General Discussion

The primary concentration of acid mine drainage pollution is found in the northern and eastern sections of the watershed. To better understand exactly where the pollution exists, this section of the report will describe the sub-watersheds individually with information as to their effect on the main stream, Georges Creek, starting from the headwaters below Chestnut Ridge.

There are a number of different approaches that could betaken in making our recommendations as to which area of the Georges Creek Watershed should receive first attention and which the second and so on. Priority could first be given to the areas that are most heavily populated where the quality of the water supply is greatly in need of improvement. Those areas that are primarily used for recreation or areas that would have the most pollution abated, regardless of the cost, could head the list. Another approach could be the number of stream miles cleaned up with in a sub-watershed.

Using information from the monitoring stations on Georges Creek,. it was found that the quality of the stream changes from alkaline to acid somewhere between Stations GC3 and GC4. Since there are five (5) sub-watersheds draining all or a portion of their area into Georges Creek between these two (2) stations, five (5) additional temporary monitoring stations were established to more accurately determine pollution effects on this segment of Georges Creek. From the information gathered at these temporary stations it was established that the quality of water significantly changes downstream from Tributary GC7L3.

Considering the above information, and the fact that the Pennsylvania Fish Commission's only report on Georges

General Discussion (contd.)

Creek dates back to 1932 and this indicates the main stem of the stream, even at that time, was polluted by AMD, the following parameters were used in our consideration of what order of work is to be done in the study area.

1) The effects of the pollution load on the main stream, Georges Creek, is given first priority; the first work priority should be assigned to the sub-watershed that overrides the natural alkalinity. From this point downstream, as polluted tributaries enter Georges Creek, they are given correspondingly decreasing priorities. For example, as mentioned above, the pollution load from Sub-watershed 7L overrides the natural alkalinity of Georges Creek; therefore this sub-watershed would be given first priority. The next polluted tributary entering Georges Creek downstream is in Sub-watershed 8R; hence this would be given second priority. This system of setting priorities will continue downstream until Georges Creek enters the Monongahela River. The sub-watersheds that fall into this category are given priorities 1 through 8 inclusive in Table 3.

2)After attention is given to the streams or sub-watersheds that presently directly affect the main stream, priorities are assigned to those areas that are of a potential

danger in making Georges Creek a polluted stream or are an obvious detrement to local environs. It should also be mentioned that as the AMD is eliminated from these sub-watersheds, the additional alkalinity that will enter the main stream will help to maintain Georges Creek as a clean stream. The sub-watersheds that fall into this category are given priorities 9 through 15 inclusive in Table 3.

General Discussion (contd.)

TABLE 3

Recommended List For Remedial Action of Sub-watersheds in Order of Importance to Georges Creek

Rank.	Sub-watershed	Major Stream Name
1	7L	Un-named
2	8R	Un-named
3	9R	York Run
4	11R	Un-named
5	8L	Un-named
6	llL	Tomcat Hollow
7	15R	Un-named
8	12L	Un-named
9	7R	Un-named
10	2R	Muddy Run
11	6L	Un-named
12	6R	Un-named
13	1L	Askon Hollow
14	4L	Un-named
l5	5L	Mountain Creek.

With this list, a change in the quality of water and an increased potential for recreational utilization of the main stream can be realized as AMD in each sub-watershed is abated.

The proposed work. recommended in the following sub-sections and the estimated costs include deep mine sealing, surface restoration and surface water diversion. The feasi-bility of abatement for each mine will have to be weighed and may alter the priority of work due to the possible load of mine maps and the fractured strata that lies above the coal seam. Other considerations such as extensive heads against a proposed seal, potential grout curtains required

General Discussion (contd.)

for complete sealing and the additional sealing of bore holes and air holes to affect the desired inundation. These problems may cause the cost per pound to increase significantly and adds to the uncertainty of priority and feasibility.

Neutralization or treatment plants have been considered as an alternative method; however the initial cost accompanied by the continuing operating cost of treatment plants have proven them to be economically unfeasible.

In the sub-watershed sections of this report, in the table of Abandoned Deep Mines under the column title "Name of Mine or Operator" there are cases where instead of a name listed there appears a reference in parentheses to another deep mine complex. This indicates there is a possible interconnection between the two mines. If these mines are listed in the table titled "Recommended Abatement Procedures - Cost Benefication" it may be necessary that construction work planned for one must include the second mine. In this same table, the columns listed as potential sources include openings that are shown on various mine maps, however have not been located in the field due to stripping operations or various other reasons. The openings included in this column could also be part of another mine complex that must be worked with that particular mine.

In the table titled "Benefication - Recommended Plans", Plan "A" always, lists the total inventoried sources of pollution within the sub-watershed with a 75% reduction. There are cases where the plans recommended in this table, show more than 100% reduction. This is primarily due to two reasons: first, the economy of removal, and second, the need for additional alkalinity to be introduced into Georges Creek at this point.

General Discussion (contd.)

The cost estimates, as described in Table 4 are based on reported costs for similar work done throughout the Commonwealth.

TABLE 4

CONSTRUCTION COSTS

Hydraulic Seals - are water tight plugs constructed in mine openings. These seals are constructed to withstand a predetermined amount of water pressure and are used as part of a technique to flood all or a portion of the mine in order to reduce the formation of pollutants. Most mine portals for which hydraulic seals are proposed are caved in and will require that the seals be installed from the surface by means of drilled holes or earth excavation to expose the portals. The cost for each seal, recommended in this report, is estimated at $20,000 if mine map is on hand. However, if a mine map is not presently available, the seal cost is estimated to be $25,000. This cost includes a normal 100 feet of grout curtain, 50 feet on either side of the portal opening.

Grout Curtains - are barriers placed in the strata to prevent water seepage. They are also used adjacent to and directly over hydraulic seals to help prevent a breakout of the flooded mine. There are many factors that determine the cost of these curtains such as depth, material used, and length of curtain. The cost, where recommended in this report, is estimated to be $140 per linear foot.

TABLE 4 (contd.)

Surface Seals - are airtight plugs or water tight seals placed in flowing or dry bore holes and air shafts to prevent air or water from entering the abandoned mine. The costs for surface seals recommended in this report are as follows:

Bore holes - $8,000
Small diameter air shafts - $8,000
Large air shafts - $12,000

Strip Mine Reclamation - can require a combination of different procedures depending upon what end results are required. The following is a list of these procedures with cost estimates:

1. Regrading (both terracing and selected grading to provide for channelization):
   a. Totally unreclaimed strip mine (no attempt previously made to reclaim the area): $1,800 per acre.
   b. Spoil pile sloping towards the high-wall (partially regraded; however, the spoil pile is sloping towards the highwall allowing ponding and infiltration at the base of the highwall): $600 per acre.
2. Revegetation for grass and tree cover: $600 per acre.
3. Clearing and grubbing for terrace areas: $100 per acre.
4. Stream channelization:
   a. Unlined: $5 per linear foot.
   b. Clay lined: $15 per linear foot.

TABLE 4 (contd.)

5. Diversion ditches: $1 per linear foot.
6. Backfill subsidence holes, moderate size: $250 each.
7. Clay surface seals where the strip mine has broken into a deep mine: $1,000 each.

For this report, where recommendations are made to reclaim a strip mine, an estimated cost of $2,000 per acre has been used.