

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science Directorate
Geologic Resources Division



Thomas Stone National Historic Site

GRI Ancillary Map Information Document

Produced to accompany the Geologic Resources Inventory (GRI) Digital Geologic Data for Thomas Stone National Historic Site

thst_geology.pdf

Version: 9/9/2021

Geologic Resources Inventory Map Document for Thomas Stone National Historic Site

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Geologic Resources Inventory Map Document



Thomas Stone National Historic Site, Maryland and Virginia

Document to Accompany Digital Geologic-GIS Data

[thst_geology.pdf](#)

Version: 9/9/2021

This document has been developed to accompany the digital geologic-GIS data developed by the Geologic Resources Inventory (GRI) program for Thomas Stone National Historic Site, Maryland and Virginia (THST).

Attempts have been made to reproduce all aspects of the original source products, including the geologic units and their descriptions, geologic cross sections, the geologic report, references and all other pertinent images and information contained in the original publication.

This document contains the following information:

- 1) **About the NPS Geologic Resources Inventory Program** – A brief summary of the Geologic Resources Inventory (GRI) Program and its products. Included are web links to the GRI GIS data model, and to the GRI products page where digital geologic-GIS datasets, scoping reports and geology reports are available for download. In addition, web links to the NPS Data Store and GRI program home page, as well as contact information for the GRI coordinator, are also present.
- 2) **GRI Digital Maps and Source Citations** – A listing of the GRI digital geologic-GIS maps produced for this project along with sources used in their completion. In addition, a brief explanation of how each source map was used is provided.
- 3) **Map Unit List** – A listing of all geologic map units present on maps for this project, generally listed from youngest to oldest.
- 4) **Map Unit Descriptions** – Descriptions for all geologic map units. If a unit is present on multiple source maps the unit is listed with its source geologic unit symbol, unit name and unit age followed by the unit's description for each source map.
- 5) **Geologic Cross Sections** – Geologic cross section graphics with source geologic cross section abbreviations.
- 6) **Ancillary Source Map Information** – Additional source map information presented by source map.
- 7) **GRI Digital Data Credits** – GRI digital geologic-GIS data and ancillary map information document production credits.

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About the NPS Geologic Resources Inventory Program

Background

The Geologic Resources Inventory (GRI) provides geologic map data and pertinent geologic information to support resource management and science-informed decision making in more than 270 natural resource parks throughout the National Park System. Geologic resources for management consideration include both the processes that act upon the Earth and the features formed as a result of these processes. Geologic processes include: erosion and sedimentation; seismic, volcanic, and geothermal activity; glaciation, rockfalls, landslides, and shoreline change. Geologic features include mountains, canyons, natural arches and bridges, minerals, rocks, fossils, cave and karst systems, beaches, dunes, glaciers, volcanoes, and faults.

The GRI is one of 12 inventories funded by the National Park Service (NPS) Inventory and Monitoring Program. The Geologic Resources Division of the NPS Natural Resource Stewardship and Science Directorate administers the GRI. The NPS Geologic Resources Division partners with the Colorado State University Department of Geosciences to produce GRI products. Many additional partners participate in the GRI process by contributing source maps or reviewing products.

The GRI team undertakes three tasks for each park in the Inventory and Monitoring program: (1) conduct a scoping meeting and provide a summary document, (2) provide digital geologic map data in a geographic information system (GIS) format, and (3) provide a GRI report. These products are designed and written for nongeoscientists.

Products

Scoping Meetings: These park-specific meetings bring together local geologic experts and park staff to inventory and review available geologic data and discuss geologic resource management issues. A summary document is prepared for each meeting that identifies a plan to provide digital map data for the park.

Digital Geologic Maps: Digital geologic maps reproduce all aspects of traditional paper maps, including notes, legend, and cross sections. Bedrock, surficial, and special purpose maps such as coastal or geologic hazard maps may be used by the GRI to create digital Geographic Information Systems (GIS) data and meet park needs. These digital GIS data allow geologic information to be easily viewed and analyzed in conjunction with a wide range of other resource management information data.

For detailed information regarding GIS parameters such as data attribute field definitions, attribute field codes, value definitions, and rules that govern relationships found in the data, refer to the NPS Geology-GIS Data Model document available at: <https://www.nps.gov/articles/gri-geodatabase-model.htm>

Geologic Reports: GRI reports synthesize discussions from the original scoping meeting, follow up conference call(s), and subsequent research. Chapters of each report discuss the geologic setting of the park, distinctive geologic features and processes within the park, highlight geologic issues facing resource managers, and describe the geologic history leading to the present-day landscape. Each report also includes a poster illustrating these GRI digital geologic-GIS data.

For a complete listing of GRI products visit the GRI publications webpage: <https://go.nps.gov/gripubs>. GRI digital geologic-GIS data is also available online at the NPS Data Store: <https://irma.nps.gov/DataStore/Search/Quick>. To find GRI data for a specific park or parks select the appropriate park(s), enter "GRI" as a Search Text term, and then select the Search button.

For more information about the Geologic Resources Inventory Program visit the GRI webpage: <https://>

www.nps.gov/subjects/geology/gri.htm. At the bottom of that webpage is a “Contact Us” link if you need additional information. You may also directly contact the program coordinator:

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The Geologic Resources Inventory (GRI) program is funded by the National Park Service (NPS) Inventory and Monitoring (I&M) Division. Learn more about I&M and the 12 baseline inventories at the I&M webpage: <https://www.nps.gov/im/inventories.htm>.

GRI Digital Maps and Source Map Citations

The GRI digital geologic-GIS maps for Thomas Stone National Historic Site, Maryland and Virginia (THST) are presented below. There is a park and vicinity map, as well as a map of the Port Tobacco quadrangle.

Digital Geologic-GIS Map of Thomas Stone National Historic Site and Vicinity, Maryland and Virginia (*GRI MapCode THST*)

The map was produced from the following source maps.

Mixon, Robert B. et al., 2000, Geologic Map of the Fredericksburg 30' x 60' Quadrangle, Virginia and Maryland: U.S. Geological Survey, Geologic Investigations Series Map I-2607, scale 1:100,000 ([Fredericksburg 30' x 60' Quadrangle](#)). (*GRI Source Map ID 2540*).

Glaser, J.D., 1984, Geologic Map of the Port Tobacco Quadrangle, Prince Georges and Charles Counties, Maryland: Maryland Geological Survey, Quadrangle Geologic Map, scale 1:24,000 ([Port Tobacco Quadrangle](#)). (*GRI Source Map ID 2942*).

The full extent of the Port Tobacco Quadrangle (Glaser, 1984) source map was used, and all geologic features within the extent were captured. For the Fredericksburg 30' x 60' Quadrangle source map (Mixon et al., 2000), only a portion of the source map extent, the Mathias Point and Nanjemoy quadrangles, was used, however, all geologic features within this extent were captured.

Digital Geologic-GIS Map of the Port Tobacco Quadrangle, Maryland (*GRI MapCode POTO*)

The source map for the Port Tobacco map, the Port Tobacco Quadrangle (Glaser, 1984), and how it was used is noted above with the park extent and vicinity map.

Additional information pertaining to each source map is also presented in the GRI Source Map Information (THSTMAP) table included with the GRI digital geologic-GIS data.

Index Map

The following index map displays the extents of the GRI digital geologic-GIS maps produced for Thomas Stone National Historic Site (THST). The extent of the park and surrounding area map is displayed in orange, whereas the extent of the Port Tobacco map is that quadrangle. The boundary for Thomas Stone National Historic Site (as of September, 2021) is outlined in green. The extent of the 7.5' quadrangles covered by the park and vicinity map is also shown, as is the state boundary between Maryland and Virginia.



Index map by Kajsa Holland-Goon and Stephanie O'Meara (Colorado State University)

Map Unit List

The geologic units present in the digital geologic-GIS data produced for Thomas Stone National Historic Site, Maryland and Virginia (THST) are listed below. Units are listed with their assigned unit symbol and unit name (e.g., Qaf - Artificial fill). Units are listed from youngest to oldest. No description for water is provided. Information about each geologic unit is also presented in the GRI Geologic Unit Information (THSTUNIT) table included with the GRI digital geologic-GIS data. Some source unit symbols, names and/or ages may have been changed in this document and in the GRI digital geologic-GIS data. This was done if a unit was considered to be the same unit as one or more units on other source maps used for this project, and these unit symbols, names and/or ages differed. In this case a single unit symbol and name, and the unit's now recognized age, was adopted. Unit symbols, names and/or ages in a unit descriptions, or on a correlation of map units or other source map figure were not edited. If a unit symbol, name or age was changed by the GRI the unit's source map symbol, name and/or age appears with the unit's source map description.

Cenozoic Era

Quaternary Period

[Qaf](#) - Artificial fill

[Qm](#) - Marsh deposits

[Qsw](#) - Swamp deposits

[Qmsw](#) - Marsh and swamp deposits

[Qal](#) - Alluvium

[Qmp1](#) - Maryland Point Formation, unit 1 (Tabb Formation, Lynnhaven and Poquoson Members)

[Qmp2](#) - Maryland Point Formation, unit 2 (Tabb Formation, Sedgefield Member)

[Qatu](#) - Alluvial terrace deposits, undivided

[Qsh](#) - Shirley Formation

[Qo](#) - Omar Formation

[Qcc](#) - Charles City Formation

[Qcm](#) - Chicamuxen Church Formation

Quaternary and Tertiary Periods

[QTw](#) - Windsor Formation

[QTr](#) - Ravens Crest Formation

Tertiary Period

[Tm](#) - Moorings Unit of Oaks and Coch (1973)

[Tug4](#) - Upland gravel 4

[Tc](#) - Calvert Formation, undivided

[Tn](#) - Nanjemoy Formation, undivided

[Tmc](#) - Marlboro Clay

[Ta](#) - Aquia Formation

Map Unit Descriptions

Descriptions of all geologic map units, generally listed from youngest to oldest, are presented below.

Qaf - Artificial fill (Recent)

Unit is comprised of mapped land unit that form a coastal feature (jetty?). Unit is not distinguished on source map. Unit present on source map: [Fredericksburg 30' x 60' Quadrangle](#)

Qm - Marsh deposits (Holocene)

Soft mud and muddy sand, medium- to dark-gray; may include grayish-brown peat or peaty sand and mud. Deposits are covered intermittently by water, may be vegetated by rushes and other grasslike plants. Locally, unit includes shells of fresh- to brackish-water mollusks. Thickness is generally less than 6 m (20 ft). Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

Qsw - Swamp deposits (Holocene)

Mud, muddy sand, and muck; brownish gray and brownish to grayish black. Contains abundant decaying leaf and stem material and trunks of trees. Unit thickly vegetated by shrubs and trees; occurs as a thin veneer (less than 3 m (10 ft) thick) directly overlying alluvial fill of stream valleys; commonly grades down valley into marsh deposits. Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

Qmsw - Marsh and swamp deposits (Holocene)

See units [Qm](#) and [Qsw](#) for unit descriptions. Unit present on source map: [Fredericksburg 30' x 60' Quadrangle](#)

Qal - Alluvium (Holocene and Pleistocene)

Qal - Alluvium (Holocene and Pleistocene)

Fine to coarse gravelly sand and sandy gravel, silt, and clay; unit is light to medium gray and yellowish gray; clasts consist mainly of vein quartz, quartzite, and other metamorphic rocks. Deposited mainly in channel, point-bar, and flood plain environments; grades into colluvium along steeper valley walls at margins of unit. Unit is mostly Holocene but, locally, may include low-lying Pleistocene terrace deposits. Thickness along major streams is as much as 15 m (49 ft). Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

Qal - Alluvium (Holocene)

Interbedded sand, gravel, and silt-clay. Fine grained to very coarse sand, glauconitic in places; pebbly sand; and fine to very coarse gravel with scattered boulders of quartzite or sandstone; subordinate massive to laminated silt-clay, in places with organic debris including leaves, twigs, and logs, and rare peat. Color tan, brown, or pale to dark gray. This unit includes typically heterogeneous, mostly poorly sorted sediments, ranging from well stratified to massive; composition and texture generally reflect source materials. Alluvium underlies stream channels, floodplains and adjacent low areas, and marshes; and is the record of streambed and overbank deposition during the past 10,000 years. Thickness 3 to 15 feet. Description from source map: [Port Tobacco Quadrangle](#)

Qmp1 - Maryland Point Formation, unit 1 (Tabb Formation, Lynnhaven and Poquoson Members) (upper Pleistocene)

Fine to medium, poorly to moderately well sorted, light- to dark-gray sand, in part, clayey and silty. Constitutes surficial deposits of terraces ranging in altitude from sea level to about 6.5 m (21 ft). Base of unit commonly at or below sea level. On the basis of lithology and stratigraphic position, unit is equivalent to unit Qtlp (Lynnhaven and Poquoson Members of Tabb Formation, undivided) in Virginia. Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

Qmp2 - Maryland Point Formation, unit 2 (Tabb Formation, Sedgefield Member) (upper Pleistocene)

Fine to coarse, poorly to well-sorted, gray sand, weathers grayish orange. Beds of medium-gray to olive-gray silty clay in middle and lower parts of unit commonly contain abundant plant fragments. Beds of oysters (*Crassostrea virginica*) that crop out 1 to 3 m (3–10 ft) above sea level in river bluffs east and west of Maryland Point indicate a brackish-water depositional environment. Unit constitutes surficial deposits of extensive terrace (altitude 7.5 to 10 m (25–33 ft)) along Maryland side of Potomac River and is equivalent to Sedgefield Member of Tabb Formation in Virginia. Thickness is about 14 m (46 ft). Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

Qatu - Alluvial terrace deposits, undivided (Pleistocene)

Qatu - terrace deposits (Pleistocene)

Fine to coarse gravelly sand, sandy gravel, silt, and clay, very poorly exposed. Constitutes surficial deposits of low-level terraces along the Poni and Mattaponi Rivers and tributaries in Caroline County, Virginia, and Nanjemoy and Burgess Creeks in Calvert County, Maryland. Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

Qt - Alluvial terrace deposits, undivided (Pleistocene)

Interbedded sand, clayey sand, gravel, and minor silt-clay. Fine grained to coarse sand, generally pebbly, commonly clayey in upper portion of deposit; and quartz gravel, mostly fine to medium; and subordinate thin silt-clay lenses. Color chiefly tan, brown, varying to gray or mottled. These are mostly heterogeneous sandy sediments with massive or lenticular bedding, cross-bedded in places, mostly poorly sorted, with gravel commonly arranged in discontinuous thin bands. Also included in this unit are subordinate amounts of unsorted colluvium, mainly on slopes. The most extensive terraces in the map area are those mantling the south and east walls of the Mattawoman Creek valley, and those flanking Port Tobacco Creek. In both cases, the deposits are thin, 15 ft. or less in thickness. The terrace sediments are wholly fluvial in origin, and are the product of Late Pleistocene deposition by the major streams in the area. Thickness 3 to 20 feet. Description from source map: [Port Tobacco Quadrangle](#)

Qsh - Shirley Formation (middle Pleistocene)

Fine to coarse sand, in part pebbly and bouldery, light- to medium-gray and pale-yellowish-gray; grades upward to silty fine sand and sandy silt, pale-gray to pinkish-gray. Constitutes surficial deposits of terraces (altitude 10.5 to 14 m (34.4–46 ft)) in Potomac River and Rappahannock River valleys. Unit typically exposed in southern Passapatanzy quadrangle where extensive borrow pits in terraces along the Rappahannock River show coarse sand and pebble-to-boulder gravel filling fluvial channels. Clay-silt plugs rich in organic matter represent fill of abandoned channels. On the basis of

lithology, stratigraphic position, and altitude of depositional surfaces, the Omar Formation (Qo) as mapped in Charles County, Maryland (see this map and McCartan, 1989a) is equivalent to the Shirley Formation and, in part, the Chuckatuck Formation. The coral *Astrangia* from the Shirley Formation in the lower Rappahannock River area has yielded a uranium-thorium age of 184 ± 20 ka (Mixon and others, 1982). Unit is commonly 10 to 20 m (33–66 ft) thick. Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

Qo - Omar Formation (middle Pleistocene)

Fine to medium gravel having coarse sand matrix in lower part of unit, grades upward to fine sand and sandy silt and clay; unit weathers yellowish gray to reddish brown. Underlies narrow remnants of a formerly extensive fluvial-estuarine terrace 12 to 15 m (39–49 ft) in altitude. Unit is equivalent to the Shirley and Chuckatuck Formations as mapped in Virginia. Thickness is as much as 15 m (49 ft). Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

Qcc - Charles City Formation (lower Pleistocene)

Upward-fining sequence consists of a basal coarse gravelly sand grading upward to moderately well sorted, medium to fine sand, silt, and clay; unit is light to medium gray; oxidizes to dark yellowish orange and yellowish brown. Constitutes surficial deposits of terraces at altitudes of 23 to 26 m (75–85 ft) in eastern part of the Virginia map area; ranges in altitude from 26 to 28 m (85–92 ft) along upper Rappahannock estuary at Fredericksburg. Unit is extensively preserved in high-level relict meander of Potomac River in parts of Dahlgren and Rollins Fork 7.5-min quadrangles; there, sand and silt in upper part of section contain abundant small invertebrate burrows which suggest an estuarine depositional environment. On the basis of stratigraphic position, lithology, and altitude of depositional surfaces, the Chicamuxen Formation ([Qcm](#)) as mapped northeast of the Potomac River in Charles County, Maryland (see this map and McCartan, 1989a), is equivalent, at least in part, to the Charles City Formation. Thickness is as much as 18 m (59 ft). Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

Qcm - Chicamuxen Church Formation (lower Pleistocene)

Coarse gravelly sand and clay-silt grades upward to clayey and silty fine sand and silty clay; unit is light to medium gray; weathers to grayish yellow, yellowish orange, and brown. Unit underlies broad terrace in southwestern Charles County, Maryland; depositional surface is commonly 24 to 29 m (79–95 ft) in altitude. Unit appears to be equivalent to the Charles City Formation in Virginia. Thickness is commonly 11 to 17 m (36–56 ft). Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

QTW - Windsor Formation (lower Pleistocene and upper Pliocene)

Fine to coarse sand, gravel, silt, and clay; unit is gray, yellowish brown, and reddish brown. Gravel is mostly vein quartz and quartzite but includes pebbles and cobbles of red mudstone, amygdaloidal basalt, and diabase derived from the early Mesozoic Culpeper basin and minor gneiss and schist from the Piedmont. Unit is surficial deposit of terraces ranging in altitude from 30.5 m (100 ft) in easternmost part of the Virginia map area to about 35 m (115 ft) in upper Rappahannock River estuary area. Unit crops out extensively in Loretto 7.5-min quadrangle and in west-central part of Rollins Fork 7.5-min quadrangle where it is inset well below base of older Moorings unit and is separated from the Moorings by a distinct scarp. The Windsor Formation and the Ravens Crest Formation as mapped in Charles and St. Marys Counties, Maryland, are equivalent units (McCartan

and others, 1996). The name Ravens Crest Formation replaces the Park Hall Formation as defined by McCartan (1989a, b). Thickness is as much as 12 m (39 ft). Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

QTr - Ravens Crest Formation (lower Pleistocene and upper Pliocene)

Medium to coarse gravelly sand interbedded with fine to medium sand and clay; grades upward to fine silty sand and clayey silt; unit is light to dark gray; the finer sediments weather to pink, pale brown, and yellowish orange. Cobble- to boulder-sized clasts of gneiss, schist, red mudstone and sandstone, and quartzite are derived from Piedmont, Culpeper Basin, Blue Ridge, and Valley and Ridge source areas. In map area, unit underlies depositional surfaces ranging in altitude from 30.5 m to about 35 m (100–115 ft). Unit was mapped as the Park Hall Formation by McCartan (1989a, b) but that name was found to be preempted (McCartan and others, 1996). On the basis of stratigraphic position and altitudes of depositional surfaces, the Ravens Crest is equivalent to the Windsor Formation in Virginia. Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

Tm - Moorings Unit of Oaks and Coch (1973) (upper Pliocene)

Quartzose sand and sandy gravel, white, light-gray, and grayish-yellow; clasts consist of well-rounded pebbles, cobbles, and boulders of quartz and quartzite; chert is a minor constituent. Unit occurs as surficial deposits of high-level terraces along Rappahannock River; altitude of depositional surface ranges from about 38 m (125 ft) in Rollins Fork quadrangle to 44 m (144 ft) in Fredericksburg area. The deposits are thought to be fluvial and estuarine equivalents of marginal-marine facies of the Moorings unit in the outer Coastal Plain along and just west of the Surry scarp (Mixon and others, 1989a). Thickness is 3 to 9 m (10–30 ft). Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

Tug4 - Upland gravel 4 (upper Pliocene)

Tug4 - Upland gravel 4 (Pliocene)

Lower part of unit is poorly sorted, medium to very coarse gravelly sand, light- to medium-gray; oxidizes to grayish yellow and yellowish orange. Pebbles are mostly vein quartz, quartzite, sandstone, and chert. These coarse materials grade upward to fine silty sand interbedded with lenticular beds of silty clay and sandy silt, gray to pink. Underlies dissected upland surface (altitude 37 to 55 m (121–180 ft)) in Charles County, Maryland (see northern parts of Nanjemoy and Mathias Point 7.5-min quadrangles). On the basis of lithology, depth of weathering profiles, and stratigraphic position, unit is equivalent to the Bacons Castle Formation and, in part, to the Mooring unit of Oaks and Coch (1973). Thickness is as much as 21 m (69 ft). Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

Tb - Brandywine Formation (Pliocene)

Sand, pebbly sand, and gravel; capped by sandy loam in places. Medium grained to coarse sand, wholly quartzose, poorly to moderately sorted; interbedded with pebbly sand and medium to coarse gravel. Pebbles are quartzite, sandstone, and chert. Bedding mostly lenticular, cross-bedded or flat-bedded to massive. Gravel concentrated in basal portion of unit, containing sporadic boulders to several feet in diameter. Color tan, orange-brown to reddish-brown. Where least dissected, uppermost Tb is yellow or reddish-brown pebbly loam up to 15 feet thick. The Brandywine Formation is fluvial in origin and was presumably deposited by the ancestral Potomac River during the time span between Late Miocene and early Pleistocene.

Thickness 3 to 40 feet. Description from source map: [Port Tobacco Quadrangle](#)

Tc - Calvert Formation, undivided (middle and lower Miocene)

Tc - Calvert Formation, undivided (middle and lower Miocene)

Chiefly fine to very fine quartzose sand, variably silty and clayey, interbedded with diatomaceous silty clay and clayey silt; thick- to very thick bedded or massive; unit is medium to dark olive gray, grayish olive, and dark greenish gray; weathers light gray to white, pinkish gray, and pale yellowish orange. Locally, contains abundant external molds of marine mollusks. Map unit includes one to five sand-silt-clay sequences ranging in thickness from 2 to 12 m (7–39 ft). Description from source map:

[Fredericksburg 30' x 60' Quadrangle](#)

Tc - Calvert Formation, undivided (Miocene)

Sand, silt, and diatomaceous silt-clay. Sand, very fine-grained to fine, clayey; silt, diatomaceous silt, and minor clay. Color olive-green, olive-brown to gray where unweathered; tan to brown in weathered outcrops. Contains in basal portion of unit a bed of diatomaceous silt with as much as 40% of diatoms, up to 10 feet in thickness; diatomaceous bed thin or absent in northwest corner of map area. Upper portion of unit relatively homogeneous sand and silty sand with stratification obscured, showing mostly burrow mottling. Molds and casts of mollusks common but shell carbonate rare. Lower contact sharp and unconformable on underlying Nanjemoy green sand. All of the Calvert sediments in the map area probably belong to the Fairhaven, the lower of the two members of the unit. The Fairhaven probably accumulated in a restricted marine basin in relatively deep water.

Thickness 3 to 70 feet. Description from source map: [Port Tobacco Quadrangle](#)

Tn - Nanjemoy Formation, undivided (lower Eocene)

Tn - Nanjemoy Formation, undivided (lower Eocene)

Glaucinitic quartz sand, fine to coarse, very clayey and silty, micaceous, shelly in part; contains abundant small concretions of iron sulphide; sand is interbedded with lesser amounts of silty and sandy clay. Fresh exposures are dark olive gray, greenish gray, and olive black; weathers yellowish brown. Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

Tn - Nanjemoy Formation, undivided (Eocene)

Sand, glauconitic, and minor clay. Sand, very fine grained to medium, variably glauconitic, poorly sorted, very clayey. Glauconite content of sand rarely exceeds 40%. Color medium-gray to dark greenish-gray where unweathered; tan, pale-gray, with yellow mottles where weathered. Sand interbedded throughout with thin lenticular beds of dark gray silty clay. Bedding obscure with burrow mottling common. Commonly fossiliferous with Venericardia the most abundant mollusk. Lower contact sharp with clay of Marlboro, marked by sand filled burrows. Sporadic iron-oxide cemented layers and concretionary bodies common. The Nanjemoy Fm. was deposited on the inner shelf in relatively shallow marine water. Thickness 3 to 100 feet. Description from source map: [Port Tobacco Quadrangle](#)

Tmc - Marlboro Clay (upper Paleocene)

Tmc - Marlboro Clay (Paleocene)

Clay, dense, and subordinate silt. Clay, dense, brittle or slightly plastic, finely laminated to thick bedded, bedding irregularly lenticular in part; interbedded with thin lenses and partings of micaceous lignitic silt. Color of clay pale red to brownish-gray; silt yellow-gray to reddish-gray. In most sections, the uppermost clay is brownish-gray to silvery-gray and the remainder red. The lowermost beds are also gray in some areas. The contact with the underlying Aquia Fm. is generally marked by thin interbeds of clay and greensand. The Marlboro outcrop is restricted to the northwestern portion of the map area where it is poorly exposed at best. The unit accumulated in very shallow marine or brackish water, possibly a tidal flat environment. Thickness 3 to 30 feet. Description from source map: [Port Tobacco Quadrangle](#)

Ta - Aquia Formation (upper Paleocene)

Ta - Aquia Formation (upper Paleocene)

Glaucconitic quartz sand, fine to medium, variably clayey and silty, thick- to very thick bedded or massive, sparsely to abundantly shelly. Commonly, sand is interbedded with a few thick- to very thick beds of sandy and shelly limestone; locally, in updip areas, silica replaces calcium carbonate as cementing material. Unit is light to dark olive gray, olive black, and greenish black; weathers to yellowish gray, grayish yellow, and grayish orange. The lower Aquia (Piscataway Member) is very clayey, fine to medium, poorly sorted sand containing scattered very fine pebbles; molluscan assemblage is dominated by large bivalves including *Cucullaea gigantea*, *Ostrea alepidota*, *Crassatellites* sp., and *Dosiniopsis* sp. In updip areas of Fredericksburg and Stafford 7.5-min quadrangles, unit is much less glauconitic and bedding is better defined. Black heavy-mineral cross-lamination, clay-lined burrows of the *Ophiomorpha* type, and small bars composed of clean, well-sorted, crossbedded sand indicate deposition in shoaling waters. The lower Aquia overlies the Lower Cretaceous Potomac Formation with pronounced unconformity and, in subsurface of south-central part of map area, laps across the Potomac onto crystalline basement rocks. Beds of the upper Aquia (Paspatansa Member) consist of very fine to fine, moderately well sorted, micaceous, thick-bedded to massive sand that is less clayey and less shelly than the lower Aquia; unit is characterized by thin layers of the large, high-spined gastropod *Turritella mortoni*; bivalves include *Ostrea sinuosa*, *Crassatellites alaeformis*, and *Cucullaea* sp. A late Paleocene (Thanetian) age for the Aquia Formation is based on foraminiferal, nannofossil, dinocyst, pollen, and molluscan assemblages. Formation thickness is as much as 35 m (115 ft). Description from source map: [Fredericksburg 30' x 60' Quadrangle](#)

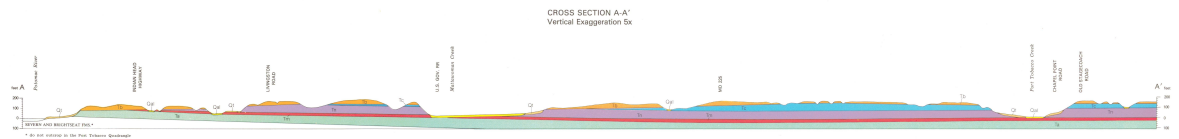
Ta - Aquia Formation (Paleocene)

Sand, variably glauconitic, and calcareous sandstone. Sand, very fine to fine grained, silty and micaceous, containing from 5 to 30% of glauconite, interbedded with layers of calcareous sandstone, friable to well-cemented, up to 6 feet thick. Color dark greenish-gray to medium gray where unweathered; tan to brownish-gray with yellow mottles in weathered outcrops. Fossils generally common, fauna dominated by large *Turritella mortoni* and *Ostrea compressirostra*. The Aquia, like the Marlboro, is con-fined in outcrop to the northwestern part of the quadrangle, and is also poorly exposed. This unit was deposited on the shallow marine shelf, probably in less than 200 feet of water. Thickness 25 to 150 feet. Description from source map: [Port Tobacco Quadrangle](#)

Geologic Cross Section

The geologic cross section present in the GRI digital geologic-GIS data produced for Thomas Stone National Historic Site, Maryland and Virginia (THST) is presented below. The cross section graphic was scanned at a high resolution and can be viewed in more detail by zooming in (if viewing the digital format of this document).

Cross Section A-A'



Graphic from source map: [Port Tobacco Quadrangle](#)

Ancillary Source Map Information

The following sections present ancillary source map information associated with sources used for this project.

Fredericksburg 30' x 60' Quadrangle

The formal citation for this source.

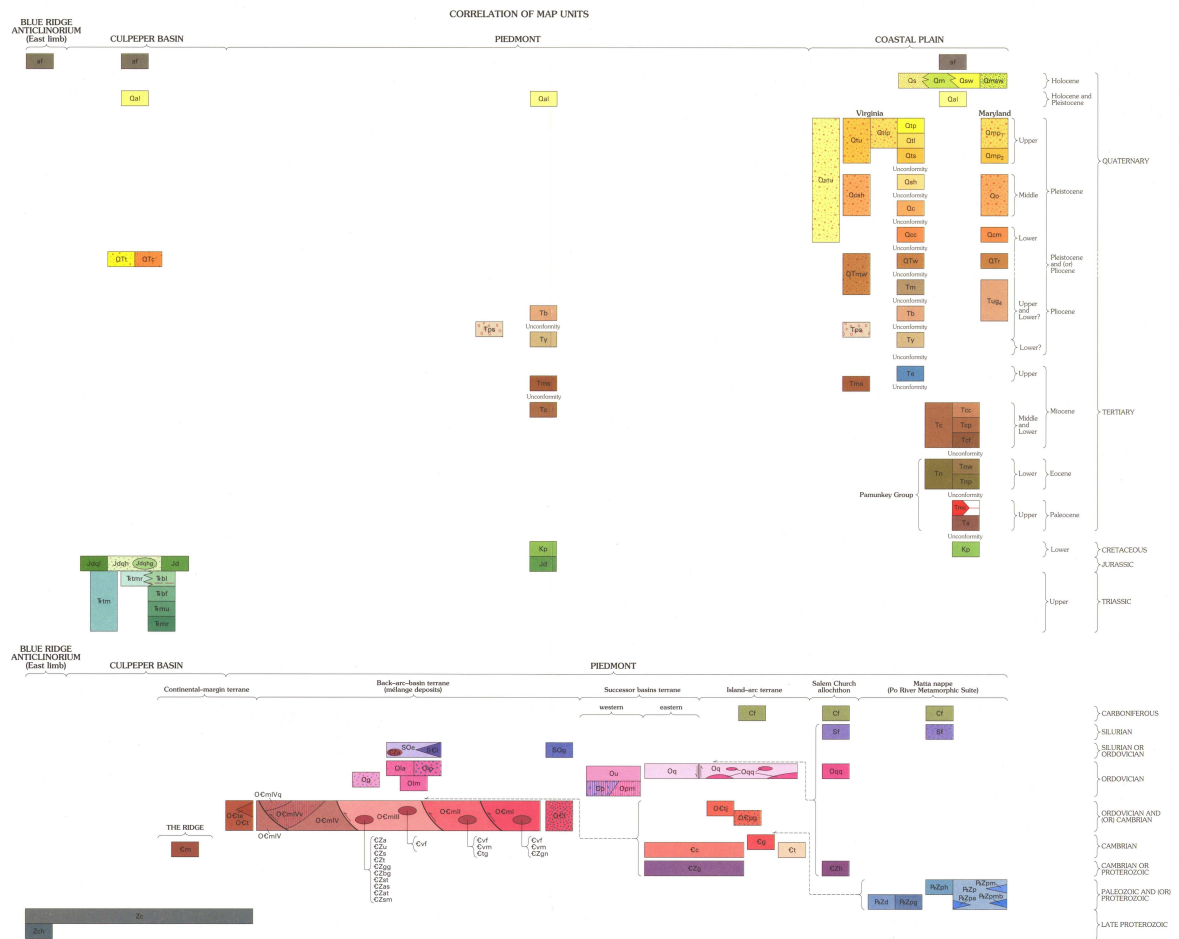
Mixon, Robert B. et al., 2000, Geologic Map of the Fredericksburg 30' x 60' Quadrangle, Virginia and Maryland: U.S. Geological Survey, Geologic Investigations Series Map I-2607, scale 1:100,000 (*GRI Source Map ID 2540*).

The U.S. Geological Survey source map publications page for this map is: <https://pubs.er.usgs.gov/publication/i2607>. The two source map plates, as well as the associated report can be obtained from the site. Users are encouraged to obtain the report, as well as map plates, for additional information pertaining to the map and mapped geologic units.

In addition, source map plates can also be viewed and obtained on/from the National Geologic Map Database (NGMDB) website for this map: https://ngmdb.usgs.gov/Prodesc/proddesc_32196.htm

Prominent graphics directly related the map from this source.

Correlation of Map Units



Graphic from source map: [Fredericksburg 30' x 60' Quadrangle](#). Note, as the GRI digital geologic-GIS data used only a portion of the source map extent, the Nanjemoy and Port Tobacco quadrangles extent, only a subset of the geologic units presented in the above figure are present in the GRI digital geologic-GIS data.

Legend

EXPLANATION OF MAP SYMBOLS

- **Contact**—Dashed where inferred; dotted where concealed
- **Isograd or limit of thermal aureole**—Ticks point to higher grade facies

FAULTS IN THE PIEDMONT AND THE CULPEPER BASIN

- **Fault**—Sense of displacement not known; dotted where concealed
- $\frac{U}{D}$ **High-angle fault**—Dashed where inferred; dotted where concealed; U, upthrown side; D, downthrown side
- **Strike-slip fault**—Arrows show relative movement; dotted where concealed
- **Thrust fault**—Sawteeth on upper plate; arrows show inferred post-thrust strike-slip movement; dotted where concealed
- **Overturned thrust fault**—Base of sawteeth on upper plate. Sawteeth indicate direction of dip; dip given where known; dotted where concealed
- **Limits of rock types that define the Mountain Run fault zone**—These rocks include phyllonite, mylonite, breccia, and phyllite with fish-scale or button-schist structure

FAULTS IN THE COASTAL PLAIN

- $\frac{80^\circ}{\uparrow}$ **High-angle reverse or vertical fault, showing dip**—Dashed where inferred; dotted where concealed

FOLDS IN THE PIEDMONT

(Showing axial trace, direction of dip of limbs and plunge direction, where known or inferred; dotted where concealed)

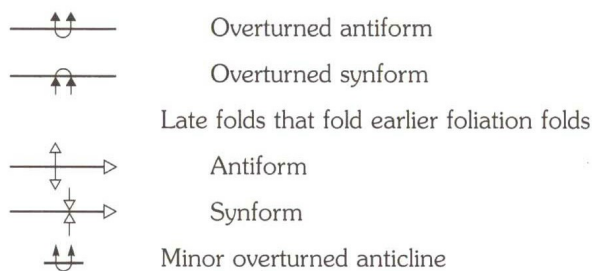
Bedding folds—Defined on the basis of bedding

- **Anticline**
- **Syncline**

Foliation folds—Foliation may be parallel to bedding and (or) compositional layering

Early folds

- **Antiform**
- **Synform**



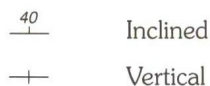
FOLDS IN THE COASTAL PLAIN

→ **Axial trace of the Skinkers Neck anticline**—Showing plunge and bifurcation. Affects mainly middle Eocene and older strata

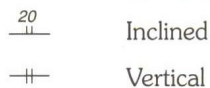
PLANAR FEATURES

(May be combined with linear features)

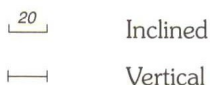
Strike and dip of bedding



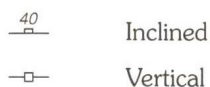
Strike and dip of compositional layering



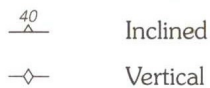
Strike and dip of cleavage



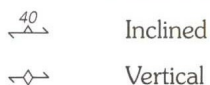
Strike and dip of joints—Two or more sets shown at point of intersection



Strike and dip of phyllitic foliation—Includes semi-schistosity and transposition; anastomosing and continuous foliation may be combined with mineral lineation symbol



Strike and dip of shear foliation



Strike of bedding parallel to phyllitic foliation

Strike of vertical compositional layering parallel to phyllitic foliation

Strike and dip of early schistosity

-  Inclined
 Vertical
 Overturned
 Crenulated

Strike of vertical late schistosity**Strike and dip of magmatic flow foliation**

-  Inclined
 Vertical

LINEAR FEATURES

(May be combined with planar features)

-  **Bearing and plunge of early mineral lineation**
 **Bearing and plunge of late mineral lineation**

OTHER SYMBOLS

-  **Stratigraphic test well coring Triassic rock**
 **U.S. Geological Survey corehole**
 **U.S. Geological Survey auger hole**
 **Oil and gas test well**
 **Water well**—G, geophysical log; L, lithic log; TD=Total depth
 **Outcrop or trench exposing a fault**—Number keyed to table 1 in pamphlet. Consult table for detailed description of faults
 **Type section of a formation or member**—A, Aquia Formation; W, Woodstock Member of the Nanjemoy Formation; M, Mountain Run Member of the Tibbstown Formation; R, Rapidan Member of the Manassas Formation
 **Triassic palynomorph locality**
 **Radiometric age determination of granophyric diabase (Sutter and others, 1985)**
 **Active quarry with dinosaur trackways**
 **Abandoned quarry**
 **Site of photograph**—Tip of arrow at point of observation; arrow shows direction of view; number keyed to figure on sheet 2

Graphics from source map: [Fredericksburg 30' x 60' Quadrangle](#). Note, as the GRI digital geologic-GIS data used only a portion of the source map extent, the Nanjemoy and Port Tobacco quadrangles extent, only a subset of the geologic features and observations presented in the above figures are present in the GRI digital geologic-GIS data.

Physiographic Provinces



Map showing parts of three physiographic provinces, the Culpeper basin, and the location of U.S. Geological Survey 7.5-min topographic quadrangles in the Fredericksburg 30' x 60' quadrangle

Graphic from source map: [Fredericksburg 30' x 60' Quadrangle](#)

Photograph (Locality) 13

The locality of one source map photograph (figure) was within the extent of the GRI digital geologic-GIS data. The figure is presented below.



Figure 13.—Principal reference section of the Woodstock Member of the Nanjemoy Formation (Tnw) in bluffs along the Potomac River estuary about 2.7 km (1.7 mi) upstream from Mathias Point, Va. (see Mathias Point 7.5-min quadrangle). Clayey and silty, very fine to fine, glauconitic and micaceous quartz sand of the Woodstock Member constitutes the lower 12.2 m (40 ft) of the 24- to 30-m (79- to 98-ft)-high bluffs. The Woodstock is unconformably overlain by 8 m (26 ft), or more, of clayey and silty, yellowish-gray fine sand and diatomaceous silty clay of the middle Miocene Calvert Formation (Tc). Upper part of bluff exposure is yellowish-orange sandy gravel and coarse sand of the Windsor Formation (QTw).

Graphic from source map: [Fredericksburg 30' x 60' Quadrangle](#)

Port Tobacco Quadrangle

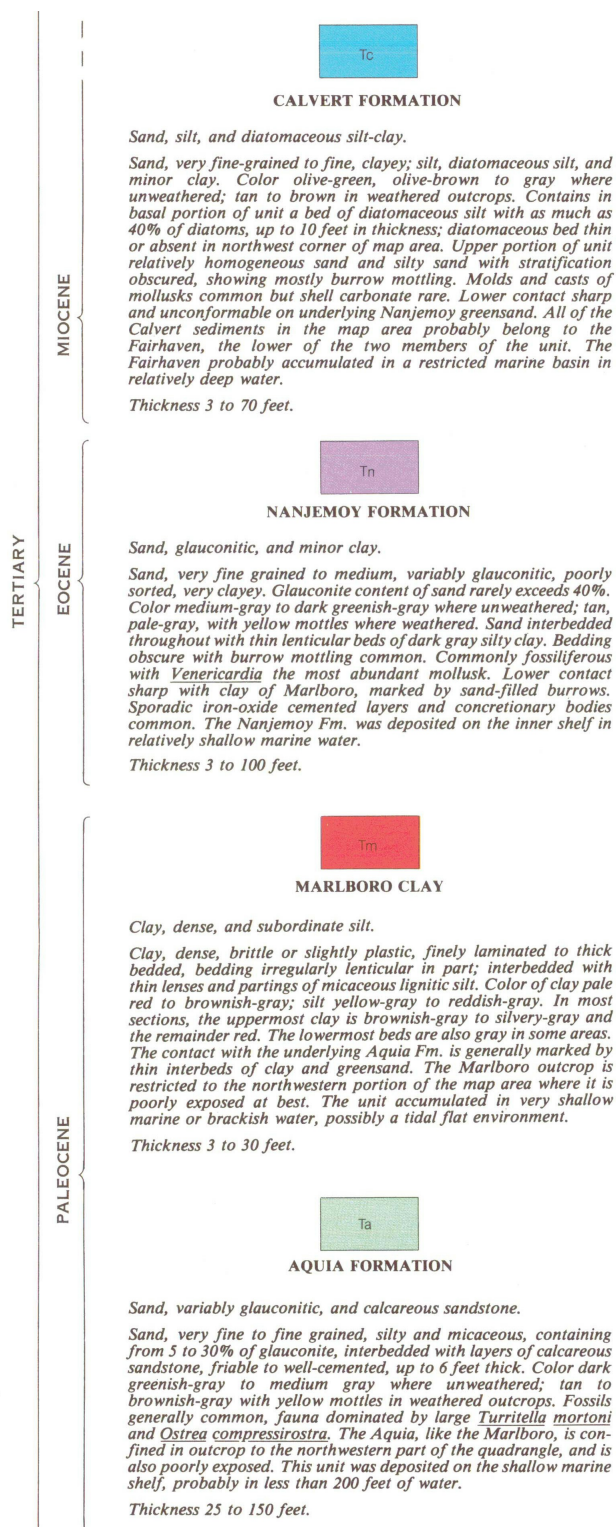
The formal citation for this source.

Glaser, J.D., 1984, Geologic Map of the Port Tobacco Quadrangle, Prince Georges and Charles Counties, Maryland: Maryland Geological Survey, Quadrangle Geologic Map, scale 1:24,000 (*GRI Source Map ID 2942*).

Prominent graphics associated with this source.

Correlation of Map Units

EXPLANATION	
QUATERNARY	Qal ALLUVIUM <i>Interbedded sand, gravel, and silt-clay.</i> <i>Fine grained to very coarse sand, glauconitic in places; pebbly sand; and fine to very coarse gravel with scattered boulders of quartzite or sandstone; subordinate massive to laminated silt-clay, in places with organic debris including leaves, twigs, and logs, and rare peat. Color tan, brown, or pale to dark gray. This unit includes typically heterogeneous, mostly poorly sorted sediments, ranging from well stratified to massive; composition and texture generally reflect source materials. Alluvium underlies stream channels, floodplains and adjacent low areas, and marshes; and is the record of streambed and overbank deposition during the past 10,000 years.</i> <i>Thickness 3 to 15 feet.</i>
	Qt TERRACE DEPOSITS <i>Interbedded sand, clayey sand, gravel, and minor silt-clay.</i> <i>Fine grained to coarse sand, generally pebbly, commonly clayey in upper portion of deposit; and quartz gravel, mostly fine to medium; and subordinate thin silt-clay lenses. Color chiefly tan, brown, varying to gray or mottled. These are mostly heterogeneous sandy sediments with massive or lenticular bedding, cross-bedded in places, mostly poorly sorted, with gravel commonly arranged in discontinuous thin bands. Also included in this unit are subordinate amounts of unsorted colluvium, mainly on slopes. The most extensive terraces in the map area are those mantling the south and east walls of the Mattawoman Creek valley, and those flanking Port Tobacco Creek. In both cases, the deposits are thin, 15 ft. or less in thickness. The terrace sediments are wholly fluvial in origin, and are the product of Late Pleistocene deposition by the major streams in the area.</i> <i>Thickness 3 to 20 feet.</i>
	Tb BRANDYWINE FORMATION <i>Sand, pebbly sand, and gravel; capped by sandy loam in places.</i> <i>Medium grained to coarse sand, wholly quartzose, poorly to moderately sorted; interbedded with pebbly sand and medium to coarse gravel. Pebbles are quartzite, sandstone, and chert. Bedding mostly lenticular, cross-bedded or flat-bedded to massive. Gravel concentrated in basal portion of unit, containing sporadic boulders to several feet in diameter. Color tan, orange-brown to reddish-brown. Where least dissected, uppermost Tb is yellow or reddish-brown pebbly loam up to 15 feet thick. The Brandywine Fm. is fluvial in origin and was presumably deposited by the ancestral Potomac River during the time span between Late Miocene and early Pleistocene.</i> <i>Thickness 3 to 40 feet.</i>



Graphic from source map: [Port Tobacco Quadrangle](#)

Legend

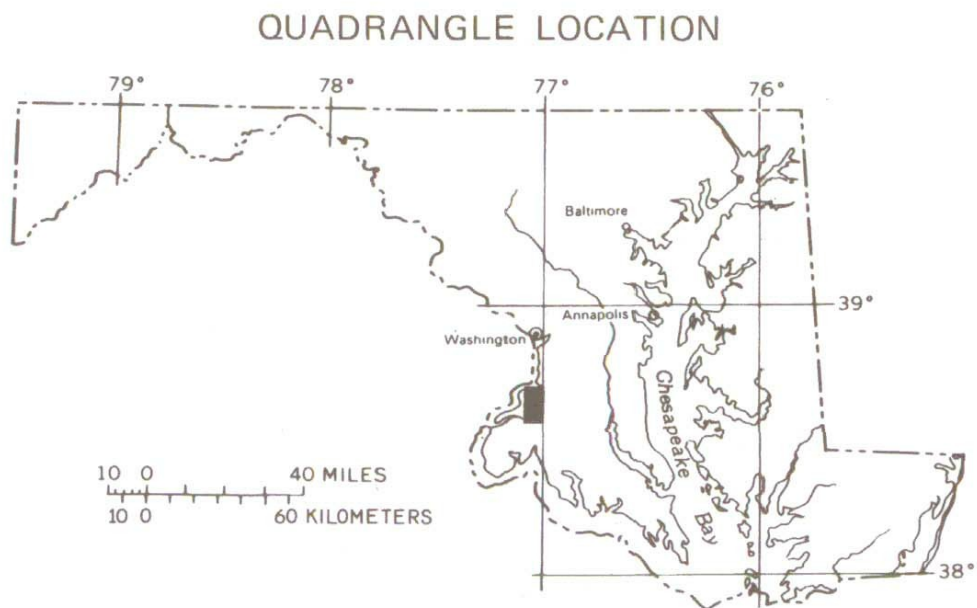


Contact

generally approximate or inferred

Graphic from source map: [Port Tobacco Quadrangle](#)

Quadrangle Location



References from source map: [Port Tobacco Quadrangle](#)

GRI Digital Data Credits

This document was developed and completed by Stephanie O'Meara and Lucas Chappell (Colorado State University) for the NPS Geologic Resources Division (GRD) Geologic Resources Inventory (GRI) Program. Quality control of this document by James Winter (Colorado State University).

The information in this document was compiled from GRI source maps, and is intended to accompany the digital geologic-GIS map(s) and other digital data for Thomas Stone National Historic Site, Maryland and Virginia (THST) developed by Stephanie O'Meara and Ron Kaprilo (see the [GRI Digital Maps and Source Map Citations](#) section of this document for all sources used by the GRI in the completion of this document and related GRI digital geologic-GIS maps).

GRI finalization by Stephanie O'Meara.

GRI program coordination and scoping provided by Bruce Heise, Jason Kenworthy and Tim Connors (NPS GRD, Lakewood, Colorado).