SL-145-1

METHODS OF INVESTIGATION

The Babb Creek Watershed Mine Drainage Project was conducted in three (3) phases:

Phase I - Watershed Reconnaissance Survey

Phase II - Watershed Investigation

Phase III- Office Computation and Engineering

Phase I - Watershed Reconnaissance Survey

Data Collection: All pertinent U.S.G.S. topographic maps, aerial photographs and several mine maps were collected and reviewed. The watershed boundary was outlined, and the study area divided into subwatersheds for separate investigation.

Field Reconnaissance: Water samples from Babb Creek, its tributaries and from various suspected sources of mine drainage were collected throughout the watershed. During the months of February, March and April, 1975, two separate samples were collected from 140 locations. Later, 50 of these sample sites were chosen for continued monitoring and 2 other sites added before the 12-month watershed investigation began. The location of all of these sites is illustrated on the Watershed Map - Plate I. Water samples were analyzed for pH, acidity, alkalinity, total iron, ferrous iron and sulfate by Buchart and Horn Laboratories, York, Pennsylvania. See Appendix A, pages 93-99, for the location description of the sample sites and Appendix B, pages 100-107, for the results of the reconnaissance water sample analysis.

Field Reconnaissance included a thorough field examination of deep mine and surface mine areas and the walking of streams to define the sources of acid mine drainage within the watershed.

Phase II - Watershed Investigation

After review of the reconnaissance data, water sampling stations were established. For the purpose of organizing this study, the areas within the watershed where mining activity had been concentrated were divided into six mining complexes. While there were sometimes small, independent mining operations within each complex, few of these are sources of acid mine drainage. Those that are have been mentioned according to locally known names as well as their alpha-numerical designation, but dealt with as part of one of the six larger mining complexes.

A total of 27 weirs were constructed at source points of deep mine and surface mine drainage. Twenty-five (25) cross-sectional flow measuring sites were selected on affected streams and at several locations where unaffected water quality was to be monitored. A Teledyne Gurley Pygmy-Type Current Meter was used for flow readings at these stations. Water samples and flow measurements were taken over a 12-month period beginning in July, 1975, and ending in June,1976. For the first 2 months of the investigation, water samples were analyzed by the Department of Environmental Resources. No analysis for concentrations offerrous iron were made by the Department during this period. Water samples were analyzed by Green International, Inc., Sewickley, Pennsylvania, for the remaining 10 months of the Watershed Investigation.

A brief description of all 12-month water sampling and flow measuring stations with their elevations[(1)], average net acidity and average net alkalinity (in lbs./day) is given on pages 23-25. The complete monthly flow data, wateranalysis and loading for each station is listed in Appendix C, pages 108-126.(1) Elevations for all source points of mine drainage were determined by running level loops from U.S.G.S. established bench marks. Elevations for the other monitoring stations were taken from locations as plotted on U.S.G.S. 7.5 minute, photo-revised topographic quadrangles.

During the Watershed Investigation, telephone communication with the Department and the presentation of two preliminary reports and a. nine month interim report were used to describe the development of the project. Phase III - Office Engineering

Preparation of Maps: During the period when field data was collected, work maps were prepared showing the extent of deep mines, surface mines, coal outcrops and structure. In order to achieve a detailed picture of each mining complex, these maps were drafted at a scale of 1 inch = 400 feet on traced enlargements of U.S.G.S. topographic quadrangles. These were updated as additional information was gathered to include the correct orientation of deep mines to topography, roads and other surface features not shown on the photorevised U.S.G.S. quadrangles.

Later, these work maps were reduced to a scale of 1 inch = 1000 feet in order to obtain a sheet size that could be bound into the final report. New topo bases were prepared at this scale to give a half tone background on which the most important surface and sub-surface details were overlayed. Six mining complex maps were prepared in this manner and can be found with the narrative section dealing with each mining complex area. They are:

Plate IV - No. I and No. II of the Arnot Mining Complex.

Plate V- Klondike Mining Complex

Plate VI - Bear Run Mining Complex

Plate VII - Antrim Mining Complex

Plate VIII - Anna S Mining Complex

Plate IX - Rattler, Mining Complex

In addition to the Watershed Map-Plate I, two maps illustrating the Location and Extent of Deep Mines-Plate II and the Geology and Structure of CoalsPlate III were prepared. These were drafted at a scale of 1 inch = 2000 feet in

order to show the relationship of one mining complex to another and they are also overlayed on a screened topo background. Plate II and Plate III can be found in a pocket on the back, inside cover of the report.

Preparation of Abatement Plans: After interpreting the results of the Watershed Investigation which included the location, concentration and magnitude of acid mine drainage discharges, the geological conditions in the area and costs, abatement methods and possible alternatives were considered. Evaluation placed emphasis on maximum stream improvement at minimum cost per pound of acid abated. Priorities were established using this cost-effectiveness ratio as well as other criteria such as: overall cost of reclamation, miles of stream improvement, the probability of abatement success, the potential and probability of future mining as well as the aesthetics of each project area. Priority rankings are listed on page 33.

METHOD OF ASSIGNING SAMPLE SITE NUMBERS

The sample site coding consists of an alpha-numeric system, such as: Cl-5 (example)

The letter that starts the code represents the major sub-watershed: A-Stony Fork, B-Wilson Creek, and C-Babb Creek. The first number, 1 in the above example, represents the minor sub-watershed within the major watershed. The last number, 5 represents the actual site number.

Many sites are coded with numbers ending in a, b, or c, which are members of a three point station. Suffix a will always represent the station on the main stream above the confluence, c denotes the station on the main stream below the confluence of the tributary and b denotes the tributary. In cases where the tributary is large enough to have its own sub-watershed code, the b designation is dropped in favor of the watershed code prefix.