CONCLUSIONS

The area within the Watershed, consisting of approximately nine and one-half (9-1/2) square miles and comprising approximately six thousand one hundred and twenty (6,120) acres, is known principally for its anthracite coal resources and its past mining history.

The area is generally one of rural character and less than five percent (5%) of the total land area is presently developed. The coal lands occupy practically all of the area within the watershed. The area lacks adequate highway facilities; the lands have been strip-mined and are subject to subsidence because of past and present deep-mining. The over-all conditions and characteristics of the housing are in dire need of renewal, and the area has very little to offer in the way of development. There are few, if any, areas that would be conducive to recreational, agricultural or industrial development.

The streams, (with the exception of one), flowing through the Watershed are contaminated; the quality of the water in the area, for the most part, is not potable and is acidic and incapable of supporting any forms of aquatic life.

The drainage within the area is of a poor quality due to the continual changes in the topography of the area. These changes have been caused by the strip-mining activities.

The hydrology of the basin is continually changing. The soil cover is continually being removed for strip-mining activities, thus inducing additional erosion. Restoration and revegetation of the topography to its original state would definite curtail the influx of surface drainage into the deep mines.

There are two (2) distinct areas within the Watershed and are treated as such. The division is based upon the two (2) main streams in the area, namely, the Lorberry Creek And Lower Rausch Creek. The other main stream, the Swatara Creek only enters and leaves the corner of the study area and is the responsibility of study of the adjoining watershed by others.

There were a total of thirty-eight (38) pollution sources: nineteen (19) active and nineteen (19) abandoned operations that contributed to the acid loads of the streams within the study area. The estimated acid load calculated at the mouth of the Lorberry Creek, (before its confluence with Lower Rausch Creek), was an average of 1,746 lbs./day. The estimated acid load calculated at the mouth of the Lower Rausch Creek, (before its confluence with Lorberry Creek), was an average of 1,216 lbs./day. The total estimated acid load for both streams was an average of 2,962 lbs./day. The estimated acid load for Swatara Creek was an average of 8,324 lbs./day. During heavy rainfalls, the acid load of Lorberry Creek increased to 2,762 lbs./day, and the acid load of Lower Rausch Creek increased to 2,749 lbs./day. The acid load of Swatara Creek during high rainfalls increased to 13,672 lbs./day. The major source contributing to the pollution of Lorberry Creek is Rowe Tunnel (Measuring Station No. 4), contributing about eighty percent (80%) of the total. The major source contributing to the pollution of Lower Rausch Creek is the Rausch Creek Tunnel, which contributes about ninety-three percent (93%) of the total.

Construction of treatment facilities would be necessary to improve the quality of the water in the watershed. These facilities would include neutralization of the acidic waters, impoundments, and surface drainage diversion swales. Complete treatment facilities have been discounted because of unsuitable topography for an optimum site. The other consideration would have to be the feasibility of combining treatment of waters from the adjoining watershed since the two (2) main creeks, Lorberry and Lower Rausch Creek of this watershed, have a point of confluence with Swatara Creek just south of the study area. Swatara Creek is the main drainage artery of the adjoining watershed. The treatment facilities would <u>not</u> require constant supervision even though they would operate continually.

Subsurface drainage does not adhere to any specific pattern and is predominantly controlled by the geologic structures within the area, i.e., the anticlines, synclines, faults, etc. What enters deep mines through surface openings usually finds an outlet through one of the many sources of outlets of underground mine water pools.

The study of watertight sealing of the deep mine openings has revealed that little would be gained by so doing. Recommendations of sealing a couple of mine openings have been set forth in the report, but mostly as a method of overcoming safety hazards. During the past mining history, little attention was paid to the mining ventures and there is very little knowledge of what exists beneath the surface. Surface outcroppings of the coal seams continue to be scarred with "crop fall", and the surface water finds its way into the deep mines through these openings.

There is a direct relationship between the precipitation that falls upon the watershed and the discharges that emerge from the active and abandoned mine workings. Dilution is definitely evident., as well as the variances- in, flow, pH, iron, sulfates and acidity. Graphs of the amounts of precipitation are included in the appendix of this report.

RECOMMENDATIONS

The recommendations set forth in this report are applicable only to this Watershed and before any actions are taken upon them, serious consideration should be given to the recommendations set forth for the adjoining watersheds and in what manner the recommendations of both studies could be combined or incorporated into one remedial program for both watersheds.

The following steps should be taken to control or eliminate the acid mine drainage pollution within the Watershed area:

1) the removal and burial of all mine refuse piles consisting of acid producing materials to the abandoned strip mine areas. Following this action, re-establishment of vegetative growth and cover must be established, This will alleviate runoff and seepage through spoil areas. Dependent upon topography and drainage, lined diversion ditches may have to be installed above the disturbed areas to keep additional waters from entering the restored areas.

2) evaluate the results of the abatement program to note if acid discharges are still prevalent and objectionable. Additional controls of pollution may be required.

3) incorporate strict measures of land reclamation with issuances of strip-mine permits. Reclamation at this time is both more effective and less expensive than at some later date.

4) seal some existing deep mine openings, both for the curtailing of the entrance of surface runoff to the abandoned deep mines as well as eliminating the danger of accidents with their remaining open.

5) should available funds permit, we recommend the construction of three (3) lagoon complexes and individual neutralization plants for each installation to treat the acid mine drainage in the area of the complex. We recommend using lime as a neutralizing agent along with aeration and sedimentation. We have included costs for sludge disposal into abandoned deep mines. Cost estimates for the complexes recommended are as follows:

Lagoon Complex I - Lorberry Creek $149,450.

Lagoon Complex II - Lower Rausch Creek $ 85,100.

Lagoon Complex III - Lower Rausch Creek $168,230.

TOTAL

$402,780.

There are no design costs for engineering or costs of resident inspection included in the above costs.