Chapter 3
Affected Environment

3.1 Introduction

Several baseline investigations have been completed in the Amendment #10 area to characterize environmental resources. This chapter provides a summary of those investigations and a brief history of mine activities in the study area. In the following sections, "project area" refers to the general area surrounding project components associated with the existing mine and RFD areas. The general project area is shown on Figure 1.1. Study area boundaries for each discipline are based on where potential direct and indirect impacts are likely to occur. In addition to issues and concerns brought out in the public scoping process, the NEPA, and CEQ, regulations, BLM policy and DEQ regulations require that potential impacts be addressed for the following critical elements:

- Wetlands/Riparian Zones
- Air Quality
- Farmlands, Prime/Unique
- Floodplains
- Water Quality (drinking/surface/ground)
- Threatened and Endangered Species
- Cultural Resources
- Areas of Critical Environmental Concern
- Wild and Scenic Rivers
- Wilderness Areas
- Native American Religious Concerns
- Hazardous Materials/Waste
- Environmental Justice
- Invasive, Nonnative Species

Of the fourteen critical elements required to be addressed, floodplains, prime and unique farmlands, areas of critical environmental concern, wild and scenic rivers, and wilderness areas do not occur within the project area and will not be discussed further.

3.2 Mine History

ACC, has been mining bentonite by surface mining methods in the Alzada area since 1977 and currently has about 3,600 acres under permit (Permit #00297) with the State of Montana. About 2,070 acres have been disturbed by mining within the current permit, 1,640 acres have been reclaimed through the seeding stage and about 300 acres are currently under some phase of mining. In addition, 1,443 acres have been released from the bond and removed from the permit, 300 acres of which were disturbed and reclaimed. About 795 acres in the permit are administered by BLM (Figure 1.2).

3.3 Location and Topography

The project area is located in Carter County, in the southeast corner of Montana. The eastern edge of the application area is about 5 miles west of the small town of Alzada and the western edge is located about 9 miles to the west. The area is also about five miles north of the Wyoming border.

It is best described as dissected upland, with relatively flat to moderately steep slopes, gently rolling terrain and broad basins. The landscape exhibits various erosional remnants, such as cuts and draws, eroded hillsides, calcite exposures, long ridge systems and isolated ridge spurs. On the West Area, mining will occur primarily in broad basins. On the East Area, mining will occur primarily on gentle ridge slopes.

It is also within a broad ridge system, which forms a drainage divide between Thompson Creek to the south and Willow Creek to the north. Elevations range from 3,520 feet to 3,700 feet above sea level.

3.4 Climate

The climate of the area is one of extremes. In 1975, the low temperature was –30 degrees F recorded in January; the high was 108 degrees F recorded in July. In 1989, the low temperature was –43 degrees F recorded in December; the high was 106 degrees F recorded in July. Precipitation is likewise erratic, ranging from a low of 7.8 inches recorded in 1952 to 21 inches in June and July, 1993 (National Weather Service, National Climatic Data Center, Asheville, North Carolina). Average annual rainfall is 10-15 inches. Winds are generally from the northwest and are subject to wide fluctuations.

Precipitation Records (National Climatic Data Center)

Year	Total Precipitation (in inches)
1995	
1996	
1997	
1998	
1999	
2000	data missing
2001	22.5
2002	9.1
2003	incomplete data available**

* 12.1 inches from May through July, 1999

** 13.3 inches from March through October, 2003

3.5 Air Quality

Under the Clean Air Act of 1970, and amended EPA developed primary and secondary National Ambient Air Quality Standards (NAAQS) for each of the seven criteria pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, fine particulate matter and sulfur dioxide. These standards establish pollution levels in the United States that cannot legally be exceeded during a specified time period.

Primary standards are designed to protect human health, including "sensitive" populations, such as people with asthma and emphysema, children and senior citizens. Primary standards designed for the immediate protection of public health, with an adequate margin of safety, regardless of cost.

Secondary standards are designed to protect public welfare, including soils, water, crops, vegetation, buildings, property, animals,

wildlife, weather, visibility, and other economic, aesthetic and ecological values, as well as personal comfort and well-being. Secondary standards were established to protect the public from known or anticipated effects of air pollution.

Montana has adopted additional state air quality standards. These Montana Ambient Air Quality Standards (MAAQS) establish statewide targets for acceptable amounts of ambient air pollutants to protect human health. A list of these standards are included in Appendix B.

NAAQS and MAAQS establish upper limits for concentrations of specific air pollutants. Incremental increases in the ambient concentration of criteria pollutants are regulated under the Prevention of Significant Deterioration (PSD) program. The program is designed to limit the incremental increase of specific air pollutants above a legally defined baseline level, depending on the classification of a location. Incremental increases in PSD Class I areas are strictly limited, while increases allowed in Class II areas are less strict. The project area and surrounding areas are classified as PSD Class II.

NEPA analysis comparisons to PSD Class I and II increments are intended to evaluate a threshold of concern, and do not represent a regulatory PSD increment consumption analysis. The determination of PSD increment consumption is an air quality regulatory agency responsibility.
Pollutants are limited within the project area, with only a few industrial facilities and residential sources in the small communities and isolated ranches. In addition, the good atmospheric dispersion conditions in the project area typically result in low concentrations of criteria air pollutants. These factors generally contribute to relatively low ambient air pollutant concentrations.

Table 3.5-1 National and Montana Ambient Air Quality Standards

Pollutant	Time Period	Feder
Carbon Monoxide	Hourly Average	35 ppm [a]
	8-Hour Average	9 ppm [a]
Fluoride in Forage	Monthly Average	
	Grazing Season	
Hydrogen Sulfide	Hourly Average	
Lead	90-Day Average	
	Quarterly Average	1.5 mg/m^3 [b] (ca
Nitrogen Dioxide	Hourly Average	
	Annual Average	0.053 mg/m^3
Ozone	Hourly Average	0.12 ppm [c]
PM-10 (existing)	24-Hour Average	150 mg/m^3 [d,j]
	Annual Average	50 mg/m^3 [e]
PM-10 (revised	24-Hour Average	150 mg/m^3 [f,j]
	Annual Average	50 mg/m^3 [e]
PM-2.5	24-Hour Average	65 mg/m^3 [g,j]
	Annual Average	15 mg/m^3 [h]
Settleable Particulate	30-Day Average	
	Hourly Average	
Sulfur Dioxide	3-Hour Average	0.50 ppm [k]
	24-Hour Average	0.14 ppm [j,k]
	Annual Average	0.03 ppm [k]
Visibility	Annual Average	

Source:
http://www.deq.state.mt.us/ppa/mdm/air/citguide/appendixb.html

a. Federal violation when exceeded more than once per calendar year.
b. Not to be exceeded (ever) for the averaging time period as described in the regulation.
c. Not to be exceeded more than once per year averaged over 3-years.
d. Violation occurs when the expected number of days per calendar year with a 24-hour average above this concentration is more than one.

e. Violation occurs when the expected annual arithmetic mean concentration is above this concentration.
f. To attain this standard, the 99th percentile of the distribution of the 24-hour concentrations for one year, averaged over three years, must not exceed this concentration at each monitor within an area.
g. To attain this standard, the 98th percentile of the distribution of the 24-hour concentrations for one year, averaged over three years, must not exceed this concentration at each monitor within an area.
h. To attain this standard, the 3-year average of the annual arithmetic mean of the 24-hour concentrations from a single or multiple population oriented monitors must not exceed this concentration.
i. State violation when exceeded more than eighteen times in any 12 consecutive months.
j. The standard is based upon a calendar day (midnight to midnight).

3.6 Hydrology

3.6.1 Groundwater

Based on exploratory drilling, no important groundwater is known to exist above the deepest projected depth of mining. Natural saline seeps are common to the area, which are usually the result of pockets of perched water tables overlying impermeable shales. These seeps are particularly evident in years of higher precipitation as water migrates over the impermeable layer until it is emitted where the ground surface intersects the elevation of the water, such as a side slope of a draw. Review of data from Montana Bureau of Mines and Geology Groundwater Information Center indicated no wells present in the permit area. The closest well is located at the Pilster buildings about 2 ½ miles north of proposed mining in the West Area. At this location, there are three wells in close proximity to one another, ranging in depth from 43 to 54 feet into the Willow Creek alluvium. They are used for stock watering. The only other known dependable aquifer is indicated by 3 other wells about 2.5 miles upstream on Willow Creek, which are drilled to a depth of 1,673 feet in the Fall River formation. The water well nearest the East Area is approximately 2 miles to the northeast.

The area within the amendment is not a recharge for any aquifer. As noted earlier in this section, the tops of the ridges do take in a very limited quantity of water that later

appears at the top of an impermeable layer as a wet spot or seep.

3.6.2 Surface Water

The surface water hydrology for the Amendment area is characterized by broad basins, gently sloping small draws, and unnamed ephemeral channels. The channels usually have a very low gradient and are usually very shallow, perhaps containing no distinct bank, and only a few feet wide. The depth and width are determined by such factors as the bankfull discharge recurrence interval, flow velocity, soil type and vegetation. The channels and surrounding overflow areas are usually better vegetated than the surrounding uplands because of the run-on quantities of water. These channels usually only carry water as a result of snow melt, spring rains or heavy summer precipitation events. The gradient also plays an important part in the erodibility of the channel. If the gradient is overly steep for the type of vegetative root mass present, erosion and headcutting may occur. No perennial or intermittent drainages are located on the proposed Amendment area.

The runoff from the area is comparatively high due to low infiltration potential of the heavy clays. Pits are typically dug to provide water for livestock. These do not require large drainage areas, because of the overland flow that occurs from precipitation events.

In the West Area, approximately 162 acres are in the Thompson Creek watershed and

598 acres are in the Willow Creek watershed, both tributaries of the Little Missouri River. In the East Area, approximately 476 acres are located on the Thompson Creek watershed and 252 acres in the Willow Creek watershed.

At its closest point, mining activity on Amendment #10 will be approximately 1.7 miles from Thompson Creek and about 0.8 mile from Willow Creek.

Only ephemeral drainages will be affected by actual mining activity and they will be re-established after mining.

ACC holds a stormwater discharge permit from the State of Montana that requires best management practices (BMP's) to control the amount of sediment leveling the site. According to ACC's mine plan, disturbed areas will be protected from run-on with berms and v-ditches. Controlling run-on will reduce water run-off from disturbed areas. Sediment-control fences, water bars, pits, or rows of straw bales will be employed where run-off threatens to carry excessive sediment to undisturbed lands.

Thompson Creek is currently identified on Montana's 303d list as an impaired stream due to suspended sediment. However, there is uncertainty as to whether the impairment is due to human influences in the region or natural erosion of the highly dispersive clay soils within the watershed. A 1997 report from the State Geologist states, "The perpetually muddy water in Thompson Creek is caused by dispersive clays, which are derived from shale bedrock of the Belle Fourche formation. The relative clarity of the water in the lower reaches of Willow Creek is caused by the presence of calcareous shales from the Greenhorn Formation, which are not dispersive."
Water quality of Thompson Creek has been monitored by the Carter County Conservation District since 1995. In 2001, a group of stakeholders including the conservation district, the bentonite mining industry, and state and federal environmental agencies began a cooperative effort to intensify efforts to monitor the watershed and water quality. However, these efforts have been hampered by extreme drought, making flow even less frequent. The existing water quality data does not indicate any solid conclusions about the nature of the impairment.

Occasionally, culverts have been placed in an intermittent stream that is crossed by a primary haul road. An example of this is the Thompson Creek crossing in Section 19, T. 9 S., R. 59 E., which has been used for approximately 20 years. ACC has no plans to place additional culverts at intermittent streams.

3.7 Wetlands

Three stockponds/pits on Amendment #10 land provide water for livestock and wildlife although the ponds/pits, which depend on precipitation events, have been observed to dry up during recent droughty years.

In the West Area, a small dugout is located in the middle of the N½SE¼, Section 1, T. 9 S., R. 57 E. ACC plans to mine through the impoundment and replace it during reclamation activities.

In the East Area, a small stockpond is located in the NW¼NE¼SE¼, Section 4, T. 9 S., R. 58 E. This pond dried to a bog hole and trapped sheep in 2003. It is located outside the mine plan and won't be disturbed. Another small pond is located in the SE¼SW¼SE¼, Section 6, T. 9 S., R. 59 E. and has been dry for at least two years. It is also located outside the mine plan and will not be disturbed.

Wetland vegetation at pond edges may support nesting, feeding and resting areas for waterfowl and cover for small mammals.

3.8 Wildlife

Historical Surveys

A four-season baseline wildlife study was conducted in the Alzada area by Ecological Consulting Service (ECS) in 1974/1975. The purpose of the study was to establish year-round biological baseline data concerning wildlife and wildlife habitat on future bentonite mine sites and in the general area. A 95-square mile study area was identified, which covered lands west of Alzada and north of the Montana-Wyoming state line to Willow Creek and included lands now contained in Amendment #10. Results of this study are contained in the original Contract #00297 application.

ECS reported that pronghorn antelope were the most common big game animals in the area, as 541 pronghorn were observed in 72 observations. The optimum pronghorn habitat was described as "rolling, open grassland with large areas of sagebrush" (ECS report dated 12/1975, page 24). Mule deer were also observed in significant numbers, i.e. 241 mule deer in 71 observations. 89% of mule deer observations were in three habitat types: creek bottom, pine/oak/juniper, and big sagebrush/grassland (ECS report, page 27). A total of 180 white-tailed deer were observed in 75 observations in creek bottom habitat (ECS report, page 30). Sage grouse were the most abundant upland game bird on the ECS study area, and a total of four mating grounds (leks) were identified (ECS report, page 33). Sharp-tailed grouse were not as common as sage grouse; 90% of all observations were along Ridge Road and Highway 212. One sharp-tailed grouse lek was identified on the study area (ECS report, pages 39-40). Non-game birds common to the shrub/grassland habitat included western meadowlark, vesper sparrow, horned lark, and Brewer's sparrow (ECS report, page 49). Waterfowl were observed along the creeks and on stockponds. Most waterfowl observations were of mallards, blue-winged teal, pintails, and American widgeons (ECS report, page 43). Of large predators, observations were made of red fox and one sighting of a bobcat; there were no sightings of coyote (ECS report, page 45). Small mammals commonly observed included white-tailed jackrabbits and mountain cottontails (ECS report, page 45). The following raptor species were observed: golden eagle, rough-legged hawk, red-tailed hawk, marsh hawk (northern harrier), and American kestrel (ECS report, page 45). There was no mention of ferruginous hawks.

In addition, four-season ecology and wildlife studies were conducted by the U. S. Forest Service, Rocky Mountain Forest and Range Experiment Station, in 1979/1980 on future bentonite mine sites in the Alzada area. A 44-square mile study area was identified which covered lands west of Alzada between Thompson Creek and the Montana-Wyoming state line and included approximately half of the lands which had been covered by ECS' study in 1974/1975. These lands are approximately two to five miles south of Amendment #10 lands. Results of the USFS study are contained in the original Contract #00455 application.

The USFS reported that 422 pronghorn were observed in 26 observations, 390 mule deer in 26 observations, and 22 white-tailed deer in 4 observations. The majority of pronghorn were seen in sagebrush habitat, and riparian habitat along streams was the preferred habitat for mule deer and white-tailed deer (USFS report, page ii). Small game and predators were represented primarily by white-tailed jackrabbits and red fox (USFS report, page ii). The most numerous game birds were sage grouse; however, only one major lek was found. Two other possible booming grounds were found; however, male grouse were sporadic in using these areas (USFS report, page 36). Very few sharp-tailed grouse were present on the study area and only occasional sightings were made of one or two grouse; no lek activity was seen (USFS report, page 40). Non-game birds, which were commonly seen in the sagebrush habitat were the vesper sparrow, western meadowlark, horned lark, and Brewer's

sparrow (USFS report, page 30). Waterfowl that were observed in riparian habitats, included Canada goose, mallard, pintail, American widgeon, shoveler, blue-winged teal, and green-winged teal (USFS report, page 26). The following raptor species were observed: marsh hawk (northern harrier), rough-legged hawk, red-tailed hawk, golden eagle, bald eagle, prairie falcon, and American kestrel (USFS report, page 26). The bald eagle and prairie falcon were believed to be migrating through the area.

Because of the relatively small size of open mine areas and mobility of big game species, mining does not appear to have reduced pronghorn or mule deer populations in the Alzada area. Numbers have remained constant or perhaps increased over the past 20 years. (Incomplete data is available for white-tailed deer populations which are not in the areas where ACC is active). See survey results, which are presented in the wildlife section of Chapter 3, Affected Environment.

Grasslands provide valuable wildlife habitat because big game species will concentrate on grassland plants during the spring and summer months as noted in the following references:

Mule deer prefer shrubs in winter and grasses and forbs in summer. Pronghorn eat mostly new grasses in the spring, and in the summer broadleaf plants. During the winter, sagebrush and other shrubs serve as their primary foods (from "Consideration for Wildlife in Industrial Development", Wyoming Game & Fish Dept.).

Pronghorns use the greatest diversity of vegetation types in summer and the least in winter (Steve Amstrup, U. S. Fish and Wildlife Service, Sheridan, WY – no date). Pronghorns generally feed mainly on grasses in the spring, Cole and Wilkins, (1958), Severson and May, (1967) and Beale and Smith, (1970). In winter there is 90% use of the big sagebrush type; in spring there is 65% use of perennial grasslands by pronghorn (Amstrup).

In "Diet and Nutrition of the Pronghorn Antelope" by Norman Messenger (1978), he reported on pronghorn in northwestern South Dakota. He found that shrub use was low in the spring and summer months: January: 96% shrubs, February 96% shrubs, March 95% shrubs, April 36% shrubs, May 36% shrubs, June 15% shrubs, July 6% shrubs, August 19% shrubs, September 45% shrubs, October 69% shrubs, November 95% shrubs, and December 97% shrubs.

In "Forage Diversity and Dietary Selection by Wintering Mule Deer", Carpenter, Wallmo, and Gill, (1978), researchers found that when available, forbs and grasses are an important component of a winter diet for mule deer.

In "Sagebrush Mowing Helps Wildlife, Livestock", Gocke, (July, 1997), the author describes a joint Wyoming G&F/BLM/Mobile Oil partnership where old sagebrush was mowed to increase diversity of young plants, grasses, and forbs. This project demonstrated that increased diversity in habitat means an increased diversity in wildlife and benefits to livestock as well.

Pronghorn

Wildlife surveys have been conducted by ACC biologists from 1993 through 2003 on new amendment areas. ACC drillers and surveyors also logged wildlife observations on occasion.

The pronghorn continues to be the most frequently observed big game animal in the sagebrush/grassland habitat in the Alzada area. Most sightings of pronghorn are made on the flats along Ridge Road three miles south of Amendment #10 and along Thompson Creek two miles south of Amendment #10. Pronghorn are generally seen in small groups; however, in the winter, concentrations of 30-80 pronghorn are often seen on big sagebrush flats along Thompson

Creek. No large concentrations have been observed on Amendment #10 lands. During 24 surveys which were conducted on Amendment #10 lands in 2002/2003, pronghorn were seen on nine occasions, usually in groups of 4-6 individuals. Pronghorn are occasionally observed very near active mining and will readily graze newly seeded reclaimed lands in the spring and summer.

Over the same general study area that the ECS and USFS baseline studies were done, ACC recorded 395 pronghorn in 36 observations in 1996, 245 pronghorn in 15 observations in 1997, 577 pronghorn in 32 observations in 1998, and 206 pronghorn in 20 observations in 1999. ACC recorded 613 pronghorn in 40 observations in 2002/2003.

Mule and Whitetail Deer

Mule deer are seen on occasion in the upland draws but more frequently along Thompson Creek and along Ridge Road. During 24 surveys conducted on Amendment #10 lands in 2002/2003, mule deer were seen on 18 occasions, primarily in the draws along the south-facing slope of Sections 5 and 6, T. 9 S., R. 59 E. Sightings were of 1 to 25 individuals.

White-tailed deer prefer heavily wooded creek and river bottoms, a habitat not found on the Amendment #10 lands.

Over the same study area, ACC recorded 86 mule deer in 13 observations in 1996, 277 mule deer in 20 observations in 1997, 270 mule deer in 28 observations in 1998, and 176 mule deer in 15 observations in 1999. ACC recorded 395 mule deer in 40 observations in 2002/2003.

ACC did not conduct any surveys for white-tailed deer.

Small Mammals

Of other mammals, the most frequently observed species reported in the baseline surveys and in current surveys are badger, red fox, coyote and white-tailed jackrabbit. No prairie dog towns occur on the mine sites or in the vicinity. A prairie dog colony can be potential habitat for the endangered black-footed ferret or the burrowing owl, a BLM "sensitive species", and US Fish and Wildlife "species of conservation concern".

Small mammals, which may be present include the deer mouse, thirteen-lined ground squirrel, pocket mouse, pocket gopher, least chipmunk, shrews and voles. ACC does no small mammal trapping; however, the USFS study conducted in 1979/1980 used live-traps and pit traps to determine the species composition in sagebrush and grassland habitats. The deer mouse was found to be the most abundant small mammal, followed by thirteen-lined ground squirrel, sagebrush vole, pocket mouse, prairie vole and shrew species (USFS report, page 82).

Game Birds

Game birds in the area include wild turkey, mourning dove, sharp-tailed grouse, and sage grouse. Mourning doves are the most frequently observed game bird in the shrub/grassland and are the only game bird recorded on the Amendment lands during baseline studies. Sage grouse depend upon sagebrush for mating, nesting, and wintering activities and grassy areas for summer broods; therefore, habitat does exist for them on Amendment #10. ACC personnel have observed wild turkey in woodland south of the Ridge Road and in open woodland along the Little Missouri River near Alzada. Sharp-tailed grouse habitat occurs along Thompson Creek and in road ditches along Ridge Road where infrequent sightings have been made.

Early-morning mating ground (lek) grouse surveys are conducted each April on ACC projects and in the area. The main sage grouse lek that has been located is in Section

25, T. 9 S., R. 57 E., approximately three miles from ACC's current mining activities. This lek has been observed to be active for over 20 years. Two small satellite leks may also exist within two miles of the main lek, south of the Ridge Road, but only a few male grouse have been observed on occasion on these grounds in recent years. A sharp-tailed grouse lek, which was first identified by the ECS study in 1974/1975 near Thompson Creek and south of the Ridge Road was discovered by ACC in 1992 to be the site of a livestock salt block station, and is no longer being used as a grouse mating ground. In 2003 and 2003 sharp-tailed mating activity was observed south of Ridge Road in Section 23, T. 9 S., R. 59 E., approximately 1 mile west of Highway 212 and 4 ½ miles from Amendment #10.

Sharp-tailed grouse habitat in the brushy road ditches of Ridge Road and along Thompson Creek and wild turkey habitat in the open woodlands south of the Ridge Road are outside of the areas where ACC is active. Mourning doves are frequently observed near mining activities, but are not dependent on sagebrush as are sage grouse for nesting and wintering activities and food. Disturbance of the sagebrush/grassland habitat on mine sites may cause temporary displacement of sage grouse, although they will use the grasslands for brood rearing, especially where the vegetation is moist. Infrequent sage grouse sightings indicate a low density of sage grouse presently in the Alzada area. In February, 1999 a local rancher reported increased sightings of grouse and also sightings of Hungarian partridge, which had not been seen in the area for several years.

The pre-mine sagebrush/grassland habitat has a low density and diversity of non-game bird species, as reported in surveys from 1974 to the present. The most abundant birds observed by ACC personnel are sparrows, western meadowlarks, horned larks and lark buntings.
Waterfowl are observed on stockponds and reservoirs in the area. They include Canada goose, mallard, pintail, teal, American coot and an occasional great blue heron.

Raptors

Raptors, which may be found in the open sagebrush/grassland country where most of the mining occurs, include single cover raptors such as northern harrier, ferruginous hawk, and short-eared owl, and multi-cover raptors, which may nest elsewhere and hunt in open country, such as the golden eagle and red-tailed hawk.

Of special interest is the ferruginous hawk, which is the largest of the North American buteos and is suffering population declines in some parts of the country. It was previously listed as a Category 2 species by the US Fish and Wildlife Service, which means there is evidence of vulnerability. It is currently listed by the USFWS as a "species of conservation concern". Protection of ferruginous hawk habitat is required by provisions of the federal Migratory Bird Treaty, which prohibits harming, harassing, or taking of birds.

A ferruginous hawk pair will occupy a territory of three square miles or more and may have up to five nests within their territory. Each spring they chose one for incubation and brooding, and it is often a different nest each year.

Ferruginous hawk nesting activity in a 64-square mile west of Alzada and north of the Montana-Wyoming state line (and including Amendment #10 lands and future mine sites) was thoroughly investigated in a study conducted by FaunaWest (Craig Knowles) for ACC in 1997. The purpose of the study was to locate all ferruginous hawk nests, active and inactive, and monitor active nests for nest success in 1997 and compare data to baseline studies conducted by K. W. Wittenhagen, BLM, in 1991 and 1992 on the same study area.

Knowles reported a total of 21 nests within the 64-square mile area (two inactive nests

were located on Amendment #10 lands) and based on the distribution of the nests concluded that there is adequate space for seven nesting territories. Most of the nests appeared to be several years old and in a "fair" or "poor" condition. Many of the nest sites had badger excavations under them. Three nests showed activity in 1997: a nesting attempt was made and failed at one nest; one active nest appeared to be abandoned shortly after hatching and may have been predated upon by a golden eagle observed near the nest; and the third nest fledged two young (this nest was the closest to ACC's activities and was located within one-half mile of the main haul road). For comparison, BLM documented four successful nests in the study area in 1991 and two successful nests in 1992.

In 1998, 1999, 2002, and 2003 ACC personnel checked some of the ferruginous hawk nests identified by FaunaWest and found no activity on nests within Amendment #10 boundaries. However, a nest in the near vicinity did show activity.

The decline in nesting, which was observed in other portions of Montana in 1997, may be due to a cyclic decline in prey - white-tailed jackrabbits, ground squirrels, and northern pocket gophers, FaunaWest, (1997). Black-tailed prairie dogs, which are a preferred food source for ferruginous hawks are not as prevalent in the Alzada area as they were a few years ago. Prairie dog colonies in the area (for instance, north of Highway 212 on the McDowell Ranch) have been killed off in recent years.
Reducing the pre-mine slopes, which are gentle to moderately steep on Amendment #10 to gentle slopes on the reclaimed land could affect ferruginous hawk nesting although no nests have been located on Amendment #10 lands. The hawks often use ridge slopes and small pinnacles as nesting sites, and many of these features remain in amongst the mine sequences. Knowles (1997) stated that there was no clear indication that mining activities were influencing ferruginous hawk nesting and that it was apparent that nest sites are not a limiting factor in this study area. Predators that may prey on ferruginous hawks include badger, red fox, coyote and golden eagle. Badgers were responsible for predation at ferruginous hawk nests in the Lone Tree and Alzada study areas in 1991, Wittenhagen, (1991).

Preferred food sources for ferruginous hawks are prairie dogs, white-tailed jackrabbits and ground squirrels, FaunaWest, (1997); although Wittenhagen reported the northern pocket gopher to be the most common prey species at active nests in 1991 and 1992. Other prey items are thirteen-lined ground squirrels, western meadowlark, sage grouse, and small birds, Wittenhagen, (1991). Wittenhagen reported that white-tailed jackrabbit numbers were lower in 1992 than in 1991 and both years were lower than in 1981 and 1982 in the Lone Tree study area, which is eight miles north of Alzada. Wittenhagen speculated that ferruginous hawks will switch to alternate prey when their principal prey species declines. His data indicated low use of jackrabbits and subsequent high use of pocket gophers. He further speculated that several mild open winters may make jackrabbits more susceptible to predators, Wittenhagen, (1992). Knowles, (1997) noted that a decline in ferruginous hawk nesting was also observed in other portions of Montana in 1997 and may be due to a cyclic decline in prey. He also stated that a few years ago there was a large prairie dog colony a few miles north of the study area, north of Highway 212, and that colony is no longer active. It is important to note that no known ferruginous hawk nests are in the proposed disturbance area, thus minimizing impacts to nesting birds.

Aquatic life

There are no known fish species to occur within the project area. However, downstream of the project area in Thompson Creek (RM 0.0 – 35.6), there are six fish species known to occur (data was provided

by extrapolated surveys from Montana Fish Wildlife and Parks). These include the fathead minnow (*Pimephales promelas*), lake chub (*Couesius plumbeus*), longnose dace (*Rhinichthys cataractae*), sand shiner (*Notropis stramineus*), black bullhead catfish (*Ictalurus melas*) and white sucker (*Castostomus commersoni*). None of these six species are sensitive or a MT species of special concern. Three of these species, the fathead minnow, black bullhead catfish, and white sucker, were found at two survey locations by Montana Fish, Wildlife and Parks in May 2004. A fish Index of Biological Integrity (IBI), developed by Bramblett et. al. (2003), was conducted on the above two survey sites (An IBI approach involves identifying characteristics of fish populations that are most responsive to anthropogenic influences and least responsive to changes in natural factors). The results indicated "poor" scores of 36 percent and 43 percent. However, additional fish sampling will be completed by DEQ during the summer of 2004 to add to the final assessment of aquatic life support.

Other aquatic life species that occur or may occur would be aquatic invertebrates and amphibians associated with ephemeral streams and the stock ponds located within the project area. There are no known BLM sensitive or a MT species of special concern aquatic invertebrates located within the project area. There may be the tiger salamander (*Ambystoma tigrinum*), great plains toad (*Bufo cognatus*), Woodhouse's toad (*Bufo wood housii*), western chorus frog (*Pseudacris triseriata),* plains spadefoot (*Scaphiopus bombifrons*), and northern leopard frog (*Rana pipiens)* within the project area. Of these species, the great plains toad and plains spadefoot are BLM sensitive species and/or MT species of special concern.

Threatened and Endangered Species

There are no known endangered species in the Alzada area. The bald eagle, which was downlisted to a threatened species in 1995 is frequently observed as a winter resident along waterways in southeastern Montana. Sightings by ACC personnel have increased in the past 15 years as the bald eagle has made a strong comeback.

3.9 Cultural

The proposed undertaking has been recently surveyed for cultural resources. ACC contracted a permitted archeologist to conduct cultural resource surveys prior to mining activity commencing on federal lands. The cultural resource inventory was conducted on the project's Area of Potential Effect and incorporated all of the project's Area of Potential Effect and a sufficient area surrounding the project to act as buffer zone between 2002 and 2004 (see report number: MT-020-04-420 and MT-020-02-256, 317 and 322; and MT-020-03-247, 256, and 316). No cultural resource sites were located or recorded in the vicinity of the proposed undertaking within the area of the project's Area of Potential Effect and no cultural resources considered eligible for the National Register of Historic Places would be impacted or affected by the proposed undertaking.

If any cultural site had been located, it would have been brought to the attention of the proper local, state, and federal officials through normal reporting procedures. Should significant sites be found, a variety of mitigation measures would be utilized, ranging from data collection (excavation) to on-site protection. In 1975, the University of Montana conducted archaeological reconnaissance over ACC's future mine sites, and it was observed that "generally the area is not well suited to aboriginal occupation", University of Montana study, (1975).

Soils throughout many of the mine sites are "compact clay hard pan, siderite concretions, pavements and exposed bentonite. The potential for unseen significant buried cultural remains in this

soil structure is very low", Llano Consultants, (1996).

Four Class III Cultural Resource Inventories were conducted by J. F. Savini of Llano Consultants, Casper, WY in 2002 and 2003 over Amendment #10 lands and some adjoining lands; 1,463 acres were covered. No previously recorded cultural resources were identified by the contractor on these lands, and only eight isolated finds were discovered during the inventories. No further work was recommended by the consultant.

3.10 Soils

A soil inventory was completed in the general area in 1980 by the Soil Conservation Service in Baker, Montana. Soil samples were tested according to Department of State Lands requirements set forth in the "Proposed Soil and Overburden Guidelines- Bentonite, Revised 12/77."

A thorough re-investigation of the soil resources on Amendment #10 lands was done by Jim Nyenhuis, Certified Professional Soil Scientist/Soil Classifier, under contract with ACC 2002. Soils mapping and classification was conducted in accordance with the standards and procedures of the National Cooperative Soil Survey and DEQ. Initial mapping units were identified using USGS 7.5' quadrangles and air photo NRCS Order 3 soil survey maps (Carter County, unpublished). These tentative boundaries were used during field observation and delineation.

As recommended in DEQ's Soils and Overburden Guidelines, soils were mapped to the detailed Order 1-2 level of intensity, and areas not to be affected were mapped, at a minimum, to the less detailed Order 3 level. Entire mapping units were traversed on foot with soil profiles periodically exposed using a sharpshooter and bucket auger. Twenty-three topsoil and subsoil samples were taken, and chemical analyses were performed by Inter-Mountain Laboratories, Inc., Sheridan, WY. The recommended topsoil and subsoil salvage depths are based on the results of these analyses.

Soils on Amendment #10 in the areas of proposed mining are characterized primarily by shallow Aridic Ustorthents (Neldore and Volborg), and Aridic Ustorthents (Vaeda). There are also numerous outcrops including rock, bentonite and shale, which will not be salvaged as topsoil. Surface textures are commonly clay and silty clay, with subsurface textures commonly clay. The recommended salvage depths were found to be generally 6" for topsoil and 0-11" for subsoil.

3.11 Vegetation

A four-season baseline vegetation study was conducted in the Alzada area by Ecological Consulting Service (ECS) in 1975. The purpose of the study was to establish year-round biological baseline data concerning vegetation on future bentonite mine sites. A 95-square mile study area was identified which covered lands west of Alzada and north of the Montana-Wyoming state line to Willow Creek. Results of this study are contained in the original Permit #00297 application.

In addition, ACC personnel conduct vegetation mapping and herbaceous cover sampling, and compile vegetation species lists and determine shrub densities on lands that are added to the contracts.

During the 2002 and 2003 field seasons, the Amendment #10 lands were reviewed by ACC personnel in order to incorporate ECS's data into ACC's vegetation classification system. The entire area was mapped onto 1 = 100 feet scale drill maps. Vegetation community types were delineated by walking the area and mapping vegetation transitions relative to drill stakes and physical features and by use of GPS system. In the office, these boundaries were

then digitized by computer onto 1 = 400 feet vegetation maps. Herbaceous cover sampling was done in June and July, 2003, and species lists were compiled based on observations from 2002 and 2003.

ACC's field data substantiated the ECS assessment that the Amendment #10 land is primarily a Big Sagebrush-Grassland. ACC further defined the main vegetation type as Big Sagebrush/Western Wheatgrass (BS/WW) because two species provide the most relative cover. Approximately 63% of the Amendment #10 land was mapped as BS/WW. Inclusions of scurfless saltbush, calcite, or bentonite outcrops where there is little or no vegetation occur throughout the community.

Sampling in the BS/WW community in the West Area showed that herbaceous cover ranges from approximately 15% to 34%, with an average of 24.4%. Bare ground ranges from approximately 41% to 69%, with an average of 56.6%. Big sagebrush plants in the height class of 4-10" inches are the most frequently encountered.

Sampling in the BS/WW community in the East Area showed that herbaceous cover ranges from approximately 15.6% to 35.8%, with an average of 23.9%. Bare ground ranges from approximately 28.8% to 61.2%, with an average of 49.2%. Big sagebrush plants in the height class of 3-10" are the more frequently encountered.

Minor vegetation communities were identified by their dominant species, i. e. Scurfless saltbush (an annual forb), Little Bluestem and Prairie Sandreed, Reclaimed land (grassland) and Black Greasewood mixed with Big sagebrush.

The following table summarizes the major vegetation community types in the Amendment #10 area.

Table 3.11-1 Major Vegetation Community Types

Name of Community	Average # of Herbaceous Cover	Average % of Bare Ground	Number of Common Species
West Area			
Big Sage/Western Wheatgrass	24.4%	56.6%	40
Little Bluestem/Prairie Sandreed	25.9%	56.2%	39
East Area			
Big Sage/Western Wheatgrass #1	23.6%	48.5%	46
Big Sage/Western Wheatgrass #2	24.5%	50.6%	39
Prairie Sandreed	13.1%	71.8%	16
Black Greasewood/Big Sage	27.3%	45.4%	54
Reclaimed Land	25.0%	45.8%	34
Scurfless Saltbush	<10%	80.0%	14

Other smaller communities include Calcite/Bentonite, Outcrops/Barrens, Prairie Sandreed and stockponds, which total an additional 41 acres.

Two noxious weed species, field bindweed and Canada thistle, were found at two locations in the Amendment #10 study area, totaling less than ½ an acre. ACC does have an approved noxious weed control plan.

No unusual, threatened, or endangered plant species have been identified during ACC's vegetation studies. Bentonite Corporation has reported a BLM "watch" species (Blue toadflax) south of the Ridge Road and east of their Vol Ash 6 claims. ACC has not encountered this species during baseline and bond release studies.

3.12 Grazing Resources

In the original Permit #00297 application, it was noted that the pre-mine range condition was generally "fair" over the 1,550 acres in the permit and the recommended livestock stocking rate was 0.3 AUM per acre, or 100 animal units for 4.7 months over the 1,550 acres (Montana Department of State Lands – from Environmental Impact Statement dated 11/12/76).
The current stocking rate for the 686 acres that would be disturbed in Amendment #10 would be 50 animals per month for 3 months. About 70 acres of the disturbance area is considered barren outcrop, etc. and does not support grazing. The other community's rates vary from 0.14 to 0.35 AUM/acre.

The proposed action will have an effect on the allotments allocated to three separate grazing permittees. The permittees and grazing allotments within the area of the proposed action is as follows:

- S&L Sheep Ranch
    - Grazing Number 2503696
    - Willow Creek Allotment (Number 10419)
- Pilster Ranch Corp.
    - Grazing Number 2503760
    - Allotment Number 10486
- Cochran Grazing Association
    - Grazing Number 2503499
    - Allotment Number 10224

S& L Sheep Ranch

S&L Sheep Ranch is operated by the Steadman and Lindberg families. This ranch is used in combination with other ranches that are owned in Custer County, Montana. The ranch utilizes both cattle and sheep in the grazing operation. The grazing operation will be affected by the East Proposal. The location of the proposed action is contained within the Southeast Summer Pasture. This pasture contains approximately 1,424 acres and has a total of 284 Animal Unit Months (AUMs). The BLM lands comprise 1,137 acres and have a grazing preference of 218 AUMs. The location of the proposed action within the S&L Ranch contains approximately 410 acres of lands that are allocated 86 AUMs.

S&L Sheep Ranch typically utilizes the Southeast Summer Pasture to graze 180 to 200 cow/calf pairs for approximately 1.5 months. Livestock water for this allotment is obtained through the utilization of pits and reservoirs. The watering locations would include the Laura McDowell Pit, which S&L rebuilt through normal maintenance the summer of 2002, and the Rip Rap 2 Pit. The Rip Rap 2 Pit also contains a shallow reservoir (McDowell Reservoir #1) above the pit that serves both wildlife and livestock.

Cochran Grazing Association

Cochran Grazing Association is an association of ranchers that, through membership rights, lease grazing from the Association. The livestock grazing will be affected by the West Proposal. The Association's members may utilize either sheep or cattle within the grazing program. The location of the proposed action is within the Willow Creek Allotment Management Plan (AMP) and the Thompson Creek AMP. These AMPs operate on grazing systems that considers the AUM allocations of both private and BLM lands in order to implement a grazing system.

The Willow Creek AMP operates as a four pasture rest rotation system. The pasture that would be affected by the proposed action is the Bentonite pasture. This pasture contains approximately 1,645 acres and has a total of 213 AUMs (private and Federal) allocated to the pasture. The BLM lands within the Willow Creek AMP comprises approximately 1,215 acres and has an associated grazing preference of 169 AUMs. The location of the proposed action within the Willow Creek AMP would contain 1 AUM on federal lands and 22 private AUMs.

The Thompson AMP operates as a two pasture deferred rotation system. The pasture that would be affected by the proposed action is the North Thompson pasture. This pasture contains approximately 1,844 acres and has a total of 583 AUMs (private and federal) allocated to the pasture. The BLM lands comprise approximately 1,277 acres and have an associated grazing preference of 157 AUMs. The location of the proposed action within the Thompson Creek AMP would contain approximately 46 acres that are associated with 5AUMs for the carrying capacity. The BLM constructed a new livestock watering pit in T. 9 S., R. 58 E., Section 7 in 2003.

Pilster Ranch Corporation

Pilster Ranch Corporation utilizes both sheep and cattle within the grazing operation. The livestock grazing activities will be affected by both the East Proposal and the West Proposal. The permit for the Pilster Ranch is a year-around permit (3/1 to 2/28) with the stipulation that livestock numbers are restricted to ensure that grazing capacity is not exceeded. Within the West Proposal, the location of the proposed action is allocated 26 AUMs BLM grazing preference. Within the East Proposal, the location of the proposed action is allocated 15 AUMs of BLM grazing preference.

3.13 Lands and Realty

3.13.1 Ownership and Land Use Authorizations

In the West Area under Amendment #10, there are 260 acres of land with Federal surface and Federal minerals and there are 500 acres of land with private surface and private minerals. In the East area under Amendment #10, there are 323.8 acres of land with Federal surface and Federal minerals and there are 403.2 acres of land with private surface and private minerals. The land with Federal surface and Federal minerals equals 583.8 acres. The land with private surface and private minerals equals 903.2 acres. The grand total is 1,487 acres, which is proposed to be added under Amendment #10. See Appendix 1 for the legal descriptions and the acres.

There are three BLM-issued rights-of-way in the area of the proposed Amendment #10. MTM040452 is issued to the Montana Highway Commission for a highway. MTM86161 is issued to the Federal Highway Administration to amend the right-of-way issued to the Montana Highway Commission. The third right-of-way is MTM46030 and is issued to Geo Resources, Inc. for gas pipeline. MTM040452 and MTM86161 are located in the SE¼NW¼ and the NW¼SE¼ of Section 5, T. 9 S., R. 59 E. MTM46030 is located in Section 12, T. 9 S., R. 57 E.

3.14 Recreation

Recreation consists primarily of big game and bird hunting although hunting is restricted on the private lands in the area.

3.15 Visual Resources

The BLM has developed the Visual Resource Management System (VRM) to classify visual resources based on scenic quality, visual sensitivity, and visual distance zones. All lands within the project area are classified as VRM Class III. The objective of this class is to partially retain the existing character of the landscape and any changes should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer. Existing mine activities have modified the landscape by creating changes in form, line, color and texture of the landforms. New temporary landforms are created including overburden stockpiles, mine pits, soil stockpiles and roads.

The landscape is dominated by short sagebrush, short grass prairie, bentonite outcrops, and barren shale ridge slopes and is similar to land throughout southeastern Montana. One tree occurs on Amendment

#10.

3.16 Noise

Existing noise in the general area of Amendment #10 results from bentonite mining activities (scrapers, dozers, haul trucks and wagons) and daily traffic on Highway 212, which is located approximately three miles north of the study area.

Noise, as perceived by humans, is affected by intensity, pitch, and duration. Loudness is measured in decibels (dB), whereas the A-weighted sound scale (dBA) represents environmental noise. Mining activities are typically subject to noise regulations imposed by the Mine Safety and Health Administration (MSHA). Noise generated by trucks, dozers and other mine equipment typically ranges from 90 to 100 dBA at the source. For comparison, a gas lawnmower at 3 feet would register about 95 dBA, and a jet flying over at 1,000 feet would register about 105 dBA.

3.17 Transportation

Access to the West Area mines site will be via ACC's main haul road that intersects the Ridge Road approximately 5 ½ miles west of Highway 212. Access to the East Area mine sites will be approximately 6 miles northwest of Alzada at Highway 212 or across previously permitted land to the west.

The bentonite is hauled by contract haul trucks. Hauling shuts down during inclement weather and during some months, but when active, there may be 75 or more loads per day hauled from ACC's Montana mine sites.

3.18 Social and Economic Conditions

The bentonite companies have been a major industry in the Alzada, Montana/Colony, Wyoming/Belle Fourche, South Dakota area for many years. The first company to begin mining in Montana was the Baroid Division of NL Industries (Bentonite Corporation) in 1968. ACC's operations near Alzada began in the late 1970's.

In 1999, the population of Alzada was estimated to be about 50 residents. (Alzada is not incorporated so census population information is not available specifically for this community). Carter County, where Alzada is located, had a 2000 population of 1,360. This indicates a very sparse population density of less than 0.5 persons per square mile, compared to a figure of over 6 persons per square mile for the state. The county lost 9.5 percent of its population between 1990 and 2000. Nearly 18 percent of the county population is 65 years or over, compared to 13 percent for the state. This area will probably continue to slowly lose population as people leave the area for more employment and education opportunities.

Colony, which is located in Wyoming about 12 miles southeast of Alzada, is also an unincorporated community. It is located in northeast Crook County, which had a 2000 population of 5,887. The county population increased 8 percent between 1990 and 2000. Belle Fourche, which is located in South Dakota 37 miles southeast of Alzada, had a 2000 population of 4,565 and is the county seat of Butte County. Butte County had a 2000 population of 9,094, which was an increase of 10 percent from 1990.

The Alzada economy is dependent almost entirely upon ranching and bentonite mine-related activities. ACC has 40 employees at its' Montana Field operation, (Lyndon Bucher, personal conversation, 5-26-04). Another 160 employees at the Colony East and West plant and mill were dependent on the Montana production. The ore is hauled to the Colony plants by contract truckers. Most of the Montana Field operations employees commute from Crook County, WY, and Butte County, South Dakota, according to ACC and U.S. Census Bureau data on county to county commuting patterns in 2000. The number of employees

covered by Unemployment Compensation Insurance was 270 in Carter County, 1,954 in Crook County, and 2,403 in Butte County in 2002 according to the U.S. Bureau of Labor Statistics.

ACC stated in its application that the average weekly wage for employees in the three state area was more than $800 in 2002. The U.S. Bureau of Labor Statistics reported the average weekly wage was $325 in Carter Co., $400 in Butte Co., and $484 in Crook Co. in 2002.

USGS production data for Montana was incomplete due to the small number of mines reporting (Bob Virta, USGS, personal conversation, 5-24-04). USGS reported Montana bentonite production was 278,000 tons in 2001, and 272,000 tons in 2002 (The Mineral Industry of Montana, 2002, USGS). This compares with reported production averaging 395,000 tons from 1994 to 1996 (Robin McCollugh, MBMG, personal conversation, 5-26-04).

ACC has surface and mineral leases with some of the area ranchers. Private landowners receive royalties and/or surface damage payments. ACC has active mining claims on the federal lands included in the permit area. The Federal Government receives a $100 per claim Maintenance Fee, there are no production royalties.

The Montana employees pay Montana income taxes. Wyoming and South Dakota have no income tax but do have sales taxes. All three states levy property taxes on plant and equipment. ACC's application stated that the annual payroll for the 200 employees in the tri-state area was 10.1 million dollars in 2002. In addition, they paid vendors 11.3 million dollars.

Montana levies a yearly ad-valorem tax on the net proceeds of bentonite production, the Miscellaneous Mines Net Proceeds Tax. The taxable value is equal to 100% of the annual net proceeds, which is multiplied by the local mill levy. The County Treasurer collects the tax. The tax is distributed on the basis of the mills levied by the taxing jurisdiction.

ACC stated that they paid 1.36 million dollars in Net Proceeds tax in 2002. Based on Carter Counties' average annual mill levy of 313.11, ACC's production accounted for approximately 72% of the total taxable value. Further, the Net Proceeds revenues account for 59% of the total taxable value for the County in 2002, (Montana Department of Revenue Biennial Report, December, 2002).

Property taxes account for one half of the county's General Fund budget, on average (Pam Castleberry, Carter County Clerk and Recorder, personal conversation, 5-26-04) and are the principal source of revenue for schools in Montana.

In 2002, Carter County received 1.36 million dollars from ACC in the form of severance taxes and will receive approximately the same amount for 2003. These monies are critical for county operations.

3.19 Environmental Justice

Executive Order 12898, Environmental Justice, requires that Federal agencies "identify and address the . . .disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." BLM has developed an instruction memo containing guidance for evaluating environmental justice issues in land use planning (IM No. 2002-164).

The populations of Carter County, Montana, Crook County, Wyoming, and Butte County, Wyoming and are each at least 95% White. The highest level of non-White persons is in Butte County, South Dakota, where Native Indians (including Alaska Natives) comprise 2.7 percent of the population.

The poverty rate for families is 15.9 percent in Carter County, Montana, compared to a state rate of 10.9. The poverty rate for families is 7.8 percent in Crook County, Wyoming, compared to a state rate of 8.0. The poverty rate in Butte County, South Dakota is 9.4, compared to a state rate of 9.3. Thus the poverty rates in the affected counties in Wyoming and South Dakota are similar to the state rates for that county.

3.20 Mineral Resources and Geology

Bentonite clay is a fine-grained rock composed mainly of montmorillonite minerals. The formation of bentonite is an in situ alteration of volcanic ash. Pyroclastic material was ejected into the atmosphere by volcanic activity and deposited as sediment in a marine environment. The resulting alteration of volcanic ash is the material we call bentonite.

Bentonite has unique chemical and physical properties and is called "the clay of 1000 uses". The principal markets for bentonite include metal casting for the formation of sand molds, iron ore pelletizing, well drilling, clumping cat litter, pharmaceutical and cosmetic industries, pelletizing aids in animal feeds, carriers for agri-chemicals, etc. Environmental products include liners for landfills, waterproofing panels, ground water products, bentonite-based flocculents to remove emulsified oils and heavy metals from waste water, bentonite-based grout, and many others.

Bentonite deposits of southeastern Montana occur in the Northern Black Hills mining district, which includes parts of Butte County, South Dakota, Crook County, Wyoming and Carter County, Montana.

The overall geologic structure of the district is that of a broad northwestward-plunging anticline, in which the strata dip gently toward the northeast, north, and northwest. The overall structure is interrupted, however, by several subordinate folds, which bring the bentonite beds to the surface repeatedly, so that large resources of bentonite are present under light overburden. (Knechtel, 1962).

Mining on Amendment #10 will consist of surface mining for bentonite clay located in the F bentonite bed which passes through the property in a broad belt. The F bed is the uppermost stratum of the lower member of the Belle Fourche Shale formation. These strata formed during the Lower and Upper Cretaceous periods (Table 3.19-1).

In order to reach the F bentonite bed, ACC will mine through a portion of the Belle Fourche Shale formation, which consists of dark-gray fissile shale with manganiferous siderite (iron rock) concretions and isolated portions of lenses of sandy shale and sandstone. Bed F is overlain and underlain by shale (Table 3.19-1). Depth of the overburden in the areas of proposed mining ranges from 0 feet (bentonite outcrops) to 50 feet. Thickness of the bentonite seam ranges from 2 to 5 feet.

Mining on Amendment #10 will affect only the Belle Fourche Shale formation, which is not considered to be geologically unique.

TABLE 3.19-1 STRATIGRAPHIC COLUMN OF THE TERIARY, MESOZOIC, AND PART OF THE PAELOZOIC SEDIMENTS IN THE MONTANA AND WYOMING PORTIONS OF THE POWDER RIVER BASIN

ERATHEM	SYSTEM, SERIES, AND OTHER DIVISIONS		POWDER RIVER BASIN, MONTANA AND WYOMING		
CENOZOIC	Quaternary		Alluvium		
	Tertiary	Pliocene			
		Miocene			
		Oligocene		White River Formation	
		Eocene	Wasatch Formation		
		Paleocene	Fort Union Formation	Tongue River Member	
				Lebo Shale Member	
				Tullock Member	
MESOZOIC	Cretaceous	Upper	Hell Creek Formation		
			Fox Hills Sandstone		
			Lewis Shale	Pierre Shale	
			Mesaverde Formation		
			Cody Shale	Niobrara Formation	
				Carlile Shale	
			Frontier Formation	Greenhorn Formation	
				Belle Fourche Shale	
			Mowry Shale		
		Lower	Muddy Sandstone	Newcastle Sandstone	
			Thermopolis Shale	Skull Creek Shale	
			Inyan Kara Group	Fall River Formation	
				Lakota Formation	
	Jurassic		Morrison Formation		
			Sundance Formation	Upper Part	
				Lower Part	
			Gypsum Spring Formation		
	Jurassic (?) or Triassic (?)		Chugwater Group or Formation	Spearfish Formation (Upper part)	
	Triassic		Goose Egg Formation	Upper part	
ALEOZOIC	Permian			Lower Part	(Lower part)
					Minnekahta Limestone
					Opeche Formation
	Pennsylvanian		Tensleep Sandstone	Minnelusa Formation	
			Amsden Formation		
	Mississippian				
			Madison Limestone	Madison Group	

From USDI FEIS (2003)