ENVIRONMENTAL ASSESSMENT

Prepared by:

Montana Department of Environmental Quality
Permitting and Compliance Division
Industrial and Energy Minerals Bureau

for the proposed

Revised Mining and Reclamation Plan for the East Decker Coal Mine
Application #00152

Decker Coal Company
Permit 83007

Big Horn County

April, 1999

I. INTRODUCTION

A. Proposed Action

Decker Coal Company (Decker) has applied to the Montana Department of Environmental Quality (MDEQ) for a major revision to its current mining and reclamation plan (Decker, 1992) at the East Decker Mine (Figure 1). Under the proposed revision (Figure 2), the mine and reclamation plans would be reduced to the area of coal reserves which are currently under sales contract. The proposed mining area would have a smaller area of disturbance than the currently approved mining area. Regrading of the smaller disturbed area would produce more topographic diversity and ephemeral stream channel length than the currently permitted plan. The spoil material in overburden stockpile #1 (OB-1) (Figure 3) would not be returned to the pit, but would be left in place as a permanent landscape feature.

The Director of MDEQ must approve, disapprove, or approve with stipulations the major revision application.

B. Background

In 1977, Decker received a strip mine permit (SMP 77007, followed by amendments and consolidation into SMP 83007) to construct, operate, and reclaim the East Decker coal mine in Big Horn County, Montana, about 95 miles southeast of Billings. Pre-mining coal reserves were estimated at 210 million tons. In the early 1990's the East Decker mine produced 1.8 to 2.9 million tons of coal annually. In 1996 and 1997, the mine produced 600,000 and 1.4 million tons, respectively. The coal is shipped to midwestern markets by train. The expected total production over the life of the mine is about 140 million tons. There are 70 million tons of reserves which have not been marketed and, therefore, are not included in the revision.

Decker's current permit allows 3,611 acres of mining disturbance and approximately 750 acres of associated disturbance, such as roads, sediment ponds, railroad spur and other facilities. Through December 31, 1998, a total of 2,024 acres had been disturbed. Of the 2,024 acres disturbed, 284 acres have been regraded, soiled and seeded (Decker Coal Company, personal communication, 1999).

C. Issues and Concerns

The proposed action would be expected to impact surface water and ground water hydrology, soils, vegetation, and wildlife. No impact to coal conservation is expected. Impacts to other resources are not expected to be different from those reviewed in previous environmental analyses.

D. Related Environmental Documents

The final environmental impact statement (EIS) for the East Decker mine was released in 1977 (U. S. Geological Survey and Montana Department of State Lands, 1977). The EIS reviewed the impacts of mining and reclamation as then proposed. Information pertinent to the present proposal is adopted from the EIS by reference.

II. ALTERNATIVES UNDER ANALYSIS

A. Alternative A - Disapprove

Disapproval of the major revision application is equivalent to the "no-action" alternative which must be considered under the rules implementing the Montana Environmental Policy Act (ARM 17.4.601 *et seq.*). Under this alternative, Decker could continue mining and reclamation operations under its current permit and approved mine plan (Decker Coal Company, 1983). The selection of this alternative would not prevent Decker from applying again in the future nor would it necessarily keep MDEQ from approving a future application.

B. Alternative B - Approve the Major Revision

Selection of this alternative would accept mining and reclamation plans based on mining only those coal reserves currently under contract. There would be less mining and associated disturbance if only reserves currently under contract are mined. The smaller disturbed area would be regraded to produce more topographic diversity and ephemeral stream channel length than current permit plans. The reconstructed pattern of the major drainages would more closely resemble the premining pattern. OB-1 would be retained as a permanent feature of the post-mine landscape under alternative reclamation provisions.

C. Alternative C - Approve with Stipulations

Selection of this alternative would result in MDEQ approving the proposed major revision with stipulations to reduce environmental impacts. In this case, overburden stockpile OB-1 would be removed or reconfigured to meet approximate original contour (AOC). In its present configuration OB-1 forms a feature that is approximately 3,000 feet long, 1,200 feet wide, 90 to 100 feet high and occupies 82.6 acres at the southwest corner of the permit area. The feature has been soiled and vegetated.

The stockpile would be modified from its current configuration or removed because the Office of Surface Mining Reclamation and Enforcement (OSM) does not concur with Decker's proposal to leave OB-1 as a permanent feature. The Department originally determined that OB-1 could be preserved as a reclamation feature with a variance from AOC requirements under the state's alternate reclamation provisions. However, alternate reclamation provisions require OSM concurrence. OSM indicated that it could not concur in an alternate reclamation proposal that would be a variance from AOC. Therefore, this alternative must be analyzed.

Alternative C would be the same as Alternative B except that Decker would be required to submit a plan to return OB-1 to approximate original contour (AOC).

III. AFFECTED ENVIRONMENT

A. Hydrology

1. Surface water

The East Decker mine is located within the Coal Creek, Middle Creek and Deer Creek drainages and is directly east of the Tongue River, with Deer Creek to the north and Badger Creek several miles to the south of the mine disturbance boundary (Figure 4). Coal Creek and Middle Creek are considered to be ephemeral drainages, while Deer Creek has intermittent flow in the lower reaches.

Deer Creek, Middle Creek, and Coal Creek have drainage areas of 53.3 square miles, 6.3 square miles and 2.9 square miles, respectively. Two unnamed ephemeral streams outlet into Deer Creek within the permit boundary. Under the existing reclamation plan, the most northwestern of the two unnamed streams would be diverted southwestward and outlet into the Tongue River.

The Tongue River generally flows in a northeastward direction, and about 110 miles downstream from the East Decker Mine it joins with the Yellowstone River. The drainage area of the Tongue River at the Montana-Wyoming state line, a few miles upstream of the Decker mines, is 1,480 square miles (U. S. Geological Survey and Montana Department of State Lands, 1977).

The Tongue River Dam, which is about eight miles northeast and upstream of the Decker mines, was constructed in the 1930's for the primary purpose of storing water for irrigation. The river valley was flooded upstream of the dam to approximately the location of the East Decker Mine. Currently, the dam is being repaired and the spillway elevation raised four feet, which will cause further inundation of the existing shoreline including areas adjacent to the mine.

Both Coal Creek and Middle Creek have been temporarily diverted in accordance with the existing East Decker mine permit. Stock ponds exist above the diversions in the upper reaches of both Coal Creek and Middle Creek near the southern permit boundary. When the Coal Creek stock pond is filled to capacity, overflow is conveyed to the west by means of a diversion ditch and eventually empties into the southwest pit (pit 13). When the Middle Creek stock pond is filled to capacity, overflow is conveyed northeasterly by means of a diversion ditch and eventually outlets into an unnamed ephemeral tributary drainage of Deer Creek.

Surface water from runoff and pit dewatering at East Decker is directed to Pond R-1. This ponded water is currently used by livestock and wildlife, although no permanent stock

ponds are proposed. A portion of the surface water collected in sediment ponds is used for dust control on the mine site.

The average flow for the Tongue River at the U. S. Geological Survey (USGS) gauging station TR09-77, located about 1.4 miles upstream and southeast of Decker, is 334,200 ac-ft/year based on data from 1961-1993 (U. S. Geological Survey, 1994) . The diversion of Coal Creek into pit 13, where it is eventually pumped into Pond R-1, diverts up to 43 ac-ft/year, equivalent to 0.013% of the total flow volume of the Tongue River. Conversely, water pumped from the East Decker pits into the Tongue River may contribute as much as 0.21% of the annual river flow. A significant portion of ground water inflow to the pit is assumed to be infiltration from the reservoir through coal seams. Therefore, what may appear to be an additional volume of water added to the Tongue River as a result of pit pumpage, may be in large part recirculation of ground water originating from the Tongue River Reservoir.

Surface water quality impacts from on-going mining have been minimal. Discharges from sediment ponds exhibit overall elevated values for alkalinity, specific conductivity, sodium absorption ratio (SAR) and total dissolved solids (TDS) in relation to the water quality of the Tongue River. This is likely due to the chemical composition of the spoil material. Due to the relatively minor amount of water discharged from East Decker in relation to the flow of the Tongue River, and the relatively benign changes found in water quality, downstream impacts in water quality are insignificant.

2. Ground water

Ground water in the Decker area can be found in coal seams, alluvium, clinker, and sandstone. Rapid facies changes cause sandstone and siltstone units to be discontinuous and therefore, they generally are not a reliable water resource. Typically, the sedimentary strata form aquitards between the coal aquifers. The only significant alluvial water sources identified in the East Decker area are along Deer Creek and alluvium associated with fluvial processes of the Tongue River.

Clinker, sedimentary rocks which have been fused and highly fractured as a result of their proximity to burning coal beds, form highly transmissive water table aquifers that usually are limited in areal extent. Some clinker is so highly transmissive that it is largely dry. Surface runoff and precipitation enter the clinker and may form zones of saturation along the irregular, undulating base that characterizes clinker material. If the clinker is not in hydrologic connection with a source of recharge, any water stored in the clinker may be quickly depleted by a pumping well.

Coal seams are the main geologic units that serve as aquifers in the Decker area. They are typically confined aquifers with highly variable permeability and hydraulic conductivity, depending upon the amount and direction of fracturing within the seam. Production from wells completed in one or more coal seams in the Decker area ranges from 60 to 10 gallons per minute or less (VanVoast, 1974), with the latter being the more common rate.

Natural ground-water flow in the coal bed aquifers is principally toward the Tongue River. On the west side of the East Decker pits, ground-water flow is currently reversed from its natural flow direction and is moving from the reservoir toward the dewatered pits. Recharge to the aquifers occurs in uplands outside the mining area.

Water Quantity

The D1 upper (Anderson), D1 lower (Dietz 1), and D2 (Dietz 2) coal seams are being removed in the mining operation at East Decker. Approximate thickness of the D1 upper is 25 feet. The D1 lower and D2 each average less than 20 feet in thickness. Including overburden, interburden, and coal, the total thickness of material removed from East Decker pits during mining is typically between 200 and 300 feet. The D3 (Canyon) coal seam lies approximately 100 feet below the D2 seam and is not being mined. Thickness of the D3 is approximately 20 feet.

A broad area of depressed water levels has developed in the D1 upper, D1 lower, D2 and D3 aquifers in the area of the East Decker pits. The areal extent of drawdown at East Decker is mitigated by the proximity of the Tongue River Reservoir to the west and a major northeast-trending normal fault south and east of the pits. The reservoir acts as a constant head boundary and the normal fault forms a no-flow boundary. Southwest of the reservoir, a second normal fault, parallel to and less than 2 miles west of the fault described above, appears to form a no-flow boundary to the west. Drawdown in all aquifers affected by mining at East Decker is concentrated in a northeast-trending zone less than 2 miles wide and approximately 5 miles long bounded by the two normal faults. Drawdown inside this zone is steep because the recharge to the zone is restricted.

D1 Upper and D1 Lower

Measured drawdown in the D1 upper ranges from a few feet immediately north of the pits, where ground water in clinker is scant, to 19 feet at the northeast corner of the pits. Drawdown extends over a mile east of the pits, where approximately 4 feet has been measured. Drawdown of 49 feet has been measured a mile southwest of the pits. Approximately 50 feet of potentiometric head remains at this location.

Detectable drawdown in the D1 lower is measurable 2.5 miles east of the pits, where 2 feet of drawdown has been recorded. Less than a mile north and northeast of the pits, 12 feet or less of drawdown has been recorded in the D1 lower. By contrast, 76 feet of drawdown has been recorded a half-mile southwest of the pits. Approximately a mile to the southwest, water levels have decreased 57 feet. More than 50 feet of potentiometric head remains at this site. Drawdown in the D1 aquifers converges with D1 drawdown at the West Decker mine southwest of the pits, extending drawdown in the combined D1 aquifers more than 2 miles to the southwest.

D2

Drawdown in the D2 is steeper and more extensive than in the D1 aquifers. Drawdown measures over 135 feet within a mile south of the pits. Drawdown within a mile north and northeast of the pits ranges from 30 feet to 50 feet. Two and a half miles to the east of the pits, 8 feet of drawdown has been measured.

Despite the steep drawdown south of the pits, a potentiometric head of more than 100 feet remains in the D2 aquifer. The current extent of detectable drawdown southwest of the pits is uncertain but is estimated to extend 4 to 5 miles.

D3

Although the D3 aquifer is not being physically disturbed by mining, head loss is being recorded in D3 monitoring wells. The greatest recorded drawdown in the D3 aquifer is 37 feet since 1981 from a well located southwest of the pits. Drawdown to the north of the pits has been 5 feet or less. Two and a half miles east of the pits, drawdown in the D3 measures 8 feet.

The D3 aquifer is designated as the source for replacement of D1 and D2 water if current or post-mine land uses of these aquifers are precluded due to mining impacts. Two hundred to 300 feet of head remain in the D3 aquifer, assuring its viability as a replacement water source.

Spoils Aquifer

Overburden material spoiled into the pits is expected to resaturate and create a spoils aquifer. Hydraulic conductivity in the spoils is variable, but is expected to fall within or slightly higher than the range of hydraulic conductivities found in the coal seam aquifers. The stratification of coarse, blocky material at the pit bottom overlain by finer material is expected to approximate the hydrologic characteristics of a confined aquifer (VanVoast and Hedges, 1975). Because upgradient advance of mining inhibits the reestablishment of natural ground water flow from the north, east, and south into reclaimed areas of the pits, the current movement of ground water into spoils is largely restricted to inflow from the Tongue River Reservoir. Resaturated thickness of the spoils aquifer currently ranges between 85 and 110 feet in reclamation near the western edge of the pits. Hydrostatic water levels in spoils wells are continuing to rise at a rate of 2 to 3 feet per year.

Water Quality

Water quality is being monitored in the D1 lower, D1 upper, D2, D3 aquifers and alluvium. Due to limited availability and use of any overburden water resources, they are not currently monitored. Typically, water quality in the sandstone and siltstone overburden is highly mineralized and unsuitable for most domestic or agricultural uses.

Water from the coal aquifers is typically a sodium bicarbonate type but, locally, also may be high in sulfate. Water quality samples for upgradient, undisturbed parts of the D1 upper, D1 lower, and D2 aquifers indicate water quality in each aquifer is variable with regard to time and location. Average total dissolved solids (TDS) values of water quality samples collected from representative wells (Figure 5) in the D1 upper, D1 lower, and D2 aquifers are listed in Table 1.

Table 1. TDS values from wells in the D1 upper, D1 lower and D2 aquifers at the East Decker Mine.

Well No.	Average TDS (mg/l)	Maximum TDS (mg/l)	Minimum TDS (mg/l)	No. of samples	Period of Record
D1 Upper					
108274	576	666	502	4	‘77 - ‘80
117274	2520	3400	2030	34	‘80 - ‘96
211680	1383	1890	1100	34	‘80 - ‘96
D1 Lower					
108174	1286	1980	432	5	‘75 - ‘80
117374	2414	3370	2040	34	‘80 - ‘96
118074	1665	1720	1590	19	‘75 - ‘96
211980	1357	1720	1140	34	‘80 - ‘96
238782	2784	4030	1750	28	‘82 - ‘96
D2					
108074	1770	1980	1670	4	‘81 - ‘96
211880	1345	1840	1220	34	‘79 - ‘80
219781	2117	3040	1920	32	‘80 - ‘96

Spoils wells at East Decker also show variability in water quality with regard to time and location. Spoils wells located at comparable depths and spaced approximately one hundred feet apart can yield samples that vary 800 mg/l in TDS. Some of the spoils wells show a trend over time of increasing TDS, some show a decreasing trend, and others show no trend.

Freshly fractured surfaces on overburden rock which is backfilled into the pit as spoils increases the availability of minerals for dissolution when exposed to ground water. Generally, TDS values from spoils water are higher than background values from coal aquifers and therefore, spoils water is typically of lower quality. As shown in Table 2, the average TDS values from spoils wells is commonly greater than 2,000 mg/l and slightly higher than the average TDS values from upgradient coal aquifers. However, five of the six spoils wells in Table 2 have average TDS values that fall within the range of average TDS values from the upgradient aquifers.

Table 2. TDS values from spoils wells at the East Decker Mine.

Spoils Well No.	Average TDS (mg/l)	Maximum TDS (mg/l)	Minimum TDS (mg/l)	No. of Samples	Period of Record
251683	2487	4280	1970	42	‘83 - ‘97
251583	2663	2930	2460	3	‘87 - ‘97
222781	192	250	142	3	‘87 - ‘97
210980	2214	2710	1770	52	‘80 - ‘97
210880	1613	1730	1500	3	‘87 - ‘97
318894	3104	3300	2960	7	‘95 - ‘97

A more complete picture of spoils water quality will emerge as reclamation progresses to the east and more spoils wells are installed. Currently, the location of spoils wells is restricted to the western part of the reclaimed pits where they receive recharge from the Tongue River Reservoir. The average TDS value calculated from 147 water quality samples collected in the Tongue River immediately upstream of the reservoir is 396 mg/l (Decker Coal Company, unpublished data, 1976-1997). The average TDS value at a sample site located downstream of the mine at the dam is 383 mg/l (Decker Coal Company, unpublished data). Upon completion of mining and restoration of the natural flow direction, water from the D1 upper, D1 lower and D2 aquifers will enter the spoils from upgradient sources to the north, east, and south. As water in the upgradient coal aquifers is higher in TDS than the Tongue River, future spoils water quality is likely to be poorer than that currently observed from wells in the western part of the reclaimed pits.

Upgradient water quality in the D1 upper, D1 lower and D2 aquifers is not being affected by mining. Monitoring indicates that mining has not caused water quality changes in the D3 aquifer or alluvial aquifers.

Affected wells and users

No currently used private well or ground water resource is known to be experiencing significantly diminished water quantity or quality due to impacts from mining. Generally, privately held land adjacent to the mine is sparsely populated. Decker Coal Company owns the land within the permit area and some adjacent areas. Most existing wells are completed in the D1 upper, D1 lower, or D2 aquifers and historically have been used for watering livestock. Multiple, deeper coal seam aquifers are used for water supply at a residence immediately southwest of East Decker. This water supply is not expected to be significantly impacted by mining.

B. Overburden and Soils

Overburden and interburden in the East Decker Mine area are composed of sedimentary layers of shale, sandstone, siltstone, and clinker. Typical of the landscape in the Northern Great

Plains, overburden and interburden materials are of alkaline nature. High accumulations of salts and sodium occur in scattered locations and in various strata.

Soil is formed by in-situ weathering of shale, sandstone, siltstone, and clinker, as influenced by the climate and biota of a semi-arid environment. Hilltops and clinker outcrops typically support thin and rocky soil. Drainages can have fairly deep deposits of transported soil particles. Soil texture is variable. Salt- and sodium-affected soils are encountered in scattered locations, sometimes in association with montmorillonitic clay. These characteristics are reflected in the electrical conductivity (EC) and sodium adsorption ratio (SAR) of the soil analysis. In deep alluvial soil with poor drainage, EC tends to be high towards the surface. On well-drained upland settings, salts are normally leached to the B and/or C horizons. The A horizons are generally 2 to 8 inches thick. Total soil depth often exceeds 60 inches but depends on depth to bedrock.

C. Vegetation

The East Decker permit area consists in large part of lowlands associated with three drainages (Deer Creek, Middle Creek, and Coal Creek) which are tributary to the east side of the Tongue River reservoir, and the intervening low ridges between the streams. The Deer Creek drainage basin is much larger than the other two basins, and contains most of the highly productive riparian shrub-grassland communities in the East Decker vicinity (the lower portion of Middle Creek was also important in this regard prior to disturbance). The southeast part of the permit area includes a portion of the Badger Hills, a dissected upland bench which rises about 800 feet above the level of the reservoir. Shrub-grass and mixed-grass communities dominated the premine vegetation within the permit area, although a few acres of Rocky Mountain juniper and ponderosa pine stands occur on north aspect slopes. Deciduous forests (primarily cottonwoods, box elder, and peachleaf willow) were present along the creek bottoms, especially near the reservoir. About 220 acres of special use pasture are located in the area which Decker has proposed to remove from the area to be disturbed.

The OB-1 stockpile occupies, for the most part, a low alluvial terrace of the Tongue River, as well as a small ephemeral stream channel which formerly bisected the terrace. The stockpile was temporarily resoiled and revegetated with an early 1980's seed mixture in which introduced cool season grasses were included as a minority component. Introduced grasses (principally smooth brome) dominate the revegetation today, although a significant big sagebrush population and several native grasses are also present.

D. Wildlife

The East Decker area consists of the disturbed area, reclaimed areas and undisturbed native habitats. Most of the native habitats consist of gently rolling topography bisected by low gradient, incised drainages. A variety of grassland and sage/grassland types are the primary vegetative types found within the native habitats. Mule deer and pronghorn antelope are frequently observed using these habitats. Upland game birds (sage grouse and sharp-tailed

grouse), a variety of landbirds, and several small mammals are known to utilize these habitats on and adjacent to the East Decker Mine. Red-tailed hawks, turkey vultures, northern harriers and kestrels are often observed foraging within these habitats. The northern harrier may also nest in these habitats.

The broken, badlands topography located in the southeastern corner of the permit area provides additional habitat diversity. The broken topography provides secure habitat for mule deer. The addition of Rocky Mountain juniper and ponderosa pine provides necessary habitat components for a number of landbirds that are not found in the less structurally diverse sagebrush/grasslands.

Cottonwood/willow riparian habitats are found adjacent to the Tongue River and the Tongue River Reservoir. Compared to other habitats in the area, the cottonwood/willow riparian habitats have increased vegetative and structural diversity resulting in use by a greater diversity of wildlife species. In addition to the white-tailed deer and wild turkey, a number of landbird and small mammal species not normally found in the grassland and sage/grassland types frequent the riparian areas. The large cottonwoods provide suitable habitat for great blue heron and double-crested cormorant rookeries. Osprey nest along the reservoir on suitable snags, power poles, etc.

A variety of waterfowl and shorebirds use the shoreline habitats associated with the Tongue River Reservoir. Some waterfowl nesting occurs in the upland habitats adjacent to the reservoir and the sediment ponds located in the permit area. Decker Coal Company has established artificial nesting structures to encourage additional nesting by osprey.

The only threatened or endangered species that has been observed at the East Decker site since the initiation of the baseline wildlife studies in 1974 is the bald eagle. Bald eagles are relatively common in the Decker area during the spring and fall migrations. During the winter, bald eagles are often observed foraging on road- and winter-kill animals. No nesting territories are known to exist within the immediate area of the East Decker Mine.

Disturbed areas have minimal vegetation established. Because of this, wildlife use of these areas is minimal. Some species, such as pronghorn, which rely on open areas for security are regularly observed in disturbed areas.

Wildlife use of the reclaimed habitats depends on the age of a particular stand. The older reclaimed areas tend to have vegetation that is more mature, diverse and well established. Vegetation characteristics of the older reclaimed stands approach those of native habitats. Wildlife communities in these areas more closely resemble those found in similar native habitats than do the wildlife communities in less mature stands.

Overburden Stockpile #1 (OB-1), located in the southwestern corner of the East Decker permit area, provides limited wildlife habitat. The uniformity of the slopes and simplicity of the

vegetative community result in a reduced value to wildlife. The addition of numerous rock piles to the temporary stockpile reclamation provided some habitat enhancement.

E. Coal Reserve

The three seams mined at East Decker are the D1 upper (Anderson), with an average thickness of 24.7 feet, the D1 lower (Dietz 1), with an average thickness of 18 feet, and the D2 (Dietz 2), with an average thickness of 15 feet. These three seams account for approximately 210 million tons of minable coal. Approximately 140 million tons of coal have been marketed. Much of the D1 upper in the north part of the pit area at East Decker is burned. Overburden ratios in this area are higher because of the burn.

IV. ENVIRONMENTAL CONSEQUENCES

A. Alternative A - Disapprove

1. Hydrology

a. Surface water

The existing mine plan allows for disturbance of 2.7 square miles in the Deer Creek drainage, while the proposed revision would disturb only 1.4 square miles in Deer Creek drainage. The acreage to be disturbed under the existing mine plan for both the Middle Creek and Coal Creek drainages remain the same under the existing and proposed revision.

Under the currently permitted reclamation plan (Figure 6) , the most northwestern ephemeral stream, which presently outlets into Deer Creek, would be diverted into the Tongue River. Drainage from approximately 178 acres of the Middle Creek watershed that lie outside the permit boundary would outlet approximately 5,000 feet farther to the south than prior to mining. The Coal Creek watershed would outlet about 2,500 feet farther south than under premine conditions.

As the existing reclamation plan requires the removal of spoil stockpile OB-1 and placement of the spoil material back into the pit area, the two ephemeral drainages that previously flowed through the area occupied by OB-1 would be reestablished to their approximate premine location.

All discharges are regulated under Decker's Montana pollutant discharge elimination system (MPDES) permit. Discharges are continuously monitored for quantity, and water quality sampling is conducted at least quarterly for all parameters in addition to the monthly sampling conducted in accordance with the MPDES program. Decker has an approved monitoring program that includes sampling the Tongue River, ephemeral drainages that traverse the permit area and, until recently, Deer Creek (Montana Department of State Lands, 1983).

b. Ground water

Water Quantity

Water levels in the D1 upper, D1 lower, D2 and D3 aquifers are expected to decline as long as mining continues. The depth and areal extent of the decline will depend on the length of time mining continues and the pits remain open. Under the current permit, no time limits are indicated for the life of mine. Even when length of mine life is known or estimated, the depth and extent of drawdown is difficult to quantify precisely due to changes in production, location of mining and other operational activities that occur throughout the life of mine. A liberal estimate of the drawdown is made by assuming that historic average or current drawdown rates will continue throughout the life of the mine. This is considered a liberal estimate because drawdown rates often decline with time.

The area of greatest drawdown associated with mine-related activity at the East Decker mine lies within the previously described 5 mile long and slightly less than two mile wide corridor formed by two parallel, northeast-trending normal faults located east, southeast and southwest of the East Decker pits. Continued drawdown is expected to be concentrated within this corridor.

A rise of between 12 and 16 feet in the Tongue River Reservoir stage is anticipated upon completion of dam spillway rehabilitation in 1999. The reservior stage has been maintained significantly below the current spillway elevation for a number of years due to concerns regarding compromised integrity of the dam. The rise in stage level should help mitigate drawdown associated with mining and facilitate more rapid recharge of the spoils aquifer. Although mitigating effects are anticipated, the exact results will not be known until the hydrologic system has had time to respond and, therefore, possible mitigating effects from the rise in stage level are not included in the drawdown and recharge estimates discussed below.

D1 Upper and D1 Lower Aquifers

Under the current mining plan, drawdown rates in the D1 upper and D1 lower are expected to remain low north and east of the East Decker pits. Drawdown is expected to be far less than one foot a year and the areal extent of drawdown is not expected to increase significantly. Southwest of the pits, drawdown in the D1 upper and D1 lower is expected to continue at a rate between 1.5 to 2 feet per year. With an additional 20 years of mining, the extent of measurable drawdown would be expected to increase to a location 4 or 5 miles south of the pits.

D2 Aquifer

The D2 aquifer is expected to experience the greatest drawdown of any of the impacted aquifers. Drawdown approximately one mile south of the pits is expected to continue at a rate of approximately 4 feet per year, and southwest of the pits, drawdown is expected to continue at

a rate of up to 6 feet per year. The current extent of detectable drawdown southwest of the pits is unknown but is estimated to extend 4 to 5 miles from the pit margin. Continued drawdown will expand the limit of measurable drawdown farther to the southwest. New wells have recently been installed to detect drawdown 2 miles southwest of the current monitoring network limits and should help assess the extent and rate at which future drawdown continues.

North and northeast of the pits, the drawdown rate is less than a foot a year and some of the monitoring wells are showing no continued drawdown. Approximately 2.5 miles east of the pits, the drawdown rate is 0.5 foot a year. Drawdown is estimated to expand another one to 2 miles to the east if mining at East Decker continues for another 20 years.

D3 Aquifer

Drawdown in the D3 at the southwest corner of the pits has averaged 4 feet per year over the past 6 years and is expected to continue close to this rate as long as the pit continues to progress to the south. Using this rate and existing gradients, drawdown in 10 years would be expected to extend 2 to 3 miles southwest of the pits. At a rate of slightly more than 0.1 foot per year since 1980, continued drawdown north of the pits is not anticipated to be significant.

Eight feet of drawdown in the D3 since 1990 has been measured 2.5 miles east of the pits. Drawdown has slowed considerably at this well over the past few years. As mining will focus at the south end of the pits, additional drawdown to the east is expected to be minor.

Spoils Aquifer

Parts of the D1 upper, D1 lower, and D2 aquifers removed during mining will be replaced by a spoils aquifer created by the backfilling of the pits with overburden. In reclaimed areas west of active mining, the spoils are expected to slowly continue to recharge due to inflow from the Tongue River Reservoir. Recharge levels will be influenced and limited by the reservoir stage. Full recharge will not occur until mining is completed, pits are backfilled and the upgradient ground water can flow into the reclaimed area.

The spoils aquifer will have different hydrologic characteristics than the coal aquifers that it replaces. For this reason, equilibrium water levels that will eventually be established in the spoils aquifer are uncertain, but are anticipated to be near former levels. The length of time required for saturation of the spoils aquifer depends upon the hydrologic system at a given mine site. A more realistic estimate of the time for saturation of the spoils aquifer at East Decker can be made once upgradient recharge to the spoils has been established and the system has begun to respond. Based on saturation time of spoils at other Montana mines, the time for saturation of the spoils aquifer at East Decker will likely be measured in decades.

Water Quality

When normal flow direction is re-established, ground water will move from areas of higher elevation through the spoils aquifer toward the Tongue River. Using paste extracts of overburden material, VanVoast and Thompson (1982) estimated an increase in TDS concentration of 1,560 mg/l in the spoils aquifer at East Decker. An increase of this magnitude would approximately double pre-mining background concentrations. Water of this quality (approximately 3,100 mg/l TDS) is expected to support the post-mine land use of grazing and wildlife habitat should ground water from spoils be needed for these uses. No domestic use of the spoils aquifer is anticipated. Eventually TDS concentrations in the spoils will be lowered as upgradient ground water recharges and flushes the spoils aquifer. The length of time needed for this process to occur is speculative and will depend on the response of the hydrologic system once upgradient recharge is reestablished.

Using mass balance calculations, estimated ground-water flow rates and estimated river flow rates, VanVoast and Thompson (1982) made simplified calculations of expected changes in Tongue River water quality due to discharge from spoils aquifers. This method lacks precision, but gives a rough estimate of impacts to Tongue River water quality from the spoils aquifer at East Decker. Based on flow frequency curves for the Tongue River at a gaging station near the Montana-Wyoming state line, a flow rate of 250 cfs was equaled or exceeded 50% of the time for the water years 1961 through 1981. Using the methodology of VanVoast and Thompson (1982), at a flow rate of 250 cfs in the Tongue River, East Decker spoils water moving at a predicted rate of 0.1 cfs would increase the TDS concentration of river water by less than 1 mg/l. Higher river flow rates would result in an even smaller increase in the concentration. At a lower flow rate, the increase in concentration would be larger. For instance, at a flow rate of 50 cfs, which is expected to occur approximately 1% or less of the time, TDS concentrations of the Tongue River would increase approximately 3 mg/l as a result of spoils water contributions. Therefore, no significant detrimental effects on river flow or reservoir water quality are expected. Samples from surface water monitoring stations on the Tongue River below and above the mine have not shown a noticeable change in water quality since their installation in the mid-1970's.

2. Overburden and Soils

Overburden and interburden material would undergo pulverization and mixing during the earth excavation process. Undesirable characteristics such as high salinity and sodicity would be diluted. Because Decker has demonstrated that the top 40 feet of the premine overburden generally exhibits plant root zone suitability, and has committed to placing this 40-foot layer of material back on the surface of the regraded spoil profile, revegetation would not be expected to suffer from unsuitable root zone characteristics.

Soil, too, would be greatly homogenized during salvage, stockpiling, and redistribution. The result would be the loss of micro-niche diversity. On the other hand, soils with undesirable physicochemical qualities would be diluted. The biological integrity of the soil would also

deteriorate, to some extent, during soil handling and in stockpiles. The deterioration could occur in microorganism population, nutrient cycling, and seed bank viability.

These negative effects could be mitigated by the practices of two-lift soil segregation, seeding the stockpiles, and limited direct-haul. These practices are included in Decker's operation plan and would continue. Direct hauling minimizes disruption in biological functions of the topsoil layer. Segregation prevents the seed reserve and organic richness of the A horizon from being diluted with subsoil. Seeding the stockpiles with perennial grasses and legume species will perpetuate nutrient cycling processes, at least in the surface layer.

Assuming a 25% overburden swell factor, the overburden mass balance indicates a shortage of spoil to construct the approved post mine topography under the current mining plan. Depending upon the magnitude of the discrepancies, Decker would be required to submit a revision to the reclamation plan.

3. Vegetation

Should the major revision application be disapproved, the current mine plan would result in the maximal disturbance to the premine vegetation resource. Approximately 4,300 acres within the permit area would be disturbed and require revegetation. Grass production on reclaimed areas may be greater than occurred premine due to gentler postmine topography, relatively uniform and homogenized soils, and the dominance of seeded species; moreover, the same factors are likely to result in a long-term reduction in plant community and species diversity on revegetated areas.

If the OB-1 stockpile area were to be graded to the currently approved postmine topography, the increased full-pool level resulting from raising the Tongue River Dam spillway would result in at least periodic inundation of the portions of the reclaimed stockpile area. The development of a mud flat in areas periodically inundated is probable. Undisturbed mud flats in the area support a summer and fall vegetative cover dominated by curly dock, broadleaf plantain, and cocklebur. The reclaimed mud flat is likely to support a similar assemblage of forbs.

4. Wildlife

Selection of this alternative would result in disturbance of the greatest amount of native habitats. Reduction in habitat diversity (topographic, edaphic, vegetative and structural) would result in adverse impacts to a variety of upland game birds, landbirds, raptors, and small mammals associated with mixed grasslands and sage/grasslands. Breeding and nesting sites for upland game birds and landbirds would be lost or disrupted by the mining operation. Small mammal populations would decline during the mining phase; populations would recover as reclamation is completed and matures. Raptors would continue to forage over the area; however, reduced small mammal populations would result in a subsequent reduction in prey availability. Bald eagles would continue to forage/scavenge across the mine area. Osprey would continue to

nest on the snags and power poles in proximity to the Tongue River Reservoir. Artificial nesting sites in reclamation would also be used.

Seasonal use of the mine area by pronghorn, mule deer and white-tailed deer would be affected. Habitat use would vary due to the reduction in habitat availability (reduction in big game use) and the increased security provided within the permit area (increase in big game use).

Annual wildlife monitoring has provided data to further document the type and extent of the various impacts. This documentation is contained in the annual wildlife reports. As reclamation proceeds and reclaimed vegetation matures so that it closely resembles the original habitats, the long-term impacts will lessen.

Reclamation of the OB-1 stockpile area would result in the loss of existing topographic diversity in an area with otherwise minimal relief. The mudflat that would occupy part of the reclaimed stockpile area would provide beneficial habitats for some wildlife (shorebirds, waterfowl and selected landbirds). The elevation provided by the stockpile provides potential benefits to wildlife including increased habitat diversity, foraging areas, bedding and security areas which would be eliminated in reclaiming the original flat-lying river terrace. The topographic relief currently offered by OB-1 provides a visual and sound barrier between the county road and the shore of the Tongue River Reservoir. While this barrier is probably of limited need or value due to low traffic volume on the road and the distance to more important wildlife use areas, it provides additional security for wildlife using trees and shrubs along the shoreline of the reservoir.

5. Coal Reserve

Pre-mine estimate of coal reserves were 210 million tons. Current mine and reclamation plans were developed for recovery of all reserves. However, not all of these reserves are under a sales contract.

B. Alternative B - Approve the Major Revision

1. Hydrology

a. Surface water

Under the proposed major revision, the northeastern portion of the mine area would not be disturbed. In addition, the most northwestern ephemeral stream would outlet into Deer Creek as it did premining, instead of being diverted into the Tongue River as currently permitted (Figure 7).

The existing mine plan allows for disturbance of 2.7 square miles in the Deer Creek drainage, while the proposed plan would disturb only 1.4 square miles. The acreage to be disturbed under the existing mine plan for both the Middle Creek and Coal Creek drainages

would not be changed by this major revision. Drainage density would remain nearly the same for Coal Creek, but would increase for Middle Creek (going from 30.4 ft/acre premine condition to 36.3 ft/acre postmine condition) and Deer Creek (going from 23.8 ft/acre premine condition to 36.3 ft/acre postmine condition) with approval of the major revision and would decrease (going from 33.4 ft/acre premine condition to 26.3 ft/acre postmine condition) for the minor unnamed drainage located in the southwest corner of the permit area next to the Tongue River. Impacts from the decrease in drainage density for the minor unnamed drainage would be offset by a decrease in the slope of the drainage channel (going from 3.3% to 2.3%). In addition, mine operators are being encouraged by the Department to create additional features, such as swales, that will collect and convey overland flow to ephemeral drainages during the reclamation process.

Under the proposed major revision, the Coal Creek diversion ditch would be mined through sometime between the years 2002 and 2006. Any outflow from the Coal Creek upper dam would enter the diversion ditch and eventually be intercepted by pit 13. The existing Middle Creek diversion ditch would not be disturbed by mining and would be reclaimed when no longer necessary. Upon reclamation, Coal Creek would outlet to the Tongue River approximately 250 feet north of the premine location. Middle Creek would outlet to the Tongue River approximately 3,000 feet north of the premine location.

Under the proposed plan, two ephemeral drainages southwest of overburden stockpile OB-1 would be permanently rerouted to the Tongue River along the south side of the stockpile via a permanent diversion ditch. Overflow from events greater than the 50-year, 24-hour precipitation event would be partially diverted to an existing channel that leads to sediment pond F. The channel that leads to Pond F has been in place for about 20 years. The channel appears to be stable, with no evidence of erosion.

Under the proposed plan, Pond F would be modified and left in place. The drop inlet culvert-style spillway would be removed from Pond F and replaced by a French drain. At the present time, the spillway on the Tongue River Dam is being raised from an elevation of 3424.4 feet to 3428.4 feet, which will raise the average elevation of the reservoir that borders the East Decker Mine. The net effect at Pond F will be the creation of a backwater lagoon that will have a seasonal variation in water elevation, since the bottom of the pond is at an elevation of 3423.9 feet and the proposed invert elevation of the French drain would be 3426 feet. If Pond F were to be removed, as planned under the existing permit, the area would become inundated only during periods of high water elevation. However, under the proposed plan of installing a French drain where the spillway presently exists, water could be impounded to a depth of up to 4 feet for longer periods of time, creating a more diverse environment and potentially a wetland feature.

All of the drainage channels would be reclaimed to have concave longitudinal profiles, as well as slope and meander configurations that would achieve dynamic equilibrium. The reclaimed drainages would approximate premine channel dimensions. In addition, the lower reaches of Coal Creek and Middle Creek drainages, as well as the Deer Creek tributary and

minor drainages, would be reconstructed based, in part, on drainage area. Therefore, impacts due to a change in the drainage area within the permit boundary should be insignificant.

The proposed reclamation plan would divert runoff from approximately 178 acres of the Middle Creek watershed, which lies outside the permit boundary, into the Coal Creek watershed. This additional drainage area would outlet into the Tongue River approximately 3,500 feet farther south than prior to mining. Impacts to the Tongue River would be insignificant.

Various drainage basins at East Decker will be altered from their premine condition, some to a much greater extent than others. With approval of the major revision, Coal Creek and minor drainage basins would increase in acreage from premine conditions. Under the existing plan these drainage basins would be reduced in area. Middle Creek and the Deer Creek tributary would be reduced in acreage from premine conditions with approval of the major revision, while under the existing plan these drainages would increase in acreage. Since Coal Creek, Middle Creek, Deer Creek and the minor drainages all outlet into the Tongue River, expected impacts outside the permit boundary should be insignificant.

b. Ground water

By not extending current mining to the north and northeast, the proposed minor revision would result in significantly less aquifer disturbance than expected under Alternative A. Drawdown in the D1 upper, D1 lower, and D2 aquifers along the north and east margins of the pit would probably not increase much more than existing levels if there was no additional mining in these areas. Drawdown south and southwest of the pits would continue as anticipated in Alternative A since mining would advance in these directions.

As less aquifer material would be removed under Alternative B, a smaller spoils aquifer would be created. With less volume of spoils to resaturate, reestablishment of the spoils aquifer would likely take less time. Water quality in the spoils aquifer would probably improve more quickly with less volume of spoils to flush. The difference in the length of time that it would take for these physical changes to occur under the revised plan is difficult to quantify and may not be significant. The difference in time for reequilibration of the hydrologic system to begin under Alternative A versus Alternative B is not anticipated to be significant as the mining and reclamation schedules are not accelerated under Alternative B.

2. Overburden and Soils

This alternative would bring similar environmental consequences and mitigations to soils and overburden as Alternative A. However, approval of this major revision would reduce the mining disturbance by approximately 800 acres.

In addition, because this major revision proposes more topographic diversity in the post-mine landform, greater diversity of soil surface (compared to the current plan) would artificially be recreated. This would likely introduce diversity in communities of vegetation and soil biota.

Assuming a swell factor of 25%, the mass balance for this alternative results in an excess of approximately 21 million yards of spoil. This is approximately 3% more than what is needed to accomplish proposed reclamation. The material in overburden stockpile OB-1 is not needed within the mined area to meet the proposed post-mine topography.

3. Vegetation

Approval of the major revision would result in about a 19% reduction of the disturbed acreage at East Decker, from the currently approved 4,329 acres to the proposed 3,498 acres. Disruption of native topographic, edaphic, and vegetative diversity would be minimized. Topographic and vegetative diversity would be increased on reclamation in general, as well as by retention of OB-1 and the wildlife habitat improvements proposed in conjunction with its retention.

4. Wildlife

Approval of the major revision would result in a reduction in the amount of acres disturbed by mining and related activities at East Decker. The negative impacts to the native topographic, edaphic, vegetative and structural diversity would be reduced from that currently approved. The proposal incorporates more vegetative and topographic diversity than the approved permit. This increased diversity would have a positive impact on the wildlife community inhabiting the area. A related increase in both wildlife use and the number of species present within the permit area would be expected. Increased vegetative diversity that would result following reclamation of the disturbed areas would provide suitable habitats for a diversity of landbird, shorebird, raptor and small mammal species. The postmine wildlife community would be similar in species composition and abundance to that present in the pre-mine situation.

Retention of OB-1, with proposed habitat improvements, would also positively affect the wildlife community. The currently approved post-mine topography includes an area of relatively flat topography in the area of OB-1. Due to the lower elevations, a significant portion of the area would be inundated when the approved increase in the storage capacity of the Tongue River Reservoir is implemented. Proposed retention of OB-1 in a ridge configuration, dissected by a few dry washes, would provide increased topographic and vegetative habitat diversity within the area that otherwise would be periodically inundated by the Tongue River Reservoir. OB-1 also creates a visual and sound barrier between the county road and shoreline habitats. While not necessary for the continued use of these habitats, the barrier would provide for a limited increase in security.

5. Coal Reserves

The proposed mine and reclamation plans reflect the amount of coal (140 million tons) which has been contracted to date. The proposed plan constitutes a reduction of 70 million tons from the currently approved plan due to changing coal market conditions. Decker Coal

Company would probably want to mine the remaining 70 million tons of coal if a future market is found. (This coal is located in the area designated in Figure 2 as "future mining area").

C. Alternative C - Approve with Stipulations

1. Hydrology

a. Surface water

Alternative C is the same as Alternative B, with the exception of the final reclamation plan for spoil stockpile OB-1. Approval of a reclamation plan for this stockpile would need to conform to AOC requirements and would return the outlets of two ephemeral drainages south of the stockpile to their premine locations.

b. Ground water

Taking OB-1 out of the major revision would not result in impacts to ground water different from those discussed in Alternative B.

2. Overburden and Soils

The effect of this alternative on soils would depend on the scope of the stipulation. For example, options for OB-1 could possibly include complete removal, partial removal, and/or partial or complete regrading in place.

Decker would need to strip soil from those parts of OB-1 that would be disturbed. This soil could be used for onsite reclamation at OB-1, or redistributed elsewhere. This means that more soil could become available for reclamation at the expense of re-disturbing a soil that has been in regeneration for approximately 20 years. If the partial grading of OB-1 incorporates more habitat diversity, then macro-site diversity of the soil surface would be artificially recreated.

OB-1 contains approximately 7 million cubic yards of spoils which are generally suitable as plant growth medium. Decker could allocate this material to other parts of the mine to attain 4 feet of suitable cover. Otherwise, this alternative would have the same environmental consequences and mitigations to soils and overburden as Alternatives A and B.

Returning OB-1 as backfill to the pit area would have no effect on the post mine topography unless it was concentrated in one or a few locations.

3. Vegetation

The surface area in the OB-1 vicinity would be reduced by decreasing the topographic relief of the stockpile to achieve AOC. Vegetative diversity on those portions of OB-1 which

would be redisturbed would likely increase, by virtue of the improved seed mixtures used for contemporary revegetation. Although dependant on the specific plans developed in response to the stipulations, topographic diversity in the OB-1 area may be increased relative to the currently approved plan.

As with Alternative B, approval of Alternative C would result in the same reduction of disturbed acreage as alternative B and would minimize native vegetation disturbance. With Alternative C, the effects on postmine topography and vegetation diversity, as well as grazing and wildlife habitat value, would be intermediate between Alternatives A and B.

4. Wildlife

With the exception of the OB-1 area, this alternative would result in similar impacts to the wildlife community as Alternative B and, therefore, would provide greater topographic and vegetative diversity than Alternative A. The decrease in disturbance and the increase in topographic and vegetative diversity associated with Alternative B would result in a wildlife community that more closely resembles the wildlife community present before mining.

The partial or total elimination of OB-1 would result in a localized reduction in topographic diversity, cover and forage available for use by wildlife. However, reshaping or reconfiguring OB-1 to acceptable AOC could result in greater topographic diversity than present before mine related disturbance at this site. With proper design, reconfiguration of OB-1 could be completed to produce a feature nearly as effective as OB-1 would be if left in the configuration proposed in Alternate B. The OB-1 site could be designed to produce a smaller, but still valuable, visual and auditory barrier between the county road and the shoreline habitats. If the spoil material from OB-1 were removed and distributed within reclamation at East Decker, the redistributed material may or may not result in a significant increase in topographic and vegetative diversity on the mine site depending upon the areas to which it would be relocated.

5. Coal Reserve

Taking OB-1 out of the major revision would not impact the coal reserve at East Decker.

V. CONCLUSIONS AND RECOMMENDATIONS

Approval of the proposed action (Alternative B) or approval with stipulations (Alternative C) would have very similar effects. Both would result in less disturbance to the topography, soils, vegetation, and wildlife habitat of the permit area than is presently permitted. The amount and areal extent of ground water drawdown would be less because of the reduced extent of mining. Fewer acres would need to be reclaimed, and the reclamation would produce greater topographic diversity than the present reclamation plan with attendant diversity in soils micro-sites, vegetation, and wildlife habitat. The smaller volume of aquifers removed and spoils returned to the pits would allow for more rapid saturation of the spoils aquifer upon completion of mining and promote faster flushing of dissolved solids from the spoils.

The difference between Alternative B and Alternative C lies in the treatment of OB-1. Alternative B would result in leaving OB-1 in place with some modification under alternative reclamation instead of returning the OB-1 site to AOC. Alternative C would require recontouring the OB-1 site to achieve AOC either by grading of the material in place, which may require returning part of the stored overburden material to the pit area, or completely removing the OB-1 material to the pit area. Premine drainage patterns that existed in the vicinity of OB-1 would be reestablished as much as possible.

Selection of either Alternative B or Alternative C would substantially accomplish Decker's goals and would be environmentally preferable to the current mining and reclamation plans. OSM has determined that Alternative B cannot be permitted. Therefore, permitting Alternative C is recommended, and the permit should stipulate that Decker prepare, for MDEQ's review and approval, a plan for returning the OB-1 site to AOC.

When an agency conditions a permit, a regulatory restrictions analysis is usually required to show the impact of the permit condition on the proponent. However, recontouring to AOC is a minimum requirement for reclamation under the Strip and Underground Mine Reclamation Act (82-4-201 *et seq*.), which governs coal mining in Montana. Since AOC is required by law, stipulating its application is not a regulatory restriction, and no further analysis is needed.

VI. CONSULTATION AND COORDINATION

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