



TR-78

Potential Impact of the Development of Lignite Reserves on Water Resources of East Texas

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This study was conducted for the Office of Water Resources Research and Technology in the U.S. Department of the Interior by the Texas Engineering Experiment Station at Texas A&M University. The project was concerned with identifying potential adverse effects of lignite strip mining and lignite utilization on the hydrology and water quality of the area. Both field and desk studies were conducted to evaluate the potential impact of lignite development on water resources of the area. Field studies included (1) monthly water sampling for a one-year period of streams, lakes and wells near the strip-mined areas at Fairfield and Rockdale and at control stations located away from the lignite development; (2) leaching studies of the lignite and overburden at Fairfield and Rockdale; (3) precipitation samples collected under the airborne waste plume from the lignite-fueled electric generating plant at Fairfield; and (4) a limited trace element enrichment study in the soils around the plant at Fairfield.

Potential lignite reserves, as defined by the Bureau of Economic Geology, include about 41 percent of the outcrop area of the Wilcox Aquifer. Strip mining can change the hydrologic characteristics of the area and full development of the near-surface lignite reserves in east and east central Texas could have a significant impact on the groundwater resources of the region. Changes in the recharge rate of the Wilcox aquifer should be considered when identifying new lignite deposits for development. Also hydrologic characteristics should be considered when developing reclamation plans for the spoil area.

Lignite-fired power plants cause environmental modifications of considerable magnitude and consume a significant quantity of water.

During the 35-year expected life of a 1,000-megawatt, lignite-fired power plant, about 21,000 acres of land would typically be strip mined. Approximately 25 percent of the identified near-surface lignite deposits are committed to

existing and presently planned lignite-fired power plants in Texas. The Development of deep-basin lignite deposits in the near future appear inevitable.

Lignite can contain elevated concentrations of certain trace elements and power plants tend to concentrate these elements. A 1,000-megawatt plant requires approximately six million tons of lignite per year. When the lignite is fired at the plant some trace metals are concentrated in the fly ash (arsenic, iron, manganese and lead), while others are discharged from the stack primarily as a vapor (mercury and selenium). Improper handling and disposal of fly ash could result in pollution of water supplies. Precipitation samples collected at Fairfield under the airborne waste plume from the Big Brown plant had elevated concentrations of chromium, iron, manganese, selenium and phosphate when compared to background precipitation samples. A trace element enrichment study of the soils around the plant should be conducted to monitor the concentrations of those elements that could adversely affect the plant and animal life of the area.

Small surface streams near Rockdale and Fairfield had elevated levels of zinc, selenium, manganese and sulfate as compared to other surface waters observed in the study. Strip mining or power generation was probably not the primary source of the elevated levels of these parameters. A water quality study should be initiated to accurately identify the source of these elevated parameters.

Water quality in the cooling lakes at the Alcoa plant near Rockdale and the Big Brown plant near Fairfield was generally good. Highest observed values of many of the surface water quality parameters were in the spoil lake in the strip-mined area at Alcoa. Since there appears to be a direct hydraulic connection between water in the spoil lake and the shallow groundwater aquifer in the area, poor water quality in the lake could adversely affect the groundwater. Additional groundwater studies were recommended for both the Rockdale area and the Fairfield area.

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