

## SUMMARY

### A. Introduction

The Office of Surface Mining Reclamation and Enforcement (OSM) is clarifying Federal regulations pertinent to section 522(e) of the Surface Mining Control and Reclamation Act (SMCRA). Section 522(e) limits coal mining activities in environmentally sensitive areas. This Economic Analysis report assesses the coal-bearing acreage in the affected areas and estimates economic costs and benefits under alternate rules including the impacts on small entities.

This document is closely related to another report prepared for OSM's rulemaking: the Environmental Impact Statement (EIS) prepared by OSM. The major focus of the EIS is on environmental impacts of alternate rules, whereas the major focus of the Economic Analysis is on economic impacts of alternate rules. Both documents contain estimates of acreage in lands protected under section 522(e) of the Surface Mining Control and Reclamation Act (SMCRA) that could be disturbed under alternate rules considered in this rulemaking. These estimates of disturbed acreage were made by using a projection model, called the Section 522(e) Coal Acreage Disturbance model or SCAD model. The Economic Analysis team was responsible for developing and applying the SCAD model. The EIS refers its readers to this Economic Analysis for a description of SCAD modeling methodology and results. Readers of the EIS who wish to learn about the SCAD model are referred to Chapter III and Appendix C in this document.

The issues and the analysis results are summarized in the following manner. Under existing State permitting programs, coal owners can proceed to file plans for opening a surface coal mine in certain environmentally sensitive areas (protected by section 522(e) of SMCRA) if they have valid existing rights. A prior condition is that they have a valid conveyance for coal in a 522(e) area that gives them the right to conduct surface mining operations. Similarly, coal owners can file a plan to place haul roads and mine-entry shafts (and other surface facilities incident to an underground mine) in areas protected by section 522(e) of SMCRA if they have a valid conveyance and if they can establish valid existing rights (VER). Currently, in most States a very restrictive VER criterion (Good Faith All Permits) is applied: to establish VER, coal owners must have undertaken a good faith effort to obtain all mining permits before SMCRA passed in 1977. Under this standard, eligibility for a permit pursuant to the VER exception to the 522(e) prohibitions is predicted to be relatively infrequent.

The Federal rulemaking considered herein examines other less restrictive VER standards as well as the current restrictive standard as alternatives for establishing a Federal rule for VER. In principle, it could be beneficial overall to move to less restrictive standards if the additional access to coal in section 522(e) areas provided a large savings to the Nation in the costs of producing and delivering coal and did not pose high risk to environmental values. However, the analysis provided in this report does not show that this is the likely outcome. Instead, less restrictive VER standards would open access to some coal in protected areas, but the amount of additional coal is so small that the reductions in coal mining and transportation costs are inconsequential. Furthermore, less restrictive standards for VER could result in significant adverse impacts to 522(e) areas.

According to the analysis, the Good Faith All Permits (GFAP) rule is the most economically beneficial rule. The GFAP rule is the most restrictive rule for establishing VER from among all the rules considered. Under the GFAP rule, future operations, costs, and environmental protection would be almost identical to the outcome under status quo. According to our analysis, a Federal GFAP VER rule would likely not provide access to some surface-minable coal in eastern National Forests that might be accessed under status quo, but it would not result in any additional cost to the economy, compared to status quo.

Current State programs (except in Illinois) that implement SMCRA do not prohibit underground-coal-mining operations in the sensitive areas listed in section 522(e) of SMCRA, except in the limited way described next. If coal owners have valid deeds, they can proceed to obtain mining permits and conduct underground operations underneath the areas listed in section 522(e). In some cases--for example, in the case of large tracts in State parks--operators may want to place mine-entry shafts and haul roads on 522(e) areas in order to extend their operation. Under current implementation of SMCRA, they are required to establish VER to place such surface facilities (incident to an underground mine) on 522(e) areas. But, aside from this limitation, they otherwise can conduct underground mining beneath 522(e) areas without regard to section 522(e) prohibitions.

The rulemaking alternatives analyzed in this report include an alternative that would prohibit subsidence in section 522(e) areas unless the operator could establish VER or obtain waivers (as allowed by section 522(e)). A rule prohibiting subsidence in combination with a restrictive VER rule could reduce underground mining in some 522(e) areas in the future. Dwellings and 300-foot buffers around dwellings are protected under section 522(e). In the case of dwellings, under a rule prohibiting subsidence (if such a rule were to be implemented), coal owners could by-pass the requirement to establish VER if (as allowed by section 522(e)) they could obtain waivers from homeowners to mine underneath their dwellings. Currently, however, subsidence is not prohibited by section 522(e), and mining companies do not have to obtain homeowner waivers. Coal mining companies that possess valid coal-mineral rights ordinarily have a legal right to mine the coal beneath dwellings owned by another party. Typically, a private individual owns the dwelling and surface that would be undermined. But under a rule that would extend 522(e) prohibitions to subsidence, homeowners would receive waiver authority and, by choosing to withhold waivers, could block the mining of coal from beneath their dwellings. Withholding of waivers by homeowners could result in large economic costs.

Analysis provided in this report indicates that longwall mining would not be economically viable if 10% or more of homeowners withheld waivers. When future longwall mining is blocked, the economy would turn to other more costly mining methods to obtain coal. The aggregate cost to the economy could be several billion dollars (in discounted terms). Some 522(e) areas would be protected from subsidence, but the expected high coal mining and transportation costs would appear to exceed any anticipated benefits. Thus, the report ranks the alternate rule that would maintain status quo as the alternative with the largest net economic benefit. Under a continuation of status quo, subsidence from underground mining would not be subject to the prohibitions of section 522(e).

In this report, the status quo rule is referred to as a Prohibitions Do Not Apply (PDNA) rule.

## **B. 522(e) Areas**

(e)(1) - Any land within the boundaries of units of the:

National Park System,

National Wildlife Refuge System,

National System of Trails,

National Wilderness Preservation System,

Wild and Scenic Rivers System, and the

National Recreation Areas.

(e)(2) - National Forests.

(e)(3) - Publicly owned parks and historic sites.

(e)(4) - Within 100 feet of the outside right-of-way line of any public road.

(e)(5) - Within 300 feet of any occupied dwelling unless waived by the owner, or within 300 feet of any public building, school, church, community, or institutional building, public park, or within 100 feet of a cemetery.

## **C. Background**

Currently, surface coal mining operations in 522(e) areas are prohibited unless the coal owner has valid existing rights (VER) as established under the applicable regulatory programs, the mining operation existed prior to SMCRA passage in 1977, waivers are granted, or the mining is determined to be compatible with other land-uses (as specified in section 522(e)). The rulemaking considered in this analysis could change the amount of 522(e) area protected from coal-mining operations. The rulemaking considers alternative criteria for establishing VER and addresses the applicability of section 522(e) prohibitions to subsidence from underground mining.

As background, Table S-1 provides estimates of total and coal-bearing acreage for the United States and for section 522(e) areas. About 17% of the United States is underlain by coal-bearing rocks. Among section 522(e) areas, historic sites have the highest coal-bearing acreage relative to total acreage (19%), whereas only about 3% of (e)(1) lands (National Parks and other Federal preserves)

**Table S-1  
Total Acreage and Coal-Bearing Acreage**

	Total Acres (million)	Coal-Bearing Acres (million)	% Coal-Bearing
U.S. Total	2,300.0	392.00	17
<u>Section 522(e) Areas:</u>			
National Parks etc. (e)(1)	207.0	5.20	3
Nat'l Forests - East (e)(2)	25.0	3.00	12
Nat'l Forests - West (e)(2)	166.0	4.50	3
Historic Sites (e)(3)	3.7	0.70	19
Rural Roads (e)(4)	56.0	6.30	11
Rural Dwellings (e)(5)	0.8	0.08	10
Rural Public Structures and Cemeteries (e)(5)	0.8	0.07	9
Rural Public Parks (e)(5)	11.1	0.60	5
Total 522(e) Areas	470.4	20.45	4

are coal bearing.

As a measure of environmental impact, this report projects the amount of acres that could be disturbed in 522(e) lands in the period 1995-2015. Projections are made for a no action or status quo case, and for other cases that apply alternate rules concerning valid existing rights and 522(e) prohibitions to underground coal mining. Our projections of disturbance to coal acreage in 522(e) lands are based in large measure upon these factors:

- recent trends in waivers and compatibility determinations allowed under section 522(e), which we assume will continue into the future,
- limited private ownership of coal in (e)(1) lands,
- the limited attractiveness to the market for much of the coal located on 522(e) lands (other than the 522(e) coal in road and dwelling buffers and in National Forests),
- the lack of deed authority in most mineral deeds to carry out surface mining operations which is a significant constraint on access to coal, and
- the technological possibility for underground mining to extend under acreage in

(e)(1) lands and (e)(5) public parks providing significant access to coal.

A small amount of the Nation's coal reserves are located within the boundaries of Federal land preserves ((e)(1), (e)(2), and (e)(3) lands)) protected by section 522(e). A recent report of the U.S. Geological Survey<sup>1</sup> estimates that about 38 billion tons of surface- and underground-minable coal are located within the boundaries of (e)(1), (e)(2), and (e)(3) lands. These tonnages represent about 8.1 percent of the U.S. Demonstrated Reserve Base.<sup>2</sup> About 80% of this coal is located within National Forests and National Grasslands.

An initial overall perspective on the effect that alternate rules could have on access to coal acreage in 522(e) lands is provided in the following results:

- In the no action or status quo case, we project that 371,381 acres in 522(e) areas would be disturbed by coal mining operations in the period 1995-2015. This 522(e) acreage is about 18% of total acreage projected to be disturbed by coal operations throughout the United States in the period 1995-2015.
- Dwellings, roads, and their associated buffers account for most of the disturbance: 274,274 acres or 74% of total 522(e) acres projected to be disturbed.
- The alternate rule that is the most protective of 522(e) lands is projected to reduce disturbed acres in 522(e) lands by 25,000 acres in the period 1995-2015. Compared to the level of disturbance in the no action case, this is a reduction of about 6% in disturbed acreage. The 25,000 acres contain about 226 million tons of coal, which is about 1% of total coal projected to be mined in the United States in the period 1995-2015.
- The alternate rule that is the least protective of 522(e) lands is projected to increase disturbed acres in 522(e) lands by 8,000 acres in the period 1995-2015 compared to no action. This is an increase in total disturbed acreage of about 2%. The 8,000 acres contain about 60 million tons of coal, which is about 0.3% of total coal projected to be mined in the United States in the period 1995-2015.

This report projects disturbed acreage, economic costs, and economic-cost savings for alternate rules.

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<sup>1</sup>Watson W.D. et al., 1995, Coal Resources in Environmentally-Sensitive Lands Under Federal Management: Reston, VA, U.S. Geological Survey, Open-File Report 95-631, 11 p., 8 map plates. The tonnage estimates in the U.S. Geological Survey report are based upon the acreage estimates that are provided in this Economic Analysis report.

<sup>2</sup>Total coal reserves in the U.S. Demonstrated Reserve Base are estimated to be about 474 billion tons. The U.S. Demonstrated Reserve Base estimates are provided in Energy Information Administration, 1993, Coal Production 1992: Washington, D.C., U.S. Department of Energy, DOE/EIA-0118(92), Oct. 1993, table A-2, p. 73.

The projections provide a basis for ranking alternate rules in terms of net benefit.

#### **D. Proposed Actions**

- OSM is considering and this Economic Analysis evaluates:
  - Five alternatives for implementing the valid existing rights (VER) exception found in section 522(e) of SMCRA. The five VER alternatives are no action (NA), good faith all permits (GFAP), good faith all permits or takings (GFAPT), bifurcated test (BF), and ownership and authority (O&A). The first alternative, no action, would maintain the status quo and would not require rulemaking. The other four alternatives would require the promulgation of a rule.
  - Five alternatives related to the issue of whether the prohibitions of 522(e) apply to the surface area potentially affected by subsidence from underground mining activities. The five prohibitions alternatives are no action (NA), prohibitions do not apply (PDNA), prohibitions apply if material damage (PAMD), prohibitions apply if subsidence (PAS), and prohibitions apply (PA). The first alternative would maintain the status quo. The other four alternatives would require the promulgation of a rule.
- Table S-2 defines the VER and prohibitions-apply alternatives. The NA case is the starting point for the analysis. The four prohibition alternatives are analyzed in combination with the four VER alternatives. For each alternative rule, we estimate additional economic costs and additional economic benefits compared to the NA alternative.

#### **E. Estimates of Economic Costs and Benefits**

##### **1. Valid Existing Rights Alternatives**

- None of the VER alternatives would have a significant economic impact on the surface-mining coal industry nationwide, relative to the NA alternative. The increase in acres predicted to be disturbed by surface mining under the O&A alternative, the alternative having the greatest impact, is only 0.11% of the total acres estimated to be impacted under the NA alternative by surface and underground coal mining in the period 1995-2015. The effects of the alternative VER rules on surface-minable coal are summarized in Table S-3.

##### **2. Prohibition Alternatives**

- This report analyzes three different rules that would apply the prohibitions of section 522(e) to subsidence. The rule labeled "Prohibitions Apply" (PA) would prohibit subsidence without qualification. The rule labeled "Prohibitions Apply if Subsidence" (PAS) would prohibit

**Table S - 2**  
**Definitions of Valid Existing Rights and Prohibitions-Apply Alternatives**

<b>VER Rules</b>	No Action (NA)	Would maintain the status quo and would not require rulemaking.
	Good Faith All Permits (GFAP)	A good-faith effort to obtain all permits before the August 3, 1977, cutoff date would have to have been made. However, in the case of areas newly subject to the protections of section 522(e), the applicable date would be the date that the area became subject to section 522(e).
	Good Faith All Permits or Takings (GFAPT)	When application of the <u>GFAP</u> standard would lead to denial of a VER claim, there would be a second level of review to determine if denial would result in a compensable taking; in which case, the regulatory agency would grant VER.
	Bifurcated Test (BF)	VER determinations would be based upon the date the mineral estate was severed from the surface estate in relation to passage of SMCRA. For those instances where the mineral estate was severed from the surface estate prior to the passage of SMCRA, VER would be determined on the basis of the <u>ownership and authority</u> test. For those instances where the mineral estate was severed after the passage of SMCRA, VER would be based on the <u>GFAP</u> test.
	Ownership & Authority (O&A)	An individual could establish VER by demonstrating possession of both a right to the coal and the property right to mine it by the method intended.
<b>Prohibition Rules</b>	No Action (NA)	Would maintain the status quo and would not require rulemaking.
	Prohibitions Do Not Apply (PDNA)	OSM would determine through rulemaking that subsidence is not a surface coal mining operation subject to the prohibitions of section 522(e). Surface activities and facilities related to underground coal mining would continue to be subject to the prohibitions of section 522(e).
	Prohibitions Apply if Material Damage (PAMD)	OSM would determine through rulemaking that subsidence causing material damage would be a surface coal mining operation subject to the prohibitions of section 522(e).
	Prohibitions Apply if Subsidence (PA)	OSM would determine through rulemaking that underground mining predicted to cause subsidence within the foreseeable future would be considered a surface coal mining operation subject to the prohibitions of 522(e).
	Prohibitions Apply (PA)	OSM would determine through rulemaking that all underground mining will be deemed to eventually cause subsidence and that, therefore, all underground mining would be considered a surface coal mining operation subject to the prohibitions of 522(e).

underground mining if it causes subsidence in the foreseeable future. For purposes of analysis, we have assumed that 40% of coal in 522(e) areas could be removed without causing subsidence in the foreseeable future. Therefore, we assume coal removal of up to 40% would not be prohibited under the PAS rule. The rule labeled "Prohibitions Apply if

Material Damage" (PAMD) would prohibit underground mining if material damage occurs as a result of subsidence. For purposes of analysis, we assume coal removal of up to 50% would not be prohibited under the PAMD rule. All three prohibitions alternate rules--PA, PAS, and PAMD--could result in the same high costs to the economy if 10% or more of homeowners block mining under their dwellings by not signing waivers. The PA rule, however, would result in smaller environmental impacts because fewer 522(e) acres would be undermined under the PA rule, compared to the PAS and PAMD rules. Thus, of the three rules that could prohibit subsidence, the PA rule would be the most cost-effective. Therefore, in this summary we emphasize analytic findings for the PA rule. However, a complete analysis of all three prohibitions rules is provided in subsequent chapters of this report.

- A prohibitions apply (PA) rule would require coal-mining companies (who do not have VER) to obtain a waiver from a homeowner to mine coal from beneath the homeowner's dwelling. Currently, in the no action or status quo case (which is equivalent to PDNA), coal mining companies with valid deeds normally can mine the coal underneath dwellings without the permission of the homeowner.

**Table S - 3**  
**Effects of Alternative Rules, 1995-2015**  
**Surface-Minable Coal Acreage**

	Alternate Rule: Change Compared to No Action		
	<u>GFAP</u> <sup>1</sup>	<u>GFAPT</u> <sup>2</sup>	<u>O&amp;A or BF</u> <sup>3</sup>
Coal mining & delivery costs	Negligible cost increase	Negligible savings slightly smaller than O&A savings	Negligible savings
Disturbed acreage	711 fewer acres in (e)(2) East	2,144 additional acres in (e)(1), (e)(2) & (e)(5) areas	2,351 additional acres in (e)(1), (e)(2) & (e)(5) areas

<sup>1</sup> GFAP = good faith all permits.  
<sup>2</sup> GFAPT = good faith all permits or takings.  
<sup>3</sup> Bifurcated test (BF) has the same effects as ownership and authority (O&A) rule.

Anal  
ysis

indicates that withholding of dwelling waivers has the potential to significantly alter coal mining



operations. We applied GIS analysis to six counties where longwall mining operations are concentrated. Using the GIS results, we determined that if 10% or more of homeowners withheld waivers, then longwall mining operations would not be economically viable.

- Under the PA rule, if 10 percent or more of the dwelling owners did not grant waivers to mine under their dwellings, longwall mining would not be economically viable.
- Longwall mining is an important and expanding type of mining. It accounted for 38% of 1993 underground mining. Under a status quo scenario, longwall mining's share of underground mining is forecast to increase to 48% by 2015.
- Longwall mining can be a relatively low cost, underground-mining method, but it requires large blocks of uninterrupted coal.
- Room-and-pillar-with-retreat mining, which has more flexibility than longwall mining, would still be economically viable under a PA rule.
- Under the PA alternative (assuming 10% or more of homeowners withhold waivers<sup>3</sup>), longwall production is projected to decline from 161 million tons in 1995 to 81 million tons in 2015 (Table S-4 and Figure S-1).
- Blocking longwall production increases coal-mining and coal-delivery costs and shifts production patterns. The additional coal-mining and coal-delivery costs to the economy would be \$2.65 billion (discounted)<sup>4</sup>.
- Assuming 10% of homeowners withhold waivers, 1,948 fewer rural dwellings would be undermined under the PA alternative than under the PDNA alternative. The cost to the economy of repairing rural houses would be reduced. The forecasted savings in rural repair costs over the period 1995-2015 (discounted to 1995 at 7%) is \$8.0 million.

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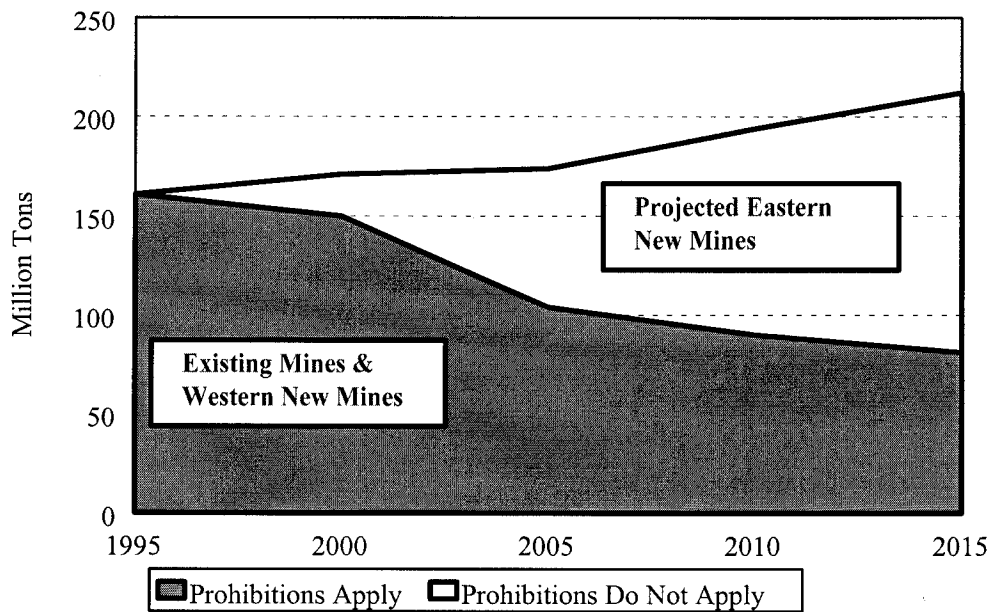
<sup>3</sup> The phrase "assuming 10% or more of homeowners withhold waivers" means "assuming for illustrative purposes." According to the analysis in this report, a 10% holdout rate is an important threshold: when 10% or more of homeowners withhold waivers, coal reserves available for longwall would become so small that longwall mining would no longer be economically viable. The 10% rate is a representative rate. Depending upon the overlap pattern of coal with dwellings, the threshold rate could be below 10% in some specific cases and above 10% in other specific cases. (See additional discussion in Chapter III and Appendix C-6.)

<sup>4</sup> See Figure I-2, Report Conventions, for explanation of the procedure used to calculate discounted costs.

**Table S - 4**  
**Forecast Comparison**  
(Million Tons)

	<u>1995</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>
Longwall Production:					
Prohibitions Do Not Apply	161	171	174	194	212
Prohibitions Apply	161	150	104	90	81
Total Coal Production:					
Prohibitions Do Not Apply	1,041	1,081	1,121	1,223	1,266
Prohibitions Apply	1,041	1,081	1,126	1,235	1,282

**Figure S - 1**  
**Longwall Production Forecast Comparison**



- Because it is assumed that coal companies would be able to obtain waivers to mine under rural roads, the PA alternative has little impact on rural road repair costs. The primary impact would be due to some production being shifted to the Powder River Basin where the miles of road that must be undermined to produce a ton of coal are very low relative to the other coal-producing areas. Only 76 fewer miles of rural roads would be undermined under the PA alternatives than under the PDNA alternative. The cost to the economy of repairing rural roads would be reduced. The forecasted savings in rural-repair costs over the period

1995-2015 (discounted to 1995 at 7%) is \$7.2 million.

- In terms of benefits, 25,000 fewer 522(e) acres would be undermined under the PA rule than in the NA case. Also, homeowners who withhold waivers would have additional benefits due to the control they would retain over access to the coal beneath their dwellings. However, time and resources were not available to measure "homeowner control" benefits. Instead, we estimated the amount that these benefits would have to be for total additional benefits under a PA rule to equal total additional costs under a PA rule. Our estimate of break-even homeowner control benefits is \$1.35 million per dwelling withheld.
- The effects of the prohibition alternatives on underground-minable coal, assuming that 10% of homeowners withhold waivers, are summarized in Table S-5.

**Table S - 5**  
**Effects of Alternative Rules, 1995-2015**  
**Underground-Minable Coal Acreage<sup>1</sup>**  
 10% Homeowner-waiver-withholding Rate

	Alternate Rule: Change Compared to PDNA/No Action		
	<u>PA/GFAP</u>	<u>PA/GFAPT</u>	<u>PA/O&amp;A</u>
Coal mining & delivery costs	Additional cost of \$2.65 billion (discounted)	Additional cost of \$2.65 billion (discounted)	No additional cost
Savings in house repair costs	\$8.0 million (discounted)	\$8.0 million (discounted)	None
Savings in road repair costs	\$7.2 million (discounted)	\$7.2 million (discounted)	None
Disturbed acreage	24,497 fewer acres disturbed	8,893 fewer acres disturbed	5,614 additional acres disturbed

<sup>1</sup> Other prohibitions apply rules: PAS and PAMD have the same coal delivery and coal transportation costs and savings in road repair costs. PAS and PAMD disturb slightly more (e)(1) and (e)(5) acres than does PA.

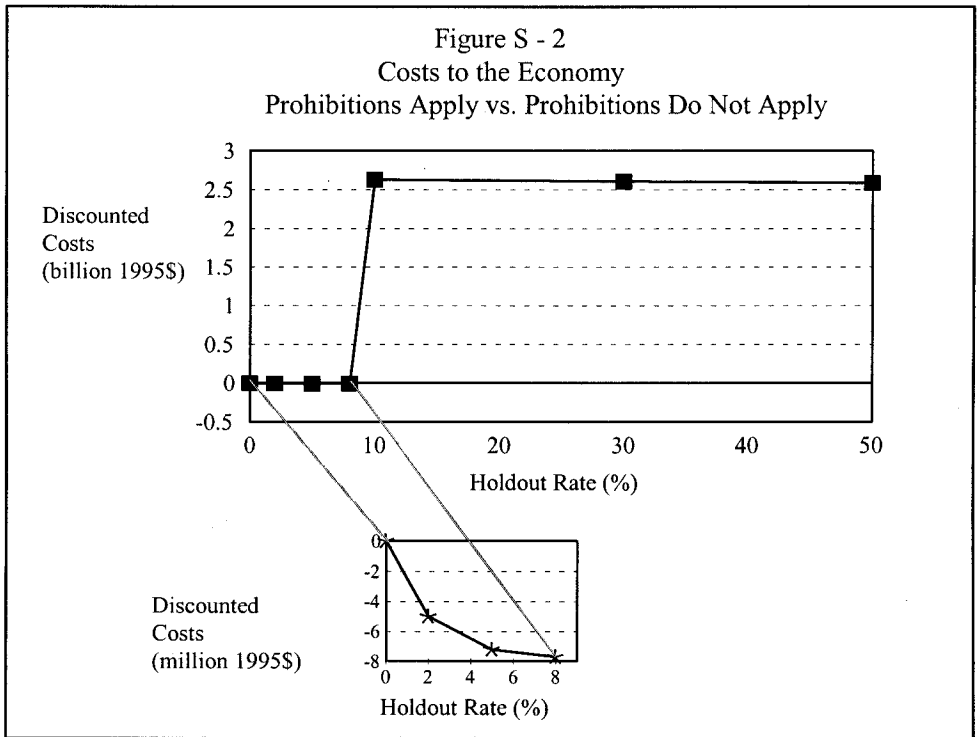
Figure S-2 shows the net present value of costs to the economy of choosing the PA rule. If the percentage of dwelling owners not granting waivers were to be less than 8 percent, up to \$7.7 million (discounted) in dwelling-repair costs could be saved (shown as negative costs in Figure S-2). But, as the percentage of homeowners denying waivers approaches 10 per-

cent, longwall mines would become uneconomic, and coal would have to be mined by more expensive room-and-pillar mines or more distant western mines. If longwall mines became uneconomic, the relatively small savings in repair costs would be dwarfed by the increased cost to the economy of providing coal, \$2.6 billion (discounted) at a minimum.

- The relatively high magnitude that homeowner control benefits would have to reach in order to achieve break-even and high expected costs of the PA rule support our overall conclusion that the PA rule has low potential for achieving positive net benefits.
- The report discusses circumstances under which a PA rule in theory could be economically beneficial. This beneficial outcome could occur under the following circumstances. The PA rule could result in large costs to the economy on the order of several billion dollars (discounted) if longwall mining were to be shut down. These costs could be passed onto consumers of electric energy. The consumers could attempt to negotiate with homeowners. By offering homeowners enough money, the consumers of electric energy (or their agent) may be able to entice some homeowners to sign waivers. If the holdout rate is reduced enough, longwall mining would not be shut down. Consumers of electric energy would pay-out less through negotiation than they would pay otherwise in the form of higher energy bills. Homeowners accepting offers would do so because, from their perspective, they would be better off. Thus, in these circumstances, the high costs of the PA rule would not occur and, on the environmental side, fewer 522(e) acres would be disturbed, compared to status quo. However, the report also indicates that practical circumstances could result in large costs for establishing effective negotiation between “true holdout” homeowners and the parties that could offer them compensation. Also, as discussed in the report, a PA rule could introduce a high degree of uncertainty about the ability of mining companies to achieve normal profit. Uncertainty could reduce opportunities to raise capital for specific mining projects and could induce investors to seek other opportunities. These various effects, which are referred to as “transactions costs,” are likely to be so constraining that it is unlikely that the interested parties would be able to reach a settlement that would avoid the shutdown of longwall mining. Thus, as before, the analysis supports the conclusion that the PA rule has low potential for achieving positive net benefits.

### 3. Cost Summary

Compared to NA, all alternate rules that combine various VER rules with PDNA or include O&A would have negligible additional economic costs. This small impact on cost is due to the fact that access to coal would be changed by only very small amounts under these alternate rules. In contrast, the alternate rules that combine various VER rules with a PA rule could have large additional costs



to the economy compared to NA. This large impact on cost would occur when 10% or more of homeowners withhold waivers. Longwall mining would become uneconomic. Coal production would be switched over to other more costly mining methods or to more distant coal. A summary of these results follows:

Alternate Rule	Changes in Costs Compared to No Action
PDNA/GFAP	Negligible
PDNA/GFAPT	Negligible
PDNA/O&A	Negligible
PA/GFAP**	Higher by more than \$2 billion*
PA/GFAPT**	Higher by more than \$2 billion*
PA/O&A	Negligible

\* Discounted over the period 1995-2015 at 7%.  
 \*\* PAS and PAMD in combination with various VER rules also are projected to have costs \$2 billion more than NA.

**4. Benefit Summary**

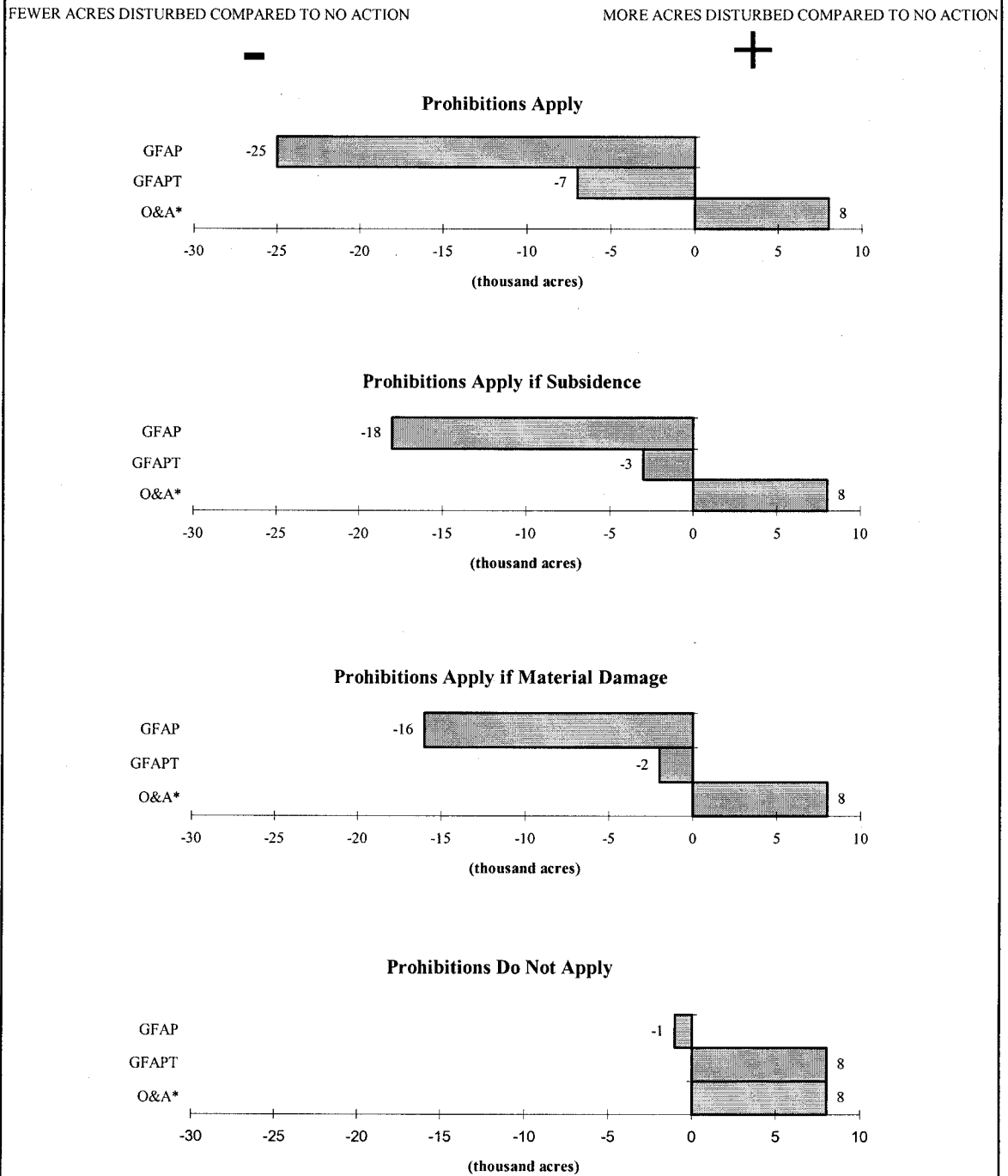
Our projections of the change to disturbed 522(e) acreage for various alternate rules are provided in Figure S-3. PA in combination with a GFAP VER rule is projected to disturb 25,000 fewer acres compared to the no action case. The PDNA rule in combination with a VER O&A rule is the least protective of any of the alternate rules. The PDNA/O&A rule would result in the disturbance of 8,000 more 522(e) acres in the period 1995-2015 compared to no action. The other alternative rules have impacts intermediate between these two rules.

#### F. Ranking of Alternative Rules

Our analysis indicates that PA, PAS, and PAMD rules all would have the same economic costs, whereas fewer acres would be disturbed under the PA rule, compared to PAS and PAMD rules. Therefore, according to our analysis, it is always possible to obtain the same or greater net benefits by choosing a PA rule over a PAS or PAMD rule. Also, our analysis indicates it is always possible to obtain greater net benefits by choosing PA/GFAP over PA/GFAPT. This leaves five alternate rules for ranking: PA with two alternative VER rules and PDNA with three alternative VER rules. Based on the analysis in this report, these five rules are ranked as follows:

PDNA/GFAP	Zero economic costs	Fewer acres disturbed	Positive net benefits
PA/GFAP	High economic costs	Fewer acres disturbed	Low potential for positive net benefits
PA/O&A PDNA/GFAPT PDNA/O&A	Zero economic cost savings	More acres disturbed	Negative net benefits

**Figure S - 3 522(e) Acres Forecast To Be Disturbed, 1995-2015,  
Surface and Underground Mining, 10% Holdout Rate,  
Change from No Action**



\* Similar results for Bifurcated rule