

CHAPTER VI

SIGNIFICANT MITIGATING MEASURES

This chapter summarizes authorities, both in law and regulation, that will mitigate possible adverse effects of coal and industrial development in the Eastern Powder River Coal Basin. Technological treatments available are discussed in Parts II through VII of this statement along with the consideration of specific actions.

Climate

Since potential weather modification is closely related to air quality standards and resource disturbance, more detailed information concerning mitigating measures are contained within these chapters. The utilization of emissions control equipment on vehicles, plant stacks, dust control measures and timely revegetation of mined lands will reduce particulate matter available to the atmosphere and reduce the effects on weather from alteration of the earth atmospheric energy balance.

Air Quality

The enforcement of all applicable federal and state laws and regulations concerning air quality standards for control of emissions will reduce the cumulative effects on air quality of regional development. These include:

1. Federal Clean Air Act, as amended in 1970;
2. National Ambient Air Quality Standards;
3. New Source Performance Standards (NSPS);
4. National Emission Standards for Hazardous Air Pollutants;
5. Wyoming Environmental Quality Act of 1973; and
6. Wyoming Ambient Air Quality Regulations.

Development and utilization of reliable emission control equipment on existing and new equipment, vehicles and plant stacks will reduce the cumulative amount of pollutants entering the regional atmosphere.

Air quality standards

National Ambient Air Quality Standards (NAAQS) for suspended particulate matter, sulfur oxides, nitrogen oxides, photochemical oxidants, carbon monoxide, and hydrocarbons were promulgated by the Environmental Protection Agency (EPA) on April 30, 1971, under provisions of the Clean Air Act, as amended in 1970. Table 1 lists these standards. It is the responsibility of the Wyoming Department of Environmental Quality to insure that these standards are attained and maintained. If the state does not carry out this responsibility, EPA must take action to enforce the standards. Primary standards are health related and, in most cases, must be achieved by July 1975. Secondary standards are welfare related (material, vegetation, visibility, etc.) and must be achieved as expeditiously as possible. In rural areas this may mean July 1975, whereas in urban areas it may mean well beyond July 1977.

Wyoming ambient air quality standards were promulgated in accordance with the Wyoming Environmental Quality Act of 1973. Under Article 2 of the Act the Wyoming Department of Environmental Quality, Air Quality Division, is empowered to enforce standards. Table 2 contains the Wyoming ambient air quality standards. Wyoming has also adopted emission regulations; these standards are shown in Table 3.

Any new fossil fuel-fired steam generators or modification to existing plants must conform to the New Source Performance Standards (NSPS). Table 4 lists these standards.

Table 1
National Ambient Air Quality Standards

Pollutant	Primary Standard	Secondary Standard
1. Sulfur Oxides	80 ug/m ³ (0.03 ppm) annual arith. mean 365 ug/m ³ (0.14 ppm) max. 24 hr. conc. not to be exceeded more than once a year.	1300 ug/m ³ (0.5 ppm) max. 3 hr. conc. not to be exceeded more than once a year.
2. Particulate Matter	75 ug/m ³ annual geom. mean 260 ug/m ³ max. 24 hr. conc. not to be exceeded more than once a year.	60 ug/m ³ annual geom. mean*, 150 ug/m ³ max. 24 hr. conc. not to be exceeded more than once a year.
3. Carbon Monoxide	10,000 ug/m ³ (9 ppm) max. 8 hr. conc. not to be exceeded more than once a year.	Same as primary.
	40,000 ug/m ³ (35 ppm) max. 1 hr. conc. not to be exceeded more than once a year.	Same as primary.
4. Photo Chemical Oxidants (corrected for NO ₂ and SO ₂ interference.	160 ug/m ³ (0.08 ppm) max. 1 hr. conc. not to be exceeded more than once a year.	Same as primary.
5. Hydrocarbons (corrected for CH ₄)	160 ug/m ³ (0.24 ppm) max. 3 hr. conc. (6 to 9 a.m.) not to be exceeded more than once a year.	Same as primary.
6. Nitrogen Oxides (as Nitrogen Dioxide)	100 ug/m ³ (0.05 ppm) annual arith. mean.	Same as primary.

*To be used as guide in assessing State Implementation Plans.

Table 2

Wyoming Ambient Air Quality Standards

Pollutant	Standard						
	Annual	Month	24-hour	8-hour	3-hour	1-hour	1/2 hour
Particulate, ug/m ³	60 G.M.	-	150**	-	-	-	-
, COH/1000 feet	0.4	-	-	-	-	-	-
SO ₂ , ug/m ³	60	-	260**	-	1.300**	-	-
, sulfation mg SO ₃ /100 cm ² /day	0.25	0.50	-	-	-	-	-
CO, mg/m ³	-	-	-	10**	-	40**	-
NO _x , ug/m ³	100 A.M.	-	-	-	-	-	-
HC, ug/m ³	-	-	-	-	160**	-	-
Oxidants, ug/m ³	-	-	-	-	-	160**	-
total, ppb	-	-	1	-	-	-	-
HF, forage - ppmw	25	-	-	-	-	-	-
gaseous - ug/cm ²	-	0.3	-	-	-	-	-
H ₂ S, ug/m ³	-	-	-	-	-	-	40 ^{*twice/} 5 days
*Not to be exceeded more than							70 ^{*twice/} year
**Not to be exceeded more than once per year							

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Table 3

Wyoming Emission Standards

A. Fuel Combustion - Particulate Matter

<u>10⁶ Btu/hr. Fuel Heat Input*</u>	<u># Particulate/10⁶ Btu</u>	
	<u>Existing Source</u>	<u>New Source**</u>
10	0.6	0.10
10,000	0.18	0.10

B. Fuel Combustion - NO_x

<u>Fuel Fired</u>	<u># NO_x/10⁶ Btu</u>	
	<u>Existing Source</u>	<u>New Source**</u>
Gas	0.23	0.2
Oil	0.46	0.3

C. Visible Emissions

Existing Source	40 percent opacity
New Source**	20 percent opacity

*Interpolate between values

**After February 22, 1972

Table 4

NSPS for Steam Generators

	<u>Allowable Emissions</u>		
	<u>Fuel-Fired</u>		
	<u>Coal</u>	<u>Oil</u>	<u>Gas</u>
Particulate, #/10 ⁶ Btu	0.10	0.10	0.10
Particulate, opacity	20%	20%	20%
Sulfur dioxide, #/10 ⁶ Btu	1.20	0.80	--
Nitrogen oxides, #/10 ⁶ Btu	0.70	0.30	0.20

Water Quality and Supply

National standards to restore and maintain the chemical, physical and biological integrity of the nation's waters were promulgated by the Federal Water Pollution Control Act (FWPCA) as amended in 1972, and as it may be hereafter amended.

Wyoming water quality standards were issued in accordance with the Wyoming Environmental Quality Act of 1973. Under Article 3 of the Act, the Wyoming Department of Environmental Quality, Water Quality Division, is empowered to enforce these water quality standards. Important prescribed standards include those which specify maximum short-term and long-term concentrations of pollution, minimum permissible concentrations of dissolved oxygen and other matter, and the permissible temperatures of the waters of the state. Effluent standards and limitations specifying the maximum amounts of pollution and waste which may be discharged into state waters are described. Other health and water quality standards pursuant to section 402(b) of the FWPCA, as amended in 1972, are described as well.

The enforcement of all applicable federal and state laws and regulations concerning water quality standards will reduce the cumulative effects of regional development on water quality. These include:

1. Federal Water Pollution Control Act, as amended in 1972, and as it may be hereafter amended;
2. Wyoming Environmental Quality Act of 1973; and
3. Water Quality Standard for Wyoming, Wyoming Department of Health and Social Services, State of Wyoming, June 28, 1973.

Water supplies

Wyoming water law requires water-right filings for water impoundments and for the general utilization of water from ground- or surface-water sources. If the mining activity interferes with existing ground- or surface-water rights, it may be required that water be provided to satisfy these rights.

Provisions under Wyoming water law make it possible to change the location of a well, a reservoir or irrigated lands that are affected by activities such as mining. This would prevent the loss of these facilities and of irrigated lands, and in many instances would reduce the impact of the mining activity.

The appropriation of and supervision and distribution of ground and surface water is under control of the office of State Engineer and the Board of Control.

Monitoring programs

Monitoring programs are being established by companies planning to mine coal. A number of the monitoring programs are being planned in consultation with the Water Resources Division of the U.S. Geological Survey. The programs consist of establishing observation wells to determine water level fluctuations in the coal and the overlying overburden in the mine lease areas. Water samples are being collected to determine the chemical quality of the water and to serve as a basis for detecting changes in water quality after mining begins. As mining of coal progresses, additional observation wells will be established in or near backfill areas to monitor for leaching of toxic materials from the backfill and movement of the water from the backfill areas.

Resource Disturbance

Federal

Significant disturbances to the natural and human environment are associated with surface mining and railroad, transmission, pipeline and road construction. Unless measures to mitigate impacts are initiated timely after disturbance occurs, productive capacity of the affected areas may be lowered and other adverse effects realized. Listed below are some of the laws and regulations which grant the Secretaries of Interior and Agriculture and the Commissioner of the Interstate Commerce Commission authority to impose measures that will mitigate adverse impacts on the natural and human environment:

1. Mineral Leasing Act (41 Stat. 437 as amended; 30 U.S.C. 181 et seq);
2. Mineral Leasing Act for Acquired Lands (61 Stat. 913; 30 U.S.C. 351-359);
3. Multiple Use-Sustained Yield Act of 1960 (74 Stat. 215; 16 U.S.C. 528-531);
4. Bankhead-Jones Farm Tenant Act of July 22, 1937 (50 Stat. 525; 7 U.S.C. 1010-1012);
5. Interstate Commerce Act (49 Stat. 543; 49 U.S.C. 1(18));
6. Title 43 CFR Parts 23 and 3500;
7. Title 43 CFR Subpart 3501;
8. Title 30 CFR Part 211; and
9. Title 36 CFR Part 213.

Mitigating measures with respect to development of coal are found in the Mineral Leasing Act of 1920, as amended. The lessee has the obligation to report quarterly on the amount and character of extracted leased coal, make quarterly royalty and

annual lease payments, and protect and rehabilitate the surface. The Mineral Leasing Act for Acquired Lands authorized the leasing of mineral deposits, with the consent of the agency having jurisdiction over the lands, in lands acquired by the United States to which the "mineral leasing laws" have not been extended. In addition, the mine operator is subject to the supervision and administration of the Department of Interior through the Geological Survey in conjunction with the agency having administrative jurisdiction of the surface. The lessee must comply with CFR Part 211, Coal Mining Operating Regulations. These coal operating regulations were revised and published in the Federal Register as proposed rules on April 30, 1973. These regulations will govern operations for discovery, testing, development, mining and preparation of coal under leases, licenses and permits issued on public domain and acquired lands pursuant to the regulations in 43 CFR Group 3500. The purpose of the regulations in Part 211 is to promote orderly and efficient operations and production practices without waste or avoidable loss of coal or other mineral bearing formation; to encourage maximum recovery and use of coal resources; to promote operating practices which will avoid, minimize, or correct damage to the environment, including land, water, and air, and avoid, minimize, or correct hazards to public health and safety; and to obtain a proper record of all coal produced.

Bonding

Title 43 Code of Federal Regulations, Part 23.9 states: "Upon approval of an exploration plan or mining plan, the operator shall be required to file a suitable performance bond of not less than \$2,000. . . . The Bond shall be in an amount sufficient to satisfy the reclamation requirements of an approved exploration or mining plan, or an approved partial or

supplemental plan. In determining the amount of the bond, consideration shall be given to the character and nature of the reclamation requirements and estimated costs of reclamation in the event that the operator forfeits his performance bond."

Deposits of cash or negotiable bonds may be used in lieu of surety bonds. An operator may file a nationwide or statewide lease surety bond with the Bureau of Land Management to cover reclamation requirements under more than one lease if its terms and conditions are sufficient to comply with the regulations in 43 CFR Part 23. The amount of bond required to cover each lease is established by the BLM district manager after consultation with the Geological Survey mining supervisor, and when appropriate with other land management agencies if involved.

43 CFR 23.9 was issued January 18, 1969, and its requirements have been incorporated in all coal leases issued by BLM since that date.

Most coal leases issued by BLM prior to January 1969 were issued on a lease form similar to the current coal lease form (Form 3130-1), which states in Sec. 2, that the lessee agrees "to maintain the bond furnished upon the issuance of this lease, which bond is conditioned upon compliance with all provisions of the lease, and to increase the amount or furnish such other bond as may be required." A nationwide or statewide bond may also be used in lieu of the bond required by this section.

Such a bond covers compliance with Sec. 5 of the lease, titled "protection of the surface, natural resources and improvements." The amount of bond required under either provision may be adjusted to cover the estimated cost of compliance, at any given time, with the lease terms and terms of any approved mining and reclamation plans.

Wyoming

Wyoming's Environmental Quality Act of 1973 created the Department of Environmental Quality and vested in that agency broad powers to oversee and enforce mined land restoration and reclamation in the state. In addition to establishing rules and regulations DEQ also grants permits and licenses to mine or explore for minerals; invokes penalties for non compliance; requires and collects performance bonds; and can reclaim mined land if bonds are forfeited. Written consent or waiver by the surface owner is required before a mining permit can be granted.

Proposed land quality regulations are in the public hearing stage and should soon be issued in final form. However, under terms of the Act, minimum reclamation standards require restoration of land to equal or higher value; revegetation of mined lands; stockpiling and reuse of topsoil; and prevention of erosion, land slides, sedimentation and water pollution. Upon conclusion of reclamation, up to 75 percent of the bond may be returned to the operator. The remaining 25 percent, and not less than \$10,000, is held for five years to insure proper revegetation. This also may be returned on consent of the landowner and the DEQ.

Violation of the Act or regulations can result in penalties up to \$10,000 per day for non-willful violations. The penalty for willful violations is up to \$25,000 per day and/or up to a year in prison. Penalty limits double for second offenses.

Surface protection and rehabilitation

Each mining operation, road, pipeline, powerline, railroad or other action that would cause surface disturbance is unique, having different construction and operating requirements. Surface disturbing activities vary from casual occupation of the surface such as off-road vehicle use to complete disruption of the land surface and underlying strata. In addition, these activities normally occur through time and over areas with differences in climate, topography, soils and vegetation.

Preplanning--land use objectives

In view of all the variations that will be encountered, preplanning is necessary to assure successful surface protection and land rehabilitation. A determination must be made in the preplanning stage of the use to which land might be committed after mining and reclamation, and consideration given to the site suitability and capability to respond to rehabilitation.

Land use objectives should be selected and decided upon before mining. Objectives should be compatible with controlling physical conditions such as climate, soils and local topography and must be realistically attainable.

In order to preplan rehabilitation and determine land use objectives, an assessment is needed of overburden, its physical and chemical characteristics. Topography, hydrology, mining methods and equipment, access roads, road grades, transportation systems, pit limits, stripping ratio of overburden to coal, production rates, and bench heights must also be considered.

In general, the mining and reclamation plan filed with the U.S. Geological Survey, in conjunction with federal regulations, state laws, and the coal lease terms, requires actions to mitigate adverse effects of surface mining. The restored landform will be determined by consultations among the operator, the agency having jurisdiction over the surface, the Wyoming Department of Environmental Quality and the U.S. Geological Survey. Such consultations will be frequent enough so as not to unnecessarily impede progress of mining or reclamation.

Topography

Topography of the existing land will be studied in view of the mining or construction activities that are expected to take place. The topography that would follow mining or construction will be predetermined in detail in accordance with the rehabilitation capabilities and land use objectives. Prior to mining, landscape models will be designed to depict a suitable topography based on the amount of overburden, mining methods and land use objectives.

The reshaping of disturbed areas should conform to adjacent terrain and the topography should be reshaped to achieve the best ecological conditions, meet proper drainage and hydrologic conditions and present a pleasing landscape. Unusual, objectionable or unnatural landforms will be avoided.

A major consideration determining topography of the mined areas throughout the region is the overburden to coal ratio. The thick coalbeds of

the area are overlain by thin overburden. Restoration of the land surface to its former elevations is unlikely due to the existing coal to overburden ratios.

The National Academy of Sciences, Study Committee on the Potential for Rehabilitating Lands Surface Mined for Coal in the Western United States, considered that the placement of excavated overburden should offer optimum conditions for land stability, drainage control and revegetation. It was stated that maximum vegetative stability could not be attained on slopes steeper than 33 percent (3:1) and that optimum vegetative stability would require slopes of less than 20 percent (5:1). Various land uses such as wildlife habitat, building sites or farming may tolerate a range of slopes.

Limits on machinery operation and erosion potential are considered essential to the rehabilitation success and maintenance of surface land values. (U.S.D.A. Soil Conservation Service 1971). Some other limitations of various slope classes are listed below:

Level to gentle slopes 0-20 percent (level to 5:1) can be reclaimed for irrigated cropland, urbanization, grazing, wildlife habitat, and recreation, including water impoundments. Various land use values may be limited to some extent within this slope class. Erosion hazards and influence on revegetation is minimal. Mechanical treatment and seeding are not limited by steepness of slope.

Moderately steep slopes 20-33 percent (5:1-3:1) can be reclaimed for grazing, woodland, orchards, recreation, and wildlife habitat, including water impoundments. Light agricultural machinery can be used for rehabilitation.

Moderate erosion hazards are experienced. Revegetation can be successfully established and maintained.

Quite steep slopes 33 percent plus (3:1 and steeper) have limited use potential. Grazing may be permitted and suitable wildlife habitat may be established. Use of machinery is restricted. Revegetation of these slopes may be difficult and severe erosion hazards persist, unless stabilizing structures are used.

Mining equipment used for overburden removal is selected after consideration of type of overburden, thickness of overburden, topography, reclamation requirements and coal production. The shaping of the topography will depend on the types of mining equipment used. The types of equipment contemplated for overburden removal in the region include draglines, power shovels and truck, dozer and scraper, and wheel excavators. Draglines and wheel excavators leave a series of peaked spoil banks or ridges in their wake that require considerable slope reduction and final shaping to achieve an acceptable topography. Scrapers and trucks can discard overburden spoil to a planned grade that requires only minor shaping and grading. Scrapers and truck methods of overburden removal are generally used only where limited amounts of overburden are present.

The placement and final grading of overburden should be accomplished in such a manner that a natural and compatible topography can be achieved. The land form will provide conditions conducive to land surface stability, adequate drainage and surface conditions capable of supporting the desired vegetation. No spoil or cut slope should exceed a 33 percent (3:1) grade after rehabilitation.



Unreclaimed highwall areas may be unsightly and can be a safety hazard to humans, wildlife, and livestock and may limit land use. High walls will be reduced to a slope no steeper than 3:1 during final cut. Erosion control structures such as terraces, water breaks, or other suitable structures may be necessary.

X If highwall areas of steeper slopes are necessary to maintain recreation lakes or ponds, protective fencing will be installed above the slope and the approach to the water should not exceed a 3:1 slope.

Drainage

During reshaping and final grading, provision will be made for adequate drainage through a reestablishment of drainage systems that are compatible with the natural drainage systems of adjoining lands.

X Accumulation and concentration of salts, toxic elements, or other harmful materials by evaporation of surface waters should not be permitted. These impoundments should be removed if not installed to control pollution of streams or land surface.

Shaping of spoils to manage water is an important aspect of rehabilitation. Where operations could result in acid or saline drainage or sediment damage to adjoining lands, provision will be made for water impoundments. Runoff from spoil areas should be prevented from causing siltation, erosion or other damage to streams or natural water courses. When desirable, downstream erosion control and flood control structures will be required prior to excavations. All water impoundments should be properly designed and constructed for that purpose with suitable outlet structures and spillways installed if appropriate.

Surface hydrology is affected materially by the surface of spoil areas. Spoil surface design is fundamental in intercepting and impeding runoff flows. Runoff from precipitation on spoils is reduced by a roughened surface or increased porosity of spoil materials. Surface manipulation may be used to retard runoff erosion and relieve compaction due to heavy machinery. Terracing, pitting, ditching, listing, deep chiseling, and discing or leaving a roughened surface may be required to reduce excessive runoff, increase soil moisture, and reduce erosion. These practices should not be performed on saline soils since accumulation and concentration of salts would create alkali spots in surface pits and hinder revegetation.

Spoil materials characteristics

Spoils left by mining are mostly a mixture of freshly broken sandstones and shale, and some soil. These spoil materials weather and break into particles that are subject to erosion. Active erosion begins as soon as mining operations expose the spoil materials and occurs most rapidly at the surface.

Overburden materials left as spoils following mining were studied by the USDA Northern Great Plains Research Center. Results showed that the physiochemical properties of materials left as spoils provided a poor environment for vegetative growth.

X The various layers of overburden may become mixed upon removal from the mine area. Some of these layers may contain toxic concentrations of elements such as boron, arsenic, and selenium. Analysis of the surface soils and overburden should be made and examined for concentration of toxic materials in relation to stratigraphic occurrence. Mining operations will be planned to provide for the segregation of spoil materials toxic to humans, animals, and vegetation. All exposed coalbeds should be covered by at least three feet of soil material to prevent coal fires and aid revegetation. Waste coal and toxic material should be buried in spoil so as not to inhibit revegetation efforts or be a potential source of pollution to ground or surface waters.

Spoil and surface soil textures influence the amount of moisture available for plant growth. Materials composed largely of sandy material exhibit good aeration and percolation properties but are apt to be droughty. Clay materials compact easily from machinery operations and crust during dry periods. Loams and silty material usually have enough fine materials to hold moisture. The textures of the spoil and soil materials are important to the types of vegetation to be established and the success of revegetation.

Unweathered and unleached spoil materials may contain significant amounts of saline or less likely acid materials which if used as surface material would be a source of pollution to adjoining lands and streams and incapable of supporting significant amounts of plant growth. Excessively acid or alkaline surface or overburden materials will not be used as surface material.

Excessive acid or alkaline surface material that contains toxic or deleterious materials and infertile materials should be buried at a depth that will not reduce reestablishment of adequate vegetative cover. The surface overburden materials should have favorable pH's capable of supporting plant growth.

pH Range 6.0-8.5: This soil class will support a wide variety of climatically adapted plants.

pH greater than 8.5: Plant establishment will be difficult.

pH less than 6.0: Plant establishment will be difficult.

Topsoil

Vegetative establishment cannot succeed without a proper medium for plant growth. The soil-forming process is slow in semiarid climates and topsoil is thin on most hilltops and steep hillsides. However, drainages may contain several feet of alluvial materials.

Beauchamp (1973) considered that topsoil should be used if it is not excessively alkaline or acid since it may contain minerals not present in the overburden spoil. The National Academy of Science Study Committee on the Potential for Rehabilitating Lands Surface Mined for Coal in the Western United States considered that special attention must be given to saving any soil of acceptable quality that exists on a mined site. It was also considered that the values to be derived from adding topsoil are often decreased by stockpiling the soil since one advantage of spreading topsoil is the transplanting of live seeds and plants, especially rhizomatous species.

The entire topsoil structure to the total depth of suitable surface materials will be stripped from all areas where surface disturbance or

coverage by spoil piles is planned and stockpiled for later use or moved directly to a reshaped and prepared rehabilitation area. Topsoil stockpiles should be located in such a manner and place that mixing with subsurface materials will be prevented. If possible, topsoil should be returned immediately to spoil areas that have been graded and shaped to the desired landform and topography since live seeds, rhizomes and soil microorganisms are lost if soil is stockpiled for any length of time. Stripping and respreading of topsoil will be considered as part of the seedbed preparation and will be timed to coincide with this phase of rehabilitation. Reinoculation of stored topsoil may be accomplished by addition of manure or mixing with fresh topsoil.

Mulch

Vegetation can be established only with difficulty on soils being rapidly eroded. Topsoil is characteristically loose, friable and susceptible to both wind and water erosion. Mulches increase infiltration, reduce erosion, soil movement, evaporation and materially enhance revegetation potential especially where poor soil texture conditions exist. Mulches are effective in areas where annual precipitation is between 9 and 14 inches. (National Academy of Science 1974).

Mulch composed of plant residues or other suitable materials will be required as part of seedbed preparation. Acceptable mulching materials are grass, hay, manure, and small grain straw. The mulch material should be applied at two tons or more per acre and anchored by discing, special mulch

machine, or a Colter type machine to a depth of two inches. Other types of mulch material such as straw mat, fine wood fiber, excelsior mesh, plastic mesh, wood chips, gravel and jute mesh can be used. The type, rate, and anchorage of mulch will be specified.

Seeding

Rehabilitation of mixed grass prairie sites has not been difficult when proper seeding has been used. The time of planting is critical for dryland seeding. In the Northern Great Plains area, early spring or late fall seedings are the most reliable. Planting of cool-season grasses that are capable of germinating under very cold conditions and can aestivate when soil moisture is depleted is desirable. (Hodder 1970).

Most land reclamation seeding will take place under dryland conditions unless irrigation water is available. Snow or spring rains provide moisture for germination, initial growth, and establishment. New seedlings, when producing rudimentary root systems and a primary leaf cannot tolerate extended drought. Supplying irrigation water will be required when drought conditions threaten seed germination and plant survival. A suitable water supply will be made available in anticipation of these periodic conditions.

The dryland farming practice of summer fallowing prior to seeding may be required to allow for an adequate accumulation of soil moisture reserves to assure successful vegetation establishment. If such a practice is used adequate erosion controls on unprotected spoil areas (such as surface manipulation and mulching) will be provided.

The species selected for planting must be adapted to local soil and climatic conditions. Native species may be desirable since they have been selected through the process of natural selection and are adapted to local climatic and soil conditions. The unavailability of seed and unreliability of seed sources limit the use of native species.

Hodder 1970, considered that some introduced species possessed superior qualities essential for rapid establishment. Many species of introduced grasses and legumes have been used successfully for stabilizing road cuts and arid ranges (National Academy of Science 1974).

Trees and shrubs may be used on lands being reclaimed for recreation or wildlife habitat. Most woody species should be planted from stock rather than seed for best success. Hodder (1973) lists several innovations or techniques being tested for tree and shrub establishment such as condensation traps, supplemental root transplanting and tubelings. Sites selected for woody species should be capable of supporting this type of vegetation. Some shrubs such as big sagebrush and fourwing saltbush have been seeded successfully. A mixture of native shrubs, trees, grasses, forbs, and introduced species of vegetation may be required on suitable areas where soils and topographic conditions are varied. This mixture would provide a greater opportunity for diverse land uses such as recreation, livestock grazing, and wildlife habitat.

Several seeding methods are available for planting grasses and legumes. Drilling the seed by readily available farm equipment has proven to be the most successful method of planting. Seed distribution and coverage is assured and uniform. Broadcast seeding is satisfactory for small or relatively inaccessible areas. Broadcast seed should be covered by raking, harrowing, or other means.

Rehabilitation of mined land is usually performed under less than ideal farming conditions. Standard seeding rates are usually doubled or increased significantly to allow for seed and seedling mortality due to adverse conditions present on mined lands and other rehabilitation areas. Revegetation failures will occur. The operator will be required to attempt revegetation as many times as necessary to achieve reasonable success.

Fertilizing

Maintenance of vegetation on disturbed areas depends to a large extent upon soil development. Applying manure, sewage sludge, or other organic material will materially enhance the soils capability to supply plants with water and nutrients. Commercial fertilizers are convenient to handle and easy to obtain. The effectiveness of nitrogen fertilizers, however, is dependent on the amount of moisture available. It is generally considered that annual precipitation should be at least 10 to 12 inches to receive benefit from commercial fertilizer on rehabilitation areas. The type of fertilizer and rate of application should be specified when appropriate.

Equipment use

A considerable amount of activity by all types of equipment will occur during construction and mining. Wheeled and tracked equipment will be used in a manner that will minimize surface damages.

Excess disturbance of drainages and high erosion hazard areas will be avoided. During muddy or wet conditions, use of heavy equipment will generally be confined to the construction or mining site.

Rights-of-way, roads

Temporary roads to construction sites or similar developments will be rehabilitated when abandoned. Spoil banks, windrowed soils, debris, and fill material will be replaced in the roadbed and graded to conform to the topography. Cut slopes will be reduced as the fill permits. Closed roads will conform to existing terrain, and be waterbarred and conditioned for revegetation upon abandonment.

Existing roads and trails will be used whenever possible for access purposes. Construction of roads on steep hillsides will be avoided where alternate routes provide adequate access. Ridge tops or level areas usually offer the best access route along with minimizing surface impacts. Drainage will not be blocked by roadfills.

Permanent service roads will be constructed to acceptable standards and maintained in a good condition for vehicle use. Adequate water drainage will be provided to minimize erosion. Erosion of borrow pits by runoff water will be prevented by diverting water at frequent intervals. This may involve construction of waterbreaks, culverts, broadbased drainage dips, graveling or other methods.

Rights-of-way will not be located across high erosion hazard areas or areas of unique values. Construction will be conducted in a manner that will minimize soil erosion. Rights-of-way will not be used for "short cut" trails or roads unless properly constructed for such purposes.

Deep vertical cuts and long fill slopes of clinker pits, roads, pipelines or other construction sites will be graded by reducing slopes, backfilling to conform to the adjacent terrain.

To prevent erosion, waterbreaks, terraces, or diversion ditches should be installed and the water spilled onto areas relatively resistant to erosion.

Waste disposal

Release of waste water containing injurious or deleterious materials will be avoided. Disposal system for solid and liquid wastes will be designed so as not to cause damage to adjoining lands or drainages. Solid waste should be buried or disposed of between impervious overburden layers to prevent its reaching surface water courses or aquifers. Liquid disposal pits containing toxic or deleterious materials will be lined or constructed so as to avoid downward percolation and contamination of ground water aquifers.

Mineral protection

Oil and gas leases are in effect for much of the area. Priorities for mining or drilling for oil and gas on public lands are established by the Conservation Division of the U.S. Geological Survey. Mining operations approaching wells or bore holes that may liberate oil, gas, water, or other fluid substances must be approved in accordance with 30 CFR 211.17 and 30 CFR 211.63. Impacts on oil and gas areas can be mitigated largely by agreements among operators where significant impact on oil well siting or pipeline location arises. In extreme instances of conflict, technology is adequate through directional drilling, drainage practice, recovery of wells lost, pipeline and flowline relocation, pillar recovery, and mining method to adequately mitigate impacts which might arise.

Impacts on uranium bearing rock not of ore grade, clinker, and sand and gravel can be mitigated by stockpiling materials in those cases where mining and construction threaten loss by disturbance of the ground. To the extent these resources are part of the federal mineral estate, operators will be required to segregate, stockpile, or otherwise isolate the resource for possible future use.

Archeological Preservation

Legislative authorities and obligations which guide issuance of federal license to develop the Powder River coal resources are the statute commonly referred to as Antiquities Act of 1906 (34 Stat. 225, 16 U.S.C. 431-433); Wyoming statutes relating to archeological and paleontological sites (sections 36-11 to 56-13 and 18-330.7 W.S. 1957); Wyoming Environmental Quality Act of 1973 (Section 35-502.12(a)(v)); an act for salvage at reservoir sites (74 Stat. 220; 16 U.S.C. 469-469c); an act for historic preservation (80 Stat. 915, 16 U.S.C. 470-470m); National Environmental Policy Act of 1969 (83 Stat. 852, 42 U.S.C. 4321 et seq); and Executive Order 11593, May 13, 1971 (36 F.R.-8921).

Both federal and state antiquities acts regulate antiquities excavation and collections, and both protect historical values on public lands. They provide for fine and/or imprisonment for violators of their provisions. The Wyoming Environmental Quality Act protects areas of the state designated unique, irreplaceable, historical, archeological, scenic or natural. The reservoir salvage act provides for recovery of historical and archeological data from areas to be inundated by certain water impoundment as a result of federal action. The Historic Preservation Act established a system of historic preservation in the nation and requires that certain federal undertakings be submitted for review by the National Advisory Council on Historic Preservation. NEPA states in Section 101(b)(4) that one objective of national environmental policy is to "preserve important historic, cultural and natural aspects of our national heritage and maintain, wherever possible, an environment which supports diversity and variety of individual choice." Finally, Executive Order 11593 affects federal agencies most intimately in that they are instructed to cooperate with the nonfederal agencies, groups, and individuals and to insure that federal plans and programs contribute to the preservation and enhancement of nonfederally owned historic and cultural

values. Agencies are directed to inventory, evaluate and nominate properties in their jurisdiction to the National Register of Historic Places.

Under the mandate of the Executive Order, federal agencies must insure that until inventories and evaluations are completed, the agencies will use caution to assure that federally owned properties which might qualify for nomination to the National Register of Historic Places are not inadvertently transferred, sold, demolished, or substantially altered and that federal plans and programs contribute to the preservation and enhancement of nonfederally owned sites.

The Antiquities Act of 1906 prohibits damage or excavation of plant and animal antiquities on federal lands without a permit (see 43 CFR Part 3). The Wyoming statutes require that permits be obtained before excavation of any archeological or paleontological deposits on either state or federal public lands (sec. 36-11 W.S. 1957).

Archeological and paleontological values on federal lands will be protected by surveys and salvage excavations. The Wyoming Antiquities Act similarly requires a permit for excavation of antiquities on public lands, permission to be granted by the State Board of Land Commissioners.

The Wyoming Environmental Quality Act requires approval of any application for a mining permit under the provisions of Section 35-502.24 (g)(iv) of this Act to assure that "...the proposed operation will not irreparably harm, destroy, or materially impair any area that has been designated by the Council to be of a unique or irreplaceable, historical, archaeological, scenic or natural value."

Surface surveys for evidence of archeological values in the alluvium are fundamental to establishing responsible stipulations for their protection. Therefore those stipulations in the mining plan and/or permit that require surveys will be followed to insure archeological and paleontological protection.

Historical Values

Authorities for protection and preservation of historic values are the same as those just described for archeologic values. Historic values are protected by the antiquities acts, and surveys conducted to ratify requirements of the reservoir salvage law have included historic research.

To meet responsibilities under these laws and the executive order, the approving federal agencies will insure that mining plans and permits include a program for historic inventory, evaluation and nomination of sites, districts, buildings, and objects, in cooperation and consultation with the State Historic Preservation Officer.

No mining plans, permits or rights-of-way will be approved until the company has coordinated its archeological surveys with the Wyoming State Historic Preservation Officer. Company survey reports will be submitted to the State Historic Preservation Officer with a copy to agencies approving plans and permits. The report will be certified by the Preservation Officer and forwarded to the approving agencies with a statement that surveys have been conducted by competent, professional archeologists and a recommendation for additional surveys to be required before plans and permits are approved. These additional surveys may be necessary if surface evidence indicates further evaluation is necessary. In addition, approvals will be conditioned to require notification to the Area Mining Supervisor of all archeological and paleontological sites discovered during mining prior to disturbance and notification to the appropriate officer of the surface administrating agency of sites discovered during right-of-way construction prior to disturbance. The Antiquities Act of 1906 and Wyoming statutes make it unlawful to excavate sites which are discovered without a permit.

Furthermore, it will be required that the alluvium to be displaced during the mining operation be surveyed and that all surveys be coordinated with the Wyoming State Historic Preservation Officer to insure competent, professional inventories, salvage, and preservation of archeological and paleontological data.

All present and future applicants could share in the cost of establishing a full-time resident basin paleo-archeologist under the supervision of the Wyoming State Historic Preservation Officer. The basin archeologist would aid in reducing lead time and development delays by performing advance surveys for support facilities, educating construction employees, sampling soils, responding to company discoveries, and conducting salvage work.

Recreation

Requests for water impoundments to supply expanded power generating, coal development and domestic uses occupying federal lands and threatening important cultural values and related recreational use, can be granted pending decisions by the State Engineer through the authority contained in the Reservoir Salvage Act of 1960 (74 Stat. 220) and the National Environmental Policy Act of 1969 (83 Stat. 852, 42 U.S.C. 4321 et seq).

If a planned reservoir covers federal surface or mineral and its water is designated for another federally approved project, it will first be assessed under the requirements of the National Environmental Policy Act and salvage requirements under the Reservoir Salvage Act. If cultural values are located the "criteria for effect" under Section 106 of the National Historic Preservation Act and Section 2(b) of E.O. 11593 will be initiated by any federal agency joined in the project.

Where scenic, historic, and recreation values are impacted, either on or adjacent to federal land, it will be required that new federal aid highway study locations and alignments complement these resources under the Federal Aid Highway Act of 1973 (Sec. 134(a) P.L. 92-87).

Land Use Planning, Zoning and Controls

A description of the current status of planning, land use controls-constraints and zoning is contained in Chapter IV. The basic situation is that a multiplicity of jurisdictions and agencies are involved in establishing policies, conducting planning, analyses and studies and implementing program actions in response to coal development. The State of Wyoming presently has at least three entities which are in some way involved with policies, planning analyses and studies, and program actions. They are the Land Use Study Commission, Department of Environmental Quality and the Governor's Energy Task Force. However, in the absence of a major overall and restructuring of existing statutory authorities and the land and resource tenure arrangements, it is possible to suggest several mitigative measures and techniques that could have a beneficial effect upon the planning base. Among these are the following:

The exemption of minerals and minerals development from county planning and zoning should be removed by legislative action while providing for a state override role on planning and zoning for minerals development. The authority in any legislation should go beyond just planning but should include management and enforcement responsibilities. The legislation should foster more joint powers agreement, a greater degree of regional planning, the changing roles for state and local governments in land use controls and the changing awareness or philosophy of land as a resource rather than a commodity.

Encourage a strict enforcement of the provisions and regulations imposed by the Wyoming Environmental Quality Act of 1973 with a

continual monitoring program on industry performance to identify nonperformance problem areas and areas needing further legislative attention.

Amendment to the existing statutes on planning which would change the authorization to effect planning and zoning from a county option basis to a required basis with procedural provisions included to effect compliance.

Institute review and comment cycles at the state and local levels on all types of planning actions and programs.

Encourage an integrated (federal, state and local) approach to all planning programs that relate to land use or resource allocation plans, policies or controls.

Advocate legislation that would increase the level of appropriations for federal agencies to be devoted to planning activities under their existing planning and resource development systems to upgrade the quality and substantive content of plans and intensify the time schedule for earlier completion of plans and implementation programs.

Same with respect to state and local agencies and governments.

Same, but to include additional increases for plan implementation and control functions such as monitoring, enforcement, compliance review, etc.

All future legislation and regulations should require public hearings or other disclosure of proposed federal, state and local plans and programs.

Encourage full public participation, to the maximum extent practicable, by the general public and special interest groups in the planning decision-making processes.

Railroad Construction

Impacts on the region's rail transportation network can be mitigated to a degree under the authority contained in Section 1 (18) of the Interstate Commerce Act (49 Stat. 543, 49 U.S.C. 1 (18)) which requires the prior approval from the Interstate Commerce Commission for the extension or new construction of a line of railroad or the abandonment of operation of a line of railroad. Exempted from this authority are spur, industrial team, switching or side tracks located wholly within one state. Section 1 (18) requires a certificate from the Commission that any construction, extension or abandonment is warranted by the present or future public convenience and necessity.

An intent of the statute is to promote sound economic conditions among individual carriers while recognizing the needs of the shipping public. For an application for new construction, consideration is given to the need for additional rail service in a particular area. If a new line would create essentially duplicative or unnecessary facilities or if the present or future demand for rail transportation is not supported by an area's overall growth and developmental patterns, an authorizing certificate may not be issued. This could arise where a new line, if authorized, would divert substantial portions of the traffic handled over an existing line thereby potentially creating an unprofitable operation which may affect the general adequacy of rail service as well as the financial health of the railroad company. In addition, even if demand patterns may warrant an expansion or additional line, the actual authorized location of such a line would be determined based on a balancing of the relevant economic, technical, and environmental factors. The prior authorization requirement applies to new rail right-of-ways as well as to additional lines in an existing rail right-of-way.

The statutory intent behind prior authorization for railroad abandonment is similar. Here the financial stability of a railroad company may be impaired where a line with declining freight revenues must nevertheless continue to be maintained or rehabilitated. Substantial expenditures may be required on a line with minimal traffic at the expense of maintenance over more highly trafficked lines. This factor, however, must be weighed against the present or potential need of the shipping public for continued rail service and the corresponding effect on the economic vitality of a particular area.

The net effect of the regulatory scheme under the Interstate Commerce Act is thus, to the extent practicable, to promote the availability of rail transportation when and where it is required. As an adjunct to the regulatory functions the Act further provides in Section 1 (19) that public notice of any application for a certificate must be given with a related right to be heard. In this manner the public will be fully informed prior to any major alterations, either additions or deletions, to an area's rail network.

Finally, since applications for construction or abandonment are considered federal actions, the certification process must comply with the provisions of the National Environmental Policy Act of 1969. Environmental values will thereby be incorporated into the pertinent decision making process.