

GEOLOGY AND GEOGRAPHY

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ABSTRACTS

Environmental and Engineering Geology of Hancock County, Indiana. G.W. CROSBY and T.R. WEST, Department of Geosciences, Purdue University, West Lafayette, Indiana 47907. — The purpose of the study is to provide information on environmental and engineering geology of earth materials in Hancock County for engineers and land use planners. Data are presented through maps, plates, cross-sections and tables providing for detailed interpretation in planning and design.

Figures depict topography, drainage development, watershed boundaries, current land use, soil associations, and ground-water availability. Twenty-six cross-sections using more than 200 water-well logs yield information on glacial geology, ground water, waste disposal, and aggregate availability. Plates depicting the county at a 1" = 1 mile scale illustrate surficial geology, glacial drift thickness, and bedrock topography. Additional information on soil series is presented in table form. For the town of Greenfield, potential sanitary landfill sites are designated within a five-mile radius.

Proper application of supplied data enables engineers and planners to 1) locate areas with favorable geologic conditions relative to a proposed land use 2) eliminate unsuitable areas for such use 3) recognize areas with potential for aggregate supply and 4) avoid locations which could lead to environmental hazards. Despite the specific geologic information provided, an on-site investigation likely including a subsurface investigation, is needed prior to final site selection. This study was supported in part by a grant from the Indiana Academy of Science.

The Renault Formation (Mississippian) in Southwestern Owen County, Indiana. GEORGINA L. CUNDIFF, F.J. Reitz High School, Evansville, Indiana 47712 and PADMAJA D. MANERIKAR, Rich South High School, Richton Park, Illinois 60471. — Sedimentologic history of the Renault Formation in the subsurface of southwestern Owen County was interpreted by utilizing well samples, core chips, and geophysical logs from 65 wells. The Aux Vases Formation underlies the Renault Formation. A thin zone of shale separates up to 26 feet of the Renault into an upper and lower limestone.

The crinoidal wackestone and packstone of the lower Renault were deposited in a subtidal marine environment under moderate wave and current activity. The oolitic grainstones of the upper Renault formed in very shallow, highly agitated shoaling waters. Superadjacent rock, including fine-grained wackestone at the Renault top and the shale and siltstone of the overlying Bethel Formation, document an increase in water depth. The structure of the Renault top indicates a gradual southwestward dip with concentrated local folding related to differential compaction above Silurian reefs over 1000 feet below the Renault. The Renault

Formation thins to less than 15 feet in the general positions above the Silurian reefs. More than 145 feet of younger Mississippian rocks above the Renault are preserved in some locations, but a pre-Pennsylvanian stream valley was cut below the Renault in the eastern part of the study area.

Indianapolis: A New Urban Image. RAHIM KHAVIDI, Department of Geography, Indiana University-Purdue University at Indianapolis, Indianapolis, Indiana 46202. — This paper takes a new look at Indianapolis and its immediate urban region in a geographic perspective focusing on its recent developmental planning policies and programs for growth and survival. First, the study briefly reviews the city's steady population and spatial growth from its first settlement (early 1820s) through the city's constant population growth (late 1960s). Second, the study overviews the population trends during the late 1960s which resulted in a net out-migration of 71,413 persons from the city to the adjacent suburban fringe, both within and outside of Marion County. The combined effect of population shift and out-migration caused a declining central-city tax base, abandoned housing, and the underutilization of urban services in the central city. Moreover, the growing urban sprawl created a high demand for urban services in the outlying areas throughout the 1970s.

Third, the study concentrates on the recent (1970s and after) urban and economic growth policies designed to halt the increasing net out-migration of residents from Indianapolis and to make the central city and downtown attractive for prospective residents and commercial establishments. This has been accomplished by various downtown and neighborhood revitalization projects, motivating public and private sources to reinvest in and improve existing urban services, facilities, and amenities as well as to expand the opportunities for new growth. In this regard, this paper will highlight many of the recent revitalization, economic, educational, and sport projects around downtown, as well as the rapidly expanding campus, of Indiana University-Purdue University at Indianapolis.

Determination of Pore Size Distribution in Soils and Rocks. C.W. LOVELL, School of Civil Engineering, Purdue University, West Lafayette, Indiana 47907. — All of the properties of soil and rock important to engineering use are influenced by the value of porosity and its distribution. It is now possible to make measurements of pore size distribution in a routine manner via the mercury intrusion technique. The mercury is pushed into the pores of an evacuated sample, with concurrent measurements of absolute pressure and volume intruded. The ordinary capillary equation allows the calculation of smallest pore diameter intruded at a given pressure. By successive increases of pressure on the mercury, smaller and smaller pores are intruded, and a cumulative curve of volume of pores vs. pore size is generated. The distribution may be converted to a differential form if this is helpful in interpreting and correlating the data.

A number of engineering properties of compacted soils and mineral aggregates have been correlated with their pore size distributions. The most prominent of these have been the water permeability and frost susceptibility of compacted soils, and the physical durability of shales and carbonate rocks. Examples are presented.

Aligned Kettles, Morgan County, Indiana. TIM MORRIS, Metropolitan School District of Martinsville, ROBERT C. HOWE Department of Geography and Geology, Indiana State University, Terre Haute, Indiana 47809 and NED K. BLEUER, Indiana Geological Survey, Bloomington, Indiana 47405. — Approximately three miles northeast of Martinsville, Indiana, in a region where the boundary of Wiscon-

sinan glaciation has a north-south orientation, about 18 topographic depressions which appear to be kettles exist within a one square mile area. These roughly circular pits, which average about 100 m in diameter, are filled to varying degrees by sediment and water. Peat has been extracted from one of them for a golf course. Several are dry at the surface but become lakes after heavy rains. Two of the basins are "double kettles". Of particular interest is the apparent alignment of the depressions mainly in a NE-SW direction but also in a NW-SW alignment of associated ridges. The NW-SW orientation parallels a NE-SW alignment of associated ridges. The NW-SE alignment appears to follow a pre-existing valley but may correspond to an ice marginal position. Thin and discontinuous Wisconsinan till occurs in that part of the area which has historically been mapped as underlain by pre-Wisconsinan till and/or outwash. Significantly, the area corresponds with the place where southwestward-moving Wisconsinan ice moved off high, impermeable siltstone bedrock onto the westward-thickening wedge of permeable, pre-Wisconsinan outwash.

Use of Chemical Surfactants in Disaggregating Argillaceous Rocks. SUZANNE PETERSON, Anoka High School, Anoka, Minnesota 55303, CHRISTOPHER G. MAPLES AND N. GARY LANE, Department of Geology, Indiana University, Bloomington, Indiana 47405.—Breaking down shales and mudstones to release small fossils or other embedded fragments, without damage to limy skeletons, has traditionally relied on either soaking in a petrochemical (kerosene, oleum spirits, and so on) or boiling them in a single chemical surfactant, Quaternary-O (Zingula, 1968). We here report on trial preparation of eight different argillaceous rocks, ranging from soft, marly mudstone (Bangor Formation, Alabama) to siliceous (Fort Payne Chert, Tennessee) and black carbonaceous (New Albany Shale, Indiana) shales. Five commercially available and three experimental surfactants were used, and diluted to a 0.01 molar solution. Each sample was boiled for four hours, the pH of each solution was determined, both before and after boiling, and the sample massed and sieved (20 and 250 mesh) after drying. Quaternary-O was used as a standard for comparison. The masses were used to calculate the percentage of disaggregation of the shale. Results varied widely from shale to shale and surfactant to surfactant, but Quaternary-O and Experimental Surfactant 2 worked best overall. Individually, however, each of the surfactants tested did as well or better than Quaternary-O on individual samples. For example, FC-760 did better on the New Albany Shale than Quaternary-O.

A Structurally and Stratigraphically Anomalous Area near Charlestown, Indiana. PETER A. WORCESTER and JAMES E. McNULTY, Department of Geology, Hanover College, Hanover, Indiana 47243.—A small area about two miles east of Charlestown, Indiana, is anomalous both stratigraphically and structurally with respect to the rest of southeastern Indiana. The surrounding stratigraphy, typical of much of southeastern Indiana, consists of the Dillsboro, Saluda, Brassfield, Salamonie, Waldron, Louisville, and Jeffersonville Formations. Within the anomalous area, a breccia apparently replaces part of the Saluda, the Brassfield, and part of the Salamonie. Above the breccia the Laurel Member of the Salamonie Formation is atypically rich in chert.

Locally within the area, the Dillsboro and Saluda Formations are steeply inclined (as much as 30°) and are cut by small thrust faults. Although their relationship is not yet clear because outcrops of the breccia and especially the deformed beds are few, it is assumed that the breccia is related to the disturbed strata.

Four possible causes of the anomaly are being considered: 1) submarine sedi-

ment flows; 2) local tectonic adjustment during the development of the Cincinnati Arch; 3) meteorite impact; and 4) a combination of 1 and 2 or 3.