GENERAL ABATEMENT MEASURES

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Strip Mine Reclamation

This work will include clearing and grubbing if necessary, backfilling, grading, revegetation and surface water diversion above the highwall. A combination of terrace and reverse terrace grading is recommended considering economy as well as stability on some of the steeper hillsides. Emphasis is primarliy on reducing infiltration of surface water into the stripped mine spoil. Expectations of this technique in relation to deep mine discharges are that transportation of pollutants from within the mine or at least sections of the mine will be reduced or completely eliminated thus reducing pollution load.

Clay Sealing

Clay seals at drift mine openings or clay barriers along the base of strip mine highwalls were deep mine workings have been intersected or lie in close proximity are recommended in specific cases. Such measures are meant as infiltration controls directed at eliminating direct channeling of surface runoff into deep mine workings from the up-dip sides with subsequent flushing of pollutants.

Hydraulic Mine Sealing

This work involves installation of grouted double bulkhead mine seals at inaccessible drift type openings along with grouting of adjacent strata. This action will result in partial inundation of the mine void with subsequent reduction in pyrite oxidation. Elimination of part of the reacting contact area means a reduction in total acid load. Prior to installation of seals, exploratory boring investigations are mandatory in order to utimately determine the true suitability of each mine site. As a preliminary safety limitation against the possible devastating results of a blowout, flood pool levels within the applicable mines are proposed to be maintained at an approximate maximum of 30 feet head on the seals. Mining may have advanced closer to the coal outcrops than available mine maps have indicated or fracturing or an inherent incompetency in the strata adjacent to the outcrop may exist. Thus, some areas may be unsuitable to contain the possible internal pressures exerted through flooding. Also to date, this mine seal type has only been proven against a maximum head of approximately 40 feet. The flood pool level can easily be maintained by establishing a cased borehole in the immediate area at the desired maximum elevation of the pool which would be capable of handling the maximum expected flow.

Utilization of Deep Mine Refuse

In-place abatement of refuse material could be accomplished with the following action and respective costs:

contouring and grading - $1,500/acre

Covering the graded refuse with soil - \$2,500/acre
or fly-ash - \$2,000/acre

revegetation - \$750/acre

In contrast, abatement can be achieved through utilization in commercial interests, which is highly recommended, at no cost to the Commonwealth. Permits issued by the State to interested companies for utilization operations initially require an approved abatement plan for any refuse left at the site after close-down. Thus, reclamation is inherent in any such operation resulting in a definite benefit to the Commonwealth.

Many avenues of utilization of coal refuse are open. Coal refuse of relatively high Btu content is presently being processed extensively in the Blacklick Creek area, as it is in many areas, for use for power production either directly or by blending with fresh coal. Large volumes of mine waste have been pumped into abandoned mine voids to alleviate mine subsidence as well as used during active operations for support to enable coal operators to extract a larger percentage of the available reserve. Coal refuse has been extensively utilized in Great Britian in the construction of highways, dams, landfills and other uses. Approximately 1.5 million cubic yards of coal refuse were used in embankment construction of the Cross Valley Expressway in Luzerne County of eastern Pennsylvania. Numerous other projects are planned in western Pennsylvania by PennDOT. The large mine waste piles near Revloc of the study area will be processed for recoverable coal and then the waste used as embankment material in the construction of Routes 219 and 422. The recovered land has also been donated to the county for use as a site for an industrial park. Coal waste can also be used in the manufacture of brick, block and lightweight aggregate.

The specific use for the material in each mine waste bank could easily be determined by compositional analysis coupled with tests defining the engineering applications.

<u>Treatment of Acid Mine Drainage</u>

Treatment of acid mine discharges is recommended as a last alternative to pollution abatement. It is preferable to abate such discharges at the source by reclamation measures that can completely eliminate acid formation and require no upkeep after initial investments. Treatment should only be employed where an industrial market or the need for a potable community water supply makes such measures economical either through subsidies or total absorption of costs. The processes which have been tested and proven successful to date are: 1) combination limestone - lime two stage neutralization; 2) reverse osmosis; and 3) ion exchange. Other promising methods are: 1) multi-stage flash evaporation; 2) electrodialysis; and 3) freezing, but little documentation exists covering their actual success. In many cases it has been found that a combination of processes was required to produce an acceptable industrial-use or potable water.

The costs of treating acid mine drainage are highly variable and depend on the existing quality of the mine drainage and the desired use of the water. Treatment costs to improve water quality for stream life will be different from costs of treating to meet industrial and public water supply needs. Comparison of capital and operating costs of ten conventional lime neutralization treatment plants show a wide variation. Capital costs vary from $164,383.04/MG for a flow of 3.999 MGD to $1,477,312/MG for a flow of 0.240 MGD 0.2398 MGD. Operating costs varied from 11 to 95 cents/MG treated per mg/l of acidity. Variations in construction costs were affected by: capacity of the treatment plant, availability of suitable land, accessibility to the site, utility services availability and method of sludge disposal. Variations in operating costs were affected by: desired quality of effluent, pumping requirements, chemical requirements, utility services requirements, labor needs and sludge disposal.