KERR- McGEE CORP.

GALATIA MINE

Oct 1983 - June 1998

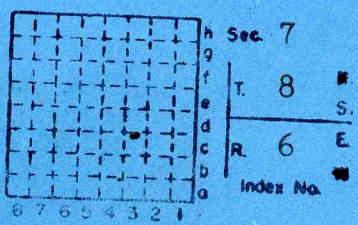
American Coal Co - Galatia Mine

June 1998 -

HERRIN

SPRINGFIELD

Mine Index No. 1001
Coal Report No. S-61



SALINE COUNTY

Mine Index 1001

MOORE'S MODERN METHODS

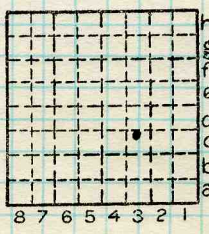
Kerr - McGee Corp. Galatia Mine

Production Figures	Year	Tonnage Total
First production October	1983	55,000 #
#6 production	1984	955,625 #
2281158	1985	1,215,813 #
7872280	1986	1,980,163
9532477	1987	2,216,402
9646625	1988	2471,963
11567732	1989	2843,124
14662433	1990	3021,851
15878033	1991	3525,200
14447744	1992	3,763,369
	1993	4,161,704
	1994	4,617,007
	1995	5,510,459

By_____ Date_____

Quad. Galatia 7.5 Part_____

County Saline



Sec. 7

T. 8 N. S.

R. 6 E. W.

Index No.

Saline County

Kerr-McGee Coal Corp.
Unnamed mine

Article from "Skilling's Mining Review",
July 25, 1981.

Contract 40 Million Tons Illinois Steam Coal

For Missouri generating plants

Kerr-McGee Coal Corp. and Union Electric Co. announced the signing of a sales agreement for 40 million tons of high-B.t.u. steam coal for two Union Electric generating facilities in Missouri. Development and construction of Kerr-McGee Coal's dual-seam underground mine near Galatia, Ill., for recovery of coal from the Harrisburg No. 5 seam and the Herrin No. 6 seam will begin in the near future. The company's Galatia mine reserve contains more than 140 million tons of recoverable coal.

The contract specifies deliveries over a 20-year period to Union Electric's Rush Island generating plant near Crystal City, Mo., and Portage Des Sioux generating facility near Machens, Mo. Initial shipments by unit trains are expected in 1984, building up to 2 million tons per year by 1987.

Kerr-McGee Coal, based in Oklahoma City, currently operates two surface coal mines in Wyoming and expects to ship more than 12 million tons of steam coal to utility customers this year. Union Electric, based in St. Louis, serves almost one million residential, commercial and industrial customers in Missouri, Illinois and Iowa.

New Illinois mine opens old wounds

By Mary Elson
Chicago Tribune Press Service

Tribune 8-23-81

GALATIA, Ill.—Joe Roberts lives a few miles outside town in a white clapboard house with a big porch and a driveway that dead-ends in a cornfield. The stillness, broken only by the crickets and the wind, is the sort that suggest cliches of life in rural America.

On most days, Roberts, a hefty, slow-moving man of 67 who drives a black pickup truck, seems as peaceful as his surroundings. He joshes that Galatia (population 800) normally "is so quiet you can sleep in the streets."

Beneath his peaceful exterior, though, a bitterness runs as deep as the coal he mined for 28 years. When the subject of unions and coal mining arises, Roberts' face hardens, and there are no more jokes.

"IT'S LIKE THIS," he says, baring a mouthful of gold-capped teeth. "If they come bringing in a bunch of people, setting up nonunion, they'll be setting up in ashes. Every one of their homes will get burned to the ground. You can count on it, as sure as I'm talking."

He adds, with a hint of mystery that has become common among tight-lipped union miners here, "I won't do it, and the people in Galatia won't do it, but it'll get done."

Roberts knows what angry miners can do. He lived through days of union violence that earned the bordering county the nickname "Bloody Williamson," and that once turned Galatia, in Saline County, into a scene of virtual civil war.

Brewing there now is a battle that Roberts and other miners say could bring back those days. If it takes violence, they say privately, they are ready for it.

TENSION AMONG miners is so great that Leroy Bird, mayor of Galatia and a member of the United Mine Workers, says flatly: "I got no comment. It's too dangerous to talk."

Last week, more than 1,000 miners from Galatia and nearby towns rampaged through the site of a mine being built by Kerr-McGee Coal Corp. of Oklahoma City. They were protesting the company's use of nonunion construction workers and its stated preference for nonunion workers when the mine opens in three years.

The site this week was deserted except for company security guards, idle equipment, and the remains of a two-mile fence that demonstrators tore down. Of the hundreds of two-inch galvanized steel poles sticking in lopsided heaps from the ground, each had been torn down by three or four of the demonstrators.

One security guard who witnessed the melee, which was quelled by national guardsmen and state police using tear gas, says, "You might say we knew how Custer felt."

James G. Randolph, company president, who toured the wrecked site last week, says work will resume Monday and persists in his statement that he will "do all I can with pay and benefits to convince the workers they don't need union representation."

Company officials say, however, that they have no choice but to abide by laws that allow workers to vote for or against union representation.

TO THE THOUSANDS of union miners in the area, a nonunion mine means nothing short of destruction of their livelihood. They fear losing benefits, high pay, and, most important, strict safety regulations.

"I can't for the life of me see how they can bring scabby coal miners in here, right in the middle of the United Mine Workers," says Dennis Higgins, a powerfully built man of 34 whose father and grandfather worked in the mines.

He sat at the kitchen table with his father, Jess, and mother, Loudean, last week, wiping up a plate of meat and gravy he had for "breakfast" before reporting to the midnight shift at the mine.

"Ain't nobody wants to see violence, but if we had to do it all over again, we'd do it the same way," Higgins says. "I think this is something worth fighting for, I sure do. If it wasn't for unions, there would be no safety conditions in mines at all."

HIS FATHER, 56, and other miners say that the first nonunion mine will have a domino effect and that once the older mines in the area shut down, the union workers will be frozen out of the new, nonunion mines. "We could lose everything we've got now," the elder Higgins says. "We just can't afford to give it up now."

The latest trouble comes in one of the nation's richest coal-mining regions and illustrates the desperate determination of unions to stem the erosion of their power over the last two decades. Already roughly half the nation's coal comes from mines not covered by UMW contracts.

The trouble also raises serious economic issues in an area where unemployment runs as high as 20 per cent.

The townspeople are edgy, frightened, and divided over the issue. Many young men in the area need jobs and would work for a nonunion company if they could.

THE MEN AROUND Galatia probably won't try that in the near future, however. At least one family has already learned the depths of miners' outrage.

Two of Bob Wallace's sons were hired to work as nonunion employes at the Kerr-McGee construction site. After one son had worked only one day, "we started getting threats that our house was going to be burned down," says Wallace, a retired union steelworker.

"He would have never went if we'd known anything like this was going to happen."

His son, Roger, 21, who was scheduled to report for work the day of the demonstration, says he has signed up for unemployment compensation and will not go back to work when the job opens despite the pay offer of $10 an hour.

"I can't do it as long as my mom and dad are living in Galatia," he says. "It's endangering their lives. I needed a job, and I needed the money, but I don't think anybody from around here will work there now."

OTHER TOWNSPEOPLE, while generally sympathetic to the union cause, fear disruption and more violence.

Neil Patterson, the executive vice president of the local bank, chooses his words very carefully in stating his own position. "It'll be beneficial to the economy whether the mine's union or nonunion," says Patterson, who was wearing a black leisure suit, an open-necked yellow shirt, and a gold chain.

"But I am concerned that the pattern of life here will be disrupted."

Marietta Ragsdale, owner of a local laundry, says: "I think what everyone is concerned about right now is the safety of our families. This has always been such a quiet little town, it's odd to have to worry, but, really, what the unions are fighting for is what they've been fighting for since the '20s."

DESPITE PEACEFUL times in recent years, all the townspeople remember the violence of half a century ago, and they seem convinced that the hot blood has been passed down to the current generation of miners.

Twenty nonunion strikebreakers were shot to death in 1922 in the infamous "Herrin Massacre" in Williamson County. The strikebreakers, according to accounts, were told to run for their lives and were shot while trying to scramble over a barbed-wire fence.

Eight men stood trial for the killings. All were acquitted.

"It's always been a volatile situation around here," says Wayne Silvey, 42, who lived in Galatia for six years and was visiting relatives here last week. "Guns are part of life, and people get

IN 1932, VIOLENCE erupted in Galatia between members of two unions: the UWM and the Progressive Union.

Delphia Wiggins, 67, remembers that during those days, "you couldn't go out of your house at night. There was a lot of trouble, a lot of killing, a lot of blowing up bridges. Well, I'm telling you, it was scary. I just hope and pray it doesn't come to that."

She says, however, she doesn't think miners will let a nonunion mine exist. She says her husband, who worked in the mines for 30 years, knew well what the dangers were. "He got a rock on his head, all the muscles in an arm ground up, a finger cut off, a foot broke—well, there's just a lot of danger. Before the union, they didn't have any safety at all."

Tom Mahan is a rangy man of 37 who sees personal irony in the current troubles. He worked in union mines for 12 years and two years ago was disabled by an accident in a union mine. He sympathizes with the miners' concern about safety, but he acknowledges, "I'm sitting here with a neck injury because of a union mine."

Mahan now owns a pool hall.

"PEOPLE IN THIS area who are not employed in the mines would be glad to see a mine come in nonunion, but the people in the unions are not going to go for it," Mahan says. "There's enough percentage of radicals in the union that it could get rough, a lot rougher than what happened out there on Tuesday."

Kerr-McGee officials have already ordered new fence material and have begun repairing equipment burned during last week's demonstration. They plan to start putting up the new fence Monday. The miners smile faintly and say the company may get the fence up again, but it won't stay there.

Ray Worley, 16, summarized the miners' feeling as he sat on his porch last week: "They hope they can blow the

Walker, Thompson at odds on Kerr-McGee disturbance

Harrisburg Daily Resistor 8/22 P1

1981 ?

SPRINGFIELD, Ill. (UPI) — Gov. James R. Thompson says former Gov. Daniel Walker is trying to make political hay out of a near riot earlier this week by union coal miners.

Thompson Friday said a list of questions Walker posed about the state's handling of the situation amount to exploitation.

But Thompson refused to directly answer questions raised by Walker in a telegram — including why National Guard helicopters and state police units were sent to the mine site hours before any violence began.

The clash was the first real confrontation between Thompson and Walker, who could wind up as opposing candidates for governor next year.

State police used National Guard helicopters Tuesday to tear gas miners who tore down 2.5 miles of fence at a non-union Kerr-McGee mine construction site near Galatia. The miners also burned some Kerr-McGee vehicles.

Although rumors of a demonstration circulated for about a day beforehand, there was no notice of the protest, nor did it coincide with an, noteworthy date in union history.

"Every Illinois citizen condemns violence," Walker said. "But the peculiar circumstances surrounding the violence in southern Illinois require public answers to be given by you to the following questions ..."

Walker then posed nine specific questions, including whether Thompson authorized use of National Guard helicopters and tear gas, why he ordered the choppers flown from Champaign to Galatia and why helicopters were needed at all.

He also asked, "Why were National Guard and state police dispatched long before violence occurred or was threatened? How many days in advance was this National Guard and state police action planned?"

Thompson said in a news conference he refuses to reply specifically to Walker's questions because, "I don't believe his questions warrant it." He also said the telegram exploits and encourages violence by labeling mob action as a labor dispute.

"We will not tolerate mob violence by anyone for any reason in the state of Illinois," he said. "Violence doesn't solve any problem."

Thompson accused the former governor of using the Galatia disturbance for political purposes.

"Your telegram to me in which you characterize the violence in Galatia last Tuesday as a 'southern Illinois labor dispute' is a pathetic and dangerous attempt to exploit a tragedy for your own political purposes even at the risk of encouraging more violence," Thompson said.

"The safety and livelihoods of all our citizens are too precious to stoop to the obvious demagoguery in which your telegram indulges," the letter said.

Thompson said he does not know whether he has accepted campaign contributions from Kerr-McGee or any of its executives.

There also were reports the FBI was investigating the disturbance but James R. Burgess Jr., U.S. attorney at East St. Louis, refused to confirm that.

Kerr-McGee said after the disturbance it plans to continue construction. A spokeswoman said the mine is being built with non-union labor, but it will be up to miners to decide whether it will be operated as a union or non-union mine once production begins.

Galatia dispute sparks political brawl

AND A

7, 1981

by Caryl Carstens

The dispute over use of non-union workers to construct a coal mine near Galatia has set off a political brawl between Gov. James Thompson and a potential Democratic 1982 election opponent, former Gov. Daniel Walker.

In a letter to Walker, Thompson characterized the former governor's telegram to him concerning the Galatia situation as a "pathetic and dangerous attempt to exploit a tragedy for your own political purposes even at the risk of encouraging more violence."

Thompson made his letter to Walker public Friday. The governor said Walker had made public the telegram he sent Thursday from Chicago.

United Mine Workers Tuesday broke down a fence at the Southern Illinois site where Kerr-McGee is constructing a mine. Equipment and buildings were set afire. State police and National Guard were at the scene and used tear gas to break up the crowd. The miners charge the Oklahoma corporation is building the mine with non-union labor.

In his telegram, Walker asked a series of questions focusing on the state's use of National Guard troops and equipment, especially helicopters from which tear gas was sprayed on the crowd.

"Why were national guard and state police dispatched long before violence occurred or was threatened?" Walker asked. "How many days in advance was this National Guard and state police action planned?"

While Thompson said he will not answer Walker's specific questions, he said he was kept abreast of events in southern Illinois by his office. He praised the troops and state police and said they acted in a rational manner. There were no injuries, he said.

"I understand the union versus non-union miners is a very controversial and emotional issue," said Thompson. But he believes it is an issue that can be solved in the courts, before the National Labor Relations Board and in other non-violent ways.

Walker's calling the Galatia events a "labor dispute" encourages further violence, according to Thompson.

Thompson in his letter refers Walker to a southern Illinois newspaper editorial that praises the police, troops, and the governor's office for being able to subdue the outbreak of violence "quickly and without injury."

The Executive Board of District 12 of the United Mine Workers Friday sought to explain the background of the Galatia situation. Kerr-McGee has a history of opposing union organization, according to the UMWA board, and closed a mine in Oklahoma after the union succeeded in organizing the workers and getting a contract for the workers there.

"Although Kerr-McGee publicly states there are over 600 jobs that will be available, they have hired almost exclusively non-union employees from out of the area to perform routine construction work, which could be done by local concerns with local labor," the board states. The company has rejected the lowest bid for fence construction from a union contractor in favor of a non-union contractor from out of the area who gave a higher bid, according to the union statement.

The board pledged to use "every available legal tool at our disposal to insure that the workers at Galatia have contracts to protect their safety and their jobs."

However, the union leaders would not condone Tuesday's violent action.

"District 12 of the United Mine Workers of America will not, however, participate in, authorize or ratify any unlawful act that occurs in connection with any labor dispute," the board stated.

KERR-MCGEE COAL CORPORATION-GALATIA MINE
December 4, 1984
John Nelson with Steve Danner,
Frank Chase from U.S. Bureau of Mines

We met all of the following:
Steve Rowland, Superintendent
Bill Murray, Director of Underground Mining
John Peters, Senior Staff Engineer
Pete Lilly, General Manager
Jim Webb
Ralf Sachs, Geologist
Roger Riffey, Geologist, formerly with Monterey Coal Company

Underground mine in Springfield (No. 5) Coal, shaft and slope, depth approximately 540 feet. Developing headings due north and east from bottom, with square pillars, not staggered. Mine opened in October, 1983.

The company is concerned about roof failures, which consistently are along N-S headings. Most fell in late summer when humidity was high.

On the Main East they have started driving crosscuts N. 60°E. and S. 60°E. So far these crosscuts have remained stable.

Mine map shows a "thin coal area," an elongate oval trending NE-SW, its SW tip about 1000 feet NE of the slope bottom.

Mr. Rowland says they have "cutters" along the ribs, especially on north-south entries. Using point-anchor roof bolts, plus trusses on outside entries.

Coal Bed near shaft bottom concealed by shotcrete. We walk east along Main East intakes. Coal 7-8 feet high, overlain by gray siltstone or silty shale (Dykersburg Shale) underlain by hard siltstone (?) poorly exposed. Regional dip to north, coal seam undulates moderately.

At No. 13 crosscut in the main East, a roll trending N-S for several hundred feet, as mapped by

Ralf Sachs. It is 10-15 feet wide, 3-5 foot deep; filled with dark gray silty mudstone or siltstone, like that of the roof. Interfingering laterally with the coal, or the mudstone faulted down against the coal along low-angle normal slip surfaces. These slips extend into the roof.

Roof shale away from site of roll is medium-dark gray, firm, well laminated, finely micaceous, very silty, almost a siltstone. Abundant plant fossils. Some bedding planes black with carbonized plant debris.

Mr. Sachs says floor is typically siltstone or firm silty shale, but locally more claylike. Generally firm, abrasive, not prone to heave.

About 60-80 feet of siltstone and silty shale above No. 5 Coal. Then the Briar Hill Coal, overlain by 15-20 foot sandstone, shale and underclay, then the Herrin (No. 6) Coal. They plan to mine the latter beginning this next summer.

At No. 16 crosscut another series of north-trending slips are seen in the roof. As in No. 13 crosscut, large pieces of the roof have fallen out between the slips. Immediately east of the crosscut, on the belt and the next entry south, two low-angle faults form a graben, with the roof shale displaced downward 5-6 feet. The view is poor because of heavy rock dust. I pried away a portion of the rib, exposing gray shale finely laminated with white sandstone. The laminae are offset by dozens of microfaults, all normal, and healed. Clearly soft-sediment deformation.

On the belt entry at No. 18 crosscut is a very large roof fall. The east side of this fall is a fault surface; the fault trends N 15° W/55-60° E. about 1 foot normal offset at top of coal, no drag, very prominent vertical slickensides. It extends to top of fall, 15 feet above the coal, and evidently is the cause of the fall, smaller synthetic and antithetic faults also are present. Roof is medium-dark gray siltstone or silty shale interlaminated with white very fine-grained sandstone. Sandstone laminae very firm regular and horizontal, to quite lenticular. Some bedding planes are coated with plant debris.

Mr. Sach's map shows the fracture zone curving to a northerly heading north of the belt, and to a more southeasterly heading to the south. There are several slips or faults, parallel or en echelon to each other.

In the entry south of the belt the fault observed in the roof fall is seen to die out within the coal seam, not reaching the floor. East of it are numerous low-angle west-dipping faults, associated with a roll 15-20 feet wide.

Mr. Sachs believes all of these faults we have seen so far are due to slumping or gravitational slippage before the sediments were lithified. I tend to agree, based on what I have seen.

Thus far we have seen no systematic joints in the roof shale.

In several of the north-trending crosscuts east of No. 16, these appear to be "cutters" forming along the east rib. Apparently the first cut with the continuous mines is made on the east rib, and this tends to spall, while the roof on the second cut, to the west, remains intact. But according to Kerr-McGee people, when the west side is cut first, the cutter develops on the west side of the heading. They use ripper-type miners that make a rectangular opening. No cutters seen in the east-west headings.

A large fall in crosscut 28 south of the belt entry. This fell about a month after mining. The rock is siltstone with sandy laminae, as before, it has broken into layers an inch or so thick. In this fall no faults, rolls or other structural irregularities are evident. Apparently no prior warning before the fall. Adjacent crosscut has no cutter. Could stress be relieved by one fall? The fall was stopped at the belt by heavy cribbing. There is no obvious "kink", but the cribs are taking weight, sagging visibly.

In the crosscut 2700 foot east of the bottom (No. 36), is a very large fall in the crosscuts both north and south of the belt. In profile it is a very high arch, the sides nearly vertical, the crest 25-30

foot above the coal. No slips are evident, but the rock appears crushed along the crest of the fall. The rock is thinly laminated siltstone, as before.

This fall continues just south of the entry south of the belt. Again the rocks near the crest appear crushed, at the south end of the fall seem to be slightly kinked downward along the centerline of the crosscut.

A single vertical planar fracture seen in the fall, striking about N. 65°E.

Eastward is the area where the crosscuts are driven NE and NW rather than N-S. The roof conditions here are very good. It is said slightly better roof in the NE crosscuts than in the NW ones. This suggests the maximum stress may be ENE-WSW rather than due E-W.

In this area the coal is 5½-6 foot thick, without persistent partings. The roof is dark gray shale with very fine parallel laminations, finely silty and carbonaceous, the floor a firm silty claystone or argillaceous siltstone, thoroughly rooted.

Cleat is prominent locally, varies from about N. 35°E. to N. 65°E. Most commonly N. 50-60°E. Occasional small pyritic lenses near top of coal, and bands of pyritized fusain. Many cleats lined with calcite. Butt cleat poorly developed.

Roof fall on return air escapeway just east of shaft bottom: in north-south crosscut, about 15 foot high, thinly laminated and ripple-marked siltstone with sandy laminae. No slips or other irregularities obvious. The rock is very brittle and slabby, with more sandstone laminae than seen elsewhere.

The mine is dry, except where water has come in from the coal or the bottom. No active seepage observed, nowhere any seepage from roof.

Near shaft bottom, one pillar south of No. 5 Power Hole, a large roof fall in the north-trending heading. The coal is more than 9 feet thick, and the contact to roof is gradational: vitrain interlaminated with bone and black carbonaceous shale, 0.5-0.8' thick. Then very firm silty shale, medium-dark gray, micaceous;

with fine laminae of sandstone becoming more abundant upward. Fall about 10 foot above top of coal. There are irregular E-W fractures at south edge of fall, but not true joints. No slips or other geologic anomalies in evidence.

Like most falls in the mine, this one is said to have occurred suddenly, with no warning, several weeks or months after mining.

Around the southwest corner of the present workings the upper half of the coal is severely split with shale. Total thickness 6½-7½ feet. The shale laminae are very fine, horizontal and regular, not lenticular; dark gray to black, very carbonaceous, some sideritic, with coal and bone interlaminated. Percentage of shale increased upward. Above interbedded coal/shale is finely laminated dark gray sideritic shale, not silty, with abundant plant fossils in many places.

A very large fall (25-30 foot high) shows shale to be thinly laminated, dark and only slightly silty - no sandstone laminae. Near top of fall is very dark gray to black shale. Slickensided fractures at top of fall trend roughly east-west.

Galatia channel lies west of mine and presumably accounts for splitting of coal.

The most brittle, carbonaceous or bony shale has joints less than an inch apart striking N. 50-75° E, and breaks into lathlike strips.

On north side of the huge fall, a set of large slickensided low-angle slips trending N. 55-60° W.

Northeastward the coal becomes less shaly, but the upper layers are very bony for some distance. The roof shale is finely silty and carbonaceous, with scattered plant fossils. It appears that gray shale splits in the seam grade laterally to black shale, then bone, then slightly dirty coal.

At the NW corner of the bottom area the coal is split by a thick wedge of massive siltstone coming in from the NW. On the SE corner of the intersection is nearly 10 feet of coal without partings; on the NW corner, nearly a solid rock face, with only a little

coal at top and bottom. Details hidden by rock dust.

On the western entry of the Main North, just north of bottom area, a split of siltstone near the base of the seam. Where first seen it is less than a foot thick and about a foot above the floor. The split is medium gray, very uniform, massive, micaceous siltstone with plant debris. The coal below thinly laminated and very shaly, appearing to grade into the underclay. Above it is 7-8 foot of good clean coal. This continues about 300 foot north; then a whole series of lenticular siltstone bodies up to 3 foot thick in lower part of seam. No trace of rooting in any of them. Thickest splits are in 2nd entry from west, 1,125 feet north of the shaft bottom. They have left most of the split coal in the floor.

Large roof fall at 1275' north, No. 6 entry (one east of belt). It is in N-S entry, about 80 foot long, 20 foot high, in well-laminated carbonaceous siltstone with sandy laminae. No slips can be seen, but view mostly blocked.

Several thin layers of siltstone can be seen near the base of the coal beside the fall. Probably related to splits, described just above.

No. 6 entry north of the fall is in poor condition with many falls 3-5 foot high, and in places a strong kink zone can be seen. No. 8 entry also is in rough shape. They have had to resort to trusses and heavy cribbing to hold the roof.

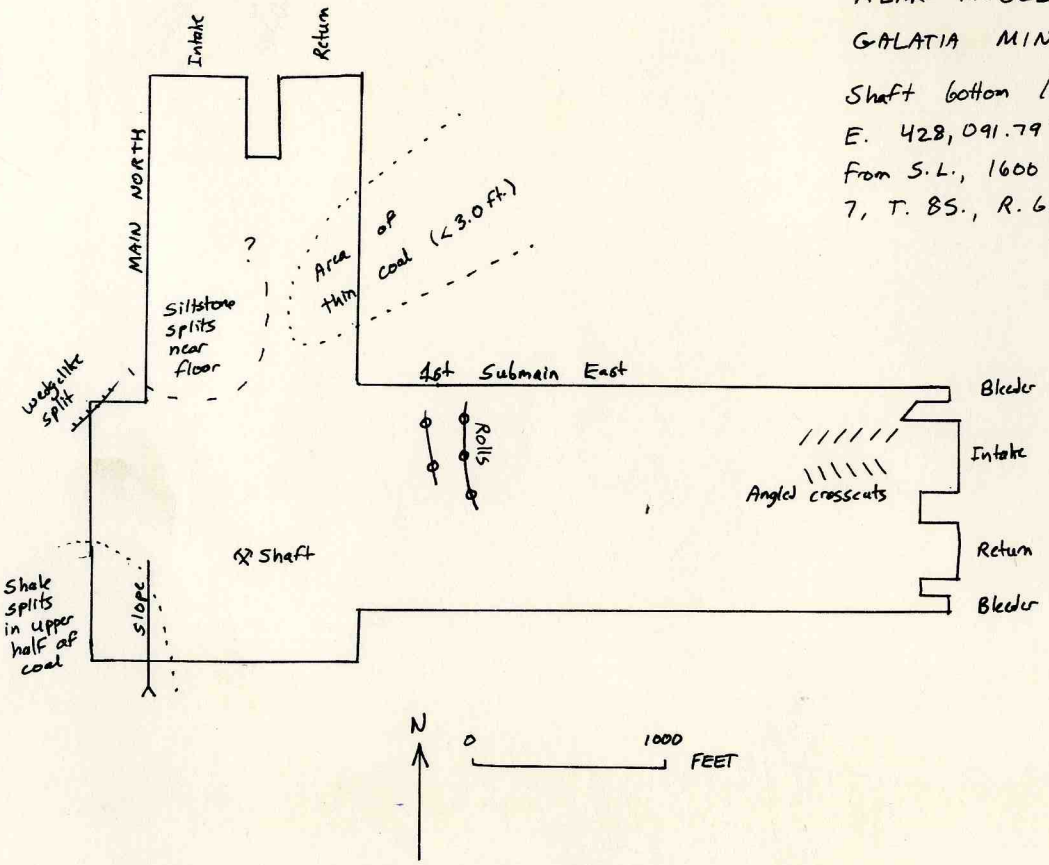
Still getting siltstone layers 1-3" thick near the base of the coal.

Area of very thin coal on east side of main North a short distance north of bottom area. The coal is less than 2 feet thick in places, and very hard; generally dull to silky lustre with very fine laminae of vitrain. Overlying it is very hard, massive micaceous gray siltstone or silty mudstone. According to Ralf, in this area the interval from No. 5 to No. 6 Coal is 15-20 feet thicker than usual. He suggests it may represent a pond in the swamp - nondeposition rather than erosion.

KERR- McGEE CORPORATION

GALATIA MINE

Shaft bottom located N. 427,256.33' E. 428,091.79'; approx. 1900 ft. from S.L., 1600 ft. from E.L., Section 7, T. 8S., R. 6E., Saline County, Ill.



Kerr McGee Corp.
Galatia Mine

December 4, 1984
Saline County

Notes by S. K. Danner. Accompanied by John Nelson (I.S.G.S.), Frank Chase (U.S.B.M.) and Ralph Sachs (Kerr-McGee).

The purpose of our visit is to observe the geological conditions at this mine. The Kerr-McGee personnel would like us to evaluate their mine roof conditions, and perhaps suggest some means of improving their roof control.

Upon our arrival at the mine, we met with the following Kerr-McGee people:

Bill Murray	- Director of Underground Operations
Pete Lilly	- General Manager
Steve Rowland	- Superintendent
Ralph Sachs	- Geologist
Tim Webb	- Engineer (No. 5 Seam)
Roger Riffey	- Assistant to the Superintendent
John Peters	- Staff engineer

The Galatia Mine is a twin seam mine located in the Springfield (No. 5) Coal seam and the Herrin (No. 6) Coal seam. The No. 6 Coal averages 6 feet thick at a depth of about 450 feet, and the No. 5 Coal averages 6.5 feet thick at about 550 feet of depth. Both seams share a 16.5^{o} slope and a vertical shaft. At present only the No. 5 Mine is active. They have connected the slope and the shaft in the No. 6 Mine, but little more. Development in the No. 6 will probably wait until market conditions improve.

The surface facilities at this mine are first class. The offices, meeting rooms, change rooms, and shaft

Galatia Mine (Con't)

portal are all housed in one large, modern building. An in-house laundry keeps the miners in clean overalls and towels. A weight room adjacent to the laundry allows the miners to work off their frustrations and excess weight. A large cafeteria area provides room for large meetings. There is a first aid room with a company nurse who treats injuries and gives physicals. All in all, this is a well-planned facility.

Ralph Sachs and a couple of mine engineers are going to give us an arm-waving tour of problem areas in the No. 5 Mine.

Stop 1. Location: #13 XC in Main East, between belt and track entry.

Long roof fall adjacent to gray shale roof roll. A series of 3 coffin covers, each about 30' long and 2 to 3' high, have fallen out of the roof. The roof roll is about 30 feet wide at this site. The shale in the roll interfingers with the coal. The roof rock here is the gray, silty Dykersburg Shale. It is reported to be 25+ feet thick over this mine.

The coal is between 7 and 8 feet thick in this area. The floor is rather rolling, with swales 6 to 8 feet deep. The floor is a silty claystone or siltstone greater than 10 feet thick.

Stop 2. Location: #17 XC on Main East, haulage entry.

A 4 foot high fall shows a set of oblique planar fractures that cause the roof to slab out in "flagstones". This fall borders another roll that is about 30 feet wide at the roof line. The roll forms a sharp,

Galatia Mine (Continued)

V-shaped wedge that penetrates almost to the bottom of the coals and is bounded by numerous slips at the roof line. It consists of gray, laminated siltstone with thin sandy plies. There are several small faults within the roll that produce stair-stepped offsets in the laminae.

Stop 3. Location: #18 XC on Main East, belt entry.

Giant "coffin cover" roof fall 15 to 20 feet high in a gray, laminated siltstone. The fall was caused by two large slip fractures that intersect to form a sharp inverted V. Siltstone is thinly laminated and well-bedded, with carbonaceous debris on bedding plane The beds in the upper 12 feet of the fall appear horizontal, while the beds in the lower 6 to 8 feet appear to slump toward the crosscut. There is little internal slippage in evidence.

Stop 4. Location: Haulageway of Main East, between XC #18 and #19.

Four large slips adjacent to 4 foot thick roof roll. Slips trend N 10^{o} W to N 35^{o} W. Roll is bounded by a long, low angle slip on one side, and a short, high angle slip on the other.

Additional Notes:

Several of the north-south cross-cuts on the Main East show signs of cutter roof. The "cutters" tend to follow the rib along the box cut, or first cut of the cross-cut. There is little or no cutter roof along the rib of the open cut. The Kerr-McGee people say

Galatia Mine (Con't)

that the cutters always follow the first cut, no matter which side of the entry is cut first. Also, shallow roof falls tend to follow the box-cut. With the stress relieved, the roof holds over the open cut.

About a half mile in by the Main East they have begun driving the cross-cuts at 60^{o} angles to the mains. The roof has held fairly well so far. There does, however, appear to be more bedding plane separation in this area.

While many of the roof falls we encountered can be attributed to roof rolls, slip fractures, and small, local faults, there are some that appear unrelated to roof structures or discontinuities. These falls occurred under a thinly-laminated, micaceous siltstone probably the result of bedding plane separation.

Kerr-McGee's contract with Union Electric Co. calls for less than 2.3 pounds SO_2 per million BTU's. This translates to between 1.2 and 1.3% sulfur for the washed coal.

FIELD NOTES

Illinois State Geological Survey

5/11/1984

Southern Illinois mine increases coal output

Quincy 5-11-84

GALATIA, Ill. (UPI) — Kerr-McGee Coal Corporation's new $182 million Galatia mine is expected to produce more than 1 million tons of coal this year the mine president said.

U.S. coal mine production dropped to 780 million tons last year from 820 million in 1982 but the outlook is brighter this year with utilities generating more electricity than a year ago, James Randolph said at a luncheon Thursday.

"Utility coal inventories are down and most coal buyers are accelerating their buying," said Randolph, noting that the mine has already sold more than a quarter-million tons of coal since January.

Utilities are generating and selling 8 percent more electricity than they did a year ago, he said.

Randolph said the non-union mine will spend $35 million for wages, salaries and other purchases in the area. The area is dominated by union coal mines and was the scene of a violent demonstration in August 1981, soon after construction started.

The mine was constructed on schedule and within budget, and its accident rate was below the national average, Randolph said. Construction was completed without fatalities or serious injuries.

William Murray, a native of Scotland and director of underground operations, said the mine currently has more than 300 employees and should have about 500 workers when it reaches full production in 1987.

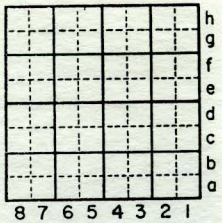
It has a contract to produce 2 million tons of coal a year for 20 years for Union Electric Co. of St. Louis.

Murray said the mine, with its computerized coal preparation plant and stock room, was designed for a production capacity of 4.1 million tons a year.

The dual seam mine taps the Harrisburg Nos. 5 and 6 coal seams at depths of 570 and 450 feet, respectively, both by shaft and slope operations. Coal is carried over Illinois 34 on a double-decked conveyor system to a $50 million automated and computerized coal preparation plant where it is sized, cleaned and stored in 185-foot high silos.

Steve Reed, manager of plant operations and engineering, said coal coming into the preparation plant has a sulfur content of 2 to 2.2 percent and leaves with a 1.3 to 1.4 percent sulfur content.

Kerr-McGee - Galatia Mine



By HHD Date 5/31/84

Quadrangle

County Saline Sec. 1 T 8S R 6E

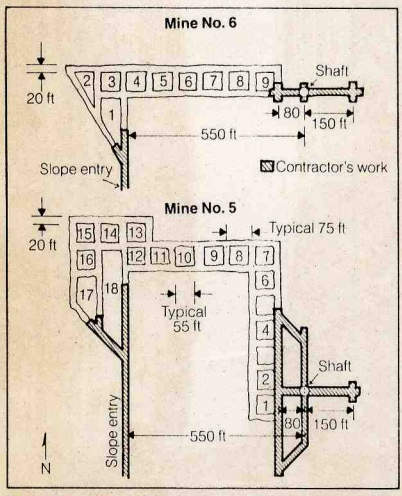
Kerr-McGee Mines Twin Seams

Diesel-powered equipment engineered to the user's exacting specifications provides productivity and maneuverability in herringbone-pattern entries.

When Kerr-McGee Coal Corp., developed its first underground coal mine it jumped in with both feet and opened a $175-million twin seam mine in Galatia, Ill., capable of producing 4.1 million tpy. Management achieved its productivity goals sooner than expected, and attributes this, in part, to diesel equipment built or modified to the company's specification.

The coal company has been acquiring coal rights in the Illinois Basin since the late 1960s and owns, in fee or lease, 180 million tons of saleable coal. Two seams extend under the Galatia property: Herrin No. 6 with 100 million tons and Harrisburg No. 5 with 80 million tons.

Herrin No. 6 averages 6 ft thick at a 450-ft depth, and No. 5 averages 6½ ft at 550 ft, 135 ft below. Kerr-McGee treats each seam as a separate mine although they share a vertical shaft and a 16.5-deg slope entry. Development of the Galatia operation began in July 1981, and 2½ years later the first unit train of coal from the Harrisburg No. 5 seam was shipped. The first coal from the No. 6 seam is expected to be mined in April 1985.



Contractor drove entries from the shaft for each mine, then Kerr-McGee mined through to connect shaft and slope entry.

Production started in the No. 5 mine first because it has a higher quality product contributing more revenue than the other seam. The mine rates clean coal from No. 5 seam at 11,797 Btu with 1.28% sulfur, and from No. 6 seam at 11,659 Btu with 2.42% sulfur.

Built to last 40 years

Management scheduled the No. 5 mine to produce 700,000 tons in 1984, but productivity exceeded expectations and it reached nearly 1 million tons by the end of the year. Kerr-McGee contracted to supply 1 million tpy of No. 5 coal to Union Electric Co. in St. Louis, and the utility also has a 1-million-tpy contract for coal from the No. 6 seam.

Kerr-McGee constructed the mine for a life expectancy of 40 years. Mine Contractors, a wholly-owned Kerr-McGee subsidiary, drove entries into each mine from the shaft (see drawing) and installed heavy structural steel supports in the immediate vicinity of the shaft. The contractor bolted the roof of the entries with 6-ft fully-grouted bolts on 4-ft centers. Supplemental roof and rib control in the main air courses and mine bottom travelways was provided with truss bolts, chain link fencing and grouting.

The development in mine No. 6 is similar to the entries in mine No. 5. During the life of the mines, only about 50% of the mining activity in No. 6 mine will be above No. 5 mine. This is because the Galatia channel washed out most of the No. 5 seam coal on the south side of the reserve. Where the two mines coincide vertically, the entries will be precisely aligned, one above the other, to columnize the pillars. The 55-ft-wide pillars allow sufficient clearance for the reflected overburden pressure on the lower entries to be transferred upwards at between 16 and 19 deg without affecting the stability of the entries in the upper mine.

Roof conditions are reasonably good. The No. 6 seam is overlaid with 3 ft to 5 ft of Anna shale with a compressive strength of 8,000 psi. The No. 5 roof has about 25 ft or more of Dykersburg shale with a compressive strength of 9,000 psi. The No. 6 mine has a fireclay floor that degrades when wet, an almost unavoidable condition when maintenance crews flush diesel engine scrubbers. No. 5 mine has a shale floor with a compressive strength exceeding 7,000 psi.

Peter Green, senior editor

concrete wall bisects the shaft, providing a 294-sq-ft space for a hoist and intake air in one half and the same area for return air in the other (see drawing on previous page). About 75% of the two mines' ventilation is down the shaft; the rest is through the slope entry.

No additional intake shafts are planned during the next five years, but in about one year's time another fan may be installed. The mine opened with provisions for two 10-ft Joy axivane fans in parallel to serve both mines. One already installed is capable of exhausting 900,000 cfm at 10-in. water gage.

Because the scoop and three Ramcars on each section and outby vehicles are powered by diesel engines, and the mine liberates an estimated 1 million cu ft of methane daily, ventilation specifications call for the system to deliver 32,225 cfm at the last open crosscut at each working unit. By law, this includes 100% of the air quantity specified for the machine with the highest air requirement, 75% for the machine with the next highest requirement, and 50% for all additional diesel units operating in the split of air.

To control methane and dust at the face, the continuous miners are equipped with wet bed scrubbers.

Safety precautions for exhaust and fuel

Diesel equipment in underground mines provide a safe and efficient power source, says Kerr-McGee. The company has operated diesel equipment in non-coal mines in the West, and believes diesels can contribute more to coal productivity than cable-reel or battery vehicles.

To allay fears of diesels, management instituted an exacting environmental monitoring schedule to ensure the quality of the air remains above federal requirements. Harold Olde, who directs the 10-man safety department, says that 27,000 tests were made for noxious gases in the first year. Each test requires three separate procedures for testing carbon dioxide, carbon monoxide, nitrogen dioxide and nitrous oxides.

The disposable tubes for the Drager multigas detector cost about $2 each per test, totaling $54,000 annually. The three-gas tests are made every eight hours in the operator's compartment of each diesel vehicle and continuous miner. The tests are repeated in the immediate return air. Diesel exhausts are tested every 24 hours.

The state of Illinois requires that during the first 500 hours of operating new equipment, every mine must test the operator's compartment twice per shift and the exhaust once per shift. State and MSHA safety agencies also periodically take the exhaust temperature and samples of air from close to the exhaust and in the operator's compartment.

Provisions had to be made for safely handling diesel fuel underground, and after the first year, Galatia changed its techniques. Instead of taking a 250-gal tank to the surface to refill it every third shift, the mine now distributes fuel in bulk.

Hydraulic fluid and diesel fuel stored in buried tanks on the surface are pumped to each mine through separate pipes in a common borehole. The two liquids are dispensed directly into the tanks of mobile lubrication trucks (one for each mine) which then distribute fuel to service centers.

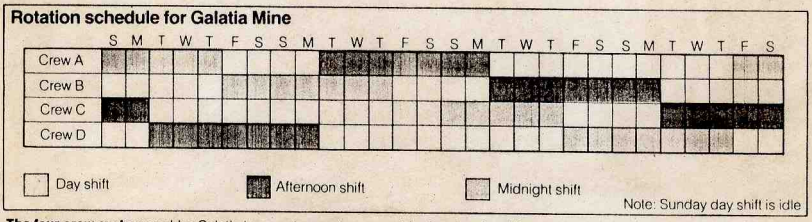
Each mine's tanker is self-propelled, but service centers are trailer-mounted. Each section has a service center, and uses a scoop to move it and power its pumps. When service centers are not in use, they are parked where air is routed directly to the returns. All the centers and tankers carry regulatory fire-fighting equipment.

Anticipating potential problems from handling flammable liquids underground, rigorous safety precautions are built into the system. The area where the borehole is located in each mine is in intake air that is routed directly to the returns. The floor is concreted and drained to a sump. Fire doors on the intake side will automatically close in an emergency to isolate the area.

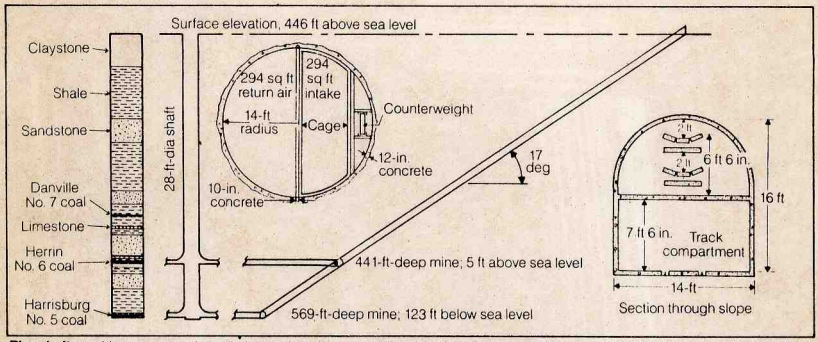
Pumps and valves in the distribution system will automatically shut if the surface storage tanks siphon into the borehole pipes, or if excessive pressure build up or if either the surface or the underground tanks are overfilled. These valves, interlocked with the fire protection system, will also close if the power fails.

Resting on the Sabbath day shift

To maintain current contract levels, Galatia needs six production shifts a day. The mine operates around the clock, shutting down only on the Sunday day shift. To achieve the six daily production shifts, Peter Lilly, general manager, divided the workforce into four crews, A, B, C, and D (see chart). Each crew fields two production units. Since one crew is always idle, the three other crews



The four crew system enables Galatia to operate nonstop, except for Sunday day shifts, and keeps miners working 20 out of 28 days.



The shaft provides access and ventilation to the mines; the slope entry handles coal haulage and rail supplies, plus some ventilation.

Miners are pushing north in No. 5 seam, extending a 42-in. belt conveyor as they go. Later, when the mining plan moves north for 5,725 ft, a 48-in. vulcanized belt will be installed in another north-south entry along the solid rib of the barrier pillar.

A regional non-conformity in the rocks caused a modification to the original mining plan. In one section where the entries are on the east-west axis, the joint pattern, which is normally between 30 deg and 40 deg NE-SW, shifts to between 5 deg and 12 deg. This creates the potential for roof falls if the cross cuts are made on the north-south axis.

To circumvent this hazard, Galatia skewed the entries in a 45-deg herringbone pattern going east. Old mine maps show that this was once a standard operating procedure near faults in the Saline County area. Steve Rowland, superintendent of No. 5 mine, says the skewed entries have resulted in improved roof control in the east submain entries and in the currently operating fourth north production panel. He also says that the herringbone pattern causes no haulage problems because the diesel-powered articulated vehicles can easily maneuver the acute angles.

The best seats in the house

Human engineering played an important role in equipment specifications, and all underground equipment is selected or designed to minimize wear and tear on the operators.

Phil Reeves, chief engineer at Galatia and superintendent of No. 6 mine, says that all seats in standard equipment were modified to make them more comfortable for the operators, and sound deadening insulation was added. Manufacturers were also told to decrease operating noise wherever possible.

All outby personnel and supply diesel vehicles were designed and built by Memco, Inc., Mt. Vernon, Ill., to meet performance specifications drawn up by Kerr-McGee engineers. Reeves says that standard battery-powered outby vehicles couldn't provide the maneuverability or the level of human engineering he wanted.

Because there is only 1 ft difference in average seam thicknesses, the same vehicle models can be used in both mines. No. 5 mine inventory includes four Ingersoll-Rand LN 800 miners and four TD2-43 roof bolters, one Fletcher DR-13 construction bolter, 12 Jeffrey 4110 Ramcars, five Wagner LST-5S Scooptrams, and four Stamler BF-14-2-7C feeder breakers with ramcar ends.

The miners are equipped with radio remote control so that when mining reaches stabilized roof conditions the machines will be able to make 35-ft cuts instead of 20 ft. Cutting heads in No. 5 mine have 2¾-in. bit spacing and operate at 44 rpm.

Engineering modifications to the miners improved air flow and dust collection, and experimentation continues to reduce the noise of the flooded bed dust collectors by lining the fan tube with sound absorbent material.

Shuttle cars are equipped with German-designed MWM/Murphy 96.4-hp diesel engines, which Kerr-McGee says are the cleanest engines in their size range and have low, MSHA-certified air requirements. The Jeffrey Ramcars exhaust system includes a water-jacketed manifold extending from the cylinder block directly to the exhaust gas scrubber, which is constructed with stainless steel internal components.

Caterpillar 150-hp and 100-hp diesel engines were selected for the scoops, and Wagner designed a new exhaust gas scrubber for the machines. The scrubber uses less water and is less likely to prematurely shut down the engine because of varying water levels.

Ventilation planned for expansion

The 28-ft-dia vertical shaft extends 574 ft to provide access and ventilation to both mines. Walls of the concrete shaft are reinforced to withstand severe earthquakes since Galatia is in a hazardous seismic zone. A

comprise the six production shifts operated each 24 hours.

The four crews rotate their working hours and may, for instance, work seven consecutive midnight shifts followed by four idle days before returning to work the afternoon shift for seven days. The pattern changes, but the result is that every underground worker works 20 out of every 28 days.

Galatia doesn't shut down the mine for a summer vacation; miners take vacations when it suits them. It also works to the advantage of the mine's safety, because when people are in a mine at all times they can see if leaks or roof falls occur.

Miners receive a bonus day off for two months perfect attendance. Alternatively, they can accumulate the earned days for a year and add six to their vacation, or take pay in lieu of time off.

Because Kerr-McGee designed the underground mine for diesel equipment, management developed a program to train miners and foremen who had not previously worked with diesels. Initially, the mine hired and trained some inexperienced miners, but took on only experienced maintenance men. Several of the men who worked on the development of the two mines, now work underground on the production shifts.

Kerr-McGee changed the traditional bathhouse facilities by creating two sections, one with lockers for the miners' own clothes, and another with lockers for their work clothes. Air ducts in each locker dry damp clothes. The showers are between the two locker rooms. All work clothes are provided by the company and are orange (for safety) coveralls that are laundered by the company on the premises.

A bank of hoses located at the bottom of the shaft enable the miners to wash their boots before coming to the surface and walking into the bathhouse. Amenities for the workers also extend to the inner man; microwave ovens are located on the maintenance service centers underground so lunches can be warmed. ■

A $50-million Washing Machine On-Line at Galatia

Kerr-McGee's preparation plant is designed for high-volume coal cleaning and low maintenance.

The No. 5 and No. 6 seams to be mined by Kerr-McGee Coal Corp. at its Galatia complex average 6½ ft and 5½ ft in thickness, respectively. In practice, however, miners may be working a 3-ft seam one day and a 10-ft seam the next. This causes wide fluctuations in the amount of refuse fed to the preparation plant. "It's not really a problem," says Steve Rowland, superintendent of No. 5 mine, "the Maytag can handle it."

The Maytag is a $50-million-plus preparation plant that Kerr-McGee built to handle high volumes of coal that can be very dirty at times. The coal company, like a prudent homemaker, was willing to spend the extra money up front to avoid calling the repair man later.

Those close to the project say they have never seen a plant of comparable size start and come up to speed with so few problems. It is a big plant for a big job. Since its initial tests in late December, 1983, the plant has cleaned and shipped about 1 million tons of Illinois Harrisburg No. 5 coal. As the Herrin No. 6 seam is developed and the mine comes up to full production, the preparation plant will be expected to process about 2 million tpy.

Goal: high output, low maintenance

Kerr-McGee was looking for a plant design that offered maximum production capabilities with minimum maintenance. Dravo Corp. of Pittsburgh and Hazen Research Inc., of Golden, Colo., came up with the conceptual design and plant schematic. The Roberts & Schaefer Co., of Chicago carried out the detailed design and construction.

The underground mine and preparation plant were built on the strength of a 20-year supply contract with Union Electric Co., the utility that supplies electricity for St. Louis. The power company will take 2 million tpy after the second seam is developed this year. And if the marketing department does its job, the mine will eventually produce twice that much coal. The high quality makes metallurgical sales possible.

Such high-volume cleaning poses a challenge for any cleaning plant, especially when the coal is mined in Saline County, Ill. The two seams are part of the Carbondale Formation, a geologic substrata of the Pennsylvanian system that occurs in southern Illinois. The coal is of relatively good steam quality (see table), but with enough abrasive and corrosive bits of shale, rock and pyrite present to cause substantial wear and tear on standard preparation plant equipment.

That is where a good deal of the money in the cleaning plant was spent: on materials that stand up to a 1,000-tph feed rate for a prolonged period, with little time allotted for replacement or maintenance. The plant is filled with ceramic and urethane-lined piping, stainless steel and polyethelene pipes, and chutes lined with rubber or ceramics. Urethane and tungsten carbide screens fight the corrosive tendencies of chloride. Throughout the plant, specially designed support systems keep lighter weight, non-steel pipelines in place. Feed headers have impact boxes ahead of elbows to resist wear. These boxes also dissipate energy from material before it goes into cleaning devices, giving them longer life.

Andrew Wright, senior editor

Coal Week
3-18-85

KERR-McGEE MOVES TO NEW SEAM AT GALATIA MINE

As it gears up to meet a 2-million t/y supply contact with Union Electric in 1986, Kerr-McGee coal is developing a new coal seam at its Galatia mine in southern Illinois.

In early April, crews that have been preparing the No. 5 seam will begin work on the No. 6 seam at the $183-million underground mine that began production in late 1983. The shift is being made because work at the No. 5 is largely completed.

The company recently hired several maintenance technicians and more will be brought aboard later. The mine's workforce, which stands at 400, will be expanded later this year when production increases.

The mine, Kerr-McGee's first east of the Mississippi River, produced about 1-million tons of coal in 1984. All of it went to Union Electric under a 20-year contract (1/23/84 *Coal Week*).

Kerr-McGee Coal Company - Galatia Mine - Saline County
Notes by John Nelson on visit with Chen-Lin Chou, Richard Winston, and Bill DiMichele. August 19, 1985. Accompanied by Jim Pfiffer from Kerr-McGee.

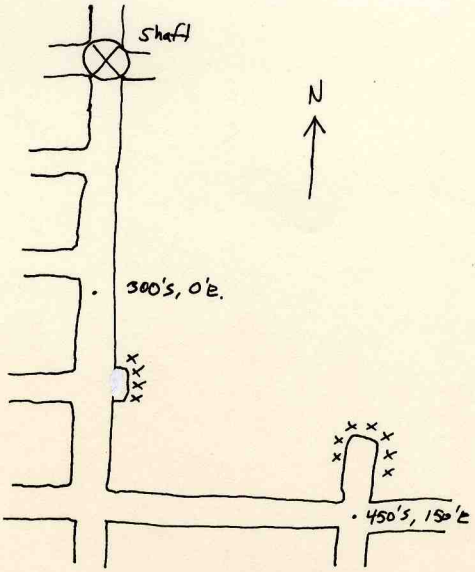
This has been a two-seam operation since April. Workings have been opened in the Herrin (No. 6) Coal, above the Springfield (No. 5) Coal, which has been mined since the mine opened. Interval between two seams is 70 to 110 feet. Main entries and submains in Herrin Coal are directly above those in Springfield Coal. This is being done to minimize stresses in the pillars.

Herrin Coal

Large masses of limestone coal balls have been encountered, replacing the full height of the seam or nearly so. One is seen in the fresh face of the entry just north of intersection +150 East, +450 South. The place is just now being bolted and is not accessible for study or collecting. The adjacent ribs are heavily rock-dusted but a few local balls were noted in places where the coal has sloughed away.

A solid face of coal balls is seen on the east face of the intersection 350 feet south and 0 feet east of the man and materials shaft. We did not examine the place in detail, but it is obvious that the coal is largely replaced by limestone across the width of the face. The roof bolter told us that they gave up mining here because the rock was too hard. The continuous miner cannot cut coal balls - it is necessary to drill and blast them. Progress was so slow that the company has not attempted to mine through the coal balls except where required for ventilation.

Herrin Coal (Con't)



If the mass of coal balls is continuous it is more than 150 feet long; width not determined.

The area will not be practical for detailed study or collecting for several months. Now there is too much mining activity in the area, and the faces are too fresh and heavily dusted.

Springfield Coal

We went to the 3rd South Panel off the Main East, where Chen-Lin and Richard took a column sample of coal (see their notes). Near 13th Left room the coal is overlain by medium-gray siltstone with varve-like laminations. Stems and trunks of Sigillaria and Lepidodendron are abundant at the base of the siltstone. No vertical stumps were noted. The siltstone does not show consistent jointing. A couple of minor "kink zones" or

Springfield Coal (Con't)

"cutters" were noted near the ribs in the entries that trend N.30°W., but no serious failures were noted. The panels are driven at 60° rather than 90° to the main entry, to minimize roof failure due to stress.

John C. Moore Corporation, Rochester, N.Y. 14604
MOORE'S MODERN METHODS
FORM 180 W

August 19, 1985.
Richard Winston
Visit to the Kerr-McGee Galatia Mine with Chen-Lin Chou W. John Nelson, and William A. DiMichele (Smithsonian Institute) in order to collect samples of high chlorine coal and observe massive coal ball occurrence.

We met with Ralph Sachs and Jim Pfifer from Kerr McGee at the mine. Both the Herrin and Springfield Coals are being mined at this mine. The Springfield Coal has low sulfur content, but the Herrin does not. Chlorine content was reported to be ~0.35% in the Springfield and ~0.2% in the Herrin.

We first visited the coal balls in the Herrin. They were 8' thick and were encountered from at least 300'S OE to 450'S 100E.

A column sample was collected from the Springfield. The coal was 6'4" thick. The column was located on the 3rd panel off the main E #13 left 840'S, 240 E NW corner. Some parts of the column were probably not collected and there was probably some overlap of adjacent blocks as well.

Kerr-McGee Coal Corp. - Galatia Mine
July 9 and 10, 1986. John Nelson

Accompanied Dave Ingram, Greg Molinda and George Persetic of U.S. Bureau of Mines, Pittsburgh. They are performing in-situ stress measurements, by overcoring the roof strata of the No. 5 coal.

One test has already been completed. It indicated maximum stress horizontal, approx. east-west, about 1400 p.s.i.; minimum stress N-S, 450 p.s.i.; overburden (vertical) stress estimated 650-700 p.s.i.

The first test hole was located in the Main North approximately 4500 ft. north of the main shaft. Also at this site five horizontal holes were drilled into the coal, and borehole platen flapjacks (B.P.F.'s) inserted, to monitor vertical load on the coal pillars. A second set of entries will be driven east of #1 test site; the B.P.F.'s will monitor the change in load as mining progresses past the test site.

The #2 test site is located on the east side of the Main North, against the barrier pillar, 2175 ft. north of the shaft. This lies just north of the large area of thin coal. The thin coal area trends NE-SW and is approximately 800 ft. wide. At #2 site only an overcoring test will be performed - no B.P.F.'s.

The procedure is to drill a 1½" diameter hole about 7 feet vertically, then overcore a 6" hole to that height to remove fractured rock. Then another 7 feet vertically, with 1½" hole, then overcoring again. This must be done in two 7-foot runs in order to keep the hole straight.

The drill is a Chicago Pneumatic, air driven, mounted on a jack. Water is used to remove drill cuttings.

The coal is 7.5 feet thick and has no significant splits or partings at the drill site. Up to about 2 feet of the roof has been cut down. The roof is shale, nearly black at the base, becoming olive-gray upward. The lower part is very carbonaceous and contains vitrain laminae. Upward one shale becomes silty. It has fine parallel laminations throughout. Coarse plant debris (bark, stems) abundant on many of the bedding planes. Occasional joints strike about N.55-60 E. The floor is claystone, heavily rooted. The strata at the test site are horizontal to very slightly undulating.

Disturbance northwest of shaft

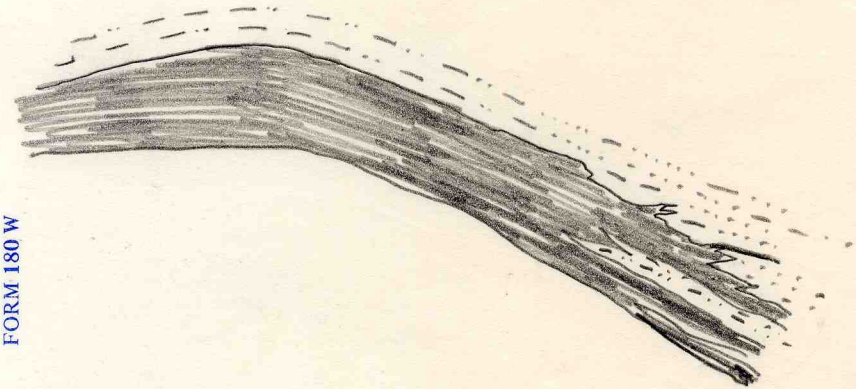
Ralph Sachs, Kerr-McGee geologist, showed me an area in northwest corner of bottom workings where coal seam is severely disrupted.

Exposures are very poor, due to heavy rock dust, and the area is only partially mined. Kerr-McGee plans to drive a set of entries through.

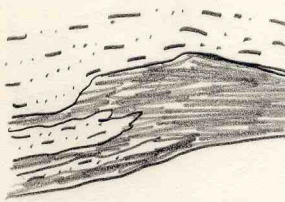
The disturbed area appears to be roughly linear and trends NE-SW. It is 200 to 300 feet wide. The coal on the southeast side rises slightly in elevation, then drops abruptly, and interfingers with siltstone. Some of the siltstone occurs as large irregular bodies within the coal, others as fairly regular bands. Also the upper part of the coal is irregularly truncated and overlain by siltstone with sandstone lenses.

Northwest of the disturbance the coal is 30-40 feet higher in elevation. It plunges abruptly down to the southeast. In one entry the upper portion is clearly eroded beneath siltstone-sandstone; coal layering is truncated, and stringers splay off into the roof.

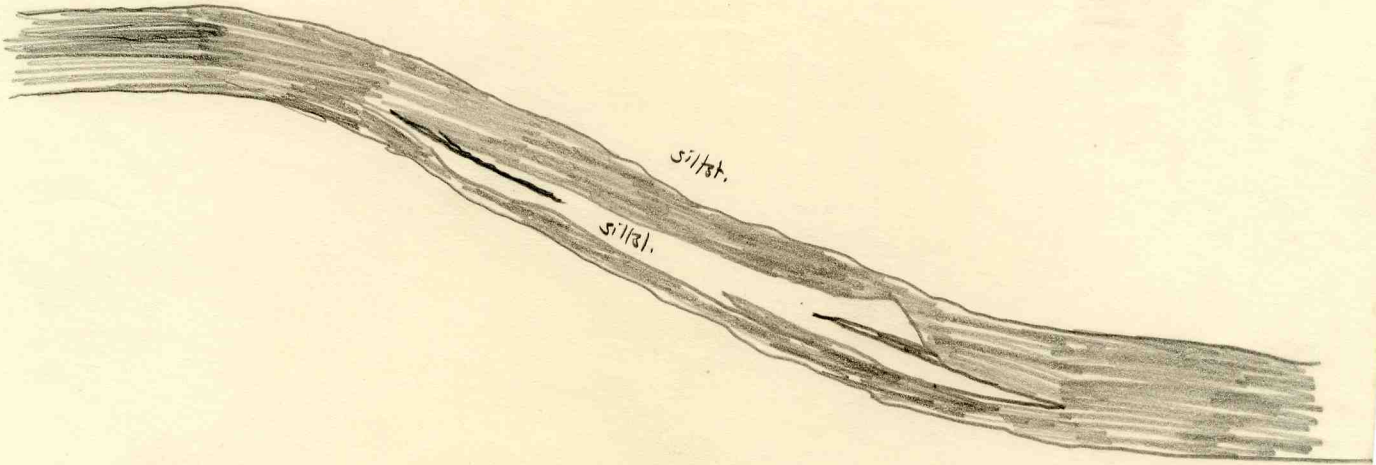
NW ← 300 ft ± → SE



not mined



Generalized section across main part of disturbance



Generalized section across eastern end of disturbance

The disturbance dies out to the east, where entries have been driven continuously across (west side of Main North). Here the coal rises strongly toward the north, and the lower part is severely split, but the coal is not cut out.

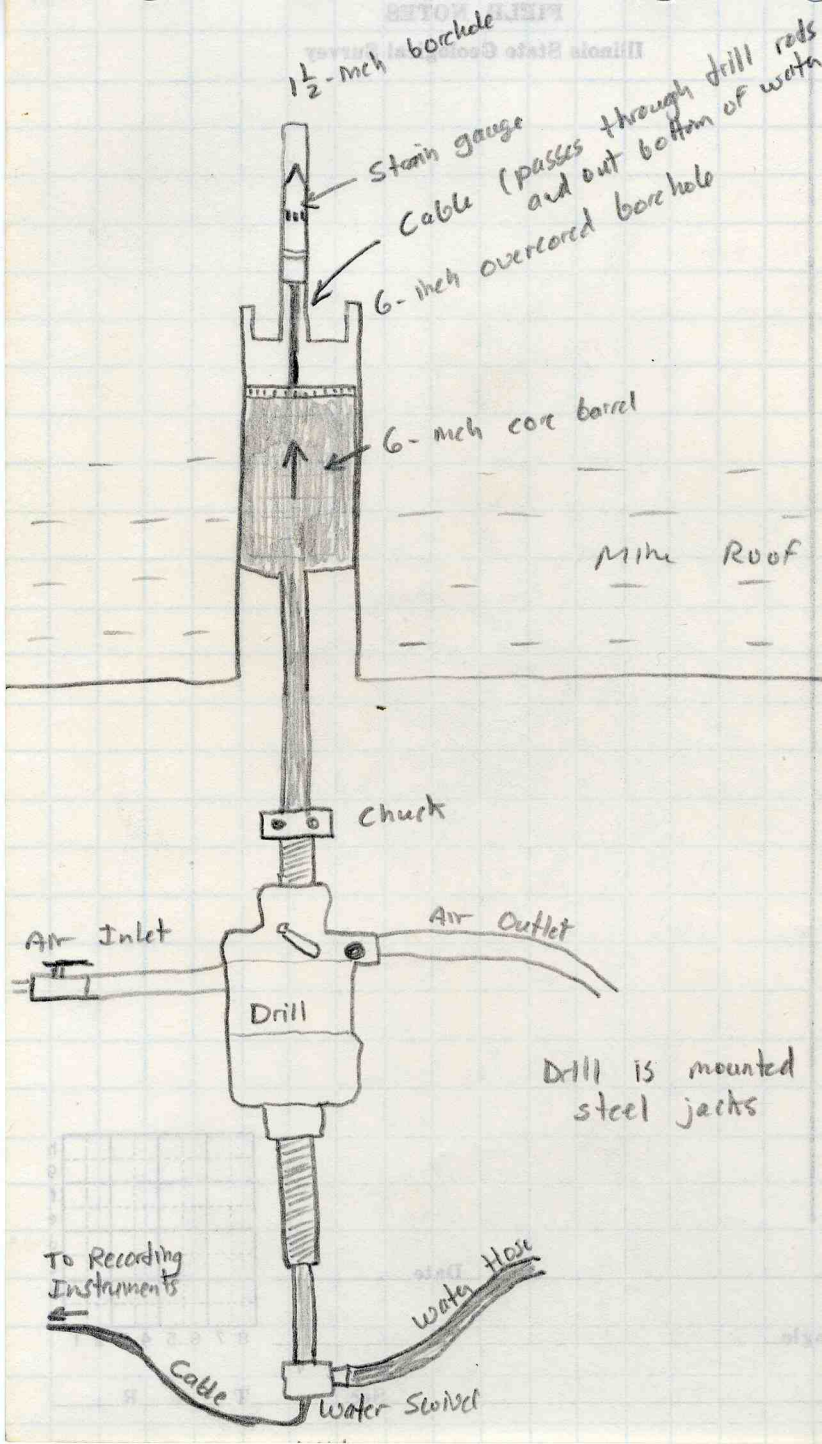
My impression is that the coal has suffered both contemporaneous and later erosion.

Stress-measurement procedure

First a 1½-inch diameter hole was drilled 7 feet vertically into the roof. Next a vertical scratch was made on the inside of the drillhole, for orientation - a special scribing tool used for the purpose. Then the hole was overcored to a height of about 3½ feet, and the 6-inch diameter core removed.

The first test was made by installing the strain gauge at about the 4-foot level. The gauge is a cylindrical device about 9 inches long. It fits snugly in the 1½-inch borehole, just above the overcored section. The gauge has 6 small pistons, spaced evenly around its circumference. These contact the wellbore, and as the rock expands or contracts, the pistons activate transducers. Signals from the transducers pass via cable to three recording instruments that are monitored during the test. The cable passes through the drill rods and out the bottom of the water swivel. See diagram. Strain gauge is oriented with aid of scribed mark in hole.

Two or three trial fittings of the gauge were required to obtain proper calibration. Adjustments were made by fitting tiny shims under the pistons. This was done to get roughly equal readings on all three instruments. Each instrument monitors two pistons, 180° apart on the gauge.


1½-inch borehole
Strain gauge
Cable (passes through drill rods and out bottom of water)
6-inch overcored borehole
6-inch core barrel
Mine Roof
Chuck
Air Inlet
Air Outlet
Drill
Drill is mounted on steel jacks
To Recording Instruments
Water Hose
Cable
Water Swivel

Now the overcoring barrel and drill rods were connected, and overcoring commenced. As the core barrel proceeds upward around the gauge, the stress on the gauge is released. This is reflected by drop in pressure values recorded by the three instruments whose readings are recorded continuously during drilling.

Following this procedure, the drill rods are disassembled, and gauge and core removed from the hole. A second test was then made at the next higher level.

This procedure would be repeated to a height of about 15 feet; I did not stay for the complete set of tests, which ordinarily take two to three days per test site.

Another procedure that I did not observe requires an intact length of 6-inch core at least 12 inches long (we did not obtain such core). The core would be placed in a biaxial test chamber, with strain gauge in the inner 1½-inch hole; the 6-inch core pressurized around its circumference, and readings taken to allow calculation of various rock properties. Failing to make this test, the rock properties must be estimated, or taken from other samples. The error should not be very great because the roof shale at this site appears to be fairly uniform.

View of roof of mine after first overcored section was removed.

The cylindrical metal chamberis used to pressurize sections of overcored rock, for calibrating the readings made in the drillhole.

Recording station. Three yellow boxes give readouts of strain from the three sets of calipers in the gauge, which is in the drillhole.

Kerr McGee Corp. Saline County
Galatia Mine
Shaft mine - Springfield (No. 5) Coal and Herrin (No. 6) Coal
Notes by D. K. Lumm
Field partner: S. K. Danner
July 23, 1986

Purpose of visit is to collect channel samples of the Springfield (No. 5) Coal and the Herrin (No. 6) Coal for Project USGS 86. Mine opened in October 1983 in the Springfield Coal and April 1985 in the Herrin Coal.

We met with Mr. Ed Doney, Chief Engineer, and were introduced to Mr. Bob Sterner, Mining Engineer, who will accompany us underground. We will first sample from the No. 5 Coal and then the No. 6 Coal.

Kerr McGee did not spare any expense in building and furnishing the above ground facilities. Each company miner is furnished with a clean pair of orange coveralls each day that is laundered on site. There is a well developed computer center for monitoring production, accumulation, shipping, and air ventilation, among other things. There is even a weight training and exercise room. This is the most complete mining facility I have seen. Perhaps the only drawback is that there is no electric generating station adjacent to the mine. All contract coal is shipped by Illinois Central Gulf Railroad to Union Electric generating stations in the St. Louis area. The mine is expected to produce up to 4 million tons/year when peak production is reached. Total production in 1985 was 1.21 million tons. Expected life of mine is 20-25 years.

John C. Moore Corporation, Rochester, N.Y. 14604
MOORE'S MODERN METHODS
FORM 180 W

Channel Sample No. 1 (No. 5 Coal) Lab No. C 25229

In-mine location: Main North Intake, cross cut 91
Surface location: 1625' from NL, 1850' from EL, Sec. 6, T.8S., R.6E., Saline Co.

Description of seam, from top to base:

roof: shale, medium gray, smooth, moderately hard, brittle, fissile, numerous plant impressions, at base, including Calamites, sp., moderately sharp contact with:

0.94' Coal: Springfield (No. 5); normally bright banded (NBB), black, vitreous, hackly fracture, predominately clarain - 85%, few vitrain bands .01' or thicker, several fusain laminae, weak cleat developed, some vertical calcite fillings and fractures, some pyrite cleat facings.

0.0-0.05 fusain, lense shaped, silky luster, sooty but moderately firm.

1.44' coal, NBB, similar to above, increasing quantity of vitrain, some bands o.o2'+ thick, several thin discontinuous bands of fusain, small amount of kaolinite on cleat facings.

0.02' durain, waxy luster.

0.49' coal, NBB, similar to above, increasing quantities of cleat pyrite downward of a dull brassy color, several small pyrite goat beards, thin calcite layers on bedding plane.

0.01' fusain, locally pyritized.

0.34' coal, NBB, similar to above, one pyrite goat beard.

0.03' fusain, firm, silky and sooty, discontinuous.

0.35' coal, NBB, similar to above.

0.02' fusain, soft, sooty, appears continuous.

0.86' coal, NBB, similar to above, some calcite and kaolinite cleat facings, patches of platy pyrite, small goat beards.

0.02' fusain, soft, sooty, silky

0.58' coal, NBB, similar to above, mostly clarain, numerous vitrain bands 0.01', small pyrite goat beards, small cleat, fusain bands increase downward, all less than 0.01'.

0.01' fusain, soft, sooty, silky

0.02'

0.15' coal, NBB, similar to above.

0.01'

0.02' fusain, soft, sooty, silky

1.40' coal, NBB, similar to above, small cleat, little calcite and kaolinite, less pyrite than middle of unit, predominately clarain, several bands of vitrain up to 0.02' thick

0.35' floor: claystone, moderately hard, medium gray, smooth texture, contains thin stringers of coal, few plant impressions, siltier downward.

0.35' coal (not sampled), NBB, very weak cleat development, thin vertical calcite fractures, very thin banded.

floor: claystone, similar to above, slickensides very firm, very smooth, little carbonaceous debris, waxy texture.

END SECTION Total sampled coal thickness = 6.74'

Springfield (No. 5) Coal
Channel Sample No. 2 Lab No. C25230
Mine location: 3rd South off Main East Return, Room 58L.
Legal description: 1250' S.L., 1625' E.L., Sec. 17, T.8S., R.6E., Saline Co., IL
Seam description from top to base:

roof: shale, medium gray, finely laminated, almost varved appearance, vitrain stringers and carbonaceous plant impressions near basal contact, well laminated, sheety fracture, dark bedding surfaces.

0.13' coal: Springfield (No. 5), normally bright banded, hackly fracture, predominately clarain, less than 10% vitrain, silky luster,

0.0-0.035' pyrite: discontinuous, silvery color, variable thickness.

0.81' coal: NBB, some calcite and kaolinite on cleat faces, silky luster, 85% clarain, 15% vitrain, moderate cleat development; coal very wet, some features obscured.

0.34' coal: NBB, similar to above, moderate pyrite on cleat facings.

1.90' coal: NBB, similar to above, wet, vitrain bands up to 0.01' thick, some calcite and kaolinite on cleat faces.

1.55' coal: NBB, very wet, with long, vertical calcite filled fractures, more vitrain than above.

0.02' shale: partly pyritized, discontinuous.

0.11' coal: NBB, similar to above

0.01' shale: partially pyritized

1.63' coal: NBB, similar to above, vitrain up to 0.04' thick, very hard, hackly fracture, minor calcite and kaolinite on cleat faces.

floor: covered

END SECTION Total coal thickness = 6.535'

Seam description: Herrin (No. 6) Coal
Channel Sample No. 1 Lab No. C25231
Mine location:
Legal description: 550' from SL, 1950' from EL, Sec. 6, T.8S., R.6E., Saline County
Description of seam, from top to base:

Roof shale: very dark gray, finely laminated, contains pyritized shell fragments, gritty texture, fairly sharp contact with:

0.77' coal: (Herrin No. 6), normally bright banded (NBB) black, silky luster, 85% clarain, fairly well developed cleat, contains one discontinuous pyrite laminae, wet

0.45' shale: pyritized, continuous

0.76' coal: NBB, similar to above, well developed calcite and kaolinite pyrite cleat facings vertical calcite filled fractures, 90% clarain, one band of fusain (0.01'-0.05'), wet.

0.49' coal: NBB, with small pyrite goat beards, one vitrain band up to 0.025' thick.

0.01' fusain: sooty

0.57' coal: NBB, similar to above, 80% clarain, 20% vitrain

0.005' pyrite: single laminae

0.74' coal: NBB, similar to above, only one vitrain band, wet

0.01'-0.03' pyrite: lense shaped

0.43' coal: NBB, 80% clarain

0.05' shale: pyritized

0.20'

0.24' coal: NBB, similar to above

0.12' shale: ("Blue Band") locally pyritized, medium brownish gray, hard

0.53' coal: NBB, some calcite and kaolinite on cleat faces, hackly fractures, very hard

0.01' fusain:

1.65' coal: NBB, very hard, small goat beards of pyrite wet, pyrite cleat faces, silky luster, minor calcite and kaolinite on cleat faces.

1'-3' floor: claystone, firm, slightly silty, medium gray, becomes plastic when wet, firm when dry, spots of carbonaceous debris.

END SECTION Total coal thickness = 7.05'

END MINE VISIT

Coal Week. Jan 4, 1988.

KERR-MCGEE SHELVES LABOR VIOLENCE SUIT; GOV. THOMPSON TAKES CREDIT IN GALATIA CASE

Playing the role of peacemaker, Illinois Gov. James Thompson (R) has helped to bring about a settlement in a six-year-old lawsuit between Kerr-McGee Coal Corp. and the United Mine Workers of America.

In announcing last week that U. S. district judge James Foreman had placed the $3-million suit on inactive status, Thompson won widespread praise from a union that once was among his harshest critics.

The Republican for years was roundly criticized by union officials for his handling of the 1981 protest at Kerr-McGee's nonunion Galatia mine in Saline County, Ill. State national guard helicopters dropped tear gas and heavily armed riot-equipped state police guarded the mine property when the demonstration by 2,000 protesters got out of hand.

In the aftermath, Kerr-McGee filed suit to replace property destroyed in the melee, in which fences were torn down and vehicles set ablaze. The company also sought punitive damages. The suit named 56 UMW locals and the union's District 12 in Illinois as defendants.

Because of delays and legal maneuvering, the case never came to trial. Now, said Thompson, it probably never will. "For all practical purposes, that should be the end of it," he said.

Thompson told union leaders during the inauguration of UMW president Richard Trumka that he and his attorneys had worked a long time to persuade Kerr-McGee to drop the suit.

"It had a wrongful, chilling effect on the activities of the UMW in Illinois," the governor said. "It stood as an irritant to coal mine operators and coal workers in Illinois." Now that the suit has been mothballed, "It rides no longer on the backs of the UMW," Thompson added.

UMW officials were pleased by the action and the governor's response. After endorsing his Democratic opponents in Thompson's first two elections, the UMW decided not to take sides when Thompson defeated Adlai Stevenson II for his third term a year ago.

A Kerr-McGee spokesperson said the judge's action was "suitable to us. We don't find it unacceptable."

N.
S.
E.
W.
R.

County Co. no.

8 7 6 5 4 3 2 1

Data sheet by Date

Kerr-McGee Coal Co. Galatia Mine Saline County, IL
Notes by John Nelson, June 6, 1988. Visit with Bill DiMichele, Don Eggert, Debbie Willard, and Dan Ganey (company).

Springfield Coal

Main entries run north and east from shaft bottom. Panels have been developed north and south of Main East Panel entries are oriented N.30°E. and S.30°E. This orientation was chosen to minimize effect of in situ stress.

Visited face of 4th South Panel briefly. Coal and roof fairly uniform. Coal is about 6.5 feet thick, with no partings. Roof is shale, medium-dark gray, poorly laminated, silty, in part has faint parallel laminations; slightly sideritic; abundant plant fossils; Sigillaria and lycopod trunks (horizontal); pteridosperm foliage (largely broken). Fossil stumps in growth position also are present. Most of the flat stems and logs are concentrated in the lower few inches. The main roof is fairly stable except where "kink zones" are present. Note Pecten fossils in shale.

Occasional joints trend about N.85°E., kink zones N.20°W. (parallel to entries at this site).

5th South Panel

Visited working face. Jeffrey and Wagner Diesel-powered shuttle cars are in use. The scoops also are Diesel. They are not pulling pillars currently. Point anchor roof bolts are in use.

Coal is 6 to 6½ feet, no shale.

Main North - Split Coal

On return-air (east) side of Main North, 4200-4700 ft. north of bottom. The coal is split by brownish-gray, hard massive siltstone up to 5 feet thick, near the middle of the seam. It goes from 0 to 2 feet thick in about 12 feet horizontally, at the north edge of the split area, reaching 5 ft. thick in about 100 feet. No rooting is present. Frequent inclined stringers or splits of coal enter the siltstone from above (mostly above) and below; also some are isolated within it. Both contacts of coal to siltstone undulate and are knife-edge sharp.

In places additional thin siltstone layers and lenses near the base of the coal. These are not rooted. The main floor is rooted claystone grading down to siltstone. The roof is gray shale, very carbonaceous and nearly black at the base; becomes firmer and less fissile upward, abundant fossil logs, etc. Occasional joints trend N.55°E.

The split pinches out on the south almost as abruptly as on the north. The split area is roughly 500 feet across.

I surmise that the coal above the split consists largely if not entirely, of transported peat. This best explains the absence of rooting in the split and the many stringers--"upside-down riders"--of coal that split off the bottom of the upper coal bench, and finger downward into the clastic parting.

The clastic parting itself probably was deposited quite rapidly and by strong currents that cleaned off the top of the underlying peat. The split is much coarser than the roof or floor rock.

Thin Coal Area

Main North Return, eastern entry. Measured section at Crosscut 14:

3.5' Shale, medium-dark gray, very silty, faint parallel laminations, occasional light gray siltstone laminae, coarse plant debris on bedding planes. Grades into:

3.0' Shale, similar to above; more distinctly laminated; siltstone laminae and horizontal burrows(?) near top, occasional coal laminae, Pecten common. Faint sideritic banding; all parallel laminations, shale becomes darker toward base. Grades into:

0.2' Carbonaceous shale to bone coal, hard, parallel laminated, vitrain laminae. Grades into:

0.6' Coal, subbright, finely laminated, about ¼ of coal vitrain in laminae 1-2 mm. thick. Blocky fracture, orange calcite (?) cleat fillings. Grades into:

0.35' Coal, dull, hard, finely laminated, occasional vitrain laminae, widely spaced cleat. Sharp undulating contact.

0.35' Sandstone, medium gray, very fine grained, hard, massive. Varies in thickness. Sharp contact:

0.15' Coal, subbright-banded, with lenticular vitrain laminae. Grades into:

0.5' Claystone, black at top to olive-gray at base, soft, very carbonaceous, many coal laminae. Grades into:

2.0' Claystone, greenish gray to olive gray, firm, silty, rooted - definite stigmarian casts. siderite.

This is nearly the thinnest coal. The units described above persist for some distance, the coal gradually

thickening to the south. The sandstone bed increases to over a foot thick, and there is only 0.1-0.2 ft. coaly shale between this and the underclay. Occasional thin siltstone laminae and lenses occur in the main, subbright portion of the coal.

In places the regular, horizontal varvelike laminations in the shale are very noticeable, especially within the basal 1-2 ft. above the coal. The presence of Pecten indicates this is not a freshwater lake deposit, but some kind of protected brackish or marine lagoon or bay.

Again I believe that most of this coal may represent detrital peat - except the part below the split, which has rooted underclay.

Herrin Coal

The area of coal balls near the shaft bottom was reconnoitered, for later bulk collection.

A large area is severely affected. One pillar about 200 feet square has the coal full of limestone nodules top to bottom, up to 75% of the seam is limestone. The roof is black shale loaded with limestone masses and concretions. The area is very well disposed for collecting.

The coal remaining between the coal balls is dull, friable, and heavily mineralized.

Dan Ganey reports coal balls have been encountered in several other areas in this mine.

Mine Notes - Kerr-McGee "Galatia #6"-Saline Co.

Trip: Sept. 8, 1988 by Phil DeMaris, John Nelson, Bill DiMichele (Smithsonian), Tom Phillips (U.of I.), Debra Willard (U. of I.) with Joe Farinelli, Mining Eng. & Guide

Coverage: Introduction
Coal ball sites at big pillar
Conclusions
Samples: Set "A" (KG6-A-1 to -10)

Introduction

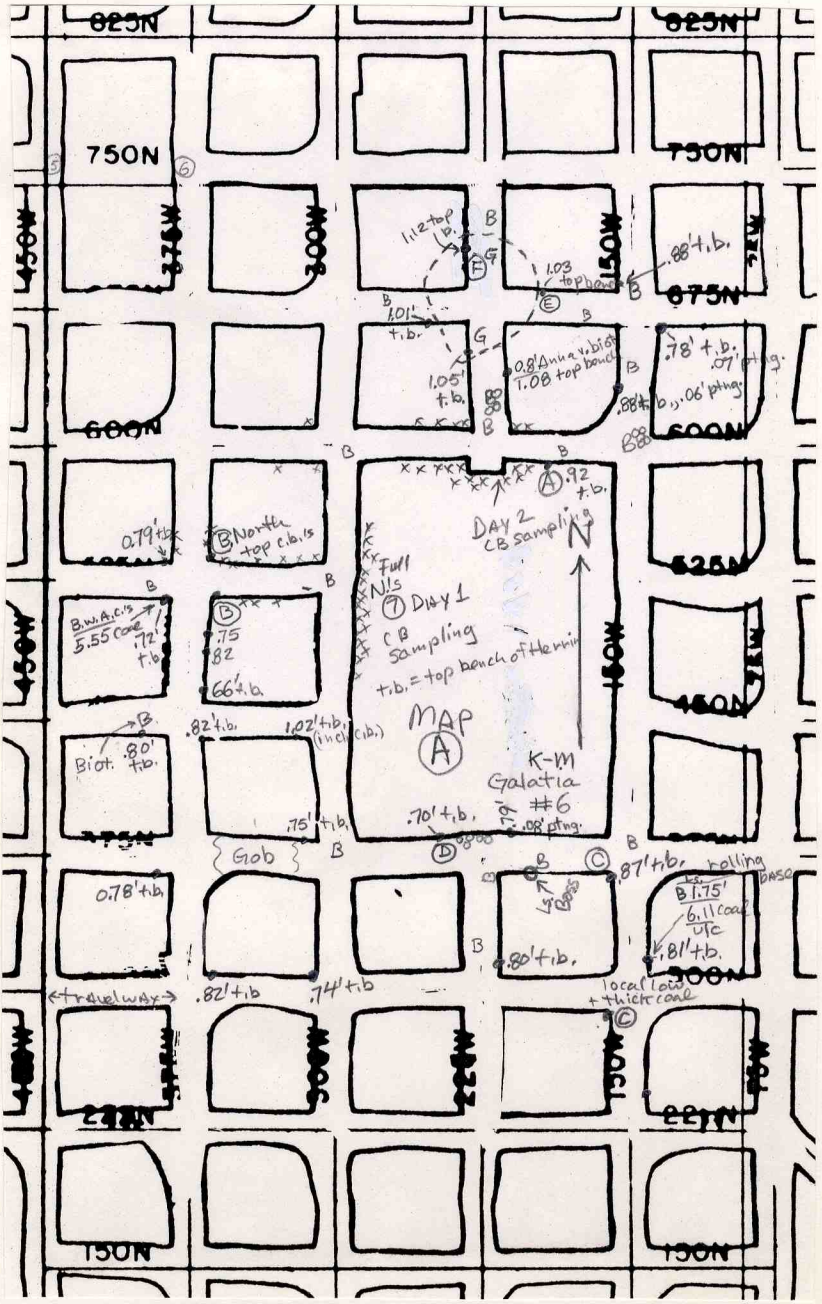
The collection of coal balls began on Sept. 7 by Nelson, DiMichele and Phillips with Dan Ganey (K-M) at Nelson's site 7 on the west side of the large pillar. (See map A). Collection site for second day is on the north side of large pillar. Purpose of visit is to assist in establishing stratigraphy of coal-ball zones, and sampling of special coal balls for C and O isotopes.

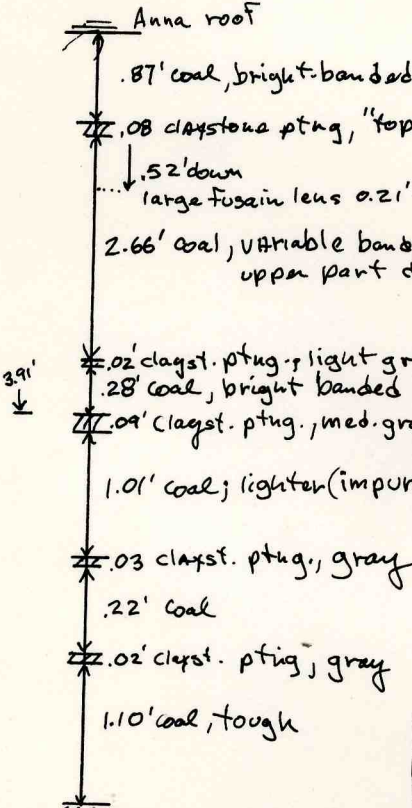
Coal-ball sites area

A. Gear dropped off at next collection site where notch was cut into pillar and shot holes drilled. Seam desc. done here later is 6 meters east of collection site, and is reported after B. North work.

B. John and I examine highly bioturbated Anna shale roof. Anna ranges from clearly recognizable Anna with tubular ls.-filled bioturbation traces (seen in various orientations and cross-sections) to a thin unit

Galatia #6





D. There is 0.70' coal above top claystone parting (.04' med gray clayst.) over mid-seam coal balls. A coal ball 3.05' from top of seam was sampled for isotopes (KG6-A-2).

full of 0.2 to 0.8' pillows of ls. (from tubes?) with traces of black, normal Anna between. Locally there are spots of tough black limestone, apparently mineralized Anna. B North follows D., below.

C. Nice Anna exposure and coal thickness taken for control. Herrin is 6.42' thick and there is 0.85' coal above top claystone ptng., which is .06 to .08' thick and pyritic. No clear "blue band" was picked from multiple bands.

Anna is 1.20' thick with a little bioturbation at the top. There are 2 sets of probable phosphatic bands; one near the top and one at the middle. Base of Brereton slightly rolly. Top of Herrin appears dull-banded; one vitrain stringer seen to go 0.2' into Anna at about 30° angle. One bioturbation "tube"(ave. .06' diam.) runs 20° to top of coal and lies near base of Anna. Two other ls.-filled biot. "tubes" were seen; lowest one is 0.8' below base of Brereton. Several thick (to 0.3') fusain lenses seen locally in bottom 2' of coal seam. Further north at corner a seam description was made:

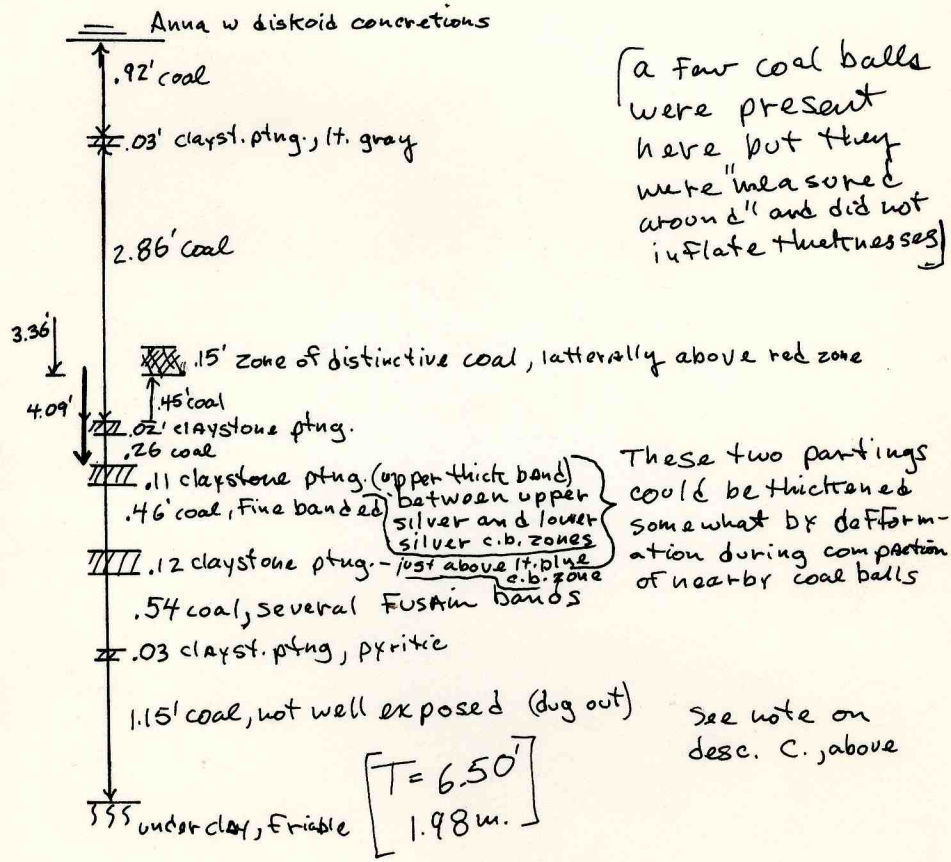
B. North Debra and I return to sample coal balls at top of coal seam; area with these high c.b.'s includes her coal collection site, just to the west at Nelson's site 8. Predominantly the coal balls are normal top seam coal balls, but several have little to no(?) coal on their top contact to the roof shale. The role of ls.-filled bioturbation traces was not appreciated in-mine, but 2 samples taken here as coal ball (A-3 and A-7) proved to contain, or were simply, bioturbation "tubes" on further examination.

A coalball which appeared to contain Medulosa, lying on the Herrin/Anna contact (A-3) proved to be a ls.-filled trace. A-4 is a normal top-of-seam coal ball only 0.3' below Anna contact, with an Anna Conc. immediately above it; it was collected 20' N. of the corner on the E. rib. To the west near N.'s 8 on west rib a coal ball, A-5 (a normal coal ball) was collected; it has a top contact direct with Anna sh. Phillips DiMichele & Nelson collected a random top-coal coal ball collection in this area near the end of the shift.

A larger normal coal ball in a block was collected (A-6) in 2 parts. Debra sees nice leaf bases in it. It will be set in plastic and cut for a photograph and peel. Top of coal ball is thrust into Anna on two symetic compactional faults, so cause is clearly post-depositional deformation. A-7A is a coal ball from top coal for isotope analysis. A-7B is a bioturbation tube trace from the Herrin/Anna contact for isotope analysis.

Further sampling is possible in this area. One normal coal ball which appeared suspended in Anna (.07' above contact) in 2D was not sampled, but could be sampled with further rib rashing. This coal ball was the best single piece of evidence for peat loss by erosion in this area, since all other coal balls examined in the area have at least a trace of vitrain on their top contact to Anna. With a 10:1 peat-to-coal ratio it would not be unusual to not encounter a partly or fully uncovered coal ball in a modest sample, assuming an early erosion mechanism for peat loss.

A. Rough seam desc. done 6 meters east of the prime collection site. The two thicker low-seam partings are recorded relative to the collected coal-ball zones. Thinner claystone partings are present as are fusain bands which have some local continuity, but I was unable to track these latterally. However, a rough match was made between sites for a zone of distinctive coal 0.73' above the upper thick claystone parting; at the coal ball collection site the zone of distinctive coal lies above the top coal-ball zone (red zone) and has an ave. of 35-40 cm. of coal balls above the top thick parting. This means that the top 3.36' (1.10m) of the 6.50' (1.98m) seam was unrepresented in the collections of the red zone and below. I was able to track the .02' claystone ptng. 0.26' above the top thick claystone ptng. close to the collection site, but it was lost at a compactional slip above a gold zone coal ball; the gold zone was extended here, but not collected here. The match of this position with the top of the gold zone is thus approximate. Description follows:



E. Mapping effort first reached patch of Energy Shale roof here (Nelson also mapped this area). Much deformation and shale/coal mixing at Herrin/Energy contact at edge of 'pod'. I didn't see a coal rider above the Energy reported by Nelson to me earlier. There are coal stringers to 0.01' thick in Energy up to 2' above contact. Shale itself is med. gray; bulk sample of bottom 0.5' taken(-A-9).

F. By this point it had become clear that the top bench of the Herrin is thicker under and near Energy Shale roof; it is 1.12' here above the top parting, but that is higher than most nearby points (see raw data on Map A). John and I discuss my hypothesis that thickest Herrin will be found under Energy shale areas, based on top bench measurements. In the meantime I have seen the coal rider that John saw, which lead him to think peat deposition lasted after Energy deposition began. This Herrin "rider" situation occurs along the Energy/Anna contact in only one exposure out of 8 rib exposures, and can be explained by compactional deformation of gray mud in a peat/black shale mud "sandwich". Elsewhere the Energy/Herrin contact is irregular; faults are common but generally die out in the top 1' of the coal.

Odd coaly unit here prominant at top of Herrin. It is not Anna (as I suggested to John) but a dull Herrin facies, about 0.4' here, and it was sampled (-A-10). Examination of unit shows it to be dull coal with thin vitrain streaks; it is probably high in ash.

Conclusions

This was my initial trip into this mine, but since the roof geology was somewhat similar to that of Franklin Co. I felt fairly familiar with the setting. Using work at O.B.#24 and #27 as a model, I hypothesize that the coal balls are associated with areas of thin coal above the top Herrin parting in this mine, typically about a foot. I believe this

correlation may be caused by differential peat loss due to erosion. Preliminary measurements support this position. More thickness data is needed to fully test this, and could show some pattern that will be useful for prediction of areas with coal balls, or areas more likely to have coal balls. Testing the above hypothesis will take more work in this same area. Evaluating possible prediction would take work in areas without coal balls for comparison.

Samples; Set "A" (KG6-A-1 to -10)

#	Site	Desc.
KG6-A-1	C	Fusain from 0.21' unmineralized fusain lens 1.47' from top of Herrin (XRD & pellet)
-A-2	D	Coal ball 3.05' from top of seam (isotopes)
-A-3	B.No.	Bioturbation tube trace from coal/Anna contact
-A-4	B. No.	Small coal ball in top coal, oriented; cast in block and cut for isotopes. Very close to Anna contact
-A-5	B.No.	Coal ball in top coal; normal, but very top contacting Anna (isotopes)
-A-6	B.No.	Large coal ball in a block with nice compactional faults. Cast for peat-to-coal measurement and as illustration.
-A-7A	B.No.	Prob. mixed c.b. with two sep. biot. traces - plants permineralized only adjacent to one. (iso.)
-A-7B	B.No.	Ls.-filled biot. trace (lost)
-A-8	B.No.	Coal ball from Herrin/Anna contt.
-A-9	E	Energy Shale, bottom 0.5' (XRD)
-A-10	F	Herrin Coal; top 0.4' where dull with fine vitrain stringers and streaks. (petrog. and chem.)

Mine originally operated by: (1)

Date

Original name or number:

Illinois Coal Report p.

LATER OPERATORS

Date	Operator	Name or No.

BRIEFLY IN COAL

"**Kerr-McGee longwall:** As its underground mine near Galatia, Ill., continues to grow, Kerr-McGee Coal Corp. is giving serious consideration to establishing a longwall mining unit to boost efficiency and cut costs. A Kerr-McGee spokesperson in Oklahoma City told Coal Week a longwall may be in the plans for the Number 6 seam at the dual-seam mine. The 6 seam is about 450 feet deep. The Number 5 seam at Galatia is about 550 feet deep. The spokesperson did not know when a final decision on the longwall would be made. Coal shipments from the Galatia mine totaled 2.2 million tons in 1987, and the company projects they will increase to 2.4 million tons this year. Most of the coal goes to Union Electric Co. in Missouri under a long-term contract."

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10 COAL WEEK • March 21, 1988

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*Also owners #See ownership sheet

Railroad, Wagon, Strip, Idle, Abandoned

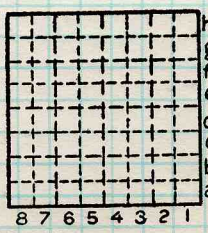
IDENTIFICATION

County No._____ Coal No.

Coal Report No._____ ☐

Quad.

County



Sec.

T. N. S.

R. E. W.

Index. No.

COAL MINE OPERATOR

(92753—1M—6-54) 2

Kerr-McGee Coal Corp. Galatia Mine
John Nelson, Sept. 7-8, 1988

Collecting coal balls with Tom Phillips, Bill DiMichele, Phil DeMaris, Debra Willard, and Dan Ganey (Kerr-McGee) about 1000 ft. north of shaft bottom in Herrin Coal.

Numbers keyed to field map.

1) Measured section of seam:

Roof - Limestone?

0.9' Anna Shale, black and fissile; numerous deformed lenses of medium dark gray fossiliferous limestone (biomicrite) in upper portion; also large oval septarium concretions of dark gray, dense sublithographic limestone; numerous small slip fractures surround lenses. Phosphate laminae and coal stringers at base. Sharp contact:

0.85' Coal, bright banded, calcite on cleat facings, pyrite lenses and "goat beards."

0.02'-0.10' Shale, medium gray, hard, slightly pyritic.

2.3' Coal, as above. Much fusain in lower 0.9 feet, especially 0.6 to 0.9 ft. above the base.

0-0.03'	Shale, medium gray, pyritic, discontinuous.
0.20-0.25'	Coal, similar to above with little fusain.
0.10-0.17'	Shale, medium to dark gray, very carbonaceous with coal laminae, lenticular.
0.40'	Coal, duller than above.
0.10-0.12'	Shale, dark gray, numerous coal stringers and laminae, in part grading to bone coal.
0.60'	Coal, bright banded.
0.02-0.05'	Shale, dark gray, and fusain intermixed with vitrain stringers.
0.22'	Coal, bright banded.
0.01-0.02'	Shale, medium gray, discontinuous.
0.95'	Coal, bright banded.
$2\frac{1}{2}' \pm$	Claystone, medium to dark gray, slightly silty, blocky fracture, medium-firm, slickensided, brownish limestone nodules near floor.

Total seam thickness - 5.9 feet.

2) Three crosscuts north of last station. Immediate roof is about 1.2 feet of Anna Shale without limestone lenses and concretions, grading to a burrowed "clod" zone at the top. The main roof is limestone.

Between this place and location 1, the Anna Shale is mostly less than a foot thick and contains abundant limestone lenses and septarian concretions, as at Loc. 1. These are much more numerous than is usual in the Anna Shale in most mines I have studied.

3) Lens of Energy Shale. The lens is roughly circular in map view and about 50 feet in diameter, maximum thickness a little over 3 feet. The shale is medium gray, locally dark, massive mudstone to weakly laminated shale, slightly silty, weather yellow, coal fragments common, Lingula present. The shale interfingers with the coal all around the outer margin of the lens. Thus, it was either deposited contemporaneous with peat, or peat was ripped out and replaced by mud not otherwise preserved. The Anna Shale overlies the Energy Shale with a sharp contact.

I disagree P.J.O.

Major coal ball accumulation begins just south of this point.

4) Major coal ball accumulation. Coal balls first appear in the mid-lower part of the seam just south of Location 3. Here they are mostly walnut to fist-size and concentrated in definite layers and lenses within the coal. They rapidly increase in size and number southward and within 50 feet the full height of the seam is replaced with 70-80% of the volume in coal balls. The seam thickens to about 8 feet on the face of the large pillar. The coal balls are medium brown and calcitic.

The roof is Anna Shale, loaded with limestone lenses and concretions. This was the 2nd coal-ball collecting site.

5) Large coal ball accumulation separate from the one of Location 4. The miners left a large pillar (one crosscut omitted) because of the coal balls.

The lower part of the seam is most heavily replaced here, and near the core of the mass, the middle part is replaced also. Only scattered coal balls (some are a foot long) are found in the upper 1 foot of the coal, above the uppermost shale parting. The seam thickens by 2 to 3 feet; the roof strata rise above the mass, but the lower part of the seam was not mined where the coal balls are thickest.

The Anna Shale thickens northward from a few inches to a little over 1 foot. It is loaded with limestone concretions and modules near the southernmost margin of the coal-ball mass, but above the thickest part of the coal balls, the shale contains few nodules.

6) Coal-ball mass; east side of mass of Location 5. The following section was measured near the thickest point of the mass:

Roof -	Limestone nodules, dark gray.
0.5'	Anna Shale, with abundant limestone nodules, as at Location 1.
0.9-1.0'	Coal, bright banded, occasional spherical to flattened coal balls less than one inch thick. Undulates.
0.05'0.15'	Shale, medium gray, with occasional coal laminae and stringers. Undulates.

3.9' Coal with coal balls, heavily replaced (50-75% coal balls), spheroid, lenticular and irregular, brown calcite coal balls ranging from less than an inch to about half a foot thick, occasionally larger. Coal balls less numerous in basal 0.5 feet of interval; gray shale lenses near the base.

0-0.25' Fusain, mineralized; lenticular band.

0.10' Coal, bright banded.

0 - 0.14' Shale, grayish-black, hard, much fusain intermixed. Lenticular.

2.2' Coal, bright banded, with several thin lenticular gray to black shale bands. Occasional coal balls. Fifteen feet south of this point, this interval is heavily replaced.

0.2' Claystone (floor) dark gray, soft, poorly exposed.

Total seam thickness approx. 7.4 feet.

7) First coal ball collecting site. This is on west side of large pillar, 3 x 2 crosscuts. The coal seam is at least 9 feet thick in places and is 70-80% replaced by coal balls, which are arranged in crude layers. Coal balls have been left in the roof and probably in the floor in some places. At the actual collecting site, the upper $2\frac{1}{2}$ feet of the seam is only slightly replaced, the remainder to the floor is heavily replaced.

The roof is fractured Anna Shale loaded with limestone nodules and concretions.

8) West of Location 7; measured section:

Roof -	Limestone
0.7-1.0'	Anna Shale, with abundant limestone nodules and concretions, as at Location 1.
0.80-0.95'	Coal, bright banded, with pyritized "goat beards"; occasional coal balls several inches in diameter at top of seam, some protruding into Anna Shale. Limestone concretions in Anna protrude into coal, making an irregular contact.
0.01-0.05'	Shale, medium to dark gray; locally thin to a streak. This parting persistent through area mapped.
1.95'	Coal, bright banded, occasional fusain band; much calcite on cleat faces, pyrite less common and found in "goat beards."
0-0.03'	Shale, dark gray to black, discontinuous.
0.43'	Coal, as above shale.
0.01-0.05'	Shale, dark gray, with much fine-grained pyrite, appears moderately continuous.
0.23'	Coal, as above.
0.10'	Shale, black, hard, laminated, many

vitrain laminae.

0.45' Coal, mostly dull, occasional vitrain laminae, many laminae of shale as above.

0.82' Coal, bright banded, with fusain lenses; shale lens 0.3' above base.

0.01-0.03' Shale, medium to dark gray, possibly the "blue band."

0.85' Coal, bright banded, with calcite on cleat faces.

0.2' Claystone (floor), dark gray, hard.

Total seam thickness 5.8 feet.

In most of the area mapped thus far, I have seen one persistent shale band 0.8 to 1.0' from the top of the coal, and a dark gray to black shale band 3.3 to 3.5' from the top. Commonly one or more thin gray shale partings closer to the floor.

On southeast corner of same intersection, a good exposure of roof strata above coal containing coal balls. The roof consists of irregular nodules of limestone, of Brereton lithology, within typical black Anna Shale. The limestone is medium to dark gray with brown crystalline patches, very fine to fine-grained with scattered fossil fragments including definite gastropods. Limestone lenses mostly have rounded edges but locally they are sharply angular. Phil DeMaris believes some limestone lenses are infilled burrows. The interval is more than a foot thick and appears to grade upward to solid limestone. The roof is "bossy" (Large broad undulations,

deforming top of coal). Some of the nodules may be Anna Shale replaced by calcite--dark, very fin grained dense limestone.

9) Measured section of coal.

Roof -	Limestone?
0.75'	Anna Shale, black and fissile, with gray calcareous laminae, occasional spheroidal limestone nodules 0.1 to 0.2' in diameter.
0.77'	Coal, bright banded, thin fusain lenses near middle, pyritized "goat beards."
0.09'	Shale, medium to dark gray, with vitrain stringers.
1.75'	Coal, similar to above; calcite cleat facings.
0-0.05'	Fusain, shaly, pyritic, lenticular.
0.45'	Coal, as above.
0-0.04'	Fusain, mineralized
0.25'	Coal, as above.
0.07'	Fusain, intermixed with black shale.
0.43'	Coal, somewhat duller than above, mor thinly laminated.
0.05'	Shale, dark gray, with finely dispersed coaly fragments.
0.52'	Coal, bright banded.

0.03' Shale, dark gray to brown.

1.10' Coal, bright banded

0.5' Claystone (floor), dark olive-gray, firm, silty.

Total seam thickness 5.53 ft.

10) Measured section of seam

Roof - Limestone

1.1' Anna Shale, black and fissile, no nodules.

0.50' Coal, bright banded.

0.05' Fusain, soft.

0.30' Coal, as above.

0.04' Shale, dark gray, with pyrite lense

2.70' Coal, bright banded, lower part slightly duller. Occasional fusain lenses. Much fine-grained pyrite, thick calcite cleat fallings.

0.08' Shale, dark gray, hard, with coal stringers.

0.42' Coal, slightly duller than above, thinly laminated.

0.10' Shale, dark gray to black, slightly pyritic.

0.60' Coal, bright banded, calcite and

pyrite.

0.05' Shale, medium gray, pyritic

1.15' Coal, as above, blocky.

Underclay (top only exposed)

Total 5.99 feet.

Addendum, Location 4

Second coal-ball collecting site was on south rib of crosscut about 20 feet east of intersectio labelled #4. At this point, the lower and middle part of the seam is solidly replaced; the upper 2.2 feet of coal contains no coal balls, and arches over the mass. The upper persistent shale parting traces across the site. Two lower shale partings, 4.1 and 4.7 feet below top of coal, can be traced through the mineralized zone, although they are greatly deformed and pinch out in many places. See sketch (next page). "Color names" refer to Tom Phillips' zonation of coal balls for collecting.

Summary

I come to no definite conclusions on the relationship of coal balls to other geologic features here. Limestone nodules and concretions in the Anna Shale seem to be associated with coal-ball masses, but we are not sure whether this has anything to do with coal-ball formation. The coal balls may have formed before the Anna Shale was deposited. This is suggested by coal balls protruding part way into Anna Shale at Location 8. The coal balls may have formed, then th e top of the peat was partially eroded before Anna Shale was deposited with the underlying peat heavily replaced by calcium carbonate, the shale may have been partially calcified also, and lime mud introduced by burrowing organisms may have been preserved where it ordinarily would have dissolved. That is, the sediments here were alkaline rather than acidic.

Summary description of coal seam

The Herrin Coal has consistent internal stratigraphy in the vicinity of the coal balls. This is illustrated by the measured sections and by numerous observations between the measured sections.

The coal is ordinarily 5.5 to 6.0 feet thick, where not replaced by coal balls. It is at least 9 feet thick where it is heavily replaced by coal balls.

There are 4 persistent shale partings in the seam. The first is medium to dark gray shale, with occasional pyrite lenses, located 0.7 to 0.95' below the top of the coal. The shale varies from a hairline to 0.15' thick and locally pinches out for a distance of a few feet. I believe this

band is the "sulphur band" found at this position in the coal in most of southeastern Illinois and adjacent parts of Kentucky.

The coal above the "sulphur band" is bright banded. A lens or discontinuous layer of fusain occurs near the middle of this interval in several places (see Loc. 10).

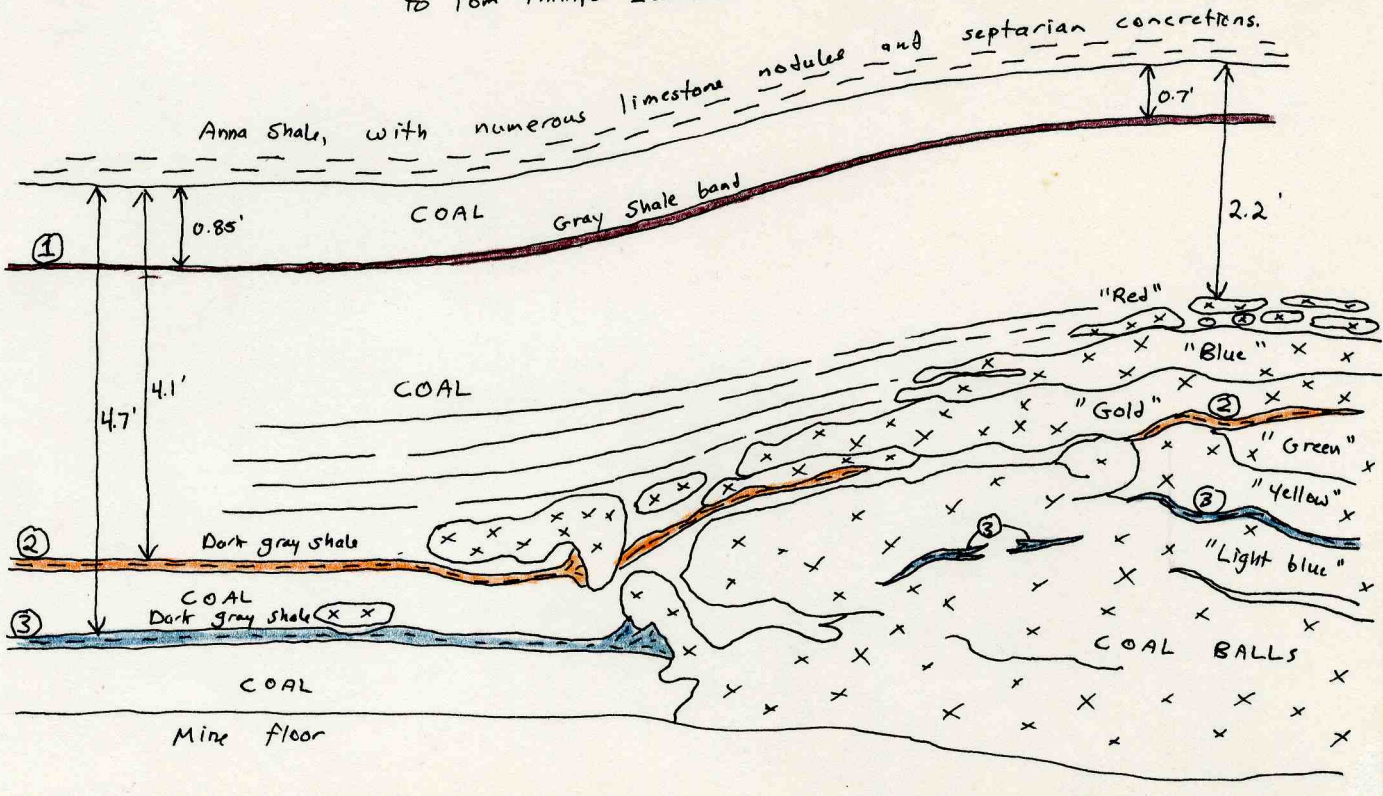
Below the "sulphur band" is 2.5 to 2.8 feet of bright-banded coal, which contains discontinuous layers of fusain and dark gray carbonaceous shale near the base.

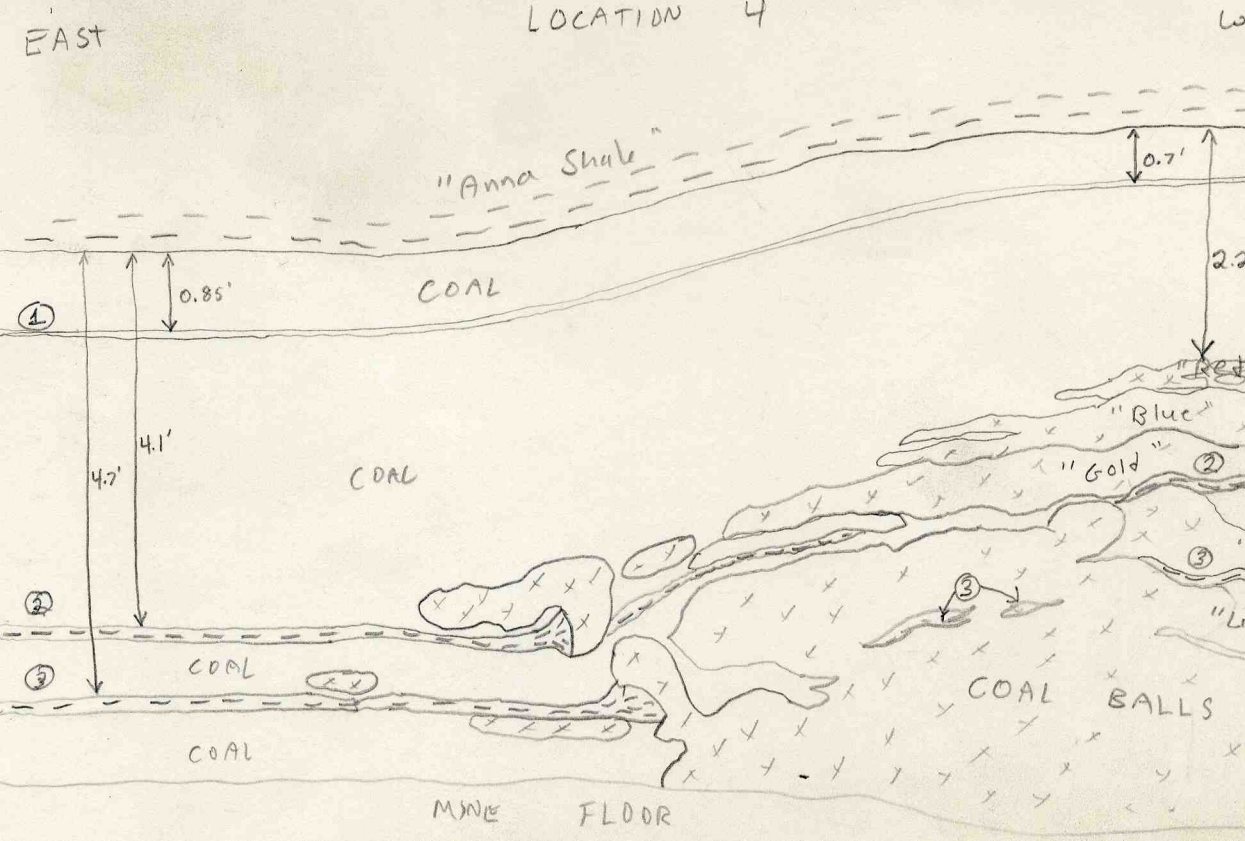
Next are found two layers of very dark gray to black bony coal to carbonaceous shale, each commonly 0.10 to 0.12 feet thick, and separated by 0.40 to 0.45 feet of coal, which is noticeably duller and more finely laminated than the rest of the seam.

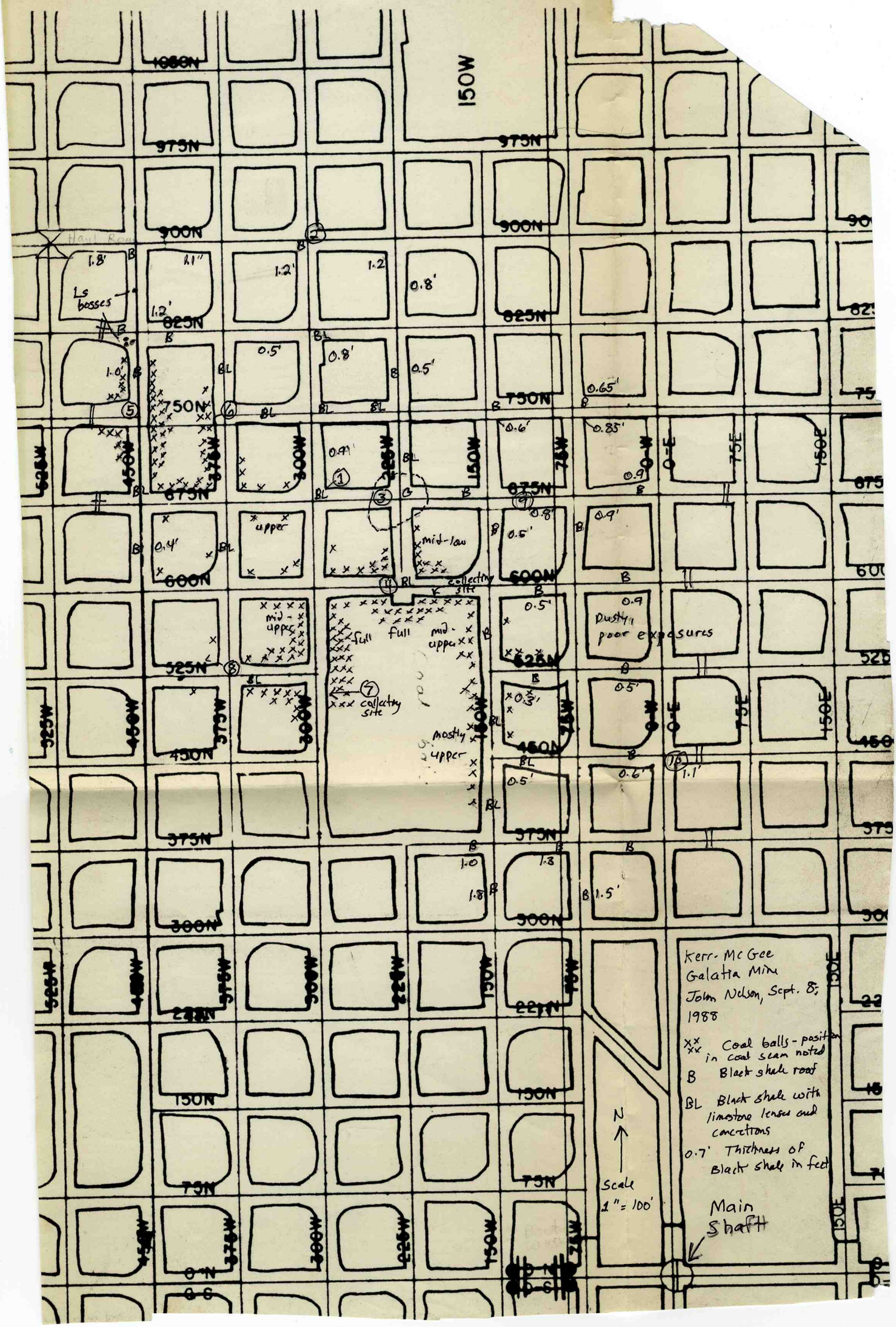
A thin layer of gray shale is found in most sections 0.6 to 0.9 feet below the lawn of the black shale bands. In some places, two or three closely-spaced shale bands occur in this position. The coal below the two black shales is bright banded.

The shale partings can be traced into areas of coal balls, even where the coal is almost entirely mineralized. The shales have been greatly squeezed and stretched between the coal balls as a result of uneven growth and compaction.

Sketch of face, Location 4, just east of collecting site. "Colors" refer to Tom Phillips' zonation.




EAST
LOCATION 4
"Anna Shale"
0.7'
0.85'
COAL
1
4.7'
4.1'
COAL
"Blue"
"Gold"
2
3
2
3
COAL
COAL
COAL BALLS
MINE FLOOR


150W
975N
900N
825N
750N
675N
600N
525N
450N
375N
300N
225N
150N
75N
0-N
0-S
Haul Road
Ls bosses
upper
mid-low
collecting site
mid-upper
full
mostly upper
Dusty, poor exposures
Kerr-McGee
Galatia Mine
John Nelson, Sept. 8, 1988
Coal balls - position in coal seam noted
B Black shale roof
BL Black shale with limestone lenses and concretions
0.7' Thickness of black shale in feet
N
Scale 1" = 100'
Main Shaft

Mine Notes - Kerr McGee "Gallatia #6" - Saline Co.

Trip: February 21, 1989 by Phil DeMaris with Anil Atri (SIU), escorted by Bob Pressett

Coverage: Introduction
Visit to N. Main's
Visit to panel W. of N. Main
Samples: KG6-B-1 to -6

Introduction

This is the third mine visited on an IMSRP-funded grand stability project under Dr. Chugh's direction.

Visit started with a meeting among Ed Doney, Chief Eng.; Rolf Sachs, Geologist from Okla. office; Bob Pressett, Eng.; Gerald ; Paul Chugh and Anil Atri of SIU and myself. We were briefed on roof conditions, mining procedures and planned longwall development, as follows:

Paul Chugh made introductory remarks about goals of study. Ed Doney pointed out that lithologic variation commonly changes over 200', so that generalizations can be made about study areas only--generalizations about mine from limited study areas are inappropriate. Doney indicted that post-mining weathering does not cause roof stability problems (we learned later that they mine-out the Anna Shale, so this makes sense). They do have water problems in no -ls. roof areas, so they do 5' cuts only there.

Bob Pressett briefed us on roof and floor lithologies. Typical roof sequence is thin Anna Shale with thick Brereton Ls. above and Anvil Rock ss. above that. Brereton 4' and over is "good roof" and 20-30' cuts can safely be made. Anna generally averages 6"-14" and locally gets to 2-3", or up to 1 1/2' thick. Energy shale roof occurs in patches 2'-

10' thick and is overlain by Anvil Rock ss. (wet!). Here they truss on 4' centers and use double-lock point-anchor resin bolts. Bolts are 6' and 8' (7/8" bar). They advance 5' at a time, bolt and truss. They tried grouting Energy with resin just ahead of mining, but unit was too tight to take enough. Slip planes in Energy add to instability. Brereton Ls. is lost laterally over Energy lenses, over as little as 15' from the edge of the lens.

Typical floor sequence is 2' fireclay, 2-4' calcareous claystone with nodular ls. below. Very rarely the floor "rolls" (up)--perhaps only a dozen cases in 50 miles of entry; no local coal lows have been hit so far.

Two geologic anomalies have been encountered so far; these are "red rock" (coql balls) and limestone "rolls" in roof (proved to be oval or round ls. protrusions to 1 1/2' deep--we call them "bosses"). Ed Doney commented on horizontal stress regime at mine. He mentioned Ingram's work on high horizontal stress influencing N-S falls. He believes relationship is present for Springfield Coal (N-S Falls and cutter roof are present locally) but has not seen much effect above Herrin.

They have 200 surface monuments, some on 50' centers (Webb's work?) and have seen no subsidence to date, and no convergence has been seen in mine. The extraction rates are 47% on mains and 52% in panels; depth is 380-420'. Herrin is mined E-W and N-S with no problems--angled crosscuts used locally are only for storage of equipment.

1st E. Longwall is being cut by 2 units at present. Panel is over 7000' as planned and 634' wide. Coal is 5 1/2' thick; 5 holes in set up room area show 4' of Brereton. Longwall is oriented E-W, which is 45° to 1% NW dip. Training is planned to end

 p.3 plus map A

in April (on equipment set up on surface) and then equipment is moved underground. Eichoff 36" web double-drum shearer is on order. They plan to be mining by May.

The company has over 100 drill holes; 8-10 are in long wall area, and several are released for our use on this project. Ed doney mentioned they had strength data on Brereton running from 16,000-20,000 (psi?, point load?) and for coal balls running from 14,000-22,000.

Rolf Sachs commented that the Energy Shale was stable after bolting; they had no clay mineralogy data on the Energy here. They indicated Anna Shale thickens as Energy Shale lenses are approached. We went underground at noon--plan to visit 1st West Panel dropped due to lack of time. We went on N. Mains to look at old workings (4yrs. is oldest).

Visit to N. Mains

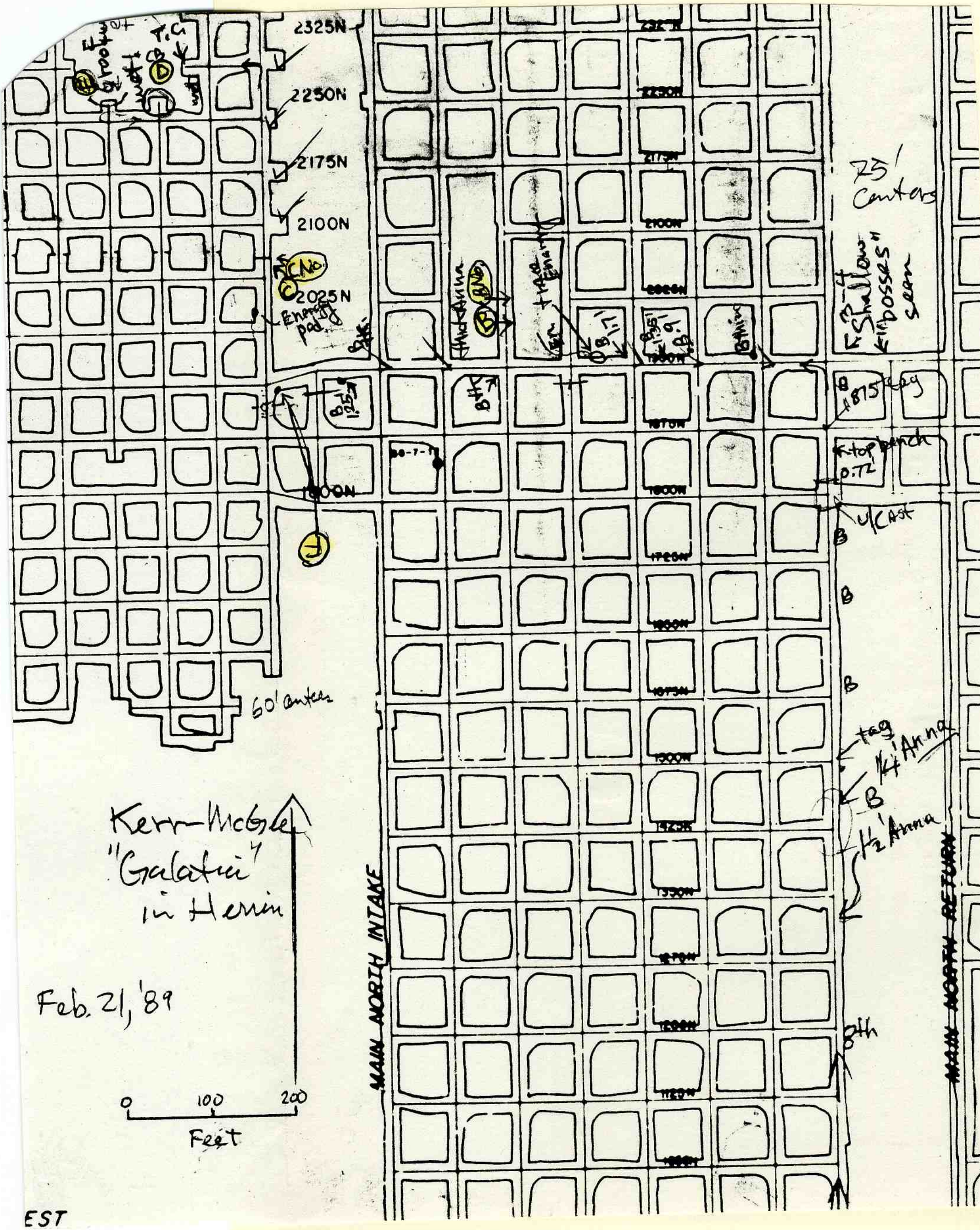
A. We walked by the 6-pillar unmined-block with coal balls at about 500' N. I took two chipped samples for c-isotope analysis from colored zones (V.S. 1) on west side site (-B-1, -2). Roof stability is good here. On the north end of block the coal balls end at mid-seam (A. North). Here there are large Anna concretions, fat discs to 1 1/2' long at nearly 1' thick. Underclay was sampled here (-B-3).

B. (3rd N. at 2000' N - See Map A) On E. rib the sequence in fall is 0.2' Energy Shale, 2.35' Anna, about 3' Brereton Ls. with wet sandstone above. Fault seen on west side appears to have passed into Brereton Ls. when it was plastic, causing weakness which lead to Fall. Fault appears to be of compactional nature.

MOORE'S MODERN METHODS

FORM 180 W

Feb 21,'89 Map (A)



 p.4, plus map A

B. No. Thirty feet further north sequence is 1' Energy Shale, 2 1/2' Anna, 0.3' coal with coarse ss. at top. Energy is dk. gray with lots of fine plant debris (-B-4). Ss. is medium to coarse with coal inclusions (-B-5).

Panel west of N. Mains

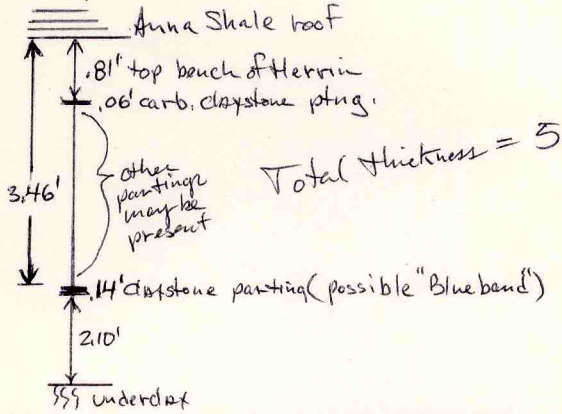
C. Small lens of Energy Shale; roof sequence is 1.2' Energy, 0.3' Anna Brer. (normal?). Energy is med. gray, slightly silty, with fine coal fragments throughout.

C. No. Just to north there is 0.4' Anna w. Brer. above--appears to be good roof. Top bench of Herrin is 0.73' thick.

D. Top coal with coal balls seen in stub to NE into unmined area; coal balls seen in this stub were all above top parting. Top parting is 0.08' thick (-B-6) and is very dark gray; top bench of Herrin is 1.08' here W. Anna roof. Area was not mined due to lost Brer. (making area wet), not to presence of coal balls. Base of Anna seen to be very carbonaceous w. vitrain streaks.

E. Next stub west in unmined block shows wet Energy Sh. roof. Energy is 1' at corner and roof is bad; 2' thick at face of stub and still very wet. Energy is med. gray w. compressions of plant fragments.

F. I took a coal thickness measure as we were leaving the panel area.



We were told the cleat direction in the mine is close to N-S and E-W, but rotated 15-30° west of north.

G. We walked 6 crosscuts south of shaft on way out. Saw some roof instability due to a high density of Anna Concretions. Top of Herrin rolls down 1' over 12' laterally, and some deep-seam compactional slip planes are present. Anna is fractured on 0.4' to 1.0' centers where concretions are not present. In crosscut coal balls are prominent on N. rib. We went around pillar to east to nice exposure of coal balls well spaced in the seam. Area has wet roof + is breezy, but would be good collection site: coal balls represent most of stratigraphic range of the coal.

Samples: KG6-B-1 to -6

#	Site	
-1	A	Coal ball - chips off "yellow 2" zone (14) c.b. (Chest high) for c-isotope analysis.

 p.6, plus map A

-2	A	Coal ball- chips of "dk. blue" zone (8) c.b. (Waist high) for c-isotop analysis.
-3	A.No.	Underclay, top 0.3', med. to med. dark gray.
-4	B.No.	Energy shale, med. to dark gray, w. carbonaceous plant fragments.
-5	B.No.	Sandstone (A.R.ss?) from top of fall; med-coarse w. coalified peat fragments.
-6	D	Claystone parting 0.08' thick found 1.08' from the top of Herrin Coal. Block and bulk samples

5/3/89
PDmineNote

Galatia Mine of Kerr-McGee Coal Corp.
Visit on 9/29/89 by
Heinz H. Damberger (reporting), Robert A. Bauer, J.J. Eidel, all ISGS, T ("T") S Ary, Director USBM and Wm. (Bill) Shafer, US House's Committee of Interior and Insular Affairs

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Our hosts were: Robert Scharp, General Mine Manager, Ed Doney, Chief Engineer, Robert M. Sterner, Managing Engineer, Kerry Durfee, Safety Engineer

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Our party arrived at about 4 pm. They showed a video on Galatia Mine and Kerr-McGee CC.

They are mining both the Herrin (No. 6) and Springfield (they refer to it as Harrisburg) (No. 5) Coals. They call the two mines the No. 6 and No. 5 Mines. These are basically separate mines. Coals are kept separate all the way. Total production is about 3 mill. tons/yr. from the two seams. They have a slope and a shaft to access the two coals. Both shaft and slope have two compartments. In slope top compartment contains coal belt. In shaft one compartment is for intake air, other for return air. Shaft is 550' deep.

No. 6 Mine started production in 9/85; is longwall mine, only way they feel they can be competitive. Longwall panels are 640'x8000'. They take 3' deep cuts; mine in retreat. Roof is:

0 - 8"	shale
4-5'	limestone (comes and goes, Energy Sh. probl.)
30-40'	sandstone
to surface	shales etc.

Floor: is fairly soft fireclay.

Anvil Rock Sandstone carries water which causes problems: weakens floor; also water is quite corrosive (contains NaCl dissolved).

In the Herrin Coal they have encountered many places with 1" to 12" large limestone inclusions in coal: coal balls. In some places the entire seam is taken up by coal balls, forcing them to leave blocks of coal unmined.

Subsidence: They have found that strata bend rather than fracture during longwalling. Subsidence interfers with drainage, in particular where drainage runs more or less perpendicular to panel. They may have to establish permanent pumping stations to re-establish proper drainage.

Company has no subsidence rights. Control coal either in fee or

through lease. They compensate surface owners fully for any damage done to structures or land. They will move homes, and so forth. Discuss what will happen with surface owners before they mine/subside. Point out that different companies have different attitutes about subsidence. Horror stories abound about what individual companies did or did not do after subsidence.
Permits from DMM: they must report on 1/4 yr basis to DMM on mine subsidence.
Subsidence extends about 50' beyond panels on S side, 200' on N side, 300' on E side (along panel!). Subsidence amount is equivalent to about 60% of mining height. Cracks form primarily NS near end of panel; these are the only ones wider than 1". Initial break creates greatest tension.
They believe that Dr. Chugh's model for subsidence above R+P mines is wrong: it assumes a priory that there will be subsidence above R+P mines which they consider to be false.
They were eager to join in Mine Subsidence Research Program (MSRP); want to find out what exactly happens during subsidence. They installed several rows of monuments at 20' interval to monitor subsidence; one set was installed through MSRP. They will subside a major pipeline, have monuments along pipeline. Next longwall panel will undermine pipeline; current panel barely avoided affecting pipeline which passes along SE corner of panel. All mitigation work will be fully paid by company.
Subsided fields: mitigate any problems developing with drainage; should be as good or better after mitigation. We visited a field which they had subsided. Cracks had formed especially along E end of panel; some cracks were still visible; they had disced the field and put on limestone; most cracks were already filled in and should disappear entirely within a short time.

Coal Reserves. They got about 50 years worth of coal reserves.

No. 5 Mine started production in 11/85; is room-and-pillar mine. The use 20' wide entries, pillars are 55x55'. They do not plan on subsidence. Use CM, ram car, feeder breaker, conveyor belt to bring coal to surface.
Cleaning plant has heavy media washers; flotation; cyclones; quite sophisticated plant. 1000 tons/hr., 4 mill. tons/yr. throughput capacity.

We toured the above-ground mine facilities. They are impressive in comparison to other mines; superb housekeeping evident throughout; miners get free work cloths which they can have washed by company as often as they prefer; have workout room; separate dirty and clean lockers, with showers in between; etc. etc.

Operator, Date

Mine, Sec. T. R.

Location in mine,

Now that its startup woes have eased, the longwall at Kerr-McGee Coal Co.'s Mine No. 6 at Galatia IL is expected to increase the mine's coal sales to Union Electric Co. by more than 50 percent this year, according to Kerr-McGee Coal President Peter B. Lilly.

"We had some startup problems like everybody else and we had some unexpected things that occurred," Lilly told *Coal Week*. "But we've just completed our first panel and we're into our second panel and the thing's going like crazy." At the current pace, Lilly said the longwall should enable Mine No. 6 to produce 1.5 million tons of coal this year — up from 950,000 tons in 1989. "We were in the buildup last year; this year is the first year we're at the 1.5 million level to Union Electric," he noted.

Kerr-McGee operates two mines — Nos. 5 and 6 — at Galatia, although they share coal preparation and surface facilities. The company occasionally has sold spot coal from No. 6; spot sales from No. 5 are more common. The two mines are expected to produce about 3 million tons in 1990. "I want to make sure we're comfortable with (the longwall's) development before I commit" to other sales, Lilly said. Lilly said Kerr-McGee "has never had a layoff" at Galatia and has no plans for one now, despite the longwall.

Coal week May 7 1990

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Total thickness of coal

Condition, Time, hr. min.

Wt. Gross, lbs. Net, lbs.

What Nos. shipped by Co.?

Excluded from sample: No.

Sample represents in. tons.

Impurities? How do they occur?

(1 division = 3 in.)

Sample No. Can No. Lab. No.

Collector, Coal: Survey No.

Mine, Co. Index No.

FORM 180 W

SAMPLE HISTORY

Plant sampled: **Galatia** Date: **9/15/92**

Company: **Kerr-McGee Coal Corp**
POB 727, Harrisburg IL 62946
Sample ID: **Galatia 5**
C32662

Company representative: **Steve Rowland, Gen Mgr., 618-268-6311**

Quality lab under service contract with
CT&E, Joe Gholson, mgr

Mine (source of sample): **Galatia** Collected by: **HPE & RRR ***

Seam identification: **Springfield** Time of closure:
just after cut

Mining period represented (dates): **9/17-18/92**

Panel(s) & location(s) in mine:
Mine locations (descriptive):

Prep plant - 1 mi E Galatia, N side Rt 34. Mining is east and south of the tipple - S½ 7, 8S - 6E, Saline Cnty

¼ or footage Section twp rge

Type of Preparation Plant:

See attached flowsheet. Heavy media tanks for coarse coal; heavy media screens on +16 m coal; 16x100 m to spirals; -100 m to flotation. All concentrates combined and shipped together.

Sampling point: # increments: ~400
Belt (describe position in plant)

Off main product belt prior to load out facility

Train Truck **rarely**

Company's sampling device (yes / no)**YES**
Type:

Mechanical primary & secondary cutters.

Other (describe)

Procedures (describe other aspects):

* **The extra material from the company's sampling was set aside for us. It represents a unit train of 100 cars (10,000 tons) processed during the 3 day period.**

FORM 180 W

SAMPLE HISTORY

Plant sampled: **Galatia** Date: **9/17/92**

Company: **Kerr-McGee Coal Corp**
POB 727, Harrisburg IL 62946
Sample ID: **Galatia 6**
C32661

Company representative: **Steve S. Rowland, Gen Mgr., 618-268-6311**

Quality lab under service contract with CT&E, Joe Gholson, mgr

Mine (source of sample): **Galatia** Collected by: **HPE & RRR ***

Seam identification: **Herrin** Time of closure: **just after cut**

Mining period represented (dates): **9/14-16/92**

Panel(s) & location(s) in mine:
Mine locations (descriptive):

Prep plant - 1 mi E Galatia, N side Rt 34. Mining is east and south of the tipple - S½ 7, 8S - 6E, Saline Cnty

¼ or footage section twp rge

Type of Preparation Plant:

See attached flowsheet. Heavy media tanks for coarse coal; heavy media screens on +16 m coal; 16x100 m to spirals, -100 m to flotation. All concentrates combined and shipped together.

Sampling point: # increments: **~400**
Belt (describe position in plant)

Off main product belt prior to load out facility

Train **X** Truck **rarely**

Company's sampling device (yes / no)**YES**
Type:

Mechanical primary & secondary cutters.

Other (describe)

Procedures (describe other aspects):

* **The extra material from the company's sampling was set aside for us. It represents a unit train of 100 cars (10,000 tons) processed during the 3 day period.**

(36941—50M—2-67)27-o

FIELD NOTES

Illinois State Geological Survey

INDUSTRY

KERR-MCGEE EXPANDING GALATIA; TO TAP NEW LOWER SULFUR NO. 5 RESERVE

Kerr-McGee Coal Co. is preparing to expand lower-sulfur production at it Galatia mine in Illinois, driving two 4,400-foot rock tunnels through to connect its new Galatia North reserves to the existing longwall section in the Harrisburg No. 5 seam.

Kerr-McGee sees the new development as a key play in the expected market for 2.5 lbs. SO2/mmBtu under Phase I of the Clean Air Act Amendments of 1990, company president Robert C. Scharp told *Coal Week*. Only about 5 percent of all reserves held in fee in the entire Illinois basin meet this requirement and Kerr-McGee hopes to capitalize on that.

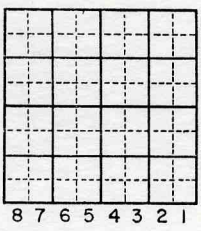
Galatia currently has two longwall mines using the same slope and haulage. The first mine is in the Herrin No. 6 seam and produces a typical high-sulfur Illinois coal. The second operates in the No. 5 seam and produces coals below 1.5 percent sulfur. The Galatia North section has No. 5 seam coal with lower sulfur but not quite down to 1.2 lbs. SO2/mmBtu Scharp said. The plan is to mine the Galatia North reserves first with continuous miners, then with longwall systems, use belt haulage to carry the coals back to the main mine and then to the surface. Kerr-McGee is sinking a separate ventilation and miner access shaft for Galatia North.

Coal week 12-14-1992

By_____ **Date**_____

Quadrangle_____

County_____ **Sec.**_____ **T**_____ **R**_____



KERR MCGEE READIES GALATIA MOVE; PLANS SALES OF 2.0 lbs. SO2/mmBtu COAL

Kerr-McGee Coal Co.'s Galatia mine will stop producing high-sulfur coal from the Illinois No. 6 seam at mid-year when the company moves a longwall mining unit to the new Galatia North workings in the No. 5 seam. Kerr-McGee already is selling development coal from Galatia North in a 2.0 lbs. SO2/mmBtu blend product.

Bob Scharp, the president of Kerr-McGee Coal, told *Coal Week* late last month that development work is well underway on the mains and gate entries and that coal has been sold in a blend with No. 5 coal from the Galatia South section. Galatia South currently operates a longwall in the No. 5 seam and a longwall in the high No. 6 seam feeding a preparation plant through a single slope. Production has been about 4 million t/y, mostly constrained by plant capacity, Scharp said.

With the advent of Phase I emissions restrictions under the Clean Air Act amendments of 1990, the market for the No. 6 seam's high-sulfur coal is drying up and Kerr-McGee moved to expand Galatia's production of mid-sulfur No. 5 seam coal. To do that, the company had to tunnel 1,400 feet through the rock of an ancient river bed that separates its current working from its northern reserves.

Under the new mine plan, Galatia will have one longwall in the No. 5 seam in Galatia South and another in Galatia North. Miners will enter through separate shafts, but coal from the north side will move by belt through the rock tunnel to Galatia South and will exit

cont. (over)

From: Coal Week, April 11, 1994

the mine through the exiting slope.

The sulfur content of the No. 5 coal at Galatia varies, with the lowest-sulfur coal found near the ancient river bed. Scharp said Galatia North will start there, producing a lower sulfur coal that Kerr-McGee will blend with coal from Galatia South to sell as a 2.0 lbs. SO2/mmBtu product. The mine's production is not sold out and the company is marketing the blend aggressively, he said.

Along with the new working in the No. 5 seam, Kerr-McGee is working to expand the preparation plant. Galatia shipped 4.13 million tons in 1993, slightly above the plant's nominal 4 million t/y. By adding to the fines circuit and making other changes, Scharp said Kerr-McGee plans to increase capacity by 50 percent to 6 million t/y of, "a perfect-fit Phase I coal."

In a separate development, Kerr-McGee will resume production at its Clovis Point mine in the Powder River Basin, shipping about 30,000 t/m to PacifiCorp's Dave Johnston plant. The mine produces a low-Btu product and originates coal only on the Burlington Northern railroad. Diligence requirements under the mine's federal leases require some production even though prices are low.

July 8, 1994

Notes from Phil DeMaris

Kerr-McGee C C has completed LONGWALL mining in the Herrin Coal as of July 6, 1994.

The headgate position on that date is 2159 ft E.
The tailgate position is 2162 ft East.
The equivalent state plane coords at the shaft are
427,256.33 ft North and 428,091.79' east.

Shields are being dissassembled and move to 'Galatia North' in Springfield Coal. The mine in the Springfield coal now has 2 longwall faces.

[refer: Jack Gilbert, Engineer with Kerr-Mcgee]

NCA Coal News of 10/31/94 reports:

Galatia mine's production capacity has been increased by 50% to 6 mill. tons/yr., thanks to $57 mill. expansion of prep plant. The project, commissioned 10/21/94 by K.M. President Robert C. Scharp will allow full use of the mine's recent $25 mill. longwall expansion. Galatia, already one of the nation's largest underground mines, is the largest in IL and the largest in U.S.

Kerr-McGee Coal Corp. suspended production at its Galatia mine last week after a fire broke out in a closed portion of the underground mine in Illinois. There were no injuries. Officials decided to seal an area of the mine where the blaze was discovered in monitoring by the Mine Safety and Health Administration.

The mine, which produces about 4 million tons of coal annually, was expected to resume operations in several days. The company did not expect any problems in delivering coal to electric utility customers in Florida and Georgia.

In the meantime, the Oklahoma-based company is keeping Galatia's approximately 600 employees busy fighting the fire. Carbon dioxide was being pumped into the area near the blaze in an attempt to displace oxygen and extinguish any remaining hot spots. The cause of the fire remained uncertain late last week.

From Coal Week, Oct. 21, 1996
Fire discovered 10/17

THE CHAMPAIGN-URBANA NEWS-GAZETTE Monday, February 6, 1995

Coal mine succeeds while others fail

GALATIA (AP) — Steve Rowland stares as a huge piece of machinery resembling the bottom half of an Army tank slides along the mine wall, gouging out tons of coal 560 feet underground.

"If this was 15 years ago, you wouldn't even be able to see your hand in front of your face," he yells, proud of how his longwall shear performs with a minimum of the dust that used to paint faces and choke lungs.

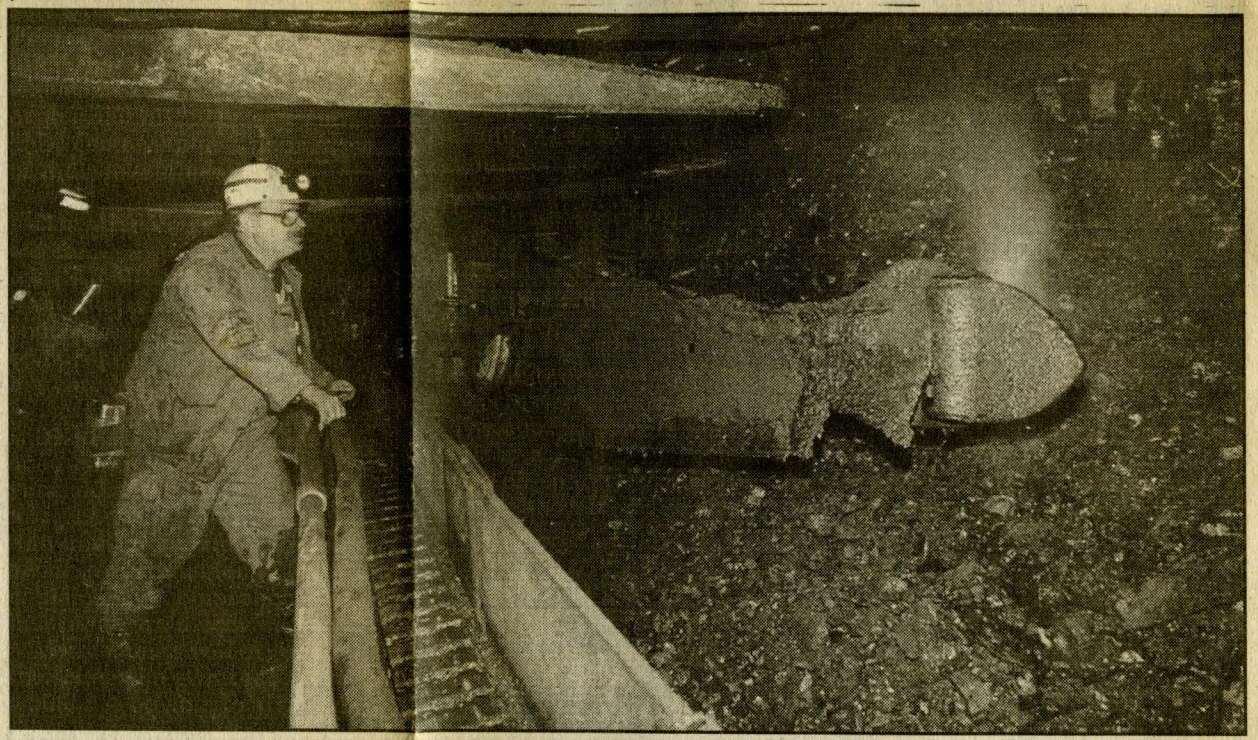
At Kerr-McGee Coal Corp.'s Galatia mine, where Rowland is general manager, the future appears a good deal clearer than it does at a lot of other mines.

The Galatia mine sits on a seam of low sulfur coal very attractive to power companies who are being forced to cut emissions suspected of causing acid rain. While federal clean air laws chip away at the jobs of thousands of high-sulfur coal miners, Kerr-McGee leads Illinois in production.

Rowland and others say the success goes beyond geology.

"Galatia is a Cadillac operation," said Art Rice of the state Department of Mines and Minerals. "It's clean, efficient. They have made sure and done all the nice little things to put them a step above the run-of-the-mill mine."

Like a Cadillac, it doesn't come cheap. Oklahoma City-based Kerr-McGee recently spent about $60 million expanding the mine that employs 570, including 400 miners, Rowland said.



Associated Press

Steve Rowland, general manager of Kerr-McGee's Galatia coal mine, checks out the long-wall mining unit. He was in the mine last month. The Galatia mine is one of the most productive in the U.S.

Being a nonunion mine since it opened in 1981, Galatia has had its share of controversy. That year, about 2,000 union supporters stormed the site and had to be driven back by police with clubs and tear gas.

Today, Galatia miners are doing some storming themselves. The target: a vast layer of coal known as the Harrisburg No. 5, the lowest sulfur coal available in Southern Illinois. Galatia shares the seam with eight other mines, but it's one of the most successful.

In 1994, Galatia mined 3.4 million tons from the seam, or 25 percent of all No. 5 coal produced in the state, according to the Department of Mines and Minerals. Only AMAX Coal Co.'s Wabash mine near Keensburg was higher: 3.99 million tons, or 29 percent of all No. 5 production.

Total state production for 1994 is tentatively estimated at 53.5 million tons.

All this would be great if it wasn't for the Clean Air Act and competition from cleaner burning coal from western states. Illinois researchers predict the act will cost the state nearly 1,500 mining jobs between 1995 and the year 2000.

By

Quad

Coun

Saline Co.

KERR-MCGEE TO HIKE 1995 PRODUCTION; CONSIDERS ACQUISITION, NEW COAL LEASES

From Coal Week v. 21 no. 29 July 17, 1995

Kerr-McGee Coal plans to increase production at its flagship Jacobs Ranch and Galatia mines and is looking at coal acquisitions in the U.S., Australia and elsewhere, company officials told securities analysts in late June.

Despite soft markets, Kerr-McGee plans to increase sales to rise to a record 32 million tons, much of which has been booked. The centerpiece of this expansion will be Jacobs Ranch in the southern Powder River Basin, which will raise sales to 24 million tons. Galatia, in Saline County IL will hike its underground production to 5.5 million tons for the year.

Kerr-McGee has nominated the Thundercloud tract adjacent to Jacobs Ranch for a federal lease sale, Kerr-McGee Coal president Bob Scharp told *Coal Week* last week. The tract contains about 400 million tons of coal and would extend Jacobs Ranch's productive life by about 20 years when it goes into production in about 10 years, he said.

Scharp declined to discuss the quality of coal in the Thundercloud tract, saying that an accurate assessment awaits extensive core sampling. Industry sources said, they believe that Thundercloud should yield 8,800 Btu/lb. coal with about 0.7 lbs. SO2/mmBtu, which is lower than Jacobs Ranch's current reserve.

Changes at Galatia include a shift of all production to the lower-sulfur No. 5 seam with two longwalls and a major expansion of the mines preparation plant. To accommodate the increased production, Kerr-McGee is exploring new markets for the coal. Currently 27-29 percent of Galatia's coal moves to export to a number of customers.

Scharp declined to discuss customers, but he did say the rail-to-export movement from Galatia to the Port of Mobile AL is a major factor in Galatia's success. About 900,000 tons of Galatia coal is blended with Venezuelan coal at Mobile then shipped to Gulf Power under a contract with Peabody COALSALES. Galatia coals also move to Japan, Europe and North Africa. Scharp said this expansion is "a challenge to the transportation infrastructure." He had high praise for the railroad and the port but he also said that neither has had to contend with the volumes produced at Galatia.

Scharp said Kerr-McGee continues to look at coal properties in Australia and elsewhere worldwide but he declined to discuss any specific site. He said the firm also is looking at other U.S. properties. He acknowledged that Kerr-McGee has shifted some reserves attached to its Pioneer Mining division in eastern Kentucky, but said the operation will remain small.

KERR-MCGEE WINS WATSON CONTRACT; GALATIA TO SUPPLY 1 MILLION TONS ANNUALLY

Mississippi Power Co. has ended a long-running search for Phase I coal supplies for its Jack Watson power plant on the Mississippi River by selecting Kerr-McGee Coal Corp. to supply 1 million t/y of 1.2 percent sulfur coal from its Galatia mine in Illinois.

In a related development Mississippi Power has extended Jader Fuels' contract to supply Watson through August, said spokesperson Tim Foley. Jader and its partner Sugar Camp Coal have been Watson's major suppliers for several years.

Foley said Kerr-McGee will ship 1 million t/y from Galatia on specs of 12,000 Btu/lb. and 1.2 percent sulfur.

Coal Week 18/96

Southern Company Services, Mississippi Power's coal buyer, first solicited bids for long-term supplies for Watson on Sept. 12, 1994 (9-19-94 *Coal Week.*) At the time, SCS asked for bids on 500,000 t/y for deliveries to run from Jan. 1, 1995 through Dec. 31, 1998. The bidding closed Oct. 7, 1994.

Watson is a Phase I affected power plant, which means that under Phase I of the Clean Air Act Amendments of 1990, the Environmental Protection Agency has assigned the plant a limit to the number of tons of sulfur dioxide it may emit in any of the years 1995-1999. At the time of the solicitation SCS said Plant Watson's unit No. 4 was allowed 17,910 tons of SO2 a year and unit No. 5 was allowed 36,700 tons annually. If the units exceed their allowances, SCS would have to obtain credits to meet Phase 1 standards.

Based on the Galatia coal's specifications, 1,000,000 t/y would contain 12,000 t/y of sulfur, so its SO2 emissions would be somewhat less than 24,000 t/y, a figure that would fall well under Watson's Phase I cap.

Although SCS has not discussed its drawn-out evaluation process, industry observers believe that the Watson contract reflects the evolution of Phase I emissions strategies. Not long after bids closed in late 1994, many observers believed that Mississippi Power would shift Watson to western coal, probably from Colorado. This belief was heightened when SCS confirmed that it was seriously considering a bid from Union Electric for the Colorado coal it is reselling.

After mid-1995, all bidders including Jader-Sugar Camp, Kerr-McGee and CONSOL were given the chance to submit new bids, sources said. By November, Mississippi Power confirmed that it had sent proposed contracts to a number of bidders including Union Electric, but it declined to identify other suppliers on its short list. Coalfield sources said, however, that Kerr-McGee had submitted the low bid, which one source said was about $20.50/t FOB barge.

A potentially hazardous atmospheric condition was discovered at the Kerr McGee Galatia Mine involving large concentrations of methane gas and what could be conceived as a potential fire source. After the mine was idled and mine safety inspectors completed their investigation, the situation was downgraded in severity and the mine allowed to complete restricted work. The atmospheric conditions were attributed to a severe drop in barometric pressure and no indications of a fire were found.

HED 9/19/97

Report by IL OMM in DNR activities report for 8/97

GALATIA RESUMES FULL PRODUCTION; KERR-MCGEE, MSHA DIFFER OVER FIRE

Kerr-McGee Coal Corp. resumed full production Oct. 23 at its Galatia mine in southern Illinois after an underground mine fire halted mining operations for about a week.

On the evening of Oct. 22, the Mine Safety and Health Administration lifted an imminent danger order, allowing Galatia's approximately 600 miners to return to work. The agency modified the order Oct. 19 so employees on the north side of the mine could go back to work, according to MSHA spokesperson Rodney Brown.

Brown said the company sealed the fire area and pumped in carbon dioxide through two 500-foot-deep bore holes drilled above the fire. "Apparently, that did not work to extinguish the fire," he said. "Right now, the area is just sealed and is being monitored constantly."

Kerr-McGee spokesperson Dow Dozier said last week that indications are the fire is out. The blaze was discovered Oct. 17 in a closed section of the mine. Dozier said Galatia had enough coal on hand to continue making deliveries during the brief shutdown. The Saline County mine is expected to produce about 5.5 million tons of coal this year.

CO problem changes plans for Galatia mine

A persistent carbon monoxide (CO) problem in part of Kerr-McGee Corp.'s Galatia underground mine in Saline County, Ill., is forcing the company to change its mining plans—a move that is expected to result in a 1-million-ton decrease in the mine's production this year.

Instead of producing about 6 million tons of coal in 1997, Galatia probably will mine about 5 million tons, according to company spokesman Dow Dozier. The reduction represents about 3% of Kerr-McGee's projected company-wide production of more than 30 million tons this year.

In mid-May Dozier said the company was removing longwall equipment from the area with the higher CO levels and relocating it to another part of the mine. "As of May 12, we had all the equipment out except for 78 shields...there are 166 shields" on the longwall, he said. "We're taking them out about 15 shields per shift."

Once the equipment was totally removed from the affected part of the mine, the company planned to seal the area. "This was in an area that was almost mined out," he said. Galatia is a two-longwall operation.

It remained uncertain if the latest CO outbreak was related to a stubborn mine fire last year at Galatia. "We can't find any relation to the fire at Galatia last year," said Dozier. "It's about 800 feet from the (1996) fire area and there doesn't appear to be any connection between those events."

According to Dozier, Kerr-McGee should have no problem supplying its customers even with this year's projected production cut at Galatia. "We're making arrangements...we have coal from our other mine, although it's a different type of coal." Because Jacobs Ranch produces low-sulfur coal, "we'll have to do some blending," he said.

Galatia's principal customers include the Tennessee Valley Authority, Gulf Power, Georgia Power, and Mississippi Power.

Although a new mining plan is being prepared, Dozier said no staffing changes are anticipated at Galatia. "We're still going to be using the same amount of people," he said.

Mine notes on visit to Galatia Mine
on October 11, 1996 by Heinz Damberger,
with John Mann's UI "explorer freshmen class"

I had arranged the visit through Dan Ganey, Chief Engineer, and Steve Rowland, General Manager. There were 14 students in the party, plus Prof. John Mann and I. We arrived at the mine at 7 a.m., got our safety training, and were completely outfitted by them. We received some general background info from Joe Hirsch, Engineer, including layout of mine, then went down into main shaft of mine around 9 a.m. The used two diesel mantrips for transportation; it was a pretty long trip to the active longwall face, the one south of the Galatia Channel (Galatia South).

We returned to the surface close to 11 a.m.; then waited outside for about 1/2 hr. for a bus to take us to the other shaft to visit Galatia North; but no bus became available (they were using them for driving tests). While we waited we surveyed the surface facilities. Joe Hirsch pointed out the cleaning plant across the road which we visited after lunch; a service hole through which they take down rock dust into the mine: the fully automated hoist which he showed us (hoist operator was not there at the time, operates by itself).

We then had lunch in the mine hall, at their invitation; I sat with Dan Ganey, Joe Hirsch, Jim Webb, another engineer, and John Mann.

After lunch we visited the cleaning plant, which impressed us by its size, its (relative) cleanliness, and its high degree of automation (we saw only a few people; the plant is controlled from a control room and operates fully automatic). We went to the top and then worked our way down, looking at both the coarse and fine coal cleaning circuits.

At the conclusion of our visit they showed us a series of maps they use in mine planning, including maps of sulfur content (%S and pd SO_2/mill. Btu), coal thickness, ash content, plans for layout of panels etc. I pointed out that the mine is turned at 30(?) degrees against N because of the prevailing nearly E-W compressive stress field that tends to cause severe roof control problems in N-S entries in mines that are laid out in the usual N-S, E-W fashion. During the long trip underground I looked particularly for any indications of roof problems related to this stress field, but I did not notice any significant problems.

P.S. Art Rice of IL Office of Mines & Minerals told me that they had a mine fire on Tuesday (10/15) following our visit, in the South Galatia mine's old workings. Mine had to be evacuated; brought in MSHA, as well as IL OMM to control fire.

Mine Company (parent)	Seam	Seam height (inches)	Cutting height (inches)	Panel width (ft)	Panel length (ft)	Over-burden (ft)	No. gate entries	Depth of cut (inches)	Shearer[1]	Haulage system
ILLINOIS										
Galatia Kerr-McGee Coal Corp.	Harrisburg (No. 5)	84	84	825	3,000-8,000	700	3	39	Long-Airdox DDR 1,170	Eicotrak
	Harrisburg (No. 5)	84	84	825	3,000-8,000	700	3	39	Long-Airdox DDR 1,170	Eicotrak

Roof supports (legs/yield)	Face conveyor Type[2] (strand, motors)	Face conveyor width (mm)/ speed (fpm)	Stageloader type width, speed	Crusher	Electrical controls	Voltage to face	Capacity (raw tons per shift)[3]	Daily no. prod. shifts
Joy 2/800	Joy 34 TIB 2x700	1,000/ 254	Joy 1,100 mm, 300 fpm	Joy	Service Machine	2,300	15,000	2 (12 hour)
Joy 2/750	Joy 38 TIB 2x700	1,000/ 254	Joy 1,100 mm, 300 fpm	Joy	Service Machine	2,300	15,000	2 (12 hour)

Longwall census U.S. mines in COAL AGE 2/98

Coal Age 12/99

American

THE AMERICAN COAL CO.
Galatia Mine
Harrisburg, Ill.

Acquired June 1998 from Kerr McGee Corp.
468 hourly, 105 salary employees
24 hours, 7 days, 3 production shifts
9-hour shifts, 3 weeks 6 days, 1 week 5 days
2 weekend warrior shifts
Production: 6.9 million tpy
Productivity: 44 tpmd

Reserves
16,900 coal acres, 125 million tons
Harrisburg No. 5 seam
50 to 72 inches (Ave. 66 inches)

Preparation Plant (2,100 tph)
Heavy media cyclones
400,000 tons raw coal storage

Transportation
Unit train loadout

Quality: Calorific value:12,100 Btu/lb, sulfur: 0.5%-1.94% (ave. 1.4%), ash: 7%, and moisture: 11%

Transportation: 110-car unit train loadout

Major Customers
Peabody Coal, Union Electric, Mississippi Power, Tampa Electric (TECO), Georgia Power, and Tennessee Valley Authority (TVA)

Mining Methods & Equipment
2 longwalls (both operating)
Joy 4-LS9 and Joy 4-LS5 shearers
4 development sections
6 Joy 14CM9 continuous miners
18 Jeffrey Ramcars
6 Fletcher crawler-mounted, dual-boom roofbolters
8 Getman shield haulers
48-inch FMC slope structure
48-inch conveyor belts

KENNECOTT BUYS JACOBS RANCH MINE; GALATIA MINE WILL BE EXPANDED

Five months after it announced plans to exit the U.S. coal industry (2-2-98 *Coal Week*), Kerr-McGee Corp. has entered into agreements to sell its Jacobs Ranch surface mine in Wyoming to Kennecott Energy for $400 million and its Galatia underground mine in southern Illinois for $200 million to The American Coal Co. (AmCoal), headed by veteran Midwest coal executive Bob Murray.

The sale of Galatia, the largest coal producer in Illinois at about 5 million t/y, is scheduled to close by June 30. Jacobs Ranch, located in the Powder River Basin about 50 miles southeast of Gillette WY, currently is permitted for 39 million tons of low-sulfur coal annually. In 1996 the mine actually produced 26.5 million st of coal.

Kennecott, which recently formed an alliance with Enron Capital and Trade Resources (3-9-98 *Coal Week*) to expand their product offerings in energy commodities for the U.S. utility market, has no immediate plans for major changes at Jacobs Ranch. The current lease reserves at Jacobs Ranch are 240 million tons of recoverable coal with another 900 million tons that potentially could be leased.

All of the mine's production is committed this year to contract buyers and will be for the next two years. Seventy percent of the mine's planned production is committed to the year 2003.

Galatia mine output will grow

Changes are planned at Galatia, Murray told **Coal Week**. "We will increase the output of the mine to 7 million tons" annually. We will increase it immediately with what's there, with existing infrastructure and employees. We will not need to hire additional people."

Murray, who also owns Ohio Valley Coal Co. in southeastern Ohio and KenAmerican Resources in western Kentucky, would not disclose how he intends to boost Galatia's production.

But the additional production is expected to be sold into southern or southeastern utility markets. "We have markets that we think are available for that additional coal and some will be traditional markets for coal and some are not," Murray said. "Galatia gives us more access to southern and southeastern markets. It gives us a geographic diversification in the southeast-

over

ern U.S. with excellent transportation and location of the property."

Both Murray and AmCoal president Donald Gentry disclosed they also were interested in acquiring Jacobs Ranch. "We were a little disappointed we didn't get all of Kerr-McGee, but (Kerr-McGee's) objective was to maximize the value of the properties," Gentry said.

Added Murray: "We were invited to bid for all of Kerr-McGee and Galatia separately." Asked if he still harbors interest in the PRB, Murray at first said yes, then demurred, saying Jacobs Ranch "presented a special opportunity and more geographic and market product diversification for our companies." Having lost out on Jacobs Ranch, "I think our interest in the PRB would not be as strong in the future," Murray said.

Murray emphasized that AmCoal is a "stand-alone company" and is not an affiliate or subsidiary of any other coal company. AmCoal was incorporated for the "sole purpose of owning and operating the Galatia mine," he said. Murray is the sole stockholder, just as he is in KenAmerican, of which Gentry also serves as president.

Galatia's acquisition means Murray's varied coal holdings — along with Ohio Valley's Powhatan No. 6 mine, KenAmerican and Maple Creek Mining in Pennsylvania — should produce about 18 million t/y. Their total number of employees is about 1,800. For several years, Murray has been involved in a running battle with the United Mine Workers of America over KenAmerican which, like Galatia, is non-union.

Joseph Angleton, UMWA District 12 president, claimed Galatia's No. 5 seam, which produces lower-sulfur coal, has only about five years left of reserves, even less if Murray plans to increase production to 7 million t/y.

From Coal Week, June 15, 1998

American Coal Co. - Galatia Mine - Millenium Portal
Saline County, Illinois

Notes by John Nelson with Scott Elrick of the ISGS, Bill DiMichele of the Smithsonian Institution, and Bobby Fuller of American Coal, June 28, 2006.

This may be our last chance to see the Springfield Coal in this mine. Because of various problems including difficult roof and wet workings, the company plans to stop mining the Springfield Coal and begin working the Herrin Coal. A slope is being driven upward from the Springfield to the Herrin, and eventually an upper landing will be built for miners and materials to access the Herrin.

Main purpose of the visit is to catalog and collect fossil plants in the roof shale as part of a basin-wide study Bill DiMichele has undertaken.

7th North Headgate

NW NE NW and SE NW NW, Sec. 9, T8S, R5E.

We walked about 1,000 feet into the headgate along one entry and returned via a different entry. The coal averages about 6 ½ feet thick and lacks clastic partings. The seam moderately undulates. The roof is dark gray, slightly silty shale that is loaded with fossil plants:

Neuropteris ovata (abundant)
Neuropteris schuechzeri (common)
Cordaites (common)
Lepidodendron (uncommon)
Lepidophlois (rare)
Calamites (rare)

Many bedding surfaces are crowded with *Neuropteris* foliage. We saw no complete fronds and few partial ones, most pieces are 6 inches or smaller in maximum dimension. Fossils are abundant within 1 foot above the coal and become sparse 2 to 3 feet above the coal.

Along the main travelway at crosscut 4, a shallow roll nearly parallels the entry. It is filled with silty shale or siltstone coarser than the normal roof. It lacks foliage, but many *Sigillaria* logs are at the top of the roll. Many run parallel to the roll, but in places they criss-cross one another.

Shear zone. Approximately 800' NL, 900' WL, Sec. 9, T8S, R5E. I accidentally re-discovered the shear zone I saw on previous visits. It crosses the travelway between crosscuts 2 and 3 and trends about N 60 °E. The structure varies from a single, nearly vertical shear plane to two or three subparallel shears that are marked by pulverized coal. Vertical offsets range from a couple of inches to about 1 foot, and the sense of offset frequently reverses. In two places we observed horizontal slickensides in the coal. The roof shale is highly broken and in places, appears as a jumble of rotated blocks that have dropped downward slightly. Open fractures are present in coal and roof, although it's difficult to be sure they were open prior to mining because so much

water and mud flowed through them. These workings are currently dry.

In more than one place we observed a shear plane turning from nearly vertical to horizontal, following bedding planes at or near the top of the coal for several feet before once again bending to a nearly vertical attitude.

This area presents strong evidence for a strike-slip fault with an extensional (pull-apart) component. I could not deduce whether slip is right- or left-lateral.

North Mains

Face of middle entry is 250' NL, 750' EL, Sec. 8, T8S, R5E.

This is the beginning of a set of entries off the Main Northwest, near the NE corner of Sec. 8.

Here is a swarm of rolls with the coal strongly undulating and the upper part eroded and split. The roof is olive-gray, nearly massive siltstone that again carries numerous *Sigillaria* logs. Some bedding planes are coated with plant debris, mostly bits of stems and bark but little foliage.

4th North Longwall

Near center east half (2640' NL, 1320' EL) Sec. 9, T8S, R5E.

At entrance to this worked-out panel, we saw coal and roof conditions nearly the same as in the 7th North. The roof rock may be slightly coarser, and it coarsens upward. Fossils, dominantly *Neuropteris ovata*, and concentrated in the basal 1 foot of the roof.

2nd North Longwall

Approximately 1800' SL, 700' WL, Sec. 10, T8S, R5E.

Again, at the entrance of a worked-out panel. Swarms of rolls are present, again with many *Sigillaria* logs.

Two crosscuts east are exposures of dark gray shale containing abundant *N. ovata* directly above the coal. The dark shale is overlain with erosional contact by light gray siltstone that has sandstone lenses and laminae. Sand content increases downward to the contact. Traced back to the west, we see the siltstone truncate the dark shale entirely and rest directly on the coal, filling rolls bearing *Sigillaria.* The siltstone bedding accretes laterally from east to west. The basal sandy lag zone is only present locally.

Northwest of slope

Approximately 1300' SL, 2000' WL, Sec. 10, T8S, R5E.

Here is a large "hill" in the coal, and at the top the coal is overlain by interlaminated sandstone/shale:

- ripple and planar laminated
- highly rhythmic lamination with probable neap-spring cycles

- multiple scour-and-fill surfaces
- coal slightly eroded with small splits and "riders"
- bedding accretes laterally toward west at 15 to 20°
- sandstone grades laterally to gray siltstone like that filling rolls elsewhere in this mine.

Conclusion: these are tidal channels, a small offshoot of the nearby Galatia channel.

American Coal Company - Galatia mine - Millennium Portal
Saline County, Illinois

Notes by John Nelson on visit with Scott Elrick (ISGS) and Bill DiMichele (Smithsonian Institution), August 30, 2006. Don Cotter is our guide.

This is second visit to Millennium Mine on Bill DiMichele's investigation of fossil plants in roof shales of Illinois Basin. We spent only about three hours underground. We were on foot, and had no map.

"Roll" near shaft bottom. A large disruption in the coal seam occurs about 1 ½ crosscuts west of the main shaft bottom. It resembles a roll in some respects, but as we walk it out, it becomes clear that this is no ordinary roll. See sketch.

The structure is exposed in two adjacent, parallel entries. From the east, the coal abruptly ends against siltstone in fishtail fashion. From the west, the coal is approximately 10 feet higher, and also "fishtails" against siltstone. The ragged termination implies that the coal (as pliable peat) was torn apart. However, the torn edges overlap by about 10 feet, as if repeated by a thrust fault.

Separating and surrounding the coal is nearly massive siltstone that contains many stringers of coal. Splits of siltstone occur in the lower part of the coal west of its torn edge. The siltstone is only slightly deformed. Its layering, although faint, is horizontal to slightly undulating, and no faults are present. On the high side, there is no underclay. The siltstone underlying the coal has no roots or other features of a paleosol.

In the southern entry, the coal on the high western side forms a little west-facing monocline and thins abruptly from nearly 6 feet to 3 ½ feet. The upper and lower layers of coal are intact where the coal thins, and the coal is sheared internally, with layers truncated at low angle against bedding-plane faults. We did not take time to sketch the detailed relationships, although Scott took photographs.

The disruption is 200 to 300 feet long (north to south) and roughly 100 feet wide. At the two ends, it dies out into a slight "hump" in the coal and the seam is not broken.

This is not a simple channel with erosion of the peat. In a channel, there would be a gap between the torn ends of the peat. It is not a fault or a paleoslump; the siltstone that surrounds the torn end of peat is not deformed.

We conclude that the peat was torn loose from its underclay and floated upward as it was submerged shortly after deposition. Silt was then deposited under the floating mat, which was stretched toward the east, thinning in the process, so that its torn end overlapped intact peat below. Finally everything was buried in sediment.

Tidal rhythmites north of shaft bottom. Walking toward the entrance to the 1st North longwall panel, we passed through an area of spectacular tidal rhythmites (which were photographed). The roof is interlaminated medium gray siltstone and light gray sandstone. The contact to coal is ragged and includes many small rolls and splayed riders. In places, the bedding is inclined as steeply as 20° to the top of the coal,

reflecting lateral accretion. Plant fossils are fragmentary. Northward into the longwall panel, the roof grades to gray silty shale in which rhythmites are less prominent.

Disrupted coal in 1st North tailgate. Just inside the air locks, the coal begins to rise. The floor is hard gray siltstone, lacking roots and paleosol features. Floor and coal interfinger in the same manner as coal and roof - small inverted rolls with riders splaying into the floor. Also, the floor siltstone contains many ragged stringers of coal, and siltstone lenses and bands are common within the coal.

As we walk northward, the coal continues to rise and undulates strongly. Don Cotter points out that "hills" generally have wet sandstone roof, whereas valleys have dry shale or siltstone. At the crest of the hill, the seam becomes heavily split with siltstone from top to bottom. In places, as little as 1 foot of coal remains, and finally the coal is lost entirely. Don told us they drilled downward (I'm not sure where) and found a full seam of coal 15 feet below the split coal they were mining. Thus again, torn ends of coal overlap. Because of these adverse conditions, longwall panel was halted northeast of this point and a large block of split coal left unmined.

On entry #3, the coal was torn apart in ragged fishtail pattern and as seen near the shaft bottom, the torn edges overlap. See sketch.

North of this point, the coal declines steeply for a distance of about 150 feet and contains many thick lenses of rock. Finally, it levels out and becomes a normal 6-foot seam of coal without rock layers. Digging shows that here the coal rests on normal underclay - olive-gray, blocky to massive, thoroughly rooted claystone.

This must be another example of peat that floated loose from its underclay and was ripped apart, with sediment deposited first below and then above the floating mat.

Bill found a small area where the immediate roof is dark gray shale containing abundant plant fossils, largely *Neuropteris*. This is near the point where the coal levels out on the north edge of the big split. Rhythmically laminated siltstone overlies the plant-bearing shale.

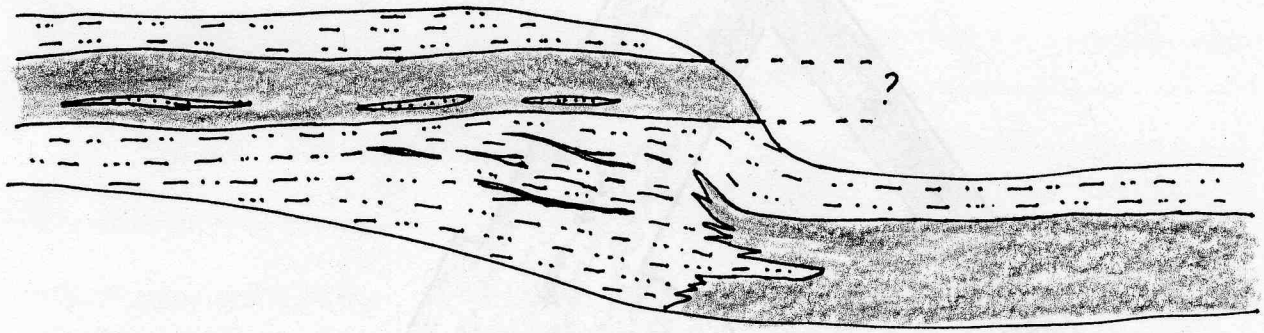
Comments: A map I received in January 2004 from Greg Smith, former geologist for Galatia, shows an area of "sandstone roof" passing through the disrupted area of the 1st North Longwall Tailgate, and curving southwest to cross the Main West entries a short distance west of the shaft bottom. See sketch map. On our previous visit (June 28) we briefly observed a large "hill" in the coal and rhythmically laminated sandstone overlying the coal where this feature crosses the Main West. The shape of the sandstone area, as mapped by Smith, suggests a meandering channel.

My field notes from visits to the Galatia North Mine in 1986 and 1988 record areas of highly split and disrupted coal that may represent similar phenomenon of rafted peat. One area is just northwest of main shaft, the other in the Main North entries, which later was driven entirely across the Galatia channel. Both areas should still be accessible.

Another possible example of large-scale peat rafting may be the Return Air Courses of Orient No. 3 Mine, Herrin Coal in Jefferson County. See ISGS Circular 530, p. 21-23.

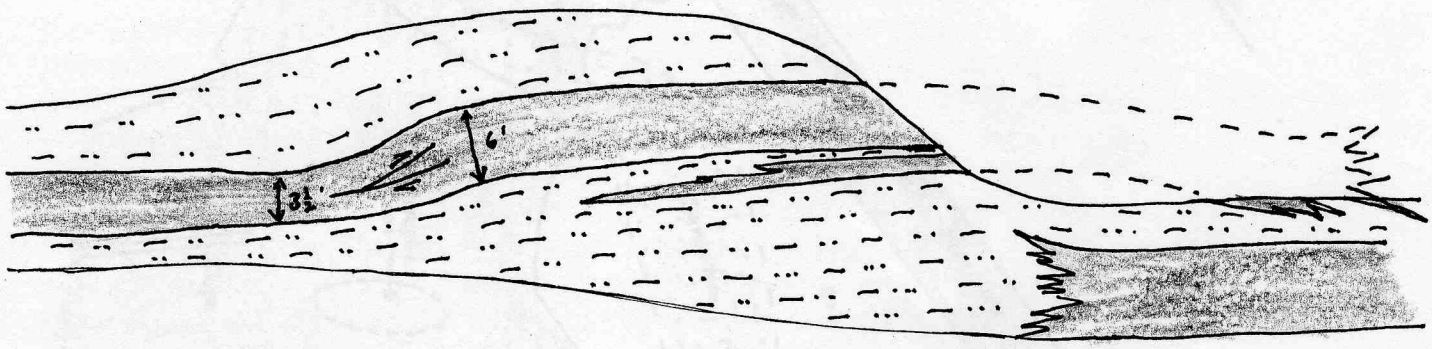
Galatia Mine, Millenium Portal Aug. 30, 2006

W E

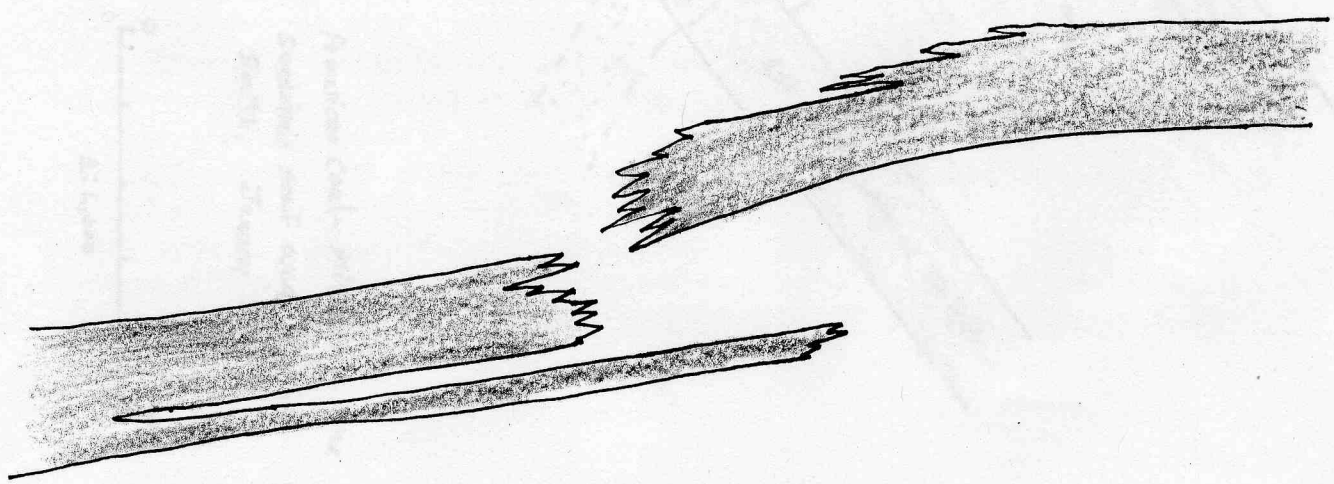


Two views of disrupted coal
just west of main shaft

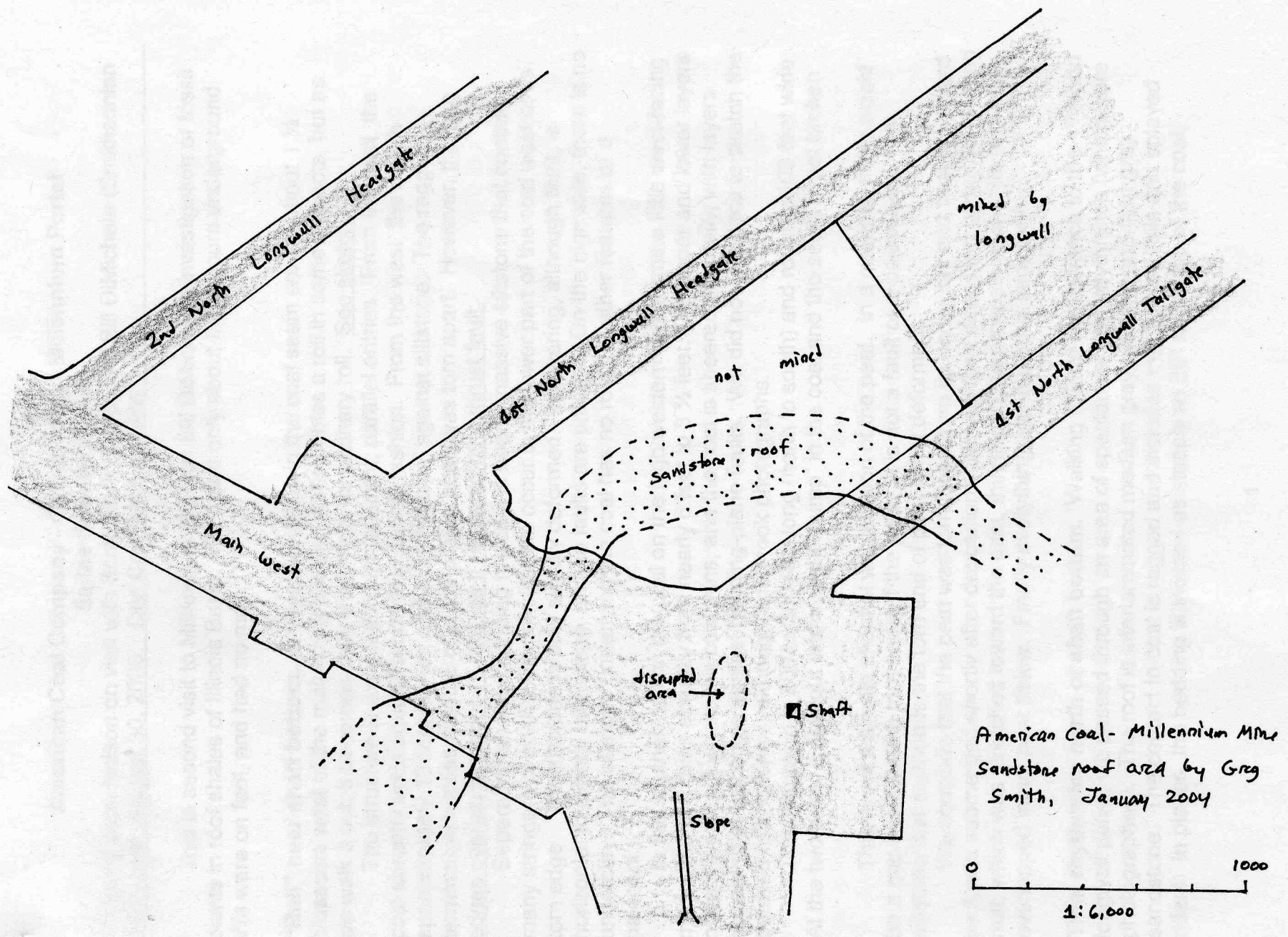
W E



NE SW



1st North Tailgate, No. 3 entry


2nd North Longwall Headgate
1st North Longwall Headgate
mined by longwall
not mined
1st North Longwall Tailgate
sandstone roof
Main West
disrupted area
Shaft
Slope
American Coal - Millennium Mine
Sandstone roof area by Greg Smith, January 2004
0
1000
1:6,000

American Coal Company - Galatia Mine - Saline County, Illinois. Notes by John Nelson with Scott Elrick of the ISGS and Bobby Fowler, company geologist. August 1, 2006.

American Coal has re-opened workings in the Herrin Coal. The former workings of Kerr-McGee (dating from 1980s) are largely sealed and the new workings are east of the shaft. Three longwall panels have been laid out. The first has been mined out and the other two are in progress.

We are here to examine masses of "red rock" that replace part or all of the coal seam and are an obstacle to mining. Fowler provides a map on which areas of "red rock" and areas of bad roof are plotted.

We go to the shaft bottom area to look at "red rock" mapped by Kerr-McGee. Footages are measured from the main shaft.

1.) Southwest of the shaft bottom, **300'S, 150'W**. North edge of "red rock" shown on map from Kerr-McGee. Several football-shaped coal balls occur near the top of the coal, above a persistent claystone parting that occurs 0.8 to 1.0 feet from the top of the seam. The roof is Anna Shale, 0.8 feet thick here and 1.5 feet on the southeast corner of the intersection - and overlain by limestone. Spheroidal limestone concretions are abundant in the Anna Shale. The largest is nearly two feet across, but most less than one foot.

2.) Next intersection south, **150'W, 375'S**. This is well within "red rock" area on company map, but only scattered coal balls are present near the top of the seam. Concretions in the Anna are large and closely spaced - much more abundant than usual. The base of the limestone is "bossy" and the Anna varies from about one to two feet thick.

3.) South of last, **150'W, 575'S**. Now we are south of the "red rock" as mapped and there are no coal balls. The Anna Shale is uniform in thickness, about two feet, and concretions much less numerous. The lower surface of Brereton Limestone is knobby but lacks bosses.

4.) Entry **75'W, 300'S**. North edge of "red rock" as mapped. Only scattered coal balls are present, flattened lenses in upper one foot of

coal, ranging from about 0.1 to 0.6 feet thick. Concretions at base of Anna Shale are abundant, locally intergrown; many are septarian. Shale averages 1½ feet thick and base of limestone is "bossy". Top of Anna is thoroughly burrowed, the burrows filled with limey sediment.

5.) **300'N, 150'E** of shaft, in return air. Anna Shale about one foot thick and has no concretions. Base of limestone is smooth. Claystone parting 0.8' from top of coal, as before. A bit of floor heave in middle of entry to north.

6.) Sump, **150'N, 160'E**. One of the few places to see full thickness of coal:

TOP - Limestone, slightly knobby lower surface.
1.1 Anna Shale, black, light bluish weathering, hard, fissile, burrowed at top, lower contact sharp.
0.8 Coal, bright banded, pyritic.
0.05 Claystone, dark gray.
2.8 Coal, bright banded, pyritic.
0.15 Claystone, grayish black, blocky, pyritic, "blue band".
2.2 Coal, bright banded, powdery light blue mineral (sulphate) as nodules and cleat filling.
BASE - Claystone, floor.

7.) Eastern return-air entry, **50'N, 450'E**. This is in the heart of a "red rock" area. All we see are isolated, flattened ovoid coal balls at the coal-Anna Shale contact. They are half in the coal, half in the shale although a thin stringer of coal commonly overlies them. Dimensions up to 2.8 feet long and 0.8 feet thick. The rock is dark gray to dark brownish gray, very finely granular, and dense, with a few fractures. Not golden brown like coal balls at previous notes. These resemble a cross between coal balls and Anna concretions.

Anna Shale is about 2.5 feet thick and its contact to limestone is smooth to slightly knobby. On the east rib, entire coal thickness is exposed - no coal balls except at top.

8.) About **140'S, 450'E**. Here at last is the real deal - coal balls replacing much of the seam. The miners left a knob about 5 feet square sticking out of the east rib. The middle to mid-lower part of coal

is solidly replaced; the upper two feet mostly unaffected and the lower part covered. Occasional coal ball/concretions occur at roof-shale interface, as before, away from the large mass, and roof geology is the same as before.

To the south and west of true coal-ball mass, concretions are common in the lower one foot of Anna Shale, and some are at the coal-shale contact. These are septarian concretions of dark gray, microgranular carbonate rock. They are not mineralized peat.

9.) Intersection **0'N, 375'E**. Although well inside Kerr-McGee "red rock", this area has neither coal balls nor concretions.

10.) **275'S, 225'E**, edge of large "red rock" area, western edge of which we saw at Sops 1, 2, and 4. Here we have both septarian concretions within the Anna Shale and coal balls at the coal-shale contact. The latter are golden brown to dark brown and largely microgranular, lacking definite appearance of mineralized peat. Perhaps they represent degraded peat. Upper part of Anna Shale contains many large burrows filled with crinoidal limestone. These burrows are larger and more extensive than those in the ubiquitous "clod" zone. Anna Shale is 1 to 1½ feet thick and base of limestone undulates. Within 50 feet north of this point the Anna pinches out.

11.) **300'S, 150'E**, northern edge of mapped "red rock". Here is a major accumulation of coal balls. The heart of the mass is at the northeast corner of the intersection, where the seam thickens to more than eight feet with the bottom not seen. Upper two feet is about 50% rock, basal one foot (exposed) has little rock, remainder is 90% rock, thoroughly intergrown. The solid mass is at least 10 feet in diameter. Outward from the center, coal balls extend 30 to 50 feet in all directions. At the outer edges they are confined to the top of the seam.

Above the coal-ball mass, the Anna Shale thickens to more than three feet, the thickest we've seen south of the center of the mass. The roof is dripping water and "rusticles" have formed. Is the limestone gone and water-bearing sandstone above shale? Concretions in the Anna Shale are largest and closely packed around outer edges of coal ball mass, but are scarce above its center.

12.) **350-450' S, 150'E**. The coal is heavily replaced by coal balls as far as the 450' S intersection, and north to the previous stop. Coal balls occur at all levels in the seam (varying from place to place), except at southern margin where they retreat to the upper layers.

Anna Shale has many large septarian concretions and many slips. In one place the limestone is visible and there are large Stigmarian roots in it. It appears that the Brereton Limestone is very thin and overlain by water-bearing sandstone. There must have been deep water here; a boardwalk was installed.

At south edge of coal balls (450' S), the Anna Shale thins to less than a foot.

13.) **450'S, 75'E** (near "inner seam hole," a water pipe leading to Springfield Coal). Coal balls are abundant on north side of entry and sparse on the south side. Roof is Anna Shale with many concretions. Limestone not visible, roof is wet.

In crosscut to south, small coal balls are scattered. Concretions at base of Anna form a nearly continuous layer.

14.) **375'SL, 225'E**. Stub heading to west encountered coal balls in the lower 1/3 of the seam. Exposure is poor. Otherwise, only a few small coal balls near top of coal, but many concretions.

Just to northeast is a lens of Energy Shale, the first we've seen. The dark gray, weakly fissile shale weathers light yellow and crumbles in moist air. Contact to Anna Shale is sharp. At north edge, a thin coal "rider" from top of Herrin overlaps the Energy.

Eastern part of Energy Shale lens has no Anna Shale above. Dark gray, gritty rock above Energy was sampled.

15.) **525'S, 375'E**. Crosscut stubbed east into coal balls in the lower half of the seam. Coal balls are largely buried in gob; only a few small ones are in the upper part of the coal. The roof is Anna Shale, about one foot thick with limestone above. The usual concretions are absent.

16.) **525'S, 450'E**. This is mapped as "red rock", but we only saw two or three fist-sized coal balls near the top of the coal, plus a few small concretions in the Anna Shale. The shale is consistently close to one foot thick.

17.) **375'N, 250'W**. South edge of large "red rock" area northwest of shaft. Coal is heavily replaced (50% or more) by coal balls on the north rib. Coal balls occur at all levels in the seam. The roof is Anna Shale that thickens from 1½ feet at the south rib to 2½ feet at the north rib, over the coal balls. Water is dripping from the roof bolts.

18.) **400-500'N, 350'W**; between two slam doors. The coal is heavily replaced again, especially on the east rib 9 in places 80-90% rock top to bottom. The Anna Shale has many large septarian concretions. Shale is 2 to 3 ½ feet thick, overlain by hard rock - limestone or sandstone? A little water dripping.

Massive coal balls continue north of the double doors, but rock dust obscures the view.

19.) **600'N, 300'W**. Coal still heavily (50% or more) replaced by coal balls. In this area, Kerr-McGee's "red rock" corresponds to massive coal balls. In the immediate roof is a nearly continuous layer of concretions.

20.) **600'N, 150'W**. Massive coal balls from last stop to this point, near edge of "red rock" area. At the edges, the Anna Shale is thin (less than a foot), concretions are abundant, and coal balls confined to top of seam. Westward the concretions are intergrown and coal balls pervasive.

Here, as throughout the area we've walked today, the claystone parting about 0.7-0.9 feet from the top of the seam is conspicuous.

21.) **525'N, 375'W**. Western boundary of "red rock" should be moved eastward, about 20-30 feet east of this point, as only a few fist-sized coal balls occur near the top of the seam. Concretions are abundant in Anna Shale.

August 2, 2006. To 1st East longwall headgate.

22.) Main East belt entry, **675'N, 975'E**. Small accumulation of coal balls coincides with "red rock" on company map. Rock dust hides the view and belt blocks access to north side of entry. The coal thickens by a foot or two; this is likely to be ~ 50% coal balls at the core, on southwest corner of intersection.

Black shale roof has numerous concretions and large burrows filled with limey sediment. A little water is dripping.

23.) 1st Submain South, crosscut 3: **72'N, 1100'E**. Here is south edge of a lens of Energy Shale. The shale interfingers with the uppermost layers of Herrin Coal; a coal stringer rides over the top of the lens, with Anna Shale directly above the coal stringer.

Energy Shale in places is very carbonaceous, with many laminae of dull coal. It tends to grade upward to medium-gray, pyritic, weakly fissile shale. Contact to coal is ragged, many splayed stringers and small rolls.

24.) **100'N, 1050'E**, just northwest of previous - Anna Shale rises above northward-thickening lens of Energy Shale. Here is no coal stringer, but "bastard limestone" at base of Anna: grayish black, impure limestone loaded with pyritized brachiopods.

About 100 feet north, the Energy Shale is six feet thick with top not seen.

25.) **280'N, 1050-1125 E**. North edge of Energy Shale lens. Shale does not interfinger with the coal, although shale has coal stringers. Anna Shale truncates Energy Shale sharply.

26.) **250'N, 1125'E**, travel entry, roof fall shows the following - unfortunately inaccessible:

TOP
1' Silty shale or siltstone, very thinly bedded, pyritic.
0.3 Coal (Jamestown)
0-1' Limestone, nodular, lenticular (Brereton)
1' Anna Shale, black, well jointed
2-3' Energy Shale
TOP of coal.

Recalling stigmarian roots seen in roof yesterday at Stop 12, these may be related to paleosol beneath Jamestown Coal where Brereton is thin. Water-bearing sandstone may be above top of fall.

27.) Belt entry, **80-280'N, 0'E** (the 1st Submain South belt entry is a new "prime meridian". It is 1,200 feet east of the shaft).

The Energy Shale lens continues through this entry across the long pillar. Two large roof falls extend 15 feet above the top of the coal. Details are obscured by dust and wire netting, but Anvil Rock sandstone definitely occurs in the upper parts of both falls. The sandstone is medium-light gray, thin- to medium-bedded with dark shale partings. Jamestown Coal not visible, Brereton Limestone lenticular and absent in places. This area is dry now, but was formerly wet enough that miners installed sheet-metal gutters to carry water away from belt. The Anvil Rock appears to have erosional contact at base and may locally cut down to Energy Shale.

28.) 1st Submain South, **280'N, 75'E**. Entry stubbed into full seam of coal balls. The borders of the coal-ball mass are quite abrupt and there are few, if any, coal balls outside of the stub. Roof is 1½ to 2½ feet of Anna Shale. As usual, concretions at the coal-Anna contact give the best advance warning of coal balls. Concretions occur several tens of feet north and east of the coal-ball mass. A little water is dripping from the roof.

We returned to the east side of the belt entry. We saw no coal balls; a few concretions are in the crosscut east of the belt at 280' north. The "red rock" area drawn on company map is too large.

29.) 1st South Longwall headgate, middle entry, **450'E**. Large accumulation of coal balls. The "red rock" on company map corresponds to the area of full-seam replacements as mapped by Bobby Fowler's predecessor, Greg Smith. As we noted yesterday, Kerr-McGee's maps of coal balls were inconsistent.

Anna Shale is two to three feet thick within and surrounding the area of dense coal balls. We see the usual association of abundant concretions at coal-Anna contact and small coal balls near top of seam surrounding the dense core. The floor rises in all directions to the central core, and the coal naturally thickens where it is heavily replaced.

30.) Southern headgate entry, **450'E**. Just south of the coal-ball mass is a lens of Energy Shale and a large, informative roof fall giving direct access to strata up to base of sandstone.

TOP - Flat surface, probably sandstone.
10-12' Sandstone, light gray, laminated to thinly bedded, laminae separated by dark gray shale, planar to wavy or rippled (?) and rhythmic (with probable neap-spring cycles). Lower contact sharp.
0-2' Sandstone, light gray, fine grained, carbonaceous, coal rip-up clasts and coalified plant stems, lateral accretion bedding dips south. Sharp contact.
0.1-0.2 Jamestown Coal, bright banded, very shaly.
0-1' Brereton Limestone, dark brownish gray, nodular, absent to south.
1-2' Anna Shale, black, fissile, well jointed, a few concretions. Lenticular "bastard limestone" overlies Energy Shale west of fall. Lower contact sharp.
0-3' Energy Shale, medium gray clay-shale, weakly fissile, weathers light yellow and brown, crumbles in moist air.
Herrin Coal. No coal balls seen.

31.) Middle entry (**(545'S)** about **1400' east**. Blue area on map signifies bad roof and slips. This proves to be another lens of Energy Shale, but viewing conditions are poor. The roof is dripping lightly, but extensive guttering indicates former heavy water flow.

32.) Now in 2nd East Longwall headgate, middle entry, **435' east**. Here is a lens of Energy Shale, "blue" on company map. Eastern but not western edge of gray shale interbeds with topmost layers of coal. Anna Shale, about 1½ feet thick, sharply overlies Energy.

33.) Southern entry, **635'S, 525' east**. Southeastern edge of Energy Shale pod. Here is the best example of shale interfingering with top layers of coal. The erosion cuts below the claystone parting that normally is about 0.8 feet from top of seam. Energy Shale is sharply overlain by Anna with thin "bastard limestone" at base. Energy Shale thickens to four feet within 20 feet horizontally.

Scott made a photo panorama and movie.

The same relationships seem to hold around the western edge. The Anna Shale maintains its 2-2½ foot thickness across the top of the Energy Shale, and the Brereton is intact above the Anna. Also notes that layering in Energy and Anna Shale are parallel.

This lens filled a depression scoured off top of peat and Anna and Brereton deposited flat on top of Energy. Later domed due to compaction, inverting topography.

34.) Middle entry, **900-950'E**. Another lens of Energy Shale interfingering with coal at margins. Lens is about 50 feet wide.

Another lens is at 980-1000 feet east (company map is inaccurate). Again Energy Shale interfingers with coal. Bedding plane of Energy Shale in roof shows pyritized *Dunbarella* and carbonized plant stems, some several feet long.

35.) Southern entry, **850-950'E**. Here is a much better view of Energy Shale lens at least five feet thick. Fresh surfaces show faint, very fine planar lamination with tidal rhythmites. Coal stringers are common; shale interfingers with coal at contact.

36.) Southern entry, **1000 to 1250'E**. The third lens of Energy Shale shows the same features as of notes 32-35. Maximum thickness at least six feet. The layer with pyritized *Dunbarella* is darker and more competent and close to (if not at) contact with Anna Shale.

37.) Crosscut 11, **1635'E**, between middle and southern entry. A roof fall exposes Anvil Rock Sandstone (confirmed by fallen pieces) with several large coalified stems. Sandstone is medium gray, fine-grained, porous and slightly friable. It rests directly on thin Jamestown Coal, below which is lenticular Brereton and about two feet of Anna. Deep standing water and gutters at roof imply heavy water flow when first mined.

Energy Shale appears about halfway through crosscut. The "blue" area on the company map is too large.

38.) Southern entry, **1900 to 2050'E**. Here is a lens of Energy Shale more than seven feet thick with top not seen. The margins are poorly exposed, but coal stringers are common and we believe shale interfingers with coal. Wet conditions continue, but units above Energy can't be seen except near margins.

Between here and the last stop, we saw only small, thin lenses of gray shale. Most of the area has Anna Shale roof.

I hardly need to add that Energy Shale makes poor roof. Most of it has fallen. Large slips are numerous.

August 3, 2006. First Submain North. Entries have been driven 7,000 feet north of shaft bottom, and the miners are turning future longwall panels to the west.

39.) First Submain North, Entry 2 (2nd from west), **6700-6900'N**. Here is a pod of Energy Shale more than six feet thick. At the margins the shale interfingers with coal, and Anna Shale overrides the lens. In one place where Energy Shale is over six feet thick, the lower one foot is finely laminated bone coal with vitrain laminae and stringers. This grades upward to dark gray shale having faint planar lamination (tidal?). Near top of shale, bedding plane contains abundant pyritized pectenoid pelecypods.

40.) Area centered on crosscut **5892'N** between Entries 1 and 2. A large mass of coal balls, invading full height of seam. The miners took out as much as three feet of underclay and left coal balls in roof where the accumulation is dense. We get a good look at lower part of coal below Blue Band, where fusain lenses are common and coal balls less abundant than above Blue Band.

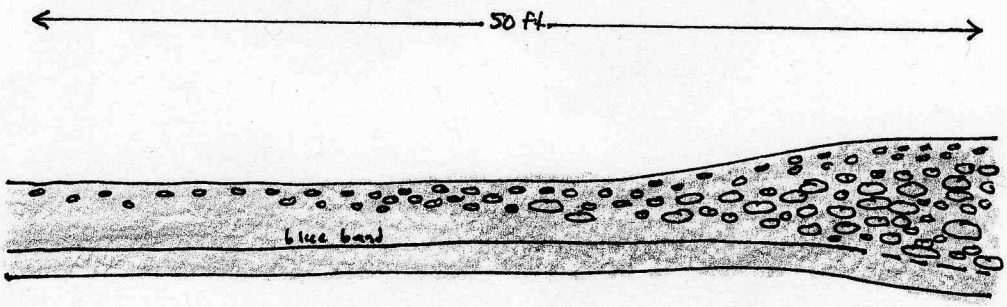
Because these are new workings with fresh rock dust, it's difficult to trace out edges of coal-ball area and map roof. At the edges it appears that coal balls thin out gradually and are mostly confined to upper part of seam. The roof is Anna Shale, with common concretions.

There is a slight amount of water dripping from the roof, but such seepage is common throughout this part of the mine.

The floor is olive-gray, thoroughly slickensided, tree fern-lycopsid-calamite rooted claystone.

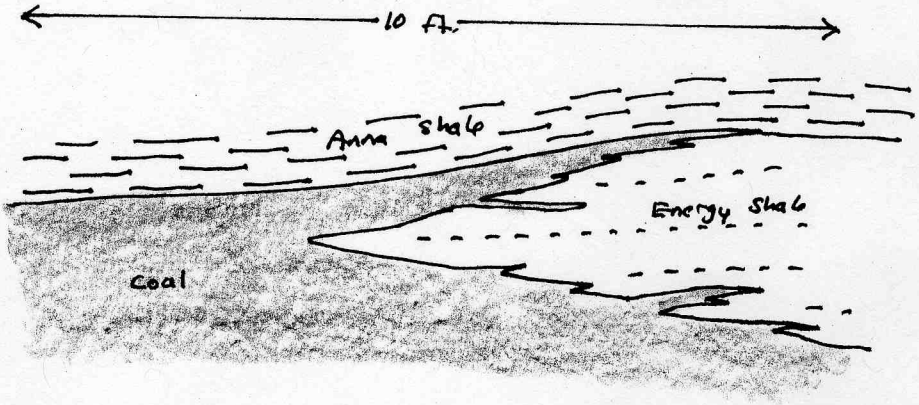
41.) Entry 1, **5550-5700'N**. Just south of coal-ball mass, roof is Energy Shale. We can't see the north margin because of top coal. At south margin, Energy Shale lies atop Herrin Coal and does not interfinger with coal. Fine planar lamination (tidal?) Is horizontal, and truncated at base of Anna Shale, which has a basal layer of "bastard limestone".

American Coal - Galatia Mine - Herrin Coal
John Nelson August 1-3, 2006



Note 11

Transition from dense coal-ball area to small, isolated coal balls at top of seam only.



Note 23

Energy shale lens interfingers with coal, and is overlapped by Anna shale.

Carbon isotopes from coal balls
Galatia Mine, Saline County, Herrin Coal

The following were collected on September 8, 1988 by Phil DeMaris at Kerr-McGee Coal Company's Galatia Mine in the Herrin Coal. Collections were made a short distance north of main shaft in Sec. 7, T8S, R6E, Saline County. Analyses were performed at the ISGS on February 17, 1989 and the following results were obtained:

Field No.	KG6-A-2	KG6-A-4	KG6-A-5	KG6-A-8
Lab No.	890160	890161	890162	890163
δ C 13	-23.356	-9.073	-2.359	-4.057
δ C 18	-7.518	-8.100	-8.552	-8.284

Sample A-2 was a coal ball 3.05 feet from the top of the seam. The other three samples were coal balls from the top of the seam, at or near the contact with the Anna Shale.

American Coal Company - Galatia Mine - No. 6 Seam
Saline County

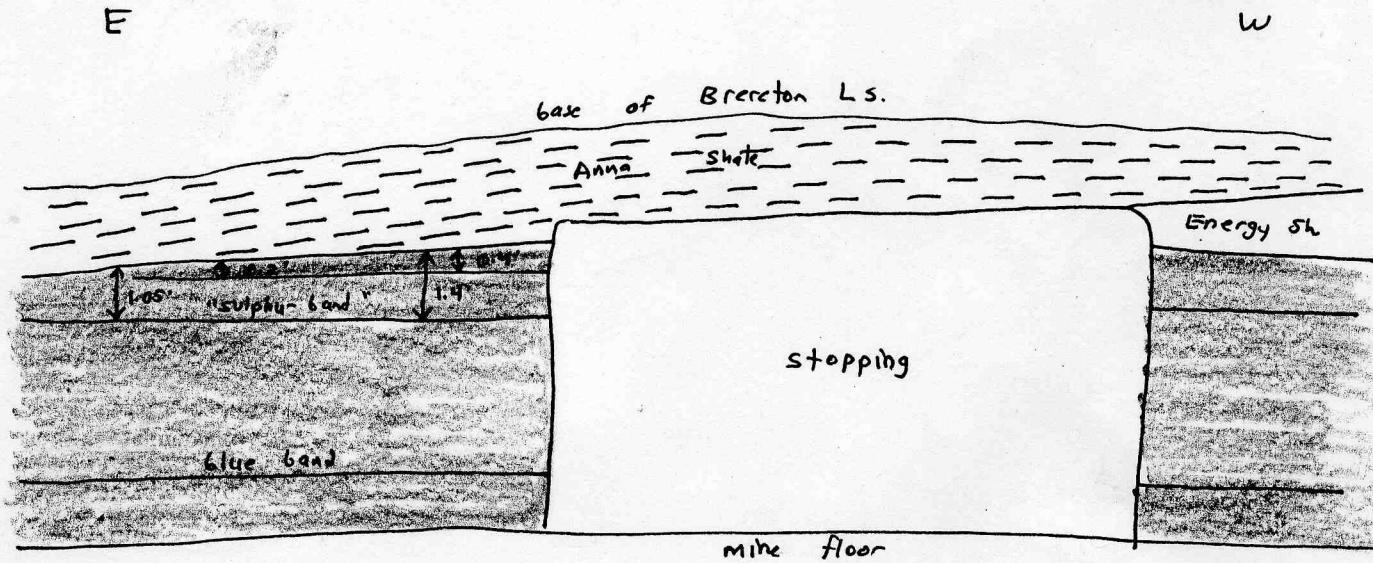
Notes by John Nelson with Scott Elrick of ISGS and Bobby Fowler, company geologist, Sept. 12-13, 2006.

Continue investigation of coal balls in the Herrin Coal, mapping the area around the shaft bottom primarily on the east (return-air) side. Scott took nearly all the notes.

Scott's locality 18.) At the edge of a lens of Energy Shale, the uppermost layers of Herrin Coal are visibly truncated beneath the Anna Shale, as shown by a series of measurements from the "sulphur band' and other thin claystone partings near the top of the seam. About 0.25 feet of coal is lost within a lateral distance of 10 feet , going eastward away from the edge of the gray shale.

This much was expected, as Phil DeMaris previously documented such thinning in this same area of the mine and attributed it to erosion.

Something I've never seen before is low-angle foreset bedding in the Anna Shale. As shown by the sketch, the Anna Shale bedding downlaps slightly toward the east. Evidently the shale accreted laterally from west to east, that is, away from the lens of Energy Shale.



American Coal Company - Galatia Mine - North Mine
Saline County, Illinois

Notes by John Nelson on visit with Scott Elrick (ISGS) and Bill DiMichele (Smithsonian), August 31, 2006.

We entered the mine through the north portal, which is just north of the Galatia channel (SE 1/4 NE 1/4, Sec. 29, T7S, R6E). A pair of entries crosses the channel, continuing south to the main portal, where coal comes up the slope via conveyor belt. All mining now takes place north of the channel.

We had a brief look at the northern part of the channel crossing. The rock walls are exposed, albeit heavily coated with rock dust. The margin of the channel is a wide zone of split coal. Time being short, we opted to leave the channel features for a future visit and pursue our main objective, to make a profile of fossil plants and roof geology north of the channel. We rode nearly 2 ½ miles north of the channel along the Main North entries and walked back to the shaft, making notes and collecting fossils in transit. Locations are variously given in terms of surveyed footages from the shaft bottom (based on survey tags), by crosscut numbers, and by panel entries.

8th West headgate, footage 12,300. This was our furthest north penetration into the workings. Coal measures 4.9 to 5.2 feet thick and lacks rock layers. Floor is olive-gray, blocky, slickensided mudstone, slightly silty and probably rooted. Roof is medium gray silty mudstone or weakly fissile shale that contains faint, rhythmic, planar lamination and diffuse siderite layers. Contact to coal is either sharp or rapidly gradational through about 0.1 ft. of "rash" (interlaminated coal and shale). In most places 2 to 2 ½ feet of roof was removed to make clearance.

Three fossil stumps are clustered together. They form a triangle with sides 3.1, 3.5, and 6.0 feet long. All three are 0.6 to 0.8 ft. in diameter. Two are inclined about 60°; the third we saw only the base and could not determine orientation. Bill was unable to positively identify the trees, but they do not appear to be calamites or lycopods.

Aside from stumps, we saw one Stigmarian root axis in the roof (about 2 feet above the coal), and scattered, unidentified plant fragments. This mudstone has little organic matter.

7th West headgate. At an undercast, the floor is hard, massive, gray siltstone with coal stringers, slickensides, and rootlets only in the uppermost few inches. The roof is as before. Joints strike N 85° E and are weakly developed. I saw one weakly developed kink zone. The coal seam undulates gently. Fossils are uncommon, a couple of flat-lying stems.

Crosscut at 10,825 ft. Four fossil stumps, three having only the base visible, the fourth very well exposed at side of entry and extending more than 2 feet above top of coal. The base of the stump flares outward. Roof lithology as before, with scattered plant debris on bedding, mostly finger-size and smaller stem fragments along with a few larger stems. Roof is uniform and competent.

6th West headgate. At the undercast on the travel road, the coal is 6.0 ft. thick and the floor consists of 1 foot of greenish gray silty mudstone with roots and slickensides, overlying about 3 feet of hard, gray, massive siltstone. The roof is perhaps a little darker gray than before and still has the faint, rhythmic lamination. Plant debris is common, but nothing collectible.

Survey 9,600 ft. The topmost few inches of seam begin to splay and interfinger with the roof. A few sandstone laminae appear, and plant debris continues to increase in quantity and size of individual fragments. At about 9,400 feet, large stems and recognizable foliage become quite abundant in the basal ½ foot of the roof. Miners did not remove shale here, giving us a better opportunity to observe immediate roof. There is clearly a real southward increase of fossils.

5th West headgate. At the undercast, the coal is 6.9 ft. thick. The upper 1 foot of floor is thoroughly rooted and slickensided olive-gray claystone, which grades downward to massive gray siltstone. Water seeping out of floor at base of undercast has strong hydrogen sulfide odor. Immediate roof is medium-dark gray shale with plentiful stem and leaf fragments along with occasional stumps.

Two crosscuts south of the undercast, the roof was taken out to 6 feet above the coal for belt clearance. The silty mudstone is nearly uniform and shows the usual planar lamination and probable neap/spring tidal rhythmites. Fossil occurrence is patchy.

3rd West headgate. Coal is 6.9 ft. thick and lacks clastic layers. The upper 1 foot of floor is medium-dark gray claystone with roots and slickensides, grading downward to 4 feet of hard, massive, greenish-gray siltstone with diffuse siderite. The roof is medium-dark gray shale with diffuse siderite layers and abundant plant remains in lower 1 foot. Flat-lying logs are numerous, but I saw no upright stumps. Coal-to-roof contact varies from sharp to gradational through several inches of "rash". The contact lacks rolls or rider splits. Planar lamination is indistinct and there are no sandy laminae. Generally monotonous geology.

Crosscut 41. This is the top of a large hill in the coal. The seam thins to less than 6 feet at the crest, compared to nearly 7 feet north of the hill. Floor is still rooted claystone at the crest. Several inches of "rash" separates coal from roof shale, which is coarser than normal: numerous fine planar sandstone laminae. Plant fossils are confined to "rash" interval. I suspect the hill reflects original topography.

On south flank of hill at crosscut 40, coal is 6.0 ft. thick and the floor is medium-light gray to greenish gray siltstone to very fine sandstone, massive and having many stigmarian roots in the upper part. Contact to coal is sharp.

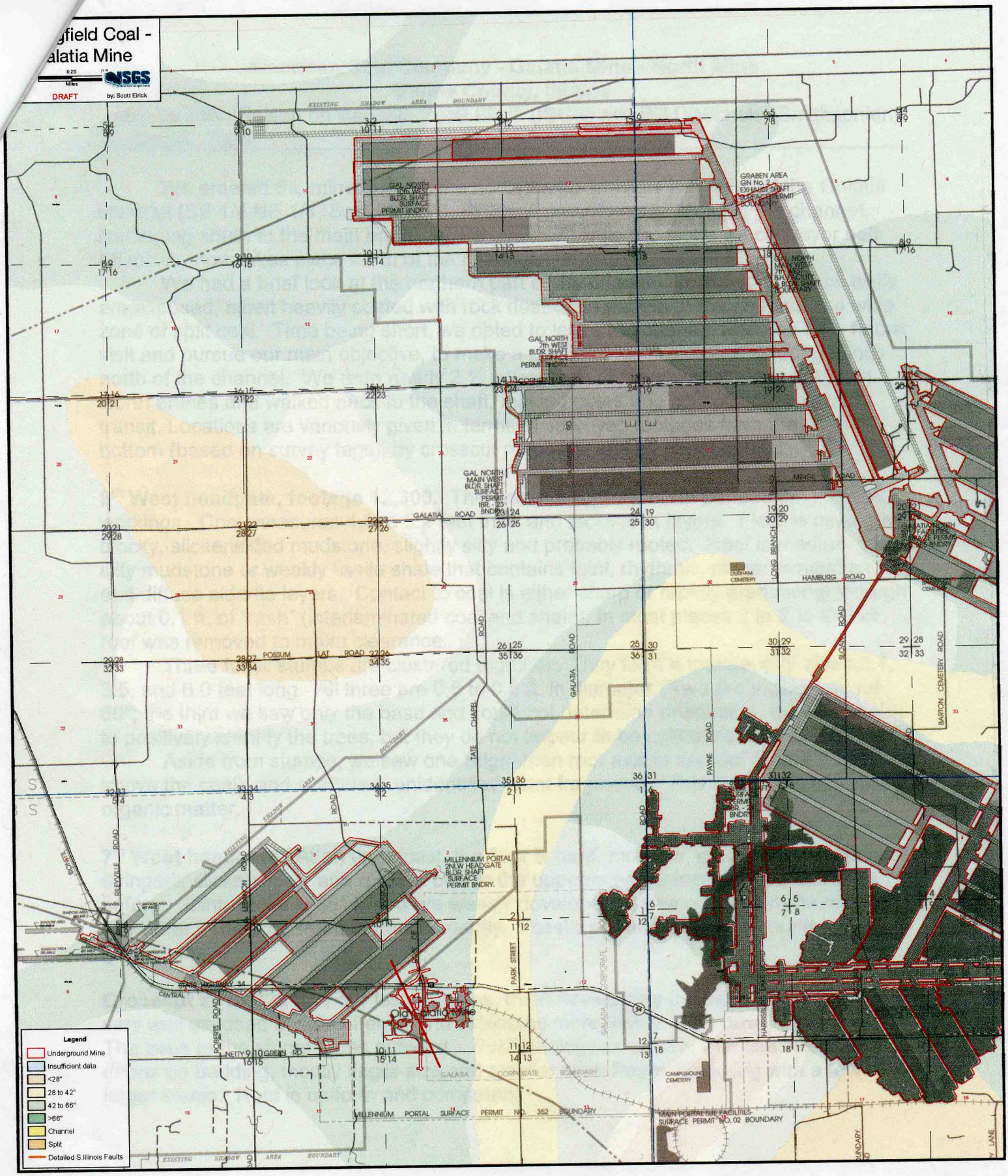
The hilly section continues to crosscut 34, where the coal levels out and plant fossils return in abundance. Mostly large medullosan stems are present, but *Pecopteris* foliage is common.

Fault zone. We took a brief side trip to look at the fault crossing at crosscut 24. Two entries were driven more than 400 feet through rock to cross a fault that has 50 feet of vertical displacement (according to our guide). As seen in southern entry, fault plane strikes N 20° W and dips 65° southeast, making this a normal fault. A "horse" or slice of coal is in the footwall. No slip indicators were evident, but thick rock dust and wire netting greatly hindered inspection, and time was running short.

Crosscut 23. Fossil plants are abundant to the top of the highest roof exposures, 4 feet above the coal. Stems continue to dominate but there is plenty of well-preserved fern foliage, both *Neuropteris* and *Pecopteris.* Shallow rolls (less than a foot deep) are common.

Crosscut 18. South of this point, rolls as deep as 2 feet become common, and fossil plants continue in abundance. *Neuropteris* now greatly outnumbers *Pecopteris.* Sections of fronds as large as a hand are common. The coal undulates moderately.

Crosscut 15. At an undercast, coal is 6.2 ft. thick and lacks clastic layers. The floor is 2 feet of olive-gray, silty mudstone with slickensides and abundant roots. The roof is as before - rolly, with abundant plants.


gfield Coal -
alatia Mine
0.25 0 Miles
ISGS
DRAFT
by: Scott Elrick
EXISTING SHADOW AREA BOUNDARY
GAL NORTH 7th WEST BLDR. SHAFT SURFACE PERMIT BNDRY.
GRABEN AREA GN No. 2 EXHAUST SHAFT SURFACE PERMIT BOUNDARY
GAL NORTH MAIN WEST 7th WEST RAIL FACILITY & BLDR. SHAFT BOUNDARY
GAL NORTH MAIN WEST BLDR. SHAFT SURFACE PERMIT BNDRY.
GALATIA ROAD
CORNETT RD
MINES ROAD
LONG BRANCH ROAD
HAMBURG ROAD
OLDHAM CEMETERY
GALATIA NORTH SITE FACILITIES SURFACE PERMIT BNDRY
POSSUM FLAT ROAD
TATE CHAPEL ROAD
GALATIA ROAD
SLOAN ROAD
BARTON CEMETERY ROAD
PAYNE ROAD
BOUNDARY
SHADOW AREA
EXISTING ROAD
MILLENNIUM PORTAL 2NLW HEADGATE BLDR. SHAFT SURFACE PERMIT BNDRY.
RILEYVILLE ROAD
LEBANON ROAD
PARK STREET
CORPORATE
GALATIA
ROBERTS ROAD
NETTY GREEN RD
Old Galatia Mine
CAMPGROUND CEMETERY
MILLENNIUM PORTAL SURFACE PERMIT NO. 352 BOUNDARY
MAIN PORTAL SITE FACILITIES SURFACE PERMIT NO. 02 BOUNDARY
Legend
Underground Mine
Insufficient data
<28"
28 to 42"
42 to 66"
>66"
Channel
Split
Detailed S Illinois Faults

Galatia Mine - Old Notes

8/19/85 W.J. Nelson with Richard Winston and W.A. DiMichele. Springfield Coal, 3rd South Panel off Main East, room 13 left. This should be approximately 1,000 ft from south line, 2,600 ft from east line, Sec. 8, T8S, R6E. Abundant *Sigillaria* and *Lepidodendron* stems and logs at base of siltstone directly overlying coal. There are no upright stumps. Roof is medium gray siltstone with "varve-like laminations".

7/9-10/86 W.J. Nelson with Ralph Sachs, company geologist. Northwest corner of shaft-bottom area in Springfield Coal, coal is split with siltstone layers and disrupted, as shown by sketches. On the southeast side, the coal is low in elevation and interfingers with siltstone. On the northwest, the coal is 30 to 40 feet higher in elevation, plunging downward abruptly toward the low side and again interfingering with siltstone. Gap where coal may be absent was not mined. Floor was not observed. On a parallel entry, the coal forms a monoclinal "hill" and contains a siltstone split near the middle, but the seam is continuous.

Comment: is this another example of floating peat deposit? Phenomenon sounds closely similar to what we observed this year in Millennium Mine. The area should still be accessible and a short walk from the main shaft.

6/8/88 W.J. Nelson with W.A. Dimichele, Debra Willard, and Don Eggert, Springfield Coal. Face of 4th South Panel off Main East. Roof is medium-dark gray, silty, weakly fissile shale with siderite and faint planar lamination. Plant fossils abundant: flat-lying *Sigillaria* and other lycopod trunks, broken pteridosperm foliage, and fossil stumps in growth position. Most stems and logs are in basal few inches of shale. Pectenoid pelecypods also are present.

Split coal area, Main North, 4,200 to 4,700 feet north of bottom. A lens of siltstone near the middle of the Springfield thickens from a feather-edge to 5 ft. within a distance of 100 ft. In places, thinner siltstone layers and lenses are within the lower part of the coal. I noted that the split material is coarser grained than either floor or roof. There are no roots in the siltstone splits, but "upside-down riders" of coal splay downward into the split. The floor consists of rooted claystone that grades downward to siltstone. The roof is carbonaceous shale, nearly black at the base and loaded with fossil logs, becoming lighter colored and more competent upward. Comment: this area should still be accessible. Was the upper part of the peat rafted upward? In my notes I hypothesized that the coal above the split consisted largely, if not entirely of transported peat.

Thin coal area, Main North, eastern entry, Crosscut 14. Coal thins to as little as 1.1 ft and is split with very fine-grained sandstone. The floor (2.5 ft exposed) is claystone having definite stigmarian roots. The roof is shale, grading from impure coal at the base and coarsening upward. It has planar varve-like siltstone laminae, plant debris on bedding (not identified), and common pectenoid pelecypods.

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American Coal Co. – New Era Mine – Galatia Mine Complex. Saline County, Illinois
Notes by John Nelson with Scott Elrick of ISGS and Chris Case from American Coal, February 23, 2012.

Currently the only active part of the Galatia complex is the New Era Mine, which is the current name for the underground mine in the Herrin Coal. This mine dates back to Kerr-McGee and is accessed from the same shaft and slope that formerly served the Galatia Mine workings in the Springfield Coal. The New Future (Millennium) Mine in the Springfield Coal is idle, although moves have been made toward opening works in the Herrin Coal from the same portal.

Faults in 6th East Headgate

My observations. Faults that offset the coal seam have recently been encountered in this set of headings advancing southeast off the Northeast Submains off the Main North. Surface projection of the fault crossing on the middle (belt) entry is approximately 1700' NL, 2000' WL, Sec. 33, T7S, R6E, Saline County, on the Galatia 7.5' quadrangle. The faults were not unexpected, because they were encountered previously in the Springfield Coal.

On the travelway (northern of three entries), we have a high-angle normal fault with the coal downthrown about 7 feet on the northeast. I measured a strike trend of N 35° W; the overall trend based on the company map is about N 25° W. There are actually two fault planes of roughly equal throw 3 to 5 feet apart, with an intermediate slice or step. Multiple calcite veins are present, and there are open fissures in the Brereton Limestone. Striations plunge nearly vertical, indicating dip-slip.

The scene is much the same in the middle (belt) entry, except the western fault (on footwall side) appears to flatten downward, merging with the eastern fault near the floor of the entry. Again, striations indicate dip slip. Crushed shale gouge lines the fault. No water is dripping.

On the southern (return-air) heading, the fault is essentially a single break and the throw is about 6 feet, slightly greater than coal thickness of 5.6 to 5.8 feet. Fault dip is 60° to 63° northeast. As in the other two entries, there is little or no drag along the fault.

Approximately 200 feet northeast of the first fault is a second fault having opposite sense of throw. As seen on the return-air entry, this fault strike N 30° W, dips 55° southwest (near the roof), and has 3 feet of normal throw down to the southwest. Calcite veins, a thin zone of gouge, and near-vertical striations mark the fault surface. Again, there is little or no drag. Another parallel fault having 1 foot of normal throw down to the southwest is 10 feet northeast of the larger break.

A good dust-free exposure of the 3-foot fault was found in Crosscut 66 off the travelway. At this point the offset if 2.2 feet at the base of the coal, and the gouge zone is 1 to 2 inches wide. Calcite veins pinch and swell to more than an inch wide. Vertical striations and mullion mark the limestone at roof level. The 1-foot fault seen in the return-air heading died out or merged with the larger fault.

Although not much of a problem in room-and-pillar mining, faults such as these are a major hindrance to longwall mining.

Chris Case's sketches. Chris Case, geologist for American Coal, provided two sketches he made of the faults underground. The view in Entry 2 (belt entry) agrees with what I saw – with allowance made for rock dust and wire mesh bolted to the ribs and hampering inspection. Case's sketch of the fault in Entry 3 differs considerably from

my observation. Case shows strong drag on both sides of the fault, with the strata folded up on both sides of the fault plane. The drag is more pronounced on the hanging wall and the fault drawn at a lower angle than I saw it, and somewhat listric. Moreover, Case depicted the Brereton Limestone as being upthrown on the hanging wall, whereas the Herrin Coal is downthrown. In other words, the fault offset is reverse in the limestone and normal in the coal.

While not impossible, this depiction necessitates either that the fault underwent a large component of horizontal (strike-slip) movement, or that the fault alternately underwent reverse and normal displacements. I have seen plenty of examples (in other mines) where segments of the Cottage Grove exhibit similar geometry. In fact, the cover sketch on ISGS Circular 522 shows such an example. However, Case's sketch does not agree with my own field observations in the New Era Mine.

Fault projections. Company maps show that the faults in 6th East Headgate align with a large fault encountered earlier to the northwest in Galatia North Mine, Springfield Coal. This fault passed east of the main shaft bottom and continued north-northwest approximately two miles. Where I observed it briefly on 8/31/06, the throw was estimated at 50 feet. Workings of Galatia North to the south of the 6th East Headgate apparently did not encounter faults. These observations indicate that the fault zone is dying out to the southeast. Unfortunately, the fault can be expected to increase in throw northward, where it crosses three projected longwall panels.

Yet another fault is projected to pass ahead of the face of the 6th East longwall panel. More accurately, the company has drilled out this fault and intends to terminate the panel before the fault is met. This fault also was found in the Galatia North Mine and probably continues southeast into the old Eldorado Coal Co. Dering No. 2 Mine, where an igneous dike accompanied the fault.

All of these structures are part of the Cottage Grove Fault System.

Coal balls in 6th East Headgate

We stopped briefly to look at and sample "red rock" (calcareous coal balls) near Crosscut 28 on the travelway. Along the east rib south of the travel entry, coal balls occupy approximately 50% of seam volume from floor to roof. Along the entry, they continue a linear distance of at least 100 feet but are mostly confined to the upper half of the coal seam. Rock dust prevents detailed study. The roof appears to be Anna Shale, but is very irregular. Uneven shale-coal contact likely reflects coal balls at the top of the seam.

"Split" coal in Main West

As Chris Case described it to us before we went underground, the present face of the Main West (about 2500 feet west of the Main North junction) encountered minor "splitting" in which upper layers of the coal went up into the roof. Between the main part of the seam and the upper splits, the roof changes to coaly or carbonaceous, pyritic shale.

Visiting the area, I observed similar conditions across each of four parallel headings. The immediate roof is typical Anna Shale, 1 to 3 feet thick. The shale is hard and fissile and contains numerous large pyrite-rimmed septarian concretions, as are common to this unit. The Herrin Coal does not split.

Above the Anna Shale is 1 to 2 feet of carbonaceous shale that is medium-dark gray to grayish black and moderately fissile. Plant remains replaced by pyrite are

plentiful, albeit poorly preserved. Among them are Stigmarian root axes. The carbonaceous shale grades upward to coal that is generally subbright (more dull than bright) and includes numerous laminae of dark gray shale or claystone. Maximum thickness observed is about one foot, but the top was not seen. The drillers report that limestone is absent.

Scott and I interpret this as an area where the Brereton Limestone pinches out and the Jamestown Coal directly overlies the Anna Shale. This is a common situation in other areas of Illinois, but unusual for this mine. However, in notes dated 8/2/06 from the 1st East Longwall Headgate of this mine, Scott and I described several areas where the Brereton is thin or absent and the Jamestown Coal is visible in roof falls. The most informative exposure was my note #30 from a large roof fall on the southern headgate entry 450 feet into the panel. In this fall, the roof succession in ascending order was:

Top of Coal
1-3 ft Energy Shale, medium gray
1-2' Anna Shale, black, fissile, with concretions
0-1' Brereton Limestone, lenticular
0.1-0.2' Jamestown Coal, shaly
10-14' Sandstone laminated, probably tidal rhythmites, lower contact (to Jamestown) erosional.

Fracture zone(s) in Main West – Main North junction

A company map shows two linear, parallel "slip planes" 400 feet apart in the area where the Main West branches off the Main North. Both strike N 65° E and die out to the northeast within the Main North (as mapped). Toward the southwest, both "slips" pass into unmined coal. The northern one is more than 1,000 feet long. Notations on the company map indicate small displacements (fraction of a foot).

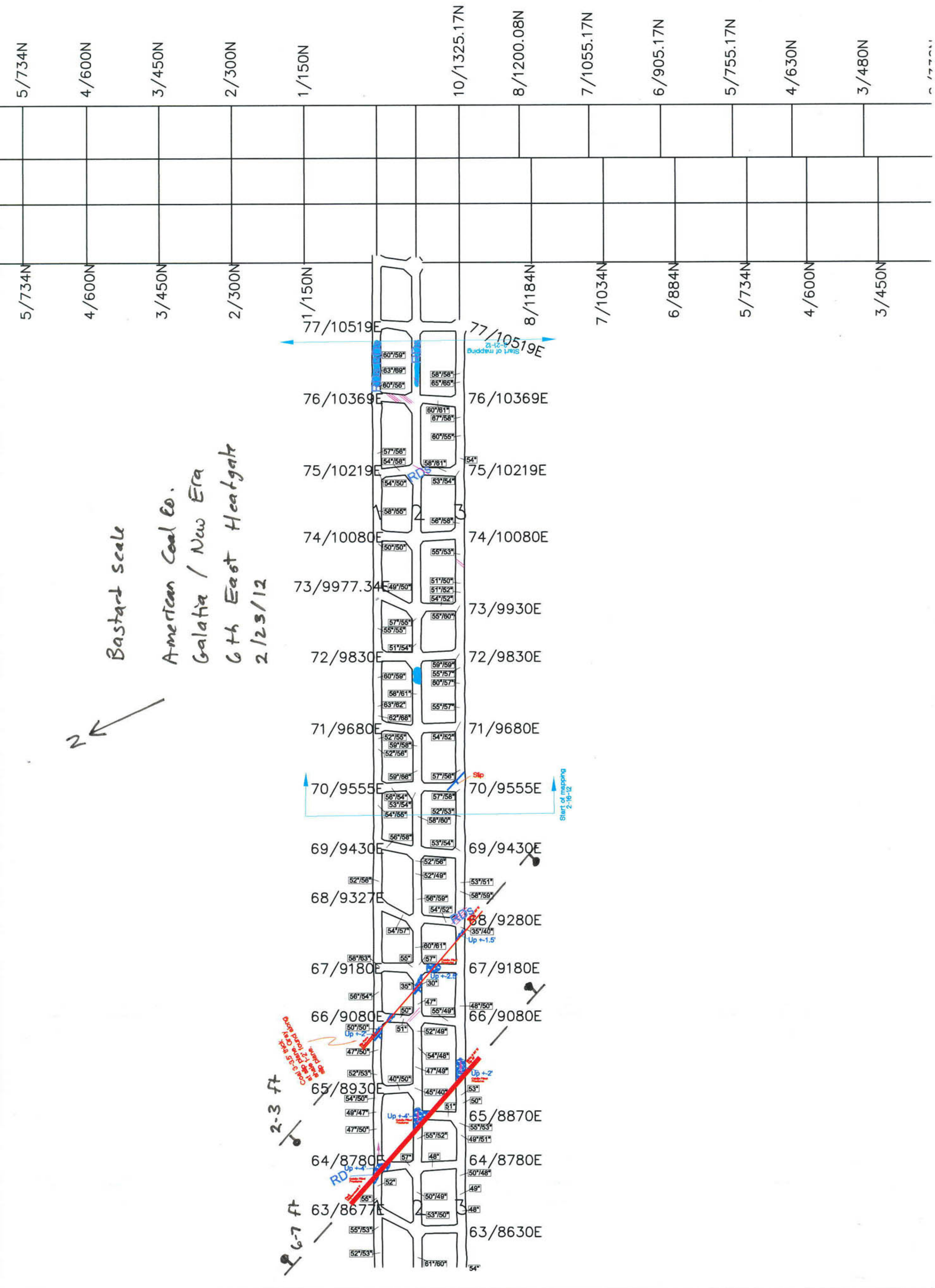
We observed the northern "slip plane" where it crosses three north-south headings that are being driven south off the Main West as a supplemental air course. They would be easy to overlook, except for the fact that they are producing water from the roof in a mine that is otherwise blessed with dry conditions. Water movement is localized and not continuous along the length of the fracture, and it varies from a trickle to a steady stream.

On close inspection, the feature proves to be a vertically oriented shear zone in the coal and roof. Coal and shale have been pulverized, and in several places we saw prominent horizontal striations and mullion. The roof is mostly intact, but in one place there is a large, angular fissure in the Brereton Limestone lined with large crystals. The irregular void is wide enough in places to admit a man's hand. Vertical displacement across the shear zone is zero to a few inches.

This is a strike-slip fault and is clearly of tectonic origin. Possibly, it is an element of the Cottage Grove Fault System. However, the lack of larger faults near by and parallelism with regional compressive stress axis leads me to believe that this fault is a product of the contemporary stress field. It may be an example of intensified jointing, with shear displacement. I recall zones of intensified ENE to E-W joints in the Inland Steel No. 2 Mine at McLeansboro, a mine that had a serious problem with *in situ* stress. Joints at Inland No. 2 lacked displacement, at least as far as I could tell. Small strike-slip faults occurred in several other Illinois mines, most notably the Crown II Mine in Macoupin County. The fault at Crown II had much larger displacement and crossed the

entire property, a distance of miles. It was to blame for many roof falls along with influx of oil, natural gas, and copious quantities of water.

These little faults at New Era Mine bear watching as new panels are developed along trend. They are likely to occasion wet conditions and unstable roof.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3/450N
2/300N
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8/1200.08N
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5/755.17N
4/630N
3/480N
8/1184N
7/1034N
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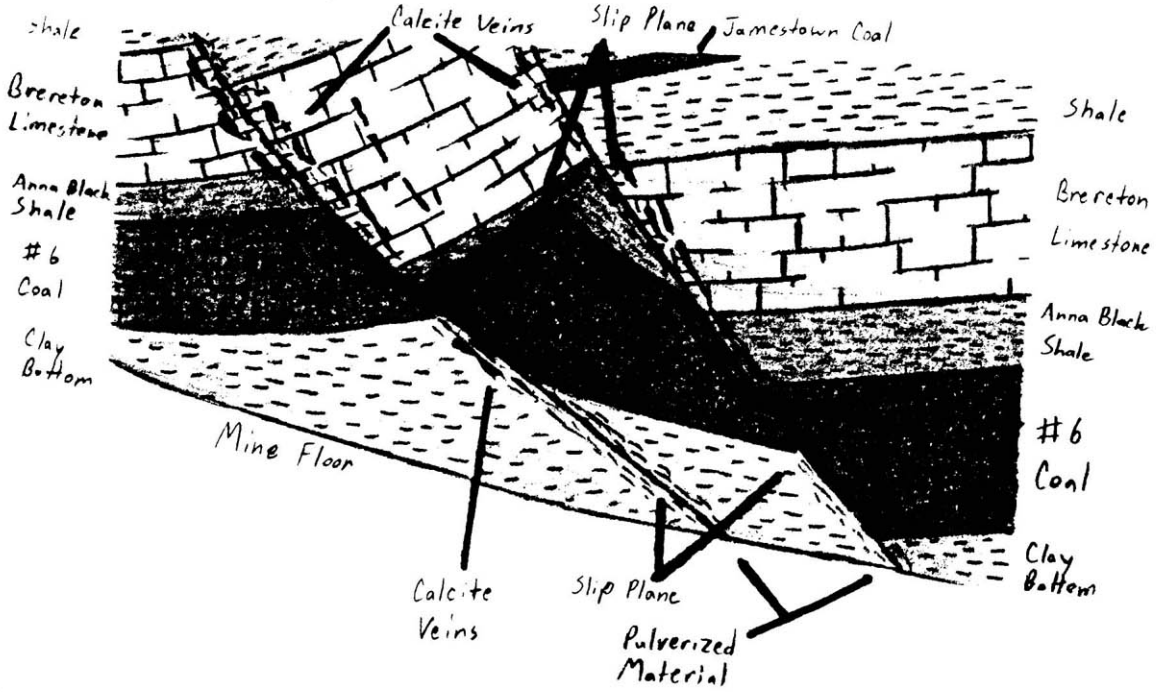
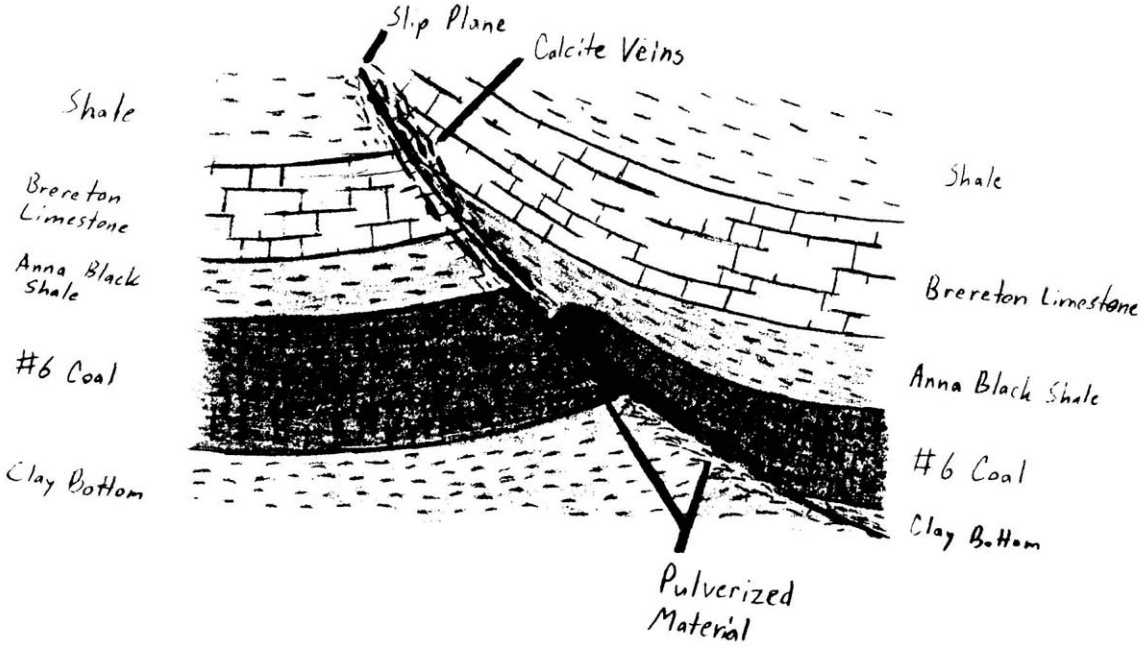
71/9680E
Slip
70/9555E
70/9555E
Start of mapping 2-16-12
69/9430E
69/9430E
68/9327E
68/9280E
Up +-1.5'
67/9180E
67/9180E
Up +-2.5'
66/9080E
66/9080E
Up +-2'
65/8930E
65/8870E
Up +-4'
64/8780E
64/8780E
Up +-4'
RD
63/8677E
63/8630E
2-3 ft
6-7 ft
Bastard scale
American Coal Co.
Galatia / New Era
6th East Headgate
2/23/12
N

TACC Fault Assessment
6th East Headgate Entry 2



6th East Headgate Entry 3



Main North

Main West

61"/63" Ls
29" Sh

Jamestown Coal th roof sequence

Start of mapping 2-21-2012

Start of mapping 1-26-2012

Strike-slip shear fractures

Irregular Coal Top

Irregular Coal Top

Irregular Coal Top

Up +-1'

Up +-1.5-2'

Up +-2'

Up +-0.5'

Up +-2.5'

Up +-3'

Up +-3'

Up +-1'

Up +-1'-0.5'

Sm RR (5X)

Irregular Top/SLX in Top of Coal

Coal Top/Sm Disturbed, No Lg Offset

Sm Offset

Top Heavily Disturbed, SLX Through Seam

Lg Open Frac/Sm Fault 0.33' of Offset

Sm RR (5X)

Sm RR (10X)

RDs

RW

RD

22/2720W
21/2570W
20/2420W
19/2270W
19/2300W
18/2150W
17/2000W
16/1850W
15/1700W
14/1550W
13/1400W
2/1258.22W
11/1183.22W
10/1108.22W
9/995W
8/870W
7/720W
6/570W
5/420W
3/270W
3/345W

2/225S
3/375S
4/525S
5/675S
6/825S
7/975S

48/6869N
3/6342N
41/6192N
40/6042N
39/5892N
38/5742N
37/5592N

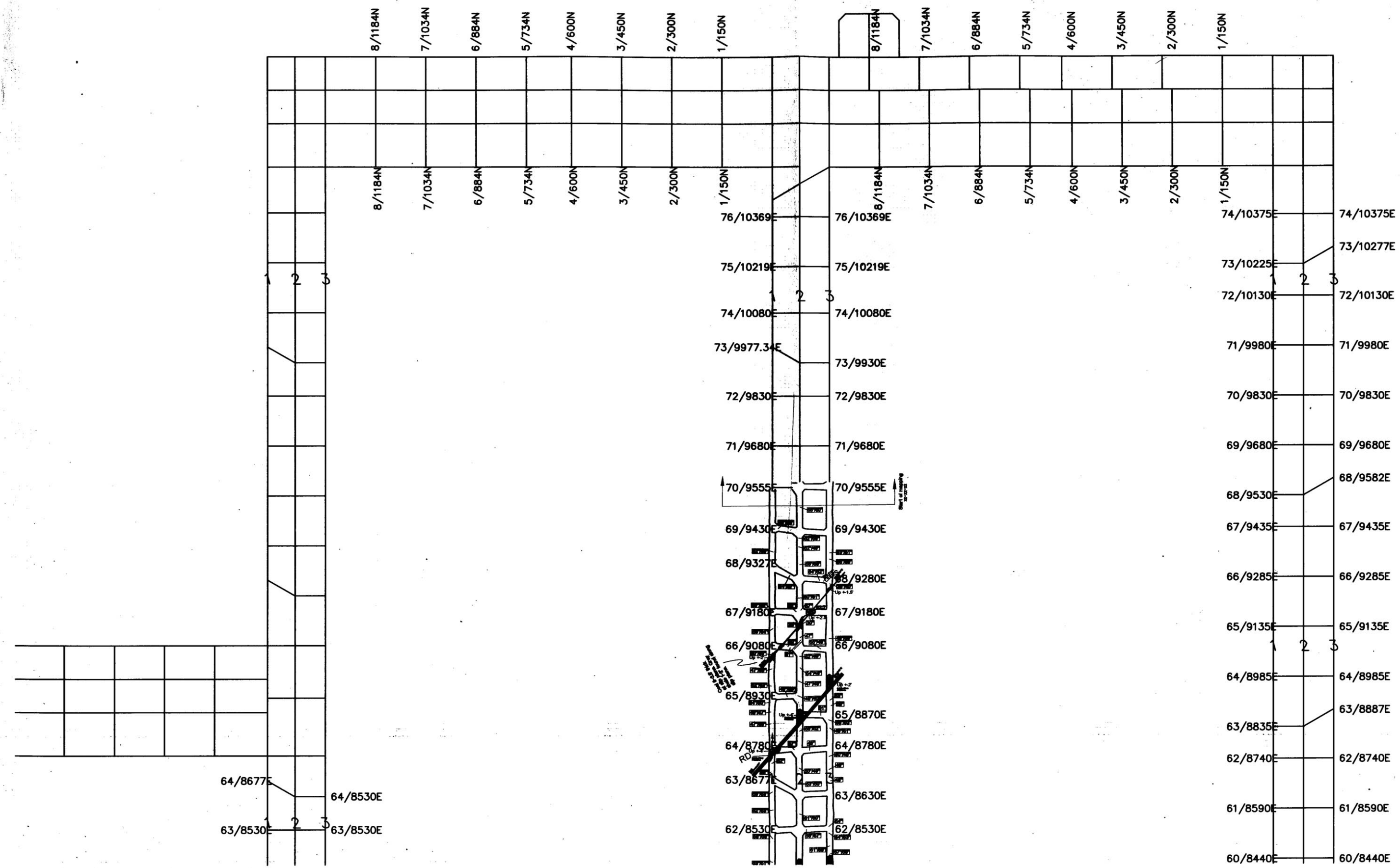
N

Bastart scale

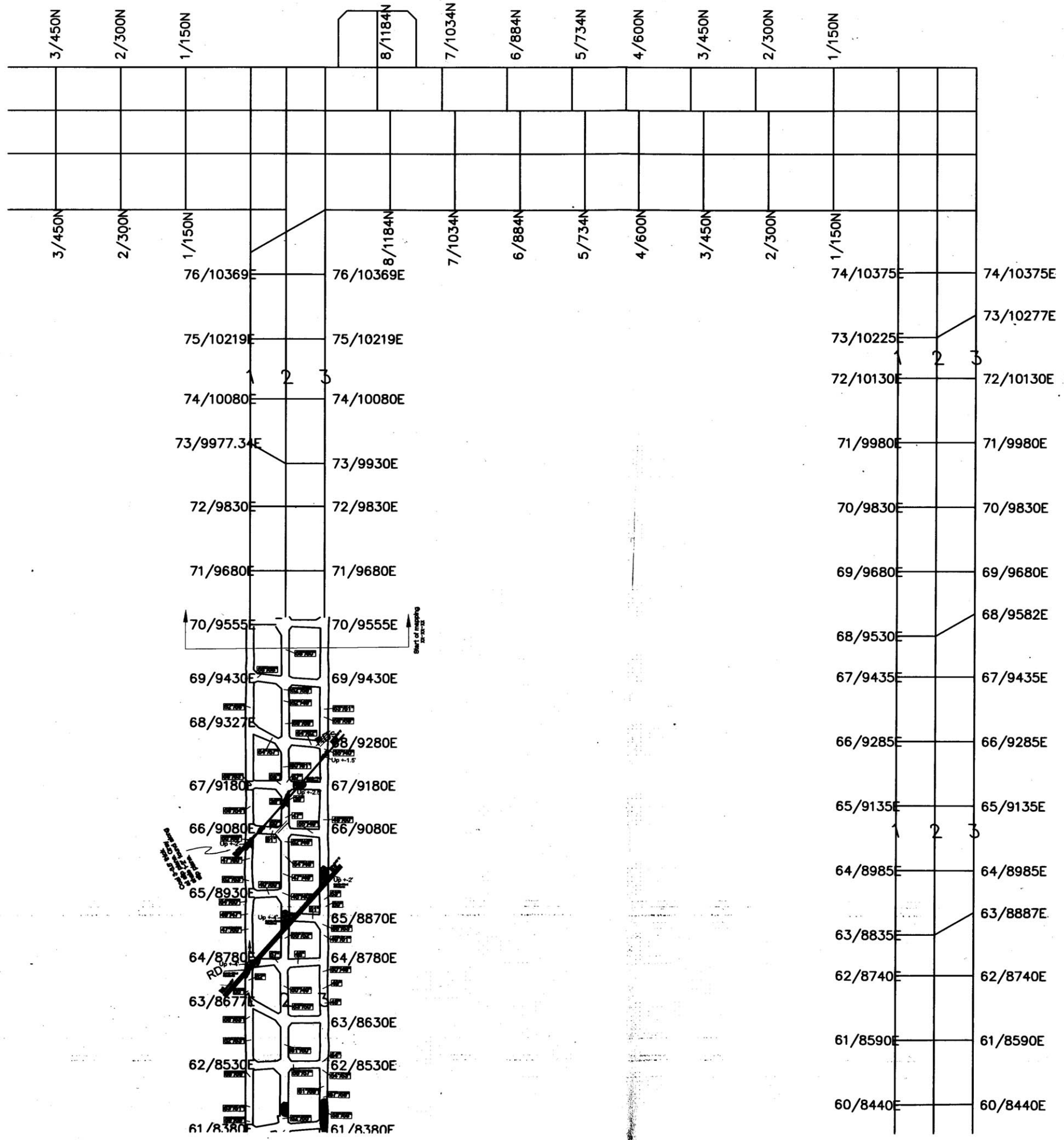
American Coal Co.
Galatia / New Era
2/23/12

Red Rock

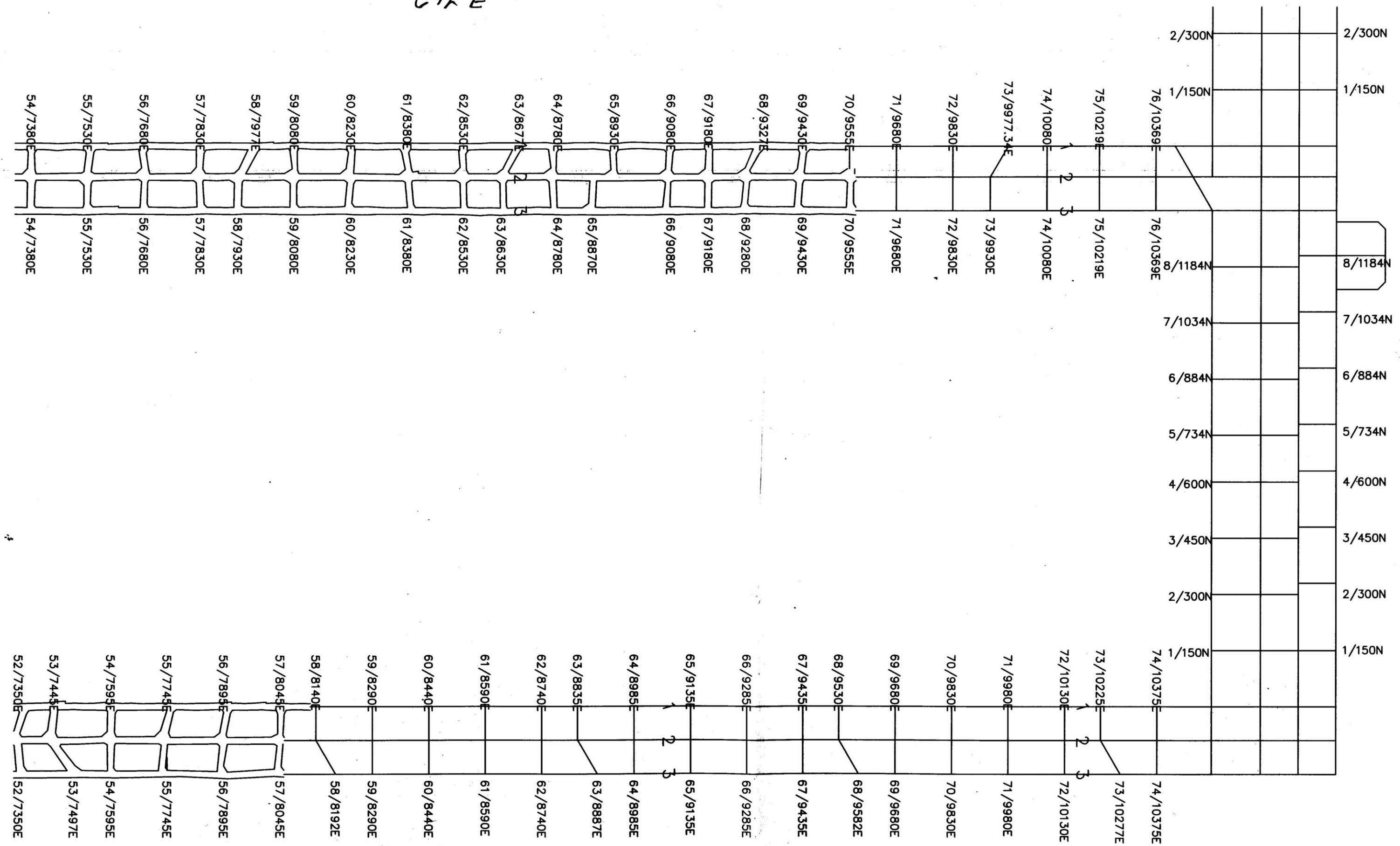
Coal Balls


8/1184N
7/1034N
6/884N
5/734N
4/600N
3/450N
2/300N
1/150N
1 2 3
76/10369E
75/10219E
74/10080E
73/9977.34E
73/9930E
72/9830E
71/9680E
70/9555E
69/9430E
68/9327E
68/9280E
67/9180E
66/9080E
65/8930E
65/8870E
64/8780E
63/8677E
63/8630E
62/8530E
64/8677E
64/8530E
63/8530E
74/10375E
73/10277E
73/10225E
72/10130E
71/9980E
70/9830E
69/9680E
68/9582E
68/9530E
67/9435E
66/9285E
65/9135E
64/8985E
63/8887E
63/8835E
62/8740E
61/8590E
60/8440E

6th E


3/450N
2/300N
1/150N
8/1184N
7/1034N
6/884N
5/734N
4/600N
3/450N
2/300N
1/150N
76/10369E
75/10219E
74/10080E
73/9977.34E
73/9930E
72/9830E
71/9680E
70/9555E
69/9430E
68/9327E
68/9280E
67/9180E
66/9080E
65/8930E
65/8870E
64/8780E
63/8677E
63/8630E
62/8530E
61/8380E
74/10375E
73/10277E
73/10225E
72/10130E
71/9980E
70/9830E
69/9680E
68/9582E
68/9530E
67/9435E
66/9285E
65/9135E
64/8985E
63/8887E
63/8835E
62/8740E
61/8590E
60/8440E
1
2
3
Start of mapping on land

C4L E


54/7380E
55/7530E
56/7680E
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58/7977E
59/8080E
60/8230E
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67/9180E
68/9327E
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71/9680E
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73/9977.34E
74/10080E
75/10219E
76/10369E
2/300N
1/150N
8/1184N
7/1034N
6/884N
5/734N
4/600N
3/450N
2/300N
1/150N
52/7350E
53/7445E
54/7595E
55/7745E
56/7895E
57/8045E
58/8140E
59/8290E
60/8440E
61/8590E
62/8740E
63/8835E
64/8985E
65/9135E
66/9285E
67/9435E
68/9530E
69/9680E
70/9830E
71/9980E
72/10130E
73/10225E
74/10375E

Kerr McGee Corp. 12-4-84
Galatia Mine Saline County

Notes by S.K. Danner. Accompanied by John Nelson (I.S.G.S.), Frank Chase (U.S.B.M.) and Ralph Sachs (Kerr-McGee).

The purpose of our visit is to observe the geological conditions at this mine. The Kerr-McGee personnel would like us to evaluate their mine roof conditions, and perhaps suggest some means of improving their roof control.

Upon our arrival at the mine, we met with the following Kerr-McGee people:

Bill Murray - Director of Ug. Oper.
Pete Lilly - General Manager
Steve Rowland - Superintendent
Ralph Sachs - Geologist
Jim Webb - Engineer (No. 5 Seam)
Roger Riffey - Asst. to the Supt.
John Peters - Staff engineer

The Galatia mine is a twin seam mine located in the Springfield (No. 5) Coal seam and the Herrin (No. 6) Coal seam. The No. 6 coal averages 6 ft. thick at a depth of about 450 feet, and the No. 5 averages 6.5 ft thick at about 550 ft of depth. Both seams share a 16.5° slope and a vertical shaft. At present only the No. 5 mine is active. They have connected

the slope and the shaft in the No. 6 mine, but little more. Development in the No. 6 will probably wait until market conditions improve.

The surface facilities at this mine are first class. The offices, meeting rooms, change rooms, and shaft portal are all housed in one large, modern building. An in-house laundry keeps the miners in clean overalls and towels. A weight room adjacent to the laundry allows the miners to work off their frustrations and excess weight. A large cafeteria area provides room for large meetings. There is a first aid room with a company nurse who treats injuries and gives physicals. All in all, this is a well-planned facility.

Ralph Sachs and a couple of mine engineers are going to give us an arm-waving tour of problem areas in the No. 5 mine.

Stop 1. Location: #13 XC in Main East, between belt and track entry.

Long roof fall adjacent to gray shale roof roll. A series of 3 coffin covers, each about 30' long and 2 to 3' high, have fallen out of the roof. The roof roll is about 30' wide at this site. The shale in the roll interfingers with the coal. The roof rock here is the gray, silty Dykersburg Shale. It is reported to be 25+ feet thick over this mine.

The coal is between 7 and 8' thick in this

area. The floor is rather rolling, with swales 6 to 8' deep. The floor is a silty claystone or siltstone greater than 10' thick.

Stop 2. Location: #17 XC on Main East, haulage entry.

A 4' high fall shows a set of oblique planar fractures that cause the roof to slab out in "flagstones". This fall borders another roll that is about 30' wide at the roof line. The roll forms a sharp, V-shaped wedge that penetrates almost to the bottom of the coal, and is bounded by numerous slips at the roof line. It consists of gray, laminated siltstone with thin sandy plies. There are several small faults within the roll that produce stair-stepped offsets in the laminae.

Stop 3. Location: #18 XC on Main East, belt entry.

Giant "coffin cover" roof fall 15 to 20' high in a gray, laminated siltstone. The fall was caused by two large slip fractures that intersect to form a sharp inverted V. Siltstone is thinly laminated and well-bedded, with carbonaceous debris on bedding planes. The beds in the upper 12' of the fall appear horizontal, while the beds in the lower 6 to 8' appear to slump toward the cross-cut. There is little internal slippage in evidence.

Stop 14. Location: Haulageway of Main East, between XC #18 and #19.

Four large slips adjacent to 4' thick roof roll. Slips trend N 10° W to N 35° W. Roll is bounded by a long, low angle slip on one side, and a short, high angle slip on the other

Additional notes:

Several of the north-south cross-cuts on the Main East show signs of cutter roof. The "cutters" tend to follow the rib along the box cut, or first cut of the cross-cut. There is little or no cutter roof along the rib of the open cut. The Kerr-McKee people say that the cutters always follow the first cut, no matter which side of the entry is cut first. Also, shallow roof falls tend to follow the box-cut. With the stress relieved, the roof holds over the open cut.

About a half mile inby the Main East they have begun driving the cross-cuts at 60° angles to the mains. The roof has held fairly well so far. There does however, appear to be more bedding plane separation in this area.

While many of the roof falls we encountered can be attributed to roof rolls, slip fractures, and small, local faults, there are some that appear unrelated to roof structures or discontinuities. These falls occurred under a thinly-laminated, micaceous siltstone; probably the result of bedding plane separation.

Kerr-McKee's contract with Union Electric Co. calls for less than 2.3 lbs. SO_2/million Btu's. This translates to between 1.2 and 1.3% sulfur for the washed coal.

KD