COMMONWEALTH OF VIRGINIA
DEPARTMENT OF MINES, MINERALS AND ENERGY
DIVISION OF MINERAL RESOURCES

THIS MAP PREPARED IN COOPERATION WITH THE
DEPARTMENT OF INTERIOR GEOLOGICAL SURVEY

PUBLICATION 47
SIMPLE BOUGUER GRAVITY ANOMALY MAP
OF THE
FARMVILLE, BRIERY CREEK, ROANOKE CREEK,
RANDOLPH, AND SCOTTSBURG BASINS AND
VICINITY, VIRGINIA

SIMPLE BOUGUER GRAVITY ANOMALY MAP OF THE FARMVILLE, BRIERY CREEK, ROANOKE CREEK, RANDOLPH, AND SCOTTSBURG BASINS AND VICINITY, VIRGINIA

Stanley S. Johnson, Gerald P. Wilkes, and Tracy L. Zeiler[1]

1985

GENERAL GEOLOGY

The Farmville basin in east-central Virginia is a north-northeast trending faulted trough that contains Early Mesozoic sedimentary (and minor igneous) rocks. The basin is surrounded by crystalline rocks of the Piedmont Province. Four other basins, all much smaller than the Farmville basin, are located to the southwest. These smaller basins are from north to south the Briery Creek, Roanoke Creek, Randolph, and Scottsburg basins. These five fragmentary basins form part of a belt of faulted basins, all of early Mesozoic age, that lie along the east coast of North America from Georgia to Nova Scotia. This group of five exposed basins is referred to as the central belt in Virginia. The eastern belt is made up of the Taylorsville, Richmond, and several small outlying basins in the same general area; the western belt consists of the Culpeper, Barboursville, Scottsville, and Danville basins. Coastal Plain sediments cover Mesozoic age basins east of the fall line.

The Farmville basin is about 27 miles long and about four miles wide at its maximum width. The basin is exposed over an area of approximately 65 square miles (Weems, 1980). The other basins to the southwest are each less than eight miles long and three miles wide. All five basins are surrounded and underlain by igneous and metamorphic rocks.

The Triassic sedimentary rocks of fluvial origin are mainly conglomerate, arkosic sandstone, and siltstone ("red beds"), but some lacustrine limestone lenses, shales, and coal measures are locally important. Most of the clastic Triassic strata was probably derived from nearby source areas. Some of the material was rapidly deposited and had probably been moved only a relatively short distance. The detritus was deposited in a dynamic, intermittently closed basin environment. The depositional environment was characterized and influenced by changing drainage patterns, source area, subsidence and intermittent movement along border faults.

The Triassic sedimentary rocks in the central belt generally dip westward toward major normal faults. These faults form the western margin of all central belt basins. The Triassic strata of the eastern margin of the basins are generally in unconformable contacts with crystalline rock. but normal and strike-slip faults are also recognized. The table summarizes the Triassic stratigraphy in the central belt basins.

Table. Triassic stratigraphy of the central belt.

Name	Character	Map Designation
Siltstone-shale	Predominantly light-gray siltstone and shale with lesser amounts of red-brown sandstone, quartz-pebble conglomerate, dark gray mudstone and coal.	Trssh Trcm where coal outcrops
Arkosic sandstone	Massive to thick-bedded arkosic sandstone with minor beds of red-brown sandstone, siltstone and shale.	Tra
Arkosic conglomerate	Subangular to subround boulder and pebble sized clasts of metamorphic rock in a light gray arkosic sandstone matrix. Silica-calcite cement.	Trac
Breccia-conglomerate	Clasts up to 18 inches of angular to subangular metamorphic and igneous rock in a dark red sandy matrix.	Trbc

[1]Pratt and Whitney Aircraft, Hartford, CT

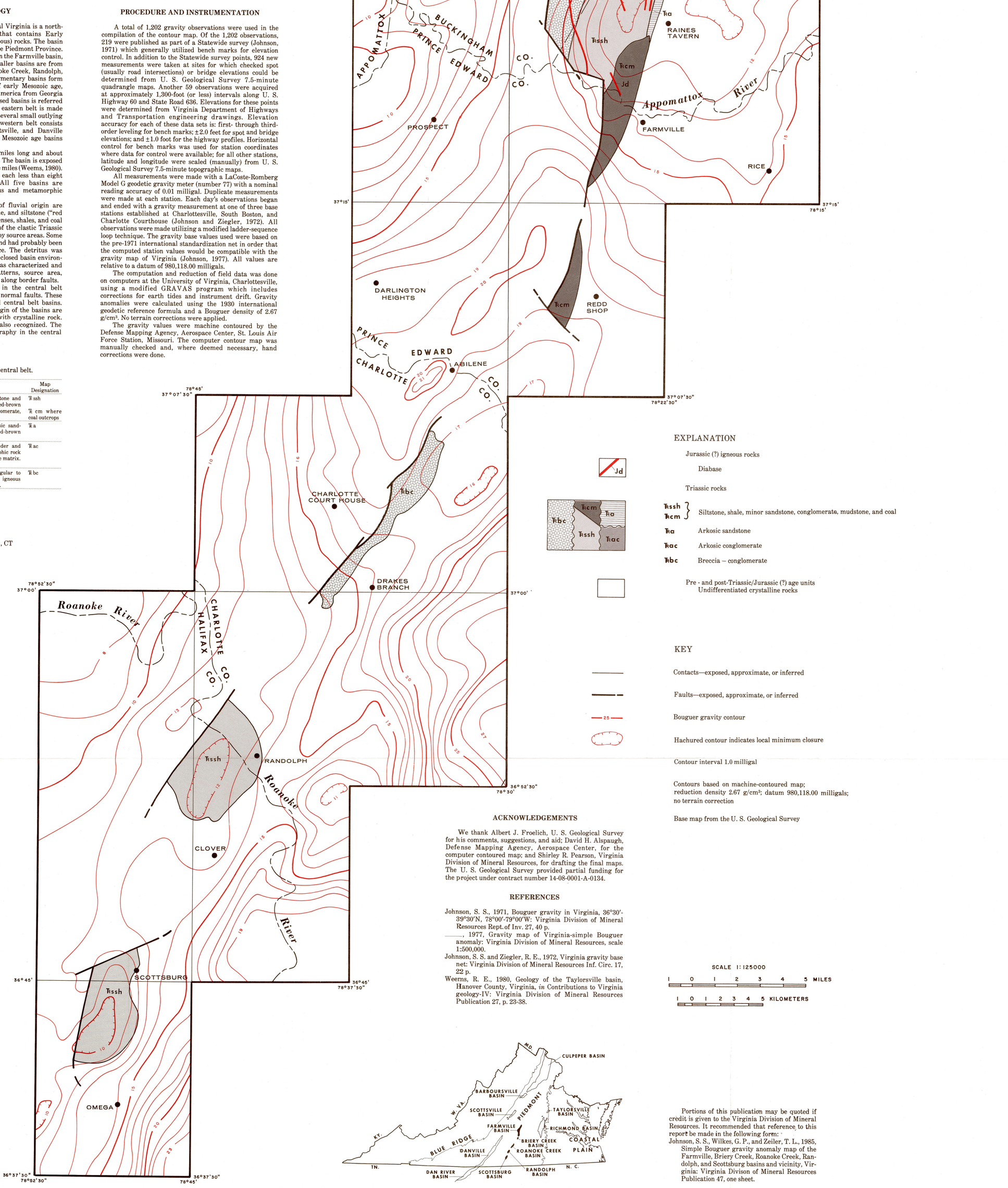
PROCEDURE AND INSTRUMENTATION

A total of 1,202 gravity observations were used in the compilation of the contour map. Of the 1,202 observations, 219 were published as part of a Statewide survey (Johnson, 1971) which generally utilized bench marks for elevation control. In addition to the Statewide survey points, 924 new measurements were taken at sites for which checked spot (usually road intersections) or bridge elevations could be determined from U. S. Geological Survey 7.5-minute quadrangle maps. Another 59 observations were acquired at approximately 1,300-foot (or less) intervals along U. S. Highway 60 and State Road 636. Elevations for these points were determined from Virginia Department of Highways and Transportation engineering drawings. Elevation accuracy for each of these data sets is: first- through third-order leveling for bench marks; ±2.0 feet for spot and bridge elevations; and ±1.0 foot for the highway profiles. Horizontal control for bench marks was used for station coordinates where data for control were available; for all other stations, latitude and longitude were scaled (manually) from U. S. Geological Survey 7.5-minute topographic maps.

All measurements were made with a LaCoste-Romberg Model G geodetic gravity meter (number 77) with a nominal reading accuracy of 0.01 milligal. Duplicate measurements were made at each station. Each day's observations began and ended with a gravity measurement at one of three base stations established at Charlottesville, South Boston, and Charlotte Courthouse (Johnson and Ziegler, 1972). All observations were made utilizing a modified ladder-sequence loop technique. The gravity base values used were based on the pre-1971 international standardization net in order that the computed station values would be compatible with the gravity map of Virginia (Johnson, 1977). All values are relative to a datum of 980,118.00 milligals.

The computation and reduction of field data was done on computers at the University of Virginia, Charlottesville, using a modified GRAVAS program which includes corrections for earth tides and instrument drift. Gravity anomalies were calculated using the 1930 international geodetic reference formula and a Bouguer density of 2.67 g/cm³. No terrain corrections were applied.

The gravity values were machine contoured by the Defense Mapping Agency, Aerospace Center, St. Louis Air Force Station, Missouri. The computer contour map was manually checked and, where deemed necessary, hand corrections were done.



EXPLANATION

Jurassic (?) igneous rocks

Jd — Diabase

Triassic rocks

Trssh, Trcm — Siltstone, shale, minor sandstone, conglomerate, mudstone, and coal

Tra — Arkosic sandstone

Trac — Arkosic conglomerate

Trbc — Breccia – conglomerate

Pre - and post-Triassic/Jurassic (?) age units
Undifferentiated crystalline rocks

KEY

Contacts—exposed, approximate, or inferred

Faults—exposed, approximate, or inferred

25 — Bouguer gravity contour

Hachured contour indicates local minimum closure

Contour interval 1.0 milligal

Contours based on machine-contoured map; reduction density 2.67 g/cm³; datum 980,118.00 milligals; no terrain correction

Base map from the U. S. Geological Survey

ACKNOWLEDGEMENTS

We thank Albert J. Froelich, U. S. Geological Survey for his comments, suggestions, and aid; David H. Alspaugh, Defense Mapping Agency, Aerospace Center, for the computer contoured map; and Shirley R. Pearson, Virginia Division of Mineral Resources, for drafting the final maps. The U. S. Geological Survey provided partial funding for the project under contract number 14-08-0001-A-0134.

REFERENCES

Johnson, S. S., 1971, Bouguer gravity in Virginia, 36°30'-39°30'N, 78°00'-79°00'W: Virginia Division of Mineral Resources Rept. of Inv. 27, 40 p.

——, 1977, Gravity map of Virginia-simple Bouguer anomaly: Virginia Division of Mineral Resources, scale 1:500,000.

Johnson, S. S. and Ziegler, R. E., 1972, Virginia gravity base net: Virginia Division of Mineral Resources Inf. Circ. 17, 22 p.

Weems, R. E., 1980, Geology of the Taylorsville basin, Hanover County, Virginia, *in* Contributions to Virginia geology-IV: Virginia Division of Mineral Resources Publication 27, p. 23-38.

SCALE 1:125000

1 0 1 2 3 4 5 MILES

1 0 1 2 3 4 5 KILOMETERS