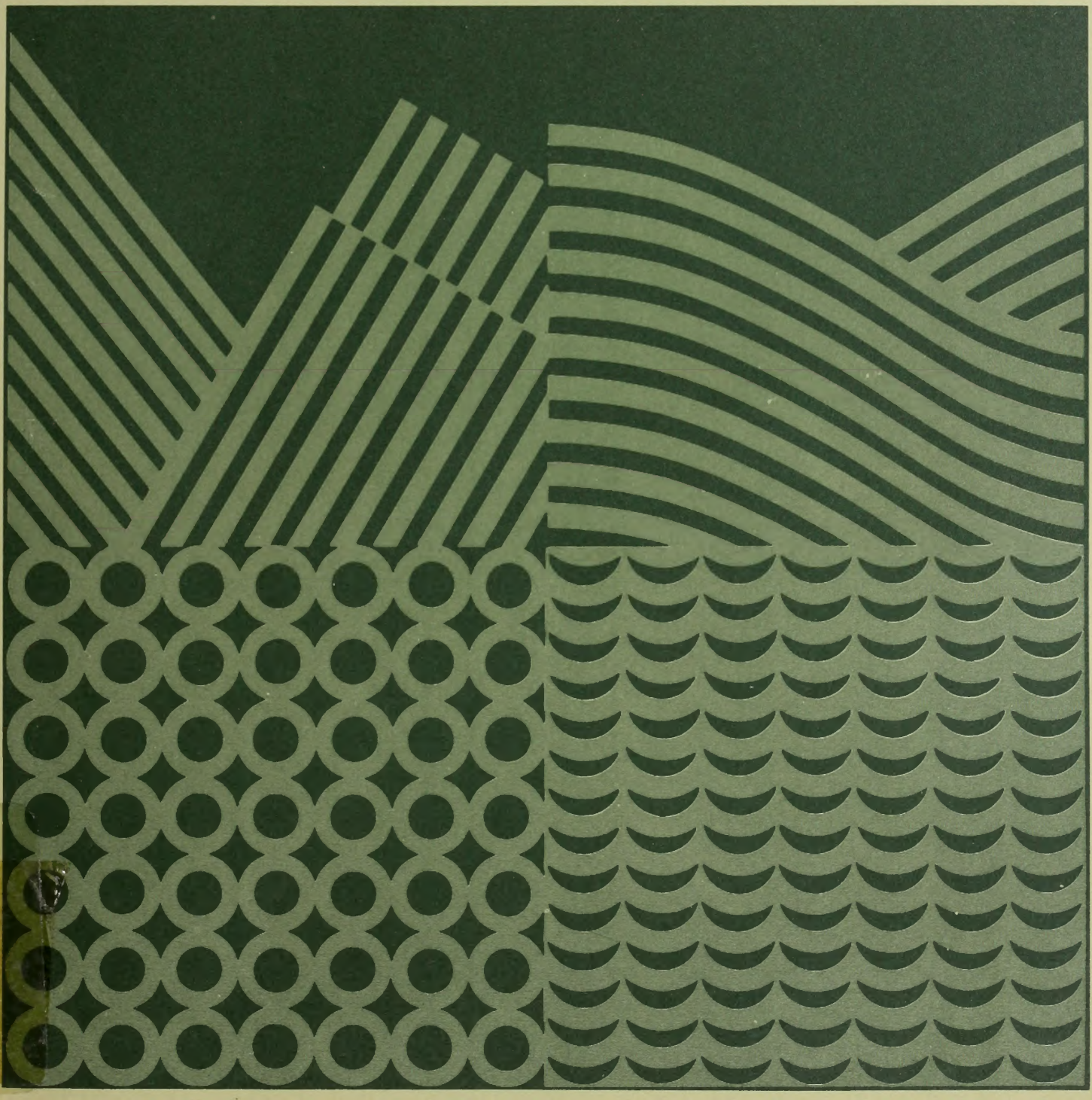
Proposed Mining and Reclamation Plan, North Rochelle Mine, Campbell County, Wyoming

Draft
Environmental Impact Statement
OSM-EIS-9

U.S. Department of the Interior
Office of Surface Mining Reclamation and Enforcement



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September, 1982

Type of Action: Administrative

Prepared by the
U.S. Office of Surface Mining Reclamation and Enforcement

in cooperation with the
Interstate Commerce Commission
Bureau of Land Management
Forest Service
Geological Survey

James P. Harris

Director

COVER SHEET

Proposed action: Approval of the mining and reclamation plan submitted by Shell Oil Company Mining for the North Rochelle mine.

Type of statement: Draft environmental impact statement (EIS)

Lead agency: Office of Surface Mining Reclamation and Enforcement

Cooperating agencies:
Federal:
Forest Service
Interstate Commerce Commission
U.S. Geological Survey
State of Wyoming:
Department of Environmental Quality
Industrial Siting Administration

For further information:
Allen D. Klein
Attn: Charles Albrecht
Office of Surface Mining Reclamation and Enforcement
Brooks Towers
1020 -15th Street
Denver, Colorado 80202

(303) 837-5656 (commercial)
327-5656 (FTS)

Abstract: Shell Oil Company Mining proposes to mine an average of about 7.6 million tons per year or 197 million tons of coal over 26 years at its North Rochelle mine. In the process, 3,271 acres of land would be disturbed. The Antelope and North Antelope mines are under construction in, and the Rochelle mine has been proposed for, the general area. The North Rochelle mine, in conjunction with these other mines, would moderately impact the social and economic conditions of the cities of Gillette, Newcastle, and Wright, and of Campbell and Weston Counties, Wyoming. In addition, impacts to transportation, especially resulting from railroad traffic from the mine, would increase over those already occurring in the region. Other impacts would be moderate or insignificant, except that the disturbance of grazing and wildlife lands by mining activities both at the proposed North Rochelle mine and at other mines in the area would continue to increase, until large areas would have to be reclaimed and returned to livestock and wildlife uses approximating premining levels.

Comments regarding this draft EIS must be received by: November 24, 1982

Please retain your copy of this draft EIS. Unless the extent of public comment is such as to require that it be commensurately revised, the **final EIS** is anticipated to be a **supplement** to this draft statement. Copies of the final EIS will be sent only to those agencies and organizations listed in chapter V, to those who comment on this draft EIS, and to those who specifically request a copy of the final EIS.

PREFACE

Shell Oil Company Mining (SOCM) proposes to open the North Rochelle mine as a surface coal mine in the eastern Powder River Basin. SOCM has submitted a detailed mining and reclamation plan (MRP) for this mine to the Office of Surface Mining Reclamation and Enforcement (OSM) and the Wyoming Department of Environmental Quality (DEQ). Both agencies have identified portions of the MRP that must be modified or clarified for the plan to meet Federal and State requirements. Stipulations that would bring the MRP into full compliance with Federal and State regulations have been proposed by OSM, the Forest Service, and Wyoming DEQ. SOCM must agree to these stipulations before a permit would be issued.

Chapter I of this environmental impact statement (EIS) discusses the need for a Federal decision on SOCM's MRP and summarizes the proposed mining method and schedule. Chapter II summarizes the alternative decisions that could be made on this mine plan and briefly compares their effects. Chapter III briefly describes the environment that would be affected by the proposed mine. Chapter IV analyzes the effects of approval of the MRP in greater detail. Included in chapter IV are discussions of the potential cumulative impacts on the environment from coal mining at the six existing and proposed mines in the area.

After completion and distribution of the final EIS, a decision on the proposed action will be made by the Secretary of the Interior, pursuant to the Surface Mining Control and Reclamation Act of 1977, the Mineral Leasing Act of 1920, as amended, and the National Environmental Policy Act of 1969, as amended. A notice of the proposed decision and availability of the final EIS will be published in the Federal Register.

We invite you to review this draft EIS, especially its conclusions, carefully. Your suggested corrections will be considered, and substantive comments addressed, in the final EIS.

SUMMARY

This environmental impact statement (EIS) describes Shell Oil Company Mining's (SOCM's) mining and reclamation plan (MRP) for the proposed North Rochelle mine. It was prepared by the Office of Surface Mining Reclamation and Enforcement (OSM), which acted as lead agency for preparation, and by an interdisciplinary team consisting of members from the Forest Service (FS), the Interstate Commerce Commission, the U.S. Geological Survey (USGS), and the State of Wyoming. Concurrent with EIS preparation, a technical environmental analysis (TEA) was prepared by the Wyoming Department of Environmental Quality (DEQ) to determine SOCM's compliance with the Wyoming Environmental Quality Act. The Wyoming Industrial Siting Administration currently is considering the separate industrial siting permit application submitted by SOCM.

Description of the proposal

SOCM proposes to open the North Rochelle surface coal mine in the eastern Powder River Basin, Campbell County, Wyoming, approximately 50 miles south of Gillette. The permit area, comprising 4,587 acres of gently rolling topography, is used for ranching and wildlife. SOCM would extract 197 million short tons of low-sulfur subbituminous coal during 26 years, and in the process would disturb 3,271 acres. The North Rochelle mine would contribute as much as 8 million tons per year toward the Department of Energy's annual coal production goals for the Powder River Basin (1 percent of the 205 million tons for 1985, and about 2 percent of the 396 million tons for 1990, as given in U.S. Bureau of Land Management, 1979b). Estimated current and future production from existing and proposed mines in the basin is 129, 253, and 262 million tons in 1982, 1985, and 1990, respectively.

Need for Federal decision

SOCM has submitted its MRP to OSM to comply with the State of Wyoming's regulations implementing the Wyoming Environmental Quality Act and the Surface Mining Control and Reclamation Act (SMCRA). Because SOCM has fulfilled the requirements of its lease, a decision by the Secretary of the Interior to grant, modify, or deny the proposed mine plan and permit application is required by law (Mineral Leasing Act of 1920, as amended). This EIS identifies two choices for the Secretary: he could approve the MRP with stipulations to bring it into full compliance with the provisions of the Wyoming Environmental Quality Act and SMCRA (alternative A) or he could disapprove the MRP (alternative B, equivalent to the "no action" alternative). Alternative A is OSM's preferred alternative. Other alternatives considered and rejected are mentioned in chapter II.

The FS, as surface management agency, administers 1,291 acres of the permit area as part of the Thunder Basin National Grassland. Therefore, the FS must consent to the terms of mine-permit approval (Federal Coal Leasing Amendments Act of 1976).

Impacts of Alternative A: Approval

The North Rochelle permit area is part of about 400 square miles (mi^2) of the eastern Powder River Basin which is at present, or may be in the future, mined for coal. Because SOCM would mine its North Rochelle site using methods comparable to those used at other surface coal mines in the area, the impacts resulting from

development of the North Rochelle mine would be comparable to those resulting from the other mines.

OSM's analysis indicates that major impacts would occur to many resources on the minesite itself. However, because the extent of these resources is comparatively small given the resources of the entire eastern Powder River Basin, these impacts are likewise insignificant. For instance, the mine would disrupt soils and vegetation on only 5.1 mi^2 out of 7,780 mi^2 of the basin (less than 0.1 percent). Even the cumulative impacts from this mine and the other five existing or proposed mines in the immediate vicinity would generally be insignificant. Only the impacts to water resources, vegetation, wildlife, socioeconomics, cultural resources, and land use are considered moderately significant, and many of these impacts would disappear within 40 to 70 years after mining ceases. Moreover, the mine would not interfere with the future usability of the region's renewable resources. About 60,226 tons of coal would be mined per acre, rail transportation is readily available, threatened or endangered species are absent from the permit area, and energy growth is generally accepted by the communities in the area. Therefore, the environmental costs of mining the 197 million tons of coal could not likely be appreciably lessened by using a different method of mining or by mining elsewhere.

Together, all the existing and proposed coal developments in the eastern Powder River Basin have had and would continue to have socioeconomic impacts on the cities of Gillette, Newcastle, and Wright and on Campbell and Weston Counties. The increased population would create an additional demand for services, such as police, fire, water supply, waste disposal, health, and recreation. Although Campbell County and the town of Wright should be able to finance upgrading most of these services to meet any new demands placed on them, the cities of Gillette and Newcastle, and Weston County would have trouble financing many of the needed improvements because of their geographic isolation, or inadequate or delayed increases in tax revenues resulting from coal mining.

Following is a brief summary of the impacts that would occur if the mine is developed as proposed:

- During mining, the overburden, soils, and vegetation on as much as 3,271 acres of the minesite would be disturbed or progressively excavated. Changes in stratigraphy would be permanent. Soil structure would be radically changed but would re-form over time. The vegetative productivity and the use of the minesite (presently, grazing and wildlife) should be restored to premining levels within about 50 years after initial disturbance. Although vegetation would support a land use similar to that before mining, postmining vegetation would be somewhat different from the existing vegetation. The minesite would remove part of a larger antelope and mule deer range. Although there would be a loss of wildlife during mining, wildlife populations would utilize the reclaimed land. The species composition and abundance would depend on the success of habitat and vegetation restoration. The lowered ground-water levels resulting from mining of the coal aquifers and from pumping water from a deeper aquifer would still be noticeable 30 years after mining ceases and may take 70 to 100 years to return to premining conditions. Existing wells that only partially penetrate the coal aquifer might have to be deepened to fully penetrate the aquifer. The quality of the ground water in the replaced overburden would not be as good as present water quality (roughly 1,000 to 3,300 milligrams

per liter (mg/L) total dissolved solids (TDS)) but would still be acceptable for anticipated postmining agriculture and wildlife uses (3,000 to 5,000 mg/L TDS). SOCM is required to replace any developed water supply affected by its mining.

. Despite some degradation of air quality in the vicinity of the mine, the quality of the air would still meet Federal and State standards. Traffic to and from the mine would cause and encounter short delays, increase the noise level, and add to maintenance requirements of the roads. When the mine is at full capacity, fourteen 110-car unit trains would convey coal from the mine and return each week. This would increase the noise and the possibility of accidents and delays at crossings along railroads between the mine and the shipping destination for the coal.

. By 1992, the mine would contribute about 1,022 and 164 persons, respectively, to the population increases in Campbell and Weston Counties resulting from energy development. Such population increases would place a demand on the county governments and the cities of Gillette, Newcastle, and Wright to provide services, such as police, fire, water supply, waste disposal, health, and recreation. Because the mine would increase sales/use taxes and total property valuation, Campbell County generally would be able to meet the demands placed on it. The cities of Gillette and Newcastle, and Weston County, however, would not have an immediate source of additional revenue, and are already experiencing difficulty in financing capital facility improvements. Moreover, a growing annual operations deficit has been projected for Gillette from 1988 through 1992.

. Mining and associated facilities would constitute a visual intrusion to the generally rural landscape during the construction and active mining phases. This intrusion would be, for the most part, local, in that the minesite is located about 9 miles east of State Highway 59 and away from major viewing areas. The facilities would be removed during reclamation and the area returned to natural conditions.

Impacts of Alternative B: Disapproval (No Action)

Under alternative B, the adverse environmental impacts associated with the approval alternative would not occur. Any mining or other resource uses needed to meet energy demands would have to occur elsewhere.

SOCM would not receive any return on its investment in developing the leasehold. The State and local governments would not receive the 50-percent share of the Federal coal royalties, which could be in excess of $3 million per year. The opportunity to provide increased employment in the area would be lost.

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ILLUSTRATIONS

(Plates indicated as "in pocket" may be found in envelope attached to the inside back cover of this volume)

TABLES

CHAPTER I

INTRODUCTION

PROPOSED FEDERAL ACTION

For purposes of this environmental impact statement (EIS), the "proposed Federal action" is defined as approval or disapproval of the mining and reclamation plan (MRP) submitted by Shell Oil Company Mining (SOCM) for the North Rochelle mine. The MRP was prepared for an area covered by Federal leases W-71692 (SOCM), W-2313 (Arco Coal Company), and W-321779 (Peabody Coal Company), which lie within the Thunder Basin National Grassland, by Wyoming lease 0-26748 (Peabody Coal Company), and by a private lease (SOCM). Of the Federal leases, only the SOCM lease (W-71692) would be mined.

NEED FOR FEDERAL DECISION

SOCM holds a Federal coal lease requiring submission of an MRP to mine that coal. It has submitted such a plan, as well as an applications for a permit under the Surface Mining Control and Reclamation Act of 1977 (SMCRA; P.L. 95-87). Therefore, the Secretary of the Interior is required to make a decision to grant or deny the permit application. This EIS describes the impacts that would result if the MRP is approved; in addition, as a basis for the Secretary's decision, it discusses alternatives to the MRP. This EIS is written in compliance with the National Environmental Policy Act of 1969, as amended (NEPA; 42 U.S.C. 4321 et seq.), and the regulations of the Council on Environmental Quality (40 CFR 1500 et seq.).

The technical analyses on which this EIS is based are contained in "Technical environmental analysis, Shell--North Rochelle mine, TFN 1 1/241," prepared by the Land Quality Division of the Wyoming Department of Environmental Quality (DEQ). Copies of this technical environmental analysis (TEA) are available for public review at the offices of Wyoming DEQ in Cheyenne and at the Office of Surface Mining Reclamation and Enforcement (OSM) in Denver; therefore, they are not reproduced here. The discussions of impacts in chapter IV summarize the analyses.

As sources of information in addition to the MRP and the TEA, the interdisciplinary staff has consulted data acquired in the course of mining the two existing mines in the area (Jacob's Ranch and Black Thunder) and the EIS's prepared for two mines (Antelope and North Antelope) under construction nearby to evaluate the nature and severity of the impacts.

OSM, the U.S. Department of Agriculture, Forest Service (FS), and Wyoming DEQ have identified stipulations (appendix B) that must be appended to the permit to bring the MRP into full compliance with Federal and State regulations. The applicant must agree to these stipulations before the permit can be issued.

The potential need for coal is not addressed in this EIS. When the lease was issued to SOCM, the need for coal was assumed. SOCM now holds a valid lease. Therefore, OSM is constrained to evaluate the proposed mine on the basis of what impacts it would have on the environment.

APPLICANT'S PROPOSAL

SOCM's lease is approximately 50 miles south of Gillette and 60 miles west of Newcastle, in Campbell County, Wyoming (fig. I-1). The permit area, comprising 4,587 acres of gently rolling land surface, is used for ranching and wildlife habitat. Coal is presently being mined at the Black Thunder and Jacobs Ranch mines north of the permit area, and construction has started at the Antelope and North Antelope mines to the southwest. Table I-1 compares the acreages of the lease area, the permit area, and the area to be disturbed by mining, and gives the surface and coal ownership acreages in the permit area. Figure I-2 shows the surface ownership; figure I-3 shows coal ownership.

SOCM proposes to extract a total of 197 million short tons of low-sulfur subbituminous coal on the lease: 192 million tons would be from the Canyon seam and 5 million tons from a rider seam above the Canyon. Thus, 95 percent of the 202 million tons of coal on the lease would be extracted. The low-quality rider seam would be recovered wherever it is both 2 or more feet thick and the ratio between parting and coal thickness is less than 3.3 to 1. (In this area, 2 feet of coal can be economically recovered when there is less than 6.6 feet of parting.) In the process of coal recovery, a total of 3,271 acres of land would be disturbed over the 2 years of construction and the 26 years of mining. Of these 3,271 acres, 1,925 acres would be mined and 258 acres would be disturbed by the railroad corridor. The remaining acreage would be used for facilities, overstripping, access roads, and other associated disturbances. The facilities and railspur would be located over unleased Federal coal, removing about 6 million tons from access during the life of the mine.

SOCM would open its initial box cut in 1984 in the southeastern corner of the permit area (NE¼ sec. 14). The active pit would be advanced west and north along the burn zone until 1993, by which time a continuous north-south pit would have been developed. Mining would then progress westerly, following the dip of the coal formation, with the pit lying approximately parallel to the seam strike.

To assure complete recovery of the coal within its lease, SOCM would have to strip overburden from land off the lease. SOCM has backstripping agreements with Black Thunder Coal Company to strip the area along the north side of the lease, and with Peabody Coal Company to strip the area along the south side. The company has submitted an application to Wyoming DEQ for permission to backstrip the State-owned land in sec. 16. A special use permit will have to be obtained from FS to backstrip on Federal land. This would issued after the permit to mine is approved.

Production from the North Rochelle mine would contribute about 1 and 2 percent, respectively, to the Department of Energy goals for coal production in the Powder River Basin for the years 1985 and 1990. The coal would be mined by surface methods and transported by unit trains to powerplants for generating electricity. (Note: Several studies have shown that mining and transportation of coal mined in the Powder River Basin consumes 1 to 2 percent of the energy production potential of that coal.) Maximum production of 8 million tons per year would be reached in the third year of mining. An average of 298 persons would be employed at the North Rochelle mine during the 26-year mine life. Schedules of coal production, overburden removal, surface disturbance, and employment are shown in table I-2.

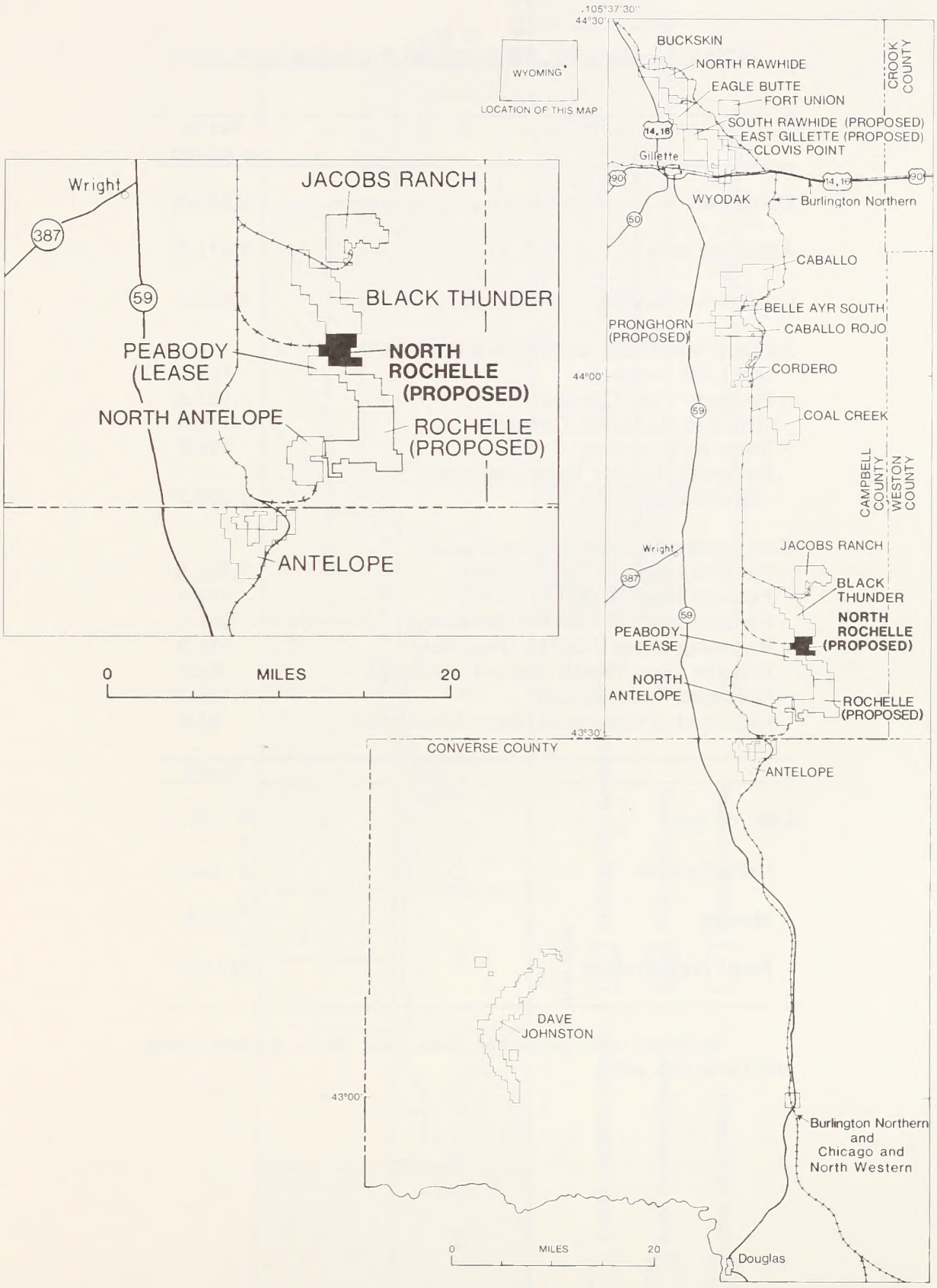


Figure I-1.--Location of the proposed North Rochelle mine.

Table I-1.--Data for the proposed North Rochelle mine

	Acres involved
Permit area	4,586.9
Affected area[1]	3,271.3
Coal removal area	1,925.4
Surface ownership within permit area:	
Shell Oil Company	718.6
Peabody Coal Company	1,825.6
Atlantic Richfield Company	398.0
State of Wyoming	354.0
Federal (Thunder Basin National Grassland)	1,290.7
Coal ownership within permit area:	
Federal lease W-71692 (Shell)	1,960.0
Federal lease W-2313 (Arco)	325.0
Federal lease W-321779 (Peabody)	361.0
Wyoming lease 0-26749 (Peabody)	354.0
Private lease (Shell; Reno Livestock)	80.0
Unleased Federal coal	1,426.9
Unleased private coal (Reno Livestock)	80.0
	Years
Life of mine	30
Construction	1-2
Mining	3-28
Final reclamation	29-30

[1]Includes coal removal area, rail spur, access roads, and facilities area.

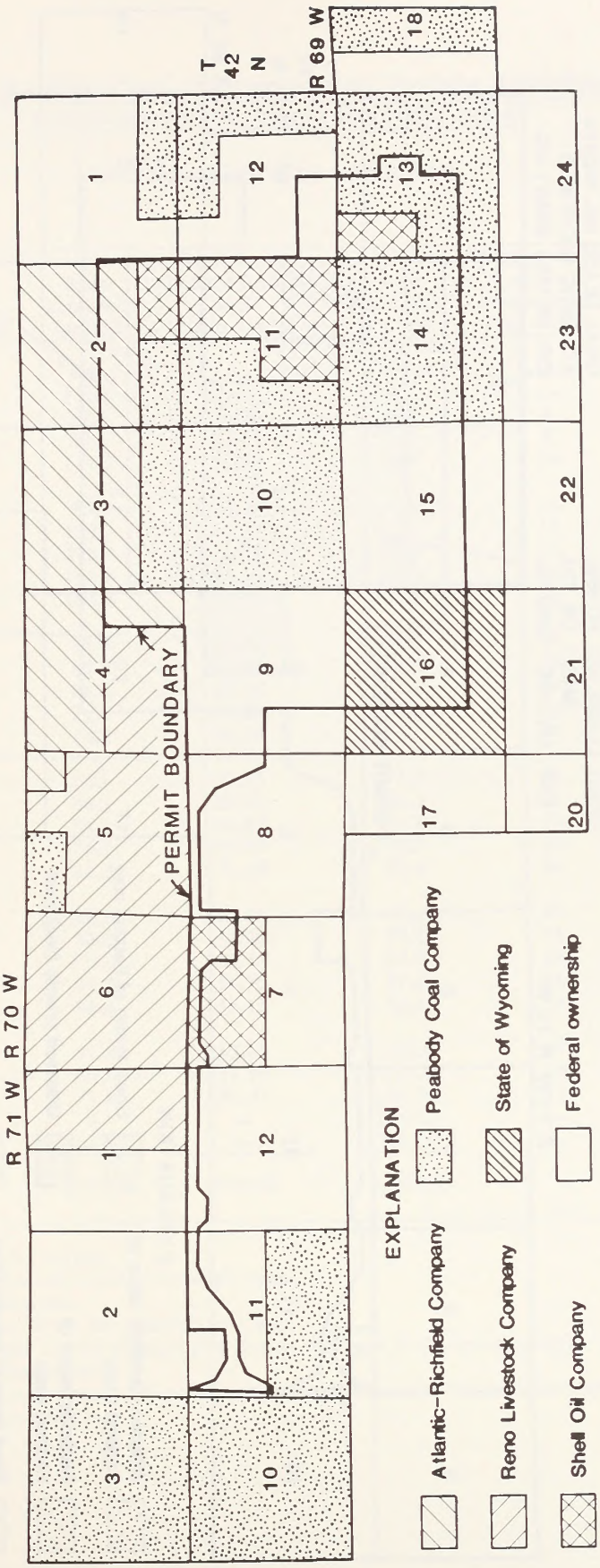


Figure I-2.--Surface ownership.

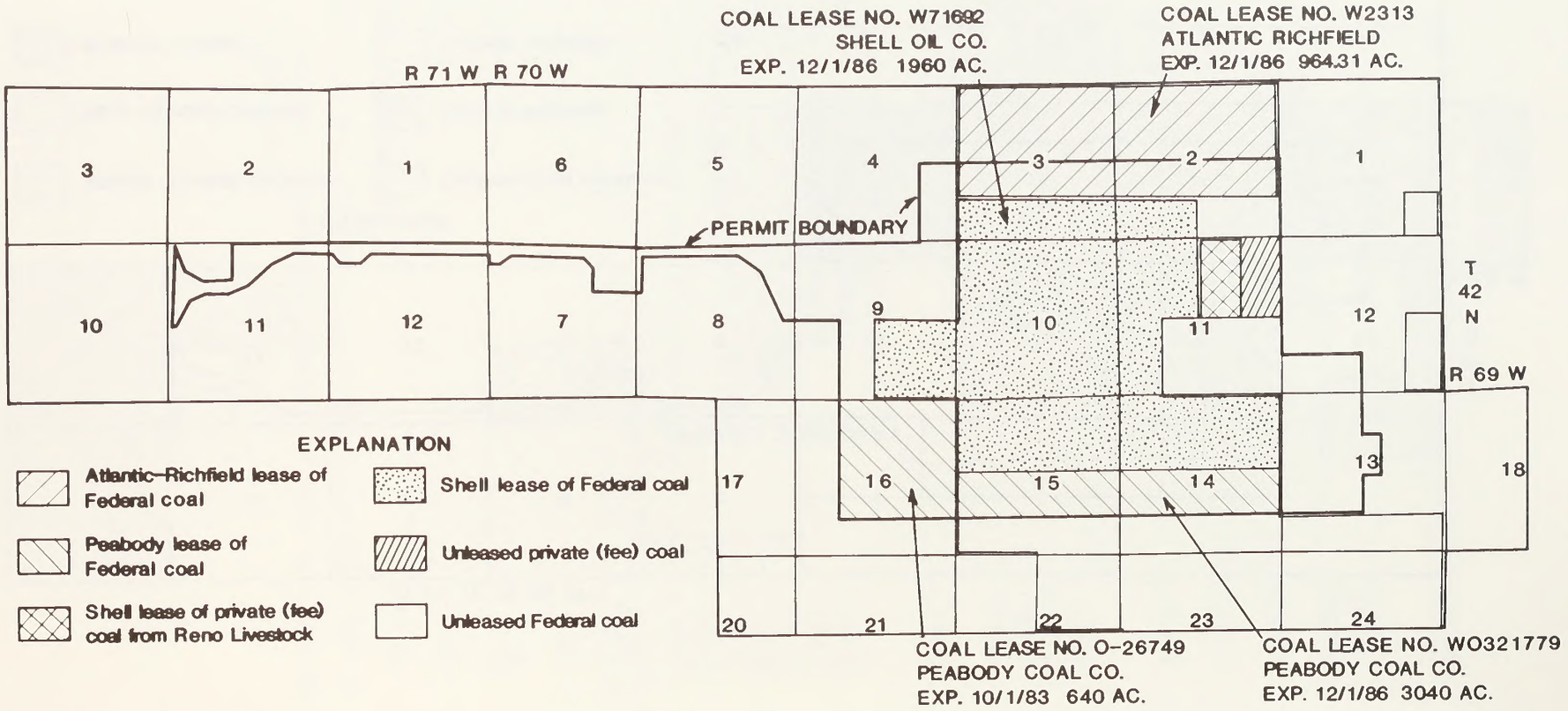


Figure I-3.--Coal ownership.

Table I-2.--Projected coal production, surface disturbance, and employment, North Rochelle mine

(Data furnished by applicant)

Year of operation	Coal production (million tons)	Area affected (acres)	Overburden removed (million bank cubic yards)	Area reclaimed (acres)	Average number of unit trains loaded per week[1]	Total employees (salaried and operations)[2]
[3]-2	---	[4]583.5	---	[5]207.3	---	[7]183
[6]-1	---	106.6	1.16	---	---	[7]299
1 (1985)	2	94.3	9.76	30.9	4	163
2	5	64.6	13.12	51.3	9	217
3	8	111.2	22.92	33.7	14	259
4	8	98.1	23.39	40.4	14	259
5	8	189.3	26.23	47.5	14	288
6 (1990)	8	208.3	21.08	64.8	14	271
7	8	151.6	23.54	80.5	14	283
8	8	104.8	26.16	67.4	14	298
9	8	92.9	26.90	69.5	14	301
10	8	80.3	23.41	126.4	14	283
11 (1995)	8	84.8	23.78	83.6	14	284
12	8	71.1	26.25	70.8	14	299
13	8	78.2	24.68	73.3	14	286
14	8	85.4	27.95	77.8	14	303
15	8	86.1	26.96	82.1	14	301
16 (2000)	8	84.1	27.85	78.2	14	303
17	8	76.1	29.77	76.8	14	329
18	8	81.3	32.29	80.8	14	341
19	8	82.6	30.91	77.1	14	339
20	8	83.5	32.30	78.0	14	339
21 (2005)	8	111.7	32.57	83.0	14	341
22	8	87.3	34.75	77.0	14	343
23	8	88.6	33.13	83.3	14	343
24	8	91.4	40.60	133.4	14	348
25	8	122.2	37.99	215.2	14	351
26 (2010)	6	71.4	30.33	[8]94.0	11	343
27	---	---	---	[8]195.5	---	223
28	---	---	---	[8]791.7	---	212
Total	197	3,271.3	709.78	3,271.3		

[1]Assumes 110-car unit trains.
[2]Includes both construction and mine employees.
[3]First year of construction.
[4]Includes 207.3 acres from the railroad corridor.
[5]The railroad corridor will be revegetated during the year of its construction.
[6]Second year of construction.
[7]Includes an annual average of 299 construction employees and 70 operations employees.
[8]Includes topsoil stockpiles.

During facility construction, in 1983, a FS stockwater reservoir (Thunder Basin No. 52 Reservoir, capacity of 41.22 acre-feet) would be relocated downstream about 1,000 feet from its present location to W½ sec. 9. The permanent water impoundment that would result from this relocation would have at least the same capacity. Both during the life of the mine and following reclamation, it would be available for wildlife and livestock use. During reclamation, all second-order and larger streams would be reconstructed to convey the 100-year, 24-hour flood, with a low-flow channel to convey the 5-year, 24-hour storm.

Trussler Creek would be diverted around the mine in 2005, when mining is scheduled to progress through its present location. This diversion would continue until 2012, at which time the creek would be restored to its approximate original location.

To minimize disturbances to wildlife, SOCM would allow wildlife continued access to water sources and would restore habitats of value to wildlife, such as rock-pile clusters, shrubland, and streamside vegetation. Fencing would be designed to facilitate deer and antelope movement.

SOCM has developed and submitted to the Wyoming Industrial Siting Administration a socioeconomic program to alleviate some of the impacts on Gillette and Campbell County. (See appendix A.) This program includes assistance in providing housing for construction workers, relocation assistance for permanent workers, reseller status on sales/use tax administration, and continuous impact monitoring through a Campbell County Chamber of Commerce industrial committee.

A more detailed discussion of the MRP is in appendix A.

OTHER ACTIVITIES IN THE AREA

A number of projects are presently proposed for the southern part of Campbell County and the northern part of Converse County, Wyoming, including the North Rochelle mine and three other coal mines. WyCoalGas, Inc., has abandoned its plan to build a coal gasification plant in Converse County. The Rochelle mine, proposed for construction by the Rochelle Coal Company (Pan Eastern Coal and Powder River Coal Company), would be located about 2 miles southeast of the proposed North Rochelle mine. The North Antelope mine, under construction by North Antelope Coal Company, is 5 miles south of the North Rochelle mine. The Antelope mine, under construction by Antelope Coal Company (NERCO), is about 9 miles south of the North Rochelle site. Two existing coal mines, Black Thunder (Black Thunder Coal Company) and Jacobs Ranch (Kerr-McGee), are located just north of the proposed North Rochelle site: the Black Thunder coal mine is 5 miles north-northwest of the site; the Jacobs Ranch mine is 2 miles east of the Black Thunder mine (fig. I-1). Table I-3 compares the four proposed and two existing coal mines. A discussion of the cumulative environmental impacts from all six mines is included in chapter IV. Cumulative impacts from the 22 existing or proposed coal mines in the eastern Powder River Basin are summarized to evaluate wider ranging socioeconomic effects. The Federal coal underlying the land between the North Rochelle and Rochelle permit areas is under lease to the Peabody Coal Company, but a permit application has not been submitted. In addition, Energy Transportation Systems, Inc. (ETSI), has proposed a coal slurry pipeline to link the coal mines of the eastern Powder River Basin to powerplants in Oklahoma, Arkansas, and Louisiana. Coal from the North Rochelle

Table I-3.--Comparison of the six mines proposed for or existing in the area

Mine (company)	County	Maximum production (million tons/year)[1]	Total acres disturbed[1]	Operating life of mine (years)[1]	Average number of unit trains loaded per week at maximum production	Average yearly construction workforce[2]	Average yearly operating workforce[2]
Proposed mines							
Antelope (NERCO)	Converse	12	5,494	29	23	231	437
North Antelope (NACC)	Campbell	5	2,685	39	10	207	165
Rochelle (Rochelle Coal Company)	Campbell	11	5,313	38	21	232	201
North Rochelle (Shell)	Campbell	8	3,271	26	14	220	287
Existing mines							
Black Thunder (Thunder Basin Coal Company)	Campbell	[3]20	8,946	[3]40	38	([4])	[3]500
Jacobs Ranch (Kerr-McGee)	Campbell	[3]15	4,464	[3]23	29	([4])	[3]250
Total		71	28,626		135	890	1,840

[1]From mining and reclamation plan.

[2]From report by Wyoming Industrial Siting Administration, 1981.

[3]From U.S. Bureau of Land Management, 1979a.

[4]Operating mine: no construction employment.

mine could be transported via this pipeline (U.S. Bureau of Land Management, 1981b), although at present there are no plans for doing so.

Other EIS's regarding projects in this area include the Bureau of Land Management (BLM) final EIS on coal leasing in the Powder River Basin, issued in December 1981, the BLM final EIS on the proposed coal slurry pipeline (ETSI), issued in July 1981, and site-specific EIS's on the proposed North Antelope and Antelope mines.

There are several producing oil and gas fields in the area. Oil and gas development will continue to be a major land use in the eastern Powder River Basin.

CHAPTER II

ALTERNATIVES

Alternatives to the development of coal resources in the eastern Powder River Basin have been previously analyzed in the regional analysis portion of the EIS's prepared by the BLM (U.S. Bureau of Land Management, 1974, 1979a), and in the final EIS on the Federal Coal Management Program (U.S. Bureau of Land Management, 1979b).

OSM has determined that two alternative potential decisions by the Secretary of the Interior on the MRP merit analysis in this EIS: alternative A, approval of the MRP as amended by stipulations (appendix B); and alternative B, disapproval of the MRP, or "no action." OSM has chosen alternative A as its "preferred alternative" and recommends that it be selected by the Secretary.

In addition to these two alternatives, a number of other alternatives were identified but were found not reasonable in the context of the proposed action. Underground mining, for example, would greatly reduce the recovery of the coal resource, would create additional safety problems, and would result in undesirable subsidence conditions. At present, neither a lease exchange for another tract nor further restrictions to the development of the permit area is indicated. Delaying approval until the demand for coal increases is more properly considered during leasing because of the due diligence clause in the lease. The BLM recently completed a sale of new leases in the Powder River Basin. There is no evidence that delaying approval would help the local communities meet socioeconomic impacts. Development of alternative energy sources and energy conservation are more appropriate for consideration on a national rather than site-specific basis. These evaluations have been made in the final EIS on the Federal Coal Management Program (U.S. Bureau of Land Management, 1979b). Any new alternatives discovered in course of review will be carefully considered.

ALTERNATIVE A: APPROVAL OF THE MINING AND RECLAMATION PLAN

Under alternative A, SOCM's MRP (summarized in chapter I and appendix A of this EIS) could be approved subject to agency-applied stipulations necessary to meet the State of Wyoming Environmental Quality Act, the requirements of SMCRA, the conditions of the lease, and all other applicable Federal laws (such as the Federal Land Policy and Management Act; the Mineral Leasing Act of 1920, as amended; the Endangered Species Act; the National Forest Management Act; the Bankhead Jones Farm Tenant Act; the Multiple Use/Sustained Yield Act; NEPA; the Archeological and Historic Preservation Act; the Antiquities Act; the Clean Air Act; and the Clean Water Act).

If SOCM meets the requirements listed below, together with those stipulated in appendix B, its proposed MRP would comply with the Wyoming Environmental Quality Act and SMCRA, and cumulative environmental impacts would be mitigated. The applicant must:

- Take three samples from the first 1.3 meters of the replaced overburden in each hole drilled to determine the suitability of the spoils for reclamation. If any unsuitable spoils are identified, the

density of the sample holes must be increased to 1-acre centers until the problem area is delineated.

- Bury all acid-forming, toxic, or other unsuitable material at least 4 feet below the topsoil layer and outside the drainage channels and flood plains.

- Submit a revised plan to mitigate impacts to wildlife. Specific mitigation procedures must include:

  - Committing to searching for blackfooted ferrets within 1 year prior to disturbing any prairie dog town;

  - Creating at least one impoundment per section and one rockpile cluster covering 5 to 10 acres per quarter section; and

  - Committing to not disturb any raptor nest during the active breeding and nesting season (February 1 through July 31).

- Commit to not disturb any previously unidentified cultural resource until it has been evaluated. Consult with the regulatory authority and the Wyoming State Historic Preservation Officer (SHPO) to develop and implement mitigation measures.

- Submit an analysis of potential drawdown in the overburden aquifer.

Appendix B gives the complete list of requirements stipulated.

Environmental impacts that would occur if alternative A is approved are described in chapter IV. The impacts analyses are based on the assumption that the additional requirements stipulated (appendix B) would be met by SOCM. If it appears, based on additional data, that other impacts would occur or that any of the impact analyses should be altered, a supplement to this draft EIS would be prepared and distributed for public comment.

FS must authorize any mine-related activities not covered by the lease by granting a special-use permit, and must consent to the provisions of the mine permit. Special-use permits would be needed for such land uses as the 69-kV transmission line, railroad spur, telephone line, topsoil and overburden stockpiles, mining scoria, drainage diversions, sediment ponds, fences, conveyor system, and the mine facilities. FS also would be responsible for any necessary changes in grazing permits or grazing allotment boundaries resulting from coal-mining operations.

ALTERNATIVE B: DISAPPROVAL OF THE MINING AND RECLAMATION PLAN (NO ACTION)

Under alternative B, 197 million tons of coal would not be mined and a peak construction workforce of about 299 and a peak permanent workforce of about 351 (based on producing 8 million tons per year) would not be employed at the mine. Those environmental impacts of mining discussed in chapter IV would not occur at the North Rochelle site.

If the MRP is not approved, SOCM would not receive any return on its investment in studying the North Rochelle minesite, preparing a mine plan, and applying for the necessary permits. The State and local governments would not receive the 50-percent share of the Federal coal royalties, which could be in excess of $3 million per year. Unless new sources of coal were mined elsewhere in Campbell County, the local governments would lose new sources of tax revenues and would not receive the assistance proposed by SOCM (appendix A).

CHAPTER III

DESCRIPTION OF THE AFFECTED ENVIRONMENT

The North Rochelle permit area is in Campbell County, northeastern Wyoming, about 45 road-miles south of Gillette, in an area that is typical of the semiarid Great Plains of the West. Following is a description of the environment and resources of that area. For additional information on the surrounding region consult the eastern Powder River Basin regional EIS's (U.S. Bureau of Land Management, 1974, 1979a).

TOPOGRAPHY

The permit area is located in the south-central part of the Powder River Basin at an elevation of about 4,500 feet. The western one-third of the permit area consists of low, rounded, gently sloping, relatively undissected hills; hills in the eastern two-thirds of the area are more steeply sloping and dissected. A prominent scarp lies along the burn line on the eastern edge of the permit area. Total relief is about 260 feet; the maximum relief at any spot is about 145 feet. The area is drained by Trussler Creek and its tributary, Olsen Draw, and by West School Creek and Holmes Creek. These creeks are either directly or indirectly tributary to Little Thunder Creek.

GEOLOGY

The Wasatch Formation underlies the general area, where the rolling hills result from weathering and erosion of the poorly consolidated clay, shale, and siltstone, which are interbedded with weakly cemented to well-cemented sandstone. The Wasatch Formation forms the overburden covering the lower Canyon seam of the Wyodak coal bed (fig. III-1). In the permit area, the overburden ranges from 110 to 290 feet thick and averages 207 feet thick; the coal ranges from 50 to 70 feet thick and averages 60 feet thick. A rider seam, varying from less than 1 foot to over 8 feet thick, and discontinuous over the permit area, contains some recoverable coal. Other coal seams are either too thin and discontinuous or too deep to be of economic value at this time. Where the coal has been exposed at the surface in the eastern part of the permit area, it has burned either partially or completely. The heat from this burning has baked the overburden into a highly oxidized, fused rock called clinker, porcellanite, or scoria. The coal and other strata dip gently about 1° W. toward the axis of the Powder River Basin. None of the strata is known to contain significant fossils.

The overburden is predominently shale and siltstone with lenticular sandstones. Lateral gradation of shale and siltstone into sandstone bodies makes correlation of units difficult. Two types of deleterious overburden occur: (1) fine-grained material with equivalent soil textures of silty clay or clay, which restricts root development and/or decreases rainfall infiltration, and (2) material whose chemistry is deleterious or potentially deleterious upon weathering. Textural analysis of the cores from ten test holes indicated an average of 47 percent clayey material. All ten holes had at least one sample with over 60 percent clay and seven had at least one sample with over 70 percent clay.

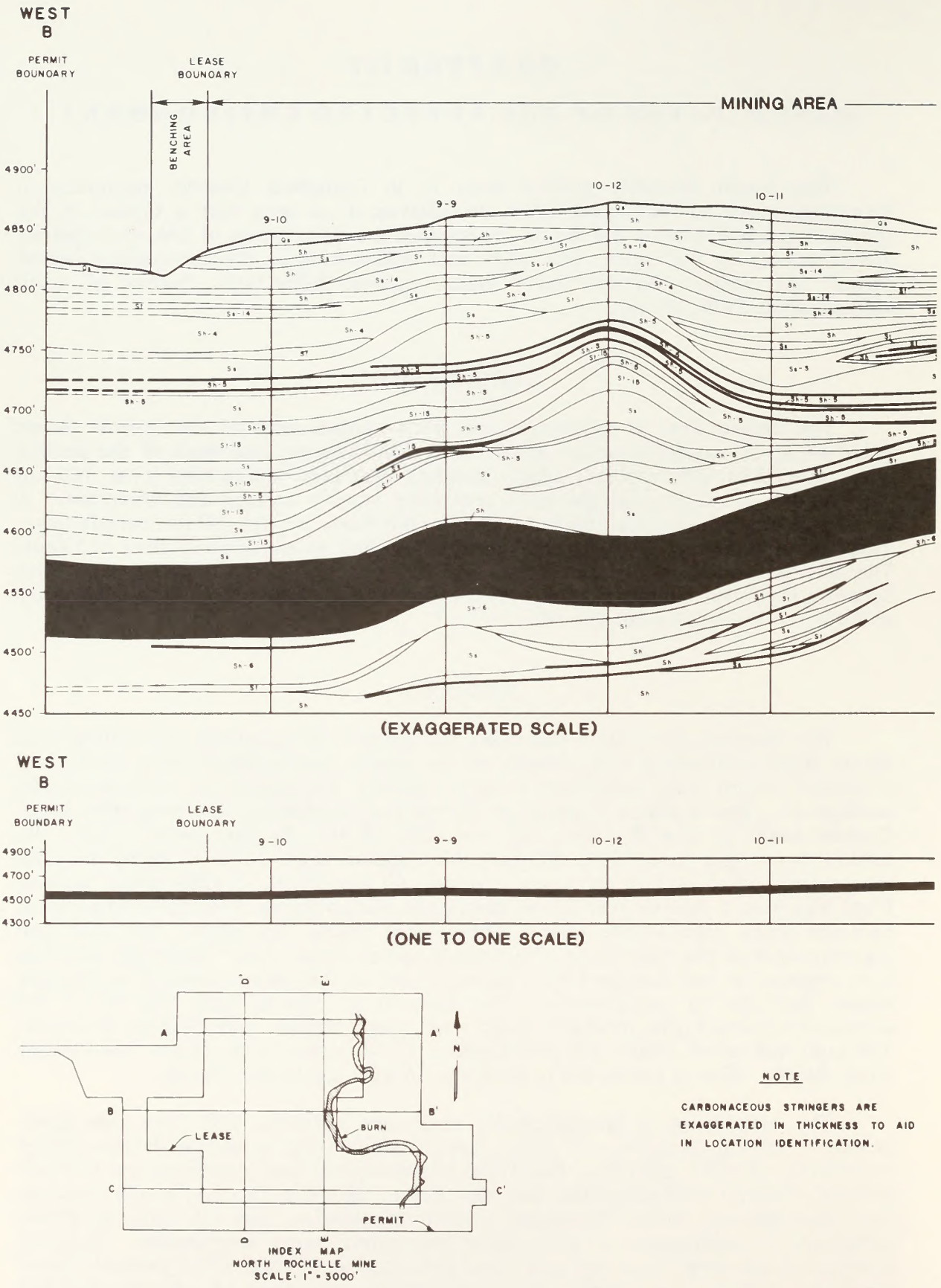
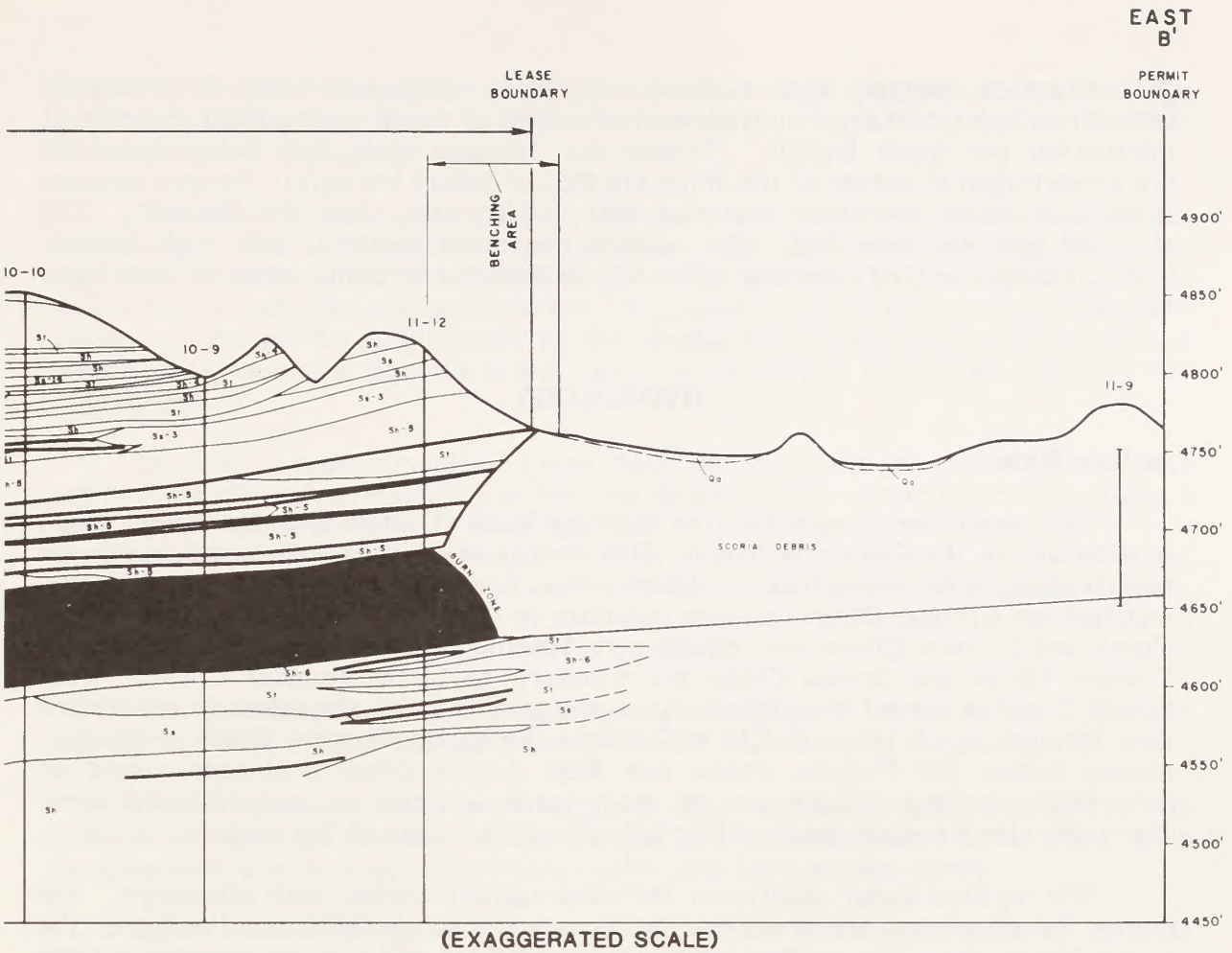
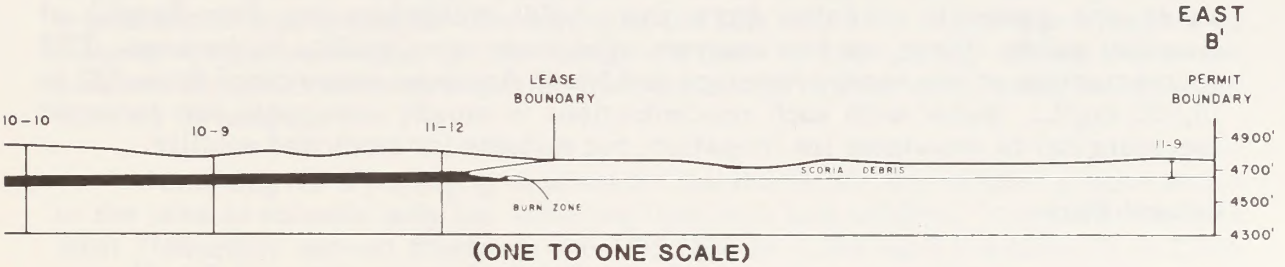


Figure III-1.--Geologic section. (Furnished by applicant.)



(EXAGGERATED SCALE)



(ONE TO ONE SCALE)

LEGEND

Ss = SANOSTONE

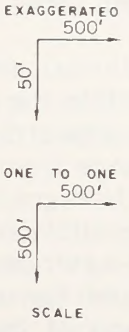
St = SILTSTONE

Sh = SHALE

Qs = QUATERNARY SEDIMENTS UNDIFFERENTIATED

Qa = QUATERNARY ALLUVIUM UNDIFFERENTIATED

NOTE: MAJOR LITHOLOGIES INDICATED NUMERICALLY



Chemical analyses were made on cores from twelve test holes. Five samples from three holes contained molybdenum in excess of the Wyoming DEQ standard (1 microgram per gram (µg/g)). Twenty-one samples from five holes contained nitrate-nitrogen in excess of the Wyoming DEQ standard (40 µg/g). Twelve samples from four holes contained material with acidity less than the Wyoming DEQ standard (pH less than 5.0). One sample contained material with high salinity (electrical conductivity greater than 8.0 millimhos per centimeter of saturation extract).

HYDROLOGY

Surface Water

The permit area lies within the drainage basin of Little Thunder Creek, which is tributary to the Cheyenne River. This area is drained by four small, north- or east-flowing, ephemeral streams: Olson Draw, Trussler Creek, West School Creek, and Holmes Creek. Olsen Draw is tributary to Trussler Creek, and West School Creek and Holmes Creek are tributary to School Creek east of the permit area. Trussler Creek and School Creek are tributary to Little Thunder Creek. West School Creek is almost completely within the permit area; the other three streams flow through it. A total of 5.11 mi^2 within the Little Thunder Creek drainage--mostly within the Trussler Creek and West School Creek drainages--would be disturbed by mining. There are ten stock ponds and two playas within the area. There are also six stock ponds within 0.5-mile downstream of the area.

The surface-water quality in the area usually varies with discharge: the higher the discharge, the lower the total dissolved solids (TDS) but the higher the suspended solids. The surface water is typically a calcium magnesium sulfate water and generally contains more than 1,500 milligrams per liter (mg/L) of dissolved solids. There are few analyses of stream-water quality in the area. TDS concentrations at the nearby Antelope and North Antelope mines range from 532 to 10,000 mg/L. Water with such concentrations is usually unsuitable for domestic use, marginal to unsuitable for irrigation, but suitable for stock and wildlife.

Ground Water

Within and adjacent to the permit area, ground water occurs in the alluvium, the scoria, the overburden, the coal, the underburden, and at depth within the Fort Union and other formations.

Alluvial deposits occur along West School Creek, Holmes Creek, and Olson Draw within the permit area, and along School Creek east of the permit area. The alluvial deposits within the permit area are interbedded with slopewash deposits. They range from 5 to 50 feet wide, and are up to 40 feet deep. The deposits are mostly fine-grained sand, silt, and clay. None of the six observation wells drilled into the alluvium yielded sufficient water to make an aquifer test, and, owing to natural water-level fluctuations, two of the wells did not always have enough water to sample for water-quality analysis. Based on these facts and on a visual inspection of the area, the alluvium within the permit area is not considered an important aquifer.

The scoria varies from extremely porous and permeable to very dense. In many places, there is less than 10 feet of saturation. The scoria occurs over about

775 acres within the permit area. Its principal hydrologic function is as a recharge area both for the coal aquifer, with which it forms a continuous aquifer, and for the area east of the permit area.

The overburden consists mostly of mudstone, with interbedded lenticular sandstones. Although it contains ground water, the overburden is not an important aquifer in the area. The sandstones generally are too discontinuous and fine-grained to be reliable sources of water. A ground-water divide running though the center of the permit area occurs in the overburden. East of the divide, ground water flows eastward into the scoria; west of the divide, flow is westward in the overburden.

The coal is approximately 60 feet thick and forms the principal aquifer in the area. Porosity and permeability in the coal depend on the amount of fracturing and jointing it has undergone. Most of the coal in the permit area has a low permeability, but studies have shown that there is a fracture zone of higher permeability running roughly east-west near the center of the permit area (fig. III-2). The coal is recharged mainly from the scoria. Ground-water flow is mainly to the west and southwest from the scoria (fig. III-2).

The underburden is very similar to the overburden. It is not an important aquifer, but acts chiefly to retard the downward movement of water.

Thick sequences of sandstone occur at depths of 1,600 and more feet in the Tullock Member of the Fort Union Formation. Ground water from these deep sandstones is used to supply the mines in the area with potable water.

There are no springs within the permit area. An area of seeps along West School Creek east of the area in the NW¼ sec. 12 is fed by water flowing from the scoria into a coal remnant. The spring in the SE¼ sec. 23 is in the upper reaches of Holmes Creek southeast of the area. Water in the spring comes from the overburden. Both areas are east of the scoria, and neither area would be affected directly by mining.

According to Wyoming ground-water standards, all the shallow ground water in the area is suitable only for watering livestock and wildlife. Constituents that most frequently exceed standards are TDS (800 to 3,700 mg/L), sulfate (9 to 2,300 mg/L), ammonia (less than 0.01 to 7.76 mg/L), aluminum (less than 0.1 to 1 mg/L), iron (less than 0.05 to 19.1 mg/L), and manganese (less than 0.01 to 10.7 mg/L). Other constituents that exceeded standards at one or more sites are boron, cadmium, chromium, fluoride, lead, mercury, zinc, pH, and SAR.

Ground water from the Tullock is of much better quality. It is slightly alkaline (pH of 8.4) and has a TDS content of 330 mg/L. The water is of the sodium bicarbonate type, and is slightly high in iron.

Of the 32 wells on or within 0.5 mile of the permit area, only 10 are used for watering livestock. The other 22 wells are used for monitoring water levels. Similarly, of the 100 wells within 3 miles of the permit area (including these 32), 22 are used for stock, 6 for stock and domestic supply, 1 for reservoir supply, and 99 for monitoring.

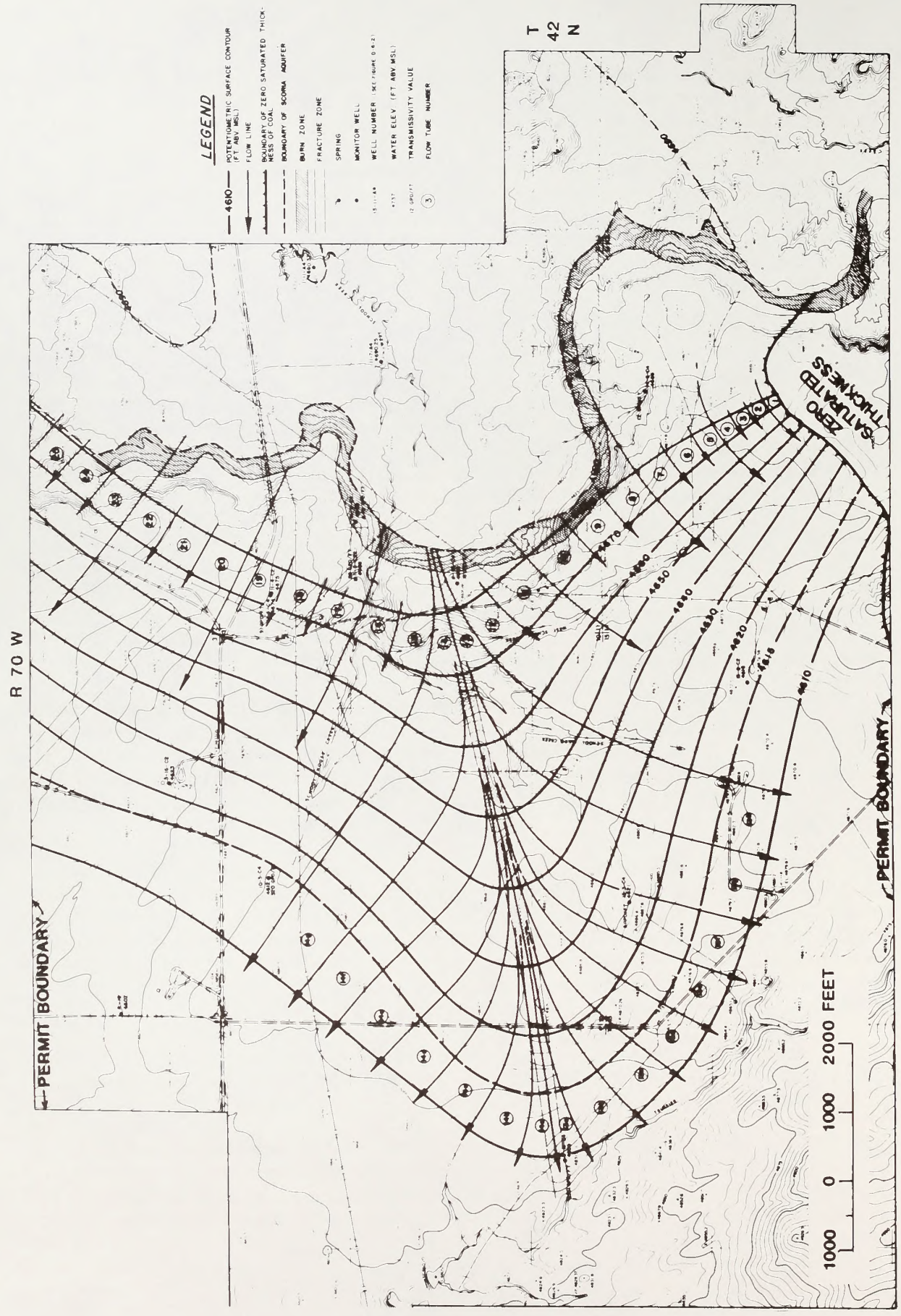


Figure III-2.--Potentiometric surface of the coal aquifer.
(Furnished by applicant.)

Water Rights

For the area within 3 miles of the permit area there are 160 ground-water rights on record with the Wyoming State Engineer's office, and 56 surface-water rights. Of the 160 ground-water rights, 32 are on or within 0.5-mile of the permit area; 22 of these 32 are for mine monitoring and 10 are for stock watering. Of the 56 surface-water rights, only 1 (Thunder Basin No. 52 Reservoir) is within the permit area. The 10 ground-water rights are for a total pumping capacity of 32.5 gallons per minute and the 1 surface water right is for a reservoir capacity of 41.22 acre-feet.

Alluvial Valley Floors

The applicant followed procedures outlined in Wyoming DEQ Land Quality Division Guidelines 6A and 9 to evaluate four areas within the permit area for alluvial valley floor (AVF) potential: West School Creek, Holmes Creek, Trussler Creek, and Olson Draw. As a result of the studies, the applicant concluded that there are no lands within the permit boundary that meet the criteria for an AVF. OSM and Wyoming DEQ concur with this conclusion. There is no evidence of flood irrigation activities along West School Creek, Trussler Creek, or Olson Draw within the permit area. An attempt at flood irrigation along Holmes Creek failed. There is no evidence of subirrigation activities along Holmes Creek, Trussler Creek, or Olson Draw. Less than 3 acres along West School Creek are subirrigated, and Wyoming DEQ agrees that the area does not qualify as an AVF. (See appendix C.) In most of the area, the streamlaid deposits that hold ephemeral streams are of too narrow an extent (less than 50 feet) to be mapped as an AVF.

Two areas east of the permit boundary do qualify as potential AVF's. West School Creek shows evidence of subirrigation from just outside the permit boundary downstream to the junction with School Creek. The source of the water for subirrigation appears to be the area north of the creek and the scoria hills to the south. In addition, a small area in the southeast corner of sec. 1 has been cultivated in the past.

Areas of subirrigation occur along School Creek from about 0.5 mile south of the permit boundary downstream past the junction with West School Creek. The water for subirrigation seems to come from the alluvium along School Creek. Water from Holmes Creek is used to flood irrigate a small area along School Creek near its junction with Holmes Creek.

CLIMATE

Climate of the region is semiarid and windy. Average annual precipitation is 13 inches (National Oceanic and Atmospheric Administration, 1965, 1973), occurring mostly as thunderstorms and varying greatly from one locality to another as the terrain becomes complex. About 50 percent of the precipitation falls during April through June, and 75 percent during April through August. Precipitation is least during December, January, and February. Hailstorms, the most destructive storms affecting the area, occasionally occur during periods of thunderstorm activity in summer. Snowpacks are scanty, with average snowfall only about 30 to 40 inches, and there is seldom any snowmelt runoff. Potential evapotranspiration at Douglas (the nearest site for which data are available) is 23 inches a year (National Oceanic and Atmospheric Administration, 1969).

This section of Wyoming is very windy, with frequent periods of 30- to 40-mile-per-hour winds and gusts to 50 and 60 miles per hour. Average annual windspeed is about 10 miles per hour. The dominant winds are from the west-southwest to north-northwest, with a secondary flow from the southeast during the summer.

Diurnal and annual temperature variations are great. Summer daytime temperatures typically reach the eighties and nineties; July's average is 71° F. Winter temperatures average in the twenties; January's average is 22° F. The mean annual temperature is 45° F. The growing season (frost-free days) averages about 110 days, beginning in mid- to late May and ending in mid- to late September.

AIR QUALITY

General air quality at the minesite is well within State and Federal standards. The only pollutant of any concern with respect to potential air-quality problems is total suspended particulates (TSP), primarily generated as fugitive dust (not emanating from a stack or any other functionally equivalent opening).

Baseline monitoring of TSP at the North Rochelle site was begun in September 1980. Data from 86 TSP samples are available for September 1980 through August 1981. These data show 24-hour TSP concentrations ranging from 1 microgram per cubic meter ($\mu g/m^3$) to 91 $\mu g/m^3$. The geometric mean of the 86 samples was 15 $\mu g/m^3$. The State annual geometric standard of 60 $\mu g/m^3$ and the 24-hour standard of 150 $\mu g/m^3$ were not exceeded during the baseline sampling period.

Monitored TSP were found to be representative of data collected from other rural TSP monitoring stations in the Powder River Basin area of Wyoming. (See table III-1.) Particulate concentrations would be expected to increase at or near the minesite (as has occurred at particulate monitoring sites Jacobs Ranch 2 and Black Thunder east) as a result of increased surface activity due to mining operations.

SOILS

The soils within the proposed permit area are shown in plate 1 (in pocket). About 14 percent of the 3,271 acres that would be disturbed by mining and associated activities is classified as having shallow or very shallow soil. For the same area, about 85 percent of the soils is moderately deep or deep and about 1 percent is rock outcrop. The surface texture of the soils varies from clay loam to sandy loam, with loam or sandy loam predominating over about 82 percent of the area. About 58.5 percent of the soils is sandy throughout salvage depth. The soils are usually calcareous, forming in colluvium, in residuum, and, to a very minor extent, in alluvium. There is no prime farmland within the permit area (appendix D).

All soil within the permit area except the rock outcrops contains at least some suitable topsoil material. Soil suitable for reclamation ranges from about 2 to about 60 inches in depth and is sufficient to cover the recontoured overburden to an average depth of about 28.7 inches. The best sources of topsoil in the area are

Table III-1.--Total suspended particulates

(Data are in $\mu g/m^3$)

Proposed site	Year	Annual geometric mean	24-hour maximum [1]	Second highest
Antelope 1a	1979	20.5	130	-
Antelope 1b	1979	20.0	130	-
Antelope 2	1979	16.5	48	-
North Antelope/ Rochelle	1980	15.5	73	-
North Rochelle	September 1980 through August 1981	15.0	91	53
Black Thunder north	1979	26.0	136	108
Black Thunder east	1979	122.0	1,065	412
Jacobs Ranch 1	1979	16.0	66	55
Jacobs Ranch 2	1979	45.0	818	245
Jacobs Ranch 3	1979	15.0	73	60

[1] State standard is 150 $\mu g/m^3$.

those soil mapping units which yield more than 30 inches of topsoil. These units are the Olney, the Maysdorf, the Maysdorf-Pugsley complex, the Olney-Briggsdale complex, and the Briggsdale. The reclaimed areas may need to have nutrients added for successful revegetation.

VEGETATION

The six vegetation types identified in the permit area are shown in plate 1 and are summarized in table III-2. The vegetation is predominantly a mixed grass prairie dominated by western wheatgrass, needle-and-thread grass, and blue grama grass. Low-growing shrubs occur in very low to moderate densities in all vegetation types; only two vegetation types--big sagebrush and rough breaks--are classified as shrublands. Sagebrush, rubber rabbitbrush, broom snakeweed, and saltbush are the major shrub species in the permit area. Fewer than 10 trees--plains cottonwood and Russian olive--occur on the permit area.

WILDLIFE

The 4,587-acre North Rochelle permit area contains several types of wildlife habitat common to this portion of the Powder River Basin. By percentage of occurrence on the permit area, these habitat types are grassland (51.7 percent), sagebrush (27.9), rough breaks (5.1), playa (1.1), riparian (1.4), agricultural land (10.6), land disturbed by mining (2.4), and ponds and/or reservoirs (0.03). The dominant wildlife species are those adapted to the open sagebrush and grassland habitats.

SOCM's field surveys of the North Rochelle site were conducted in compliance with Wyoming Game and Fish Department's requirements for wildlife surveys in Wyoming. See appendix E for a description of these requirements and of SOCM's method of compliance with them.

Pronghorn antelope and mule deer were the only big game species observed on the North Rochelle permit area. Elk were seen several miles east of the proposed minesite but habitat preferred by elk does not exist on the permit area. Pronghorn abundance and affinity for North Rochelle habitat were estimated from pellet group counts and from road and aerial surveys. The greatest number of pronghorn seen from the air was 176 animals during a 2-day survey in February 1982. The greatest ground count was 66 animals in November 1982. Pellet group counts and road surveys indicated an antelope preference for sagebrush, grassland, and the ecotone between the two. Surveys did not reveal that antelope concentrations varied significantly according to the seasons of the year. Only 6.5 percent of the North Rochelle permit area contains habitat preferred by mule deer. Just one deer was seen during road counts; a maximum of six were seen during aerial surveys.

Medium-sized mammals observed on the site include coyote, red fox, bobcat, striped skunk, cottontail rabbit, jackrabbit, and long-tailed weasel. Coyotes and foxes were sighted in grassland habitat, whereas cottontails and jackrabbits were most often sighted in both grassland and sagebrush habitat.

Raptors observed in the North Rochelle area include rough-legged, ferruginous, red-tailed and Swainson's hawks, turkey vultures, kestral, prairie falcon, and

Table III-2.--Vegetation on the North Rochelle minesite

Vegetation type	Acres to be disturbed	Percent of disturbed area	Percent cover	Production (lbs/acre)	Shrub density (individuals/ acre)	Animal unit months[1]	Cattle supportable each year
Mixed grass prairie	1,698	51.9	32.2	652	---	424.5	35.4
Bunchgrass	31	1.0	20.4	404	---	7.8	0.7
Big sagebrush shrubland	750	22.9	34.9	952	[2]6,726	11.52	9.4
Streamside meadows	32	1.0	56.2	1,842	---	32.0	2.7
Playa grassland	47	1.4	19.9	673	---	11.7	1.0
Rough breaks shrubland	184	5.6	18.4	542	[2]5,128	18.4	1.5
Total or mean	2,742	[3]83.8	[4]31.9	[4]738	[2, 4]2,181	606.9	50.7

[1]Figures for animal unit months/acre were obtained from Soil Conservation Service range site descriptions.

[2]Density figures are for all height classes combined.

[3]The remaining 16.2 percent of the proposed disturbance area consists of agricultural land (425 acres or 13.0 percent), previously disturbed land (103 acres or 3.1 percent), and a reservoir (1.0 acre or 0.03 percent). Thus, the total acreage of land disturbed is 3,271 acres.

[4]This composite mean is determined from the acreage-weighted means of each vegetation type.

golden and bald eagles. The only active nest found within the permit area belonged to a red-tailed hawk. Golden eagles were observed year-round but no nests were found within the permit area.

Mallard, gadwall, widgeon, shoveler, and green-winged teal are the waterfowl species observed on the site. Of these, only mallard were confirmed to breed there. Other game birds species sighted include mourning dove and sage grouse. Mourning doves breed on the site. Aerial surveys could locate no sage grouse leks. Pellet counts for sage grouse confirmed their very infrequent use of the North Rochelle site.

Deer mice were captured most often during small mammal surveys but the grasshopper mouse, olive-backed pocket mouse, prairie vole, Ord's kangaroo rat, thirteen-lined ground squirrel, and black-tailed prairie dog were also observed. Deer mice were caught in and apparently inhabit all habitats; however, slightly more were caught in the rough breaks habitat.

Twenty-eight species of songbirds were observed on the North Rochelle site. The greatest diversity of breeding birds occurred in the riparian habitat, whereas the greatest abundance of breeders occurred in both riparian and grassland habitats.

Of the eighteen herptile species potentially inhabiting the proposed minesite, only the short-horned lizard, plains garter snake, and chorus frog were found during surveys.

Fish sampling efforts on the North Rochelle site failed to produce any specimens, indicating that aquatic habitat on the site is not suitable for fish. The ephemeral nature of these waters, as well as livestock use of them, prevents establishment of fish communities.

Threatened and endangered species that may occur in the area are the bald eagle, peregrine falcon, and black-footed ferret. Bald eagles are winter residents in the area; however, their nearest roost is some 2.5 miles east of the North Rochelle site. Peregrine falcons are migrants through this area but none was seen during field studies. Only one prairie dog colony occurs within 2 miles of the permit area and surveys did not discover any evidence of black-footed ferrets in this colony. The U.S. Fish and Wildlife Service's (USFWS's) biological opinion of impacts on these species is noted in chapter IV.

LAND USE

The North Rochelle permit area is currently used for stock (cattle and sheep) grazing, wildlife habitat, oil and gas production, sightseeing, and hunting. The area provides sufficient forage for about 120 animal units (one unit equals one cow or five sheep). Approximately 15 percent of the proposed permit area is administered by FS as the Thunder Basin National Grassland. There is a proposal for another surface mine within about 3 miles of the proposed North Rochelle site, and two mines are under construction within 10 miles. Drilling for oil, gas, and water has occurred and is occurring on the minesite.

Several uses have been authorized by special-use permits on lands within the permit area that are administered by FS. These include:

- Mountain States Telephone and Telegraph Company, buried telephone cable through secs. 8 and 9, T. 42 N., R. 70 W. and secs. 11 and 12, T. 42 N., R. 71 W.;

- Belle Fourche Pipeline Company, buried crude oil pipeline through sec. 9, T. 42 N., R. 70 W.;

- Tri-County Electric Association, Inc., overhead distribution line through sec. 12, T. 42 N., R. 70 W.;

- Phillips Petroleum Company, 4-inch high-pressure buried gas pipeline through sec. 11, T. 42 N., R. 71 W.;

- Ladd and Lukowizc, access road to an oil well through sec. 8, T. 42 N., R. 70 W.;

- Apco Oil Corporation, access road to an oil well through secs. 9 and 15, T. 42 N., R. 70 W. (Champlin Petroleum also uses this road for access to wells south of the permit area.)

SOCIOECONOMICS

The information presented in the socioeconomics sections of chapters III and IV of this EIS is derived from SOCM's Industrial Siting Application for the North Rochelle mine, which was submitted to the Wyoming Industrial Siting Administration on June 7, 1982. Data also frequently reflect the "1981 Campbell County Monitoring Report," prepared by Browne, Bortz, and Coddington in February 1982 for the Campbell County Monitoring Association.

SOCM's MRP assumes that no North Rochelle mine employees would reside in Newcastle or in Weston County. However, the Wyoming Industrial Siting Administration and OSM believe the some mine employees would reside in Newcastle/Weston County because of easy access from the city and county to the mine over paved Highway 450 and because of the availability of housing in both Newcastle and Weston County. Therefore, potential impacts to these areas from the North Rochelle mine are addressed below.

Campbell County, Campbell County School District No. 1, the city of Gillette, the unincorporated town of Wright, Weston County, Weston County School District No. 1, and the town of Newcastle are the local governments or areas that would be primarily affected by development of the proposed North Rochelle mine because of the location of the access road and the company's proposed transportation and housing program. (See appendix A, assistance to the community.)

Population and Employment

The population of Campbell County has increased approximately 142 percent from 12,957 in 1970 to an estimated 31,400 in 1981. Similarly, the population in Gillette has increased approximately 108 percent, from 7,194 in 1970 to an estimated 15,000 in 1981. Both units of government are expected to continue growing during the next decade. Campbell County is expected to have a population of 45,583 by 1990; 21,971 of these persons are expected to reside in Gillette. The

labor force has increased approximately 236 percent from 4,933 in 1970 to an estimated 16,600 in 1981.

The unincorporated town of Wright was established by the Atlantic Richfield Company in 1976 as a planned community development. Currently, Wright has a population of 1,400. Local officials anticipate and encourage growth to at least the designed 1,900 dwelling units.

Weston County has experienced far less growth than has Campbell County. The population of Weston County grew from 6,307 to 7,106 during the last decade, an increase of 12.7 percent. Population in the town of Newcastle increased only 4.8 percent during the same period, from 3,432 to 3,596. Most of the growth in Weston County has occurred in the rural area surrounding Newcastle.

It is generally accepted that the major impetus for growth in Weston County is the job opportunities for individuals willing to commute to Campbell County. Based on recent trends, 130 individuals are expected to move into Weston County and commute to the mines in Campbell County during the next 5 years. These basic employment positions would increase the labor force by 230 individuals; they would also result in an increase of 190 households, a population increase of 540, and an increase of 120 school-age children. These people would probably reside in Newcastle or the rural area surrounding Newcastle.

Data regarding personal income at the county level are available from Bureau of Economic Analysis's Regional Economic Information System (REIS) and the Wyoming Employment Security Division. Total proprietor and labor income in Campbell County grew from $60.3 million in 1974 to $343.0 million in 1981, an increase of 469 percent. Per capita income grew from $5,337 in 1974 to $10,766 in 1979, an increase of approximately 102 percent. The average per capita income in Wyoming in 1979 was $9,630.

Housing

The number of dwelling units in Campbell County increased 141 percent between 1970 and 1980, from 3,937 to 9,505. As of December 1981, the overall vacancy rate had increased to 4.5 percent from 1.8 percent in July 1981, even though vacancies normally decrease in winter.

There is no shortage of available building spaces in Campbell County. Developers have firm plans to build 4,900 units in the next 2 years. The potential supply exceeds the anticipated demand, but problems persist in the availability and cost of loans and mortgage money. Financing problems are being alleviated somewhat by channeling proceeds from municipal bonds and State permanent funds into mortgage loans.

Government Administrative Facilities

The Campbell County Courthouse was remodeled in 1972 and expanded recently to provide adequate administrative office space through 1990. The Gillette city government is currently housed in the old city hall and the remodeled post office. The city has tentative plans to construct a new administrative building in downtown Gillette. However, the $4 million required to fund construction has not been committed.

The Weston County Courthouse was built in 1910 and is very cramped. In particular, the need for administrative office space is pressing. During 1982, the county will begin construction of a city-county law enforcement facility as well as an addition to the library. The county hopes to pay for these facilities with the $1.5 million bond issue passed this fall, applying to the Wyoming Farm Loan Board for a matching grant. Any excess space would be available to lease for administrative offices.

The administrative office in Newcastle is currently filled to capacity, but there are no immediate plans to expand the city hall. The Newcastle City Hall currently houses city and county law enforcement facilities along with administrative offices. After construction of the city-county law enforcement facility is completed, the vacated space will be used for administrative offices.

Funding for most services in the impacted areas generally has been adequate in the past, consisting of a mix of Federal, State, and local funds. With the recent cuts in the Federal budget, the local governments may have difficulty in financing needed expansions unless other sources of money become available.

Wastewater Systems

The city of Gillette is planning to build a new sewage treatment plant designed to treat 3.85 million gallons per day (gal/day) and serve a population of 35,000. Design for this plant should be completed in 1982. Due to recent cuts in the Federal budget, it appears that the city will be forced to find other sources of funding, including increased user and connection fees, for this plant. Since it does not appear to be one of Wyoming's high-priority projects, funding for it will likely not be provided before the expanded facility is actually needed. Campbell County and the city of Gillette have agreed to establish a plan for an area-wide wastewater treatment system, but to date Wyoming DEQ has not accepted this intergovernmental agreement.

The existing sewage treatment facility in Wright is capable of handling a population of more than 2,500. The facility, maintained and operated by the Wright Water and Sewer District, is part of a staged design and can be expanded readily to handle additional flows. No problems are anticipated.

The existing sewage treatment facility in Newcastle does not meet applicable wastewater treatment standards at this time, and the town is under a compliance schedule to upgrade the facility. Newcastle will have to find some source of funding for the new sewage treatment facility, estimated to cost about $1 million.

Water Systems

In 1981, the city of Gillette completed construction of a new water supply system which will provide the city with a total supply of 8.8 million gal/day. This should be adequate to meet the community's needs through 2000.

The Wright water system is capable of producing approximately 86,000 gal/day of chlorinated water. The existing system is estimated to be capable of handling a population between 2,500 and 3,500. The system is maintained by the Wright Water and Sewer District and can be readily expanded to handle additional growth.

The town of Newcastle obtains 3.2 million gal/day from artesian wells in the Madison Formation. Based on current user rates, the existing system appears to be adequate to handle the community's demands through 1992. Newcastle has a storage capacity of 2.5 million gallons, which exceeds requirements for emergency and fire reserves. However, the town anticipates a need for additional storage, owing to the high peak demand in the summer months for the refinery and golf course. The $1.5 million required to fund construction has not been committed.

Solid Waste Disposal

The sanitation division of the Gillette Public Works Department provides weekly garbage collection services for the community. In addition, two private haulers serve parts of the county, including Wright. Campbell County operates a new, $1 million baling, transfer, and recycling facility which processes solid waste from Gillette and the entire county. Negotiations are underway to acquire a surface coal mine near Gillette as a new disposal site for baled solid waste.

The town of Newcastle makes weekly garbage collections and operates a 40-acre solid waste landfill open to county residents. The landfill meets all applicable regulations but is expected to reach capacity somewhere between 1982 and 1983. The town currently is in the process of procuring and developing a new solid waste landfill which will have enough capacity to last more than 30 years.

Law Enforcement

The Campbell County Sheriff's Department has 30 full-time sworn officers and 19 other support personnel, or about 1.8 officers per 1,000 rural residents. The department occupies 5,000 square feet in the county courthouse and maintains a rural substation in Wright. The courthouse expansion, planned for 1981-82, will increase the administrative space available to the department to a level adequate to serve the department through 1990. The county jail has a capacity for 38 prisoners, and average occupancy in 1981 was about 90 percent.

The Gillette Police Department presently employs 29 full-time sworn officers, about 2 officers per 1,000 population, and 13 support personnel. The department is presently housed in the basement of the city hall. Additional space will be available when the city moves to the new administration building. The department has jail facilities for overnight prisoners but depends on county facilities for all other prisoners.

The Weston County Sheriff's Department provides primary police protection in the unincorporated portions of Weston County and support for the Newcastle and Upton Police Departments. The sheriff's staff includes an undersheriff, three deputies, and a secretary. The sheriff feels that one or two additional officers will be needed in the immediate future. The Sheriff's Department is housed, along with the Newcastle Police Department, in the basement of the city hall. The county jail was condemned in 1977, and the two departments have had to share facilities since then. Office space is very cramped, and the jail facilities are not adequate to meet the needs of both the city and county departments. A $1.5 million bond issue was passed in 1981, which allocated $750,000 for construction of a new law enforcement facility. Jail facilities are to be built first. Construction will start if the county's request to the Farm Loan Board for $550,000 is approved.

The Newcastle Police Department has a staff of 17, and the police chief is requesting two additional positions in the upcoming budget year. The city jail, which the department shares with the county, has a capacity of 10, with no separate facilities for women and juveniles. This jail is normally near capacity, forcing the department to transport prisoners to Sundance or Gillette.

Fire Protection

Fire protection in Campbell County, Gillette, and Wright is provided by the Gillette-Campbell County Fire Protection Joint Powers Board. Facilities maintained by the department include a main station and three substations in Gillette, a substation in Wright, and other substations throughout the county. The department operates on a volunteer basis. According to standards developed by the National Board of Fire Underwriters, the pumping capacity available in the Gillette and Wright areas is adequate to serve the city and adjacent fringe areas. Gillette's fire insurance rating is 7, an excellent level for an area served by a volunteer fire department. A county-wide ½-mill levy provides an adequate operating budget for the department. Joint city-county funding would be required for capital improvements.

Weston County provides financial support and some equipment to the Newcastle, Upton, and Osage Fire Departments for fighting fires in the rural areas surrounding their localities. In addition, the county has more than 50 pieces of fire-fighting equipment distributed throughout the county, generally on ranches. Most of the department's equipment is in good condition, but three additional pumping units are needed.

The county recently built a new fire station on the county fairgrounds in Newcastle. The station also houses the Newcastle Fire Department and should be adequate for a number of years. Newcastle has a 40-member volunteer department. The fire chief feels that the present number of volunteers and equipment will be adequate for the near future.

Health Care Facilities

Campbell County and the city of Gillette are presently served by the Campbell County Memorial Hospital, a new 52-bed facility completed in 1980. The hospital board hopes to build a 65-bed addition with the $12.5 million bond issue passed in 1981. This new addition could be finished by 1983. Wright has an ambulance service, and the bond issue for the hospital addition includes provisions for equipment at the Wright Clinic.

Campbell County currently has 23 physicians and 8 dentists. According to Wyoming State standards, there is a current need for an additional 8 physicians and 14 dentists. The lack of dentists is so acute that Campbell County has been designated a "Severe Shortage Area" by the Department of Health and Human Services. The community hopes that the new hospital facilities will prove beneficial in recruiting additional physicians. However, the recruitment of dentists appears more difficult.

The Northern Wyoming Mental Health Center maintains a branch office in Gillette to provide inpatient, outpatient, and emergency care services through a staff of six professionals and two consulting psychiatrists. Steady expansion of services and facilities has been necessary to accommodate the growing case load at

the center. Federal funding (less than 30 percent of revenues) is expected to wane after fiscal year 1982.

The Weston County Memorial Hospital is the primary general health care facility in the county. The 30-bed facility experienced declining occupancy rates over the past decade. In fiscal year 1980, the hospital's occupancy increased by nearly 25 percent; this occupancy rate has been maintained throughout fiscal year 1981. The hospital's board of trustees has recently accepted a consultant's report recommending construction of a new hospital. The new hospital would have approximately the same number of beds as does the present facility but would have expanded outpatient facilities and other improvements. Estimated cost of the facility is $5.5 million. To obtain funding for its construction, a special county hospital district may be formed, with authority to incur debts and to levy property taxes. Individual firms in the county would have to back petitions to the Weston County Commissioners in order to establish such a district.

Weston County currently has three full-time physicians and one semi-retired practitioner. A committee has been formed to recruit at least two additional doctors. At present, there is an adequate number of other health care professionals in the area.

The Northern Wyoming Mental Health Clinic of Weston County is located in Newcastle and has an adequate staff of three professionals. The clinic is housed in a 2,500-square-foot building which should be adequate for a number of years.

Recreation

Campbell County maintains the Gillette Recreational Center, the Bi-Centennial Park, three small parks, and the recreation center in Wright. The city of Gillette provides several parks and other recreational facilities for local residents. The Campbell County Parks and Recreation Department has approached the school district for use of the 1.0 mill levy for parks and recreation. If they receive this 1-mill levy, they should have adequate sources of revenue to provide for recreational facilities throughout Campbell County. Recreation and park budgets for both Campbell County and Gillette have increased steadily, supplemented by a local-option 1-percent sales tax. Future recreation space is ensured by city/county land dedication requirements imposed on real estate developments. Energy companies have made notable contributions to recreation facilities: in 1981, SOCM gave $45,000 to Gillette's Adopt-a-Park program; in 1978, ARCO and Kerr-McGee donated the Wright Recreation Center to Campbell County.

Newcastle has three public parks which total 9.4 acres. The parks are maintained by three to four seasonal employees. There appears to be a definite need for certain types of recreational facilities in Newcastle, particularly baseball fields and an indoor recreation center. A city recreation complex has been recommended for a number of years, but other city projects have taken precedence.

Library Facilities

The Campbell County Library is located in Gillette, with branch facilities in Wright and Recluse. A new 31,000-square-foot facility being built in south Gillette should be adequate to serve the needs of the population in the foreseeable future.

The Weston County Library system includes the main library in Newcastle and a branch library in Upton. Expansion of the main library in Newcastle is scheduled to begin in 1982, financed by a $650,000 bond issue approved in November 1981.

Education

Campbell County School District No. 1 encompasses all of the county and has a design capacity for 7,422 students. The district has pursued an aggressive building policy during recent years and has demonstrated its ability to keep up with demand. The district enrolled 6,492 students during school year 1981-82; it has capacity to enroll an additional 930 students. Under the current system of financing, the school district should have sufficient resources available for both operating and capital facilities budgets. Because of county-wide unification, Gillette has profited from increased property values of energy projects in rural Campbell County. From 1970 to 1982, the district's assessed valuation increased over 1,000 percent from $72 million to $999 million. However, the district's favorable financial position may change when the new school equalization program becomes effective in July 1983.

The Newcastle area is served by Weston County School District No. 1, which also serves the southern half of Weston County. At present, the district has excess capacities at all grade levels and could accommodate approximately 350 additional students; it currently receives about 30 percent of its funding from the State School Foundation Program. The legislature's action equalizing school funding in Wyoming could be beneficial to Weston School District No. 1 because of its low assessed valuation.

Government Finance

Assuming that the range of services offered by Campbell County remains at the present levels, the county appears to be in excellent fiscal condition. Oil and gas production, as well as increased coal production, will more than double its assessed valuation in 4 years. Therefore, fiscal problems are not anticipated for the Campbell County government.

The city of Gillette finances its governmental functions and services through three separate budgets: the operating budget, the budget for capital facilities, and the enterprise funds budget. With the expected changes in operating revenues (as, for example, a decrease in the proportion of county-wide sales and use tax revenues), it is anticipated that the operating budget for the city of Gillette would experience a deficit each year under present conditions. This will result in the elimination or reduction of some services each year rather than deficit spending.

Weston County appears to have sufficient revenue sources to cover future operating budgets, but the financing of several necessary capital facility projects is in doubt. Major projects include an expansion of the courthouse, construction of the city-county law enforcement facility, expansion of the main library in Newcastle, and construction or renovation of the county hospital. Even if the county uses its entire debt capacity of $1.5 million, and directs all anticipated oil and gas severance tax receipts to these projects, a substantial amount of outside funding will still be needed.

Newcastle's anticipated revenue sources for operating budgets are expected to be only marginally adequate in the future. Funding for a number of major capital facility projects may be difficult to obtain. Although new capital facility items have been identified as needed for a number of years, their costs may continue to be prohibitive.

Both counties and municipalities will be receiving such revenues attributable to energy development as severance tax payments from oil and gas, mineral royalties, and newly legislated impact-assistance payments. While these special revenue sources supplement local sources, it does not appear that they will cover projected budgetary shortages, particularly for Gillette and, in general, for the capital facility needs throughout most of the impacted area.

TRANSPORTATION

Access to the North Rochelle mine would be by the Reno County Road via State Highway 59 and the Verse-Hilight Road and by School Creek via Highway 450 (fig. III-3). Traffic on the Verse-Hilight Road is currently moderate to heavy; traffic on the Reno County Road is moderate. Traffic on both roads will increase substantially with the proposed coal mines and other energy developments. Traffic on State Highway 59 near the permit area averaged about 940 vehicles per weekday in 1978. Usage of this road, portions of which have been upgraded by the State, is expected to increase as a result of energy development.

Burlington Northern Railroad is the only coal-hauling transportation system currently serving the eastern Powder River Basin. Burlington Northern's line runs from Donkey Creek Junction, east of Gillette, south to Orin Junction; it passes about 5 miles west of the permit area. The Interstate Commerce Commission recently approved the Coal Line Project, which would allow Chicago and North Western Transportation Company to serve the southern part of the basin, including the North Rochelle mine. Joint operations over the southern part of Burlington Northern's line, from Gillette to Orin Junction, have not yet begun pending a financing agreement between Burlington Northern and Chicago and North Western.

RECREATION

The primary recreational use of the permit area is hunting of mule deer and antelope. Although complete data on number of hunters are not available, the Dilt's Ranch, which is adjacent to the minesite, has had 200 or more in some years. The only other recreational uses of the area are dispersed activities, such as offroad vehicles, rock hunting, and sightseeing.

The Medicine Bow National Forest southwest of Douglas provides fishing, camping, cross-country skiing, snowmobiling, and similar activities, but it is more than 90 miles from the minesite. The Big Horn and Black Hills National Forests offer similar activities but are even farther away.

The closest areas of water-based recreation are the Glendo Reservoir and State Park (90 miles from the proposed minesite) and the Keyhole Reservoir and State Park (95 miles away). Fishing can generally be found along the North Platte River near Douglas.

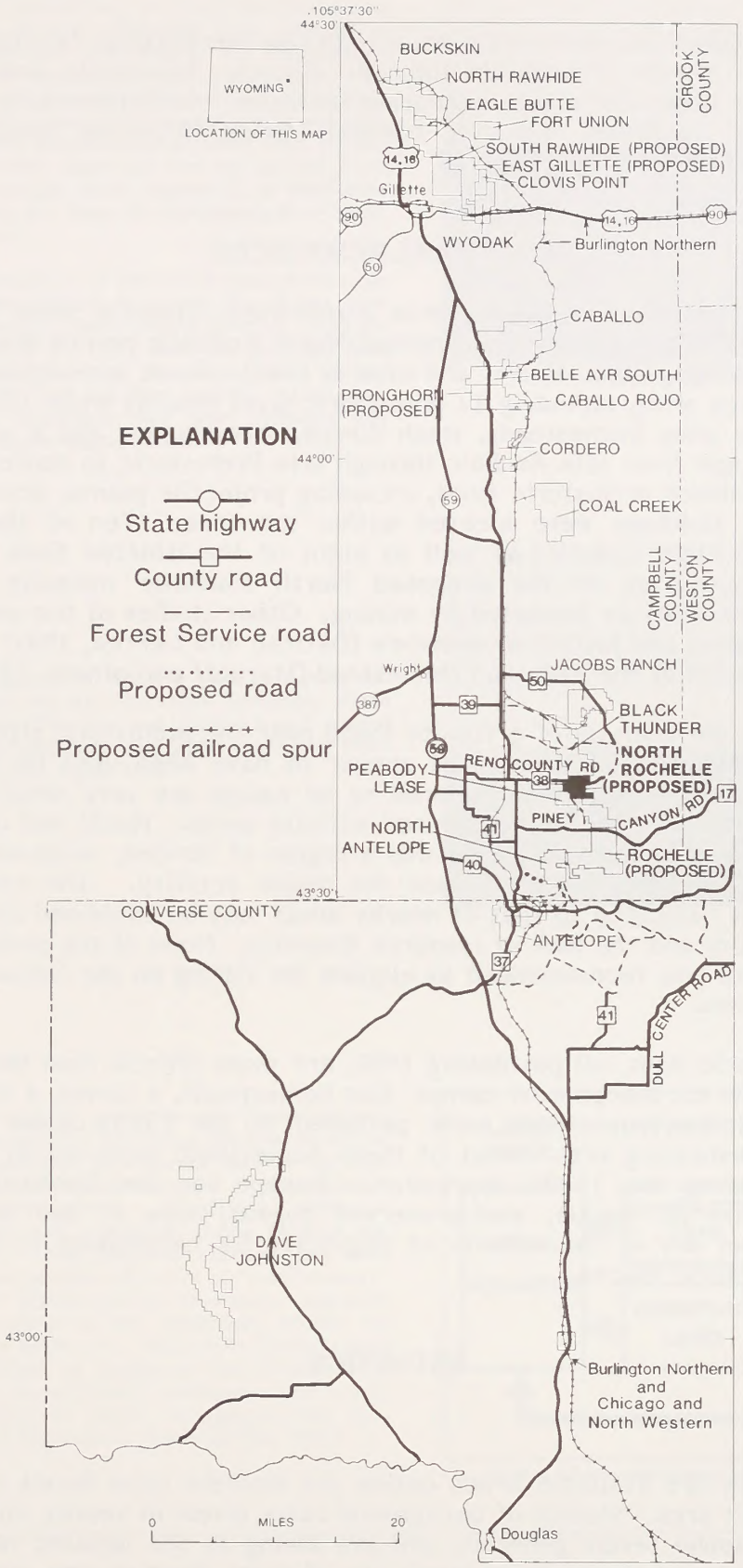


Figure III-3.--Transportation network around the North Rochelle mine.

Both Campbell and Weston Counties maintain recreational facilities, although the facilities in Weston County are limited. Gillette, Newcastle, and Wright also maintain public parks and other recreation facilities. Both Newcastle and Wright need additional facilities, including baseball fields (Wyoming Industrial Siting Administration, 1981).

CULTURAL RESOURCES

Several intensive cultural resource inventories, covering some 7,320 acres, have been made in and around the proposed North Rochelle permit area (Hauff and others, 1981; Reiss, 1981; Pinner and others, 1981). These inventories located 28 cultural resource sites, including 11 prehistoric sites (mainly small lithic scatters) and 17 historic sites (homesteads, trash dumps, sheepcamps, and a school). The sites range in age from late Archaic through late Prehistoric to contemporary. In addition, 17 isolated prehistoric finds, including projectile points, scrapers, biface segments, and flakeage were located within the area. Ten of the sites (two prehistoric and eight historic) as well as eight of the isolated finds are located within the boundaries of the proposed North Rochelle minesite and could, therefore, conceivably be impacted by mining. Other studies of the area include a brief archeological and historical overview (Batman and LeFree, 1981) as well as a detailed evaluation of the Rockwell Homestead (Markoff and others, 1981).

Based on the analysis of artifacts found near the prehistoric sites within the study area, a majority of these sites appear to have been used for hunting and processing. Sites heretofore considered to be camps are very small and should, therefore, probably be considered limited activity areas. Hauff and others (1981, p. 160) conclude that the study area was a region of limited, seasonal occupancy, where hunting (probably of bison) was the major activity. The relatively low density of sites compared to that of nearby areas may be explained by the limited water availability and the lack of resource diversity. None of the prehistoric sites or isolated finds was recommended as eligible for listing on the National Register of Historic Places.

The historic sites, all postdating 1900, are more diverse than the prehistoric sites and include six sheepherder camps, five homesteads, a corral, a windmill, and a school. All the homesteads were patented in the 1920's under one of the numerous homesteading acts. Most of these homesteads reverted to the Federal government during the 1930's depression. Except for the Rockwell/Thornberg Homestead, with its unique, well-preserved dugout, none of the historic sites appears to meet any of the criteria of eligibility for nomination to the National Register of Historic Places.

ESTHETICS

Noise

No studies are available which define the ambient noise levels at the North Rochelle permit area. Studies of background noise levels in nearby mines indicate that ambient sound levels generally are low owing to the isolated nature of the area. The infrequent higher noise levels are of short duration and result, in large part, from low-flying aircraft, trains, and trucks on the Reno County Road.

The landscape surrounding the North Rochelle site is characteristic of that stretching from Gillette to Douglas, Wyoming. (See chapter III, Topography). Thus, the area appears limitless, bounded only by the horizon. The sagebrush grassland (see chapter III, Vegetation)--interrupted by scoria hills and rock outcrops--offers little variety in form, line, or texture. The whole landscape can be viewed from almost any vantage point; vegetation or landforms rarely obstruct the view of middleground or background features.

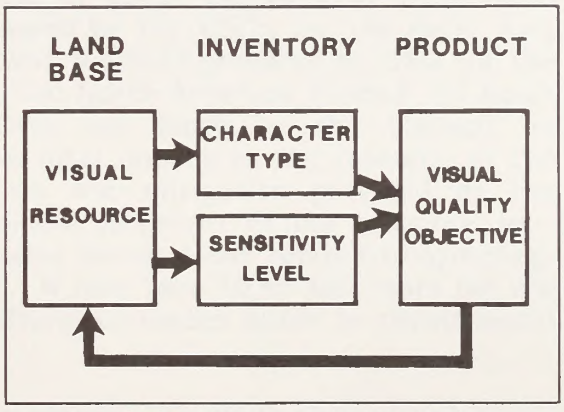
The natural character of this short-grass prairie has been somewhat altered by man's use of the land (note, for example, the livestock fences). Agriculture (see chapter III, Land use), the principal land use in the area, has been the major cause of this alteration. The land has been heavily grazed and, consequently, vegetation has been modified and some gulley erosion has occurred.

Present landscape character with no mining visible.

Currently, proposed or existing surface mining adjoining or near the site (Antelope, Rochelle, North Antelope, Black Thunder, and Jacobs Ranch mines) forms a continuous band nearly 21 miles long from north to south (see figure I-1).

Present landscape character with present mining visible.

Discontinuous parcels of the Thunder Basin National Grassland, managed by the Forest Service, lie within the permit boundary. The Forest Service has analyzed this landscape and assigned it management objectives developed by identifying landscape variety classes and measuring public concern for scenic quality. The proposed minesite has been assigned a management objective of "modification." "Modification" allows activies to visually dominate the original characteristic landscape, except for vegetation and landforms. "Maximum modification" allows alterations of vegetation and landforms to dominate the characteristic iandscape. (For a further explanation of visual management see U.S. Department of Agriculture Handbook No. 462.)



Forest Service visual management system flow chart.

Figure III-4.--Description of visual characteristics of the proposed North Rochelle minesite.

Visual Resources

The landscape within the area of the proposed North Rochelle minesite is rolling sagebrush and short-grass prairie land, with few distinctive landforms. Figure III-4 portrays this vista, both in its natural state and with existing mining, and describes the visual management assumptions that have been used to determine its present "quality." Because of the grassland's serrated landform, the permit area's restorations would be more of a rolling topography.

CHAPTER IV

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter describes the environmental effects of alternative A, the MRP as proposed by SOCM and modified to comply with State and Federal laws. Impacts from alternative B, disapproval of the MRP, are given in chapter II. Each section of this chapter begins with a summary of the anticipated environmental impacts of alternative A printed in **boldface** type. The conclusions in the summary are documented in the discussion of site-specific impacts in the text that follows it. A discussion of cumulative enivronmental impacts from the two existing mines (Black Thunder and Jacobs Ranch), the two mines under construction (Antelope and North Antelope), and the two proposed mines (North Rochelle and Rochelle) follows each site-specific discussion. Cumulative socioeconomic impacts are discussed in terms of all 22 existing and proposed coal mines in the eastern Powder River Basin. A summary of all the cumulative impacts follows the discussions of the specific resources. Table IV-1 summarizes the entire impact analysis.

The interdisciplinary staff has not considered the impacts of the proposed mine in isolation: we have defined its impacts as the difference between the total expected changes in each impacted resource with the mine and existing and proposed development, and the total expected changes in that resource during the same period without the mine. Thus, for example, the impact of the proposed mine on the population of Gillette is measured by the difference between the anticipated population with the mine and the anticipated population without it.

Moreover, the staff has discussed impacts in terms of their **significance.** The analysis shows that the communities of Gillette and Newcastle and Weston County would experience moderately significant cumulative socioeconomic impacts from the existing and proposed developments; the North Rochelle mine would contribute to these impacts. The team considers that none of the other resources outside the minesite would experience significant impacts from activities at the North Rochelle mine during mining. Impacts would be about the same as those from other mines in the area. (See the EIS's prepared by the USGS for the Belle Ayr, Caballo, Coal Creek, and Pronghorn mines, and the EIS's prepared by OSM for the Rojo Caballos (now Caballo Rojo), Antelope, and North Antelope mines.) As bases for this conclusion, we have used criteria set forth by the Council on Environmental Quality (40 CFR 1508.27), the total impact to the resource in the context of the resource within the region, the mitigation provided by the stipulations in appendix B, and the professional judgment of our resource specialists. After reclamation, all physical impacts except those related to hydrology and cultural resources would be insignificant. It may take 70 to 100 years for the water table to reach normal levels. The cultural resources would be permanently removed or destroyed.

The eastern Powder River Basin regional EIS (U.S. Bureau of Land Management, 1979a) discusses the cumulative impacts from most of the coal mines in the area. The North Rochelle, Rochelle, Antelope, and North Antelope mines were not specifically discussed. However, BLM estimated production and impacts from these mines to include as part of its high-production scenario for the eastern Powder River Basin.

Table IV-1.--Summary of impacts

Resource	Nature of impact	Extent	Magnitude[1]	Duration	Significance[2]
Topography	Lower land surface and decrease the average slope.	Minesite.	Major.		
		Adjacent areas.	Would be one of four proposed and two existing mines in the area which would have similar changes.	Permanent.	Insignificant.
	Many of the small topographic features would be replaced by a few larger ridges and valleys, with accompanying minor changes in drainage patterns.	Region.	Would be part of a 30-square-mile area disturbed by surface mining.		
Geology	The natural stratigraphic sequence would be disrupted on about 1,925 acres. The physical properties of the overburden would be altered.	Minesite.	Major.		
		Adjacent areas.	Negligible.	Permanent.	Insignificant.
	About 197 million tons of coal would be removed.	Region.	Negligible.		
Hydrology	Runoff characteristics and sediment yields would change as mining progresses.	Minesite. Adjacent areas. Region.	Moderate. Minor. Negligible.	Life of mine.	
	Water levels in the Wyodak Coal aquifer would be lowered up to 5 miles from the mine. It could take as much as 70 to 100 years after mining ceases for water levels to return to normal.	Minesite.	Major.		
		Adjacent areas.	Major.	During life of mine. Diminishing next 70 to 100 years.	Moderately significant, decreasing to insignificant after about 50 years.
		Region.	Negligible.		
	Quality of ground water in the replaced overburden would decrease.	Minesite. Adjacent areas. Region.	Moderate. Minor to moderate. Negligible.	Permanent.	
Air quality	TSP and fugitive dust levels would increase, but would be within Federal and State limits.	Minesite. Adjacent areas. Region.	Moderate. Minor. Negligible.	Life of mine.	
					Insignificant.
	Increased gaseous emissions.	Minesite. Adjacent areas. Region.	Minor. Negligible. Negligible.	Life of mine.	
Soils	Progressive disturbance of topsoil on 3,271 acres. Alteration of the soils would result in the formation of new soils with different properties. Postmining productivity would be similar to premining conditions.	Minesite.	Major.		
		Adjacent areas.	Negligible.	Some changes may be permanent, but the postmining land use would not be affected.	Insignificant.
		Region.	Negligible.		
Vegetation	Progressive loss of vegetation on 3,271 acres, replaced by vegetation with less total diversity. This would not affect productivity after reclamation is complete.	Minesite.	Major.	Loss of productivity during life of mine. Partial loss of diversity until 20 to 30 years after end of mining.	
		Adjacent areas.	Minor.		Moderately significant.
		Region.	Negligible.		
Wildlife	Progressive loss of 3,271 acres of wildlife habitat would result in the temporary loss of some animals, particularly antelope. Loss of topographic diversity would reduce use of the area by mule deer.	Minesite.	Moderate.	Until reclamation is completed. Reduction in mule deer would be permanent.	
		Adjacent areas.	Moderate.		Moderately significant.
		Region.	Minor.		

[1]See end of table for explanation of footnote.

Table IV-1.--Summary of impacts--Continued

Resource	Nature of impact	Extent	Magnitude[1]	Duration	Significance[2]
Wildlife--Continued	Increased road kills, hunting, and poaching.	Minesite. Adjacent areas. Region.	Moderate. Moderate. Minor.	Life of mine.	
Socio-economics	The population increase of about 1,200 people would increase the demand for public services, housing, schools, and recreation.	Campbell and Weston Counties.	Moderate to major initially, becoming minor as service capabilities develop.	Life of mine.	
	Additional strain on Gillette's, Newcastle's, and Weston County's financial resources.	Gillette, Newcastle, and Weston County.	Moderate.	Until additional sources of revenue materialize and growth stabilizes.	Moderately significant.
	About 1 fatality and 172 lost-time injuries.	Individuals.	Major.	Life of mine.	
Land use	A maximum of 600 acres would be unavailable for grazing and wildlife habitat during each year. Oil and gas production could be interrupted. Fences and utility lines would have to be moved.	Minesite. Adjacent areas. Region.	Major. Moderate. Minor.	Life of mine.	Moderately significant.
Transportation	Increased local traffic would cause increased noise, dust, accidents, and use of gasoline.	Minesite and adjacent areas. Region.	Moderate. Negligible.	Life of mine.	Insignificant.
	About 14 round trips per week by unit coal trains at full production would cause delays at grade crossings, noise, and accidents.	Minesite. Adjacent areas. Region.	Negligible. Moderate. Moderate to major.	Life of mine.	
Recreation	Increased demand on developed recreation facilities.	Gillette and Newcastle. Campbell and Weston Counties.	Moderate. Minor.	Life of mine.	Insignificant.
Cultural resources	A plan to mitigate impacts to the site eligible for the National Register of Historic Places has been approved. Unknown sites could be destroyed during mining. Vandalism and unauthorized collecting could increase.	Minesite. Adjacent areas. Region.	Major. Moderate. Minor.	Permanent.	Moderately significant.
Noise	Increased noise levels, vibrations, and dust at the minesite; increased noise along the rail line.	Minesite. Adjacent areas. Region.	Moderate. Minor. Minor.	Life of mine.	Insignificant.
Visual	Intrusion of mine-related activites and buildings would create high contrast with existing landscape.	Minesite. Adjacent areas. Region.	Major. Moderate. Minor.	Life of mine.	Insignificant.

[1]Magnitude: negligible = at lower levels of detection; minor = detectable but slight; moderate = readily apparent; major = causing great change.

[2]Significance was based on the total impacts of the North Rochelle mine to each resource, taken in the context of the total resource of the region.

As the following analysis indicates, mining would not severely interfere with the future use and/or usability of the region's or the Nation's resources. The use of some resources--soils and vegetation, for example--would be decreased on the minesite during the 30-year life of the mine and into the reclamation period. However, the minesite would support the main land uses of the region (for grazing and/or wildlife habitat) after reclamation is completed.

Because of the amount of, and impacts associated with, development already occurring in the area, the general acceptance of energy growth by the communities in the area, and the fact that about 60,226 tons of coal would be mined for each acre disturbed, the environmental costs of mining the 197 million tons of coal at the North Rochelle site could not be appreciably lessened by using a different method of mining or by mining elsewhere (U.S. Office of Surface Mining, 1980a).

TOPOGRAPHY

Impacts on the topography would be minor although the topographic diversity provided by gullies and scoria hills within the area of mining would be lost permanently. Topographic changes during mining would not seriously conflict with regional land uses, and the postmining topography would adequately support anticipated land uses. Mining activities would disturb 3,271 acres, and would lower the overall topography about 38 feet. The restored land surface would contain fewer topographic features, but the basic drainage network would be retained. These changes would be made over 3,271 acres or 8 percent of a 40,000-acre area that is undergoing similar changes due to mining operations.

Site-Specific Impacts

Final topographic elevations would be dependent on the amount of swelling of the excavated and backfilled overburden, which can vary depending on the materials in the overburden and the methods of removing and replacing them. In preparing the postmining contour map (plate 2, in pocket), the applicant assumed a final swell factor of 10 percent for the replaced overburden. This number appears low; at other mines in the area, a swell factor between 10 and 15 percent is reasonable for truck-shovel operations and a swell factor between 18 and 20 percent is reasonable for dragline operations. Overburden at the North Rochelle mine would be replaced by both truck-shovel and dragline. Therefore, the proposed reclaimed contours on plate 2 are very conservative and represent a worst-case scenario. The applicant would be able to restore the land surface to approximate the original contours.

Mining would decrease the elevation of the minesite a net of 38 feet, but the land surface would be lowered unevenly, so that existing deep gullies and hills would be eliminated. Should the average swell factor be higher than that anticipated by SOCM, the decrease in elevation would be less.

The applicant plans to create 20 small depressions (approximately 250 by 175 feet by 3 feet deep) in the restored surface. These depressions would simulate the existing playas, and would increase moisture availability and vegetation diversity of the postmining land surface.

The following table, which compares premining with postmining slopes on the permit area, indicates that postmining topography would be similar to premining topography, with a reduction in average slope from 4.1 to 3.1 percent.

Slope interval (percent)	Premining (percent)	Postmining (percent)
0 - 5	74.5	85.6
5 - 10	19.8	12.8
10 - 15	4.8	1.4
greater than 15	0.9	less than 0.1

These changes would result in a minor reduction in peak flows from the drainage areas, thereby increasing infiltration, and could result in decreased erosion.

Cumulative Impacts

Similar changes in topography are occurring in an elongated corridor that encompasses 40,000 acres of the eastern Powder River Basin. As a result of surface mining for coal, this area will contain fewer outstanding topographic features and, consequently, will be more monotonous. Because of the thick coal deposits present, the impacted area will be of a lower elevation once these are removed. This overall flattening and lowering of the topography will result in an increased infiltration of surface water and in reduced peak flows from the drainage area. These changes will not be significant because the streams flow from east to west across the area of disturbance rather than north to south along the entire corridor. Therefore, only a very small part of each stream's drainage area would be disturbed. Also, the total area that would be disturbed does not constitute a significant portion of the Cheyenne River drainage basin.

GEOLOGY

Changes in the geology would be insignificant. Mining would remove an average of 207 feet of overburden and 60 feet of coal over about 1,925 acres. The replaced overburden would be a relatively featureless, partly recompacted mixture averaging about 232 feet thick. Approximately 197 millions tons of coal would be mined.

Site-Specific Impacts

Overburden to be removed during mining ranges from about 110 to 290 feet in thickness, and averages 207 feet thick over the minesite. The shale and sandstone interbeds of the present overburden would be replaced by a relatively featureless, partly recompacted mixture averaging about 232 feet thick because of bulking.

Mining would also remove an average of 60 feet of coal (192 million tons) from the Wyodak coal bed and an average of 5 feet from a rider seam mineable only in the northern part of the lease. The total 197 million tons is about 0.94

percent of the 21 billion tons of strippable coal in the eastern Powder River Basin. A minewide average of 3.35 feet of overburden (including backslope) would be removed for each foot of coal mined. A deeper coal seam (at about 590 feet) is beyond the practical range for strip mining at this time.

The overburden is predominantly shale and siltstone with sandstone lenses. Overburden inhibitive to plant growth is mainly concentrated in the strata adjacent to the coal seam. Two types occur: (1) fine-grained material with equivalent soil textures of silty clay or clay, which restricts root development and/or decreases rainfall infiltration, and (2) material whose chemistry is deleterious or potentially deleterious upon weathering. Textural analysis of the cores from ten test holes indicated an average of 47 percent clayey material--too impervious for a suitable plant growth medium. Chemical analyses of cores from 12 test holes showed that 12 samples had excess acid levels (pH less than 5.0) and 5 samples had excess molybdenum (greater than 1 µg/g).

Though much of the unsuitable overburden, which is close stratigraphically to the coal seam, would be deposited at the bottom of the adjacent mined-out cut by dragline spoiling, adequate dilution of deleterious material would not be assured. Therefore, SOCM has committed to place 10 feet of suitable overburden above run-of-mine backfill as an acceptable base for the replaced topsoil.

Cumulative Impacts

Mining at the six existing and proposed mines would disrupt the natural stratigraphy over about 25,000 acres. This disturbance would extend as deep as 350 feet below the land surface. The discrete beds of clay, sand, and coal that presently exist would be replaced by a relatively featureless, partly recompacted mixture that would be about 35 feet thinner than the present deposits. About 2,067 million tons of coal would be removed and shipped to generating stations, most of which are outside Wyoming. An unknown amount of clinker would be mined and used locally for surfacing haulroads and parking areas.

HYDROLOGY

Impacts on the hydrologic system would range from insignificant to moderately significant during the life of the mine, decreasing to insignificant after about 70 years. Changes in quantity and quality of both surface and ground water would be minor and would not interfere with anticipated postmining grazing and wildlife uses of the area.

During mining, runoff characteristics and sediment discharge would change over the disturbed area. Sediment would be trapped in sedimentation ponds unless a storm greater than the 10-year, 24-hour storm occurred. Dewatering would lower the water level in the Canyon coal aquifer as much as 5 feet up to 5 miles from the mine. Pumping from a deep well for potable water could lower the potentiometric surface of the Tullock Member of the Fort Union Formation as much as 310 feet up to 10 miles from the well. About 305 acre-feet of water would be used at the mine each year.

After mining, it would take less than a year for the potentiometric surface of the Tullock Member to recover, and up to 100 years for the water level in the restored coal overburden (spoil) aquifer to reach a normal position. Surface-water

quality would be about the same as at present. Total surface-water discharge and sediment yield would likewise be about the same as at present but, because of the relocation of the West School Creek drainage divide, would be distributed differently. The ground water would be of lower quality, but would still be acceptable for the anticipated postmining grazing and wildlife use.

Site-Specific Impacts

Surface water.--Continuous changes in runoff characteristics and sediment discharge would occur during mining because of changes in the location of diversions and other ditches and the destruction and reconstruction of drainage channels as mining progresses. Because of scour and erosion in the reclaimed areas, sediment discharges could reach high values on the disturbed areas. However, both Wyoming and Federal regulations require that all surface runoff from affected lands must pass through sedimentation ponds. Therefore, the sediment would be trapped in sediment ponds before leaving the permit area. A portion of the sediment produced by large storms (greater than the 10-year, 24-hour storm) could affect areas downstream. The sediment ponds would, however, partially reduce the impact of larger storms. Downstream impacts from large storms could increase if the ponds were full of water and sediment at the time of the storm or if the runoff caused a dam to fail. (OSM considers dam failure to be a remote possibility.) However, sediment ponds No. 1, 4, 6, and 8 would be equipped with emergency spillways capable of safely passing runoff from at least the 25-year, 24-hour storm; ponds No. 2, 3, 5, and 7 would have spillways to pass runoff from the 100-year, 24-hour storm. SOCM has a monitoring program to assure that the ponds would always be capable of holding at least 1-year's sediment accumulation.

A number of stock ponds owned by SOCM would be destroyed during mining and would not be replaced. The Thunder Basin No. 52 Reservoir, administered by FS, would be removed and reconstructed about 1,000 feet downstream.

Runoff would increase somewhat due to loss of soil structure during soil removal and replacement. Soil structure would gradually re-form over time, and vegetation (after successful reclamation) would retard surface flows so as to control runoff at approximate premining levels. The decrease in average slope of the reclaimed land would increase infiltration and reduce the peak flows within the mine area.

The drainage divide between Trussler and West School Creeks would be relocated to the west and north. The Trussler Creek drainage would be reduced approximately 0.4 mi^2 at the point where it leaves the permit area; it would be reduced approximately an additional 0.2 mi^2 where a small tributary joins it about a mile downstream. The West School Creek drainage would be increased approximately 1.1 mi^2. Because these streams are ephemeral, any impact resulting from this relocation of the drainage area would occur mainly during peak flows. For Trussler Creek, the decrease in runoff owing to the 11-percent decrease in drainage area would be about offset by the increase in runoff owing to the change in soil structure: the net result would be a negligible increase of 2 percent in the magnitude of the 100-year flood. For West School Creek, the increase in runoff owing to the 33-percent increase in drainage area would be compounded by the change in soil structure, resulting in an increase of 55 percent in the magnitude of the 100-year flood. This increase probably would cause some erosion in the channel downstream of the permit area.

After mining and reclamation are complete, surface-water flow and quality and sediment discharge from the total permit area would approximate premining conditions. However, because of the relocation of the drainage divide, both flow and sediment discharge from the subbasins within the permit area would vary from their present characteristics.

Ground water.--Development of the proposed North Rochelle mine would impact the ground-water resources of the area in four ways: (1) mining would remove the coal aquifer and replace it with unconsolidated overburden (spoils); (2) water levels in the coal aquifer adjacent to the mine would be lowered as a result of seepage into the open pit; (3) the head in the deep aquifer (Tullock) would be lowered in the vicinity of the mine as a result of pumping water to supply the mine; and (4) the quality of the ground water in the coal aquifer would be reduced as it flows through the replaced spoils.

None of these impacts is considered significant, even in conjunction with similar impacts at nearby mines, because: (1) the replaced spoils would form an aquifer with hydrologic properties about equal to those of the coal; (2) most of the existing wells would still be able to supply sufficient water despite the lowered water levels, and other, albeit deeper, ground-water sources are available to replace any wells that go completely dry; (3) the head in the Tullock aquifer would still be several hundred feet above the top of the aquifer; and (4) the ground-water quality would still be suitable for watering livestock, the only current use.

Removal of coal aquifer.--Mining at the North Rochelle mine would remove the coal aquifer over about 1,925 acres. This aquifer, which averages 60 feet in thickness and is the principal source of ground water in the area, would be replaced by the shale, siltstone, and sandstone of the overlying Wasatch Formation.

Rahn (1976) found that the permeability of a replaced spoil aquifer depends on the method of its emplacement. Replaced strip-mine spoil is composed of a nonhomogeneous mixture of clay-to gravel-size grains. Where the spoil has been emplaced by a dragline, this material is loosely compacted. Frequently, the coarsest grains roll down the spoil piles and form a layer of coarse rubble at the base. This results in a relatively permeable aquifer with a zone of higher permeability at the base. Spoil material emplaced by trucks, bulldozers, and/or scrapers, on the other hand, is more compacted and has a lower permeability. Rahn (1976, p. 27) reported an average permeability of 450 gallons per day per square foot (gal/day/ft^2) for spoils emplaced by dragline compared with an average permeability of 4 gal/day/ft^2 for spoils emplaced by bulldozer-scraper. He concluded that, all other things being equal, dragline-emplaced spoils have a permeability several times greater than that of the natural aquifer. Bulldozer-scraper-emplaced spoils have a permeability about the same as the natural aquifer.

Mining at the North Rochelle mine would involve a mix of dragline and truck-shovel operations. Therefore, the permeability of the replaced spoil probably would range from about the same as, to several times greater than, that of the undisturbed overburden. Because the permeability of the coal is dependent on secondary features--such as joints (cleats) and structure--rather than on intergranular openings--as in the overburden and the spoil--it is hard to compare permeabilities. Never-

theless, it appears that the permeability of the spoil would be several times greater than that of the undisturbed coal.

Lowered water levels.--Using methods described by Lohman (1972) for analyzing an infinite line sink and an infinite point sink, the applicant has calculated that inflow from the coal into the open pit would range from 0.24 gal/min in 1987 to 4.87 gal/min in 1993, for a total of about 217 acre-feet over the 26 years of mining. This inflow would create an ovoid area of lowered water levels in wells tapping the coal aquifer. A drawdown of 5 feet is considered the minimum amount needed to cause measurable impacts on the availability of ground water to wells tapping the coal aquifer. Figure IV-1 shows the extent of 5 or more feet of drawdown in the coal aquifer both for the life of the mine and after the first 5 years of mining. Mining should have little or no effect on ground water in the overburden.

During the first 9 years of mining, there would be additional inflow to the pit from the scoria along the east end of the permit area. Although this would amount to several times the inflow from the coal, it would only lower the water level in the scoria about 0.6 feet, and would have no effect on the water level in the coal aquifer.

Only four wells tapping the coal aquifer occur within the 5-foot drawdown isolith and may be affected by the mine pit inflow. Two other wells, located within the permit area, would be destroyed by mine operations. All six wells are used solely for watering stock. In compliance with Wyoming law, the applicant has agreed to provide the owner of a water right, whose water source is interrupted, discontinued, or diminished by mining, with water of equivalent quantity and quality. The most probable source of replacement water would be one of the aquifers underlying the coal.

The equations used to calculate pit inflow and drawdown in the aquifers are designed for aquifers having certain hydraulic characteristics and for certain types of flow. However, these assumed conditions do not all occur at the minesite. For instance, the coal at North Antelope is not isotropic nor is the aquifer dewatered instantaneously. For this reason, and because any assumptions made to analyze the effects of pit inflow were worst-case assumptions, the results of calculations using these equations represent a "worst-case analysis." The extent of drawdown resulting from mining could be less than that shown on figure IV-1.

Tullock aquifer.--While in operation, the mine would require a maximum of 272,210 gallons of water per day. Of this, 14,000 gallons would be potable water, 8,210 gallons would be utility water, and 250,000 gallons would be for dust control. Most of this water would be supplied by a well tapping the Tullock aquifer at a depth of about 1,200 to 2,000 feet. (Some water for dust control would come from inflow to the mine pit.) The applicant has received an appropriation of 250 gal/min for this well from the Wyoming State Engineer's Office.

Pumping the well continuously at 250 gal/min for 30 years would lower the head in the Tullock aquifer 460 feet at a distance of 5 miles, and 310 feet at a distance of 10 miles. However, because the well would be

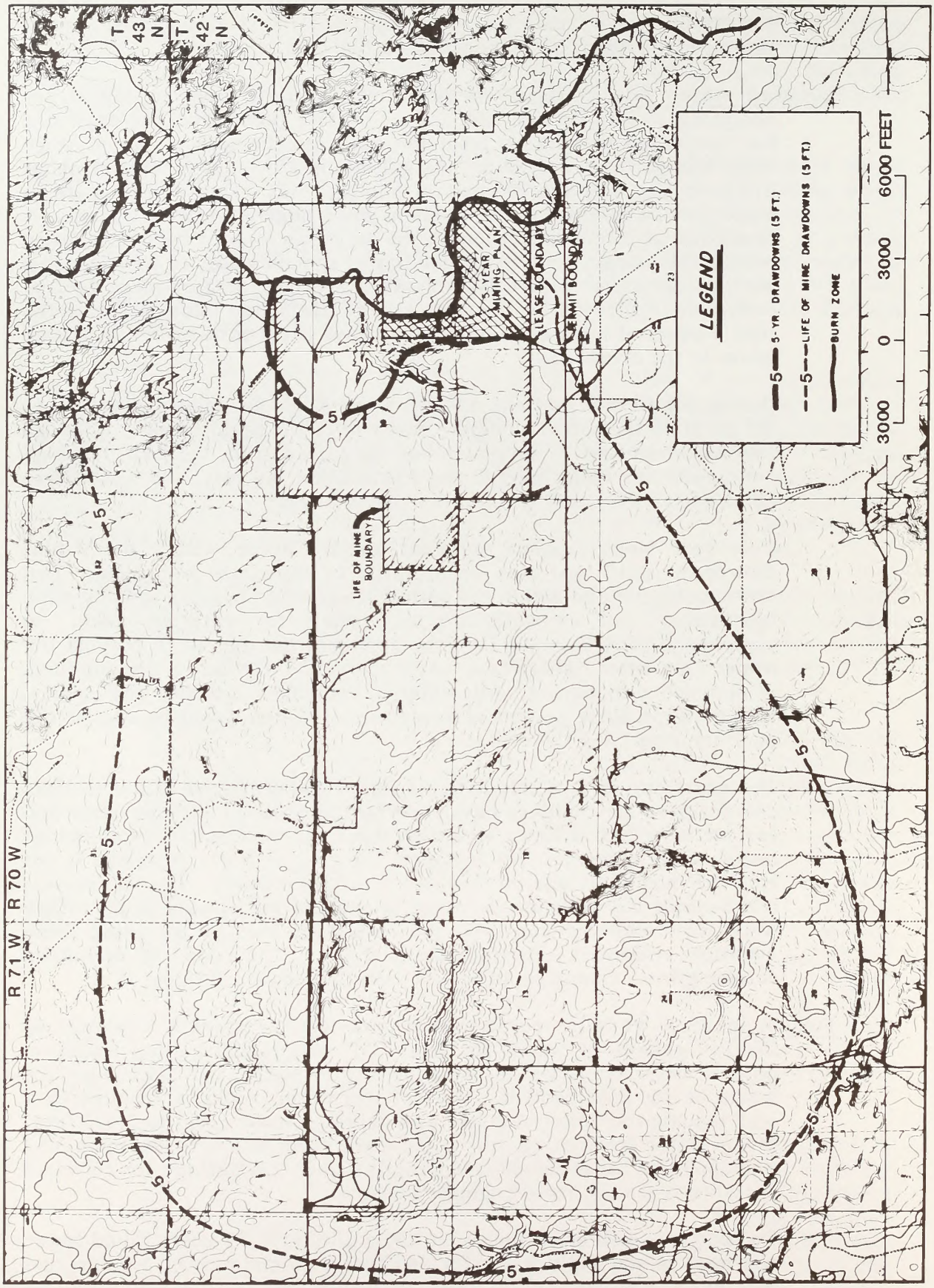


Figure IV-1.--Drawdown in the coal aquifer at the end of mining.
(Furnished by applicant.)

pumped continuously only during extended dry periods, these figures represent worst-case estimates. Most of the time pumping would be intermittent, as demand occurs, allowing the head to recover during periods of no pumping. Therefore, the actual decline in head would be less.

At present, no wells in the area pump water from the Tullock aquifer. However, the Antelope, North Antelope, and Rochelle mines all plan to pump from this aquifer. (The Black Thunder and Jacobs Ranch mines obtain water from a shallower aquifer.)

Once mining has ended, the heads in the various aquifers would start to recover. For the Tullock aquifer, in which the decline in head represents a loss of pressure, recovery should occur rapidly, with only an insignificant amount of decline left after a few weeks. The coal and spoil aquifers, on the other hand, would take much longer to recover completely. As mining progresses and spoils are placed in the mined-out pit, ground water would start seeping into the spoils from the sides of the pit as well as percolating down through the spoils from precipitation. Because ground water moves very slowly through the coal and spoils (several tens of feet per year), it may take as many as 100 years for the water level in the coal and spoils aquifers to fully recover. However, it is very likely that by the time surface reclamation is completed, and the mine area is restored to pastureland, sufficient saturated material would be present to supply a stock well, particlarly in the areas that were mined first.

Water quality.--As the overburden is broken up in course both of its removal and of its replacement as spoils, fresh surface is exposed to the ground water moving through it. Because this ground water is not saturated with respect to any mineral constituents, it is able to dissolve many of the newly exposed minerals. Therefore, ground water in the spoils would be significantly more mineralized that is ground water in the adjacent aquifers. Rahn (1976) and Van Voast (1974) have found that ground water in spoils contains increased amounts of calcium, sulfate, magnesium, manganese, and TDS. TDS in the spoil water at the North Rochelle site may increase from the present range of from 800 to 3,900 mg/L to a range of from 1,500 to 5,000 mg/L. However, such an increase would be insignificant because water containing TDS within this latter range is still suitable for watering livestock, the only current use of ground water in the permit area.

The heavy minerals within the spoils would not be dissolved because the ground water would have a near neutral pH. Overburden analyses have shown that pH reduction occurs only in a few isolated zones where carbonaceous material is present. Most of the overburden at North Rochelle contains an abundance of calcite. During removal and replacement of the overburden, the isolated zones of carbonaceous material would be mixed with the rest of the overburden. The abundant calcite should neutralize this carbonaceous material; the pH in the overburden should thus remain near neutral.

A study made for the proposed Rochelle mine showed that it would take the equivalent of five pore volumes of water moving through the spoils

to dissolve out the newly exposed minerals and so to restore the water to a quality comparable to that of the adjacent aquifers. It was further estimated that this process would take more than 11,000 years. The change in water quality in the spoils should, therefore, be considered permanent.

As the ground water moves westward out of the spoil, it would gradually improve in quality. Because ground water moves so slowly, ion exchange would occur and other ions would become adsorbed to the fine particles in the aquifer. Also, some dilution would occur as the plume of ground water from the spoils dissipates and is mixed with ground water from the undisturbed aquifer.

Recharge.--Mining and reclamation at the proposed North Rochelle site would have little, if any, effect on recharge. The scoria, which is the principal source of recharge to the coal aquifer, would not be disturbed. Recharge through the spoils would be equal to or slightly more than the recharge that occurs now through the overburden. The process of removing and replacing this overburden would break up the more consolidated beds, which would increase the permeability of the material.

Alluvial valley floors.--Although there are no AVF's within the permit area, there are two segments of AVF's downstream along West School Creek and School Creek. The essential hydrologic functions of these AVF's (providing subirrigation and water for existing and potential flood irrigation) should not be affected by mining at North Rochelle. The quality of some of the ground water may be diminished, particularly along West School Creek, by water flowing out of the mine area. However, the major source of water for the AVF's is infiltration from precipitation and streamflow, and water from the scoria. These waters are of good quality and would dilute any poorer quality water from the mine.

Cumulative Impacts

Surface water.--All six mines in the area are in the Cheyenne River basin. Table IV-2 shows both the immediate drainage basin within the Cheyenne River basin and the estimated area of disturbance for each of these mines. The cumulative impact of the three mines in the Antelope Creek basin (Antelope, Rochelle, and North Antelope) would be a decrease in flow of about 2 to 3 ft^3/s in Antelope Creek (U.S. Office of Surface Mining, 1982). The cumulative impact of the three mines in the Little Thunder Creek basin (Jacobs Ranch, North Rochelle, and Black Thunder) would be an increase in flow of about 1 ft^3/s in Little Thunder Creek.

Drainage from all six mines combines where Black Thunder Creek joins the Cheyenne River. The drainage area of the Cheyenne River basin at this point is approximately 2,430 mi^2. If all the land projected for disturbance for the life of all the mines were disturbed at one time, only 1.9 percent of the drainage basin of the Cheyenne River at its confluence with Black Thunder Creek would be affected by mining. This percentage figure is a worst-case estimate since the total disturbance at each mine would not occur at once but would be spread out over 30 to 40 years. In addition, sedimentation ponds and other structures would assist in controlling sediment, and diversions would pass runoff from undisturbed areas.

Table IV-2.--Immediate drainage basin and estimated area of disturbance for existing and proposed mines in the Cheyenne River basin

Mine name	Immediate drainage basin	Estimated area of disturbance	
		Acres	Square miles
Proposed mines			
North Antelope	Porcupine Creek	2,685	4.20
Rochelle	Porcupine and Antelope Creeks	5,313	8.30
Antelope	Antelope Creek	5,494	8.58
North Rochelle	School and Little Thunder Creeks	3,271	5.11
Existing mines			
Jacobs Ranch	North Prong Little Thunder and Little Thunder Creeks	4,464	6.98
Black Thunder	North Prong Little Thunder and Little Thunder Creeks	8,946	13.98
Total area disturbed			
		30,173	47.15

Any impacts to the Cheyenne River resulting from mining would be insignificant and beyond detection limits. Discharge from the Cheyenne River basin is extremely variable owing to the semiarid climate of the region and the likewise variable precipitation regime. Discharge from the basin ranges from approximately 50,000 to 180,000 acre-feet per year at Angostura Reservoir, the downstream gaging station. The potential for adverse impacts to the Cheyenne River is also minimized because it is dry for months at a time.

Ground water.--Although all six mines in the area are experiencing or anticipate seepage into the open pit, the amount of seepage would vary greatly from mine to mine and from year to year, depending on area mined and saturated thickness of the overburden and coal. The Antelope mine anticipates having to pump as much as 2,200 gal/min (including pumpage from dewatering wells) in some years. By contrast, the Rochelle mine anticipates a maximum inflow to the pit of 13 gal/min. By the year 2000, it is anticipated that total pumpage from dewatering wells and from the pits would be as much as 2,300 gal/min from all six mines. This would produce a zone of lowered water levels in the coal aquifers extending outward from the mines (fig. IV-2).

Mining operations at the six mines could destroy as many as 16 wells. Of these, 2 are listed as domestic and stock wells, the rest are strictly stock wells. In addition, the water levels in as many as 36 other wells could be lowered by dewatering. Two of these wells are listed as domestic and stock wells, the rest as stock wells. There are many observation wells that could be affected, but, because their use is to monitor effects to ground water in coal mine areas, this impact is considered insignificant.

Dewatering of the coal aquifer at the mines may also temporarily affect the water supply in the alluvium of the major streams in the area, such as Antelope, Porcupine, and Little Thunder Creeks. Because the alluvium would be recharged by any flow in the creeks, this affect would only be short term and is not considered significant.

The Antelope, North Antelope, North Rochelle, and Rochelle mines all plan to obtain water from the Tullock aquifer. (The Black Thunder and Jacobs Ranch mines are obtaining their water from a shallower aquifer in the Fort Union). Pumping from the four mines would reduce the head in the Tullock aquifer over a large area. At present, no other wells are known to tap this aquifer. Therefore, the only impact from this pumping would be a mutual interference among the four mine wells. In response to a request from Wyoming DEQ, SOCM has submitted an analysis of this impact (written commun., June 30, 1982). This analysis assumed that each well would pump 250 gal/min for 30 years. It concludes that drawdown would be 376 feet at the Antelope well, 424 feet at the North Antelope well, 367 feet at the North Rochelle well, and 422 feet at the Rochelle well. The drawdown figures represent maximum declines as a result of continuous pumping. In fact, the wells would rarely be pumped continuously and the estimates are, therefore, worst-case estimates.

The top of the Tullock aquifer is about 1,200 to 1,300 feet below the land surface. The head in the aquifer at the North Antelope mine is 35 feet above land surface; at the North Rochelle mine, it is 280 feet below land surface. Clearly, even given the maximum drawdowns estimated, the head would still be 500 to 900 feet above the top of the aquifer.

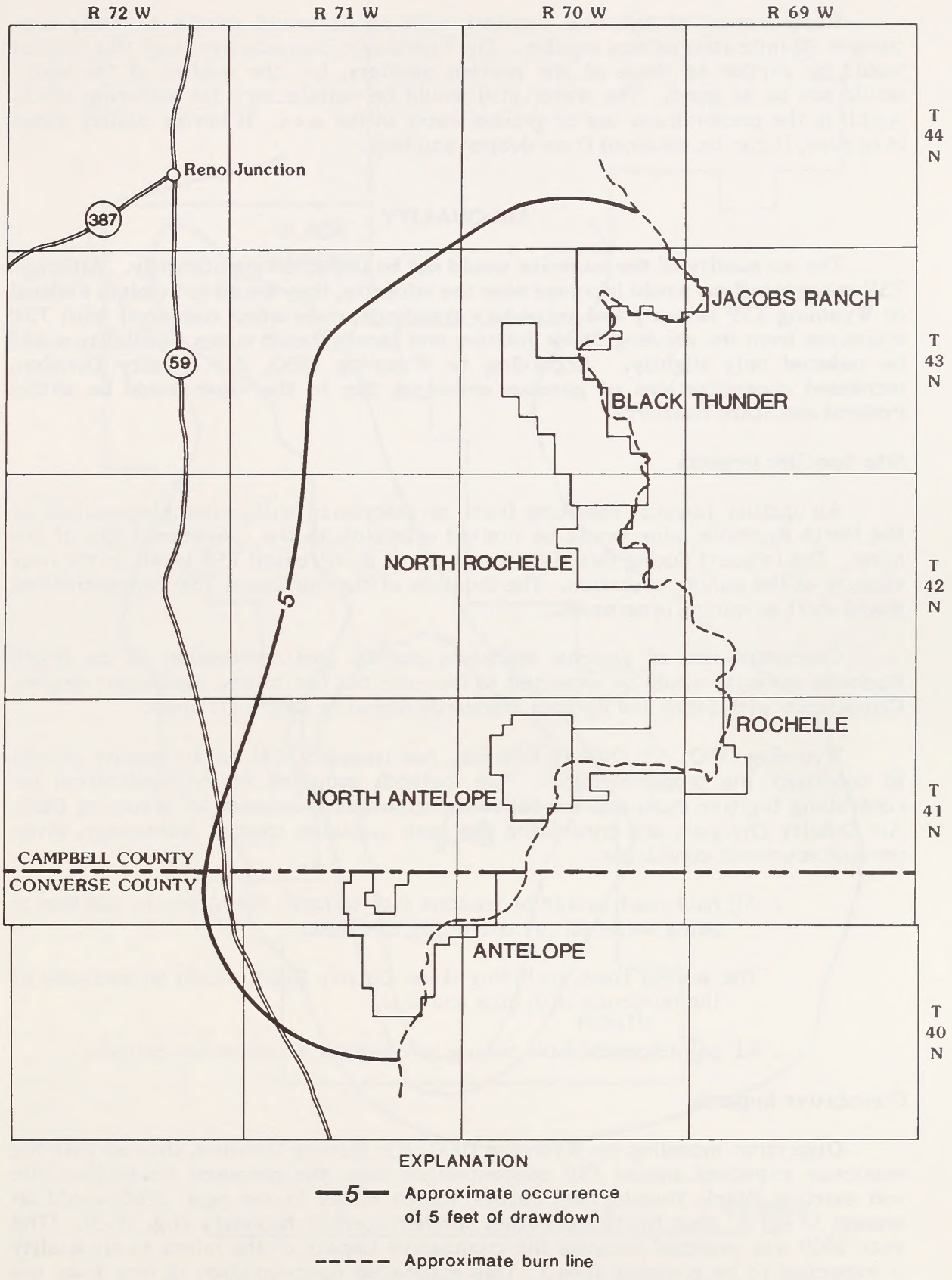


Figure IV-2.--Extent of drawdown in the coal aquifers with all mines operating.

Replacement of the coal aquifers with spoils would create a nearly continuous 20-mile strip of new aquifer. The hydrologic characteristics of this aquifer would be similar to those of the present aquifers, but the quality of the water would not be as good. The water still would be satisfactory for watering stock, which is the predominant use of ground water in the area. If better quality water is needed, it can be obtained from deeper aquifers.

AIR QUALITY

The air quality of the minesite would not be impacted significantly. Although TSP concentrations would increase near the minesite, they would not violate Federal or Wyoming TSP primary and secondary standards, even when combined with TSP emissions from the existing Black Thunder and Jacobs Ranch mines. Visibility would be reduced only slightly. According to Wyoming DEQ, Air Quality Division, increased concentrations of gaseous emissions due to the mine would be within Federal and State standards.

Site-Specific Impacts

Air quality impacts resulting from, or associated with, mining operations at the North Rochelle mine would be limited primarily to the operational life of the mine. The impacts during this time would result in increased TSP levels in the near vicinity of the mining operation. The location of the maximum TSP concentrations would shift as mining progresses.

Concentrations of gaseous emissions due to fuel combustion at the North Rochelle minesite would be expected to increase but not to any significant degree. Compliance with State and Federal standards should be easily attained.

Wyoming DEQ, Air Quality Division, has issued SOCM an air-quality permit to construct the proposed mine. The methods proposed in the application for controlling fugitive dust, and the following stipulations imposed by Wyoming DEQ, Air Quality Division, are considered the best available control technology, given present economic conditions:

- All haul roads would be treated with suitable chemicals, in addition to being watered, to control fugitive dust.

- The access road, including Reno County Road, would be surfaced at the minimum with chip and seal.

- All point sources have been given specific emission limitations.

Cumulative Impacts

Dispersion modeling by Wyoming DEQ, Air Quality Division, showed that the maximum expected annual TSP concentration from the proposed North Rochelle and existing Black Thunder and Jacobs Ranch mines in the year 2000 would be around 55 $\mu g/m^3$ near North Rochelle's northern permit boundary (fig. IV-3). (The year 2000 was modeled because the cumulative impact of the mines to air quality is expected to be greatest then.) This estimated concentration is less than the State and Federal annual TSP standard of 60 $\mu g/m^3$.

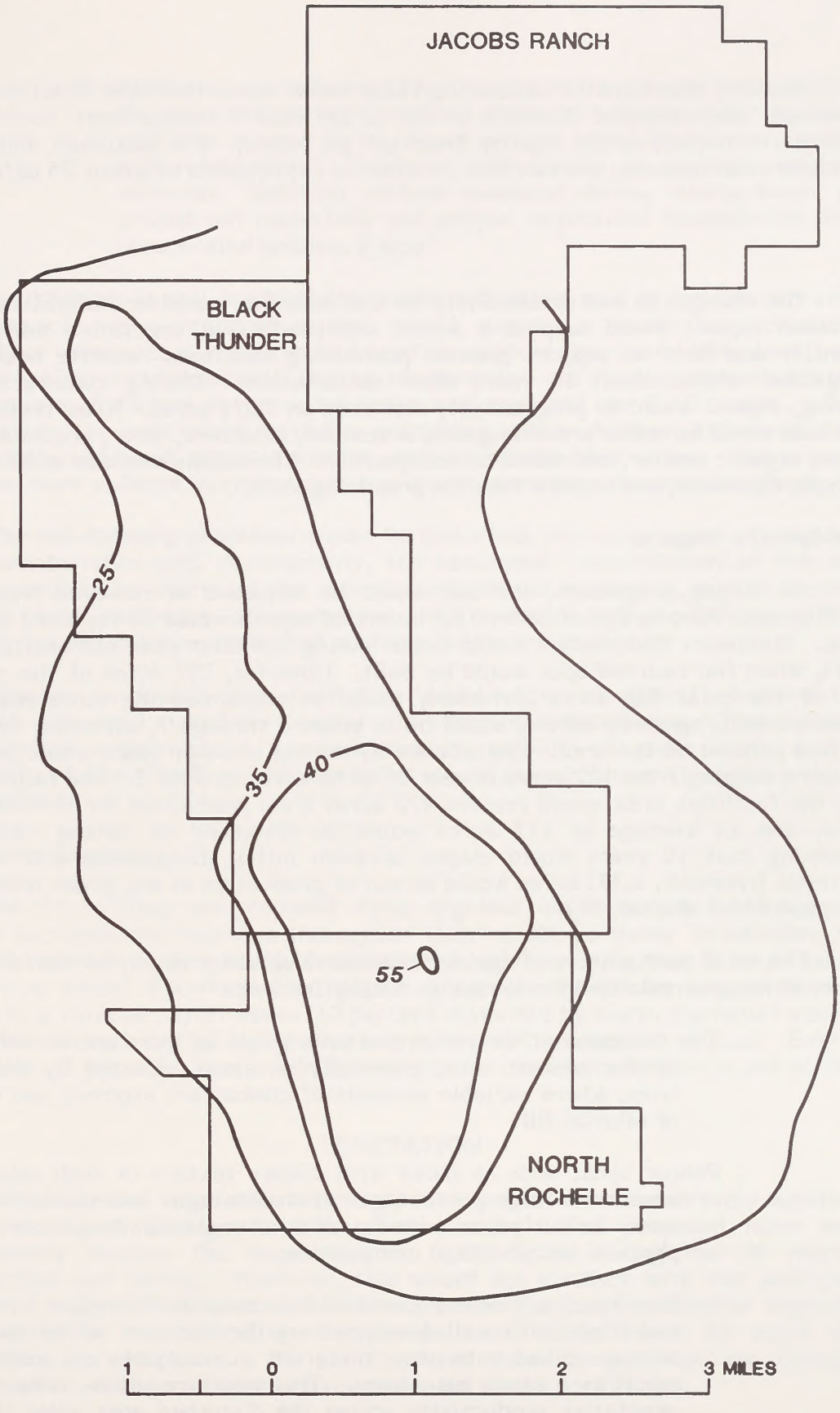


Figure IV-3.--Particulate concentrations, in $\mu g/m^3$, for the year 2000. (Includes a baseline of 15 $\mu g/m^3$.)

Because the distance separating these three mines from the Antelope, North Antelope, and proposed Rochelle mines is at least 2 miles, there would be no cumulative impact to air quality from all six mines; the maximum annual TSP concentration between the two sets of mines is expected to be about 25 $\mu g/m^3$.

SOILS

The changes in soil productivity on the minesite would be insignificant: the replaced topsoil would support a stable and productive vegetation adequate in quantity and kind to support planned postmining land uses--wildlife habitat and rangeland--within about 10 years after reclamation. During construction and mining, topsoil would be progressively disturbed on 3,271 acres. After reclamation, the soils would be unlike premining soils in texture, structure, color, accumulation of clays, organic matter, and chemical composition. These soils would be more uniform in type, thickness, and texture than the premining soils.

Site-Specific Impacts

As mining progresses, the soil would be disturbed or removed from about 3,271 acres. An average of about 28.7 inches of topsoil would be replaced over this area. Maximum disturbance would occur during the first year of construction in 1983, when the railroad spur would be built. However, 207 acres of the railroad, out of the total 584 acres disturbed, would be reclaimed the same year. The greatest disturbance by mining would be in years 5 through 7, affecting 549 acres or 16.8 percent of the area. Disturbance by mining in other years would be rather uniform, ranging from 122 acres in year 25 to 64 acres in year 2. The railroad spur and the facilities area would remove 472 acres from production for the life of the mine, and an average of 112 acres would be disturbed by mining each year. Assuming that 10 years would elapse between initial disturbance and reuse by domestic livestock, 1,592 acres would be out of production at any given time during full production of coal.

The total productivity of the disturbed area would probably remain about the same, although productivity may change locally because:

- The thickness of the reclaimed soils would be more uniform than that of the present soils, especially on areas affected by coal-seam fires, where variable amounts of clinker are exposed, and in areas of alluvial fill.

- Poorer soils, such as those with clayey texture or high salinity, or areas with large percentages of shallow soils and exposed bedrock would be buried, or mixed with other materials to a more uniform physical and chemical composition.

- Uniformity of soil texture would be increased: clayey or sandy soils and those with well-developed argillic horizons would inevitably become mixed with other materials in stockpiles and would likely result in a sandy clay loam. This would result in more uniform vegetative productivity across the disturbed area when the soils are redistributed, which may disrupt subsequent animal communities.

. Erodibility of the soils would be reduced in the steeper areas, whereas the more stable soils, such as those on uplands under grassland, would be subject to increased erosion until effectively stabilized with vegetation. However, soil losses, in general, would be minimal: sediment control measures during mining would trap eroded soil materials, and proper vegetation stabilization would reduce wind erosion.

The changes in soil productivity on the minesite would be a relatively short-term impact. The replaced topsoil would support a stable and productive vegetation adequate in quantity and kind to support the postmining land uses--wildlife habitat and rangeland. During construction and mining, topsoil would be progressively disturbed or removed from and replaced on 3,271 acres. After reclamation, the soils would be unlike premining soils in texture, structure, color, accumulation of clays, organic matter, and chemical composition. The new soils would be more uniform in type, thickness, and texture than the premining soils.

The soil-forming processes would be disturbed, resulting in the alteration of soil characteristics and, consequently, the taxonomic classification of the soils. Soil characteristics that would be affected include soil structures, argillic horizons, horizons with carbonate accumulations, soil texture, soil erodibility, salinity, productivity capabilities, biological activity, and nutrient content.

Changes in topsoil characteristics would occur in topsoil removed from disturbed areas and stored for several years before redistributing. These changes would include a decrease in nutrient content, viability of plant seeds, and soil microbial activity. Some of the stockpiles would remain intact throughout the life of the mine.

Cumulative Impacts

The six existing and proposed mines together would disturb 5,097 acres for support facilities and railroads throughout their combined lives; in addition, they would disturb 810 acres annually for actual mining. Assuming that it would take 10 years from initial disturbance to reclaim a parcel of land for use by domestic livestock, a total of 13,197 acres (12 percent disturbed by North Rochelle) would be unsuitable for such use at any given time during full production of coal. Even so, eventually all disturbed land would be brought back to use by livestock and wildlife.

VEGETATION

Disturbance of vegetation on the minesite would have a moderately significant long-term impact during the life of the mine. The proposed mine would progressively remove the vegetation on 3,271 acres during the 30 years of construction and mining. However, this would not conflict with the anticipated long-term regional land uses, and a diverse, effective, and permanent vegetative cover would be established on the permit area within about 10 years after reclamation is completed. No plant species listed or proposed for listing as threatened or endangered have been documented on the permit area.

Site-Specific Impacts

Vegetation would be removed from 3,271 acres during the life of the mine. Short-term impacts associated with vegetation removal during the construction and operation phases consist of increased erosion and habitat loss for wildlife and livestock. Habitat loss would occur primarily in areas currently used as winter range for sheep, as summer range for cattle, and as wildlife habitat. Potential long-term impacts consist of a degradation of livestock and wildlife forage yield because of continued higher than normal levels of erosion, undesirable species invasion, and reduced species diversity on reclaimed lands.

Estimates of the time elapsed from topsoil stripping through reseeding of 1 year's operation range from 3 to 9 years. (See appendix A, Reclamation.) It is estimated that the entire minesite would be returned to a productive state within about 40 years after the mine opens. A maximum of about 35 percent of the permit area would be removed from livestock production at any one time due to mining; grazing restrictions prior to mining and during revegetation would increase this to as much as 100 percent of the permit area. (See chapter IV, Land use.) This reduction in vegetation production would not seriously affect livestock production in the region, and long-term productivity on the reclaimed land would return to premining levels within 19 years of disturbance. About 17 acres of vegetation would be disrupted for each 1 million tons of coal mined, or an average of about 112 acres of surface disturbance per year. By the time mining ceases, 70 percent of the disturbed land would have been reseeded. The reestablished vegetation would be dominated by species found in the permanent seed mixtures. Most of these species presently occur on the permit area. (The reclamation plan includes steps to control site invasion by weedy species.) Additional species from surrounding areas would gradually invade the reclaimed areas and become established on the reclaimed land. Nevertheless, grassland vegetation would dominate the site immediately following reclamation. This temporary difference in diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed postmining land use should be achieved even with the changes in vegetation composition and diversity.

Continued higher-than-normal levels of erosion and undesirable plant species invasion are likely and normal on areas being reclaimed prior to the successful establishment of the intended revegetation species. The applicant's proposed revegetation plan would minimize erosion on reclaimed areas through mulching and the use of cover crops. Weed infestation would be mechanically controlled. Likewise, the decline in species diversity on reclaimed areas, compared with premining diversity, is normal and would be mitigated to a large extent by the applicant's use of diverse and predominantly native species of the appropriate seasonal variety, as well as by direct replacement of topsoil and by creation of a mosaic of different topographic features (e.g., rock piles and depressions). Although postmining topography would be flatter than premining topography, the slope-associated rough breaks shrubland community would not be entirely eliminated from the minesite; over time, this community should again develop on the reclaimed minesite to some extent.

The climatic record for the Western United States suggests that a severe drought could occur at least once during the mine life. Such a drought would severely hamper revegetation efforts during the drought year: lack of sufficient moisture would reduce germination and could damage newly established plants. Plants all of one age could be more susceptible to disease than would plants of

various ages. Severe thunderstorms could also adversely affect revegetation efforts by causing erosion, which could remove or bury newly established vegetation. Once a stable vegetative cover is established, these storms would have a similar impact on both the reclaimed and native vegetation.

Changes expected in the surface-water network as a result of mining and reclamation would affect the reestablishment of vegetation patterns on the reclaimed areas to some extent. The maximum slope would be comparable both before and after mining--about 25 to 30 percent; however, the average reclaimed slope would be less than the average premining slope. This slight flattening of the topography would inhibit the reestablishment of the slope-associated rough breaks shrubland community, but it would also both reduce surface-water runoff (and, consequently, erosion) and increase infiltration (and, therefore, soil moisture availability to plants).

Dewatering of the permit area aquifers as a result of mining activities may affect some subirrigated land outside the permit area along School and West School Creeks. The subsequent vegetation impacts would probably be slight.

The nonagricultural vegetation communities most affected by mining would be the mixed prairie grassland and the big sagebrush shrubland (accounting for 61.9 and 27.4 percent of the total disturbance, respectively). After reclamation, acreages for each of the premine vegetation types would change. Substantial acreage gains would occur in the mixed prairie grassland (41.8 percent increase in acreage) and the streamside meadow (275.4 percent increase in acreage) communities, while losses would occur in the big sagebrush shrubland (3.0 percent loss in acreage), the rough breaks shrubland (91.2 percent loss), and the bunchgrass (potentially as much as 100 percent loss) communities. The amount of playa grassland to be restored has not yet been determined, but at least partial restoration would occur. The number of vegetation types would thus be reduced from the present six to basically four--prairie, sagebrush shrubland, streamside, and playa--immediately following reseeding of the affected areas.

Although the reduction in topographic diversity may also decrease the potential for community diversification over time, a number of the proposed reclamation methods should at least partially offset any actual or potential impacts to habitat diversity on the reclaimed areas. Further community diversification within the postmine vegetation types should be enhanced by the applicant's use of species from the bunchgrass vegetation type, by direct hauling of topsoil, by restoration of premine drainage patterns, by selective placement of shrub plantings in the streamside community type, by creation of depressions and rock piles, and by special planting procedures around the rock piles. Over the long term, the net effect of the applicant's reclamation plan may be the restoration, at least in part, of all six original vegetation types found on the site. Only the relatively unproductive breaks shrubland community may be substantially reduced in areal extent as a result of the overall reduction in slope on the reclaimed lands. Since all of the vegetation types found on the proposed permit area are typical of this region of eastern Wyoming (U.S. Bureau of Land Management, 1979a), the impact of this community's loss on the vegetation of the region should be minor.

Cumulative Impacts

By 1990, 5,256 acres of land disturbed by mining activities at the six proposed or existing surface coal mines would be unreclaimed (i.e., would not have been

planted with permanent seed mixtures); the proposed North Rochelle mine would account for 18.6 percent of this disturbance. By 1995 and 2000, surface disturbance would increase to 5,870 and 7,043 acres, respectively; however, North Rochelle's contribution to this increase would decline to 18.2 and 15.5 percent, respectively. Over the life of the six mines, a total of 30,173 acres would be disturbed; almost all of this acreage would be native rangeland.

Several impacts to vegetation would result from operations at these six mines. Most of the surface disturbance would occur in three vegetation types: mixed grass prairie (38 percent of total disturbance), sagebrush shrubland (24 percent), and rough breaks (22.5 percent). All six mines plan to restore the first two types to more or less their premining extent. However, the rough breaks type would usually not be deliberately reestablished on these mine areas. Since this vegetation type is slope-dependent and since the postmining topography of the areas would, in general, be more level, the potential for restoring this vegetation type on acreages similar in extent to premining areas would be somewhat diminished. Although relatively unimportant for forage, the rough breaks type can be important mule deer habitat. The Antelope, North Antelope, and Rochelle permit areas contain considerable amounts of this mule deer habitat. The reduction in acreage of the rough breaks type would, therefore, moderately impact the mule deer populations in the area. Of the rough breaks acreage to be disturbed by operations at the six mines, North Rochelle would account for only 3 percent.

Although some of the less extensive vegetation types (e.g., riparian or meadow communities) would typically be specifically restored during reclamation, most of the minor types would not. Consequently, community, as well as species, diversity would initially be lower on reclaimed lands. The shrub and tree component of any revegetated community would take the longest to be restored to premining conditions. Replacement of mature trees with seedlings or saplings would, over the short term, result in a reduction of potential nesting sites for raptors and other bird species. Shrub cover and forage value would only increase gradually. Over longer periods of time, species reinvasion and further topographic diversification on reclaimed lands should largely restore the species and community diversity on these lands to premining levels. Only the scoria-dependent bunchgrass type may decline substantially from premining levels because of the general lack of segregation of this substrate material during mining and reclamation. However, this vegetation type occurs on only 7 percent of the areas to be disturbed; North Rochelle's contribution to this percentage is negligible.

For additional discussions of the cumulative impacts of energy-related development in the eastern Powder River Basin on vegetation see the BLM's regional EIS's (1974, 1979a).

WILDLIFE

Development and operation of the North Rochelle mine would reduce the acreage of habitat available to the area's wildlife populations. By itself, the North Rochelle operations would not have significant impacts on the regional populations of wildlife because the site does not contain any unique or critical habitat, and habitat would be disturbed in parcels, with reclamation progressing as new disturbance occurs. However, cumulative impacts from all the development in the area would be more significant. Construction of facilities, population growth, and

demands for housing, services, recreation, etc. would further reduce habitat availability while increasing disturbance of the area's wildlife.

Site-Specific Impacts

Big game.--Development and operation of the North Rochelle mine would affect 3,721 acres of antelope range and 184 acres of mule deer range. Although the antelope range would be disturbed in parcels, it would be several years before the vital shrub component is adequate on reclaimed areas to support premining numbers of antelope. Another adverse impact to antelope would be potential barriers to movement created by additional fences, spoil piles, facilities, and pits. To the extent possible, fencing would be designed to permit antelope passage, but in some areas, the hazard would remain. During severe winter storms, antelope may be driven into such barriers, resulting in increased losses.

Although mule deer use of the North Rochelle site is low, there would be long-term, perhaps permanent, reductions in population because the rough breaks habitat would not be restored. Rock pile clusters may offset an unknown percentage of the rough breaks destruction. Mule deer displaced into adjacent areas would have to compete for limited resources, with subsequent losses, until a carrying capacity is reached.

Impacts to antelope and mule deer resulting from mining the North Rochelle operation alone would not have regional significance owing to the mitigation measures SOCM would use. These include: (1) planting a mixture of grasses, forbs, and shrubs in configurations beneficial to antelope and mule deer; (2) designing fences to permit antelope and mule deer passage where possible; (3) placing rock clusters and creating shallow depressions to add topographic diversity; (4) reducing vehicle speed limits to minimize losses; and (5) instructing employees not to harass or disturb wildlife.

Raptors.--The single documented raptor nest on the North Rochelle site is that of a red-tailed hawk, which would be disturbed in 1989. Prior to that date, SOCM would consult with the USFWS to obtain the required clearance. Foraging habitat for other raptors would be reduced until revegetation successfully attracts small mammals to serve as their prey. Power transmission lines would serve as additional perching sites. In the long term, successful establishment of the cottonwoods proposed for planting by SOCM would create more raptor nesting sites than exist at present.

Site-specific impacts to raptors would be insignificant because there is only one nest on the site and because SOCM proposes the following measures to mitigate impacts to raptors: (1) power poles would be made raptor safe and would provide new perching sites; (2) cottonwood plantings would eventually create more nesting sites than are available at present; (3) successful revegetation may support a greater than premining rodent (prey) population; and (4) employees would be instructed to avoid harassing raptors using the area.

Waterfowl.--Disturbing impoundments on the North Rochelle site would impact waterfowl which rest and feed there during migration. The creation of sedimentation ponds would somewhat mitigate this impact during mining. Thunder Basin No. 52 Reservoir, which would be moved prior to mining, would retain its value as habitat for waterfowl.

Impacts to waterfowl resulting from mining at North Rochelle would not have regional significance since the site has a limited value for waterfowl production. Even so, mitigation plans currently proposed appear inadequate to restore the area to its premining level of use as a feeding and resting spot. Wyoming DEQ has stipulated creation of additional impoundments during reclamation to sufficiently mitigate this impact.

Upland gamebirds.--The North Rochelle mine would eliminate habitat providing food and cover for a small number of sage grouse. Restoration of this habitat may take several years until revegetation success results in an adequate height and density of sagebrush.

Mourning doves nest and feed on the site, so dove production would drop as parcels of land are disturbed. These effects should be insignificant since doves feed on a variety of abundant seed sources and have general nest-site requirements.

Impacts from North Rochelle on these upland species would be minor, although those on sage grouse will last longer because the food and cover values of sagebrush would take longer to restore, whereas doves should return to reclaimed lands as soon as grasses are established on them. Specific mitigation measures for these species include adopting an approved revegetation mix of grasses, forbs, and shrubs. In addition, cottonwood plantings may provide new perching and nesting sites for doves. Trees and shrubbery would be grouped to improve cover value and create edge.

Medium-sized mammals.--As mine development proceeds, most of the medium-sized mammals at North Rochelle would move to adjacent habitat and would have to compete for resources. Where adjacent lands are at carrying capacity, this competition would result in some losses. Those animals that retreat into burrows may be lost during blasting and overburden removal. The abundance of those species requiring the rough breaks habitat would be permanently reduced unless rock clusters mitigate some of the impacts to that habitat. Those predators relying on small mammals would return to reclaimed lands only after revegetation efforts succeed in establishing sufficient food and cover.

Since most medium-sized mammal species are wide-ranging, and have general food habits and moderate reproduction potential, the North Rochelle development should not affect them significantly. Measures would be taken to lessen impacts on these species. Such measures include: (1) restoring food and cover using a diverse seed mix and a special riparian revegetation plan; (2) providing rock clusters for topographic diversiy and additional denning sites; and (3) imposing vehicle speed limits to reduce road kills. However, the current mine plan does not include plans to replace all of the small impoundments. Unless this is done, the lack of available water would reduce the suitability of reclaimed lands for most species in this group. (See appendix B.)

Passerines.--Passerines would have to compete for available territory and resources as their habitats are disturbed by land-clearing operations. Where adjacent habitat is at carrying capacity, this competition would mean some losses. Losses would be higher when habitat disturbance coincides with egg incubation and rearing of young. These effects would be short term for grassland species but would last longer for species needing shrubs.

Several mitigation measures are proposed by SOCM to minimize mining impacts on passerines. The diverse seed mixture with shrub groupings would provide food, cover, and edge effect. Successful cottonwood plantings would produce more perching and nesting sites than presently exist. Also, the special riparian revegetation plan would attempt to restore the values and diversity evident in baseline surveys.

Small mammals.--Direct losses within this group would be higher than for other groups since the mobility of small mammals is limited and many of them retreat into burrows when disturbed. Thus, there would be great losses during land clearing, blasting, and overburden removal. These losses would be short term since these species rapidly reinhabit reclaimed lands.

Impacts from the North Rochelle operation would not be significant since habitat would be lost in parcels and small mammals would quickly colonize reclaimed sites. The specific mitigation measures planned are revegetation diversity and placement of rock clusters.

Herptiles.--Like small mammals, herptiles have a limited mobility. Thus, many would be lost on the land parcels disturbed. This would mean less food for the birds and mammals that consume herptiles.

Development and operation of the North Rochelle site would not have significant effects on the regional population of herptiles since their use of this site is limited. Proposed mitigation includes reestablishment of grasses, forbs, and shrubs, and placement of rock clusters. Creation of both sedimentation ponds and impoundments (appendix B) should provide habitat for amphibians.

Fish and fish habitat.--Since baseline surveys failed to document the presence of fish on the site, impacts to fish and fish habitat are not expected. Relocation of the Thunder Basin No. 52 Reservoir and the creation of additional impoundments may create a potential for fish stocking, but stocking success may be limited by the size and ephemeral nature of such impoundments.

Threatened and endangered species.--The North Rochelle mine would not jeopardize the existence of any threatened or endangered species nor would it affect their critical habitat. There are no prairie dog towns on the site and surveys of nearby towns produced no evidence of black-footed ferrets. Although bald eagles roost in the area, the loss of foraging habitat would be minor and short term. There is a chance that increased road kills may provide additional food for scavenging eagles. Finally, peregrine falcons only pass through this area during migration and the North Rochelle site offers no unique values for peregrines. Appendix E gives the USFWS biological opinion regarding impacts of this mine on these species.

Mitigation proposed by SOCM would ensure protection of any previously unreported threatened or endangered species. Prairie dog towns would be surveyed for ferrets within 1 year prior to surface disturbance. The results of such surveys would be reviewed by USFWS, and by FS if Federal land is affected, before mining could proceed. Employees would be instructed to avoid disturbing bald eagles and revegetation should restore the disturbed parcels of foraging areas. All power poles would be raptor safe and usable as perches by bald eagles and any transient peregrines.

Cumulative Impacts

Cumulative impacts from coal development and industrialization of the eastern Powder River Basin are discussed in BLM's EIS's for the region (1974, volume II; 1979a).

Big game.--Cumulative impacts to antelope resulting from mining at the six mines in the area would increase as additional habitat is disturbed and many more barriers created. A study to assess regional impacts on antelope is proposed and SOCM may be required to participate. Mule deer losses may be permanent since the North Rochelle and other mines would destroy rough breaks habitat which cannot be restored. Cumulative secondary impacts would also be significant: with increased population come more poaching, vehicle/big game collisions, and increased disturbance in general.

Raptors.--Cumulative impacts from the six mines in the area to raptors would decrease in proportion as proposed mitigation techniques are refined. Mine companies are working with the USFWS to study raptor tolerance to disturbance, test protective buffer zones, relocate nests, and attract nesters to artificial sites. Since the lack of nesting sites can be a limiting factor in this region, the addition of power transmission poles modified to support nests may enhance raptor populations. On the other hand, where power poles border roads with increased traffic, perched raptors may be illegally shot. Where increased traffic results in additional road kills of prey for scavenging eagles, vehicle-eagle collisions may occur. Finally, the influx of people may result in more disturbance of nesting raptors and, perhaps, theft of eggs and young.

Waterfowl.--Cumulative impacts from the six mines on waterfowl should be minor. Waterfowl are mostly transient in this area because most ponds in the area are ephemeral. In addition, the more permanent impoundments, as well as Reno and Porcupine Reservoirs, would be restored. Sedimentation ponds would provide loafing spots for waterfowl during mining. Finally, where restoration procedures include partial protection of a pond from livestock, its value for waterfowl may be increased.

Upland gamebirds.--Habitat disturbance from the six area mines should not affect upland gamebirds significantly because (1) there are no vital sage grouse wintering areas or leks scheduled for disturbance, and (2) the general food and cover requirements for doves permit their rapid return to reclaimed lands.

Medium-sized mammals.--The combined effects of the six area mines on medium-sized mammals would be to reduce habitat and food availability. As reclamation proceeds, these species should respond quickly and invade suitable reclaimed lands. The most significant cumulative impact would be the increased number and activity of people in the region. This would lead to increased harassment, shooting, and road kills.

Passerines.--Cumulative impacts to passerines from the area mines would largely result from general habitat loss and increased human activities in the region. These are not expected to be significant since many of these species are highly mobile, and have general food and cover requirements and a moderate reproduction potential.

Small mammals.--The combined impacts of the six mines on small mammals would not be significant since these species invade reclaimed areas rapidly and have tremendous reproduction potential. In fact, studies have shown that many areas support more small mammals after reclamation than before mining.

Herptiles.--Cumulative impacts on this group, although not significant, would include temporary habitat loss, increase road kills, and perhaps increased taking by collectors.

Fish and fish habitat.--Overall, fish habitat and populations on the six minesites are marginal. The drainages have limited value owing to their intermittent or ephemeral flow. Some of the more permanent pools along drainages support minnows and other nongame fish. Two larger impoundments, Reno and Porcupine Reservoirs, which have fish populations, would be restored after mining. On the North Antelope minesite, the company has agreed to develop Porcupine Reservoir for an improved fishery and to allow public access to it. Furthermore, some of these restored impoundments would be partially protected from livestock, resulting in better water quality and shoreline cover.

Threatened and endangered species.--Because several bald eagle roosts have been found in the six-mine area, OSM prepared a biological assessment of that area which concluded that these operations might affect bald eagles. Following requirements of the Endangered Species Act, OSM then requested a biological opinion from the USFWS (appendix E), which was expanded to include commentary on black-footed ferrets and peregrine falcons. The opinion was that cumulative impacts would not be adverse for bald eagles or the peregrine but might be adverse for ferrets. As a result, OSM requires additional ferret surveys within 1 year prior to surface disturbance, either as a commitment in the mine plan or as a permit stipulation.

Secondary Impacts

Mining-related, secondary impacts to wildlife result from human population growth. Energy development has been the primary cause of human influx into the eastern Powder River Basin. The demand for housing and numerous services, and for outdoor activities including hunting and fishing, have increased proportionately. However, at the same time these demands are increasing, wildlife habitat and populations are being reduced.

This conflict between decreased habitat availability and increased recreation demand would have several impacts. First, sales of hunting and fishing licenses would increase to the point that these activities would become less enjoyable due to overcrowding, less hunting and fishing success, etc. Second, poaching would increase in an area where there is already a strain on limited law-enforcement capabilities. Third, more people and increased traffic would lead to shooting of nongame species and additional road kills. Finally, increased offroad activities would increase disturbance of wildlife during sensitive wintering and reproductive periods.

These impacts would be reduced at each of the six mines in the area by onsite mitigation measures such as prohibiting hunting, limiting vehicle speeds, educating employees, and timing activities to avoid sensitive periods. However, the cumulative secondary impacts will be significant unless fish and wildlife habitats are enhanced by increasing food and cover, creating additional water impound

ments with adequate cover, and developing and managing larger reservoirs for sport fishing. Additional funding would help Wyoming Game and Fish Department more effectively enforce the law. As of August 1982, there are no plans to enhance offsite areas to increase their wildlife carrying capacities and to satisfy the additional demands for outdoor recreation.

LAND USE

The proposed North Rochelle mine would have insignificant effects on regional land-use patterns. Mining operations would preclude grazing from as much as 100 percent of the permit area at any time and would hinder wildlife use during the mine life. Within 10 years after initiation of each reclamation phase, rangeland and wildlife use would return to near premining levels. Cumulative impacts of coal mining in the eastern Powder River Basin would include a reduction in revenues from livestock production over approximately the next 50 years. The mine also would impact oil and gas development over the life of the mine.

Site-Specific Impacts

The major past and present uses of the North Rochelle permit area and adjacent areas are livestock grazing, wildlife habitat, oil and gas production, and recreation. There are no prime farmlands on the permit area (appendix D).

The major adverse environmental consequences of the proposed action on land use would be the reduction of livestock grazing, loss of wildlife habitat, curtailment of oil and gas production, and loss of public land available for recreation activities. Also, SOCM's facilities and the rail spur would be located over unleased Federal coal, making that coal unavailable during the period of mining operation. Wildlife (particularly big game) and livestock (cattle and sheep) use would be displaced for the life of the mine. (See chapter IV, Vegetation and Wildlife.)

Development of the North Rochelle mine would affect livestock grazing on one grazing allotment. Because of private land sale transactions, this allotment is no longer under term permit to a local ranching interest. However, a temporary 1-year permit has been granted to a local rancher on a year-to-year basis, with no long-term renewal obligation implied. Because no existing ranching operation would be adversely affected by mining at North Rochelle, FS would withdraw all Federal lands within the permit boundary from Thunder Basin Grazing Association's administration.

Prior to commencing construction, SOCM would be required to fence all permit boundaries on Federal land. To facilitate big-game movement, fencing on Federal land would be constructed to meet FS's 5-wire standards. No fence would be constructed on Federal land between the railroad grade and the Reno County Road.

To mitigate the loss of Thunder Basin No. 52 Reservoir, which is a livestock and wildlife water source, SOCM would be required to drill a water well prior to fencing the permit boundary and to erect such structures as would be necessary to deliver and hold water in the SE¼ sec. 8, T. 42 N., R. 70 W.

Modification of shrubland on the permit area would have no major long-term effect on wildlife and livestock use. The entire disturbed area would be restored to a mixed grassland-shrubland community. The topographic diversity provided by the gullies and hills would be substantially lost.

At present, there are ten producing oil and gas wells within the permit area. Oil and gas leases on the mine area could not be further developed in areas where mining is occurring. However, areas not being mined, or areas which are reclaimed after mining, could be drilled while mining and/or reclamation is occurring in adjacent areas.

Development of the North Rochelle mine would necessitate construction of a 69-kV powerline and a buried telephone cable. The 69-kV powerline serving the Black Thunder and Jacobs Ranch mines would be extended southward to enter the North Rochelle permit area from the southeast. It would then parallel the conveyor system to the facilities area. An alternate route would be to extend the 69-kV line serving the North Antelope mine northward directly into the North Rochelle facilities area. In either case, the amount of surface disturbance would be negligible--less than 1.0 acre of grassland.

Construction of a buried telephone cable along Reno County Road from the existing cable in NW¼ sec. 12, T. 42 N., R. 71 W. to the facilities area would disturb less than 0.25 acre of grassland. The 5-mile railspur to be constructed from the Burlington Northern line to the mine would disturb about 36.5 acres. Other off-lease disturbances include the conveyor system, topsoil and overburden stockpiles, and the facilities area in the N½ sec. 9, T. 42 N., R. 70 W. Together, the off-lease activities would have a moderately significant impact, removing about 400 acres from agricultural production.

Use of the area for 30 years for a mine and reclamation of the land after mining would not conflict with any regional, local, or Federal land-use plans or policy.

Cumulative Impacts

Cumulative impacts resulting from mining at the six coal mines within the Thunder Basin National Grassland include a reduction of livestock grazing and revenues, a reduction of habitat for wildlife (particularly antelope and mule deer), disruption of oil and gas development, and loss of access to the public lands involved for use by recreationists (particularly hunters). In addition, several miles of existing pipelines, telephone lines, and power distribution lines would require relocation during mining. Existing special use permits for relocated facilities on FS land would have to be amended.

Beyond the 30,173 acres of land disturbed by the six mines per se, additional land would be disturbed by facilities such as access roads, railroad spurs, and power transmission lines. Any fences would affect livestock and big game movement. Roads and railroads would affect allotment boundaries and access routes.

Total acreage to be disturbed by existing and proposed coal mines in the eastern Powder River Basin (Campbell and Converse Counties) is 78,370 acres (about 1 percent of the acreage in the basin). By 1990, roughly $117,000 would be lost annually in agriculture income due to removing 27,300 acres from production in these two counties. (The calculations assume 3.5 acres/AUM, a 90-percent calf

crop, a revenue of $200/calf at sale time, and a 10-year grazing exclusion after initial revegetation.) By the years 2000, 2010, and 2020, $134,000, $118,000 and $57,000, respectively, would be lost annually.

SOCIOECONOMICS

The North Rochelle mine would contribute to both beneficial and adverse social and economic changes resulting from increased populations in the eastern Powder River Basin. The impacts to Campbell County associated with the mine would be moderate. Without the mine, its population would increase between 1982 and 1992 from 31,958 to 48,560; with the mine, population would increase to 49,582. For this same period, Gillette's population would increase from 15,914 to 23,309 without the mine and to 23,794 with it; Wright's population would increase from 1,630 to 2,914 and to 3,192, without and with the mine, respectively. Population impacts to Weston County/Newcastle associated with the North Rochelle mine would be insignificant.

The cumulative socioeconomic impact from all 22 existing and proposed mines in the basin area, however, grows increasingly significant. Gillette and Weston County/Newcastle, in particular, face difficulties in financing present capital improvement needs and future operating budgets.

Site-Specific Impacts

The term socioeconomics defines many aspects of social and economic interaction among people. Because these relationships are so complex and far reaching, the effect of a given mine on the socioeconomics of the area surrounding it is difficult to localize and to quantify per se. Impacts to the other resources or environments addressed in this EIS may be from activity at one mine (as, for example, the impact of mixing the soils on a site) or from activity at six (as, for example, displacing wildlife populations). The wider-ranging socioeconomic impacts to the eastern Powder River Basin are discussed in terms of activity at 22 existing and proposed mines, including the North Rochelle mine.

In the following discussion, impacts "without the North Rochelle mine" include anticipated population impacts from the Antelope, Rochelle, and North Antelope mines, as well as other energy projects planned for the eastern Powder River Basin. Impacts "with the mine" add the anticipated impacts from the North Rochelle mine to the other impacts.

The socioeconomic impacts associated with the North Rochelle mine would start with its construction, which is expected to begin in the first quarter of 1983, pending the availability of all necessary permits and approvals. Construction would last for about 21 months, with completion expected in November 1984. The maximum construction workforce is projected to be 346 in November 1983. The estimated construction cost of the mine is $166 million in 1982 dollars. The company estimates that almost $3 million would be paid in sales and use taxes to the city of Gillette and to Campbell County through 1992.

People employed directly by SOCM ("direct employees") would generate demands for secondary or nonbasic employees. The peak labor force associated with the North Rochelle mine, including both direct and secondary employees,

would be 511 in 1992, or 1.7 percent more than it would be for the area without the mine.

Campbell County.--Impacts to the socioeconomics of Campbell County owing to the North Rochelle mine would be relatively minor. The population would increase from 31,958 in 1982 to 49,582 in 1992. This is 1,022 persons (6.2 percent) more than the increase expected without the mine. The county has adequate housing, administrative services, (although additional employees will be required), fire protection, recreation facilities, library services (with the planned expansion), and school facilities with or without the mine. The North Rochelle mine would contribute to the need for increased solid waste disposal equipment and employees, would require the addition of one officer and a vehicle to the sheriff's department, and would contribute to the need for permanent 24-hour coverage at a substation in Wright.

The increase in population due to the mine would also generate a need for two additional hospital beds, one doctor, and one dentist. The hospital board has completed plans for expanding the hospital to 131 beds from 52 beds; a $12.5 million bond issue approved in November 1981 will provide the financing. Although the county has been moderately successful in recruiting doctors, there is still a critical shortage of dentists. The North Rochelle mine would compound the problem unless a recruitment program is successful.

With the development of the North Rochelle mine, Campbell County would experience an increasing revenue surplus through 1992. Although operating expenditures are projected to increase over 43 percent from 1982 to 1992, general fund revenues should increase by 65 percent, primarily in property, sales, and use taxes. This revenue surge would occur with or without the North Rochelle mine as a result of concurrent development of several mines and the Hampshire Energy project. Likewise, Campbell County would experience an increasing surplus in its capital improvements budget with the North Rochelle mine. The net fiscal impact from the mine would fluctuate but would remain positive through 1992.

Gillette.--It is estimated that construction and operation of the North Rochelle mine would increase the population of Gillette in 1992 by 485 persons (table IV-3), or by 2.1 percent over the population without the mine. The city has adequate water supply, police protection, fire protection, recreation facilities, and library facilities to meet the needs of the increased population. The mine would add about 2 percent to the demands on the administrative services. The city plans to have a remodeled administrative building by 1983, which would more than meet these demands. The sewage-treatment facilities are inadequate with or without the North Rochelle mine. Gillette plans to construct a new plant by 1983 that would be able to serve a population of 35,000. By 1992, Gillette's need for two additional garbage trucks and eight more employees for solid waste disposal would be slightly accelerated by development of the North Rochelle mine.

Because of developer plans and the availability of space for dwelling units, housing does not appear to be a problem in Gillette. However, interest rate costs and the availability of loan money may deter actual construction. During the mine construction phase, the housing supply in Gillette is expected to be sufficient to accommodate inmigrating temporary construction workers who choose to commute to the North Rochelle mine. Furthermore, as part of its mitigation plan, SOCM would provide operating employees with substantial relocation assistance to encourage the purchase of permanent single-family dwelling units.

Table IV-3.--Demographic variables with and without the North Rochelle mine, Campbell County, 1982-92

(Source: Stearns-Roger Engineering Corporation estimates in SOCM's application to the Wyoming Industrial Siting Administration)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
North Rochelle direct employment:[1]											
Construction	---	191	220	---	---	---	---	---	---	---	---
Operation	---	5	70	163	217	259	259	288	271	283	298
Total	---	196	290	163	217	259	259	288	271	283	298
Total employment:											
With North Rochelle mine	16,665	18,728	21,235	22,384	23,015	21,800	22,068	22,493	22,926	23,417	23,898
Without North Rochelle mine	16,665	18,515	20,900	22,190	22,720	21,425	21,650	22,025	22,485	22,945	23,405
Net	0	213	335	194	295	375	418	268	441	472	493
Occupied households:											
With North Rochelle mine	11,058	12,374	14,032	14,792	15,272	14,652	14,800	15,153	15,544	15,980	16,418
Without North Rochelle mine	11,058	12,234	13,811	14,663	15,077	14,400	14,519	14,838	15,245	15,658	16,079
Net	0	140	221	129	195	252	281	315	299	322	339
Gillette population:											
With North Rochelle mine	15,914	17,588	19,799	20,976	21,714	21,240	21,426	21,913	22,396	22,998	23,794
Without North Rochelle mine	15,914	17,476	19,581	20,778	21,424	20,870	20,958	21,465	21,971	22,540	23,309
Net	0	112	218	198	290	370	468	448	425	458	485
Wright population:											
With North Rochelle mine	1,630	2,054	2,397	2,366	2,543	2,594	2,726	2,829	2,932	3,077	3,192
Without North Rochelle mine	1,630	1,832	2,101	2,280	2,405	2,395	2,458	2,572	2,689	2,817	2,914
Net	0	222	296	86	138	199	268	257	243	260	278
Other rural population:											
With North Rochelle mine	14,414	15,996	18,076	19,258	20,033	19,681	19,952	20,549	21,148	21,850	22,596
Without North Rochelle mine	14,414	15,926	17,955	19,173	19,894	19,503	19,706	20,313	20,923	21,601	22,337
Net	0	70	121	85	139	178	246	236	225	249	259
Total Campbell County population:											
With North Rochelle mine	31,958	35,638	40,272	42,600	44,290	43,515	44,104	45,291	46,476	47,925	49,582
Without North Rochelle mine	31,958	35,234	39,637	42,231	43,723	42,768	43,122	44,350	45,583	46,958	48,560
Net	0	404	635	369	567	747	982	941	893	967	1,022
School District No. 1 students:											
With North Rochelle mine	6,414	7,177	8,139	8,579	9,010	8,791	9,028	9,395	9,793	10,277	10,672
Without North Rochelle mine	6,414	7,096	8,010	8,505	8,895	8,640	8,857	9,200	9,604	10,021	10,451
Net	0	81	129	74	115	151	171	195	189	256	221

[1] Average annual figures.

Construction and operation of the North Rochelle mine should prove to be generally positive for the Gillette budget during the study period, although small net deficits in the general fund operating budget are projected after 1986. This would be more than offset by a net cumulative surplus of $818,000 in the capital budget by 1992 due to the North Rochelle mine. Even so, Gillette faces a $3.3 million deficit in capital improvement funding in 1982 and a growing deficit in its general fund operating budget after 1987 owing to the cumulative impacts of energy development in the eastern Powder River Basin. Either increased revenues or reduced services and postponed capital improvements are therefore likely.

Wright.--Sixty percent of the North Rochelle construction workforce is expected to reside in Wright, thus increasing its population more than 30 percent, by 222 persons in 1983 and 296 persons in 1984. Wright is a planned community development designed for at least 1,900 dwelling units. Moreover, local representatives anticipate and encourage growth. Consequently, accommodating the new residents should not be a problem.

Wright's Water and Sewer District has adequate capability to meet demands for water and sewerage. Fire protection, hospital, library, and recreation services, and schools are provided by the county; a new sheriff's substation is needed to provide 24-hour law enforcement service in the area.

SOCM intends to provide approximately 70 housing units for 110 construction workers in Wright to help mitigate any temporary housing shortage.

Weston County/Newcastle.--Because it is anticipated that most, if not all, of the employees at the North Rochelle mine living in Weston County would live in or near Newcastle, impacts to the two entities are discussed together.

From 15 to 25 percent of the employees of the North Rochelle mine are expected to reside in Weston County during the construction and operating phases. During the peak construction year (1984), an average of 33 construction employees and 15 operating employees are expected to reside in the Newcastle area. These employees, in turn, would increase the county's secondary employee workforce by 25 persons. Thus, the county's labor force would be increased by a total of 79 persons. The 70 new households would mean a population increase of 179 persons, with 39 additional school-age children. Population increases attributable to the mine in Weston County and Newcastle would be minimal (table IV-4), reaching a maximum of 215 additional persons, a 2.52 percent increase, by 1987.

With the planned expansion of the courthouse, both the county and Newcastle would be able to meet increased requirements for administrative service employees and space. Water supplies, library services (with the planned expansion), and schools are adequate to meet the increased demands. Even without impacts from the North Rochelle mine, the sewage treatment facility needs to be upgraded or a new one built; a new sanitary landfill and one additional sanitary landfill worker are needed; the sheriff's department currently needs two additional officers and additional jail, office, and communications facilities, plus a third officer by 1992; the Newcastle Police Department needs additional staff, vehicles, and equipment, plus two more officers and one vehicle by 1992; and the fire departments need a new substation and equipment by the mid-1990's. At least two more doctors are needed for the county, as well as a means for funding the $5.5 million new hospital. Additional recreational facilities, particularly an indoor recreation complex, are needed, but, to date, they have been given a low priority in budgetary considera

Table IV-4.--Demographic impacts to Weston County from the North Rochelle mine

(Source: Stearns-Roger Engineering Corporation estimates in SOCM's application to the Wyoming Industrial Siting Administration)

Net addition to	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Basic employment	29	51	41	52	57	39	43	41	42	43
Nonbasic employment	20	25	28	36	40	27	30	28	30	31
Total labor force	51	79	71	91	100	68	75	71	74	76
Households (Newcastle area)[1]	44	74	60	76	84	57	64	60	63	64
Population (Newcastle area)	107	171	153	195	215	146	162	153	159	164
Students (Weston County School District No. 1)[2]	19	31	25	32	36	25	28	28	29	30

[1]Newcastle area reflects Newcastle division of the census.

[2]Students are projected in terms of average daily membership for school years.

tions. The population increase resulting from the North Rochelle mine would increase these needs only incrementally.

Since the North Rochelle mine would not be in Weston County, the county would not benefit directly from the project's assessed valuation. When construction of the mine begins, in 1983, personal income within Weston County would increase by approximately $1 million as a result of the mine. Personal income within the county would increase to $3 million by 1987 and would average more than $2 million per annum thereafter. This additional income should result in increased sales and use tax receipts, but these revenues probably would not be substantial.

Weston County is currently faced with a number of costly capital facility projects. Even though the projected population increases associated with the mine would not significantly impact the county, the mine-related residents would contribute toward the need for these expanded facilities.

Newcastle's most important revenue is the sales tax. The increases in personal income associated with the mine would increase the city's tax base, but an increased demand for city services also can be expected. Like the county, Newcastle is anticipating major capital facility expenditures. Although the impact of the mine may not be substantial, project-related residents would further reinforce the need.

The 1981 Wyoming State Legislature enacted W.S. 39-6-411(b)(i), which provides for impact assistance payments. These payments are to be made to a county, and towns within that county, in which industrial facilities are located. The new act provides that, upon request from the county commissioners of any adjoining county, the Wyoming Industrial Siting Council may determine that the social and economic impacts from the construction of the facility are likewise significant in that adjoining county. The council may then establish a ratio according to which impact payments would be divided between the counties. Therefore, impact assistance payments probably will be made to Campbell and Weston Counties according to the ratio of impacts actually received. These funds probably will be distributed among Campbell County, Gillette, Weston County, and Newcastle.

SOCM has developed proposals to help alleviate some of the major socioeconomic impacts resulting from the mine. These may be incorporated as permit conditions in the applicant's siting permit to be issued by the Wyoming Industrial Siting Council in the next few months. (See appendix A.)

Cumulative Impacts

While socioeconomic impacts associated with the proposed North Rochelle mine are moderate, the cumulative impact of the expanding coal mining industry in Campbell County is significant. Updated projections of employment and production for the 12 existing mines and the 10 mines proposed or under construction in the eastern Powder River Basin are given in table IV-5. Annual coal production is projected to increase from 88 million tons to almost 141 million tons by 1985 and to 217 million tons by 1990. Campbell County's population is expected to grow 55 percent between 1982 and 1992, with 33 percent of the surge occurring by 1985. The total labor force is projected to grow from 17,090 in 1982 to 22,848 in 1985, an increase of 33.7 percent in 3 years. Steady growth, in excess of 10 percent

Table IV-5.--Employment and production projections for coal mines in the eastern Powder River Basin, 1982-90

(Sources include Wyoming Mineral Development Monitoring System (updated to June 1982); DEPAD, Cheyenne, Wyoming; U.S. Bureau of Land Management, 1981; and EIS's prepared by OSM for several coal mines. Note that data regarding individual mines may not reflect current planning. The total of 4,691 operation-phase employees in 1985 corresponds with the 1981 Campbell County Monitoring Report's estimated total of 4,610)

Mine	1982 Employees Con-struction	1982 Employees Oper-ation	1982 Production (million tons/yr)	1985 Employees Con-struction	1985 Employees Oper-ation	1985 Production (million tons/yr)	1990 Employees Con-struction	1990 Employees Oper-ation	1990 Production (million tons/yr)
Existing									
Belle Ayr	---	416	14.9	---	424	10.0	---	422	12.0
Black Thunder	---	456	17.6	---	470	17.3	---	525	22.0
Buckskin	---	70	1.5	---	156	6.1	---	80	1.5
Caballo	---	126	5.0	---	170	7.0	---	305	12.0
Clovis Point	---	142	2.7	---	142	3.4	---	142	3.4
Coal Creek	30	121	1.0	---	309	6.6	---	385	12.0
Cordero	---	224	8.5	---	350	13.0	---	350	24.0
Eagle Butte	45	299	9.0	48	369	15.4	49	511	16.9
Fort Union	---	54	1.2	---	54	1.2	---	54	1.2
Jacobs Ranch	---	352	10.7	---	380	11.7	---	375	11.7
Rawhide	---	235	13.0	---	330	24.0	---	555	24.0
Wyodak	---	66	2.8	---	66	3.8	---	90	5.0
Subtotal	75	2,560	87.9	48	3,220	119.5	49	2,794	145.7
Proposed or under construction									
Antelope	176	8	---	---	108	0.9	---	537	5.6
Dry Fork	---	---	---	---	267	2.0	---	300	8.0
East Gillette	---	---	---	40	35	---	---	257	11.0
North Antelope	169	---	---	---	88	2.5	---	165	5.0
North Rochelle	---	---	---	---	163	2.0	---	271	8.0
Rochelle	---	---	---	162	151	---	---	292	3.0
Rocky Butte	25	---	---	100	90	2.5	---	250	5.0
Rojo Caballo	500	173	---	---	335	9.0	---	477	15.0
South Rawhide	---	---	---	---	104	1.0	---	236	7.0
WYMO	75	---	---	113	130	2.0	---	250	4.0
Subtotal	944	181	---	415	1,471	21.9	---	3,035	71.6
Total	**1,019**	**2,741**	**87.9**	**463**	**4,691**	**141.4**	**49**	**6,829**	**217.3**

annually over such a short period, challenges the capability of local government to absorb and accommodate without extraordinary planning efforts and special assistance.

The preceding sections reviewed socioeconomic impacts (both with and without the North Rochelle mine), describing needs for additional community facilities and services and the anticipated fiscal ability of impacted areas to respond. Significant problems occur in two of the five public entities affected: Gillette and Newcastle/Weston County.

Gillette.--Construction and operation of the North Rochelle mine should be generally beneficial to Gillette's budget. Nevertheless, the city faces a $3.3 million shortfall in capital improvement funding in 1983 and a growing deficit in its general fund operating budget after 1987 due to the cumulative effect of area energy development. To avoid a fiscal shortfall, revenues must be increased, service levels reduced, capital improvements postponed, or some combination of these approaches implemented.

Newcastle/Weston County.--The minimal population increases attributable to the North Rochelle mine would not alter the financial status of these two entities materially. Nevertheless, mine-related residents would reinforce the need for expanded facilities, including additional water storage, a new or upgraded sewage treatment plant, new sanitary landfill, additional law enforcement and fire protection facilities and staffing, a new hospital, and an indoor recreation center. The total cost of these additional facilities exceeds $10 million; only a fraction of the required funding has been committed.

Direct coal-related and secondary induced employees are expected to approach 9,000, or 39 percent of the Campbell County workforce in 1985. The total of 4,691 direct operating employees projected for 1985 in table IV-5 supports this estimate. Both the BLM report on the Powder River Coal Region (1981a) and the Campbell County Monitoring Association report for 1981 reflect similar projections. Although there is no coal-related employment within Weston County itself, approximately 500 operating and construction employees--a sizeable segment of the workforce--would be commuting from the Newcastle area to the six existing or proposed coal mines in southern Campbell and northern Converse Counties.

The Wyoming Industrial Siting Council has recognized the significant influence of the coal industry in both Gillette and Newcastle/Weston County. At its urging, the coal industry established the Campbell County Monitoring Association, which produces a comprehensive annual report on socioeconomic conditions within the county and studies problems or trends highlighted by that report. Under the cooperative monitoring concept, the coal industry works with local governments to evaluate priority needs that cannot be financed through ordinary revenue sources. Mitigative assistance may then be designed on a cooperative, shared basis according to relative socioeconomic impacts from each mine or related enterprise. Consideration and credit is given previous or ongoing mitigation efforts, whether voluntary or required.

Because of the growing weight of the cumulative impact of coal development in the Powder River Basin, the following impact-control measures may be considered by the Wyoming Industrial Siting Council:

. Continued support of mass transit programs for employees from Gillette and Wright, as well as from the Newcastle area if necessary.

. Specific consultation by the Campbell County Monitoring Association with the city of Gillette and development of mitigative measures to help alleviate the city's fiscal problems.

. A new, similar cooperative monitoring and mitigation effort by the six mines in southern Campbell County and northern Converse County to help alleviate the difficult funding problems facing Newcastle/Weston County.

SAFETY

Working in a coal mine is a hazardous occupation. Accident figures for Wyoming for 1980 from the Mine Safety and Health Administration show there was 1 fatality and 137 disabling accidents. This is an average of 2.76 disabling (lost-time) injuries and 0.02 fatal accidents for every 200,000 man-hours worked in a coal strip mine. Assuming the employees average 2,400 man-hours a year for 26 years, and an average of 200 employees are actually involved in mining, this would mean about 172 disabling injuries and 1 fatality during the life of the North Rochelle mine.

TRANSPORTATION

Increased road traffic due to the North Rochelle mine and the other mines proposed for the area would necessitate the relocation/reconstruction of the Verse-Hilight and Reno County Roads. Transportation of coal from the mine would not, by itself, cause significant impacts. Cumulative railroad impacts (grade crossing interference and noise) from this mine and other mines could be significant in some communities.

Site-Specific Impacts

Road traffic would increase noticeably on Wyoming State Highway 59, northward from Douglas to the junction at the Verse-Hilight Road (County Road 37) and southward from Gillette and Wright to the Reno County Road. (See figure I-1.) Both of these roads may provide access to the North Rochelle mine. In addition, traffic would increase on State Highway 450 from Newcastle west to the junction with School Creek Road.

FS (1981) prepared an environmental assessment of this road network, including alternative access routes to serve the four proposed coal mines on the Thunder Basin National Grassland. Its selected alternative (fig. IV-4) would provide adequate access to the mines, as well as serve other uses in the area, such as ranching, oil and gas development, and recreation.

Concurrent mining activities at the proposed North Rochelle and the existing Black Thunder mines would necessitate closing the Reno County Road for a period of about 20 years beginning in 1990. Since this would essentially eliminate public access to Federal lands administered by FS east of the proposed mine, a public

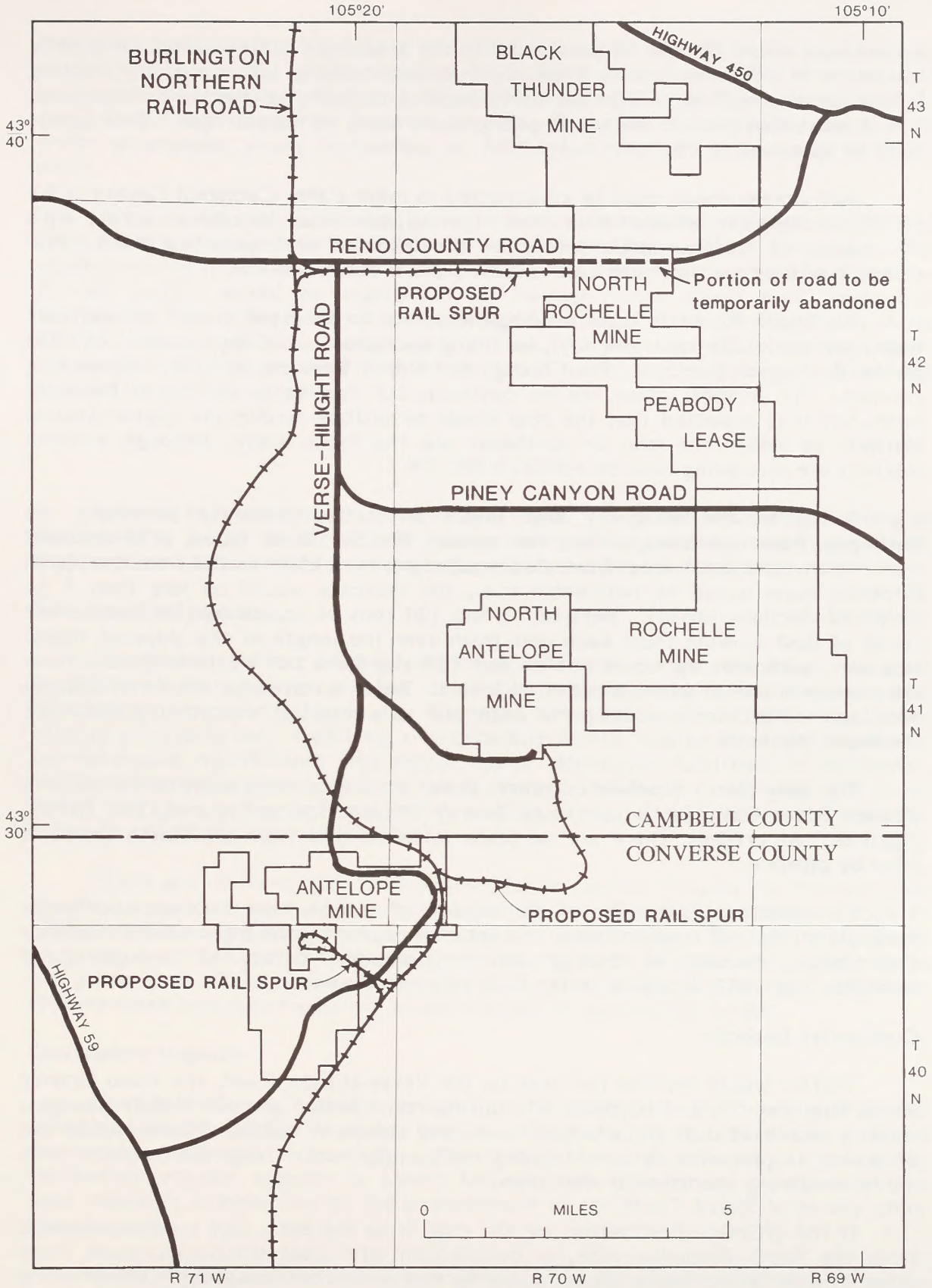


Figure IV-4.--Public access routes.

access road would have to be provided into the area from State Highway 450 prior to closure of the Reno County Road. Such access could be either over the existing School Creek Road or on another route located on National Forest System land. SOCM must also provide access to public lands south of the rail spur. This access must be approved by FS.

Both access roads must be constructed to meet either Campbell County or FS guideline standards, whichever is more rigorous, and must be commensurate with the volume of traffic, public safety, or the loads to be imposed on them. The standard of construction must be the same for the entire system.

The North Rochelle mine would generate up to fourteen loaded 100-car unit trains per week (2.3 trains per day), assuming operations are 6 days a week, on lines of the Burlington Northern, the Chicago and North Western, and their connecting carriers. At present, there are no contracts for coal from the North Rochelle mine, but it is expected that the coal would be utilized within the United States. Markets to either the east or southeast are the most likely, although western markets are also being considered.

Owing to the relatively high levels of traffic presently traversing the Burlington Northern lines serving the eastern Powder River Basin, it is doubtful that incremental noise level increases resulting from traffic to and from the North Rochelle mine would be noticeable (i.e., the increase would be less than 3 A-weighted decibels (dBA)). Between 5 and 100 tons of coal would be lost as the result of dust blowing from each unit train over the length of the shipping route. However, such blowing would not exceed TSP standards nor would emissions from the engines increase gaseous pollution levels. Based on average accident data, an additional 12 accidents would occur each year as a result of transporting coal from the North Rochelle mine.

The only slurry pipeline currently under active consideration in the eastern Powder River Basin is the proposed Energy Transportation Systems, Inc. (ETSI), pipeline. At present, there are no plans to move coal from the North Rochelle mine by pipeline.

For additional discussion of the impacts of transporting the coal, see "North Rochelle mine, coal transportation impacts," prepared by the Interstate Commerce Commission, Section of Energy and Environment, Office of Transportation Analysis, July 1982, available in the OSM office in Denver.

Cumulative Impacts

Traffic would become heaviest on the Verse-Hilight Road, the Reno County Road, Highway 59, and Highway 450 during construction and work-shift changes, causing increased dust disturbance, noise, and delays in traffic. However, the use of buses, as proposed by some mining companies, would keep the impacts to a minimum during operation at the mines.

If the ultimate destination for the coal is to the east, unit train movements from the North Rochelle mine, in conjunction with coal traffic increases from other Powder River Basin mines, would further exacerbate existing grade-crossing blockage, grade-crossing safety, and community development problems along Burlington Northern and/or Chicago and North Western and their connecting lines in Wyoming, Nebraska, and Missouri (table IV-6). Previous studies indicate that

increased coal traffic (including coal from the North Rochelle mine) could necessitate additional grade separations in 43 communities along the probable routes of coal traffic in Wyoming (5) and Nebraska (38). Studies further indicate that, should unit trains be destined south to Texas via Colorado, as many as 18 grade separations would be needed on Burlington Northern's Wyoming to Texas route.

Anticipated cumulative traffic increases could raise noise levels at 100 feet from the track by at least 5 decibels on rail lines in Wyoming and Nebraska. The grade crossing interference and noise pollution impacts from cumulative increases in rail traffic would be significant if Powder River Basin coal production approaches the 1990 preferred leasing targets outlined in the Powder River Basin EIS (U.S. Bureau of Land Management, 1981a). Air pollutant emissions from open-top hopper cars (coal dust) and locomotives would be insignificant, even with cumulative traffic increases.

RECREATION

Impacts to recreation would be insignificant. The present moderate hunting on the minesite would be eliminated during construction, mining, and reclamation. Dispersed recreation would increase in Campbell and Weston Counties.

Site-Specific Impacts

The primary effect of the North Rochelle mine on the recreation resources would be to increase the number of people seeking recreational opportunities. Developed recreation sites in the Gillette, Newcastle, and Wright areas would receive additional use. Resulting overcrowding would lead to increased vandalism and increased maintenance and repair costs. Municipal facilities, in particular, would be inadequate to meet local needs, except in Gillette. Although tax bases would increase, a lag between need, availability, and sufficiency of funds for expanding facilities appears inevitable.

There are no recreation facilities, wilderness areas, etc., on the minesite, and the land is seldom used by the public except for dispersed recreation, such as offroad vehicles, hunting, rock collecting, and sightseeing. The plantsite, transportation facilities, and annual mining operations would physically eliminate up to 600 acres of potential hunting areas during any given year. The acreage withdrawn from recreational uses for safety reasons would be appreciably larger.

Cumulative Impacts

Campbell County's public recreation facilities are the most extensively developed in the Rocky Mountain Region. Usage by young, recreation-oriented inmigrants continues to be high. The strong financial position of the county recreation program appears to assure future indoor recreation opportunities for area residents irrespective of the development of the North Rochelle or any other specific mine.

Gillette's fiscal situation inhibits development of additional recreation facilities. However, SOCM's (and other mining companies's) continued participation in the Adopt-a-Park program would assist the city in providing recreation facilities needed as a result of mine-generated population increases.

Table IV-6.--Maximum possible rail traffic on Burlington Northern, Chicago and North Western, and Union Pacific lines resulting from opening of the Antelope, North Antelope, Rochelle, and North Rochelle mines

(Values are in trains per day)

Burlington Northern segment	1980 traffic	Maximum Antelope, North Antelope, Rochelle, and North Rochelle traffic[1]	Expected 1991 traffic	
			Low Powder River Basin demand[2]	High Powder River Basin demand[2]
North Antelope mine to Orin, Wyoming	13	19.5	25	64
Orin, Wyoming, to Wendover, Wyoming	17	19.5	29	68
Wendover, Wyoming, to Northport, Nebraska	18	19	28	67
Northport, Nebraska, to Alliance, Nebraska	14	19	26	58
Alliance, Nebraska, to Grand Island, Nebraska	29	19	54	128
Grand Island, Nebraska, to Lincoln, Nebraska	39	19	59	131
Lincoln, Nebraska, to Napier, Missouri	17	19	24	51

[1]Maximum amount of coal from the four mines that could be transported over the line segments listed. Only the routes of three movements comprising 10.6 million tons per year are known. The routes of the remaining 25.4 million tons per year are not known.

[2]Based on the assumption that Burlington Northern is the only carrier serving the four mines. Under the low Powder River Basin demand column, annual Powder River Basin coal production is 160 million tons per year; under the high Powder River Basin demand column, production is 375 million tons per year.

Table IV-6.--Maximum possible rail traffic on Burlington Northern, Chicago and North Western, and Union Pacific lines resulting from opening of the Antelope, North Antelope, Rochelle, and North Rochelle mines--Continued

(Values are in trains per day)

Chicago and North Western or Union Pacific segment[3]	1980 traffic	Maximum Antelope, North Antelope, Rochelle, and North Rochelle traffic	Expected 1991 traffic	
			Low Powder River Basin demand[3]	High Powder River Basin demand[3]
North Antelope mine to Shawnee, Wyoming	[4]13	19.5	16	24
Shawnee, Wyoming, to Crandall, Wyoming	2	19	18	26
Crandall, Wyoming, to Joyce, Nebraska	0	19	16	24
Joyce, Nebraska, to Northport, Nebraska	2	19	18	26
Northport, Nebraska, to O'Fallons, Nebraska	4	19	20	28
O'Fallons, Nebraska, to Gibbon, Nebraska	57	19	73	81
Gibbon, Nebraska, to Topeka, Kansas	22	19	28	32

[3]Based on the assumption that Burlington Northern and Chicago and North Western are the only carriers serving the four mines. Low Powder River Basin demand assumes a 160-million-ton-per-year production level for the entire Powder River Basin, whereas high Powder River Basin demand assumes a 375-million-ton-per-year production level.

[4]1980 traffic is for Burlington Northern trains only.

Weston County's need for indoor recreation facilities would be reinforced by development of the North Rochelle mine. However, funding difficulties continue.

Recreational impacts to the Big Horn, Black Hills, and Medicine Bow National Forests, to the Glendo Reservoir and State Park, and to the Keyhole Reservoir and State Park would increase.

CULTURAL RESOURCES

Significant cultural resource sites on the permit area would be only slightly impacted by mining the proposed North Rochelle mine. One such site is considered eligible for nomination to the National Register of Historic Places; adverse impacts to this site would be mitigated. An eligibility and a "no adverse effect" determination is being sought from the Wyoming SHPO; concurrence is expected. Increased vandalism and unauthorized collecting could affect sites on nearby lands. An assessment of cumulative impacts to cultural resources resulting from mining is to some degree a relative determination.

Site-Specific Impacts

Wyoming State law requires an evaluation of mine permit areas to determine their significant "artifacts (and) fossil or other articles of culture, historical, archeological or paleontological value" (Wyoming Department of Environmental Quality, Land Quality Rules and Regulations, chapter II, Section 2.1.(1)(k), 1981). Federal law requires an inventory of all cultural resources that are both listed or eligible for listing on the National Register of Historic Places and situated on lands that are or are proposed to be federally licensed. It further requires mitigation of any adverse impacts to such cultural resources (National Historic Preservation Act of 1966, as amended in 1980, Executive Order 11593, 36 CFR 800.4).

SOCM has produced five reports describing the cultural and paleontological resources within the permit area. Survey methods and recording and data analysis techniques associated with the inventories and preparation of the reports, taken together, meet or exceed current performance standards. The data collected during the inventory effectively constitute mitigation of adverse effects caused by proposed land-disturbing activities for all located cultural resources (sites not eligible) except the Rockwell Homestead. The Wyoming SHPO recommends that adverse impacts to this latter site would be mitigated after it is photographed, using the standards of the Historic American Building Survey, prior to its destruction. Given this stipulation, the Wyoming SHPO is expected to concur with OSM's "no adverse effect" determination.

North Rochelle's cultural resource sites contribute little to the significant findings for the cumulative impacts. However, an understanding of why there are so few significant sites on North Rochelle contributes important data to the cultural resources framework for the area.

Cultural resources located adjacent to the permit area may be impacted by mining activities as a result of increased population in the general area. There may be increased vandalism and unauthorized collecting associated with recreational activity and other pursuits. Moreover, there is always a possibility that cultural resources inventories based on current technology may not have located all

"significant" sites or data within the survey boundaries. Therefore, the potential exists of destroying unknown sites.

Present treatment of cultural resources allows for collection of a portion of the scientific data present at a given site. However, current methodologies, technologies, and priorities may overlook, or find unimportant, sites or data that in the futre may be critical to the interpretation of past lifeways. Additionally, the selection of sites for further treatment in lieu of others may cause the loss of important cultural resources.

Cumulative Impacts

An assessment of cumulative impacts to cultural resources of an area is to some degree a relative determination. It is a dynamic system in which the factors affecting significance or insignificance of the impacts will change as more is learned about the area. The loss of sites can be accepted to a certain degree because of the information that has been gained while studying them before destruction. However, it is never possible to fully mitigate all impacts.

A majority of the known cultural resource sites in the southern part of the Powder River Basin have been recorded as a result of studies for the existing and proposed coal mines. At present, it is not possible to exactly quantify the significant prehistoric and historic sites that would be impacted by mining in the southern part of the Powder River Basin. However, an estimate (table IV-7) can be made based on inventories at the four proposed (where data are collected and available) and two existing (where data are as yet incomplete) mines in the area. Note that the density of sites at the two mines where inventories have not been completed is not expected to vary greatly from the average density at the four mines where inventories are complete. However, the projections may be somewhat high considering other environmental parameters.

Clearly, a number of significant sites, or sites eligible for nomination to the National Register of Historic Places, have been or will be impacted by coal mining operations within the basin. Ground disturbance, the major source of impact, can affect the integrity of or destroy a site. Changes in setting or context greatly impact historical properties. Mitigative measures such as stabilization, restoration, or moving of buildings cause adverse impacts to context, in situ values, and overall integrity. Additionally, loss of sites through necessary mitigation can constitute an adverse impact by elimating the site from the regional data base and/or affecting its future research potential.

Even with well organized mitigation plans and associated procedures, impacts are unavoidable. It is not possible nor practicable to mitigate all sites; thus, unmitigated sites are likely lost. Research is based on current standards so research designs are often wide ranging in orientation, satisfying only the needs of the researcher and contributing little to the understanding of the region. In most cases, treatment of eligible sites is confined to those that would be directly impacted, while those that may be indirectly impacted received little or no consideration unless a direct mine-associated effect can be established. Increasing population associated with the coal development coupled with the opening of previously hard to get to areas would result in increased vandalism both on and off mine property. Finally, environments in which coal is strip minable (shallow overburden) may contribute to the unintentional selective distruction of segments of the archeological record.

Table IV-7.--Summary of cultural resource data

Existing or proposed mine	Study area (acres)	No. of sites			No. of eligible sites	Site density per section
		Prehistoric	Historic	Total		
Data from completed surveys						
North Rochelle	7,320	11	17	28	1	2.4
Rochelle	7,200	88	[1]25	113	[2]29	10.0
North Antelope	3,800	105	3	108	[2]61	18.3
Antelope	7,542	88	10	98	[2]48	8.2
Total and/or average	25,962	292	55	347	139	8.5
Data projected						
Jacobs Ranch	5,000	54	10	64	---	[3]8.5
Black Thunder	10,500	117	22	139	---	[3]8.5
Total and/or average	15,500	171	32	203		[3]8.5

[1]Figure represents the number of sites having both historic and prehistoric artifacts.

[2]Noncontiguous archeological/historic district (all district sites located within permit boundaries).

[3]The projected site density per section is assumed to be the average density for sections where surveys are complete.

Beneficial results or impacts may be expected from coal development. Valuable data is being and has been collected by the various surveys. Data that would otherwise not be collected until some time in the future or lost in the interim is available for study. Mitigation also results in the collection and preservation of data that would likely otherwise be lost. Upon completion of mining in the southern part of the Powder River Basin, a detailed, all-encompassing history and prehistory of this limited area should be available. The collection of cultural-resource data potentially benefits a number of other disciplines such as socioeconomics and land-use planning.

The cumulative impacts of mining on significant cultural resources in the southern part of the Powder River Basin must be considered significant when no other factors are considered. When mitigation is factored into the equation, the impacts are greatly lessened. However, they are not totally resolved. With mitigation and concurrences from the SHPO in findings of "no adverse effects," the previous significant determinations may be lowered to moderately significant in regards to the southern part of the Powder River Basin.

It is proposed that an estimate or prediction of the numbers of sites and "eligible sites" within the Powder River Basin be developed in the very near future. Statistical techniques could then be employed by the area's cultural resource land managers to determine when impacts to cultural resources approach the significant level, and to develop a plan to deal with the findings.

NOISE

Impacts from noise generated by mining activities at the proposed site are expected to be insignificant owing to the remote nature of the site. Observations at other surface coal mines in the area indicate that wildlife adapt to noise conditions associated with active coal mining.

Site-Specific Impacts

Noise levels at the site would be increased considerably by mining activities, such as crushers, conveyors, rail car loading, scraping, hauling, etc. During reclamation, noise would be generated by equipment used to regrade, till, and prepare seedbeds. However, OSM's noise impact report, written for the Rojo Caballos mine (U.S. Office of Surface Mining, 1980b), indicates that a noise level from crushers and a conveyor under the worst of conditions would not exceed 45 dBA at a distance of 1,500 feet from the source of noise. Moreover, the Noise Control Act of 1972 indicates that a 24-hour equivalent level of less than 70 dBA prevents hearing loss and that a level below 55 dBA in general does not constitute an adverse impact due to noise intrusion. Thus, noise resulting from mining and reclamation activities would be both of an acceptable degree and restricted to within or near the permit boundary.

Because of the remoteness of the site and because mining has already been accepted in the area, noise would have little offsite effect. Wildlife on the site might be affected by noise; however, it is not possible to determine the extent of this impact alone and, in any case, the destruction and disruption of habitat during mining would be a greater impact. After reclamation is completed, noise would return to its present level.

The increased train traffic resulting from the North Rochelle mine would not increase noise levels along line segments in Wyoming and Nebraska by more than 3 dBA on the L_{dn} (decibels weighted on a day-night basis) scale. The EPA rates a 3-dBA increase as noticeable yet insignificant.

Explosives would be used at the North Rochelle mine to fragment the overburden and coal to facilitate their excavation. The air overpressure created by such blasting is estimated to be 123 decibels flat. This is well below the level at which damage could occur to the nearest occupied dwelling (4,700 feet away).

Cumulative Impacts

Cumulative increases in noise from trains serving the North Antelope and other mines in the Powder River Basin could cause substantial increases (more than 5 dBA) in L_{dn} levels along segments of the rail lines over which the coal is transported to markets.

VISUAL RESOURCES

During construction and mining, visual impacts would be insignificant because the minesite would not be visible from any major travel routes, and the facilities area would be partly concealed by surrounding hills. The landscape character would not be significantly changed after reclamation is completed.

Site-Specific Impacts

Visual impacts would be evident during the 26 years of mining. However, these impacts would be about the same as at the two ongoing and three proposed mines in the area. Because this mine would affect landscapes classified by FS as "common," the visual impacts would be relatively insignificant. (See figure IV-5.)

After reclamation, impacts would be negligible--reclaimed terrain would be almost indistinguishable from the surrounding terrain to the north and west. Slopes might appear smoother (less intricately dissected) than undisturbed terrain to the south and east, and sagebrush would not be as abundant for several years. Still, within a few years after reclamation, the mined area would be distinguishable from the surrounding undisturbed terrain only to somebody very familiar with landforms and vegetation.

Cumulative Impacts

During mining, the principal visual impact from the six area mines would be the visibility of the mine pits and facilities areas. However, except for the facilities areas at the Black Thunder and Jacobs Ranch mines (which sit across State Highway 450 from each other), facilities at the six mines are located several miles apart. Moreover, anyone likely to see the facilities would either be passing through the area or visiting it on mine-related business. And except from the air, it would not be possible to see either the pits or the facilities at more than two mines from any one spot. Thus, any cumulative impacts to visual resources of the area during mining would be insignificant.

After mining, the reclaimed slopes might appear a bit smoother than premining slopes; there might be fewer gullies than at present. Even so, the

The present landscape character of the minesite is not unique to the region, nor is it outstanding. The Forest Service classified most of it as "common," and rated its sensitivity level (measure of people's concern for scenic quality) to be "level 3," that is, the level of lowest user concern. Most people would be visiting the area on mine-related business rather than seeking an esthetic visual experience.

Present landscape character.

During its 26-year active life, the proposed mine would totally change the appearance of the 3,271 acres it would disturb (see appendix A). Angular forms, straight lines, bright colors, and coarse textures of mining facilities would be readily apparent on and around the site and would contrast with present amorphous forms, curved lines, muted colors, and fine textures.

The minesite would be located about 9 miles from Wyoming State Highway 59, and facilities would be partially obscured by several hills. Thus, passengers traveling Highway 59 might not be able to see the mine pit or the facilities. The 290-foot-tall loadout structure would be noticeable in the distance, but would be far less apparent from the vantage of Highway 59 than the facilities areas at the Caballo or Cordero mines: these are some 6 miles closer to the highway than would be the North Rochelle mine. However, North Rochelle facilities would be clearly visible from Piney Canyon Road south of the minesite; but practically all travelers on that road would be going to the mines.

Present landscape character with simulated mining activity.

After reclamation, the landscape would look very much like the undisturbed landscape around the minesite (the photo at right, taken at the Black Thunder mine, indicates what might be expected in the fall after a spring seeding). The reclaimed slopes might appear a bit smoother (less intricately dissected) than premining slopes to an observer familiar with the site but would closely resemble slopes that occur naturally in the area. After reclamation, the area would probably have fewer gullies than at present, and vegetation would probably be more uniform.

Present landscape with reclaimed landscape in upper portion.

Figure IV-5.--Visual characteristics of the proposed North Rochelle minesite during and after mining.

landscape of the reclaimed mines would look very much like undisturbed landscape in the area.

SUMMARY OF CUMULATIVE IMPACTS

The proposed North Rochelle mine would be situated almost in the middle of a nearly continuous corridor of six coal mines in southern Campbell and northern Converse Counties, Wyoming. This corridor is 21 miles long and up to 4 miles wide, and covers 39,736 acres. Two of the six mines (Black Thunder and Jacobs Ranch) are already in operation, two (North Antelope and Antelope) have been issued permits to mine by OSM and Wyoming DEQ, and two (Rochelle and North Rochelle) have submitted permit applications to those agencies.

This section summarizes the cumulative impacts that would occur to the eastern Powder River Basin environment if all six mines were in operation, the assumed case in the discussions of cumulative impacts relative to each specific resource. Because (1) the total areas of all six mines would not be disturbed at once, (2) the number of acres, type of vegetation, and so forth disturbed would vary from year to year, and (3) the impacts to ground water would vary as mining progresses through each permit area (depending on saturation, how close the next mine pit is, etc.), it is not feasible to precisely determine these cumulative impacts at any given time. Therefore, the following is a broad discussion of estimated total impacts; frequently, it represents a worst-case analysis.

Production of coal in the area began in 1977 at the Black Thunder mine and in 1978 at the Jacobs Ranch mine. Under current mining plans, production from all six mines would be 34.4 million tons per year in 1985, 55.3 million tons per year in 1990, and 71.5 million tons per year in 1995 and 2000. Production would end at the Jacobs Ranch mine in 2002, and the last mine to finish mining (Rochelle) would end its production in 2025. By then, 2,067 million tons of coal, or about 90 percent of the estimated 2,291 million tons of coal underlying the six minesites, would have been mined and shipped to powerplants from Colorado to Louisiana. At full production, 19 unit trains would be needed every day to haul the coal to the powerplants. This increase in train traffic would cause additional delays at grade crossings, increased accidents, and increased noise impacts along the routes of coal shipment.

In the process of mining the coal, the mines would disturb about 30,000 acres--25,000 by mining and 5,000 by roads, railroads, facilities, temporary stockpiles, and other mine-related functions. Assuming that mined areas require 10 years from initial disturbance until they can be returned to grazing, about 13,000 acres from all six mines would be unavailable for grazing during each full production year.

Most of the land that would be disturbed is grassland, sagebrush shrubland, or rough breaks and is used for grazing and/or wildlife habitat. Rangeland is by far the predominant land use in the area, comprising 92 percent of the land in Campbell and Converse Counties. A small amount of dryland farming would be disrupted by mining--540 acres of wheat, 76 acres of barley, and 25 acres of oats, plus about 3 acres of irrigated hay. At the completion of mining, it is anticipated that all the disturbed land would be reclaimed for grazing and wildlife habitat in the form of mixed grass prairie and sagebrush shrubland. Because the rough breaks vegetation type is slope-dependent and the restored land surface would have

gentler slopes, this vegetation type would be substantially reduced in extent after mining. This may affect postmining use of the areas by mule deer. Some of the minor vegetation types, such as those occurring on scoria, also would not be restored to premining levels. This, however, would not have a long-term impact because of the minor importance of these vegetation types, and because of the likelihood of their restoration by natural processes over time. All of these vegetation types are commonly found in the eastern Powder River Basin.

Cumulative impacts to most wildlife would increase as additional habitat is disturbed. However, mitigation measures would keep these impacts within the limits of acceptability. A study has been proposed to assess impacts on antelope and to recommend additional mitigation measures. Erection of transmission poles and planting of trees on reclaimed land would gradually replace raptor nesting and perching sites. There is no important habitat for waterfowl, upland gamebirds, or fish on the minesites. Small and medium-sized mammals, passerines, and herptiles would rapidly move back into the areas once reclamation is completed. The USFWS has evaluated potential threatened or endangered species on the permit areas and has determined that no adverse impacts would occur to bald eagles or peregrine falcons, but that the black-footed ferret might be affected. OSM is requiring that a ferret survey be made within 1 year prior to the disturbance of any prairie dog town.

In addition to a reduction in livestock grazing and wildlife habitat during the life of the mines, there would be disruption of oil and gas development and the loss of access to public lands (affecting mainly hunters). Approximately 550 cultural resource sites would be impacted. At least 140 of these sites are eligible for nomination to the National Register of Historic Places.

Changes in drainage patterns and surface disturbance would decrease flow in Antelope Creek 2 to 3 cubic feet per second (ft^3/s) and increase flow in Little Thunder Creek about 1 ft^3/s. There would be no discernible impact to the Cheyenne River. The mines would use about 1,736 acre-feet of water per year for drinking, sanitation, washing equipment, and dust control. This water would come from deep wells and from seepage into the mine pits. The mines would pump an estimated 1,367 acre-feet per year from the pits and from dewatering wells. Water levels would be lowered in the overburden, coal, and deeper aquifers over nearly 200 mi^2. In addition to lowering the water levels in 36 wells, as many as 16 wells, all stock or stock and domestic, would be destroyed by mining. The water levels would gradually recover as reclamation proceeds. The coal companies must replace any water source that is interrupted, discontinued, or diminished.

Only the Antelope (78 acres) and North Antelope (1,275 acres) mines would affect AVF's. The essential hydrologic functions of these two areas would be maintained or restored.

Because there would be at least 2 miles between the Antelope mine and the North Antelope and Rochelle mines, and between the North Antelope and Rochelle mines and the North Rochelle, Black Thunder, and Jacobs Ranch mines, no cumulative impacts are anticipated from all six mines to the air quality. Maximum TSP concentrations between the sets of mines are estimated to be 25 $\mu g/m^3$. Even for the latter set of mines, the maximum annual TSP concentration is expected to be about 55 $\mu g/m^3$--below the State and Federal Standard of 60 $\mu g/m^3$.

Because of all the energy-related development that has been occurring in and around Campbell County during the last 10 years, the socioeconomics of that and adjacent counties would be the resource most seriously impacted by development of the six mines. The city of Gillette faces a $3.3 million shortfall in capital improvement funding in 1983 and a growing deficit in its general fund operating budget after 1987. Although increases in the number of mine-related residents would not greatly alter the financial status of the city of Newcastle and Weston County, they would reinforce the need for expanded facilities.

At the urging of the Wyoming Industrial Siting Council, the coal companies operating in Campbell County have established the Campbell County Monitoring Association, which produces a comprehensive yearly report on socioeconomic conditions. The coal companies work with local governments to evaluate means of resolving problems highlighted by the report. A similar cooperative effort could be established for Weston County.

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Based on anticipated production levels, the North Rochelle leasehold would be committed to coal production for 26 years. During this time, mining would result in the introduction of additional roads, railroads, powerlines, fences, mine structures, and associated human populations into the eastern Powder River Basin--an area already undergoing change from a semiagriculturally based economy to coal and uranium mining, and oil and gas activities. This increase in population would create an increased demand for all public services. Overall, the open, basically treeless landscape would be visibly intruded more by the construction, equipment, and other human activities due to the increased population than by mining excavation and reclamation. Part of this intrusion would still be in evidence long after coal mining has ceased.

As the coal is mined, almost all components of the present ecological system, which have developed more or less harmoniously on the affected land over a long period of time, would be modified and in some cases destroyed. In partial consequence, the reclaimed land would be topographically lower, and, although it would have approximately the original contour, it would lack some of the original variety of geometric form.

During construction and operation of the North Rochelle mine, there would be a loss of vegetation on 3,271 acres and an accompanying disturbance of wildlife habitat and grazing land. However, it is estimated that the minesite would be returned to an equivalent or better forage production capacity for domestic livestock within about 40 years after initial disturbance. Long-term productivity would depend largely on range-management practices.

Mining would disturb parcels of antelope range, but these areas would be suitable for antelope after successful reclamation. Reduced topographic diversity would make the area permanently less suitable for mule deer. Despite loss and displacement of wildlife during mining, it is anticipated that reclaimed habitat would support a similar diversity of wildlife species.

Although introduced, as well as native, grasses and shrubs would be planted, the diversity of species found in undisturbed rangeland would not be completely

restored in the minesite for about 50 years after the initiation of disturbance, and reestablishment of mature sagebrush habitat for antelope could take even longer.

There would be a deterioration of the ground-water quality in the mine area because of mining. This deterioration would probably take place over a long period of time. The water quality would still be adequate for livestock. During mining, depth to ground water would increase for as much as 5 miles from the pit in the coal aquifer. Except for the immediate vicinity of the mine pit, the water levels in the coal aquifer should return to premining levels some distant period of time (possibly 70 to 100 years) after mining has ceased. There would be a temporary depletion of the quantity of ground water when the pit intercepts the aquifer and the water is pumped out. There should be no permanent depletion after mining.

Mining operations and associated activities would degrade the visual resources of the area on a short-term basis. Following removal of surface facilities and completion of reclamation, the long-term impact on visual resources would be minor.

In the short term, the greatest impacts to recreation values would occur from land disturbance, increases in population, and pollution. These changes would primarily have an impact on hunting on the permit area and on existing recreation facilities elsewhere. However, because reclamation would result in a wildlife habitat similar to that which presently exists, and because it appears that local recreation facilities would be increased, there should be no long-term adverse impacts on recreation.

The proposed mine would provide employment directly and indirectly to about 570 workers, thereby enhancing the long-term economy of the region. However, community services and facilities would be strained as demands from increasing populations exceed capacities. It is expected that these strains, as well as increased traffic congestion and urban crowding, would be short-term effects that would be resolved as the area stabilizes. In the long term, as local government revenues increase, the economic situation would stabilize at new levels of use and need.

Other types of industries in the region would be subjected to short-term instability and adverse impacts from the shift of employees to higher paying jobs. People on fixed income, retirees, and agricultural workers would face increased living costs with no commensurate increase in income.

Development of mine operations and ancillary facilities would result in increased rail and highway use to move construction workers and necessary materials to the various construction sites and to transport coal. All facilities developed for short-term purposes would continue to be used over the long term.

Increased traffic noise and road dislocations related to construction would be short-lived--a few years. However, operation of the railroad and mine would result in longer-term noise, increased traffic conflicts, and esthetic impacts for the duration of operations.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The major commitment of resources would be the mining and consumption of 197 million tons of coal to be used for electrical power generation during the 26 years of mining. It is estimated that 1 to 2 percent of the energy produced would be required to mine the coal.

An indeterminable amount of clinker for aggregate would be used in the construction of mine facilities, the railroad loop, and access roads. Clinker deposits mined with the overburden and moved with other spoil would also be irretrievably lost.

The quality of topsoil on approximately 3,271 acres would be irreversibly changed. Soil formation processes, although continuing, would have been irreversibly altered by mining-related activities. Newly formed soil material would be unlike that in the natural landscape in surrounding unmined areas.

Such materials as steel, aluminum, and copper used for the railroad and transmission lines and in the manufacturing of mining machinery and buildings would be committed for the life of the various projects, but much of it would be salvageable upon abandonment.

Loss of life would occur due to both the mining operations and increased vehicular and train traffic. On the basis of strip-mine accident rates in Wyoming as determined by the Mine Safety and Health Administration for 1980, fatal accidents would occur at the rate of 0.02 per 200,000 man-hours worked. Disabling (lost-time) injuries would occur at the rate of 2.76 per 200,000 man-hours worked. This would be an irretrievable commitment of human resources.

Disturbance of all known historic and prehistoric sites on the minesite would be mitigated. Any accidental destruction of presently unknown archeological or paleontological values would be irreversible and irretrievable.

The coal-mining development would add to the loss of the small-town atmosphere and way of life. About 1,200 persons would be added to the area if the proposed action is approved. An additional burden would be placed on the service facilities of the impacted towns and counties. The proposed action would only add to these problems, however, because other developments in the area will cause even greater changes.

The forage and associated grazing and wildlife habitat that the affected land provides would be lost during the period of mining and reclamation. The rough breaks habitat along the gullies and low hills, which is important for mule deer, would only be partially restored, even over the long term.

As much as 300 acre-feet per year of water would be consumed by domestic use, plant and equipment cleaning, fire control, and dust suppression. This would be a total of 7,800 acre-feet over the life of the mine. Although the quality of the ground water would be decreased, the water still would be acceptable for the anticipated postmining uses for agriculture and wildlife.

CHAPTER V

CONSULTATION AND COORDINATION

This EIS was prepared by OSM in cooperation with the Interstate Commerce Commission, which contributed to the discussion on impacts to railroads and the ETSI Pipeline, the Wyoming Industrial Siting Administration, which provided information on the socioeconomics of the area, the Forest Service, which manages the Thunder Basin National Grassland, and the U.S. Geological Survey. Wyoming DEQ provided the technical analyses on which much of the description of impacts in chapter IV is based.

The public is urged to comment on, and to make suggestions regarding, this draft EIS. In addition, comments are solicited from the following:

Department of the Interior:

Bureau of Indian Affairs
Bureau of Land Management
Bureau of Mines
Bureau of Reclamation
Minerals Management Service
U.S. Fish and Wildlife Service
U.S. Geological Survey

Other Federal agencies:

Department of Agriculture:
  Forest Service
  Soil Conservation Service
Department of Energy
Department of Health and Human Services
Department of Housing and Urban Development
Department of Labor:
  Mine Safety and Health Administration
Department of Transportation
Environmental Protection Agency
Federal Energy Regulatory Commission
Interstate Commerce Commission
President's Advisory Council on Historic Preservation

State of Wyoming:

Department of Environmental Quality:
  Air Quality Division
  Land Quality Division
  Water Quality Division
Governor's Clearing House
Industrial Siting Council
State Historic Preservation Officer

Local agencies:

Board of County Commissioners, Campbell County
Board of County Commissioners, Weston County
Campbell County School District No.1
Weston County School District No.1
City of Gillette
City of Newcastle

Applicant:

Shell Oil Company Mining

Private organizations:

Friends of the Earth
Gillette News-Record
Izaak Walton League, Wyoming Division
National Resources Defense Council, Inc.
Newcastle Newsletter Journal
Powder River Basin Resource Council
Public Lands Institute
Rocky Mountain Center on Environment
Sierra Club
State League of Women Voters, Wyoming
Wildlife Society, Wyoming Chapter

CHAPTER VI

PREPARERS AND REVIEWERS

Name	EIS Responsibility	Education
	Office of Surface Mining	
Duane H. Gentz	Interdisciplinary team leader, soils	B.S., Agronomy, Texas A&M University
Thomas Guobis	Vegetation	M.S., Plant Ecology, State University of New York at Syracuse
Donald Henne	Wildlife	M.S., Wildlife Biology, University of Montana, Missoula
Herb Homan	Socioeconomics, recreation	M.S., Public Administration, University of Colorado at Denver
Floyd L. Johnson	Air quality	M.S., Meteorology, Utah State University
Foster E. Kirby	Cultural resources	M.A., Archeology, University of Calgary
Keith Kirk	Noise, blasting, topography	M.S., Geology, West Virginia University
Jennifer Shawe	Editor, word processor	B.A., English, University of Denver
William G. Weist, Jr.	Assistant team leader, ground-water hydrology	M.S., Geology, University of Colorado
	Forest Service	
Charles Tankersley	FS coordinator, land use, roads, visual resources	B.S., Hydrology, Utah State University
	U.S. Geological Survey	
Mark Busby	Surface-water hydrology	B.S., Civil Engineering, University of Wisconsin
W. Bradley Myers	Geology	B.A., Geology, University of California, Los Angeles

Name	EIS Responsibility	Education
	Interstate Commerce Commission	
Paul Mushovic	Transportation	M.S., Regional Planning University of Massachusetts
	Wyoming Industrial Siting Administration	
Carl B. Ellis	Socioeconomics	M.A., Sociology, University of Wyoming

CHAPTER VII

REFERENCES CITED

(Note: Copies of environmental impact statements are available for consultation at Office of Surface Mining, Brooks Towers, 1020 -15th Street, Denver, Colorado and at U.S. Geological Survey, Room 2D324, National Center, Reston, Virginia.)

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APPENDIX A

THE APPLICANT'S PROPOSAL

APPENDIX A CONTENTS

ILLUSTRATIONS

(Plate 3, indicated as "in pocket," may be found in envelope attached to the inside back cover of this volume)

TABLES

APPENDIX A

THE APPLICANT'S PROPOSAL

This appendix summarizes the North Rochelle MRP submitted by SOCM to OSM, including those measures proposed by SOCM to mitigate some of the impacts that would result from the mining.

PREMINING

If the Secretary of the Interior approves the North Rochelle MRP, SOCM would take 2 years to prepare its mine support facilities before starting coal production. A 3.7-mile overland coal conveyor system and a 5-mile rail connection to the west would be surveyed and constructed. Surface facilities would be erected in the northwestern part of the mine permit area (plate 3, in pocket). They would consist of an administration building, change house, service building with ready area, service building/pump house, fuel station, storage building and storage yard, boiler house, secondary crushing and loadout facilities, rail loop, parking lot and gate, explosives storage, and electric power substations.

The service building/pump house would also contain storage tanks for lubricating oil, antifreeze, hydraulic oil, transmission fluid, and solvents, as well as an air compressor for the service area. Reject coal from the continuous sampling system would be the primary fuel for the boiler, which would heat the facilities buildings. Emissions from the boiler plant would meet Wyoming emission standards.

The explosives storage area would be isolated 0.25 mile from the nearest facility and shielded from the facilities area by topsoil stockpile No. 1.

Temporary coal storage or stockpiles are not planned for the North Rochelle mine. The coal handling and storage facilities would consist of two secondary crushers, covered conveyors, and four 12,500-ton reinforced concrete silos from which coal would be loaded onto unit trains on either or both of the double tracks. Coal dust collected in negative-pressure baghouses would be periodically combined with the 2- by 0-inch product from the crusher.

Power would be delivered to the mine by a 69-kV line, which is owned by the Tri-County Electric Association and which would terminate at a main substation near the southwest corner of the permit area. All transmission and distribution lines would be designed to minimize electrocution of raptors.

The mine is scheduled to produce 2 million tons of coal during the first year of production (year 3), increasing to 8 million tons per year for years 5 through 27. The final 6 million tons of the coal reserve would be mined in year 28 (2010).

Part of the Reno County Road, which passes through the permit area, would be temporarily abandoned in year 8 and restored to approximately its original location in year 27.

A 5-mile railroad spur would connect westward from the facilities area to the existing Gillette-Orin main line of the joint Burlington Northern and Chicago and

North Western line at Antelope Creek. A rail loop on the west edge of the facilities area would be largely double-tracked to allow loading of two unit trains simultaneously. The natural channel of Trussler Creek in the western part of the leasehold would be shifted southwestward beyond the pit area in year 23. This 1.63-mile (8,585-foot) diversion channel would be reclaimed and the stream restored to its original location and slope at the end of mining. The Forest Service's Thunder Basin No. 52 Reservoir would be relocated about 1,000 feet downstream to accommodate the coal conveyor system and other facilities.

The North Rochelle mine is anticipated to require a maximum of about 272,000 gal/day of water (304 acre-feet per year). An estimated 14,000 gal/day of potable water and 8,210 gal/day of utility water would be used at the facilities area. This would be provided by an existing 250-gallons-per-minute well and a planned fresh-water reservoir, which also would be adequate to supply the remaining 250,000 gal/day estimated maximum usage for dust suppression, if the latter were not available from the dewatering well, as is expected. The 3.95-acre-feet (1,287,000-gallon) fresh-water reservoir would contain a dedicated fire-protection storage of 0.59 acre-feet (193,000 gallons) exclusive of inventory for other use.

Data for the proposed mine are given in table A-1.

MINING

The Wyodak seam (also called the Wyodak-Anderson seam or, by older usage and according to the MRP, the Roland seam) averages 60 feet thick over the leasehold, and represents 97 percent of the reserve. This thick seam would be mined over most of the leasehold, and a thin overlying rider seam would be mined locally. During the 26 years of mining, extraction of the coal and reclamation of the mined area would be integrated but sequential, using topsoil stripping, truck-shovel and dragline overburden removal, coal extraction, dragline and truck-shovel spoil backfilling, spoils shaping, topsoil replacement, and revegetation. The acres disturbed each year and cumulative disturbance are shown in figure A-1.

The areas to be mined and the site of the first operation are shown in figure A-2. Mining would begin in shallow overburden in the southeast corner of the leasehold. The first box cut would advance west and north along the burn line to form a continuous north-trending pit in year 11. Mining would then progress in the direction of the 1^{o} to 2^{o} west dip of the coal, with the overburden gradually increasing in thickness for the rest of the mining.

To reduce the number of coal haulage trucks, haulage miles, and fugitive dust, an overland conveyor system would be used to transport the coal from the primary crushers, in or near the pit, to the loadout facilities on the rail loop. The system, which would be covered and elevated above grade, would consist of a series of 60-inch-wide belts, four transfer towers, a metal detector and electromagnet, and four dust collection systems. The initial system, with four conveyor sections, each about a mile long, would total 3.7 miles in length. The loadout terminus would be adjacent to the original pit area. For the first 6 years of coal production, coal trucks would drive up out of the pit to two truck-dump hoppers and primary crushers. In 1991, the modularized facilities would be disassembled and moved to the pit floor and a ramp conveyor attached to the overland conveyor to move the coal out of the workings. Every 1 to 3 years thereafter, a new ramp would be

Table A-1.--Data for North Rochelle mine

(Data furnished by applicant)

	Railroad spur corridor	Mine block	Total
Affected area			
Acres disturbed	207.3	3,064.0	3,271.3
Acres permitted	303	4,283.9	4,586.9
Average topsoil depth (feet)	3.30	2.39	2.59
Topsoil volume (bank cubic yards)	1,058,185	12,631,583	13,689,768

	Amount
Coal quantity	
Production rate (tons/year)	8,000,000
Inplace reserve (tons)[1]	207,600,000
Recovered reserve (tons)[1]	197,000,000
Percent recovered	97.0
Average thickness (feet)	60.3
Acres extracted	1,925

	Heating capacity or percentage content
Coal quality	
Btu (as received)	8,500
Percentage ash (as received)	5.4
Percentage sulfur (as received)	0.2
Percentage volatiles (as received)	30.5
Percentage fixed carbon (as received)	36.0
Percentage equilibrium moisture	28.0

	Amount
Overburden	
Average thickness (feet)	207
Range (feet)	110 to 290
Virgin overburden removed, including backslope (bank cubic yards)	709,780,000
Stripping ratio (bank cubic yards/ton mined coal)	3.60

	Description
Miscellaneous	
Average employees	291 persons
Mine life	30 years
Railroad spur length	5.0 miles to Orin Junction connector
Overland coal conveyor length	3.7 miles
Access road	Existing Reno County Road
Location	Approximately 50 miles south-southeast of Gillette
Owner, operator	Shell Oil Company Mining

[1]Tonnage estimate assumes 1,764 tons/acre-foot for inplace reserves.

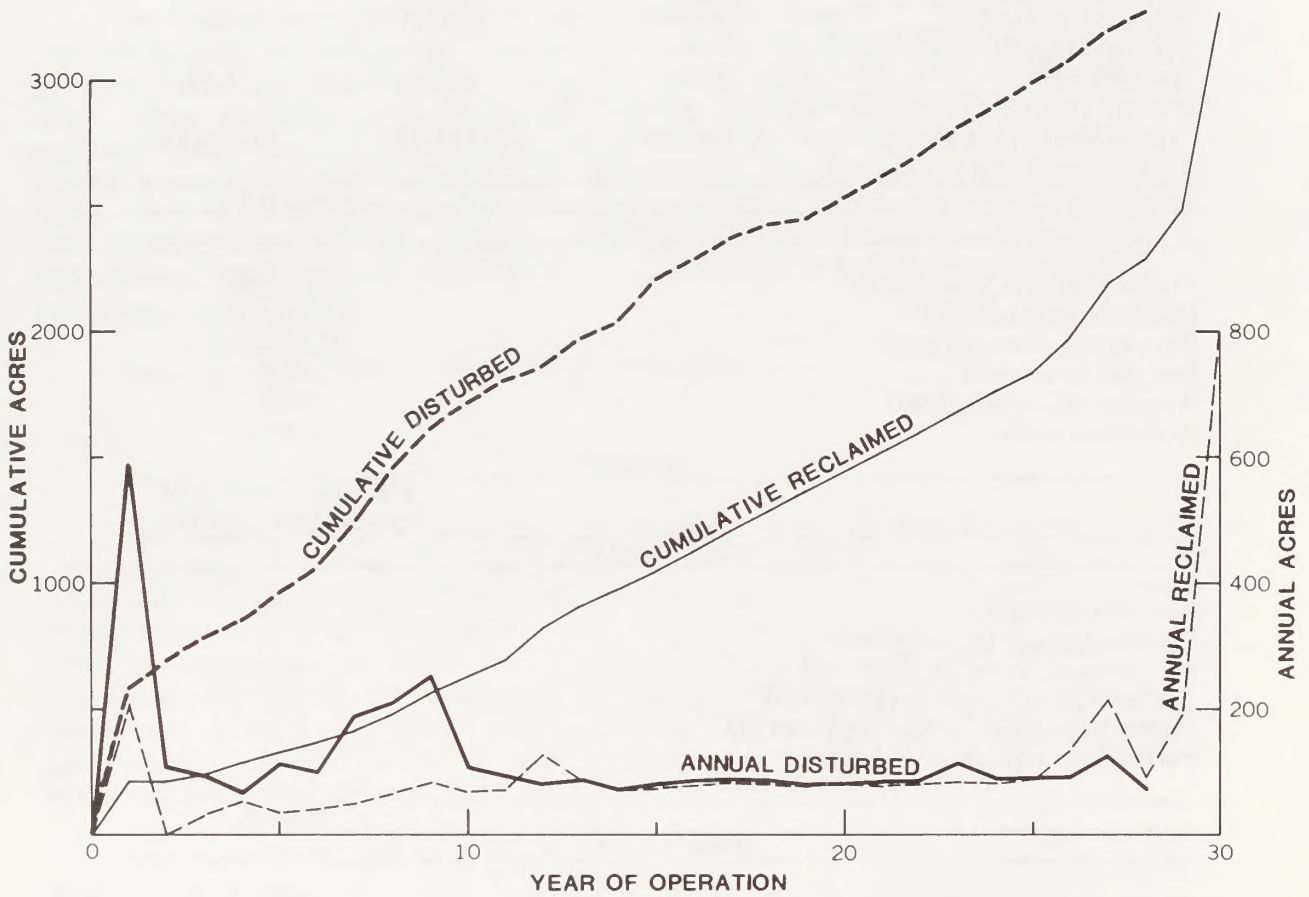

Figure A-1.--Acres disturbed and acres reclaimed during mining.

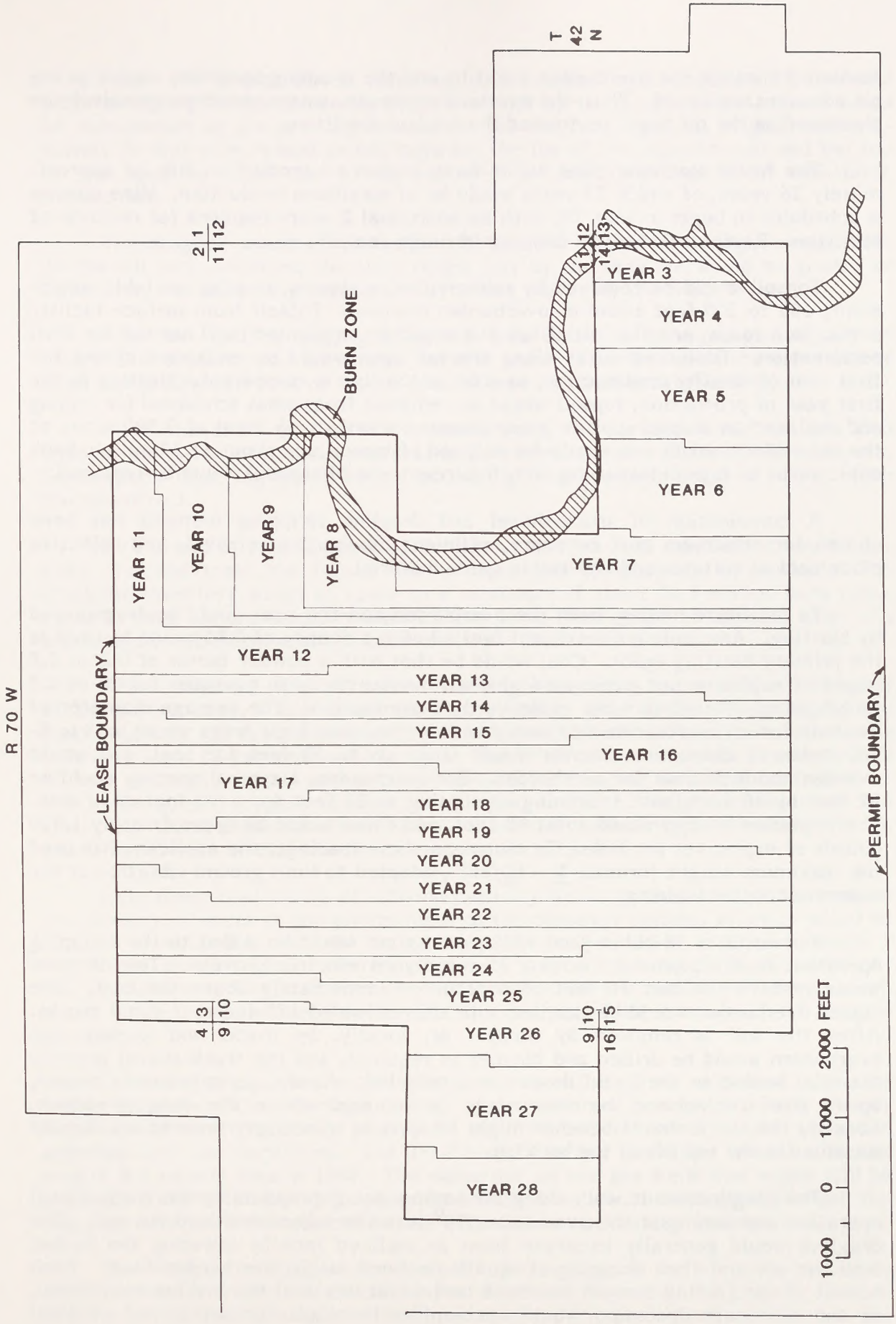

Figure A-2.--Annual coal removal.

fashioned through the overburden backfill, and the crushing facilities moved as the pit advances westward. Thus, the overland conveyor system would progressively be shortened as the pit migrates toward the loadout facilities.

The North Rochelle mine would have a planned production life of approximately 26 years, of which 23 years would be at maximum production. Mine closure is scheduled to begin in year 28, with an additional 2 years required for removal of facilities. Reclamation would continue through year 30.

Topsoil would be removed by rubber-tired scrapers, or other suitable equipment, 100 to 200 feet ahead of overburden removal. Topsoil from surface facility areas, haul roads, and the initial box cut would be stockpiled until needed for final reclamation. Disturbed areas along the rail spur would be reclaimed during the first year of facility construction, as soon as the line is completed. Starting in the first year of production, topsoil would be removed from areas scheduled for mining and replaced on shaped spoil in a continuous operation. A total of 2,949 acres of the mine block would eventually be stripped of topsoil and about 11.37 million bank cubic yards of topsoil (assuming and 10-percent loss of topsoil) would be replaced.

A combination of truck-shovel and dragline stripping methods has been chosen for maximum coal recovery, efficient overburden removal, and selective placement of suitable and unsuitable spoils material.

To facilitate mining, both the overburden and the coal would be fragmented by blasting. Ammonium nitrate and fuel oil with a density of 0.85 would be used as the primary blasting agent. Coal would be shot with a powder factor of 0.2 to 0.6 pound of explosive per cubic yard of coal, overburden with a powder factor of 0.3 to 1.0 pound of explosive per cubic yard of overburden. The average diameter of the hole for an overburden shot would be 9 inches; coal blast-holes would be 3 to 6-7/8 inches in diameter. Depths would range up to 50 feet for coal, and would average about 50 feet for overburden. For overburden, a typical spacing would be 22 feet by 40 feet, with stemming amounting to 22 feet for a 70-foot-deep hole. The explosive charge would total 48 feet, and there would be approximately 1,520 pounds of explosives per hole. To calculate these loadings, the applicant has used the maximum weight formula $\underline{W} = (\underline{D}/60)^2$, adapted to limit ground vibration at the nearest occupied building.

In year 5, a 38-cubic-yard walking dragline would be added to the stripping operation to complement the two 25-cubic-yard electric shovels. The dragline would remove the last 70 feet of overburden immediately above the coal. The higher overburden would be handled with shovel-loaded 170-ton rear-dump trucks. After the soil is removed by scraper or, locally, by trucks and loaders, the overburden would be drilled and blasted as required, and the truck-shovel prestrip material hauled to the backfill area or stockpiled. As the cover becomes deeper, up to five truck-shovel benches would be required above the dragline bench. Locally, the truck-shovel benches might be split to selectively recover overburden suitable for the top lift of the backfill.

The dragline would walk along the bottom bench prepared by the truck-shovel operation and side cast the overburden 90° into the adjacent mined-out pit. The dragline would generally excavate from an inclined face by lowering the bucket into the pit and then dragging it up the inclined virgin overburden face. Each bucket of spoil would contain numerous horizontal strata of the overburden column, so the side cast operation would accomplish thorough horizontal and vertical mixing.

After the overburden is removed, the exposed coal would be blasted and removed by a 30-cubic-yard electric shovel and by front-end loaders. Coal would be transported to the primary crusher in 120-ton coal haulers. A gap, approximately 40 feet wide, would be left between the toe of the exposed coal and the toe of the spoil to allow for a roadway and for selective disposal of unsuitable overburden.

The dragline would remove about 30 percent of the total virgin overburden. As the fill face advances, the spoil ridges left by the dragline would be graded or covered by the advancing overburden lift being placed by the truck fleet.

After the spoil is rough-graded, the area would be surveyed periodically to assure that leveled spoil elevations were at least 12.4 feet below the elevation of final topography (2.4 feet of topsoil plus 10 feet of suitable overburden).

Once the final spoil grade is established, the surface would be scarified (ripped) along the contour in preparation for emplacement of topsoil by scrapers. Seeding and mulching would follow according to procedures detailed below. (See Reclamation.)

By the end of year 8, about 16.3 million cubic yards of overburden would have been removed from the initial mining area and temporarily stockpiled. The stockpile inventory would increase to a maximum of about 50.5 million bank cubic yards in year 25, and would remain at that level until years 29 and 30, when the stockpiled overburden would be used to fill the final mining cuts.

This overburden would be stored in a single stockpile in the southeastern part of the permit area, which would have an eventual area of 288 acres, an average final height of 123 feet, and would contain an estimated 56.54 million cubic yards (allowing for a 12-percent swell factor). The 3H:1V slopes would be benched every 40 feet vertically, runoff across the inward-facing benches would be controlled by check dams, and bypass ditches would girdle the 2.5-mile perimeter of the stockpile. Outer slope runoff would be collected in sedimentation reservoir No. 3, which would have a total storage capacity of 36 acre-feet.

Rear dump coal trucks of 120-ton capacity would be used to haul the coal to the primary crushers at the pit terminus of the conveyor system, where it would be reduced to minus 8 inches. At the rail loop, the coal would be crushed to minus 2 inches and stored in four concrete silos with a total capacity of 50,000 tons. At full production of 8 million tons of coal per year, 14 unit trains of 110 cars each would leave the mine every week. SOCM expects to load a maximum of 5 trains per day.

Oil and gas pipelines within the permit area would be relocated or buried deeper to prevent their damage during construction and operation. Reno County Road would be temporarily abandoned in 1990 and returned to use when the affected area was backfilled. The Tri-County Electric powerline would be routed around the permit area in 1984. The numerous oil and gas wells that might still be productive at the time mining operations reach them would be plugged beneath the coal, cut off, and later restored to production after backfilling is completed.

The designed surface-water control structures would be built in accordance with the requirements of Guideline No. 8 of the Wyoming DEQ, Land Quality Division. The ditches would be designed to carry the peak discharge from a 10-

year, 24-hour storm. Prior to its release, runoff from disturbed areas, stock piles, and reclaimed areas would be routed through sediment ponds having a 3-year holding capacity (table A-2). Sediment would be removed from these ponds when they became filled to 60 percent of their capacity. Thus, at least 1-year's sediment storage capacity would always be available.

Trussler Creek, which flows northwest through the west part of the permit area, would be temporarily diverted south in year 23 to avoid the mine pit and overstrip benches. The 1.63-mile (8,585-foot) channel would be constructed to carry the 100-year peak discharge of Trussler Creek. Preliminary cross sections of the diversion channels have been calculated to balance the requirements for 100-year peak flow capacity without creating uncharacteristically low velocities and consequent silting of the channel at 10-year peak flows. The applicant calculates a peak discharge of 1,063 ft^3/s and a peak velocity 4.8 feet per second for a 100-year, 24-hour flood at a typical mid-diversion cross section. Detailed designs would be submitted prior to construction.

The coal seam would be dewatered by pumping from a dewatering well and pit sumps. Some of this water would be used for dust control. Excess water would successively flow into sedimentation reservoirs No. 4 (1984-89), No. 5 (1989-98), and No. 7 (1998-2010).

The North Rochelle minesite is located within a Class II air-quality control region. SOCM has indicated its intention to use best available control technology to control all mine-related particulate emissions, in compliance with the permit issued for the North Rochelle mine by Wyoming DEQ, Air Quality Division. A meteorological and air quality station (TSP-1) has been operating in the northeast corner of the permit area since September 1980, and would continue to collect data there until it is relocated to the facilities area. Additional TSP monitoring stations would be installed in the southeastern and southwestern corners of the permit area 1 year prior to construction of the facilities.

Suspended particulates would be the principal air pollutants at the site. Roads would be sprayed with both chemical dust suppressants and water to alleviate dust. A covered conveyor system would significantly minimize dust from truck haulage. The coal crushing facilites, truck dump, conveyor transfer points, and sampling station would be equipped with baghouses to reduce fugitive dust, and coal conveyors and silos would be enclosed to minimize wind-borne emissions. The fluidized-bed coal-fired boiler used to heat the buildings would have low SO_2 and NO_x emissions and practically no CO. Topsoil removal would be coordinated with mining to minimize wind erosion.

RECLAMATION

SOCM's reclamation plan provides for reestablishment of vegetation comparable in cover and density to that existing on the permit area, and for restoration of the land to a postmining use of livestock grazing and wildlife habitat conforming to its historical usage. The plan stresses reclaiming the landform to a geomorphologically stable configuration that is esthetically pleasing and natural in appearance.

Rippers would prepare the surface of the regraded overburden for topsoiling. The applicant estimates that an average of 28.7 inches of topsoil (ranging from 24

Table A-2.--North Rochelle sediment control reservoirs, first 7-year mine plan

(Data furnished by applicant)

Name	Year to be built	Year to be reclaimed	Drainage area controlled (acres)	Maximum depth (feet)[1]	Freeboard (feet)[1]	Discharges to
Sedimentation Reservoir No. 1	1983	2012	121.9	8.00	[2]4.00	Trussler Creek
Sedimentation Reservoir No. 2	1983	2012	177.4	5.00	[2]3.00	Holmes Creek
Sedimentation Reservoir No. 3	1984	2012	356.9	15.05	[3]4.95	West School Creek
Sedimentation Reservoir No. 4	1984	1989	126.9	11.14	[3]4.86	West School Creek
Sedimentation Reservoir No. 5	1989	1998	1,627.7	12.67	[3]5.33	West School Creek
Wastewater Reservoir No. 1	1983	2012	21.0	6.00	[2]3.00	Trussler Creek
Wastewater Reservoir No. 2	1983	2012	([4])	10.80	2.20	Trussler Creek
Thunder Basin No. 52 Reservoir[5]	1983	Permanent	1,966.0	12.35	[3]5.65	Trussler Creek
Water supply reservoir	1983	2012	([6])	15.25	[7]3.00	no discharge

[1] At high water discharge.
[2] Designed for a 25-year, 24-hour precipitation event.
[3] Designed for a 100-year, 24-hour precipitation event.
[4] For sewage treatment; will not receive any runoff.
[5] Replaces existing reservoir 1,000 feet upstream.
[6] Will store water from supply well; will not receive any runoff.
[7] Above the winter operating level.

to 30 inches) would be spread over the area affected by mining or related activities. Topsoil would be temporarily stockpiled during construction of the railroad corridor and replaced along the graded slopes once the rail spur is complete. Proper combinations of soil amendments would be used to develop optimum plant growth under prevailing conditions at the time of reclamation. The final topography would be similar to the present topography, but with somewhat lower average slopes (3.1 percent) than now present (4.1 percent), and without the fine-grained network of minor drainages that fret the natural landscape. A total of 2,949 acres would be reclaimed within the permit area, exclusive of the railroad corridor.

The applicant has proposed largely native permanent revegetation mixtures, which are both diverse and usable by livestock and wildlife. The three mixtures contain 14 or 15 species (including 7 or 8 grasses, 3 to 5 herbs, and 1 to 4 shrubs), most of which are common. Each mixture contains a different percentage of shrub seeds (table A-3).

- A mixed-grass prairie seed mixture, containing very few shrub seeds (5.5 percent, by weight), would be used in exposed upland regions having the least likelihood of mesic conditions. This mixture would also be sown on most of the reclaimed facilities area and the railroad embankment. Of the 15 species comprising the mixture, 14 are native. This mixture would be applied to 73.6 percent of the reclaimed area.

- A big sagebrush shrubland mixture, containing a maximum amount of shrub seed (16.4 percent, by weight), would be planted on mesic uplands, generally downslope from the areas seeded with mixed-grass prairie. Of the 14 species comprising the mixture, 10 are native. This mixture would be applied to 22.25 percent of the reclaimed area.

- A streamside meadow mixture would be used for final reclamation along drainages and around the relocated Thunder Basin No. 52 Reservoir. Of the 14 species comprising the mixture, 13 are native. The intermediate abundance of shrub growth expected from the mixture would be enhanced by transplanting 100 mixed shrub seedlings per acre (planted in 6 clumps) from local mesic stock. In addition, plains cottonwood and peach-leafed willow saplings would be planted along drainage channels and around the reservoir. This mixture would be applied to 3.65 percent of the reclaimed area.

An introduced species, cicer milkvetch, would be added to the mixed-grass prairie and shrubland mixtures for nitrogen fixation. The applicant reports that cicer milkvetch has been successfully introduced at other minesites in the eastern Powder River Basin.

Topsoil and overburden stockpiles, mine embankments, wastewater and sedimentation reservoirs, and areas not immediately topsoiled would be sown with a temporary seed mixture of three wheat grasses, which are drought-tolerant, cool-weather, sod-formers (table A-3).

A cover crop of barley, wheat, or millet would be used as a short-term expedient to stabilize disturbed areas that would otherwise be subject to erosion. Such a crop might be used in conjunction with permanent or temporary seed mixtures or alone when conditions were unsuitable for seeding those mixtures. Cover crop plantings would consist of 25 pounds of pure live seed per acre drilled or 50 pounds of pure live seed per acre broadcast.

Permanent seed mixtures would be sown at advantageous dates in spring or fall (preferably before April 15 or after October 15). The schedule for planting the temporary mixture would be more flexible (as late as May 31 and as early as October 1). Weather permitting, cover crops would be sown at any time. Seeding rates for the permanent mixtures would be approximately 15 pounds of pure live seed per acre drilled and 30 pounds of pure live seed per acre hydroseeded with a hydromulch slurry (table A-3). In the former case, the seeds would be separated by size. Large seeds would be drilled first, in the direction of the slope. The smaller seeds would then be drilled along the contour.

All newly seeded areas would be mulched to temporarily control erosion until the vegetation is established. Straw mulch would be applied at a rate of 2 tons per acre by a blower spreader, and crimp-anchored into the soil by discing. Areas that could not be seeded by drilling would be mulched using wood-fiber or straw hydromulch at a rate of 1 dry ton per acre.

SOCM would determine the need for fertilization through a soil-testing program prior to revegetation activities; amendments would be added if indicated. Weeds deemed noxious by Wyoming DEQ, Land Quality Division, would be controlled by mowing during the first 2 years after seeding. Other methods of control would be used if needed.

The reseeded areas would be protected by fences around the active mining and adjacent reclaimed areas. Fencing around the mine area would be 5-strand and sheep-tight, designed to meet specifications outlined in Wyoming DEQ Land Quality Division Guideline No. 10 and to exclude domestic livestock. The south side of the railroad corridor and the north side of Reno County Road would have 3- or 4-strand cattle fences. A chain-link fence would enclose the facilities area. Maintenance and operation of the relocated Thunder Basin No. 52 Reservoir would remain the responsibility of the FS.

To minimize disturbances and adverse impacts to wildlife in the area, the applicant has included vegetation of value to wildlife in its revegetation seeding mixtures (table A-3). Powerlines would be designed to minimize impacts to raptors, in accordance with REA Bulletin 61-10.

ASSISTANCE TO THE COMMUNITY

SOCM has a record of voluntary assistance to public and private organizations in Gillette and Campbell County, including:

- $45,000 contributed during 1980-82 for park development in Gillette;
- $7,500 contributed toward a Girl Scout lodge at Casper Mountain; and

Table A-3.--Seed mixtures for the North Rochelle mine area

(Data furnished by applicant)

Common name	Pounds of pure live seed/acre[1]
Prairie seed mixture	
Grasses:	
Western wheatgrass	4.0
Bluebunch wheatgrass	1.0
Blue grama grass	3.0
Prairie junegrass	1.5
Indian ricegrass	1.0
Alkalai sacaton	1.0
Needle-and-thread	1.0
Green needlegrass	1.5
Forbs:	
Cicer milkvetch	0.2
Scarlet globemallow	0.15
Prairie thermopsis	0.15
Shrubs:	
Fringed sagewort	0.1
Big sagebrush	0.05
Fourwing saltbrush	0.2
Winterfat	0.5
Total	15.35
Shrubland seed mixture	
Grasses:	
Thickspike wheatgrass	0.5
Western wheatgrass	3.5
Blue grama grass	2.0
Basin wildrye	1.0
Prairie junegrass	3.0
Alkalai sacaton	0.5
Green needlegrass	2.0
Forbs:	
Cicer milkvetch	0.1
Scarlet globemallow	0.05
American vetch	0.05
Shrubs:	
Fringed sagewort	0.2
Big sagebrush	0.8
Winterfat	1.0
Antelope bitterbrush	0.5
Total	15.2

Table A-3.--Seed mixtures for the North Rochelle mine area--Continued

(Data furnished by applicant)

Common name	Pounds of pure live seed/acre
Streamside seed mixture	
Grasses:	
Western wheatgrass	3.5
Slender wheatgrass	1.0
Blue grama grass	1.5
Canadian wildrye	1.0
Basin wildrye	1.0
Prairie junegrass	1.0
Kentucky bluegrass	2.0
Green needlegrass	1.0
Forbs:	
Western yarrow	0.05
Prairie coneflower	0.2
Scarlet globemallow	0.05
Prairie thermopsis	0.05
American vetch	0.05
Shrub:	
Wood's rose	1.0
Total	13.40
Temporary stabilization and stockpile seed mixture	
Grasses:	
Thickspike wheatgrass	5.0
Streambank wheatgrass	5.0
Western wheatgrass	5.0
Total	15.0

[1]Seeding rates are for rangeland drill application. Rates would be doubled on areas where seed is included in a hydromulch slurry.

. Regular contributions to community welfare, youth, arts, little league, Volunteer Fire Department, and regional education institutions.

In addition, SOCM has complied with the following mitigation measures, specified by OSM for development and operation of the company's Buckskin mine:

. Leased 91 spaces and purchased 67 additional mobile home units for construction workers;

. Purchased $965,900 of unsalable Local Industrial District Bonds issued to finance water, sewer, and street improvements in Gillette;

. Maintained its reseller status with a Wyoming Sales and Use Tax License, paying $640,000 in taxes during the 1980-81 construction phase. Also paid $549,000 in property, coal gross proceeds, and severance taxes in 1981;

. Monitored and provided common transportation assistance as the work forces peaked; and

. Contributed over $5,000 and helped to develop a socioeconomic monitoring and forecasting system coordinated by the Campbell County Chamber of Commerce.

SOCM has proposed two mitigation measures to ease primary potential impacts of the North Rochelle mine:

. Construction worker housing assistance.--Sixty percent of the mine construction work force is expected to locate in Wright. SOCM intends to provide 70 housing units for 110 construction workers: 50 single-family mobile homes and 20 multiperson units for 60 single-status persons. The actual numbers of units would depend upon the local need that develops. Additional housing would be provided as required. Gillette's housing supply should satisfy the anticipated demand.

. Housing assistance for operating personnel.--A sizable, industry-competitive relocation allowance would be provided to eligible employees to encourage them to purchase housing in any primary impact area.

SOCM would open accounts in local Campbell County banks and continue its reseller status on sales/use taxes. Social and economic trends in Campbell County would be monitored under two programs:

. Under the Campbell County Monitoring Program, SOCM would join with other energy industries to monitor adverse trends due to energy development. Mitigation measures would be developed in cooperation with community officials.

. SOCM would monitor quarterly during construction and annually during mine operation the residential location patterns and demographic characteristics of worker families in all primary impact

areas. Mitigation measures would be developed or modified to correct deviations from predicted patterns.

It is probable that the Wyoming Industrial Siting Council will specify certain additional socioeconomic mitigation measures as permit conditions when it acts on SOCM's siting permit application in October or November 1982. No advance information on what these mitigation measures might be is available at this time (August 1982).

APPENDIX B

PROPOSED STIPULATIONS

APPENDIX B

PROPOSED STIPULATIONS

OSM and Wyoming DEQ have identified portions of the MRP that must be modified or clarified for the plan to comply with requirements of the Wyoming Environmental Quality Act and SMCRA. The following stipulations, to which SOCM must agree, require such modification and/or clarification and would be attached to the permit if it is issued.

1. Within 90 days after accepting permit approval, the applicant must submit a revised topsoil stripping plan. This plan must provide for:

    a. Revising stripping depths for complex 7B and complex 14G to reflect variations in depth to bedrock.

    b. A sampling program for complex 6G.

    c. Revising stripping depth for the Tassel soil to 16 inches.

    d. Staking the topsoil depths prior to stripping in soil complex areas so the scraper operators have guidance as to how much material to take.

    Requirements "1a" and "1b" may be omitted if requirement "1d" is fully met.

2. To adequately describe the root-zone environment, the applicant must commit to sampling the first 1.3 meters of postgrading overburden. Three such composite samples must be taken, on 10-acre centers, plus whatever samples are necessary below 1.3 meters.

3. If any deleterious material is located in the course of sampling postgrading overburden on 10-acre centers, the applicant must commit to sampling on 1-acre centers to more closely delineate the problem area.

4. Within 90 days after accepting permit approval, the applicant must submit a revised soil classification that considers organic content, presence of montmorillonite, amount of clay increase, depth, and revised climate characteristics.

5. The applicant must commit to burying acid-forming, toxic, or other unsuitable material at least 4 feet below the topsoil layer and outside drainage channels or flood plains.

6. Within 120 days after accepting permit approval, the applicant must submit a detailed design to reclaim West School Creek so that the confluence with its southeast tributary would be erosionally stable.

7. Within 120 days after accepting permit approval, the applicant must submit either its justification for assuming that the time of concentration is zero or a recalculation of peak flows.

8. The applicant must commit to analyzing ground-water samples quarterly, to determine water quality, until valid data have been collected for at least 2 years. Thereafter, sampling is to be done semiannually. Water levels are to be measured quarterly.

9. Within 180 days after accepting permit approval, the applicant must submit a plan for determining infiltration rates in backfilled spoils.

10. Within 180 days after accepting permit approval, the applicant must submit an analysis of drawdown in the overburden including:

    a. A map showing the 5-foot drawdown for both term of permit and life of mine;

    b. A list of privately owned wells that would be affected;

    c. A plan to mitigate impacts to these privately owned wells; and

    d. A description of the effect of the drawdown on the spring in SE¼ sec. 23.

11. Within 90 days after accepting permit approval, the applicant must submit an analysis of the proposed relocated Thunder Basin No. 52 Reservoir. This analysis must include:

    a. An alternative relocation plan for the reservoir in case the quality or quantity of water proves to be inadequate to its intended use; and

    b. An estimate of the stability of the proposed embankment, both after construction and during sudden drawdown conditions.

12. Within 60 days after accepting permit approval, the applicant must submit a recomputation of the possible reduction in surface flow as a result of mining.

13. Within 180 days after accepting permit approval, the applicant must submit a revised plan to decrease the loss of wildlife habitat. The plan should provide for at least one impoundment per section and 1 rockpile cluster covering 5 to 10 acres per quarter section.

14. The applicant must commit to searching for blackfooted ferrets within a year prior to disturbing each existing or new prairie dog town. If evidence of ferrets is found, the Office of Endangered Species, USFWS, Billings, Montana, must be notified immediately.

15. The applicant must commit to not disturb any raptor nest during the active breeding and nesting seasons unless USFWS permits such disturbance.

16. Within 90 days after accepting permit approval, the applicant must submit a plan for special handling all of unsuitable overburden comprising 15 percent or more of any drill hole sample. This plan must provide for special handling of any organic sulfur forms which produce

acid. Also, the plan should identify where suitable replacement material, if needed, will be obtained.

17. Within 90 days after accepting permit approval, the applicant must submit a plan for restoration of playa grassland communities and for the preservation of a playa grassland control area.

18. Within 30 days after accepting permit approval, the applicant must submit a map showing the location of all proposed fords. Use of a ford is to be temporary, not exceeding one construction season, and is to be confined to favorable weather conditions.

19. Within 180 days after accepting permit approval, the applicant must submit a plan for providing access across the permit area during the period that the county road is abandoned.

20. The applicant must commit to fragmenting the silo pad and other foundations left in place during reclamation.

21. Within 120 days after accepting permit approval, the applicant must submit photographic documentation, which meets Historic American Building Survey standards, of the Rockwell Homestead. It must also submit a completed National Register of Historic Places nomination form.

22. The applicant must commit to requiring the operator not to disturb previously unidentified cultural resources discovered during mining operations. Should he locate such resources, the operator must immediately cease land disturbing activities within the vicinity of the site, notify the regulatory authority of the find, and ensure that the resource(s) is properly evaluated according to requirements for nomination to the National Register of Historic Places (36 CFR 60.6). Should the regulatory authority and the Wyoming SHPO determine that the resource is eligible for nomination to the register, the operator must consult with and obtain the approval of these agencies to develop and implement mitigation measures, as appropriate. Activities will not resume until these measures have been taken.

23. Within 30 days after accepting permit approval, the applicant must submit detailed engineering calculations to support the estimated reclamation costs. These must include:

    a. Type and size of equipment used;

    b. Haul distance from each stockpile or fill to appropriate replacement area;

    c. Production per hour taken from appropriate production curve;

    d. Cost of equipment, operator, and supervisor;

    e. Cost per square foot and per cubic yard for each building or structure; and

f. Cost for removing a linear foot of roadway, including the costs for removing ties and rails for railroad loop and spur.

All costs should be referenced from a standard source such as "Rental Rate Blue Book" or "Wyoming State Highway Department Equipment Rental Rate."

In addition to these stipulations proposed by OSM and Wyoming DEQ, FS has proposed the following:

1. The applicant must commit to protecting shrub and tree plantings for the life of the mine or until the plantings can withstand the natural effects of the environment.

2. Any costs associated with adjusting or mitigating premining land uses on Federal land must be borne by the applicant.

3. Prior to fencing the permit boundary, the applicant must drill a water well and construct other structures necessary to deliver and hold water in the SE¼ sec. 8, T. 42 N., R. 70 W.

APPENDIX C

CORRESPONDENCE CONCERNING ALLUVIAL VALLEY FLOORS

THE STATE OF WYOMING

ED HERSCHLER
GOVERNOR

Department of Environmental Quality

LAND QUALITY DIVISION

401 WEST 19TH STREET TELEPHONE 307-777-7756 CHEYENNE, WYOMING 82002

INSPECTION REPORT

TO FILE: Shell Rochelle Mine, Proposed, Campbell County, Wyoming

FROM: Frank W. Bergstrom, Hydrologist FB

DATE: January 16, 1981

SUBJECT: Potential Alluvial Valley Floor Investigations at the Proposed Shell Rochelle Coal Mine

Participants: Frank W. Bergstrom, DEQ
Bill Kearney, DEQ
Richard Scofield, Shell
Ray Boyle, Hydrology Associates, Inc. (H.A.I.)
Doug Frazier, H.A.I.

The proposed Shell Rochelle Coal Mine area (Township 43N, Range 70W) was visited 17 December 1980 by DEQ, Shell and H.A.I. personnel to investigate a potential alluvial valley floor. The permit application for this property is currently under construction, and this visit was intended to expedite that application.

The area in question is a wide flat formed by a collasped burn across which an unnamed tributary to School Creek flows. It is located in Sections 1 and 12, Township 42N, Range 70W. Area draining to this flat is small, consisting of a higher geomorphic surface and the connecting breaks. The question was whether the surficial deposits in this flat area constitute an alluvial fill, deposited by the existing stream, or if it is of some other origin.

Several backhoe pits were dug and the materials examined in an attempt to determin the depositional environment. Backhoe pit BH-17 showed a column of massive clays, and small laminae of coal. These materials were felt to be deposited by slope wash processes.

A second pit was dug mid way from the modern stream to the north side road on a slight topographic high. Trough cross bedded sands, forming several fining upward sequences 21 to 24 inches thick, were observed to an 8 foot depth. These were overlain by 1 to 2 feet of silty material with poorly sorted concentrations of larger clasts. The sands were clearly fluvial, while the overlying fines were deposited by slope wash processes.

Pits were dug on either side of the second pit perpendicular to the stream, and they showed the fluvial deposits thinning in both directions. A pit dug in the modern stream bed showed abundant fine materials with poorly sorted concentrations of coarser clasts and small (1" - 3" thick) random, poorly sorted scoria lenses. A final pit dug on the valley side slope showed these same scoria lense deposits, attesting to their slope wash origin.

The only modern alluvial deposits were small bar deposits (~4 meters by 0.4 meters) on the inside of the modern stream channel bends.

On the basis of backhoe pits and general site reconnaissance the surficial deposits are interpreted as slope wash containing one and perhaps more isolated, lense shaped channel deposits. The modern stream is erosional, having cut its channel into the slope wash deposits. There are no modern stream deposits to speak of.

These surficial deposits should not be classified as fluvial in origin, though they do contain some small channel sands. The bulk is composed of slope wash. Since there is no alluvial valley, it is recommended this area not be considered as a potential alluvial valley floor.

FWB:sgv

cc Bill Kearney
Margery Hulburt
Gary Beach
Richard Chancellor, District IV Engineer
Ray Boyle, Western Water Consultants
Richard Scofield, Shell Oil Company

APPENDIX D

CORRESPONDENCE CONCERNING PRIME FARMLANDS

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Suite C, Centennial Center
Gillette, Wyoming 82716

August 21, 1980

Mark Kornblau
P.O. Box 1831
Ft. Collins, Colorado 80522

Dear Mr. Kornblau:

In reference to your request on Shell's North Rochelle site there are no soil mapping units on this site that are classed as prime farm lands.

Sincerely,

Richard L. Gray
District Conservationist

(copy)

APPENDIX E

CORRESPONDENCE CONCERNING WILDLIFE

Shell Oil Company
Proposed Rochelle Mine, Campbell County, Wyoming

BASELINE WILDLIFE INVESTIGATIONS

The material presented here is an incapsulation of the wildlife proposal for the Rochelle Site dated March 1980. Tasks to be performed are in compliance with Guideline No. 5, Wyoming Department of Environmental Quality, Land Quality Division (Revised October 1979). These include:

Big Game Studies. Field observations will occur at five separate times (April, May-June, July-August, October-November, and February). Aerial and road counts will occur during four seasons; pellet-group counts will occur during fall and spring. The study area will include a 2-mile zone surrounding the permit area.

Upland Game Birds. Sage grouse leks will be searched for using aircraft during April. If located, the number of strutting males will be estimated and the location mapped. The study area will include a 2-mile zone surrounding the permit area. Production estimates will occur during summer and fall.

Waterfowl and Shorebirds. Counts within the permit area will be made during all field trips.

Raptors. Counts of migrating and nesting raptors will be made within a 2-mile zone surrounding the permit area. + productivity.

Passerines and Other Nongame Birds. Quantitative belt transect counts will be made in all major habitats during the May-June period. The method to be used will be a modified Emlen procedure whereby relative abundance (not density) is estimated within replicated 100x800m transects. Qualitative observations will be performed during other seasons of the year. Quantitative by habitat type in winter, also

Other Mammals. Quantitative small mammal studies will be performed by trapping within all major habitat types during August, September, or October.

Endangered Species. Prairie dog colonies within 1-mile of the permit area will be examined for signs of black-footed ferrets. Identifications of other endangered species are part of studies mentioned above.

Reptiles, Amphibians, Fish. Identifications will be made in suitable habitats during the July-August period.

Shell Oil Company, Mining Ventures, hereby submits the above 1980 wildlife plan for approval to the Wyoming Game and Fish Department.

Approved by: Vern Stelter

Title: Environmental Biologist

Date: 11/12/80

Also need lagomorph survey and predator survey. See guideline 5.

Robert E. Stoecker, Animal Ecologist
stoecker-keammerer & associates ecological consultants

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Billings Area Office
Federal Building, Room 3035
316 North 26th Street
Billings, Montana 59101-1396

IN REPLY REFER TO:

SE

March 4, 1982

Mr. Richard E. Dawes
Acting Administrator
Western Technical Center
Office of Surface Mining
Brooks Towers
1020 15th Street
Denver, CO 80202

Dear Mr. Dawes:

This is the Fish and Wildlife Service's (FWS) biological opinion prepared in response to your request for formal consultation on the effects of surface mining on bald eagles in portions of Campbell and Converse Counties, Wyoming. Your request was received by this office on January 18, 1982. Although your letter did not request our opinion on the endangered black-footed ferret, this document does include our biological opinion and recommendations on mining impacts on ferrets that may occur within the project area. We also concur with your "no effect" decision on endangered peregrine falcons which may occur in the project area during migration periods. This opinion will consider those mine areas known as the Jacobs Ranch, Black Thunder, North Rochelle, Rochelle, North Antelope, and Antelope mines. The Fish and Wildlife Service has examined the proposed action in accordance with Section 7 Interagency Cooperation Regulations (50 CFR 402, 43 FR 807) and the Endangered Species Act as amended. This biological opinion refers only to potential effects on the bald eagle and black-footed ferret, and not the overall environmental acceptability of the proposed action.

Biological Opinion

The FWS's biological opinion on the effects of surface mining in the areas listed above is that this action is not likely to jeopardize the continued existence of the bald eagle. Our opinion is based upon information provided in your "Assessment of Impacts on Bald Eagles" and mine information packets, details contained in the mining and reclamation plans, references listed in this document, and personal communications with individuals knowledgeable of the area and bald eagle and

black-footed ferret biology. Our opinion on black-footed ferrets is that surface mining in these areas is likely to jeopardize this endangered species. Our opinion on black-footed ferrets is based upon the absense of appropriate measures in proposed mine plans which will ensure protection to this endangered species in areas proposed for surface mining disturbances. Consultation should be reinitiated if new information obtained prior to project completion indicates unforeseen adverse impacts to endangered species, the presence or sign of ferrets within or immediately adjacent to the mining areas, new species are listed, or mine plan changes are proposed.

Project Description

The proposed action is surface mining on the Jacobs Ranch, Black Thunder, North Rochelle, North Antelope, and Antelope mine sites in Wyoming, between the Cities of Gillette and Douglas. The total area of these six mine sites is approximately 38,600 acres. Vegetation disturbed by coal extraction will be reclaimed over the life of the project. Eagle and ferret prey species will be eliminated on disturbed sites until reclamation of habitat components necessary to support these prey species is complete and prey reoccupation occurs. Mine plans call for reclamation to proceed at a rate nearly equal to the average number of acres disturbed, beginning one to five years after the initial surface disturbance.

Mine plans call for truck and shovel methods of coal extraction. Bulldozers, graders, scrapers, and front loaders will be used to handle topsoil. Rail lines and spurs are planned to transport coal from mine sites. A number of mines and other mineral extraction projects are active or planned in the project area and the Powder River Basin. Ranching has been the major economic activity in the project area. There were 186 permittees with 203 allotments, using 143,000 AUM's for forage for cattle, sheep, and horses in the Thunder Basin Ranger District of the U.S. Forest Service in 1980 (U.S. Forest Service 1981). Oil and gas extraction is presently ongoing and expanding in the project area. These ongoing projects, proposed projects, and activities that are likely to occur were considered in cumulative effects analysis of this project proposal.

Basis of the Opinion

Bald eagles

For the purposes of this opinion, the affected area is considered to be the area encompassing Thunder Basin National Grassland and the communities within or immediately adjacent to the grassland. This area includes the proposed mine project areas and about 1.75 million other acres

including 1.22 million acres of state and private land. The U.S. Forest Service estimates that 50 to 100 bald eagles winter on the Thunder Basin National Grassland. In addition, golden eagles nest and winter on the Grassland (U.S. Forest Service 1981). Studies of interaction and competition between these species during winter have not been conducted.

There are at least three bald eagle roosts in the area affected by this proposal and ongoing surface mining activity. These roosts are located within secluded wooded canyons in the Rochelle Hills which are from one to five miles from mining areas and major planned and ongoing activities. Legal descriptions of roost locations are:

1. Campbell County, Wyoming
   T.41N., R.70 W., S. 9.
   T.43N., R.69 W., S. 5.

2. Campbell and Converse County line
   T.43N., R.69 W., S. 25

No simultaneous census of these roosts has been conducted since their discovery. Therefore, minimum estimates of the total number of bald eagles using these three roosts are lacking. However, during 1981-82 bald eagle counts, numbers of eagles at separate roosts varied from five or six eagles (Alan Beske pers. comm.) to 16 eagles (Walt Gasson pers. comm.). It is likely that other roosts exist in the project area. Bald eagles are known to be in the project area from late October through March in some years.

Because mine plans do not indicate any coal extraction activity within one mile, or appurtenant construction disturbances within one-half mile of known eagle roosts, and because of the isolated location and buffering effect of physical features of the landscape around known eagle roosts, it is our opinion that proposed mining activities should not adversely impact known bald eagle winter roost habitat.

For this opinion, we have assumed the eagle foraging area to be at least a 15 mile radius from known roosting areas based on Edward's (1969) winter study of eagle foraging areas in Utah.

Bald eagles in the project area are known to feed primarily on deer, antelope, jackrabbits, and domestic sheep carrion. The abundance and availability of these species as a food source is presently considered adequate to sustain eagles foraging in the area during winter. Antelope and mule deer that die as a result of motor vehicle collision, hunter crippling losses or natural mortality factors provide a major food source for eagles. Estimates of hunter-caused crippling losses of deer and antelope totaled 520-930 carcasses in 1980, using a 10-15 percent loss due to crippling of the estimated hunter kill recorded in the project area (Walt Gasson pers. comm.). In 1981, there were 24,622

domestic sheep permitted on Federal lands within the Thunder Basin Grassland. We found no current estimate of sheep carcases available to eagles each winter, although bald eagles are known to use sheep carrion. Rabbits and prairie dogs are known or probable (Steenhof 1978) foods for wintering eagles as well. Both species are considered abundant in the project area (Dave Koberec pers. comm. and U.S. Forest Service 1981).

The impact of surface disturbance on eagle prey populations will be somewhat mitigated because reclamation of mine lands will occur more or less simultaneously. The carrion base may increase slightly due to an increase in road kills resulting from increased human activity. Other surface disturbance activities in the project area, such as developments within road and railroad right-of-ways, will also disturb a small area in proportion to the overall foraging habitat available to eagles. Overall, carrion food sources are not expected to be significantly reduced or extirpated from the estimated foraging area as a result of the proposed activity.

Recommendations

The need to continue monitoring these bald eagles is great, if, in light of the development projected over the next few decades, we are to accurately assess and minimize the cumulative impacts of continued development on these endangered species and inter-related wildlife species in this area. Information on use of roosts, feeding behavior, weather effects on bald eagle activity, feeding flight distances, etc., is necessary to further refine these conservation measures. We recommend that bald eagle monitoring projects be continued and intensified over the next three to five years by State and Federal land management agencies and mining companies in order to gain greater insight of the importance of roost habitat and other bald eagle feeding and loafing habitat within the project area.

In order to further minimize impacts to roosting eagles, we recommend curtailment of construction activities (such as access roads or railroads) within one mile of platted sections containing eagle roosts during the period November 1 through April 1 each year. These precautions and the secluded locations of known bald eagle roosts in the Rochelle Hills should provide a buffer between roosting eagles and human activity. Transmission lines erected within the project area should be constructed to minimize collision and electrocution hazards. Raptor Research Report No. 4 by Olendorff et al. (1981) should be followed in raptor-proofing transmission lines within the affected project area.

Increased human activity for work and recreational purposes is expected in and around the project area. Impacts of these activities to wintering eagles can be reduced by incorporating environmental awareness topics into mine safety or training sessions. Mine worker awareness of

the presence of eagles, eagle protection laws, and penalties for illegal taking or harrassment of eagles is recommended to minimize increasing human disturbance within this bald eagle wintering area.

Black-Footed Ferret

Prairie dog towns are considered the primary habitat of black-footed ferrets (Henderson et al. 1969). The U.S. Forest Service estimates that 161 prairie dog towns totaling 23,123 acres (1.3 percent of total land area) existed on the Thunder Basin National Grassland and associated private lands in 1980 (USFS 1981). This study indicated the presence of prairie dog towns on the proposed Black Thunder, Rochelle, North Antelope, and Antelope mine areas. Sightings of ferrets within the area affected by this project have been reported (Clark and Stromberg 1977 and Dave Koberec pers. comm.) within the last ten years. Surveys conducted on two prairie dog towns on the Antelope Mine area did not indicate the presence of ferrets on these two towns (Biota 1980). Studies of prairie dogs, the most probable prey of ferrets (Henderson et al. 1969), have been conducted in the project area by the U.S. Forest Service and private consultants.

Mine plans inadequately address the need to conduct definitive ferret surveys on prairie dog towns prior to surface mining disturbances. We recognize that, at the present time, only five or six prairie dog towns and not a complex of towns will be affected by surface disturbance. However, we are concerned that any size dog town may contain ferrets at the time surface disturbance occurs. Moreover, since ferrets may occupy different dog towns in different years (Hillman pers. comm.), because they may be transitory within large prairie dog complexes (such as the prairie dog complex in the project area considered in this opinion), and because of their elusive nocturnal behavior, definitive surveys for ferrets should be conducted as close to the time of ferret habitat disturbance as possible.

Alternatives

The FWS presents the following alternative to preclude jeopardy to the endangered ferret.

Mine areas containing prairie dog towns should be surveyed for black-footed ferrets within one year of surface mining disturbances to the dog town. Once completed, the FWS should be notified of survey findings. If ferrets or their sign are found during pre-disturbance surveys, consultation should be reinitiated with FWS. If surveys do not locate any sign of ferrets and FWS concurs with these findings, then surface disturbance of prairie dog towns can proceed. Draft FWS black-footed

ferret survey guidelines are available as a survey procedure reference. Since these guidelines are expected to change as ferret research in northwestern Wyoming adds knowledge supporting revisions, updated guidelines should be obtained and used to develop methods to survey for ferrets during the year prior to prairie dog town disturbance.

Recommendations

In addition to the previously outlined alternative to preclude jeopardy, we consider the following recommendations as important conservation measures to be considered during the life of proposed mining operations.

1. We recommend that mining companies consider periodic surveillance of prairie dog towns on lease areas as an early warning ferret detection system. These searches can provide additional time for mining companies and regulatory agencies to improvise and initiate suitable alternatives to protect the species and mining company interests if ferrets are discovered.

2. We recommend that mine workers be instructed during safety or training meetings to identify and watch for ferrets, and be informed of laws protecting ferrets and the importance of reporting sightings of ferrets to the appropriate authorities. Recreational activities, including prairie dog hunting, are expected to increase as a result of local human population increases. Hunters, including miners, that are knowledgeable of the habits and identity of ferrets are likely to be more selective and discriminatory when shooting on prairie dog towns. This measure can reduce the chances of illegal taking of a ferret while the chances of locating resident ferrets will be increased.

This concludes the FWS's biological opinion on the effects of proposed surface mining activities on endangered species in Campbell and Converse Counties, Wyoming.

Sincerely,

John G. Wood
Acting Area Manager

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Olendorff, R.R., A.D. Miller, and R.D. Lehman. 1981. Suggested practices for raptor protection on powerlines - the state of the art in 1981. Raptor Research Report No. 4. 111 pp.

Steenhof, K. 1978. Management of wintering bald eagles. U.S. Fish and Wildlife Service. 59 pp.

U.S. Forest Service. 1981. Environmental assessment on Thunder Basin prairie dog management. Douglas District Medicine Bow National Forest. June 30, 1981. 170 pp.

APPENDIX F

CORRESPONDENCE CONCERNING CULTURAL RESOURCES

THE STATE OF WYOMING

ED HERSCHLER
GOVERNOR

Wyoming Recreation Commission

604 EAST 25TH STREET CHEYENNE, WYOMING 82002

COMMISSION OFFICERS
E. LAWSON SCHWOPE
PRESIDENT
900 Foyer Avenue
Cheyenne 82001
CHARLES H. JOHNSON
VICE PRESIDENT
1121 Alder
Rawlins 82301
RICK KILMER
TREASURER
P.O. Box 51
Lusk 82225

MEMBERS
MRS. ROBERT FRISBY
3269 Forest Drive
Cheyenne 82001
FLOYD BARTLING
P.O. Box 172
Douglas 82633
WILLIAM MOFFAT
107 W. Jackson Avenue
Riverton 82501
JACK D. OSMOND
P.O. Box 216
Thayne 83127
ALBERT PILCH
1800 Morse Lee
Evanston 82930
DAN MADIA
1017 Victoria
Sheridan 82801

JAN L. WILSON
Director
777-7695

April 13, 1981

Greg Smith
Department of Environmental Quality
Land Quality Division
401 West 19th Street
Cheyenne, Wyoming 82002

Dear Mr. Smith:

The OWSA survey of Shell Oil Company's North Rochelle Mine, Campbell County was received in this office March 16, 1981. Thank you for giving us the opportunity to review the report.

Enclosed are memoranda from our staff historian and archeologist who reviewed the report. They indicate that provision must be made for a Class III survey of the site 48CA114. Such a survey is necessary before cultural clearance can be recommended by the Wyoming State Historic Preservation Officer (SHPO) for the purposes of applicable state and federal laws.

If you have any questions concerning this recommendation please contact the appropriate member of our staff.

Sincerely,

Mark Junge, Chief
Resources Division and
Deputy SHPO

FOR:

Jan L. Wilson, Director and
State Historic Preservation Officer

MGJ:klm
Encls.
cc: Kathleen Bateman, Sterns-Roger, Denver, Colorado
Bureau of Land Management, Casper, Wyoming

WYOMING RECREATION COMMISSION

STATE HISTORIC PRESERVATION OFFICE

REVIEW AND COMPLIANCE

Interdisciplinary Staff Comments

Archeology • *History* • *Historical Architecture* • *Recreation Planning*

TO: Mark Junge, Chief

FROM: Thomas E. Marceau, Review & Compliance Section Head TEM

DATE: April 7, 1981 (district 4)

RE: Shell Oil Company North Rochelle Mine, Campbell County, Wyoming

The report "Cultural Resource Investigations of the Proposed Shell Oil Company's North Rochelle Mine Study Area, Campbell County, Wyoming "authored by J. Hauff et al. of the Office of the Wyoming State Archeologist has been read and approved. Archeological clearance is recommended.

This study is valuable for both cultural resource management and scientific research. Each of the 11 archeological sites is evaluated for inclusion in the National Register of Historic Places; none is determined eligible. Based on adequate field survey methodologies, site content discussion and collecting/recording techniques we concur with these determinations.

This is one of the few reports which utilizes a number of objective measures in proposing possible site functions. Diversity indices are developed for tool types, raw materials and debitage raw materials present with each assemblage. A series of bivariate analyses are then evaluated and the combined results used to estimate site function(s) (see pages 158-163). This is an interesting technique and could be applied elsewhere in order to assess its reliability.

The site density of 0.96 sites per square mile might be considered low if taken at face value. However, this report relates the variables which characterize this survey area to other nearby study areas and provides adequate justification for the limited number of archeological sites discovered. We may point to (1) the lack of environmental/vegetative diversity, (2) upland rolling grassland topography, and (3) infrequent and intermittent water sources as contributing factors. This study is to be commended for its use of a regional model relating to settlement patterns and the incorporation of data from pertinent areas adjacent to the mine area in its resource evaluation.

WYOMING RECREATION COMMISSION

STATE HISTORIC PRESERVATION OFFICE

REVIEW AND COMPLIANCE

Interdisciplinary Staff Comments

Archeology • History • Historical Architecture • Recreation Planning

TO: Mark Junge, Chief

FROM: Michael A. Massie, Historical Review & Compliance Officer MAM

DATE: April 7, 1981 (district 5)

RE: DEQ, OWSA Survey of Shell Oil Company's North Rochelle Mine, Campbell County

If this project were surveyed in 1981, the report would need to contain an historical overview and an historian's evaluation of all historical remains. By these professional standards, I would recommend that a qualified, state-approved historian investigate sites 48CA514, 48CA650, 48CA657, 48CA658, 48CA780 and 48CA114. Archeologists are not qualified to assess the National Register eligibility of historic sites. Also, archeological information gained from excavations is valuable to an historian but is not the sole source used in determining the significance of a site. The historian must analyze and evaluate the importance of the site according to national, regional, state and local histories. This report did not provide this crucial and necessary information.

However, since OWSA performed this survey in the summer of 1980, I will offer recommendations in reference to the standards of that time. Mr. Hauff and company provided enough information that I concur with their recommendations of no further work for all sites except 48CA114. As the report stipulates, more information is needed on the National Register eligibility of the Rockwell Homestead. Therefore, pursuant to 36CFR800.4(a), I recommend that the lead federal agency consult a qualified historian (state standards) to evaluate the National Register eligibility of the Rockwell Homestead (48CA114). Before starting this survey, the historian should check with the SHPO concerning the state's historical report standards and requirements. I need to review this report prior to recommending historical clearance

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

R-2

REPLY TO: 2360 Special Interest Areas

SUBJECT: Cultural Resource Inventory

TO: Forest Supervisor, Medicine Bow NF

This is to certify that I have reviewed the final report on cultural resources evaluation for North Rochelle (Coal) Mine/Shell Oil Company dated N.D. . It is my recommendation that it be:

[X] ACCEPTED without revision,

[ ] ACCEPTED with the following revision(s)*:

[ ] NOT ACCEPTED for the following reasons:

Revisions/Reasons	Document Actions Taken
Site density seems a little low.	

(Continued on other side)

Concur with Recommendation

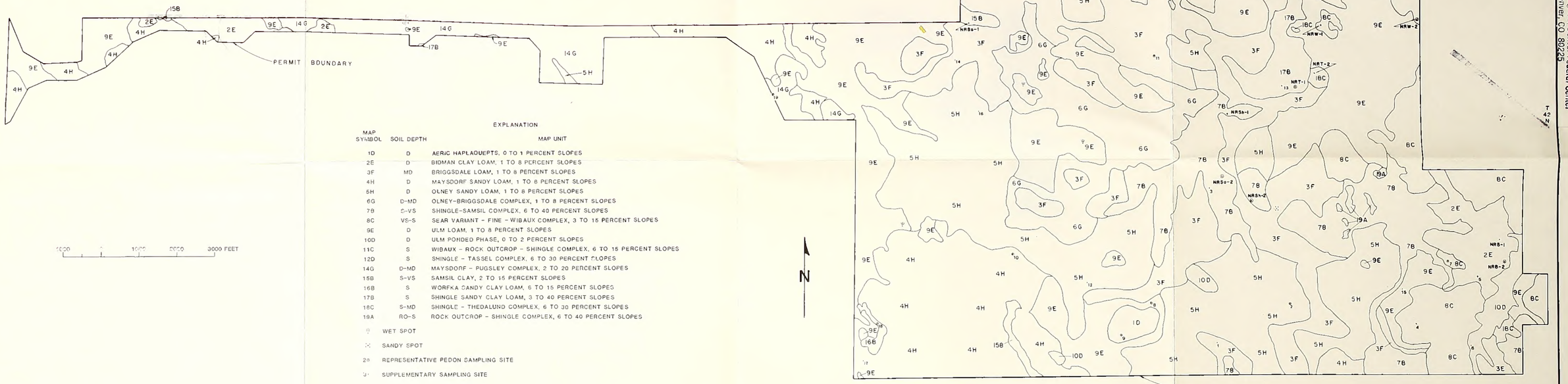
Steve Sigstad
STEVE SIGSTAD
Regional Archeologist

Stanley E. Allgeier
STANLEY E. ALLGEIER
Acting Director, Recreation

cc: Greg Smith, Wyoming DEQ
Foster Kirby, OSM

4/23/82
Date

R. 71 W. R. 70 W.



EXPLANATION

MAP SYMBOL	SOIL DEPTH	MAP UNIT
1D	D	AERIC HAPLAQUEPTS, 0 TO 1 PERCENT SLOPES
2E	D	BIDMAN CLAY LOAM, 1 TO 8 PERCENT SLOPES
3F	MD	BRIGGSDALE LOAM, 1 TO 8 PERCENT SLOPES
4H	D	MAYSDORF SANDY LOAM, 1 TO 8 PERCENT SLOPES
5H	D	OLNEY SANDY LOAM, 1 TO 8 PERCENT SLOPES
6G	D–MD	OLNEY–BRIGGSDALE COMPLEX, 1 TO 8 PERCENT SLOPES
7B	S–VS	SHINGLE–SAMSIL COMPLEX, 6 TO 40 PERCENT SLOPES
8C	VS–S	SEAR VARIANT – FINE – WIBAUX COMPLEX, 3 TO 15 PERCENT SLOPES
9E	D	ULM LOAM, 1 TO 8 PERCENT SLOPES
10D	D	ULM PONDED PHASE, 0 TO 2 PERCENT SLOPES
11C	S	WIBAUX – ROCK OUTCROP – SHINGLE COMPLEX, 6 TO 15 PERCENT SLOPES
12D	S	SHINGLE – TASSEL COMPLEX, 6 TO 30 PERCENT SLOPES
14G	D–MD	MAYSDORF – PUGSLEY COMPLEX, 2 TO 20 PERCENT SLOPES
15B	S–VS	SAMSIL CLAY, 2 TO 15 PERCENT SLOPES
16B	S	WORFKA SANDY CLAY LOAM, 6 TO 15 PERCENT SLOPES
17B	S	SHINGLE SANDY CLAY LOAM, 3 TO 40 PERCENT SLOPES
18C	S–MD	SHINGLE – THEDALUND COMPLEX, 6 TO 30 PERCENT SLOPES
19A	RO–S	ROCK OUTCROP – SHINGLE COMPLEX, 6 TO 40 PERCENT SLOPES

WET SPOT

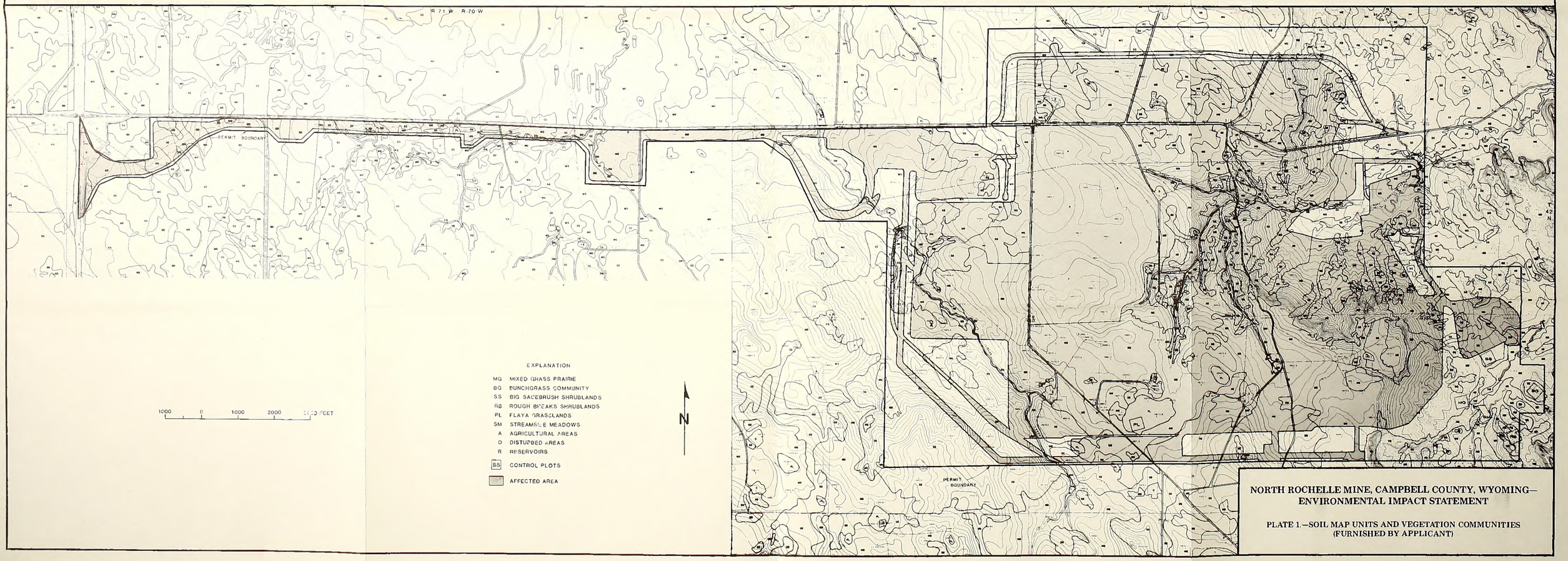
SANDY SPOT

2 REPRESENTATIVE PEDON SAMPLING SITE

SUPPLEMENTARY SAMPLING SITE

SOIL DEPTH
DEEP (D) 40 INCHES I
MODERATELY DEEP (MD) 20–40 INCHES
SHALLOW (S) 10–20 INCHES
VERY SHALLOW (VS) LESS THAN 10 INCHES

R. 71 W. R. 70 W.



EXPLANATION

MG	MIXED GRASS PRAIRIE
BG	BUNCHGRASS COMMUNITY
SS	BIG SAGEBRUSH SHRUBLANDS
RB	ROUGH BREAKS SHRUBLANDS
PL	PLAYA GRASSLANDS
SM	STREAMSIDE MEADOWS
A	AGRICULTURAL AREAS
D	DISTURBED AREAS
R	RESERVOIRS
SS	CONTROL PLOTS
	AFFECTED AREA

NORTH ROCHELLE MINE, CAMPBELL COUNTY, WYOMING—ENVIRONMENTAL IMPACT STATEMENT

PLATE 1.—SOIL MAP UNITS AND VEGETATION COMMUNITIES (FURNISHED BY APPLICANT)

NORTH ROCHELLE MINE–ENVIRONMENTAL IMPACT STATEMENT
PLATE 2

R 70 W

T 42 N

LEASE BOUNDARY

PERMIT BOUNDARY

WEST SCHOOL CREEK

SCHOOL CREEK

TRAVELER

4800

4825

4775

4750

4725

4850

4875

4900

N

500 0 500 1000 1500 2000 FEET

NORTH ROCHELLE MINE, CAMPBELL COUNTY, WYOMING–
ENVIRONMENTAL IMPACT STATEMENT

PLATE 2.–POSTMINING CONTOURS
(FURNISHED BY APPLICANT)

R 70 W

T 42 N

E 469,000 E 470,000 E 471,000 E 472,000 E 473,000

N1,052,000 N1,051,5 N1,050,000

SETASIDE TRUCK AREA

PARKING LOT (198 SPACES)

READY AREA

TOPSOIL STOCKPILE #1

RAILROAD LOOP

60-INCH OVERLAND COAL CONVEYOR

N 35° E

POINT	FACILITY
1	NORTHEAST LOADOUT SILO
2	SECONDARY CRUSHER
3	WATER WELL TWW-2
4	ADMINISTRATION BUILDING
5	CHANGE HOUSE
6	SERVICE BUILDING
7	PUMP HOUSE
8	POTABLE WATER TANK
9	WATER SUPPLY RESERVOIR NO.1
10	FUEL STATION
11	PRIMARY SEWAGE LAGOON
12	SECONDARY SEWAGE LAGOON
13	INDUSTRIAL WASTE POND
14	STORAGE YARD
15	SEDIMENTATION POND NO.1
16	AMMONIUM NITRATE PRILL BIN
17	HIGH EXPLOSIVE MAGAZINE
18	CAP MAGAZINE
19	SERVICE BUILDING PUMP HOUSE
20	THUNDER BASIN NO.52 RES. RELOCATION
21	BOILER HOUSE
22	GATE HOUSE
23	STORAGE BUILDING

0 50 100 200 300 400 500
SCALE 1" = 200'
CONTOUR INTERVAL = 2'

NOTE: FACILITIES IN GENERAL AREA ARE ORIENTED DUE GRID NORTH UNLESS NOTED

NORTH ROCHELLE MINE, CAMPBELL COUNTY, WYOMING—
ENVIRONMENTAL IMPACT STATEMENT

PLATE 3.—FACILITIES AREA
(FURNISHED BY APPLICANT)