

INTRODUCTION

Acknowledgments

We of Carson Engineers are grateful to the many federal, state, and local government agencies for their cooperation during the term of this project. Special acknowledgment is extended to the staff of the Pennsylvania Department of Environmental Resources for providing valuable time, information, and suggestions pertinent to the conduct of this study. We would also like to extend our thanks to the local watershed associations and to the sportsmen groups in the area for their interest and the help they have given us, and to the many individuals who through their efforts, have contributed much to aid in the completion of this study.

Purpose

This report, prepared for the Department of Environmental Resources, referred to as D.E.R., presents results of extensive investigation, during the period from September, 1971 thru July, 1973, of pollution sources and conditions in the southern portion of the Stony Creek Watershed, located in Somerset County, from its headwaters near Berlin to a point just north of the town of Hooversville.

Much of the Stony Creek Watershed is underlaid by coal deposits which constitute an important economic mineral resource for this area. Extensive commercial mining of coal began in the late 1800's with little or no concern for the protection of the land surface and water supplies. These natural resources are necessary for a livable and pleasant environment. Acid mine drainage (AMD) from numerous mines has contaminated and polluted many miles of streams in the Watershed. Acidity, iron, sulfates, and hardness contained in this mine drainage have destroyed aquatic life and rendered portions of the streams unfit for domestic, industrial or recreational use.

Geologic and hydrologic factors in the 139 square mile study area of the Stony Creek Watershed have been analyzed to understand their effect on the production of the acid mine drainage. This work was necessary to determine the sufficiency of the remedial measures to be employed for the prevention and abatement of acid mine drainage, i.e., deep mine sealing, regrading, and backfilling, water diversion, and replanting of vegetation.

Sources of acid mine drainage, deep mines and strip mines, have been located, identified, and mapped to deter their individual effect on stream quality of the tributaries and Stony Creek itself. Since January, 1972, 498 sampling and gauging stations have been established for this purpose.

As a result of this Watershed Study, specific plans for abating mine drainage pollution from certain of these sources are developed and recommended.

Purpose (contd.)

As this proposed remedial work is accomplished, the water quality of the southern portion of the Stony Creek Watershed will show a marked improvement.

Orientation

The State of Pennsylvania, responding to increasing demand for a range of projects, aimed at the control and prevention of pollution in all its worst forms. This effort has involved the Department of Environmental Resources in a concentrated drive to eradicate the blight of acid mine drainage pollution from the Pennsylvania scene.

As in many other regions, acid mine drainage has caused the deterioration of the Stony Creek, tributary to the Conemaugh River located south of that river in the counties of Cambria and Somerset. The Study Area, however, includes only that portion of the Stony Creek Watershed located in the central, eastern section of Somerset County from the headwaters near Berlin downstream to Hooversville. A large number of abandoned deep mines and strip mines are to be found in the Watershed, predominantly in the areas of the coal outcropping.

In September of 1971, the Department contracted with Carson Engineers to execute a total watershed study of the southern portion of the Stony Creek drainage basin, Somerset County, Pennsylvania, beginning in the area of Hooversville, and extending southward to the headwaters near Berlin. This watershed study is to be coupled with three (3) "Site Evaluation" recommendations.

Specifically, our contract objectives call for us to:

- 1) Secure existing available information on the watershed.
- 2) Determine locations of mine openings, deep mines, strip mines, refuse areas, coal contours, and coal outcrops.
- 3) Select and establish water sampling stations.
- 4) Evaluate types of corrective measures.
- 5) Evaluate and prepare cost estimates for plans.
- 6) Prepare recommendations for necessary abatement projects.
- 7) Conduct extensive site evaluation for three deep mine complexes.

During our investigation of this Watershed, we researched the state records concerning the number of mines, both strip

Orientation (contd.)

and deep, that were located within the boundaries of the study area. These state records indicated there were two hundred fourteen (214) strip mines and one hundred ninety-nine (199) deep mines.

Definition of Terms

Acidity	The quantitative capacity of aqueous solution to react with hydroxyl ions. It is measured by titration with a standard solution of a base to a specified end point. Usually expressed as milligrams per liter of calcium carbonate.
Air Seals	Barriers which exclude air from entering a deep mine but permitting normal flow of water at the place (point) of discharge.
Air Shaft (AS)	A vertical or inclined opening into a deep mine by which air can be forced to circulate.
Alkalinity	The capacity of water to neutralize acids, a property imparted by the water's content of carbonates, bicarbonates, hydroxides, and occasionally borates, silicates, and phosphates; expressed in milligrams per liter of equivalent calcium carbonate.
AMD	Acid Mine Drainage
Anticline	An upfold or arch of stratified rock in which the beds or layers dip in opposite directions from the crest.
Bore Hole (BH)	A vertical or inclined hole drilled into a deep mine to permit ventilation for the mine, water to be pumped from the mine or electrical wires to enter the mine.
CaCO ₃	See acidity or hardness.
Coal Contour	A line of equal coal elevation above a specified datum, usually mean sea level.
Coal Pillars	Natural coal columns used in deep mines for roof support.
Confluent	Flowing together to form one stream.
Contour Lines	Lines that connect points of equal elevation above a specified datum, usually mean sea level.
Core Drilling	See Test Hole.
CFS	Cubic Feet Per Second.

Definition of Terms (contd.)

Curtain Grouting	See Grouting.
D.B.	Deed Book.
Deep Mine	An underground excavation of economic minerals.
Demography	The study of human vital statistics and population dynamics.
D.E.R.	Department of Environmental Resources.
Dip, Up or Down	The angle at which a bed, stratum, or mineral vein is inclined from the horizontals.
Dry Seals	Barriers which close deep mine drift openings, slope, or shaft openings, and subsidence areas where there will be very little or no hydrostatic pressure in the area.
Easement	A right of one person to use the land of another for some special purpose.
Ecosystem	Energy-driven complex of a community of organisms and its controlling environment.
Egress	A place of outlet.
Flow Meter or Current Meter	A mechanical device for determining the velocity of moving water or other liquids.
GPM	Gallon Per Minute.
Gob	A pile of loose waste in a mine, or backfill waste packed in stopes to support the roof .
Gob Pile	A pile or geap of mine refuse on the surface.
Grouting	To seal off or to fill in with concrete and/or other sealant.
Hardness (CaCO ₃)	A characteristic of water imparted by salts of calcium magnesium and iron such as bicarbonates, carbonates, sulfates, chlorides and nitrates.

Definition of Terms (contd.)

Head	Energy contained by fluid because of its pressure, velocity, and elevation, usually expressed in feet of water.
Headwater	The region where groundwaters emerge to form a surface stream.
Hydraulic Seals or Wet Seals	Barriers which close deep mine entries, drifts, slopes, shafts, and adjacent strata where there is hydrostatic pressure in the area of the seal.
Highwall	The vertical working face of a strip or surface mine.
Hydrologic Cycle	The continuous water-transfer cycle between earth and atmosphere consisting chiefly of evapo-transpiration, precipitation, and runoff.
Hydrostatic Pressure	(1) The force, expressed as a total quantity or per unit of area, exerted by a body of water at rest. (2) In the case of groundwater, the force per unit area generally due to the weight of water at higher levels in the same saturation zone.
Influent	Water, wastewater, or other liquid flowing into a reservoir, basin, or treatment plant, or any unit thereof.
L.F.	Lower Freeport Coal Seam. Referred to as "D" vein.
L.K.	Lower Kittanning Coal Seam. Referred to as "B" vein.
M4R59A	An example of the designation used for a deep mine opening other than a bore hole or air shaft. M (Deep Mine); 4R (Sub-watershed Designation); 59 (Mine No.); A (Mine opening designation).
Monitor	The procedure or operation of scheduled observation.
M.K.	Middle Kittanning Coal Seam. Referred to as "C" vein.
Outcrop	That part of a stratum which appears at the surface of the ground.

Definition of Terms (contd.)

Overburden	Consolidated and unconsolidated material that overlies a coal bed or other mineral deposits.
p.	Page.
Parameter	A standardized value or a guideline by which other similar quantities can be rated or evaluated.
pH	The negative common logarithm of the hydrogen-ion concentration; $\text{pH} = -\text{Log}(\text{H}^+)$.
Physiography	A description of nature or natural phenomena in general. Physical Geography.
Point of Discharge	The single geographical location at which all drainage from a given area comes together as outflow.
PIN	Pollution Index Number.
Portal Shaft (PS)	A vertical or inclined opening into a deep mine.
ppd	Pounds Per Day.
ppm	Parts Per Million.
Precipitation	Rain, snow, hail, dew, and frost.
Pyrite	A common mineral of a pale brass-yellow color and metallic luster, chemically iron metallic-looking sulfides (FeS_2). Generally associated with coal bearing strata.
Rock Roll	A large solid rock intrusion.
Seam	Synonymous with bed, vein, strata, etc.
Shaft	A vertical or inclined excavation into a mine extending downward from the surface.
Spoil	The overburden or nonore material removed in gaining access to the ore or mineral material in surface mining.
Stratigraphic Column	Graphic Representation of strata as it is found by geologic investigations.

Definition of Terms (contd.)

SC1	An example of the designation used for a monitoring station on Stony Creek. SC (Stony Creek); 1 (Monitoring Station Number).
SC3L2	An example of the designation used for the sampling stations on the tributaries feeding Stony Creek. SC (Stony Creek); 3L (Sub-watershed Designation); 2 (Tributary and Sampling Station Number).
Strip Mines	Surface excavations which extract minerals or other resources from the earth by first removing overlying soil and rock materials.
S1L2	An example of the designation used for a strip mine. S (Strip Mine); 1L (Subwatershed Designation); 2 (Mine Number).
Subsidence	A downward movement of natural ground surface not induced by external loads.
Subsurface	Soil just below land surface.
Sulfate	A salt or ester of sulfuric acid (SO ₄).
Syncline	A downfold of stratified rock in which the beds or strata are dipping towards a common line.
Test Hole or Core Drilling	A well hole drilled for experimental or exploratory purposes.
Total Iron (ppm as Fe)	A total measure of both ferrous and ferric iron.
Tributary	Branch of a stream that contributes flow to the primary or main channel.
U.F.	Upper Freeport Coal Seam. Referred to as "E" vein.
U.K.	Upper Kittanning Coal Seam. Referred to as "C Prime" vein.
Water Sampling Stations	An established location where water samples and flow measurements are obtained.
Water Table	The upper boundary of a free groundwater body, at atmospheric pressure.
Watershed	All land drained by a stream or river, and its tributaries.

Master Drawing Lists

Title	Drawing Number
General Location Map	7119- 1
Geological Plan, Coal Contours and Outcropping	7119- 2
Geological Cross Sections	7119- 3
Topographic Plan and Drill Hole Locations	7119- 4
Selected Stratigraphic Columns.....	7119- 5
Water Sampling Stations - Stony Creek and Tributaries	7119- 6
Water Sampling Stations - Deep Mines.....	7119- 7
Water Sampling Stations - Strip Mines	7119- 8
Deep Mine Location	7119- 9
Strip Mine Location	7119-10

The above drawings are found in the back of this text.

General Location Map	Page 19
Generalized Stratigraphic Section	Page 27

AVAILABLE MINE MAPS

The following deep mine maps were collected during the course of this study. It was later found that a number of these mine were not within the study area. We have, nevertheless, listed these maps together with those that are pertinent to this report. The following maps can be found in the offices of Carson Engineers, Greensburg, Pennsylvania.

Mine Maps Where Location Is Known

<u>Sub-watershed</u>	<u>Operator</u>	<u>Mine Name</u>	<u>Permit No.</u>
4R	Adams Mine	-	-
4R	Adams Mine	No. 2 & No. 3	-
6L	Alumbaugh Coal Co.	Mine No. 1	-
1L	A.M. & K. Corp.	-	-
3R	Atlantic Coal & Coke Co.	Vulcan Slope No. 1	9524
4R	Aust, William	Aust Mine	468M010
4L	Bahorik Coal Co.	No. 1	-
1L & 2L	Baker Whitely Coal Co.	Elma No. 1 & No. 2	-
1L	Baker Whitely Coal Co.	Elma No. 3	-
5L	Berkebile Bros. Coal Co.	-	-
4R	Boswell Branch	Mine No. 1 & No. 2	-
9R	Burk, Charles H. Jr.	No. 1	18530

AVAILABLE MINE MAPS (contd.)

<u>Sub-watershed</u>	<u>Operator</u>	<u>Mine Name</u>	<u>Permit No.</u>
4R	Butterbaugh & Adams Mine	-	-
7R	Cambria Fuel Co.	No. 6	9053
7R	Cambria Fuel Co.	No. 15	16439
7R	Cambria Fuel Co.	Nos. 3,4,7,8, 9,10,14,14A & 18	-
4R	City Coal Co.	-	461M62
7R	D & J Svonavec Co. Inc.	Mine No. 27	468M002
6L	Delta Mining Company	-	-
7R	Donald Svonavec Coal Co.	Nos. 3,4,6,7,8, 9,10,14,17,18, 19,20 & 22	-
4R	Eldora Land Co.	-	-
9R	Everett & Snyder	No. 18	467M082
1R	Federal Coal Co.	-	-
4R	Flick Coal Co.	No. 4	10516
3R	Flick Coal Co.	No. 5	13482
4R	Gilmour & Jones	-	-
10L	G. M. & W. Coal Co.	-	-
1L	Hritz, George	Hritz Mine	16260
4R	Johnstown & Somerset Coal Co.	No. 1 & No. 2	-
1L & 2L	Knickerbocker Smokeless Coal Co.	Nos. 1,2,3 & 4	-
4R	Listie Mines	No. 1 & No. 4	-

AVAILABLE MINE MAPS (contd.)

<u>Sub-watershed</u>	<u>Operator</u>	<u>Mine Name</u>	<u>Permit No.</u>
4R	Listie Coal Corp.	Louis Mines No. 1 & No. 2, Bingler Mine Junior Mine	- - -
7R	Luce & Kowaleski Co. Luce & Kowaleski Co.	No. 22 Nos. 1,3,4,6,7, 8,9,10,12,15,17, 18 & 16	466M096 -
4R	Meyersdale Coal Co.	Wells Creek Mine	-
5L	Paul, Vernon R.	-	-
10L	P.B.S. Coal Inc.	Shade No. 1	467M058
6L	Quenahoning Valley Coal Co.	-	-
4R	Reading Iron Co.	No. 3 & No. 5	-
3R	Reading Iron Co.	No. 4	-
15L	Ream, John O.	Ream Mines	-
9R	Rice & Schrock Coal Co.	No. 5	13166
9R	Rice & Schrock	No. 3 & No. 6	-
3R	Royal Quemahoning Coal Co.	Hite No. 1 & No. 2	-
3R	Royal Quemahoning Coal Co.	-	-
6L	Sanner Coal Co.	Sanner No. 1	-
14L	Scurfield Coal Co.	Penmar No. 3	-

AVAILABLE MINE MAPS (contd.)

<u>Sub-watershed</u>	<u>Operator</u>	<u>Mine Name</u>	<u>Permit No.</u>
13L	Shiplely Mine	No. 1	-
2L & 4L	Solar Fuel Co.	No. 3	466M093
1L & 2L	Solar Fuel Co.	No. 4	465M10
4R	Somerset & Cambria Smokeless Coal Co.	-	-
4R	Somerset Coal Co.	Listie Mine	-
4R	Stauffer Quemahoning Coal Co.	No. 1 & No. 2	-
6L	Swank Coal Co.	No. 1 & No. 2	-
4L	Toth Coal Co., John	No. 2	
4R	Trent Coal Co.	-	15767
			466M070

The following is a list of available mine maps, the location of which is unknown or beyond the limits of the study area.

<u>Operator</u>	<u>Mine Name</u>
Anson Powell Mine	-
W. C. Armagost Mine	-
Atlantic Coal & Coke Co.	Atlantic Mine
Barron, Ira	-
B & B Coal Co.	-
Berkebile Freeman	-
Berwind White Coal Co.	-
Cable Coal Co.	Boswell Mine

AVAILABLE MINE MAPS (contd.)

<u>Operator</u>	<u>Mine Name</u>
Cambria Fuel Co.	No. 1 & No. 2
Coleman & Gindelsburger	-
Consolidation Coal Co.	Nos. 109, 112, 113, 114, 118, 119, 120, 121, 123, 124, 126, & 127
Custer Coal Co.	-
Deerfield Coal Co.	-
Eureka Mines	No. 30 & No. 39
Gilmour & Jones Coal Co.	-
Glitsky Coal Co.	No. 1 Mine
Henry Beam Coal Co.	Beachley Mine
Higgins Run Coal Co.	-
Huskin Mine	Mine No. 4
Hyasota Mine	No. 1
Imperial Coal Corp.	Shade Creek Mine
Jerome Mines	-
Loyalhanna Coal & Coke Co.	No. 7
Maple Ridge Mines	
Pittsburgh Coal Co.	
Purity Coal Co.	Mine No. 1
Randolph Coal Co.	-
Rice & Schrock Coal Co.	-
Romesburg Coal Co.	Buffalo Mine

AVAILABLE MINE MAPS (contd.)

Operator

Mine Name

Scurfield Coal Co.

-

Shade Coal Mining Co.

A & B Mine

Somerset Coal Co.

Wilson Creek Mine

Standard Quemahoning Coal Co.

Mine No. 1

Statler Mine

No. 1

Thomas, Samuel N.

No. 2

Turcheck, Joseph

-

Victor Coal Mining Co.

Lenmore No. 3