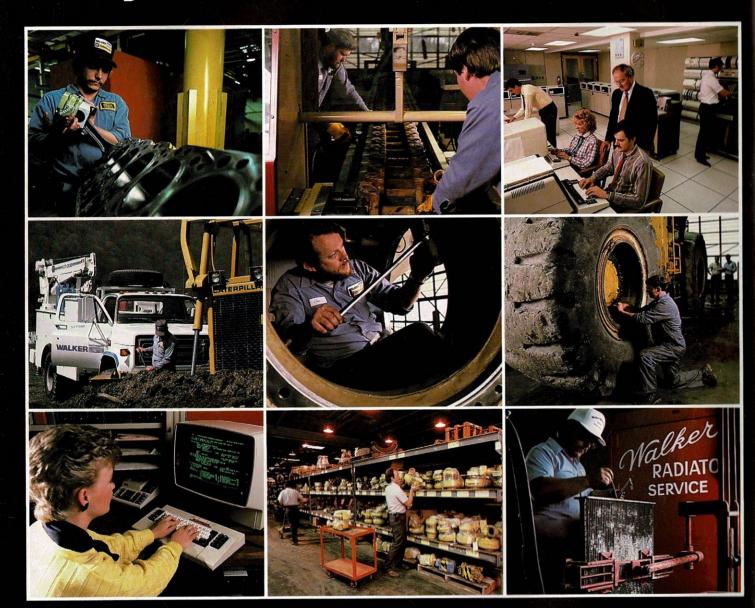
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Green Lands is a quarterly publication of the West Virginia Mining & Reclamation Association, with offices at 1624 Kanawha Boulevard, E. Charleston, West Virginia 25311 (304) 346-5318

The road to a permit has been long and hard for Black Gold of West Virginia, Inc. But the company has secured permission to mine, and now we will see if its long-term reclamation can match the quality of its reclaimed prospecting sites, shown on our Summer cover.

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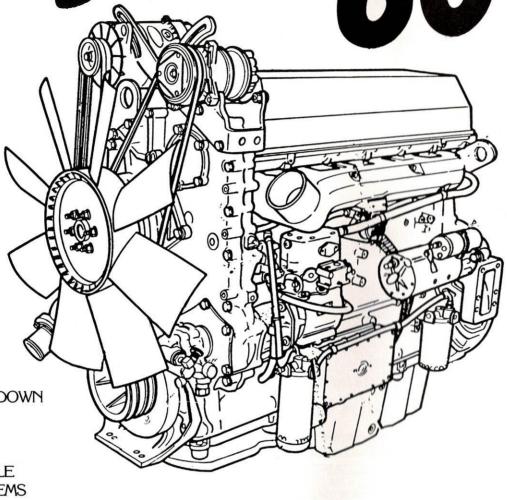
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Will your legislators let you vote on Right-To-Work?

Back in January, and again in March, the West Virginia Alliance for Jobs put a very simple question to West Virginia State legislators:

WOULD YOU BE WILLING TO PUT THE ISSUE OF COMPULSORY UNION MEMBERSHIP ON THE BALLOT?

The West Virginia Alliance for Jobs has now reported the results of that survey. Those senators and delegates who twice declined to answer the question have rightly been placed in the "will not say" column. Unfortunately, this accounts for nearly 75% of the Legislature. It is left to their constituents to decide what to make of that non-response. Of 34 state senators, 25 "would not say." Eight favor the proposal and one is opposed. Of 100 delegates, 75 "would not say." Seventeen stand in favor, and eight are opposed.

Here's how those who voted feel about the issue.

In	Favo	r

Opposed

iii i avoi		Opposed	
Senator Donna Boley C.N. "Bud" Harman Tracy W. Hylton John M. Karras Joe Manchin, III William R. Sharpe George Warner M. Jay Wolfe	Party-County R-Pleasants R-Taylor R-Raleigh R-Ohio D-Marion D-Lewis R-Monongalia R-Harrison	Senator Robert K. Holliday	Party-County D-Fayette
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Editorial

Uneven Application of Law

The concept of citizen participation in the mine permitting process, greatly expanded by the Surface Mining Control and Reclamation Act of 1977, has had a detrimental side effect.

Mine regulatory programs, at both the state and federal levels, set down very specific standards for permitting, mining, and reclamation. One strong argument for a national program was the attractiveness of uniform regulation.

When citizen participation comes into play, however, uniformity goes out the window. The idea of ordinary citizens participating in the decision making process during the permit application phase is very fair minded and reasonable, in theory.

In practice, however, the "ordinary citizen" becomes the "organized citizen," complete with lawyers, catchy titles, and a sympathetic press. And that's where inequities enter the picture.

Citizen input is supposed to be based on an imminent threat to the environment, to private property, to public health, or at least to the local heritage, which might be caused by mining activity.

Too often, however, these concerns are raised by "citizens" who virtually make a living from opposing industrial development. Then too, geographic boundries have a lot to do with whether opposition to a proposed mining operation will arise.

For example, anyone planning to develop a surface mine in Lincoln County is almost sure to run into problems. Lincoln was part of the old 22 county "moratorium," a relic from the days when the surface mining abolition movement was flourishing. In those counties, no permits could be issued for a period of six years (1971-1977).

A decade later, it is still an extremely time consuming and costly process to obtain a permit to surface mine in Lincoln County. This, despite the fact that Lincoln lies at the edge of the state's major southern coalfield, with no unique environmental sensitivity compared to the neighboring major coal counties of Kanawha, Boone, Logan, and Mingo.

Black Gold of West Virginia, Inc. is the latest coal company to go through the Lincoln County ringer. As company president Sandra Perry put it, "If we were applying in Boone County, we'd be mining coal by now."

An early sticking point in the Black Gold permit process was the prospective participation by an alleged permit violator from Kentucky. When that issue was resolved, litigants and officeholders began questioning the expertise of the company's principals.

Now, how many citizens in West Virginia can hold forth on the qualifications of their local mine operator? This "objection" has become just another hearing room weapon in the fight to keep surface mining out of Lincoln County.

The citizen participation concept remains an important part of the permitting process. It should and will be retained. It would be a vast improvement, however, if the procedure were tempered so as to confine it to relevant issues, and to citizens with legitimate concerns.

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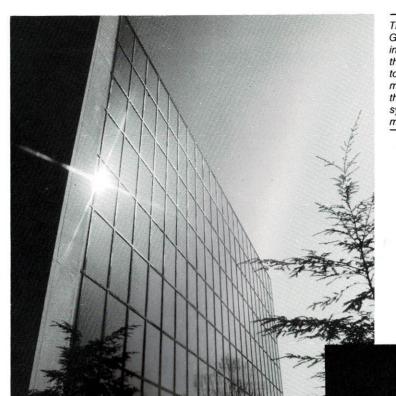
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Apparently, Black Gold of West Virginia, Inc. will mine coal in Lincoln County, after all. For those concerned with the eventual reclamation of the mine site, Green Lands will monitor its progress, to see if it matches the quality achieved in the reclamation of its prospecting sites.

Black Gold Gets its Permit

After months of applications, accusations, revisions, revelations, editorials, hearings, and general controversy, Black Gold of West Virginia, Inc. has been issued a permit to mine coal in Lincoln County, West Virginia.

The Department of Energy, insistent on exercising the authority granted it by the Legislature in 1985, issued the permit July 27, despite the fact that there was less than unanimous agreement from environmentalists, their lawyers, the press, and the State's congressional delegation.

The permit covers 125 acres, near Branchland in Lincoln County. Earlier, Black Gold officals indicated that the actual mining may be contracted to another company. Before mining can begin, Black Gold must post a reclamation bond of \$125,000, and identify the actual operator, who must be approved by DoE.

It is reported that local landowners, aided by anti-industry lawyers, will file suit to block the permit. Such an action could delay the start of mining for several more months.

In addition to several heated hearings in Lincoln County, Black Gold's permit application was the primary topic of a congressional subcommittee hearing in Logan last April.

The enactment of national surface mining legislation in 1977 greatly increased the role of "citizens" in the permitting process (see related editorial - page 7).

Since that time, environmental groups and their lawyers have sought, and sometimes successfully, to block mining operations.

The integrity of DoE officials is invariably brought under attack in these efforts.

Once mining has begun, the trend has been that these operations drop out of the headlines.

In this case, **Green Lands** will follow the progress of Black Gold's mining and reclamation, and report to its readers the outcome, following which someone will owe someone else an editorial apology.



The expertise of Black Gold operators Sandra Perry and Michael Letson, shown above on one of the company's reclaimed prospecting sites, was called into question during permit hearings. Black Gold's ability to reclaim mined land is evident from the photographs on these pages.





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Green Lands 13

Acid Rain ———

The Imminent Danger of Acting Rashly

Editor's Note: Information for this report on the current status of the "acid rain" controversy was compiled from several sources, primarily from "Acid Rain -- The Whole Story to Date," by Dr. John J. McKetta of the National Council for Environmetna Balance, headquartered in Louisville, KY.

There is an ominous concensus forming in Washington D.C., even among congressional coal industry supporters, that now is the time for "compromise" acid rain legislation.

This feeling stems from several sources. The outcry from the environmental lobby is that the problem has been studied enough; now is the time for action.

Then too, the process of repetition has eroded much of the support from "neutral state" congressmen and senators. That is, lobbying from Canada and northeastern states, as well as anti-coal environmental groups, has been so long and loud and persistent, that many lawmakers are ready to act, just to get the controversy overwith.

With the Reagan era coming to a close, and the major presidential candidates making facile promises to campaign audiences, many coal state congressmen feel that "acid rain" legislation is inevitable, and that the coal industry's best bet is to get on the bandwagon, in order to try and get the best deal possible.

This kind of thinking can put the U.S. coal industry, the U.S. utility industry, and the U.S. consumer in serious difficulty. To say that the issue has been studied enough is to ignore the results of that study. As with any controversial issue based on inexact science, each side of the issue has piled up a lot of paperwork supporting its position. But the fact remains, the

preponderance of available scientific evidence points to these conclusions:

- There is no clear trend toward increased scientific evidence that acidification of Canadian and Northeast U.S. lakes and rivers is increasing;
- 2) While sulfur is certainly an agent in the acidification process, industrial states in the U.S. are worlds ahead of their counterparts in Canada and the Northeast U.S. in reducing sulfur emissions.
- Local sources, prominently auto emissions and oil burners, are a major factor in sulfur emissions.
- 4) Legislation enacted in past years is working, and its effects are now making an impact on sulfur emissions.
- The U.S. is not standing pat in making further reductions in sulfur emissions.

What is acid rain?

The term "acid rain" itself is misleading. The air contains 0.03% carbon dioxide (which forms carbonic acid). Over 99% of the carbon dioxide come from nature. Therefore, natural acidity is present in all kinds of precipitation.

Acid rain is a relative phrase. Nearly all rainfall is acidic to some extent. The term acid relates to the pH scale, which measures the acidity or alkalinity of a given substance. The scale ranges from 0-14, 7 being neu-

tral, neither acid or alkaline.

Sea water, with its high salt concentration is about 8 on the pH scale. Blood is between 7 and 8. Drinking water is between 5 and 6. Apples rate a 3. Soft drinks are between 2 and 3. Battery acid is slightly over 1. It is incorrect to assume that the higher the pH the better. Lye soap, not exactly a life sustaining substance, is a 13.

A great concern was raised in the late 1960's when Swedish scientists claimed that the cause of the acid lakes and acid rain was the sulfur dioxide emissions from industrial sources in Great Britain.

In the U.S., the controversy arose back in 1974 when a Cornell University researcher released reports (using data collected in the 60's and before for other purposes) concluding that rain acidity was increasing in the northeast and spreading in all directions. Since then, others have speculated that acid rain is a post-World War II phenomenon caused by the increased use of fossil fuels for generating electricity, as well as the increased use of automobiles.

Where does acid rain fall?

Acid rain falls everywhere. Natural rainfall is acidic. Natural rainfall has a pH averaging about 5. In the Northeast, readings in the 4.0 to 4.5 range are not uncommon. Rainfall over most of the western states is closer to 5. But in some areas, such as San

Francisco, Seattle, Denver, and Los Angeles, the rainfall has been measured at 4 pH. Acid rain pH of 4 has been measured at such remote spots as Samoa in the South Pacific, the tropical jungles of South America, the arctic coast of Alaska, as well as Hawaii and the islands in the mid Indian Ocean.

The three areas of the world where acid rain appears to be of the greatest concern are: Southeast Canada, the Northeast United States, and Scandinavia.

What is the effect of 'acid rain' on lakes and fish?

For some lakes in sensitive regions, evidence indicates the lakes have been highly acidified and will not propagate fish life. The rate, character, and the full extent of these changes are scientific unknowns. These studies have not been made in sufficient detail to document the actual changes.

Many people in the Northeast claim that acid rain is the cause of the acidity of the lakes. In fact, many newspapers and magazines displayed maps showing the acid lakes. The lakes shown were the volcanic origin lakes which have been acid for thousands and millions of years. These lakes have never propagated fish. Within a relatively few miles of these lakes are non-volcanic based lakes containing fish of standard size.

The acidity of most of the waters involved are actually the greatest in the spring. The fish kills occur almost yearly in the Midwest United States lakes such as in Wisconsin because of the interception of the light by ice and snow on the lakes so that green aquatic plants are not able to produce adequate oxygen. Then the fish simply suffocate.

Regardless of the scare stories of the media, there are larger amounts, and record sizes, of fish caught in the New England lakes each year. In fact, just as an example, on January 1, 1984, the New York State Department of Environmental Conservation released the size and quantity records for freshwater fish, listing 34 species. A review of this release reveals that, in the period 1979-83, 25 of the 34 records have been broken, 13 in 1983 alone.

Except for four of these records from Lake Ontario, all others were from separate lakes or rivers. Of the 25 broken for the five year period, these occurred on 16 different lakes and rivers.

It is true that in the 1920's and 1930's, many people did catch fish in some lakes where fish are not available today. The fact is that during those years, many of the Adirondack lakes were stocked annually by the Fish and Game Commission. Many of these lakes would not propagate fish. The people who did catch fish in these lakes were catching the fingerlings put there by the stocking group. The stocking of fish was discontinued about 1940.

In the U.S., 219 lakes have been identified as acidic, and 206 of these lakes are in the Adirondacks. However, these 206 lakes account for only 4% of the total lake surface in New York State. This is far from being a widespread problem affecting all of the USA. This is a highly localized problem. The same applies in Southeast Canada which contains the highest percentage of the acid lakes.

Is "acid rain" increasing?

So far, the evidence indicates that acid rain is not increasing in severity. The acidity of rain must be measured for a long time, years in fact, at the same location before reporting some meteorological average. That's because the average acidity of the rain during one single rainfall measured at the same time, at points only several

hundred feet apart, may vary, plus or minus 200 to 400 percent. Therefore, to establish an accurate trend, one must collect data over a 5-10 year period. When this has been done, there has been no evidence that the rain is becoming more acid.

The United States Geological Survey collected rainfall samples in various locations in and near New York State during the period March 1965 to September, 1979. These data indicated that the long-term level of the acidity was essentially constant.

The existing data and studies show that there has been no significant changes in acidity in Northeast U.S. precipitations since 1960. In fact, the new data show that the sulfate concentrations have decreased and the nitrate concentrations have increased. The U.S.G.S. has concluded that acidification of surface waters in the Northeast has "probably occured long before the 1960's." They have also stated that the acidity of precipitation has been stable since the mid-fifties.

What about local sources?

We're always going to have acid rain, because 70 percent of the acid rain comes from nature. But the big problem is mostly local. The Northeast United States uses over 40 percent of the high sulfur fuel oil that is used in the United States and still the Northeast occupies only 4.5 percent of the land area. For example, there are over 35,000 apartment houses in New York City alone burning high sulfur oil.

Manmade sulphur dioxide has been decreased about 40 percent since 1970, even though the use of coal has increased about 85 percent during that time. The highest percentage of acidified Canadian lakes is located near Sudbury, Ontario, which also happens to be the home of several high emitting smelters.

The best available estimates of current interregional sulfate deposition are from the Advance Statistical Trajectory Air Pollution (ASTRAP) model. This model shows that each region is its own largest source of deposited sulfate.

the rain collected in the Northeast.

Who is decreasing sulfur emissions?

From 1980 to 1986, U.S. coal consumption by electric utilities rose by 21.6 %. At the same time So2 emissions from coal-fired power paints showed a 5.4% decline. Going back to 1973, the direction is even more dramatic. Utility coal use has increased by 78%, and emissions have declined by 28%.

Emission rates for sulfur are higher in Canada than in the U.S. Also, in this decade, the U.S. has achieved a greater sulfur reduction than has Canada.

The U.S. has 146 sulfur scubbers in operation and another 44 in the planning or construction stages, at a cost of \$5.5 billion, plus an annual operating cost of \$2.1 billion. Canada has none in operation.

The huge INCO Smelter at Sudbury, Ontario, alone emits 1,950 tons of sulfur dioxide each day. Many of the Canadian so-called dead lakes (lakes which no longer support fish stocks and other wildlife or vegetation) are located near these INCO smelters, which annually send nearly 1 million tons of sulfur dioxide into the atmosphere.

Canada has spent \$12 billion on

clean air compliance programs in the past ten years. The U.S. spent \$225 billion from 1970-1984. This amounts to \$470 per capita in Canada and (940 per capita in the U.S.

It's interesting to note that Canadians keep pointing out our lack of pollution control when they do not require pollution control devices, even on their motor vehicles. There is no requirement for catalytic converters on cars in Canada. The total Canadian emissions of sulfur are twice those of the United States, on a per capita basis. The decline in the sulfur emissions in Canada is mostly due to declining production by the copper smelting industry, and to increasing use of nuclear and hydrogeneration of electricity. The decline is not due to governmental policies, nor laws intended to improve the environment.

What is the U.S. doing now?

The United States, has probably done more than any country to reduce sulfur emissions. Yet, the U.S. is not standing pat.

In 1984, Congress created the \$750 million Federal Clean Coal Technology Reserve. From this, in 1986, nearly \$400 million was appropriated for the federal share of a joint government/industry clean coal demonstration program. More than 50 proposals were submitted to the Department of Energy, and nine were selected for negotiations, representing nearly \$1 billion in total value. Negotiations have been successfully concluded on seven projects.

In the past fiscal year, an additional \$575 million was appropriated for the second round of solicitations.

Conclusion

Some of the suggestions made by Washington politicians include placing scrubbers on all coal burning equip-

ment in a 31 state area. The cost is estimated as high as \$30 billion. The politicians say that this should be paid by the electric utilities.

An SO2 stack gas scrubber for a coal burning power plant has an initial cost of \$100 to \$300 million for the equipment alone. In addition, the scrubbers require energy to operate. Consequently, 4 to 6 percent of a plant's power has to be put back directly into operation of the equipment. Other costs, including the purchase of chemicals and the disposal of sludge collected from the scrubbing, add further to the plant's operating cost. Disposing of that sludge actually imposes another problem for those concerned with the clean environment. These are all part of the \$30 billion cost mentioned above.

Proposals contained in Senate Bill 1894, The Clean Air Standards Attainment Act of 1987, would add at least \$32 billion per year in pollution control expenditures and would, at a minimum, jeopardize 300,000 to 600,000 jobs. This would make it the most expensive environmental legislation ever adopted.

The joint recommendation issued by Governor Mario Cuomo of New York and Governor Richard Celeste of Ohio is little more palatable than past proposals.

The U.S. coal and utility industries, and thier remaining congressional supporters must not allow inappropriate legislation to be stampeded through Congress, simply because its proponents has been verbose and tenacious.

Any further legislation concerning sulfur emissions must take into account the exact nature and extent of the problem, its proportional sources, past and present corrective measures, and, most importantly, ratio of costs and benefits to the millions of Americans who will certainly be affected.

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Annual Meeting Program

West Virginia Mining & Reclamation Association
The Greenbrier Hotel, White Sulphur Springs, West Virginia
August 11-14, 1988

Thursday, August 1	1th		
11:00 a.m 5:00 p.m.	Registration	Registration Lobby	
12:30 - 2:00 p.m.	Committee MeetingsCo	ntact Chairman for time and place	
2:00 - 4:30 p.m.	Board of Directors' Meeting	McKinley Room	
6:00 - 7:00 p.m.	Associate Members' Welcoming ReceptionColonial Terrace Everyone on their own for dinner - Reservations required for hotel dining		
10:00 p.m 12:00 Midnight	Monte Carlo Party	Chesapeake Hall	
Friday, August 12th	ĺ		
7:00 a.m.	Fun Run	Greenbrier Jogging Trail	
8:00 a.m 1:00 p.m.	Registration	Registration Lobby	
8:00 - 10:30 a.m.	Annual Membership Meeting	Eisenhower Parlor A	
	Continental Breakfast - Election of new Board		
	Associate Division MeetingGeneral Division Meeting	Eisenhower Parlor C	
10:00 a.m.	Ladies' Golf Tournament	Lakeside Course	
	Betty Rader, Chairperson		
9:30 - 11:00 a.m.	Ladies Program - "Image Impact for the '80's		
9:30 a.m 4:00 p.m.	Children's Program	To be announced	
10.15			
10:45 a.m 12:00 Noon	Board of Directors' Meeting	Fisenhower Parlor C	
12.00 140011	Election of new officers		
11:30 a.m.	Men's Annual Golf Tournament	Old White Course	
	John Rader, Chairman		
1:00 - 5:00 p.m.	Tennis Tournament (Women's & Men's Doubles) Larry Roberts, Chairman	Hilltop Courts	
1:30 - 4:30 p.m.	Committee MeetingsCo	ontact Chairman for time and place	
· ·	Bowling Tournament Cleo Foster - Chairperson	Individual convenience	

Friday, August 12th (continued)			
	Fishing TournamentIndividual convenience Charlie Miller - Chairman		
6:45 p.m.	RegistrationKate's Mountain		
7:00 p.m.	"Company Pride Coal Miner's Party"Kate's Mountain "Company Pride Awards" will be given to the group with the most prolific		
	expression of company pride through hats, tee shirts, belt buckles, etc. Everyone is encouraged to dress in typical coal mining attire. Entertainment: The Production Company		
Saturday, August	13th		
7:30 a.m.	"Meet The New Chairman Breakfast"Eisenhower Parlors A & B (Families are urged to attend) Presiding: James W. Anderson - WVMRA Chairman of the Board		
8:30 a.m 12:00 Noon	RegistrationRegistration Lobby		
9:00 a.m 12:00 Noon	Technical Sessions		
10:00 - 11:00 a.m.	Ladles' Program - Greenbrier Spa PresentationMcKinley Room Monica Brown - The Greenbrier Spa Director		
12:30 - 3:00 p.m.	Trap TournamentGreenbrier Gun Club Joe Ison - Chairman (Note: Greenbrier guns only)		
1:00 - 5:00 p.m.	Mixed Doubles Tennis TournamentHilltop Courts Larry Roberts - Chairman		
1:30 - 4:30 p.m.	Committee MeetingsContact Chairman for time and place		
6:30 - 7:30 p.m.	Chairman's ReceptionColonial Hall		
7:30 - 9:30 p.m.	Banquet (Black tie optional)Colonial Hall Master of Ceremonies: New WVMRA Chairman of the Board Entertainment: Dennis Reaser Orchestra		

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WVMRA staff and Board members gather for a picture in the LBJ Room of the U.S. Capitol Building. The office of former President and Senate Majority Leader Lyndon B. Johnson was made available for the meeting through the courtesy of the current Majority Leader, West Virginia's own Senator Robert C. Byrd.



Senate Majority Leader Robert C. Byrd of West Virginia addressed the group at length on current congressional issues, including implications of the forthcoming presidential campaign on proposed "acid rain" legislation.

Board Convenes in the LBJ Room

Breakfast in the LBJ Room of the Capitol and a first ever visit to the Coal Building highlighted the Board of Directors Spring Board Meeting in Washington D.C.

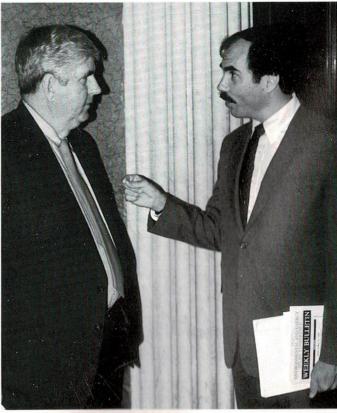
The National Coal Association kindly made its conference room available in the "Coal Building" for an afternoon briefing from congressional staff on current legislative issues.

WVMRA, in turn, hosted senate and congressional staff at an evening reception at the Capitol. The next morning, breakfast was served in the LBJ Room, which was once the office of former President and Senate Majority Leader Lyndon Baines Johnson. This room was provided through the courtesy of the current Majority Leader, West Virginia Senator Robert C. Bryd.

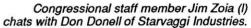
Board members were joined for breakfast by Senator Byrd, and West Virginia Congressmen Bob Wise, Nick Rahall, and Harley Staggers, Jr.

Following breakfast, the Board convened, welcoming new member Gerald Ramsburg of C & W Coal Co., Clarksburg, and approving the membership applications of 34 companies.

Following extensive discussion on congressional proposals to make mining without a permit a felony, the Board voted to oppose the bill in its present form, on the ground s that it makes no distinction between outright illegal mining, and minor infractions, such as inadvertent mining beyond the permit boundaries.



Tracy Hylton (I) of Perry & Hylton, Inc., who also happens to be a West Virginia state senator, confers with 3rd District Congressman Bob Wise.







Congressman Harley Staffers, Jr., of West Virginia's 2nd District



John Bryan (r) of Pittston Coal Group, with 4th District Congressman Nick Rahall.

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The Latest Word On Wetlands

by Jeff Skousen and John Sencindiver Division of Plant and Soil Sciences West Virginia University

A reclamation conference sponsored by the American Society for Surface Mining and Reclamation (ASSMR) and the U.S. Department of the Interior (Bureau of Mines and Office of Surface Mining Reclamation and Enforcement) was held in Pittsburgh during April 1988. The West Virginia Surface Mine Drainage Task Force was also a co-sponsor of this meeting. Several sessions of the Conference were devoted to presentations on the use of wetlands to treat acid mine drainage (AMD). This article is written to provide a general overview of the latest information of wetland research reported at this meeting.

In an earlier Green Lands article, Dr. Robert Kleinmann of the Bureau of Mines, introduced the subject of wetland treatment of AMD with some general diagrams and an explanation of construction criteria and possible mechanisms for metal removal. For background information, please refer to Dr. Kleinmann's article, entitled "A Biological Alternative to Conventional AMD Treatment," in the Spring 1987 issue.

Metal Removal

A quick survey of the 26 wetland papers and posters presented at the Pittsburgh meeting showed that iron removal by both natural and constructed wetlands ranged from 28 to 99%. During initial stages after construction, while vegetation was becoming established, iron removal was generally low (around 30-50%). After

vegetation development, iron removal increased to 50-90%. Several researchers in the eastern U.S. reported a consistent iron reduction of 85% by constructed wetlands. Manganese removal by wetlands was erratic and reported to range from 8 to 98%. Many of the researchers stated that manganese removal was generally less than 30%. Evidence still suggests a sequential removal of metals: iron concentrations must be lowered first, then manganese may be decreased. Water pH remained approximately the same after flowing through most wetlands unless limestone was placed as a foundation to the organic matter/soil substrate. As long as the limestone was not coated with iron, it continued to raise pH of the water. In wetlands where the water pH was increased, the system was better at decreasing manganese and aluminum concentrations in the water.

Mechanisms for Metal Re-

Possible mechanisms of metal removal in the wetland are: 1) direct uptake by plants, 2) adsorption and ion exchange with living or dead organic matter, 3) adsorption and ion exchange with inorganic substrates, and 4) microbial and/or chemical transformations (assimilation, reduction, or oxidation). Several reports documented substantial concentrations of metals in wetland plant tissues. But even with elevated concentrations in plant parts, plant uptake is

not a major mechanism for metal removal. Cattail and Sphagnum plants collected from wetlands which treated AMD were analyzed and, based on mass balance calculations, accounted for less than 1% of the total amount of metal removed by the wetland system. Several studies reported that greater vegetation density in a wetland improved metal removal. Therefore, vegetation probably improves conditions in the wetland for removing metals by providing a substrate for microorganisms, by lowering the redox potential (enhancing the reducing environment), and by adding organic matter for metal adsorp-

A survey of natural wetland sites in West Virginia revealed that cattails have a broader environmental tolerance than Sphagnum, and are found in water with pH from 2.0 to 8.5, iron concentrations up to 150 mg/L, and manganese concentrations up to 50 mg/L. Another study in Pennsylvania reported cattails growing in a manmade wetland with water pH as low as 2.5, iron up to 400 mg/L, manganese up as high as 550 mg/L, aluminum at 200 mg/L, and sulfate up to 12,000 mg/L. The wetland on this site was reducing iron by 75%.

Sphagnum species appear to have a greater potential for filtering metals from the water than cattails, due to their large below water biomass. These species also provide microcosms where oxidized products could be deposited, then subsequently reduced by microorganisms.



Figure 1. A good, thick stand of cattails that were planted approximately one year ago. The organic matter used in this wetland substrate was composted for several years and provided a good material for cattail planting.

Algae are also receiving some attention, and attempts to determine the effects of algae on water treatment are being initiated.

Two papers explained that organic materials by themselves (such as peat and sawdust) were responsible for removing 50 to 80% of the metals in AMD. Researchers in Alabama reported that five different substrates (clay, topsoil, mine spoil, acid wetland soil, and non-acid wetland soil) with associated vegetation were no different in iron removal after one growing season. This finding suggests that a particular substrate material may not be as important as the conditions created by wetland plants and the presence of an anaerobic, reducing zone.

Microbial transformations received attention in several papers, but

all of the research concerning measurement of microbial activity in wetlands was in its initial phases. Iron and manganese oxidizing bacteria were isolated from aerobic zones in wetlands, and probably helped in precipitating iron and manganese oxyhydroxides. Sulfate-reducing bacteria were found in greater numbers as water/sediment samples were taken deeper into the substrate. Hydrogen sulfide, a malodorous gas, was often detected as the wetland substrate was disturbed by researchers. Other sulfur compounds (such as elemental sulfur, metal monosulfides, and pyrite) were also found in the anaerobic zone. Sulfate concentrations in water passing through wetlands were reduced from 10 to 50%, and this reduction is probably a result of sulfatereducing bacteria. There was evidence from studying the anaerobic zone in the wetland that ferric was reduced to ferrous iron and that it reacted with reduced sulfur forms to produce pyrite.

Most of the reports did not distinquish the metal removal by each separate component of the wetland system; that is by living plants, organic matter, inorganic material, or microbial or chemical reactions. It is much easier to simply report the metal concentrations in the water at the inflow versus the outflow and calculate a percent reduction. The amount of metal removal is the most important factor in terms of wetland treatment because of the potential for reducing chemical treatment costs. However, understanding the mechanisms and the contribution of each mechanism in wetland treatment of AMD will help

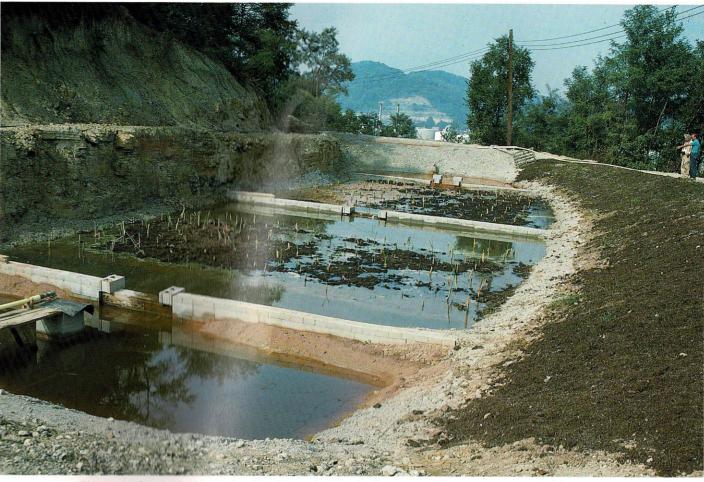


Figure 2. Some constructed wetlands require "staging" or cells. Evidence suggests that iron concentrations in AMD must be decreased before manganese can be removed. Different cells provide for different plants and microorganisms, and even allow for different depths of water to meet specific conditions for metal removal.

wetland builders to construct more efficient systems and to tailor the system to specific water conditions.

Tips on Wetland Construction

Cattails were the predominant vegetation planted in most constructed wetlands. They have demonstrated a wider tolerance of water conditions and quicker response after planting than Sphagnum. Most wetland builders also understand the advantage of planting clumps of cattails rather than single rhizomes. And, as already mentioned, density of the vegetation was found to be an important factor in improving the efficiency of metal removal. Different stages or cells may also be helpful in sequentially decreasing certain metals. The specific type of material in the substrate placed in the wetland may not

be as essential to the function of the wetland as was initially thought, but it still must provide an environment for plants to grow and for microorganisms to reside. The anaerobic zones in the substrate where reducing microorganisms reside may be a critical component in the wetland system, and more research is needed to isolate the species which are present and the conditions needed to improve their efficiency.

IMPPS

Though not reported at the Pittsburgh meeting, another water treatment system, called IMPPS, was recently developed. The acronym IMPPS stands for "Immobilized Microbial Pollution Purification System." This system is reported to contain a series of microorganisms isolated

from AMD on a site to be treated and hybridized with proprietary microbial strains, and placed in a nutrient matrix. The matrix plus IMPPS are then pumped into the ponds on the site. The microbial process appears to oxidize, chelate, and assimilate the metals and sulfate because very small amounts of sludge (yellow boy or typical chemical sludge) were observed in ponds treated with IMPPS. Water analysis showed substantial reductions in iron, manganese, and sulfate at the outflow. It has been hypothesized that the metals, after oxidation and deposition, may be reduced along with sulfate, to form metal sulfides in the anaerobic zone. The system does show promise for treating AMD. For more information concerning IMPPS, please contact us at West Virginia University.

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WVMRANew Member Profiles

Following are capsule introductions to the latest new members of the West Virginia Mining & Reclamation Association. The company name is followed by the location, the company representative, and a brief description of what products or services the company offers, and the general area of operation.

Akers Supply, Inc. - North Matewan - David Akers - Manufacture & sale of magnetite in West Virginia, Kentucky, Virginia, and Ohio.

Bridgeport Mining Co. - Bridgeport - James Atkinson - Surface mining in Barbour County.

Brake Supply Co., Inc. - Evansville, IN - Tom Ashby - Parts, repair, & service for off-highway equipment in 14 state area, including West Virginia, Ohio, Kentucky, and Pennsylvania.

Christian Colliery Co. - Wayne, PA - Walter Barrows - Holding & investment company in eastern Pennsylvania.

Daniels Branch Coal Co. - Gilbert - Bruce Burgess - Underground mining in Mingo County.

Drive Line Service, Inc. - Charleston - Labe McKinney - Manufacture, sales, and service of clutches, pumps, bearings, power takeoffs, drive lines, etc. in West Virginia and eastern Kentucky.

E-Town Supply Co./Dock's Creek River Terminal -Kenova - Dale Anderson - Loading facilities for Ohio River coal traffic.

High Voltage Construction Co., Inc. - Sissonville - Jerry Wilkinson - Design, engineering, and construction of power lines, substations, and electrical contracting for prep plants, coal conveyor systems, etc. in southern West Virginia, eastern Kentucky, southeast Ohio, and southwest Virginia.

J-H Service Co., Inc. - Evansville, IN - Robert Keller - Sales, repair, and supply for electric mine cable, installation of bore hole cable, eastern and midwest U.S.

J & L Equipment Co. - Huntington - Marv Jones - Distributor for Gardner-Denver Co., general blasting machinery in West Virginia, Virginia, eastern Kentucky, and southern Ohio.

Johnson Railway Service, Inc. - Cornelia, GA - Hugh Johnson - Diesel locomotive field repair, service, & shop rebuild throughout the eastern U. S.

Justice Supply Co. - Huntington - Carroll Justice - Sales, service, and parts for Kaiser and Sigma air conditioning units for automobiles and off highway equipment, southern West Virginia, southern Ohio, eastern Kentucky and southwest Virginia.

K.K. Mills and Sons, Inc. - Roanoke, VA - Keith Mills
 Site clearing for mines, highways, etc. in West Virginia,
 Virginia, North Carolina, Tennessee and Kentucky.

Keen Transport, Inc./Hubert Jones, Inc. - Dunbar - Mack Lilly - Rigging setup, crane leasing and operation, heavy hauling, nationwide.

Kelso Coal Co., Inc. - Seth - Joe Gaither - Surface mining in Boone County.

Logan Auto Parts, Inc. - Logan - Jim Rupe - Parts and service for underground and surface mining equipment in southern West Virginia, branches in Pineville, Gilbert, Matewan, Williamson, Kermit, Man and Madison.

Lo-Ming Coal Corp. - Gilbert - Carey Cline - Underground mining in Logan County.

MEPCO, Inc. - Morgantown - James Laurita, Jr. - Surface mining in Monongalia County.

Mid-Valley Supply Co. - Ironton, OH - Clarence Maynard - Sales of pipe valves and fittings, nationwide.

Mingo Logan Coal Co. - Wharncliffe - Markus Ladd - Surface mining in Mingo County.

92 Coal Corp. - Grafton - Larry Reed - Surface mining in Barbour County.

Payhauler Corp. - Glen Allen, VA - Wayne Lowery - Sales, service, and parts for off road hauling equipment, nationwide.

Pyramid Parts/Division of American Alloy Corp. -Cleveland, OH - Robert J. Cicek - Manufacture of replacement parts for electric mining shovels and rotary blast hole drills, internationally Safety Caution Equipment Co. - Charleston - Paul Anderson, Jr. - Manufacture, sales/rentals of all types of safety equipment, including barricades, flasher lights, signs, etc., central and southern West Virginia.

Transervice Industrial Supply, Inc. - Nitro - Lionel Kozee - Distribution and sales of all types of tools, wire rope, and hoist in West Virginia, eastern Kentucky, and southeast Ohio.

Uphold Trucking - Morgantown - Johnny Owens - Surface mining in Preston County.

Varel Manufacturing Co. - Dallas, TX - Daniel Varel - Manufacture and sale of drill bits, nationwide.

Wesco Fuels, Inc. - Clarksburg - Walter Swiger - Distributor for motor oils, lubricants, and other industrial petroleum products in north central West Virginia.

White Flame Energy, Inc. - Clintwood, VA - Don Nicewonder - Surface mining in Mingo County.

WVMRA Schedule of Upcoming Events

Annual Meeting
August 11-14, 1988
The Greenbrier
White Sulphur Springs

Fall Board of Directors' Meeting October 28-29, 1988 (WVU-Penn State Football) Lakeview Conference Center Morgantown

Semi-Annual Meeting January 17-24, 1989 Westin Hotel Maui, Hawaii

16th WV Mining Symposium February 16-17, 1989 Holiday Inn Charleston House Charleston

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Association Notebook

Great Coal Leaders

November 1 is the target publishing date for a new book that should be of great interest to West Virginia coal people.

Great Coal Leaders of West Virginia, by Fred R. Toothman, features concise biographies of "58 of the most prominent coal men in the state."

Toothman's historical perspective begins around 1850, which is when railroads penetrated the coal fields, and which he calls "the beginning of the modern industry."

According to the author, 43 of his biographical subjects have "passed into history," and 15 are still living. The names of these 15 were not listed, but good authority has it that several Association members are among the honorees.

The book is 220 pages long, with 75 illustrations. It will be available in bothe soft and hard bound copies. The author is a native of Clarksburg, and a retired executive from the Chessie System. His first book, an autobiography entitled, Coal in My Blood, was published in 1986.

For more information contact Fred R. Toothman, 44 Fairfax Dr., Huntington 25705, (304) 523-4410.

West Virginia Gazetteer

Another publication of interest to the industry, or anyone else who wants to know "where it's at" would be the West Virginia Gazetteer of Physical and Cultural Place Names, an 840 page hardbound book listing 30,806 place names throughout the Mountain State, including streams, communities, schools, cemetaries, hollows, parks, country clubs, caverns, waterfalls, trails, and 28 other categories.

The book is now available from the West Virginia Geological Survey.

All entries are stored on an on-line computer disk drive, which allows for

customized listings, such as "streams in Wayne County," or towns below 1,000 ft. in Wyoming County," or towers within specified map coordinates.

To order the Gazetteer and its accompanying maps, send \$35 post-paid, plus State sales tax of 6%, to West Virginia Geological Survey, P.O. Box 879, Morgantown 26507.

WVU Emeritus Club

The University Alumni Association Emeritus Club inducted 56 graduates of West Virginia University into its membership at its annual reception and dinner on May 13.

Among them were our own F.F. "Fil" Frasher of St. Albans, who retired from a long career at Risy Equipment, and now does consulting work for Western Branch Diesel.

Fil qualified for the Emeritus Club by virtue of his standing in WVU's class of '38, and he has been a loyal and staunch supporter of the University through all the intervening years. Congratulations. Fil!

NRA Public Service Award

Another pair of Association members were honored this spring at the 1988 Annual Awards Luncheon of the National Rifle Association.

Ed and Delores Williams of Willco Reclamation, Summersville, earned the NRA Public Srvice Award, recognizing "a lifetime of supporting and promoting the shooting sports and objectives of NRA." This marks the first time that the award has been presented jointly to two individuals.

This is especially appropriate in the case of Ed and Delores, who work as a team in all of their many successful endeavors. Both are past officers in the West Virginia NRA chapter and former state shooting champions. Ed has also won national competitions.

Hillbilly Heaven

This year's edition of the Cherry River Festival (Richwood, WV's annual week-long party) has a definite Hillbilly flavor to it. Hillbilly, as in **West Virginia Hillbilly**, that is.

Festival planners made Hillbilly Editor and Richwood native Jim Comstock the feature attraction. Jim's name is prominent throughout the program. Part of the "mini-writers seminar" focused on "The Comstock Style of Journalism." Jim was honored at the "Past 80 Party (a Comstock original)" and at the "Flowers for the Living" luncheon.

Jim and his family were also featured in the Festival Grand Parade, which was followed by a "celebrity auction," the proceeds of which will fund a scholarship in his name.

For decades now, the name of Jim Comstock has been almost synonomous with West Virginia history, culture, heritage, and pride. No one is more deserving of recognition and no forum could be more appropriate than Jim Comstock's hometown festival.

IMCC Director

Gregory E. Conrad is the new Executive Director of the Interstate Mining Compact Commision, a multistate industry organization. Conrad replaces founding director Kenes C. Bowling, who retired this year after 16 years with IMCC.

Conrad, 36, is a former senior counsel for the American Mining Congress, having served in that position since 1979. Prior to that, he was an attorney advisor for the U.S. Department of Labor. Clark is graduate of tge University of Michigan and the University of Detroit Law School.

IMCC recently moved its headquarters from Lexington, Ky. to Herndon, Virginia.









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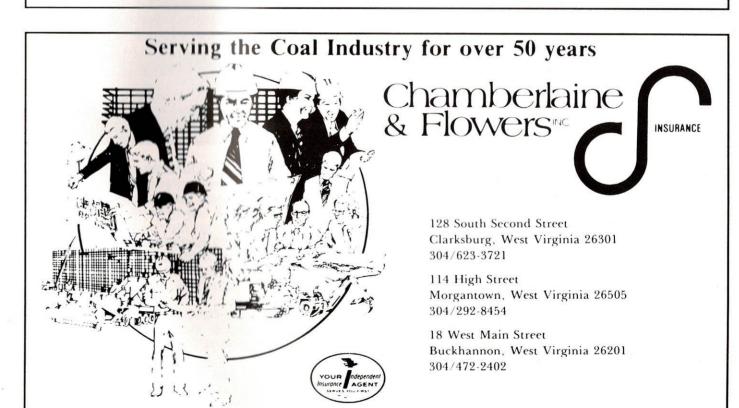
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Coal Calendar

August

- 11-14 Annual Meeting, West Virginia Mining & Reclamation Association, The Greenbrier, White Sulphur Springs, contact Patty Bruce, WVMRA, 1624 Kanawha Blvd. East, Charleston 25311, (304) 346-5318.
- 23-26 VIIth International Conference on the Pneumoconiosis, Vista International Hotel, Pittsburgh, PA, contact Professional Management Associates, Inc., P.O. Box 7069, Gaithersburg, MD 20898.

September

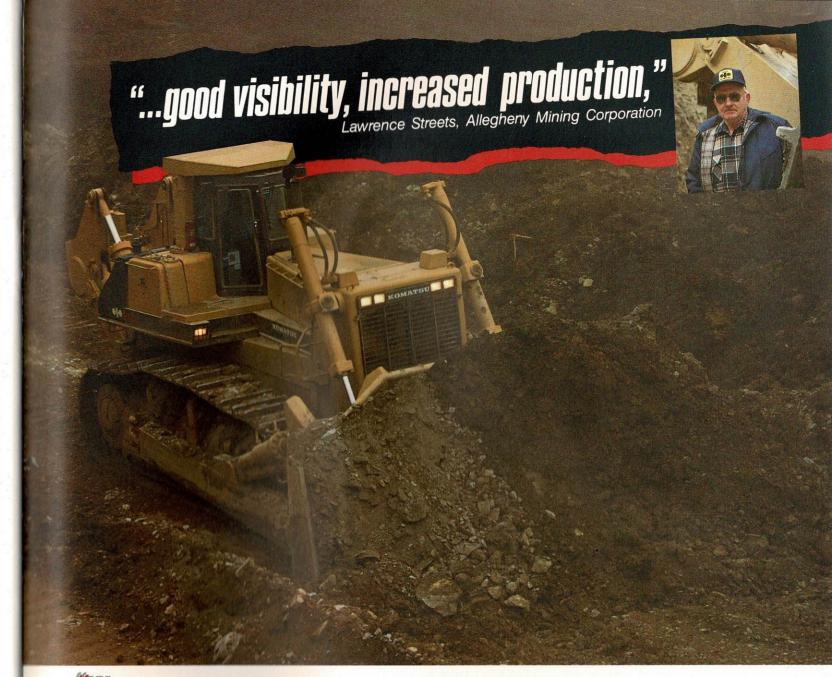
- 7-9 Short Course, "Mine Management Information Systems, University Park, PA, contact R.L. Frantz, Penn State University, University Park, PA 16802, (814) 865-7472.
- 13-15 Bluefield Coal Show, Brushfork Armory-Civic Center, Bluefield, contact Greater Bluefield Chamber of Commerce, P. O. Box 4098, Bluefield 24701, (304) 327-7184.
- 12-16 Fifth Annual Pittsburgh Coal Conference, Pittsburgh Hilton Hotel, Pittsburgh, PA, contact Pittsburgh Coal Conference, One Northgate Square, P. O. Box 270, Greensburg, PA 15601, (412) 836-6813.
- 19-20 Eleventh Annual "Coal Marketing Days," Hyatt Hotel Chatham Center, Pittsburgh, PA, contact Pasha Publications, 1401 Wilson Blvd., Suite 900, Arlington, VA 22209, (703) 528-1244.
- 19-21 Short Course, "Technical Elements of Surface Coal Mining and Land Reclamation,"
 University Park, PA, contact R.L. Frantz, Penn State University, University Park, PA 16802, (814) 865-7472.
- 19-23 Short Course, "Review Course for the Professional Engineering Examination of Mining/ Mineral Engineers," University Park, PA, contact R.L. Frantz, Penn State University, University Park, PA 16802, (814) 865-7472.

September

- 25-28 Mining Convention '88 American Mining Congress, Marriott City Center Hotel/ Hyatt Regency Hotel, Denver, CO., contact AMC, 1920 N St. NW, Washington, D.C. 20036, (202) 861-2800.
- 26-30 Professional Engineer Exam Review in Mining/Mineral Engineering, Mountainlair Student Union, Morgantown, contact Department of Mining Engineering, WVU, P.O. Box 6070, Morgantown 26506, (304) 293-5695.
- 29-2 1988 Coal Lawyers Conference, The Westin-St. Francis, San Francisco, CA, contact National Coal Association, 1130 17th St. NW, Washington, D.C. 20036, (202) 463-2625.

October

- 3-6 1988 Annual Meeting, Interstate Compact Commission, Gulf Shores Park Resort, Gulf Shores, AL, contact IMCC, 1364 Devonport Dr., Lexington, KY 40504, (606) 253-1576.
- 5-7 Short Course, "Fundamentals of Water Pollution," University Park, PA, contact R.L. Frantz, Penn State University, University Park, PA 16802, (814) 865-7472.
- 10-12 Short Course, "Elements of Underground Mining," University Park, PA, contact R.L. Frantz, Penn State University, University Park, PA 16802, (814) 865-7472.
- 20-22 Annual Meeting, Kentucky Coal Association, Marriott Griffin Gate Resort, Lexington, KY, contact KCA, 340 South Broadway, Lexington, KY 40508, (606) 233-4743.
- 28-29 Fall Board of Directors' Meeting, West Virginia Mining & Reclamation Association, Lakeview Resort & Conference Center, Morgantown, contact Patty Bruce, WVMRA, 1624 Kanawha Blvd. East, Charleston 25311, (304) 346-5318



with Rish standing behind it," said Lawrence Streets, President, Allegheny Mining Co., Mt. Storm, West Virginia. Allegheny Mining operates a surface mining project which provides coal for VEPO's Mt. Storm Power Plant.

A Komatsu D475A-1 Crawler Dozer is used on the project for both the mining and reclamation, according to Streets. "Visibility from the cab is excellent which allows us to see both corners of the blade when pushing a load... and to the rear when ripping. Good visibility means increased production," Streets added.

Availability on the dozer has been over 95 percent since it was introduced to the surface mining project. "We have had above average availability on the D475A," Streets said. "We have purchased a lot of machines from

Rish and feel good about Komatsu with Rish having it. Rish is very attentive to their customers," Streets added. The D475A has a blade capacity of 42 cyd, 740 flywheel hp and weighs approximately

approximately 205,000 lbs.

Rish and Komatsu are the choice for a growing number of coal surface mining contractors throughout the area. Join the switch to Komatsu. Contact a Rish sales representative near you for more details.

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