

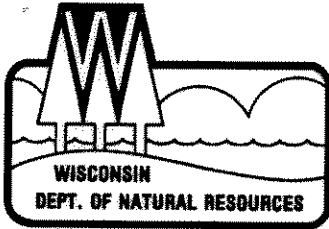
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George E. Meyer
Secretary

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Southern District Headquarters
3911 Fish Hatchery Road
Fitchburg, Wisconsin 53711
TELEPHONE 608-275-3266
TELEFAX 608-275-3338

February 28, 1995

Ms. Char Bertstrom
P.O. Box 289
Manitowish Waters, WI 54545

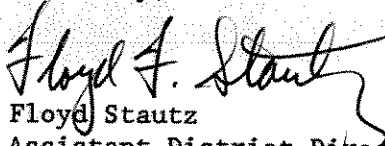
Dear Ms. Bertstrom:

You previously requested and received a copy of the 1993 Field Survey of the Southwestern Wisconsin Zinc-Lead Mining District. Enclosed you will find a follow-up to that report concerning well water sampling.

This survey, containing thirty-two wells located in the vicinity of past mines, indicates that groundwater does not appear to be adversely affected above current drinking water standards by metal contaminants.

We still look forward to remediating water waste piles that adversely affect surface waters during periods of runoff. Thank you for your interest in this survey.

Sincerely,


Floyd Stautz
Assistant District Director
Telephone: (608) 275-3316

FFS:ps

Enc.

Report on Follow Up Sampling

for

Southwestern Wisconsin Mining District

by

Marty Nessman

Southern District Water Supply

February 20, 1995

Summary

This report summarizes the sample results of a study of private well water in the southwestern Wisconsin mining district. Thirty-two wells were sampled to provide further insight into the potential impacts of past mining activities on groundwater quality, as recommended in the Waste Water Program Report "Results of the 1993 Spring/Summer Field Survey of the Southwestern Wisconsin Zinc-Lead Mining District" by Janet Blabaum, Brenda Howald, and Tom Harpt. The Water Supply Program decided to sample wells for Arsenic (As), Barium (Ba), Cadmium (Cd), Lead (Pb), Nickel (Ni), Sulfate, and Zinc (Zn).

Methods

The approximate locations of former zinc and lead mines were determined from USGS paper 309 titled "The Geology of the Upper Mississippi Valley Zinc-Lead District" by Allen Heyl Jr., Allen Agnew, Erwin Lyons, and Charles Behre, Jr.. These locations were plotted on township plat maps, and were used to determine which wells to sample. Well construction reports for the township and range sections of the most heavily mined areas were examined and a list of well owners to contact for sampling was generated.

With the exception of four wells in the Hazel Green area, wells with construction reports on file were selected for sampling in order to provide information on well location, depth, depth to bedrock, casing depth, static water level and formations intersected. This information was needed to correlate the sample results with well construction. Wells closest to abandoned mines were sampled whenever possible. This does not mean that there were no wells closer to mines. However, it is our opinion that the wells sampled are representative of most of the wells which exist in the mining district. See the attached maps for well locations.

Of the wells sampled, six wells draw water from the Platteville limestone formation, six draw from the St. Peter Sandstone, three from Trenton Limestone, four from Magnesia limestone, one from Franconia limestone, one from Prairie du Chein limestone and four from unknown formations. Ten wells had casing depths to 80 feet or more and the rest had 40-63 feet. Three of the wells were of unknown construction (See the attached tables for construction information).

All samples were analyzed at the State Lab of Hygiene. Samples were taken from various system locations; whenever possible, the sample tap before the pressure tank was used. The sample faucets were run for at least five minutes to obtain water representative of the aquifer. All metals samples were field preserved by adding 2.5 mL of nitric acid, and field screened for pH using an electronic pH meter. Sulfate samples were put on ice for delivery to the lab.

Results

One well in Grant County (EK193) and one well in Lafayette County (GQ019), had Pb concentrations higher than the public drinking water action level of 15 ppm (parts per billion) and were resampled. Well EK193 had concentrations below 15 ppb in the second sampling. Well GQ019 was resampled for lead on three occasions, with samples taken from locations throughout the system. A total of twelve Pb samples were taken. Laboratory Pb results varied from no detection to 110 ppb. Due to the highly variable concentrations, the Pb detected is believed to be a plumbing artifact and not representative of aquifer conditions. Additional samples were taken from four wells in the area for As, Ba, Cd, Pb, Zn and Sulfate. Well construction reports were not available for these wells (GS968, GS969, GS970 & GT191), but GS969 was known to be a tin cased well with a depth of 40 feet. None of those samples had metals concentrations exceeding the drinking water standards.

Two (or 5.6%) of the wells sampled, had detects of sulfates above the NR140 Wisconsin Administrative Code Public Welfare Standard and NR809 Secondary public drinking water standard of 250 ppm. A sample from well GQ019 had 270 ppm and well GS970 had 610 ppm sulfate. Except for the unusual Pb results from GQ019, the other metals detected were not correspondingly higher in either well. In addition, six of the wells, or 25% of the wells sampled, had sulfates above the NR140 Preventative Action Limit (PAL) of 125 ppm. It should be noted that the EPA is considering a Maximum Contaminant Level (MCL) for sulfates of 500 ppm. A table of sample results is attached. Based on the characteristics of the aquifer, it appears likely that sulfates could be found in the groundwater in many locations in the area regardless of whether any mines are there.

Conclusions

Based on the results of this sampling, groundwater does not appear to be widely affected by metals contamination above current drinking water standards in the mining district. Field pH values were between 6.7 and 7.6 for all samples. In a buffered carbonate aquifer, the pH of groundwater tends to be neutral. It is believed that neutral pH values inhibit the solubility of metals into the water. It is also believed that the return of groundwater to near pre-mining elevations has decreased dissolved oxygen concentrations sufficiently to prevent the dissolution of lead and other metals. This reduction in the amount of oxygen present has prevented the production of sulfuric acid. In the absence of sulfuric acid the pH of the groundwater remains neutral and the metals remain in the sulfide (solid) form. It is believed that the sulfide minerals will not release metals into the groundwater in a neutral pH environment. It is reasonable to assume that these factors have limited the mobility of the metals in the aquifer.

Although isolated cases of elevated sulfate or metals concentrations may be found, it does not appear that groundwater is widely affected by metals contamination. Therefore, further groundwater sampling for metals and/or special casing requirements in the mining district are not warranted at this time.

WUWN	Date Sampled	Last Name	Township	As [50]	Ba [1000]	Cd [10]	Pb [50]	Ni [100]	Sulfate (ppm) [250*]	Zn [5000*]	PH
AD140	6/17/94	Busch	Benton	1.0	110	0.16	5.9	ND	130	63	7.00
AT754	6/24/94	Reichel	Highland	1.3	<40	1.2	6.8	ND	13	210	7.10
AV260	6/3/94	Stone	Willow Spring	2.1	<40	ND	ND	ND	15	ND	7.30
CM572	6/3/94	Bennet	Mineral Point	ND	41	0.05	14	ND	190	140	7.10
CM577	7/1/94	Atkins	Dodgeville	ND	<40	ND	ND	ND	28	11	7.20
CM791	6/9/94	Curran	Shullsburg	1.2	53	ND	14	ND	110	41	7.20
DO974	6/24/94	Naukee	Highland	1.0	<40	0.04	1.6	ND	7.0	38	7.60
DS594	6/17/94	Bertram	Platteville	ND	65	ND	1.1	ND	75	20	7.20
EK193	6/17/94	Groom	Platteville	ND	56	0.08	86	ND	79	340	7.20
EK193	7/29/94	Groom	Platteville				1.3				
EK206	6/24/94	Keicher	Highland	ND	<40	ND	5.6	ND	17	670	7.50
EK454	6/24/94	Hanson	Highland	ND	<40	ND	2.0	ND	48	58	7.40
ER837	6/24/94	Pavek	Highland	ND	60	0.08	ND	ND	26	17	7.20
FQ589	7/15/94	Shepard	Shullsburg	2.5	76	ND	1.3	ND	52	210	7.20
FQ590	6/17/94	Wilson	Elk Grove	1.4	42	ND	4.2	ND	34	84	7.10
FQ602	7/1/94	Riedmiller	Dodgeville	6.7	<40	ND	ND	15	65	320	6.70
FQ605	6/9/94	French	Benton	ND	75	ND	2.3	ND	16	53	7.20
FU898	7/1/94	Laufenberg	Highland	4.6	<40	0.71	2.7	ND	83	1100	7.20
GQ015	6/3/94	Stephenson	Mineral Point	1.3	<40	ND	1.0	ND	34	16	7.30
GQ016	6/3/94	Bauman	Mineral Point	2.0	40	0.21	1.4	61	58	430	7.20
GQ017	6/3/94	Hanson	Dodgeville	1.2	43	ND	ND	24	64	750	7.30
GQ018	6/9/94	Beau	New Diggings	1.2	44	0.96	7.1	ND	160	460	7.00
GQ019	6/9/94	Reid	Benton	11	<40	0.57	40	12	270	270	6.80
GQ019	7/21/94	Reid	Benton				18				7.10
GQ019	8/26/94	Reid	Benton				110				7.10
GQ019	8/26/94	Reid	Benton				15				0.00
GQ019	10/4/94	Reid	Benton				68				0.00
GQ019	10/4/94	Reid	Benton				96				0.00
GQ019	10/4/94	Reid	Benton				26				0.00
GQ019	10/4/94	Reid	Benton				36				0.00
GQ019	10/4/94	Reid	Benton				14				0.00
GQ019	10/27/94	Reid	Benton				14.0				6.80
GQ019	10/27/94	Reid	Benton				13				0.00
GQ019	10/27/94	Reid	Benton				1.3				0.00
GQ021	6/17/94	Leifker	New Diggings	ND	70	ND	8.9	ND	97	13	7.10
GQ022	6/17/94	Calvin	Platteville	ND	93	ND	1.3	ND	38	20	7.20
GQ023	7/21/94	Studier	New Diggings	2.6	74	ND	ND	ND	17	40	7.00
GQ024	7/21/94	Digman	Platteville	ND	55	2.6	ND	ND	140	95	7.10
GQ025	7/21/94	Van Natta	Platteville	5.9	99	0.04	ND	10	37	35	7.10
GQ026	7/28/94	Webber	Shullsburg	2.7	79	0.23	2.7	ND	120	180	7.10
GS968	10/27/94	Freiberger	Hazel Green	0.7	55	0.03	1.7	9	190	880	7.00
GS969	10/27/94	Hillary	Hazel Green	ND	45	0.03	ND	ND	190	12	7.10
GS970	10/27/94	Shellum	Benton	ND	19	0.13	1.3	32	610	790	6.90
GT191	10/27/94	Harker	Benton	ND	30	0.35	12	ND	99	300	7.20

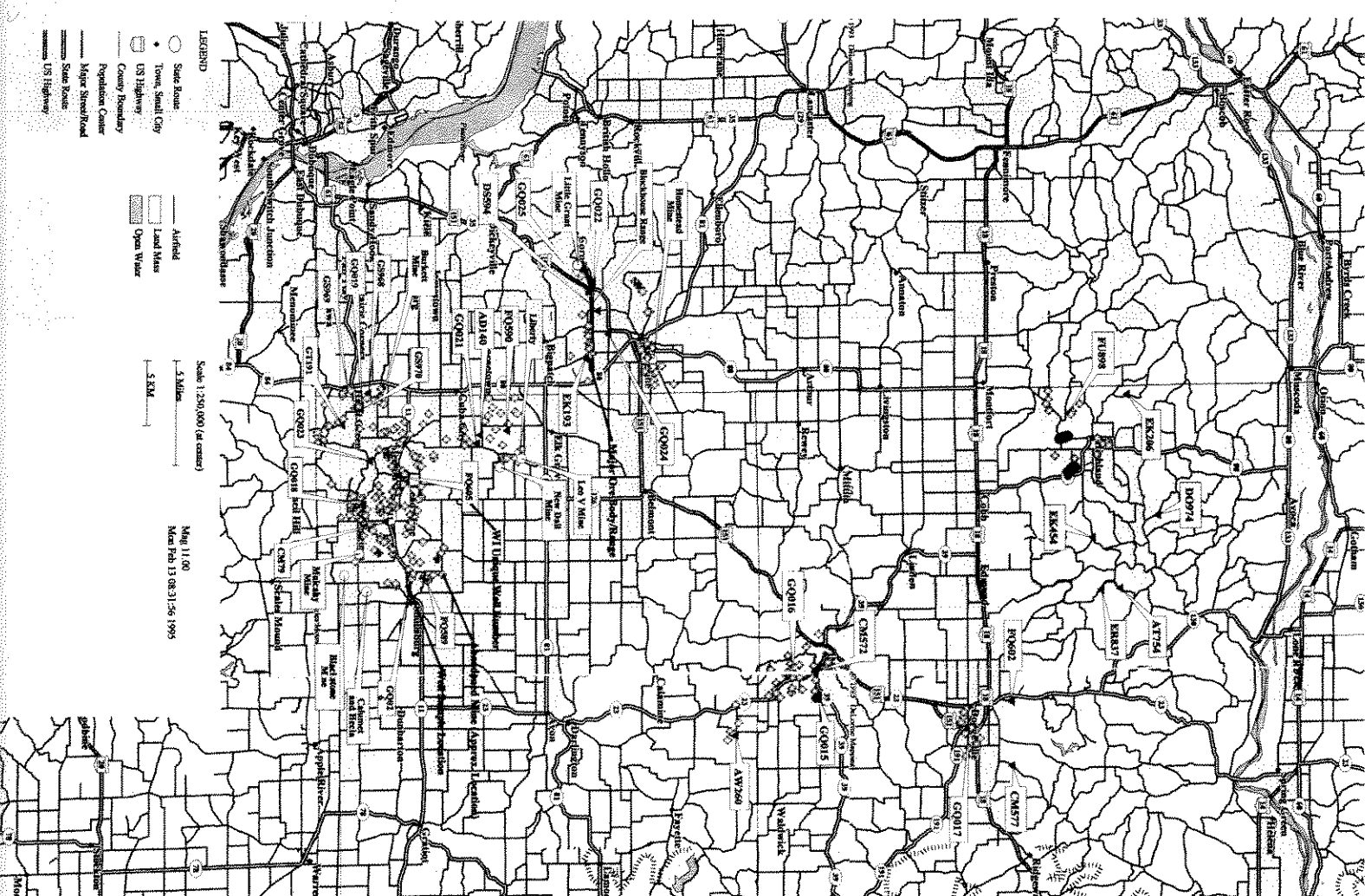
Maximum Contaminant Levels Are Indicated in Brackets []. All MCL's are Health Limits Except Those Indicated by [*] Which are Aesthetic Limits

Friday, January 13, 1995

Construction Properties

WUJWN	Last Name	County	Township	Depth	Cas'g Depth	Static H2O	H2O Bearing
AD140	Busch	Lafayette	Benton	124.00	40.00	25.00	GAL
AT754	Reichel	Iowa	Highland	120.00	42.00	75.00	MAG
AW260	Stone	Iowa	Willow Springs	120.00	42.00	25.00	TRE
CM572	Bennet	Iowa	Mineral Point	204.00	101.00	115.00	STP
CM577	Atkins	Iowa	Dodgeville	360.00	323.00	250.00	MAG
CM791	Curran	Lafayette	Shullsburg	205.00	50.00		GAL
DO974	Nanke	Iowa	Highland - NE	100.00	55.00	51.00	GAL
DS594	Bertram	Grant	Platteville	150.00	60.00	73.00	GAL
ED193	Groom	Grant	Platteville	152.00	80.00	62.00	GAL
EK206	Keicher	Iowa	Highland	510.00	383.00	297.00	FRA
EK454	Hanson	Iowa	Highland-SE	260.00	168.00	196.00	STP
ER837	Pavek	Iowa	Highland	180.00	63.00	95.00	PDC
FQ589	Shepard	Lafayette	Shullsburg	212.00	118.00	104.00	TRE
FQ590	Wilson	Lafayette	Elk Grove	232.00	60.00	92.00	PLA
FQ602	Riedmiller	Iowa	Dodgeville	312.00	120.00	160.00	STP
FQ605	French	Lafayette	Benton	222.00	138.00	101.00	TRE
FU898	Laufenberg	Iowa	Highland	260.00	186.00	178.00	MAG
GQ015	Stephenson	Iowa	Mineral Point	120.00	42.00	45.00	GAL
GQ016	Bauman	Iowa	Mineral Point	190.00	42.00	105.00	STP
GQ017	Hanson	Iowa	Dodgeville	310.00	245.00	205.00	STP
GQ018	Beau	Lafayette	New Diggings	270.00	40.00	125.00	PLA
GQ019	Reid	Lafayette	Benton	185.00	42.00	100.00	PLA
GQ021	Leifker	Lafayette	New Diggings	224.00	42.00	170.00	STP
GQ022	Calvin	Grant	Platteville	160.00	112.00	70.00	PLA
GQ023	Studier	Lafayette	New Diggings	255.00	255.00	175.00	GAL
GQ024	Digman	Grant	Platteville	144.00	42.00	50.00	GAL
GQ025	Van Natta	Grant	Platteville	284.00	42.00	195.00	PLA
GQ026	Webber	Lafayette	Shullsburg	200.00	40.00	130.00	PLA
GS968	Freiberger	Grant	Hazel Green				UNK
GS969	Hillary	Grant	Hazel Green				UNK
GS970	Shellum	Lafayette	Benton				UNK
GT191	Harker	Lafayette	Benton				UNK

FRA = Franconia Limestone
 GAL = Galena Limestone
 MAG = Magnesia Limestone
 PLA = Platteville Limestone
 PDC = Prairie du Chein Limestone
 STP = St. Peter Sandstone
 TRE = Trenton Limestone
 UNK = Unknown



LEGEND

- State Route
- Town, Small City
- US Highway
- ▭ Airfield
- ▭ Land Mass
- ▭ Open Water
- County Boundary
- Population Center
- Major Street/Road
- State Route
- US Highway

Scale 1:250,000 (at center)

1 Mile
5 KM

May 11, 00
Map No. 13 98.31.26 1995

Mike Ivey

FOOTLOOSE

Mine waste plagues state's southwest

By Mike Ivey
The Capital Times



Ivey

Most of the mining talk in Wisconsin has focused on recent developments in the northern part of the state.

But mining has a long history in the Badger state, which takes its nickname from the 19th century Cornish miners who would burrow into the mineral-rich hillsides of southwestern Wisconsin like animals.

At the turn of the century, mining for lead, zinc and other metals was the major industry from Dodgeville south to the Illinois border, supporting towns like Mineral Point, Belmont and Cuba City.

As many as 73 mines were in full-scale operation in 1906, according to state records. Many of these were large operations, some processing as much as 100 tons of ore each 10-hour shift. Mining continued until 1979, when the Shullsburg Mine finally closed.

All this digging, unfortunately, has left a toxic legacy in parts of Iowa, Grant and Lafayette counties.

Piles of mine waste — bare of all vegetation because the dirt is so contaminated it won't support life — still litter the countryside in places like Lead Mine and New Diggings. These communities once buzzed with activity, but are now as poor and desolate as any in Wisconsin.

With each successive rainfall and snow melt, more contaminants wash from these waste piles into the creeks and streams, where livestock drink and fish swim. Heavy metals, including lead and arsenic, have seeped into the groundwater where rural residents draw their drinking water.

Much of this contamination

was detailed by researchers in the state Department of Natural Resources in a report the authors say almost never saw the light of day because of the sensitivity surrounding the mining issue.

The report, "Results of the 1993 Spring/Summer Field Survey of the Southwestern Wisconsin Mining District," was initiated following citizen complaints that the Galena River in southern Lafayette County was running red with pollution after heavy rains last spring.

But even though a draft was completed in the fall of 1993, the report wasn't released until April of this year. By that time, news of the report's existence became widely leaked and DNR officials had no choice but to go public with the 61-page document.

Janet Blabaum, who authored much of the report for the DNR, claims to this day she was pressured, harassed and generally discouraged in her efforts to bring the mining problems of southwestern Wisconsin to public attention.

Blabaum, a certified geologist, is convinced that some in state government and those with a vested interest in opening new mines in Wisconsin didn't want any publicity that could portray mining in a negative fashion.

"For whatever reason, a lot of people didn't want this report to ever be written," she says.

Tom Harpt, a DNR engineer who also worked on the project, says he felt similar pressures, even receiving a harassing phone call at home that left him shaken.

"I guess I feel it's a shame when politics and some of these other issues get in the way of the DNR's main role, which should be protecting the environment," Harpt says.

But Jim Huntoon, director of the DNR Southern District, denies there was any effort to bury the report or temper its content.

"If we had really wanted to suppress anything we would



CRAIG SCHREINER PHOTO

Rain water flows through a pile of mine tailings near the town of New Diggings, just north of the Illinois border.

never have done an investigation to begin with," he says.

Huntoon is also quick to point out that mining today is much more sophisticated than in the past and must operate under strict government controls.

All politics aside, however, the report raises some serious questions about potential health impacts for residents in the area. It also recommends further and more extensive testing.

The DNR has held one public meeting in Shullsburg and promised area residents their water is safe to drink. Tests of municipal water supplies there show contamination is within safe drinking water limits.

The department has also pledged to do further cleanup as time and money allow. A similar contaminated site near Mineral Point has recently been cleaned up and fish are living again in a stream there that once wouldn't support life.

Yet those living daily with mining's toxic legacy say they don't expect anything to be done. This is a region of Wisconsin that doesn't carry much political clout or garner

much public attention.

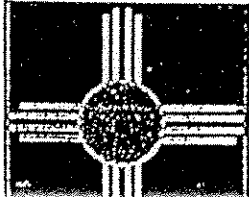
Earle Griffiths runs his own construction business and has lived his entire life in New Diggings. He rents a home from a Chicago area landlord and has no way of knowing if his private water supply is poisoning him or not.

"All I can tell you, if they think something is in our water they ought to get down here and test it," he says.

But even some landowners in the affected areas have been reluctant to delve into the problem for fear it may reveal heavy contamination and drive down property values. Some are also holding out hope that the hilly, driftless area may one day support a tourist economy and bring some badly needed money into the region.

But Blabaum says trying to ignore the problems left from mining in southwestern Wisconsin isn't going to make them disappear.

"It's great to talk about bringing in tourists and everything," she says. "But tell me, where are they going to find water to drink?"



THE SANTA FE NEW MEXICAN

Cyanide leak from Colorado gold mine annihilates life in river

Staff and wire reports

ALAMOSA, Colo. — Water carrying cyanide from a gold mine near Wolf Creek Pass has killed all aquatic life in a 17-mile stretch of the Alamosa River and the Terrace reservoir, state and federal officials said.

And leaks from Summitville Consolidated Mining Co. continue, despite a \$100,000 fine levied against the company this year; agreements take remedial actions; closure of

the once-popular fishing reservoir after a massive fish kill; and complaints from downstream users.

State and Environmental Protection Agency officials said the leak even may have reached the Rio Grande.

"We went up to the mine last month to investigate reports of an environmental disaster and we found an environmental disaster," said Mark Hughes, an attorney with the Sierra Club's Legal Defense Fund.

In northern New Mexico, the Pegasus Gold Corp. wants to use the cyanide heap leach method to extract at least one million ounces of gold in the Ortiz Mountains south of Santa Fe.

J.R. Phillips of Pegasus said he would have a hard time commenting on the leach pad in Colorado because he doesn't know the intricacies of the Summitville operation.

"You have to realize there are differences in methodology," Phillips said. "They have a different

climate, a different environment. I'm sure there are a number of conditions that are different."

Jeanie Cragin of the Friends of Santa Fe County, however, said the only difference between the two operations is that the Pegasus proposal is larger. If approved in its current form by county commissioners, the Pegasus operation will include a leach pad of more than 100 acres.

"This is exactly the problem we're concerned about," Cragin said.

"While we don't have a river, we're very concerned about our ground water resources. This mining operation will have a very, very large impact on Santa Fe County."

The open-pit Summitville mine is 11,700 feet above sea level and about 16 miles southeast of the summit of Wolf Creek Pass in southern Colorado near the New Mexico border.

A state Department of Health video of the seepage showed brili-

Please see GOLD, Page A-1

GOLD

Continued from Page A-1
 Brilliant blue sludge and water leaking into natural waterways from the mine site last summer.

The company, a wholly owned subsidiary of Galactic Resources Inc. of Canada, is using 40 million to 50 million gallons of cyanide-laced water in the 45-acre heap leaching process to extract gold from several million tons of ore, mine general manager Bill Williams said.

"We've got problems, there is no question about that," said Williams, who estimated that about 100 gallons of water a minute are leaking from the leach heap. That's about 144,000 gallons a day.

A system of ditches and ponds is designed to catch the leaks and either pump the fluids back to the leach pad, or treat them and then spray the treated water on the landscape.

However, under an agreement between the company, state health department and Mined Land Reclamation Board, the company ceased landscaping applications Oct. 30.

"At this point, there isn't any acid runoff from the heap," Williams said. "We feel we are on the right track, and we are going to clean this place up."

The company expects to continue leaching operations at least another six months, although it finished mining operations this fall.

State game officials in Colorado stopped stocking the Terrace Reservoir with 15,000 trout fingerlings annually after a massive cyanide leak rolled down Whiteman Creek into the Alamosa River in 1990, killing all life in 17 miles of the river and in the reservoir, which is south of Del Norte, said Jerry Apker of the Colorado division of wildlife.

The fish kill extended seven or eight miles below the reservoir. Fish were killed in at least one private farm pond, said state officials and Melanie Pallman of the EPA.

The first reported fish kill attributed to the mine occurred in 1986, shortly after the operation began. The most recent was six weeks ago, when 500 to 1,000 gallons of the cyanide-laced water spilled into Whiteman Creek.

The reservoir and 17-mile stretch of river will remain uninhabitable to fish as long as the leaks continue, officials said.

The mine has produced more than 286,639 troy ounces of gold since it began using cyanide to leach gold out of ore in the spring of 1986. It was the most productive of the 13 gold mines in Colorado in 1988, said Jane Orl of the U.S. Bureau of Mines.

Mine's toxic leaks render river lifeless

Despite fines, promises, cyanide flowing into Alamosa River and downstream

By Kit Miniclier
Denver Post Staff Writer

Deadly cyanide-laced water from a huge gold mine near Wolf Creek Pass has killed all aquatic life in 17 miles of the Alamosa River and the Terrace Reservoir, and it may have seeped downstream to the Rio Grande, say state and federal officials.

The leaks from Summitville Consolidated Mining Co. continue, despite a \$100,000

fine levied against the company this year, agreements to take remedial actions, closure of the once-popular fishing reservoir after a massive fish kill and complaints from downstream users.

"We went up to the mine last month to investigate reports of an environmental disaster and we found an environmental disaster," said Mark Hughes, an attorney with the Sierra Club's Legal Defense Fund.

"I was appalled. There seemed to be substantial leaks and runoff, and the mine operators didn't seem to know where it came from or what might be in it."

The sprawling open-pit mine is 11,700 feet above sea level and about 16 air miles southeast of the summit of Wolf Creek Pass in southern Colorado.

A Colorado Department of Health video of the seepage showed brilliant blue sludge and water — ranging in color from

orange to yellow to molasses — leaking into natural waterways from the mine site last summer.

"This ought to be on the 9 o'clock news," observed the filmmaker on the unedited video.

The company, a wholly owned subsidiary of Galactic Resources Inc. of Canada, is using 40 million to 50 million gallons of

Please see MINE on 7A

Gold mine's leaks deadly for aquatic life

MINE from Page 1A

cyanide-laced water in the 45-acre heap leaching process to extract gold from several million tons of ore, said mine general manager Bill Williams.

"We've got problems, there is no question about that," Williams readily admits, explaining that about 100 gallons of water a minute are leaking from the leach heap.

An elaborate system of ditches and ponds is designed to catch the leaks and either pump the fluids back to the leach pad, or treat them and then spray the treated water on the landscape.

However, under an agreement between the company, state health department and Mined Land Reclamation Board, the company ceased landscaping applications on Oct. 30.

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The fish kill extended 7 or 8 miles below the reservoir, killing fish in at least one private farm pond, and may have reached the Rio Grande.

The first reported fish kill attributed to the mine occurred in 1986, shortly after the operation began. The most recent was six weeks ago, when 500 to 1,000 gallons of the cyanide-laced water spilled into Whiteman Creek.



DEADLY WATER: A sign warns of the danger at one of the Summitville Consolidated Mining Co.'s holding ponds.

The Denver Post / Karl Gehring

curbs put ine after de leak

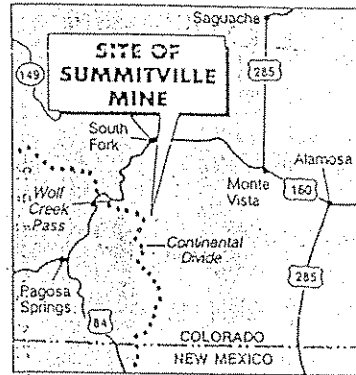
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Department of Health yesterday
cyanide leak from a gold mine
Pass and announced the imposi-
restrictions on the discharge of
the Summitville Consolidated

Officials have denied that dis-
mine are responsible for increas-
Alamosa River. They have 30
the proposed new limits on mine
by a Nov. 11 cyanide leak at
Pat Nelson, industrial permits
Colorado Department of Health.

Horn, a Durango-based district
health department, said he found
ly discharge totaling 510 pounds
of cyanide, 180 pounds of iron
and zinc flowing into the Wightman
Alamosa River at the mine site during
sample" earlier this year.

Please see MINE on 12A



The Denver Post / Bruce Gault

New curbs placed on gold mine discharges

MINE from Page 1A

Although neither Horn nor an independent analyst directly blamed Summitville for a dramatic increase in river toxicity which killed 15,000 trout fingerlings in 1990, both said poison levels are much higher at or below the mine site than upstream.

Summitville was fined \$100,000 earlier this year after officials blamed a cyanide spill for killing all the aquatic life in 17 miles of the Alamosa River and the Terrace Reservoir. Experts said the poison may also have seeped downstream to the Rio Grande. In addition to the Nov. 11 incident, state health officials are investigating a mid-September spill.

The mine has produced more than 286,639 troy ounces of gold since it began using cyanide to leach the valuable metal from ore in the spring of 1986. Summitville's leach heap — the stack of ore from which the gold is removed — contains 40-to-50 million gallons of cyanide.

Mine to cease leaching

The mine will cease leaching operations next summer but it will take another three years to get the cyanide out of the heap and remove the threat to nearby water supplies, said David Bucknam, acting director of Colorado's Mined Land Reclamation Board.

Bucknam said he believes a \$2.2 billion performance bond posted by Summitville at the request of

the state is enough to ensure the proper cleanup of the mine operation.

But a senior Summitville representative yesterday denied responsibility for the increased toxicity of the river.

"To suggest that we have killed all the water life for 17 miles of the stream is just not true . . . and we didn't contribute anything to kill anything in the reservoir," said Russ Russell, senior vice president of Summitville's parent company, Galactic Resources of Canada.

Company officials don't think the water quality has changed substantially since mining began in the area over a century ago, he said.

Russell denied a report from an employee at the Colorado mine that the firm tripled its environmental budget on Nov. 11, a few hours after The Denver Post first reported the cyanide spills, fines and other problems at the mine. The employee asked not to be identified.

Calls to the mine by The Denver Post were referred to corporate headquarters in Vancouver, Canada.

Rancher's complaints

Rancher Don Grett, who takes irrigation water from the Terrace Reservoir, insists the water quality has declined. He said fish began dying in his ponds last summer after he used reservoir water.

Grett said he and several neighbors, who live 15 to 20 miles downstream from the reservoir and 10 miles from the point where the Alamosa meets the Rio Grande, have tried to determine whether the high concentration of acids and metals that killed their fish might also be damaging their crops, livestock or drinking water.

They are awaiting a lab report from the federal Environmental Protection Agency.

Horn, other health state officials and the division of wildlife agree with the mine owners that area waters contain high levels of metals and acid because of heavy natural minerals and old mining operations.

Increase in acidity

However, an increase in acidity and metal content since Summitville began operating have raised the toxicity beyond the tolerance of fish or other water life, DOW fish biologist John Alves said.

"If we find cyanide you know it has to come from the mine, that is the only reason it would be in the water," Alves added, as he examined the dead reservoir 23 miles southwest of Monte Vista recently.

12B *

Mining company goes bust

Ongoing cleanup efforts in question

By Mary George

Denver Post Environment Writer

The company that owned one of Colorado's largest gold mining operations has filed for bankruptcy, leaving questions about how the environmental mess it created near Wolf Creek Pass will be cleaned up.

Strangled by \$70 million in unanticipated environmental costs in operating the mine, Summitville Consolidated Mining Co. filed for Chapter 7 bankruptcy this week, a couple of years and millions of dollars before the scheduled completion of a massive cleanup at its Summitville Mine.

The open pit mine and gold-extraction operation 24 miles southwest of Del Norte shut down this spring.

But in the five years that the company sprayed cyanide on huge piles of crushed ore to leach out the gold, leaks of cyanide-laced water killed almost all aquatic life along 17 miles of the nearby Alamosa River.

The company had been repeatedly cited by the state for environmental violations.

The cleanup, which was being conducted by Summitville Mining Co., is expected to cost more than \$20 million.

The company this week announced plans to lay off all its workers Dec. 15.

The Colorado Mined Land Reclamation Board, which directs the state division overseeing the cleanup, will hold an emergency meeting at 1 p.m. Monday to discuss what happens next.

The meeting is open to the public and will be held in Room 0112 at the state Capitol.

Summitville already has spent more than \$2 million on grading, topsoil replacement and surface water controls.

The state holds a \$4.7 million bond for further reclamation of the 1,231-acre site.

The bond includes about \$3.8 million in cash and treasury bills, and \$900,000 in mine assets the state has authority to liquidate.

But dismantling the structures on the site likely will cost as much as they can be salvaged for, said Bruce Humphries, state minerals program supervisor.

The remainder of the bond "will allow us to do a traditional reclamation," restoring the land to productive use, he said.

But the money won't begin to solve water quality problems caused by leaking cyanide.

Summitville is a subsidiary of Galactic Resources Ltd. of Vancouver, Canada.

Galactic President Peter Guest said yesterday his staff has met with Colorado officials to work out a reclamation plan.

"We are trying to meet all the reclamation and closure obligations," Guest said.

"The problem for us is that if we continue along these lines, the whole company will be pushed into bankruptcy, and that wouldn't do anybody any good."

Galactic has agreed to forfeit the cleanup bond and has pledged \$2.3 million from the sale of a gold claim known as the Bodie Property near Mono Lake, Calif., Guest said.

Bankrupt mine exceeding water pollution limits

By Mary George
Denver Post Environment Writer

Water leaving the bankrupt Summitville gold mine is carrying more poisonous copper than the facility's permit allows, even though the Environmental Protection Agency is spending \$37,000 a day to control water pollution there.

EPA environmental scientist Melanie Pallman confirmed yesterday that effluent from Summitville's water treatment plant carries up to 5 parts per million of copper. The state permit for the mine, located near Wolf Creek Pass, allows a daily average of only 0.30 parts per million.

Scientists say the excess copper poses a threat to fish in the Alamosa River downstream of the plant. But the EPA is allowing the discharges to avoid a more disastrous springtime overflow of the 280 million gallons in the mine's "heap leach" field contaminated with cyanide, copper and other heavy metals, Pallman said.

"There are 300-400 parts per million of copper in the heap water," she said. "Having that overflow would be a lot worse than discharging copper at 5 parts per million."

Aquatic life already killed

Cyanide-laced waste from the gold extraction already has killed off aquatic life in 17 miles of the Alamosa River.

EPA's standard for copper in the Alamosa is set at 0.012 parts per million, and the state's standard is 0.125, much lower than what's now reaching the river, said EPA environmental engineer Bruce Zander.

"If only 1.5 parts per million of copper were coming off the site, by the time it reached the Alamosa, it would be about 0.125," Zander said. "But a brook trout will withstand only short periods at 0.1 parts per million." EPA still is studying the copper's effects on irrigation and crops.

EPA took over Summitville under the tax-financed Superfund hazardous waste clean-up program on Dec. 16, 12 days after mine owner Galactic Resources Ltd. of Vancouver, British Columbia, filed for Chapter 7 bankruptcy. Galactic had operated Summitville since 1986, extracting 280,000 troy ounces of gold.

Cleanup costs estimated

Last week, clean-up costs were estimated at \$800,000 a month. Yesterday, that figure was revised upward to \$1.11 million monthly, largely because of rising labor costs at the 12,000-foot site, officials said.

The mine's treatment plant uses hydrogen peroxide to neutralize the cyanide used to extract gold from ore in the heap, but it isn't equipped to extract all the copper from the effluent, said EPA environmental engineer Dana Allen. "If we had a great deal of money and time, you could meet that limit (for copper). But we're talking about much more money and time than is available to us now."

Mark Hughes of the Sierra Club Legal Defense Fund said he was surprised that EPA wasn't meeting standards. "It indicates that the scale of the problem may be of a larger magnitude than the public is aware of."

Bonds' use OK'd for mine cleanup

By The Associated Press

Colorado authorities were given the go-ahead yesterday to collect more than \$3.8 million in bonds posted by a gold-mining firm that was trying to clean its mountain-top site when it ran out of money.

Mined Land Reclamation Board members, angered at what they felt was misleading information from the mine company and its parent company, voted to grant collection powers to the state division overseeing cleanup of the Summitville Consolidated Mining Co. site near Wolf Creek Pass.

The forfeited bonds would help continue the cleanup and water protection programs in progress.

Board members angry

Chairman James B. Cooley and member Luke Danielson were angered that they and other members, Maxine Stewart and Catherine Kraeger-Rovey, were not advised of Summitville's pending financial crisis when they were given a tour of the site less than a year ago.

A new lawyer representing parent company Galactic Resources Inc., Rodney D. Knutson, told the board he didn't have specific information about the reasons for Summitville's financial problems. "We got no notice of this (bankruptcy and financial situation) until Friday," Knutson said.

Danielson said: "What use is counsel if he is not able to answer questions? It's not a sign of good faith. . . . No one for the company is here at all."

Another lawyer, Tom Quinn, responded that "the resources ran out before the problems ran out."

Cooley noted that he felt the board had been misled. "It's only a few months since we had a blue ribbon tour," he said. He said it appeared then that Galactic was "well funded."

Closed last spring

The open pit mine and gold-extraction operation 24 miles southwest of Del Norte shut down last spring. Its money all but depleted in unanticipated environmental costs, Summitville filed for Chapter 7 bankruptcy last week, with several years of work left and millions needed before the cleanup's completion.

The bankruptcy action brought several contractors to yesterday's meeting, complaining they hadn't been paid for machinery and consultation. They wondered where they stood following the bankruptcy filing.

They were told the state has no hand in paying Summitville's bills, and that a bankruptcy trustee would have to be contacted for debts the company owned.

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TUESDAY
Dec. 8, 1992

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Galactic files for bankruptcy

CMLRD to request Summitville injunction

By ERIN MACGILLIVRAY SMITH
Special to the Courier

DEL NORTE — The Colorado Mined Land Reclamation Division and the Colorado Department of Health's Water Quality Control Division expect to file a request for an injunction in district court here sometime today asking the Galactic Resources Ltd. of Vancouver, Canada, not abandon its Summitville Mine in the San Juan Mountains about 35 miles west of here.

The decision, along with authorization to the CMLRD by the Colorado Mined Land Reclamation Board to revoke Summitville's \$4.7 million bond without hearing if

necessary, was made at an emergency meeting of the board on Monday afternoon in the wake of an announcement by Galactic that it was closing down its Summitville Consolidated Mining Co.-run mine on Dec. 16.

Galactic, parent company for Summitville Consolidated Mining Co., last week announced it is seeking Chapter 7 bankruptcy for Summitville.

Loretta Pineda, public information specialist for the CMLRD's division of mineral and geology, said Monday evening that the board's emergency session also resulted in approval of revoking the bond so the money can

be used for detoxification of the site should Summitville Mining be allowed to close down as it announced last week.

Ms. Pineda said the state would rather see the bond money used for reclamation than for operation of the site.

Bruce Humphries, supervisor of the CMLRD's minerals program, said his agency believes it would take \$230,000 a month to run the site's water treatment plant. At detoxification of 400 gallons a minute, the heap should be detoxified of the threatening cyanide by August 1994, Humphries said.

Although Galactic announced earlier that it has spent more than \$10

million in reclamation at Summitville, Ms. Pineda said the CMLRB puts the amount closer to \$2 million.

At Monday's hearing attended by 40 to 50 people, four vendors, including at least one from Pueblo, told the board they remained to be paid for their work at Summitville, Ms. Pineda said.

The bond, which was up to \$6.5 million at the time Summitville and three governmental agencies reached an agreement last July as to cleanup, cannot be used to pay the vendors, Ms. Pineda said.

The board has released more than \$2 million of the bond as reclamation efforts have occurred, she added.

Bankruptcy attorneys for Galactic

told the board the company intends to pull out Dec. 16. "They said not much will happen at Summitville after Dec. 16," Ms. Pineda said.

Ms. Pineda said the Environmental Protection Agency is pursuing avenues similar to the CMLRD and the Water Quality Control.

EPA plans to send a contractor to the area later this week to evaluate the situation. Dr. Harry Posey, a reclamation specialist for the CMLRD, was at the site Monday making a similar evaluation, Humphries said.

All three governmental entities are putting together an emergency plan for the area should Summitville Mining Co. be allowed to pull out.

Taxpayers get \$15 million shaft in Summitville mine fiasco

Ever since Colorado voters approved the Amendment 1 tax-limitation measure, most government officials have been trying to cut costs and increase efficiencies. But Gov. Roy Romer's environmental regulators responded differently.

They wasted \$15 million.

In a pathetic series of stumbles and bumbles, state officials let a Canadian mine company transform a southern Colorado mountain into a festering toxic stew — and then stick taxpayers with the cleanup bill.

State regulators knew from the very beginning that the Summitville gold mine posed a major environmental risk. Constructed near the headwaters of the Rio Grande near Wolf Creek Pass, the Summitville operation involved spraying millions of gallons of cyanide-laced fluids

**MARK
OBMASCIK
ENVIRONMENT**



onto huge piles of crushed ore.

The plan was for the cyanide to separate the gold chemically from the rock. The fear was that the cyanide might leak out and pollute the surrounding national forest.

It didn't take long for fear to become reality. Work crews built the Summitville heap-leaching pile with a faulty protective liner, officials say, and cyanide soon

began oozing out.

The first environmental violations were detected in June 1986, two years after Summitville began operations. State mine inspectors slapped the Vancouver-based company on the wrist with a \$3,600 fine for failing to do required cleanup work and hurting a nearby creek.

THAT SAME MONTH, the state found cyanide seeping through the protective liner. Regulators ordered mine executives to build a pumping system to contain the contamination.

In June 1987, Summitville's pumping system broke down. The mine operation dumped at least 85,000 gallons of cyanide-laced water into a Rio Grande feeder creek — and the Colorado Health Department slapped Summitville's wrist again with a \$27,000 fine.

By 1990, concentrations of several heavy metals had doubled in a creek downstream of Summitville. Cyanide pollution levels were 25 times greater.

Summitville's wrists were slapped again with a \$100,000 fine in 1991. But that penalty was couched further by a special state exemption that permitted Summitville to violate standards for silver pollution for another 16 months.

By then, though, the pollution had taken a heavy toll. State wildlife officials said almost all aquatic life was wiped out in 17 miles of the Alamosa River downstream of the leaking mine.

Once again, the mine managers promised to do better. Once again, the state regulators took them at their word. Instead of shutting down Summitville for repeated environmental law-breaking, the state gave the mine another chance.

But last week, Summitville went bust. Complaining of rising environmental costs, the mine company filed for Chapter 7 bankruptcy protection.

ROMER'S WATCHDOGS didn't anticipate this maneuver. All they required of Summitville was to post a \$4.7 million bond for cleanup. But officials say cleanup will cost \$20 million — a burden that usually falls on government.

So, Summitville will keep leaking more toxic wastes until taxpayers kick in the extra \$15 million.

Thanks to Romer's regulators, the mine operators got to haul off 280,000 troy ounces of gold.

Taxpayers got the shaft.

Mark Obmascik's environmental column appears on Saturday in Denver & The West.

RECEIVED 23 DEC 1992

THE DENVER POST

EPA to take over Summitville mine

Action taken to halt cyanide-laced liquid from leaking into river

By Mark Obmascik
Denver Post Environment Writer

The pollution-plagued Summitville mine in southwestern Colorado will be taken over temporarily by the U.S. Environmental Protection Agency, officials announced yesterday.

Environmental officials said the takeover was needed to stop one of the state's biggest gold mines, built near Wolf Creek Pass above Del Norte, from leaking thousands of gallons of cyanide-laced liquid into the Alamosa River.

The Summitville Consolidated Mining Co. Inc., an affiliate of a Vancouver, B.C., Canada, corporation, filed for Chapter 7 bankruptcy protection this month after ex-

tracting more than 280,000 troy ounces of gold. Officials said rising environmental costs helped destroy the profitability of the eight-year-old gold operation.

The bankruptcy means that the mining company will stop operating the pumps and treatment systems preventing at least 100 million gallons of cyanide-tainted fluid from flowing into the headwaters of the Rio Grande.

In an agency statement, EPA official Hays Griswold said the federal government will operate the mine's pumping system on "a limited basis while state and federal officials assess both the possible legal actions, and the long-term needs at the site."

Colorado state mining officials have estimated that Summitville will require at least \$20 million of cleanup work. But state environmental regulators only required Summitville to post a \$4.7 million cleanup bond.

It still isn't determined who will pay the \$15 million difference.

Summitville was regulated since its inception by the Colorado Health Department and the Colorado Mined Land Reclamation Board. State regulators fined the mine \$130,000 for a string of environmental violations. But the EPA statement yesterday said the Colorado Health Department asked the government to take over operations at the site.

Bankrupt mine costly to EPA

Agency spends \$800,000 a month to clean up cyanide wastes

By Mark Obmascik
Denver Post Environment Writer

The Environmental Protection Agency is being forced to spend \$800,000 a month to prevent a bankrupt gold mine from polluting the Alamosa River with millions of gallons of cyanide-laced wastes, officials said yesterday.

EPA managers said they have hired 45 workers to operate waste-treatment systems at the troubled Summitville gold mine near Del Norte. Summitville already has been blamed for wiping out virtually all aquatic life in the 17 miles of the Alamosa River downstream

from the mine.

Federal intervention was required after state regulators failed to require the mine operator, Galactic Resources of Vancouver, British Columbia, to post a reclamation bond big enough to cover cleanup costs.

EPA officials are concerned that Summitville pollution will kill wildlife, hurt irrigation supplies for downstream San Luis Valley farmers and taint shallow drinking-water wells used by residents of the small town of Capulin.

The Summitville site now is contaminated with at least 170 million gallons of cyanide-contaminated

liquids. But money shortages may force the federal government to stop treating up to 30 percent of the polluted discharges from the mine, said EPA site manager Hays Griswold.

"It's a bit disturbing what was put out here," said Griswold, who's directing the crew of workers. "We're trying to do the best we can, but because of the cost factor, we're going to have to scale down."

EPA hopes to cut pollution-control costs to \$250,000 per month, Griswold said. But the agency still

Please see MINE on 5B

EPA may run out of money to pay for gold mine cleanup.

MINE from Page 1B

is expected to run out of money to control Summitville contamination by May, he said.

The Summitville project is being paid by the federal Superfund, which is financed by a tax on petroleum products.

One of Colorado's biggest mining operations, Summitville opened in 1984 and extracted an estimated 280,000 troy ounces of gold before the company declared bankruptcy this month.

State regulators usually require mine operators to post a bond adequate to cover cleanup costs. But the Colorado Mined Land Reclamation Board only required Summitville to put up \$4.7 million — far short of the \$20 million needed for cleanup.

Both Gov. Roy Romer, who appointed six of the mine board's seven members, and Colorado Department of Natural Resources Director Ken Salazar, who is a board member, declined to comment

yesterday on the Summitville fiasco.

Mike Land, director of the state division of minerals and geology, said the \$4.7 million would have been sufficient if Summitville had obeyed its state operations permit. The state levied \$130,600 in fines against the mine company for repeated environmental violations before Summitville filed for Chapter 7 bankruptcy protection.

Rio Grande County District Judge John Kuenhold this week made permanent a temporary injunction preventing the Summitville operator from abandoning the mine site. But the effect of that order is unclear, because the EPA already has taken over mine operations.

"This is a tragedy," said Mark Hughes, an attorney with the Sierra Club Legal Defense Fund. "State government saw the tragedy coming, but everybody who had the levers of power in state government didn't do anything about it. The state blew it."

Et Cetera

RECEIVED 28 DEC 1992

Mine's bankruptcy could be devastating

By Gary Thirmer

Local businesses and county government stand to lose more than a million dollars as a result of the bankruptcy filing by the Summitville Mine.

"Summitville employees were charging for supplies up until the day we found out about it," said Terry Haynie, owner of the Del Norte NAPA Auto Parts Store. "The press release said the papers were filed on Dec. 1, but we weren't notified until the third."

While Mr. Haynie would not reveal the specific amount owed to his company by Summitville Mining, he acknowledged that he and Bill Keeling of Keeling Oil were probably the two major creditors.

"It's still early enough that we don't know if we'll see any of the money," he said. "I've dealt with bankruptcy filings in the past and we haven't been successful yet." Mr. Haynie said Summitville informed him that there was still "some money flowing through the company" but didn't know what that meant in regard to debts owed to his business. When contacted at his office in Del Norte, Bill Keeling said the amount several years to recover from this. It's

owed to his firm was about \$25,000. Keeling Oil had been supplying Summitville Mine with gasoline and diesel fuel for nine years, he said.

Referring to Peter J. Guest, president and chief executive of Galactic Resources Inc., of which Summitville Consolidated Mining Co. is a subsidiary, Mr. Keeling said, "I'm shocked that Guest would not pay local merchants first."

He explained that the mine had been a good customer until now and he thought nine years of doing business together should count for something.

Mr. Keeling also owns Quick Stop Food Stores in Del Norte, South Fork, and Monte Vista.

"A lot of Summitville people traded at those stores," he said. "I'm concerned about how this will affect my employees. We're looking at reduced hours."

He said he may have to cut hours at the oil company just to reduce expenses. "This single loss would be more money than all other losses I've suffered in bad credit in the past twenty-five years combined," Mr. Keeling said. "It's going to take more than several years to recover from this. It's

had."

Be it assuaged by the news of Summitville's bankruptcy action, Rio Grande County Treasurer Billy Jean Garetson said there was about \$287,000 still owed the county on last year's tax assessment. This is the amount owed on the assessed value of the mine's buildings and their contents.

Ms. Garetson said the land taxes, once in arrears, have been paid. She was quick to point out that the amount owed did not include this year's assessment, to be mailed out in January. Ms. Garetson explained the county was perhaps better off than some of the Summitville creditors because if the taxes are not paid it can seize the mine or sell it, but admitted

"there's lots to sort out yet."

Bob Davie, Rio Grande County assessor, tried to put things in a more favorable light.

"One way to look at it is that Summitville was going to close in another year or two and the county was going to lose that money anyway."

Still, Mr. Davie estimates that adding the \$287,000 owed on last year's taxes to amounts due this year means the total loss to Rio Grande County may approach \$800,000.

Hardest hit will most likely be the Del Norte School System. Superintendent of Schools Marlin Janas said they were expecting a \$180,000 check from the mine next month.

"Right now, I'm sick over the thing," said Mr. Janas. "We were already looking at a budget shortfall for

next year of 9 to 15 percent."

That translates to a loss of at least \$230,000, which could go as high as \$383,000, he said. Coupled with the lost tax revenues and the restrictions of Amendment 1, which requires that all tax increases must be put to a vote, the results could be devastating.

County and local businesses are continuing to explore options. Many said it's early and more information is needed before deciding how to deal with possible losses due to the bankruptcy. But the shared feeling of helplessness and dismay was probably best summed up by Terry Haynie at NAPA. He said that he had always done business with Summitville in good faith.

"I don't think it's right," he said with a touch of anger in his voice.



VALLEY COURIER

SERVING ALAMOSA, CONEJOS, COSTILLA, MINERAL, RIO GRANDE AND SAGUACHE COUNTIES

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Pullout would create tax issue

Summitville hearing Thursday in Conejos

By ERIN MACGILLIVRAY SMITH
Special to the Courier

DEL NORTE — District Judge O. John Kuenhold has slated a tentative hearing for 3 p.m. Thursday in Conejos District Court on a request by the Colorado Attorney General to prevent Galactic Resources Ltd. of Vancouver, Canada, from abandoning its Summitville Mine in the

San Juan Mountains about 25 miles southwest of here.

Although Kuenhold set the hearing on Tuesday, no pleadings had been filed by the end of the day by the state. Because the mine is in Rio Grande County, the filing would be in district court in Del Norte, but Conejos is part of the 12th Judicial District for which Kuenhold is a judge

and Conejos will be sitting in that county on Thursday.

Last week Galactic announced in The Wall Street Journal that it was closing the controversial mining operation on Dec. 15.

Several state agencies, including the Colorado Mined Land Reclamation Board, which learned of the possible action on Friday after the

national article appeared, became concerned.

Meeting Monday in Denver, several members of the CMLRB were angered at what they considered a breach of "good faith" in that no one from Galactic was present to answer questions about the Summitville Consolidated Mining Co.'s Chapter 7 bankruptcy proceeding, intention to

pull out of Summitville and quit the cleanup of cyanide in the heap from which it was extracting gold.

The CMLRB gave the reclamation division permission to use the \$4.7 million in Summitville reclamation bond money to continue detoxification should the company abandon the site without conducting a hearing.

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However, since the CMLRB would rather the money remain for reclamation, it is trying to obtain a court order stopping Summitville, whose parent company is Galactic, from closing down.

"Galactic said it agreed with its

unit (at Summitville) that they will jointly quantify its reclamation liabilities. Upon approval of this agreement by a bankruptcy court in Denver, the company said it will pay Summitville \$200,000 to cover current costs," the Journal stated.

Loretta Pineda, public information

specialist for the CMLRB's division of mineral and geology, said Monday evening how the cleanup will occur and who will do it is not clear.

Rio Grande County Administrator Suzanne Benton said Saturday that the county won't be required to do the work as the state made it apparent

long ago the county was not involved.

But the county is being injured by the pullout. Not only is the area losing jobs but also Summitville is leaving without paying all its property taxes.

It owes the county \$287,000 in 1991 taxes, County Treasurer Billie Jean Garretson said Saturday.

Mrs. Benton said most of those taxes would go to the Del Norte School District.

Mrs. Garretson, with the approval of the county commissioners, did not put the taxes up for sale at last month's tax sale because Summitville assured her it will pay them by the end of December.

"Anything they've told me, they've done," Mrs. Garretson said.

Taxes are held in abeyance and are not sold at tax sales if a company is in bankruptcy, Mrs. Garretson added.

It is unlikely that a buyer at the tax sale would have picked up the company's taxes even if they had been

sold, Mrs. Benton and Mrs. Garretson indicated.

Mrs. Benton said if the taxes aren't paid once the company comes out of bankruptcy and Summitville has not completed its cleanup, it is unlikely a private individual would pay them with an eye to obtaining the property

eventually and the county would not accept deed to them either because of the environmental hazards on the land.

"I think it's a legal mess," Mrs.

Benton said, "but they can't come back to the county because the county has never been involved."

Mrs. Garretson was among half a dozen landowners who leased their property to Summitville. Last week she was notified that the leases were being returned to the owners in anticipation of the bankruptcy filing.

She said she is luckier than some of the other owners because when she

learned Summitville planned to dump cyanide-tainted heap leachings on her property, she instructed her lawyer to go to court and obtain an injunction against the company. Her property was unscathed.

Hearing moved

By ERIN MACGILLIVRAY SMITH
Special to the Courier

CONEJOS -- The illness of an assistant attorney general in the middle of a court proceeding here Thursday afternoon forced District Judge O. John Kuenhold to continue a hearing on a state request to prevent Galactic Resources, Ltd. of Vancouver, Canada, from abandoning its Summitville Mine in the San Juan Mountains about 25 miles southwest of Del Norte.

Kuenhold said he has continued the matter until 1:30 p.m. today in Alamosa District Court.

Assistant Attorney General Amelia Whiting became ill during the court hearing in Conejos District Court, requiring the continuance.

Last week Galactic announced in The Wall Street Journal that it was closing the controversial mining operation on Dec. 15.

Several state agencies, including the Colorado Mined Land Reclamation Board, which learned of

the possible action on Friday after the national article appeared, became concerned.

Meeting Monday in Denver, several members of the CMLRB were angered at what they considered a breach of "good faith" in that no one from Galactic was present to answer questions about the Summitville Consolidated Mining Co.'s Chapter 7 bankruptcy proceeding, intention to pull out of Summitville and quit the cleanup of cyanide in the heap from which it was extracting gold.

The CMLRB gave the reclamation division permission to use the \$47 million in Summitville reclamation bond money to continue detoxification should the company abandon the site without conducting a hearing.

However, since the CMLRB would rather the money remain for reclamation, it is trying to obtain a court order stopping Summitville, whose parent company is Galactic, from closing down.

Mine ordered to run

Judge grants request to keep firms on the job

By Ray James

District Judge John Kuenhold on Friday ordered the owners of the Summitville mine to keep an access road to the high mountain site open and to continue running the water purification plant through the winter.

The judge said allowing Galactic Resources Ltd. and its subsidiaries to escape responsibility for the cleanup presented an imminent danger to the public because of potential cyanide pollution of the Alamosa River. However, federal and Canadian bankruptcy judges may make the final decision in the case.

Lawyers from the state Attorney General's office said the ruling makes it clear to the operation's owners that they must live up to a settlement reached last summer with the Canadian mining firm, Galactic Resources Ltd.; its American subsidiary, Galactic Resources Inc.; and the operating company, Summitville Consolidated Mining Co., to clean up the cyanide heap-leaching process at the mine. Peter Guest, president and chief executive officer of Galactic and Summitville, said he was devastated by the judge's decision. Galactic's attorney, Thomas Quinn, said Judge Kuenhold's ruling "sounds the death

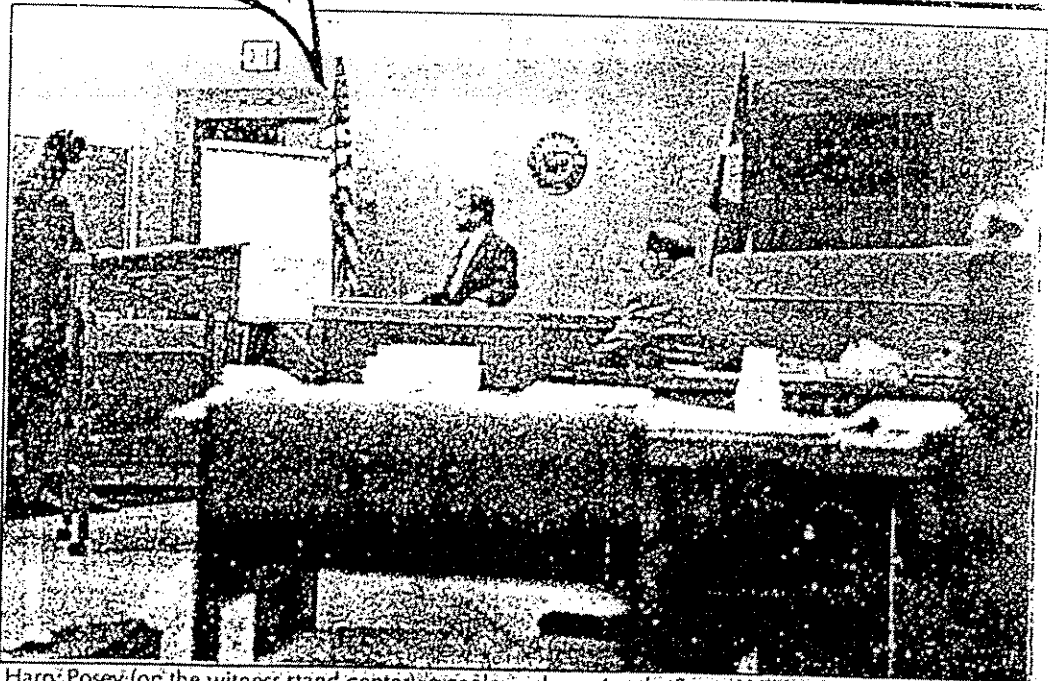
See COURT on Back Page

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The Alamosa News

Et Cetera



Harry Posey (on the witness stand center), a geologist with the state Division of Minerals and Geology, testified Friday on a restraining order to keep Summitville Consolidated Mining Co. working on a cleanup at the Summitville Mine. Left is Assistant Attorney General Amelia Whiting questioning Dr. Posey. To his right is court reporter Jon Alana and at far right, Judge O. John Kuenhold. Staff photo by Ray James.

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Continued from Page 1A

knell for my client's company.

"The state Attorney General's office thinks they won a great victory," Mr. Quinn said, "but they really haven't accomplished anything except to destroy the company and the plan it had for cleaning up the site."

He labeled the suit by the state unnecessary, saying that Galactic was working to abide by its agreement and had already agreed to put all of its resources into the cleanup effort.

Mr. Guest said on the witness stand Friday that until a California subsidiary of Galactic was sold, the company had no more money to put into the cleanup.

"If you want the last four or five hundred thousand dollars we have, you can have it, but we consider that nothing (toward solving the problem)," said Mr. Guest.

The president said that he expected \$12 million from the sale of the California property, also a gold mine, and expected that money to go toward the cleanup as had money from the sale of company subsidiaries in South Carolina and Nevada.

When asked by Judge Kuenhold if he had known his company was in financial trouble when he made the reclamation agreement with the state, Mr. Guest said he thought there would be enough money available to finish the job but the sale of the California operation, Galactic's last in the United

States, had not gone well. He said he was on his way to California to check on that after the hearing.

Mr. Quinn said that the temporary restraining order puts all of the parent company's plans in jeopardy. He added that the decision may force Galactic itself into bankruptcy and that would let a Canadian trustee determine what to do with the rest of the company's assets. He said Galactic had planned to put those into the Summitville project.

The judge explained in his decision that he believed an emergency situation existed; that there was imminent danger to the public's health and the environment; and that Galactic and its subsidiaries must get the clear message that they have to live up to the agreement they made less than six months ago.

That agreement calls for treatment of the water coming from the mine and complete repair of the Summitville site damage caused by the cyanide-heap leaching process and damage, some as old as 100 years, caused by previous operations.

The state had estimated cleanup costs at between \$18 million and \$23 million, but Mr. Guest said those figures have never been verified and he believes them to be closer to the \$12 million, about what his company should have available.

Mr. Guest also said that at a meeting in Denver with Summitville's bankruptcy trustee, Tom Connelly, he repeated his company's promise to meet its agreements until it was no longer able to do so and said that the U.S. Environmental Protection

Agency had promised to step in and continue the cleanup, especially the water treatment, the day after Summitville and Galactic stop operations.

The EPA said it would interview Summitville employees already familiar with the operation if it has to take over the cleanup project. That would could mean fewer of the 52 employees still working at the mine would be out of work.

Mr. Guest said that it was costing between \$250,000 and \$300,000 a month to clean up the site, and that Galactic had been paying that, but the company would no longer be able to do so after Dec. 15.

He said the parent company had been paying the bills for Summitville since he took over the parent company 2 1/2 years ago and had never made anything back.

"This has not been a gold mine," Mr. Guest said. "It's been a water treatment and a land reclamation project."

The mine has earned more than \$130 million from the sale of gold but the firm spent \$215 million to do it.

Lawyers for both Galactic and the state said they were uncertain what effect Judge Kuenhold's restraining order would have on an emergency agreement being worked out between the EPA, the state and the trustee, but said that could be determined Monday at a meeting among the parties.

Judge Kuenhold set a hearing on a preliminary injunction against Galactic for Dec. 21 and 22, at which time he could make the temporary restraining order permanent.

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Government takes charge of cleanup

By Gary Theimer

Members of the U.S. Environmental Protection Agency's Emergency Response Team will be at the Summitville Mine next week to ensure that the company's water treatment plant keeps operating.

The agency's on-scene coordinator, Hays Griswold, said he fully expects to be in charge of plant operations next Wednesday, after employees of Summitville Consolidated Mining Co. and its parent, Galactic Resources Ltd., are expected to leave the job.

"If Galactic had any money," he said, "we might expect them to continue with the cleanup effort under our supervision."

However, Mr. Griswold said he had no reason to believe the company would take any responsibility for day-to-day operations after next Tuesday.

"We had a meeting with Galactic earlier this week and I'm not reassured," he said.

Peter J. Guest, president and chief executive of Galactic, said Thursday that his company had put \$215 million into the Summitville project and only retrieved \$130 million in gold and other minerals. He claimed that his company could no longer afford to operate with that kind of loss.

On Dec. 1, Summitville Consolidated Mining filed for Chapter 7 bankruptcy liquidation in federal court, saying that it could not afford to continue operation of the mine's water treatment plant, or to finish construction of a waste water management

system, now only 70 percent done.

Under the direction of Mr. Griswold, the federal agency will take the lead in the cleanup. He said that first the agency would be establishing a "holding action" to ensure that no further degradation to the site or water quality occurred. After that, they would try to get ahead of the problem.

Jim Horn from the Durango office of the state Department of Health said he was convinced that the agencies could make the treatment plant work, but changes made to the plant last month have not improved its performance. Water sent through the system the first time does not meet quality standards and has to be recycled a second time before a new batch of water can be processed. Mr. Horn explained that on the first pass through the system, water taken out of the leaching pond has very high concentrations of cyanide and heavy metals.

"Copper may be 200 ppm above permitted levels," he said. "Once treated it may be only 2 or 3 ppm out of tolerance."

Mr. Horn said that by operating the treatment plant in this way, it will never be able to achieve maximum performance.

How much the cleanup will cost and the role each agency will play is still very much in doubt.

What is not in doubt is who is calling the shots. Mr. Griswold of EPA made it very clear.

"The federal government has taken over and we're in charge," he said.

Mining board delays decision on cleanup of cyanide leaks

The Associated Press

DENVER — The state Mined Land Reclamation Board has delayed action on two cyanide leaks at a controversial gold mine near Wolf Creek Pass as it continues to discuss plans on shutting the mine down.

The state and the mine's owners are in the midst of prolonged negotiations about how the sprawling site will be shut down, cleaned up and reclaimed.

Some board members in a two hour meeting on Wednesday questioned whether \$2.2 million in reclamation bonds are adequate to cover the entire cost of reclamation.

Peter Guest, president and chief executive officer of Galactic Resources Ltd. of Vancouver, B.C., has said it might cost \$9 million to

\$15 million to shut down the operation and reclaim the site over the next three years.

Galactic owns Summitville Consolidated Mining Co. The firm will have extracted an estimated 300,000 troy ounces of gold from the area by next spring — 33,000 ounces more than 50 underground mines in the area produced in 60 years.

Board members had many questions about how Summitville plans to flush out and detoxify 354 acre-feet of cyanide-laced water in the 48-acre leach heap. The cyanide-water mixture is used to extract gold from ore. One acre foot of water equals 325,850 gallons.

The company has been fined more than \$130,000 for cyanide leaks prior to the most recent leaks in September and November.

THE DENVER POST

Friday, January 22, 1993

VER POST

Friday, January 22, 1993

Cleanup bond partly repaid before mine goes bankrupt

BOND from Page 1A

ing company agreed to start reclaiming land on the site. In return, the state was compelled to refund some of the company's money in three installments beginning Oct. 20.

The company had provided the state with bonds worth \$7.2 million to ensure that the site, near Wolf Creek Pass, would be restored and rendered harmless to the environment. That amount was to be re-evaluated after publication of an amended reclamation plan, which the division requested after many discharge violations by the mine operator.

The amended plan was completed Nov. 30. Summitville notified the state of its intention to file for bankruptcy the next day, Dec. 1.

"We were going along in good faith and 'boom,'" said Mike Long, who became division director early last year. State officials had become concerned that the cost of operating the mine's water-treatment facilities, while completing land reclamation, would far exceed original estimates.

The final report by Golder Associates in Lakewood set cleanup costs at \$20.6 million, far less than the original \$70 million estimate.

State-mandated criteria changed considerably by the time the final report was issued, said

Dirk Van Zill of Golder Associates. And the state division should have known that its cleanup money would be inadequate, he added.

Summitville apparently already had been preparing for the worst.

"I think it goes back to the fact that everybody saw the writing on the wall," said Mike Holmes of the EPA's office of external affairs. "We heard from some of their former employees that they stopped maintaining their equipment in April."

Since the EPA began operating the site, six more people had to be hired just to keep up with repairs, Holmes said. "We hired most of the Summitville employees, but that wasn't enough."

The EPA team took control of water purification and snow removal Dec. 16 after Summitville Mining and its Canadian parent, Galactic Resources Ltd., told the state that they no longer could afford to protect the environment while reclaiming land at the open pit gold mine high in the San Juan Mountains.

The mine's three water-treatment plants must operate to prevent water laced with cyanide and with high concentrations of heavy metals from spilling into surface streams.

Galactic operated Summitville since 1986, extracting 280,000 troy ounces of gold worth more than

\$130 million.

Having signed the July settlement, however, the division had to refund the company's bond money, pending Golder's final report.

To prevent such problems in the future, Long said, "We're looking at writing good permits, doing good inspections and improving the bonding process."

But, "if you're going to pick one, I think it's definitely the bond ... the ability to look at and evaluate the bond needs to be improved."

Since 1986, Summitville received seven violation notices from the division for release of polluted water into Cropsey drainage, Wightman Fork and eventually the Alamosa River.

Why was the company allowed to continue processing gold?

"I wish I could answer that," Long said. "But if you look at Battle Mountain Gold, you'll see we handled that very differently. We made them shut down."

"If the Summitville violations happened today, we would shut them down, too."

The Colorado Mined Land Reclamation Board will meet Wednesday to decide whether to keep Summitville's remaining \$4.7 million bond.

And the EPA and the Office of Mined Land Reclamation will update the board on the status of reclamation efforts:

THE DENVER POST

Friday, January 22, 1993

Mine gets refund; taxpayers hold bag

Bond pared just before bankruptcy

By Gary Thalmer
Special to The Denver Post

ALAMOSA — A Colorado agency charged with protecting the environment from mine pollution got a surety bond for about \$7.2 million from a mining company for a massive cleanup — but refunded \$2.5 million just 1½ months before the company declared bankruptcy.

Yet a report issued Aug. 30 — more than 1½ months before the refund — had said reclamation and remediation at the gold mine south of Del Norte could cost up to \$70 million.

Now the cleanup is costing U.S. taxpayers about \$37,000 a day. The U.S. Environmental Protection Agency will hit its \$2 million spending limit on the cleanup Feb. 15. The EPA team then must find more money or stop operations.

Unless nature cooperates, the EPA said this week, more than 100 million gallons of cyanide-laced wa-

ter could spill next spring into a creek, the Alamosa River and perhaps the Rio Grande. If the cleanup stops, that is certain to happen, the EPA says.

The Alamosa River, downstream from the mine, supplies water to San Luis Valley farmers and ranchers through a series of canals and enters the Rio Grande below Alamosa. Aquatic life in the Alamosa River is dead for 17 miles because of previous spills at the mine.

Summitville Consolidated Mining Co. filed for Chapter 7 bankruptcy protection Dec. 3, not long after it got the \$2.5 million refund from the Colorado Department of Natural Resources's Division of Minerals and Geology.

But in July, Summitville, the state division and the Colorado Department of Health had signed a settlement agreement in which the min-

Please see BOND on 20A.

Chemical-mine moratorium urged

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By Mark Obrnascik
Denver Post Environment Writer

Environmental damage caused by the Summitville mine fiasco prompted the Colorado Department of Natural Resources yesterday to propose a moratorium on state approval of any new chemical mining operations.

After the Summitville gold operation polluted southern Colorado streams with cyanide and copper — and left taxpayers with an estimated \$15 million in cleanup costs by declaring bankruptcy — state regulators have come under fire for their handling of the situation.

"I think everybody understands there needs to be some dramatic action to prevent this kind of situation from happening again," said Ken Salazar, director of the department of natural resources. "We need some sweeping change."

Colorado is home to 23 chemical-treatment mine operations. Salazar asked the Colorado Mined Land Reclamation Board to reject all permit applications for new cyanide heap-leach operations until the state can toughen its mine statutes and regulations.

The proposal was opposed by the Colorado Mining Association,

which represents 115 local mine companies.

"I don't think there's a need to put a moratorium on all applications," said Dave Cole, director of the association. "I think these issues can be addressed under the present laws."

The Mined Land Reclamation Board scheduled a meeting next month to consider the department of natural resources' moratorium request.

In addition to the moratorium, Salazar asked the board to let the state require mine companies to post higher reclamation bonds.

Summitville's parent files for bankruptcy in Canada

By Gary Theimer
Special to The Denver Post

The Vancouver company whose subsidiary ran the beleaguered Summitville Mine announced yesterday that it had filed for bankruptcy in Canada because of "Colorado's inability to reach a settlement agreement" on the massive cleanup at the polluted mine site.

Galactic Resources Ltd. had been negotiating with the state since its subsidiary, Summitville Consolidated Mining Co. Inc., filed for liquidation Dec. 4 under U.S. bankruptcy laws.

Superfund site, eligible for a federal cleanup.

The EPA crew, in the meantime, expects to get an extra \$3 million from its headquarters to keep the water-treatment plants running

Officials of both companies told the state then that they couldn't afford to keep the mine's three water-treatment plants running or

ALAMOSA

keep an 18-mile access road open in winter, both needed for the cleanup.

So the state department of health and the department of natural resources' division of minerals and geology asked the federal government to step in. The U.S. Environmental Protection Agency took control of the site Dec. 16.

If the treatment plants shut

down, water containing cyanide and heavy metals will begin spilling into streams at the Summitville Mine, 24 miles southwest of Del Norte.

Colorado mining industry strikes again

What was Colorado's largest gold mine in the 1980s is now the state's worst mine pollution disaster.

On Dec. 15, Summitville Consolidated Mining Co. declared bankruptcy and abandoned its cyanide heap-leach gold mine at 11,700 feet in southern Colorado's rugged San Juan Mountains. It left behind a six-year legacy of pollution violations, a 17-mile stretch of the Alamosa River sterilized by mine waste, and a 170 million-gallon tailings pond leaking large amounts of cyanide.

A day later, on Dec. 16, worried state officials called in the Environmental Protection Agency to prevent wholesale damage to the Rio Grande basin. The agency's Superfund program now has 45 people working at the mine and it is spending \$38,000 a day to treat the cyanide waste.

"(We) kind of had it pitched in the middle of our laps," says Superfund spokeswoman Sonya Pennock.

EPA officials estimate the cleanup could eventually cost taxpayers \$20 million — unless the agency is fortunate enough to get some of it back from a bankruptcy court.

In the meantime, the EPA is wondering how to pay for it. The Colorado Mined Land Reclamation Board, which permits, regulates and sets bonds for all mining operations in the state, only obtained a \$4.7 million bond from Summitville Consolidated. And Summitville's parent company, Galactic Resources Inc., of Nevada, has also gone under.

As an angry Colorado public and EPA officials confront the state Mined Land Reclamation Board over the disaster, the story that unfolds reveals an environmental and financial boondoggle that state officials say they were helpless to prevent.

Seven people sit on the Mined Land Reclamation Board. They are appointed by the governor and affirmed by the state Senate. Critics say that generally results in a slight industry bias, but board members say that isn't the problem.

"The key reason why things turned out the way they did is the (Colorado) Mined Land Reclamation Act," says environmental lawyer and six-year board member Luke Danielson. "There is a strong pro-industry bent in the way our law is written."

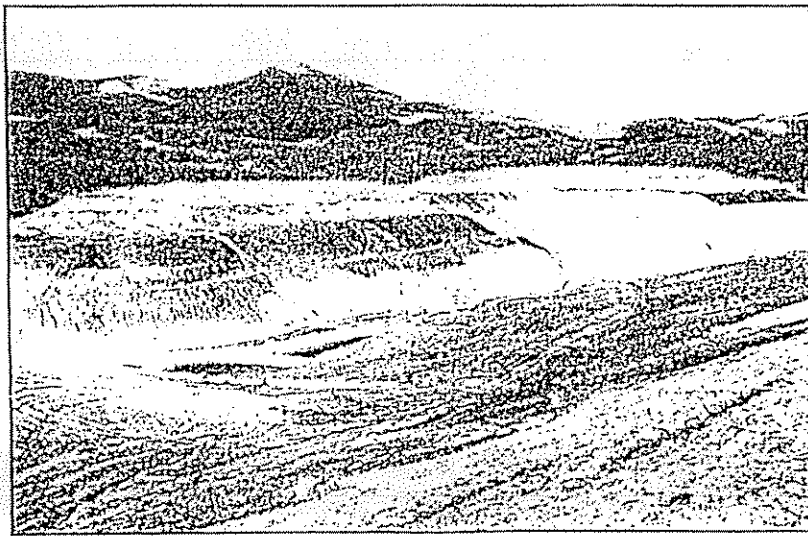
Danielson, one of two board members appointed to represent the conservation community, says the chronology of Summitville illustrates what's wrong with the law. In a heap-leach gold mine, ore is crushed, piled in a heap and then sprinkled with cyanide. As cyanide filters through the pile it dissolves the gold. The "pregnant" solution is then pumped out, the gold recovered and the cyanide re-used. Summitville won a permit for a "valley-fill" heap-leach in 1984. Valley fill means instead of building a special heap-leach pad, the company simply dumped on a small valley

Danielson says the design, which also buried a creek under the pile, should never have been approved. However, under state law the Division of Minerals and Geology only has 120 days to review a mining application before a permit is automatically granted. Danielson says the law allows extremely narrow grounds to deny a permit. Moreover, the division is limited in what restrictions it can enforce and how high it can set reclamation bonds. As a result, the mine won easy approval with an initial bond of less than \$1 million.

To make matters worse, in 1986, the year Summitville went into operation, the Colorado Legislature eliminated the division's entire budget. Says chief geologist James Pendleton, there were no mine

by creating an emergency reclamation fund and by giving more money and authority to the Mined Land Reclamation Board and its staff in the state Division of Minerals and Geology.

Summitville, Danielson warns, may not be the only problem. In 1988, a smaller, yet mirror image of Summitville occurred near Cripple Creek, where the earthen dam on a cyanide pond owned by the bankrupt Newmont Mining Corp. burst. In that case, the state had only required a \$60,000 bond; the cleanup bill ultimately exceeded \$250,000. Danielson says many of the state's 350 operating mines may have inadequate bonds, or, because of a rule that bars adding inflation rates, bonds that are significantly outdated.



Division of Minerals and Geology
A Summitville waste pile, partially reclaimed, foreground, with the heap leach pad behind

inspections anywhere in Colorado for one and a half years. Thus, the agency didn't find out until 1989 that Summitville's heap-leach pile had a dangerous water imbalance, with more water coming in than going out.

In addition, the company reported that cyanide was leaking through the plastic liner and into groundwater below. The attempted repair — trapping the contaminated groundwater and pumping it back into the heap-leach pile — did not work. Danielson says the rising waters threatened to breach the dam.

"The mine couldn't be shut down without causing more problems than we already had," says Danielson. Without an emergency cleanup fund, or a higher bond, the mining board members felt that the state's only option was to try and keep Summitville in business so it could control the problem.

Ultimately, the company was fined \$100,000. In negotiations with state officials, mine officials also agreed to raise their bond to almost \$5 million and build a water treatment plant to start emptying the tailings pond.

Although state officials such as Danielson and Pendleton have taken the heat for the disaster, they say the blame lies with the state Legislature and the state's powerful mining lobby.

"This is what happens when the Legislature decides to take a political pot shot at a state program," Danielson says. He wants the Legislature to fix the problem

State and national environmental groups worry that more disasters are primed to happen. But Division of Minerals and Geology spokesman Mike Long says the bulk of the problems were fixed in 1990, when the division won permission from the Legislature to fund its programs by charging higher fees. Now inspections are up.

"The level of expertise on our staff has increased by leaps and bounds," adds Long. "We have taken great pains to make sure our people have the proper backgrounds."

Long and his department will soon have a chance to show that they are up to speed. The largest cyanide gold mine in the state will open near Victor, Colo., later this year (*JCN*, 5/18/92). Long says the proposal for the so-called Cresson Mine is receiving "more scrutiny" in the wake of the Summitville debacle.

But Jim Lyon of the reform-minded Mineral Policy Center in Washington, D.C., says added training won't solve Colorado's ills. "It doesn't have as much to do with expertise as it does with political will," Lyon says.

Lyon fears that given the historic power of the mining industry in Colorado, the state can't be trusted. The EPA should be involved in permitting and enforcement, not just cleanup, he says. "There will be more Summitvilles unless there is a federal approach."

— Steve Hinchman, Barry Norcen

News

Summitville reclamation may last longer than mine operated

By JIM CARRIER
Special to the Courier

EDITOR'S NOTE: The following article is being reprinted from the Friday, April 24 issue of The Denver Post. Jim Carrier is a staff writer for the Post.

Colorado's largest cyanide heapleach gold mine, a five-year environmental and financial mess, has begun a reclamation process that could last longer than the mine operated.

On March 31, the last cyanide was sprayed on a huge pile of crushed rock that has produced about 300,000

Troy ounces of gold at the Summitville Consolidated Mining Co., 16 miles from Wolf Creek Pass.

While the mine produced \$90 million in gold, the company says it lost \$70 million because of environmental problems it did not expect and failures in the basic design.

"There are a lot of problems at the site," said Bob Shukle, chief of enforcement for the state health department's water quality division. "It's been a real headache."

agreed Charles Russell, senior vice president of the mine's owner, Galactic Resources Ltd. of Vancouver, B.C. He said the En-

vironmental Protection Agency is considering the mine as a Superfund site.

This week, Galactic and the state of Colorado agreed to \$10,600 in fines for two cyanide leaks last fall. The company has had four serious releases of cyanide into the Alamosa River that state wildlife officials say killed aquatic life in a 17-mile stretch. The company denies responsibility for the kill, but has paid \$135,000 in fines for leaks that began within a month after the mine began operating in 1986.

Mark Hughes, an attorney for the Sierra Club Legal Defense Fund, called the latest fines "a joke" for a

company that had a long list of violations. "It's like a murderer getting his charges reduced to a parking fine."

The company says it could end up spending \$9 million to \$15 million to detoxify the mining site, a huge open-pit at 11,700 feet on South Mountain.

"As a school, it has been incredibly interesting," said Russell, who added that Galactic was bailing out of the United States to head to South America, where mining regulations, based on World Bank standards, do not change according to political winds.

Jim Pendleton, scientific coordinator for the Colorado Mined Land

Reclamation Division, said detoxification of the mine will be difficult because there is no way to eliminate silver from its waste water.

The pile of crushed rock must be flushed with water for 6-12 months until the cyanide is gone. Then the solution must be treated to the level of the pre-mine stream, standards which are normally as acidic as Pepsi-Cola, he said. Eventually, the site will be regraded and covered with topsoil.

The company has posted \$2 million in bonds for cleanup, but will be required to post more as cleanup proceeds, said Pendleton.

*Charles
Bugstrom*



MISCELLANEOUS
PAPER
85-1

IMPACT ON GROUNDWATER
FROM CLOSURE OF AN
UNDERGROUND ZINC-LEAD MINE
IN SOUTHWEST WISCONSIN

by Thomas J. Evans and Marten J. Cieslik

available from
Geological and Natural History Survey
University of Wisconsin
3817 Mineral Point Road
Madison, Wisconsin 53705

IMPACT ON GROUNDWATER
FROM CLOSURE OF AN
UNDERGROUND ZINC-LEAD MINE
IN SOUTHWEST WISCONSIN

by
Thomas J. Evans and Marten J. Cieslik¹

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ABSTRACT

Following closure of the Shullsburg Mine, an underground zinc-lead mine in southwestern Wisconsin, water quality in nearby private water-supply wells deteriorated. Affected wells were located within the cone of depression created by the large pumps used to keep the underground mine dewatered. Following mine closure, groundwater from these wells showed increased levels of sulfate, iron, calcium, magnesium, and total dissolved solids. The mechanism for increasing the concentrations of these materials in the groundwater is postulated to be the following sequence: (1) oxidation of sulfide minerals, (2) formation of soluble sulfate mineral phases, (3) breakdown of carbonate host rock by acid produced during sulfide oxidation, and (4) dissolution of soluble materials by groundwater within rock strata that was previously dewatered during active mining.

INTRODUCTION

The Shullsburg Mine in Lafayette County, Wisconsin, is a complex of zinc-lead ore bodies ranging up to 350 ft below the land surface within dominantly dolomitic host rocks (fig. 1). The mine, operated as a single mining unit accessible initially through a vertical shaft and later through an incline, was opened in 1949 and was operated almost continuously until the mine closed in 1979. A second mine (known as the Blackstone Mine) was opened in 1950. The two mines were joined by mine drifts in 1970. Cones of depression developed as a result of pumping necessary to dewater both mines. Because of the mines close proximity and similar location about 300 ft. below the pre-mining water table, these areas of water-level decline coalesced shortly after 1950.

Within one year following cessation of mining operations, private water-supply wells in the immediate vicinity of the Shullsburg Mine began to produce water with elevated concentrations of sulfate which ranged from 700 mg/l to 3500 mg/l (fig. 2). The laxative effect of sulfate in drinking water is well-documented (Environmental Protection Agency, 1976). The adverse impact of these sulfate-laden waters on both humans and livestock prompted citizen complaints to the Wisconsin Department of Natural Resources (WDNR). In addition to diarrhea and related gastric distress in humans, some local farmers noted pronounced declines in milk production from dairy cattle.

The Wisconsin Geological and Natural History Survey (WGNHS) initiated an investigation in 1980 to determine the extent of groundwater quality decline in the area, to identify the probable cause of the poor water quality, and to suggest mitigation measures for affected landowners (Evans and others, 1983). The results of this investigation indicate that there is a close spatial and temporal relationship between mine dewatering and subsequent recovery of water levels and the development of adverse water quality. The role of water-well construction in the presence or absence of poor-quality groundwater in private wells near the mine complex was also evaluated. In cooperation with the WDNR, the WGNHS formulated guidelines for new well construction to mitigate the local water-supply problems.

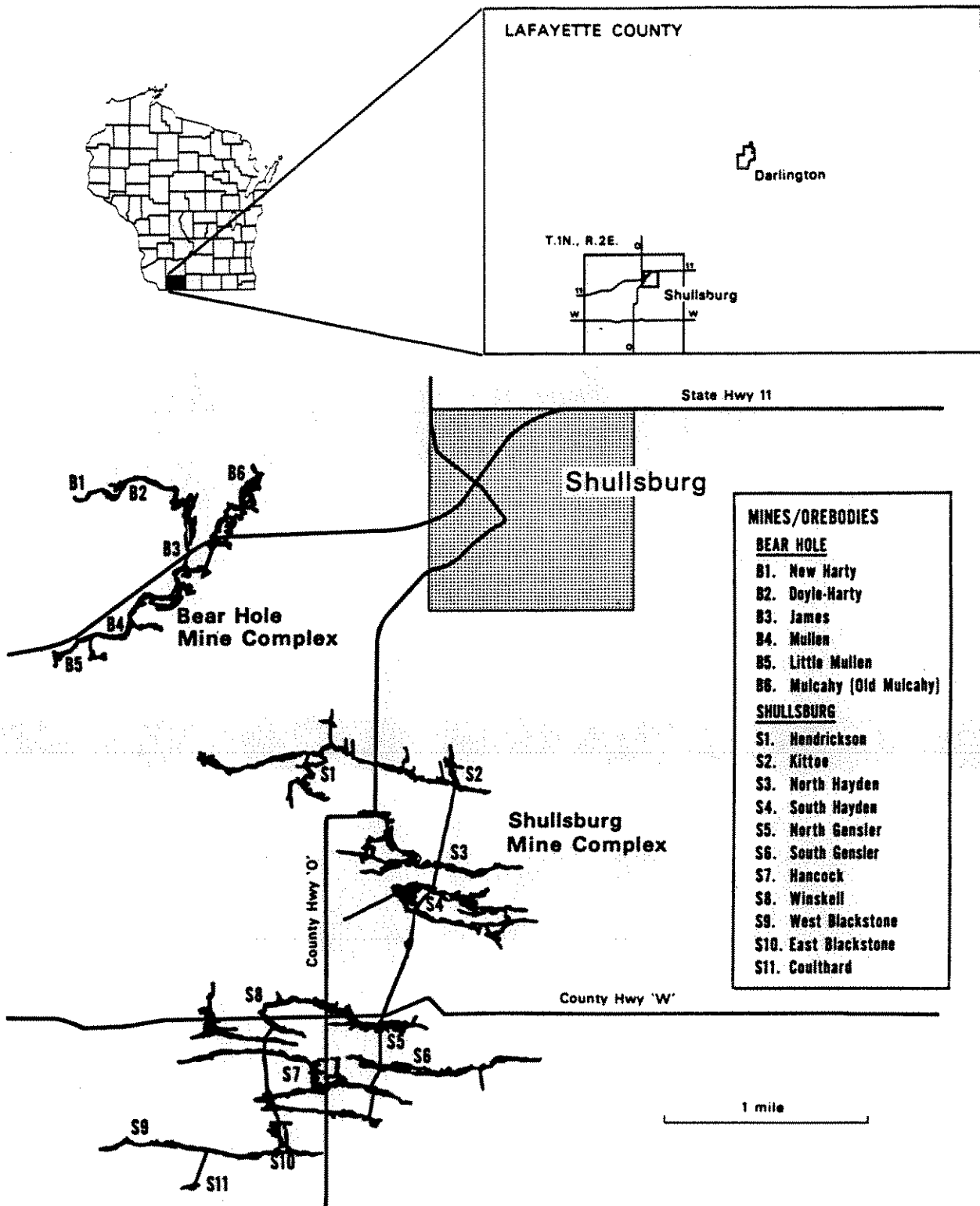


FIGURE 1.-- Map of the Shullsburg Area, Lafayette County, Wisconsin, showing location of the Shullsburg (including Blackstone) and Bear Hole Mine complexes. Each complex represents a group of ore bodies or separate mines that were interconnected by underground mine drifts (tunnels). The Bear Hole Mine complex is discussed by Evans and others (1983).

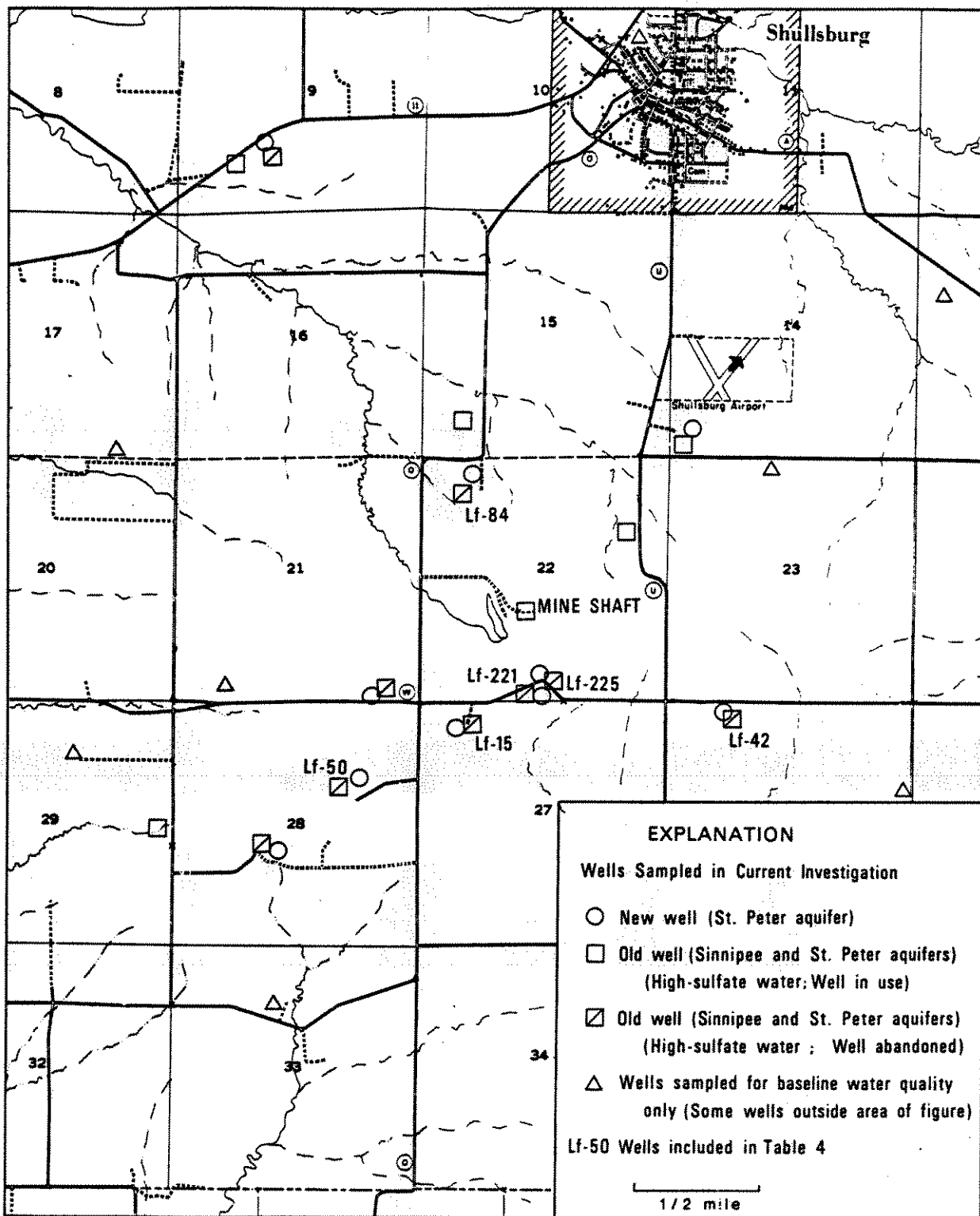


FIGURE 2.— Location of wells sampled during investigation of the Shullsburg groundwater-quality problem. Triangles (△) represent wells sampled to obtain information on water quality within the Sinnipee and St. Peter aquifers unaffected by mining. Squares (□, ▣) represent wells with high concentrates of sulfate. Circles (○) represent new wells constructed during the course of this investigation.

ACKNOWLEDGMENTS

The contribution of C.L.R. Holt, Jr., formerly with the U.S. Geological Survey Water Resources Division, to the understanding of Shullsburg mine hydrology has been invaluable to the present investigation.

The cooperation of the personnel of the Wisconsin Department of Natural Resources is gratefully acknowledged as are the comments and assistance of Ron Hennings, Head of the Water Resources Section, Wisconsin Geological and Natural History Survey. Harold Haman, formerly with Eagle-Picher Industries, Inc., supplied water-level data and other useful information on the Shullsburg Mine complex.

GEOLOGIC AND HYDROGEOLOGIC SETTING

The Shullsburg Mine is located in southwestern Wisconsin in the Upper Mississippi Valley Zinc-Lead district (Hyle and others, 1959). Numerous, small zinc-lead ore bodies occur as mineralized zones associated with (1) vertical joints (gash-vein deposits), (2) inclined fractures (itches), (3) bedding-plane fractures (flats), and (4) as disseminated occurrences of sulfide minerals. The Shullsburg Mine includes principally ore bodies of the gash-vein and pitch-and-flat types, but disseminated sulfide mineralization is also common within the carbonate host rocks.

Mineralized zones include sphalerite (ZnS) and galena (PbS) as ore minerals. Common gangue minerals include marcasite and pyrite (FeS_2), calcite (CaCO_3), and minor amounts of barite (BaSO_4). Sulfide mineralization extends into country rock strata from mineralized fractures as a replacement phenomena for distances up to 400 ft (122 m) (Mullens, 1964).

The host rock for zinc-lead ore bodies at the Shullsburg Mine is the Middle Ordovician Sinnipee Group (Platteville, Decorah, and Galena Formations), a more than 300 ft sequence of dolomite with lesser amounts of limestone and shale (table 1). The Sinnipee Group is overlain to the southeast in the immediate area by the Upper Ordovician Maquoketa Formation, a shale unit that increases in thickness from 0 ft at the Shullsburg Mine to over 100 ft towards the southeast. The Middle Ordovician St. Peter Formation underlying the Sinnipee Group is a very fine to coarse-grained quartz sandstone that varies from less than 40 ft to more than 100 ft thick within the immediate Shullsburg area. A 1-ft to 3-ft shale interval (Middle Ordovician Glenwood Formation) overlies the sandstone of the St. Peter Formation, but is not present everywhere. The St. Peter and Glenwood Formations are known collectively as the Ancell Group.

From a hydrogeologic perspective, the Sinnipee Group and the St. Peter sandstone of the Ancell Group are aquifers (table 1, fig. 3). The Maquoketa Formation and the Glenwood Formation of the Ancell Group (where present) are aquitards. The Sinnipee aquifer is characterized by fracture flow within the fractured and cavernous dolomite and limestone. To the northwest, where the Sinnipee Group crops out and the Maquoketa Formation is absent, the Sinnipee aquifer is unconfined. To the southeast the Sinnipee aquifer is located below the Maquoketa aquitard and may behave as a confined aquifer, but hydrogeologic

Table 1. Principal Geologic Units in the Shullsburg Area

Stratigraphic Unit Group	Formation	Dominant Lithology (thickness in ft)	Hydrogeologic Function
	Maquoketa	shale (0-100+)	aquitard
	Galena		
Sinnipee	Decorah	dolomite (300-340)	aquifer
	Platteville		
Ancell	Glenwood	shale (0-3)	aquitard
	St. Peter	sandstone (40+)	aquifer

data are lacking in that region. The St. Peter aquifer is confined, with the potentiometric surface, as measured in area wells open only in the St. Peter aquifer, being approximately 100 ft (30 m) above the top of the St. Peter Formation.

GROUND-WATER QUALITY AND QUANTITY NEAR THE SHULLSBURG MINE

Prior to Mine Development

The construction of the Shullsburg Mine began in late 1948 with shaft sinking completed in 1949 to 765 ft above mean sea level (m.s.l.) for a total depth of 330 ft. Prior to mine construction the shape of the water table generally reflected land-surface topography. The potentiometric surface of the Sinnipee aquifer for January 1947 is shown in Figure 4A (data from C.L.R. Holt, Jr. in an unpublished manuscript on Shullsburg Mine hydrology prepared in the early 1960s).

Groundwater quality data for the pre-mining period in the Shullsburg area are lacking. Construction reports prepared for private water-supply wells indicate that water quality in the Sinnipee aquifer was acceptable for domestic use. Hindall and Skinner (1973) characterize water quality from the Sinnipee aquifer in the region as "good" with the following averages for selected chemical constituents: total dissolved solids, 375 mg/l; sulfate, 40 mg/l; and total alkalinity as CaCO₃, 320 mg/l.

During Active Mine Development

Figure 4B shows the potentiometric surface of water in the unconfined Sinnipee aquifer as of June 1958, about nine years after Shullsburg Mine development and dewatering of the Sinnipee host rock had been initiated. (Water-level data after June 1958 and before mine closure are not available.) The maximum decline in water level within the Sinnipee between 1947 and 1958 is in excess of 280 ft (fig. 4C). According to Holt (undated), rates of groundwater pumping for mine dewatering ranged from 4 to 17 million gallons per day. Higher rates of water removal were necessary when mining activity involved development of a new area of mineralization. The increased rate of water inflow as mining reached a new ore body reflected the fractured nature

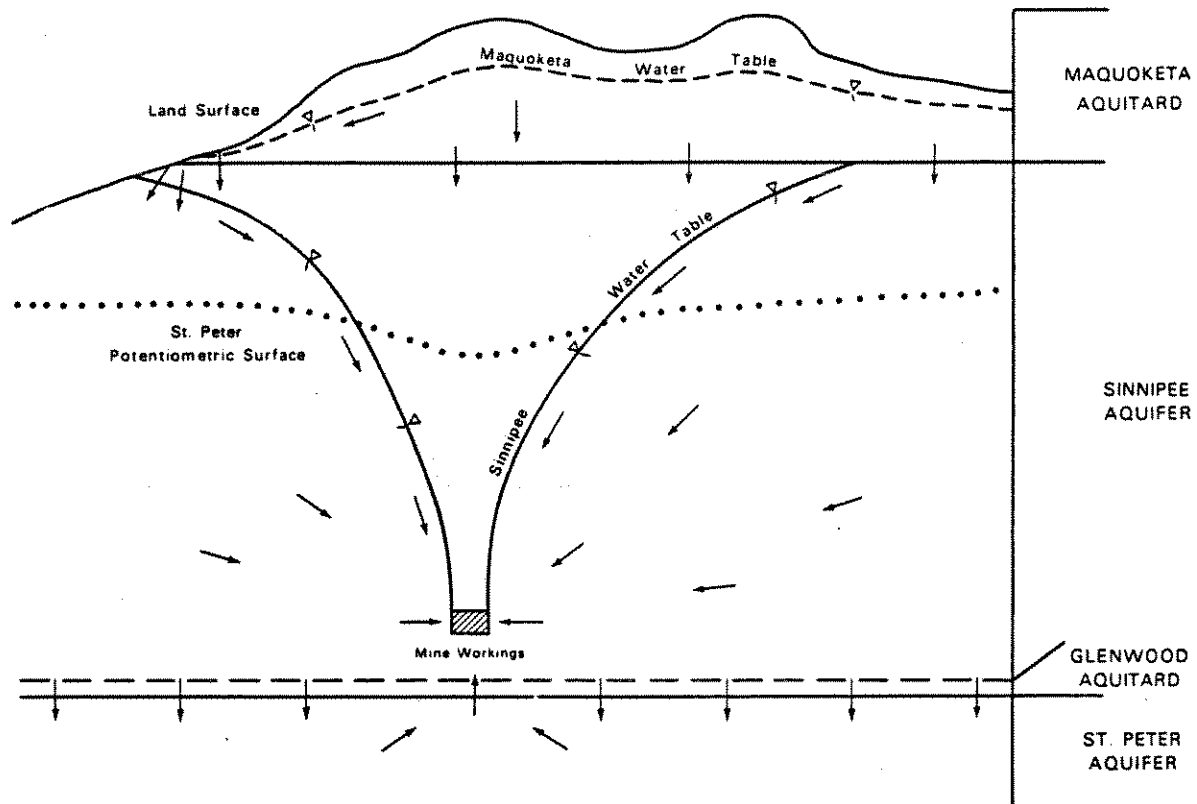


FIGURE 3.-- Schematic illustration of groundwater conditions during active mining in the Shullsburg Mine (modified from Holt, undated). Arrows show inferred directions of ground-water flow. Dashed line at top of Glenwood aquitard indicates the irregular occurrence of the Glenwood in this area.

of the Sinnipee host rock associated with zinc-lead mineralization. The areal extent of the cone of depression resulting from mine dewatering had reached over 12 mi² by 1958 (fig. 4C).

Investigations during active mine development in the late 1950s (Holt, undated) and within three years of mine closure (Eagle-Picher Industries, 1977) indicate that groundwater quality changed as a result of mine-related activity. Increases in total dissolved solids, zinc, sulfate, calcium, and magnesium are apparent (Table 2). Holt (undated) suggested that the change in water quality from groundwater collected in wells near the mine and from water collected as it entered the mine along fractures, solution channels, bedding planes, and open drill holes was the result of dissolution of oxidized sulfide (now, sulfate) mineral phases. These more-soluble sulfate mineral phases were dissolved by groundwater moving through the dewatered bedrock in the vicinity of mine workings. Alternatively, data in Table 2 could also be explained by assuming that the chemical quality of groundwater near mineralized zones differs from groundwater present some distance away from these zones even before

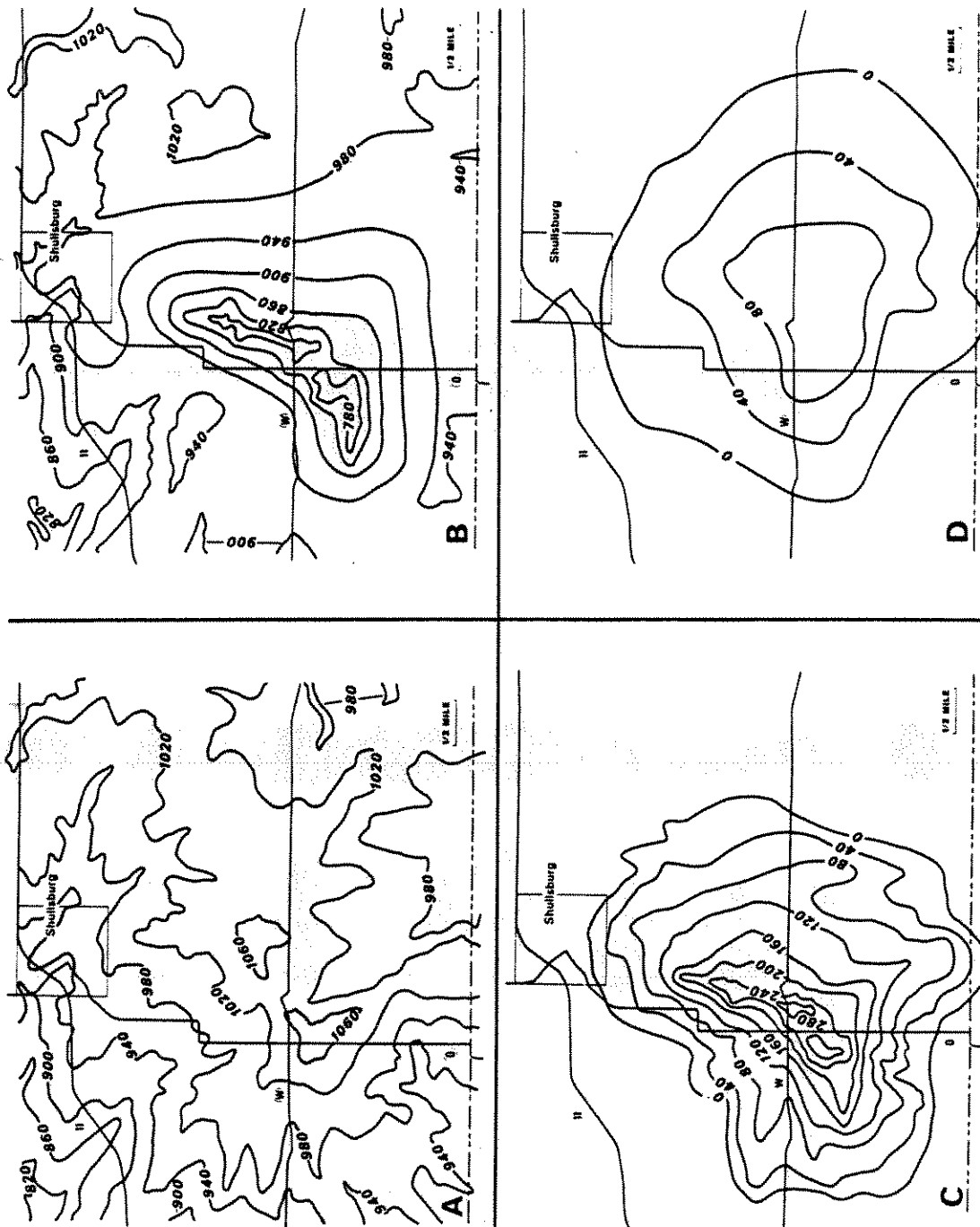


FIGURE 4.--- Groundwater levels in the Sinipee Group aquifer.
 A. Water levels in January 1947 (before-mining) from Holt (undated).
 B. Water levels in June 1958 (during mining) from Holt (undated).
 C. Water-level decline between 1947 and 1958 (Holt, undated).
 D. Remaining water-level decline in June - September 1983 about four years after mine closure (Toran, 1984).

mining began. However, the presence of soluble sulfate mineral phases within the zone of saturation in the Sinnipee Group has not been observed (Heyl and others, 1959). The first explanation as proposed by Holt (undated) is the more likely hypothesis to explain the observed water quality.

Following Mine Closure

Pumping to dewater the Shullsburg Mine ceased in late September 1979. Water-level recovery, as measured in the main vertical shaft, was initially rapid with the rate of recovery declining over time (fig. 5). At present, water level in the main shaft at 945 ft above m.s.l. is approximately 180 ft (55 m) above the active-mining water level. The original (pre-mining) water table elevation at the main shaft was 1050 ft m.s.l. (Holt, undated). Thus, the current water level in the shaft remains 100 ft below the pre-mining level.

Figure 4D shows the cone of depression decline remaining in mid-1983 in the Sinnipee Group near the Shullsburg Mine. The cone of depression developed during mine dewatering is still present four years after mine closure, though less pronounced than during active mining (Toran, 1984). The areal extent of groundwater decline is over 14 mi² indicating the maximum development of the cone of depression during active mining must have exceeded 14 mi². This larger areal development of water-level decline as compared to that measured in June 1958 (fig. 4B) is the result of continuing mine development after 1958.

Groundwater quality in the vicinity of the mine following shutdown in September 1979 was determined by sampling private water-supply wells and water within the main shaft. Table 3 shows average values of selected chemical constituents in water sampled during the course of the present investigation. Table 4 shows groundwater quality during and after mining for specific wells sampled in the 1950s and in the early 1980s. Data collected to date indicate that groundwater that has moved through rock strata dewatered during the active phase of mine development shows increased levels of sulfate, calcium, magnesium, zinc, and total dissolved solids. Increases in iron concentration within this same water is suggested as well.

CAUSE OF WATER QUALITY CHANGES

Water-quality changes resulting from mining activity include increases in the concentrations of sulfate, calcium, magnesium, zinc, iron, and total dissolved solids. The cause of these changes is postulated to be the oxidation of sulfide minerals present within the Sinnipee Group. Field observations within the Upper Mississippi Valley zinc-lead district indicate oxidized mineral phases are common in areas above the water table. Examples of oxidized minerals encountered include hydrous magnesium sulfate (epsomite), hydrous iron sulfates (copiapite and melanterite), hydrous calcium sulfate (gypsum), and iron oxides, such as hematite and limonite (Heyl and others, 1959).

The oxidation of pyrite and marcasite is postulated to be the principal cause of observed water-quality changes within groundwaters passing through formerly dewatered rock strata in the vicinity of the Shullsburg Mine. Under

Table 2.— Average values of selected chemical constituents in groundwater sampled during active mining. See Holt (undated) and Eagle-Picher Industries (1977) for sampling methodology, analytical laboratories, and analytical methods.

A. Private Water-Supply Wells Near Shullsburg Mine^a

Aquifer	Constituent						Dissolved Solids	pH
	Iron	Lead	Zinc	Calcium	Magnesium	Sulfate		
Sinnipee Gp.	0.6 (5) ^b	--	--	--	--	33 (5)	400 (5)	7.4 (5)
Sinnipee and Ancell Gps. (St. Peter)	0.5 (13)	0.003 (5)	0.4 (5)	74 (3)	42 (3)	75 (13)	370 (5)	7.3 (13)
Ancell Gp. (St. Peter)	1.5 (7)	0.05 (7)	0.3 (7)	61 (4)	35 (4)	8 (7)	280 (7)	7.5 (7)

B. Groundwater Collected Within Shullsburg Mine

Source	Constituent						Dissolved Solids	pH
	Iron	Lead	Zinc	Calcium	Magnesium	Sulfate		
Mine ^a Workings	0.1 (12)	0.02 (10)	0.4 (10)	110 (10)	61 (10)	200 (13)	650 (13)	7.6 (13)
Shullsburg ^c Pump (24) (24)	--	0.01 (24)	1.1 (24)	390 ^d (24)		480	740 (24)	6.8
Blackstone ^c Pump	--	0.01 (24)	2.2 (24)	340 ^d (24)		230	740 (24)	6.8

a Data modified from Holt (undated). Samples collected and analyzed in late 1950s. Values rounded to reflect probable analytical precision. All values shown are in parts per million, except for pH.

b Numbers in parentheses are number of analyses included in the average value.

c Data from twice-monthly sampling in 1976 in support of Shullsburg Mine permit application (Eagle-Picher Industries, 1977). Samples collected at groundwater discharge points. All values shown are in milligrams per liter, except for pH.

d Values shown are for alkalinity as CaCO₃ in mg/l.

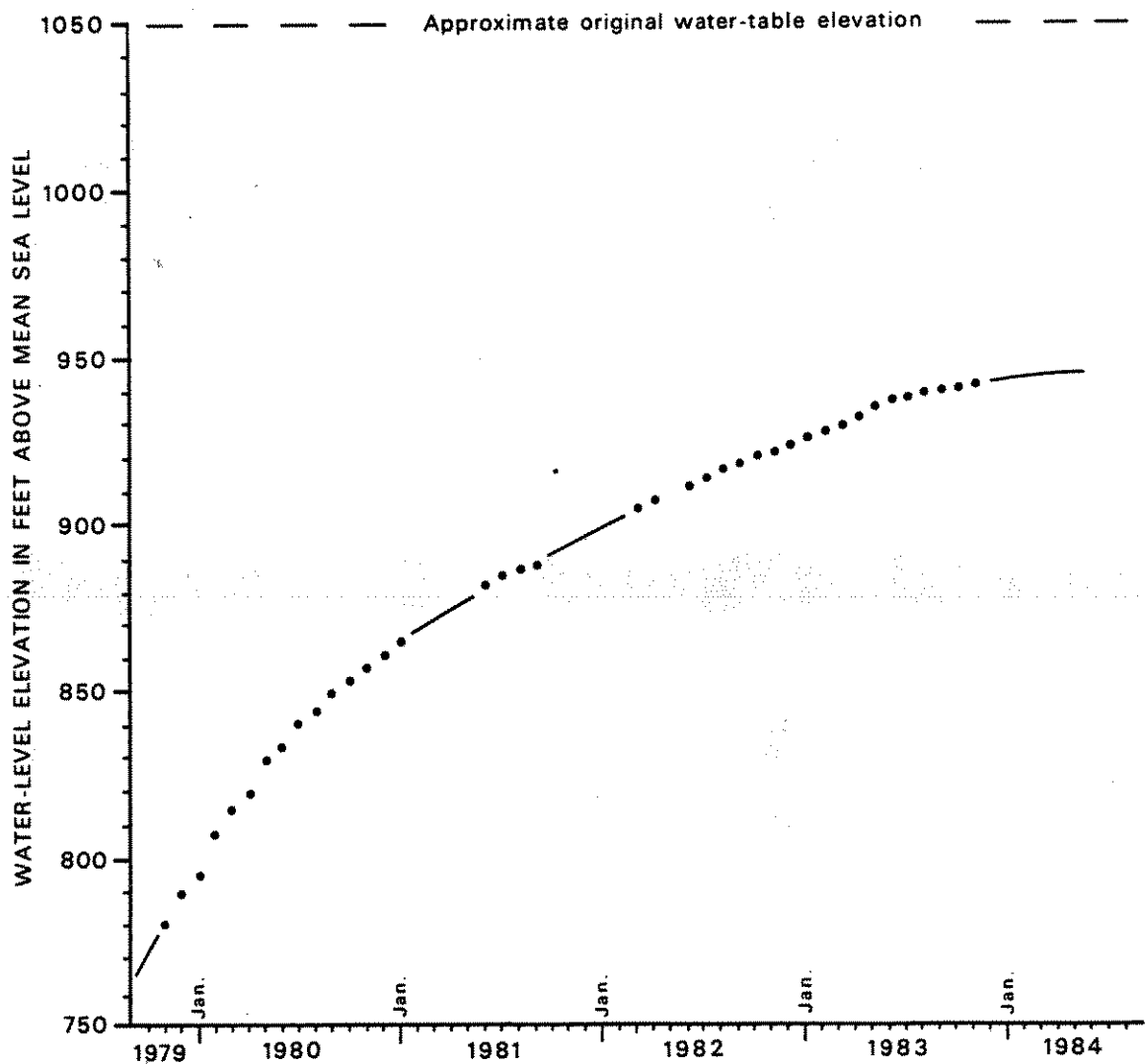


FIGURE 5.-- Water-level recovery in main shaft at Shullsburg Mine (data courtesy of Eagle-Picher Industries, Inc. and Inspiration Mines, Inc). Original (pre-mining) water level is about 1050 feet above mean sea level (Holt, undated). Dots indicate actual values; line indicates inferred values.

TABLE 3. Arithmetic averages of selected constituents in wells near Shullsburg Mine sampled after mine closure. See Evans and others (1983) for discussion of sampling methodology, analytical laboratory, and analytical methods.

Aquifer	Constituent							Dissolved Solids	Alkalinity (HCO ₃ ⁻)
	Iron	Manganese	Lead	Zinc	Calcium	Magnesium	Sulfate		
Sinnipee Gp.	0.16 ^a (19) ^b	0.05 (19)	0.012 (19)	0.42 (19)	115 (19)	63 (19)	230 (20)	800 (19)	388 (18)
Sinnipee and Ansell Gps. (St. Peter)	3.2 (7)	0.05 (8)	0.044 (7)	0.54 (7)	106 (8)	61 (8)	210 (7)	730 (7)	386 (10)
Ansell Gp. (St. Peter)	0.60 (35)	0.05 (36)	0.003 (31)	0.45 (36)	68 (37)	40 (37)	57 (30)	490 (33)	357 (28)
Complaint-Investigation ^c [Open to both Sinnipee and St. Peter Aquifer]	4.3 (31)	0.89 (29)	0.033 (34)	6.05 (31)	357 (31)	330 (30)	1,860 (28)	3,370 (29)	445 (24)

a All values shown are milligrams per liter.

b Numbers in parentheses indicate number of analyses included in average.

c Complaint-investigation wells are wells sampled as a result of a complaint concerning water quality.

aerobic conditions as would develop with dewatering, the iron sulfide is oxidized releasing hydrogen ions and sulfate, probably in the form of hydrous iron sulfates. The hydrogen ion would be available to attack associated sulfide minerals, such as sphalerite.

Therefore, groundwater that is in contact with oxidized, iron-sulfide-rich intervals, which include other sulfide minerals that are less-readily oxidized, should show an increase in the concentration of iron, sulfate, certain metal cations, total dissolved solids, and hydrogen ion. Increases in hydrogen ion concentration (lower pH) within groundwater sampled near the Shullsburg Mine have not been observed reflecting the buffering effect of the carbonate host rocks of the Sinnipee Group. Increases in the concentrations of calcium and magnesium indicate dissolution of dolomite. A more detailed investigation of the geochemical relationships responsible for the changes in water quality is currently in progress (Toran, 1984).

ROLE OF WELL CONSTRUCTION

Domestic water-supply wells in the Shullsburg area are typically constructed to depths of 100 to 200 ft into the Sinnipee Group and are cased to depths of 40 to 50 ft. In the vicinity of Shullsburg Mine the lowering of

Table 4. Arithmetic averages of selected constituents in groundwater sampled during active mining and after mine closure. See Holt (undated) and Evans and others (1983) for sampling methodology, analytical laboratory, and analytical methods.

Well Number	No. of Samples	Constituent						Dissolved Solids	Alkalinity (HCO ₃ ⁻)	
		Iron	Lead	Zinc	Calcium	Magnesium	Sulfate			
Lf-15	During	2	0.6 ^a	5	0.5	60	24	6.7	290	344
	Post	2	4.4	27	12	257	120	800	1540	383
Lf-42	During	2	0.5	10	0.07	89	54	107	484	403
	Post	3	0.6	4	6.9	355	369	2050	3650	414
Lf-50	During	2	0.7	< 3	1.5	66	35	74	312	380
	Post	3	3.7	61	8.5	448	395	2830	4080	524
Lf-84	During	1	1.3	<10	0.04	61	34	13	290	346
	Post	1	<.1	< 3	18	320	160	1260	2450	—
Lf-221	During	1	0.8	—	—	—	—	14	—	349
	Post	3	5.2	5	2.9	419	840	3450	6820	480
Lf-225	During	3	0.2	—	—	—	—	30	—	371
	Post	4	0.1	2	1.5	475	438	2970	4290	430

a All values shown are in milligrams per liter except for lead which is shown as micrograms per liter.

area groundwater levels due to dewatering required the deepening of several private wells, which was a common practice of the mining companies active at the Shullsburg Mine complex. Additional casing was generally not added. Because the amount of water-level decline was significant, deepened wells were completed into the underlying St. Peter aquifer. Due to the confined nature of the St. Peter aquifer, water levels within these deepened wells were generally 100 ft above the top of the St. Peter sandstone.

As long as the mine was operating and pumps maintained the lowered water level within the Sinnipee Group, the deepened wells, which were open to both the St. Peter and Sinnipee aquifers, produced water of acceptable quality. Upon cessation of mining and the ensuing recovery of water levels within the Sinnipee, contaminated groundwater (water containing increased levels of sulfate, calcium, magnesium, certain metal cations, and total dissolved solids)

entered the open boreholes of wells. As water-level recovery continued and increasingly larger volumes of contaminated water became available, the quality of water pumped from the wells declined and complaints of poor water quality were made. The initial concern regarding declining water quality came to the attention of local officials about ten months following mine closure. To date, 14 wells have been affected by the sulfate-contaminated groundwater.

In a few cases wells had been constructed by the mining company for land-owners near the operating mine that were cased into the St. Peter aquifer. All these wells have continued to produce water of acceptable quality. Thus, the importance of well construction to the mitigation of inferior water quality in the vicinity of the Shullsburg mine is clear (fig. 6). Since hauling water from some distant source was prohibitively expensive and construction of shallow wells was impractical due to slow water-level recovery, the only recourse to mitigate the water-supply problem was a new well drilled into the underlying St. Peter aquifer. New wells, cased and pressure-grouted into the St. Peter sandstone, have been completed for ten households, and at least one more well is scheduled for completion in the near future (Summer 1985). In all cases where the wells have been constructed properly (with one exception, see following paragraph), the wells have produced water of excellent quality.

A review of the head relationships between groundwater in the St. Peter aquifer and in the Sinnipee aquifer indicates that recovery of water levels within the Sinnipee to an elevation higher than the potentiometric surface of the St. Peter will result in a head reversal. The downward gradient resulting from the reversal of head across the Glenwood aquitard overlying the St. Peter aquifer poses a continuing threat to new wells constructed to alleviate existing water-supply problems. New wells cased and pressure-grouted into the St. Peter aquifer may produce water of inferior quality if some path allowing water movement between the Sinnipee and the St. Peter aquifers exists (Glenwood Formation absent or fracture opening between the two formations). To date, one new well constructed in accordance with official state guidelines to mitigate the Shullsburg water problem has been adversely affected by this head-reversal phenomenon.

Eventually, the Sinnipee water levels should recover sufficiently to allow movement of contaminated water away from zones having soluble sulfate minerals. With dilution and dispersion the impact of declining water quality in the Shullsburg area is expected to eventually dissipate. However, estimates of rates of water-level recovery and rates of infiltration of uncontaminated water into the Sinnipee aquifer in this area have not been made.

SUMMARY AND CONCLUSIONS

The dewatering between 1948 and 1979 necessary to develop the numerous zinc-lead ore bodies within the Sinnipee Group south of Shullsburg resulted in the formation of soluble oxidized mineral phases, principally hydrous sulfate minerals. Upon mine closure and cessation of pumping the formerly dewatered area in the vicinity of the Shullsburg Mine workings became newly saturated. Groundwater entering the formerly dewatered rock strata dissolved the oxidized mineral phases and promoted further dissolution of associated sulfide minerals. The quality of water in private water-supply wells open to either the

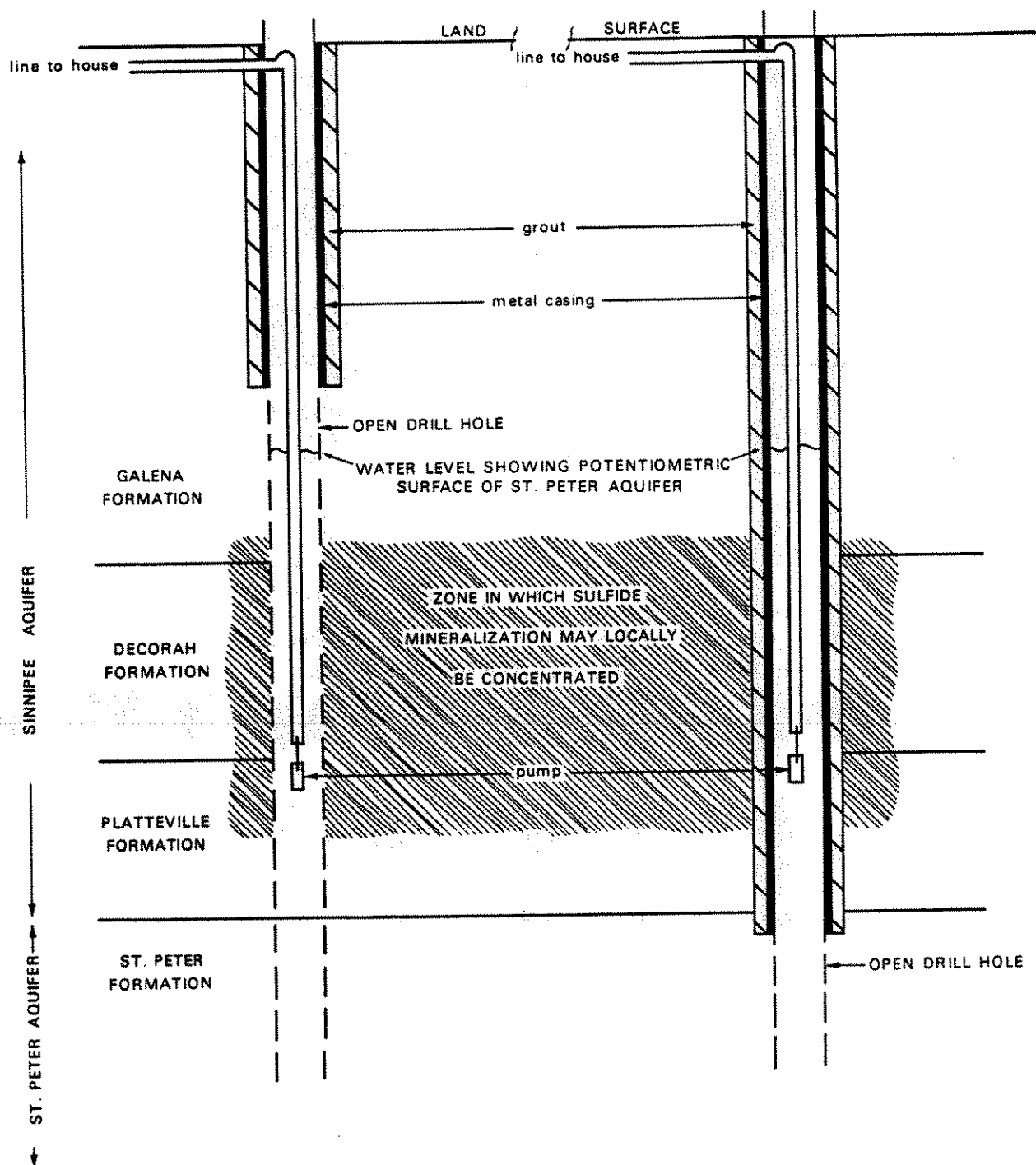


FIGURE 6.-- Schematic illustration of the role of well construction in determining if groundwater that has been in contact with oxidized sulfide minerals (sulfates) will enter the well. Well on the left is open to water contaminated with sulfate; the well on the right is not. Movement of sulfate-laden groundwater down into the St. Peter Formation following a head reversal may permit contaminated water to affect newly constructed wells (right).

Sinnipee aquifer alone or to both the Sinnipee and St. Peter aquifers is characterized by increased concentrations of sulfate, iron, calcium, magnesium, zinc, and total dissolved solids as compared to water from these same aquifers in locations at some distance (more than one mile) away from the mine.

Sulfate levels in affected wells ranged from 700 mg/l to 3500 mg/l causing physical discomfort among humans using the water and serious economic losses for dairy operations having cattle affected by the water. Complaints to the WDNR and the WGNHS by affected individuals resulted in a program of investigation, recommendations for new well construction, and help in obtaining financial assistance for new well construction.

The eventual disposition of the Shullsburg water problem is not known at this time. Dilution and dispersion of contaminated groundwater in the Sinnipee Group is expected. However, no estimate is yet possible of when this severe impact of mining on groundwater near Shullsburg will actually disappear.

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