

5.0 Cumulative Impacts

5.1 Overview

In its Regulations for Implementing NEPA (40 CFR Parts 1500-1508), the CEQ defines a cumulative impact as follows in Section 1508.7:

"Cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Cumulative impacts are the combination of the individual effects of multiple actions over time in the context of other development in the project area or the region. The individual effects may be minor when considered separately but may be major or significant when considered in combination with all others in the region. A CEQ memorandum issued in 2005 (CEQ 2005) provides additional guidance on the consideration of past actions in cumulative effects analysis. This memorandum stresses the "forward-looking" nature of NEPA analysis. It states that the effects of past actions are only required to be analyzed if they are relevant and useful to determine whether the proposed project "may have a continuing, additive and significant relationship" to projected future impacts in the region.

The relevant past and current actions within the project area contributed to the current conditions described as the affected environment in Chapter 3.0. For this reason, the cumulative impact analysis included in this chapter focuses primarily on reasonably foreseeable future actions that are known by the BLM at the time the analysis was performed. The impacts of the proposed project and the reasonably foreseeable future actions, along with the effects of the past and current activities that affect the same resources, would combine to have a cumulative impact on the environment in the region.

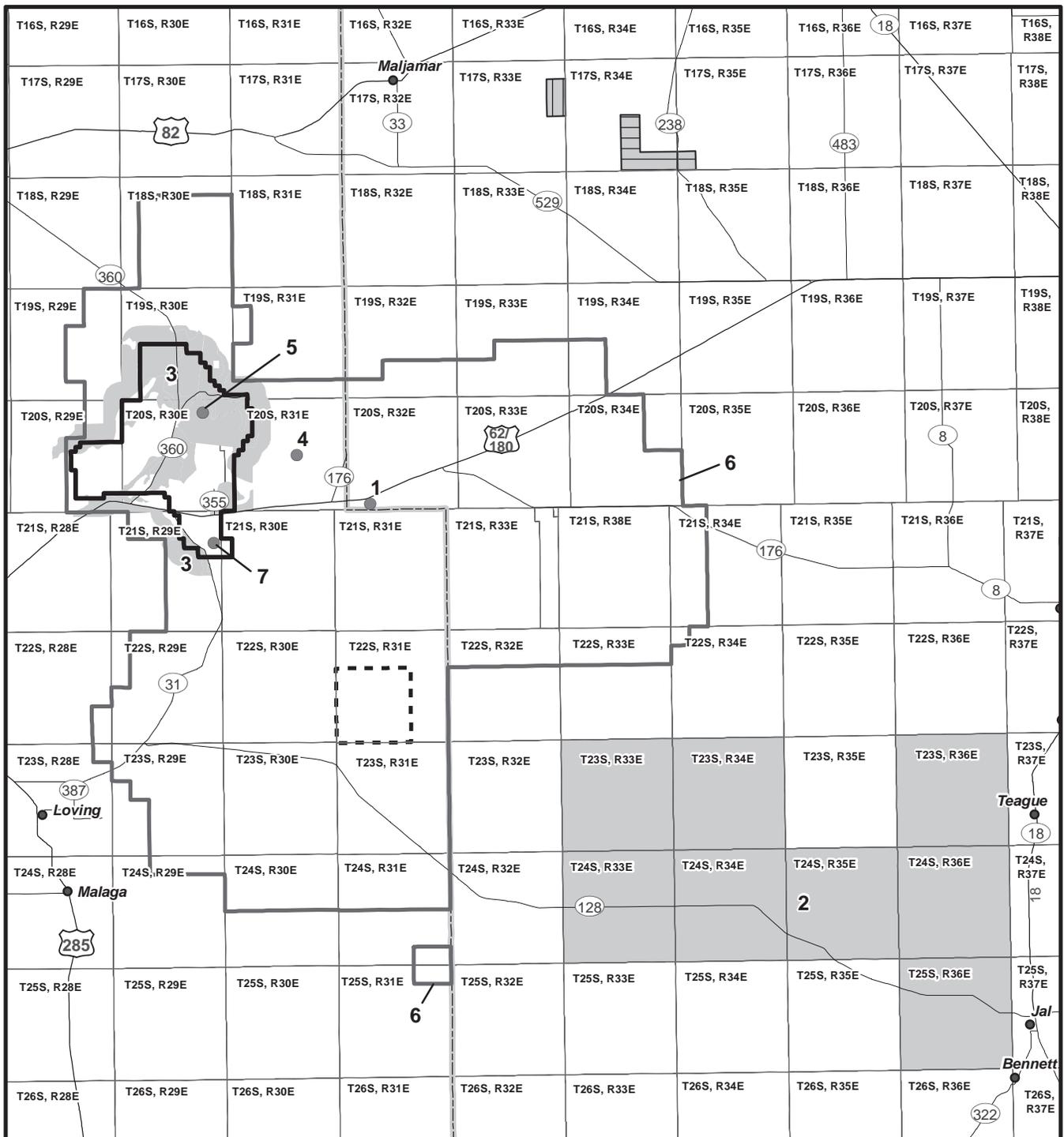
Almost 13 percent (4,822 acres) of the project area is affected by surface disturbance due to the previous installation of facilities such as roads, pipelines, well pads, OHV trails, tailings piles and ponds, and mine plants. This disturbance occurred in the past and is currently being maintained to support mineral development, mining operations, recreational activities, or other approved land uses.

The areas that are covered with impervious materials (concrete, hardened salt, roofs, for example) would not contribute to accelerated soil erosion or fugitive dust emissions but would contribute to increased surface water runoff and loss of forage for livestock and wildlife. Other past and present activities include vegetation treatments to manage invasive plants and improve forage, such as those that are part of the Restore New Mexico program.

The activities and proposed projects listed in **Table 5-1** are reasonably foreseeable in the vicinity of the SPA. The approximate location of each project is displayed on **Figure 5-1**. The list includes actions that are likely to affect the same resources that were analyzed in Chapter 4.0. The areas of potential impacts may vary from one resource to another, and are described for each resource in the following sections. The impacts of these activities on the region over the life of the proposed project (28 years) were considered in combination with the proposed HB In-Situ Solution Mine Project and other past and ongoing activities to predict the potential cumulative effects of all actions combined on each of the resources analyzed in the EIS.

Table 5-1 Reasonably Foreseeable Future Actions in the Region

Project	Brief Description	Approximate Location
1. Intrepid water-saving improvements	Planned upgrades to Intrepid's East Mine langbeinite process plant, projected to be completed by the end of 2011, anticipated to decrease Caprock water usage by approximately 700 to 800 gpm.	Intrepid East Mill
2. Polyhalite mining project	Intercontinental Potash is proposing a polyhalite mining operation on state and federal mineral leases and surface. The planned extraction method is underground room and pillar mining approximately 1,500 feet below the surface. Exploratory drilling is ongoing to evaluate the extent and quality of the potash formations. Water for processing is proposed to come from the Capitan Aquifer.	In five townships in Lea County, New Mexico, approximately 9 miles from the eastern boundary of the SPA
3. BLM vegetation management	As part of the Restore New Mexico program, the BLM plans several chemical treatments to manage invasive plants (mesquite and creosote). No surface disturbance is planned.	Within and near project area
4. Construction and maintenance for recreation	There is a proposal to construct a new parking lot in the Hackberry Recreation Area, approximately 0.5 to 1 acre in size. Trail maintenance is ongoing and involves little, if any, surface disturbance.	Hackberry Recreation Area
5. Creamer water project	A private landowner is proposing to develop a well on state land to supply saline water for sale to the oil and gas industry. The water may be coming from the Rustler Formation. Also proposing a pipeline running north up a small dirt road, crossing under the highway and ending at an old caliche pit where storage tanks would be installed.	Section 2, T20S, R30E (southeast of Clayton Lake)
6. Oil and gas drilling and production	Oil and gas drilling of new wells and production from existing wells would continue in the SPA according to BLM policy and approval. It is anticipated that oil and gas drilling operations would continue at the current rate of 75 per year in the SPA and an average of 1 per year within the project area. An average of 3.5 acres would be disturbed for each new well pad constructed.	In the SPA and project area
7. Derrick well	Intrepid recently converted an old core hole to a water supply well in the vicinity of the Rustler wells proposed for the project. The well extracts from the Rustler Formation, using the same source as the proposed new Rustler wells. Intrepid anticipates using this well at a rate of approximately 20 gpm to supplement processing water at the West Plant.	Section 1, T21S, R29E



Legend

- Project Area Boundary
- East Caprock Field
- HB/Eddy Caprock Field
- WIPP

Note: Numbers identify reasonably foreseeable future projects listed in Table 2-10.

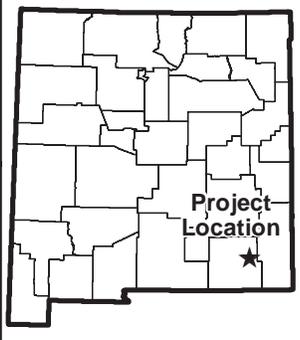


Figure 5-1 Locations of Reasonably Foreseeable Future Actions

5.2 Geology and Minerals

5.2.1 Mining Subsidence

The cumulative effects study area (CESA) for mining subsidence is the project area. The proposed project and alternatives would result in approximately 4,354 acres of area at risk for additional subsidence, in addition to the approximately 17,000 acres of mining in the project area that has already resulted in some degree of surface subsidence. The additional subsidence due to solution mining is expected to be about 0.6 foot. Other projects in the vicinity of the project area are not anticipated to add to this projected subsidence amount or area. The proposed polyhalite mine listed in **Table 5-1**, Project 2, would most likely contribute to regional subsidence due to mining, but this project is far outside the project area and subsidence impacts would not occur until long into the future.

5.2.2 Mineral Resources

5.2.2.1 Potash

The CESA for potash resources is southeast New Mexico including Lea and Eddy counties. As of 2009, an estimated 138 million short tons of potash minerals (K_2O equivalent) have been mined from the area (USGS 1933 to 2004; NM Mining and Minerals Division 2009). The proposed solution mining project estimates that around 6,000,000 tons of sylvite ore would be removed (or roughly 3,780,000 tons of K_2O equivalent), which represents roughly 3 percent of the cumulative production to 2009. Based on the USGS's estimate of 551 million short tons of resource (USGS 2009a), the proposed solution mining recovery is a small fraction of the total remaining resource.

5.2.2.2 Oil and Gas

The CESA for oil and gas is the Oil Potash Leasing Area (OPLA), defined by OCC Order R-111-P that encompasses most of the SPA. The OPLA was chosen because a recent oil and gas resource assessment was conducted based on the OPLA (Balch et al. 2009). The OPLA contains an estimated 1.4 billion barrels of oil equivalent (BOE) of undiscovered oil and gas resources (Balch et al. 2009) and consists of about 362,000 acres. It is estimated 75 wells a year would be drilled in the SPA, and most of them would be drilled in the OPLA. An average of one well per year would be drilled in the project area.

The HB In-Situ Solution Mine project area covers approximately 38,453 acres or about 11 percent of the OPLA. The area encompassed by existing mine workings is large enough to preclude directional drilling as a recovery method except for a small fraction of the area. The use of horizontal drilling would enable access to oil and gas to be extracted under the potash-bearing formations without affecting the solution and conventional mining operations. The area encompassed by existing mine workings is large enough that directional drilling as a recovery method may be technically but not economically feasible in portions of the area. It would be reasonable to assume that economic constraints would limit the recovery of oil and gas resources in spite of technological advances. However, it may not be possible to estimate how much fluid minerals recovery would be lost or delayed until the end of potash mining. Production islands would continue to be established where necessary to enable access to oil and gas according to the procedures established by the 1986 Order and OCC Order R-111-P. The proposed project would not prevent oil and gas exploration and production in the OPLA where no commercial-grade potash occurs so development and production operations would continue.

5.2.3 Caves and Karst

The protection measures for caves and karsts applied to this proposed project would be applied to RFFAs where the BLM is the authorizing agency. The protection measures would reduce potential impacts to caves and cumulative impacts would accordingly be small. Natural karst processes would continue to pose risks for surface and subsurface facilities in the area and the cumulative effects are expected to be small with the implementation of the protection measures.

5.2.4 Paleontological Resources

The CESA for paleontological resources is the project area. The generally limited potential for fossils in the Rustler Formation and other bedrock that could be affected by activities in the project area, in conjunction with the proposed protection measures, would result in a low potential for adverse impacts to fossil resources. The cumulative impacts are expected to be negligible.

5.3 Water

The CESA for groundwater resources is the SPA, as shown in **Figure 3.3-1** along with the Caprock area near Intrepid's well fields in western Lea County. Past and present actions are reflected in the description of the current conditions described in affected environment Section 3.3 and have not been calculated for this cumulative impact section. For water resources, the cumulative effects analysis focused on the past, present, and reasonably foreseeable water conservation plans, additional water depletions, oil and gas development, and recreation.

5.3.1 Surface Water

Cumulative impacts to surface water resources primarily would be directly related to ground disturbance from construction for additional mining and oil and gas development because it may contribute to erosion and sedimentation. Up to approximately 260 acres may be disturbed annually from oil and gas development (less than 0.1 percent of the CESA). Additional minor disturbance would occur from the Creamer water project if a supply pipeline and storage tanks were constructed and from the proposed Hackberry SRMA parking lot.

A slight increase in total surface water runoff would occur due to the addition of impervious surface from the establishment of the new HB mill, well pads, roads, and other associated structures where the land was previously natural soil and vegetation. The construction of new structures and roads associated with Projects 4, 5, and 6 in **Table 5-1** would add to the total amount of impervious surface and associated increase in stormwater runoff. Because the terrain in the project area is flat to gently sloping with numerous depressions, the increased surface water runoff is likely to travel only short distances before infiltrating the soil, so there would be little increase in downstream flooding or flows in drainageways and streams in the region due to the combined effect of all construction.

Because the surface disturbance would be scattered throughout the SPA and would be stabilized according to BLM requirements, this additional surface disturbance, in combination with the proposed solution mine project, would have only a minor impact on surface water quality.

5.3.2 Groundwater

Groundwater drawdown in the Clayton Basin area associated with the Creamer Project would increase the projected drawdown from the proposed in-situ solution mine project, especially under the Proposed Action where the majority of pumping would occur in the Rustler North area, approximately 2 miles from the area of the Creamer Project and from the same aquifer. Groundwater also may be affected if new fluid mineral development requires pumping to supply water for drilling mud. However, the projected quantity of pumping from the proposed Creamer Project or future oil and gas development is unknown, so the extent of the drawdown cannot be predicted.

Water withdrawn from the Caprock area would decrease under Intrepid's water-saving improvements at its East Mine process plant (Project 1 in **Table 5-1**). The amount projected to be saved would be more than enough to offset Caprock pumping under the Proposed Action, and would lessen the pumping impacts discussed under the Alternative B and Preferred Alternative pumping scenarios in Chapter 4.0. Water withdrawn from the Derrick well (Project 7 in **Table 5-1**) would potentially limit the amount of Rustler water available for the HB In-Situ Solution Mine Project because there is a limited amount of water available for use from the Rustler. The extent of drawdown is not expected to increase, however,

and the Enhanced Calibration Model drawdown results presented in Section 4.3 would cover all pumping in the Rustler South area. Under the Preferred Alternative, with the combination of Rustler and Caprock water proposed for the solution mine project, the flexibility in water sources would accommodate using Rustler water from the Derrick well without further affecting groundwater drawdown as analyzed in Chapter 4.0, so there would be no change in the impacts presented.

Water would be needed for the processing plant at the proposed Intercontinental Potash polyhalite mine operation. If the primary groundwater source is the Capitan Aquifer as proposed, it is unlikely that this project would combine with the HB In-Situ project groundwater drawdown to cause cumulative impacts to regional groundwater or increased reductions of groundwater contributions to the Pecos River.

5.4 Soil

The CESA for soils is the same as the project area boundary plus the ROW that would be disturbed for the Caprock pipelines. Reasonably foreseeable projects that would be expected to produce incremental and cumulative impacts within the analysis area are summarized in **Table 5-1**. These projects would contribute incremental changes to the current level of effects to soil resources described in the analysis area from historic and ongoing management activities.

Projects that have contributed to cumulative impacts to soils result from surface disturbance associated with mining, grazing, vegetation management, recreation, oil and gas exploration and development, roads, and other natural and anthropogenic activities within the analysis area. Impacts associated with these types of activities include removal of vegetation, exposure of the soil, mixing of soil horizons, soil compaction, and loss of topsoil productivity. These impacts could increase runoff, decrease surface water infiltration, and lead to increased susceptibility of the soil to erosion and sedimentation.

It is possible that pumping for the Creamer water project would further reduce the water supply to the hydric soils found at playas, seeps, and springs due to drawdown associated with the pumping of groundwater from the Rustler Formation.

Vegetation management projects would result in a decrease of invasive species and an increase in vegetation with better soil holding capacity, which would be a beneficial impact to soil resources.

With implementation of standard and additional mitigation measures, the proposed project, when added to past, present, and reasonably foreseeable future actions is not expected to result in significant cumulative impacts to soil resources.

5.5 Air Quality

Cumulative impacts to air quality would include impacts from the proposed project emissions sources in combination with impacts from background emissions sources associated with past and present actions and RFFAs.

As described in Section 4.5, air dispersion modeling predicted that the maximum concentration of TSP from the proposed in-situ solution mine project would result in an annual impact of $15.7 \mu\text{g}/\text{m}^3$ and a 24-hour impact of $54.7 \mu\text{g}/\text{m}^3$. The addition of an annual and 24-hour TSP background concentration of $26.6 \mu\text{g}/\text{m}^3$ would result in a total cumulative impact of $42.3 \mu\text{g}/\text{m}^3$ on an annual basis and a total cumulative impact of $81.3 \mu\text{g}/\text{m}^3$ on a 24-hour basis. These total cumulative impacts are well below the TSP annual and 24-hour NMAAQS of $60 \mu\text{g}/\text{m}^3$ and $150 \mu\text{g}/\text{m}^3$, respectively. All other modeled pollutant emission levels are well below the NAAQS and NMAAQS.

Cumulative air quality impacts in the vicinity of the proposed project would be minimal as oil and gas development is currently ongoing. Additional oil and gas development and plugging and abandoning old wells in the project vicinity would continue at generally the same rate that has been conducted in the

past. Because past oil and gas activity is already included in the ambient background concentration, total cumulative impacts are expected to remain below the NAAQS and NMAAQs for the region.

5.6 Climate Change

Cumulative impacts to climate change would include impacts from the proposed project emissions sources in combination with impacts from background emissions sources and RFFAs and consider their incremental contribution to global and regional climate change. In 2008, total U.S. GHG emissions amounted to 6,956.8 teragrams (Tg) or million metric tons CO₂-equivalent, with net GHG emissions (which include GHG emissions sources while subtracting out GHG sinks) amounted to 6,016.4 Tg CO₂-equivalent (USEPA 2010b). Using the worst-case GHG emissions identified in Section 4.6, the estimated GHG emissions from the proposed project, including GHG emissions from construction, amount to 161,300 metric tons CO₂-equivalent. This equates to 0.0023 percent of the total GHG emissions in the United States in 2008.

Cumulative impacts to climate change in the vicinity of the proposed project would be negligible on a regional and global scale. Oil and gas development is currently ongoing, and additional oil and gas development in the project vicinity would continue at generally the same rate that has been conducted in the past. Past oil and gas activity is already included in the 2008 GHG emissions inventory, and the incremental contribution in addition to the proposed project would be small.

5.7 Vegetation

5.7.1 General Vegetation

The CESA for vegetative resources is the project area boundary for the action alternatives. Past and current projects are described in the affected environment and environmental consequences sections (3.7 and 4.7). For vegetative resources, the cumulative effects analysis focused on the past, present, and reasonably foreseeable impacts associated with mining, livestock grazing, recreation, oil and gas exploration and development, groundwater drawdown, noxious weeds, and vegetation management.

Past, present, and reasonably foreseeable future actions would cumulatively and incrementally reduce vegetation cover types until such time that reclamation is deemed successful and native plants are reestablished. Cumulative losses for vegetation resources potentially would include the reduction of native ecosystem functions such as soil stability, erosion control, livestock and wildlife forage, and wildlife habitat.

It is estimated that herbaceous-dominated plant communities would require a minimum of 3 to 5 years to establish adequate ground cover to minimize erosion and provide forage for wildlife species and grazing operations. Woody-dominated plant communities would require 25 to 50 years for shrubs of similar stature to recolonize the area.

In addition to cumulative vegetation loss, other impacts on vegetation likely would occur as a result of cumulative forage use by livestock, and wildlife, affecting plant productivity and vegetation community structure and composition. Indirect impacts to vegetation resources associated with surface disturbance-related activities may include soil loss and compaction, habitat fragmentation, and introduction or spread of noxious weeds and invasive species. Fugitive dust from development activities can adversely affect native vegetation communities and alter vegetative composition (USEPA 2008c; USFWS 2008). Fragmentation of the landscape by the cumulative impact of multiple linear and localized surface disturbances can adversely impact native vegetative communities and native plant species.

Noxious weeds and invasive species exist throughout the CESA. Surface disturbance activities from implementation of the proposed project as well as other future projects could further spread noxious weed and invasive species into previously undisturbed areas, and may increase the acreage and population numbers of already established noxious weed and invasive species populations. Linear

surface disturbances such as those associated with pipelines, roads, transmission lines and seismic surveys provide corridors for further spread of noxious and invasive species (Gelbard and Belnap 2003; Watkins et al. 2003) into the project area.

The combined impacts associated with surface-disturbing activities resulting from past, present, and future activities and the proposed project's groundwater drawdown would be likely to result in the increased spread of mesquite and noxious and invasive weed species into disturbed areas. Weed management and vegetation treatment projects would help to control this spread of invasive plants.

The BLM vegetation treatment projects to the north and east of the project area seek to increase native grasslands, and reduce the cover and amount of invasive native and non-native shrubs (creosote and mesquite). Successful reclamation of disturbed areas with native grasses and forbs could assist in restoring the native grasslands and other vegetation, and may further the goals of the vegetation treatment programs.

5.7.2 Sensitive Plant Species

5.7.2.1 Scheer's Beehive Cactus

Within the CESA, potential habitat for the Scheer's beehive cactus is found in desert grassland and Chihuahuan desert scrub, which are common land cover types within the area. Due to the limited knowledge of the species and its distribution, it is unknown whether the species actually occurs in the CESA. If the species does occur, direct adverse impacts would result from surface-disturbing activities associated with livestock grazing, off-road vehicle use, and construction. Indirect impacts would include habitat fragmentation, potential increased dust effects, and the temporary or permanent loss of suitable habitat.

5.7.2.2 Gypsum Wild Buckwheat

Within the CESA, potential habitat for the gypsum wild buckwheat is found in sparsely vegetated areas on gypsum soils. Known locations of the species are found northwest of the CESA near the border of Eddy and Chaves counties. Due to the extremely limited distribution of this species, it is unlikely the species is found within the CESA, so would not be affected by the proposed project or the RFFAs.

5.8 Wildlife and Fish

The CESA for wildlife and sensitive species includes the extent of the RFFAs shown in **Figure 5-1**. For wildlife resources, consideration was given to the cumulative effects of the past, present, and reasonably foreseeable mining activities, mining exploration programs, vegetation management, and potential habitat conversion associated with additional water depletion.

5.8.1 Terrestrial Wildlife

Cumulative impacts to wildlife resources would be primarily related to habitat loss, habitat fragmentation, and animal displacement and mortality. Nesting birds, small mammals, and reptile species would be the most susceptible to localized activities that remove their native habitat, especially in areas that may be at carrying capacity. Many of the local larger wildlife species like mule deer that occur in the CESA would be likely to continue to occupy their respective ranges and breed successfully, although population numbers may decrease due to cumulative habitat loss and disturbance from incremental development.

The RFFAs in combination with implementation of the proposed project would result in additional habitat disturbance. While these activities would result in an incremental increase in habitat-related wildlife impacts, reclamation and revegetation of disturbed areas would minimize the impacts to wildlife. The BLM vegetation treatment program would have a beneficial cumulative effect on habitat in the CESA over time.

Indirect impacts associated with human presence and noise would increase incrementally in the CESA due to the implementation of the RFFAs in combination with the proposed project.

Groundwater drawdown associated with existing and proposed pumping operations from the in-situ solution mine project and the Creamer water project would result in a long term reduction in the amount and extent of available water supply to seeps, springs, streams, and associated riparian habitats and wetlands used by wildlife. Potential loss or reduction of available groundwater or possible long-term effects to riparian communities could result in the loss of wildlife breeding, foraging, and cover. Animals that use perennial water sources would be displaced as the available water and riparian vegetation declines, concentrating the remaining animals within smaller habitat areas within the CESA.

Species likely to be adversely affected by the potential cumulative reductions of seeps, springs, streams, and riparian habitats include big game, upland game birds, raptors, songbirds, nongame mammals, amphibians, and reptiles. The extent of these indirect effects from water level change would depend on the species' use and relative species' sensitivity.

5.8.2 Fisheries

The combination of the pumping for the proposed in-situ solution mine project and the possible pumping for the Creamer water project may decrease the flows from Nash Draw that reach the Pecos River. This could decrease instream flows in the river, but the likelihood and amount of the change cannot be predicted with the currently available information.

5.8.3 Sensitive Species

Potential cumulative impacts to special status wildlife species would parallel those described above for terrestrial wildlife. Specific species impacts would be similar to those described in Section 4.8.

5.9 Rangelands and Livestock Grazing

The CESA for rangelands/livestock grazing is the entire five grazing allotments that encompass the project area and the additional twelve grazing allotments that encompass the existing and proposed Caprock pipelines. In addition to cumulative available forage and AUM loss resulting from the RFFAs and proposed solution mine in the area, the development of access roads and utility corridors would affect livestock grazing activities, livestock management, range facilities, and resources. Range facilities including water sources, fences, cattle guards, and corrals could be adversely impacted by construction and maintenance activities associated with the proposed project and the other future actions within the CESA. There may be a loss of access to water sources due to the placement and construction of new facilities, roads, and fences. Fences, cattle guards, and corrals could be damaged or destroyed by operation and maintenance activities, but maintenance and repairs would be required to mitigate damages on public lands.

Past, present, and RFFAs would cumulatively and incrementally reduce available acres of forage from active grazing preference during construction activities and where permanent structures or facilities are maintained. Successful reclamation and revegetation would result in an increase in native grasses that would be available for forage. Grazing may inhibit the reestablishment of woody species in grazing allotments.

5.10 Lands and Realty

The CESA for lands, realty, and transportation is the project area and the immediate surrounding area. Resource development has been prominent on the landscape in and around the project area for many years, and with the anticipation of 75 new oil and gas wells a year, this trend is likely to continue. New ROWs within the CESA may open up access to the public where none previously existed and may affect existing and future land uses; however, because the predominant use of the CESA is mining and fluid

mineral development, cumulative impacts to land use and realty are expected to be minimal because the current land uses would continue.

The project area has a road network in place. Further expansion of this network to accommodate mineral resource development may have adverse and beneficial impacts. Adverse impacts would include an increase in traffic within the CESA and primary access roads, as well as greater maintenance needs on new and existing roads as heavy truck traffic increases. A potential benefit would include a larger maintained road network that may be utilized by recreational and other land users.

5.11 Recreation

The CESA for recreation is the project area with a 2-mile buffer outside the boundary. Within the CESA, there is already a considerable amount of surface disturbance caused by decades of potash mining and oil and gas development. Assuming 3 to 5 acres of initial surface disturbance for each well pad, approximately 260 acres per year would be disturbed.

Adverse cumulative impacts to recreational resources within the CESA include access closures (mostly short-term), increased noise and activity associated with resource development, and a reduction in dispersed camping opportunities. Due to previous potash and oil and gas development through the years, the existing road network has reduced the value of primitive recreational values in the area including naturalness, primitive and unconfined recreation, and solitude. Additional roads for mineral development would provide increased easy access to motorized recreational users. This increase in human activities from mineral development and motorized vehicles is likely to have a long-term impact on recreational users such as hunters and hikers who tend to avoid areas that have been heavily developed. While a substantial portion of the CESA would be affected by industrial activities from the proposed project in combination with other RFFAs, there would be minimal overall impact to recreational activities within the CESA.

5.12 Visual Resources

The CESA for visual resources is the project area, as well as the viewshed of the proposed project. This is the area within which public users (travelers on roads, recreational campers, hunters, OHV users, and hikers) would see potential changes in the landscape. The primary source of cumulative impacts to visual resources would be caused by mineral development. The management directive for visual resources for BLM-managed lands in the CESA allows for management activities that may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of activities through careful location, minimal disturbance, and repeating the basic landscape elements of color, form, line, and texture. Past, present, and reasonably foreseeable future resource development in the CESA would have both direct and indirect cumulative impacts to visual resources from emissions, ancillary facilities, and the general increase of human activities. In the future, the combination of all mineral development activities may dominate the view and become the major focus of viewer attention.

5.13 Cultural Resources

The CESA for cultural resources encompasses the project area. As directed by law, cultural resources inventories are conducted for any actions involving federal lands or requiring a federal permit, license, or approval. Avoidance through project redesign is the preferred method of mitigation; however, when avoidance is not feasible, data recovery or other forms of mitigation are implemented prior to ground-disturbing activities. All NRHP-eligible sites located in the project APE would be mitigated in accordance with the Protocol Agreement. In addition, any previously unknown NRHP-eligible sites that may be discovered during construction activities would be mitigated in accordance with applicant-committed protection measures. Therefore, the proposed project is not expected to cumulatively contribute to direct effects to NRHP-eligible sites. However, if data recovery is necessary to mitigate

unavoidable effects to NRHP-eligible sites, the process would recover a significant amount of data but ultimately the site would be destroyed by the undertaking. Over time, this represents a cumulative loss.

Indirect effects, such as illegal collecting of artifacts, have occurred and most likely would continue to occur in the CESA due to increased access, development, and increased human presence.

No sites of tribal importance, including TCPs, were identified by any of the tribal groups contacted by the BLM as part of the Section 106 consultation efforts. Therefore, no cumulative effects to sites of tribal importance, including TCPs are anticipated as a result of the Preferred Alternative.

5.14 Health and Safety, Hazardous Materials

The CESA for health, safety, and hazardous materials handling is the SPA. The transportation and use of hazardous materials and the generation and disposal of solid waste due to the proposed project and the RFFAs would represent a small increase from current conditions. Potash processing at the new HB mill, as well as fluid mineral development, would result in a small incremental increase in the use of hazardous materials and the generation of wastes that must be disposed of safely in the CESA. Assuming that all of the potash mines and oil and gas development locations follow state and federal laws for hazardous materials management, waste handling, spill prevention and cleanup, and health and safety, the cumulative impacts would be minimal.

5.15 Socioeconomics and Environmental Justice

This section addresses the socioeconomic impact of the project alternatives when added to the past, present and RFFAs in the CESA, which is defined as Eddy and Lea counties. Past mining and oil and gas development are two key elements of the existing regional economy and social conditions. Other historically and economically important segments of the region's economic base are agriculture, recreation, tourism, and more recently, lifestyle migration. The effects of past and current development in the region are evident in the existing settlement patterns, physical development and infrastructure, fiscal structures, and social settings and networks in the region. Such development and the related activities, events, and people associated with it provide the area with its rich heritage and cultural history. Absent the area's mineral and energy resource endowments, the region would likely be much less developed and populated than it is today.

The collective past development activity has contributed to growth and development and underlies important economic and social conditions and trends in the area. These trends include labor markets characterized by unemployment that is commonly below statewide levels, higher transient elements of the work force, competition and occasional shortages of qualified labor and cyclical population change. Such growth has provided much of the impetus for new residential and commercial development and expansion of local government infrastructure and services. Social effects of development also have occurred and natural resource development has resulted in some conflict between the mineral and energy resource industries, and with recreation, tourism, and grazing on public lands. Development-related impacts to recreation arise from fragmentation of contiguous areas available for outdoor recreation, changes in access, and development related traffic, dust and other factors that affect the quality of recreational experiences.

The Preferred Alternative would occur in the socioeconomic context and setting described above. The past and present development activities helped create a setting based in part on natural resource development and more specifically, with potash extraction, contributing to conditions wherein local labor, housing resources, community infrastructure, and local government are capable of accommodating construction projects. Consequently cumulative effects of past and present socioeconomic conditions, when combined with the Preferred Alternative is likely to be mainly beneficial

Cumulative effects on socioeconomic conditions in the CESA from the proposed project with present and future actions would potentially arise if the employment, economic activity, population, housing, public service demand, and fiscal aspects of RFFA projects occurred concurrently with those of the proposed in-situ solution mine project. Cumulative socioeconomic activities also could occur if activities or land use associated with RFFAs occupied or proposed to use the same surface or subsurface areas as the Preferred Alternative. Cumulative socioeconomic impacts have the potential to be both beneficial and adverse.

The construction schedule for the planned improvements to Intrepid's East Mine langbeinite process plant would overlap the construction schedule for the Preferred Alternative in 2012. Intrepid's projected construction work force for the first quarter of 2012 is relatively low (74 workers) and should not result in substantial cumulative effects on housing or public service demand on Eddy County or nearby communities. Although the Preferred Alternative-related work force is projected to increase to 237 workers during the final quarter of 2012, the East Mine improvements are anticipated to be completed during that period, minimizing the potential for cumulative work force-related impacts on local communities. The sequencing of the East Mine improvements and the Preferred Alternative may provide an opportunity to transition portions of the construction work force from one project to the next, sustaining the construction period and enhancing the beneficial aspects of construction such as project and employee spending and increases in local gross receipts tax revenues from company and construction worker purchases.

Given the current exploration and project feasibility status of the Intercontinental Potash polyhalite project (Project 2 in **Table 5-1**), it is unlikely that the project would initiate construction in time to coincide with the construction schedule for the Preferred Alternative. The project's location also would preclude land use and construction activity impacts.

The BLM's vegetation and construction management activities could coincide in time with Preferred Alternative-related construction activities but would be temporary and different in nature so would not be likely to result in substantial land use or construction activity impacts.

If construction of a new parking lot on the Hackberry Lake SRMA were approved, there would be the potential for the timing of some traffic and construction activities to coincide with the proposed in-situ solution mine project. This would not be anticipated to result in substantial cumulative effects, given the relatively small level of construction required and the short schedule anticipated for parking lot construction. Ongoing trail maintenance activities within the recreation area would not be anticipated to result in cumulative socioeconomic impacts due to the small number of jobs and multiple locations involved.

The proposed Creamer water project may similarly coincide with the construction schedule for the Preferred Alternative, but would result in relatively minimal additional cumulative construction activity and traffic.

Ongoing oil and gas activity was anticipated as part of the socioeconomic baseline. A relatively constant level of ongoing oil and gas development activity is assumed in the assessment of existing socioeconomic conditions within the CESA, which would not represent an incremental cumulative impact.

Based on the foregoing, major cumulative socioeconomic effects are not anticipated to be associated with any of the RFFAs.

5.16 Summary of Cumulative Impacts

In general, the implementation of the proposed in-situ solution mine project in conjunction with the RFFAs listed in **Table 5-1** would result in small incremental changes to the landscape and impacts on

the human environment in the project area and the region. Groundwater is the resource likely to experience the greatest potential cumulative effects.

Pumping from the Rustler Formation to supply water to the Creamer project and for oil and gas development would increase the predicted substantial drawdown of existing groundwater levels in the project area if the pumping scenarios analyzed for the Proposed Action occur. The in-situ solution mine project-related drawdown is expected to alter vegetation communities and associated wildlife habitat in the project area. Because the project-related groundwater drawdown would already be major, it is unlikely that the incremental increase of groundwater drawdown due to implementation of the Creamer water project or fluid mineral development would result in additional significant changes to vegetation and wildlife habitat.

Groundwater from the project area that supplies instream flows to the Pecos River is likely to be reduced more by the combined effects of the proposed project and the RFFAs than by the proposed project alone. The cumulative effects of the proposed project and the RFFAs in the region may incrementally change each of the other resources analyzed, but the amount of the impacts are anticipated to be relatively small.