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TOPOGRAPHIC MAPS FOR THE COMMONWEALTH

Harry W. Webb, Jr.

For the first time detailed topographic maps are available for the entire Commonwealth of Virginia. These 805 modern maps, scale 1:24,000, were produced within an 8-year period at a cost of more than $9 million. The maps are graphic representations of an indicated portion of the earth's surface drawn to scale with information being depicted by standard colors and symbols. They provide an inventory of the physical features of the surface; many features are named. To keep these maps up to date each portion of the Commonwealth will be examined for revision need each five years by inspection of growth as depicted on aerial photographs. Maps that are selected to be photorevised will depict cultural growth features in purple. Aerial-mapping photography which complements the symbolization of the topographic map is available in several scales. More than 850 different uses for topographic maps have been demonstrated in 22 categories. All persons interested in the Commonwealth should investigate possible uses of these maps for themselves.

Topographic maps portray both natural and manmade features. A topographic map is comparable to an aerial view of any given area. Each map, according to its scale, pictures a definite portion of our planet. Information on these is shown by standard colors: water features, blue; manmade objects, black; vegetation, green; major highways and selected fence lines, red; and the shape and elevation of the land surface, brown. Symbols are used to indicate the various cultural features such as houses, dams, schools, churches, piers, and other structures. The relationship of horizontal distances depicted on the map to those on the earth's surface is indicated by the map scale. On a map with a scale of 1:24,000, one unit on the map represents 24,000 of the same units on the ground; for example 1 inch on the map equals 24,000 inches on the ground. Elevations above mean sea level are depicted by contour lines and by spot elevations of certain significant locations. Each contour line represents a series of points of equal elevations above sea level; each fifth line usually has the elevation value indicated. The appearance of the land surface can be obtained by inspecting the shape and values of these lines. Names are indicated on these maps in accordance with local accepted usage. In the map margin are the assigned name of the topographic quadrangle, date when the map was surveyed or revised, scale, contour interval, magnetic declination, names of adjoining quadrangle maps, and names of the organizations which prepared and underwrote the cost of the map. (Map format is explained in Webb, H. W., 1968, Topographic maps and their uses: Virginia Minerals, vol. 14, no. 1, p. 1-6. Copies of Virginia Minerals can be ordered from

the Virginia Division of Mineral Resources for 25 cents plus 1 cent sales tax each.)

There are several types of topographic maps available for areas in Virginia. The most significant types are: 1:250,000 series, where 1 inch on the map portrays about 4 miles on the ground; 1:62,500 series, where 1 inch portrays about 1 mile, and 1:24,000 series, where 1 inch portrays about 0.4 mile. The 1:250,000 series, useful for regional planning can be obtained either as flat paper maps or as plastic relief maps (the latter has an exaggerated vertical to horizontal scale ratio of 4:1). The 1:62,500 series includes selected quadrangles with relief shading, which makes the map appear three dimensional. The 1:24,000 series has the most recent and the greatest amount of information depicted. Complete Commonwealth coverage is available only in the 1:24,000 and 1:250,000 series. Base maps of the Commonwealth at the 1:500,000 scale are available in topographic, planimetric, and shaded relief editions. Special maps are available which depict the Shenandoah National Park, Blue Ridge Parkway, and national monuments, seashore, and historical parks.

The preparation of modern topographic maps [redacted] vation, drainage, vegetation, and cultural data which is derived from the stereoscopic inspection of overlapping aerial photographs. These photos are produced under rigid mapping specifications, usually during times of minimal vegetation cover. The horizontal and vertical survey control, classification of cultural features, drainage, and vegetation, and identifying names data are obtained during an on-the-spot examination of the areas being mapped. Uncertain information derived from aerial photographs is also checked at this time. After a multi-editing of the accuracy and clarity of the data shown, the map is printed and made available for sale to the public through U. S. Geological Survey sales offices and map dealers. (Details on map preparation can be obtained from Rader, E. K., 1963, Topographic mapping: Virginia minerals, vol. 9, no. 1, p. 1-7.)

Topographic mapping in Virginia began in 1883 at the 1:125,000-scale (1 inch on the map equals about 2 miles on the earth) series; by 1908 about 75 percent of the Commonwealth had been mapped. The quality of these early reconnaissance-type maps was often dependent upon the mapmaker's skill in artistic sketching and woodsmanship. In 1900 with the realization of the need for maps with greater accuracy and topographic detail, the 1:62,500-scale (1 map inch equals about 1 mile on the earth) series was developed. This soon supplanted the 1:125,000 maps, even before Virginia was fully covered by this series. In 1909 the Comonwealth, with an expenditure of $1750, became one of the first to begin a cooperative mapping program with the U. S. Geological Survey; this program continues to the present. By the late 1930s, due to the demand for even greater detail and accuracy, the present series of mapping on the 1:24,000-scale (1 inch on the map equals 2000 feet on the earth) was begun. At this time the inspection of aerial photographs as well as on-site investigations became a better way of making maps. Each of these maps portrays an area of 7.5 minutes of latitude and longitude, which is about 60 square miles. They have now supplanted the older 1:62,500-scale series. (See U. S. Geological Survey, 1959, Topographic mapping in Virginia: Virginia Minerals, vol. 5, no. 3, p. 1-8, for early history of topographic mapping in Virginia.)

An accelerated cooperative $9 million Commonwealth of Virginia-U. S. Geological Survey mapping program was initiated by the Virginia Division of Mineral Resources in 1962 to complete coverage of the 1:24,000-scale series. (Information on this program for topographic mapping can be found in Virginia Advisory Legislative Council, 1962, Recommendation for topographic mapping: Virginia Minerals, vol. 8, no. 1, p. 1-3.) By November 1972 all of the modern 805 maps needed to depict the State became available. Virginia becomes the tenth state to be completely covered at this scale map. According to Mr. Blackmore, Director, Virginia Commission of Outdoor Recreation, topographic maps are "an invaluable contribution to good planning and resources conservation." With the recognition that maps in urban areas quickly become outdated, a revision program was begun in 1968. Data changes are determined from inspection of aerial photographs within this program; new data is indicated on the map in purple. These photorevised maps, in addition to the usual topographic information, now depict the dimension of time which is useful for planning and urban development (Figure 1); maps for

most independent cities are now available in this form. Beginning Spring 1972 a new method of determining revision need was initiated with the obtaining of high-altitude quad-centered photography for the northern fifth of the Commonwealth. The amount of change determined from photographs data can be obtained on type and extent of woodland, fence and field lines, land use, configuration of ephemeral water bodies, etc., whereas maps classify many features and depict relief. (For a discussion of aerial photography see Penley, H. M., 1969, Aerial photographs in Virginia: Virginia Minerals, vol. 15, no. 2, p. 13-17.)

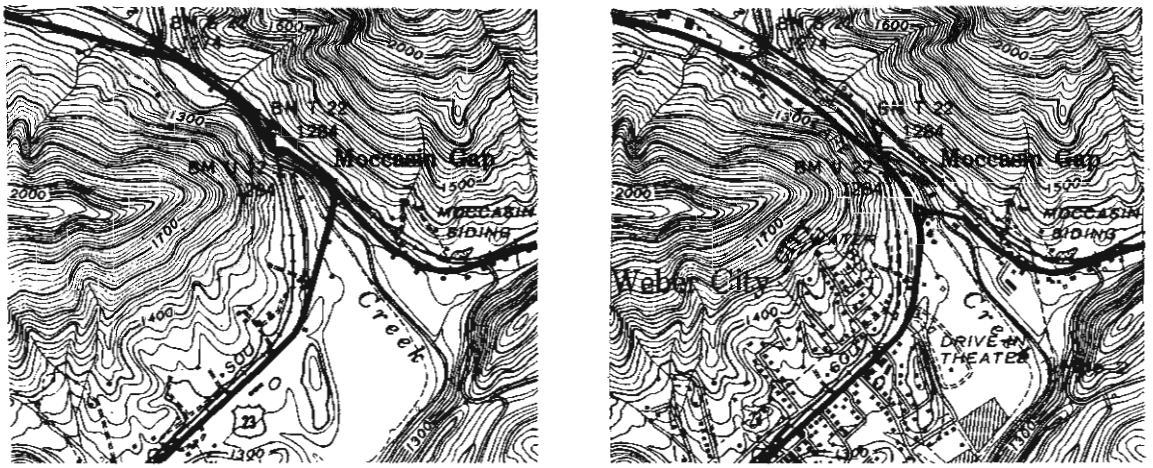

Figure 1. Urban growth depicted on photorevised map; new buildings, water tower, trail, roads, drive-in theater, and drainage alinement were constructed in southern Scott County within a 30-year period (left map, 1938; right map, 1968).

the photographs will determine which maps need to be revised. By this method each portion of the Commonwealth will be examined photographically once every five years.

Cultural names on the 1:24,000-scale series of places, water features, landforms, and churches are being recorded, classified as to type of name, located by city or county and quadrangle designation, and placed onto computer tape. This index of geographic names will be useful in the location of geographic features which are named on the maps.

As a by-product of the cooperative mapping program, aerial photography of about the same scale (1:24,000) as the map is available for most of the Commonwealth. From 15 to 20 of these overlapping 9-inch x 9-inch photo prints are needed to portray the area of the map. Stereoscopic examination of overlapping prints depicts the landscape in three dimensions. For optimum information on the land surface the photos and the corresponding topographic maps made from inspection of the photos complement each other. From Beginning Spring 1972 high altitude quad-centered photography is to be flown for each sector of Virginia once each five years. The first sector includes that part of northern Virginia approximately bounded by Waynesboro-Loretto-Arlington-Winchester-Harrisonburg. Only one of these 9-inch by 9-inch photographs at a scale of about 1:72,000 is needed to depict the area of a 1:24,000-scale map; the center of the photo is the center of the corresponding topographic map. A 3-times enlargement is about the same scale as the map. A topographic map printed on see-through stable-base mylar used with an enlargement of this high-altitude photography would be an effective base to determine surface information or to serve as a base for the plotting of data. Photography can be ordered from the Atlantic Region Engineer, U. S. Geological Survey, 1109 N. Highland Street, Arlington, Va. 22210. Information on availability of other aerial photography flown by government and private agencies can be obtained from the Map Information Office, U. S. Geological Survey, Washington, D.C. 20242.

The following factors should be considered in determining the accuracy of maps. Information is current only to the date of the map. A comparison of new maps with old maps may show that place names have changed or been deleted, or that roads have been renumbered or relocated. Streams also may differ in geographic position, and as a result of the use of more accurate methods of determining horizontal and vertical control, landform shapes may differ. The 1:24,000-scale series presents the best picture of Virginia. Because the paper on which maps are printed is affected by changes in temperature or humidity, scale measurements may differ across the face of the map. Stable-base mylar copies can be obtained. Accuracy of locating points on topographic maps is prescribed under National Map Accuracy Standards. For maps of 1:24,000 scale, 90 percent of well-defined points are within 40 feet of their horizontal position and within one-half contour interval their vertical position. If a map is enlarged, scale measurements may be in error due to the location of certain points, which at the original scale were shifted from their true position to obtain clearance from other adjacent graphic symbols or were enlarged in size so they could be shown on the map. Roads are depicted with a minimal width of 40 feet. Vegetation and cleared areas in woodland less than certain minimal dimensions are not shown.

Over 850 different uses for topographic maps have been demonstrated. Both state and local agencies, individuals, and companies make applications of these. Mr. B. Whitlow, President, Virginia Section, American Institute of Professional Geologists, states that "all concerned with the shape of the ground on which we live should be appreciative" for these maps, "the rewards of which will be continuing and long-term."

Many state agencies are using topographic maps to develop and present information on the surface of the Commonwealth. The Division of Mineral Resources uses them as bases on which to depict geological mapping data such as areal extent of rock type, structural position of rock strata, and position of present and potential quarries (Figure 2), mines, and pits. The Division coordinates the topographic mapping program for the Commonwealth, maintains a sales office, and prepares displays of topographic and geologic features which are depicted on the maps. The Division of Forestry determines access routes and control lines for fire fighting and portrays the areal extent of insect infestation and tree disease. For timber-land management and multiple land-use, topographic maps (Figure 3) are a primary base. Individuals submitting requests under the seed-tree and reforestation acts submit outlines on these maps of the property that is affected.

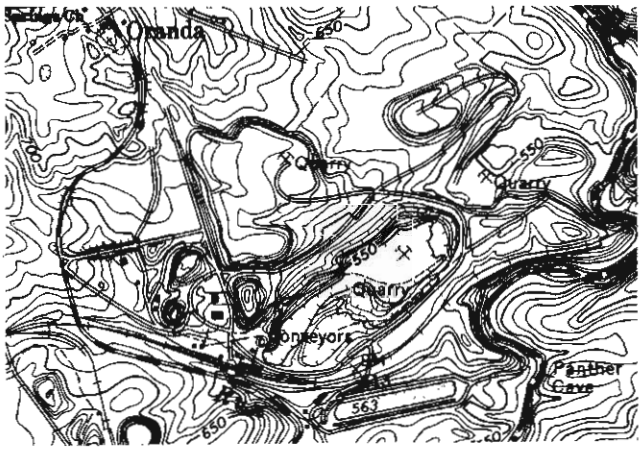

Figure 2. Quarries; shown are the locations of quarries, rock waste piles, and processing equipment, northeastern Shenandoah County.

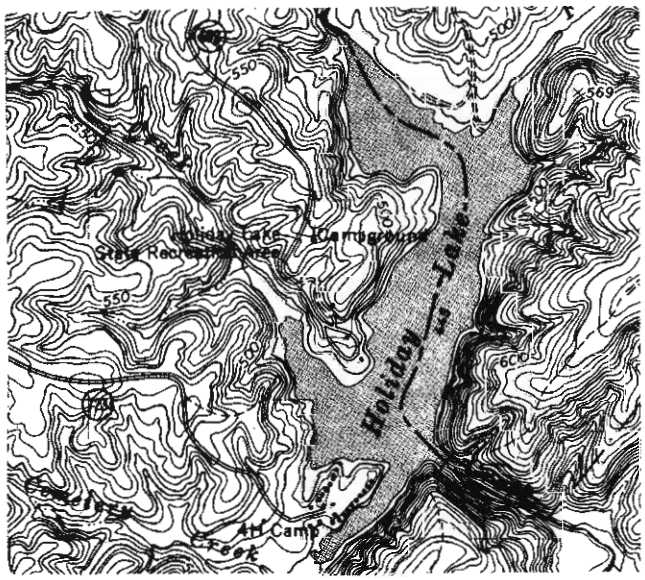

Figure 3. Multiple land-use of forest land; recreation areas have been developed within Appomattox-Buckingham State Forest, eastern Appomattox County.

The Virginia Bureau of Water Resources submits annotated locations for proposed water well sites for public and industrial use. The Game and Inland Fisheries Commission has prepared for distribution sportsmen's guide maps that indicate access routes, boat launching ramps, stocked trout streams, campsites, etc. of their properties utilizing the topographic map as a base. Similar sportsmen maps are available for some state and national forests. The Division of State Planning and Community Affairs depicts the extent of flood plains and drainage basins and assist in zoning studies. Many state planning districts are obtaining stable-base copies to depict their areas. The Central Virginia Planning District, centered on Lynchburg, has prepared reduced copies (scale 1 inch = 1 mile) of these maps in a 9-inch x 11-inch format as field manuals which depict the culture, topography, and drainage of the district and of individual counties. The Division of Industrial Development uses topographic maps to illustrate and to determine the position and surroundings of potential industrial sites (Figure 4).

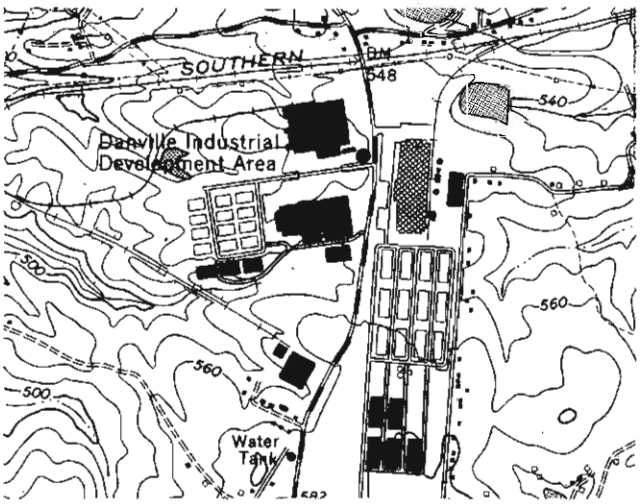

Figure 4. Industrial development site; the relation of industrial buildings to the transportation network is shown, southeastern Pittsylvania County.

The Department of Highways in studies relating to the type and positions of bridges uses maps to determine the location and extent of drainage basins. For the planning of new highway routes, relocations of existing roads, and flying of aerial surveys the topography, drainage, and relief of areas is studied (Figure 5). During times of emergency such as flooding from hurricane Camille 1969 and tropical disturbance Agnes 1972 the Office of Civil Defense determined access routes to aid victims.

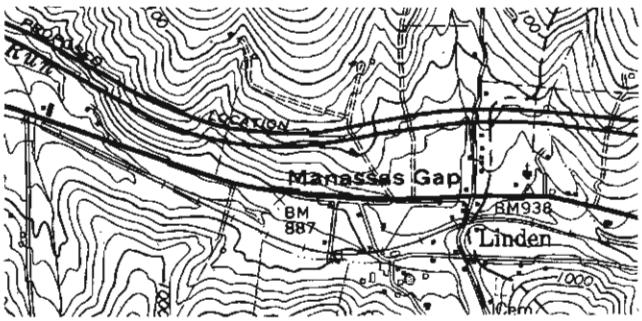

Figure 5. Proposed highway location; this is the proposed route of Interstate 66, southern Loudoun County.

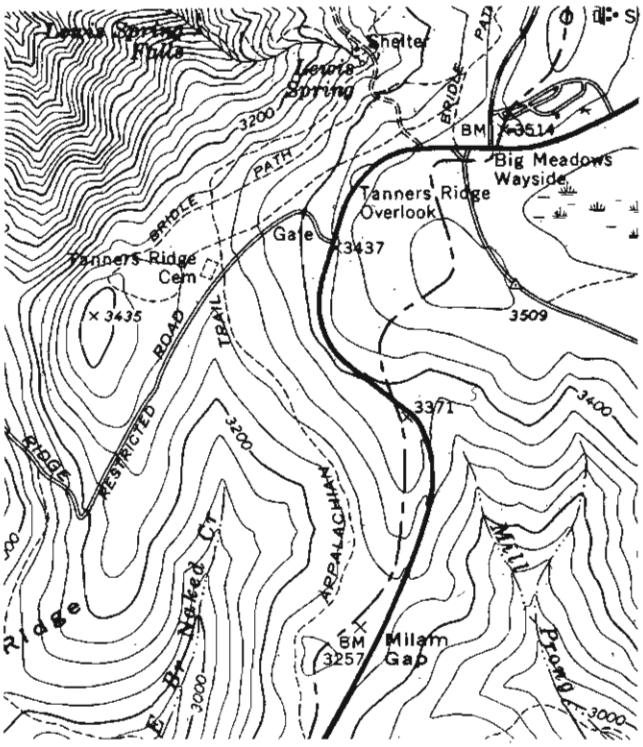

Figure 6. Recreational facilities; a spring, waterfalls, horse and foot trails, fire road, shelter, and overlook are adjacent to the Skyline Drive, Shenandoah National Park.

Multiple applications of topographic maps have been developed by individuals, companies, and local governments of the Commonwealth. Realtors determine favorable areas for development. City and county planners use maps to plan for future expansion or development of urban areas and public utilities, such as pipelines and solid-waste disposals. Bank officials determine the topographic setting of property or buildings as a part of making assessments for loans. Attorneys use them as a source of information on the ground surface and on drainage conditions which affect cases dealing with man's misuse of the environment. Well drillers determine access routes and make preliminary determinations where to drill for water. Ministers in rural areas for reference can annotate their parishioners houses. Policemen, rescue squads, firemen, and game wardens shorten their response time, especially in rural areas, by examining the road network and positions of buildings. Locations of radio transmitters or relay towers which have line-of-sight transmission is aided by inspection of elevations and relief. Salesmen plan how to effectively service their territories by considering the road network and buildings.

Teachers use maps as visual aids in the study of landforms and drainage. Hikers and Boy Scouts determine where to walk and camp from the trails, springs, and shelters shown (Figure 6). Mineral collectors look for quarry and mine symbols. Archeologists determine sites to excavate by looking for flat, high areas near streams.

All 805 quadrangle maps of the 1:24,000-scale series needed to depict the Commonwealth are available. *Each quadrangle* costs 75 cents (plus 4 percent sales tax for maps mailed to Virginia addresses). Maps can be purchased from the Virginia Division of Mineral Resources office or by mail to the Division at Box 3667, Charlottesville, Va. 22903. Prepayment by cash, money order, or check is required; checks are to be made to the order of the Division of Mineral Resources. As this office maintains a limited stock of maps, only five (5) copies of each map can be sold; larger quantities can be ordered from the Distribution Section, Geological Survey, 1200 South Eads Street, Arlington, Va. 22202. A free Index listing names and indicating locations of these 1:24,000-scale maps can be obtained from the Map Information Office, U. S. Geological Survey, Washington, D.C. 20242. This index includes information on other types of maps for Virginia; addresses of firms in Virginia selling maps are also listed. Information on the status of topographic maps being revised and on the applications of the maps can be obtained from the Division of Mineral Resources.

Investigate the various types of topographic maps that are available, examine the information portrayed, and plan to use them in your work or recreation. They will reveal to you new dimensions and knowledge of any area.

GROUND MAGNETIC SURVEY, OUTER COASTAL PLAIN, SOUTHEASTERN VIRGINIA

Robert Q. Oaks, Jr.[1] and William H. Rodgers, Jr.[2]

INTRODUCTION

In June and July, 1963, a ground survey of vertical magnetic intensities was made in the Outer Coastal Plain of southeastern Virginia to extend the program of magnetic investigations of the Coastal Plain that was begun by the Virginia Dision of Mineral Resources in 1960 (Le Van and Pharr, 1963). The purpose of the program was to increase understanding of subsurface geology in the Virginia Coastal Plain. Magnetic data are particularly helpful in supplying information about the "basement," although effects of the basement rocks are progressively masked eastward by the overlying coastal-plain sediment wedge.

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[2]302 River Oaks Drive, New Orleans, Louisiana.

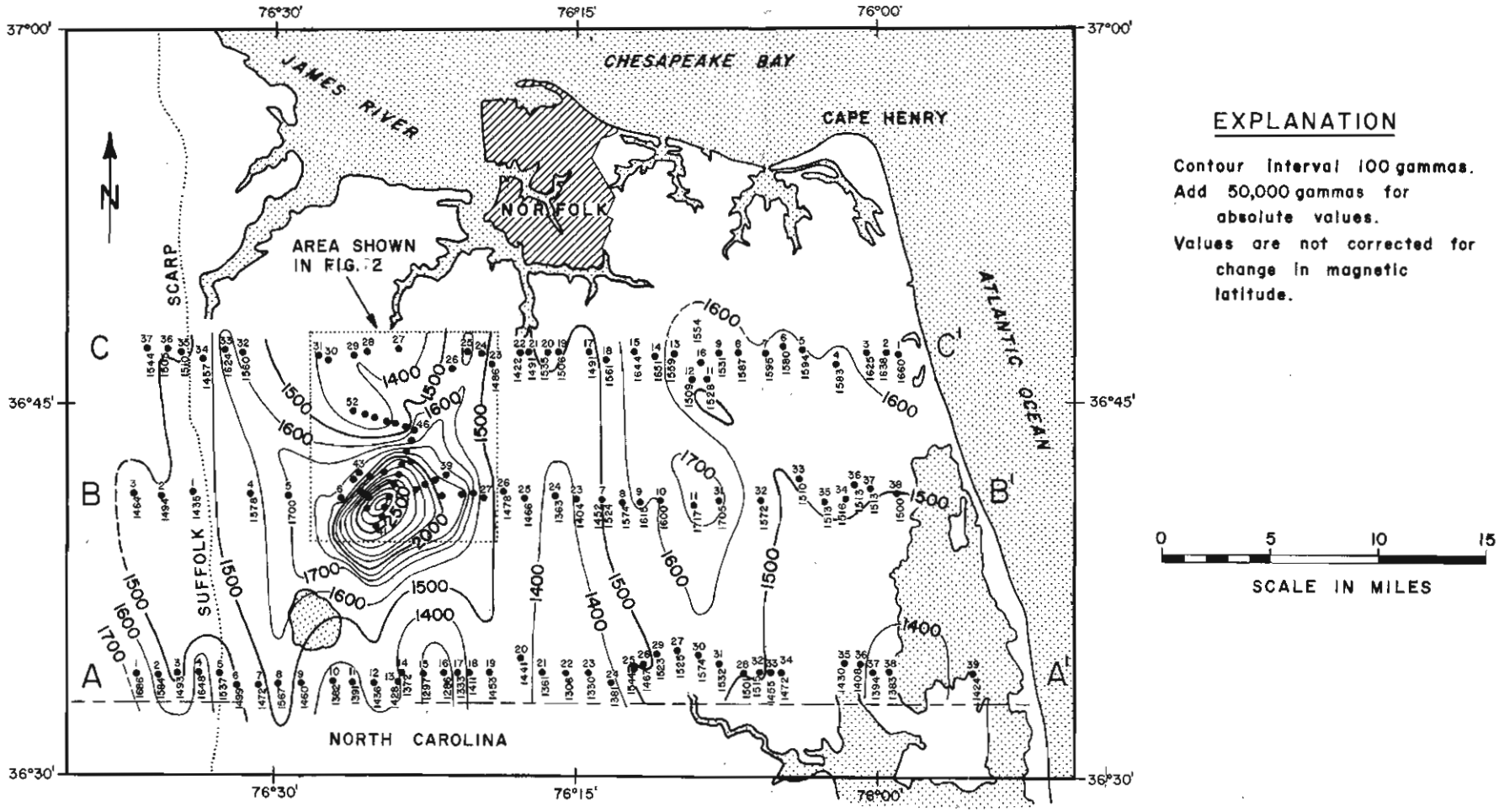

Figure 7. Vertical magnetic intensities, Outer Coastal Plain, southeastern Virginia.

Determinations of the vertical intensity of the earth's magnetic field were made at 130 ground stations which were coordinated with the Fredericksburg Geomagnetic Center, Corbin, Virginia, and were reduced to absolute values for the vertical component of the magnetic field.

In 1972 an aerial-magnetic survey of southeastern Virginia, which includes the area of this report, was completed by the U. S. Geological Survey (1972, open-file report).

The ground survey extended from near Suffolk, Virginia, east to the Atlantic Coast, and from Norfolk, Virginia, south to near the Virginia-North Carolina boundary, an area of approximately 525 square miles (Figure 7). The area forms a divide between northward-flowing drainage into Chesapeake Bay and the James River, and southward-flowing drainage into Albemarle Sound in North Carolina. Low altitude and low relief characterize southeastern Virginia; the most prominent topographic feature is the Suffolk scarp, a Pleistocene shoreline near the west side of the survey area, where the surface elevations rise westward from 25 to 70 feet. East of the Suffolk scarp the subdued topography has a nearly north-south grain closely related to original depositional morphology of Pleistocene coastal sediments (Oaks, 1965).

Sediments underlying the area consist of Cenozoic and Cretaceous wedges of unconsolidated to poorly consolidated clay, sand, gravel, and marl that have a gentle easterly dip. The sediments increase from a feather edge near the Fall Line to a thickness of approximately 2300 feet at Fort Monroe, two miles north of Norfolk (Cederstrom, 1957), and to approximately 2900 feet at Cape Henry (Ewing, Crary, and Rutherford, 1937). These sediments lie on an eastward-dipping erosional surface that truncates underlying igneous and metamorphic rocks and down-faulted inliers of Triassic strata. Granitic basement rocks were encountered in a well at Fort Monroe (Darton, 1902).

Previous gravity and magnetic work in the Virginia Coastal Plain was reviewed by Le Van and Pharr (1963), who also reported on east-west aeromagnetic traverses in southeastern Virginia. They recognized a northwestward-trending magnetic high immediately west of the area reported here, and a broad, subequant slight high around Cape Henry. Their data suggested a north-trending, slight, magnetic low extending from the mouth of the James River southward through Lake Drummond and into North Carolina, and a second slight low with similar trend extending from just south of Portsmouth into North Carolina.

The writers wish to thank the staff members of the Fredericksburg Geomagnetic Center and the Virginia Division of Mineral Resources for their help and cooperation during the present survey.

MAGNETIC SURVEY

The basic ground survey consisted of 113 stations established at approximately one-mile intervals along three east-west traverses eight miles apart. From south to north the traverses are: A-A′, B-B′, and C-C′ (Figure 7). Seventeen additional stations were established at approximately 0.5-mile intervals northeast of Lake Drummond near traverse B-B′ to define the magnitude, shape, and extent of a limited magnetic high (Figure 8).

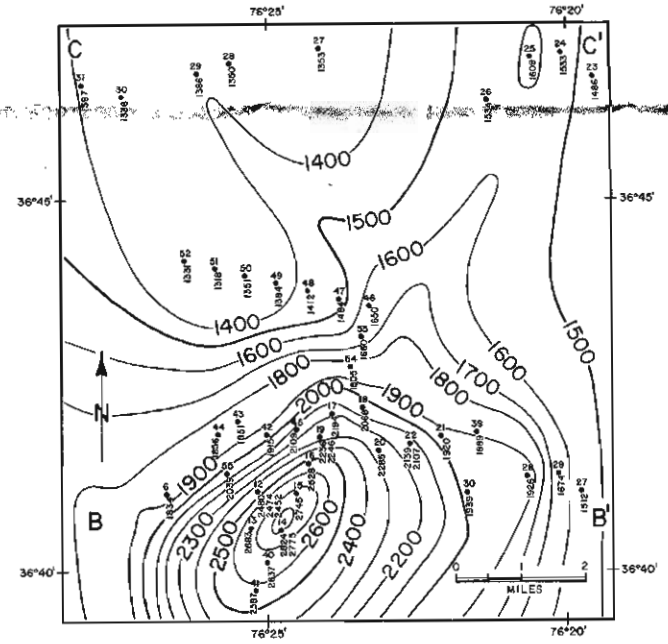

Figure 8. Vertical magnetic intensities near positive anomaly northeast of Lake Drummond (see Figure 7, for location and explanation).

The Askania Magnetic Field Balance Model GF-6 was used to measure the vertical component of the earth's magnetic field. The scale value

of the instrument was determined initially by means of a Helmholtz coil at the Fredericksburg Geomagnetic Center; the value was checked periodically in the field by use of the coil. The scale value ranged from 27.1 to 28.5 gammas per scale division during the survey.

All stations were established some distance from roads, powerlines, fences, buildings, and other potential sources of magnetic interferences. Locations of stations were plotted on 7.5-minute topographic maps.

Four readings were made at each station, two with the north end of the magnet system oriented east, and two with the north end oriented west. To minimize errors due to orientation these four readings were averaged to obtain a mean for each station. The mean magnetic reading for each station was corrected for temperature and for diurnal variations of the earth's magnetic field. The latter correction was made by adjusting field data to variometer curves established by the Fredericksburg Geomagnetic Center; this permitted field readings to be reduced to absolute values. The final values reported here are not corrected for differences in magnetic latitude.

Calibration with the Fredericksburg Geomagnetic Center was made on June 17, 1963. Field readings and coordination of the survey with the Center were made by W. H. Rodgers, Jr. and Thomas Huber between June 19 and July 3, 1963. Necessary adjustments of field readings were made by the authors.

The configuration of vertical intensity of the earth's magnetic field in the Outer Coastal Plain of southeastern Virginia is shown in Figures 7 and 8. Observed values of vertical magnetic intensity lie between 51286 (A-16) and 52824 (B-14) gammas, a range of 1538 gammas.

The most prominent magnetic feature in the survey area is a northeastward-trending elliptical high five to eight miles in diameter, with a relief of 1100 to 1400 gammas, which occurs northeast of Lake Drummond. Over most of the remaining area north-trending highs and lows of slight relief are present; however, magnetic values near the coast show little variation, and in the northeast appear to have an indistinct east-west trend. Between Suffolk and Norfolk, magnetic lows surround the elliptical magnetic high. The eastern end of traverse C-C′ appears to define the irregular southern boundary of the broad subequant high that Le Van and Pharr recognized around Cape Henry.

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AEROMAGNETIC MAPS, SOUTHEASTERN VIRGINIA

An open-file aeromagnetic map of southeastern Virginia by the U. S. Geological Survey at a scale of 1:250,000 was released on November 16, 1972. This map and the fifty-four 1:62,500-scale sheets from which the 1:250,000 composite was made are available for reference in the Division's library at Charlottesville. Ozalid copies of each map are available from the Division for distribution to interested persons. The price of the 1:250,000 composite map is $2.50 and each individual 1:62,500 map is $5.00; each order to be mailed to addresses in Virginia should additionally include 4 percent for sales tax. Orders for individual 1:62,500-scale maps (15-minute quadrangle area each) should be by map number as indicated in Figure 9.

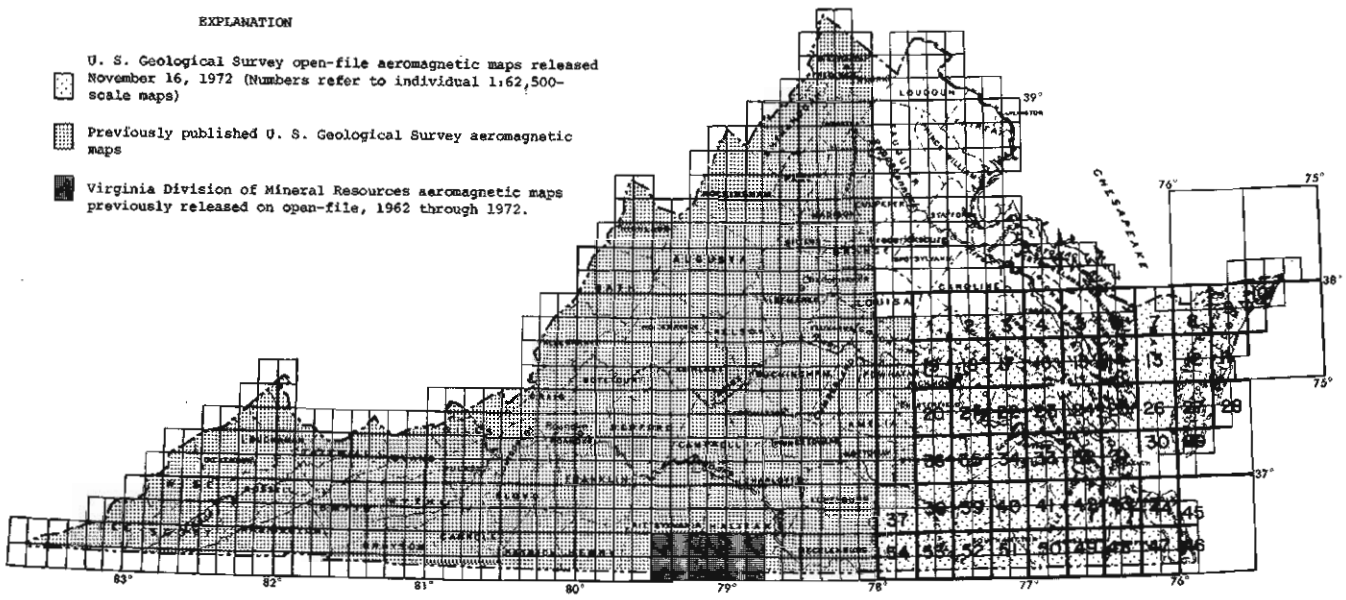

Figure 9. Index to aeromagnetic surveys in Virginia.

THE MINERAL INDUSTRY OF VIRGINIA IN 1972[1]

PRELIMINARY DATA

Total value of mineral output in 1972 in Virginia was $440.8 million, an increase of $55.6 million according to estimates by the Bureau of Mines, United States Department of the Interior. The value was 14 percent greater than the $385.2 million reported in 1971. This was the tenth consecutive year that mineral values have increased. Of the total mineral production value, approximately 69 percent was contributed by fuels, 2 percent by metals, and 29 percent by nonmetals.

Production of bituminous coal, the Commonwealth's leading commodity, increased 11 percent to 34 million short tons and output value increased by 20 percent. Natural gas output increased 11 percent and value increased 13 percent, while petroleum production was unchanged.

Stone, the second ranking commodity in Virginia's mineral economy, increased 9 percent in output and 13 percent in value. Sand and gravel increased 5 percent in output, but declined 3 percent in value. Clay increased slightly in both output and value while lime continued to decline from the highs of 1969. Masonry cement increased in shipments and value while portland cement declined in both categories.

Lead production increased 6 percent and value increased 16 percent. Zinc output increased slightly; however, output value increased 12 percent.

[1]Prepared in Division of Fossil Fuels, U. S. Bureau of Mines, under a cooperative agreement between the Bureau and the Virginia Division of Mineral Resources.

Table 1. — Mineral production in Virginia.[1]

Mineral	1971 Quantity	1971 Value (thousands)	1972 Quantity	1972 Value (thousands)
Clays ..... thousand short tones	1,710	$ 1,800	1,740	$ 1,830
Coal (bituminous) ..... do	30,628	254,870	34,000	305,000
Gem stones	NA	12	NA	13
Lead (recoverable content of ores, etc.) ..... short tons	3,386	934	3,600	1,084
Lime ..... thousand short tons	759	11,049	734	10,700
Natural gas ..... million cubic feet	2,619	822	2,900	931
Petroleum (crude) ..... thousand 42-gallon barrels	1	W	1	W
Sand and gravel ..... thousand short tons	12,796	20,201	13,435	19,538
Soapstone ..... short tons	3,704	8	3,900	9
Stone ..... thousand short tons	34,643	63,482	37,648	71,579
Zinc[2] (recoverable content of ores, etc.) ..... short tons	16,829	5,419	17,000	6,052
Value of items that cannot be disclosed: Aplite, cement, feldspar, gypsum, kyanite, salt, titanium concentrate, and values indicated by symbol W	—	26,564	—	24,020
Total	—	$385,161	—	$440,756

NA Not available. W Withheld to avoid disclosing individual company confidential data.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Recoverable zinc valued at the yearly average price of prime western slab zinc, East St. Louis market. Value established after transportation, smelting, and manufacturing charges have been added to the value of ore at the mine.

VIRGINIA FIELD CONFERENCE

The fourth annual Virginia Field Conference, led by C. S. Bartlett, Jr., Emory and Henry College, Emory, Virginia and H. W. Webb, Jr., Virginia Division of Mineral Resources, Charlottesville, was held on October 27-29, 1972 from Abingdon, Virginia. More than 200 people from 10 states and the District of Columbia examined geologic features in the Virginia part of the Bristol and Wallace quadrangles and inspected lower Mississippian rocks in the northwestern portions of Washington and Smyth counties. Virginia participants from many parts of the Commonwealth included geology professors, high school earth science teachers, secondary school science supervisors, state resources agencies, the U. S. Geological Survey, a gem and mineral society, an archeological society, and students. The Saturday lunch stop was at scenic Abrams Falls, recently designated as a critical environmental area. A 50-page illustrated guidebook with road logs and applicable articles on the Price and Grainger formations by C. S. Bartlett, Jr.; R. D. Kreisa, Virginia Division of Mineral Resources; and K. O. Hasson, East Tennessee State University was prepared. Copies of the guidebook are available for $1.50 each from C. S. Bartlett, Jr., Department of Geology, Emory and Henry College. The Virginia Field Conference is sponsored by the geology section of the Virginia Academy of Science for all people interested in earth science of the Commonwealth.

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TOPOGRAPHIC MAPS

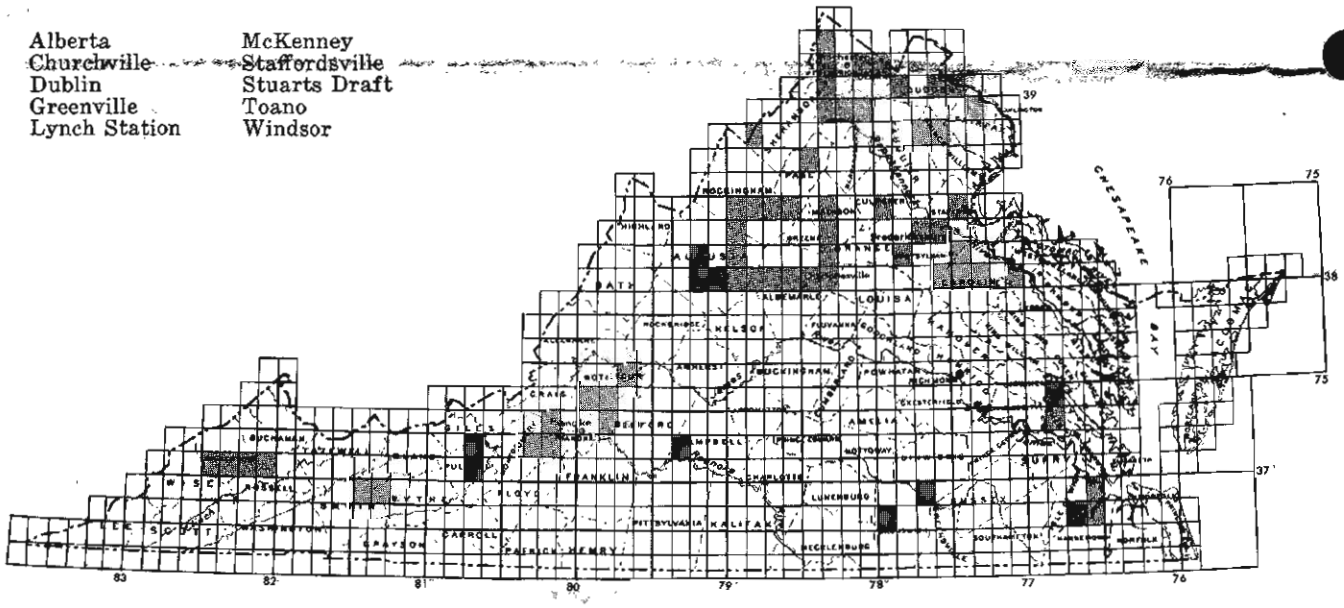
7.5-MINUTE QUADRANGLE MAPS

☐ Maps published prior to October 1, 1972

▒ Map updating in progress

■ Updated maps published from October 1, 1972 through December 31, 1972:

Alberta	McKenney
Churchville	Staffordsville
Dublin	Stuarts Draft
Greenville	Toano
Lynch Station	Windsor



PUBLISHED MAPS

State index is available free. Updated maps, on which recent cultural changes are indicated, are now available for certain areas of industrial, residential, or commercial growth. Published maps are available at 75 cents each (plus 4 percent state sales tax for Virginia residents) from the Virginia Division of Mineral Resources, Box 3667, Charlottesville, VA 22903.