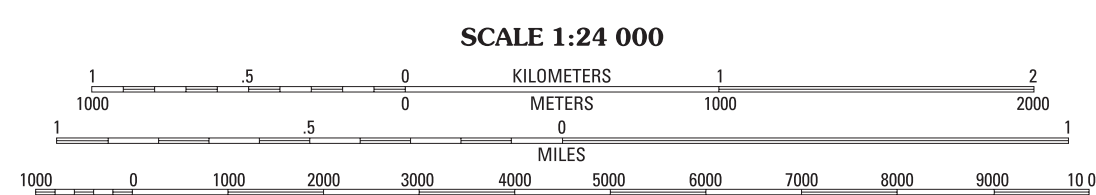
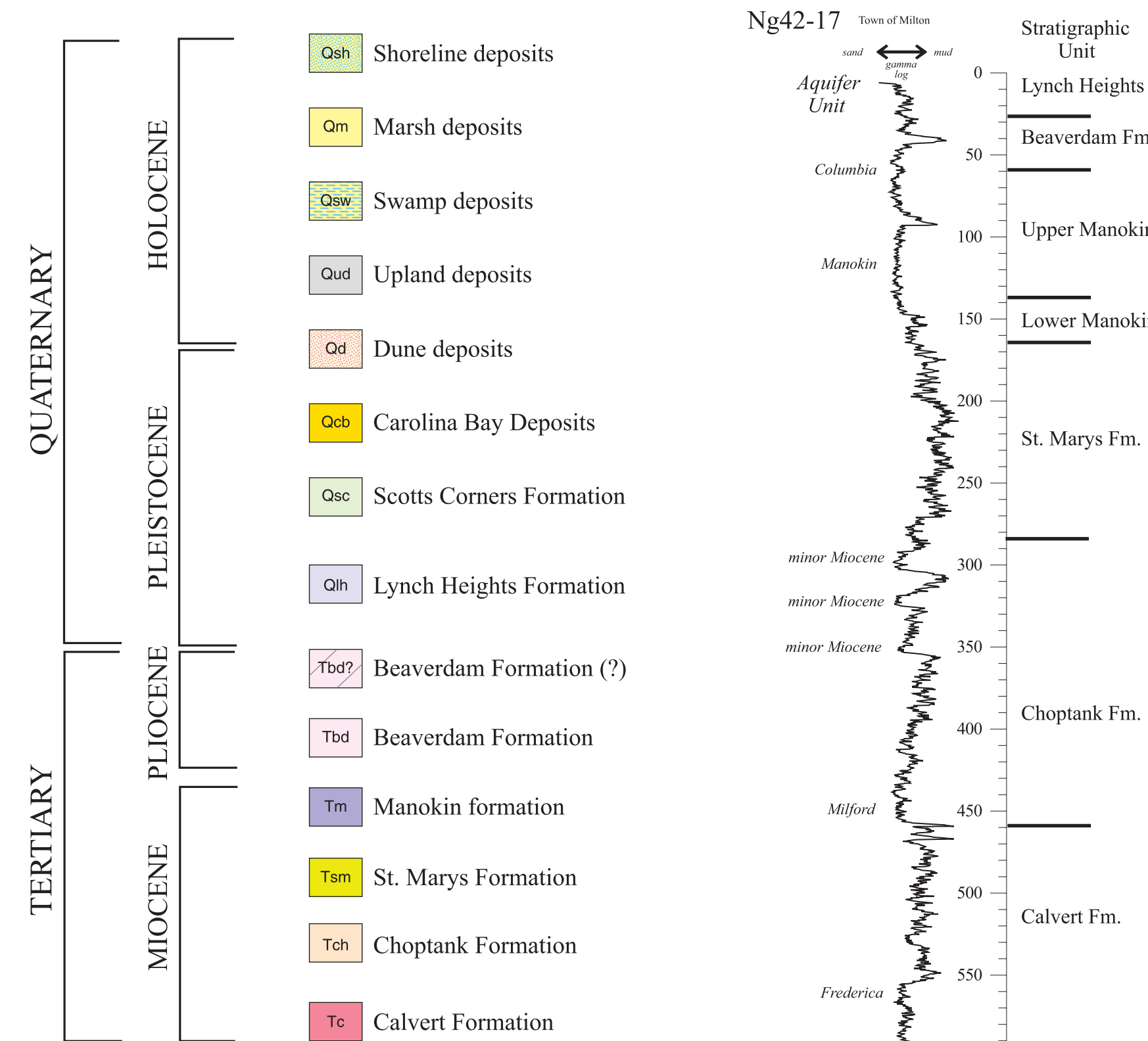
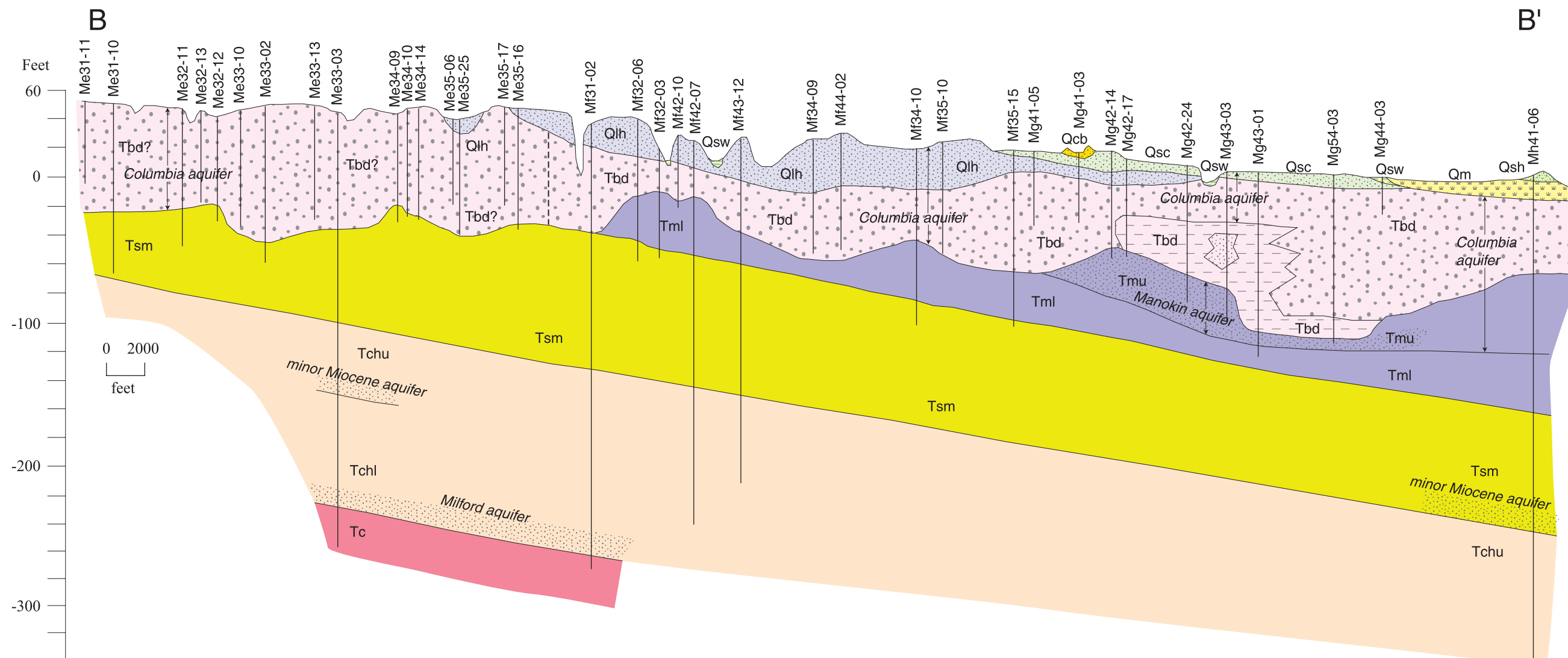
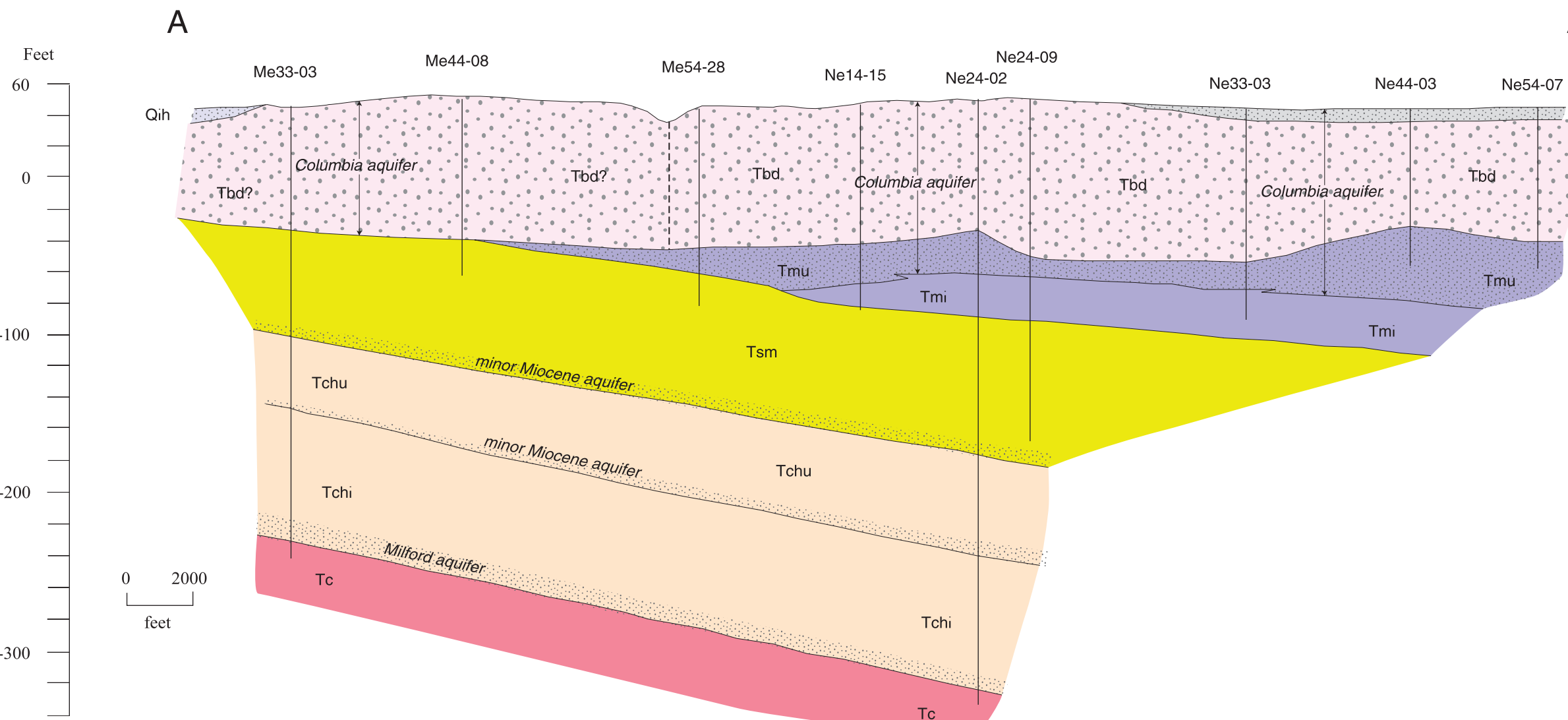


GEOLOGIC MAP OF THE ELLENDALE AND MILTON QUADRANGLES, DELAWARE

by
Kelvin W. Ramsey
2001



CONTOUR INTERVAL: 5 FEET
NATIONAL GEOLOGIC WORKING DATUM: 1985 (TO CONVERT ELEVATIONS TO THE NORTH AMERICAN VERTICAL DATUM OF 1988, SUBTRACT 1 FOOT)



MANOKIN FORMATION (subsurface only)
Inferred unit. The Manokin fm. is subdivided into an upper unit (Tmu) and a lower unit (Tml). The upper unit consists of well-sorted, clean, white to reddish brown, fine to medium sand. Some beds of medium to coarse sand and gray to white clayey silt are also present. The lower unit consists of gray, silty, very fine to medium sand with rare to common pieces of lignite. The upper and lower units are conformably to unconformably on the St. Marys fm.

ST. MARYS FORMATION (subsurface only)
Light gray to gray to brown clayey silt and fine to medium quartz sand and clayey silt. Discontinuous beds of fine to medium quartz sand and shelly quartz and are common. Unconformably overlies the Choptank Formation. Thickness of the unit ranges from 10 feet in the northwestern corner of the Ellendale Quadrangle to 80 feet in the southeast corner of the Milton Quadrangle. Gamma ray logs show a fining upward sequence with a basal sand grading upward into a fine silty sand into a fine sandy silt with discontinuous sand beds. The St. Marys fm. is interpreted to be a marginal marine deposit. Late Miocene.

CHOPTANK FORMATION (subsurface only)
Light gray to blue gray, fine to medium, silty quartz sand and clayey silt. Discontinuous beds of fine sand and medium to coarse sand are common. Unconformably overlies the Calvert fm. Discontinuous beds of fine sand and medium to coarse sand are common. Unconformably overlies the Choptank Formation. Thickness of the unit ranges from 10 feet in the northwestern corner of the Ellendale Quadrangle to 80 feet in the southeast corner of the Milton Quadrangle. Gamma ray logs show a fining upward sequence with a basal sand grading upward into a fine silty sand into a fine sandy silt with discontinuous sand beds. The Choptank fm. is interpreted to be a marginal marine deposit. Late Miocene.

CALVERT FORMATION (subsurface only)
Light gray to gray to brown clayey silt and fine to medium silty quartz sand and clayey silt. Discontinuous beds of shelly sand and shelly clayey silt are common. Rarely penetrated by water wells in the map area. Top of the unit ranges from 200 to over three hundred feet in depth. The Calvert is interpreted to be a marine deposit. Middle to late Miocene.

Discussion

The surficial geology of the Ellendale and Milton quadrangles reflects the geologic history of the Delaware Bay estuary and successive high and low sea levels during the Quaternary. Ramsey (1992) interpreted the Beaverdam Formation as deposits of a fluvial-estuarine system during the Pliocene. Sediment supply was high, in part due to geomorphic adjustments in the Appalachians related to the first major Northern Hemisphere glaciations around 2.4 million years ago. The Beaverdam Formation forms the core of the central Delaware Peninsula around which grew the Quaternary deposits.

The Carolina Formation which is recognized in the south of the map area was deposited as the result of the distal portion of partial outwash of the Delaware and possibly Susquehanna rivers during the early Pleistocene (Ramsey, 1997). After the deposition of the Columbia, the Delaware River and Bay developed their present geographic positions.

In the northwestern portion of the map area contiguous with the area mapped by Ramsey (1993) is the Columbia Formation, the surficial unit has many similarities in texture, color, bedding, topographical lag character, and blockiness with the Beaverdam Formation to the south and east. No diagnostic pollen-bearing beds or other fossils have been found in the area to aid in identification of the unit. Because of the continuity in thickness and little character with the Beaverdam, the area is mapped as Tbd. Where the Beaverdam is mapped, silty clay to clayey silt beds yielded pollen assemblages characteristic of the unit (Andres and Ramsey, 1995, 1996; Gross and Jordan, 1999).

The Lynch Heights and the Scotts Corners Formations (Ramsey, 1993, 1997) represent shoreline and estuarine deposits associated with high stands of sea level during the middle to late Pleistocene on the margins of Delaware Bay. The western boundary of these units is found at a topographic break (scarp) that marks the ancestral, erosional shoreline of Delaware Bay during the sea-level high stand. Lynch dunes (Qld) are extensive, linear dunes and large dune fields found along the contact between the Lynch Heights and older deposits to the west. Some of these dunes may be relict coastal dunes associated with the ancestral shoreline of Delaware Bay at the time of Lynch Heights deposition. Dunes to the west may be younger, late Pleistocene or early Holocene in age. Carolina Bay deposits are circular to semi-circular depressions with sand rims found in the northern half of the map area. They are thought to be cold-climate features associated with reduced tree cover and increased winds during the glacial periods of the Pleistocene (Ramsey, 1997).

Quaternary upland deposits (Qud) cover much of the southern half of the Ellendale Quadrangle. These deposits represent deposition in swamps associated with poor drainage and estuarine deposition during cold climate phases of the late Pleistocene and early Holocene. The estuarine sands are found both in small dunes in this area, but more commonly, as sheets of fine to medium sand with no to rare sedimentary structures. Although no radiocarbon dates have been collected from this area, the age of the deposits is considered to be late Pleistocene to early Holocene on the basis of similarities in stratigraphic position and depositional style with the Cypress Swamp Formation (Andres and Howard, 2000) found to the south of the map area. Quaternary and older deposits are interpreted by Holocene swamp, marsh, sheeting, and estuarine deposits along the stream valleys and the shoreline of Delaware Bay.

Stratigraphic units found at depths within the map area are shown with the geophysical log of Ng42-17, a deep test well drilled in Milton. Major aquifer units are also shown. Cross section A-A' is a north-south section roughly along Route 115 through the center of the Ellendale Quadrangle. It shows the relationship of the Beaverdam Formation (Tbd) and the Beaverdam Formation (Tbd).

Also shown are the units underlying the surficial units and the position of the major aquifers. Cross-section B-B' is a west-east section showing the relationships between the Quaternary-Tertiary deposits and the underlying Lynch Heights, and Scotts Corners formations as well as underlying Manokin and St. Marys formations. Aquifers shown in the cross-sections are water-bearing sand layers that are used for public, domestic, agricultural, and industrial sources of water. Where the surficial or water-table aquifer is in contact with sands of an underlying aquifer, such as the Manokin formation, the entire water-bearing unit is called the Manokin aquifer.

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