

CONCLUSIONS

AND

RECOMMENDATIONS

## CONCLUSIONS

The modular sampling approach combined with the grab sampling method proved to be simple, time-saving and effective in the study of large watershed areas. The approach is also adaptable to all ranges of water quality simply by redefining the hot and cold classification parameters. The few flow measuring problems that were encountered with the major streams and tributaries did not adversely affect the study results.

The study revealed that the major sources of acid mine drainage within the study area are the Clarion-Brookville and Lower Kittanning coals. Acid mine drainage severely pollutes nearly all streams where these coal seams lie within the Houtzdale Syncline.

The Clearfield Creek Watershed can be easily divided into a northern and southern regime, each with vastly different water quality and abatement requirements. The southern regime, extending upstream from Madera shows relatively good overall water quality but is degraded by a few scattered pollution sources. The effects of abatement work within this regime will be highly visible, resulting in improved quality of Clearfield Creek as far north as Glen Hope, making that portion of the creek suitable for fishing and recreation.

Clearfield Creek's northern regime is grossly polluted by two deep mine discharges from the Middle Penn No.4 Mine and the Brookwood

Shaft Mine. These discharges must be abated before any meaningful improvement in the water quality at Clearfield Creek's mouth is realized. Additional acid production within several hot modules within the northern regime degrades many of the creek's tributaries.

Moshannon Creek is severely degraded by acid mine drainage throughout its length. Relatively few tributaries to that stream have acceptable water quality. The largest discharges to the creek emanate from the large deep mining complex in the northwest portion of the watershed. There is presently no feasible technology for eliminating these discharges and the cost of treating them is presently prohibitive.

Large portions of both watersheds were found to be practically inaccessible for needed abatement work because of the complexity of the active mine permits within those areas. The changing aspects of this mine permit information presents major problems to consultants attempting to recommend abatement work. New permits are being issued and existing permits are being completed, changed, revoked or voided. As a result, boundaries within which abatement work can be recommended without conflict to active mining are continually changing. There have probably been numerous changes in permits that in some way affect the contents of the report, but the complexity of the current mine permit filing system utilized by the Bureau of Surface Mine Reclamation prohibits the assembly of complete

permit information for large areas such as the one studied. Many man hours were spent by Skelly and Loy in obtaining the mine permit information shown on the Mine Development Drawings and that information is thought to be incomplete in some areas.

The abatement plan devised for the study area consists of twenty-five relatively large projects. Twenty-one of these projects are presented with cost data and estimated abatement figures. These combined projects account for the abatement of roughly 79,400 lbs/day acid at source at a total cost of \$17.7 million. This abatement work can be accomplished with an overall cost effectiveness of only \$216 per lb/day acid abated, and will result in considerable improvement of the water quality of Clearfield Creek, Moshannon Creek, and the West Branch of the Susquehanna River. The remaining four individual abatement plans presented concern areas in which further study or coordination of some type will be required to determine the feasibilities of the suggested abatement measures. If the suggested measures for these four projects prove to be feasible, they could represent the abatement of 56,000 lbs/day acid (assuming 40 percent of at source acid abated). This additional abatement, if accomplished, would produce even greater improvements in the streams mentioned, and could render Clearfield Creek suitable for fishing and recreation throughout its length. Most importantly, many

miles of the West Branch Susquehanna River upstream from Lock Haven will be improved to the extent that a viable sports fishery can be re-established.

## RECOMMENDATIONS

It is recommended that the abatement projects discussed be implemented as soon as possible. Full water quality improvement does not immediately follow abatement. Most of the recommended abatement within the study area is strip mine reclamation, which becomes more effective in abating acid with time. The sooner the abatement projects are implemented, the sooner the benefits will be evident.

The projects recommended for further study should be acted upon as soon as possible. If these projects prove feasible, they could represent some of the largest acid load abatement values resulting from this pilot program. The Clearfield Creek Watershed recommendations are particularly important because that stream is not as grossly polluted as Moshannon Creek, and less abatement work is required to raise that stream's water quality to acceptable levels.

It is also recommended that the Department of Environmental Resources employ a consultant possibly on a retainer basis, to keep abreast of the constantly changing mine permit situation and its affects, if any, on the abatement recommendations submitted in this report. The consultant could simply bill the Department on a monthly basis dependent on the number of hours spent in obtaining the latest mine permit information, updating mapping, and reporting this information and its effects on the

abatement areas. This monthly report could include the mapping of the pertinent changes and a brief discussion of how recommended abatement could be expanded or decreased in size, changed in method, combined with an active stripping operation, or varied in any other manner that presented itself based on the new information. Such a report would keep the Department up-to-date on the status of the various abatement project areas presented in this report.

The Department of Environmental Resources should attempt to work as closely as possible with strip miners in planning future mining activities. In this manner, it might be possible to shift the heaviest mining emphasis from those acid-producing portions of the Clarion-Brookville and Lower Kittanning coals to the less acid Upper Allegheny Group coals. This would greatly benefit any future abatement plans within these acid producing areas, and the coal industry would not suffer greatly from such a gradual shift.

Another recommendation that would greatly benefit the Department's abandoned surface mine reclamation program is the establishment of a bounty on the order of \$100 to \$200 per acre, payable to any surface mine operator who restrips abandoned, unreclaimed strip mines. Since many of these abandoned areas could presently be stripped on a marginal or low profit basis, the bounty would provide the profit incentive needed to get strip mine operators to open operations in such areas

Such a measure, in combination with the State's existing effective reclamation laws, will enable the Department to reclaim many acres of abandoned stripping at nominal cost.

It is further recommended that the Bureau of Surface Mine Reclamation of the Department of Environmental Resources establish and maintain some type of mine permit index mapping system, updated weekly, that would show new permits granted, amendments or changes to existing permits, and the expiration of old permits. Such a system would greatly simplify the location of information on and mapping of mine permits within a given area, and would minimize the excess time and confusion frequently involved in obtaining such information. 'The final result of the system would be the inclusion of more reliable mine permit information in all of the Departments' Scarlift Reports and an easy means for any government official to quickly determine the status of mining in his district.