United States
Environmental Protection
Agency

Office of Water
(4303)

EPA 821-B-01-013
December 2001

EPA

Economic and Environmental Impact Assessment of Final Effluent Limitations Guidelines and Standards for the Coal Mining Industry: Remining and Western Alkaline Subcategories

Economic and Environmental Impact Assessment of Final Effluent Limitations Guidelines and Standards for the Coal Mining Industry: Remining and Western Alkaline Subcategories

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ACKNOWLEDGMENTS AND DISCLAIMER

This document was prepared by the Office of Water staff. The following contractors provided assistance and support in performing the underlying analysis supporting the conclusions detailed in this document.

Abt Associates, Inc.
DynCorp I&ET
Eastern Research Group, Inc.
The Western Coal Mining Work Group

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Introduction

EPA has finalized amendments to effluent limitations guidelines and standards for coal mining under the Clean Water Act (40 CFR part 434). The final amendments add two new subcategories for coal mining, the first applying to coal remining operations and the second applying to reclamation activities at western alkaline coal mines. This Economic and Environmental Impact Assessment (hereafter referred to as the EA) presents an analysis of costs, benefits, economic impacts and environmental impacts attributed to each of the additional subcategory rules.

Coal Remining Subcategory

Coal remining is the mining of surface mine lands, underground mine lands, and coal refuse piles on a site where coal mining was previously conducted and where the site has been abandoned or the performance bond has been forfeited. Prior to SMCRA, reclamation of mine lands was not a federal requirement. Many coal mines were left in an abandoned state and continue to degrade the environment and pose health and safety risks. The acid mine drainage that originates from these abandoned mine lands is considered “pre-existing discharges.” Acid mine drainage from abandoned coal mines is a major environmental problem in the Appalachian and mid-Continent Coal Regions of the eastern United States. The Coal Remining Subcategory was added to provide a regulatory structure to encourage remining activities, and in turn, reduce acid mine drainage and improve water quality. Remining is also expected to reduce the risk of injury at abandoned sites by closing mine openings, removing highwalls, and stabilizing spoils.

EPA’s final amendments include BPT, BCT, BAT, and NSPS limitations that have an equivalent technical basis for the Coal Remining Subcategory. The final limitations have been established as a combination of numeric and non-numeric standards. Specifically, BAT is defined as implementation of a pollution abatement plan that incorporates best management practices designed to reduce pollutant levels of acidity, TSS, iron, and manganese, as well as a requirement that such pollutant levels are not increased over baseline conditions. This is essentially the level of treatment currently required under permits issued in accordance with the Rahall Amendment to the Clean Water Act.

Western Alkaline Coal Mining Subcategory

The previous effluent guidelines at 40 CFR Part 434 subpart E for reclamation areas established numeric effluent limits based on the use of sedimentation pond technology. Although sedimentation ponds are proven to be effective at reducing sediment discharge, EPA believes that there are numerous non-water quality impacts from their use in the arid west that need to be considered. Controlling sediment in areas that naturally contain large amounts of sediment through the exclusive use of sedimentation ponds can disturb the natural hydrologic balance, accelerate erosion, reduce groundwater recharge, reduce water availability, and impact large areas of land for pond construction. EPA established this new subcategory to address these impacts.

For the Western Alkaline Coal Mining Subcategory, the final amendments established BPT, BAT, and NSPS limitations as having an equivalent technical basis. The regulation requires the mine operator to develop a site-specific sediment control plan for surface reclamation and non-process areas. The sediment control plan must identify BMPs, and present design, construction, and maintenance specifications and expected performance. Specifically, BPT must consist of BMP requirements projected through modeling to maintain average annual sediment yield at or below pre-mined undisturbed conditions. The rule requires that the coal mining operator develop and implement a sediment control plan to demonstrate compliance. BAT and NSPS standards will be equivalent to BPT. EPA did not establish BCT limitations under this rulemaking.

This executive summary reviews the major components of the EA, including: (1) estimates of industry compliance costs; (2) evaluation of the economic impacts to the coal mining industry, including impacts on small firms and new sources; (3) analysis of additional economic impacts, including costs to NPDES permitting authorities, community impacts, and impacts on foreign trade; (4) evaluation of environmental impacts and benefits; and (5) a summary of the social costs and benefits attributed to the final rule.

Industry Compliance Costs

EPA analyzed the costs and cost savings to the coal mining industry attributed to the final rule. These are the changes in compliance costs associated with differences between current requirements and requirements under the final subcategories. Except where noted, all costs are reported in 1998 dollars; the present value of costs that are incurred in the future is calculated using a 7 percent discount rate; annualized costs are developed using an annualization period of 10 years and a 7 percent discount rate.

Coal Remining Subcategory

EPA estimated economic baseline conditions for remining based on existing state and federal regulations and current industry practices. As economic baseline, EPA assumed the conditions that would exist if remining under a Rahall permit, pursuant to section 301(p), rather than comparing compliance with Part 434 regulations. EPA projects that states will permit 43 to 61 new remining sites each year under this new subcategory (see Chapter 3). EPA projected costs for each remining site by calculating the cost of added requirements beyond those currently required for Rahall permits. These include the cost of increased monitoring requirements for determining baseline, the cost of potential increases in compliance monitoring requirements, and the potential costs associated with developing and implementing the required pollution abatement plan.

To assess the increased monitoring requirements of the rule, EPA evaluated current state requirements for operations permitted under the Rahall provision and calculated the sample collection costs that exceed the current state requirements. Under the final rule, EPA requires operators to conduct monthly sampling for a period of one year to characterize the baseline pollutant levels for iron (total), and manganese (total), and TSS. EPA has assumed monthly compliance monitoring for costing purposes. EPA estimates that the total annual incremental monitoring costs are in the range of $133,500 to $193,500. Of this, approximately $83,000 to $120,000 is associated with incremental baseline monitoring requirements and approximately $50,500 to $73,500 results from incremental compliance monitoring during a five year remining period.

In addition to monitoring requirements, remining operators must develop and implement a site-specific pollution abatement plan for each remining site. In many cases, EPA believes that the requirements for the pollution abatement plan will be satisfied by an approved SMCRA plan. However, EPA recognizes that some operators may be required to implement additional or incremental BMPs under the final rule beyond what is included in a SMCRA-approved pollution abatement plan. EPA developed a general estimate of the potential costs of additional BMPs based on review of existing remining permits contained in the EPA's Coal Remining Database (U.S. EPA, 1999a), and on information provided in the *Coal Remining Best Management Practices Guidance Manual* (U.S. EPA, 2000d). Total estimated costs associated with potential additional BMP effort are between $199,500 and $565,000 per year.

The total estimated annual compliance costs associated with the final Coal Remining Subcategory are approximately $333,000 to $758,500 per year. Table ES-1 summarizes the total incremental compliance costs.

Table ES-1: Annual Compliance Costs for the Final Coal Remining Subcategory

Monitoring Costs	$133,500 - $193,500
Additional BMP Effort	$199,500 - $565,000
Total Compliance Costs	**$333,000 - $758,500**

Western Alkaline Coal Mining Subcategory

EPA determined that 46 surface coal mines and 24 underground coal mines are likely to be in the scope of the new subcategory. EPA believes that the rule will be at worst cost-neutral for the underground operators. Although EPA believes that compliance with the final rule will result in operational savings for many underground producers, EPA did not estimate the savings due to data limitations. Hence, only the 46 surface mines were included in the analyses of costs and benefits.

EPA expects that the sediment control plan will largely consist of materials generated as part of the SMCRA permit application. The requirement to use watershed modeling techniques is not inconsistent with these materials. While the Office of Surface Mining (OSM) does not specifically require modeling, most coal mine operators already perform watershed modeling to support their SMCRA permit application that is sufficient to meet EPA's new effluent guideline subcategory requirements. However, some incremental costs may occur for cases where this rule increases model complexity.

Information provided by OSM for proposed rulemaking indicates that a surface mine operator might incur a one-time additional cost of up to $50,000 to meet the watershed modeling requirements. Although most sites are not expected to incur any additional modeling costs (as supported by OSM comments on the proposed rule), EPA conservatively assumed that all 46 existing surface operators would incur additional costs of $50,000. The $50,000 estimate represents an annualized cost of $7,119 per mine, resulting in a total annualized cost estimate of $327,000. These costs would be offset by reduced sediment control costs associated with implementing the required sediment control plans, as well as savings resulting from an expected reduction in the reclamation bonding period.

EPA projects that reclamation costs at western alkaline surface coal mines will be lower with the required BMP approach than with exclusive use of sedimentation ponds. Analyses provided by the Western Coal Mining Work Group (WCMWG) calculated cost savings for three representative model coal mines differentiated by geographic region: Desert Southwest (DSW), Intermountain (IM), and Northern Plains (NP). EPA extrapolated from the WCMWG model mine analyses and industry profile information to estimate savings in sediment control costs. EPA projects that compliance with the final rule will result in annual savings of $12.7 million in sediment control costs.

EPA also calculated cost savings that may result due to earlier Phase 2 bond release. The OSM hydrology requirements to release performance bonds at Phase 2 at 30 CFR part 800.40(c)(1) requires compliance with the existing effluent standard. The use of BMPs under the final rule for this subcategory is expected to allow earlier Phase 2 bond release, because less time will be needed to meet the hydrology bond release requirements. According to information provided by the WCMWG, the BMP-based approach would reduce the time it takes reclaimed lands to qualify for Phase 2 bond release by about five years. EPA used a number of simplifying assumptions to estimate the savings associated with earlier Phase 2 bond release. The WCMWG industry profile provides information necessary to calculate associated bond savings for 26 mines. The total estimated savings for these mines range from $197,000 to $289,000 when annualized over a five year permit period. EPA assumed that the remaining 20 mines, for which savings could not be calculated, would achieve similar savings ($7,200 to $10,600 per mine), resulting in total annualized savings of between $341,900 and $501,400.

The estimated net savings in compliance costs associated with this subcategory of the final rule, considering additional modeling costs and the savings to mine operations in sediment control and bonding costs, is estimated to be approximately $12.8 million, as shown in Table ES-2.

Table ES-2: Annual Costs and Cost Savings for the Final Western Alkaline Coal Mining Subcategory

Incremental Modeling Costs	$327,000
Sediment Control Costs (Savings)	($12,721,000)
Earlier Phase 2 Bond Release (Savings)	($341,900 - $501,400)
Total Compliance Costs (Savings)	**($12,735,900 - $12,895,400)**

Industry Impacts

EPA is required to assess the economic achievability of effluent limitations guidelines and standards that are based on the best available technology economically achievable (BAT). To assess the economic achievability of the requirements, EPA assesses the expected impacts on the profitability of the potentially affected facilities, the firms that own these facilities, and the directly-affected industry as a whole. Requirements that may result in significant numbers of facility or firm closures, or that may otherwise cause significant reductions in financial returns to the affected economic activities, may be deemed to be economically unachievable.

Economic Achievability

For purposes of this economic impact analysis, EPA assumes that the final Coal Remining Subcategory will not impact existing Rahall-type permits with established "best professional judgement" (BPJ) limitations. Thus, the final subcategory will not have any economic impacts on operations under existing Rahall-type permits. For new permits, remining operators will have the opportunity to assess the overall economic return to remining in compliance with the final requirements before any investment is made at a remining site.

The methods used to assess the economic impacts of the final Coal Remining Subcategory differ from approaches EPA has used in analyses for other rules because EPA believes that the final requirements will only affect new remining permits. Hence, information needed to quantify the economic impacts to industry in terms of facility closures or impacts to firm financial ratios is not available. Alternatively, EPA compared the potential added costs of the final requirements with the current price of coal produced from the Appalachian region to provide a measure of economic impact. Where additional requirements imposed by the final subcategory represent only a small percentage of the price received for coal, EPA concludes that the final requirements will not have a significant economic impact on potential remining projects.

Under worst-case assumptions, EPA estimates that additional monitoring costs could represent as much as $0.11 per ton remined. However, even this worst-case estimate represents less than one-half of one percent of the 1997 average price of $26.55 per ton of coal mined in the Appalachian region. These findings suggest that the incremental monitoring requirements will not deter investments in remining projects. EPA estimates that the additional BMP costs associated with the pollution abatement plans could represent 5.6 cents per ton of coal recovered, or two-tenths of one percent of the 1997 average price of coal mined in the Appalachian region. However, these additional BMPs will be site-specific, with economic achievability considered in BPJ determination.

Since the final Western Alkaline Coal Mining Subcategory rule results in net cost savings to existing mine operations, it is inherently economically achievable. Because reclamation costs under the rule will be less than or equal to those under the existing effluent guidelines for all individual operators, no facility closures or direct job losses associated with post-compliance closure are expected. However, EPA estimated changes in labor requirements attributed to the final subcategory rule by extrapolating from the WCMWG model mine results, which calculated change in labor hours associated with changes in the types of erosion and sediment control structures used. EPA estimates that the subcategory requirements could result in the loss of 5.2 full-time equivalent employees (FTEs) per year. This represents less than 0.1 percent of the total 1997 coal mine employment (6,862 FTEs) in the western alkaline region States.

The cost savings associated with the final rule are not expected to have a substantial impact on the industry average cost of mining per ton of coal, and are therefore not expected to have a major impact on coal prices. While the savings are substantial in aggregate, on average the savings represent a small portion of the total value of coal produced by the affected mines. The final rule is not expected to result in significant industry-level changes in coal production or prices.

Impacts on Small Firms

The Regulatory Flexibility Act as Amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), generally requires an agency to prepare a regulatory flexibility analysis for any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. An agency may certify that a rule will not have a significant economic impact on a substantial number of small entities if the rule relieves regulatory burden, or otherwise has a positive effect on all small entities subject to the rule.

For purposes of this analysis, small entity is defined as: (1) a small business that has 500 or fewer employees (based on SBA size standards); (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population less than 50,000; or (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

The final Coal Remining Subcategory provides standardized procedures for developing effluent limits for pre-existing discharges, thereby reducing the uncertainty involved in interpreting and implementing current

Rahall requirements. The final subcategory is intended to remove barriers to the permitting of remining sites with pre-existing discharges, and is therefore expected to encourage remining activities by small entities. Thus, the Agency concludes that the subcategory will relieve regulatory burden for all small entities. EPA projects that the final Western Alkaline Coal Mining Subcategory will result in cost savings for all small surface mining operators. For all small underground operators, EPA projects no incremental costs, and the Agency believes that many are likely to experience some cost savings. Thus, the Agency concludes that the subcategory will have a positive impact on all affected small entities. The Agency thereby certifies that the final rule will not have a significant economic impact on a substantial number of small entities.

Impacts on New Sources

EPA does not believe that the final rule will present any barriers to entry in the coal mining industry. EPA believes that the final rule will not impact existing remining permits. For new permits, remining operators will have the opportunity to choose among potential remining sites, and will only select sites that they believe are economically achievable to remine. The final requirements will not create any barriers to entry in coal remining, but instead are specifically designed to encourage new remining operations.

EPA believes that new sources will be able to comply with the NSPS requirements under the final Western Alkaline Coal Mining Subcategory rule at costs that are similar to or less than the costs for existing operators. New sources can plan for site-specific BMP reclamation from the outset rather than altering existing reclamation plans based on the new requirements. For example, new sources would be able to avoid costs associated with designing and installing sedimentation ponds. There is nothing about the final rule that would give existing operators a cost advantage over new mine operators. Therefore, NSPS limitations will not present a barrier to entry for new operators.

Additional Economic Impacts

EPA evaluated three additional categories of economic impacts for the final rule: costs to NPDES permitting authorities, community impacts (due to potential impacts on employment), and potential foreign trade impacts.

Costs to NPDES Permitting Authorities

NPDES permitting authorities will incur additional costs to review new permit applications and issue revised permits based on the final rule. Total additional NPDES permit review costs for the final rule are estimated to be between $60,000 and $80,000 per year ($47,500 to $67,500 for remining permits, and $12,500 for permits under the Western Alkaline Coal Mining Subcategory).

Community Impacts

The final rule could have community-level and regional impacts if it significantly altered the competitive position of coal produced in different regions of the country, or led to growth or reductions in employment in different regions and communities. EPA concluded that the final rule would not have a significant impact on relative coal production in the West versus the East. This is because: (1) annualized cost savings estimates for Western Alkaline surface mines average about $0.033 per ton, or 0.4 percent of the value of coal production from these mines; (2) coal from western mines appears to compete directly with eastern coal in about eight states, where the $0.033 savings per ton comprises about 0.13 percent of the average delivered price (the average delivered price of coal in these eight "competitive" states was about $25.51 per ton in 1998); and (3) Department of Energy data indicates that the average cost of rail transportation for coal from western to midwestern states is approximately $0.00912 per ton-mile, implying that Western Alkaline mines would be able to ship their coal about 4 additional miles while maintaining the same delivered price. The final Coal Remining Subcategory rule is likely to shift the location of production and employment toward eligible abandoned mine lands, but not to increase national coal production or affect coal prices significantly overall.

EPA projects that impacts of the final rule on mine employment will also be minor. Increased remining might create new employment opportunities in some locations. As discussed above, EPA estimated a reduction in labor requirements of 5.2 FTEs per year for the final Western Alkaline Coal Mining Subcategory rule. The estimated annual 5.2 FTE direct job losses would result in an additional 8.7 FTE indirect job losses based on RIMSII regional employment multipliers for the western alkaline states. Therefore, the total impact on employment, direct and indirect, that may result from the final Western Alkaline Coal Mining Subcategory is a reduction of between 13.9 FTEs per year.

Foreign Trade Impacts

EPA does not expect any foreign trade impacts as a result of the final rule. U.S. coal exports consist primarily of Appalachian bituminous coal, especially from West Virginia, Virginia and Kentucky. Coal imports to the U.S. are insignificant. The final rule could encourage additional exports, with a positive impact on the U.S. balance of trade, if coal from expanded remining in the Appalachian region found markets overseas. Impacts are difficult to predict, however, since coal exports are determined by economic conditions in foreign markets and changes in the international exchange rate for the U.S. dollar. Any impacts on foreign trade are likely to be small, given EPA's expectation that the final rule will not increase overall coal production.

Environmental Impacts and Benefits

Coal Remining Subcategory

Appalachia has been the site of substantial coal mining historically, and much of this mining took place before passage of laws regulating the environmental impacts of coal mining. The result is an environmental legacy that includes more than a million of acres of abandoned mine lands. These areas are associated with a wide range of public health and safety problems and aesthetic degradation, including abandoned mine openings, highwalls, unstable spoils, and hazardous water bodies. In addition, acid mine drainage from abandoned mine lands causes serious water quality problems, and is a major source of water quality impairments in Appalachia.

EPA evaluated the environmental impacts of remining BMPs on land and water resources using data from a Pennsylvania study of 112 closed remining sites and another study of 105 Pennsylvania remining permits. The 112-site Pennsylvania study found significant decreases or elimination in the levels of specific pollutants in 38 to 44 percent of the pre-existing discharges monitored. Based on an assumption that discharges are evenly distributed across reclaimed acres, EPA estimated that 38 percent to 44 percent of the additional AML acres reclaimed per year will experience significant decreases in pollutant levels. EPA further assumed that 57 percent of the acres permitted would actually be reclaimed, based on a study of 105 Pennsylvania remining permits (Hawkins, 1995).

EPA was able to quantify some of the benefits expected from increased remining, and was able to monetize some of the quantified benefits using a benefits transfer approach. Benefits transfer involves use of the results of previous studies that estimate consumers' willingness to pay for various improvements in environmental quality. EPA applied willingness to pay values from previous studies of similar environmental improvements to estimate the value of the environmental improvements expected to result from the final rule. Benefits are estimated by multiplying relevant values from the literature by the additional acreage reclaimed under the final subcategory rule. EPA assumed that benefits from remining begin to occur five years after permit issuance and are calculated for a five year period.

Table ES-3 presents EPA's estimates of total annual monetized benefits for the final Coal Remining Subcategory. These estimates include values of enhanced recreational use of water bodies and reclaimed abandoned mine land, the value of aesthetic improvements to water bodies, and nonuse values associated with improved water bodies. Nonuse values are assumed to equal one-half of water-related use values.

Annual monetized benefits are estimated to range from approximately $0.70 to $1.2 million using a discount rate of 3 percent, and between $0.6 and $0.9 million using a discount rate of 7 percent. In addition to these monetized benefits, EPA estimates that between 216,000 and 307,000 additional feet of highwall will be removed each year, resulting in significant public safety benefits. Remining may also reduce drinking water treatment costs; reduce damage to wells, pipes, and other structures; and enhance the commercial potential of the affected areas. EPA was unable to quantify these benefits in the analysis.

Table ES-3: Estimated Benefits for the Final Coal Remining Subcategory Rule

Benefit Source	Additional Acres AML reclaimed/year[1]	Annual Present Value from Literature[3]	Estimated Present Value of Benefits from Remining Permits Issued Each Year Discounted at 3%[4]	Estimated Present Value of Benefits from Remining Permits Issued Each Year Discounted at 7%[4]
Recreational Use of Improved Water Bodies	667 - 1,115	$37	$100,500 - $168,000	$77,000 - $129,000
Aesthetic Improvements to Water Bodies	667 - 1,115	$140	$380,000 - $635,500	$292,000 - $488,500
Recreational Use of Reclaimed Land	1,773 - 2,512	$28	$202,000 - $286,000	$155,000 - $220,000
Nonuse (Improved Water bodies)	667 - 1,115	$19	$51,500 - $86,000	$40,000 - $66,500
Total			$734,000 - $1,175,500	$564,000 - $904,000

1. Assumes that implementation of the rule will result in an additional 3,111 to 4,407 acres of AML permitted for remining per year, that 57% of those acres are actually reclaimed, and that significant water quality improvements will occur in 38% to 44% of the reclaimed acres.
2. Per acre per year ($1998). See text for literature sources for these values.
3. Benefits = $\sum_{i=0}^{5} \{Acres\ reclaimed * Value\} / \{(1+r)\wedge(i+5)\}$, where r = discount rate and average life of remining operation = 5 years.
4. Numbers are rounded to the nearest $500.

Western Alkaline Coal Mining Subcategory

Affected western mines are located in arid and semiarid regions characterized by very low annual precipitation. Rainfall occurs generally during localized, high-intensity, short-duration thunderstorms, with runoff often resulting from flash flooding. Evapotranspiration normally exceeds precipitation. These conditions create severe soil moisture deficits, limited surface water resources, and poor plant growth and cover. Most runoff from undisturbed areas has baseline sediment levels that exceed the 40 CFR part 434 guidelines for settleable solids.

The exclusive use of sediment ponds to treat runoff from reclamation areas can have detrimental environmental effects in arid and semiarid regions. Sedimentation ponds create large disturbance areas which may disrupt fragile habitats and sensitive hydrological features. Sedimentation ponds also reduce water quantities downstream. Site-specific BMPs have the potential to conserve topsoil, control surface erosion and sedimentation, increase vegetation density, and minimize disruption of downstream flows.

The WCMWG Model Mine Report compares the performance, costs, and benefits under existing reclamation requirements to a BMP approach for three model mines typical of surface mines in the arid/semiarid west. EPA extrapolated the model mine estimates of sediment loadings, runoff delivery downstream from the reclamation areas, changes in vegetative cover, and size of disturbed area to assess benefits associated with the final subcategory rule. EPA used a benefits transfer approach to value two categories of benefits: land-related benefits and water-related benefits.

The land-related benefits stem from the increased availability of open space, which provides enhanced hunting opportunities. EPA estimates that annual land-related benefits range from $2,000 to $13,000 per year discounted at 3 percent, and from $1,500 to $11,000 per year discounted at 7 percent.

Estimated water-related benefits include the value of enhanced recreational opportunities due to improved water flow. EPA used "willingness to pay" (WTP) values for preserving perennial stream flows sufficient to support abundant stream side plants, animals and fish from a previous study. EPA applied this WTP value to the estimated number of water-based recreation participants in western counties where there are mining operations that affect water bodies with perennial flows. The estimated monetary value of recreational water-related benefits for these streams ranges from $25,000 to $488,000. EPA assumed that nonuse benefits were equal to one-half of the water-related recreational benefits, or $12,500 to $244,000 per year.

As shown in Table ES-4, total estimated annualized benefits from implementing the final subcategory rule range from $39,500 to $745,000 discounted at 3 percent, and from $39,000 to $743,000 discounted at 7 percent. The benefits estimates do not include a number of benefit categories, including nonuse ecological benefits, the benefits of increased vegetative cover, and possible recreational fishing benefits.

Table ES-4: Estimated Benefits for the Final Western Alkaline Coal Mining Subcategory Rule

Benefit Categories	Annual Benefit Values ($1998)[1]	
	Discounted at 3%	Discounted at 7%
Avoided Surface Disturbance	$2,000 - $13,000	$1,500 - $11,000
Recreational Benefits from Improved Water Flow	$25,000 - $488,000	$25,000 - $488,000
Nonuse Benefits	$12,500 - $244,000	$12,500 - $244,000
Total Benefits	$39,500 - $745,000	$39,000 - $743,000

[1]Results have been rounded to the nearest $500.

Social Costs and Benefits

Tables ES-5 and ES-6 summarize the estimated total annual social costs and benefits of the two final subcategories. The estimated social costs include industry compliance costs and the costs incurred by NPDES permitting authorities to implement the final rule. The benefit estimates presented reflect only those benefit categories that EPA was able to quantify and monetize.

Table ES-5: Annual Social Costs and Benefits for the Final Coal Remining Subcategory Rule ($1998)

Social Costs:		Discounted at 7%
Compliance Costs:		
Additional BMP effort		$199,500 - $565,000
Monitoring costs		$133,500 - $193,500
Costs to NPDES Permitting Authorities:		$47,500 - $67,500
Total Social Costs		***$380,500 - $826,000***
Monetized Benefits:	**Discounted at 3%**	**Discounted at 7%**
Recreational Use of Improved Water Bodies	$100,500 - $168,000	$77,000 - $129,000
Aesthetic Improvements to Water Bodies	$380,000 - $635,500	$292,000 - $488,500
Nonuse (related to improved water bodies)	$51,500 - $86,000	$40,000 - $66,500
Total Water-Related Benefits:	***$532,000 - $889,500***	***$409,000 - $684,000***
Recreational Use of Reclaimed Land	$202,000 - $286,000	$155,000 - $220,000
Total Monetized Benefits:	***$734,000 - $1,175,500***	***$564,000 - $904,000***

Note: Totals may not add due to rounding

EPA projects that states will permit 43 to 61 new remining sites each year under this new subcategory. Based on this projection, EPA estimates annual industry compliance costs in the range of $333,000 to $758,500. This estimate includes potential costs associated with increased BMP effort (i.e., pollution abatement plan costs) and additional monitoring. Estimated annual costs to NPDES permitting authorities are between $47,500 and $67,500. The estimated total annual social cost of this subcategory rule ranges from $380,500 to $826,000.

Table ES-6: **Annual Social Costs, Cost Savings and Benefits for the Final Western Alkaline Coal Mining Subcategory Rule ($1998)**

Social Costs Discounted at 7%:	
Compliance Costs (Savings)	
Incremental Modeling Costs	$327,000
Sediment Control Costs (Savings)	($12,721,000)
Earlier Phase 2 Bond Release (Savings)	($341,900 - $501,400)
Costs to NPDES Permitting Authorities:	$12,500
Total Social Costs (Savings)	***($12,723,400 - $12,882,900)***

	Annual Benefit Values ($1998)	
Benefit Categories	**Discounted at 3%**	**Discounted at 7%**
Avoided Surface Disturbance	$2,000 - $13,000	$1,500 - $11,000
Recreational Benefits from Improved Water Flow	$25,000 - $488,000	$25,000 - $488,000
Nonuse Benefits	$12,500 - $244,000	$12,500 - $244,000
Total Monetized Benefits	$39,500 - $745,000	$39,000 - $743,000

Note: Totals may not add due to rounding

The total monetized benefits range from $734,000 to $1,175,500 discounted at 3 percent, and from $564,000 to $904,000 discounted at 7 percent. Between 72 and 76 percent of the total monetized benefits result from projected improvements to water bodies. Of the water-related benefits, 71 percent reflects the value of aesthetic improvements to water bodies, 19 percent reflects water-related recreational benefits, and the remainder reflects nonuse benefits. Estimated land-related benefits result from improved recreation on reclaimed lands, including hunting and wildlife-viewing, and account for 24 to 28 percent of the total monetized benefits.

In addition to the benefits EPA was able to monetize, the projected increase in remining is expected to result in the removal of approximately 216,000 to 307,000 feet of highwall each year, resulting in substantial benefits associated with increased public safety. Furthermore, increased remining has the potential to recover and utilize coal resources that might otherwise remain unrecovered. Other benefit categories that EPA was not able to monetize include health and safety benefits, nonuse benefits related to reclaimed land, potential savings in drinking water treatment costs, and secondary economic impacts from increases in tourism and recreation.

The final Western Alkaline Coal Mining Subcategory rule is projected to result in substantial industry cost savings while creating environmental benefits for society, as summarized in Table ES-6.

EPA believes that the only incremental industry compliance costs attributed to the final subcategory rule are associated with the watershed modeling requirements, estimated to be approximately $327,000 per year. These costs would be offset by reduced sediment control costs associated with implementing the required sediment control plans (an estimated savings of approximately $12.7 million) and savings resulting from an expected reduction in the reclamation bonding period (an estimated savings of $341,900 to $501,400). EPA estimates that the annual cost to NPDES permitting authorities to implement the final subcategory rule will be approximately $12,500, resulting in a total annual social cost *savings* of approximately $12.8 million.

The final Western Alkaline Coal Mining Subcategory rule is also expected to result in environmental benefits. Total monetized benefits range from $39,500 to $745,000 per year discounted at 3 percent, and from $39,000 to $743,000 discounted at 7 percent. The majority of the monetized benefits results from improved water flow that will preserve perennial water bodies affected by western coal mining operations.

The improved flow is expected to result in benefits to water-based recreation consumers ($25,000 to $488,000), and in water-related nonuse benefits ($12,500 to $244,000). Land-related benefits result from reduced disturbance of land areas. EPA estimated the value of enhanced hunting opportunities associated with the undisturbed lands, but was not able to monetize other land-related benefits. Categories of benefits that EPA was not able to monetize include land-related ecological benefits, the benefits of increased vegetative cover, and possible recreational fishing benefits.

Chapter 1

Introduction

1.0 Overview and Definitions

The Federal Water Pollution Control Act Amendments of 1972 established a comprehensive program to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (Section 101(a)). To implement these amendments, the U.S. Environmental Protection Agency (EPA) issues effluent limitations guidelines and standards for categories of industrial dischargers. The regulations that the EPA establishes are:

- ***Best Practicable Control Technology Currently Available*** **(BPT)**. These rules apply to existing industrial direct dischargers, and generally cover discharge of conventional pollutants.

- ***Best Available Technology Economically Achievable*** **(BAT)**. These rules apply to existing industrial direct dischargers and the control of priority and non-conventional pollutant discharges.

- ***Best Conventional Pollutant Control Technology*** **(BCT)**. These rules are an additional level of control beyond BPT for conventional pollutants.

- ***Pretreatment Standards for Existing Sources*** **(PSES)**. These rules apply to existing indirect dischargers (i.e., facilities whose discharges enter Publicly Owned Treatment Works, or POTWs). They generally cover discharge of toxic and non-conventional pollutants that pass through the POTW or interfere with its operation.

- ***New Source Performance Standards* (NSPS)**. These rules apply to new industrial direct discharges and cover all pollutant categories.
- ***Pretreatment Standards for New Sources* (PSNS)**. These rules apply to new indirect dischargers and generally cover discharge of toxic and non-conventional pollutants that pass through the POTW or interfere with its operation.

This report presents the economic and environmental impact assessment for the final amendments to effluent limitations guidelines and standards for coal mining under the Clean Water Act (40 CFR part 434). EPA is adding two new subcategories for coal mining, the first applying to coal remining operations and the second applying to reclamation activities at western alkaline coal mines. This report discusses the two new subcategories, provides a brief overview of the coal industry, and describes the mining operations that will be affected by the final rule. The report then presents an analysis of costs, benefits, economic impacts, and environmental impacts attributed to each of the final subcategories. This report supports EPA's compliance with the following requirements:

- The Regulatory Flexibility Act (RFA) as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA), which requires, among other things, that the Agency determine whether a rule will have a "significant impact on a substantial number of small entities;"

- The Unfunded Mandates Reform Act (UMRA), which requires that the Agency assess the effects of regulatory actions on state, local and tribal governments and the private sector;

- Executive Order 12866, which requires that the Agency determine whether a regulatory action is "significant."

1.1 Coal Remining Subcategory

1.1.1 Background

Coal remining is the mining of surface mine lands, underground mine lands, and coal refuse piles on a site on which coal mining was previously conducted and where the site has been abandoned or the performance bond has been forfeited. Prior to SMCRA, reclamation of mine lands was not a federal requirement. Many coal mines were left in an abandoned state and continue to degrade the environment and pose health and safety risks. The acid mine drainage that originates from these abandoned mine lands is considered "pre-existing discharges." Acid mine drainage from abandoned coal mines is a major environmental problem in the Appalachian and mid-Continent Coal Regions of the eastern United States. Information gathered from the Interstate Mining Compact Commission (IMCC) and OSM's Abandoned Mine Land Inventory System (AMLIS) indicates that there are over 1.1 million acres of abandoned mine lands, over 9,700 miles of streams polluted by acid mine drainage, and many miles of dangerous embankments, highwalls, and surface impoundments.

The guidelines at 40 CFR Part 434 subpart C include numerical limits on pH, iron, manganese and total suspended solids (TSS). No distinction was made between new coal mining operations and remining operations, or between pre-existing and new discharges at remining sites. The previous regulations created a disincentive for remining by imposing limitations on pre-existing discharges for which compliance is cost prohibitive. Congress attempted to address this problem by passing the Rahall Amendment to the Clean Water Act (CWA) to provide incentives to encourage coal remining. The Rahall Amendment (Section 301 (p)) allows NPDES permit writers to issue permits with site-specific limits for iron, manganese, and pH for pre-existing discharges at remining sites where remining has the potential to improve water quality. These modified limits may not exceed baseline levels in the pre-existing discharges, and discharges from the remining operation may not violate any state water quality standards.

EPA recognizes that one of the most successful means for improving abandoned mine land is for coal mining companies to remine abandoned areas and extract the coal reserves that remain. EPA also recognizes that if abandoned mine lands are ignored during coal mining of adjacent areas, a time-critical opportunity for reclaiming the abandoned mine land is lost. During remining operations, acid-forming materials are removed with the extraction of the coal, pollution abatement best management practices (BMPs) are implemented under applicable regulatory requirements, and the abandoned mine land is reclaimed. During remining, many of the problems associated with abandoned mine land (AML), such as dangerous highwalls, can be corrected without the use of public funds. Furthermore, implementation of appropriate BMPs during remining operations can be effective at improving the water quality of pre-existing discharges.

Unfortunately, the potential of the Rahall Amendment to remove the disincentives and derive the maximum environmental benefits from remining has not been fully realized in the absence of implementing regulations. The statute does not specify how to determine site-specific limits or baseline pollutant discharge levels, leaving these decisions to individual permitting authorities. Without standardized procedures for developing effluent limits for pre-existing discharges, many states with extensive AML remain hesitant to pursue formal remining programs. EPA is implementing the Coal Remining Subcategory to provide a regulatory structure to encourage remining activities, and in turn, reduce acid mine drainage and improve water quality.

1.1.2 Summary of the New Subcategory

The new subcategory will apply only to "pre-existing discharges" located within pollution abatement areas of coal remining operations and that are not commingled with wastestreams from active mining activities. All other discharges will continue to be subject to the current effluent limitations. EPA is establishing a new subcategory with effluent guideline limitations based on a combination of numeric limits and non-numeric BMP requirements. EPA is also establishing a standardized procedure for determining pollutant levels for baseline and compliance monitoring. Potential BMPs include: daylighting abandoned underground mines, removing coal refuse piles, reducing the volume of acid mine drainage through proper handling of acid-forming materials, eliminating abandoned highwalls, reconstructing streambeds, draining and backfilling abandoned pits, and establishing vegetation.

EPA is incorporating BMP standards into the new rule by requiring that remining operators develop and implement a site-specific pollution abatement plan for each remining site. In many cases, EPA believes that the requirements for the pollution abatement plan will be satisfied by an approved SMCRA plan. However, EPA or the State NPDES permitting authority will review the plan and will retain the authority to recommend additional or incremental BMPs as necessary to meet Clean Water Act requirements.

The final effluent limitations guidelines and standards for the Coal Remining Subcategory are established as follows:

- EPA is establishing **BPT, BCT, BAT, and NSPS** limitations that have an equivalent technical basis for the Coal Remining Subcategory. The final limitations are defined through a combination of numeric and non-numeric standards. Specifically, EPA is establishing that BAT is implementation of a pollution abatement plan that incorporates BMPs designed to reduce pollutant levels of acidity, TSS, iron, and manganese, and a requirement that such pollutant levels are not increased over baseline conditions.

- EPA did not consider any regulatory options for new sources for the Coal Remining Subcategory, and therefore is not establishing **NSPS** standards. By definition, pre-existing discharges at abandoned mine lands covered by this rule were in existence prior to passage of SMCRA in 1977. Therefore, all pre-existing discharges are considered existing sources, and are subject to the requirements for BPT, BCT, and BAT.

1.2 Western Alkaline Coal Mining Subcategory

1.2.1 Background

The previous effluent guidelines at 40 CFR Part 434 subpart E for reclamation areas established BPT, BAT, and NSPS numeric effluent limits based on the use of sedimentation pond technology. These guidelines applied to all reclamation areas throughout the United States, regardless of climate, topography, or type of drainage (i.e., acid or alkaline). These guidelines established relatively stringent controls on the amount of sediment that could be discharged into waterways from post-mined areas. In the arid and semiarid west, use of sedimentation ponds was generally required to meet these standards. Although sedimentation ponds are proven to be effective at reducing sediment discharge, EPA believes that there are numerous non-water quality impacts from their use in the arid and semiarid west that need to be considered.

EPA believes that environmental conditions in the arid and semiarid west differ significantly from those in other coal mining areas. In arid and semiarid regions, the natural vegetative cover is sparse and rainfall is commonly received during localized, high-intensity, short-duration storms. These conditions contribute to flash-floods and turbulent flows that transport large amounts of sediment. Controlling sediment in areas that naturally contain large amounts of sediment through the predominant use of sedimentation ponds can result in numerous non-water quality impacts that harm the environment, including disturbing the natural hydrologic balance, accelerating erosion, reducing groundwater recharge, reducing water availability, and impacting large areas of land for pond construction. To address these impacts, the new subcategory rule requires coal mine operators to implement BMPs so that post-mined lands are reclaimed to mimic natural conditions that were present prior to mining activities.

1.2.2 Summary of the New Subcategory

In order to maintain natural conditions at reclamation areas, EPA is requiring that non-numeric effluent limits be based on the design, implementation, and maintenance of best management practices (BMPs). BMP technologies for the coal mining industry are well known and established. Common BMPs used at post-mining coal areas include: regrading, revegetation, mulching, check dams, vegetated channels, and contour terracing, as well as sedimentation ponds.

Specifically, EPA is requiring that operators develop and implement site-specific sediment control plans for surface reclamation areas in lieu of the numeric limits for pH and Settleable Solids (SS) required under current guidelines. The sediment control plan must identify BMPs and present design, construction, and maintenance specifications, and expected performances. The regulation requires the operator to select BMPs aimed at ensuring that average annual sediment levels in drainage from the reclamation area does not exceed predicted natural background levels of sediment discharges at that site. The operator is required to demonstrate, using watershed models accepted by the regulatory authority, that implementation of the selected BMPs meets this goal.

EPA expects that the components of the sediment control plan will largely be satisfied by materials generated as part of the SMCRA permit application. The SMCRA permit application process requires that a coal mining operator submit a reclamation plan, documentation and analysis to OSM or the permitting authority for approval. Based on these requirements, EPA believes that plans developed to comply with SMCRA requirements will usually fulfill EPA's requirements regarding sediment control plans. The requirement to use modeling techniques is not inconsistent with OSM reclamation plans. While modeling is not a required component of the SMCRA permit application, mining facilities already submit a watershed model as part of their SMCRA reclamation plan. EPA believes modeling is particularly valuable in arid and semiarid areas where the infrequency of precipitation makes it difficult to gather data. While EPA is not specifying a particular model be used, the Agency wants the model be the same watershed model the operator used to acquire the SMCRA permit.

The final effluent limitations guidelines and standards for the Western Alkaline Coal Mining Subcategory are established as follows:

- **BPT** consist of BMP requirements projected through modeling to maintain average annual sediment yield at or below pre-mined undisturbed conditions. EPA requires the coal mining operator to develop and implement a sediment control plan to demonstrate compliance.

- No **BCT** limitations are being established at this time since numerical effluent limitations for any conventional pollutants are not being established.

- **BAT** standards will be established equivalent to BPT.

- **NSPS** standards will be established equivalent to BAT and BPT. EPA estimates that the rule will result in a net cost savings to all affected surface mine operators, and will be at worst cost-neutral to affected underground operators. Therefore, implementing NSPS standards will result in no barrier to entry based upon the establishment of this level of control for new sources.

1.3 Structure of the Report

This report presents EPA's analysis of the costs, benefits, economic impacts and environmental impacts attributed to the final rule. Separate analyses are presented for each of the two final subcategories. Both analyses start with identification of the affected mine operations and characterization of the economic baseline, and then estimate the incremental industry compliance costs attributed to the final rule. The analyses of the economic impacts of each final subcategory include analysis of potential impacts on coal mine operators, coal markets (coal production and prices), employment, and small coal mining companies. In addition to these industry impacts, EPA also examined additional impacts, such as costs to the NPDES permitting authority to implement the final standards, community impacts, and foreign trade impacts.

EPA analyzed the adverse environmental impacts of current practices as a basis for assessing the incremental environmental impacts and benefits of the final rule. These baseline impacts include the effects of pollution from abandoned mine lands that have not been reclaimed or remined, and the hydrologic effects and land disturbance caused by predominant use of sedimentation ponds to control sediment loadings from western alkaline mine reclamation areas. EPA then assessed reductions in these baseline adverse environmental impacts that will result from implementation of the final rule. EPA was able to quantify these environmental improvements for some categories of benefits, and estimate their value using benefits transfer techniques. Benefits transfer involves use of the results of previous studies that estimate consumers' willingness to pay for various improvements in environmental quality. EPA applied willingness to pay values from previous studies of similar environmental improvements to estimate the value of the environmental improvements expected to result from the final rule.
The remainder of this report is organized as follows:

- Chapter 2 describes the data sources used in the economic and environmental impact assessment.

- Chapter 3 provides a profile of the affected mines and a description of the economic baseline. The chapter first presents a brief overview of the coal industry in general and discusses the two subcategories. The regulatory requirements that currently apply to the affected coal mining operations are then examined. The final section describes how the economic baselines were characterized for the two subcategories.

- Chapter 4 presents EPA's estimate of the industry compliance costs attributed to the final rule.

- Chapter 5 discusses the economic impacts to industry of the final rule. This chapter discusses the potential significance of the economic impacts in general, and analyzes potential impacts for small entities and new sources in particular.

- Chapter 6 presents an evaluation of additional economic impacts, including: costs to the NPDES permitting authority to implement the final standards; impacts on coal production and prices; community employment impacts; and foreign trade impacts.

- Chapter 7 discusses cost-effectiveness.

- Chapter 8 discusses the environmental impacts of the final rule, and presents EPA's analysis of the benefits of the rule.

- Chapter 9 summarizes the social costs and benefits of the final rule.

- References for all chapters are provided at the end of the main body of the report.

- The following appendices support the report:

    — Appendix A provides information on current state remining programs.

    — Appendix B provides information on the Office of Surface Mining's Abandoned Mine Lands Program, including the abandoned mine land (AML) fund and the Abandoned Mine Land Inventory System (AMLIS) database.

Chapter 2

Data Sources

2.0 Introduction

This chapter describes the data sources used by EPA to support the economic and environmental impact analyses of the final rule. EPA is developing this regulation using an expedited rulemaking process. As part of the expedited approach, EPA chose not to gather data using the time-consuming approach of a Clean Water Act Section 308 questionnaire. Therefore, EPA's economic analysis relied on industry profile information voluntarily provided by stakeholders, on data compiled from individual mining permits, and on data from publicly available sources. These sources include those that provide data on the coal industry as a whole, and sources that are specific to the Coal Remining Subcategory or to the Western Alkaline Coal Mining Subcategory in particular. The categories of sources are described in separate sections below.

2.1 General Industry Sources

2.1.1 DOE/EIA Coal Data (Form 7A)

The Department of Energy's Energy Information Administration (DOE/EIA) collects and reports a wide range of energy-related information, including information on coal production and use. These include data collected from coal producers using EIA Form 7A, which must be completed by all coal mining companies that own a mining operation that produced, processed or prepared coal during the reporting year. Data are reported separately for each mining operation. However, most of the data are reported only by mines producing 10,000 short tons per year or more of coal. This form collects a variety of information on mining operations, including type of mine, mining methods, coal beds mined, recoverable reserves, coal production, quantity and value of sales, employment and productivity. Summaries and analyses of these data for1997 are reported in DOE/EIA's *Coal Annual 1997*. In addition, some data are available publicly in electronic form from the DOE/EIA website.[1] The publically-available data include identifying information for the coal company and mine (name and location), type of mine, state and Mine Safety and Health Administration (MSHA) permit numbers, mine type (underground, strip, auger, strip/auger combination, etc.), type of operator (independent, operating subsidiary, or contractor), location on federal property, and coal production for the reporting year. The DOE/EIA data were used to prepare the profile of western surface and underground mines, as well as to provide basic industry information on prices, production and employment needed to assess the economic impacts of the final rule.

2.1.2 Keystone Coal Industry Manual

The *1998 Keystone Coal Industry Manual* provided information on the ownership and production of individual mines, as well as background information on industry conditions from the Coal Age Year in Review summary (e.g., information on acquisitions and company sales, and recent regional trends in production).

2.1.3 Census Data

Census data summarized in the *Statistics of U.S. Businesses* were used to assess the size of firms that own coal mining operations. The *1992 Census of Mineral Industries* provided information on revenues, costs and employment by size of establishment (mine).

2.1.4 Financial Data

EPA used the Security and Exchange Commission's (SEC) Edgar database, which provides access to various filings by publicly held firms, such as 8Ks and 10Ks, for financial data and information on corporate structures. EPA also used a database maintained by Dun & Bradstreet (D&B), which provides estimates of employment and revenue for many privately held firms, and obtained industry financial performance data from Leo Troy's *Almanac of Business and Industrial Financial Ratios*.

[1] http://www.eia.doe/cneaf/coal/data/summary/files.html

2.2 Sources for Coal Remining Subcategory

Various databases were used to characterize abandoned mine lands that are potential candidates for remining, and to characterize past and potential future remining sites. These databases are described below.

2.2.1 AMLIS Database

The Abandoned Mine Land Inventory System (AMLIS) database (U.S. DOI, 1998b) characterizes the extent of environmental problems associated with AML in the United States. The database, which provides an inventory of water bodies and lands impacted by abandoned coal mining sites, is maintained by the Office of Surface Mining (OSM) to provide information needed to implement the Surface Mining Control and Reclamation Act of 1977 (SMCRA). The AMLIS database is a dynamic system that is continuously updated by OSM program officials, states, and tribes with field survey data.

The AMLIS data are presented in two different tables. One table presents basic information about problem areas, and the other defines specific problem types that exist within problem areas. The first "problem area" table gives a general count of problem areas and contains information such as ownership, mine type, and location. Overall, there are 14,852 problem areas in the AMLIS database as of February, 1999. Of these, 7,966 problem areas (accounting for 368,804 acres) are former coal mining sites that have not been funded for reclamation. The second table collects data on the specific types of problems and problem size (e.g., feet of abandoned highwall, counts of mine openings), as well as estimated reclamation costs. Each problem type is reported only once for each area. Therefore, the feet reported for abandoned highwall at a given area, for example, represents the total footage of all highwall at that area. (Definitions of the AMLIS problem types are provided in Appendix B.) In total, there are 18,426 problems that have not yet been funded for reclamation at coal-related sites.[2]

[2] The AMLIS data analysis excluded problem areas that did not have a problem type reported.

2.2.2 NALIS Database

The National Abandoned Land Information System (NALIS) database is maintained by the Pennsylvania Department of Environmental Protection (PA DEP, 1999b) and supplements the AMLIS data for the Commonwealth. EPA used NALIS data available as of March 1999 in the economic analyses. NALIS includes 5,488 problem areas identified from high altitude aerial photography as resembling mine lands. Data available for each problem area include location, ownership, and whether an active mine drainage permit may apply to the problem area. From these 5,488 problem areas, Pennsylvania selected 2,218 problem areas that might qualify for federal funding and gathered data on these areas using the Inventory Update Form. The Inventory Update Form includes data on:

- Location and total acres of problem area;
- Reclamation costs;
- Mine type;
- Type and quantity of priority 1 and 2 problems;
- Type and size of priority 3 problems;
- Injury/death, accident, or property damage reports;
- Problem area visibility status;
- Extent of public access; and
- Number of people directly affected by problem area.

The NALIS database provides more comprehensive information on Pennsylvania AML than does AMLIS. NALIS includes 2,218 problem areas, slightly more than the 2,095 problem areas included in AMLIS that actually meet the standards for federal funding in Pennsylvania. However, there are 6,055 problem types reported in NALIS for Pennsylvania, compared with 4,022 problem types reported for the Commonwealth in AMLIS. The following data are reported for each problem type:

- Funding source;
- Problem and mine type;
- Height or depth of mine lands;
- Volume or flow of water; and

- Miles of streams polluted by a given discharge.

2.2.3 EPA Coal Remining Database

EPA's Coal Remining Database (U.S. EPA, 1999a) includes information on remining and AML reclamation operations for selected sites in six Appalachian states (WV, VA, PA, AL, KY, and TN). EPA compiled the database from existing state data packages. The database contains the following information:

- Mine permit data;
- Mine location;
- Affected acres;
- Discharge and water quality data;
- Mine geology; and
- Information on abatement techniques (BMPs).

As of December 1998, the database contains information on 62 Appalachian mine sites, 19 of which are located in Pennsylvania.[3] Information is also provided for Alabama, Kentucky, Tennessee, Virginia and West Virginia sites. Three of the sites were not included in the economic impact analysis, because they involved only reclamation and not remining as defined by the final rule. Of the 59 permits included in the analysis, the Commonwealth of Pennsylvania has the largest number of records (18), followed by Alabama (16), West Virginia (9), Virginia (8), and Kentucky and Tennessee (both with 4).

2.2.4 Interstate Mining Compact Commission Solicitation

The Interstate Mining Compact Commission (IMCC, 1999) obtained information on current remining activities and potential future remining from state agencies. As of July 1999, twenty states had responded to the IMCC solicitation (Alaska, Alabama, Colorado, Illinois, Indiana, Kentucky, Maryland, Missouri,

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[3] Note that of the 19 Pennsylvania mines included in the database, only 9 matched with problem areas in NALIS. NALIS and EPA's Coal Remining Database are not directly comparable, since EPA's database reports on specific mine sites and NALIS reports on problem areas.

Mississippi, Montana, North Dakota, New Mexico, Ohio, Pennsylvania, Tennessee, Texas, Utah, Virginia, West Virginia and Wyoming). The data provided include types of remining permits issued (e.g., Rahall, non-Rahall), characteristics of current and potential future remining operations (e.g., numbers of abandoned coal refuse piles, surface mined and underground mined sites), types of best management practices (BMPs) used and assessments of their success, stream miles impacted by acid mine drainage (AMD), and industry profile statistics. The industry profile data include numbers of companies holding remining permits, total employment at remining operations, annual coal production from remining sites, and estimated coal reserves that could be remined. The IMCC data were used to estimate the number of potential future remining sites and to supplement information provided in EPA's Coal Remining Database.

2.2.5 Total Maximum Daily Load Tracking System

The Total Maximum Daily Load (TMDL) Tracking System (U.S. EPA, 1996) was used to characterize the environmental impacts of AML. The database provides information collected under Section 303(d) of the Clean Water Act (CWA) on waters that do not currently support designated uses. Section 303(d) requires states to identify such waters and to develop TMDLs for them. The tracking system combines all final 1996 303(d) lists from all states into a common database. Because the data were compiled at the state level, information is not always reported in the same format and some data fields are incomplete. This database contains information on water body type, size of impaired water body, and cause of the impairment. Water quality impairments that are likely to be caused by AMD from coal mines were variously reported as caused by: AMD, AML discharge, mining operations, mining, or resource extraction. TMDL information was used to identify water bodies impaired by coal mining activities in individual states. To the extent possible, EPA excluded extraction of mineral resources other than coal from the relevant causes of water quality impairment. Nevertheless, the assessment of water quality impairment is likely to include adverse effects on water quality from resource extraction activities other than coal and pollutants other than those found in AMD.

2.2.6 EPA Region III GIS Database

EPA's Region III office in Wheeling, West Virginia compiled a Geographic Information System (GIS) database of streams with fisheries impacted by acid mine drainage in 1995 (U.S. EPA, 1995). This EPA database defined two levels of impact: streams with severe impacts were characterized as "no fish" by state fisheries biologists; and streams with less severe impacts were denoted "some fish," where acid mine drainage had reduced the number of species or reduced productivity. These data cover all six states (PA, WV, VA, MD, OH and DE) in EPA Region III. Three of these states (PA, WV, and VA) are also included in EPA's Coal Remining Database. EPA used the Region III database to estimate the number of streams with fisheries impacted by acid mine drainage in each state.

2.2.7 Pennsylvania's 112 Remining Site Study

A study of 112 closed remining sites prepared by the Pennsylvania Department of Environmental Protection evaluated the impact of remining on the water quality of pre-existing and post-remining discharges (PA DEP, 1999a). The study was used to estimate the average number of pre-existing discharges per remining site and to assess the impact of remining on pollutant levels in the discharges.

2.3 Sources for Western Alkaline Coal Mining Subcategory

EPA worked with a Western Coal Mining Work Group (WCMWG) composed of representatives from the Office of Surface Mining (OSM), the Western Interstate Energy Board (WIEB), State regulatory authorities, the National Mining Association (NMA), and other stakeholders to identify, compile and analyze existing information and data. NMA supplied EPA with a number of reports supporting the need for, and feasibility of, establishing a separate Western Alkaline Coal Mining Subcategory. The group provided three overall types of information relevant to this report.

2.3.1 Profile of Affected Coal Mining Operations

The WCMWG provided industry profile information on western alkaline surface and underground coal mines believed to be in the scope of the final rule (WCMWG, 1999b). These data included information on:

- Mine name and location;
- Date when the mining operation began;
- Annual coal production (1,000 tons);
- Average value of coal sold by all reporting mines in the state in which the mines are located ($/ton);
- Mining permit information including permit number and the issuance date;
- Whether the mine is located on Indian Tribal lands;
- Number of acres disturbed to date by the mining operation;
- Projected additional acres disturbed over the lifetime of each mine;
- Projected mine life;
- Bond amount; and
- Name and characteristics of the receiving waters.

The information was compiled from DOE/EIA data, the Keystone Manual, and data from current permits for individual mines.

2.3.2 Model Mine Analysis

The work group also supplied EPA with a mine modeling study sponsored by the National Mining Association and reviewed by OSM (WCMWG, 1999a, 2001). The study presents a comprehensive analysis comparing the predicted performance, costs and benefits of current 40 CFR part 434 Guidelines to the requirements for the final subcategory rule for three representative model mines in the arid and semiarid western coal region. Characterization of background water quality, soil loss rates, and sediment yield were predicted using computer models for both pre-mining (undisturbed) and post-mining (reclamation) conditions. The model cost estimates of the two reclamation systems relied on cost data taken from case study mine permit applications, mine records, technical resources and industry experience. The study estimated capital costs (design, construction and removal of ponds and BMPs) and operating costs (inspection, maintenance, and operation) over the anticipated bonding period. Cost savings result both from lower capital and operating costs associated with the BMP systems and from an expected reduction in the bonding period during which the reclamation costs will be incurred. The calculations assume that the post-mining Phase II bond release period is 10 years under the current effluent guidelines and that Phase II bond release could occur in five years under the new subcategory rule. The cost model is discussed in detail in *Development Document for Final Effluent Limitations Guidelines and Standards for the Western Alkaline Coal Mining Subcategory* (U.S. EPA, 2001).

2.3.3. Information on Environmental Impacts

The WCMWG provided information on the environmental impacts of reclamation practices at western alkaline mines, including the impacts of sedimentation ponds and various sediment control BMPs, in the following formats:

- Paired watershed studies, which assess water quantity and quality impacts of different types of sediment controls.

- *Technical Information Package: Western Alkaline Mining Subcategory* (WCMWG, 1999c). This package provides an overview of the environmental characteristics of western alkaline mines, a description of the current BMPs and alternate sediment control technologies (ASCTs) to control sediment runoff, and a discussion of potential environmental impacts from different types of BMPs, based on a variety of sources.

Chapter 3

Industry Profile and Economic Baseline

3.0 Introduction

This chapter describes the foundation of the economic impact analysis of the final rule. The chapter begins with a brief overview of the U.S. coal mining industry. This section discusses industry profile data, market characteristics, and recent trends in coal mine production and employment. The chapter then describes the current regulatory requirements that apply to coal mining operations that are affected by the final rule, including existing effluent guidelines, SMCRA requirements, the Rahall Amendment to the Clean Water Act, and state remining programs. Finally, the chapter describes how the economic baselines were characterized for the two coal mining industry segments that will be affected by the final rule. EPA's estimates of the number and acreage of new remining sites that will be permitted each year under the final Coal Remining Subcategory are presented, and the western alkaline coal mines that are considered in the economic impact analysis for the Western Alkaline Coal Mining Subcategory are discussed.

3.1 Overview of the Coal Industry

The United States produces approximately one-fourth of the world's coal, and is the second largest national holder of coal reserves. Estimated recoverable reserves in the U.S. equal more than 250 years' supply at today's production levels. The U.S. coal industry has undergone substantial streamlining and restructuring in recent years in an attempt to remain profitable, including a dramatic reduction in the number of mines, increases in mining productivity and the average size of mines, regional shifts in production, and consolidation in ownership (DRI, 1998).

Coal is mined from several distinct regions and provinces in the United States, which differ significantly in both their economic and environmental characteristics. The major regions include:

- **Appalachian**: Alabama, Georgia, Eastern Kentucky, Maryland, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia;
- **Interior**: Arkansas, Illinois, Indiana, Iowa, Kansas, Western Kentucky, Louisiana, Missouri, Oklahoma and Texas;
- **Western**: Alaska, Arizona, California, Colorado, Montana, New Mexico, North Dakota, Utah, Washington, and Wyoming.

Historically, the Appalachian Region has been the Nation's most important source of coal, accounting for about three-fourths of the annual production as recently as 1970.[4] However, its share of total U.S. production has been declining steadily since that time. A major consolidation and a shift in production from eastern to western coal mines has occurred over the last 10 years. There has been a significant reduction in the total number of coal operations since 1988, with the sharpest reduction occurring in the Appalachian region. From 1988 to 1997, the number of coal mine operations decreased by:

- 54 percent in the Appalachian Region, falling from 3,469 mines to 1,602 mines;
- 46 percent in the Interior Region, dropping from 277 mines to 149 mines; and
- 32 percent in the Western Region, decreasing from 114 mines to 77 mines.

While the number of mines has decreased since 1988, total U.S. coal production has increased over the same period. Production has increased in the Appalachian Region by four percent, declined in the Interior Region by almost twelve percent, and increased by over 46 percent in the Western Region. By 1997, western production was almost equal to total production from the Appalachian Region — the United States produced 1.09 billion short tons of coal, with the Appalachian Region producing approximately 468 million short tons, the Interior Region producing approximately 172 million short tons, and the Western Region producing approximately 451 million short tons.

[4] DOE/EIA, 1995. Information in the remainder of this section is taken from DOE/EIA, 1995; DOE/EIA, 1997; and DOE/EIA, 1999.

Employment in coal mining has shown a long-term decline, despite the increase in coal production. This decline in employment reflects the replacement of manual labor by machines in virtually all aspects of mining. Overall coal employment has declined from approximately 229,000 in 1980 to less than 82,000 in 1997. Employment reductions have been the greatest in Appalachia, where employment has fallen from 171,000 in 1980 to less than 55,000 in 1997. Despite the decline, coal mining employment is still substantially higher in Appalachia than in other regions, due to the use of more labor-intensive underground mining methods. Appalachian, Interior and Western mining accounted for 72, 16 and 12 percent of 1997 coal mining employment, respectively.

3.1.1 Coal Remining

IMCC member states have estimated that there are currently 150 mining companies in ten states involved in remining operations (under either Rahall-type permits or current 40 CFR 434 limitations). These companies are producing approximately 25 millions tons of coal annually, and are employing approximately 3,000 people. To date, approximately 1,072 permits that include coal remining operations have been issued. Of these, 330 (31 percent) are Rahall-type permits where the operator is required to meet determined baseline limits for pre-existing discharges. Seven states have established formal remining programs, and combined have issued approximately 330 Rahall permits. The vast majority of these, approximately 300, were issued by the Commonwealth of Pennsylvania. Of the remaining thirty, ten were issued by Alabama, eight by West Virginia, four by Kentucky, three by Virginia, three by Ohio, and two by Maryland.

Remining operations currently underway have proven to be a viable means of remediating the environmental conditions associated with abandoned mine lands without imposing a significant cost burden to industry. Remining operations are affecting approximately 270 abandoned coal refuse piles, 1,600 abandoned surface mines, and 1,100 abandoned underground mines. Information provided by IMCC indicates that there are approximately 2,100 coal refuse piles, 2,000 abandoned surface mines, and over 8,000 abandoned underground mines that have the potential for remining.

3.1.2 Western Alkaline Coal Mining

This section describes the subset of coal mines that would be eligible for the final Western Alkaline Coal Mining Subcategory. These are mines west of the 100th meridian, located in areas with 26 inches or less annual precipitation, and in arid or semiarid environments. States in the coal-bearing zones of the West are: Arizona, Colorado, Utah, Montana, New Mexico, Wyoming, and portions of North Dakota. Coal mines in the western alkaline region represented only 3.7 percent of U.S. coal mines in 1997, but accounted for 38 percent of total coal production.

EPA prepared the document *Coal Remining and Western Alkaline Mining: Economic and Environmental Profile* (U.S. EPA, 1999e) in support of this rule. The report provides industry profile information on the 47 surface coal mines and 24 underground coal mines initially believed to be in the scope for the final subcategory rule.[5] Future reclamation at these existing mines, as well as reclamation at new western alkaline mining operations, will be eligible for the new subcategory. Forty-two of the surface mines report positive coal production, totaling 502.6 million tons with an estimated value of $4.4 billion in 1996-97. Four of these (producing 26.5 million tons) were located on Indian Tribal land, including two mines on Navajo land and two mines on both Navajo and Hopi land. DOE/EIA data on the 24 existing underground mines show that they produced 47.4 million tons of coal in 1997. Most of the firms operating coal mines in the western arid/semiarid region are large, as defined by the Small Business Administration (more than 500 employees). Based on Dun & Bradstreet information on parent firm employment, only three of the surface mines and three of the underground mines are owned by small firms.[6]

[5] EPA later determined that one of the surface mines profiled was already in the final reclamation stage and would not be affected by the final rule; hence, only the remaining 46 surface mines were included in the analyses of costs and benefits.

[6] Five surface mines and eight underground mines could not be classified by size of parent firm.

3.2 Current Regulatory Requirements

This section describes the relevant state and federal requirements that currently apply to coal mine operators affected by the final rule. This description provides the basis for determining how the final rule will change compliance requirements, resulting in the costs, cost savings, environmental benefits, and economic impacts that are estimated in subsequent chapters.

3.2.1 Current Effluent Guidelines

Discharges from coal mines are regulated as point sources under the Federal National Pollutant Discharge Elimination System (NPDES), established under Section 402 of the Federal Clean Water Act. EPA promulgated the effluent limitations guidelines and standards that are in effect today for coal mining under 40 CFR part 434 on October 9, 1985 (50 FR 41296). Currently, there are four subcategories, including: Coal Preparation Plants and Coal Preparation Plant Associated Areas, Acid or Ferruginous Mine Drainage, Alkaline Mine Drainage, and Post-Mining Areas, along with a subpart for Miscellaneous Provisions.

Under the existing rule, a remining operation is defined as a new source coal mine. No distinction is made between new coal mining operations and remining operations, or between pre-existing and new discharges at remining sites. Hence, the effluent limitations set by NPDES permit writers for all discharges at remining operations must be at least as stringent as the federal new source performance standards (NSPS) at 40 CFR part 434. The guidelines include numerical limits on iron (total), manganese (total), pH, and total suspended solids (TSS).

The existing regulations for post-mining areas (subpart E) apply to all reclamation areas throughout the United States, regardless of climate, topography, or type of drainage (i.e., acid or alkaline). Hence, the effluent limitations set by NPDES permit writers for discharges from reclamation areas at western coal mines must be at least as stringent as the federal BPT, BAT, and NSPS limitations at 40 CFR part 434. The guidelines include numerical limits for settleable solids and pH, at 0.5 ml/L and 6 to 9 units respectively.

3.2.2 SMCRA

The Surface Mining Control and Reclamation Act passed in 1977 established programs to control the negative environmental impacts of surface coal mining. SMCRA created the Office of Surface Mining Reclamation and Enforcement in the Department of Interior, and provided for two major programs. The first establishes standards and procedures to prevent environmental degradation from active coal mining and reclamation operations, both surface and underground. The second is a reclamation program for abandoned mine lands, funded by fees on coal production, to reclaim land and water resources adversely affected by pre-1977 coal mining and not adequately reclaimed. OSM has promulgated comprehensive regulations to control surface coal mining and the surface effects of underground coal mining at 30 CFR parts 700 et seq.

SMCRA requires that mine operators obtain mining permits from OSM or a delegated state agency. The existing permitting process under SMCRA is a site-specific process requiring baseline data to describe the quality and quantity of both the affected ground and surface water. To be eligible, a permit must be dated on or after August 4, 1977 and must be accompanied by a reclamation plan. To be approved, the proposed surface mining operation must not further degrade any surface or ground water basins, and the affected area must be capable of being reclaimed. If the mining permit is approved, the mining operators must adhere to a number of OSM performance standards, and must accept all potential environmental liabilities associated with the site, such as AMD and public health risks. The SMCRA rules also reference existing water quality laws and existing federal or state programs to regulate effluent discharges.

Mining operators must post a performance bond payable to the federal government or the state, in an amount sufficient to assure the completion of the reclamation plan if the work has to be completed by the governing agency. The bond can only be fully released after the regulatory authority certifies that all performance standards have been met and full reclamation of the site has occurred. Such a determination is generally not made until the mine operation has been completed for five years in the east and midwest regions, and 10 years in the western region. However, the bond can be partially released at various stages (as discussed in Chapter 4) if the reclamation plans are being met on schedule.

Prior to the 1977 promulgation of SMCRA, some operators remined abandoned mine land because they were held to less restrictive environmental standards given the already-poor environmental conditions at the sites (Veil, 1993). In the process of remining, safety, aesthetics, and water quality conditions were often improved. After passage of SMCRA, much of the remining of the most degraded areas ceased, because SMCRA shifted total liability for environmental impacts to the present operator of the site, regardless of past practices. Operators were reluctant to accept liability, particularly for water quality requirements, and instead mined virgin sites or sites without pre-existing discharges.

A number of amendments and changes to the SMCRA permitting program have been adopted to encourage more remining of AML. Federal SMCRA regulations include less restrictive standards for remining operations regarding topsoil, revegetation, and backfilling and grading. In addition, the Small Operator Assistance Program (SOAP) (30 CFR 795) provides assistance to eligible small coal mine operators, including remining operators, by providing funding for site evaluations required to obtain a permit. Operators are eligible if they intend to apply for a permit under SMCRA, and can demonstrate that the probable total attributed annual production for all locations on which they are issued a surface coal mining and reclamation permit will not exceed 300,000 tons. States are granted the authority to use alternate criteria for determining operator eligibility so long as the grant request does not exceed the amount that would be authorized under the federal SOAP provisions.

3.2.3 The Rahall Amendment

The Clean Water Act was amended by the Water Quality Act of 1987. The amendments added Section 301(p), commonly referred to as the Rahall Amendment, to provide incentives to encourage coal remining. The Rahall Amendment allows the NPDES permit writers to issue permits with site-specific limits for iron, manganese, and pH for pre-existing discharges at remining sites where remining has the potential to improve water quality. Technology-based limits for these pollutants are based on BPJ. These modified limits may not exceed baseline levels in the pre-existing discharges, and discharges from the remining operation may not violate any state water quality standards.

To date, EPA has not established regulations or guidance implementing the Rahall Amendment. The final Coal Remining Subcategory rule will establish specific requirements for eligible sites consistent with the Rahall Amendment provisions.

3.2.4 State Remining Permit Programs

Many states have been delegated authority under SMCRA and the NPDES program, and several states have established or are developing remining programs. State remining permit terms and conditions must follow provisions established in the SMCRA regulations, except where these provisions are modified by the state and approved by the Secretary of the Interior. The IMCC solicitation collected information on twenty states' remining programs (IMCC, 1999). As of July 1999, seven of the twenty states responding (Alabama, Kentucky, Maryland, Ohio, Pennsylvania, Virginia and West Virginia) had issued Rahall permits, and another four states (Illinois, Indiana, Missouri, and Tennessee) had issued non-Rahall remining permits. Pennsylvania had issued by far the greatest number of Rahall permits (300), followed by Alabama (10).

Pennsylvania has a particularly active remining program. Pennsylvania has standardized requirements for remining permits, and provides for a single application that covers both SMCRA and NPDES requirements. Pennsylvania establishes BPJ limits for iron, manganese, and acidity for pre-existing discharges under remining regulations that were approved by OSM and EPA in March 1986. Bond release is contingent on the post-mining discharge having pollutant levels equal to, or less than, the pre-remining baseline. Vegetation must be restored to pre-remining levels as well. Applicants must provide data on baseline water quality and quantity sufficient to characterize baseline pollutant levels, and must develop a pollution abatement plan that is integrated with the mining and reclamation plan. Appendix A provides additional information on state remining programs.

3.3 Characterizing the Economic Baseline

3.3.1 Coal Remining

EPA estimated economic baseline conditions based on existing state and federal regulations and current industry practices. For remining, EPA assumed economic baseline conditions to be remining under a Rahall permit, pursuant to Section 301(p), rather than comparing to compliance with current part 434 regulations. The Agency relied on information provided by the states on the number and acreage of AML sites that are potential candidates for remining, as well as information on Pennsylvania's experience with permitting under its active remining program, to estimate the number of new remining sites with pre-existing discharges that might be permitted each year under the final subcategory.

Specifically, this estimate was based on states' responses to the IMCC survey, which included a request for information on the number of potential remining sites in three categories: coal refuse piles, surface mined sites, and underground mined sites. Table 3-1 provides EPA's estimates of potential remining operations per state (U.S. EPA, 1999b).

Table 3-1: Potential Remining Operations by State

State	Number of Coal Refuse Piles	Number of Surface Mined Sites	Number of Underground Mined Sites
AL	1	--	--
IL	30	10	12
IN	150	453	615
KY	200	400 - 600	800 - 1,000
MD	10	75	75
OH	219*	605*	4,000
PA	858	4,183*	831*
TN	36*	1,210*	800
VA	400 - 450	750	800
WV	--	3	--
Totals	**1,900**	**7,790**	**8,000**

* denotes numbers calculated by EPA based on state estimate of potential remining acres
-- = no response
Source: U.S. EPA, 1999b.

In order to evaluate how many remining permits would be issued annually due to the new subcategory, EPA evaluated the number of remining permits issued in Pennsylvania following state implementation of a regulation that is similar to the final remining rule. EPA believes that implementing the rule is likely to have a similar effect on other states with remineable coal reserves and similar acid mine drainage problems. In an average year, Pennsylvania issued permits to 0.36 percent of the potential remining sites in the Commonwealth, with a maximum of 0.51 percent being issued in 1990. Therefore, EPA calculated the number of sites potentially affected by assuming that each state would issue permits to 0.36 percent to 0.51 percent of their reported potential remining sites on an annual basis. Table 3-2 presents these estimates.

Table 3-2: Estimated Remining Operations Permitted Annually

	Coal Refuse Piles		Surface Mined Sites		Underground Mined Sites	
	Number	**Acres**	**Number**	**Acres**	**Number**	**Acres**
Alabama	0	0	0	0	0	0
Illinois	0	1	0	1 - 2	0	2
Indiana	1	3 - 4	2	62 - 88	2 - 3	84 - 119
Kentucky	1	4 - 5	2 - 3	68 - 97	3 - 5	123 - 174
Maryland	0	0	0	10 - 15	0	10 - 15
Ohio	1	4 - 6	2 - 3	83 - 117	14 - 20	2,160 - 3,060
Pennsylvania	3 - 4	15 - 22	15 - 21	572 - 811	3 - 4	114 - 161
Tennessee	0	1	4 - 6	166 - 235	3 - 4	109 - 155
Virginia	2	8 - 11	3 - 4	103 - 145	3 - 4	109 - 155
West Virginia	0	0	0	0 - 1	0	0
Total Sites Permitted Each Year	**7 - 10**	**35 - 49**	**28 - 40**	**1,066 - 1,510**	**29 - 41**	**2,712 - 3,840**

Source: U.S. EPA, 1999b.
Entries may not sum to totals due to rounding.

Although EPA estimated that the Coal Remining Subcategory would be applicable to 64 to 91 remining sites and 3,810 to 5,400 acres annually, EPA projects that fewer sites would realize costs or benefits from the final rule. The Commonwealth of Pennsylvania has an advanced remining program, and EPA does not believe that the final rule will have a measurable impact on Pennsylvania's remining activities. Therefore, EPA did not include Pennsylvania's remining sites in the estimation of costs or benefits. EPA's cost and benefit analysis were based on a total of 43 to 61 sites representing 3,100 to 4,400 permitted acres each year. EPA assumed that 57 percent of the acres permitted (1,800 to 2,500 acres) would actually be reclaimed each year based on a study of 105 remining remining permits in Pennsylvania (Hawkins, 1995). The study found that on average, a remining site had 67 AML acres, of which 38 acres (or 57 percent), were actually reclaimed. Table 3-3 shows the various estimates EPA used in the economic and environmental impact analysis.

Table 3-3: Annual Estimates of Affected Remining Sites Used in the Economic and Environmental Impact Analysis

Additional Sites Permitted	Number of Sites	Acres	Used in Analysis of:
All types, all states (initial estimate)	64 - 91	3,812 - 5,401	
All types, excluding PA	43 - 61	3,111 - 4,407	Monitoring costs for selected states; NPDES permitting authority costs
10% of surface & under- ground sites only (no coal refuse piles), excluding PA	3.9 - 5.6	309 - 438	Costs of additional BMPs
Additional acres reclaimed: (57% of acres permitted, all types excluding PA)		1,773 - 2,512	Benefits from recreational use of reclaimed land
Additional acres reclaimed expected to have significant decreases in AMD pollutant levels (37.6 - 44.4% of additional reclaimed acres)		667 - 1,115	Benefits from recreational use of improved water bodies; Aesthetic improvements in water bodies; Nonuse benefits

As discussed in Chapter 8, EPA evaluated evidence on the impacts of remining on water quality and on various hazards posed by abandoned mine lands to estimate environmental impacts of the final subcategory rule. This analysis included a detailed review of BMP performance, loadings and water quality impacts for a sample of remining sites, as well as review of other literature on the impacts of remining. Based on this evidence, the Agency was able to quantify and monetize some of the benefits of additional remining induced by the final subcategory rule using a benefits transfer approach. The Agency was not able to quantify other important potential benefits of the rule, however, including human health and safety impacts.

3.3.2 Western Alkaline Coal Mining

EPA prepared the document *Coal Remining and Western Alkaline Mining: Economic and Environmental Profile* (U.S. EPA, 1999e) in support of the rule. The report provides industry profile information on the 47 surface coal mines and 24 underground coal mines initially believed to be in the scope of the new subcategory. However, EPA determined that one of the surface mines profiled was already in the final reclamation stage and would not be affected by the final rule; hence, only the 46 remaining surface mines were included in the analyses of costs and benefits.

As discussed in Chapter 4, EPA believes that the only incremental cost attributed to the final subcategory is associated with watershed modeling requirements. Information provided by the Office of Surface Mining indicates that a typical underground operator would not incur any additional modeling costs as a result of the final rule due to the small acreage and lack of complexity associated with these reclamation areas (U.S. DOI, 1999a, 1999b). EPA projects that cost savings for this subcategory would result from lower capital and operating costs associated with implementing the required BMP plans, and from an expected reduction in the reclamation bonding period. The methodologies used to estimate the costs and cost saving are discussed in Chapter 4.

Although EPA believes that compliance with the final rule would result in operational savings for many underground producers, EPA did not estimate the savings due to data limitations. The industry profile data submitted by the WCMWG did not provide information on disturbance acreage, mine life, or bond amounts for the underground mines, and the model mine analysis addressed conditions typical of surface mines rather than underground mines. It was therefore not possible to estimate cost savings associated with the subcategory for reclamation of surface areas at underground mines. However, any savings are likely to be small given the limited acreage and lack of complexity associated with these reclamation areas. Hence, EPA assumes that the final rule would be cost-neutral for the underground operators. The remainder of this report considers only the 46 active surface mines in its discussion.

The WCMWG model mine analysis on comparative sediment loadings, as well as other evidence from the literature, supported EPA's analysis of the environmental impacts of the new subcategory.
EPA developed a partial monetary estimate of expected benefits attributed to the final regulation for two categories: land-related benefits and water-related benefits. The estimated water-related benefits include the value of enhanced recreational opportunities from improved water flow conditions. The land-related benefits result from reduced land disturbance due to the reduced use of sedimentation ponds. The benefits estimates do not include a number of benefit categories, including nonuse ecological benefits.

Chapter 4

Industry Compliance Costs

4.0 Introduction

This chapter presents EPA's analysis of the costs and cost savings to the coal mining industry attributed to the final rule. These are the changes in compliance costs associated with differences between current requirements and requirements under the new subcategories.

EPA estimated compliance costs for two additional requirements associated with the final Coal Remining Subcategory: (1) monitoring costs; and (2) pollution abatement plan costs. The Agency evaluated current state requirements for operations permitted under the Rahall provision and calculated the sample collection costs that exceed the current state requirements based on estimates of typical sampling, analysis and monitoring device costs. EPA also estimated the costs associated with developing and implementing a pollution abatement plan. In many cases, EPA believes that the requirements for the pollution abatement plan will be satisfied by an approved SMCRA plan. However, EPA recognizes that some operators may be required to implement additional or incremental BMPs under the final rule beyond what is included in a SMCRA-approved pollution abatement plan. EPA developed a general estimate of the potential costs of these additional BMPs.

For the Western Alkaline Coal Mining Subcategory, EPA believes that plans developed to comply with SMCRA requirements will usually fulfill the new requirements for sediment control plans. The requirement to use watershed modeling techniques is not inconsistent with OSM reclamation plans. While OSM does not specifically require modeling, most coal mine operators already perform watershed modeling to support their SMCRA permit application that is sufficient to meet the new subcategory requirements. However, some incremental costs may occur where the rule increases model complexity. EPA developed a conservative estimate of these costs by assuming that all existing surface mines would need to perform additional modeling. EPA also estimated the cost savings for this subcategory expected to result from lower capital and operating costs associated with implementing the BMP plans, and from an expected reduction in the reclamation bonding period.

Except where noted, all costs are reported in 1998 dollars; the present value of costs that are incurred in the future are calculated using a 7 percent discount rate; and annualized costs are developed using an annualization period of 10 years and a discount rate of 7 percent. The following formula was used to calculate annualized costs and cost savings:

$$\textit{Annualized Cost} = PV \times \frac{r \times (1 + r)^n}{(1 + r)^n - 1}$$

where

PV	=	Present value of compliance costs
r	=	Discount rate (7 percent in this analysis)
n	=	Amortization period (10 years)

4.1 Coal Remining

4.1.1 Methodology

EPA projected that states will permit 43 to 61 new remining sites each year under the new subcategory (see Chapter 3). EPA projected costs for each remining site by calculating the cost of added requirements beyond those currently required for Rahall permits. These include the cost of increased monitoring requirements for determining baseline, the cost of potential increases in compliance monitoring requirements, and the potential costs associated with implementing the required pollution abatement plan.

4.1.2 Monitoring Costs

To assess the increased monitoring requirements of the final rule, EPA evaluated current state requirements for operations permitted under the Rahall provision and calculated the sample collection costs that exceed the current state requirements. Current state sample collection requirements for determining and monitoring baseline are included in Appendix A.

Under the final rule, EPA is requiring that operators conduct one year of monthly sampling to characterize the baseline pollutant levels for iron (total), manganese (total), acidity, and TSS. Although most states with remining activities have similar requirements, remining sites in Alabama and Kentucky will be required to add six samples annually. EPA did not have data for Illinois, Indiana, or Tennessee, because the remining operations that occur in these states do not incorporate Rahall provisions for pre-existing discharges. For these states, EPA has conservatively assumed that 12 additional samples will be necessary for monitoring annually, and that remining operators would have to purchase and install flow weirs to comply with the baseline determination and monitoring requirements.

Although EPA is not requiring a specific monitoring frequency to demonstrate compliance, EPA has assumed monthly compliance monitoring for costing purposes. Most states already have similar requirements, with the exception of Ohio, who currently requires quarterly sampling. Again, EPA did not have data for Illinois, Indiana, or Tennessee, because these states do not incorporate Rahall provisions in their remining permits. EPA has conservatively assumed that an additional 12 compliance monitoring samples per year would be required for these states and has costed this requirement for five years.

Because each remining site will typically have more than one pre-existing discharge, EPA reviewed Pennsylvania remining sites to estimate the average number of pre-existing discharges per site. EPA used this calculated average of four pre-existing discharges per site for estimating baseline determination and compliance monitoring costs. Tables 4-1 and 4-2 show the expected incremental monitoring costs required for each state (low and high estimates respectively). These represent an upper bound estimate of additional monitoring requirements based on the assumptions discussed above.

Table 4-1: Estimated Increase in Annual Monitoring Costs: Low Estimate

	Baseline Monitoring		Compliance Monitoring			Total Incremental Cost		
State	Number of Additional Samples/Year	Increased Cost/Mine (PV)*	Number of Additional Samples/Year	Increased Cost/Mine (PV)**	Annual Number of Sites Permitted	Baseline Monitoring	Compliance Monitoring	Total
AL	6	$1,128	0	$0	0	$0	$0	$0
IL***	12	$6,928	12	$9,900	0	$0	$0	$0
IN***	12	$6,928	12	$9,900	4	$27,712	$9,024	$36,736
KY	6	$1,128	0	$0	6	$6,768	$0	$6,768
MD	0	$0	0	$0	1	$0	$0	$0
OH	0	$0	8	$6,600	17	$0	$25,568	$25,568
PA	0	$0	0	$0	21	$0	$0	$0
TN***	12	$6,928	12	$9,900	7	$48,496	$15,792	$64,288
VA	0	$0	0	$0	7	$0	$0	$0
WV	0	$0	0	$0	0	$0	$0	$0
Total					**64**	**$82,976**	**$50,384**	**$133,360**

* Number of additional samples per year * $188/sampling period ($47 per sample * 4 average sampling points)
** Number of additional samples per year * $825 present value of annual compliance sampling (present value of $160 per year for 5 years @ 7%)
*** Baseline requirements not available; assumed to require 12 additional samples per year for baseline and compliance monitoring plus 4 flow weirs at $1,168 per weir.

Table 4-2: Estimated Increase in Annual Monitoring Costs: High Estimate

	Baseline Monitoring		Compliance Monitoring			Total Incremental Cost		
State	Number of Additional Samples/Year	Increased Cost/Mine (PV)*	Number of Additional Samples/Year	Increased Cost/Mine (PV)**	Annual Number of Sites Permitted	Baseline Monitoring	Compliance Monitoring	Total
AL	6	$1,128	0	$0	0	$0	$0	$0
IL***	12	$6,928	12	$9,900	0	$0	$0	$0
IN***	12	$6,928	12	$9,900	6	$41,568	$13,536	$55,104
KY	6	$1,128	0	$0	8	$9,024	$0	$9,024
MD	0	$0	0	$0	1	$0	$0	$0
OH	0	$0	8	$6,600	25	$0	$37,600	$37,600
PA	0	$0	0	$0	30	$0	$0	$0
TN***	12	$6,928	12	$9,900	10	$69,280	$22,560	$91,840
VA	0	$0	0	$0	10	$0	$0	$0
WV	0	$0	0	$0	0	$0	$0	$0
Total					**91**	**$119,872**	**$73,696**	**$193,568**

* Number of additional samples per year * $188/sampling period ($47 per sample * 4 average sampling points)
** Number of additional samples per year * $825 present value of annual compliance sampling (present value of $160 per year for 5 years @ 7%)
*** Baseline requirements not available; assumed to require 12 additional samples per year for baseline and compliance monitoring plus 4 flow weirs at $1,168 per weir.

As shown in Tables 4-1 and 4-2, the total annual incremental monitoring costs are estimated to be in the range of $133,500 to $193,500. Of this, between $83,000 and $120,000 is associated with incremental baseline monitoring requirements and between $50,500 and $73,500 results from incremental compliance monitoring during a five year remining period.

4.1.3 Pollution Abatement Plan Costs

In addition to monitoring costs, remining operators must develop and implement a site-specific pollution abatement plan for each remining site. In many cases, EPA believes that the requirements for the pollution abatement plan will be satisfied by an approved SMCRA plan. However, EPA recognizes that some operators may be required to implement additional or incremental BMPs under the final rule beyond what is included in a SMCRA-approved pollution abatement plan. EPA developed a general estimate of the potential costs of additional BMPs based on review of existing remining permits contained in the EPA's Coal Remining Database, and on information provided in the *Coal Remining Best Management Practices Guidance Manual* (U.S. EPA, 2000d).

EPA determined that the most likely additional BMP that NPDES permit writers might require would be a one-time increase in the amount of alkaline material used as a soil amendment to prevent the formation of acid mine drainage. EPA assumed that an average mine facility requiring additional BMP effort would need to increase its alkaline addition by a rate of 50 to 100 tons per acre to meet the additional NPDES permit review requirements. Finally, EPA estimated an average cost for alkaline addition of $12.90/ton, and assumed that 10 percent of surface and underground remining sites would be required to incur these additional BMP costs.[7] Because the typical BMP for coal refuse piles is simply removal of the pile, EPA believes that no incremental BMP costs would be incurred for these sites.

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[7] EPA assumed that ten percent of the surface and underground remining site acreage in states other than Pennsylvania would require addition of alkaline material.

Based on EPA's estimate that between 309 and 438 acres could require additional alkaline addition each year, the estimated annual cost of additional BMP requirements would range from $199,500 to $565,000:

> (3,091 acres in remining * 10 percent requiring alkaline addition * 50 tons alkaline material per acre * $12.90 per ton for alkaline material); and
>
> (4,380 acres in remining * 10 percent requiring alkaline addition * 100 tons alkaline material per acre * $12.90 per ton for alkaline material).

4.1.4 Total Annual Compliance Costs for the Coal Remining Subcategory

The estimated annual incremental costs attributed to the final rule range from $333,000 and $758,500 per year. This cost includes $133,500 to $193,500 in estimated incremental monitoring costs, and $199,500 to $565,000 in estimated additional BMP effort per year. These costs are based on EPA's estimates of future remining, and would most likely be incurred by new remining operations. Table 4-3 summarizes the incremental costs associated with the new subcategory.

Table 4-3: Annual Costs for the Coal Remining Subcategory

Monitoring Costs	$133,500 - $193,500
Additional BMP Effort	$199,500 - $565,000
Total Compliance Costs	**$330,000 - $758,500**

4.2 Western Alkaline Coal Mining

4.2.1 Methodology

The cost impacts of this subcategory will vary, depending on the site-specific conditions at each eligible coal mine. However, based on data and information gathered to date, EPA believes that the costs of reclamation under this rule will be less than or equal to reclamation costs under the existing effluent guidelines for each individual operator, and thus, for the subcategory as a whole.

EPA expects that the sediment control plan will consist entirely of materials generated as part of the SMCRA permit application. The SMCRA permit application requires that a coal mining operator submit a reclamation plan, documentation and analysis to OSM or the permitting authority for approval. Based on these requirements, EPA believes that plans developed to comply with SMCRA requirements will fulfill the requirements for sediment control plans. The requirement to use watershed modeling techniques is not inconsistent with OSM reclamation plans. While OSM does not specifically require modeling, coal mine operators already perform watershed modeling to support their SMCRA permit application that is sufficient to meet the final requirements. Thus, EPA expects no coal mine will incur incremental modeling costs to develop its sediment control plan. However, some incremental costs may occur where the rule increases model complexity. As discussed below, these costs would be offset by reduced sediment control costs associated with implementing the required BMP plans and savings resulting from an expected reduction in the reclamation bonding period.

4.2.2 Watershed Modeling Costs

As discussed above, EPA believes that some operators may incur incremental watershed modeling costs where the final rule increases model complexity. Information provided by OSM indicates that a typical surface mine operator may incur a one-time additional cost of zero to $50,000 to meet the modeling requirements (U.S. DOI, 1999a, 1999b). This figure represents the additional modeling effort attributed to the final requirements; it does not represent the total cost associated with watershed modeling. Although most sites would not incur additional modeling costs, EPA conservatively assumes that all 46 existing surface operators would incur additional modeling costs of $50,000. The $50,000 estimate represents an annualized cost of $7,119 per mine, resulting in a total cost estimate of $327,000. These costs would be offset by the cost savings discussed below.

4.2.3 Reduced Sediment Control Costs

EPA projects that cost savings would result from lower capital and operating costs associated with implementing BMPs relative to the predominant use of sedimentation ponds. The costs savings for sediment controls based on BMPs were calculated for three representative model mines differentiated by geographic region: Desert Southwest (DSW), Intermountain (IM), and Northern Plains (NP). The cost models were submitted by the Western Coal Mining Work Group (WCMWG, 1999a, 2001) and are discussed in detail in the *Development Document for Final Effluent Limitations Guidelines and Standards for the Western Alkaline Coal Mining Subcategory* (U.S. EPA, 2001). The cost estimates for each model mine relied on data taken from case study mine permit applications, mine records, technical resources, and industry experience. The models estimated capital costs (design, construction, and removal of ponds and BMPs) and operating costs (inspection, maintenance, and operation) over the anticipated bonding period.

EPA extrapolated from the WCMWG model mine analyses and industry profile information to estimate savings in sediment control costs for the subcategory. EPA identified all surface mines in the Western Alkaline region and classified them by region within the subcategory (DSW, IM, or NP). Cost savings for reclamation at each mine were calculated by extrapolating the cost savings per disturbed acre calculated for the appropriate model mine. Individual mines may achieve lower or higher savings per acre than the savings estimated for its associated model mine due to site-specific conditions. To the extent that this occurs, EPA's estimate of total cost savings may be over- or underestimated.

Table 4-4 presents the sediment control costs and the discounted present value of those costs as estimated by WCMWG for post-mining reclamation at each of the three model mines under both the existing guideline and the new subcategory. Costs are discounted at a seven percent real rate over the ten year expected reclamation period modeled for the current guideline. The present value of cost savings for the DSW model mine is expected to be $671,897 ($1,760 per acre) under the new subcategory, about 40 percent of costs under the existing guideline. For the IM model mine, the present value of expected cost savings is $198,866 ($522 per acre), about 24 percent of costs under the existing guideline. Finally, the NP model mine is expected to achieve a present value of cost savings of $235,377 ($617 per acre) under the new subcategory, a 26 percent savings compared to the current guideline.

Table 4-4:
Model Mine Reclamation Sediment Control Costs and
Present Value of Sediment Control Savings per Acre Reclaimed
Current Effluent Guideline versus Proposed Subcategory (1998 dollars)

DESERT SOUTHWEST REGION								
	Current				Proposed			
Year	Capital	Operating	Total Capital & Operating Costs	Present Value of Total Costs	Capital	Operating	Total Capital & Operating Costs	Present Value of Total Costs
1	$975,435	$15,384	$990,819	$990,819	$760,816	$3,300	$764,116	$764,116
2	$2,720	$142,804	$145,524	$136,004	$43,577	$103,368	$146,945	$137,332
3	$0	$190,181	$190,181	$166,112	$0	$59,876	$59,876	$52,298
4	$0	$88,956	$88,956	$72,615	$0	$77,895	$77,895	$63,586
5	$0	$26,231	$26,231	$20,011	$0	$14,147	$14,147	$10,793
6	$0	$161,999	$161,999	$115,503	—	—	—	—
7	$0	$15,269	$15,269	$10,175	—	—	—	—
8	$0	$15,269	$15,269	$9,509	—	—	—	—
9	$0	$133,377	$133,377	$77,626	—	—	—	—
10	$171,607	$15,269	$186,876	$101,648	—	—	—	—
Total	$1,149,761	$804,739	$1,954,501	$1,700,021	$804,393	$258,586	$1,062,979	$1,028,124
Present Value of Total Cost Savings over 10 Years								$671,897
Acres per Model Mine								381.8
Present Value of Total Cost Savings per Acre over 10 Years								$1,760

Table 4-4 (continued):
Model Mine Reclamation Sediment Control Costs and
Present Value of Sediment Control Savings per Acre Reclaimed
Current Effluent Guideline versus Proposed Subcategory (1998 dollars)

	Current				Proposed			
	Capital	Operating	Total Capital & Operating Costs	Present Value of Total Costs	Capital	Operating	Total Capital & Operating Costs	Present Value of Total Costs
1	$479,458	$10,777	$490,235	$490,235	$428,315	$3,677	$431,992	$431,992
2	$43,577	$65,142	$108,718	$101,606	$43,577	$58,065	$101,642	$94,992
3	$0	$36,230	$36,230	$31,645	$0	$29,142	$29,142	$25,454
4	$0	$67,818	$67,818	$55,359	$0	$60,808	$60,808	$49,637
5	$0	$45,677	$45,677	$34,847	$53,049	$3,563	$56,612	$43,189
6	$0	$41,310	$41,310	$29,453	—	—	—	—
7	$0	$10,663	$10,663	$7,105	—	—	—	—
8	$0	$10,663	$10,663	$6,640	—	—	—	—
9	$0	$11,698	$11,698	$6,808	—	—	—	—
10	$134,550	$13,319	$147,869	$80,431	—	—	—	—
Total	$657,585	$313,295	$970,881	$844,130	$524,940	$155,255	$680,195	$645,264
Present Value of Total Cost Savings over 10 Years								$198,866
Acres per Model Mine								381.2
Present Value of Total Cost Savings per Acre over 10 Years								$522

Table 4-4 (continued):
Model Mine Reclamation Sediment Control Costs and
Present Value of Sediment Control Savings per Acre Reclaimed
Current Effluent Guideline versus Proposed Subcategory (1998 dollars)

NORTHERN PLAINS REGION								
	Current				Proposed			
Year	Capital	Operating	Total Capital & Operating Costs	Present Value of Total Costs	Capital	Operating	Total Capital & Operating Costs	Present Value of Total Costs
1	$513,552	$11,682	$525,234	$525,234	$432,631	$3,677	$436,309	$436,309
2	$43,577	$66,628	$110,204	$102,995	$43,577	$58,646	$102,223	$95,535
3	$0	$37,426	$37,426	$32,689	$0	$29,433	$29,433	$25,708
4	$0	$68,723	$68,723	$56,098	$0	$60,808	$60,808	$49,637
5	$0	$46,582	$46,582	$35,537	$57,317	$3,563	$60,880	$46,445
6	$0	$42,408	$42,408	$30,236	—	—	—	—
7	$0	$11,568	$11,568	$7,708	—	—	—	—
8	$0	$11,568	$11,568	$7,204	—	—	—	—
9	$0	$12,699	$12,699	$7,391	—	—	—	—
10	$140,054	$14,224	$154,278	$83,917	—	—	—	—
Total	$697,183	$323,508	$1,020,691	$889,010	$533,525	$156,126	$689,651	$653,633
Present Value of Total Cost Savings over 10 Years								$235,377
Acres per Model Mine								381.2
Present Value of Total Cost Savings per Acre over 10 Years								$617

To estimate annual reclamation cost savings for existing western alkaline surface mines, EPA identified each of the 46 mines in current production by region. For those mines with data available, EPA divided the projected disturbed acreage by the expected remaining mine life to estimate the annual acres disturbed at each mine site. This information was available for 26 mines: two DSW mines, one IM mine, and 23 NP mines. For each of these 26 mines, EPA multiplied estimated annual disturbed acres at the mine by the present value of projected reclamation savings per acre for that region's model mine ($1,760 for the DSW region, $522 for the IM region, and $617 for the NP region).

The 20 mines without data available on expected mine life and disturbed acreage are all located in the NP (18 mines) and IM (two mines) regions. EPA used the average of 305 expected disturbed acres per year for the 24 IM and NP mines with available data to estimate reclamation cost savings.[8] Average disturbed acres were multiplied by the present value of savings per acre for the model mine in that region and totaled. The two IM mines without data are expected to save $0.3 million annually, while annual savings for the 18 NP mines without data are expected to total $3.4 million. Estimated annual reclamation cost savings total $12.7 million for the 46 producing surface mines in the Western Alkaline subcategory. Table 4-5 summarizes the estimate of reclamation cost savings for the Western Alkaline subcategory.

[8] EPA used only IM and NP mines to calculate average expected disturbed acres for the following reasons. First, all mines without expected disturbance data are in the IM and NP regions, and none are in the DSW region. Second, average expected disturbed acres for IM and NP mines with data are about 25 percent of the average for the two DSW mines. Third, the largest mine with data in the IM and NP regions is only half as large as the smallest DSW mine. Because of this apparent regional difference in mine size, EPA excluded DSW mines from the calculation of average expected disturbed acres. Data were insufficient to support a further distinction between average disturbed acres for IM and NP mines.

Table 4-5: Estimated Subcategory Sediment Control Cost Savings

Region	Mine Life (years)	Expected Disturbance Acres	Average Expected Disturbance Acres/Year	NPV of Reclamation Savings per Acre	Estimated Annual Reclamation Savings (x $1,000)
DSW	6	7,236	1,206	$1,760	$2,122
DSW	12	16,351	1,363	$1,760	$2,398
IM	26	4,960	191	$522	$100
NP	16	3,810	238	$617	$147
NP	15	1,161	77	$617	$48
NP	16	6,300	394	$617	$243
NP	6	500	83	$617	$51
NP	28	8,579	306	$617	$189
NP	20	875	44	$617	$27
NP	17	4,485	264	$617	$163
NP	18	2,085	116	$617	$72
NP	30	11,300	377	$617	$233
NP	12	4,546	379	$617	$234
NP	18	11,000	611	$617	$377
NP	18	6,216	345	$617	$213
NP	18	5,172	287	$617	$177
NP	24	12,172	507	$617	$313
NP	14	6,631	474	$617	$292
NP	14	7,275	520	$617	$321
NP	9	2,000	222	$617	$137
NP	28	1,886	67	$617	$42
NP	15	8,207	547	$617	$338
NP	25	10,429	417	$617	$258
NP	12	5,765	480	$617	$297
NP	12	3,576	298	$617	$184
NP	32	2,129	67	$617	$41
Total for 26 Mines with Data:					$9,017
2 IM Mines with Missing Data:			305	$522	$318
18 NP Mines with Missing Data:			305	$617	$3,386
Total Estimated Annual Savings:					$12,721

Comparison with Estimated Cost Savings under the Proposed Guideline

The economic impact analysis for the proposed rule estimated annual reclamation cost savings of $30.8 million, significantly larger than the estimated $12.7 million annual savings for the final rule, as presented above. The primary reason for the magnitude of this revision is differences in regional characteristics of surface mining within the Western Alkaline subcategory. The estimate for the proposed rule was based on a single model mine from the DSW region. The results for this model mine were scaled to reflect all 46 mines in the subcategory. However, compared to the region specific model mine information now available for the IM and NP regions, DSW mines appear to be significantly larger, incur greater reclamation costs under current guidelines, and are projected to receive larger savings per acre under the proposed guidelines than other mines in the subcategory.

In summary, reclamation cost savings for the proposed rule were based on:

- 1 model mine representing:
  — 46 mines, 26 with expected disturbed acres data available,
  — 380 expected disturbed acres per mine,
  — $1,760 NPV of reclamation savings per acre,
  — $30.8 million reclamation cost savings (46 mines × 380 acres × $1,760 per acre).

Revised reclamation cost savings for this final rule are based on:

- 1 model mine representing:
  — 2 DSW mines, both with expected disturbed acres data available,
  — 1,280 expected disturbed acres per mine,
  — $1,760 NPV of reclamation savings per acre,
  — $4.5 million reclamation cost savings (2 mines × 1,280 acres × $1,760 per acre).

- 1 model mine representing:
  — 3 IM mines, 1 with expected disturbed acres data available,
  — 305 expected disturbed acres per mine,
  — $522 NPV of reclamation savings per acre,
  — $0.5 million reclamation cost savings (3 mines × 305 acres × $522 per acre).

- 1 model mine representing:
  — 41 NP mines, 23 with expected disturbed acres data available,
  — 305 expected disturbed acres per mine,
  — $617 NPV of reclamation savings per acre,

— \$7.7 million reclamation cost savings (41 mines × 305 acres × \$617 per acre).

The decrease in total estimated annual reclamation savings is primarily due to the lower savings per acre at IM and NP mines that compose the majority of the subcategory. Had EPA used the higher average annual expected disturbed acres from the proposed rule in this analysis (380 acres instead of 305 acres), expected annual cost savings would have totaled about \$13.6 million. Thus, most of the reduction in savings relative to those estimated in the EA for the proposed rule can be attributed to lower per acre cost savings in the IM and NP mines.

4.2.4 Savings Associated with Earlier Bond Release

EPA also calculated cost savings that may result due to earlier Phase 2 bond release. Under SMCRA requirements, permit applicants must post a reclamation bond to ensure that the regulatory authority will have funds to reclaim the site if the permitee fails to complete the reclamation plan approved in the permit. Permitees may apply for release of all or part of the bond as reclamation is completed. The regulations recognize three phases of reclamation for purposes of bond release:

- Phase 1: backfilling, regrading and drainage control;
- Phase 2: topsoil replacement and establishment of vegetation; and
- Phase 3: meeting the revegetation success standards and completing the revegetation responsibility period.[9]

The amount of bond release at each phase varies from site to site. Typical stages of bond release in the West are 60 percent released at the end of Phase 1, an additional 25 percent released at the end of Phase 2, and the final 15 percent released at the end of Phase 3.[10]

The OSM hydrology standards to release performance bonds at Phase 2 at 30 CFR part 800.40(c)(1) require compliance with the existing effluent standard. The use of BMPs under the new subcategory is

[9] The revegetation responsibility period is ten years in the arid/semiarid west.

[10] Personal communication with Wayne Erickson, Habitat Management, Inc. OSM regulations require that 15 percent of the bond amount remain in place until the end of the revegetation responsibility period.

expected to allow earlier Phase 2 bond release, because less time will be needed to meet the hydrology bond release requirements. According to information provided by WCMWG (1999a), meeting the existing guidelines in the arid/semiarid west may take 10 years or longer, and may require significant topographic modifications and excessive maturation of vegetation. In addition, sampling to demonstrate compliance with existing standards is difficult, given the infrequent and flash nature of flows in the region. The BMP-based approach for this rule uses the inspection of BMP design, construction, operation and maintenance to demonstrate compliance instead of sampling and analysis of surface water drainage. The report estimates that the BMP-based approach would reduce the time it takes reclaimed lands to qualify for Phase 2 bond release by about five years.

The savings associated with earlier Phase 2 bond release will vary among individual mines, depending on the bond amounts and on the type of bond. The cost incurred by mine operators to maintain bonds varies according to the type of bond. For example:

- Interest must be paid on certificates of deposit;
- Surety bonds require an annual payment based on the size of the bond -- typical annual fees for western mines are reported to range from $3.75 to $5.50 per $1,000 in bond value;[11]
- Self-bonding requires that companies submit periodic reports, and may prevent the use of some company assets as collateral for other financing or may prevent the sale of assets.

A survey conducted by the Office of Surface Mining in 1995 found that

> . . . approximately 75 percent of the bonds posted for coal mining operations were corporate surety bonds. Small operations with bond amounts in the tens of thousands of dollars tend to use certificates of deposit and other assets. Bond amounts in excess of tens or hundreds of millions of dollars are typically in the form of corporate surety bonds (U.S. DOI, 1998c).

[11] Personal communication with Wayne Erickson, Habitat Management, Inc.

EPA used a number of simplifying assumptions about the timing of reclamation and bond release and the cost of maintaining reclamation bonds to estimate the savings associated with earlier Phase 2 bond release. The WCMWG industry profile provides information necessary to calculate associated bond savings (reclamation bond amounts, disturbance acreage, and mine life) for twenty-six mines. EPA calculated savings for each these mines using the following assumptions:

- The amount of bond released at the end of Phase 2 is equal to 25 percent of the reported bond amount;
- All bonds are surety bonds, with annual fees of between $3.75 and $5.50 per thousand;
- Mining under the current permit is assumed to end in year 5. Savings is calculated as the difference between the present value of maintaining the bond for 10 years after Phase 2 bond release (i.e., in year 15) and the present value of maintaining it for 5 years (i.e., in year 10). Costs are annualized over the 5 year permit period using a 7 percent discount rate.

The calculation steps are as follows:

(1) Calculate the Percent of Expected Disturbed Acres Bond Occurring in 5 Year Permit Period:

= 5 year permit period / expected mine life

(2) Calculate the Phase 2 Bond Amount Attributed to Permit Period Disturbed Acres:

= 25 percent of total bond amount * percent expected disturbed acres in permit period

(3) Calculate the Annual Cost of Maintaining the Phase 2 Bond Amount:

= Phase 2 bond amount (in thousands of dollars) * $3.75 (low estimate) or $5.50 (high estimate) annual surety bond fee per thousand dollars;

(4) Calculate the Present Value of Savings due to Earlier Phase 2 Bond Release:

= present value of avoided payment of surety bond costs in years 11 through 15, discounted at 7 percent real rate;

(5) Annalize the Present Value of the Avoided Surety Bond Costs:
annualized present value over the 5 year permit period, at 7 percent real rate.

The simplified assumptions regarding the timing of different stages of reclamation, as well as the assumptions regarding the type and cost of bonds, may under- or overstate actual savings. The analysis understates total savings by ignoring savings associated with reclamation bonds posted under future permits, but may overstate costs by assuming that all bonds obtained are surety bonds rather than some obtained through self-bonding. In addition, the timing of Phase 2 bond release will vary from site to site depending on the nature of the BMPs used and the success in establishing revegetation. This calculation assumes that mines will achieve Phase 2 bond release five years earlier under the new subcategory than would otherwise occur, but the actual results may differ from mine to mine.

EPA made a number of assumptions to estimate early Phase 2 bond release for the 20 mines that did not have sufficient data available. Of these 20 mines, data on total bond value was available for 13 mines, but needed to be estimated for seven mines (one IM mine and six NP mines). For the seven mines with missing data, EPA used the average bond value (weighted by the percent expected disturbed acres in the five year permit period) from the 24 IM and NP mines with available bond value, mine life, and expected disturbed acres data. The average bond value used for each of these seven mines was $49.5 million. EPA used the average percent expected disturbed acres in the five year permit period (31.6 percent) from the 24 IM and NP mines with complete data available for the 20 mines without disturbed acres and mine life data.

Table 4-6 presents the lower and upper estimates of annual bond savings in the Western Alkaline subcategory. The early release bond savings for the 26 mines with complete data are projected to range from $0.2 to $0.3 million when annualized at seven percent over the five year permit period. EPA estimates that early release bond savings for the remaining 20 mines without complete data ranges from $0.1 to $0.2 million. Projected bond savings for the entire subcategory total from $0.3 to $0.5 million. These estimated bond savings are about 2 percent less than the estimated bond savings calculated for the proposed rule. The difference in the two estimates is entirely attributable to lower expected disturbed acres per permit period in IM and NP mines.

Table 4-6: Estimated Savings from Early Phase 2 Bond Release

Region	Bond Value ($1,000)	Percent Expected Disturbance Acres per Permit Period	Phase 2 Bond Release ($1,000)	LOWER BOUND ESTIMATE ($3.75 per $1,000 surety bonds) Annual Surety Cost	PV of Early Phase 2 Bond Release ($1,000)	Annualized Value of Bond Release ($1,000)	UPPER BOUND ESTIMATE ($5.50 per $1,000 surety bonds) Annual Surety Cost	PV of Early Phase 2 Bond Release ($1,000)	Annualized Value of Bond Release ($1,000)
DSW	$6,198	83.3%	$1,291	$4,842	$10.1	$2.5	$7,102	$14.8	$3.6
DSW	$79,854	41.7%	$8,318	$31,193	$65.0	$15.9	$45,750	$95.4	$23.3
IM	$46,838	19.2%	$2,252	$8,444	$17.6	$4.3	$12,385	$25.8	$6.3
NP	$16,000	31.2%	$1,250	$4,688	$9.8	$2.4	$6,875	$14.3	$3.5
NP	$2,009	33.3%	$167	$628	$1.3	$0.3	$921	$1.9	$0.5
NP	$18,500	31.2%	$1,445	$5,420	$11.3	$2.8	$7,949	$16.6	$4.0
NP	$34,446	83.3%	$7,176	$26,911	$56.1	$13.7	$39,469	$82.3	$20.1
NP	$142,448	17.9%	$6,359	$23,847	$49.7	$12.1	$34,976	$72.9	$17.8
NP	$2,945	25.0%	$184	$690	$1.4	$0.4	$1,012	$2.1	$0.5
NP	$42,000	29.4%	$3,088	$11,581	$24.1	$5.9	$16,985	$35.4	$8.6
NP	$344	27.8%	$24	$90	$0.2	$0.0	$131	$0.3	$0.1
NP	$58,500	16.7%	$2,438	$9,141	$19.1	$4.6	$13,406	$27.9	$6.8
NP	$124,002	41.7%	$12,917	$48,438	$101.0	$24.6	$71,043	$148.1	$36.1
NP	$111,000	27.8%	$7,708	$28,906	$60.3	$14.7	$42,396	$88.4	$21.6
NP	$50,000	27.8%	$3,472	$13,021	$27.1	$6.6	$19,097	$39.8	$9.7
NP	$37,124	27.8%	$2,578	$9,668	$20.2	$4.9	$14,179	$29.6	$7.2
NP	$120,200	20.8%	$6,260	$23,477	$48.9	$11.9	$34,432	$71.8	$17.5

Table 4-6: Estimated Savings from Early Phase 2 Bond Release (continued)

				LOWER BOUND ESTIMATE ($3.75 per $1,000 surety bonds)			UPPER BOUND ESTIMATE ($5.50 per $1,000 surety bonds)		
Region	Bond Value ($1,000)	Percent Expected Disturbance Acres per Permit Period	Phase 2 Bond Release ($1,000)	Annual Surety Cost	PV of Early Phase 2 Bond Release ($1,000)	Annualized Value of Bond Release ($1,000)	Annual Surety Cost	PV of Early Phase 2 Bond Release ($1,000)	Annualized Value of Bond Release ($1,000)
NP	$46,857	35.7%	$4,184	$15,689	$32.7	$8.0	$23,010	$48.0	$11.7
NP	$50,026	35.7%	$4,467	$16,750	$34.9	$8.5	$24,566	$51.2	$12.5
NP	$61,037	55.6%	$8,477	$31,790	$66.3	$16.2	$46,625	$97.2	$23.7
NP	$3,800	17.9%	$170	$636	$1.3	$0.3	$933	$1.9	$0.5
NP	$47,297	33.3%	$3,941	$14,780	$30.8	$7.5	$21,678	$45.2	$11.0
NP	$149,388	20.0%	$7,469	$28,010	$58.4	$14.2	$41,082	$85.6	$20.9
NP	$27,943	41.7%	$2,911	$10,915	$22.8	$5.5	$16,009	$33.4	$8.1
NP	$24,950	41.7%	$2,599	$9,746	$20.3	$5.0	$14,294	$29.8	$7.3
NP	$58,425	15.6%	$2,282	$8,558	$17.8	$4.4	$12,552	$26.2	$6.4
Total, 26 mines with data available:						$197.2			$289.2
2 IM Mines without data:[1]						$12.5			$18.3
18 NP Mines without data:[2]						$132.2			$194.0
Total, 46 mines:						$341.9			$501.4

Expected Disturbance Acres calculated as projected disturbance acres divided by expected mine life, multiplied by 5 (permit period in years).
[1] Percent EDA estimated for 2 mines; bond value estimated for 1 mine.
[2] Percent EDA estimated for 18 mines; bond value estimated for 6 mines.

4.2.5 Total Compliance Costs for the Western Alkaline Coal Mining Subcategory

The estimated net savings in compliance costs associated with the new subcategory, considering the savings to mining operations in sediment control and bonding costs, is estimated to be approximately $12.8 million, as shown in Table 4-7.

Table 4-7: Annual Costs and Cost Savings for the Western Alkaline Coal Mining Subcategory

Incremental Modeling Costs	$327,000
Sediment Control Costs (Savings)	($12,721,000)
Earlier Phase 2 Bond Release (Savings)	($341,900 - $501,400)
Total Compliance Costs (Savings)	**($12,735,900 - $12,895,400)**

4.3 Summary of Compliance Costs

Table 4-8 summarizes EPA's estimates of the compliance costs and cost savings associated with the final rule. These costs are before-tax changes in costs incurred by the mine operations eligible for the two new subcategories.

Table 4-8: Summary of Estimated Annual Compliance Costs and Cost Savings

Remining Subcategory:		
•	Monitoring Costs	$133,500 - $193,500
•	Additional BMP Effort	$199,500 - $565,000
Subtotal		*$333,000 - $758,500*
Western Alkaline Coal Mining Subcategory		
•	Incremental Modeling Costs	$327,000
•	Sediment Control Costs (Savings)	($12,721,000)
•	Earlier Phase 2 Bond Release (Savings)	($341,900 - $501,400)
Subtotal		*($12,735,900 - $12,895,400)*
Total Compliance Costs (Net Savings)		***($12,402,900 - $12,136,900)***

Chapter 5

Industry Impacts

5.0 Introduction

This chapter presents EPA's analysis of the economic impacts to the coal mining industry as a result of compliance with the final rule. The analysis considers expected impacts on the profitability of coal mining projects at the mine and company level, and supports the Agency's findings about the economic achievability of the rule. EPA assessed the potential for significant industry-level changes in coal production, prices, and employment by comparing estimated costs, cost savings, and direct changes in employment under the final rule with current industry levels. This chapter also examines the potential impacts on small coal mining firms and on new sources, and assesses whether the final rule has the potential to create disproportionate impacts for these two categories.

5.1 Impacts of the Coal Remining Subcategory

5.1.1 Methodology

EPA is required to assess the economic achievability of effluent limitations guidelines and standards that are based on the best available technology (BAT) economically achievable. To assess the economic achievability of the requirements, EPA assesses the expected impacts on the profitability of the potentially affected facilities, the firms that own these facilities, and the directly-affected industry as a whole. Requirements that may result in significant numbers of facility or firm closures, or that may otherwise cause significant reductions in financial returns to the affected economic activities, may be deemed to be economically unachievable.

EPA believes that the selected option will not impact existing Rahall-type permits with established BPJ limitations. EPA believes that it may not be feasible for a remining operator to re-establish baseline pollutant levels during active remining. Therefore, EPA is considering an alternative where pre-existing discharges at these operations would remain subject to baseline pollutant levels established during the original permit application. For purposes of this economic analysis, EPA assumes that this alternative will apply. Thus, the final rule will not have any economic impacts on operations under existing Rahall-type permits. For new permits, remining operators will have the opportunity to assess the overall economic return of remining in compliance with the new requirements before investing at a remining site.

The final rule will encourage remining by reducing uncertainty about Clean Water Act requirements for remining sites. The rule will reduce uncertainty about the steps that must be taken for a permit to be approved in two ways: (1) by clarifying procedures to establish baseline conditions and monitor for compliance with permit requirements, and (2) by providing guidance on the use of BMPs in a pollution abatement plan to meet requirements of the new rule (see U.S. EPA, 2000d). EPA expects that the rule will create opportunities for profitable remining at additional AML sites, particularly those with pre-existing discharges.

The methods used to assess the economic achievability of the Coal Remining Subcategory differ from approaches EPA has used in analyses for other rules because EPA believes that these remining requirements will only affect new remining permits. Hence, information needed to quantify the economic impacts to industry in terms of facility closures or impacts to firm financial ratios is not available. Alternatively, EPA compared the potential added costs of the final requirements with the current price of coal produced from the Appalachian region to provide a measure of economic impacts. Where additional requirements imposed by the new subcategory represent only a small percentage of the price received for coal, EPA concludes that the new requirements will not have a significant economic impact on potential remining projects. EPA also evaluated the relative costs imposed on mines owned by small entities to assess the potential for differential impacts.

5.1.2 Results

EPA expects that the final rule will create increased economic incentives for remining by increasing the expected returns to remining sites with pre-existing discharges. The use of standard procedures to characterize baseline conditions and demonstrate compliance, and EPA's guidance on the use and performance of BMPs (see U.S. EPA, 2000d) will reduce the uncertainties associated with remining sites containing pre-existing discharges. Currently, companies in some states face substantial uncertainty about permit requirements, and about their ability to demonstrate compliance with Rahall requirements for pre-existing discharges. Profit-maximizing investors require higher expected returns to justify the additional risk of investments with uncertain outcomes. Therefore, some sites that would otherwise provide acceptable returns to remining, if not subject to uncertainty, are not currently remined. Based on Pennsylvania's experience with its standardized remining permit program, EPA expects the reduced uncertainty provided by the final rule to make additional sites with pre-existing discharges attractive for remining investments.

As discussed in Chapter 4, the only potential costs imposed by the final subcategory are: (1) costs associated with additional monitoring where the new requirements exceed current state requirements for Rahall permits; and (2) potential costs associated with implementing the required pollution abatement plan (i.e., additional BMP requirements beyond what is included in a SMCRA-approved pollution abatement plan at some sites). The following sections compare these additional costs with the average price of Appalachian coal as a basis for assessing the economic impacts of these requirements.

Impact of Additional Monitoring Costs

An analysis by the Department of Energy of potential remining sites estimated an average coal recovery of between 2,300 and 3,300 ton per acre of remined land (Veil, 1993). At these coal recovery rates, the estimated steady state annual increase in acres being remined would produce between 7.1 and 14.5 million tons of coal per year. This represents only 1.5 to 3.1 percent of total 1997 Appalachian coal production of 468 million tons. Table 5-1 shows the estimated annual incremental monitoring costs per ton of coal from remining sites for the states that have the potential to require increased monitoring.

Table 5-1: Impact of Increased Annual Monitoring Costs Per Ton of Coal Mined

	Annual Monitoring Costs *	Acreage in Remining per Year **	Tons of Coal Produced***	Average Monitoring Cost per Ton
IN	$55,104	211	485,300	$0.11
KY	$9,024	276	634,800	$0.01
OH	$37,600	3,183	7,320,900	$0.01
TN	$91,840	391	899,300	$0.10
Total	$193,568	4,061	9,340,300	$0.02

* Table 4-2, high estimate.
** Table 3-1, high estimate.
*** Based on an average 2,300 tons of coal recovered per acre remined, the low end of the range estimated by DOE (2,300 - 3,000 tons per acre). See Veil, 1993.

Because the estimates shown in Table 5-1 are based on the highest compliance monitoring cost estimates and the low-end estimates of tonnage of coal produced, they represent an upper-bound estimate of the economic impacts.

Under these worst-case assumptions, additional monitoring costs could represent as much as $0.10 to $0.11 per ton remined, due primarily to the very conservative assumptions used to estimate incremental monitoring costs for Indiana and Tennessee.[12] However, even these worst-case estimates represent less than one-half of one percent of the 1997 average price of $26.55 per ton of coal mined in the Appalachian region (DOE/EIA, 1997). These findings suggest that the incremental monitoring requirements will not deter investments in remining projects.

Impact of Pollution Abatement Plan Costs

As discussed in Chapter 4, EPA believes that the requirements for the pollution abatement plan will be satisfied by an approved SMCRA plan. However, EPA recognizes that additional BMP costs may be

[12] EPA did not have data on existing monitoring requirements for these states because their remining operations do not incorporate Rahall provisions. EPA conservatively estimated incremental costs based on: 12 baseline samples; 12 compliance monitoring samples per year for five years; and four new flow weirs per site.

incurred under some new remining permits, potentially reducing expected returns on investments. EPA's high estimate of additional BMP costs assumes that 438 acres per year would require additional alkaline materials, at an annual cost of $565,000. If these acres produced 1,074,000 tons of coal per year (assuming the low-end DOE estimate of 2,300 tons per acre in Veil, 1993), the additional BMP costs would represent only 5.6 cents per ton of coal recovered. This added cost represents only two-tenths of one percent of the 1997 average price of $26.55 per ton of coal mined in the Appalachian region (DOE/EIA, 1997). These additional BMPs would be required by NPDES permit writers only where necessary to meet Clean Water Act requirements. Any additional BMPs required will be site-specific, with economic achievability considered in BPJ determination.

EPA recognizes that some of the existing AML sites may not be profitable to remine, either under current conditions or under the final rule requirements. However, new remining operators will have the opportunity to choose among potential remining sites, and will only select sites that they believe are economically achievable to remine.

5.1.3 Impacts on Small Firms

The Regulatory Flexibility Act as Amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA) generally requires an agency to prepare a regulatory flexibility analysis for any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. An agency may certify that a rule will not have a significant economic impact on a substantial number of small entities if the rule relieves regulatory burden, or otherwise has a positive effect on all small entities subject to the rule.

For purposes of this analysis, small entity is defined as: (1) a small business that has 500 or fewer employees (based on SBA size standards); (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population less than 50,000; or (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

As discussed in Chapter 1, the current regulations at 40 CFR 434 create a disincentive for remining by imposing limitations on pre-existing discharges for which compliance is cost prohibitive. Despite the statutory authority provided by the Rahall Amendment, coal mining companies and states remain hesitant to pursue remining without formal EPA guidelines. The final Coal Remining Subcategory provides standardized procedures for developing effluent limits for pre-existing discharges, thereby reducing the uncertainty involved in interpreting and implementing current Rahall requirements. The new subcategory is intended to remove barriers to the permitting of remining sites with pre-existing discharges, and is therefore expected to encourage remining activities by small entities. Thus, the Agency concludes that the new subcategory will relieve regulatory burden for all small entities and thereby certifies that the final subcategory rule will not have a significant economic impact on a substantial number of small entities.

Furthermore, EPA believes that the new subcategory is likely to create opportunities for small firms. As described in EPA's *Coal Remining and Western Alkaline Mining: Economic and Environmental Profile* (U.S. EPA, 1999e), 95 percent of the firms owning coal mines in the Appalachian states are small firms as defined by the Small Business Administration (firms with 500 or fewer employees). Furthermore, these small firms own an estimated 74 percent of the coal mines in the Appalachian region. It is likely that firms applying for new remining permits will be similar to, or the same as, those already active in the region. According to an OSM source, "Quite likely, most remining related reclamation activities will be economically feasible now and in the future only for small coal operators or, alternately, where the AML are located adjacent to previously unmined lands containing coal" (U.S. DOI, undated). This is because many of the available remining locations are within fragmented and relatively small sites. While small firms may be more likely than large firms to apply for permits under the new subcategory, the final rule itself does not create any particular advantage for small or large firms. The incremental compliance costs are likely to vary with the size and complexity of the remining site, but not with firm size per se.

5.2 Impacts of the Western Alkaline Coal Mining Subcategory

5.2.1 Methodology

EPA developed estimates of expected annual costs and savings associated with the Western Alkaline Coal Mining Subcategory as discussed in Chapter 4. Since the subcategory results in net cost savings to existing mine operations, it is inherently economically achievable. Nonetheless, EPA estimated changes in labor requirements attributed to the rule and examined potential impacts on coal prices. It is important to note that there is significant variability in EPA's estimates for individual mine operations. The estimates rely on extrapolating from model mine results using a variety of assumptions about the timing and pace of reclamation and bond release at each site. In reality, many of the variables that affect employment and cost savings differ significantly among individual mining operations. Nonetheless, the calculations provide some indication of the potential economic impacts of the rule on western alkaline coal mines.

5.2.2 Results

As discussed in Chapter 1, EPA is setting BPT, BAT, and NSPS limitations that have an equivalent technical basis for the Western Alkaline Coal Mining Subcategory. EPA concludes that nearly all economic impacts are positive and finds the new subcategory to be a cost savings to the industry and thus, economically achievable. Because reclamation costs under the rule will be less than or equal to those under the existing effluent guidelines for all individual operators (thus, to the subcategory as a whole), no facility closures or direct job losses associated with post-compliance closure are expected. However, EPA did estimate potential changes in labor requirements attributable to the rule caused by changes in labor hours associated with the types of erosion and sediment control structures used.

EPA based its estimates of changes in labor requirements on the detailed cost estimates developed for the three model mines by the WCMWG (1999, 2001). For a 380-acre model mine in the DSW region, approximately 2.2 fewer full time equivalent employees (FTEs) over ten years are needed under the final rule compared to the current guidelines. In model mines of similar size, labor savings in the IM region model mine total 0.9 FTEs over 10 years, while 1.1 fewer FTEs are needed in the NP region model mine over the same time period.

It is important to note that the estimated net reduction in labor hours at each model mine are the sum of a relatively small number of reductions in hours distributed over many different jobs and different reclamation years. For example, the expected net reduction of approximately 1,800 labor hours over 10 years at the IM model mine is attributable to changes in design hours required in year 1, equipment operator, supervisory, and construction labor hours to build the sediment pond in year 1, clean the pond in year 5, and remove it in year 10, periodic sampling by environmental technicians, and periodic inspection by engineers — to mention just a few line items. Because the reduced hours are spread over many jobs in different years, these results cannot be interpreted simply as one FTE lost over 10 years.

Dividing the FTE reduction for each model mine by the 10-year project life results in an estimated annual reduction of 0.22 FTE at the DSW model mine, 0.11 FTE at the NP model mine, and 0.09 FTE at the IM model mine. Scaling the model mine reductions in FTE to each mine in the appropriate region results in an estimated annual reduction of 5.2 FTEs in the 46 Western Alkaline surface mines. This represents less than 0.1 percent of total 1997 coal mine employment (6,862 FTEs) in the western alkaline region states.

The cost savings associated with the final rule are not expected to have a substantial impact on the industry average cost of mining per ton of coal, and are therefore not expected to have a major impact on coal prices. While the savings are substantial in aggregate (and for some individual mine operators), on average the savings represent a small portion of the total value of coal produced by the affected mines. Table 5-2 compares the estimated cost savings with the value of current annual production for 25 surface mines with sufficient information available to estimate sediment control and bond release savings, as well as having annual production and value of production data available. Table 5-2 also provides the estimated cost savings relative to production and value of production for 19 mines which do not have complete data available, and presents overall estimates based on the 44 mine total.[13] On average, the overall estimated cost savings are 3 cents per ton, about 0.4 percent of the value of production. In addition, note that value of production reflects the value of coal at the mine head. Transportation costs of coal, especially from the Western Alkaline region to Midwestern utilities and other consumers, are significant and the estimated savings as a percent of delivered coal price will be smaller than 0.4 percent. Thus, as with the Coal Remining Subcategory, the Western Alkaline Coal Mining Subcategory is not expected to result in significant industry-level changes in coal production or prices.

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[13] One IM and one NP region mine did not have production or value of production available.

Table 5-2: Estimated Savings to Western Alkaline Surface Mines per Ton Produced and as Percent of Value of Production, Selected Mines

Region	Production (1,000 tons)	Value of Production ($1,000)[1]	Estimated Annual Cost[2] ($1,000)	Annual Savings per Ton Produced	Annual Savings as Percent of Value of Production
DSW	4,634	$116,638	$2,125.4	$0.46	1.82%
DSW	7,090	$178,455	$2,417.5	$0.34	1.35%
IM	4,402	$26,412	$104.8	$0.02	0.40%
NP	2,002	$36,957	$246.5	$0.12	0.67%
NP	9,015	$88,708	$170.2	$0.02	0.19%
NP	330	$3,333	$27.4	$0.08	0.82%
NP	4,200	$37,800	$157.1	$0.04	0.42%
NP	2,375	$51,846	$71.6	$0.03	0.14%
NP	8,200	$213,200	$395.5	$0.05	0.19%
NP	5,544	$102,342	$150.0	$0.03	0.15%
NP	4,335	$42,656	$68.3	$0.02	0.16%
NP	4,900	$106,967	$238.3	$0.05	0.22%
NP	6,607	$144,231	$264.3	$0.04	0.18%
NP	11,700	$115,128	$204.1	$0.02	0.18%
NP	3,242	$19,452	$46.4	$0.01	0.24%
NP	13,559	$81,354	$183.5	$0.01	0.23%
NP	27,113	$162,678	$347.1	$0.01	0.21%
NP	500	$3,000	$190.1	$0.38	6.34%
NP	14,681	$88,086	$302.3	$0.02	0.34%
NP	13,324	$79,944	$331.4	$0.02	0.41%
NP	50,000	$300,000	$327.9	$0.01	0.11%
NP	1,005	$6,030	$42.0	$0.04	0.70%
NP	600	$3,600	$303.5	$0.51	8.43%
NP	6,231	$37,386	$275.1	$0.04	0.74%
NP	4,072	$88,892	$221.4	$0.05	0.25%
Total, 25 mines[3]	209,661	$2,135,095	$9,211.7	NA	NA
Average	8,386	$85,404	$368.5	$0.044	0.43%
Total, 19 mines[4]	187,667	$1,193,760	$3,714.3	NA	NA
Average	9,877	$62,829	$195.5	$0.020	0.31%
Total, 44 mines[5]	397,328	$3,328,855	$12,925.9	NA	NA
Average	9,030	$75,656	$293.8	$0.033	0.39%

[1] Mine production multiplied by the average value per ton of coal sold in the state in which the mine is located. Where state values are unavailable, EPA used the western region average value (see *Economic Profile*, U.S. EPA, 1999e).
[2] Estimated annual reclamation cost savings plus midpoint of early Phase 2 bond release savings.
[3] Mines with complete production, acreage, and bond value data available.
[4] Mines for which at least one of the following was estimated: production, acreage, bond value.
[5] Production and value of production data is unavailable for one IM and one NP mine.

5.2.3 Impacts on Small Firms

The Regulatory Flexibility Act as Amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA) generally requires an agency to prepare a regulatory flexibility analysis for any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. For the purpose of this analysis, small entity is defined as: (1) a small business that has 500 or fewer employees (based on SBA size standards); (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population less than 50,000; or (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

In determining whether a rule has significant economic impact on a substantial number of small entities, the impact of concern is any significant adverse economic impact on small entities, since the primary purpose of the regulatory flexibility analysis is to identify and address regulatory alternatives "which minimize any significant economic impact of the final rule on small entities" (5 U.S.C. sections 603 and 604). Thus, an agency may certify that a rule will not have a significant economic impact on a substantial number of small entities if the rule relieves regulatory burden, or otherwise has a positive economic effect on all of the small entities subject to the rule.

EPA projects that the final rule will result in cost savings for all small surface mining operators. For all small underground mine operators, EPA projects no incremental costs, and the Agency believes that many are likely to experience some cost savings. Chapter 4 discusses the likely cost savings associated with the subcategory in more detail. Thus, the Agency concludes that the final rule will not have a significant economic impact on a substantial number of small entities.

5.2.4 Impacts on New Sources

EPA is setting NSPS limitations equivalent to the limitations for BPT and BAT for the subcategory. In general, EPA believes that new sources will be able to comply at costs that are similar to or less than the costs for existing sources, because new sources can apply control technologies more efficiently than sources that need to retrofit for those technologies. In this case, new sources would be able to avoid costs associated with installing sedimentation ponds. There is nothing about the final rule that would give existing operators a cost advantage over new mine operators; therefore, NSPS limitations will not present a barrier to entry for new facilities.

Chapter 6

Additional Economic Impacts

6.0 Introduction

This chapter discusses three additional categories of potential economic impacts attributed to the final rule. The chapter first estimates costs that may be incurred by NPDES permitting authorities to review permit applications under the final rule. The chapter then discusses potential impacts on communities (due to potential impacts on employment), and potential foreign trade impacts.

6.1 Costs to the NPDES Permitting Authority

Additional costs will be incurred by the NPDES permitting authority to review new permit applications and issue revised permits based on the final rule. Reviewers will incur additional costs because permit applications under the final rule will require more time to review than would an existing permit on the five-year review cycle. Under the final rule, NPDES permitting authorities will review baseline monitoring results and pollution abatement plans for the Coal Remining Subcategory, and watershed modeling results and sediment control plans for the Western Alkaline Coal Mining Subcategory.

EPA estimates that permit review will require an average of 35 hours of a permit writer's time per site. This includes 25 hours per plan review (based on OSM's estimated SMCRA burden for review of reclamation plans) plus 10 hours per plan for NPDES permit preparation. EPA assumes that permit writers receive an hourly wage of $31.68. The average annual salary rate reported by the U.S. Department of Labor for state and local government employees is $41,185, or $19.80 per hour for 2,080 available labor hours per year. EPA estimates that overhead costs for state and local government employees are 60 percent of the direct labor cost. The total loaded hourly rate is therefore $31.68 (1.6*$19.80). At this rate, each permit would cost $1,109.[14]

Based on these assumptions, total annual costs to the NPDES permitting authorities range from $47,500 to $67,500 for the 43 to 61 additional sites expected to be permitted each year under the final Coal Remining Subcategory.[15] An upper bound estimate of costs associated with implementing the final Western Alkaline Coal Mining Subcategory assumes that all 46 existing surface mine permits are renewed at one time. The total incremental annual cost would be $12,500 when annualized over the 5-year permit life. Total incremental NPDES permit review costs for the final rule are therefore estimated to be between $60,000 and $80,000 per year.

6.2 Community Impacts

6.2.1 Regional Competitiveness

The final rule could have community-level and regional impacts if it significantly altered the competitive position of coal produced in different regions of the country, or led to growth or reductions in employment in different regions and communities. As described in Chapter 3, there has been a long-term trend toward higher production in the West and a decline in coal employment in the Appalachian region.

EPA examined the potential impact of the proposed guidelines on the competitiveness of coal production in the East relative to coal production in the West. First, revised cost savings estimates for Western Alkaline subcategory surface mines total $12.8 million per year (reclamation cost savings plus the midpoint of early Phase 2 bond release savings). The revised estimated cost savings comprise an average

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[14] The estimated number of hours required per permit and the average hourly rate for staff review are consistent with those used in the ICR for the proposed rule (U.S. EPA, 2000b).

[15] Remining estimates were based on the annual number of permits reviewed; hence, costs did not need to be annualized.

of about $0.03 saved per ton of coal produced in Western Alkaline surface mines (397 million tons per year), or about 0.4 percent of the value of coal production ($3.3 billion).

Second, based on Energy Information Administration (EIA) data, either Eastern or Western coal tends to dominate regional coal markets; direct competition appears to occur in only a handful of states. Thus, Eastern coal producers provide almost 100 percent of coal to the New England, Middle Atlantic and South Atlantic Census Divisions. Western states dominate the coal market in the West North Central, Mountain, and Pacific Census Divisions. In eight states Western coal has a market share greater than 20 percent but less than 80 percent: Alabama, Illinois, Indiana, Louisiana, Michigan, Mississippi, Tennessee and Texas. In four of these states, Alabama, Illinois, Louisiana, and Texas the competition lies primarily between coal produced within the state and Western coal (i.e., in Texas almost all coal purchased is produced either in Texas or in Western states). In Indiana, Michigan, Mississippi, and Tennessee significant competition exists from out-of-state, non-western coal producers. This geographic pattern of competition emphasizes the importance of transportation costs in the coal market.

Third, due to transportation costs, the delivered price of coal in these “competitive” states is much higher than the Western minehead price. EPA estimated the average minehead price for affected Western Alkaline surface mines as $8.34 per ton. Based on EIA data, the average price of coal delivered to electric utilities in the eight “competitive” states was $25.51 per ton in 1998 (electric utilities accounted for over 90 percent of U.S. coal usage in 1998). Thus, while the $0.03 savings per ton represents 0.4 percent of the average minehead price, it comprises a much smaller 0.13 percent of the average delivered price in the eight “competitive” states.

Fourth, EIA data indicates that the average cost of rail transportation from Western to Central states is approximately $0.00912 per ton-mile. This suggests that under the proposed guidelines Western mines can ship their coal about four additional miles and maintain the same delivered price attained under the current guidelines.

The relatively small percentage decrease in delivered price, combined with the effect of transportation costs suggest that the impact of the savings on the relative competitiveness of Eastern and Western coal should be very small. Finally, note that while Western Alkaline surface mines account for perhaps 80 percent of total Western coal production, a significant percentage of Western coal production will not achieve these cost savings. EPA therefore concludes that the final rule is not likely to have significant impacts on relative coal production in the West versus the East.

The new Coal Remining Subcategory may shift the location of production and employment toward eligible abandoned mine lands, but is not likely to increase national coal production or affect coal prices significantly overall. Furthermore, the projected cost savings to western mine operators do not represent a large portion of the value of western coal production, and therefore are not likely to result in a significant change in the relative cost advantage of western verses eastern production.

6.2.2 Regional Employment

EPA projects that impacts of the final rule on coal mine employment will also be minor. Increased remining might create new employment opportunities in some locations. If total coal production from remining sites were to increase by the estimated 1.2 to 2.9 percent, employment in the affected regions could also experience similar increases. However, it is possible that much of the increase in coal production from remining will displace production elsewhere, with offsetting decreases in employment at other locations. The new subcategory may shift the location of production and employment toward eligible abandoned mine lands, but is not likely to increase coal production and employment or affect coal prices significantly overall.

As discussed in Chapter 5, EPA estimated a reduction in labor requirements of 5.2 FTEs per year for the final Western Alkaline Coal Mining Subcategory by extrapolating from the model mine results. This represents less than 0.1 percent of the 6,862 total 1997 coal mine employment in the western alkaline region states. Regional multipliers relating total direct and indirect employment to coal industry employment range from 2.6 to 3.2 for the western alkaline states (U.S. Bureau of Economic Analysis, RIMSII). The estimated annual 5.2 FTE direct mine job losses would result in an additional 8.7 FTE indirect job losses based on RIMSII regional employment multipliers. Thus, FTE losses, both direct and indirect, resulting from the projected reclamation cost savings will total 13.9 jobs. This ignores any potential positive employment impact resulting from increased output due to lower production costs.

6.3 Foreign Trade Impacts

EPA does not expect any foreign trade impacts as a result of the final rule. U.S. coal exports consist primarily of Appalachian bituminous coal, especially from West Virginia, Virginia and Kentucky. Coal imports to the U.S. are insignificant (DOE/EIA, 1995; DOE/EIA, 1997). The final rule could encourage additional exports, with a positive impact on the U.S. balance of trade, if coal from expanded remining in the Appalachian region found markets overseas. Impacts are difficult to predict, however, since coal exports are determined by economic conditions in foreign markets and changes in the international exchange rate for the U.S. dollar. The impacts on foreign trade are likely to be small, given the relatively small projected increase in production from increased remining.

Chapter 7

Cost-Effectiveness

Cost-effectiveness calculations are used during the development of effluent limitations guidelines and standards to compare the efficiency of regulatory options in removing toxic and non-conventional pollutants. Cost-effectiveness is calculated as the incremental annual cost of a pollution control option per incremental pollutant removal. The increments are considered relative to another option or to a benchmark, such as existing treatment. In cost-effectiveness analysis, pollutant removals are measured in toxicity normalized units called “pounds-equivalent.” The cost-effectiveness value, therefore, represents the unit cost of removing an additional pound-equivalent of pollutants. In general, the lower the cost-effectiveness value, the more cost-efficient the regulation will be in removing pollutants, taking into account their toxicity. While not required by the Clean Water Act, cost-effectiveness analysis is a useful tool for evaluating regulatory options for the removal of toxic pollutants.

While cost-effectiveness results are usually reported with the economic analysis for effluent guidelines, such results are not presented in this report because of the nature of the two subcategories. For the Coal Remining Subcategory, EPA is unable to predict pollutant reductions that would be achieved at future remining operations. It is difficult to project the results, in terms of measured improvements in pollutant discharges, that will be produced through the application of any given BMP or group of BMPs at a particular site. EPA is therefore unable to calculate cost-effectiveness. For the Western Alkaline Coal Mining Subcategory, cost-effectiveness was not calculated because there are no incremental costs attributed to the new requirements.

Chapter 8

Environmental Impacts and Benefits

8.0 Introduction

EPA analyzed the adverse environmental impacts of current practices as a basis for assessing the incremental environmental impacts of the final rule. These baseline impacts were discussed previously in the EA. This chapter describes the methodologies EPA used to assess the environmental improvements that will result from implementation of the final rule. EPA was able to quantify these environmental improvements for some categories of benefits, and estimate their value using benefits transfer techniques described below.

The analyses summarized in this chapter are described in detail in *Benefits Assessment of Proposed Effluent Limitations Guidelines and Standards for the Coal Mining Industry: Remining and Western Alkaline Subcategories* (hereafter referred to as the "Benefits Assessment"; U.S. EPA, 2000a).

8.1 Coal Remining Subcategory

8.1.1 Environmental Impacts of Abandoned Mine Lands

Appalachia has been the site of substantial coal mining historically, and much of this mining took place before passage of laws regulating the environmental impacts of coal mining. The result is an environmental legacy that includes more than a million acres of abandoned mine lands (AML). AMLs are associated with a wide range of public health and safety problems and aesthetic degradation, including abandoned mine openings, highwalls, unstable spoil piles, and hazardous water bodies. In addition, acid mine drainage (AMD) from AML causes serious water quality problems. AMD is highly acidic, and may contain high levels of dissolved metals or salts. Common AMD contaminants include total suspended solids (TSS), iron (Fe), manganese (Mn), and aluminum (Al). AMD may contaminate groundwater and/or run off directly into adjacent streams or creeks.

Acidity from AMD influences chemical reactions in receiving streams. Some of these reactions increase the toxicity of other pollutants. For example, aluminum in combination with low pH can exacerbate the toxicity of aluminum alone and therefore represent an additional stress to aquatic receptors. Other reactions result in aesthetic degradation of the surface water. Dissolved iron can coat banks and stream bottoms with a rusty, brownish-red discoloration. Iron and aluminum oxides will precipitate out of solution at higher pHs and can make the water cloudy or cover the stream bottom with a layer of colloidal material. Such conditions are unaesthetic.

Acidity alone or in combination with high levels of metals, dissolved solids, and suspended solids affects sensitive life stages of fish and invertebrate species. The most sensitive vertebrate and invertebrate species die off at pH between 6.0 and 6.5. Most fish species are eliminated when pH reaches 5.0, and only a few can survive at pH 4.5. Over time, the diversity of the aquatic communities may decrease downstream from AMD discharges.

8.1.2 Impacts of Remining on Environmental Quality

EPA's benefits analysis included an evaluation of the environmental impacts of remining best management practices on land and water resources using data contained in EPA's Coal Remining Database (U.S. EPA, 1999a). EPA used only those mines that had both baseline and active remining or post-remining (post-baseline) data to assess the potential impacts of remining BMPs on water quality. Complete information on mine discharges was available for 13 mines. These 13 mines were associated with 42 pre-existing discharges. In addition, EPA used information on 105 remining permits issued for the bituminous region in Pennsylvania to assess benefits from improved landscape quality and enhanced public safety stemming from remining and subsequent reclamation of AML (Hawkins, 1995).

EPA performed statistical analyses to evaluate the effect of remining on water quality at the 13 remining sites for which sufficient water quality information was available.[16] Approximately 24 to 38 percent showed a statistically significant decrease in pollutant levels for acidity, total aluminum, total iron, and sulfate. Flow significantly decreased for 35 percent of the post-baseline observations. The mine locations examined in this analysis are active remining operations, and decreases in pollutant levels are expected to become more significant with time.

EPA compared findings from the analysis with those from a Pennsylvania study of remining sites. The Pennsylvania Remining Site Study of 112 closed remining sites is summarized in EPA's *Coal Remining Best Management Practices Guidance Manual* (U.S. EPA, 2000d). The Pennsylvania study focused on sites that had been reclaimed to at least Stage II bond release, and therefore reflects the effects of BMPs more fully than the EPA's analysis. The Pennsylvania study found significant decreases or elimination of levels for acidity, total iron, total manganese, and total aluminum in 44 percent, 42 percent, 41 percent, and 38 percent respectively, of the pre-existing discharges monitored.

EPA identified three broad categories of potential benefits from increased remining: (1) improvements in human health and public safety; (2) ecological benefits; and (3) economic productivity benefits. Remining can generate human health benefits by reducing the risk of injury at AML sites and reducing discharge of acid mine drainage to waterways from which water is taken for human consumption. However, the human health benefits associated with consumption of water and organisms taken from the water bodies affected by AMD are unlikely to be significant because: (1) most acid mine drainage constituents are not bioaccumulative, and therefore adverse health effects associated with fish consumption are not expected;[17] and (2) public drinking water sources are treated for most acid mine drainage constituents that are associated with adverse health effects.[18] Improving public safety is a significant benefit of

[16] The complete list of statistical results are provided in Appendix B of the Benefits Assessment (U.S. EPA, 2000a).

[17] One constituent, aluminum, has a potential to bioaccumulate in aquatic biota. However, EPA has established oral RfDs for aluminum phosphide only; no RfDs for other aluminum compounds (i.e., aluminum compounds found in AMD) are available.

[18] A secondary drinking water standard is set for sulfate, which is not enforceable. (See Table A-4 of Appendix A to U.S. EPA, 2000a.) Recent health studies indicate that sulfate may cause diarrhea. Epidemiological data are not conclusive, however.

remining. Eliminating safety hazards by closing abandoned mine openings, regrading highwalls, stabilizing unstable spoils, and removing hazardous water bodies potentially prevents injuries and saves lives.

Remining and the associated reclamation of AML is expected to generate ecological and recreational benefits by improving terrestrial wildlife habitat and reducing pollutant concentrations below levels that adversely affect aquatic biota. Remining is also likely to improve the aesthetic quality of land and water resources. Finally, remining and reclamation of AML sites may result in several economic productivity benefits, including reduced drinking water treatment costs and enhanced commercial potential of the affected areas.

8.1.3 Methodology for Estimating Benefits

EPA was able to quantify some of the benefits expected from increased remining, and was able to monetize some of the quantified benefits using benefits transfer techniques. Benefits transfer involves use of the results of previous benefits analyses that estimate consumers' willingness to pay (WTP) for various improvements in environmental quality. EPA applied WTP values from previous studies of similar environmental improvements to estimate the value of improved environmental conditions at remining sites under the final rule. EPA reviewed six candidate studies to support valuation of recreational use, passive use, and drinking water treatment benefits at remining sites, and selected two of the studies for use in this analysis.[19]

The first is a study of surface mine reclamation in Appalachia by Randall et al. (1978). The study estimates the total annual value of environmental damage and the present value of water-related damage from disturbing land for coal mining. For analyzing impacts of the final rule, EPA assumes that the benefits from AML reclamation can be equated to the value of reversing environmental damages from disturbing land surfaces. EPA used a study by Feather et al. (1999) to assess various categories of land-related benefits from remining. The study focuses on improved recreational opportunities for hunting and nature viewing due to preservation of wildlife habitats.

[19] The studies reviewed by EPA and the criteria used to select studies for the benefits transfer analysis are described in the Benefits Assessment document (U.S. EPA, 2000a).

EPA estimated the total monetary value of ecological benefits from remining by summing over each benefit category from Randall et al. (1978) and Feather et al. (1999) deemed applicable to remining. Based on these studies, benefits associated with reclamation of AML sites are estimated as follows:

- *Estimate the percentage of additional acres expected to experience significant decreases in AMD pollutant levels*. EPA estimates that from 38 to 44 percent of AML acres affected by remining would experience significant decreases in AMD pollutant levels. Thus, 667 to 1,115 of the projected 1,773 to 2,512 additional AML acres reclaimed per year will experience significant decreases in AMD pollutant levels. In-stream water quality improvements are assumed to occur as a result of decreases in pollutant levels.

- *Estimate benefit values using benefits transfer techniques*. EPA applied WTP values from the two studies to estimate the value of the environmental improvements expected to result from the new subcategory.

- *Estimate the annual monetized environmental benefits.* To estimate total annual benefits, the Agency calculated the present value of the stream of environmental benefits from AML sites beginning remining each year. EPA assumes that annualized benefits from remining begin to occur five years after permit issuance and are calculated for a five year period.

8.1.4 Results

Human Health Benefits

In addition to the monetized benefits described above, the increase in remining is projected to result in the removal of some 216,000 to 307,000 feet of highwall each year. It is clear that AMLs are dangerous sites and that the remining rule will result in benefits from making these sites more safe. For example, there are 305 AML problem areas in Pennsylvania where injury, death, accident, or damage to property has been recorded (PA DEP, 1997). Ten deaths have been recorded since 1952 at the Muddy Creek AML area (U.S. DOI, 1998a) alone. However, although anecdotal evidence of the hazardous nature of AML is available, EPA was unable to find systematic, reliable data to evaluate the decreased risk of serious injury or death resulting from remining safety improvement. Had EPA been able to estimate the reduction in the rate of accidents at AML sites attributable to the remining rule, the number of lives saved annually would have been evaluated using the concept of the value of a statistical life (VSL). VSL measures willingness to pay for a small reduction in the risk of premature death. Most estimates of VSL range from $3 million to $9 million (Viscusi, 2000).

Water-Related Benefits

Randall et al. (1978) analyzed the environmental damage from coal mining for a study area that experienced both surface and underground mining. The regional population of the study area is about 80,000 persons, with socioeconomic characteristics typical of the central Appalachian coal region (i.e., incomes are lower and families are larger than the national average). The study identifies and estimates five mutually exclusive categories of environmental damage associated with coal mining. EPA determined that three of the damage categories were not directly applicable to remining. Therefore, EPA based the value of water-related benefits for remining on the two remaining damage categories:[20]

- Degradation of life-support systems for fish, wildlife, and recreation resources. The study estimated recreational losses due to degradation of water quality for three recreational activities -- fishing, boating, and swimming. First, the study estimated the reduction in recreational use (days lost) of the affected water resources due to water quality impairment. Then, the value of the recreation lost was estimated based on the user day values (derived from a recreational demand model). In addition, regional fishing losses were quantified based on an annual cost of fish replacement (i.e., the cost of purchasing fish and restocking streams). The total recreational losses were estimated by summing over the estimates of fish replacement cost and lost recreation values. This yielded an estimate of $37 per acre per year.

- Aesthetic damages to landscape and water. Aesthetic damages to water result from increased stream siltation and discoloration of water by AMD. Aesthetic damages to the landscape occur due to "drastic landscape modifications including exposed highwalls, flat benches, mountaintop removal, and soil deposits." Individual willingness to pay (WTP) for improved aesthetic quality of landscape and water are derived from a contingent valuation study. Based on the regional WTP for aesthetic improvements, the estimated value of aesthetic damages from mining one acre of land is $140 per year.

[20] All study values were adjusted to 1998 dollars based on the relative change in the Consumer Price Index from 1976 to 1998 (2.89) and rounded to the nearest dollar.

Land-Related Benefits

Restoring the surface area at AML sites by removing mine shaft openings, refuse piles, and highwalls and by vegetating surface areas will enhance sites' appearance and improve wildlife habitats. Improvements in wildlife habitats will increase species abundance and diversity by improving species productivity and survivability. These changes are likely to increase the value of land for post-remining uses. Among the post-reclamation uses reported for past mining areas are wildlife habitat, hunting preserves, pasture/hayland, public park and open space for community use (Smith and Bridger, 1998). An increase in the number and diversity of wildlife species, improved aesthetic quality, and availability of recreation amenities (e.g., state parks) will enhance recreational activities such as hunting, wildlife viewing, biking, hiking, and photography.

A recent study by Feather et al. (1999) develops a recreational demand model for pheasant hunting and wildlife viewing, where demand is modeled as a function of landscape characteristics, including measures of the level of undisturbed surface, forest land, landscape diversity, and urbanization.[21] Based on findings from this study, the annual per acre recreational values resulting from open space preservation are:

- Improved pheasant hunting:
  The North Eastern Region (PA, DE, MD, and OH) — $7.24
  The South Eastern Region (WV, VA, KY, and TN) — N/A[22]

- Enhanced wildlife viewing:
  The North Eastern Region (PA, DE, MD, and OH) — $41.11
  The South Eastern Region (WV, VA, KY, and TN) — $1.54.[23]

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[21] The study used data form the National Survey of Fishing, Hunting, and Wildlife Associate Recreation. The FHWAR survey collected information on demographic characteristics and recreation behavior using a nationwide sample of 50,000 individuals.

[22] Not applicable. Only negligible pheasant hunting occurs in these regions.

[23] The disparity in the wildlife viewing values is likely to result from the difference in the presence of wildlife conservation areas, various intensities of recreation that occur in each region, and different population density.

The Coal Remining Subcategory is expected to provide incentives for remining in the North Eastern and South Eastern region states. EPA estimates an aggregate land-based benefit value of $28 per acre per year (the sum of the average enhanced wildlife viewing value of $21 and the improved pheasant hunting value of $7 for the North Eastern region).

Nonuse Benefits

Individuals who never visit or otherwise use a natural resource may nevertheless be affected by changes in its status or quality. Empirical estimates indicate that such "nonuse value" may be substantial for some resources (Harpman, 1993; Fisher and Raucher, 1984; Bergstrom, 1993). Because nonuse value is a sizable component of the total economic value of water resources, EPA estimated changes in nonuse values for water quality using a rule of thumb developed by Fisher and Raucher (1984). For this analysis, EPA conservatively estimated that nonuse benefits compose one-half of water-related recreational use benefits. EPA estimates that the annual recreational use values associated with water-related benefits are approximately $37 per acre, resulting in corresponding nonuse values of $19 per acre.

Total Annual Benefits

As shown in Table 8-1, EPA estimates that annual monetized benefits range from approximately $0.70 to $1.2 million using a 3 percent discount rate, and between $0.6 and $0.9 million using a 7 percent discount rate.

In addition to the benefits EPA was able to monetize, the projected increase in remining is expected to result in the removal of approximately 216,000 to 307,000 feet of highwall each year, resulting in substantial benefits associated with increased public safety. Other benefit categories that EPA was not able to monetize include health and safety benefits, nonuse benefits related to reclaimed land, potential savings in drinking water treatment costs, and secondary impacts from increases in tourism and recreation. Omissions, biases and uncertainties in the benefits estimates are discussed in more detail in the Benefits Assessment (U.S. EPA, 2000a).

Table 8-1: Summary of Benefit Estimates for the Coal Remining Subcategory

Benefit Source	Additional Acres AML reclaimed/year[1]	Annual Present Value from Literature[2]	Estimated Present Value of Benefits from Remining Permits Issued Each Year Discounted at 3%[3, 4]	Estimated Present Value of Benefits from Remining Permits Issued Each Year Discounted at 7%[3, 4]
Recreational Use of Improved Water Bodies	667 - 1,115	$37	$100,500 - $168,000	$77,000 - $129,000
Aesthetic Improvements to Water Bodies	667 - 1,115	$140	$380,000 - $635,500	$292,000 - $488,500
Recreational Use of Reclaimed Land	1,773 - 2,512	$28	$202,000 - $286,000	$155,000 - $220,000
Nonuse (Improved Water Bodies)	667 - 1,115	$19	$51,500 - $86,000	$40,000 - $66,500
Total			$734,000 - $1,175,500	$564,000 - $904,000

1. Assumes that implementation of the rule will result in an additional 3,111 to 4,407 acres of AML permitted for remining per year, that 57% of those acres are actually reclaimed, and that significant water quality improvements will occur in 38% to 44% of the reclaimed acres.
2. Per acre per year ($1998). See text for literature sources for these values.

3. Benefits = $\sum_{i=0}^{5} \{Acres\ \ reclaimed * Value\} / \{(1+r)^\wedge(i+5)\}$, where r = discount rate and benefits from remining begin to

8.2 Western Alkaline Coal Mining Subcategory

8.2.1 Environmental Impacts from Western Mining

Affected western mines are located in arid and semiarid regions characterized by very low annual precipitation. In arid and semiarid regions, the natural vegetative cover is sparse and rainfall is commonly received during localized, high-intensity, short-duration storms. These conditions contribute to flash-floods and turbulent flows that transport large amounts of sediment. Controlling sediment in areas that naturally contain large amounts of sediment through the predominant use of sedimentation ponds can result in numerous non-water quality impacts that harm the environment, including disturbing the natural hydrologic balance, accelerating erosion, reducing groundwater recharge, reducing water availability, and impacting large areas of land for pond construction. These impacts have the potential to disrupt fragile habitats and sensitive hydrological features. To address these impacts, EPA is requiring coal mine operators to implement BMPs so that post-mined lands are reclaimed to mimic natural conditions that were present prior to mining activities.

Site-specific best management practices (BMPs) have the potential to conserve topsoil, control surface erosion and sedimentation, increase vegetation density, and minimize disruption of fluvial stability by using more holistic approaches to reducing sediment runoff, protecting water quality, and providing water treatment and drainage control. BMPs may be used singly or in combination with sedimentation ponds to control and minimize erosion and sedimentation from disturbed areas, thereby reducing the adverse hydrologic impacts associated with the predominant use of sedimentation ponds.

8.2.2 Potential Benefits Categories

EPA identified two categories of benefits associated with the new subcategory: ecological benefits and economic productivity benefits. Ecological benefits result from improvements to habitats, ecosystems, or general areas affected by an effluent or disturbed surface area. Although some ecological benefits will have positive impacts on recreational use values (e.g., recreational fishing, hunting, wildlife viewing, etc.), others are more likely to fall under the traditional nonuse benefit categories.

Ecological benefits from implementation of the final rule have two components:

- ***Land-related benefits*:** The potential land-related benefits arise from the reduced disturbance of land area, increased soil conservation, and improved vegetation density. Use of BMPs will reduce the land area disturbed, resulting in terrestrial habitat protection and improvements in aesthetic quality. In addition, implementation of BMPs enhances soil conservation and promotes vegetation growth and development within reclamation areas. Enhanced vegetation cover improves terrestrial habitats and attracts wildlife, potentially resulting in increased species abundance and diversity in the affected areas.

- ***Water-related benefits*:** The potential water-related benefits arise from the preservation of natural stream flows. Sedimentation ponds reduce flows to streams and underground

> systems that feed surface waters, thereby reducing natural habitats for riparian and aquatic species and disturbing natural drainage settings. Ponds also reduce sediment delivery downstream. In arid/semiarid western coal mining regions, climate, topography, soils, vegetation and hydrologic components all combine to form a hydrologic balance that is naturally sediment rich. Eliminating sediment delivery is likely to disturb dynamic fluvial systems that depend upon a continual source and flow of sediment. Implementation of BMPs can preserve a more natural sediment delivery. Improved hydrological balance and an increase in water quantity is likely to have positive effects on aquatic and riparian life habitats. The use component of water-related ecological benefits is likely to be insignificant, however, because many of the water bodies affected by mining drainage are intermittent and ephemeral in nature and do not support water-based recreation.

Implementation of the new subcategory may also generate economic productivity benefits. Because construction and operation of sedimentation ponds have the potential to reduce the amount of surface runoff available for downstream users, an increase in the quantity of water available for downstream users is one of the most important benefits of BMP systems. For example, economic productivity gains are expected to occur through improved supply of irrigation water for agricultural uses, municipal drinking water, and industrial cooling water. Another possible economic productivity benefit from BMP implementation is improved post-mining land use. In the arid/semiarid western United States, livestock grazing is normally a part of the post-mining land use. Improved vegetation density resulting from implementation of BMPs is likely to increase productivity of the rangeland used for livestock grazing, and, as a result, to increase the value of land for post-mining land uses.

8.2.3 Methodology and Results

This section describes the methodologies EPA used to quantify and monetize the benefits associated with the new subcategory. EPA extrapolated from the WCMWG model mine analysis and industry profile information to estimate the environmental improvements attributable to the new subcategory (WCMWG, 1999a). EPA developed monetary estimates of these environmental impacts using the benefits transfer techniques described below.

Land-Related Benefits

EPA anticipates that land-related benefits of the final rule will accrue from the following three categories:

- Decreased acreage disturbed by construction of sediment ponds;
- Increased Soil Conservation;
- Improved Vegetation.

Estimation of Benefits from Avoided Disturbance Acres

Adopting the new subcategory is expected to reduce surface disturbance area. Using the three regional model coal mines, one each for the DSW, IM, and NP regions, EPA projects that 591 fewer acres per year will be disturbed for sedimentation ponds under the new subcategory. This includes: 37 acres for each of two Desert Southwest mines, 11.2 acres for each of three Intermountain mines, and 11.8 acres for each of 41 Northern Plains mines.

To value avoided disturbed area, EPA estimated a range of benefits associated with enhanced hunting opportunities stemming from improved wildlife habitat. EPA used a benefits transfer methodology from two wildlife habitat valuation studies to estimate these benefits.

A study by Feather et al. (1999) provides a lower-bound estimate. The study develops a recreational demand model for pheasant hunting, where demand is modeled as a function of pheasant habitat characteristics, including a measure of undisturbed surface area at hunting sites. Undisturbed surface cover is regarded as a critical habitat characteristic because it provides good nesting cover, insects for newly hatched chicks, and winter cover. The study estimated the annual hunting benefits from increased availability of undisturbed open space at $0.37 per acre in the Pacific/Mountain region.[24]

A study by Scott et al. (1998) estimating various components of the natural shrub-steppe habitat value provides an upper-bound estimate of recreational hunting benefits. The study uses a WTP value for hunting shrub-steppe-dependent game birds to estimate a recreational element of the land preservation value. Data yielded an aggregate estimate of annual WTP of $8.2 million for game bird hunting in the study area, which has approximately 565,498 acres of land available for upland bird hunting. Dividing the

[24] EPA adjusted the 1992 study value of $0.33 using the change in the Consumer Price Index from 1992 to 1998, yielding an estimate of $0.37 in 1998 dollars.

aggregate WTP value by the estimate of bird habitat acreage yields an estimate of $6.00 per acre per year. EPA adjusted this value according to the number of hunting licences sold in the states affected by western surface coal mining,[25] resulting in an annual per acre value of $2.46.[26]

Estimation of Benefits from Increased Soil Conservation

The results from the DSW model mine analysis demonstrate that the new subcategory is expected to promote soil conservation compared to undisturbed conditions. The weighted average soil loss rate for the undisturbed slopes and slope segments is 4.7 tons per acre per year; the weighted average soil loss rate for the post-mining model mine reclamation area under the new subcategory is 3.0 tons per acre per year. This difference represents a net change in estimated average soil loss rate of 1.7 tons per acre per year from the undisturbed to post-mining reclaimed conditions. The soil loss rates for the reclaimed area under the existing guidelines and new subcategory are essentially the same, since the types and applications of slope stabilizing alternate sediment controls remains similar between them. Therefore, EPA did not estimate soil conservation benefits.

Estimation of Improved Vegetation

Arid/semiarid reclaimed plant communities tend to have relatively low vegetation cover and productivity, particularly where annual rainfall is less than 9 inches per year. Total vegetation cover values frequently fall within the range of 5 percent to 20 percent. Yearly vegetation production tends to be low, with most reclaimed areas producing between 500 and 1,000 pounds per acre annually. Increased focus on the use of BMPs would enhance vegetation growth and community development on reclaimed lands compared to the existing effluent guidelines. Typical vegetative cover in this area ranges only from 5 to 20 percent. Vegetative cover in a constructed drainage area (which is included in the model mine system) can be 25 percent or more in absolute value. Thus, at least a 5 percent increase is expected for the drainage area (WCMWG, 1999a, Section 4.2.2).

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[25] Hunting licence data are obtained from the 1996 National Survey of Fishing, Hunting, and Wildlife Associated recreation.

[26] Detailed calculations are contained in the Benefits Assessment (U.S. EPA, 2000a).

Individual plant and vegetation community development is holistically linked to all of the factors in the environment that influence plant germination, establishment, and growth. The WCMWG model mine analysis indicates that the cumulative effect of BMPs can produce a synergistic benefit to plant growth that favorably influences vegetation production. The most significant effects that may promote an increase in vegetation density are summarized below:

- Improved soil moisture availability;
- Decreased soil detachment and erosion;
- Enhanced nutrient retention and availability; and
- Increased plant species diversity resulting from the use of a diverse seed mixture in the reclamation process.

However, the WCMWG model mine analysis does not quantify changes in vegetation cover, and, as a result, EPA did not quantify or monetize benefits from enhanced vegetation cover for the new subcategory.

As shown in Table 8.2, the expected land benefits from the new subcategory that could be monetized are small, most likely ranging from $2,000 to $13,000 discounted at 3 percent, and from $1,500 to $11,000 discounted at 7 percent. However, the monetized value does not include a number of benefit categories, most notably nonuse ecological benefits that may account for the major portion of land benefits.

Water-Related Benefits

Implementation of the new subcategory is expected to yield water-related benefits to society by improving hydrologic and fluvial stability in the watersheds affected by reclamation areas. EPA believes that the use of BMPs will minimize disruptions to the hydrologic balance. Blockage of natural surface flow would be minimized through establishment of a natural flow pattern from the reclamation area, and passage of undisturbed area drainage through the reclaimed area in stable channels, essentially uninterrupted, to the undisturbed watershed downstream.

Table 8-2: Annual Land Related Benefits from Western Alkaline Coal Mining Subcategory

Benefit Category	Physical Measure	Per Acre Value ($1998)	Total Value[1]	
			Discounted at 3%	Discounted at 7%
Avoided surface disturbance	Decreases by 591 acres/year	$0.37 - $2.47	$2,000 - $13,000	$1,500 - $11,000
Increased soil conservation	Negligible	—	—	—
Improved vegetation	Vegetative cover Increases by 5%	Not available	Not estimated	Not estimated
Total Monetized Land Benefits			$2,000 - $13,000	$1,500 - $11,000

[1]Numbers have been rounded to the nearest $500.

The DSW model mine analysis was used to characterize the increase in runoff delivered to the drainage area below the reclamation area. The model predicts that approximately 73 acre-feet of water would be released downstream from the example reclamation watershed as a result of the receipt of a 10-year, 24-hour precipitation event under the new subcategory. This represents a 49 percent increase in drainage volume over the existing guidelines for this watershed, and is similar to the 80 acre-feet of drainage volume from the pre-mining undisturbed watershed scenario.

EPA estimated benefits from improvements in water quantity using benefits transfer from a study by Crandall et al. (1992). The study estimates the recreational value of instream flows that are considered adequate for supporting abundant streamside plants, animals, and fish. The estimated user value of an improvement in riparian quality from intermittent to perennial with the associated enhancement in plant and animal habitat and animal species diversity is $81.25.[27] EPA applied this value to water-based

[27] EPA adjusted the study value of $65 (1990$) to 1998 dollars using the relative change in CPI from 1990 to 1998 (1.25).

recreation consumers residing in the counties affected by western alkaline coal mining operations discharging or affecting water bodies with perennial flow.[28]

Seven perennial streams located in six counties are currently affected by western alkaline coal mining operations. The number of recreational users residing in these counties are estimated to be equal to the percent of the population engaged in near-water recreational activities (i.e., including activities such as wildlife viewing but excluding fishing). EPA found no evidence that fishing occurs in water bodies affected by the new subcategory, and thus assumed that benefits from improvements in fishing are negligible. Information in EPA's Reach File 1 indicates that the ratio of affected reach length to the total number of reach miles within a county ranges from 0.02 to 0.39. This analysis assumes that recreation activity among residents of the counties affected by western mining is distributed evenly across all reach miles within those counties. Accordingly, EPA estimates that 2 percent to 39 percent of users within the county are affected. The average ratio of reach length to the total number of reach miles within a county is 0.06. Annual water-related benefits are equal to the affected population multiplied by $81.25 per user. In this analysis, EPA assumed that riparian and ecological improvements expected to occur in perennial water bodies as a result of natural flow preservation from improved hydrological stability are similar to improvements in riparian habitat described in Crandall, et al. (1992).

EPA estimated the monetized value of recreational benefits from improved water flow by applying the WTP value for water flow preservation to water-based recreation consumers residing in the counties affected by western alkaline coal mining operations discharging to water bodies with perennial flow. EPA identified six counties, involving approximately 900 users, affected by western mining and containing the relevant drainage features. The estimated monetary value of recreational water-related benefits ranges from $25,000 to $488,000 per year.

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[28] For detail on drainage features associated with Western Alkaline Coal Mining Subcategory mines, see Table F-3 in Appendix F of the *Coal Remining and Western Alkaline Mining: Economic and Environmental Profile* (U.S. EPA, 1999e).

Nonuse Benefits

Individuals who never visit or otherwise use a natural resource may nevertheless be affected by changes in its status or quality. Empirical estimates indicate that such "nonuse value" may be substantial for some resources (Harpman et al., 1993; Fisher and Raucher, 1984; Bergstrom, 1993). Because nonuse value is a sizable component of the total economic value of water resources, EPA estimated change in nonuse values using a rule of thumb developed by Fisher and Raucher (1984). For this analysis, EPA estimates that nonuse benefits are equal to one-half of water-related recreational benefits. This yields a range of nonuse benefits attributable to the Western Alkaline Coal Mining Subcategory of $12,500 to $244,000 per year. The nonuse benefit rule of thumb method is based on water-related recreation benefits and is therefore not applied to land-related benefits.

Total Annual Benefits

EPA estimated expected benefits for the new subcategory in terms of land-related benefits and water-related benefits. As shown in Table 8-3, summing the monetary values reported in the preceding sections across these two categories results in total monetized benefits per year ranging from $39,500 to $745,000 discounted at 3 percent, and from $39,000 to $743,000 discounted at 7 percent.

Table 8-3: Total Monetized Benefits for the Western Alkaline Coal Mining Subcategory

	Annual Benefit Values ($1998)[1]	
Benefit Categories	**Discounted at 3%**	**Discounted at 7%**
Avoided Surface Disturbance	$2,000 - $13,000	$1,500 - $11,000
Recreational Benefits from Improved Water Flow	$25,000 - $488,000	$25,000 - $488,000
Nonuse Benefits	$12,500 - $244,000	$12,500 - $244,000
Total Benefits	$39,500 - $745,000	$39,000 - $743,000

[1]Results have been rounded to the nearest $500.

Chapter 9

Social Costs and Benefits of the Final Rule

9.0 Introduction

This chapter summarizes the total estimated social costs and benefits of the two new subcategories. The estimated social costs include industry compliance costs and the costs incurred by NPDES permitting authorities to implement the final rule. The benefit estimates presented reflect only those benefit categories that EPA was able to quantify and monetize. However, benefit categories that EPA was not able to quantify and/or monetize are briefly reviewed. The chapter also examines assumptions, exclusions, and uncertainties in the economic impact analysis, and where possible, indicates the direction of their potential bias on the estimated costs and benefits.

9.1 Social Costs and Benefits of the Final Coal Remining Subcategory

The previous chapters of this report provide detailed information on the Agency's cost and benefits analyses for the final rule. This section summarizes the results of the analyses for the final Coal Remining Subcategory. Table 9-1 presents EPA's estimate of the total annual social costs and benefits attributed to the new subcategory.

EPA projects that states will permit 43 to 61 new remining sites each year under the new subcategory. Based on this projection, EPA estimates annual industry compliance costs in the range of $333,000 to $758,500. This estimate includes potential costs associated with increased BMP effort (i.e., pollution abatement plan costs) and additional monitoring. Estimated annual costs to NPDES permitting authorities are between $47,500 and $67,500.

Table 9-1: Annual Social Costs and Benefits of the Final Coal Remining Subcategory ($1998)

Social Costs:		**Discounted at 7%**
Compliance Costs:		
Additional BMP effort		$199,500 - $565,000
Monitoring costs		$133,500 - $193,500
Costs to NPDES Permitting Authorities:		$47,500 - $67,500
Total Social Costs		***$380,500 - $826,000***
Monetized Benefits:	**Discounted at 3%**	**Discounted at 7%**
Recreational Use of Improved Water Bodies	$100,500 - $168,000	$77,000 - $129,000
Aesthetic Improvements to Water Bodies	$380,000 - $635,500	$292,000 - $488,500
Nonuse (related to improved water bodies)	$51,500 - $86,000	$40,000 - $66,500
Total Water-Related Benefits:	***$532,000 - $889,500***	***$409,000 - $684,000***
Recreational Use of Reclaimed Land	$202,000 - $286,000	$155,000 - $220,000
Total Monetized Benefits:	***$734,000 - $1,175,500***	***$564,000 - $904,000***

Note: Totals may not add due to rounding

The estimated total annual social cost of the new subcategory ranges from $380,500 to $826,000.

The total monetized benefits range from $734,000 to $1,175,500. Between 72 and 76 percent of the total monetized benefits ($532,000 to $889,500) result from projected improvements to water bodies. Of the water-related benefits, 71 percent ($380,000 to $635,500) reflects the value of aesthetic improvements to water bodies, 19 percent ($100,500 to $168,000) reflects water-related recreational benefits, and the remainder ($51,500 to $86,500) reflects nonuse benefits. Estimated land-related benefits result from improved recreation on reclaimed lands, including hunting and wildlife-viewing, and account for 24 to 28 percent of the total monetized benefits ($202,000 to $286,000).

In addition to the benefits EPA was able to monetize, the projected increase in remining is expected to result in the removal of approximately 216,000 to 307,000 feet of highwall each year, resulting in substantial benefits associated with increased public safety. Furthermore, increased remining has the potential to recover and utilize coal resources that might otherwise remain unrecovered. Other benefit categories that EPA was not able to monetize include health and safety benefits, nonuse benefits related to reclaimed land, potential savings in drinking water treatment costs, and secondary economic impacts from increases in tourism and recreation.

Table 9-2 provides an overview of the assumptions, exclusions, and uncertainties in EPA's economic impact analysis, and where possible, indicates the direction of their potential bias on the estimated costs and benefits. Uncertainties result from the fact that the subcategory will apply to new remining permits for sites with unknown characteristics.

9.2 Social Costs and Benefits of the Final Western Alkaline Coal Mining Subcategory

The previous chapters of this report provide detailed information on the Agency's cost and benefits analyses for the final rule. This section summarizes the results of the analyses for the final Western Alkaline Coal Mining Subcategory. Table 9-3 presents EPA's estimate of the total annual social costs and benefits attributed to the new subcategory.

The final Western Alkaline Coal Mining Subcategory is projected to result in substantial industry cost savings while creating environmental benefits for society. EPA believes that the only incremental industry compliance costs attributed to the new subcategory is associated with the watershed modeling requirements, estimated to be approximately $327,000 per year. These costs would be offset by reduced sediment control costs associated with implementing the required sediment control plans (an estimated savings of approximately $12.7 million) and savings resulting from an expected reduction in the reclamation bonding period (an estimated savings of $341,900 to $501,400). EPA estimates that the annual cost to NPDES permitting authorities to implement the new subcategory will be approximately $12,500, resulting in a total annual social cost *savings* of approximately $12.8 million.

Table 9-2: Assumptions, Exclusions & Uncertainties in Estimated Coal Remining Subcategory Costs and Benefits

Omission/Uncertainty	Likely Impact on Estimated Costs	Likely Impact on Estimated Benefits
Uncertainty about the number and characteristics of sites that will be remined under the new subcategory	?	?
Assumption that remining sites in Illinois, Indiana, and Tennessee will require 12 baseline samples and flow weirs	+	
Assumption that monthly compliance monitoring will be required	?	
Estimate of four discharge points per mine site requiring monitoring	?	
Assumption that alkaline addition will be required for 10% of surface and underground remining sites	?	
Health and safety improvements excluded		-
Land-related nonuse benefits excluded		-
Savings in drinking water treatment costs excluded		-
Indirect or secondary economic impacts (e.g., new industry/business to support increases in tourism and recreation) excluded		-
Possible differences in environmental characteristics of pre-existing discharges between benefits transfer study sites (mostly sediment) and future remining sites (AMD)		?
Potential that remined AML sites have undergone some natural reclamation.		+
Significant decreases in AMD loads not correlated with immediate improvements in surface water quality		+
All reclaimed acreage is expected to provide improved hunting, fishing and wildlife viewing opportunities (the relative value of other land uses may be higher or lower than the value associated with recreation)		?

+ may overstate costs or benefits; - may understate costs or benefits; ? likely effect unknown.

Table 9-3: **Annual Social Costs/Savings and Benefits of the Final Western Alkaline Coal Mining Subcategory ($1998)**

Social Costs	Discounted at 7%:
Compliance Costs (Savings)	
Incremental Modeling Costs	$327,000
Sediment Control Costs (Savings)	($12,721,000)
Earlier Phase 2 Bond Release (Savings)	($341,900 - $501,400)
Costs to NPDES Permitting Authorities:	$12,500
Total Social Costs (Savings)	***($12,723,400 - $12,882,500)***

Benefit Categories	Annual Benefit Values ($1998)	
	Discounted at 3%	Discounted at 7%
Avoided Surface Disturbance	$2,000 - $13,000	$1,500 - $11,000
Recreational Benefits from Improved Water Flow	$25,000 - $488,000	$25,000 - $488,000
Nonuse Benefits	$12,500 - $244,000	$12,500 - $244,000
Total Monetized Benefits	$39,500 - $745,000	$39,000 - $743,000

Note: Totals may not add due to rounding

The final Western Alkaline Coal Mining Subcategory is also expected to result in environmental benefits. Total monetized benefits range from $39,500 to $745,000 per year discounted at 3 percent, and from $39,000 to $743,000 per year discounted at 7 percent. The majority of the monetized benefits results from improved water flow that will preserve perennial water bodies affected by western coal mining operations. The improved flow is expected to result in benefits to water-based recreation consumers, and in water-related nonuse benefits. Land-related benefits result from reduced disturbance of land areas. EPA estimated the value of enhanced hunting opportunities associated with the undisturbed lands, but was not able to monetize other land-related benefits. Categories of benefits that EPA was not able to monetize include land-related ecological benefits, the benefits of increased vegetative cover, and possible recreational fishing benefits.

Table 9-4 provides an overview of the assumptions, exclusions, and uncertainties in EPA's economic impact analysis, and where possible, indicates the direction of their potential bias on the estimated costs and benefits.

Table 9-4: Assumptions, Omissions & Uncertainties in Estimated Western Alkaline Coal Mining Subcategory Costs and Benefits

Omission/Uncertainty	Likely Impact on Estimated Costs	Likely Impact on Estimated Benefits
Assumption that sediment control costs per acre and impacts on loadings and vegetation for the model mine are representative for all western surface mines	?	?
Assumption that all surface coal mines will incur incremental modeling costs of $50,000	+	
Assumptions about the cost of performance bonds and the effect of the subcategory on the timing of Phase 2 bond release	?	
Ecological nonuse benefits not included for land-related benefits		-
Benefits of increased vegetative cover not monetized		-
Recreational fishing benefits excluded		-
Recreational benefits from water quality improvements consider resident users only		-
Recreational benefits from water quantity improvements assume that perennial stream flows are preserved		+
Unknown recreational importance of the affected sites		?
Sites for which information on drainage features is not available excluded from water-related benefits analysis		-

+ may overstate costs or benefits; - may understate costs or benefits; ? likely effect unknown.

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Appendix A
State Remining Programs

Many states have been delegated authority under SMCRA and NPDES programs, and several states have established or are developing remining programs. State remining permit terms and conditions must adhere to provisions established in the SMCRA regulations, except where these provisions are modified by the state and approved by the Secretary of the Interior. This appendix presents selected information on state remining programs and provides an overview of current state monitoring requirements for coal remining sites.

A.1 State Programs

Pennsylvania

The Commonwealth of Pennsylvania has a particularly active remining program. Pennsylvania provides a single application that covers both SMCRA and NPDES requirements. Under remining regulations that were approved by OSM and EPA in March 1986, Pennsylvania establishes best professional judgement (BPJ) limits for pre-existing discharges. Bond release is contingent on the post-mining discharge having pollutant levels equal to, or less than, the pre-remining baseline. Pennsylvania has formalized and standardized the permit process using a series of worksheets, modules (the REMINE program developed by EPA and researchers at Pennsylvania State University), and forms to allow efficient processing of remining applications. Applicants must provide data on baseline water quality and quantity sufficient to characterize baseline pollutant levels, and must develop a pollution abatement plan that is integrated with the mining and reclamation plan. The permitting authority establishes baseline limits for acidity, iron and manganese based on a BPJ analysis.

Pennsylvania also has an incentives program for remining operators. The Remining Operator's Assistance Program (ROAP) provides subsidies to eligible operators for the initial land surveying and bonding requirement costs. The party responsible for creating the abandoned mine land cannot be an eligible operator. Subsidies include payments to a qualified consultant to:

(1) Assess existing resources within the area adjacent to the proposed remining area that may be affected by surface mining activities;

(2) Collect and report general hydrological information of the proposed remining area;

(3) Prepare a statement of results of test borings or core samples; and

(4) Provide a detailed plan of the proposed surface coal mining activities.

Subsidies may also be used to meet operator bonding obligations. Operators must reimburse the Commonwealth for the cost of the services performed if they do not meet their obligations as described in Title 25 of the Pennsylvania Code for Environmental Protection section 86.270 (relating to operator liability). As of July 1999, Pennsylvania had permitted 343 remining operations, including 300 Rahall-type permits.

Kentucky

Kentucky has a remining program similar to Pennsylvania's. Kentucky’s permitting program requires applicants to submit baseline monitoring data and an abatement and reclamation plan. In addition, applicants may submit results from the REMINE program. The applicant must demonstrate that remining operations have the potential to improve water quality. The permit limits are based on BPJ analysis.

While Kentucky’s program is meant to create incentives for the reclamation of AML in general, it offers particular incentives for small mine operators. Under the Kentucky Revised Mining Statutes, small mine operators are subsidized for at least 20 percent of the initial surveying and planning costs of remining AML. In the event that no bids are submitted by small coal operators, these funds may be transferred to the public. The State of Kentucky also provides bonding assistance to any applicant who obtains an approved remining permit. Under this assistance program, the Bond Pool Commission may provide coverage to mine operators for up to 50 percent of the bond amount determined necessary to ensure reclamation of the remined area. The state also imposes lower bonding requirements for eligible remining sites: there is a two year bonding period for remining, and the base bond rate for remining areas is $1,500 per acre instead of the $2,500 per acre rate that normally applies (Kentucky Department for Surface Mining Reclamation and Enforcement, 1998).

Alabama

According to OSM's Annual Evaluation Summary Report for Alabama, many coal mine operators are combining remining of AML acres with regular coal mining. Sixteen of 21 permits issued by the state between October 1996 and September 1998, and 5 of 6 permits issued between October 1998 and April 1999, involved some remining of AML acres. OSM provided assistance to the state by presenting information on the national remining initiative and the regulatory authorities affecting remining, and by encouraging interest in expanded remining. OSM is discussing the potential for a working partnership of the coal industry, the state regulatory authority, and OSM to discuss issues that would encourage additional remining in the state (U.S. DOI, 1999c).

Tennessee

OSM has implemented the SMCRA regulatory program in Tennessee since the state repealed its surface mining law in October 1984. The Knoxville Field Office of the OSM formed a remining team in May 1996. The Team solicited remining initiatives from industry, the environmental community, and regulators. The State has recently begun working with industry and OSM on a case by case basis to modify effluent limitations requirements for remining sites (U.S. DOI, 1998d).

West Virginia

West Virginia's NPDES permitting requirements include the Rahall provisions which allow for modified effluent limits in remining permits based on Best Professional Judgement (BPJ). Monitoring of baseline conditions for at least 12 months is required, and the BPJ limits cannot exceed levels of pH, iron and manganese in pre-existing discharges (U.S. DOI, 1998e).

Maryland

The majority of coal that was surface mined in Maryland during the period October 1998 to September 1999 was recovered from remining operations. Maryland promotes remining and issued a Reclamation Advisory to all coal operators in Maryland in March 1999 outlining remining benefits and incentives to the coal mining industry. The Maryland remining program includes a variety of incentives, including bond credits, reduced bond liability period, excess spoil disposal on AML, and Rahall-type modified effluent limitations for pre-existing discharges (U.S. DOI, 2000).

A.2 Summary of State Sampling Requirements

The IMCC solicitation collected information on twenty states' remining programs (IMCC, 1999). As of July 1999, seven of the twenty states responding (Alabama, Kentucky, Maryland, Ohio, Pennsylvania, Virginia and West Virginia) had issued Rahall permits, and another four states (Illinois, Indiana, Missouri, and Tennessee) had issued non-Rahall remining permits. Pennsylvania had issued by far the greatest number of Rahall permits (300), followed by Alabama (10).

EPA collected information on the state monitoring requirements for remining operations in the seven states that have issued Rahall permits to characterize the regulatory baseline for the new subcategory. Table A.1 lists the current State monitoring requirements for both Rahall and non-Rahall permits in each of these states.

Table A.1: State Sampling Requirements: Rahall vs. Non-Rahall Sites

State	Baseline Monitoring Requirements		During Mining		Post-Mining	
	Rahall	Non-Rahall	Rahall	Non-Rahall	Rahall	Non-Rahall
Alabama	6 monthly samples	6 monthly samples	Monthly	Monthly	Monthly, for at least one year, typically at Phase II Bond Release (2 yrs.)	Monthly, for at least one year, typically at Phase II Bond Release (2 yrs.)
Kentucky	6-12 monthly samples + Biological Assessment	None	2 per month	2 per month	6 months + biological	2/month until Phase I; 6 months of monthly; then quarterly until Phase III
Maryland	12 monthly samples	6 monthly samples	Monthly	Quarterly	Monthly, for at least one year	Quarterly
Ohio	12 monthly samples	6 monthly samples	Quarterly	Quarterly	Quarterly until Phase III	Quarterly until Phase III
Pennsylvania	12 monthly samples	6 monthly samples	Monthly	Quarterly	Monthly, for at least one year, typically at Phase II Bond Release (2 yrs.)	Quarterly
Virginia	12 monthly samples	6 monthly samples	Biweekly	Biweekly	Monthly, for at least one year, typically at Phase II Bond Release (2 yrs.)	Monthly, for at least one year
West Virginia	Twice monthly for 12 months		2 per month	2 per month	12 consecutive months of semi-monthly samples after Phase I Bond Release	

Appendix B
AML Reclamation Program

B.1 AML Reclamation Program and Fund

Title IV of SMCRA established the AML Reclamation Program in response to concern about extensive environmental damage caused by past coal mining activities. The program is funded primarily from a fee collected on each ton of coal mined in the country. The fee is deposited into a special fund, the Abandoned Mine Land Fund, and is appropriated annually to address abandoned and inadequately reclaimed mining areas where there is no continuing reclamation responsibility by any person under state or federal law. Mine operators must make fee payments quarterly and accompany them with a statement reporting the amount and type of coal mined during the quarter. The per ton fee schedule is as follows:

- 35 cents for coal produced by surface coal mining;
- 15 cents for coal produced by underground mining; and
- 10 cents for lignite coal.

While the program was initially slated to run from 1977 to 1992, Congress has reauthorized the tax to generate AML funds through 2004. Even with this extension, OSM has estimated that only 10 percent of AML problem areas will be corrected over the life of the reclamation program. According to estimates in the Abandoned Mine Land Inventory System, the most serious AML problems — those identified as Priority 1 or Priority 2 sites — would cost more than 2.6 billion dollars to reclaim. These include highwalls, open shafts and accessible underground mines presenting a danger to human health, safety and welfare. Many other AML sites — Priority 3 sites that do not pose the same degree of danger to the public but that do adversely affect the environment — would cost tens of billions dollars more to correct.

There is very little likelihood that enough AML money will be available to fund all the reclamation of even the most serious of the eligible sites, let alone the eligible sites with only environmental impacts. Programs that encourage remining have the potential to address some of the AML problems without spending public funds.

B.2 AMLIS

As described in Chapter 2, the Office of Surface Mining (OSM) reports information on Abandoned Mine Land (AML) in the Abandoned Mine Land Inventory System (AMLIS) database. AMLIS presents data collected by OSM program officials, States and Tribes on lands and waters adversely affected by past mining (primarily coal mining) that are eligible for reclamation under the Abandoned Mine Reclamation Fund. The database is updated as new problems are identified and as existing problems are reclaimed. States are required to inventory only AML with Priority 1 and Priority 2 problems — those that pose threats to health, safety and the general welfare of people. Reporting on lower priority sites (those that pose environmental problems (Priority 3) or that involve public facilities or the development of publicly-owned land (Priority 4 or 5) is voluntary and hence may not be complete.

The “problem area” is the primary geographic unit reported in AMLIS. Problem areas are classified by priority and by “problem type.” A problem area may have more than one problem type, but each problem type is reported only once for each problem area. There were 31,887 problem area/problem type combinations in AMLIS as of February 1999. Of these totals, only a subset are coal mining sites with pre-existing discharges that have not yet been remediated or funded for reclamation. These sites are potentially affected by the new subcategory. Of the total reported in AMLIS, 7,966 problem areas (covering 368,803 acres and reporting 18,426 problem types) are coal mining sites for which some or all problems are not yet reclaimed or funded for reclamation. Of these, 2,188 problem areas (covering 55,352 acres) have some type of water quality problem. EPA’s analysis of the AMLIS data included AML with the following problem types as sites with water quality problems: clogged streams; clogged stream lands; hazardous water body; polluted water body: agricultural or industrial use; polluted water body: human consumption; and water problem.

The following are definitions of these and other AMLIS problem types:

Priority 1 and 2 Problem Types

Clogged Streams Lands. Any AML-related pile, bank, mine waste, or earth material distributed by mining activity which could be eroded and carried downstream by surface runoff. Clogged stream lands are measured in acres of land affected by spoil, mine waste and earth material that are directly contributing to the clogged streams. Those piles and banks which are identified and included as other AML problem types, such as dangerous highwalls, are not included in this problem type.

Clogged Streams. A filled stream bed, usually in a narrow valley, with AML-originated silt and debris carried downstream by surface runoff. This causes reduced carrying capacity of the stream resulting in a danger to property and human health, safety and welfare. Clogged streams are measured in miles of streams that must be dredged to abate the problem.

Dangerous Highwalls. Any unprotected, unreclaimed highwall located in close proximity to a populated area, public road, or other area of intense visitation, which poses a threat to the public health, safety and general welfare.

Dangerous Impoundments. Any AML-related, large-volume water impoundments such as mine waste embankments, sedimentation ponds, or underground mine water pools which pose a threat of flooding and catastrophic destruction to downstream property and human health, safety and general welfare.

Dangerous Piles or Embankments. Any AML-related waste pile or bank located within close distance to a populated area, public road, or other area of intense visitation, and posing a danger to public health, safety and general welfare by adverse effects resulting from an unstable steep slope or wind-blown particulate matter.

Dangerous Slides. A land mass slide of surface-subsurface soil, a mine waste pile or bank, or surface mine spoil that, due to instability of its own weight or lubricating effects of mine drainage water, endangers the public or threatens destruction of improved property located uphill or downhill from the land mass.

Gases: Hazardous or Explosive. Any AML-related venting of hazardous or explosive gases. Includes hazardous or explosive gases problem areas unrelated to underground mine fires.

Hazardous Equipment or Facilities. Dilapidated hazardous equipment or facilities located within close proximity of populated areas, near public roads, or other areas of intense visitation.

Hazardous Water Body. Impounded water, regardless of depth or surface area, that is considered an attractive nuisance and is located within close proximity to a populated area, public road, or other areas of intense visitation. The hazard must result from some AML-related feature(s) such as steep or unstable banks, hidden underwater ledges, or rocks or debris on the bottom.

Industrial or Residential Waste. Unauthorized use of AML-impacted areas for residential or industrial waste disposal that poses a danger to the public from unsanitary conditions or from the toxic emissions from burning refuse.

Polluted Water Body: Human Consumption or Agricultural and Industrial Use. Surface or subsurface water used for either direct human consumption, or agricultural, industrial or recreational purposes which does not meet the standards (especially those for suspended solids, acid or alkaline conditions, heavy metals concentrations, or radioactivity) appropriate to the historical use.

Portals. Any AML-related surface entrances to a drift, tunnel, adit or entry which is not sealed or barricaded and is posing a threat to the public.

Subsidence. Any surface expression of subsidence such as tension cracks, troughs, shearing faults, or caving caused by AML-related underground mine voids which may damage property and endangers the public.

Surface Burning. The continuous combustion of mine waste material resulting in smoke, haze, heat, or venting of hazardous gases which is currently occurring or demonstrated to occur on a regular basis. Burning in a mine dump, even if beneath the surface of the material, is also considered surface burning.

Underground Mine Fires. The continuous combustion of underground mine waste material resulting in smoke, haze, heat, or venting of hazardous gases which pose a danger to the public.

Vertical Openings. Openings which typically occur when subsidence results in a vertical or steeply-inclined shaft, isolated pothole or opening which is not sealed or barricaded and that poses a threat to public health, safety and general welfare.

Priority 3 Problem Types

Bench. A ledge that forms a single level operation along which mineral or waste material are excavated. The portion of a bench formed on solid, unexcavated material is considered a solid bench, and the portion which consists of unconsolidated spoil material extending outward from the solid bench is considered a fill bench.

Industrial or Residential Waste Dump. An area used to dispose of any kind of industrial or residential waste not related to mining or processing.

Gob. Refuse or waste removed from a mine. This includes mine waste, rock, pyrites, slate or other unmarketable material which is separated during the cleaning process.

Highwall. The face of exposed overburden or the face or bank on the uphill side of a contour strip mine excavation or the vertical wall consisting of the deposit being mined and the overlying rock and soil strata of the mining site.

Haul Road. A heavy built road which runs from pit to loading dock, tipple ramp or preparation plant and is used for transporting mined materials.

Pit. The last uncovered cut adjacent to the highwall. In surface mining, the working area may be known as a strip pit, and mine workings or excavations open to the surface are also termed pits.

Spoil Area. The overburden material removed in gaining access to a coal seam or mineral deposit.

Slurry. A fine particle-size material from coal or mineral processing stored in a pond. This solid must be separated from the water in order to have clear effluent for refuse or discharge.

Slump. A surface expression resulting from the caving in of underground mine voids.

Equipment and Facilities. Any equipment or buildings used to mine, process or transport coal or mineral ores.

Mine Openings. Any surface entrance or opening related to an underground mine excavation.

Water Problem. When water leaving the AML problem area causes a negative environmental impact because of its pH, sediments load, or other pollutants, or because of its effect on other lands due to poor drainage conditions (i.e., agricultural flooding).