Richmond Quadrangle, Maine

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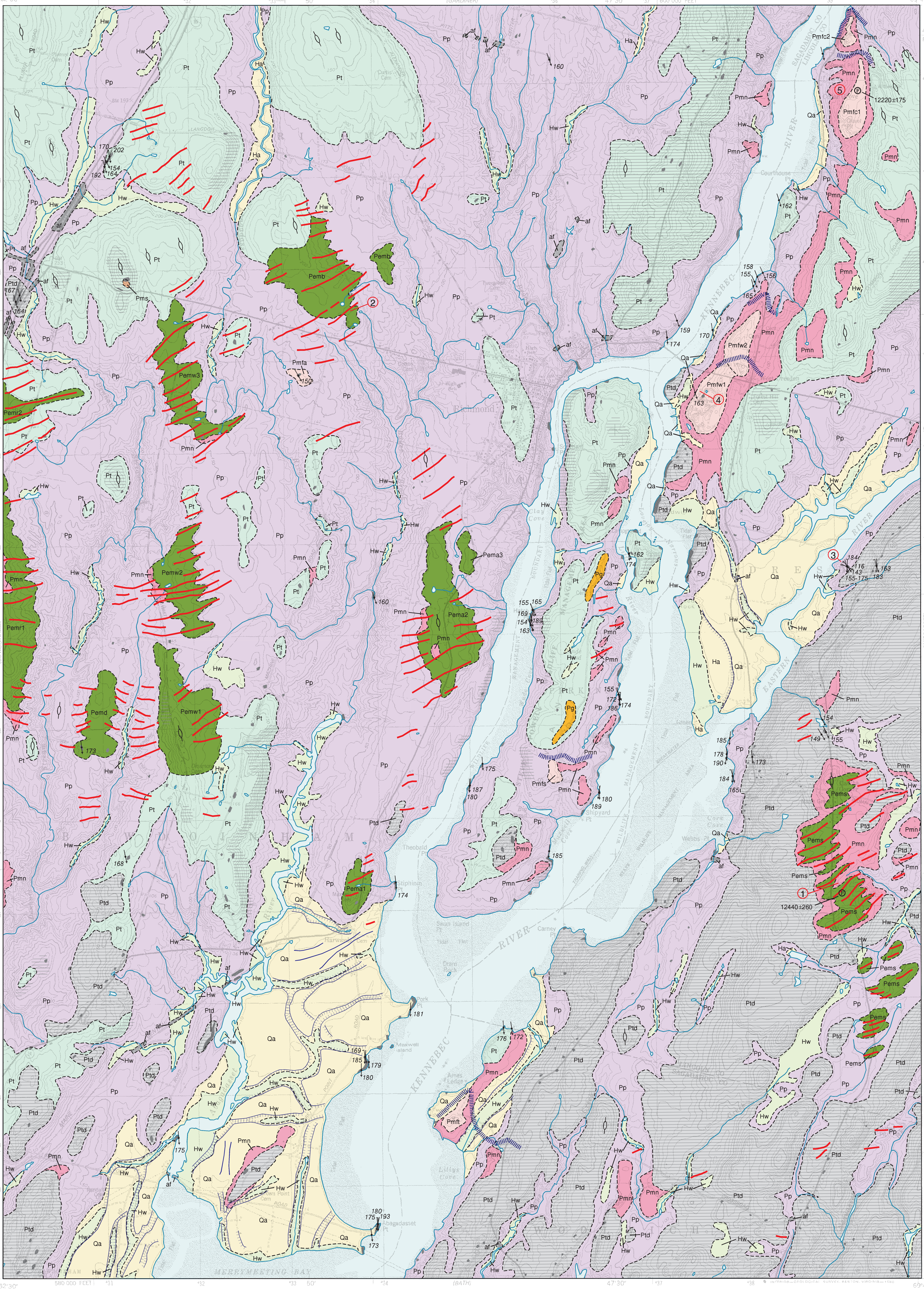
Surficial Geology



SOURCES OF INFORMATION

Surficial geologic mapping of the Richmond quadrangle was conducted by Thomas K. Weddle and Daniel S. Frost during the 2003 field season. Funding for this work was provided by the U. S. Geological Survey STATEMAP program, the Association of American State Geologists Field Research Experiences for Undergraduates Mentoring Program, and the Maine Geological Survey, Department of Conservation.

Quadrangle Location

SCALE 1 : 24,000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET

TRUE NORTH

Topographic base from U.S. Geological Survey Richmond quadrangle, scale 1:24,000 using standard U.S. Geological Survey topographic map symbols.

NOTE: A thin, discontinuous layer of windblown sand and silt, generally mixed with underlying glacial deposits by frost action and bioturbation, is present near the ground surface over much of the map area but is not shown.

af — **Artificial fill** - Man-made. Material varies from natural sand and gravel to quarry waste to sanitary landfill, including highway and railroad embankments and dredge spoil areas. This material is mapped only where it can be identified using the topographic contour lines or where actually observed. Minor artificial fill is present in virtually all developed areas of the quadrangle.

Ha / Qa — **Stream alluvium** (Ha - Holocene, Qa - Quaternary) - Sand, silt, gravel, and muck in flood plains along present rivers and streams. Extent of alluvium indicates most areas flooded in the past that may be subject to future flooding. In places, this unit is indistinguishable from, grades into, or is interbedded with wetlands deposits (Hw).

Hw — **Wetland deposit** (Holocene) - Muck, peat, silt, and sand deposited in poorly drained areas. In places, this unit is indistinguishable from, grades into, or is interbedded with stream alluvium (Ha).

Pms — **Marine shoreline** - Pleistocene beach and dune sands deposited during regressive phase of marine submergence. Beach morphology is poorly preserved, but sand and gravel are present along the ridge crest.

Pmn — **Marine nearshore deposits** (Pleistocene) - Sand, silt, mud, and minor gravel. Consists of reworked ice-contact, till, submarine outwash, and bottom materials redistributed by marine currents and wave action as sea level fell during late-glacial time. May contain shoreline, beach, and dune deposits in places.

Pg — **Undifferentiated ice-contact deposits** (Pleistocene) - Sand, gravel, and silt ice-contact deposits. May include esker or glaciomarine fan deposits.

Pp — **Presumpscot Formation: Glaciomarine bottom deposits** (Pleistocene) - Silt and clay with local sandy beds and intercalations. Consists of late-glacial fine-grained (marine mud) bottom deposits. Commonly lies beneath surface deposits of unit Pmn; in places, may be coated with unmapped thin dune deposits.

Pem — **End moraines** - Linear ridges consisting of bedded sand and gravel interbedded with Presumpscot Formation silty clay and occasionally interlayered with till on the ice-proximal faces of the moraines. Some moraines, or groups of moraines, have been assigned a unique geographic name listed below:

Pemb	- Baker Brook moraines
$Pemr_x$	- Ridge Road moraines 1-2
Pemd	- Denham Stream moraines
$Pemw_x$	- White Road moraines 1-3
$Pema_x$	- Abagadasset River moraines 1-3
Pems	- South Dresden moraines

Pmf — **Submarine outwash fans** - Thick sand and gravel accumulations formed at the mouth of subglacial tunnels along the receding late Pleistocene ice margin. The sand and gravel is interbedded with and overlain by Presumpscot Formation clays at the distal edges of the fans, and occasionally interlayered with till at their ice-contact faces. Some fans, or group of fans have been assigned a unique geographic name listed below:

$Pmfc_x$	- Cedar Grove fans 1-2
$Pmfw_x$	- West Dresden fans 1-2
Pmfa	- Abagadasset River fan
Pmfs	- Swan Island fan
Pmft	- Twing Point fan

Pt — **Till** (Pleistocene) - Light- to dark-gray, nonsorted to poorly sorted mixture of clay, silt, sand, pebbles, cobbles, and boulders; a predominantly sandy diamicton containing some gravel. Generally underlies most other deposits. Many streamlined hills in this area are bedrock-cored.

Ptd — **Thin glacial drift** (Pleistocene) - Areas with generally less than 10 ft of drift covering bedrock. Till overlies bedrock on hillslopes and ridge crests; Presumpscot Formation silty clay is present in depressions; and nearshore deposits overlie till, Presumpscot Formation, and bedrock on hillslopes and at the base of these slopes.

Bedrock exposures - Not all individual outcrops are shown on the map. Gray dots indicate individual outcrops; ruled pattern indicates areas of abundant exposures and areas where surficial deposits are generally less than 10 ft thick. Mapped in part from aerial photography, soil surveys (McEwen, 1970; Hedstrom, 1987), and previous geologic (Thompson and Smith, 1977; Thompson and Borns, 1985) and materials maps (Locke, 1999).

Contact - Boundary between units, approximately located.

135 **Striations** - observations made at dot. Number indicates azimuth (in degrees) of ice-flow direction. Where two directions are observed in the same outcrop, flags indicate older trends where discerned.

Drumlin form or streamlined hill. Indicates general direction of glacial ice movement.

Moraine ridge - Ridge of till, sand, and gravel deposited and/or deformed by glacial ice, often mantled by Presumpscot Formation.

Stream channels and scarps.

Meander scars.

Mapped and inferred **ice marginal positions**.

10,150±450 Ⓕ **Marine fossil locality**. 600 years subtracted from lab analysis for marine reservoir correction (Weddle and Retelle, M. J., 2001).

④ **Photo locality** - Location of photographed site shown and described in map legend.

REFERENCES

Hedstrom, G. T., 1987, Soil survey of Knox and Lincoln Counties, Maine: U. S. Department of Agriculture, Soil Conservation Service, 174 p., scale 1:20,000.

Locke, D. B., 1999, Surficial materials of the Richmond quadrangle, Maine: Maine Geological Survey, Open-File Map 99-52.

McEwen, B. W., 1970, Soil survey of Androscoggin and Sagadahoc Counties, Maine: U. S. Department of Agriculture, Soil Conservation Service, 83 p., scale 1:15,840.

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Thompson, W. B., and Smith, G. W., 1977, Reconnaissance surficial geology of the Gardiner 15' quadrangle, Maine: Maine Geological Survey, Open-File Map 77-43.

Weddle, T. K., and Retelle, M. J., eds., 2001, Deglacial history and relative sea-level changes, northern New England and adjacent Canada: Geological Society of America, Special Paper 351, Boulder, Colorado, 292 p.

USES OF SURFICIAL GEOLOGY MAPS

A surficial geology map shows all the loose materials such as till (commonly called hardpan), sand and gravel, or clay, which overlie solid ledge (bedrock). Bedrock outcrops and areas of abundant bedrock outcrops are shown on the map, but varieties of the bedrock are not distinguished (refer to bedrock geology map). Most of the surficial materials are deposits formed by glacial and deglacial processes during the last stage of continental glaciation, which began about 25,000 years ago. The remainder of the surficial deposits are the products of postglacial geologic processes, such as river floodplains, or are attributed to human activity, such as fill or other land-modifying features.

The map shows the areal distribution of the different types of glacial features, deposits, and landforms as described in the map explanation. Features such as striations and moraines can be used to reconstruct the movement and position of the glacier and its margin, especially as the ice sheet melted. Other ancient features include shorelines and deposits of glacial lakes or the glacial sea, now long gone from the state. This glacial geologic history of the quadrangle is useful to the larger understanding of past earth climate, and how our region of the world underwent recent geologically significant climatic and environmental changes. We may then be able to use this knowledge in anticipation of future similar changes for long-term planning efforts, such as coastal development or waste disposal.

Surficial geology maps are often best used in conjunction with related maps such as surficial materials maps or significant sand and gravel aquifer maps for anyone wanting to know what lies beneath the land surface. For example, these maps may aid in the search for water supplies, or economically important deposits such as sand and gravel for aggregate or clay for bricks or pottery. Environmental issues such as the location of a suitable landfill site or the possible spread of contaminants are directly related to surficial geology. Construction projects such as locating new roads, excavating foundations, or siting new homes may be better planned with a good knowledge of the surficial geology of the site. Refer to the list of related publications below.

OTHER SOURCES OF INFORMATION

1. Frost, D. S., Weddle, T. K., and Locke, D. B., 2004, Surficial materials of the Richmond quadrangle, Maine: Maine Geological Survey, Open-File Map 04-2.
2. Neil, C. D., 2004, Significant sand and gravel aquifers of the Richmond quadrangle, Maine: Maine Geological Survey, Open-File Map 04-17.
3. Thompson, W. B., 1979, Surficial geology handbook for coastal Maine: Maine Geological Survey, 68 p. (out of print).