	1	Each pipeline counts as one, unless the pipeline crosses a 0.6 mile lek NSO. If it crosses a lek NSO then each crossing counts as one.
Compressor station or substation	Each compressor station or substation counts as 1.	1	1	
Wind turbines	Each wind turbine counts as 1.	0	0	Individual turbines and associated support structure counts as 1 (e.g., collection system).
Gas Plant/Refinery	Each gas plant or refinery counts as 1.	0	0	
Railroads	Each railroad counts as 1.	1	0	
Roads	Each time a road passes within 0.6 mile lek NSO counts as 1.	53	0	
Total Number of Facilities		162	2	
Existing Facilities + Proposed Facilities			164	
Maximum Allowed Facilities (Total Greater Sage-grouse Habitat / 640 acres)			727[2]	
Proposed Facilities per 640 acres			0.23[2]	

Table 5-3 Number of Energy Production and Transmission Structures within the Greater Sage-grouse Cumulative Impacts Analysis Area

Feature	Feature Density Calculation	Long-Term Disturbance		Notes
		Existing Facilities within Core Areas	Proposed Action Facilities within Core Area	
Meets WY IM 2010-012 Requirements?			Yes	BLM WY IM 2010-012 (Pg. 4) states that cumulative disturbance must not exceed 1 energy production facility per 640 acres of greater sage-grouse habitat.

[1] Not included in Energy Production and Transmission Structures Analysis:
Communication sites
Other disturbances (e.g., O&M buildings, substations, etc.)
Coal mines
Met towers

[2] Based on a total of 465,425 acres of greater sage-grouse habitat within the analysis area.