

I. INTRODUCTION

The Department of Mines and Mineral Industries engaged L. Robert Kimball Consulting Engineers on October 10, 1968, to conduct an extensive investigation of coal mine drainage pollution within the Two Lick Creek Watershed in Indiana County for the purpose of recommending engineering measures necessary to effectively abate the pollution and correspondingly improve the quality of water within the system to an acceptable level.

This report contains the results of the investigation and includes engineering recommendations with related cost beneficiation and pertinent descriptions of the basin's geography, geology, weather conditions, mining history and methods, municipal sewage treatment facilities and general stream conditions in relation to acid mine drainage.

Also described are the methods employed in the overall investigation, methods used in chemical analysis of water samples, water quality criteria, the chemistry of mine drainage formation and methods generally used in mine drainage abatement.

The main body of the report deals at length in describing the major watersheds of the Two Lick Creek Basin. Sources of mine drainage are defined and analyzed to determine their effect on the individual tributaries and on the entire drainage system.

Recommendations are set forth for abating mine drainage based on cost beneficiation with the ultimate objective of raising stream quality to a desired level.

A list is included that sets priorities for the recommended abatement work.

Maps and charts at a reduced scale are contained in the various applicable sections of the report.

Accompanying this report are maps which show the specific location of pertinent coal mining, geological and physical features.

The investigation was directed by Charles Allender, C. P. G., Head of the Earth Sciences Department. Project Engineer in charge was Darrell E. Wilson, P. F.

II. METHOD OF INVESTIGATION

The investigation was conducted by stages or phases beginning with Phase I continuing through Phases II and III and completed in Phase IV.

During Phase I, various public agencies and private coal companies were contacted that had been, or were presently involved with mining operations within the watershed. All known sources of mine drainage were cataloged and mapped.

Phase II began by determining, through field reconnaissance, the most desirable locations for establishing sampling stations to best evaluate the various sources of pollution and the effect of each source on the total pollution of each tributary.

Approximately two hundred and fifty (250) weirs and gaging stations were installed to effectively accomplish the above. Samples were then collected from each station and tested on a weekly basis for a period of one (1) year. Each sample was analyzed to determine the pH, alkalinity, acidity, iron, and sulfate content of the water.

A weather station was established to measure, on a daily basis, the temperature and precipitation fluctuations in the watershed area.

Geological data was collected from diamond drill records and by locating coal and rock outcrops to verify existing coal contours.

Further field reconnaissance was conducted to pinpoint road beds constructed of refuse material and any other additional sources of pollution not identified by existing maps.

During Phase III, topographic maps (scale 1" = 1,000') were made from aerial photographs and existing U. S. G. S. base maps.

The new maps include the following pertinent information: (1) Mine openings (including the extent of underground workings and subsidence areas); (2) Strip mine areas; (3) Coal refuse areas; (4) Roadbeds constructed of refuse material; (5) Coal contours; (6) Coal outcrops; (7) Flow measurements and sampling stations; and (8) Diamond drill holes.

At this stage, several Quick Start projects were recommended to the Department of Mines and Mineral Industries. These projects deal with mine drainage pollution abatement work that could be readily implemented and would result in the desired amount of beneficiation. The projects let to this company in November 1969 under contract SL-109-1 are now underway on two major tributaries and include: (1) Placing watertight seals on several drift mines; (2) Covering and revegetating a large coal refuse pile; and (3) Moving and burying a small coal refuse pile in an abandoned strip pit and covering and grading the stripped area.

All data on water quality was coded for computer analysis under the Storet System for the Federal Water Pollution Control Administration.

During Phase IV, a review of all data and an analysis of corrective measures for each source of pollution was conducted. The types of corrective measures that were considered include the following: (1) Mine sealing; (2) Backfilling; (3) Revegetation; (4) Grouting; (5) Surface water diversion; (6) Stream channel improvements; (7) Burial of coal refuse; and (8) Chemical treatment.

For each method analyzed, the expected degree (range) of abatement was determined and the estimated cost of implementation, as well as the annual operation and maintenance costs, were calculated. The results of these evaluations are presented as alternates and in such a manner as to indicate the estimated costs of achieving various degrees of abatement. These evaluations are made on the basis of the various small individual watersheds within the entire drainage area of Two Lick Creek. The results are presented on the same basis and the projects listed on a priority basis in this report.

Phase IV was concluded with the actual completion of writing and publishing this report which presents our findings together with conclusions, recommendations and cost estimates of proposed alternative corrective measures.