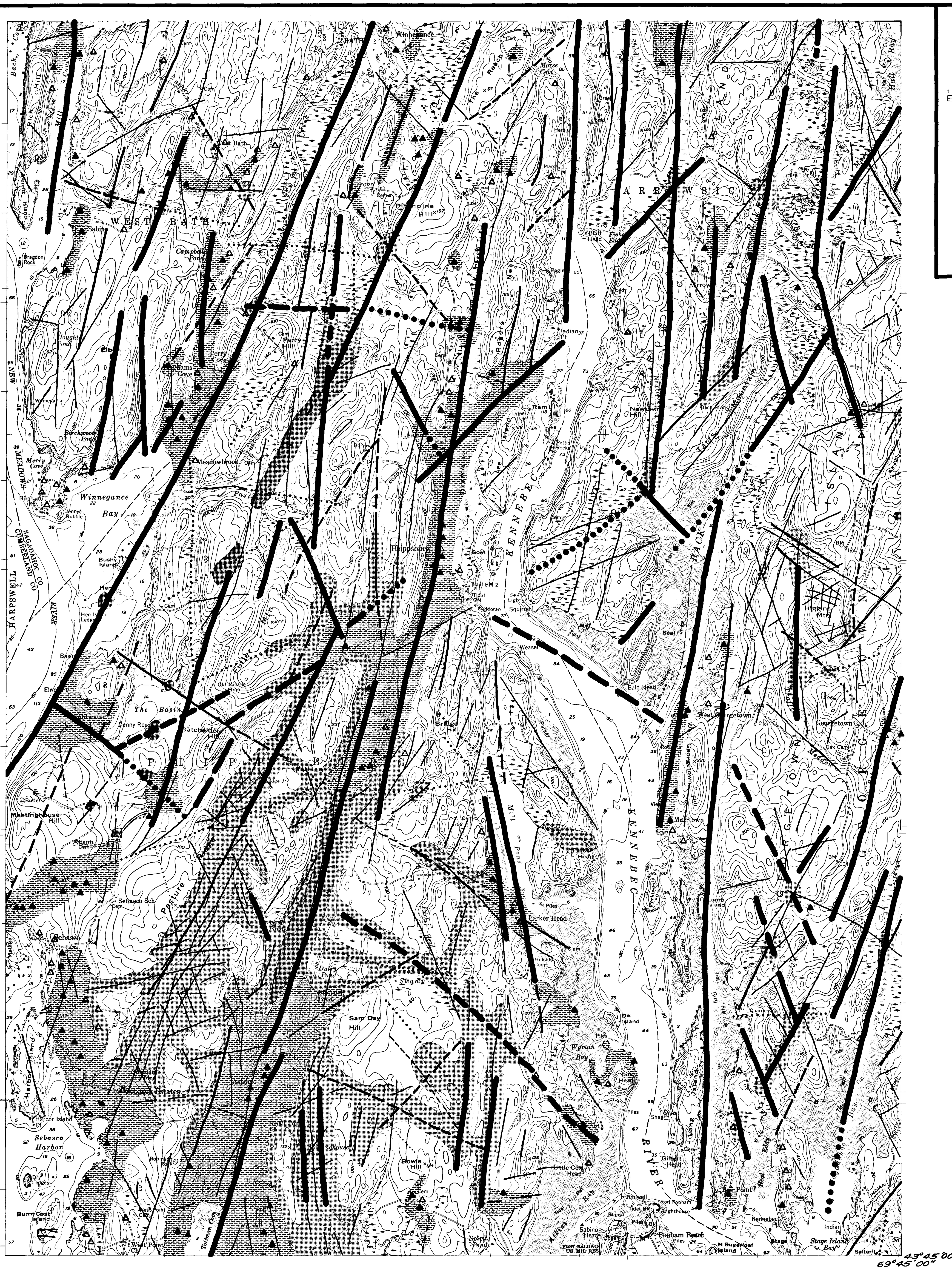
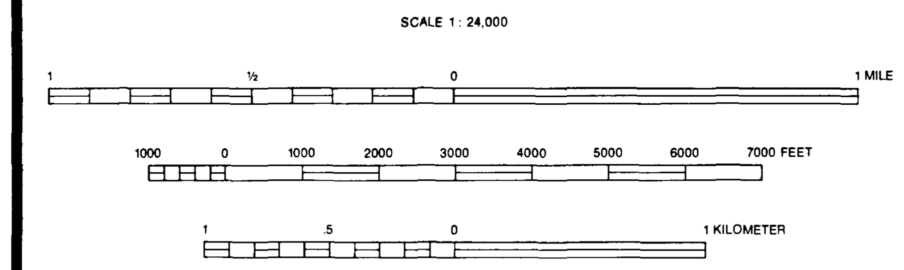
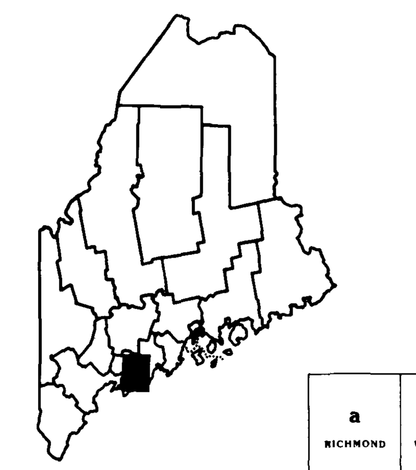




Funding for this study was provided by the Maine Low-Level Waste Siting Commission.



Quadrangle Locations

a RICHMOND	b WISCASSET	c DAMARISCOTTA
d BATH	e WESTPORT	f BRISTOL
g PHIPPSBURG	h BOOTHBAY HARBOR	i PEMAQUID POINT

POTENTIAL ZONES OF HIGH GROUND WATER TRANSMISSIVITY IN THE PHIPPSBURG QUADRANGLE, MAINE

prepared for the

Maine Geological Survey
DEPARTMENT OF CONSERVATION

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EXPLANATION

Relative Strength

	Strong	Moderate	Weak
1st order linear features	▬▬	▬ ▬ ▬	● ● ● ● ●
2nd order linear features	──	— — —	• • • • • •
3rd order linear features	──	– – –	· · · · · ·

▲ Bedrock well with yield ≥ 5 gallons per minute

△ Bedrock well with yield < 5 gallons per minute

Zone of potential high transmissivity based on bedrock well yield

Zone of potential high transmissivity based on photolinear features and existing bedrock geologic information

Zone of potential high transmissivity based on photolinear features and intersections

OBJECTIVE AND METHODOLOGY

Under federal law, the State of Maine will be responsible beginning in 1986 for the disposal of all low-level radioactive waste generated within its borders. The Maine Low-Level Radioactive Waste Siting Commission was formed in 1981 by the Legislature to identify and address the problems involved in the safe disposal of low-level radioactive waste. The Commission reports its findings to the Governor and Legislature. As part of its assessment, the Commission asked the Maine Geological Survey to investigate the geologic suitability of the mid-coastal region in the vicinity of the Maine Yankee Nuclear Power Plant for a low-level waste disposal or long-term storage facility. The study included a photographic analysis of the region to identify bedrock linear features and assess their significance with respect to potential zones of high ground-water transmissivity or flow, as well as bedrock mapping with an emphasis on locating fractures. This assessment does not propose sites for further investigation; it is one part of an area-wide suitability study.

Several types and scales of imagery were used in the photographic analysis. These included conventional black-and-white and color aerial photography at scales of 1:20,000, 1:40,000, 1:80,000, 1:128,000, and 1:130,000; LANDSAT Multispectral Scanner (MSS) and Return Beam Vidicon (RBV) imagery at scales of 1:1,000,000 and 1:500,000 respectively; and Synthetic Aperture Side-Looking Airborne Radar (SLAR) imagery at a scale of 1:250,000. 435 separate scenes were examined, including composites and mosaics.

On these maps, linear features are classified according to the scale of the imagery on which they were identified. "First order" features observed on small scale (1:250,000 to 1:1,000,000) imagery are generally the principal features of the landscape. They are regional in nature and control the major drainages and general morphology of the coastal islands and peninsulas. "Second order" features (observed at scales of 1:80,000 to 1:130,000) exert less of a controlling influence on the overall landscape. "Third order" features (identified at scales of 1:20,000 to 1:40,000) exert an influence on local topography and vegetation. In addition, linear features were ranked according to their relative strength on the imagery - strong, moderate, or weak. These nine possible categories are represented by line width and type on the maps.

In addition to the photogeologic analysis, existing bedrock and hydrologic information was correlated with the linear features. To determine hydrologic characteristics, the location of the bedrock linears was compared with bedrock well yield information obtained from published Maine Geological Survey maps. A well yield of 5 gallons per minute (GPM) was used as a threshold for a potential zone of high ground water flow. Based on an analysis of well yields, linear features, and bedrock geologic information, a three-fold system for the classification of potential zones of high ground-water flow was developed:

- zones where well data indicates a potential zone of high ground-water flow;
- zones where photolinear elements coexist with bedrock information suggesting highly fractured rock, or with rock types associated with elevated well yields (such as mafic dikes);
- zones where, based on patterns recognized from comparison of photolinear elements and well yields, high ground-water flows are suspected to occur. In order of decreasing potential for high flow, elements for identifying zones based solely on photographic analysis were:
  1) high density intersections of linear features of any order or strength;
  2) intersections of two or more strongly expressed, first order features
  3) intersections of first order features with lower order features
  4) unintersected first order features
  5) intersections of two or more strongly expressed second order features
  6) unintersected second and third order features

These three types of estimated zones of high ground-water flow are shown by three different patterns on the maps. In addition, the well yield data (greater than or less than 5 GPM) are also shown on the maps.

SUMMARY

Based on the comparison of well yields and photolinear elements, potential zones of high ground-water flow appear to be of limited extent. The major trend of high-flow zones is northeast-southwest, paralleling the line of coastal embayments. Other linears intersect these zones; such intersections have the highest potential flow rates. Yield appears to decrease rapidly with distance away from the linear features.

Areas mapped as high potential flow zones should be eliminated from further study as potential low-level radioactive waste disposal sites. Areas between mapped high-flow zones require further study to identify whether they lack the ability to transmit ground water.