

I regret that we had to call you on a Friday, but it was necessary this week.

(Dr. Hibbard's prepared statement follows:)

PREPARED STATEMENT OF WALTER R. HIBBARD, DIRECTOR, BUREAU OF MINES, DEPARTMENT OF THE INTERIOR

Mr. Chairman and members of the Subcommittee on Science, Research, and Development:

I appreciate the opportunity to appear before you today and to discuss the programs and activities of the Bureau of Mines relating to Solid Waste Disposal. Our research in this important area was initiated under the authority of Public Law 89-272, The Solid Waste Disposal Act. One of the purposes of this Act was to—

"initiate and accelerate a national research and development program for new and improved methods of proper and economic solid waste disposal, including studies directed toward the conservation of natural resources by reducing the amount of waste and unsalvageable materials and by recovery and utilization of potential resources in solid wastes."

Authority for the work rests with both the Department of the Interior and the Department of Health, Education, and Welfare. To make sure that the problem areas were fully covered and to prevent duplication of research, a letter of agreement was drawn up between the two agencies in which the responsibilities of each were clearly defined.

Following passage of the Act, the Bureau of Mines organized a research program directed toward solving the problems involved in utilizing or disposing of the enormous quantities of solid wastes generated in mining and in the mineral and metal processing industries. As a first step a survey was initiated to appraise the magnitude and nature of solid wastes accumulated to date with emphasis on delineating those waste piles which pose the greatest threat to the quality of the environment. Concurrently, investigations were started on the problems that appeared to be the most urgent. A program of contract and grant research also was organized to supplement the Bureau's own work and to aid in the training of engineers and scientists in the field of solid waste research. The total research program covers three major categories: municipal wastes, tailings, and scrap.

MUNICIPAL WASTES

Although the overall responsibility for the disposal of municipal wastes is with the Department of Health, Education, and Welfare, the Bureau of Mines is interested in the recovery of the large metal and mineral component of these wastes for recycle to industry. Under the present methods for disposing of municipal wastes, which amounts to about 165,000,000 tons per year, nearly twelve million tons of valuable metal are buried every year in dumps and landfills. The total value of ferrous and nonferrous metals in the 165 million tons of waste, based on current prices is estimated at over \$1 billion.

The Bureau's preliminary work on this problem has been on recovery of metals and minerals from municipal incinerator residues. Since most of the refuse from large cities, and approximately one-third of the total municipal refuse, is processed by incineration which concentrates the metal and mineral values, the residue from municipal incinerators represents a good starting material for recovery of these values. When refuse is incinerated, it is reduced about 75 percent by weight. Our analyses show that each ton of residue from municipal incinerators contains about 550 pounds of metals. Of this about 500 pounds is iron and the rest consists mainly of aluminum, copper, lead, tin and zinc.

In addition to the metallic residue, for every ton of refuse incinerated about 20 pounds of fly ash is generated. Our analyses have indicated that this waste may become an important source of secondary silver, since it contains silver in amounts ranging from 2 to 9 oz. per ton, and gold in amounts ranging from 0.02 to 0.05 oz. per ton. About 500,000 tons of the fly ash is now generated annually from municipal incinerators and, if economic methods could be developed for collection of the ash and extraction of the metals, this seemingly unlikely source could yield appreciable quantities of silver and gold to help meet the Nation's industrial and commercial demands.