turbid water should not be limited by the movement and accumulation of suspended sediment in the basin material.

HALL, CLINTON W.

U.S. ENVIRONMENTAL PROTECTION AGENCY POLICY ON SUBSURFACE EMPLACEMENT OF FLUIDS BY WELL INJECTION

The Federal Water Pollution Control Act Amendments of 1972 (public law 92–500) provide for comprehensive controls on surface water, but do not provide for specific regulatory control over subsurface water at the federal level. The only applicable regulatory provision of the act is for a federally approved state permit program which, among other things, requires a qualifying state authority to issue permits to control the disposal of pollutants into wells. Because of provisions in the new legislation requiring upgrading of the quality of discharges to both air and surface water, an increased assault on the quality of the nation's groundwater resources is anticipated. The EPA policy statement does not purport to have legal sanction, but rather puts the Agency on record as being opposed to the emplacement of materials by subsurface injection without strict controls and a clear demonstration that such emplacement will not interfere with present or potential use of the subsurface environment, contaminate groundwater resources, or otherwise damage the environment. The EPA policy does have some clout, however, in that it is designed to discourage the diversion of wastes treatable on the surface to the subsurface for the purpose of avoiding discharge permits or other provisions of P.L. 92–500, and most certainly will be used by the states in designing permit programs that will meet federal approval for the disposal of pollutants in wells.

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SUBSURFACE DISPOSAL OF LIQUID INDUSTRIAL WASTES IN ALABAMA

Five subsurface disposal wells have been drilled and completed in Alabama. These are: Stauffer Chemical Co., Mobile County; Ciba-Geigy, Inc. (2), Washington County; U.S. Steel Corp., Jefferson County; and Reichhold Chevmicals, Inc., Tuscaloosa County. The Geological Survey of Alabama has been involved directly in all 4 projects. The Survey served as a consultant to the Alabama Water Improvement Commission (the state agency responsible for protection of surface and groundwater in Alabama) on the Stauffer and Ciba-Geigy projects, and as consultant and supervisor on the U.S. Steel Corp. and Reichhold Chemicals, Inc., projects. The Environmental Protection Agency provided some funding on the research aspects of the Reichhold Chemicals, Inc., disposal well. These projects were undertaken as a research effort to insure that the responsible state agencies are fully cognizant of all aspects of this method of waste disposal.

At present, in Alabama, subsurface disposal is permissible for some types of wastes, if the well is properly designed and completed in an appropriate geologic environment, if conventional methods of waste treatment have been evaluated and proved to be inadequate, and provided an adequate monitoring system has been installed.

The Stauffer and Ciba-Geigy wells are in the Coastal Plain geologic province and the U.S. Steel and Reichhold Chemicals, Inc., wells are in Paleozoic sediments of the Warrior basin, The geology, drilling, completion, and testing techniques are presented as a basis for decision making for approval or rejection of the proposed deep-well disposal projects by a regulatory agency.

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ELECTRONIC DATA PROCESSING FOR DECISION MAKING IN SUBSURFACE INJECTION OF LIQUID WASTES

The West Virginia Geological Survey began a pilot study on subsurface industrial waste disposal in 1972 under a research grant from the U.S. Bureau of Mines. Electronic data processing (EDP) was chosen as the means of information assimilation and output. Data output includes maps showing freshwater and saltwater levels, oil and gas well locations, structure contours, isopachs, fracture pressure gradients, formation pressures, *etc.* A cost and effort determination has been made for each type of output, and leads to an overall evaluation of EDP for decision making in subsurface waste injection.

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EFFECTS OF WASTE PERCOLATION OF GROUNDWATER IN ALLUVIUM NEAR BARSTOW, CALIFORNIA

Barstow is 96 mi northeast of Los Angeles in the Mojave Desert region of southern California, adjacent to the normally dry Mojave River. Groundwater in alluvial fill is the only reliable source of water for the main water purveyors (the city of Barstow and the U.S. Marine Corps Supply Center). The alluvial aquifer near Barstow has been subjected to contamination from percolation of industrial and municipal sewage for nearly 60 years. The contamination has forced the abandonment of several domestic wells because of taste, odor, and foaming, and it threatens the well field serving the U.S. Marine Corps Supply Center. An intensive investigation was made to determine (1) the nature of groundwater degradation; (2) the areal and vertical extent of the degradation; (3) the rate and direction of movement of the degraded water; and (4) the effects of several proposed management practices designed to alleviate the problem.

A series of 53 observation wells was installed within the 10-sq-mi study area to supplement data from existing domestic and irrigation wells. Groundwater samples were analyzed for the usual chemical constituents plus arsenic, hexavalent and total chromium, dissolved organic carbon, detergents, ammonia, phosphates, and oil and grease. Concentration gradient for dissolved solids and several individual constituents were defined in 3 dimensions. The dispersive characteristics were investigated by use of a 2-well tracer-dilution test.

The chemical stratification found within the aquifer indicates that an old plume of degraded water (produced by percolation from sewage facilities near Barstow) occupies the lower part of the alluvial aquifer. Since 1910 this plume has moved down gradient about 4 mi. A more recent overlying plume of degraded water occurs near the downstream edge of the deeper plume. This recent plume is produced by effluent from sewage-treatment facilities installed in 1968. Detergent concentrations beneath this site reflect the current use of LAS-type detergents in contrast to the ABS types that are found in the deeper zones of degradation.