DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

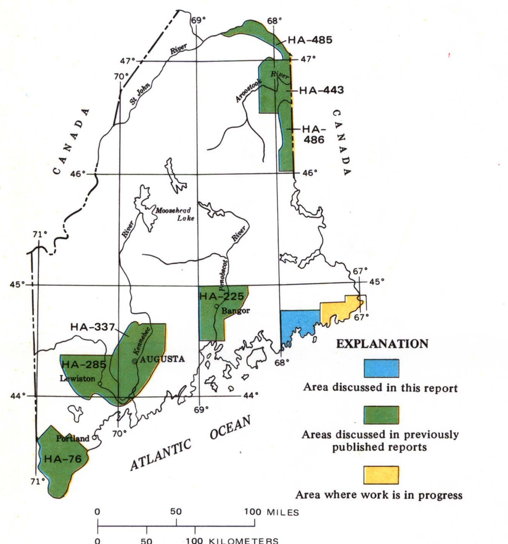
Prepared in cooperation with the
STATE OF MAINE PUBLIC UTILITIES COMMISSION

HYDROLOGIC INVESTIGATIONS
ATLAS HA-529

INTRODUCTION

This report is one of a series describing the geologic and hydrologic conditions governing the occurrence of ground water in Maine (see index map). These reports are intended to provide information to resource planners or to those wishing to develop water supplies, particularly supplies large enough for public, commercial, or industrial use, from ground-water sources. The magnitude of yields that might be expected from properly located and constructed wells or from springs is indicated by the map showing ground-water-favorability areas and surficial geology. This map gives a generalized interpretation of observed geologic and hydrologic data and provides a logical basis for directing detailed exploration for ground water but does not eliminate the need for such exploration.

The project includes about 400 sq mi (square miles) in eastern Maine. Most of the area is in Washington County; less than 10 sq mi is in Hancock County.



INDEX MAP SHOWING AREAS OF GROUND-WATER INVESTIGATIONS

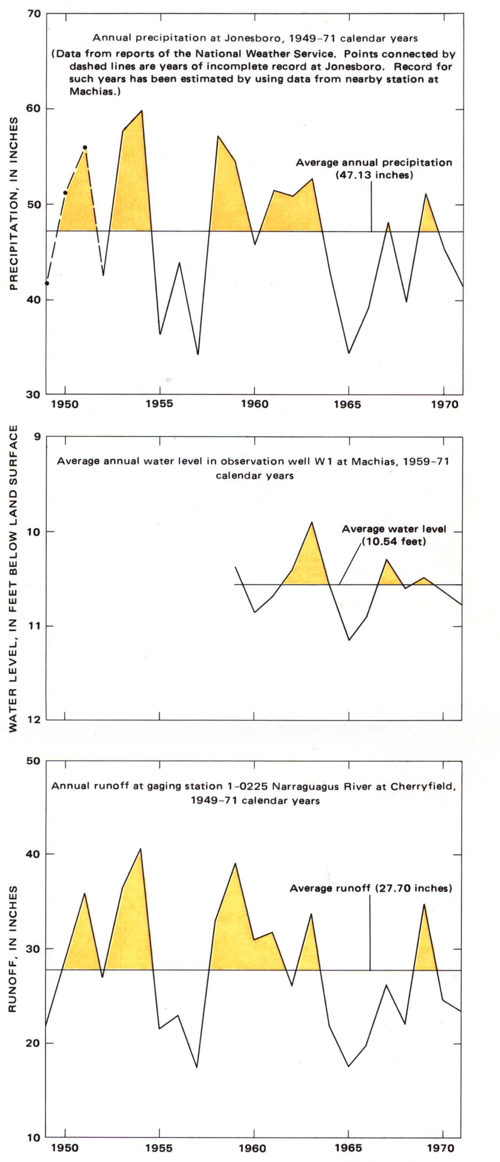
RELATION OF CLIMATE TO AVAILABILITY OF WATER

Annual precipitation at Jonesboro during 1949–71 ranged from 34.20 inches in 1957 to 59.87 inches in 1954 and averaged 47.13 inches. Years of above-average precipitation are normally years of above-average ground-water levels and runoff, as indicated on the graphs showing annual data.

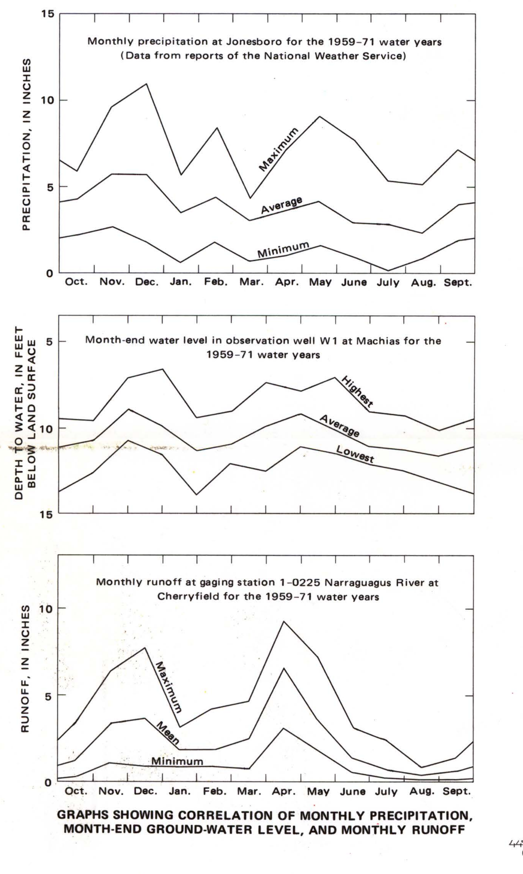
Monthly fluctuations in ground-water levels are caused by variations in precipitation and other climatic factors. The largest monthly amounts of precipitation, normally more than 5 inches, are received in November and December, and the smallest amounts, normally less than 3 inches, during June, July, and August. Ground-water levels decline during the summer months of low rainfall and high evapotranspiration (graphs showing monthly data). Beginning in September, increases in precipitation and decreased evapotranspiration cause increased streamflow and a rise in ground-water level. Much of the high December precipitation is snow on frozen ground and is not immediately available for ground-water recharge or increased streamflow. Therefore, ground-water levels and streamflow generally decline from December until the time that water from snowmelt or rain has the opportunity to percolate into the ground and recharge the body of ground water or to run off in streams (graphs showing monthly data). With the coming of the growing season and increased evapotranspiration, ground-water levels and streamflow again decline.

All fresh ground water available in the Cherryfield-Jonesboro area is derived from local precipitation. Of the approximately 47 inches of precipitation, nearly 28 inches runs off directly or through ground-water discharge to streams; most of the remainder is evaporated or transpired.

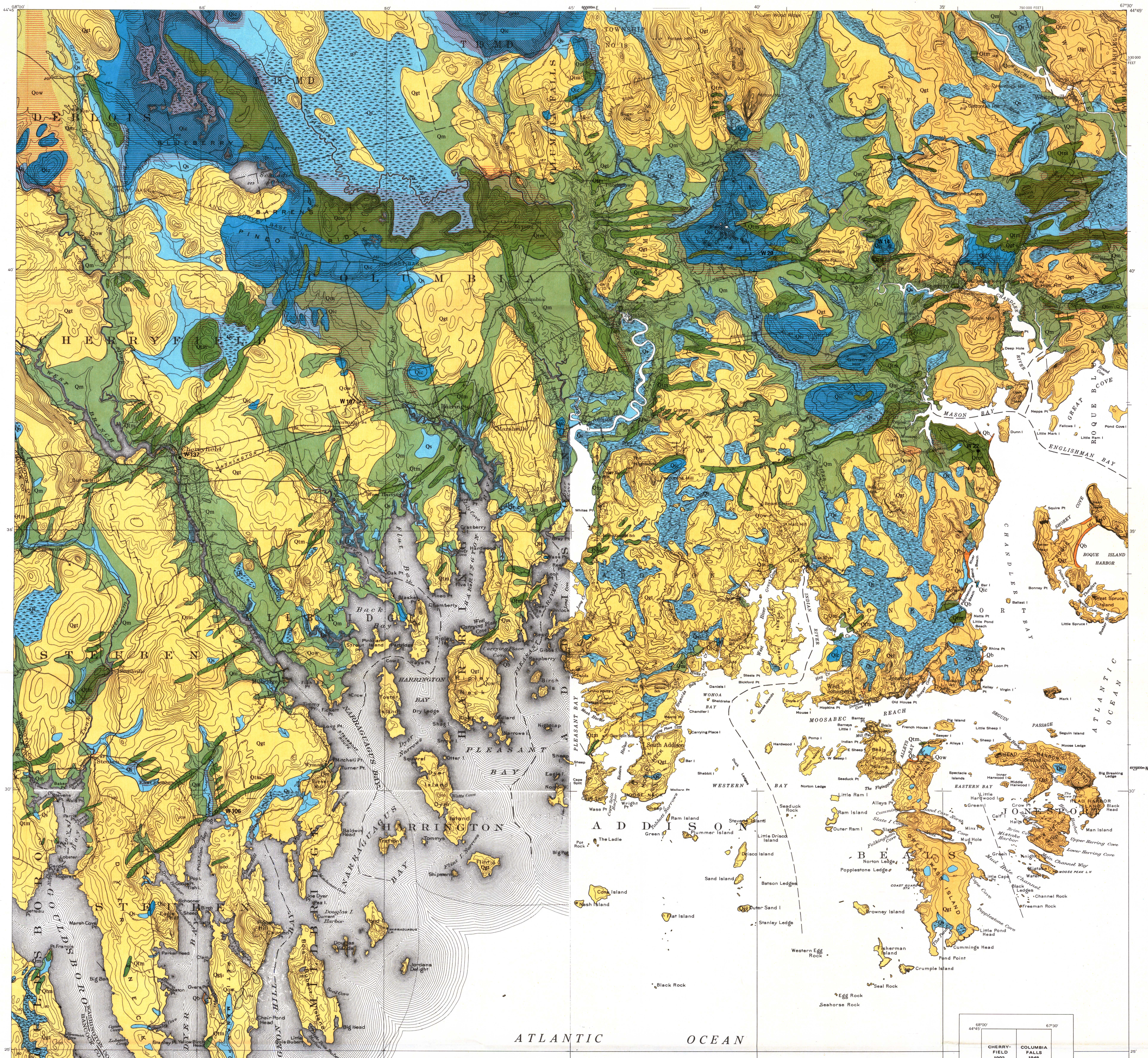
Most of the precipitation on the permeable soils of blueberry barrens, such as Pineo Ridge and the Deblois plain, except for water that is evaporated or transpired directly, sinks into the ground and becomes a part of the ground-water body. Some ground water percolates into the underlying bedrock, but most reappears as springs or seeps, where the water table intersects the land surface. A greater fraction of precipitation on less permeable soils runs off directly after storms than in the areas of sandy soils.



GRAPHS SHOWING CORRELATION OF ANNUAL PRECIPITATION, GROUND-WATER LEVEL, AND RUNOFF



GRAPHS SHOWING CORRELATION OF MONTHLY PRECIPITATION AT JONESBORO, MONTH-END GROUND-WATER LEVEL, AND MONTHLY RUNOFF

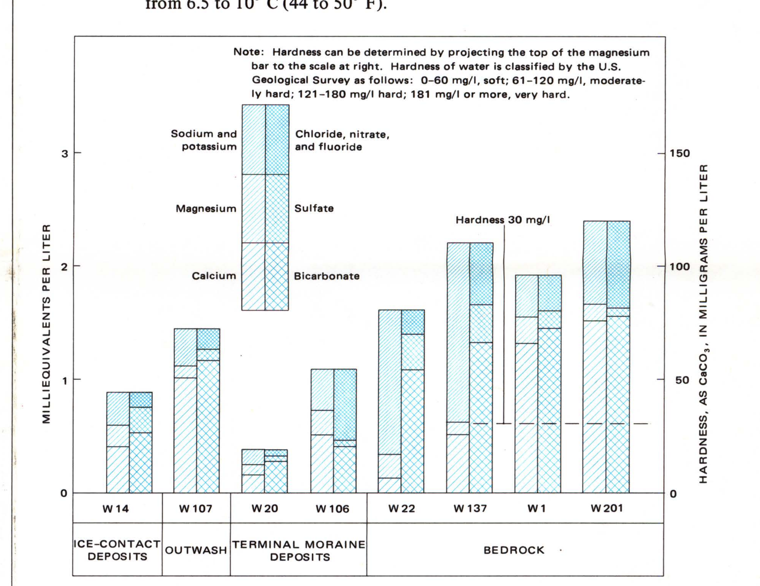


WATER QUALITY

The quality of ground water is generally good for most purposes. (See chemical diagrams.) It is normally soft, low in dissolved solids and in most areas is free from constituents that would limit its usefulness. In local areas or in individual wells water may contain excessive concentrations of iron, manganese, chloride, or nitrate, or may be exceptionally hard. Several wells in the village of Corea yield water that is high in iron, which apparently is derived from bedrock.

Unusual concentrations of chloride or nitrate or very hard water may indicate possible contamination. Along the coast, numerous wells drilled in bedrock have either penetrated brackish or salty water bodies at the time of drilling or have yielded salty water with continued pumping. Salt used to deice roads during the winter is a source of contamination to wells, especially where the salt is stored. Effluent from septic tanks, barnyards, and fertilized fields is also a source of pollution by nitrate, chloride, phosphate, or coliform bacteria.

The temperature of six samples of ground water ranged from 6.5 to 10° C (44 to 50° F).

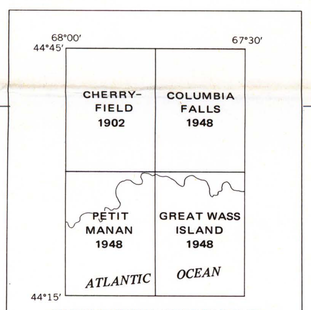


DIAGRAMS SHOWING CHEMICAL CHARACTER OF GROUND WATER

EXPLANATION

System	Series	Geologic unit	Thickness (feet)	Character and occurrence	Water-bearing characteristics
QUATERNARY	Holocene	Qb Beach deposits	[1]0–25	Sand, gravel, and cobbles of a few small recent beaches or bars. Other beaches are too small to be shown at the present mapping scale. Includes some associated deposits of eolian sand, particularly in the Sand Beach area of Jonesport.	A few wells obtain water from beach deposits where they lie above sea level, but generally the saturated parts contain salt water. Not a significant aquifer.
		Qs Swamp deposits	[2]0–20	Peat and organic muck and some intermixed silt, clay, and sand of alluvial or colluvial origin. Occurs in poorly drained areas. Includes salt-marsh deposits along tidal streams.	Swamp deposits are not known to yield water to wells in this area. They may release water slowly to underlying permeable beds or to streams flowing through or issuing from them. The water may be acid, highly colored, or high in nitrate or organic material.
	Pleistocene	Qm Marine deposits	[1]0–130	Blue-gray to tan silt, clay and fine to very fine sand. Occurs in areas that were inundated by the sea subsequent to or during the retreat of the glacier. The most extensive outcrop areas of clay lie below 100 feet above mean sea level, but clay has been found in this area up to about 200 feet above mean sea level. Deposits probably correlate with the Presumpscot Formation of southwestern Maine (Bloom, 1960, p. 55).	Marine deposits are generally too fine grained and impermeable to be a significant aquifer. Yields small amounts of water to some dug wells or springs, probably from sandy zones. The water is of good quality.
		Qow Outwash	[3]0–40	Stratified deposits of sand and gravel and some silt, clay, and cobbles. Occurs as a large outwash plain in Deblois and in small deposits elsewhere.	Outwash yields small amounts of water to some dug or driven wells or to springs. The areas of outcrop are generally too small or deposits are of insufficient saturated thickness to permit developing of large yields. Water in outwash is soft and of good quality.
		Qic Ice-contact deposits	[1]0–153	Stratified deposits of sand and gravel and some silt, clay, and boulders. Occur as large kames, e. g., Carr Hill, and Gilman Hill; small kames, large deltas, for example, Pineo Ridge, and small deltas.	Deposits contain small to large supplies of water, but, because they occur in lightly populated areas, they are not used heavily as a source of supply. Ice–contact deposits supply water to many springs, particularly in the area of Pineo Ridge but most of these are unused. One well in ice–contact deposits has a yield reported to be too large to measure (presumably by a bailer). The water is soft and of good quality.
		Qtm Terminal moraine deposits	[1]0–235	Unstratified, unsorted mixture of clay, silt, sand, gravel, cobbles, and boulders (till), and stratified deposits of sand and gravel (ice-contact deposits). Some of the moraines are entirely till; some are all stratified drift; and others are a combination of till and stratified materials (Borns, 1967, p. 14).	Terminal moraine deposits, where they consist of stratified sand and gravel, may be a good source of water to wells and springs if the saturated thickness is sufficient. The largest reported yield is 300 gpm. The water is soft and of good quality.
CAMBRIAN TO QUATERNARY	Pre-Pleistocene and Pleistocene	Till / Qgt / Bedrock	[1]0–45	Till and bedrock are mapped together. Till is an unsorted, unstratified mixture of clay, silt, sand, gravel, and boulders. Deposits generally have a clay-rich matrix and contain numerous boulders, but in places are sandy or gravelly and resemble ice-contact deposits, except for lack of stratification. Bedrock consists mainly of a variety of both intrusive and extrusive igneous rocks, including granite, granodiorite, gabbro, diorite, basalt, rhyolite, and tuff; metamorphic rocks, including phyllite, gneiss, slate, schist, and quartzite; and some shale.	Till is the source of water to numerous dug wells and springs. Sustained yields of most dug wells are low, and the wells are likely to go dry in the summer. Some springs have been enlarged and storage provided and are used for public water supplies. The water is soft and of good quality. Bedrock formations are dense and relatively impermeable and contain little water. They contain recoverable water only in secondary openings, such as cleavage or bedding planes, fractures, or solution openings. Based on present knowledge it is impossible to predict accurately the depths at which water-bearing zones will be found or how much water will be available to wells. The water in bedrock is confined under artesian conditions and will rise above the level at which it is reached by the drill. Several wells for which information is available flowed at the land surface when drilled. Water is of good chemical quality. Wells near the seashore are subject to contamination by salt water.

[1] Maximum value from well record.
[2] Maximum value from Bastin and Williams (1914, p. 12).
[3] Maximum value estimated.



INDEX SHOWING QUADRANGLES IN THIS REPORT

EXPLANATION

FAVORABILITY AREAS

More than 50 gallons per minute

Areas most favorable for developing water supplies of 50 gpm (gallons per minute) or more from wells or springs. Water-bearing materials are stratified sand and gravel deposits of glaciofluvial or glaciomarine origin, including ice-contact deposits and terminal moraine deposits. The maximum reported yield of wells is 300 gpm; as much as 1,000 gpm probably can be obtained in favorable locations. The greatest potential yields are where coarse-grained saturated deposits are thick and are in hydraulic contact with a body of surface water as a source of induced recharge

10 to 50 gallons per minute

Areas most favorable for the developing of water supplies from 10 to 50 gpm from wells and springs. Water-bearing materials are stratified sand and gravel deposits of glaciofluvial or glaciomarine origin and include outwash, ice-contact deposits, and terminal–moraine deposits where the saturated section is thin, deposits are relatively fine grained, or where induced recharge is not possible

NOTE

Areas where most wells and springs will yield less than 10 gpm are shown without colored overprint used for the areas mentioned above. Aquifers may include any of the formations described in the map explanation. About 22 percent, or nearly 1 of every 4 wells drilled in bedrock, yielded more than 10 gpm. As explained elsewhere, it is not feasible to delineate areas on the map where bedrock wells within certain yield ranges can be expected.

Contact

Direction of glacial striations
Tip of arrow indicates location of striations

W 14
Well in unconsolidated deposits

W 107
Spring in unconsolidated deposits

W 137
Well in bedrock

WELLS COMPLETED IN BEDROCK

The depth of 487 bedrock wells ranged from 27 to 600 feet. The average was 150 feet and the median 145 feet. A few of the wells were drilled for industrial or commercial use, but most were drilled for domestic purposes. In general, then, the depths reflect the depth necessary to drill for domestic water supplies; the deeper wells do not indicate attempts to obtain supplies of water sufficient for industrial, commercial, or public-supply purposes.

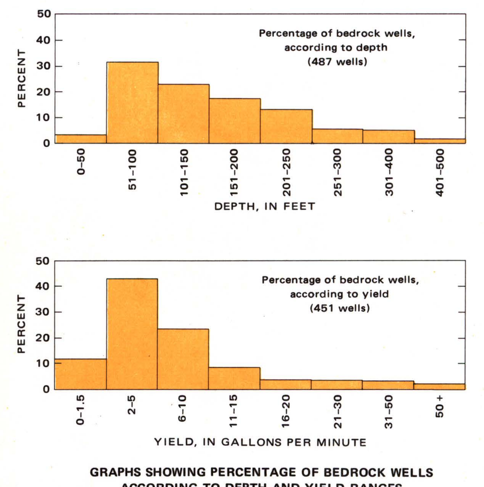
The yield of wells ranged from less than 1 to 250 gpm (gallons per minute) (estimated by the driller). The average yield was 11 gpm, and the median was 5 gpm. Yields of less than 1 gpm were obtained from wells in all but the 0- to 50-foot depth range, where the minimum reported yield was 1.5 gpm. (See table.) The yield of about 12 percent of the wells was less than 2 gpm. (See graphs.) Only about 7 percent of the wells 200 feet or less in depth yielded less than 2 gpm, but about 28 percent of wells deeper than 200 feet yielded less than 2 gpm. About 14 percent of the wells yielded more than 15 gpm. Most of these were in the 51- to 100-foot range, which also includes the largest total number of wells. The highest percentage of wells yielding more than 15 gpm (37.5 percent) is in the 401- to 500-foot range. (See graphs.) However, four of eight wells (50 percent) in this depth range had yields of less than 2 gpm. About 5 percent of the wells yielded more than 30 gpm, and yields exceeding 50 gpm were reported from several depth ranges. (See table.) The largest reported yield, 250 gpm, was from a well 130 feet deep.

Yield figures are based on information obtained by drillers from pumping or bailing tests made at the time of drilling and do not necessarily reflect the rate at which the wells were subsequently pumped.

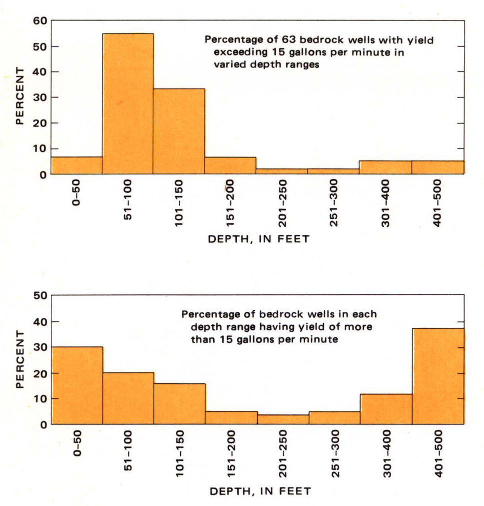
Yield of wells according to depth range

Depth (feet)	Number of wells	Yield (gallons per minute)			
		Minimum	Maximum	Average	Median
0–50	14	1.5	75	18	6
51–100	140	less than 1	100	13	8
101–150	106	less than 1	250	14	5
151–200	75	less than 1	30	5	4
201–250	63	less than 1	40	5	2
251–300	20	less than 1	30	6	4
301–400	25	less than 1	100	10	3
401–500	8	less than 1	100	24	2
501–600	a1				

aNo yield data available.



GRAPHS SHOWING PERCENTAGE OF BEDROCK WELLS ACCORDING TO DEPTH AND YIELD RANGES



GRAPHS SHOWING PERCENTAGE OF BEDROCK WELLS YIELDING MORE THAN 15 GALLONS PER MINUTE, IN RELATION TO DEPTH

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Base from U.S. Geological Survey

SCALE 1:62 500

1 ½ 0 1 2 3 4 MILES

1 .5 0 1 2 3 4 KILOMETERS

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

Geology mapped in 1971
Location of terminal moraines adapted and modified from material supplied by H. W. Borns, Jr. (1967, and unpublished)

Interior—Geological Survey, Reston, Va.—1974

GROUND-WATER FAVORABILITY AND SURFICIAL GEOLOGY OF THE CHERRYFIELD–JONESBORO AREA, MAINE

By
Glenn C. Prescott, Jr.

1974

For sale by U.S. Geological Survey, Reston, Va. 22092, price $ 1.00