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Geology of the Mid-Atlantic Corridor (GOMAC)

A project of the National Cooperative Geologic Mapping Program

What Is the Geology of the Mid-Atlantic Corridor (GOMAC) Project?

The U.S. Geological Survey (USGS) Geology of the Mid-Atlantic Corridor (GOMAC) project, under the National Cooperative Geologic Mapping Program, conducts geologic mapping and related investigations in the urban corridor extending from Virginia to New Jersey. Project efforts are directed to complete 1:100,000-scale geologic mapping of the Washington-Baltimore urban area (figs. 1 and 2), to complete geologic maps of New Jersey in cooperation with the New Jersey Geological Survey, to complete geologic mapping in progress in cooperation with the Maryland Geological Survey and Virginia Division of Mineral Resources, to investigate and interpret the regional geology as a foundation for numerous applications, and to work with other agencies and customers to identify useful information products that can be derived from the geologic mapping.

Why Are Geologic Maps Needed?

Urban areas are dynamic systems that interact with their environments through expansion, consumption of natural resources, production of pollutants, and modification of watersheds. In regions of rapid growth, this interplay changes continually as the urban area evolves and leads to changing needs for geologic information.

The Mid-Atlantic urban corridor is one of the largest and most complex urban areas in the United States. This area of rapidly growing and coalescing cities and towns has sustained three centuries of urban growth. Spatial geologic information about this region is needed to address problems such as those related to the quality and quantity of ground water and surface water; supplies of natural aggregate and industrial minerals (fig. 3); waste disposal (fig. 4); protection of coastal, wetland, and Piedmont environments; and preparation for hazards such as flooding, sinkholes (fig. 5), and slope failure. GOMAC is designed to provide basic geologic information that is relevant to these problems and to contribute to the National Geologic Map Database.

Cooperative geologic mapping in the Mid-Atlantic urban corridor provides information to support land-use decisions, sustain quality water and aggregate resources, avoid natural and induced hazards, and protect fragile environments of the Chesapeake Bay watershed.

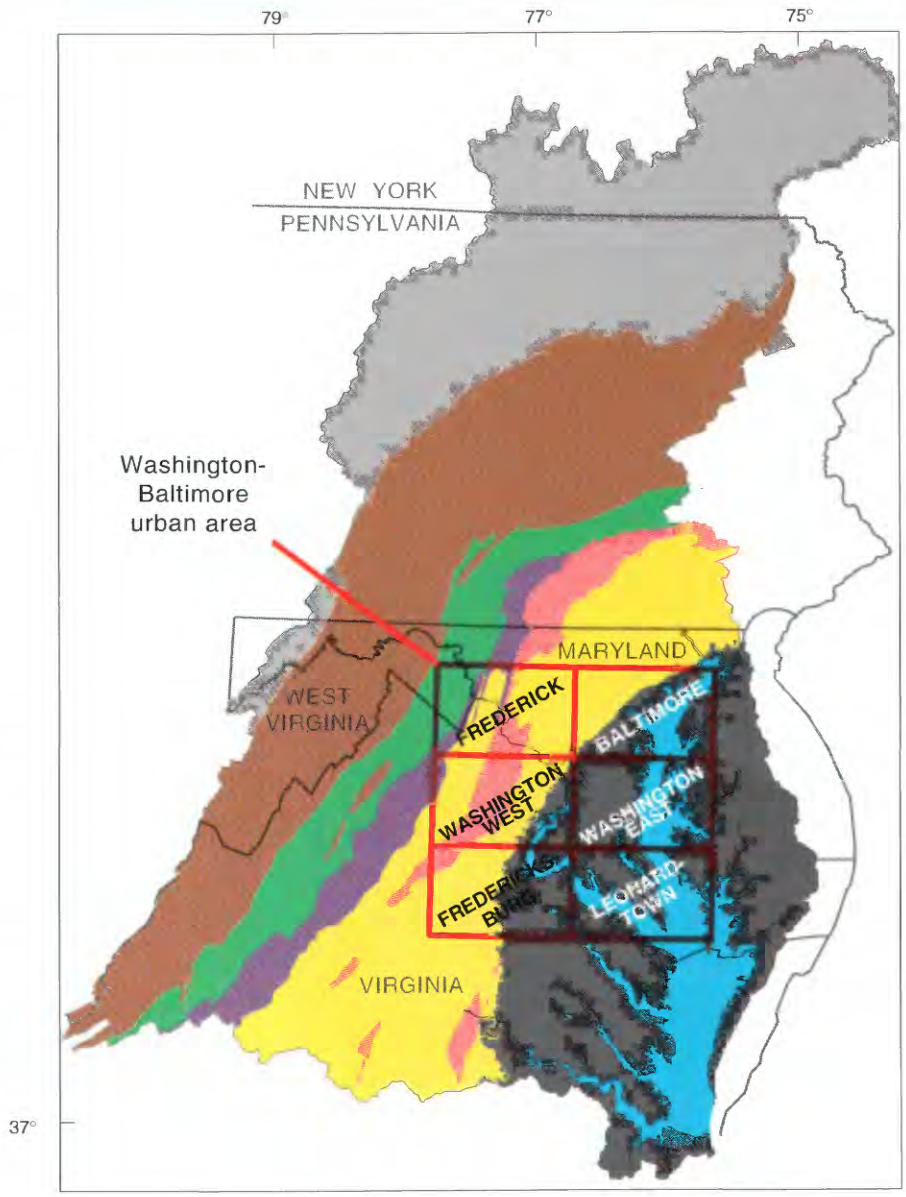

Figure 1. Area of Washington-Baltimore geologic mapping (red boxes) in relation to Chesapeake Bay watershed physiographic provinces, including Atlantic Coastal Plain (dark gray), Piedmont (yellow), Mesozoic basins (pink), Blue Ridge (purple), Great Valley (green), Valley and Ridge (brown), and Appalachian Plateau (light gray). Modified from Langland and others (1995).

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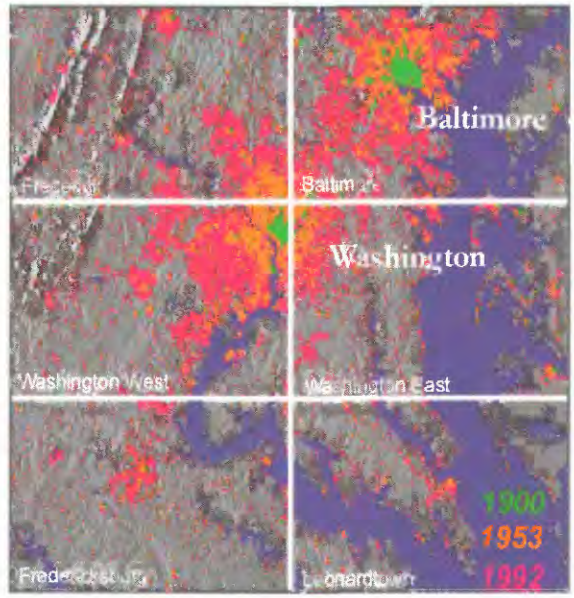

Figure 2. Areas of geologic mapping (30' x 60' quadrangles, white boxes) in relation to urban growth for the years 1900 (green), 1953 (orange), and 1992 (red), adapted from urban growth maps produced by the U.S. Geological Survey Mapping Applications Center in cooperation with the University of Maryland Baltimore County, the U.S. Bureau of Census, and others. Further information is available on the World Wide Web at http://edcwww.cr.usgs.gov/umap/umap.html.

Who Uses Geologic Maps?

In 1997, a "Forum on Geologic Mapping Applications in the Washington-Baltimore Urban Area" was jointly sponsored by the U.S. Geological Survey and the Maryland Geological Survey with assistance from the Virginia Division of Mineral Resources. The forum was a significant step in ongoing efforts to promote communication between users and providers of geologic map information and to encourage user input and partnerships in the design of geologic mapping activities and products. Many different users of geologic maps from private industry, as well as local, State, and Federal agencies and universities, participated in the forum. In the forum proceedings published as USGS Circular 1148 (Horton and Cleaves, 1997), different types of users explain why they need geologic map information, how they use it, and how it can be made more useful. The Circular contains summaries from issue-oriented panel discussions, focus-group assessments of the needs for geologic information, results of customer surveys in Maryland and Virginia, and other information.

GOMAC is responding in several ways to the needs identified by the user community. For example, supplementary layers of information are being added where possible to make geologic maps more useful for special applications. Efforts to standardize terminology and map formats are being encouraged. Regional 1:100,000-scale geologic maps for media such as CD-ROM's and World Wide Web sites are being explored to disseminate information more rapidly. User-friendly formats that can be used to generate customized maps are under consideration. Partners and cooperators are being actively sought in all of these efforts.

Partners and Cooperators

By cooperating with other agencies and actively developing partnerships, GOMAC is attempting to address the identified needs for regional geologic information and to maximize the usefulness of our products. Cooperation and communication with Federal, State, and local agencies and with other user groups are important. Recent surface and subsurface geologic investigations have been conducted in partnership with the National Park Service, U.S. Environmental Protection Agency, and U.S. Army (fig. 6). Ongoing cooperation with State geological surveys includes geologic mapping in collaboration with the Maryland Geological Survey and Virginia Division of Mineral Resources. Other partners include the Maryland National Capital Parks and Planning Commission and several universities. GOMAC provides regional geologic information for other USGS endeavors, including the Chesapeake Bay Ecosystem Program, the Mid-Atlantic Geology and Infrastructure Case Study, and the Southeastern U.S. Mineral Resource Assessment.

What Activities Are Included?

The GOMAC project will—

- Investigate the regional geologic framework as a foundation for applications involving land use, water and aggregate resources, avoidance and remediation of natural and induced hazards, and fragile environments in the Chesapeake Bay watershed.

- Complete geologic mapping of six 30' x 60' quadrangles covering the Washington-Baltimore urban area (figs. 1 and 2), partly in collaboration with the Maryland Geological Survey.

- Complete 1:100,000-scale bedrock and surficial geologic maps of the State of New Jersey.

- Complete geologic mapping in two 30' x 60' quadrangles (South Boston, Appomattox) in cooperation with the Virginia Division of Mineral Resources.

- Work with other agencies, governments, and customers to identify useful information products that can be derived from the mapping data.

How Is GOMAC Designed?

GOMAC's primary effort is directed toward completing the 1:100,000-scale geologic maps of the Washington-Baltimore urban area to provide a basic geologic foundation for land use, resource, and hazard investigations; help build the National Geologic Map Database; and provide a regional geologic base for special applications. Map areas have been chosen on the basis of several considerations, including societal relevance, customer needs, interagency agreements and partnerships, available staff, and contribution to USGS initiatives. Six 30' x 60' quadrangles have been designated for completion in the Washington-Baltimore area (figs. 1 and 2), and nearby quadrangles may be added on the basis of these criteria. Collectively, these geologic mapping efforts will establish a foundation for future infrastructure and water resource investigations, as well as for the USGS Chesapeake Bay Fragile Environments initiative. In addition, the bedrock and surficial geology of New Jersey is being published in 1:100,000-scale maps.

What Products Are Planned?

GOMAC's production of geologic maps in this region is enhanced by building on a legacy of previous work and by collaboration among scientists of the USGS and State geological surveys. Bedrock and surficial geologic maps covering the State of New Jersey (USGS Miscellaneous Investigations Series Maps I–2540–A–D) were recently compiled in cooperation with the New Jersey Geological Survey; the first map (Drake and others, 1996) is published, and the remainder are in production. In the Washington-Baltimore urban area, 1:100,000-scale geologic maps of 30' x 60' quadrangles are being rapidly completed for the National Geologic Map Database. A geologic map of the Leonardtown, Md.-Va., quadrangle has been released (McCartan and others, 1995). Geologic maps of the Fredericksburg, Va.-Md. (Mixon and others, in press), and Washington West, D.C.-Va.-Md., quadrangles were recently submitted for publication, and color plots have been generated from preliminary digital coverages. In collaboration with the

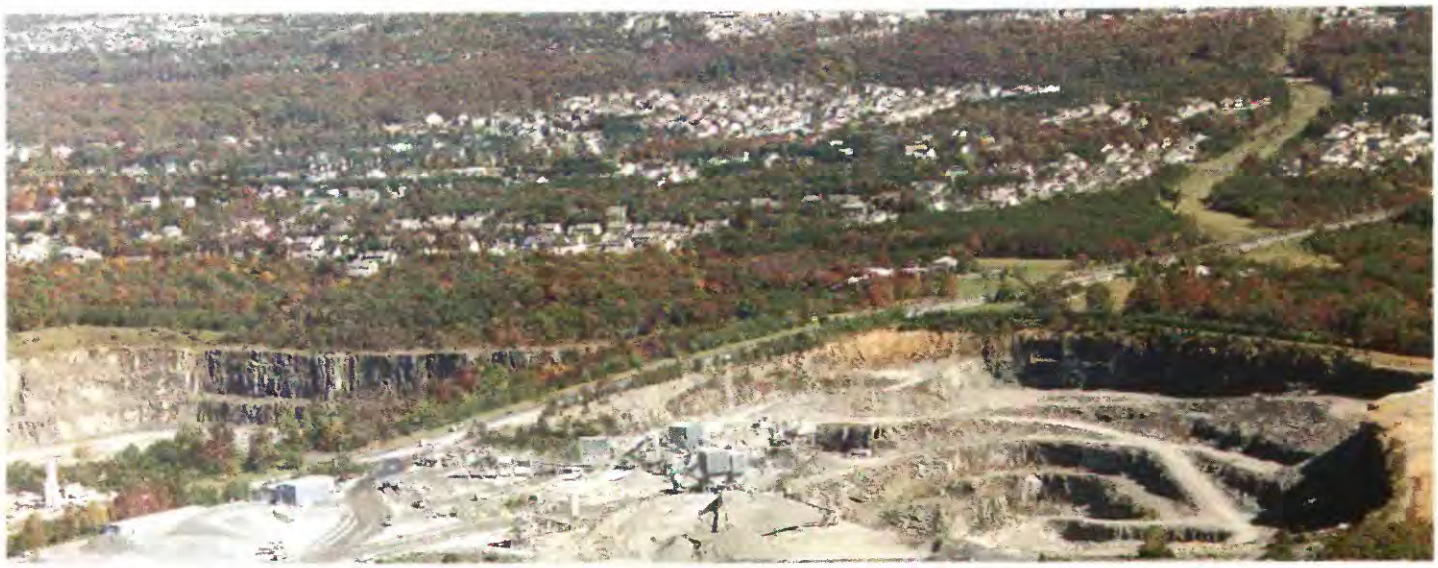

Figure 3. Quarry in Northern Virginia. Geologic maps are used in planning to sustain local supplies of crushed stone. Depending on distance, costs of transportation can exceed those of materials, thus affecting public and private construction costs and local costs of living.

Figure 4. Commercial solid-waste disposal facility in the Patuxent River valley. Understanding the geology of Coastal Plain deposits in this area helped locate clay beds forming the impermeable boundary at the botttom of the pit. Photo by W.L. Newell.

Figure 5. Collapsed home in sinkhole on Ordovician limestone in the Shenandoah Valley exemplifies karst hazards associated with carbonate rocks such as limestone, dolomite, and marble in areas of the Piedmont, Great Valley, and Valley and Ridge. Photo by R.C. Orndorff.

Maryland Geological Survey, geologic mapping of the Frederick, Md.-Va.-W.Va., and Washington East, D.C.-Md., quadrangles is underway. Collectively, these geologic maps of the Washington-Baltimore area will provide a foundation for addressing issues where urban growth is spreading across diverse geological environments of the Atlantic Coastal Plain, Appalachian Piedmont (including Mesozoic Culpeper basin), Blue Ridge, Great Valley, and Valley and Ridge provinces.

In accord with interagency agreements with the Virginia Division of Mineral Resources, collaborative 1:100,000-scale geologic maps are being completed for the Appomattox, Va., and South Boston, Va.-N.C., 30' x 60' quadrangles. The GOMAC project continues to produce 1:24,000-scale geologic maps (fig. 7) in response to the strong demand for detailed information in areas of urban and suburban growth. The quality and accuracy of 1:100,000-scale geologic maps are strongest where these compilations are supported by more detailed mapping and related investigations. Special-purpose maps derived from the basic geologic maps include lithogeochemical maps of the Chesapeake Bay watershed for the USGS Fragile Environments Program and maps delineating potential sources of aggregate for the USGS Mineral Resource Surveys Program.

Sources of Additional Information

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Figure 6. USGS drilling crew helping U.S. Army Corps of Engineers develop a hydrogeologic framework for ground-water modeling at a weapons-disposal Superfund site on the Aberdeen Proving Ground in the Coastal Plain near Chesapeake Bay (Powars, 1997). Geologic mapping includes subsurface as well as surface information. Photo by D.S. Powars.

Figure 7. Image of map showing geology of the Great Falls National Park area, Falls Church 7.5-minute quadrangle, Virginia and Maryland (Drake and Froelich, 1997).

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— J. Wright Horton, Jr.

For more information, please contact:

Wright Horton
U.S. Geological Survey
National Center, MS 926A
Reston, VA 20192
Telephone: (703) 648–6933
E-mail: whorton@usgs.gov