Assessment of Alternative Funding Mechanisms to Encourage Environmental Compliance and to Maintain Solvency of the Special Reclamation Fund

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FINAL REPORT

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Executive Summary

This report evaluates a broad range of alternative financial mechanisms to complete environmental reclamation, restoration and abatement of and at revoked permit sites while providing for the overall fiscal stability of the Special Reclamation Fund (SRF). The need for this analysis was identified in HB 3003, that was passed in the 2005 regular session of the West Virginia Legislative Session. HB 3003 amended §22-3-11 of the WV Code to, among other things, require the Secretary to determine the feasibility of different bonding systems or funding mechanisms and their impact on the overall stability of the SRF. This report evaluates the history of expenditures made by the Special Reclamation Fund (SRF) in reclamation of liabilities it has inherited since implementation of the Surface Mining Control and Reclamation Act of 1977 and projects future liabilities through FY 2026.

This report builds upon an actuarial report conducted by the Hay Group, Inc. that provided a foundation on which to base the methodology used here to evaluate historical expenditures of the SRF. Due to constraints of actuarial science, that report was unable to incorporate the impact of regulatory and economic events on changing costs. The work enabled in this report was greatly advanced by the base approach designed by the Hay Group, and builds upon the Hay Group's report by incorporating the impact of these types of events over the history of the SRF.

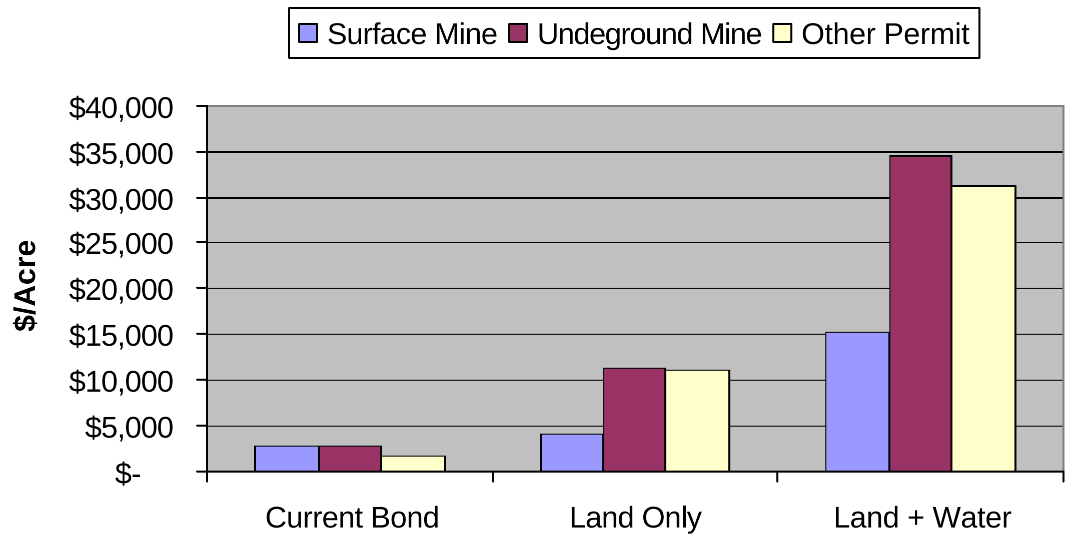
The pattern of coal mine forfeitures over the study period (2005-2026) is projected to be similar to that seen over the last decade. Consolidation in the industry continues, and under-financed reclamation bonds force some marginal operations to close, albeit at lower rates than seen prior to 1996. The current historically low rates of forfeiture may be related to sustained high coal prices, although historical coal price movements have not correlated well with forfeiture rates. This result is most likely due to the overpowering impact of increased productivity in mining which has transpired over the last decades. The portion of forfeited acreage requiring water reclamation is projected to decline as the population of permits issued under the current, more stringent regulatory system grows.

In spite of the expected decline in forfeited permits that contain acid mine drainage, a number of existing operations permitted prior to 1990 remain open and represent large potential water liabilities to the SRF. Operations of this vintage comprise about 35% of bonded mining acreage and represent the largest liabilities to mine operators, who may be faced with higher bonds for non-producing sites.

Three categories of expenditures were evaluated in this analysis: land capital, water capital and water treatment. These expenditures were evaluated separately for underground and surface mining operations as well as other non-mining permits. These liability amounts per acre are not an estimate of full-cost bond amounts because liability rates are not equivalent to full reclamation costs. Liability rates include costs on sites that have already been partially or even fully reclaimed. Another consideration is that the level of bonding may impact the permit owner's incentives to self-reclaim. In particular, a full-cost bond may reduce the number of forfeitures for those sites whose reclamation costs are between the current (partial) bond amount and the full-cost bond.

For most permits forfeited to the SRF, current bond amounts have fallen short for both land and water reclamation. The difference between average current bond amounts per acre and estimated average liabilities is shown in the following chart. For surface reclamation, liabilities were higher than current bond amounts for all types of permits.

Figure E.1: Current Reclamation Bond Amounts vs. Historical Liabilities



As the chart above shows, for reclamation requiring water treatment related to acid mine drainage (AMD) bond amounts would need to be considerably higher than current amounts. The cost of acquiring these larger bonds would have a greater impact on smaller producers because of the significantly higher annual and initial bond costs. In addition, because the market for surety bonds covering acid mine drainage is largely untested, full-cost bonding is not recommended for sites that require water treatment. For this type of reclamation a trust fund, either site-specific or state-wide, is recommended. This type of mechanism would place more control over the effects of unexpected reclamation needs in the hands of operators and state regulators and would provide more incentive for permit holders to complete reclamation.

Using the average calculated rates creates projected annual liabilities of between $12 and $15 million (inclusive of administrative costs) between FY 2009 and FY 2026. After FY 2009 reclamation of legacy sites forfeited prior to FY 2002 will be complete. As these legacy sites are completed reclamation liabilities drop from the current annual levels of $14 to $27 million for reclamation planned for FY 2006 through FY 2009.

Continuing the current system of partial-cost bonding plus the permanent seven cent per ton tax would leave the SRF comfortably solvent through 2026. In fact, under this system the fund balance would continually increase over time. After completion of legacy reclamation, the tax could be lowered to approximately five cents per ton and still maintain an average fund balance of no less than 150 percent of annual liabilities through 2026. The temporary seven cent tax could be repealed without endangering the fund.

Because of the legacy costs, instituting full-cost bonding as the only funding mechanism would leave the fund solvent but with a declining balance. The legacy costs can not be covered through bonding, as they are not associated with any of the current operators.

If only deep mines, preparation plants and refuse sites are required to post full-cost bonds and other operators continue with the status quo, the SRF is projected to fall short of the recommended 150 percent balance beginning in about 2017.

Implementing a trust fund for all water costs, or all non-legacy water costs, would cause the SRF to remain comfortably solvent through 2026, with an increasing balance beginning in about 2017.

Other mechanisms evaluated include offering operators the choice of the status quo system or full-cost bonding. This option is not recommended due to the likelihood of the fund going negative even if tonnage taxes are held at seven cents per ton. In that case, tonnage taxes would have to be raised to levels that would most likely induce the smaller operators that chose the status quo to go with full-cost bonding. The variability associated with allowing operators to switch the type of bonding selected would also add risk to the SRF.

The recommended policy option is to have full cost bonding for sites requiring land reclamation. These costs are more predictable than water treatment and usually short lived as the site closes operations. Each bond should be site specific considering the requirements for restoration that each site presents. A single bond rate could not be considered as a full cost bond since the costs per acre for reclamation will vary from site to site. Information gathered during the permitting process could provide the necessary information to determine these site specific bonds.

Treatment of water presents two different situations. First, for future permits it is less likely that water problems, particularly AMD, will occur due to regulations now in place. Even so, unforeseen circumstances and conditions could create future conditions requiring remediation. For that reason some financial mechanism is necessary to cover these unanticipated costs. A trust fund could be created by a permit fee or bond which is required from each site and is deposited in the trust fund and could be redeemed when and if the problem is solved. The problems of such an approach have been mentioned earlier, but it is used in the neighboring state of Pennsylvania. The difficulty remains of determining the appropriate level for these site specific fees.

Second, even if full cost bonding for water reclamation would be satisfactory for future permits, the legacy problems remain. These sites still need coverage, several of which may require treatment in perpetuity. It is recommended that a trust fund be established to cover both the legacy costs and the unanticipated expenses of water reclamation. The appropriate approach would be to finance the trust fund by the continuation of the tonnage tax. The tax could be reduced from its present seven cent level as land reclamation costs are covered by the full cost bonds. As more and more of the legacy sites are reclaimed, the tax would decrease even further.

There are two approaches to the trust fund. One would be to establish the fund as an annuity where the contributions would build to the point where the earnings on the fund were estimated to be sufficient to cover the anticipated costs. This approach has the disadvantage of being comparatively costly until the trust fund is sufficient to cover future outlays. The tax would remain relatively high to build the fund.

A second approach to establishing the trust fund would be to establish the anticipated annual expenses and set the tax sufficient to cover those expenses with a reserve of 20 to 50 percent. This approach involves lower tax rates at least in the short run, but it does mean the tax would have to be adjusted periodically to insure the necessary level of reserves. While in most cases the adjustment would be downward, if there was a catastrophic event tax increases might be dictated. These fluctuations could be covered by use of a "circuit breaker" which would automatically make the adjustments.

The complete explanation of these recommendations is given in the full report. It should be noted that none of the full-cost bond amounts used in this report are estimates of what actual bond amounts will be, but are hypothetical amounts used for analysis.

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I. Introduction

This report evaluates a broad range of alternative financial mechanisms to complete environmental reclamation, restoration and abatement of and at revoked permit sites while providing for the overall fiscal stability of the Special Reclamation Fund (SRF). The need for this analysis was identified in HB 3003, that was passed in the 2005 regular session of the West Virginia Legislative Session. HB 3003 amended §22-3-11 of the WV Code to, among other things, require the Secretary to determine the feasibility of different bonding systems or funding mechanisms and their impact on the overall stability of the SRF.

Trends in Forfeitures

The report describes the general trends of forfeiture observed within the coal industry and the nature of the liabilities created by those forfeitures. A projection of liabilities for each of the major categories of reclamation – land capital, water capital, and water treatment – is presented covering the time period through FY 2026. Several funding mechanisms that could be used to cover the projected liabilities, as identified by the West Virginia Department of Environmental Protection (WVDEP) are discussed.

This introductory section provides an overview of the historical trends and current status of the events related to the SRF. This provides a foundation for the latter analysis and conclusions that are reached by the CBER staff. This introductory section has five major topics:

- Acreage and Permits (issued, forfeited, released, or open),
- Bonds (issued, forfeited, released, or open),
- Consolidation within the WV coal industry,
- Water and acid mine drainage (AMD), and
- Data issues.

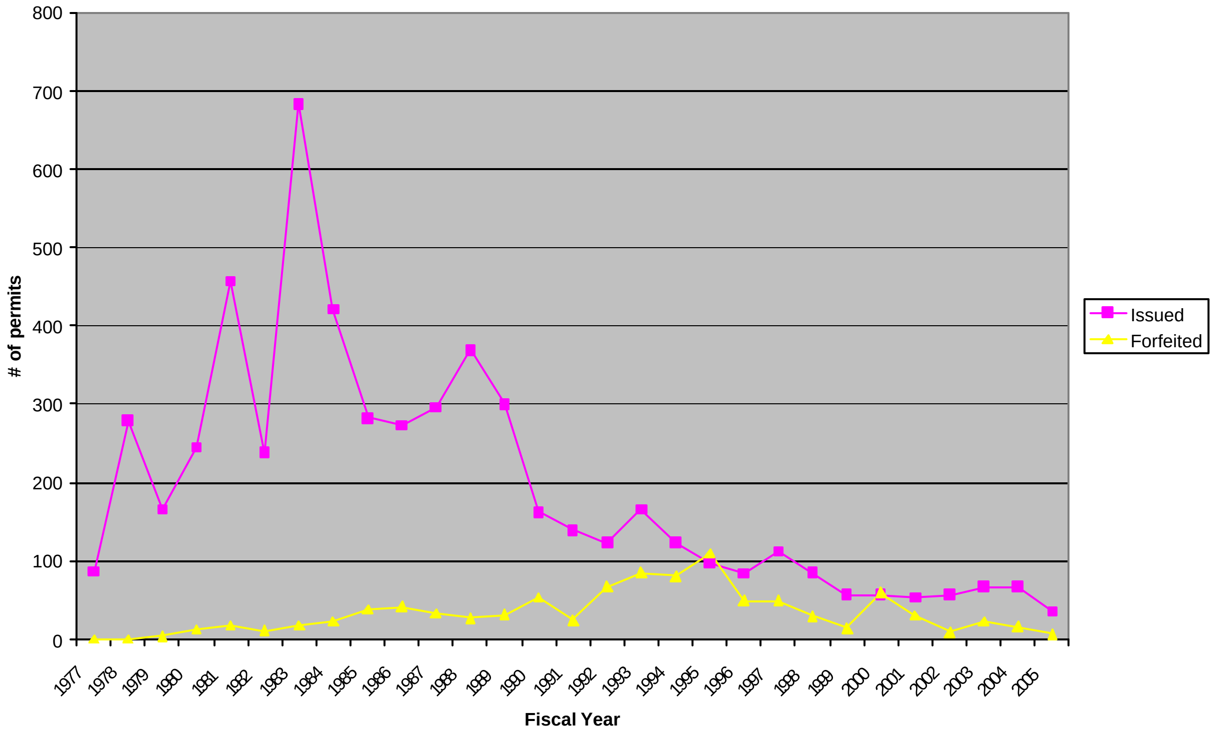
Acreage and Permit History & Status

The following graphs provide a characterization of the historical patterns of permit forfeit and release with respect to number of permits, acreage, and bond dollars.

Figure 9 describes the history of permit issuance and forfeits since 1977. The interpretation of these trends is important. The higher issuance that occurred in the early 1980s is distorted by the fact that many of those operations already existed at the time they applied for a SMCRA permit (i.e. the operations existed prior to 1977). The permitting of existing operations under permanent program requirements creates the impression that larger numbers of operations started in those years.[1] Only a portion of the operations listed as having been permitted in 1981 to 1983 actually began operations in those years.

[1] For example, prior to 1981, no prep plants had operating permits although refuse sites did have permits.

Figure 1: Permit History of Sites under the SRF (by year of event).



Issuance and Forfeiture Rates:

- A total of 5,577 permits and 465,615 acres, were issued from FY 1977 through FY 2005 (this excludes 55 revoked permits that did not have acreage or bond data).
- Of the 5,577 permits, 955 (17.12%) have been revoked, 2,715 (48.68%) released, and 1,907 (34.19%) are still outstanding (active, inactive, or in a stage of phase release).
- Of the 465,615 acres, 39,490 (8.48%) have been revoked, 131,617 (28.27%) released, and 294,509 (63.25%) are still outstanding (active, inactive, or in a stage of phase release).
- Of the 1,907 outstanding permits, 801 are underground mining permits, 607 are surface mining permits, 142 are haul roads, 108 are prep plants, 115 are refuse sites and 67 are loading facilities. The remaining permits are miscellaneous non-producing permits such as haul roads, preparation plants and refuse sites.
- The number of permits issued peaked in the early to mid-1980s and has fallen precipitously since then. The issue numbers from the years 1981 to 1983 are distorted due to permitting of pre-law mines.
- The number of permits (and acres) forfeited has dropped sharply since the early- to mid-1990s. This trend began well before the sharp coal price increases in 2003. The graphs can easily be misinterpreted in that part of the growth in forfeitures in the 1980s was due to an expanding population of pre-law operations that were covered by post-law permits that if forfeited fell under the SRF. Similarly the late-1990s to the present data largely represents 'young' sites that have very low forfeiture rates, especially in their initial years of production.

Figure 2 describes the trend that new permits are becoming increasingly fewer in number but larger in size. The trend toward larger acreage permits is stronger for issued permits but the trend is also observed in forfeited permits. Technological reasons as well as the permitting process itself have contributed to this change.

Figure 2: Acres per Permit

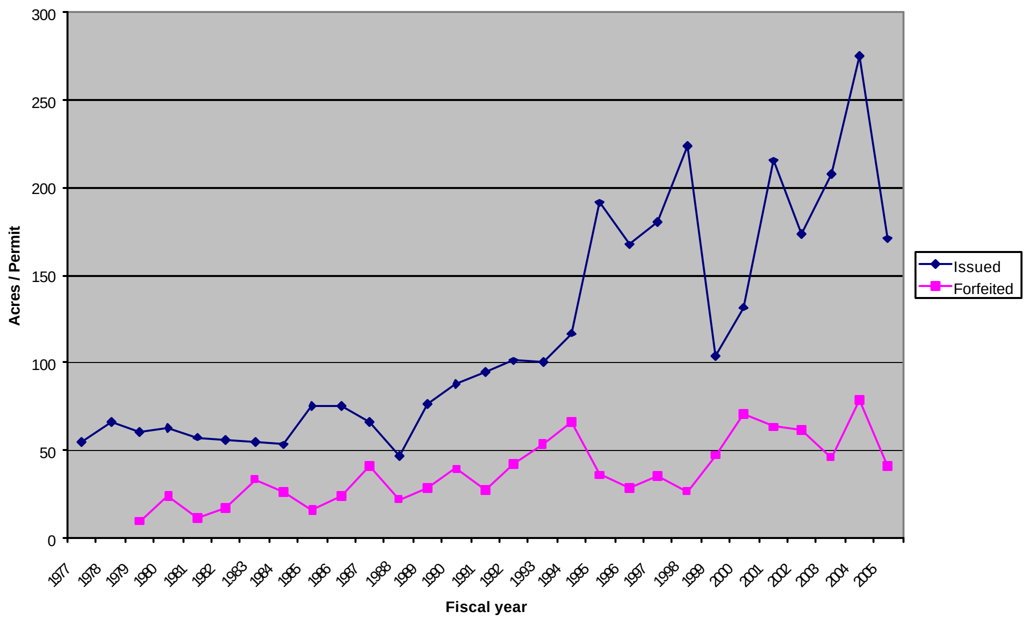


Figure 3 describes the pattern of forfeits matched with the year a permit was issued. The higher numbers of forfeit in the 1980s are due to the fact that these earlier permitted sites have had more time (in some cases decades) to default, whereas the more recently issued permits cover operations designed, permitted and operated under the SMCRA program. In addition, it is much easier to survive initial years of operation, especially in the current high coal price and high demand environment. Only two permits out of 279 issued since 2001 have been released or forfeited.

Figure 3: Permits Revoked, By Year of Issuance

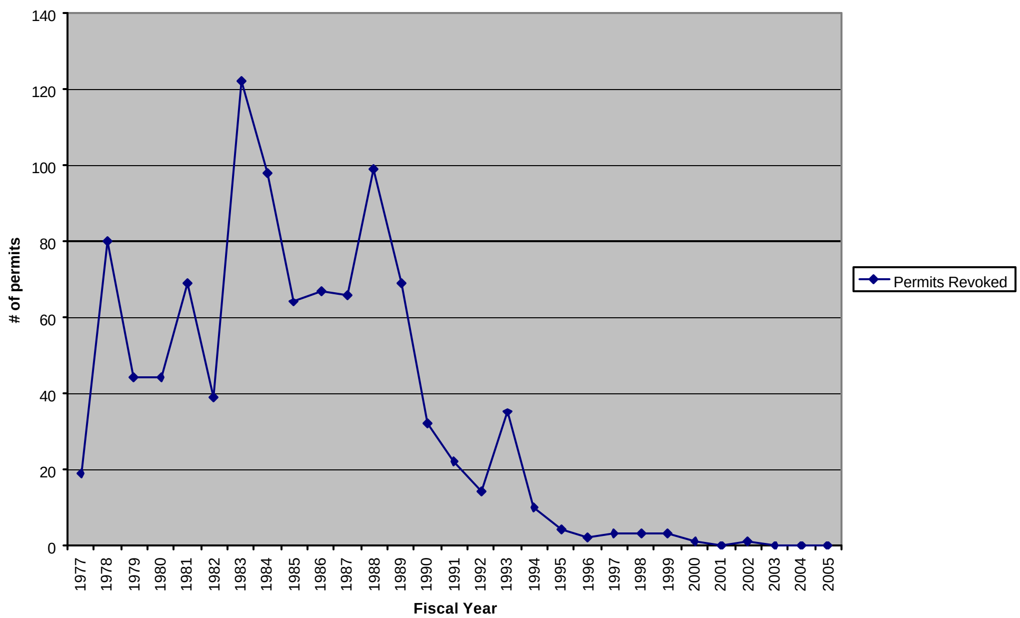
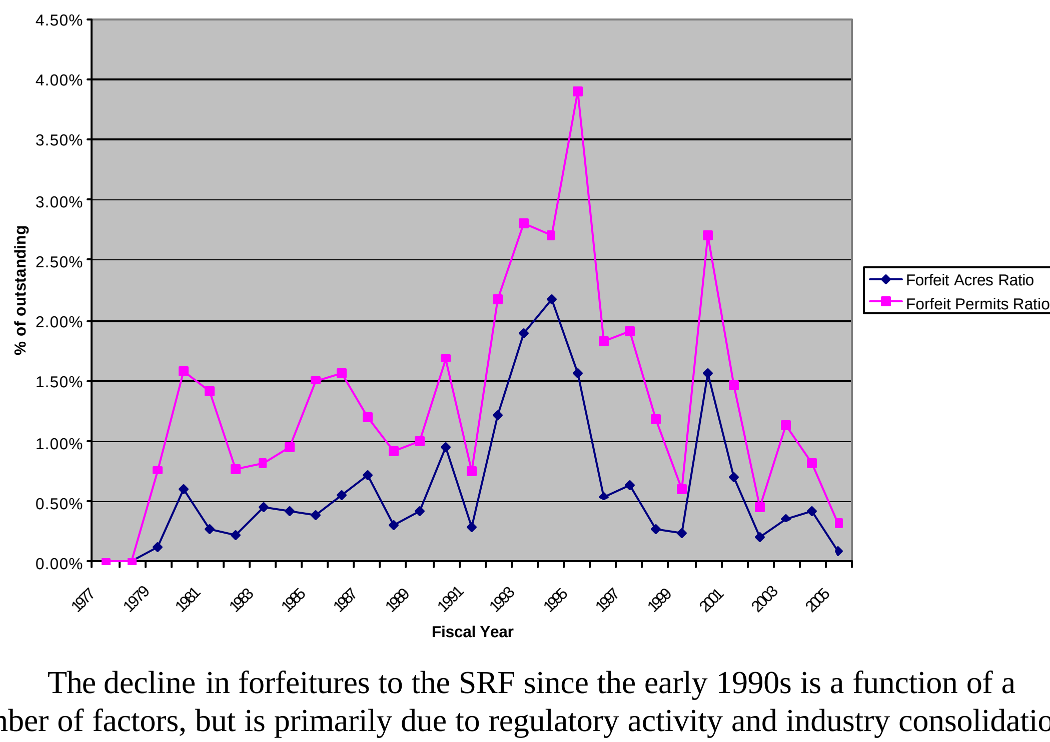


Figure 4: Forfeit Rates (percentage of acres vs. percentage of permits)

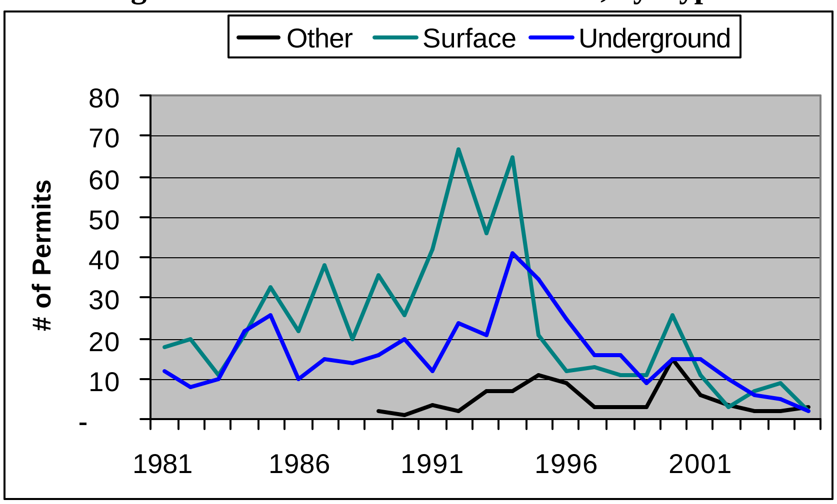


The decline in forfeitures to the SRF since the early 1990s is a function of a number of factors, but is primarily due to regulatory activity and industry consolidation. The 1980s through the early 1990s can be considered a time of regulatory adjustment for the West Virginia coal industry as the Department of Environmental Protection (DEP) received permanent control of the program and implemented its alternative bonding system. The early 1990s marked the institution of site-specific bonding which more than doubled of per acre bond amounts and instituted a $5,000 per acre cap on bond amounts.

From 1977 through 2005, 1,223 permits were forfeited in 36 West Virginia counties. Figure 1 describes the annual numbers for these events. As described later in this report, the spike in forfeitures in the years 1992 to 1994 was the result of more stringent permitting and institution of higher bond levels. Site-specific bonding has allowed the DEP to more closely match bond rates with potential liabilities, although the current rates still fall considerably short of full costs and thus do not provide enough incentive to reclaim.

Figure 5 describes the history of forfeitures to the SRF beginning in 1981, by type of permit. Since 1981, 591 surface (S) permits, 405 underground (U) permits and 155 "other" (O) type permits have forfeited. O type permits include preparation plants, refuse permits, haul roads and loading facilities.

Figure 5: Permit Forfeits Over Time, by Type

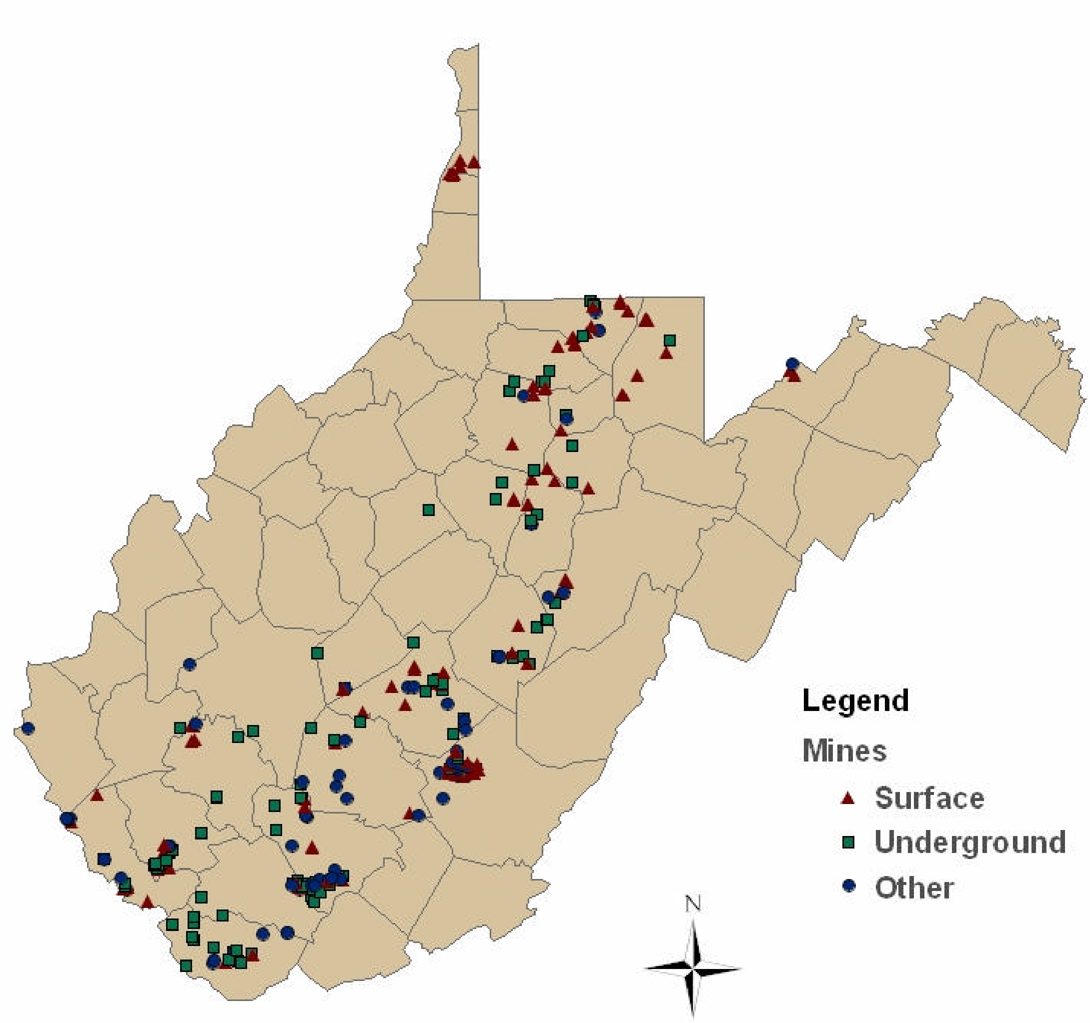


This report focuses on forfeits that occurred since 1996. A number of factors provide justification for the focus on this more recent activity to project future activity. The history of permit issuance and forfeitures prior to 1996 was influenced by a number of factors that no longer hold true for the coal industry and most likely will not be repeated. The most significant factors were: 1) the Surface Mining Control and Reclamation Act (SMCRA) of 1977; 2) implementation of site-specific bonding in the early 1990s; and 3) increased scrutiny of permits with AMD beginning in the 1990s.

Of the above three factors, site-specific bonding is the unifying activity that is probably most responsible for change. The DEP hired more inspectors and reduced the number of permits for which an inspector is responsible from about 130 to 35 permits. This reduction allows inspectors to become more familiar with site to site variations in reclamation needs and allows focus on more of the details of reclamation, e.g. erosion, subsidence, the presence of perennial or intermittent streams, sediment control.

Forfeits to the SFR, categorized by type of permit, are shown spatially in Figure 6.

Figure 6: Permits Forfeited to the SRF, 1996 through 2005

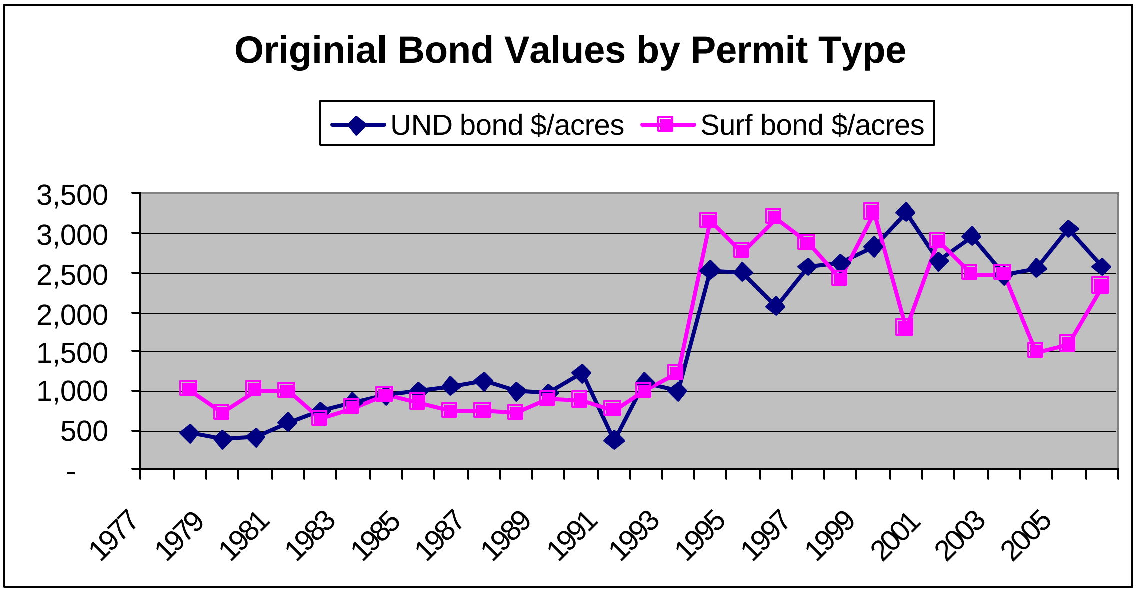


Bond Historical Trends and Current Status

Bond Trends:

- There have been a total of $875 million in bonds issued since 1977 (this excludes 55 revoked permits that did not have acreage or bond data).
- Of this $875 million, $27 million (3.11%) has been revoked, $132 million (15.13%) released, and $715 million (81.76%) in bonds are still outstanding (active, inactive, or in a stage of phase release).
- Bond amounts per acre jumped sharply in the early 1990s, in conjunction with the institution of site-specific bonding, as shown in Figure 7. Today there is an average $2,430 in bonds per permitted acre for all types of mining operations.
- There exist a large number of 'old' permits still outstanding in 2005; especially permits from the early 1980s related to pre-SMCRA permitting.

Figure 7: Original Bond Amounts for Underground and Surface Mines, Nominal $/acre



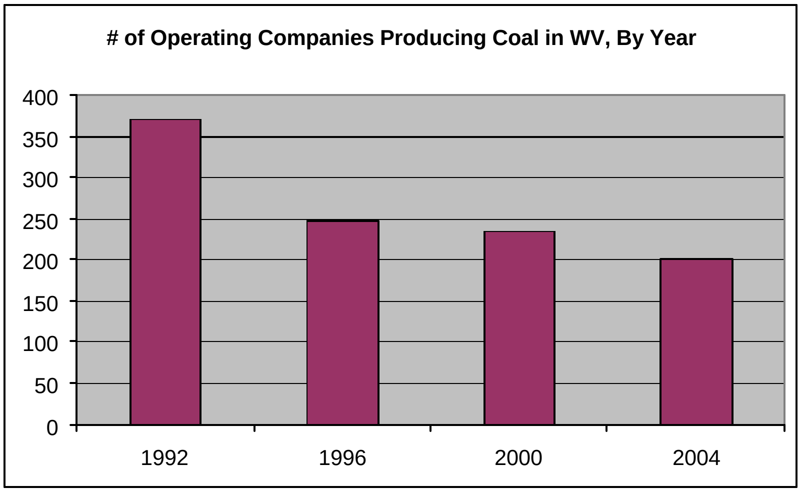
Structure of the Coal Industry

Consolidation Trends

The influence of the required increase in reclamation bond costs contributed to the exit of many smaller firms and consolidation of the industry in the early 1990s. Another significant influence was the low sulfur requirements of the Clean Air Act, which induced acquisitions as suppliers of coal to electric utilities secured access to low sulfur coal. It is apparent that this recent consolidation, as well as the consolidation of the early 1990s, did not impact production levels as production has risen since 1992 and is currently near 1996 levels.

In 1992, approximately 370 operating companies were actively mining coal in West Virginia and produced about 132 million tons in that year. By 1996, fewer companies were producing more coal as the number of companies dropped to 247 in production of nearly 163 million tons in 1996. By 2000 the number of producing companies dropped again, to 235, with production at about 158 million tons. In 2004 there were again fewer companies mining coal and production remained quite constant at about 160 million tons. These operating trends are shown graphically in Figure 8.

Figure 8: Number of Operating Companies Producing Coal in WV, by Year[2]

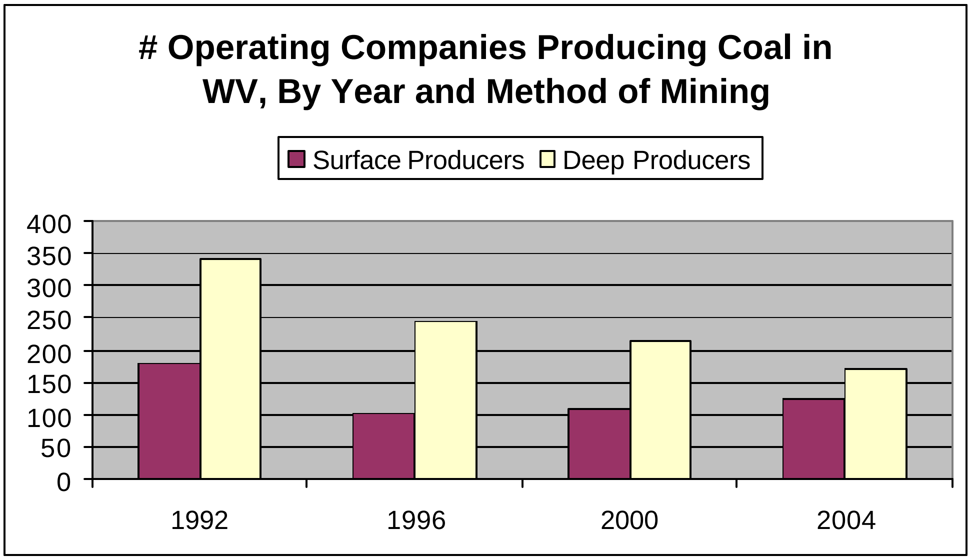


Consolidation has an overall positive effect on bonding and appears to reduce the likelihood of forfeiture of those bonds. Consolidated operations have more assets and generally longer operating histories that hold more weight in regards to bond issuance than do smaller operations with shorter track records. However, in a consolidated state the impact of any single corporate forfeiture has a potentially greater impact on the overall industry and associated activities that a corporation supports than would a single forfeiture in a more distributed industry. The risk of forfeiture is greater for smaller, less-capitalized firms. Horizon Natural Resources was the number six producer of coal in West Virginia when it began bankruptcy proceedings. As most of Horizon's holdings have been purchased by other companies, it is still uncertain whether that bankruptcy will significantly impact the SRF.

The trends toward fewer operating companies have not been quite uniform over the entire industry in the state (see Figure 9). Underground operations, the historically dominant method of mining, have followed this pattern while surface operations have followed it less closely. In fact, in the last eight years there has been an increase in the number of operating companies producing surfaced-mined coal in West Virginia.

[2] U.S. Department of Energy, Energy Information Administration, Coal Production Data Files.

Figure 9: Number of Operating Companies, by Year and Mining Method[3]



In 2003, between 120 and 140 separate legal entities held ownership over approximately 202 operating companies mining coal in West Virginia. For most operations, it is the capital assets and financial history of these entities that bond issuance is based on. When projecting a risk of forfeiture, it is the potential default of one of these entities that is being evaluated. Recently however, changes in Federal law regarding the distinction between ownership and control have reduced the legal liability that a parent corporation can have over a subsidiary that it does not control.[4] Because this rule did not become effective until 2001 it is uncertain what impact it will have on forfeiture rates.

Water Liabilities and Acid Mine Drainage

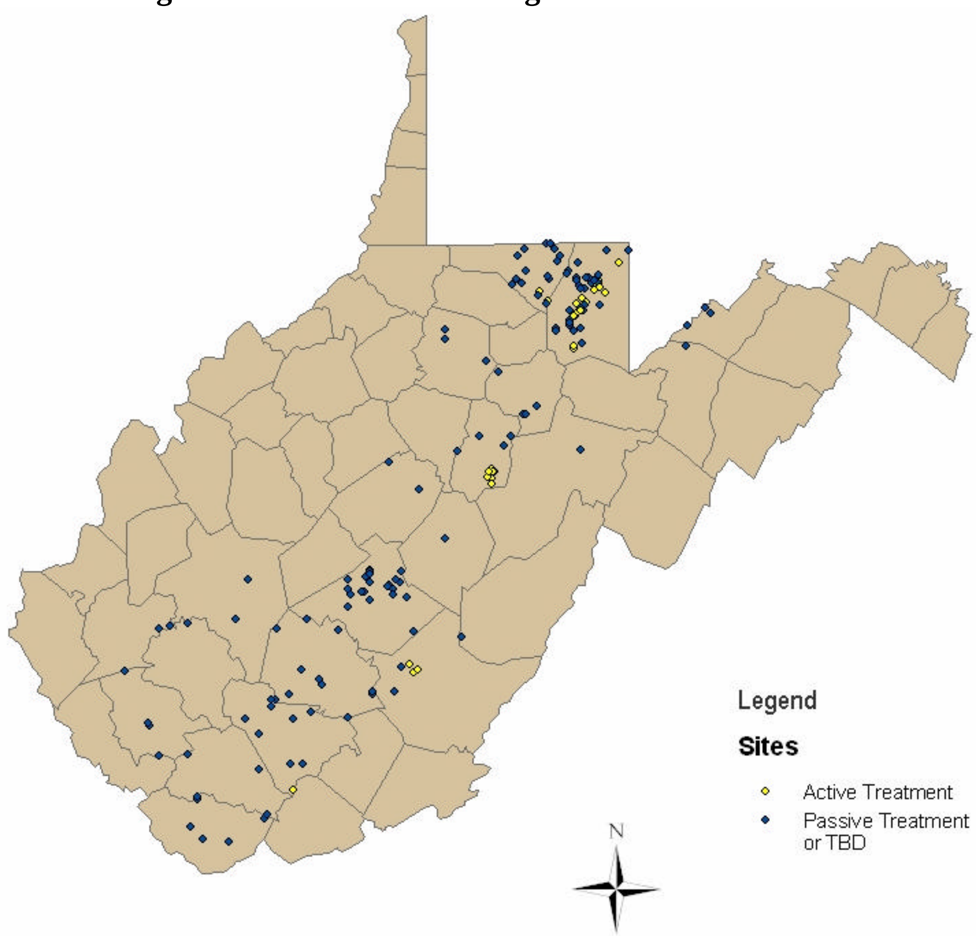
Acid mine drainage (AMD) has been a major contributor to forfeitures. Currently, about 21 percent of operators treat AMD on their sites, yet 25% of forfeited acreage requires AMD treatment. The cost of containment of AMD has led a number of companies to bankruptcy when those costs were not included in their operating plans. Particularly for sites that require active treatment and are above-drainage, containment is a perpetual problem. Current knowledge of the nature of these sites allows such potential liabilities to be avoided through site analysis as required in the permitting process. Still, this type of liability is the largest variable in future liabilities and requires strong site-specific evaluation to estimate treatment costs. For this reason, full-cost bonding for permits requiring water treatment will always be a task requiring detailed inspection and with a highly variable outcome.

[3] U.S. Department of Energy, Energy Information Administration, Coal Production Data Files.
[4] 30 CFR 773.12(a).

Above all, a bond amount should be set to encourage completion of reclamation. Current bond amounts fall exceedingly short here. The high bond amounts that would be required for a 20 or 30-year water treatment bond are generally larger than the current partial bond plus tonnage tax system paid by most operators, except for some of the largest underground mines. Because bond premiums and fees for letters of credit are non-refundable, a trust fund that returns funds paid into the fund following completion of reclamation would provide greater incentive for reclamation to be completed. A carefully calculated full-cost bond rate would hedge against this risk, as would contribution to a trust fund for water treatment by operators in acid-producing seams. Both systems could potentially be more burdensome to a small operator with less cash flow and fewer assets that can be leveraged for long-term credit.

As of the end of fiscal year 2005 there were 165 forfeited permits that were confirmed to have AMD. An additional 59 permits potentially contain AMD and many of these permits are on site of the permits already identified as having AMD. Of the 165 forfeited permits determined to have AMD, 116 were surface mines, 34 underground mines and 15 were other types of permits, typically refuse sites or prep plants. The location of these permits are shown in Figure 10, by type of treatment.

Figure 10: Acid Mine Drainage Sites Within the SRF



Reclamation Overview

As shown in Figure 11, land reclamation has been the largest category of liability to the SRF. However, the land liability per acre is much lower than for AMD-related reclamation and it is somewhat easier to predict. The largest cost component of land reclamation is typically earth-moving, although other categories of costs such as high-wall removal can also constitute considerable expense. The most expensive land reclamation project undertaken by the SRF was for a threatened impoundment failure.

Because water treatment costs are ongoing and cumulative, this category of reclamation could eventually become the largest. Water reclamation is not a function of acreage due to its fluid nature, although for the purposes of this analysis it is modeled as such in order to calculate an expected liability. The presence of AMD requires either active or passive treatment depending on the quantity of iron in the coal seams and on whether the mining takes place above or below drainage. The more expensive reclamation projects take place above-drainage to a water system.

Figure 11: SRF Reclamation Costs by Category[5]

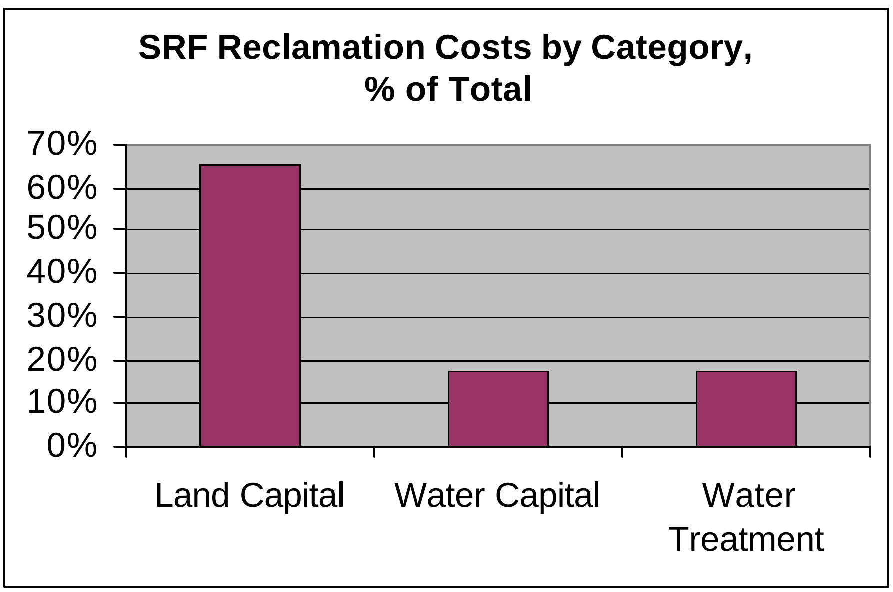
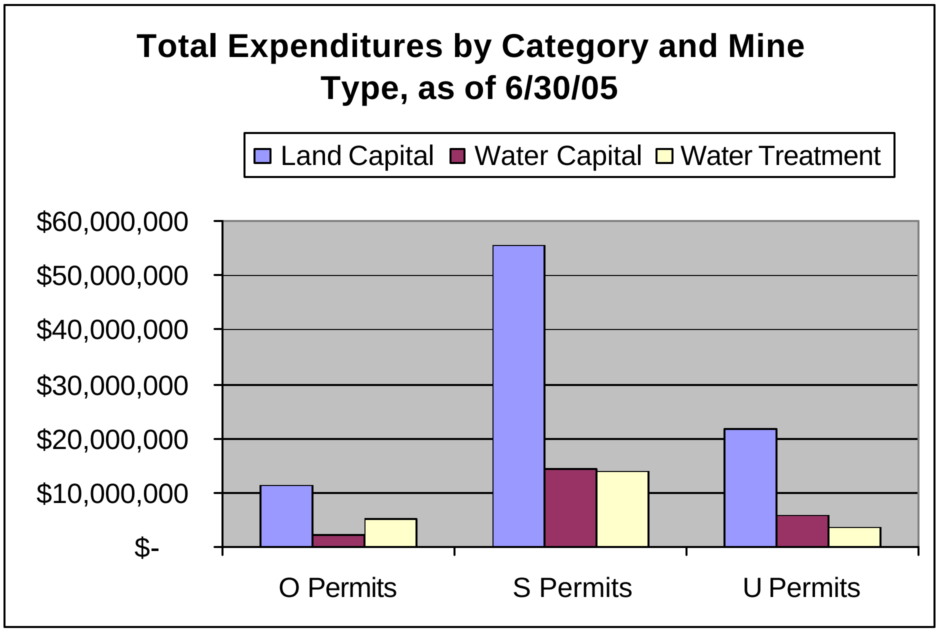


Figure 12 describes the break-down of SRF expenditures by category and by permit type, exclusive of indirect costs. Land reclamation of surface mines accounts for the largest component of expenditures, followed by land reclamation of underground mines. This fact is due much to the earthmoving required at the larger surface mine sites.

[5] Special Reclamation Fund, OSR forfeitures database as of June 30, 2005.

Figure 12: SRF Expenditures by Category and Permit Type[6]



[6] Due to omitted cost data from reclamation that occurred prior to 1981, these expenditures do not amount to total SRF expenditures but account for expenditures made from 1981 through FY 2005.

II. Liability Projections of the Special Reclamation Fund

This analysis is an extension of a recent actuarial liability report completed by the Hay Group, Inc. and Tiller Consulting Group, Inc. (henceforth referred to as the "Hay Group"). The CBER study is not simply a replication of the actuary results. In regards to the SRF liabilities, this report extends the analysis in two important dimensions. First, the type of permit is disaggregated to provide more detailed characterizations of the reclamation costs of specific operations (e.g. surface mining, underground mining, and "other" operations such as coal preparation, haul roads and loading facilities). Second, the analysis extends the actuarial study by making it a dynamic analysis, i.e. the potential liabilities associated with permits issued in the future are included. Comparisons with the Hay Group's methodology and results are summarized in Appendix A.

Overview of Trends in the SRF

The liabilities of the SRF can be divided into three overlapping groups. The first group of liabilities emanates from those sites with revoked permits (as of 7/1/2005) that have not been fully reclaimed. The second group contains permitted sites (as of 7/1/2005), some of which are likely to forfeit and require reclamation resources. The Hay Group results focus on these two groups.[7] The third source of potential liabilities arises from permits issued after July 2005, some of which could create potential liabilities that are analogous to the currently open permits.

The extension to a dynamic environment is necessary to accurately portray the fund's fiscal stability. Where the studies overlapped (e.g. on current forfeitures and outstanding permits with the potential to forfeit) similar methodologies to those used by the Hay Group were implemented. This was done to facilitate comparison between the two studies when there was no over-riding reason to select a competing model. However some calculations are significantly different than those found in the Hay Group's report. These differences are summarized throughout this section.

[7] Hay Group Inc. and Tiller Consulting Group, Inc. September 22, 2005. "2005 Actuarial Valuation of Special Reclamation Fund"

Methodology

An important extension of the Hay Group's model was to explore differences in forfeiture rates across permit types. Three different specifications were estimated: Surface (S), Underground (U), and a combined other group (O) for all other types of sites. The O group is comprised of smaller categories (e.g. prep plants and haul roads) that have sparse data preventing an independent statistical model for each sub-category.

Future liabilities of the SRF associated with forfeited sites arise from three cohorts of permitted operations. The three potential sources of liabilities can be summarized as the past, present, and future:

1) Sites that have already been forfeited and are awaiting reclamation by the DEP. Currently there are over 200 sites that await reclamation. The majority of these are scheduled to be contracted and to receive reclamation under the current schedule that goes through FY 2008. This schedule completes all reclamation (other than on-going water treatment) for sites forfeited prior to July 2001.[8] The estimated expenditures for these liabilities have already been figured into the projections for those years.
2) As of 6/30/05 there were 1907 open sites (e.g. active, inactive, or in a stage of phased release). These sites potentially could have their permits revoked thus creating a liability for the SRF.
3) In the future, additional sites will be permitted and presumably some of them will be revoked creating liabilities for the SRF to the extent the associated bond is not sufficient to cover reclamation costs.

The total liabilities for each year are the sum of the three sources. The flowchart on the next page characterizes how the data is used to create the necessary information. The general method used to calculate the liabilities of each type are as follows:

1. Pre-2005 forfeitures in acreage: These are the same values as those used in the Hay report which are taken directly from the DEP's 2005-2009 schedule of reclamation.
2. Pre-2005 issued permits, outstanding: The projected total costs are the product of two outcomes – the projected revoked acreage that will be revoked and the cost of reclaiming that acreage. Cost estimates for land, water capital, and on-going water treatment are based on the relevant historical cost data. Outstanding permit acreage is subject to attrition from two sources – forfeiture or release. The rates of forfeiture and release are based on historical patterns.
3. Post-2005 issued permits. The liability estimates for this group are nearly identical to the second group with one important exception. Unlike the current stable of permits whose acreage, type of mine, etc. is known, future acreage issued had to be forecasted before it could be estimated what proportion of that acreage will expected to result in forfeiture. The costs of reclamation are multiplied by the projected acreage defaulted to give the expected liability, based upon historic costs per acre to reclaim.

[8] There are approximately 219 sites scheduled for reclamation between July 2005 and December 2008.

Further details on the methods and assumptions employed are described in the comparison section with the Hay Group model later in the report. A schematic that describes the relationship between inputs and outputs of this analysis follows.

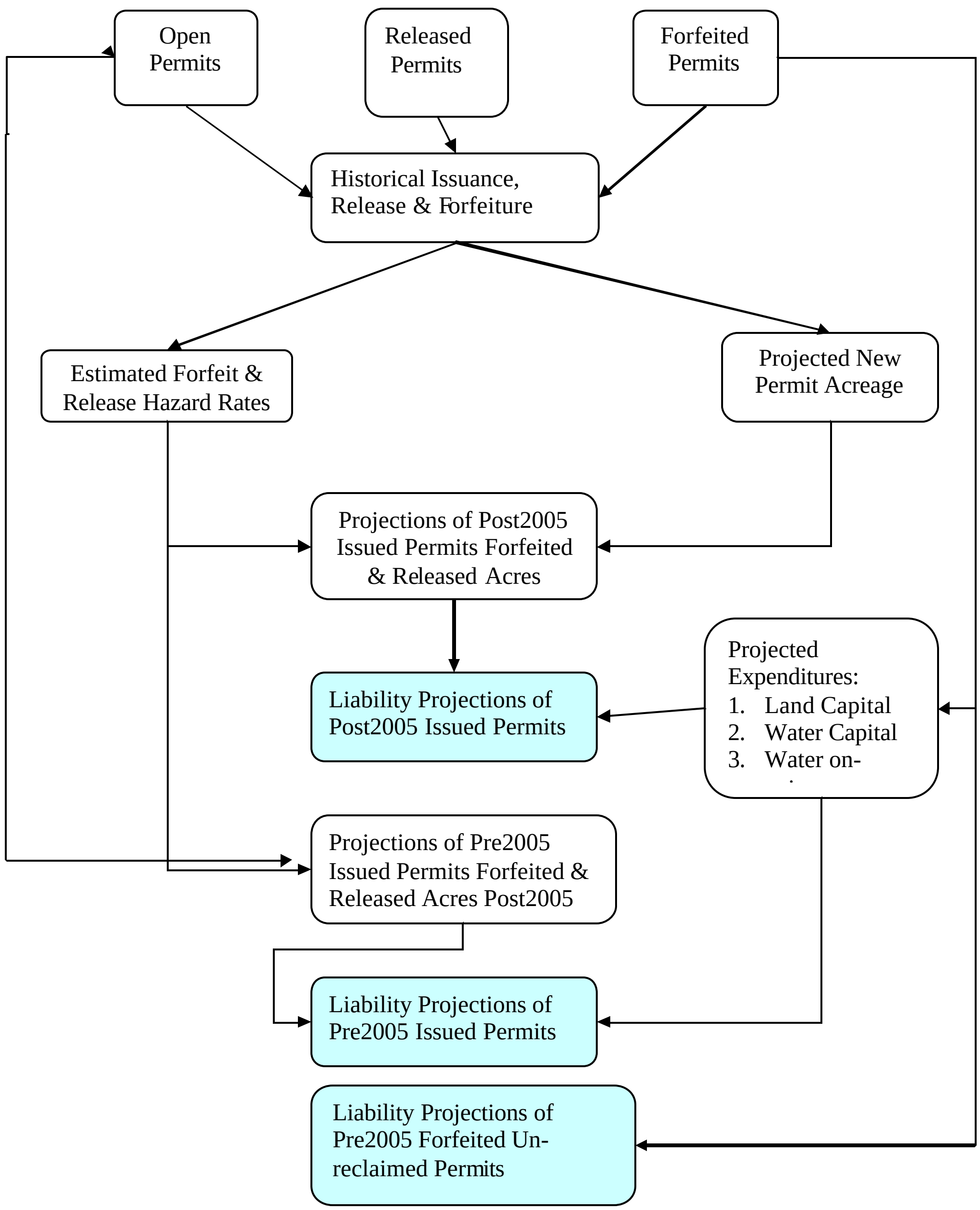
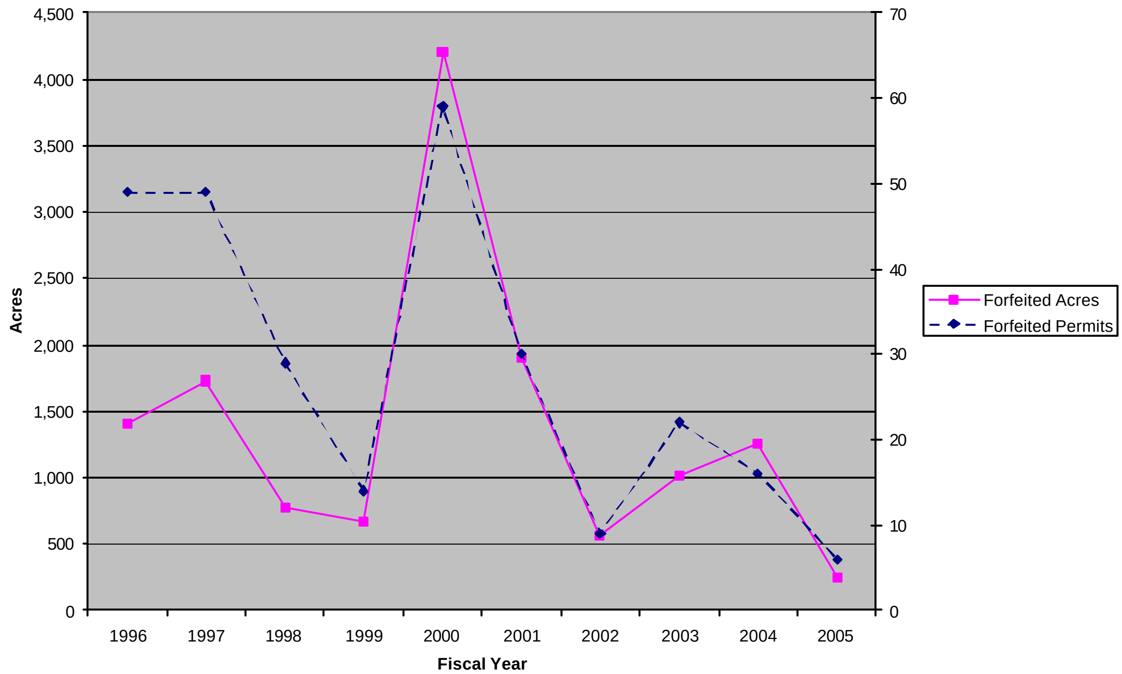
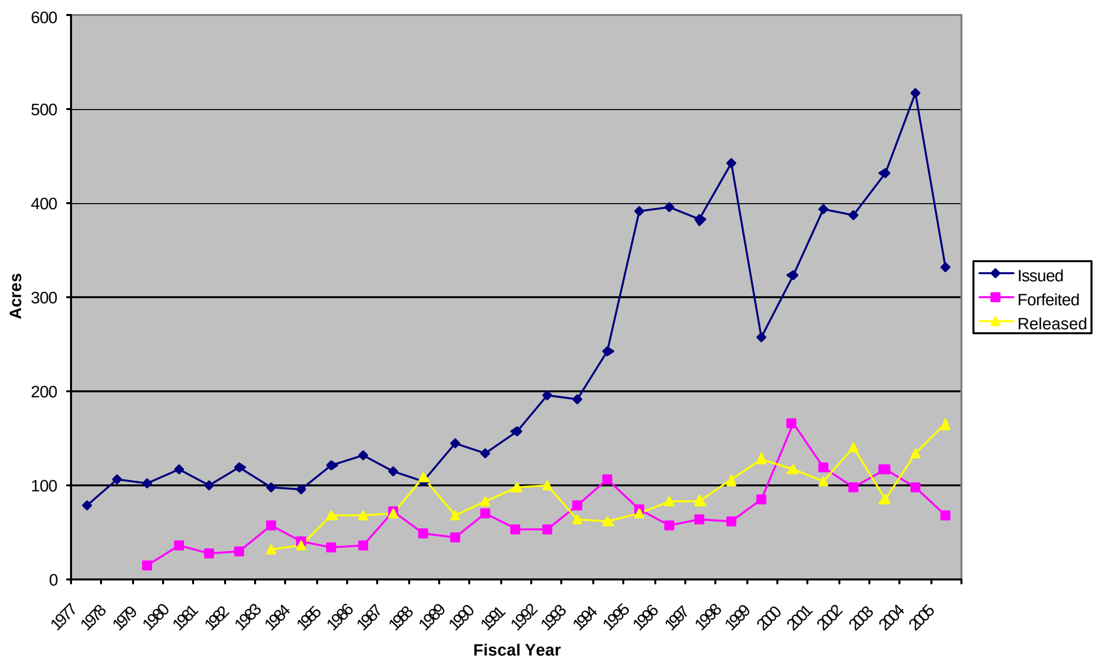


Figure 13: Historical Forfeiture Patterns



As shown in Figure 14, two important trends are evident in the typical acreage of a permit. The first trend is a dramatic increase in the size of new issues. This is especially evident in surface mines. In the early 1980s the average acres per permit was roughly 100 acres for a surface mine. By the early 1990s this had grown to the 200 acre range. In the last decade the average size of a surface has run into the 400 to 600 acre range. A second trend in the size is that those sites that have been revoked or released tend to be the small and marginal permits. The tandem of these two trends is that the typical permit has grown dramatically over time with large-acre new issuances and smaller-acre sites being forfeited or released. The jump in 1995 in the acreage of new issuances correlates well with the much lower forfeit rates since 1996, operator consolidation, and the statistical findings that larger acreage sites are less likely to forfeit.

Figure 14: Acres per S Permit



There are two cohorts that can create future liabilities. The first cohort is the currently open 1,907 sites that will ultimately either forfeit or complete restoration and receive full release of the associated bond. Figure 15 below illustrates the expected total forfeitures for those permits issued in FY 2005 or earlier that have not forfeited as of July 2005. The lines are stacked with surface mines comprising about 90% of the total forfeited acreage in each year and underground and other types of sites having relatively small contributions to the total forfeited acreage. In FY 2006 the total acreage forfeited is 1,472 and this falls to 475 acres in FY 2026. The declining trend is a product of the static nature of this cohort. Due to attrition there is a smaller outstanding population that can potentially default. In comparison, the Hay Group estimates that this cohort will forfeit 1,958 and 1,821 acres in FY 2005 and 2006, respectively.[9] That report projects slightly sharper drop over the twenty years with total forfeited acreage falling to 433 in 2025. Although the overall patterns of CBER's and the Hay Group's results are somewhat different, the overall tally is similar. CBER has a total of 20,297 acres forfeiting over the next 20 years (from this cohort) whereas the Hay Group has a total of 20,800 acres.

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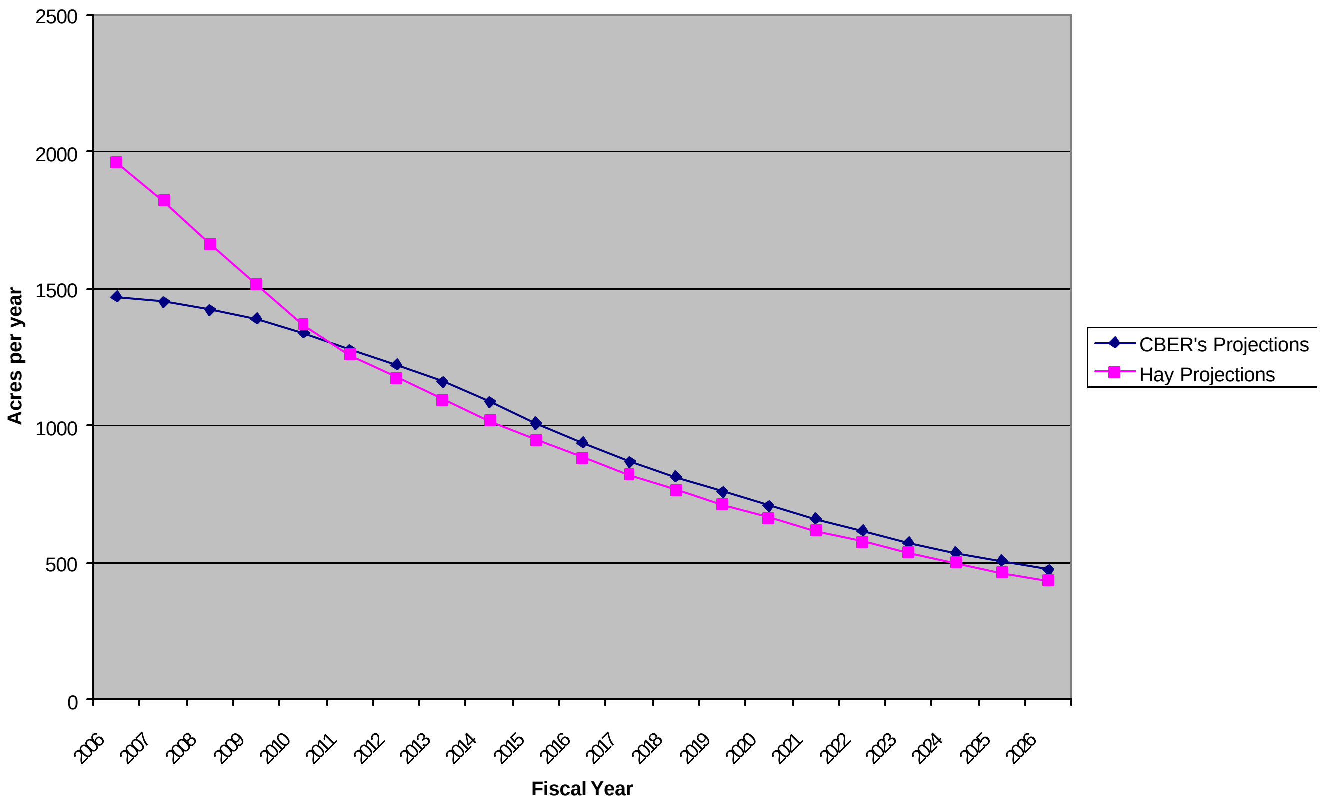
[9] The Hay Group, 2005. Table 1.18.

Figure 15: Cumulative Expected Forfeited Acreage for Permits Issued Before FY06

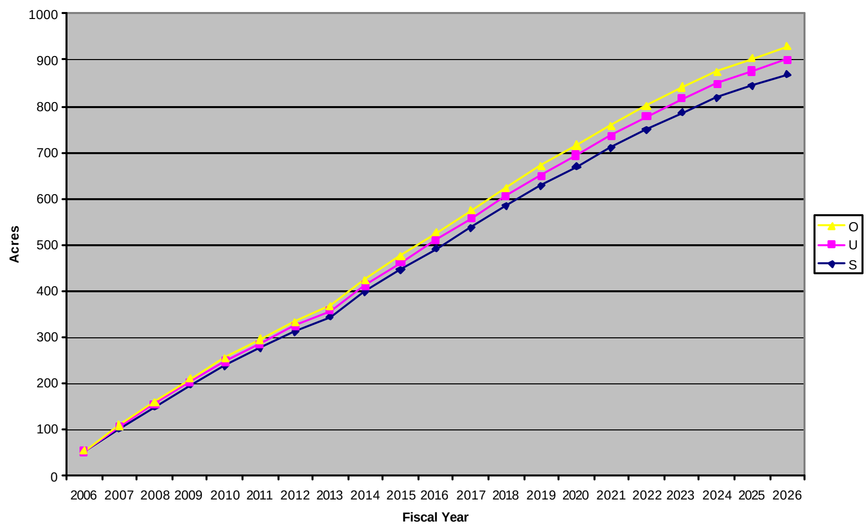


The current set of sites, all the important site characteristics are known – type of mine, age, acreage, bond amount, and stage of phase release. The type of mine determines which model parameters are used to forecast the probabilities of default and release. If the mine is currently in a stage of phased release the probability of default is reduced by 60% if Phase I release is complete and an additional 25% if Phase II release is complete. These percentages match the amount of bond releasable upon completion of each stage and thus serve as a proxy of the amount of reclamation that is completed.

The second source of potential liabilities arises from the new cohort of permits issued after June 2005. The probabilities associated with this cohort are estimated using the MNLM. However, unlike the first cohort, the site specific information such as the size and age are unknown. It is necessary to characterize what the typical future site will look like in terms of the number of acres. Based on the recent attributes of new issuances, it was estimated that the typical S, U, & O site would have a distribution of acreage sizes identical to the distribution of sizes over the past decade. Based on these characteristics, the future liabilities arising from this cohort are given in the Figure 16 below.

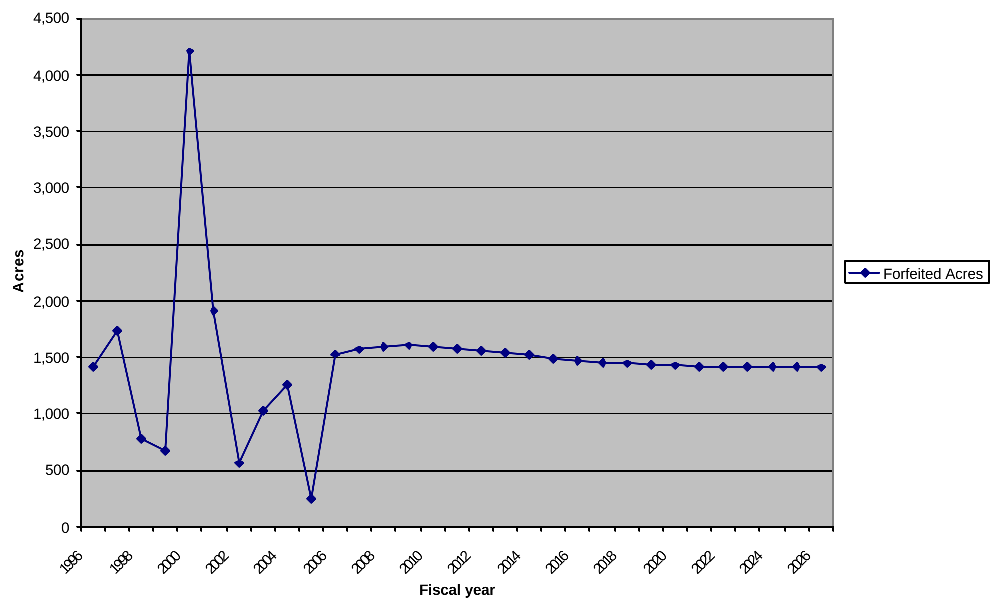
The annual total starts out very low in 2006 as the cohort is starting from scratch and the observed very low rate of default in the early life of a permit. Total forfeited acreage reaches 929 acres in 2026. This result is primarily a function of the much larger permits that are expected to be issued along with the lower rates of forfeiture from these large permits.

Figure 16: Expected Cumulative Forfeited Acreage - Permits Issued After FY 2005



Combining the two cohorts gives the total acreage expected to forfeit over the next two decades. Figure 17 appends the forecast to the most recent ten years of data. The 1996-2005 average annual forfeited acreage was 1,377. The forecast over 2006 to 2026 predicts an average annual rate of 1,485 acres. Hence the next twenty years are predicted to be very similar to the past decade's experience with slight improvements in 2017 to 2026 in terms of acres forfeited.

Figure 17: Forfeited Acres (Historical & Predicted)



Estimation of Costs for Liability Projection

Reclamation costs per acre have been highly variable throughout the history of the SRF for all types of mining operations. Analysis of future reclamation expenditures requires an understanding of the level and patterns of past expenditures and a projection of these costs into the future augmented by what is known about recent developments in the permitting process. To date, the largest liabilities to the fund were associated with threatened impoundment failure, categorized in the "O" type of mining, and containment of acid mine drainage for both "S" and "U" operations.

A disaggregated analysis was undertaken to evaluate separately the capital expenditures associated with reclamation on different types of permits: surface mines (S), underground mines (U) and other permits (O) that include prep plants, refuse sites, loading facilities and haul roads. This analysis used cost data for sites reclaimed in the years 1983 through 2004 and was evaluated separately for land and water capital expenditures. Only permits designated with land reclamation being complete or near complete, and that reported positive land capital costs or non-AMD water capital costs, were evaluated. Permits that met these requirements and with status C (Completed), TPL (Tree Planting required), SSR (Sediment Structure Removal required) and RO (reopened) were included. In total, 633 permits were included in the land capital portion of this analysis and 58 permits in the water capital portion.

To illustrate the large variation in expenditures, the range of costs/acre for the three types of permits is shown below, with the highest and lowest expenditures omitted from each type of operation. Much of this variation is due to the operation's stage of reclamation at the time of forfeiture. Many sites were forfeited after reclamation was partially or even fully complete. Reclamation expenditures can not be considered an estimate of full-cost bond rates for this reason. Thus, these average expenditure rates are lower than what will be required to provide full-cost bonding.

Table 1: Range of SRF Expenditures for Completed Site Reclamation, $/Acre, by Type of Operation, 1983 to 2004 (in 2005$)

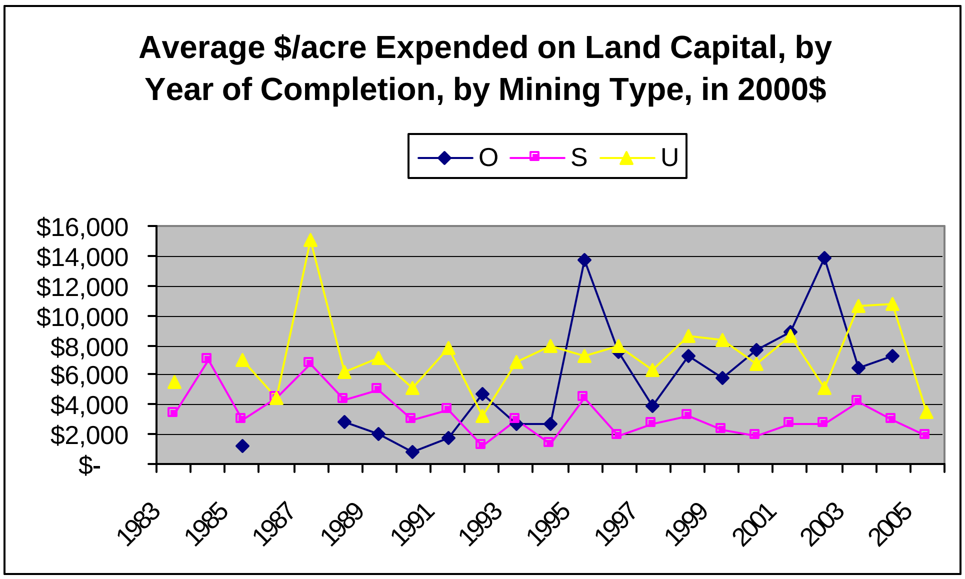
		Surface (S)	**Underground (U)**	**Other (O)**
Land Capital	**High**	$43,228	$66,278	$38,433
	Low	$39	$156	$982
	Average	$3,118	$9,326	$8,668
Water Capital	**High**	$15,117	$50,560	$20,542
	Low	$47	$140	$2,889
	Average	$5,762	$12,237	$10,602

Figure 18 shows that the pattern of costs per acre exhibited since 1983 is sporadic, although it is less so for surface mines. Rising costs per acre are observed for underground and other operations while a declining real cost per acre is observed for surface mining operations. In spite of this reality, applying a continuing declining trend to the future would not be prudent due to the recent decline in productivity in surface mining. It is likely that the declining costs associated with surface mining reclamation are caused by factors similar to those that caused increased productivity in surface mining.[10]

To account for this observed decline, no cost inflation is assumed for capital expended for land reclamation of surface operations. This is based on the change in reclamation costs/acre equals inflation minus productivity change plus other input costs. The rise in productivity will offset the impact of inflation on costs.

Because a generally increasing cost is observed for land reclamation of underground and other operations a half percent and three percent annual inflationary impact is assumed for capital expended for land reclamation of underground and other operations respectively, to account for an expected continuation of historical inflation.

Figure 18: Average $/Acre Expended on Land Capital



Water capital expenditures are quite sporadic as well, but show increasing costs for all three types of operations. In addition, considerably less data is available to establish a trend that indicates an impact of time. Thus, an overall three percent inflationary impact is assumed for that category of reclamation.

<u>Test for Costs Correlation</u>

As part of the disaggregated analysis of capital expenditures, a test for the ability to predict costs per acre was also conducted. To do this analysis, some assumptions had

[10] Although the mining productivity index was not a statistically significant variable in explaining changes in reclamation costs per acre, the trends observed over time are incorporated into future projections.

to be made regarding individual forfeited permits where data was unavailable. These assumptions were:

1. The year in which reclamation was completed: if no other date provided, it was assumed to have been completed in the same year it was started; or, if the year started was not provided, it was assumed to have been completed four years after the year in which the permit was revoked.
2. Disturbed acreage: If this area was not reported the permitted acreage was used.

The regression to test variables influencing land and water capital costs was modeled as follows, and evaluated separately for surface and underground mine sites. Capital costs per acre (both land and water) are a function of:

- average acreage per mine
- coal production in West Virginia (for surface and underground mining)
- surface and underground mining productivity (tons/worker hour) East of the Mississippi[11]
- WV construction productivity index

Results were not conclusive regarding any predictive ability to identify factors that influence costs. When applying standard techniques of regression analysis, none of the four variables listed above were statistically significant for either surface or underground operations. Nor were the results significant when applied as a lagged variable at one, two or three years prior to the expenditure. Thus, it was concluded that historical average costs per acre are the best predictor of future costs per acre. However, using acreage to determine bond amounts for water treatment would not be adequate due to variables such as water flows and water quality that are independent of acreage.

Analysis of Historical Costs

Surface mines represent the largest cost category due to their majority in the state; however, on a per acre basis they are less expensive than deep mines and other operations. The per acre costs for deep mines calculated in this analysis reflect that difference, in costs that are more than double that of surface mines for both land and water capital reclamation.

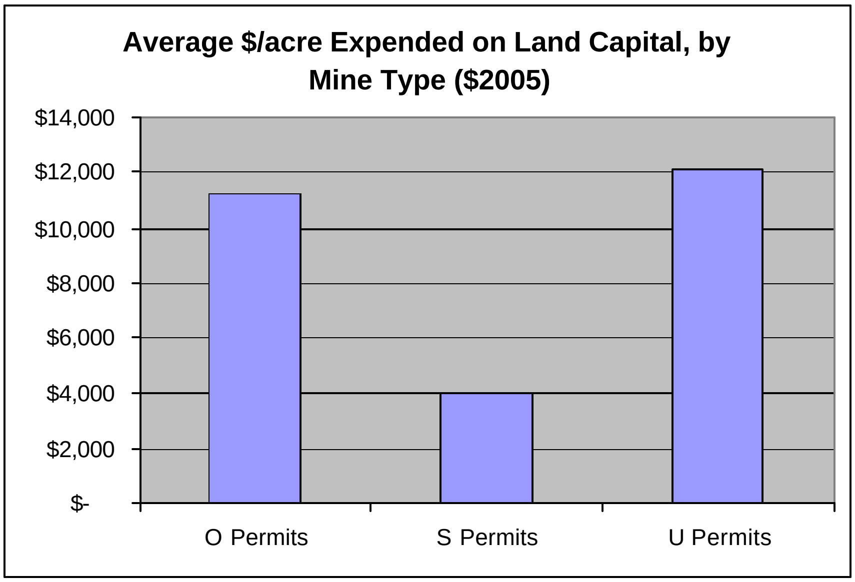
Land Capital – This category comprises the largest single cost to the fund at about 65% of total reclamation expenditures to date. The cost of $5,613[12] per acre, as calculated by the Hay Group, includes both land-only and water-related reclamation that is not associated with acid mine drainage (AMD) and thus does not have perpetual treatment costs, e.g. the Antaeus Gary impoundment.

This cost was recalculated using the same method, but excluding permits forfeited prior to 1982. This calculation provides an estimate of $6,246 per acre.

[11] Energy Information Administration, 2005. Table 7.6, Coal Mining Productivity, 1949-2004. http://www.eia.doe.gov/aer/txt/ptb0706.html
[12] The Hay Group, 2005.

When disaggregating by mine type, and accounting only for actual expenditures, the following average costs per acre were calculated. About 72% of the acreage of all forfeited permits actually required land reclamation. As discussed above, no cost inflation is assumed for reclamation of surface operations in this category. A half percent and three percent increase was assumed for underground and other operations respectively. To account for the potential impact of a large and unexpected liability representing an above-average liability, $700,000 every other year was added to this section of liabilities as major forfeiture event.

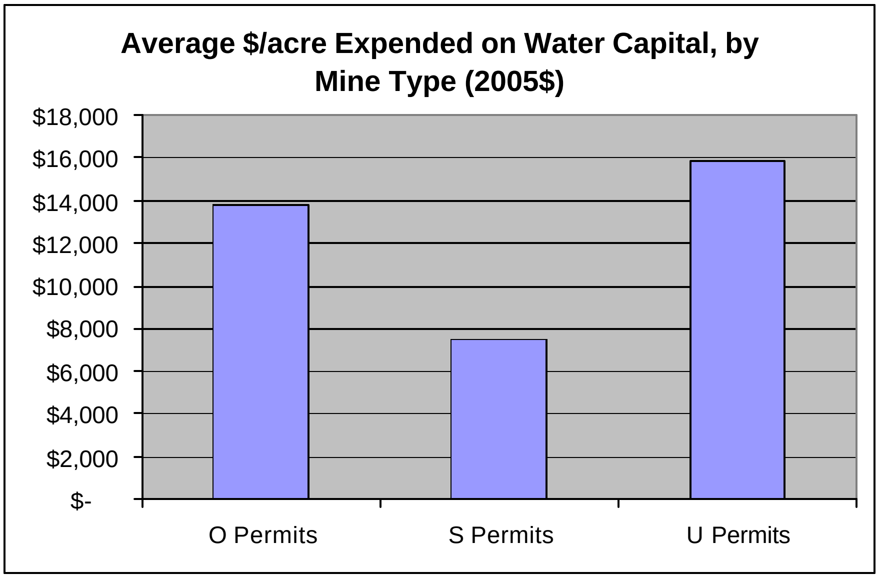
Figure 19: Land Capital Expenditures (avg. per acre in 2005$)



Water Capital – At the aggregate level, these costs were similarly adjusted using the same method. This results in an aggregate cost of $602 per acre, up from $485 as calculated by the Hay Group, for all capital expended on water treatment equipment at AMD sites, when divided by total acreage forfeited since 1981 (29,437 disturbed acres).

This cost is somewhat meaningless when evaluated at the disturbed acre level because as expenditures have little to do with acreage due to the movement of water. However, due to the need to price reclamation bonds based on acres permitted, calculation of water capital costs per acre is a necessary component of this analysis. Figure 20 describes the average $/acres expended on water capital for AMD treatment by mine type.

Figure 20: Water Capital Expenditures (avg. $2005/acre)



Water Treatment Costs – This cost also varies tremendously by site. Active treatment costs range from over $300,000 per year to a couple hundred dollars per year, and account for the large majority of costs in this category. Passively treated sites constitute a smaller portion of these costs. Of the 195 forfeited permits evaluated that already receive water treatment (of about 201 in total), 127 are surface mines, 49 are underground mines and 19 are other types of permits.

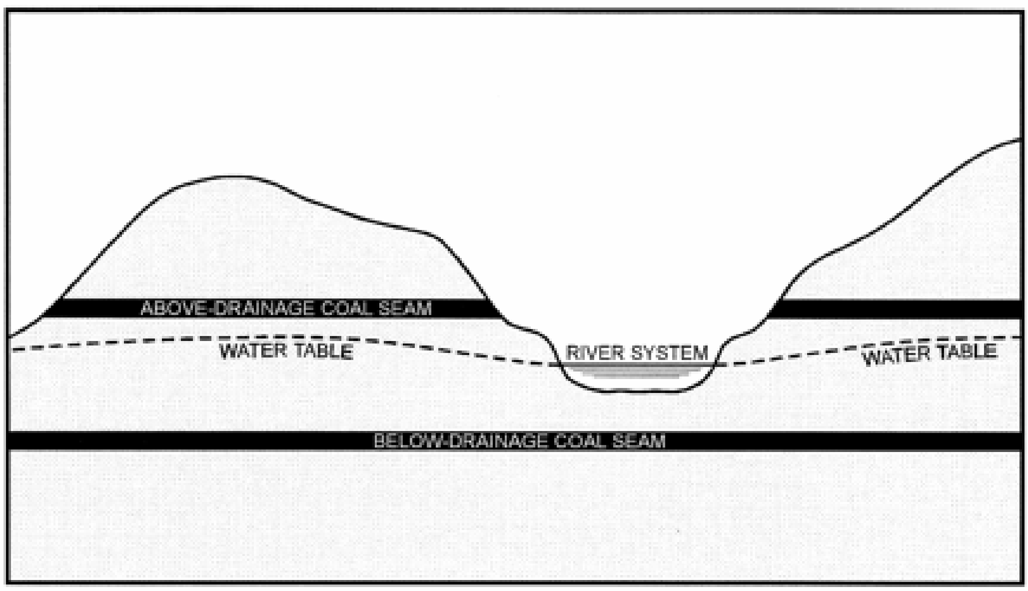
The method used by the Hay Group to calculate annual water treatment expenditures calculates a daily cost as a function of water capital costs. When including the five SRF sites that require 24-hour monitoring (DLM, F&M, Omega, T&T, and Royal Scot), the portion of annual treatment costs to capital costs is 30 percent. When removing these five sites, the annual costs drop to two percent of capital expenditures. To adjust for their dominance, these five sites were removed from the formula used to calculate the impact of new forfeitures requiring water treatment. The actual costs associated with these sites is also expected to decline due to streamlined operations and treatment strategies as well as alternative use of at least one site with perpetual water treatment needs.

For permits issued after 1996, it is expected that the likelihood of a future forfeiture requiring the level of treatment that these five sites require is remote. Active treatment is generally associated with sites located above-drainage from a water table. It is now known that treatment of water discharges from above-drainage acid-producing seams is a more perpetual condition than treatment of below-drainage seams. It is likely that an operation that occurred below a drainage system would experience more quickly declining costs due to reduced exposure to oxygen while operations that lie above a drainage system will result in higher rates of continued treatment costs due to the greater exposure to oxygen.

It was not able to be established which past forfeitures and open sites (that receive water treatment) lie above or below drainage. It is also difficult to predict this proportion for future permits, although experience does suggest that fewer permits that require this type of treatment will be issued. It is the population of permits issued prior to the 1990s that contain the largest potential liabilities to the SRF in terms of water treatment costs. The impact of a new $500,000 per year water treatment liability was modeled as occurring once every five years through the study period, with the next such liability being paid for by the SRF in 2009.

An illustration of the location of an above-drainage versus a below-drainage coal seam is shown below in Figure 21. The Omega site, an example of an above-drainage mine, had the most expensive water capital costs of any permit within the SRF.

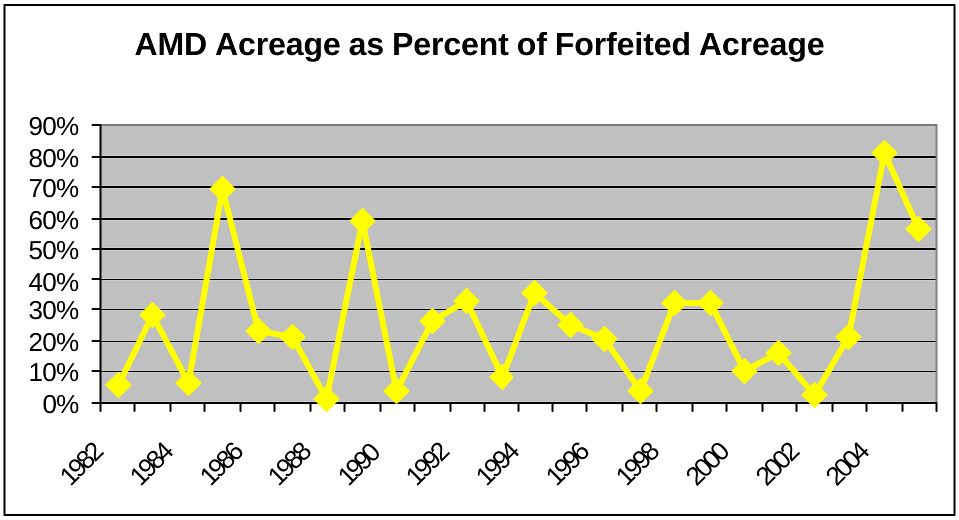
Figure 21: Depiction of Above-Drainage vs. Below-Drainage Coal Seams[13]



Based on the history of mine forfeits that are associated with acid mine drainage, it is difficult to predict a trend in this type of forfeiture, at least for the large majority of the population of permits that have already been issued. (see Figure 22) The trend toward declining ratios of AMD-related forfeits was interrupted in 2004. Historically, about 25% of the acreage of forfeited permits has required water treatment. This same percentage is used as a beginning point for this analysis, and that rate is expected to decline through 2026. The lower per site treatment costs assumed indicate a shift from actively treated sites to more passively treated sites.

[13] J. Demchaka, J. Skousen, and L. M. McDonald, 2003. “Surface Water Quality: Longevity of Acid Discharges from Underground Mines Located above the Regional Water Table.”

Figure 22: AMD Acreage



Refuse Site and Preparation Plant Analysis

It is somewhat difficult to evaluate these types of permits as historically many surface and underground mining permits have also included these types of facilities. In addition, very few preparation plants have forfeited. These two types of permits represent some of the more expensive reclamation liabilities outside of mining permits.

Analysis of a set of 52 forfeited refuse sites resulted in a set of 24 with cost records. These 24 sites had an average land reclamation cost of $10,640 per acre and a water reclamation cost of $5,012 per acre. Excluding the Antaeus Gary impoundment reclamation project reduces the average land reclamation cost to $6,951 per acre. This cost is very similar to the average for forfeited permits within the O category in general. Water costs on the other hand, are calculated as more expensive for O permits as a whole ($9,528 per acre) even though refuse sites exhibited the same percentage of AMD as did the forfeitures dataset as a whole; 25 percent of forfeited sites contained AMD. Again, as in the full liability analysis, the very high-cost treatment sites were removed from the calculation. A result was that only four sites were closed water cases that had complete water capital cost information. Thus, the water cost rate is a less accurate representation of all refuse sites although it is the best data available.

There is much less data on which to evaluate the liabilities of prep plants. This type of permits forfeits less frequently and therefore has much less need for reclamation. Preparation plants owned by defaulted companies are often purchased by others, depending on the condition of the remaining equipment.

One permit provides an example of the cost to fully reclaim a preparation plant. This site requires passive containment of acid mine drainage and contains a refuse disposal area. The total costs of reclamation are estimated at $937,000, of which $400,000 is the estimated cost of structure removal and $143,000 is the cost of reclaiming the refuse area. Toxic and non-toxic chemical clean-up amounts to $282,000, and the remaining costs cover miscellaneous costs such as revegetation and regrading. Per acre the cost of reclaiming the entire permit, including the prep plant, amounted to $11,797 per acre, including water treatment, although the prep plant is likely confined to only 20 or so of the 200 acre permit. Overall, a liability of this type occurred only once in the last ten years.

Only three prep plants have forfeited since 1996, the year from which the majority of this analysis begins. Since 1994, four prep plants have forfeited. Of the three plants that were forfeited since 1996, only one required extensive reclamation. Refuse permits forfeit more frequently than prep plants. Since 1990, 45 “Other” permits containing refuse sites have forfeited and 23 have forfeited since 1996. On average this is about two of these type permits forfeited per year.

Site-specific reductions in water treatment costs

The legacy sites for which the SRF is responsible include at least four permits that have potential to be re-mined. These sites would then be re-permitted and the remaining liabilities transferred to the new owners. The impact of removing these four sites from the SRF liability portfolio would be a reduction of about $7.7 million from projected FY 2008 expenditures in addition to some ongoing water treatment expenditures. One of the four, the Royal Scot site, could be removed as a liability through burning of its coal waste pile in the Greenbrier Cogeneration project. This project has a planned initiation date of 2007 and is thus modeled as reducing the liabilities of the SRF as described below.

The annual costs associated with treating AMD on the Royal Scot site have averaged about $306,697 per year since treatment began. (This method averages six years of treatment costs beginning in FY 2000 through FY 2005. The large majority of these costs are associated with a single 400 acre surface mine permit that was revoked in 1999. Current operating plans project that the estimated 12 million tons of waste coal at the site will be consumed in four and a half years. As the facility is scheduled to begin operating in 2007, it can be expected that the waste coal, and thus the source of the acid mine drainage on the site, will be removed from the site by the end of 2011, if not sooner. When removing the ongoing water treatment liability of this site beginning in 2012, the projected liabilities for treatment sites categorized as “active in perpetuity” declines from $1.68 million per year to $1.38 million per year.

Other Events Leading to Site Specific Declines in AMD Treatment Cost

It has been suggested by Dr. Ziemkiewicz at West Virginia University that some AMD sites will experience declining treatment costs due to dwindling levels of acidity in the Freeport and Pittsburg seams. While this may be true, no analysis has been done on the other seams in which perpetual treatment sites exist. A considerable amount of treatment in those seams is currently done by industry and data on these expenditures are not readily available. Of the 165 AMD permits within the SRF, 36 are within the Freeport seam and eight within the Pittsburg seams. The impact of declining costs would primarily be seen in three quite expensive treatment sites, the Omega, F&M and T&T Fuels mines in the Freeport seam. For purposes of costs calculation, these sites (four permits) were removed from this analysis along with the other two sites that are receiving 24-hour active water treatment. In addition, water treatment costs are in effect assumed to decline at the rate of inflation as the nominal cost of treating these sites is modeled to be constant.

Liability Projections

The results of the previous two sections provide the basis for the liability projections. Section II forecast the annual forfeited acreage for each year and section III estimated the costs per acre associated with each type of permit. The following four tables provide the liability estimates for land capital, water capital, on-going water expense and the overall liability estimates of the SRF for 2006-2026.

Table 2: Land Capital Expenditures

	Existing Forfeits		Future Forfeits		
Fiscal Year Ending	Forfeited <7/1/2001	Forfeited >7/1/2001 but < FY 2006	Permits Issued Before FY 2005	Permits Issued After FY 2005	Total Annual Cost
30-Jun-05					
30-Jun-06	$2,413,480	$403,056			$2,816,536
30-Jun-07	$4,022,620	$3,716,873			$7,739,493
30-Jun-08	14,259,688	4,464,861			$18,724,549
30-Jun-09	288,622	1,926,810	$3,793,963	$142,201	$6,851,596
30-Jun-10			$3,758,298	$283,027	$4,041,325
30-Jun-11			$3,698,152	$418,829	$4,816,981
30-Jun-12			$3,621,318	$548,840	$4,170,158
30-Jun-13			$3,505,877	$668,600	$4,874,477
30-Jun-14			$3,353,774	$775,523	$4,129,297
30-Jun-15			$3,226,407	$880,777	$4,807,184
30-Jun-16			$3,081,579	$974,861	$4,056,440
30-Jun-17			$2,896,323	$1,128,581	$4,724,903
30-Jun-18			$2,701,883	$1,270,261	$3,972,144
30-Jun-19			$2,521,199	$1,407,944	$4,629,143
30-Jun-20			$2,348,688	$1,539,983	$3,888,671
30-Jun-21			$2,215,602	$1,682,829	$4,598,432
30-Jun-22			$2,075,264	$1,813,954	$3,889,218
30-Jun-23			$1,946,042	$1,943,383	$4,589,425
30-Jun-24			$1,823,282	$2,069,353	$3,892,636
30-Jun-25			$1,711,928	$2,195,709	$4,607,637
30-Jun-26			$1,602,397	$2,315,760	$3,918,157

Table 3: Water Capital Expenditures					
	Existing Forfeits		Future Forfeits		
Fiscal Year Ending	Forfeited <7/1/2001	Forfeited >7/1/2001 but < FY 2006	Permits Issued Before FY 2005	Permits Issued After FY 2005	Total Annual Cost
30-Jun-05					
30-Jun-06	$7,024,422				$7,024,422
30-Jun-07	$4,020,027	$518,256			$4,538,283
30-Jun-08	$3,249,720	$318,600			$3,568,320
30-Jun-09	$344,088		$2,697,476	$20,293	$3,061,857
30-Jun-10			$2,633,081	$41,484	$2,674,565
30-Jun-11			$2,548,383	$63,046	$2,611,429
30-Jun-12			$2,449,516	$84,840	$2,534,357
30-Jun-13			$2,322,703	$106,126	$2,428,829
30-Jun-14			$2,171,080	$126,389	$2,297,469
30-Jun-15			$2,035,473	$147,369	$2,182,842
30-Jun-16			$1,889,135	$167,444	$2,056,579
30-Jun-17			$1,719,817	$198,980	$1,918,797
30-Jun-18			$1,548,397	$229,870	$1,778,267
30-Jun-19			$1,388,813	$261,486	$1,650,299
30-Jun-20			$1,237,902	$293,503	$1,531,405
30-Jun-21			$1,111,461	$329,102	$1,440,562
30-Jun-22			$984,848	$363,972	$1,348,820
30-Jun-23			$867,478	$400,046	$1,267,523
30-Jun-24			$756,988	$436,971	$1,193,959
30-Jun-25			$655,272	$475,570	$1,130,843
30-Jun-26			$558,394	$514,413	$1,072,807

Table 4: Ongoing Water Treatment Costs

Fiscal Year Ending	Permits Forfeited <7/1/2001	Active in Perpetuity	Future Forfeited Permits	Total Water Quality Cost
30-Jun-06	$361,639	$1,680,000	0	$2,041,639
30-Jun-07	$536,155	$1,680,000	$0	$2,216,155
30-Jun-08	$777,351	$1,680,000	$0	$2,457,351
30-Jun-09	$902,204	$1,680,000	$561,237	$3,143,441
30-Jun-10	$929,270	$1,680,000	$614,728	$3,223,998
30-Jun-11	$929,270	$1,680,000	$666,957	$3,276,227
30-Jun-12	$929,270	$1,380,000	$717,644	$3,026,914
30-Jun-13	$929,270	$1,380,000	$766,221	$3,075,491
30-Jun-14	$929,270	$1,380,000	$1,312,170	$3,621,440
30-Jun-15	$929,270	$1,380,000	$1,355,827	$3,665,097
30-Jun-16	$929,270	$1,380,000	$1,396,959	$3,706,229
30-Jun-17	$929,270	$1,380,000	$1,435,334	$3,744,604
30-Jun-18	$929,270	$1,380,000	$1,470,900	$3,780,170
30-Jun-19	$929,270	$1,380,000	$2,003,906	$4,313,176
30-Jun-20	$929,270	$1,380,000	$2,034,534	$4,343,804
30-Jun-21	$929,270	$1,380,000	$2,063,345	$4,372,615
30-Jun-22	$929,270	$1,380,000	$2,090,322	$4,399,592
30-Jun-23	$929,270	$1,380,000	$2,115,672	$4,424,942
30-Jun-24	$929,270	$1,380,000	$2,639,551	$4,948,821
30-Jun-25	$929,270	$1,380,000	$2,662,168	$4,971,438
30-Jun-26	$929,270	$1,380,000	$2,683,624	$4,992,894

Table 5: Composite Liability Cash Flows (FY 2006-26)

Fiscal Year Ending	*Land Capital Expenditures*	*Water Capital Expenditures*	*Ongoing Water Treatment Expenditures*	*Admin Costs and Other*	*Total Expenditures*
5-Jun					
6-Jun	$2,817	$7,024	$2,042	$2,625	$14,507
7-Jun	$7,739	$4,538	$2,216	$2,704	$17,197
8-Jun	$18,725	$3,568	$2,457	$2,785	$27,535
9-Jun	$6,852	$3,062	$3,143	$2,868	$15,925
10-Jun	$4,041	$2,675	$3,224	$2,954	$12,894
11-Jun	$4,817	$2,611	$3,276	$3,043	$13,747
12-Jun	$4,170	$2,534	$3,027	$3,134	$12,866
13-Jun	$4,874	$2,429	$3,075	$3,228	$13,607
14-Jun	$4,129	$2,297	$3,621	$3,325	$13,373
15-Jun	$4,807	$2,183	$3,665	$3,425	$14,080
16-Jun	$4,056	$2,057	$3,706	$3,527	$13,347
17-Jun	$4,725	$1,919	$3,745	$3,633	$14,022
18-Jun	$3,972	$1,778	$3,780	$3,742	$13,273
19-Jun	$4,629	$1,650	$4,313	$3,855	$14,447
20-Jun	$3,889	$1,531	$4,344	$3,970	$13,734
21-Jun	$4,598	$1,441	$4,373	$4,089	$14,501
22-Jun	$3,889	$1,349	$4,400	$4,212	$13,850
23-Jun	$4,589	$1,268	$4,425	$4,338	$14,620
24-Jun	$3,893	$1,194	$4,949	$4,468	$14,504
25-Jun	$4,608	$1,131	$4,971	$4,603	$15,312
26-Jun	$3,918	$1,073	$4,993	$4,741	$14,724

Liabilities remain stable over the next two decades, with the exception of the erratic jumps in 2008 as unusual expenses associated with the completion of the legacy sites occur. Land capital and water capital expenses fall after 2010. The on-going water expense rises due to its perpetual nature and to the assumption of a new large forfeits every fifth year. The administrative costs also rise by 3% per year by assumption.

Summary

The results of this liability analysis project required cash expenditures of the Special Reclamation Fund through FY 2026. These projections begin with expenses occurring in FY 2009, and correspond with forfeits projected to take place in FY 2006. Expenditures occurring in July 2005 through December 2009 are part of an existing schedule to reclaim "legacy" sites that have already been or will soon be contracted for.

This analysis was based on observation of the characteristics of mine defaults since 1977 and expenses made by the SRF since 1982. Rates of forfeitures were analyzed separately for three types of operations: surface mines, underground mines and other non-mining support operations. Projected forfeitures were predicted based on individual mine characteristics, with size and age being the primary determinants of the probability of default. Per acre expenses were calculated in real terms and evaluated separately for land capital, water capital and water treatment costs. These costs are the average real costs of what has been historically expended on these categories of reclamation.

The resulting calculated annual expenses are projected to grow at a stable rate, rising from $12.9 million in FY 2010 to $14.7 million by FY 2026. Expenditures made on land capital are initially the highest cost category to the fund, but become an increasingly smaller portion of total expenditures. The assumption of no inflation in surface mine reclamation costs, the largest component of land reclamation in the fund, results in a reduction in real per acre costs for that category of operations. Water capital expenditures do experience inflation-induced costs increases that are equivalent to overall expected rates of inflation, and thus rise over the course of time, but are offset by the assumption of a declining forfeited acreage requiring water treatment. Per site water treatment costs are expected to fall slightly resulting from an efficiency gain due to operational experience, and are thus not expected to rise with inflation. However, due to their perpetual and cumulative nature, these expenses exceed both land capital and water capital expenses by the end of FY 2026. Administrative costs rise with the expected rate of inflation.

The liabilities of the SRF are sensitive to a number of variables that cannot be fully accounted for in a single projection. The effect of re-permitting is one development that could potentially lower the existing population of liabilities. Re-permitting is expected to occur for one liability within the SRF and was accordingly removed from the projections. Three other liabilities could potentially be removed, although none of those three currently has a firm commitment.

Deviation from projected costs in any of the primary categories of reclamation costs could cause the fund to fall short of or to exceed the liabilities projected here. While the per acre land and water capital costs closely match what has been expended historically, the annual water treatment costs assumed for future forfeits are lower than those observed for past forfeits.

III. Funding Mechanisms

There are multiple objectives in designing the optimal revenue structure to support the liabilities of the SRF. The ideal system will raise the required revenue and have justification in sound public finance principles. The objectives considered for the revenue systems were as follows:

1) [Solvency] Ensure adequate funds to complete reclamation responsibilities as required by both federal and state regulations.
2) Does not threaten the economic viability of the West Virginia coal industry.
3) Holding each mine, whether a surface or underground mine and AMD creating or. non-AMD creating, accountable for their liabilities. [This is essentially the definition of full-cost bonding.]
4) Holding each time cohort accountable for their liabilities.
5) Provide strong incentives for operators to self-reclaim.
6) Simple to understand and easy to enforce.
7) Low DEP administration costs.

In some cases these objectives are mutually compatible and reinforce some of the other objectives, e.g. providing strong incentives to self-reclaim supports the solvency of the SRF. In other cases, there exists incompatibilities that require tradeoffs be made between the objectives. For example, a full-cost, site-specific bond satisfies (3) but would add complexities to the system and raise administration costs (counter to 6 and 7).

In each of the revenue proposals made, the solvency of the SRF is the one objective that is mandatory. In some cases the bond and/or tax levels may not be realistic as they are too high and could cause major behavioral changes (e.g. defaults) in the industry. The third objective is theoretically violated by any tax/bond structure that imposes an extra cost on the industry. In relative terms the overall liability burden is a modest expense on the industry. A related objective is how smaller operators would be affected by a new policy, e.g. an inability to acquire full-cost bonding.

The third and fourth objectives are similar in spirit. Holding accountable each mine type for its actions appeals to a sense of fairness. However issues arising from legacy debts (not fully paid by their cohort) lead to the need to fund these resources out of the current and/or future cohorts. Under any policy there is likely to be times when even a full-cost bond system is over-capacitated by unusually expensive liability cases.

The primary source of reclamation should be the operators. It is typically less expensive to contemporaneously reclaim a site as the equipment is there, access is assured (e.g. the haul-road has not been destroyed before reclamation) and the reclamation can commingle with the traditional mining work, e.g. moving land. If the DEP needs to contract the work, it is likely to be substantial more expensive to reclaim the site. With this principle in mind, care needs to be taken to ensure that a policy does not create too little or even pervert incentives to self-reclamation. A simplistic case would be a pure-tax policy where there is no financial incentive to reclaim any site.

Other more realistic examples would be those policies that move away from an operator having a substantial amount of collateral (via a letter of credit and surety bond) backing the self-reclamation. For example, a trust fund initiated upon the discovery of AMD may overwhelm the capacity or willingness of the operator to begin paying into the trust fund.

The last two objectives are closely related. A simple system promotes the ability of the DEP to institute, regulate, and administer the permit process. It allows operators to better comprehend their reclamation and compliance costs. However simplicity can also lead to over-generalization forcing some sites to implicitly subsidize other sites. If the optimal policy based on the other five criteria turns out to be somewhat complex and requires a significant increase in DEP personnel and resources, then these last two principles are secondary in importance. The ideal system will raise the required revenue and have justification in sound public finance principles.

This section outlines several options for funding, including full-cost bonding and combinations of bonding and taxation based on tonnage. This report recommends full-cost bonding for land reclamation combined with establishment of a trust fund for water treatment. The following options are evaluated below:

- Current system of Partial-Cost Bonding and Taxation (with Modified Rates)
- Full-Cost Bonding with Separate Bonding for Water Treatment and Land Reclamation
- Full Cost Bonding for Deep Mines, Prep Plants and Refuse Sites
- Full Cost Bonding or Partial Cost Bonding with Tax (Operator choice)
- Trust Fund for Water Treatment
- Tax Only Covering All Costs
- State General Fund to Cover Legacy Costs

These alternatives have been derived from an investigation of practices in other coal producing states including conversations with authorities in those states and from the legislation requesting this study. In addition, state and federal reports and decisions have also been consulted. Discussions have been held with representatives of the coal industry in West Virginia.

The first five policy scenarios were analyzed with the following assumptions:

1) Bond amounts were based on current bond averages and inflated by 3 percent annually. Forfeited bonds are assumed to have a 95 percent collection rate.
2) The 7 cent per ton temporary tax is removed in October 2006. The permanent tax of 7 cents is also removed for the simulated policies that require only a full-cost bond.
3) A new policy would not be instituted until July 2007 (FY 2008). The status quo (partial-cost bond + tax) numbers are used throughout FY 2007 for all scenarios. The next five years is a phase-in with 20 percent of permits presumed to come up for renewal each year and at that time are required to switch to the new policy. After five years the transition is complete, i.e. all sites have had a 5-year renewal date.
4) The percentage of acres that forfeited with AMD begins at 25% and falls by 1% per year ending up at 5% of forfeits in 2026. This reduces revenues from forfeited water bonds which are less abundant with declining levels of sites producing AMD.

5) Policy regime changes do not alter firm behavior in terms of production or forfeit rate. All policies have adequate incentives for self-reclamation.

The 20-year projected liability and revenue cash-flows are provided in the appendix.

Current System of Bonding and Taxation with Rate Modifications

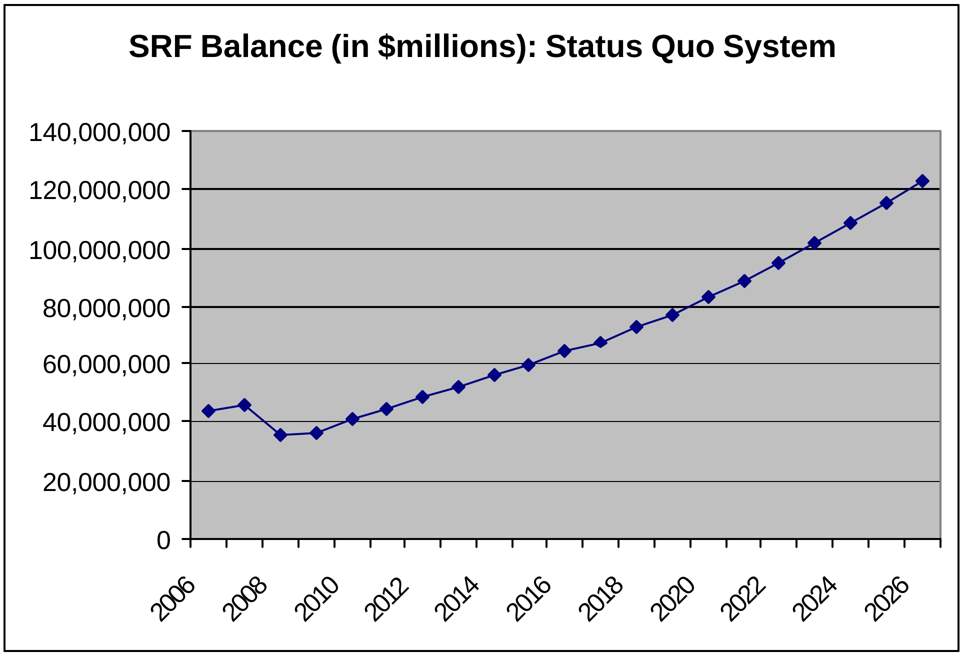
This case is the status quo and serves as the benchmark scenario. The 7 cent permanent tax provides a strong revenue stream of roughly $11 million throughout the two decades. Bond forfeitures also contribute strongly to the revenues. One caveat is that the bonds collected are historically on the high side. In recent years the best (or worst depending on the vantage point) year was 2000 when $3.27 million was collected. The mid-1990s saw collections in the $2 million dollar range but recent experience has been relatively lower occasionally under $1 million. That said, under the assumptions made the SRF balance moves strongly upward from $29.6 million to almost $154 million in 2026.

The benefit to continuing the current system combining bonding and taxation is that this option has the advantage of being known to the participants and therefore relatively easy to administer. There would be no implementation time and no need for administrative changes, except the rates for both the bonds and the tax would have to be adjusted to fit the projected liabilities. There seems to be little theoretical guidance to assist in how the division should be accomplished between bonds and taxes. As developed further below, there is a case that the tax should cover the legacy costs and the bonds the expected costs of new permits.

This approach has the major disadvantage that the current system has little support. It does not appear it will be adequate to cover the full costs of all forms of future reclamation without increasing bond costs or tonnage taxes. The industry will only be satisfied if they are convinced the level of taxation and fees are appropriate. This may be able to be accomplished by simply lowering the tonnage tax as the predicted cost declines occur and if a lower rate does not risk the solvency of the SRF.

Extension of the current system and the permanent seven cent tax is projected to result in an increasing SRF balance as shown in the following chart.

Figure 23: SRF Balance – Status Quo System



Partial or Full-Cost Bonding (Operator Choice)

When presented with a choice, the selection of full-cost bonding is determined by a number of factors. The expense of full-cost bonding is a function of permit acreage, type of operation (surface mine, underground mine, other), length of permit (about 40% of bonds are released by ten years) and presence of AMD. To bond AMD-based reclamation requires that treatment have a definite endpoint in order to calculate the bond. The presence of AMD will almost always require that a bond be held for more than ten years. To fulfill the definition of full-cost bonding, the bond value must equal the expected cost of reclamation.

The cost of tax plus partial bonding is a function of acreage, length of permit and production. Throughout much of history, type of operation and the presence of AMD do not strongly influence average bond costs. Mine type does factor in somewhat in determining the current per acre bond value, as underground mines currently are bonded at slightly higher rates than are surface mines, but that difference is less than $200 per acre.

<u>Methodology – Break Even Analysis</u>

This analysis calculates bond amounts that would make industry costs equal to costs under the current system. This analysis answers the question, "What bond amount would impose a cost that would, on average, make industry indifferent between the current tonnage tax and partial-bond versus simply a bond for land reclamation?" This hypothetical model is relevant for the industry in the near future when the 'temporary' tax of 7 cents is removed leaving only the 'permanent' 7 cent tax. The structure is based on the production/acre and bond/acre of the 2004 coal industry. Of course in 2004 all firms paid 14 cents per ton tax; however, the reasonable assumption is that in the next few years the choice will be between a total tax of 7 cents (e.g. the 'temporary' tax has expired) and no tax. Thus the status quo policy is modeled as a partial bond plus a 7 cent tax.

The break-even rates serve as a hurdle rate for the full-cost bond. If the full-cost bond amounts are below the hurdle rate then the goals of the coal industry and the DEP will be met. The industry will benefit from the removal of the tax and the SRF will be solvent. On the other hand, if the necessary full-cost bonds are above the hurdle rate then industry will fair better under the current system. The added bond fees would exceed the cost savings from tax elimination.

The break-even rates are calculated separately for coal-producing permits versus all permits. This is an important point due to the extraordinary number of non-producing surface and underground mines as well as other ancillary sites. In 2005 there were approximately 1900 open sites of which only about 300 produced coal and hence paid a tax. The remaining 1600 sites have nothing to gain by the lowering or elimination of the tax. A tradeoff of lower taxes for higher bonds negatively impacts the majority of coal related sites in the state of WV. In practice, corporations will hold a portfolio of the non-producing sites and production sites such that the gains from a reduced tax on production are somewhat offset by the added bond fees associated with non-production sites.

This analysis is based on several assumptions regarding the impact of bonding and the underlying factors of production that characterize an operator and that operator's decision to choose one mechanism over the over. These assumptions are:

1. The cost of full-cost bonding is the annual premium for the bond (one to two percent of the face value of the bond) plus the fee for a letter of credit (about one percent of the value). The annual premium is assumed to be two percent for large producers who would probably put up more collateral and three percent for small producers.[14]
2. A partial cost bond is on average $2,505 per acre for surface mines and on average $2,651 per acre for deep mines, the nominal average bond value issued between 1993 and 2005. Figure 24 describes average bond amounts for surface mines based on acreage. This degree of variance does not hold for deep mines.
3. Full-cost bond amounts will be higher than the average liabilities presented in that section of this report. For surface mines, bond amounts were distributed based on acreage to represent the larger bond rates required for larger acreage

[14] These rates are based on conversations held with industry contacts that represent issuers of letters of credit and surety bond purchasers.

mines and based site-specific bonding requirements outlined in the OSM bonding manual.[15]

These assumptions were used to model an annual cost of obtaining a bond. The expense of obtaining a partial-cost bond plus paying an annual tonnage tax of seven cents was compared to that of obtaining a hypothetical bond representing the equivalent firm costs via bond fees.

Surface Mines

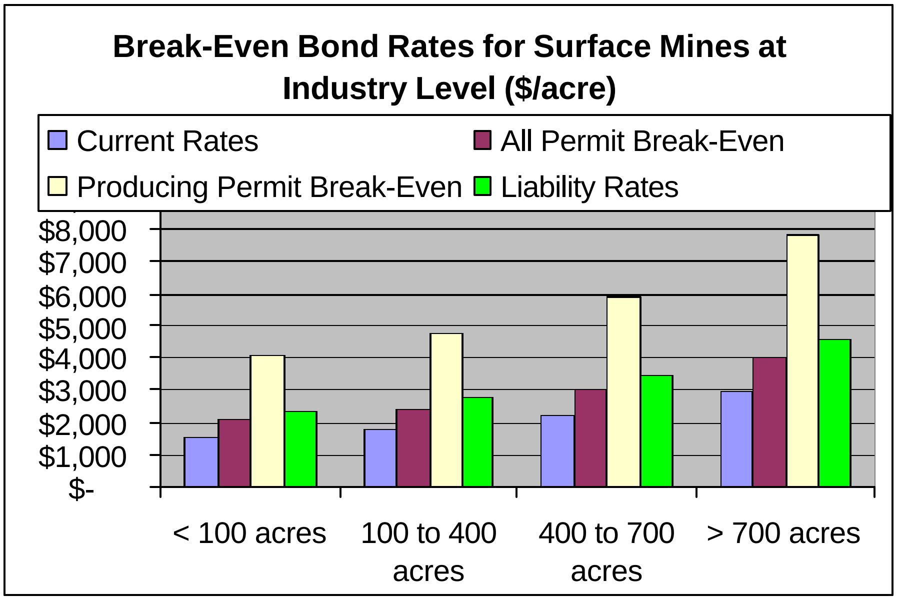
The CBER analyzed 73 surface mine permits that had complete production, bond, and acreage data. This is a good representative sample of the 125 surface permits with positive production in 2004, out of a total of about 607 open S permits. The 73 S mines produced a total of 44.7 million tons of coal, covered 38,540 acres and had bonds of $111.8 million. The analysis proceeded as follows.

1. Calculation of status quo bond and tonnage tax payments. The sample of firms paid approximately $3.1 million in taxes (at a rate of seven cents per ton) and $2.3 million in bond fees to surety companies (or equivalent). The total costs are $5.4 million for these permits. Note that the actual recipient of the funds (taxes to SRF or bond fees to surety) is irrelevant in terms of the companies cost calculations. The entire population of surface mines, both producing and non-producing, paid approximately $3.9 million in production taxes and $10.6 million in bond fees, for a total annual cost of $14.5 million. The population of unreleased surface mining bonds is dominated by non-producing mines. Current bond amounts are shown below in Figure 24.

2. Break-even analysis at the industry level – producing and non-producing mines: This hypothetical exercise proportionally raised the respective full-cost bond amounts to equate industry costs versus the status quo for producing permits. To match industry costs under the status quo of $5.4 million, bond amounts would need to be raised by about 120% for all producing surface mines. These results are shown below along with the average liability rates:

[15] The larger surface mines are required to post higher bond amounts per acre due to a number of factors including a higher incidence of valley fills, contemporaneous reclamation waivers, mountaintop mining, presence of multiple seams, steepness of slopes and frequent presence of more sandstone in overburden.

Figure 24: Break-Even Bond Rates for Surface Mines ($/acre)



These bond rates leave the industry indifferent between the status quo and full-cost bonds at these rates. However, within the industry individual firms still stand to gain or lose depending on their production and acreage. These rates represent an average bond amount at which the industry would be indifferent in the aggregate.

The presence of a large amount of non-producing surface mines with open bonds is a significant issue. When incorporating non-producing sites into the equation the overall break-even bond rate falls considerably. In fact, the break-even rates are only 37 percent higher than they would need to be for total industry bond costs to equal costs under the current system. This fact suggests that the surface mine industry as a whole will pay more under a full-cost bond system unless bonds for non-producing permits are reclaimed and released.

Underground Mines

CBER was able to match production, bond and acreage data for 119 underground mines. This is a good representative sample of the 170 underground mines with positive production in 2004, out of a total of about 770 open U permits. The 119 U mines produced a total of 85 million tons of coal, covered 8,021 acres and had bonds of $25.5 million.

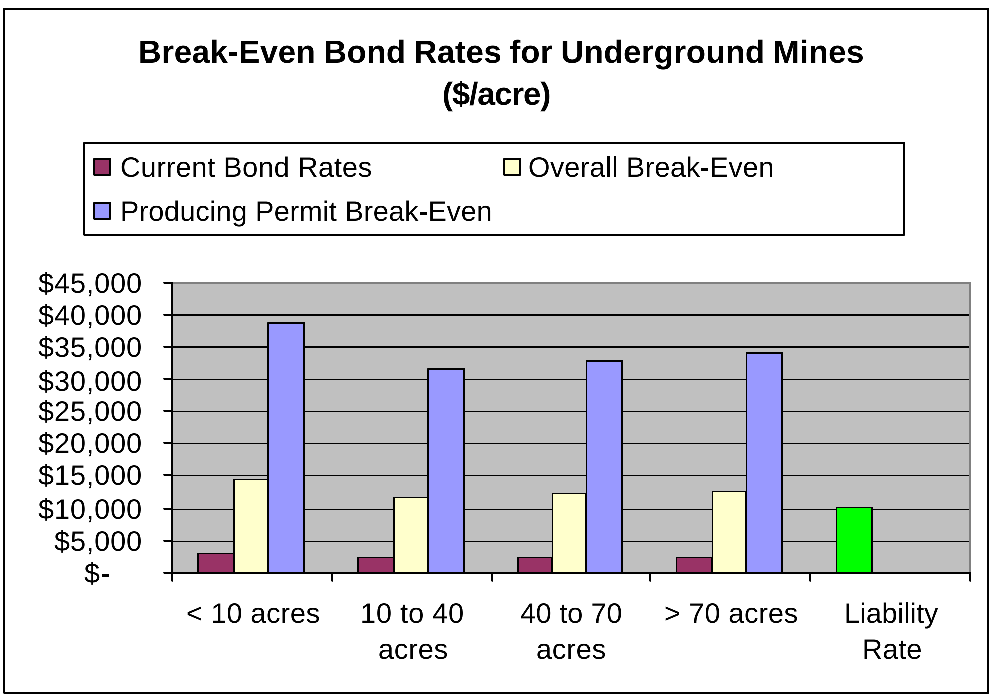
The analysis proceeded as with the S mines.

1. Calculation of status quo bond and tonnage tax payments. The sample of firms paid approximately $5.9 million in taxes (at a rate of seven cents per ton) and an estimated $0.6 million in bond fees to surety companies (or equivalent). Total annual costs are $6.6 million for these permits. The entire population of underground mines, both producing and non-producing, paid approximately $6.9 million in production taxes

and $1.5 million in bond fees, for a total annual cost of $8.4 million. As with surface mines, the population of unreleased underground mining bonds is dominated by non-producing mines. Bond rates for underground mines do not vary significantly by size as is the case with surface mine bond rates. Thus, average liability rates were used for all size cohorts for underground mines in comparison to actual current rates. The current bond rates by size cohort along with the historical land reclamation liability of the Special Reclamation Fund for underground mines plus 30% for indirect costs, or the minimum average liability rate, is shown below in Figure 25.

2. Break-even analysis at the industry level – producing and non-producing mines: This exercise proportionally raised the respective full-cost bond amounts to equate industry costs versus the status quo. For producing mines, the break-even point is about thirteen times the current bond rate for all sizes of mines. To match industry costs under the status quo of $8.4 million in annual costs for all permits the rates would need to be about four times current bonds. These results are shown below, along with the average liability rate for the SRF for this category of surface reclamation.

Figure 25: Break-Even Bond Rates for Underground Mines ($/acre)



These results indicate that producing underground mines are likely to fair well under higher bond amounts. Even though average bond amounts are likely to be higher than the liability rate of just over $10,000 per acre, producing mines break even at over $30,000 per acre. When including non-producing mines however, all underground mines break even at between $11,000 and $15,000 per acre. These significantly lower rates suggest that underground mines as a whole could pay more under a system of full-cost bonding unless some non-producing sites are reclaimed and released.

<u>"Other" Permits</u>

Just like non-producing surface and underground mines, "Other" permits will lose financially in the move to full-cost bonding. In 2004 only about 300 permits had recorded production out of approximately 1900 open permits. Thus, about 1600 permits have nothing to gain by the elimination of the tax and will pay higher bond fees proportional to the jump in bond rates. All 530 of the open type "O" permits fall into this group.

Summary

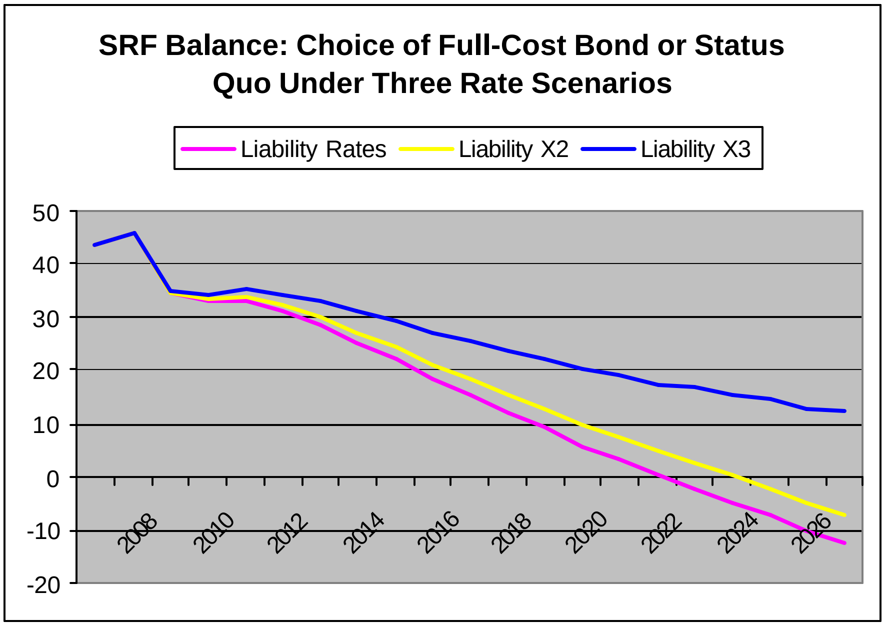
This analysis also shows that for producing mines, underground mines have a higher threshold for bond increase than do surface mines. The break-even bond rate for surface mines is about three times the current bond rate while for undergrounds mines the break-even rate is thirteen times current rates. This analysis also shows that underground mines fair better than do surface mines in terms of the impact of unreclaimed, non-producing permits on overall costs. For the population of permitted surface mines, the break-even rate is only 37 percent higher than current bond rates. For the population of permitted underground mines, this rate is nearly five times current bond rates.

For surface mines, if bonded at the average historical liability rates of $4,111 per acre operators representing about eleven percent of surface mined tons would choose the status quo's partial bond plus tax system. If bonded at double the liability rates, for an average of $8,222 per acre, operators representing about 46 percent of surface mined tons would choose the status quo. If bonded at triple the liability rates, an average of $12,333 per acre, operators representing about 55 percent of surface mined coal would choose to be taxed. This amount approaches the approximately $15,120 per acre historical liability rate for surface mines that required land and water reclamation.

For land reclamation of deep mines, if bonded at historical liability rates, an average of $10,057 per acre, operators representing about two percent of underground mined coal would select the status quo. If bonded at two times the historical liability rates, an average of $20,114 per acre, about 14 percent of underground mined coal could select the status quo. If bonded at three times historical rates, an average of $30,170 per acre, operators representing 31 percent of underground mined coal would select the status quo. Historical liabilities for sites with water treatment lie somewhere between two and three times historical land costs.

Figure 26 describes the SRF balance under these three bonding rates: 1) historical liability rates; 2) liability rates times two; and 3) liability rates times three. The fund's balance increases with higher bond rates.

Figure 26: SRF Balance Full Cost versus Status Quo



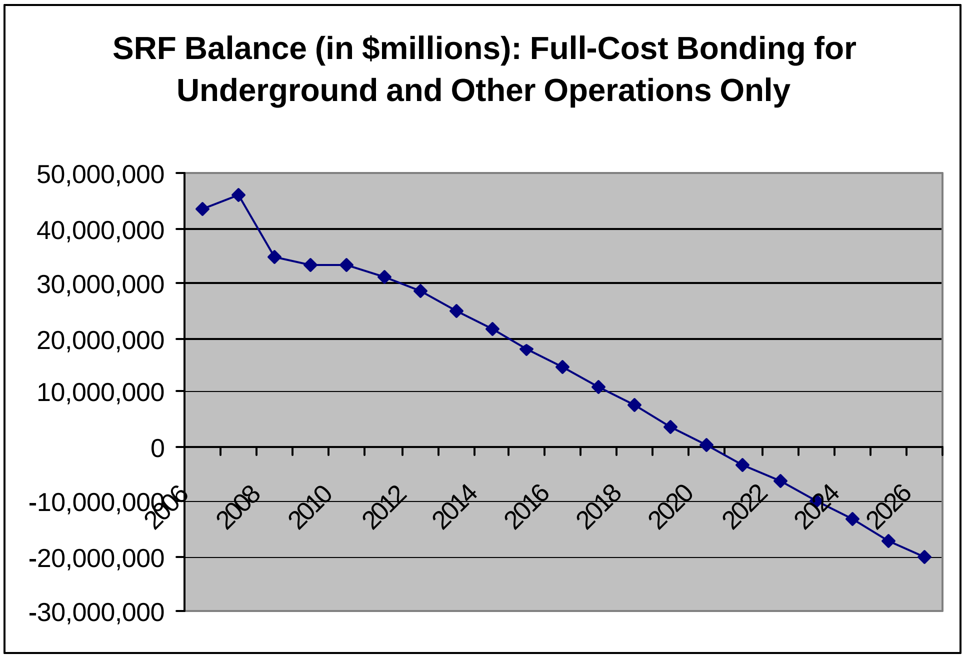
Full-Cost Bonding for Deep Mines, Prep Plants and Refuse Sites

The open permits data shows that about one prep plant permit is issued per year and that two refuse site permits are issued per year. As additional refuse sites and prep plants are also included within some mining permits it is difficult to fully separate the impact of full-cost bonding on these two types of permits from surface and underground mining operations. As described in the liabilities section, the reclamation costs of these two types of permits drive overall costs for the "O" category of permits.

For this scenario, the combined rate of forfeiture for all O permits was evaluated, rather than separating preparation plants and refuse sites, due to their dominance in explaining average per acre costs.

It policy has the benefit of keeping a 7 cent tax on surface production that along with relatively high bond forfeitures keeps the fund solvent through the year 2026. The projected balance of the SRF under this scenario is shown in Figure 27 below.

Figure 27: SRF Balance – Full Cost for Underground and Other Permits



Bond Only: Separate Bonding for Water Treatment and Land Reclamation

Under this approach, fines and forfeitures provide all the revenue inflow into the SRF. At least some in the industry seem to favor this approach as collateral is released when the reclamation of a particular site is complete. This approach does have support as it is used in many of the other coal producing states. It is worthy of note that in virtually all of these states, as is the case in West Virginia, the bonding approach has led to deficits.

There are several other problems with a bond only approach. Many of these objections apply to including bonds in any approach that combines them with taxes. The current bond requirement is based on acreage with a fairly uniform per acre fee used for all types of mines. This one-size-fits-all approach should be rejected as it fails to recognize the cost structures associated with different types of mines and different types of reclamation problems that mines may encounter.

For a bond only approach to be rational, all bonds would have to be "site specific". The amount of the bond would have to vary from mine to mine varying at least based on its type (S,U,O) and if AMD were a problem. Underground mines cause less surface disruption, so bonds for land reclamation are generally smaller than for surface mines although per acre this is not the case. Bonding for water treatment would be valued separate of land reclamation bonds for mines that are expected to encounter that problem. The DEP's permitting process already requires extensive descriptions of each mine site that may allow for the development of a site-specific bond structure. Their history of evaluating permit applications and in treating AMD sites provides significant experience with which to evaluate this risk.

Sites that are known to be in acid-producing seams when permitted would require detailed planning to treat any AMD that would appear during the mining process. This already occurs under the DEP's standard permitting process. To be equitable, bond amounts should be calculated taking into account as much site variation as possible.

But site-specific bonding is complicated and is more likely to lead to litigation than uniformity in bond valuation. From a legal perspective site-specific bonding is less "arbitrary and capricious" then a uniform per acre system is as it aligns costs with problems. The courts in other states have sustained the latter as not violating that legal principle.

Again, the key variable for bonding of water treatment is the length of the bond. The liabilities estimated for this category of reclamation and the 30-year assumption modeled earlier are a water treatment program where no long-term AMD sites are permitted and those that are permitted require primarily passive treatment. With a correctly priced bond, there will not be an increased risk of forfeiture resulting from a liability that became too large for the operator to maintain. It is difficult to see how any bond could be adequate to cover perpetual AMD costs. Furthermore, in order to set a bond amount, a treatment plan must have a defined endpoint.

It is clear that bonding can not deal with the legacy problems. This cost will have to be covered through a trust fund or funding source that is not based on a bond. Since under the bonding approach bonds are refunded based on degree of completion, bonds that are uniform per acre will often be insufficient. Forfeitures and fines, particularly in the case of bankruptcy, will often prove inadequate supplements. This is much less likely to be true in the absence of AMD treatment that is not perpetual, but should take into consideration as much site detail as possible in order to correctly match bond amounts to liabilities.

There is a further issue concerning the availability of bonds. Currently bonds are said to be available but limited to financially sound operators or their parent companies. In the past it has been difficult to obtain bonding by smaller and less well capitalized operations. There is no guarantee that full cost bonding will be available. That is almost a certainty for full cost bonding of water problems.

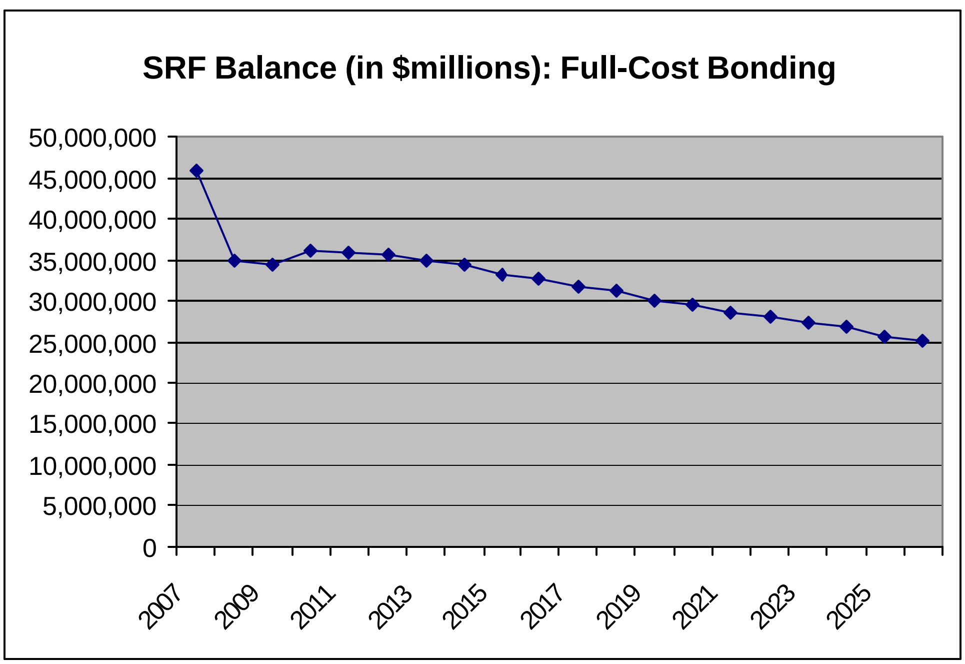
Bonding companies operate using "portfolio" analysis in which they balance all the different types of risks they insure. The purpose is to obtain an overall level of risk in the portfolio which is acceptable. This means mine reclamation bonds may not be available in the future if companies determine that they comprise too much exposure.

Also, bonding companies may reject bonding specific sites after they perform their on site inspection. While the DEP permitting process may significantly reduce this probability, it remains a concern particularly if unsuspected or undetected problems occur after the bond is issued.

The last issue concerns the potential for bankruptcy of the bonding companies. It has happened before. Currently there are only two companies writing mine bonds although some other insurance companies appear to write these bonds as part of a total liability policy for their "better" customers. But the failure of any company which has issued bonds would create a liability for the DEP which would not be covered.

The distinguishing features of this policy are higher bond amounts but disappearing tax revenue. The loss of approximately $11 million in taxes is partially made-up by the higher bond amounts but not enough to maintain fund solvency. This could be rectified in two ways. Firstly, bump up the full-cost bond amounts to cover the liabilities. This is easily incorporated by a proportional rise in the bond amounts that were based on historical costs but may not be fully reflective of a true full-cost bond. Secondly, a relatively small tax (perhaps 2 to 4 cents per ton) could be justified to be maintained to cover the on-going water treatment from legacy sites that is not priced directly into the newly permitted full-cost bonds. The tax could take various forms such as staying at 7 cents until a trust fund like balance was held in the SRF and then the tax could be removed. The projected balance of the SRF under this scenario is shown in Figure 28.

Figure 28: SRF Balance – Full Cost Bonding for All Permits



Trust Fund for Water Treatment

The unique problem of AMD liabilities is that they are:

- Perpetual in nature with no readily estimable extinction date, and
- Difficult to objectively predict, detect, and measure.

Although there is some evidence of declining AMD liabilities there does not appear to be a consensus by the scientific community that AMD has a finite life. Even if a date in the future of 50, 75 or 100 years can be used as a point where the drainage has become trivial, this still presents an extended liability well beyond the life of most conventional bonds (e.g. 30-year Treasury bonds) or letters of credit. Furthermore most companies, including corporations which are in principle considered to be perpetual entities, are in practice likely to have lives significantly shorter than their AMD liabilities.

In comparison, land reclamation can often by completed in months and land problems are obvious even to the layperson. These two characteristics of AMD require that a funding mechanism be put in place that is perpetual in nature and can be flexible enough to cover unexpected cases of AMD. This leads to the conclusion that a trust fund is the best mechanism by which to fund water liabilities. The method of funding of the trust fund is then the question.

There are three revenue sources that can provide resources in perpetuity:

- The current system of a per ton coal tax is essentially a perpetual stream of payments contributed to by all active mines regardless of their past, current, or future creation of AMD liabilities. This system relies on the perpetual nature of the coal mining industry in West Virginia. It is highly implausible that the entire industry will implode in the next century leaving no one to tax. An obvious complaint is that this perpetual system of taxation imposes a liability on existing firms who may or may not have contributed to the AMD problems.

- The second choice is to require those companies who have sites with AMD to set up a private trust fund to cover all future liabilities. The operator would need to establish sufficient funds to cover initial and subsequent capital costs and annual operating expenses. Furthermore the trust fund would need to grow over time to account for inflation of the associated materials and labor.

- A third option is a combination of these two approaches. A tax is collected from all operators currently treating water above and beyond contemporaneous liability needs in order to establish a statewide trust fund. This is the model Dr. Michael Hicks outlined in his proposal, "The Mountain State Clean Water Trust Fund".[16] A benefit of this approach is that it removes the tax or surcharge on coal once the trust fund is fully endowed. However, it has a related drawback in

[16] Hicks, Michael (2001). "The Mountain State Clean Water Trust Fund."

that the legacy debts are concentrated on coal companies that will be in existence over the next couple of decades. This would mean a very high initial contribution to fully fund the endowment. A smaller tax that does not fully-endow such a fund would distribute the legacy (and subsequent costs) over all companies operating regardless of when they came into existence. That is, there is tradeoff between a "high tax / no tax" scenario or a moderate perpetual tax to fund AMD liabilities.

A model program using trust funds has been established by the Pennsylvania DEP. The PA DEP has evolved over the years from an alternative bonding system (e.g. partial bond & coal tax) to a conventional bonding system (e.g. full-cost bonding). The bond is written in anticipation of land but not water liabilities. The trust fund is not part of the original agreement but is instituted when AMD is detected. As in West Virginia the Pennsylvania DEP will not issue new permits where there is even the slightest risk of AMD liabilities. Their ability to exclude sites that will develop AMD liabilities has improved significantly over time. Initially their accuracy was limited with 20 percent of new permits subsequently developing AMD problems. Recently, their record has improved dramatically such that less than 2 percent of new permits have AMD problems.

Furthermore these problems are typically minor in nature so a relatively inexpensive passive treatment system can be used. The operator has responsibility to maintain the water costs out of their own pocket until the trust fund is fully endowed. Once the trust fund reaches this point, the fund's earnings are partially returned to the company to cover their water expenses; the balance of the return is used to grow the fund to match inflation. The fund and anticipated expenses are evaluated periodically to ensure that it remains sufficient to pay all future liabilities.

In appearance, the site-specific trust fund approach has much to offer. It connects liabilities with the companies who created them. It is not subject to any separate risk inherent within the surety business. However there are several challenges in instituting individual trust funds:

1) How are water liabilities projected? The PA DEP uses AMDTreat software jointly developed with the OSM. Additionally they ask operators to keep records of their actual reclamation costs. It was found that many companies had little idea of their reclamation costs. It is not a simple accounting exercise as reclamation activities often commingle with traditional mining activities (e.g. moving land). This analysis used an average per acre cost to estimate future aggregate liabilities. However, that would not be an appropriate method for calculating the necessary funds to contribute to a trust fund.
2) How are current sites monitored for AMD and at what level does it become 'a problem'? Dr. Paul Ziemkiewicz stated, "All underground mines have AMD". This statement likely has some important caveats such as "the AMD is virtually contained or at trivial levels" but still highlights the ambiguity in this type of identification.

3) The endowment of these funds may be significant. A constant perpetuity (e.g. paying $1 every year forever) will require an endowment of C/r where C is the annual liability payout and r is the return on the fund. For example a $10,000 annual liability would need $100,000 in the trust fund if the fund could average a very optimistic 10% annual return. A more realistic annual return of 5 percent would require a $200,000 endowment. If the annual costs are rising with inflation, this amount would need to be deducted from r. Continuing with the example if an aggressive fund could earn 8 percent per year but inflation was 3 percent then a $10,000 liability would require a $200,000 endowment [$10K/(.08-.03)]. These high funding requirements would likely result in allowing operators several years to build up the trust fund. If not, the upfront costs could threaten the existence of the mine, particularly smaller mines. How much time is granted for the operator to fully endow the trust fund and what happens if forfeiture occurs prior to the funding being completed?
4) What incentives are there for an operator to establish a large trust fund when the problem is discovered? How is the site to be treated beyond when the owner is interested in owning the property? The owner may balk at the high levels of funding needed to endow the trust fund. The threat of being black-listed is important for many operators but not all. What resources are there to cover these forfeited sites?
5) How much reimbursement will trustees require to manage these funds? The PA approach allows for operators to pay into a Master Trust Fund which reduces fixed fees and also provides stability to the fund over time as it is better diversified.
6) What happens in the future to the trust fund if the AMD reaches trivial levels due to natural attrition or a technological advance? Is the money refunded to the owner? What if it is 50 years later and the corporation is extinct?

These issues, while complicating, are not insurmountable. One final benefit of trust funds is that it may allow a compromise between environmental and economic interests. A rigid interpretation of ‘No AMD’ by the DEP could sharply curtail potentially profitable sites that have a minor but non-negligible chance of AMD. The tradeoff between environmental stewardship and economic opportunity for coal operators and their employees could be balanced by allowing trust funds to allow marginal sites to produce coal with the contingent backing that if AMD arises, there would be additional liability demands.

The concept of having a trust fund which could cover anticipated costs out of future earnings has an appeal. But establishing such a trust would take a long time if it is to self-sustaining. If a master fund financed by statewide tax was levied to cover all legacy costs and anticipated AMD costs then the amount needed from each site would be significantly reduced.

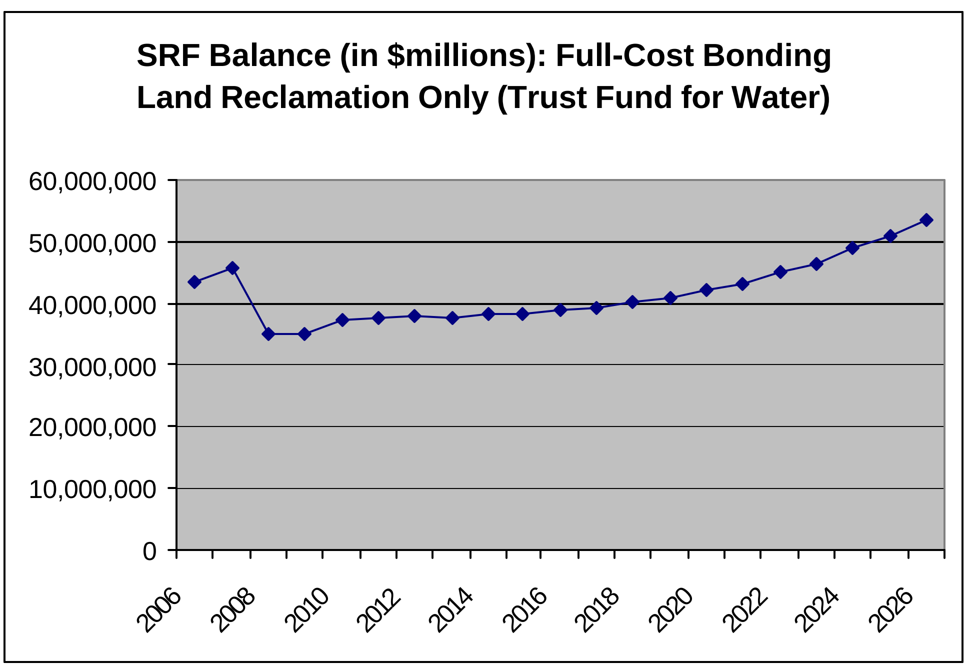
The trust fund would also require almost annual actuarial reports to ascertain the solvency of the trust. As is the case with any trust, the actuarial requirement is subject to change and the contribution is variable. West Virginia has consistently under-funded its other trust funds, mainly those for pensions. So from a practical standpoint this may not work unless the revenue source is mandated to expand as needed to meet the actuarially liability and does not require a legislative enactment to be altered.

Further, the fund and the contributions to fund it would have to provide a reserve between 20- 50 percent above anticipated costs. This is the usual approach for bonds of this type. This would further increase the cost of the trust fund, but it does insure solvency for any unanticipated events.

The benefit of this approach is that water is treated independently of land reclamation. A site-specific trust-fund would be established by the operator upon the discovery of AMD. This leads to future water capital and on-going water treatment expenses being treated effectively outside of the SRF. It is important to note that the legacy (up to the full implementation of the trust fund policy) water costs remain a perpetual liability of the SRF. All taxes disappear in 2012 as the full-cost bonds are phased in. The balance of the fund remains solvent through 2026 although it is falling throughout most of the two decades. If a higher balance is desired, a correction for this can be made as suggested for the full-cost bonding policy. Either land bond amounts could be raised or the 7 cent tax could be kept to form a trust fund for the legacy water or a perpetual smaller tax to fund that liability.

The projected balance of the SRF under this scenario is shown below. This balance is from the remaining liabilities and forfeitures related to land reclamation, as water liabilities are managed separately under a trust fund.

Figure 29: SRF Balance – Full Cost Bonding for Land Reclamation Only



Tax Only Covering All Costs

This method can be justified on the grounds that it at least roughly assigns benefits from remediation to costs, although it is not a perfect assignment. A ton of coal from some locations or formations presents more potential environmental damage that a ton severed elsewhere, but the approach comes closer to matching benefits to costs than the per acre permit fee does.

There is a strong element of administrative simplicity in using the tonnage tax. It is easy to identify and to collect. All the needed data is there and the tax is currently in use. Given the projected levels of WV coal output the tax can be easily designed to reflect the need for revenue. A schedule providing for reductions over time could be implemented, subject to periodic review.

The tonnage tax appears to be the most appropriate way to deal with legacy issues. Because this approach requires existing businesses to pay for problems they did not create, a fairness question arises, but the costs must be borne. The case for using the tonnage tax rests on its relative neutrality. It spreads the legacy costs over a large base thereby damping any adverse impacts on production.

This method does reduce the competitive advantage of WV coal when compared to coal from other states where no such tax is levied. However, a comparison of the tax to the price of a ton of coal renders that disadvantage insignificant. Other factors are clearly greater competitive obstacles to WV coal than is the current or any anticipated tonnage tax. If the price of coal should drop dramatically, then the competitive argument would carry more weight. But that downturn in coal markets is not forecast at least in the foreseeable future.

A problem to be anticipated with the tax only approach is that it may encourage default. Having already paid the tax, there is little incentive to reclaim or to provide perpetual treatment of AMD. Having nothing to lose from “walking away”, operators may chose that alternative and it would be economically rational for them to so do. Fines could be used, but that leads to a double taxation argument.

Further, the fund and the contributions to fund it would have to provide a reserve between 20- 50 percent above anticipated costs. A tax of about 11 to 12 cents per ton would accomplish this. This is the usual approach for bonds of this type. This would further increase the cost of the trust fund, but it does insure solvency for any unanticipated events.

State General Funds for Legacy Costs

A final alternative would be to have the legacy costs covered in whole or in part from the State general fund. The rational for such an approach is that the state has benefited economically from the coal industry and the taxes it has contributed. The State should therefore be expected to cover the costs associated with the general benefits received. The economic benefits from the production of coal are general and spread throughout the economy as the primary, secondary and tertiary effects play out. The "general benefits" theory of taxation justifies such an assignment. This argument can be more positively advocated for the coverage of legacy costs than future expenditures. Some states have used this approach to cover legacy costs or have used general fund injections when their SRAs show a deficit.

Sensitivity Analysis

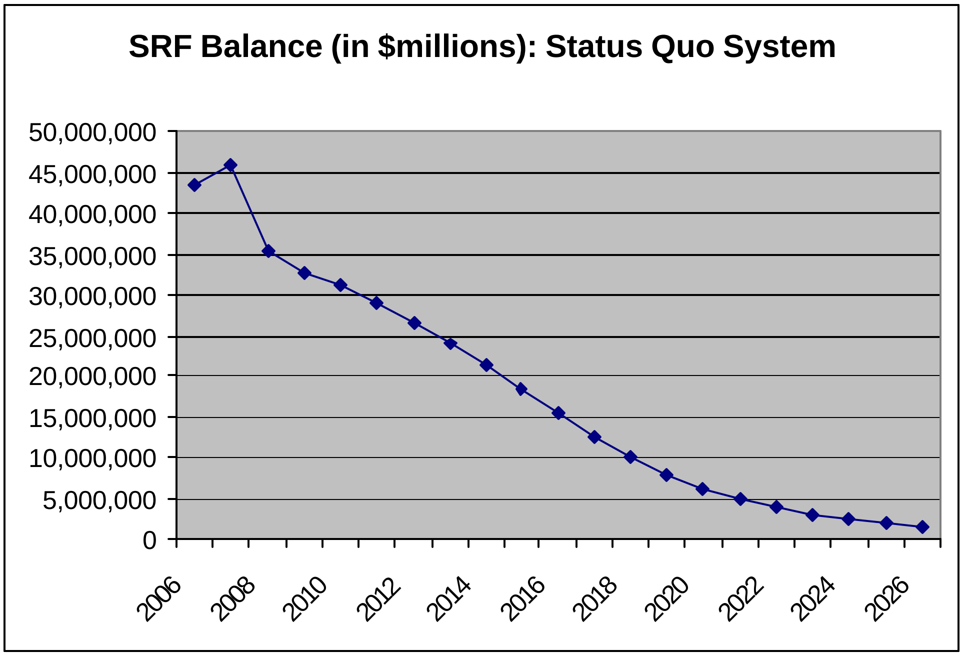
The projections for the alternative financial mechanisms are CBER's prediction of the most likely outcome. However, as with all forecasts, the outcomes could vary due to a number of events. Based on judgment and conversations with the DEP a conservative approach in estimating the liabilities associated with the SRF has been taken. The key areas which may differ are:

- the amount of forfeited acreage,
- the typical liability associated with that acreage, and
- unforeseen rare, expensive reclamation sites.

Higher levels of forfeited acreage are a problem for the status quo as each forfeited acre is supported by only a partial bond. The tax revenue is unaffected by a forfeiture and hence cannot cover the difference between the forfeited bond and the typical liability. The forfeited acreage is not a problem for full-cost and/or trust-fund systems as each permit is fully insured (assuming complete receipt of the bond which may not hold in practice).

The liability could out-strip the amount of the associated bond in any bonding system. In the benchmark case there will be sites that end up with costs higher than their full-cost bond but these will be offset by sites whose bond is more than adequate for its site. In practice the average could rise due simply to randomness or events within the industry. To model this possibility, the land liabilities were adjusted by excluding historical data that had relatively low reclamation costs. For land those sites that had less than $2000/acre reclamation for surface permits and less than $5000/acre reclamation for underground and other permits were removed. This raised the per acre liability from $3162 (S), $8722 (U), and $8557 (O) to $5369 (S), $12,634 (U), and $12,942 (O). For the status quo case, no adjustments were made on bond amounts. This represents the status quo policy under a 'worst-case scenario'. The system is expected to remain solvent through 2026 although the SRF fund is largely depleted at the end of the 20-year projection.

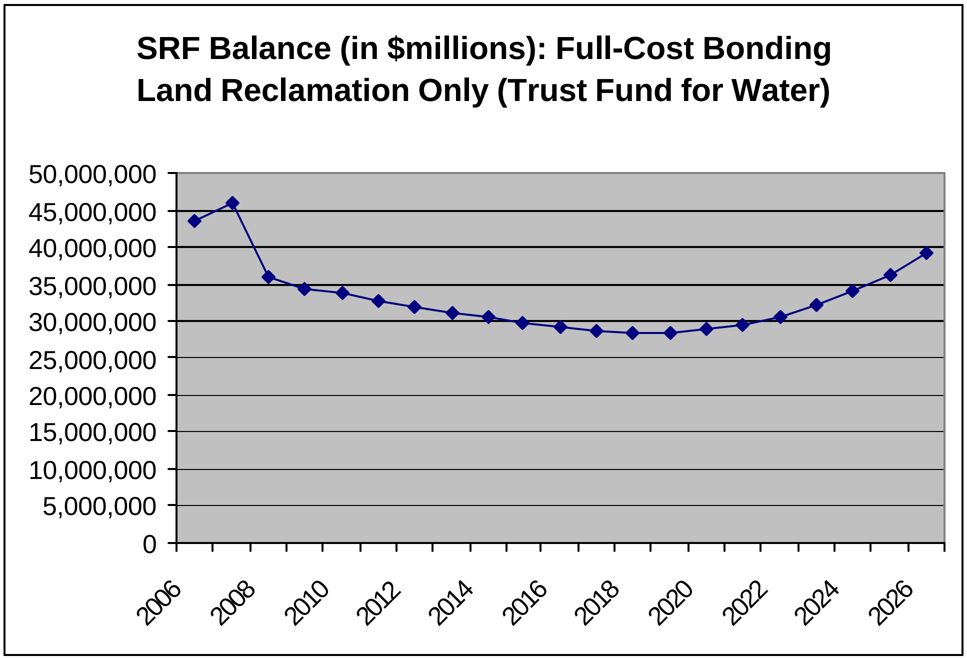
Figure 30: SRF Balance – Status Quo System (Worst Case Scenario)



In the case of the two other major policies – full-cost bonding and a water trust-fund, it was assumed that the full-cost bonds were reset to cover the higher liability outcomes. This simulation provides a high-end estimate of what a typical full-cost bond would need to be. Adding a 30% overhead the land bond amounts would be $6980 (S), $16,424 (U) and $16,825 (O). It may in fact be a likely outcome under full-cost bonding that the typical liability handed the DEP rises as the less expensive cases are self-reclaimed. A rational firm is much less likely to forfeit a site with modest reclamation if it has a hefty bond it stands to lose. The worst-case projections for full-cost bonding and a water trust-fund are given in the following figures.

The third major uncertainly lies in the possibility of multi-million dollar liabilities being brought under the SRF. These events are rare and nearly impossible to predict. The approach used is to allow the SRF to keep a solid balance to guard against these major liabilities.

Figure 31: SRF Balance – Full Cost Bonding (Worst Case Scenario)



IV. Conclusions and Recommendations

The decision between the seven policies described in section III is based on seven criteria. Table 6 scores each policy on a five-point scale with 5 representing outstanding, 3 adequate and 1 unacceptable.

Table 6: Rating Scale of Policies

	Status Quo	Full-Cost Bond	Full-Cost bond (U, O), status quo (S)	Choice model	Full-cost bond (land), trust fund (water)	Tax only	State General Revenues
Solvency	4	4	3	1	4	2	2
Economic viability	4	3	3	3	3	4	4
Site accountability	2	4	3	3	5	1	1
Cohort accountability	2	4	3	3	5	1	1
Incentives to self-reclaim	2	4	3	3	5	1	1
Simplicity	4	3	3	2	2	5	5
Administrative costs	3	3	3	3	2	4	3

Under the right parameters a perpetuation of the status quo, a full-cost bonding system or a trust-fund system could virtually guarantee solvency. The industry as a whole is not significantly affected by a relatively minor tax, bond fees or the establishment of a trust fund. However there may be companies that see significant shifts in their costs if they are forced to shoulder the full burden of their (water) liabilities. The trust-fund approach is the most accountable system as it is the only one that makes perpetual water liabilities an individual permit responsibility rather than a general industry cost. The tax-only approach and the unloading of the SRF liabilities to the state are the 'simple' solutions but deliver poorly in almost every other category.

Note that the assignment of a ranking is somewhat subjective. However it serves to give a general impression of the strengths and weaknesses of each policy. There is a temptation to add up the columns and deliver a winner! Due to the fact that some categories are more important criteria than others, this could lead to a false conclusion. The trust-fund approach appears to be the optimal system based on its alignment with public finance principles of assigning responsibility with the associated liability. The drawback to this system is the added complexity for the industry and the DEP. The transition from the status quo system could be difficult if and when firms are required to post significant trust funds.

Recommendations

The literature reviewed and the experience of other states provides no ideal plan for imitation in WV. All coal producing states seem to be struggling with the same issue. After investigating the alternatives discussed above CBER's recommendation is as follows.

The report concludes that full-cost bonding for land reclamation is feasible and may be preferred over the current system by most operators. Full cost bonding is a less feasible solution when water treatment is required. The lower degree of predictability in bond collection plus the high and variable costs makes an alternative system such as a trust fund, or a tax for water reclamation a preferred option.

Establish full cost, site specific bonding for land reclamation costs. These costs are easily ascertained and can be completed in a definite period of time. These characteristics make land reclamation an ideal candidate for full cost bonding. Indications for the insurance industry are that these are the type of bonds they are most likely to issue due to their predictability and relatively low cost. The CBER analysis indicates that most operators would choose this option on economic grounds if it were available. Each bond would have to be site specific and would vary with the conditions at the site. Since the DEP permitting process already includes a detailed evaluation of each cite, devising individual bonds does not appear to present a formidable deficiency. Before accepting this recommendation answers to the questions raised in the above discussion on bonding should be addressed.

A site-specific bond is the most equitable way to accurately match bond amounts with potential liabilities for land reclamation and water treatment costs, although the degree of site-specific evaluation is more important for water reclamation. To cover the growth in costs over time, bonds should include an inflation adjustment. If a site is to be operated over a period of years, even small inflationary pressures can lead to significant uncovered costs in the case of future forfeits. There do not appear to be any companies that now issue inflation adjusted bonds.

There are some states that require periodic renewal of bonds. These are usually every 3-5 years. The renewed bonds reflect the increased costs and also cover any unanticipated events which are present since the original bonds were issued. A problem has arisen in getting these bonds renewed in recent years, as many bonding companies have dropped out of the market having reached their "risk capacity" for coal bonding in the balancing of their risk portfolios. Although conversations with those in the industry indicate that bonds are now available, the terms can be quite onerous.

Establish a trust fund to deal with legacy and water reclamation costs. The fund would have to be funded in part by a continuation of the current tonnage tax. But that tax would quickly and significantly decline as the backlog of reclamation projects is completed. The trust fund would need to have sufficient reserves (20-50 percent) to cover any defaults in bonds as well as unforeseen problems. The trust fund could also be financed in part by site specific bonds to cover water treatment costs. This approach has been used in Pennsylvania. There does appear to be a strong reluctance on the part of insurers to issue these bonds where there is the potential for perpetual treatment. The high initial costs of obtaining these bonds may be a problem for smaller operators and could lead to certain sites not being developed. Such a situation would require the creation of a master-fund to which all would contribute. The costs of the bonds may have to be prorated over several years to make them economically feasible.

Tonnage Taxes for Legacy Problems. Legacy problems would continue to be covered by a tonnage tax which would support a special trust fund. Since the legacy costs have been established, a tax with a declining rate reflecting the decreasing legacy costs would be appropriate. That rate would have to be subject to periodic adjustment if the estimates of legacy costs proved to be either too high or too low. Water treatment for future forfeits with AMD could be covered via either a site-specific trust fund or state-wide general trust fund.

Annual evaluations of fund solvency. The recommendations above would have to be reinforced by an annual review of SRF solvency. This would allow for any adjustments in the per-acre full cost bonds if the estimates used in this report turn out to be either too high or low. This annual evaluation would be the basis for the establishment of new full cost bonds when there are renewed every three to five years. Such updating of the full cost bonds is essential to insure solvency.

The legislation should provide a "circuit breaker" which would allow for the automatic adjustment of tax rates. This circuit breaker would remove the discussion from politics or at least reduce it. The rate of taxation should be set at the upper limit of probability to insure that reductions rather than increases would be likely under the circuit breaker. A certain level of taxation should continue to cover any unforeseen contingencies, particularly with AMD. As is the case with other trust funds coverage would have to exceed anticipated expenses by some percentage. It is usual for trust funds to be maintained between 120-150 percent of expected payouts.

A variant of the above would be to use the tonnage tax only to cover legacy costs and apply it to coal from sites with potential AMD problems. If DEP is correct there may not be any of these in the future. Such a variant does violate the principle of neutrality as it discriminates against coal from the potential ADM sites. But that objection may be overcome as the tax would align costs and payments.

There is no perfect solution to creating a solvent SRF. The above suggestions do accomplish this objective and provide a means which more closely conforms to the principals of sound public finance. It more accurately recognizes the special characters and problems of each type of mine and thereby more accurately assigns costs than does the current system. The proposal will mean a significant increase in bonding costs over the current system. This will be partially offset by the reduction in the tonnage tax. The current additional 7 cent a ton tax is eliminated and the permanent 7 cent tax can be dramatically reduced over time.

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Appendix A: Statistical Modeling (Theory and Results)

The data on patterns of coal permits forfeiture and release can be analyzed using several classes of statistical models. Two of the more prominent models used for this type of data are hazard models and discrete-choice models. The former is employed by the Hay Group and the later model was selected by CBER. Although both have distinctive features, the predictions of the two models can be complimentary.

The first question needed to be answered is "Given that a permit is still in existence X many years into its life, what are the probabilities that it will default, attain complete release, or remain open in the next year?" The forfeiture 'hazard rate' is the conditional probability that a permit will forfeit in a given year of life. In general the hazard rate can be a function of time and other variables such as the mine characteristics (e.g. acreage) or industry-wide events (e.g. productivity changes).

The empirical hazard model is the simplest model for this data. This model calculates hazard rates by dividing the number of permits that forfeited in a specific year of life (1^{st}, 2^{nd}, 3^{rd}…etc.) by the total number of open permits that have 'lived' that many years.[17] The Hay group employs this model with the modification of smoothing the rates over time and extrapolating for lengths of time outside the duration of the data. The strengths of the empirical hazard model is that it is relatively simple to calculate and easy to interpret. Its weakness is that it does not adjust the probabilities to allow for explanatory variables such as price shifts or the size of the permit. Furthermore there is the challenge of understanding what historical data is relevant to the future patterns of forfeiture and release.

The model selected by CBER to calculate the hazard rates is the multinomial logit model (MNLM). The basic premise of the MNLM is that there are three outcomes that can occur to a permit each year – forfeiture, release, or remain open. The probability of each of these events is modeled as a function of site characteristics and industry effects[18]. Three explanatory variables were chosen for initial consideration – the age of the permit, the size of the permit in acres, and the prevailing coal price in each year. All models were estimated using the latest ten years of data (FY 1996-2005).

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[17] For example, suppose there is a total of 100 permits that are issued in various years. In the first year of life, 3 permits are forfeited and 7 are released. The forfeit hazard rate for year 1 is 3% (3/100) and the release hazard rate is 7% (7/100). At the beginning of the second year there is a population of 90 (100-3-7); 5 sites forfeit and 9 sites are released in the second year. The forfeit hazard rate for year 2 is 1/18 (5/90) and the release hazard rate is 10% (9/90).

[18] The MNLM is a non-linear model which makes it more difficult to estimate and interpret. The parameters of the model can be used to forecast the probability of an event. For example the probability of default for each site is calculated as:

$$\Pr(default\,@\,t \mid alive\,t-1) = \frac{\exp(b_{default} + b_1 \cdot Acres + b_2 \cdot Age)}{\exp(b_{default} + b_1 \cdot Acres + b_2 \cdot Age) + \exp(b_{release} + b_1 \cdot Acres + b_2 \cdot Age) + 1}$$

The age variable accounts for the observation that it is rare to see a permit being forfeited or released early in it life. This may reflect several underlying causes – the time it takes to begin operations, for operating conditions to become unprofitable, time needed to shutdown operations, etc.

The second explanatory variable is the size of the permit as measured by acreage. This variable could be based on the observation that larger sites are

1. more efficient and hence have a better chance of success,
2. more likely to be backed by a major corporation with broader experience and better financial standings (and who do not want to jeopardize their right to mine by defaulting), and
3. concurrently disturb a smaller proportion of their site (effectively self-imposing a higher bond rate).

The third potential explanatory variable is the WV coal price. Figure A.1 compares forfeited acreage to coal prices and shows that while real coal prices declined from 1980 through 2000, forfeitures did not correspondingly rise throughout the time period. Real coal prices fell from the late 1970s through 1994 but this downward trend was not the primary driver to the rising forfeitures in the 1980s. The post-1994 era also (until recently) experienced falling prices but the number of forfeitures fell.
These trends support the conclusion that price was not determined to be a statistically significant variable in explaining and thus predicting industry level forfeitures. Other factors such as regulatory policy, permitted acreage and previous forfeitures were historically more significant than price in explaining forfeits.

Figure A.2 compares productivity in coal mining with the deflating coal prices and shows the gains in productivity exceeding declines in price during the time period. Technology (measured by output per miner-hour) more than offset the fall in prices. Other costs such as non-miner employment and higher capital costs may also contribute to higher costs and lower profit.

The high prices currently experienced may cause forfeitures to be low in the near-term, but they may also entice marginal sites to begin operating that could not compete in a lower-price market.

Figure A.1: Forfeited Acres & Coal Prices

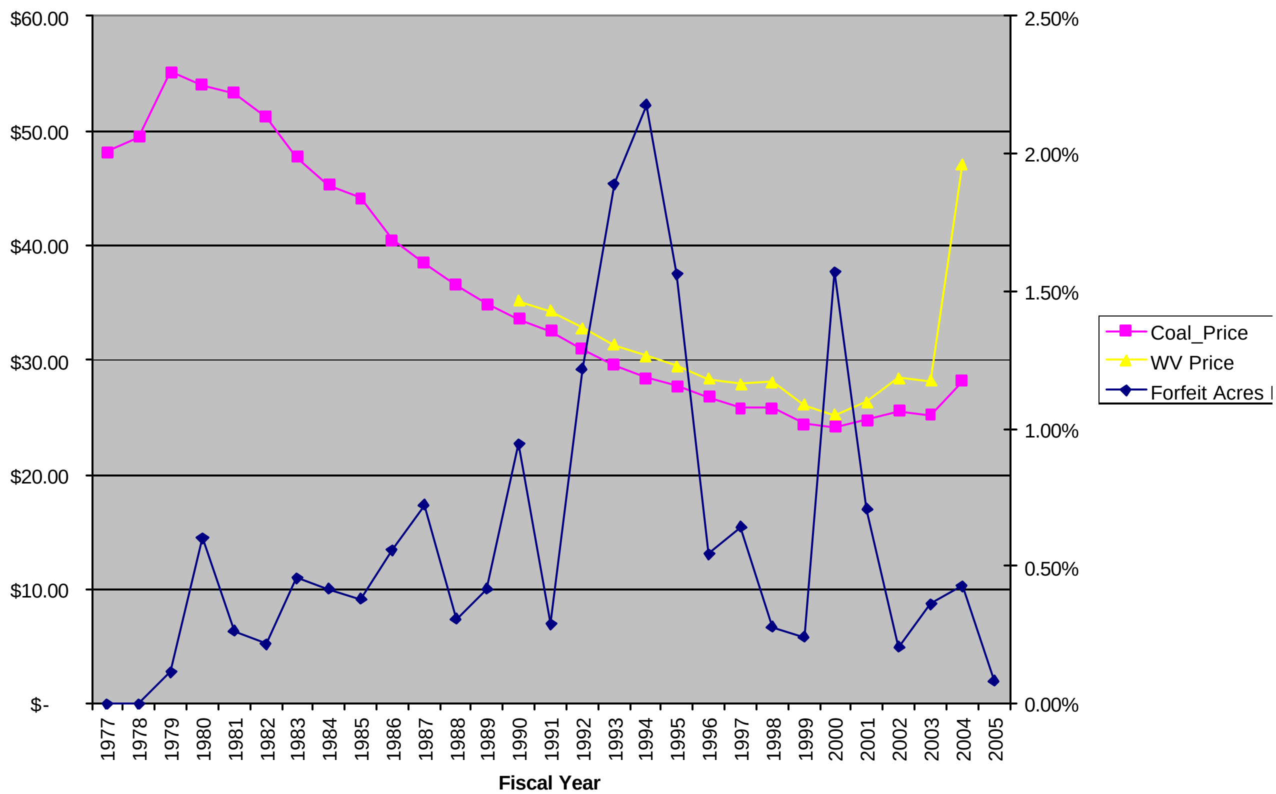
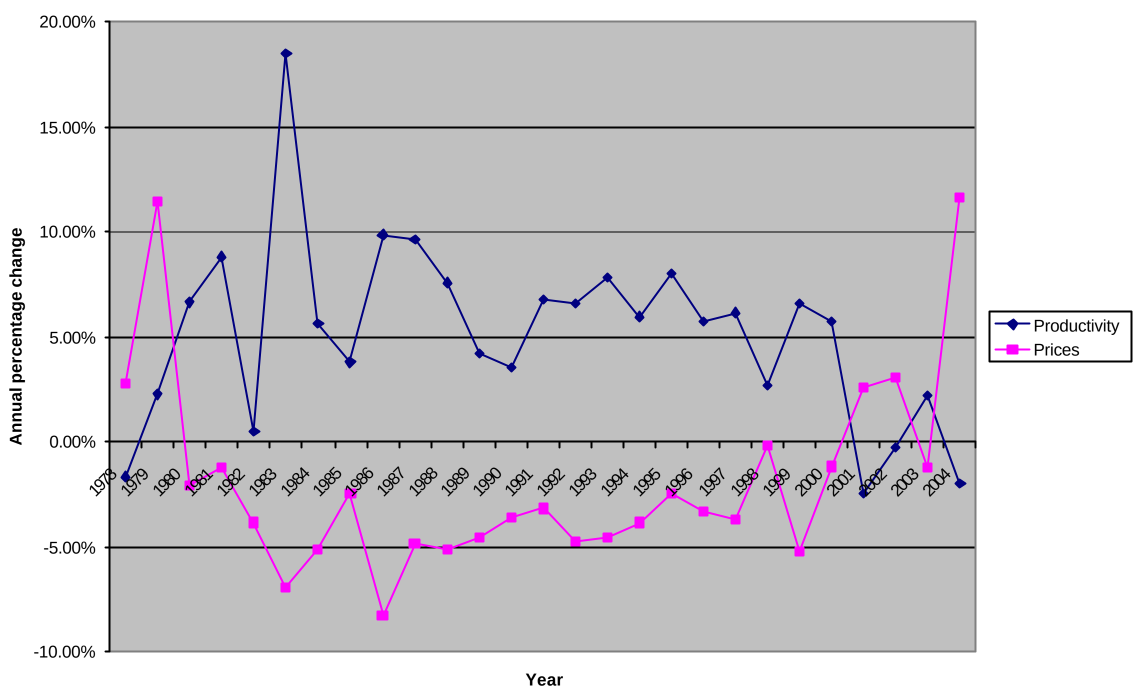


Figure A.2: Coal Productivity and Deflation



Fiscal year 2005 did in fact experience very low levels of forfeiture. However the broader period with high prices (2003-5) did not experience distinctively lower forfeitures than over the last decade (post-1995). Figure 16 illustrates that the fiscal years prior to 2003 were comparable (other than the outlier in FY 2000) to the high-price era 2003-5.[19] The MNLM was unable to detect a statistically significant relationship between coal price and forfeiture rates. The recent sharp spike in real coal prices may have altered the rates of default that are undetectable with the statistical model. Assuming this is true then there is the possibility that forfeiture rates will be higher if and when prices collapse or are reduced in real terms by inflation over several years. The important point is that there appears to be other events in the coal industry that are the principal factors of the past decade's low forfeit record.

CBER explored several specifications including aggregate forecasting (e.g. linear models of the overall amount of permits or acreage forfeited as well as micro-based models. The final model selected is a multinomial logit model. The owner of a permit can make one of three choices each year: remain open (y=0), complete phase release (y=1), or the bond can be forfeited (y=2). These three choices were modeled as a function of their years in existence (very similar to a traditional hazard model), size (proxied by acreage under permit), and the prevailing price of coal in that year. The price models gave nonsensical and statistically insignificant values. Therefore, the final model chosen contained only acreage and age as covariates.

<u>Statistical Results</u>

The final specification of the MNLM was estimated with two explanatory variables:

1. Size (permitted acres)
2. Age (dummy variable equal to 1 if 'old', 3rd year of life & beyond, otherwise 0)

Note that was price was not included in the final model as it had indeterminate effects on long range forfeit rates. The cutoff of newer versus mature sites was determined by estimating the model with cutoffs ranging from one year to five years. The three year point was selected based on a statistical model fit criterion.

The data sets were divided into three groups – S mines, U mines, and non-mining sites (O), e.g. prep plants, haul roads, etc.. Independently estimating the models allowed for each type to have a unique probabilities as the size of the mine and its age varied with each site.

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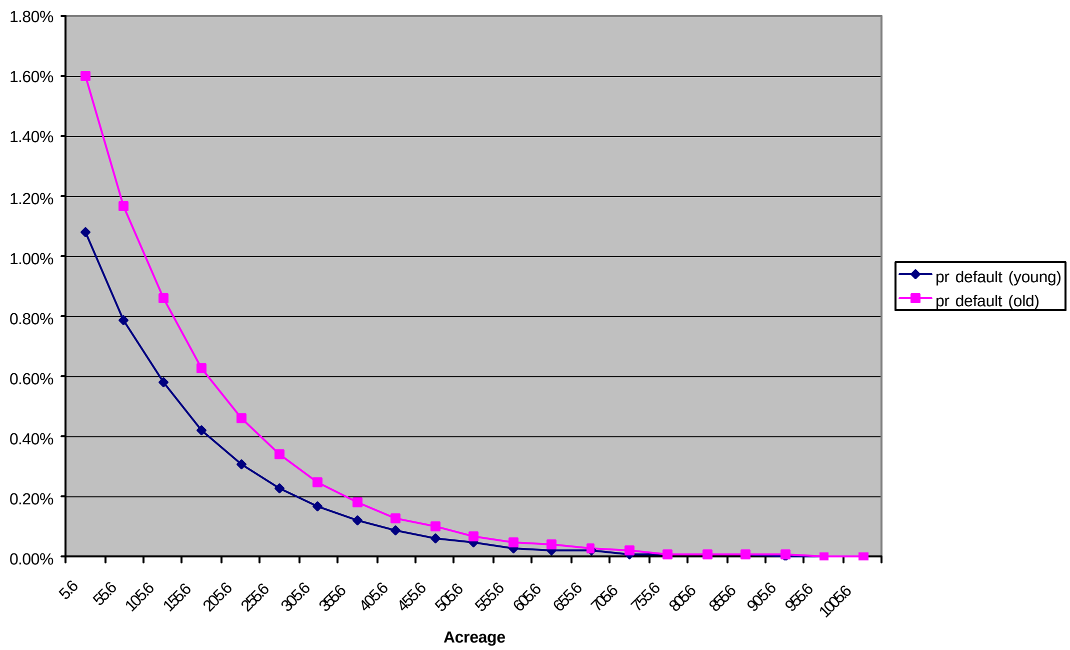
[19] The forfeitures that occurred in 2000 may have been influenced by utility stockpiling of coal that took place in 1999, in preparation for Y2K. That stockpiling caused a reduction in demand for spot market coal in 2000 and caused some mines that primarily sold into that market to exit the industry.

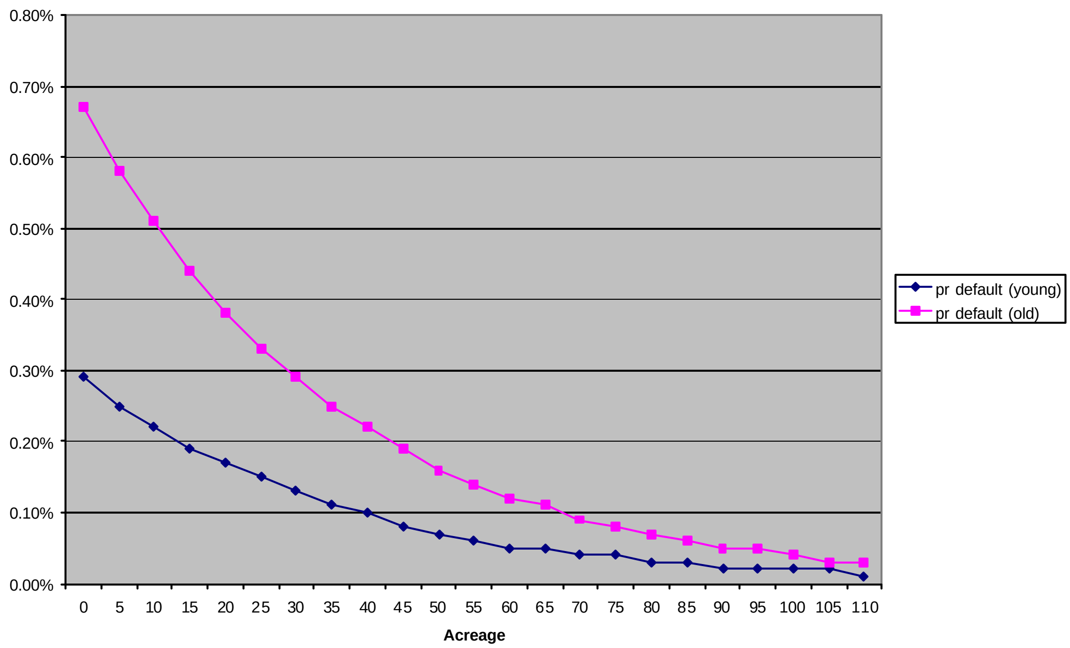
The results are best characterized in Figures A.3 for S mines and 19 for U mines. As shown in Figure 10, for very small surface mines the annual probability of default is above 1%. For a typical new issue S mine with 300 acres its likelihood of default in each of the first three years is only 0.20% and then about 0.30% in later years. For the largest sites (600+ acres) the probability of default in any year is negligible.

Figure A.3: Forfeiture Hazard Rates (S mines)



Similarly, the probability of default of underground mines is also strongly influenced by their permitted acreage. A thirty-acre site has about half (0.29% vs. 0.51%) the rate of default relative to a ten-acre site. Figure A.4 shows that an older underground mine has approximately twice the rate of default after three years of life, although in general the probabilities of default are quite low. Similar relationships were found in the other types of permits, e.g. prep plants, haul roads.

Figure A.4: Forfeiture Hazard Rates (U mines).



These rates of default and the rates of release are used to estimate how much acreage is forfeited and released each year for each specific site. The expected open acreage for that site is reduced by the forecasted default and released acreage (see footnote 2). This approach is much like the Hay Group's – it conditions the probabilities of default on age and size. The key differences in CBER's approach are to treat each type of site (S, U, O) independently and to include the site's size explicitly in the model rather than outside the statistical model.[20]

[20] The Hay Group bases their site size on bonds (rather than acreage). They weight the probabilities by 0.38 for larger sites (bonds < $100K) and smaller sites (bonds < $10K) by 2.5

Appendix B: Comparison of the CBER Methodology and Results with Actuarial Liability (Hay Group) Projections

<u>Aggregate Costs Analysis</u>

The Hay Group's liability projections are based on the history of reclamation expenditures made by the DEP for forfeited mining operations in each of the primary cost categories: land capital, water capital and water treatment. This method allocates all of the approximately 36,551 disturbed acres in the forfeitures database to total dollars expended on these three categories of reclamation. The trends on expenditures may be the best possible analysis completed showing a relationship between categories of expenditures and forfeited acreage under the SRF.

However, the method averages costs over the entire population of forfeited permit acreage including forfeits that occurred prior to 1977 and during the 1977 through 1981 time period, prior to SMCRA design and performance requirements and corresponding increased state standards, and when records are sparse regarding reclamation. While reclamation is complete on these sites and permitted and disturbed acreage is reported, cost data is generally not reported due to lost or incomplete records. Thus, the method of aggregating costs for the entire population of forfeitures tends to underestimate actual costs of reclamation. However, because this method is based on actual expenditures made and covers the experience of the SRF, this aggregate method incorporates the impact that extraordinarily large forfeits have had on the fund and, applied to the future, the risk associated with potential forfeits of the same magnitude.

This CBER analysis was applied to a smaller subset of forfeitures data that more accurately reflects actual aggregate costs. This method thus excludes acreage associated with older forfeits that occurred prior to 1982 when reclamation costs were often not reported, evaluates 29,437 acres of forfeited permits, and is a much closer estimate of actual aggregate reclamation costs for a population of permits for which complete data will be reported. These results produced costs that are approximately 11% higher than those calculated by the Hay Group. These aggregate results, however, were not applied to the final analysis. Instead, disaggregate costs based on evaluation of actual expenditures were applied.

Table B.1 details the assumptions used by the Hay Group in making their projects of the SRF liabilities while Table B.2 specifies where the CBER assumptions differ from those used by the Hay Group. As can be noted they differ significantly since the Hay group did not separate their projections by mine type as did CBER. The Hay analysis also did not consider forfeitures from permits issued after 2005 as the CBER analysis did.

Table B.1: Hay Group Model Assumptions

	Land Capital Expenditures	Water Capital Expenditures	On-going Water Treatment Expenditures
Pre-2005 Forfeitures	• Use DEP schedules	• Use DEP schedules	• Use DEP schedules
Post-2005 Forfeitures, Pre-2005 Issuance	• Cost = $5613/acre; grow at 3% • Alt. hazard rates. • Liability occurs 4 yrs. after forfeiture.	• Cost = $444/acre, grow at 3% • Alt. hazard rates. • Liability occurs 4 yrs. after forfeiture.	• 30% of Water Capital • Expenditures, not adjusted for inflation (implied experience gain)
Post-2005 Forfeitures, Post-2005 Issuance	N.A.	N.A.	N.A.

Table B.2: CBER Model Assumptions [only variances with Hay model shown]

	Land Capital Expenditures	Water Capital Expenditures	On-going Water Treatment Expenditures
Pre-2005 Forfeitures			• - $300K in 2012 for Royal Scot
Post-2005 Forfeitures, Pre-2005 Issuance	• S Mines = $3,239/acre • U Mines = $7,736/acre • O Permits = $7,646/acre • Applied to 72% of forfeited acreage • Alt. hazard rates.	• S Mines = $5,351/acre • U Mines = $10,997/acre • O Permits = $9,528/acre • Applied to 25% of forfeited acreage • Alt. hazard rates.	• 2% of Water Capital per year
Post-2005 Forfeitures, Post-2005 Issuance	• Forecast issued & forfeited acreage • Costs same as above	• Forecast issued & forfeited acreage • Costs same as above	• Same as above.

The Hay Group used smoothed estimates of the empirical hazard, and did not consider any covariates other than the age of the permit. Differences from the Hay Group calculations are shown below for land capital (Figure B.1), water capital (Figure B.2) and water treatment (Figure B.3) costs.

Figure B.1: Comparison of Land Capital Liabilities Projections

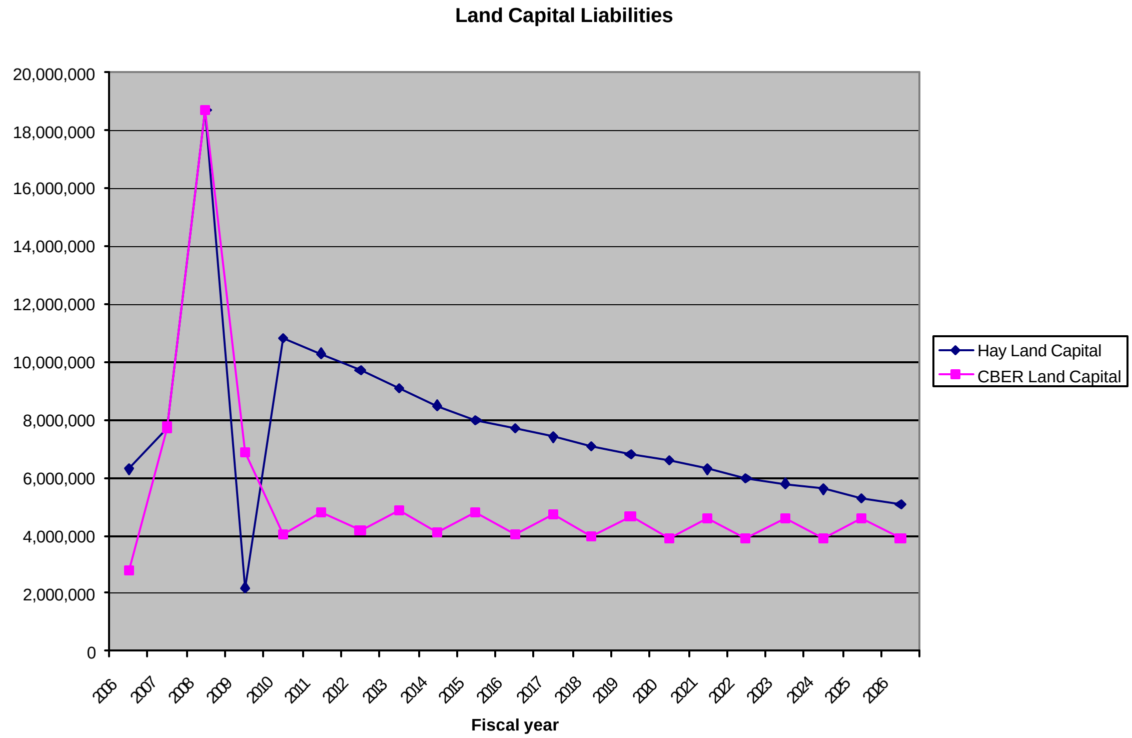


Figure B.2: Comparison of Water Capital Liabilities Projections

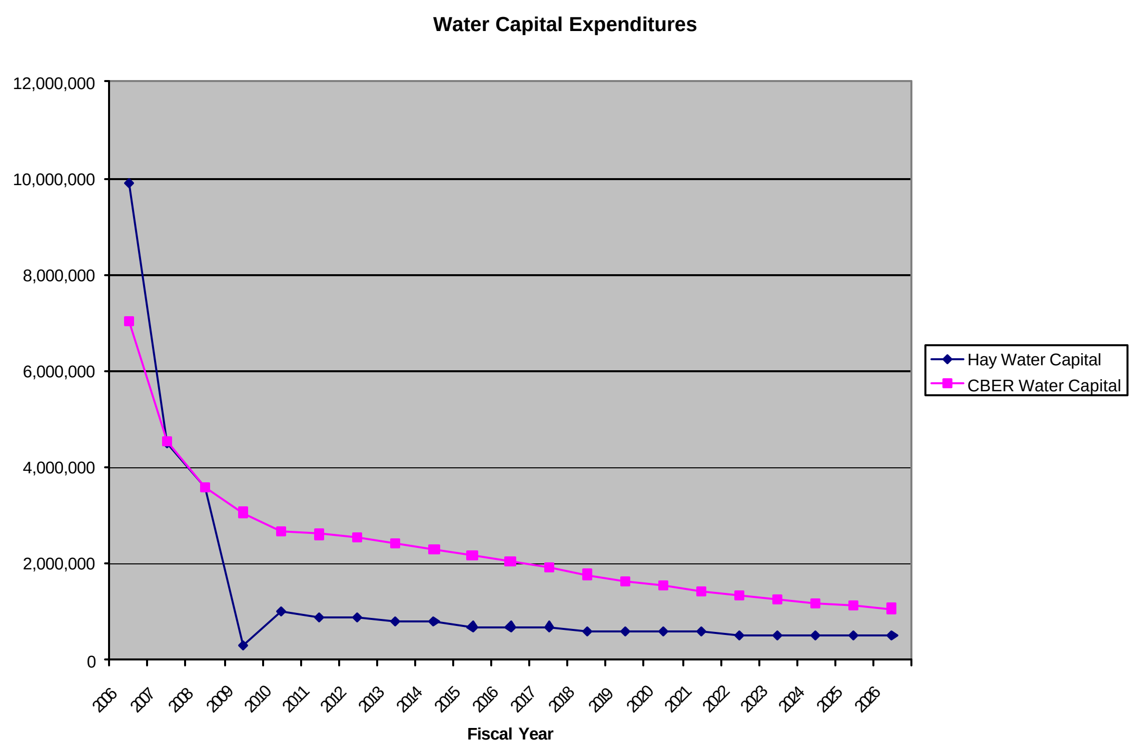
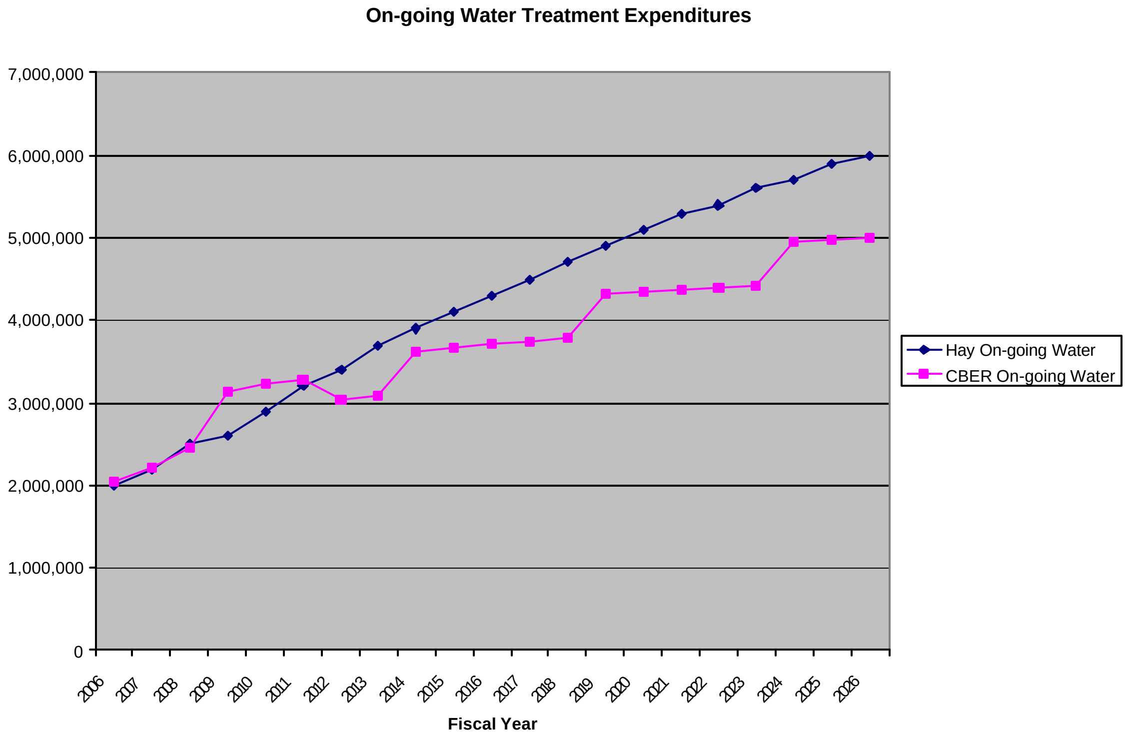


Figure B.3: Comparison of Water Treatment Liabilities Projections



Appendix C: Cash-flows for each Financial Structure

Partial-cost bond + Tax

Fiscal Year Ending	Land Capital Expenditures	Water Capital Expenditures	Ongoing Water Treatment Expenditures	Admin Costs and Other	Total Expenditures	Coal Tax Receipts	Civil Penalties & Court Settlements	Bond Forfeitures	Investment income	Total Income	Fund Balance
2005											29,600,000
2006	2,816,536	7,024,422	2,041,639	2,624,766	14,507,363	23,100,000	1,000,000	3,497,310	740,000	28,337,310	43,429,947
2007	7,739,493	4,538,283	2,216,155	2,703,508	17,197,439	13,879,977	1,030,000	3,684,561	1,085,749	19,680,287	45,912,795
2008	18,724,549	3,568,320	2,457,351	2,784,614	27,534,834	11,008,872	1,060,900	3,851,420	1,147,820	17,069,013	35,446,973
2009	6,151,596	3,061,857	3,143,441	2,868,152	15,925,046	11,032,650	1,092,727	4,002,631	886,174	17,014,182	36,536,109
2010	4,041,325	2,674,565	3,223,998	2,954,197	12,894,085	11,040,575	1,125,509	4,110,710	913,403	17,190,197	40,832,221
2011	4,116,981	2,611,429	3,276,227	3,042,823	13,747,460	10,771,100	1,159,274	4,171,420	1,020,806	17,122,599	44,207,361
2012	4,170,158	2,534,357	3,026,914	3,134,107	12,865,536	10,636,362	1,194,052	4,256,137	1,105,184	17,191,735	48,533,559
2013	4,174,477	2,428,829	3,075,491	3,228,130	13,606,927	10,533,327	1,229,874	4,311,702	1,213,339	17,288,242	52,214,875
2014	4,129,297	2,297,469	3,621,440	3,324,974	13,373,180	10,311,406	1,266,770	4,388,177	1,305,372	17,271,725	56,113,421
2015	4,107,184	2,182,842	3,665,097	3,424,724	14,079,847	10,469,921	1,304,773	4,441,811	1,402,836	17,619,341	59,652,914
2016	4,056,440	2,056,579	3,706,229	3,527,465	13,346,713	10,422,367	1,343,916	4,506,322	1,491,323	17,763,928	64,070,130
2017	4,024,903	1,918,797	3,744,604	3,633,289	14,021,594	10,271,777	1,384,234	4,574,011	1,601,753	17,831,775	67,880,311
2018	3,972,144	1,778,267	3,780,170	3,742,288	13,272,869	10,525,401	1,425,761	4,702,595	1,697,008	18,350,765	72,958,207
2019	3,929,143	1,650,299	4,313,176	3,854,557	14,447,175	10,699,768	1,468,534	4,811,031	1,823,955	18,803,288	77,314,319
2020	3,888,671	1,531,405	4,343,804	3,970,193	13,734,073	11,048,501	1,512,590	4,933,733	1,932,858	19,427,682	83,007,928
2021	3,898,432	1,440,562	4,372,615	4,089,299	14,500,908	11,325,903	1,557,967	5,063,137	2,075,198	20,022,205	88,529,225
2022	3,889,218	1,348,820	4,399,592	4,211,978	13,849,607	11,539,898	1,604,706	5,211,415	2,213,231	20,569,250	95,248,868
2023	3,889,425	1,267,523	4,424,942	4,338,337	14,620,228	11,658,784	1,652,848	5,357,535	2,381,222	21,050,388	101,679,028
2024	3,892,636	1,193,959	4,948,821	4,468,488	14,503,903	11,745,968	1,702,433	5,510,253	2,541,976	21,500,629	108,675,754
2025	3,907,637	1,130,843	4,971,438	4,602,542	15,312,460	11,785,596	1,753,506	5,663,404	2,716,894	21,919,400	115,282,695
2026	3,918,157	1,072,807	4,992,894	4,740,618	14,724,476	11,825,225	1,806,111	5,808,907	2,882,067	22,322,311	122,880,529

Full-cost Bonding

Fiscal Year Ending	Land Capital Expenditures	Water Capital Expenditures	Ongoing Water Treatment Expenditures	Admin Costs and Other	Total Expenditures	Coal Tax Receipts	Civil Penalties & Court Settlements	Bond Forfeitures	Investment income	Total Income	Fund Balance
2005											29,600,000
2006	2,816,536	7,024,422	2,041,639	2,624,766	14,507,363	23,100,000	1,000,000	3,497,310	740,000	28,337,310	43,429,947
2007	7,739,493	4,538,283	2,216,155	2,703,508	17,197,439	13,879,977	1,030,000	3,684,561	1,085,749	19,680,287	45,912,795
2008	18,724,549	3,568,320	2,457,351	2,784,614	27,534,834	8,807,098	1,060,900	5,609,393	1,147,820	16,625,211	35,003,171
2009	6,151,596	3,061,857	3,143,441	2,868,152	15,925,046	6,619,590	1,092,727	6,818,700	875,079	15,406,096	34,484,221
2010	4,041,325	2,674,565	3,223,998	2,954,197	12,894,085	4,416,230	1,125,509	8,108,383	862,106	14,512,228	36,102,364
2011	4,116,981	2,611,429	3,276,227	3,042,823	13,747,460	2,154,220	1,159,274	9,392,201	902,559	13,608,254	35,963,158
2012	4,170,158	2,534,357	3,026,914	3,134,107	12,865,536	0	1,194,052	10,591,044	899,079	12,684,176	35,781,798
2013	4,174,477	2,428,829	3,075,491	3,228,130	13,606,927	0	1,229,874	10,671,910	894,545	12,796,329	34,971,200
2014	4,129,297	2,297,469	3,621,440	3,324,974	13,373,180	0	1,266,770	10,674,966	874,280	12,816,016	34,414,036
2015	4,107,184	2,182,842	3,665,097	3,424,724	14,079,847	0	1,304,773	10,726,428	860,351	12,891,552	33,225,740
2016	4,056,440	2,056,579	3,706,229	3,527,465	13,346,713	0	1,343,916	10,717,580	830,643	12,892,140	32,771,167
2017	4,024,903	1,918,797	3,744,604	3,633,289	14,021,594	0	1,384,234	10,730,828	819,279	12,934,341	31,683,914
2018	3,972,144	1,778,267	3,780,170	3,742,288	13,272,869	0	1,425,761	10,747,046	792,098	12,964,904	31,375,949
2019	3,929,143	1,650,299	4,313,176	3,854,557	14,447,175	0	1,468,534	10,899,594	784,399	13,152,527	30,081,301
2020	3,888,671	1,531,405	4,343,804	3,970,193	13,734,073	0	1,512,590	10,997,555	752,033	13,262,177	29,609,405
2021	3,898,432	1,440,562	4,372,615	4,089,299	14,500,908	0	1,557,967	11,120,177	740,235	13,418,380	28,526,877
2022	3,889,218	1,348,820	4,399,592	4,211,978	13,849,607	0	1,604,706	11,249,500	713,172	13,567,379	28,244,648
2023	3,889,425	1,267,523	4,424,942	4,338,337	14,620,228	0	1,652,848	11,411,319	706,116	13,770,283	27,394,703
2024	3,892,636	1,193,959	4,948,821	4,468,488	14,503,903	0	1,702,433	11,558,522	684,868	13,945,822	26,836,622
2025	3,907,637	1,130,843	4,971,438	4,602,542	15,312,460	0	1,753,506	11,709,727	670,916	14,134,148	25,658,311
2026	3,918,157	1,072,807	4,992,894	4,740,618	14,724,476	0	1,806,111	11,851,571	641,458	14,299,140	25,232,974

Full-cost (U&O) and Partial-cost (S)

Fiscal Year Ending	Land Capital Expenditures	Water Capital Expenditures	Ongoing Water Treatment Expenditures	Admin Costs and Other	Total Expenditures	Coal Tax Receipts	Civil Penalties & Court Settlements	Bond Forfeitures	Investment income	Total Income	Fund Balance
2005											29,600,000
2006	2,816,536	7,024,422	2,041,639	2,624,766	14,507,363	23,100,000	1,000,000	3,497,310	740,000	28,337,310	43,429,947
2007	7,739,493	4,538,283	2,216,155	2,703,508	17,197,439	13,879,977	1,030,000	3,684,561	1,085,749	19,680,287	45,912,795
2008	18,724,549	3,568,320	2,457,351	2,784,614	27,534,834	9,467,630	1,060,900	4,550,260	1,147,820	16,226,610	34,604,571
2009	6,151,596	3,061,857	3,143,441	2,868,152	15,925,046	7,943,508	1,092,727	4,638,098	865,114	14,539,447	33,218,972
2010	4,041,325	2,674,565	3,223,998	2,954,197	12,894,085	6,403,534	1,125,509	4,744,255	830,474	13,103,772	33,428,659
2011	4,116,981	2,611,429	3,276,227	3,042,823	13,747,460	4,739,284	1,159,274	4,834,335	835,716	11,568,610	31,249,809
2012	4,170,158	2,534,357	3,026,914	3,134,107	12,865,536	3,190,909	1,194,052	4,958,375	781,245	10,124,581	28,508,854
2013	4,174,477	2,428,829	3,075,491	3,228,130	13,606,927	3,159,998	1,229,874	5,013,609	712,721	10,116,202	25,018,129
2014	4,129,297	2,297,469	3,621,440	3,324,974	13,373,180	3,093,422	1,266,770	5,090,450	625,453	10,076,095	21,721,044
2015	4,107,184	2,182,842	3,665,097	3,424,724	14,079,847	3,140,976	1,304,773	5,140,437	543,026	10,129,213	17,770,410
2016	4,056,440	2,056,579	3,706,229	3,527,465	13,346,713	3,126,710	1,343,916	5,202,698	444,260	10,117,585	14,541,281
2017	4,024,903	1,918,797	3,744,604	3,633,289	14,021,594	3,081,533	1,384,234	5,268,289	363,532	10,097,588	10,617,276
2018	3,972,144	1,778,267	3,780,170	3,742,288	13,272,869	3,157,620	1,425,761	5,403,691	265,432	10,252,504	7,596,911
2019	3,929,143	1,650,299	4,313,176	3,854,557	14,447,175	3,209,930	1,468,534	5,515,404	189,923	10,383,790	3,533,526
2020	3,888,671	1,531,405	4,343,804	3,970,193	13,734,073	3,314,550	1,512,590	5,642,907	88,338	10,558,386	357,838
2021	3,898,432	1,440,562	4,372,615	4,089,299	14,500,908	3,397,771	1,557,967	5,777,618	8,946	10,742,303	-3,400,767
2022	3,889,218	1,348,820	4,399,592	4,211,978	13,849,607	3,461,969	1,604,706	5,933,286	-85,019	10,914,943	-6,335,431
2023	3,889,425	1,267,523	4,424,942	4,338,337	14,620,228	3,497,635	1,652,848	6,085,858	-158,386	11,077,955	-9,877,704
2024	3,892,636	1,193,959	4,948,821	4,468,488	14,503,903	3,523,790	1,702,433	6,246,077	-246,943	11,225,358	-13,156,249
2025	3,907,637	1,130,843	4,971,438	4,602,542	15,312,460	3,535,679	1,753,506	6,406,574	-328,906	11,366,853	-17,101,856
2026	3,918,157	1,072,807	4,992,894	4,740,618	14,724,476	3,547,568	1,806,111	6,557,735	-427,546	11,483,868	-20,342,465

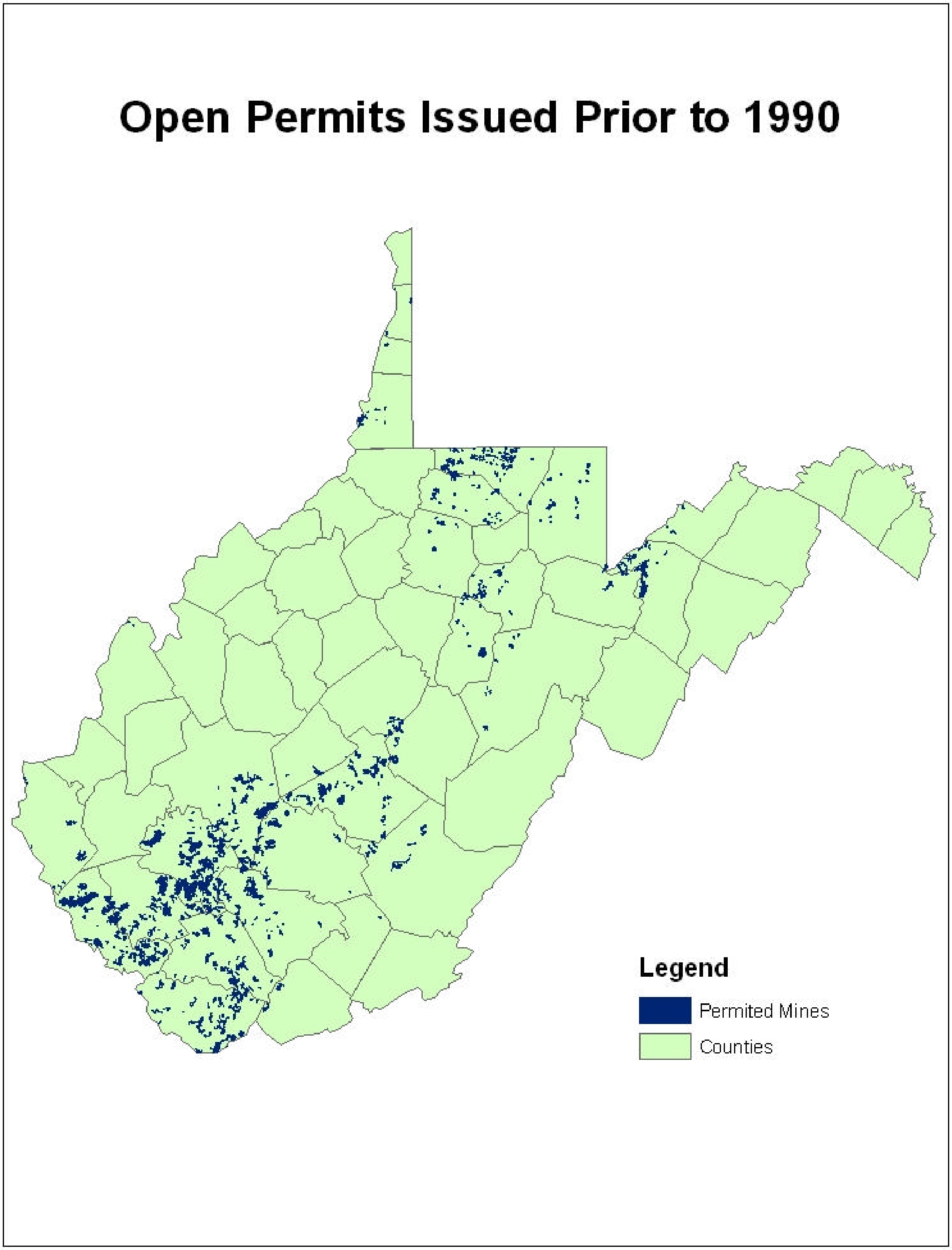
Water Trust Fund & Full-Cost Land Bonds

Fiscal Year Ending	Land Capital Expenditures	Water Capital Expenditures	Ongoing Water Treatment Expenditures	Admin Costs and Other	Total Expenditures	Coal Tax Receipts	Civil Penalties & Court Settlements	Bond Forfeitures	Investment income	Total Income	Fund Balance
2005											29,600,000
2006	2,816,536	7,024,422	2,041,639	2,624,766	14,507,363	23,100,000	1,000,000	3,497,310	740,000	28,337,310	43,429,947
2007	7,739,493	4,538,283	2,216,155	2,703,508	17,197,439	13,879,977	1,030,000	3,684,561	1,085,749	19,680,287	45,912,795
2008	18,724,549	2,854,656	2,457,351	2,784,614	26,821,170	8,807,098	1,060,900	5,026,795	1,147,820	16,042,612	35,134,237
2009	6,151,596	1,837,114	2,582,204	2,868,152	14,139,066	6,619,590	1,092,727	5,650,922	878,356	14,241,595	35,236,765
2010	4,041,325	1,069,826	2,609,270	2,954,197	10,674,618	4,416,230	1,125,509	6,366,282	880,919	12,788,940	37,351,088
2011	4,116,981	522,286	2,609,270	3,042,823	10,991,359	2,154,220	1,159,274	7,114,087	933,777	11,361,358	37,721,086
2012	4,170,158	0	2,309,270	3,134,107	9,613,535	0	1,194,052	7,837,747	943,027	9,974,827	38,082,378
2013	4,174,477	0	2,309,270	3,228,130	10,411,877	0	1,229,874	8,002,030	952,059	10,183,963	37,854,464
2014	4,129,297	0	2,309,270	3,324,974	9,763,541	0	1,266,770	8,111,531	946,362	10,324,663	38,415,586
2015	4,107,184	0	2,309,270	3,424,724	10,541,178	0	1,304,773	8,261,248	960,390	10,526,410	38,400,818
2016	4,056,440	0	2,309,270	3,527,465	9,893,175	0	1,343,916	8,367,929	960,020	10,671,865	39,179,508
2017	4,024,903	0	2,309,270	3,633,289	10,667,462	0	1,384,234	8,495,008	979,488	10,858,730	39,370,776
2018	3,972,144	0	2,309,270	3,742,288	10,023,702	0	1,425,761	8,627,999	984,269	11,038,029	40,385,103
2019	3,929,143	0	2,309,270	3,854,557	10,792,970	0	1,468,534	8,875,751	1,009,628	11,353,912	40,946,044
2020	3,888,671	0	2,309,270	3,970,193	10,168,134	0	1,512,590	9,085,545	1,023,651	11,621,786	42,399,696
2021	3,898,432	0	2,309,270	4,089,299	10,997,001	0	1,557,967	9,322,128	1,059,992	11,940,088	43,342,783
2022	3,889,218	0	2,309,270	4,211,978	10,410,466	0	1,604,706	9,571,433	1,083,570	12,259,709	45,192,026
2023	3,889,425	0	2,309,270	4,338,337	11,237,032	0	1,652,848	9,856,309	1,129,801	12,638,957	46,593,951
2024	3,892,636	0	2,309,270	4,468,488	10,670,394	0	1,702,433	10,137,085	1,164,849	13,004,366	48,927,924
2025	3,907,637	0	2,309,270	4,602,542	11,519,449	0	1,753,506	10,430,156	1,223,198	13,406,860	50,815,335
2026	3,918,157	0	2,309,270	4,740,618	10,968,045	0	1,806,111	10,724,018	1,270,383	13,800,513	53,647,802

Operator Choice of Full-Cost Bond or Partial-Cost Bond + Tax

Fiscal Year Ending	Land Capital Expenditures	Water Capital Expenditures	Ongoing Water Treatment Expenditures	Admin Costs and Other	Total Expenditures	Coal Tax Receipts	Civil Penalties & Court Settlements	Bond Forfeitures	Investment income	Total Income	Fund Balance
2005											29,600,000
2006	2,816,536	7,024,422	2,041,639	2,624,766	14,507,363	23,100,000	1,000,000	3,497,310	740,000	28,337,310	43,429,947
2007	7,739,493	4,538,283	2,216,155	2,703,508	17,197,439	13,879,977	1,030,000	3,684,561	1,085,749	19,680,287	45,912,795
2008	18,724,549	3,568,320	2,457,351	2,784,614	27,534,834	9,145,621	1,060,900	4,832,143	1,147,820	16,186,484	34,564,445
2009	6,151,596	3,061,857	3,143,441	2,868,152	15,925,046	7,298,098	1,092,727	5,232,396	864,111	14,487,332	33,126,730
2010	4,041,325	2,674,565	3,223,998	2,954,197	12,894,085	5,434,723	1,125,509	5,672,589	828,168	13,060,989	33,293,634
2011	4,116,981	2,611,429	3,276,227	3,042,823	13,747,460	3,479,065	1,159,274	6,107,613	832,341	11,578,293	31,124,468
2012	4,170,158	2,534,357	3,026,914	3,134,107	12,865,536	1,635,341	1,194,052	6,604,090	778,112	10,211,594	28,470,526
2013	4,174,477	2,428,829	3,075,491	3,228,130	13,606,927	1,619,499	1,229,874	6,702,755	711,763	10,263,891	25,127,491
2014	4,129,297	2,297,469	3,621,440	3,324,974	13,373,180	1,585,379	1,266,770	6,834,005	628,187	10,314,341	22,068,652
2015	4,107,184	2,182,842	3,665,097	3,424,724	14,079,847	1,609,750	1,304,773	6,929,914	551,716	10,396,154	18,384,959
2016	4,056,440	2,056,579	3,706,229	3,527,465	13,346,713	1,602,439	1,343,916	7,042,963	459,624	10,448,942	15,487,188
2017	4,024,903	1,918,797	3,744,604	3,633,289	14,021,594	1,579,286	1,384,234	7,161,193	387,180	10,511,893	11,977,487
2018	3,972,144	1,778,267	3,780,170	3,742,288	13,272,869	1,618,280	1,425,761	7,375,134	299,437	10,718,613	9,423,231
2019	3,929,143	1,650,299	4,313,176	3,854,557	14,447,175	1,645,089	1,468,534	7,558,037	235,581	10,907,241	5,883,297
2020	3,888,671	1,531,405	4,343,804	3,970,193	13,734,073	1,698,707	1,512,590	7,763,701	147,082	11,122,081	3,271,304
2021	3,898,432	1,440,562	4,372,615	4,089,299	14,500,908	1,741,358	1,557,967	7,980,537	81,783	11,361,645	132,041
2022	3,889,218	1,348,820	4,399,592	4,211,978	13,849,607	1,774,259	1,604,706	8,227,635	3,301	11,609,902	-2,107,665
2023	3,889,425	1,267,523	4,424,942	4,338,337	14,620,228	1,792,538	1,652,848	8,471,945	-52,692	11,864,639	-4,863,254
2024	3,892,636	1,193,959	4,948,821	4,468,488	14,503,903	1,805,943	1,702,433	8,727,409	-121,581	12,114,204	-7,252,953
2025	3,907,637	1,130,843	4,971,438	4,602,542	15,312,460	1,812,035	1,753,506	8,984,313	-181,324	12,368,530	-10,196,883
2026	3,918,157	1,072,807	4,992,894	4,740,618	14,724,476	1,818,128	1,806,111	9,229,646	-254,922	12,598,964	-12,322,396

Appendix D: Open Coal Mining Permits Issued Prior to 1990



Appendix E: Open Permits with Water Treatment (as of 2000)