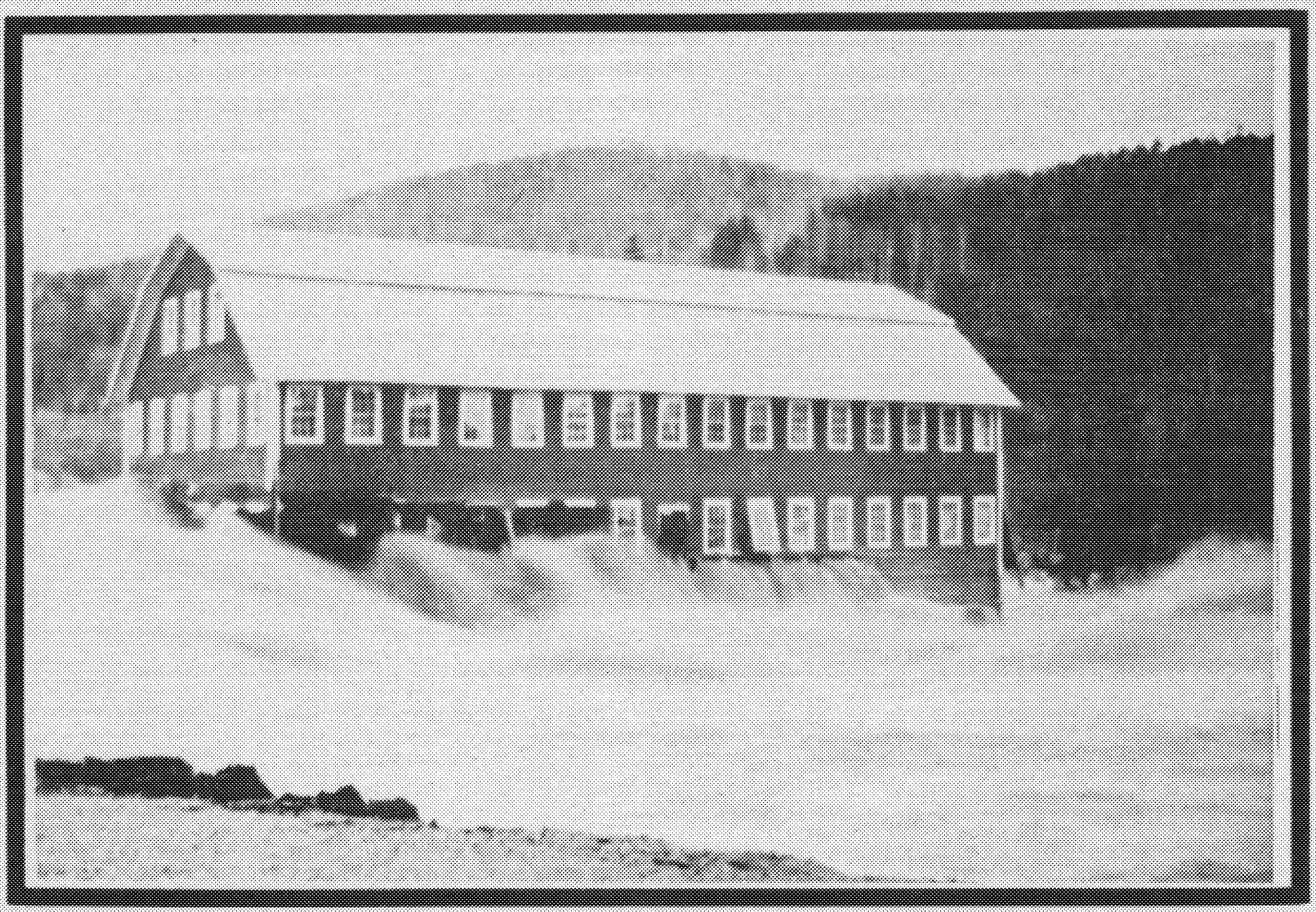
FLOOD PLAIN INFORMATION

PASSUMPSIC and STEVENS RIVERS AND SOUTH PEACHAM BROOK

BARNET, VERMONT



PREPARED BY THE DEPARTMENT OF THE ARMY, NEW ENGLAND DIVISION
CORPS OF ENGINEERS, WALTHAM, MASSACHUSETTS

APRIL 1978

CONTENTS

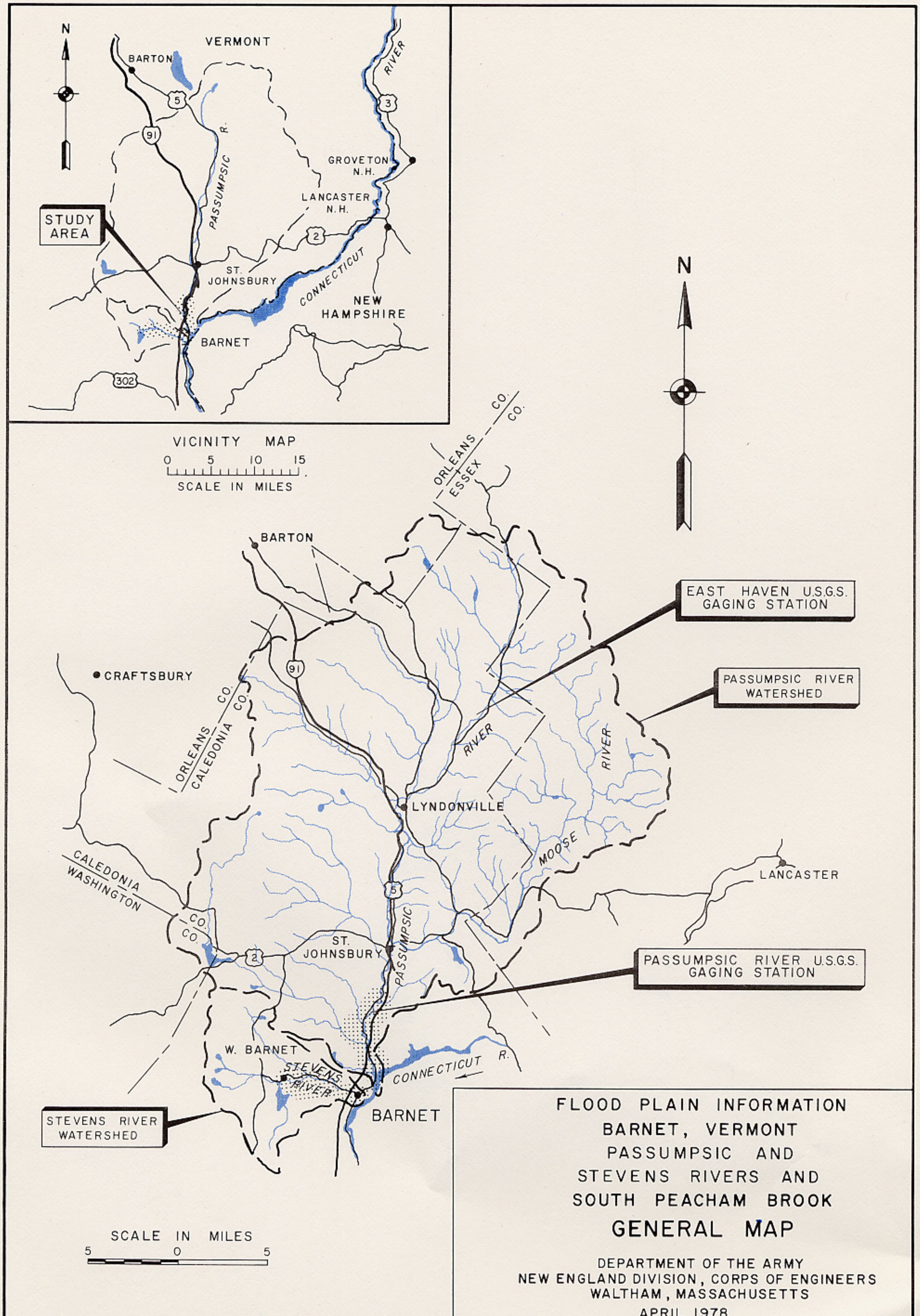
CONTENTS (Continued)

TABLES

FIGURES

PLATES

PLATES (Continued)



FLOOD PLAIN INFORMATION
BARNET, VERMONT
PASSUMPSIC AND
STEVENS RIVERS AND
SOUTH PEACHAM BROOK

GENERAL MAP

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS
APRIL 1978

PLATE I

PREFACE

The portion of the town of Barnet, Vermont covered by this report is subject to flooding from the Passumpsic and Stevens Rivers and the South Peacham Brook. The properties along these streams are primarily agricultural and have been severely damaged by the floods of 1927 and 1936. The open spaces in the flood plains which may come under pressure for future development are limited. Although large floods have occurred in the past, studies indicate that even larger floods are possible.

This report has been prepared because a knowledge of flood potential and flood hazards is important in land use planning of flood plains. It includes a history of flooding in Barnet and identifies those areas that are subject to possible future floods. Special emphasis is given to these floods through maps, photographs, hydrographs, profiles, and cross sections. The report does not provide solutions to flood problems; however, it does furnish a suitable basis for the adoption of land use controls to guide flood plain development and, thereby, prevent intensification of the loss problems. It will also aid in the development of other flood damage reduction techniques such as works to modify flooding and other adjustments, including flood proofing, which might be embodied in an overall Flood Plain Management (FPM) program. Other FPM program studies -- those of environmental attributes and the current and future land use role of the flood plain as part of its surroundings -- would also profit from this information.

This report was prepared at the request of the town of Barnet, with the endorsement of the State of Vermont Highway and Water Resources Departments by DuBois & King, Inc., Engineering and Environmental Services, Randolph, Vermont, for the U.S. Army Corps of Engineers, New England Division under continuing authority provided in Section 206 of the 1960 Flood Control Act (Public Law 86-645), as amended.

Assistance and cooperation of the U. S. Geological Survey, the town of Barnet, the Vermont Historical Society and private citizens in supplying useful data and photographs for the preparation of this report are appreciated.

Additional copies of this report can be obtained from the town of Barnet. The U.S. Army Corps of Engineers, New England Division, upon request, will provide technical assistance to planning agencies in the interpretation and use of the data presented as well as planning guidance and further assistance, including the development of additional technical information.

BACKGROUND INFORMATION

Settlement

The town of Barnet was chartered on September 16, 1763, by Benning Wentworth, Governor of the Province of New Hampshire. The town is situated on the right bank of the Connecticut River at its confluence with the Passumpsic River. Into the town came settlers, many from Scotland, who cleared the wooded land, built homes and turned the wilderness into productive farms.

The first sawmill in Barnet was built in 1771 taking advantage of the plentiful supply of water power and wood that the area offered. Later, woolen mills were built in the town. The woolen mills originated in Barnet in approximately 1830; however, Barnet was and still is chiefly considered a farming and agricultural community.

The first population census, tabulated in 1790, showed the population to be approximately 500. The town grew to a peak of 2,521 residents in 1850 after which the population gradually declined to the current levels. The temporary increase in population could be attributed to the first railroad being built through that area. According to the 1970 United States Census, the population of Barnet was 1,342. A slight increase in population is projected during the foreseeable future.

The Streams and Their Valleys

The Passumpsic River basin is located in northeastern Vermont and is formed by the confluence of its east and west branches in the town of Lyndon, Vermont. The Passumpsic River flows in a southwesterly direction to Lyndonville (see General Map, Plate 1) from there it follows a southerly course through St. Johnsbury and Passumpsic to its confluence with the Connecticut River at East Barnet. The river has an overall length of approximately 23 miles and a fall of about 250 feet for an average slope of 10.9 feet per mile. The total drainage area for the Passumpsic River at the upstream boundary of the study, the Barnet-Waterford town line, is 428.6 square miles. The downstream boundary is its confluence with the Connecticut River where the drainage area is 507 square miles. The river falls approximately 73 feet from the upstream to the downstream boundary of the study area, a distance of 5.2 miles, for an average slope of 14.0 feet per mile. There are two dams on the Passumpsic River within the study area, one is situated in Passumpsic and the other is in East Barnet. The two dams account for approximately 8 and 17 feet of the drop in bed elevation respectively. The average slope of the river through the study area excluding the vertical drop at the two dams is 9.2 feet per mile. The U.S. Geological Survey gage located near Passumpsic, approximately 1.2 miles below the Barnet-Waterford town line, has a drainage area of 436 square miles.

The Stevens River drainage basin lies to the southwest of the Passumpsic River and has its source at the outlet of Harvey Lake. From that point, it flows in an easterly direction for about 7 miles and discharges into the Connecticut River at Barnet, Vermont. The river drains an area of 43 square miles and falls approximately 450 feet from Harvey Lake to its mouth for an average slope of 64.3 feet per mile. There are two dams on the Stevens River, one at the outlet of Harvey Lake, accounting for 5 feet of drop, and the other located near Barnet Center, accounting for 7 feet of drop.

South Peacham Brook originates to the northwest of the Stevens River at Foster Pond in Peacham, Vermont. From its source, it travels in a southeasterly direction for 5 miles to its confluence with the Stevens River at West Barnet. The brook drains an area of 13 square miles and falls about 600 feet for an average slope of 120 feet per mile. The study area for South Peacham Brook extends from the Barnet-Peacham town line to its confluence with the Stevens River, a river reach of approximately 0.6 miles.

Drainage areas at various locations in the study area are shown in Table 1. This table presents the areas contributing to runoff for each of the three streams in the study area.

TABLE 1

DRAINAGE AREAS

Passumpsic River, Stevens River and South Peacham Brook

Location	Drainage Area in Square Miles
PASSUMPSIC RIVER	
PASSUMPSIC RIVER at Barnet-Waterford Town Line	428.6
PASSUMPSIC RIVER, USGS Gaging Station at Passumpsic	436.0
PASSUMPSIC RIVER above Joes Brook	450.7
PASSUMPSIC RIVER at its confluence with the Connecticut River	507.0
STEVENS RIVER	
STEVENS RIVER at its confluence with the Connecticut River	43.0
SOUTH PEACHAM BROOK	
SOUTH PEACHAM BROOK at its confluence with the Stevens River	13.0

The climate of the study area is variable and characterized by frequent but short periods of heavy precipitation. It lies in the path of the "prevailing westerlies" and, consequently, in the path of cyclonic disturbances that cross the country from the west or southwest. The average annual precipitation over the area is approximately 36 inches with average snowfall of approximately 80 inches. The mean annual temperature for the Barnet study area is 44° F. Freezing temperatures can be expected between the latter part of September and early May. The winters are moderately severe with subzero temperatures quite common, summers are cool with temperatures averaging 60° to 70° F.

Developments in the Flood Plain

The flood plains of the three study streams in Barnet are relatively narrow and undeveloped. Most of the flood plain of the Passumpsic River is devoted to agricultural uses, mainly for grazing and the production of fodder. A good portion of the flood plains for the Stevens River and South Peacham Brook are wooded with some areas used for agricultural purposes.

Residential development in the flood plain is limited to Passumpsic, East Barnet, Barnet and West Barnet. Commercial development consists of several small retail sales and services establishments; there is little industrial development in Barnet. There are currently no planned major residential, commercial, or industrial developments in the flood plain in Barnet for the near future.

Transportation facilities which parallel the riverbanks are subject to periodic flooding. The Canadian Pacific Railroad and U.S. Route 5, as well as certain arterial roads in the study area, have major portions of track and roadway located in or near the flood plain. Public utilities, such as water mains and electric lines, following the natural watercourse and crossing at bridges are also vulnerable to possible damage or destruction by flood waters.

The projections for the town of Barnet foresee a relatively stable population growth. Through proper planning, little if any pressure should exist towards expansion into the flood plains of the study streams.

SOURCES OF DATA

The U.S. Geological Survey has maintained stream gages on the Passumpsic River and its East Branch. The U.S.G.S. Gage (01135500) on the Passumpsic River used for this report is located 1 mile downstream from the dam in the village of Passumpsic. The gage has been in continuous operation since 1928 and its location is shown on the General Map, Plate 1. The U.S.G.S. Gage (01133000) on the East Branch of the Passumpsic River is approximately 2.1 miles south of East Haven, Vermont, and has a period of record from 1939 to 1945 and 1948 to present. This latter gage is located outside the study area. The river mile, drainage area and period of record for the gaging stations are presented in Table 2.

The Corps of Engineers has been collecting information for many years on existing and prospective flood conditions in the Passumpsic River Basin. Investigations were conducted after each significant flood that occurred during the period of record. Information, such as high water marks, has been obtained by interviewing local residents through the years and making appropriate field investigations. In addition, newspaper files, historical documents, and other records were searched for information concerning past floods. These records have helped to develop a knowledge of historical flooding in the Barnet Area.

Maps prepared for this report were based on the U.S. Geological Survey and Vermont State Highway Maps.

Permanent elevation bench and reference marks used for this study are described in Plates 13, 14, 15 and 16. In addition, their locations are shown on Plates 5 through 12. The descriptions of these marks indicate their location and elevation above mean sea level. All reference marks were set by DuBois & King, Inc. unless stated otherwise.

Photographs of the 1927 Flood were obtained from the Vermont Historical Society. Newspaper accounts of the 1927, 1936 and 1973 Floods are from the Caledonian Record. Research material concerning various aspects of this report was obtained from the Vermont State Library in Montpelier.

For this report, 138 river cross sections were taken along the three study streams. Fifty-seven sections were taken along the Passumpsic River, sixty-nine along the Stevens River and twelve along South Peacham Brook.

The hydraulic and hydrologic computations, cross sections, and bridge and dam cross sections are being retained by the U.S. Army Corps of Engineers for general reference. Also available are current pictures of structures that are built over the streams in the study area.

TABLE 2

U.S.G.S. GAGING STATIONS

East Branch Passumpsic and Passumpsic Rivers

Location	River[1] Mile	Drainage Area Square Miles	Period of Record
East Branch Passumpsic River near East Haven, Vt.	32.0	53.8	Jul. 1939 to Oct. 1945 Oct. 1948 to date
Passumpsic River at Passumpsic, Vermont	4.0	436.0	Oct. 1928 to date

(1) Miles above mouth of river

FLOOD SITUATION

Flood Season and Flood Characteristics

Major floods have occurred in the study reaches of the Passumpsic and Stevens Rivers and South Peacham Brook during all seasons of the year, but the main flood season is the spring. River stages can rise from normal levels to flood stages in a relatively short period of time because of the numerous steep tributaries feeding the study streams. The hilly watershed area, largely forest covered, contains little effective pond or valley storage.

The study streams are susceptible to various types of floods. Occasionally, the area is exposed to coastal storms, some of tropical origin that move inland, but the most severe general storms are those that develop along a slow moving (or stationary) air mass boundary (or front) that separates warm humid air to the south or east from colder dry air to the north or west. In addition to floods caused by rainfall alone, the area is subject to flooding caused by rainfall in combination with snowmelt and ice jamming or any combination of the three factors.

Floods caused by a combination of rainfall and snowmelt generally occur in the springtime when the winter's accumulation of snow, warmed by above-freezing temperatures, and accompanied by spring rains produce excessive runoff over a large area. In the summer, the area is subject to occasional severe thunderstorms which produce local, severe flash flooding. These floods generally affect a smaller area than the spring floods, and they are of shorter duration. The area is sometime affected by extra-tropical disturbances during late summer and early fall. These storms produce heavy amounts of rainfall over large areas, and they are generally associated with a decadent (or spent) hurricane. Although the latter storms occur in the general New England Area, they happen infrequently and are considered relatively rare events. Ice jam induced flooding generally occurs in late winter at constrictive sections of the river where the ice floes knit together to form a natural barrier across the channel. This type of event can cause locally severe flooding, and it is usually associated with snowmelt and above normal temperatures.

Factors Affecting Flooding and Its Impact

Obstructions to floodflows.--Natural obstructions to floodflows include trees, brush and other vegetation growing along the streambanks in floodway areas. Narrow sections of the river channel tend to raise flood levels and contribute to the development of ice jams. Manmade encroachments on or over the streams such as dams and bridges produce a backwater effect which may create more extensive flooding than would normally occur. Representative obstructions to floodflows are shown in Figures 1 through 6.

Trees, brush and other debris may be washed away and carried downstream by floods to collect on bridges and other obstructions. As floodflows increase, masses of debris break loose, and a wall of water and debris surges downstream until another obstruction is encountered. Debris may collect against a bridge until the forces exerted by the water exceeds its structural capacity and the bridge is destroyed. The limited capacity of obstructive bridges retards floodflows and contributes to increased flooding upstream. This increased flooding results in erosion around bridge approach embankments and damage to overlying roadbeds. Although these unusual floods may occur at any constriction, it is impossible to predict the degree or the location of an accumulation of debris or ice. Therefore, during the development of the flood profiles, no attempt was made to model the flooding from an ice jam or other unpredictable event. In general, obstructions restrict floodflows and result in overbank flows and unpredictable areas of flooding, destruction of, or damage to, bridges and an increased velocity of flow immediately downstream.

The two dams on the Passumpsic River and the two dams on the Stevens River are not designed for flood control storage. In addition, these four dams will not seriously alter the flow characteristics of the floodwaters.

The three study streams are spanned by twenty-two bridges and one culvert. Of these twenty-three structures, eleven are on the Passumpsic River, ten on the Stevens River and two on South Peacham Brook. Some of these river crossings are obstructive to floodflows and are covered elsewhere in the report.

Effect of ice.--During the spring breakup, water levels at numerous locations along the rivers in the basin are elevated by the erratic downstream movement of ice floes. Ice jams form in the main river channel at sharp bends and other constrictions, such as bridges. The amount of increase in stage is dependent upon the flow rate, structure and soundness of the ice cover, and the timing of the breakup.

Flood damage reduction measures.--There are no existing flood control projects in the Barnet study area at the present time. In addition, the town currently has neither flood plain regulations nor flood proofing policies.

The State of Vermont has limited regulatory control in flood hazard areas under Act 250 and other land use regulations and has a law which requires and enables municipalities to develop local flood plain zoning regulations.

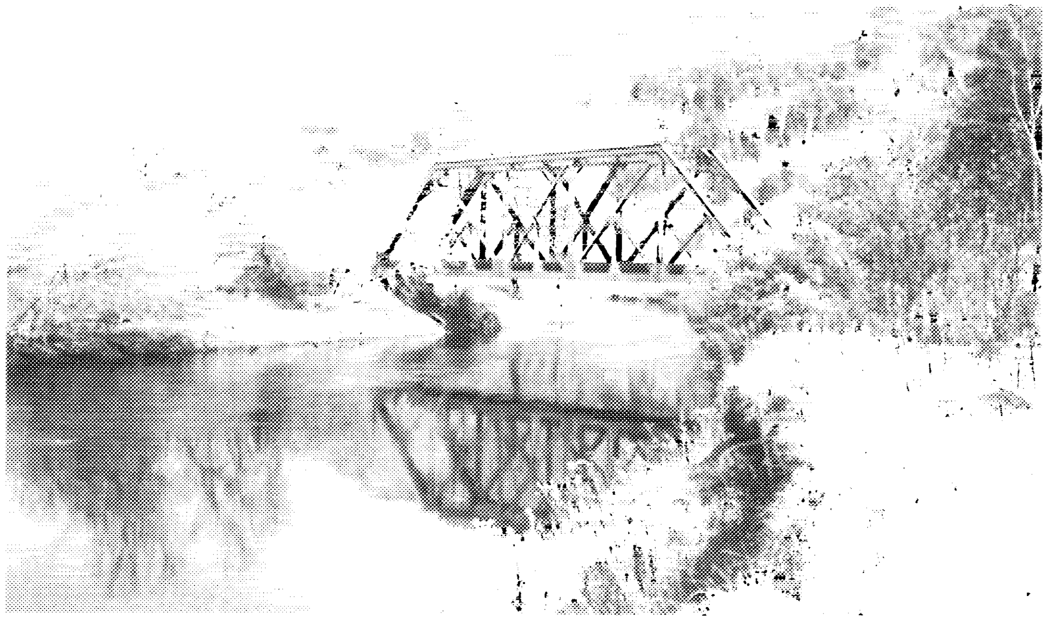


FIGURE 1 - Canadian Pacific Railroad Bridge crossing Passumpsic River (Bridge XS 32, River Mile 2.82)

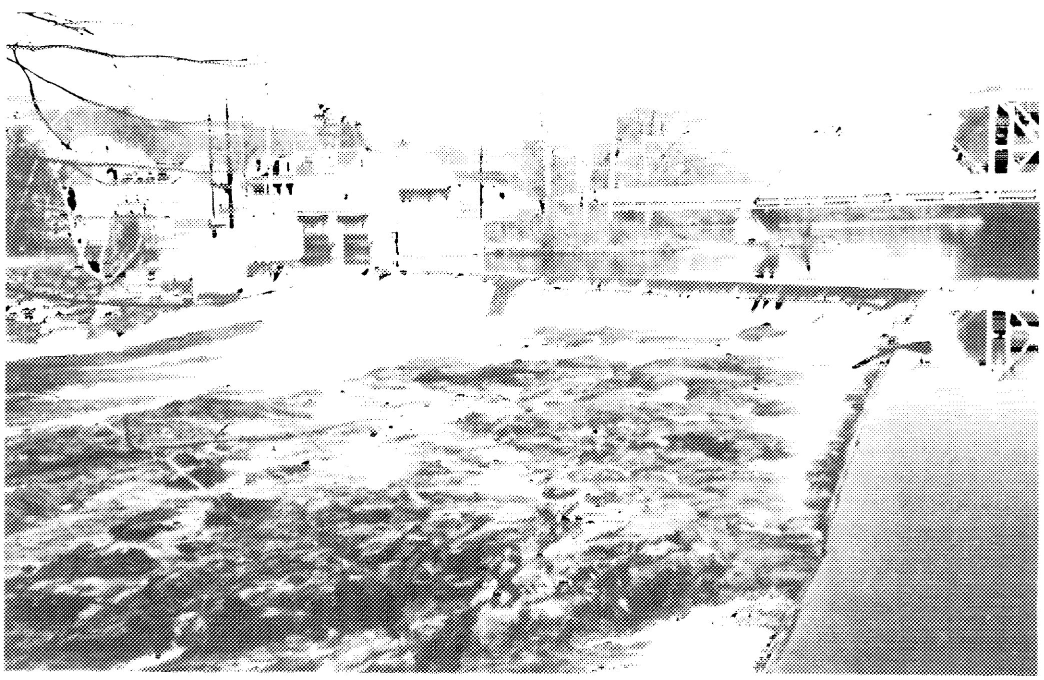


FIGURE 2 - Passumpsic Dam on Passumpsic River (Dam XS 53, River Mile 5.13)

FIGURE 3 - U.S. Route 5 Bridge crossing Stevens River
(Bridge XS 10, River Mile 0.56)

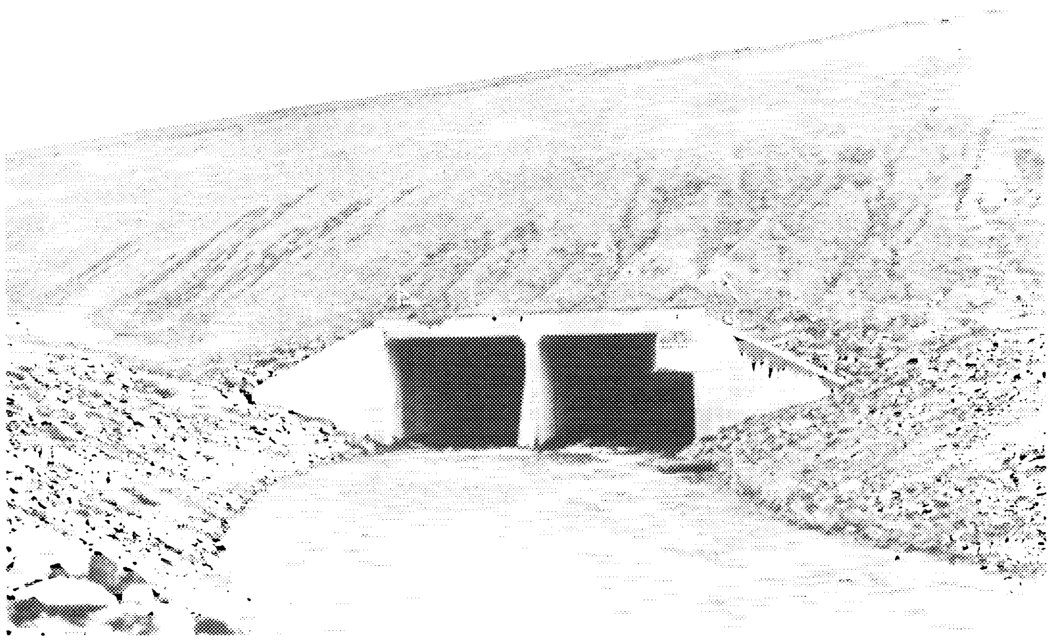


FIGURE 4 - Interstate 91 Culvert, Stevens River
(Culvert XS 17, River Mile 0.92)

FIGURE 5 - Mill Dam on Stevens River (Dam XS 39, River Mile 3.93)

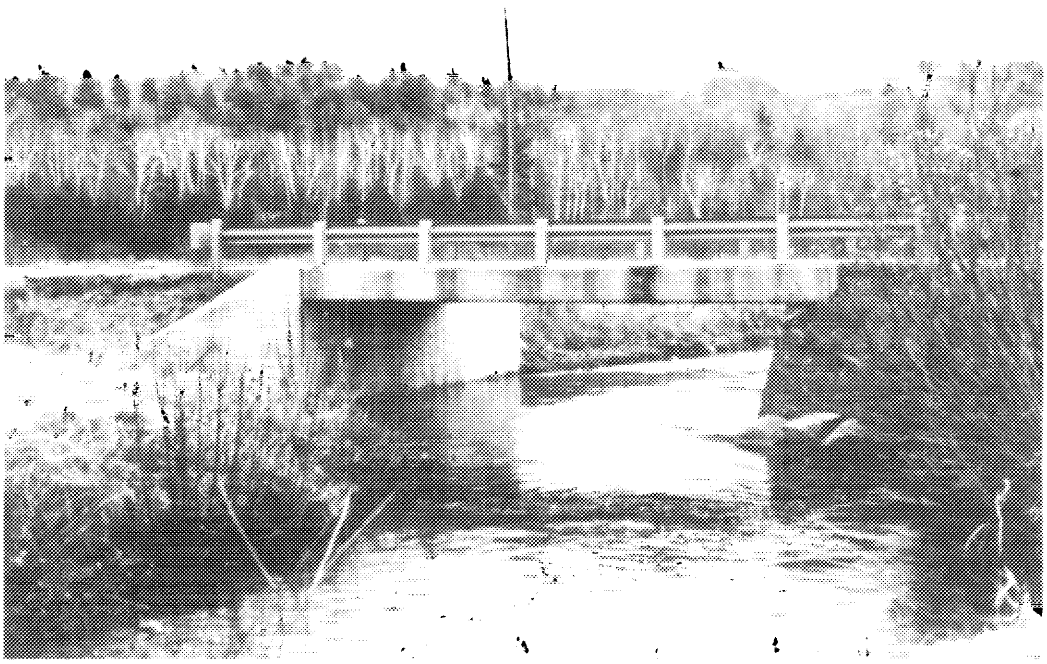


FIGURE 6 - Main Street Bridge crossing South Peacham Brook (Bridge XS 4, River Mile 0.19)

Other factors and their impacts.--The impact of flooding in Barnet can be affected by the ability of local residents to anticipate and effectively react to a flood emergency. Efficient flood warning and forecasting systems can give homeowners, businesses and industries valuable time to remove damagable materials from low-lying areas. Increased damages to downstream areas can also be reduced if buoyant materials stored on the flood plain can be removed in anticipation of floods. This action will prevent such material from being carried downstream to block bridge openings. Implementation of effective flood fighting and emergency evacuation plans can further reduce both flood damages and the incidence of personal injury or death where the rivers have reached flood stage.

Flood warning and forecasting.--The National Weather Service River Forecast Center at Hartford, Connecticut has the responsibility of issuing flood warnings and forecasting river stages in the Connecticut River Basin. That area includes all the rivers and streams in the study area. The flood warnings and forecasts are issued by teletype to the press services, state police, civil defense and many other state and local agencies. In the event of communication failure, the state police and civil defense have an emergency plan for receiving flood warnings and notifying responsible officials.

Flood fighting and emergency evacuation plans.--Although there are no formal flood fighting or emergency evacuation plans for the town of Barnet, coordination of such flood emergency efforts are handled through the state police and civil defense authorities in cooperation with town officials.

Material storage on the flood plain.--During past floods, historical records show that buoyant materials have been carried downstream by floodwaters creating additional hazards. At the present time there are buoyant materials stored in flood prone areas which could be picked up by floodwaters, making them floating hazards. These materials can be carried downstream where they might collect on a fixed obstruction, possibly causing additional backwater flooding or damage. Examples of existing floatable objects in flood prone areas include storage tanks, lumber, dead trees and other miscellaneous objects. The possible washing away of shacks or homes could present particularly dangerous buoyant debris problems.

PAST FLOODS

Summary of Historical Floods

Damaging floods were reported in the Barnet area as early as 1828. Floods causing significant damage occurred in 1828, 1862, 1913, 1927, 1936, 1938, 1954 and 1973. Historic accounts indicate that the most severe flood was the flood of November 1927, the result of excessive rainfall over a large geographic area. The flood of March 1936 was caused by rainfall in combination with snowmelt; whereas, the floods of September 1938 and June-July 1973 were caused by rainfall associated with hurricanes, the latter producing the second highest discharge on record.

Flood Records

Information on historical floods in the Barnet area was obtained from the U.S. Geological Survey Stream Gaging Stations located on the Passumpsic River in Passumpsic, Vermont and on the East Branch Passumpsic River near East Haven, Vermont. Crest stage and discharge for known floods at the Passumpsic Gage are shown in Table 3.

TABLE 3

FLOOD CREST ELEVATIONS

Passumpsic River Gage at Passumpsic (since 1927)

Date of Crest	Elevation at Gage (a) ft. m.s.l.	Peak Discharge cfs.
Nov. 5, 1927	521.5	42,500 (est)
July 1, 1973	513.5	18,200
March 18, 1936	511.2	16,000
Jan. 10, 1935	507.7 (b)	8,500
May 5, 1972	506.9	11,900
March 24, 1938	506.3	11,000 (est)
April 23, 1954	505.7	10,900
March 21, 1950	505.6	10,700
March 24, 1968	505.0 (b)	-
April 19, 1969	504.8 (b)	10,000
June 2, 1952	504.4	9,670
Sept. 22, 1938	502.2	7,710

(a) Zero of gage is 490 ft. m.s.l. (from topographic map)
(b) Stage due to ice
(est) Estimated discharge

Flood Descriptions

The following descriptions of past known large floods in the Barnet area are based on newspaper accounts. These accounts were taken for various flooding events from The Caledonian Record, published at St. Johnsbury, Vermont.

November 1927

In November 1927, a large amount of precipitation fell on a highly saturated ground surface. The dormant vegetation did little to retard the rainfall and a rapid runoff occurred, resulting in a high peaked hydrograph. The antecedent wet conditions extended the duration of flooding longer than would normally occur. Much damage resulted from this flood.

The following quotes from the Caledonian Record, describe the magnitude of the 1927 Flood:

NOVEMBER 9, 1927

"East Barnet and Barnet today are villages transformed from attractive landscapes to scenes of havoc and waste. Flood waters of the Passumpsic gorged and battered the two communities almost beyond recognition and caused discomfort and inconvenience to scores of residents."

"At daylight, Roy's meadow was flooded and the stacked lumber began to come down the river and pile up against the railroad bridge and bank up the water. The water veered against the depot and car house and over the railroad track. At about 8 o'clock, the bridge over the Passumpsic went out, this cutting off half the village and the farms on the Waterford Road from the rest of the village."

"About 1,000,000 feet of lumber that came down the river is piled up on the Waterford Road and men have been working since Sunday clearing it away."

March 1936

In March 1936, heavy rainfall in combination with snowmelt brought many Vermont streams to flood stage. Heavy flooding was the result of high water in combination with ice jams.

The Caledonian Record, March 21, 1936

"Barnet, which gets the full swish of the Connecticut River, just below where it is swelled by the emptying Passumpsic, was watersoaked in its lowlands. The railroad station and several houses and barns were marooned. The railroad span moved by the ice and its abutments were still unseen, the full extent of the damage being held secret under roiling waters."

The flood profiles shown in Plates 17 and 18 show the high water marks for the 1936 Flood along the Passumpsic River at various locations.

June-July, 1973

The flooding event of June-July, 1973 ranks as the second highest discharge of the Passumpsic River in the period of record, 1928 to the present.

The Caledonian Record, June 30, 1973

"Area meterologist, Fred Mold said late this morning that flooding is inevitable with the Passumpsic River only a foot away from flood stage. As of 11:00 am, a new monthly rainfall record for the area had been established at 8.61 inches. Mold observed that the flood situation will get worse as the rainfall moves along tributaries to major bodies of water."

The Caledonian Record, July 3, 1973

"The town clerk in Barnet said this morning that road crews are busy repairing flood damage to roads in that area. During the storm Saturday, a portion of the Comerford Dam Road slid into the river just out of the Village of East Barnet."

Figures 7 through 10 depict the flooding in Barnet during the 1927 Flood. (Photos and quotes located on the following pages, courtesy of the Vermont Historical Society).

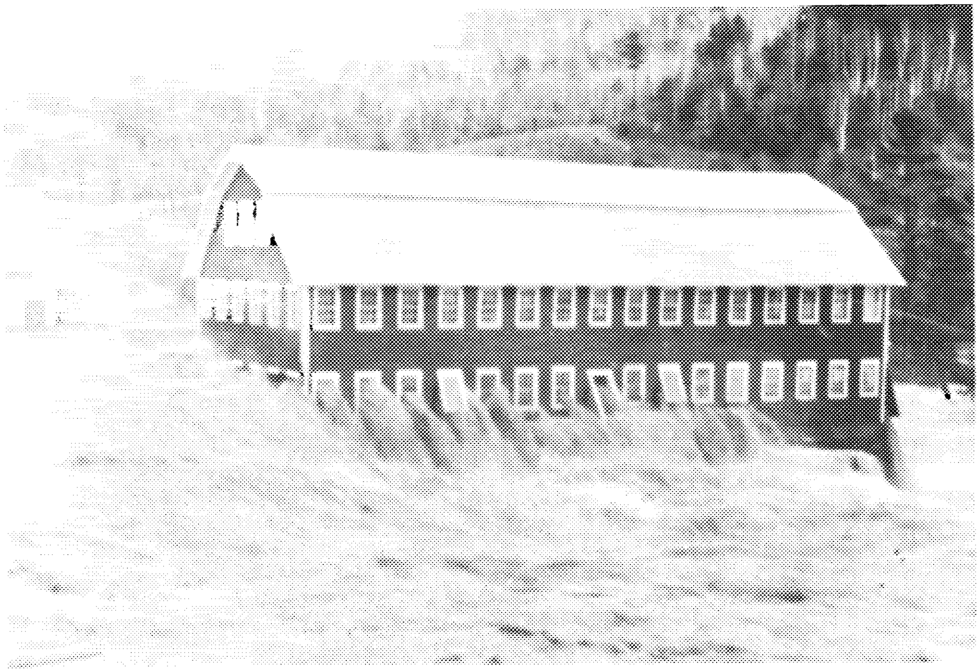


FIGURE 7 - Roy Brothers Mill at East Barnet,
November 3, 1927 - Croquet Set Factory

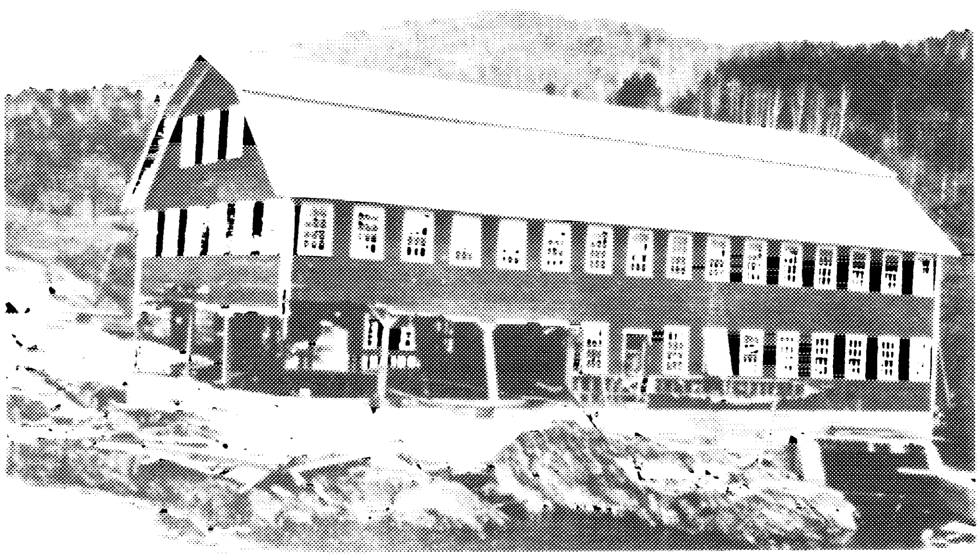


FIGURE 8 - Roy Brothers Mill after the floodwaters
had subsided (1927).

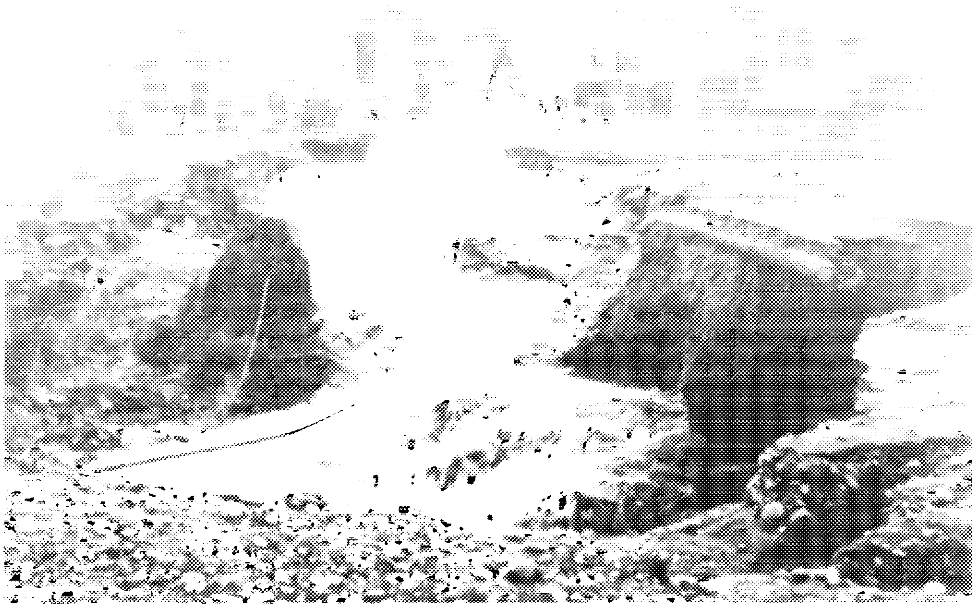


FIGURE 9 - Barnet, where the Stevens River broke loose above the Falls (1927).

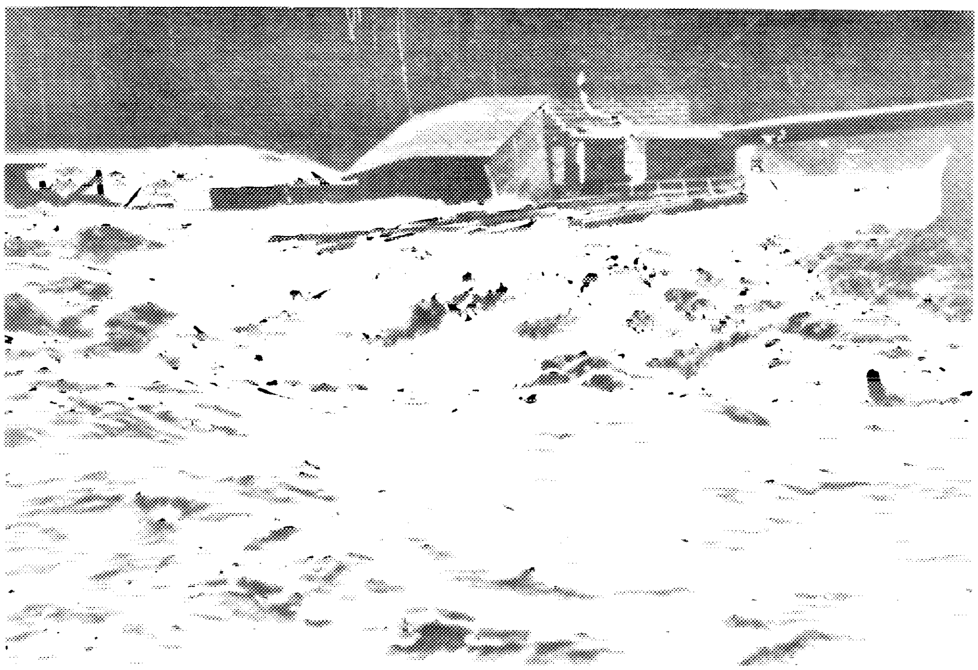


FIGURE 10 - Debris obstructing flow on Passumpsic River at Passumpsic (1927).

FUTURE FLOODS

Floods, of the same or larger magnitude as those that have occurred in the past, could occur in the future. Larger floods have been experienced in the past on streams with similar geographical and physiographical characteristics as those found in the study area. Similar combinations of rainfall and runoff which caused these floods could occur in the Barnet area. Therefore, to determine the flooding potential of the study area, it was necessary to consider storms and floods that have occurred in regions of like topography, watershed cover, and physical characteristics. Discussion of the future floods in this report is limited to those that have been designated as the 100-Year Flood and the 500-Year Flood. The 500-Year Flood represents a reasonable upper limit of expected flooding in the study area. The 100-Year Flood may reasonably be expected to occur more frequently, although it will not be as severe as the infrequent 500-Year Flood.

Flood Magnitudes and Their Frequencies

A frequency curve of peak flows was constructed on the basis of available information. The frequency curve thus derived, which is available on request, reflects the judgment of engineers who have studied the area and are familiar with the region; however, it must be regarded as approximate and should be used with caution in connection with any planning for flood plain use. Flows were computed, by statistical analysis, for floods up to the magnitude of the 500-Year Flood. Floods larger than the 500-Year Flood are possible, but the combination of factors necessary to produce such large flows would be extremely rare. Discharge data for return frequencies of 10-, 50-, 100- and 500-Year Floods are shown in Table 4. The representative discharges are displayed for the Passumpsic River Gaging Station at Passumpsic, the Stevens River at its mouth, and South Peacham Brook at its mouth.

The 100-Year Flood is defined as one that could occur on the average of once in 100 years, or a one percent chance of occurrence in any given year. The 100-Year Flood has a probability of occurrence during a seventy year human life span of approximately 51 percent or during a fifty year commercial lease of 39 percent or during a standard twenty-five home mortgage term of 22 percent. The 100-Year Flood has also been known as the "Intermediate Regional Flood."

TABLE 4

PEAK FLOWS FOR 10-, 50-, 100-, and 500-YEAR FLOOD

Passumpsic River, Stevens River and South Peacham Brook

Location	Drainage Area Square Miles	Peak Discharge of Flood, cfs. 10-Yr.	50-Yr.	100-Yr.	500-Yr.
Passumpsic River					
At Barnet-Waterford Town Line	428.6	13800	22700	28700	48400
At U.S.G.S. Gage at Passumpsic	436.0	14000	23000	29000	49000
Upstream of the confluence with Joes Brook	450.7	14300	23500	29700	50200
At Mouth	507.0	15600	25600	32200	54500
Stevens River					
At Mouth	43.0	2300	4100	5200	9000
South Peacham Brook					
At Mouth	13.0	1000	1800	2300	4000

Hazards of Large Floods

The extent of damage caused by any flood depends on the topography of the area flooded, depth and duration of flooding, velocity of flow, rate of rise of floodwaters, and developments in the flood plain. A 100-Year or 500-Year Flood in the study area would result in the inundation of residential and commercial properties. Deep floodwaters, flowing at high velocity and carrying floating debris, would create conditions hazardous to persons and vehicles attempting to cross flooded areas. In general, floodwater three or more feet deep and flowing at a velocity of three or more feet per second could easily sweep an adult person off his feet, thus creating definite danger of injury or drowning. Rapidly rising and swiftly flowing floodwater may trap persons in homes that are ultimately destroyed, or in vehicles that are ultimately submerged or floated. Water mains can be ruptured by deposits of debris and the force of floodwaters, thus creating the possiblity of contaminated domestic water supplies. Damaged sanitary sewer lines and sewage treatment plants could result in the pollution of floodwaters creating health hazards. Isolation of areas by floodwater could create hazards in terms of medical, fire or law enforcement emergencies.

Flooded areas and flood damages.--The areas in the Barnet study area that would be flooded by the 500-Year Flood are shown on Plate 4 which is also an Index Map to Plates 5 through 12. Areas that would be flooded by the 100-Year and 500-Year Floods are shown in detail on Plates 5 through 12. The actual limits of these overflow areas may vary somewhat from those areas shown on the maps because the contour interval and the scale of the maps do not permit precise plotting of the flooded area boundaries. The areas that would be flooded by the 100-Year and 500-Year Flood include commercial industrial and residential sections and the associated streets, roads and public or private utilities. Some damage to these facilities would occur during the 100-Year Flood which would inundate approximately 480 acres adjacent to the river channels. However, due to the wider extent, greater depths of flooding, higher velocity flow, and longer duration of flooding during a 500-Year Flood, damage would be even more severe than during a 100-Year Flood. Plates 17 through 22 show water surface profiles of the Passumpsic and Stevens Rivers and South Peacham Brook. Selected cross sections in the study area with the elevations for stage for the 100-Year and 500-Year Floods can be found on Plates 23 and 24.

Public utilities damaged from floodwater would result in the interruption of service to the community. In the case of water and sewer mains, breakage often causes contamination to potable water sources and conditions conducive to the spread of disease. Power blackouts during flooding also have widespread repercussions. The hardships resulting from loss of utilities in the flood plain affect the entire community.

TABLE 5

BRIDGE AND CULVERT ELEVATION DATA

Passumpsic River, Stevens River & South Peacham Brook

Identification	River Mile	Underclearance Elevation ft. m.s.l.	Water Surface Elevations 100 Year Flood ft. m.s.l.	Water Surface Elevations 500 Year Flood ft. m.s.l.
PASSUMPSIC RIVER				
Canadian Pacific R.R.	0.03	474.1	475.6	487.6
State Aid Hwy. 3	0.60	498.2	503.2	519.2
Canadian Pacific R.R.	0.66	498.2	508.4	521.6
I-91, Northbound Bridge	0.80	535.9	508.6	521.6
I-91, Southbound Bridge	0.82	552.1	508.6	521.7
Canadian Pacific R.R.	1.63	501.7	510.2	524.0
Canadian Pacific R.R.	2.41	503.4	512.1	526.3
Canadian Pacific R.R.	2.82	505.0	514.4	529.0
Canadian Pacific R.R.	4.42	508.4	517.6	531.7
Canadian Pacific R.R.	4.97	515.1	519.0	533.9
Town Hwy. 11	5.16	530.2	531.8	537.7

TABLE 5 (cont.)

BRIDGE AND CULVERT ELEVATION DATA

Passumpsic River, Stevens River and South Peacham Brook

Identification	River Mile	Underclearance Elevation ft. m.s.l.	Water Surface Elevations 100 Year Flood ft. m.s.l.	500 Year Flood ft. m.s.l.
STEVENS RIVER				
Canadian Pacific R.R.	0.07	458.2	455.5	460.2
Town Hwy. 64	0.44	461.3	460.2	472.8
U.S. Hwy. 5	0.56	525.6	519.1	522.2
State Aid Hwy. 1	0.59	556.1	553.8	558.2
I-91, Culvert	0.92	571.0	564.1	568.1
Town Hwy. 57	1.21	598.1	587.4	590.6
Town Hwy. 56	1.61	636.6	635.9	648.7
Town Hwy. 7	3.57	729.6	724.5	736.5
State Aid Hwy. 1	4.61	764.4	763.0	772.9
Town Hwy. 81	6.35	880.1	886.1	892.6
SOUTH PEACHAM BROOK				
Main Street	0.19	898.8	899.0	905.5
State Aid Hwy. 1	0.47	907.2	904.7	906.3

Certainly, damage to homes, mills and other buildings within the flood plain will be unavoidable, and there is the possiblity of loss of life. Consideration must also be given to the cost to a community with developments within the flood plain for emergency relief. The problems associated with destroyed businesses unable to reopen after a flood, such as permanent employment losses to a community, must also be considered.

Obstructions.--During floods debris collecting on bridges and culverts could decrease their carrying capacity and cause greater water depths (backwater effect) upstream of these structures. Since the occurence and amount of debris are indeterminate factors, only the physical characteristics of the structures were considered in preparing profiles of the 100-Year and 500-Year Floods. Of the 23 structures crossing the three study streams in Barnet, 17 are obstructive to the 500-Year Flood and 11 are obstructive to the 100-Year Flood. In some cases, bridges may be high enough so as not to be inundated by floodflows; however, the approaches to these bridges may be at lower elevations and subject to flooding. Table 5 lists water surface and underclearance elevation for all bridge and culvert crossings in the study area.

Velocities of flow.--Water velocities during floods depend largely on the size and shape of the cross sections, conditions of the stream and the bed slope. All of these factors vary for different streams and at different locations on the same stream. During a 100-Year Flood, velocities of main channel flow in the Passumpsic River would be 2 to 23 fps, 1 to 20 fps in the Stevens River, and 2 to 14 fps in South Peacham Brook. Water flowing at the higher rates is capable of causing severe erosion to stream banks and fill around bridge abutments and transporting large objects. Overbank flow for the 100-Year Flood would average 2, 2.5, and 1.3 fps for the three streams respectively. Velocity of flow during a 500-Year Flood would be higher than during a 100-Year Flood. Flows would be between 2 and 22 fps on the Passumpsic River, 1 and 20 fps on the Stevens River and 1 to 14 fps on the South Peacham Brook. Over bank flow would average 3, 3, and 2 fps, respectively. Water flowing at 2 fps or less would deposit debris and silt.

Rates of rise and duration of flooding.--Based on the hydrographs of the March 1936 and September 1938 flooding events (see Plates 2 and 3), the Passumpsic River could be expected to rise at a rate of between 0.25 and 1.0 feet per hour. The river is, however, capable of rising much faster, especially during ice jams. From information available on the 1927 and 1973 Floods, the peak discharge can be expected to occur approximately 24 hours after intense rainfall over the basin. This time can vary depending on the distribution and intensity of rainfall over the basin. The duration of flooding will vary from about 5 to 10 days. The approximate time between bankfull and peak flow stages is estimated at around 12 hours.

On the Stevens River and South Peacham Brook, the rate of rise would be expected to be equal to or greater than that of the Passumpsic River. This is due to the fact that since their watersheds are much smaller than the Passumpsic River, precipitation runoff reaches these streams in a shorter time period. Also, duration of flooding, time to peak after intense rainfall, and time between bankfull and peak flow stages would be less than those of the Passumpsic River.

Photographs, future flood heights.--The levels that the 100-Year and 500-Year Floods are expected to reach at various locations along the Barnet Study Area are indicated on the following photographs, Figures 11 through 14.

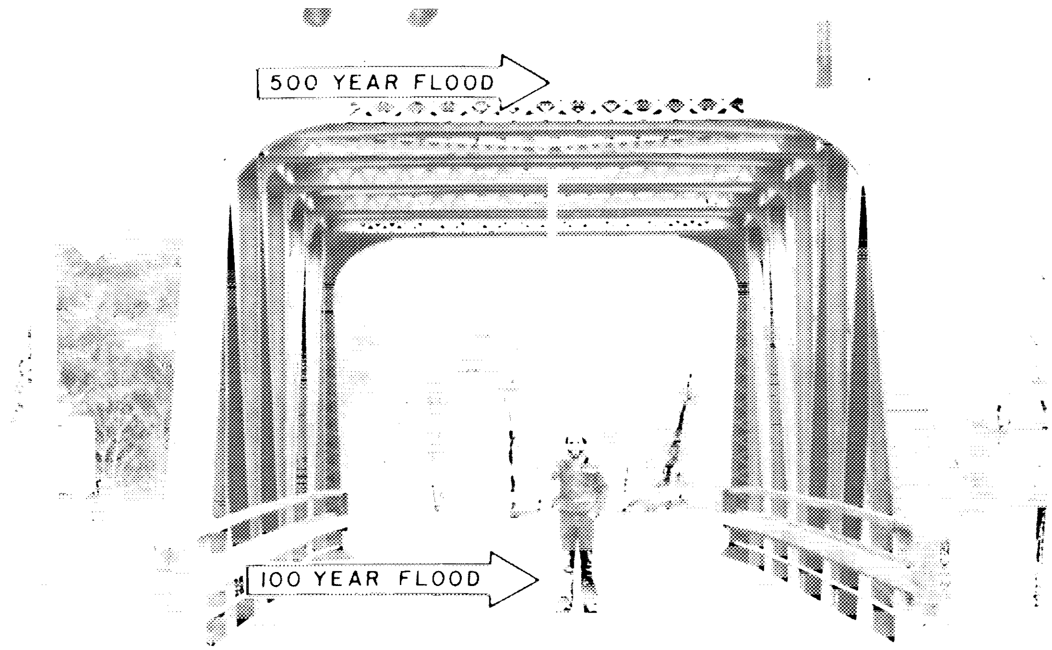


FIGURE 11 - Future flood heights at the State Aid Highway 3 Bridge crossing the Passumpsic River in East Barnet.

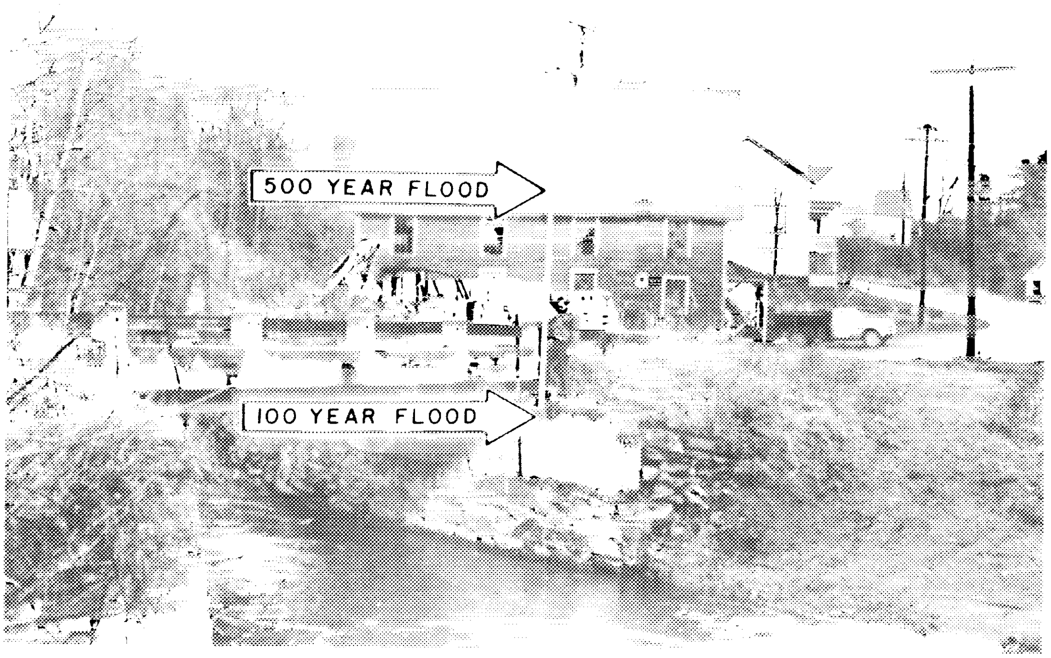


FIGURE 12 - Future flood heights at the Town Highway 64 Bridge crossing the Stevens River in Barnet.

FIGURE 13 - Future flood heights at the Presbyterian Church in West Barnet by the Stevens River.

FIGURE 14 - Future flood heights at the Main Street Bridge crossing the South Peacham Brook in West Barnet.

GUIDELINES FOR FLOOD PLAIN MANAGEMENT

Man has been building on and occupying the flood plains of rivers and streams since the arrival of pioneer settlers. The streams first provided transportation and water supply and later their gentle valley grades encouraged the construction of highways and railroads. Today, uncontrolled growth of cities often results in unwise encroachment on the flood plains of local streams.

Through bitter experience, man has learned that floods periodically inundate portions of the flood plain, damaging property and often causing loss of life. This experience has led to a relatively new approach for reducing flood damages. Called "flood plain management," this approach consists of applying controls over the use of land lying adjacent to streams. Planned development and management of flood hazard areas can be accomplished by a variety of means.

Interpretation of Data

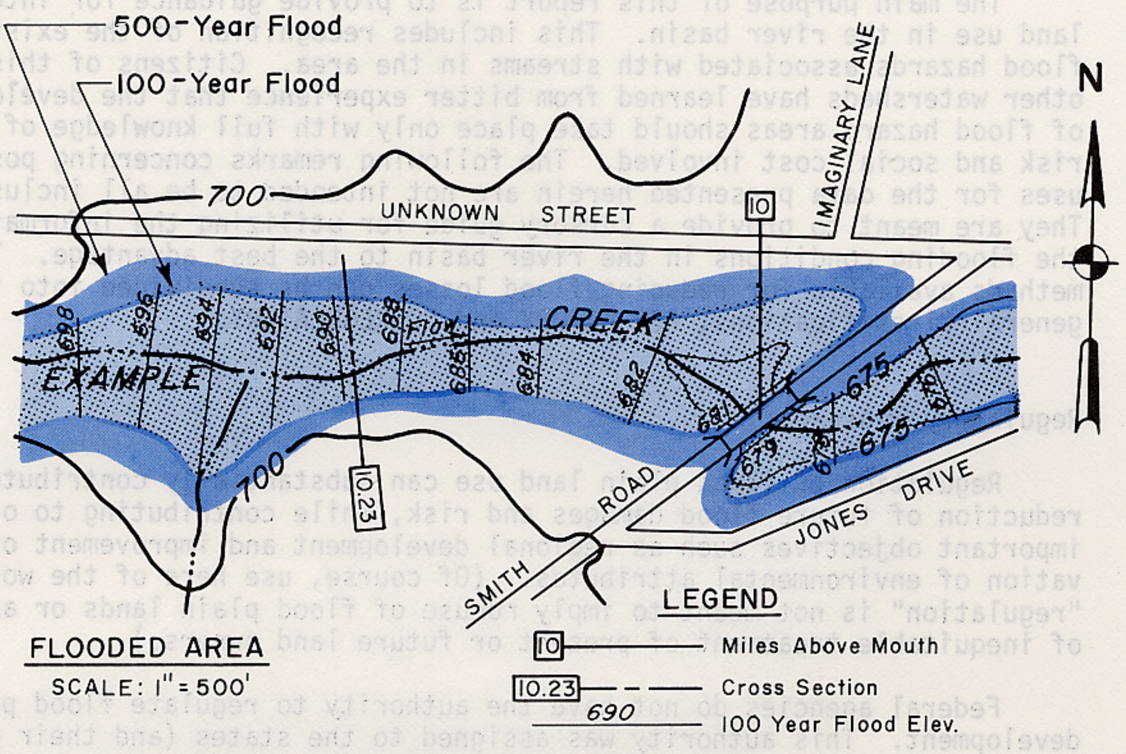
Flooded area maps and profiles are provided in this report to define the limits of flooding that would occur during a 100-year flood and a 500-year flood. The actual limits of these overflow areas on the ground will vary from those shown because the scales of the available maps do not permit precise plotting of the flooded area boundaries. Important land use decisions in specific areas should be verified by field surveys. Changes in the land use, drainage patterns, and structural occupancy of the flood plain may result in higher flood elevations than those shown.

Hypothetical examples of the map and profile, shown on Figure 15, depict the areal limits and elevations of the respective floods at imaginary locations.

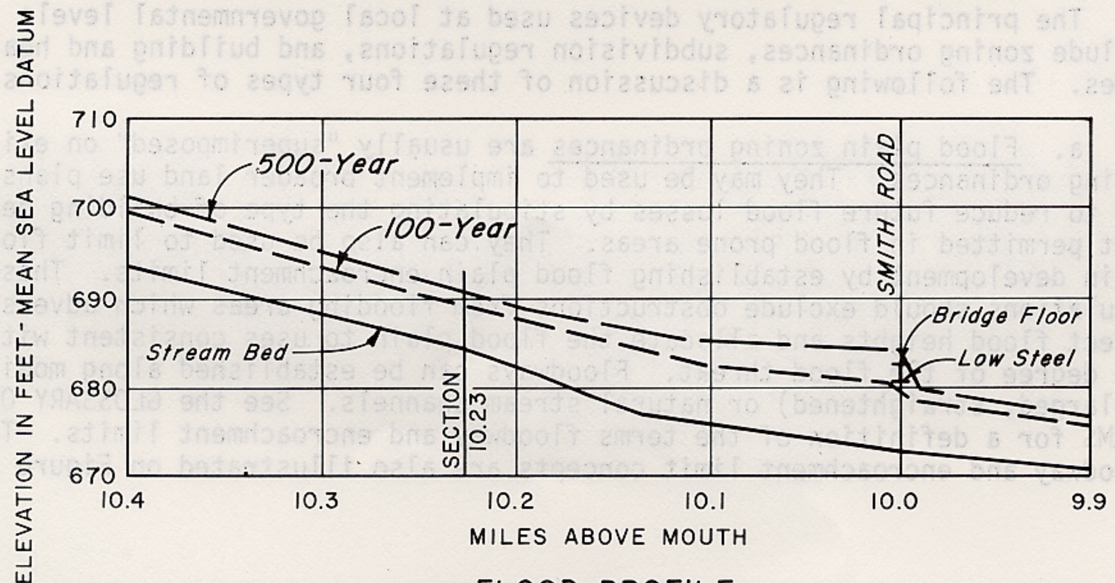
The lateral limits of flooding from the 100-year flood are shown by the light shaded area, while the darker area indicates the additional land that would be inundated by the 500-year flood. The line and numeral in the shaded area represent the elevation of the 100-year flood at that particular location. The flood profile shows the relative depth of floodwaters along the centerline of the stream.

By using information as illustrated above, together with other data such as frequency of occurrence, velocity of flow, and duration of flooding, government entities and individuals can make knowledgeable decisions relative to the use, development, and management of areas subject to inundation.

HYPOTHETICAL FLOOD PLAIN INFORMATION



FLOODED AREA



FLOOD PROFILE

FIGURE 15

Flood Plain Management Tools

The main purpose of this report is to provide guidance for intelligent land use in the river basin. This includes recognition of the existing flood hazards associated with streams in the area. Citizens of this and other watersheds have learned from bitter experience that the development of flood hazard areas should take place only with full knowledge of the risk and social cost involved. The following remarks concerning possible uses for the data presented herein are not intended to be all inclusive. They are meant to provide a cursory guide for utilizing the information on the flooding conditions in the river basin to the best advantage. The methods available for reducing flood losses can be subdivided into two general classifications, REGULATORY and NONREGULATORY.

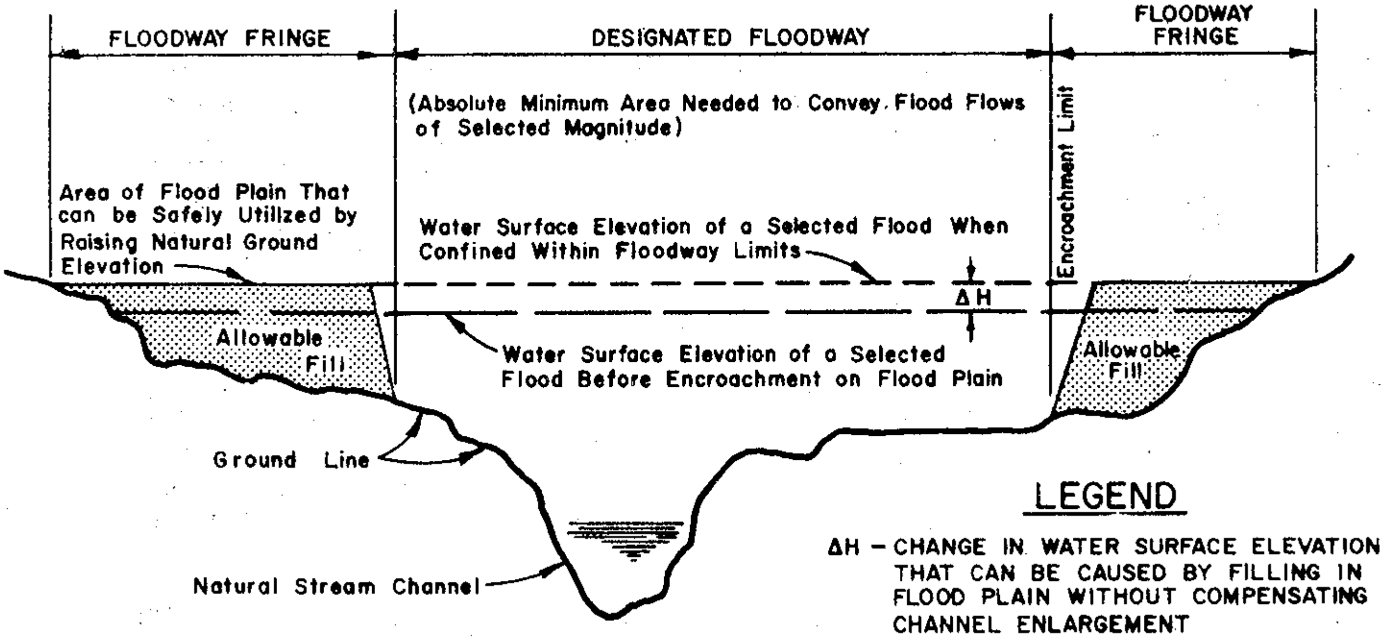
Regulatory Measures

Regulation of flood plain land use can substantially contribute to the reduction of future flood damages and risk, while contributing to other important objectives such as regional development and improvement or preservation of environmental attributes. (Of course, use here of the word "regulation" is not meant to imply ronuse of flood plain lands or any type of inequitable treatment of present or future land owners.)

Federal agencies do not have the authority to regulate flood plain development. This authority was assigned to the states (and their political subdivisions) in the tenth amendment to the U.S. Constitution and has never been delegated to the Federal Government. Consequently, it is local government bodies utilizing available states legislation that have to assume the day to day responsibility for guiding development in flood prone areas.

The principal regulatory devices used at local governmental levels include zoning ordinances, subdivision regulations, and building and health codes. The following is a discussion of these four types of regulations.

a. Flood plain zoning ordinances are usually "superimposed" on existing zoning ordinances. They may be used to implement broader land use plans and to reduce future flood losses by stipulating the type of building development permitted in flood prone areas. They can also be used to limit flood plain development by establishing flood plain encroachment limits. These regulations should exclude obstructions from flooding areas which adversely affect flood heights and allocate the flood plain to uses consistent with the degree of the flood threat. Floodways can be established along modified (enlarged, straightened) or natural stream channels. See the GLOSSARY OF TERMS for a definition of the terms floodway and encroachment limits. The floodway and encroachment limit concepts are also illustrated on Figure 16.



FLOODWAY FRINGE

Suggested Uses

Uses permitted in the floodway area.
Residential, Commercial, Industrial, Public & other development with floodwater entry points at or above design elevation for encroachment.

Uses Not Appropriate

Hospitals & Nursing Homes
Boarding Schools & Orphanages
Sanitariums
Detention Facilities
Refuge Center
Permanent Storage of Materials or Equipment (Emergency Equipment)

FLOODWAY AREA

Suggested Uses

Farms, Truck Gardens & Nurseries
Livestock & Other Agricultural Uses.
Non-obstructive Structures
Parking Lots, Playgrounds & Parks
Golf Course & Open Recreation
Preserves & Reservations.

Uses Not Appropriate

Land Fills & Obstructive Structures
Floatable Storage
Disposal of Garbage
Rubbish, Trash or Offal
All uses precluded from floodway fringe area.

FIGURE 16 – FLOOD PLAIN CROSS SECTION
SHOWING FLOODWAY & ENCROACHMENT LIMIT CONCEPTS

b. Subdivision control ordinances may also be effective tools for flood plain building control. Subdivision control relates to the way in which land is divided and made ready for building development. For example, a city may control the subdivision of land within its jurisdiction by requiring that a large percentage of the minimum lot area of a subdivision be a designated height above an adopted floodwater elevation as a requisite for plat approval. Unlike zoning ordinances, which extend only to a city's limits, cities have some control over subdivision development in areas within their extraterritorial jurisdiction.

c. Building codes set forth standards of construction for the purposes of protecting health, safety and general welfare of the public. Building codes may be written to set minimum standards for water (flood) proofing of structures, for establishing minimum first floor elevations consistent with potential flood occurrences, and requirements for material strength and proper anchorage.

d. Health codes can serve as a control over the use of flood plains for waste disposal and the construction of water and sewage treatment facilities that may create health problems during floods.

Nonregulatory Measures

Other methods that can be used to reduce flood damage losses include:

a. Structural measures can be used to reduce flood heights (channel modifications, dams) or provide a barrier between floodwaters and development (levees, dikes).

b. Fee purchase of lands for open space uses. Many grant and loan programs are available to local governments through the Department of Housing and Urban Development and other federal agencies for preserving flood plain lands as green belts, development of these areas for parks, nature trails, etc.

c. Acquisition of flooding easements. Purchase of less than fee interest in flood prone land is another approach to controlling development.

d. Flood proofing by elevating structures, water proofing, or filling of low areas for building sites. Some buildings can be raised in place up to a reasonable limit to prevent flood damages. Other structures can be made to withstand flood velocities and depths through the use of bulkheads, watertight openings, flotation anchors, plumbing cutoff valves, and structural reinforcements. Structures can be built in flood plain fringe areas at elevations above a selected flood magnitude. However, this should be done only in connection with an established floodway width or encroachment limits to eliminate obstructions that would raise upstream flood stages.

e. Flood insurance can now be made available through the Department of Housing and Urban Development to communities that adopt appropriate flood plain regulations. Flood insurance does not reduce flooding or flooding caused damages, but reduces the risk of large economic losses by individual flood victims.

f. Development policies in regard to extending public services. "Flood conscious" governmental policies that limit or discourage the extension of public roads, utilities, and other services into flood prone areas can play an important role in encouraging prudent flood plain use. Private developments usually depend on the extension of public services. By avoiding the extension of such services into flood hazard areas, local government and private utility companies can encourage the occupancy of safer, and in the long run, cheaper flood free areas.

Very little building is carried on without outside financing. Therefore, lending institutions, both federal and private, are in a position to exercise control over flood plain development by denying mortgage guarantees or funds to subdivision or individual builders for projects that will eventually become "flood problems."

GLOSSARY

Backwater. The resulting high water surface in a given stream due to a downstream obstruction or high stages in an intersecting stream.

Flood. An overflow of water onto lands not normally covered by water and that are used or usable by man. Floods have two essential characteristics: the inundation of land is temporary; and the land is adjacent to or inundated by overflow from a river, stream, ocean, lake or other body of standing water.

Normally a "flood" is considered as any temporary rise in streamflow or stage, but not the ponding of the water surface, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land area, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, rise of groundwater coincident with increased streamflow, and other problems.

Flood Crest. The maximum stage or elevation reached by the waters at a given location during any flood event.

Flood Plain. The areas adjoining a river, stream, watercourse, ocean, lake, or other body of standing water that have been or may be covered by floodwaters.

Flood Profile. A graph showing the relationship of water surface elevation to location, the latter generally expressed as distance above mouth for a stream of water flowing in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.

Flood Stage. The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which elevation is measured. This is also referred to as critical stage.

Hurricane. An intense cyclonic windstorm of tropical origin in which winds tend to spiral inward in a counterclockwise direction toward a core of low pressure with maximum surface wind velocities that equal or exceed 75 miles per hour (65 knots) for several minutes or longer at some points. Tropical storm is the term applied if maximum winds are less than 75 miles per hour.

Hydrograph. A graph showing flow values, usually measured in cubic feet per second, versus time at a given point. The area under the curve indicates the total volume of flow. Also, a graph showing the stage in feet against time at a given point and the rate of rise and duration above flood stage.

Left Bank. The bank on the left side of a river, stream, or watercourse looking downstream.

Low Bank. The lower of the two banks of a river, stream, or watercourse designated as left or right looking downstream.

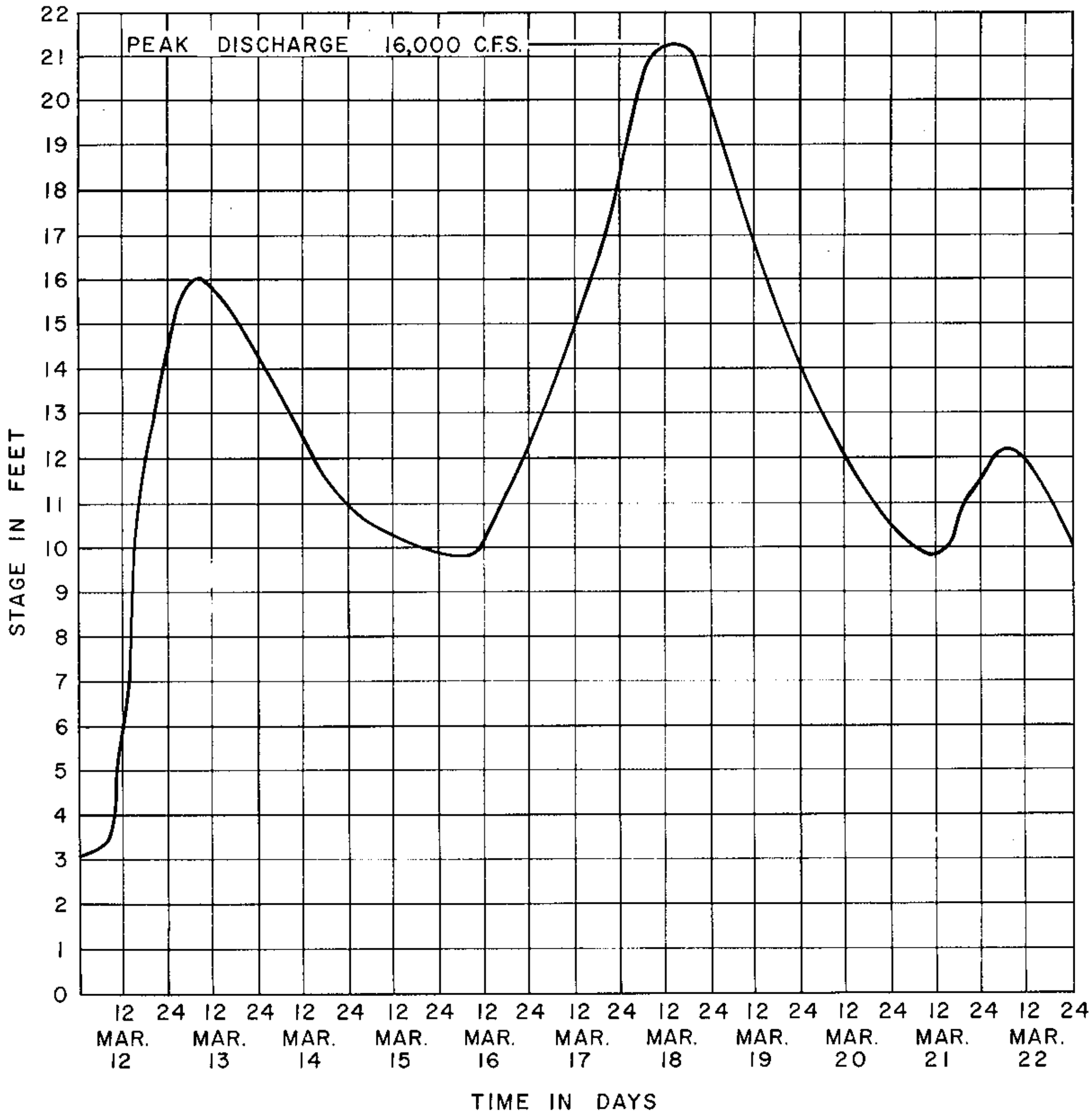
Rating Curve. A graph or plot of discharge versus gage height at a given location with a given cross section.

Right Bank. The bank on the right side of a river, stream, or watercourse looking downstream.

Underclearance Elevation. The elevation at the top of the opening of a bridge, culvert or other structure through which water may flow along a watercourse. This is referred to as "low steel" in some regions.

100-Year Flood. The 100-Year Flood is the flood having an average frequency of occurrence of once in 100 years, although it can occur in any year. It is sometimes known as the Intermediate Regional Flood and has been defined as a flood that has a one percent chance of occurring in any one year.

500-Year Flood. The 500-Year Flood is defined as a major flood that has an average frequency of occurrence of once in 500 years, although it could occur any year; or a flood that has a 0.2 percent chance of occurring in any one year.



NOTE:

THIS HYDROGRAPH REPRESENTS THE STAGES AT THE U.S.G.S. GAGING STATION AT PASSUMPSIC. MARCH 1936

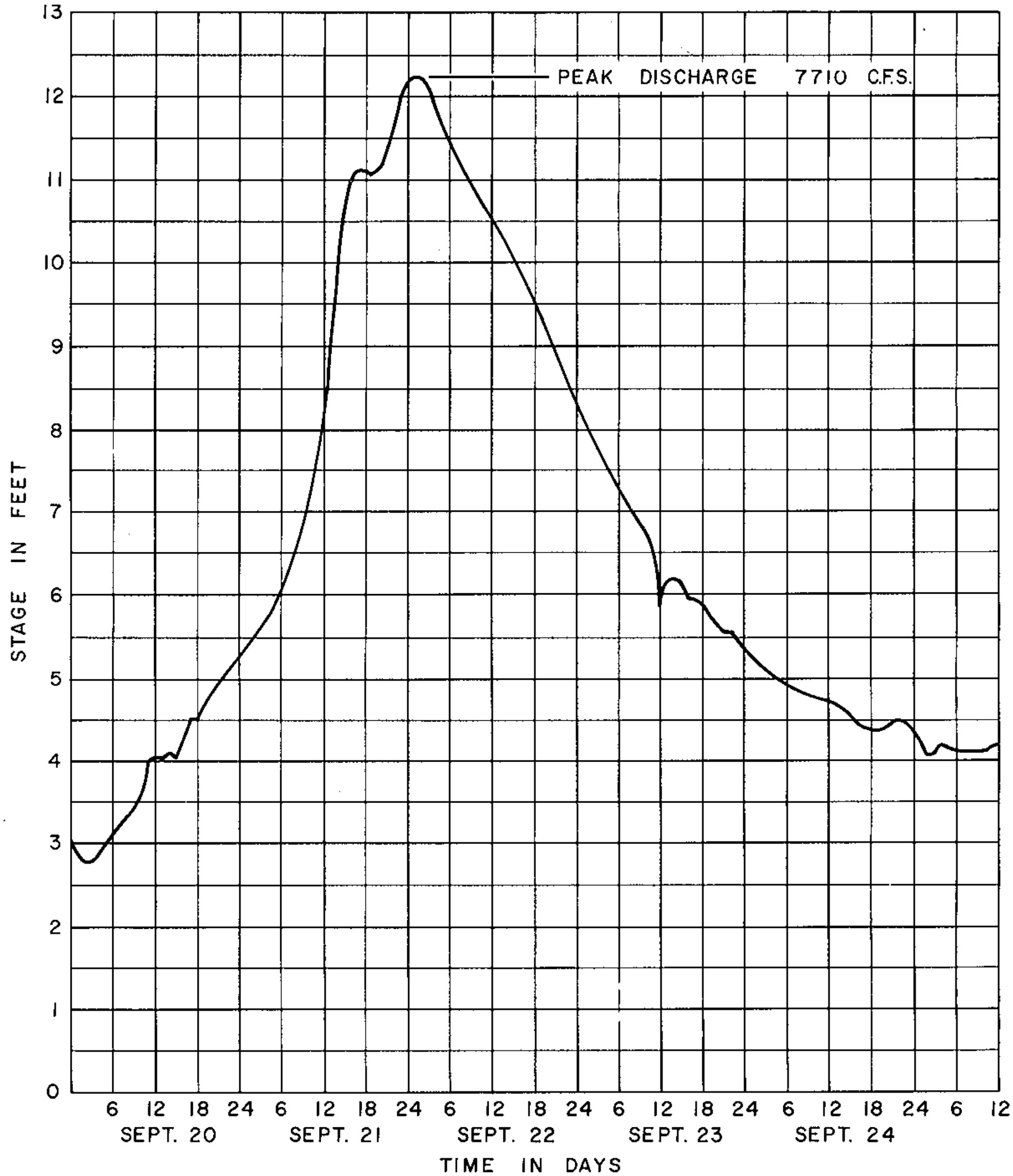
FLOOD PLAIN INFORMATION
BARNET, VERMONT

PASSUMPSIC RIVER

HYDROGRAPH

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

APRIL 1978



NOTE:

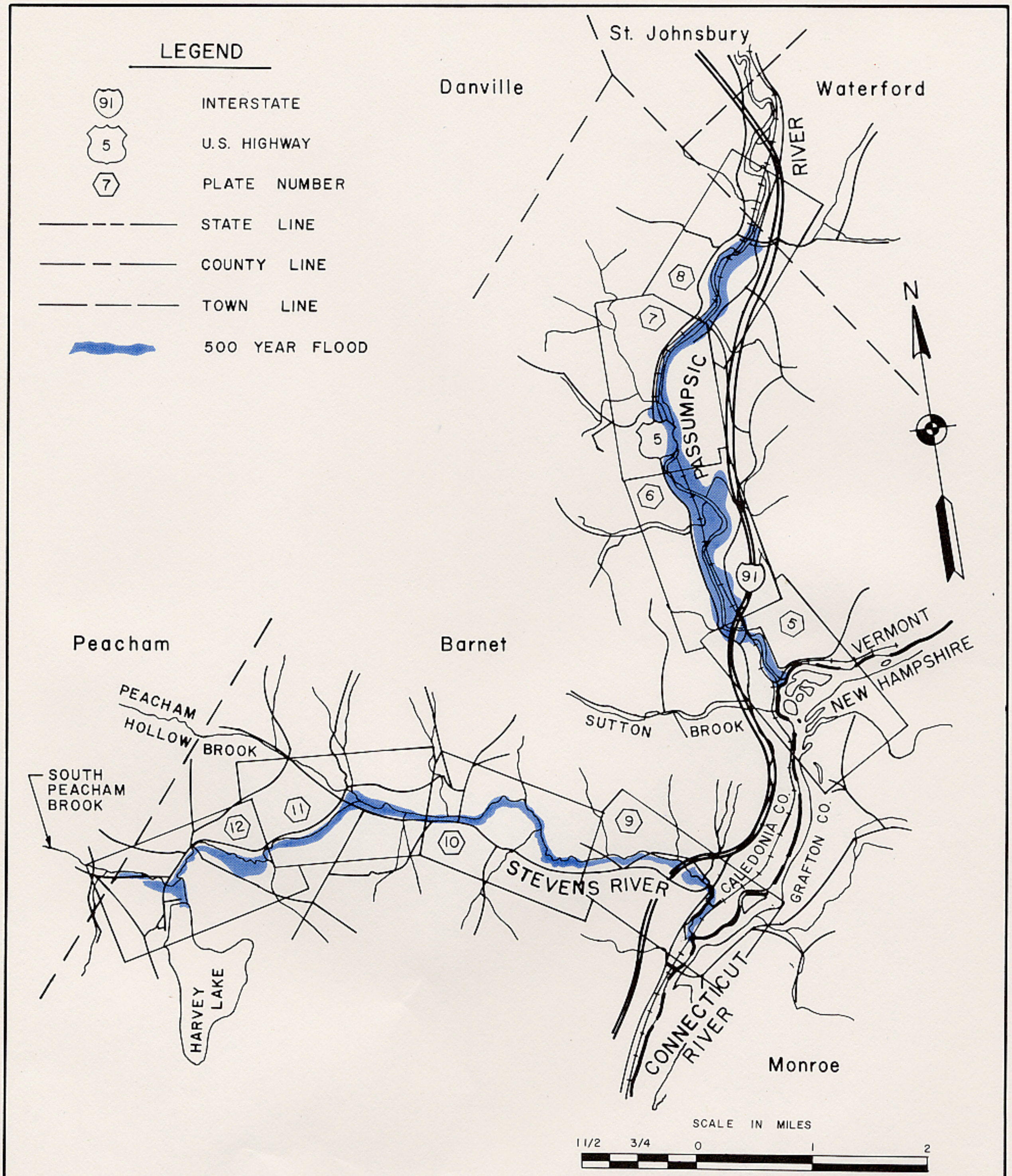
THIS HYDROGRAPH REPRESENTS THE STAGES AT THE U.S.G.S. GAGING STATION AT PASSUMPSIC. SEPTEMBER 1938

FLOOD PLAIN INFORMATION
BARNET, VERMONT

PASSUMPSIC RIVER

HYDROGRAPH

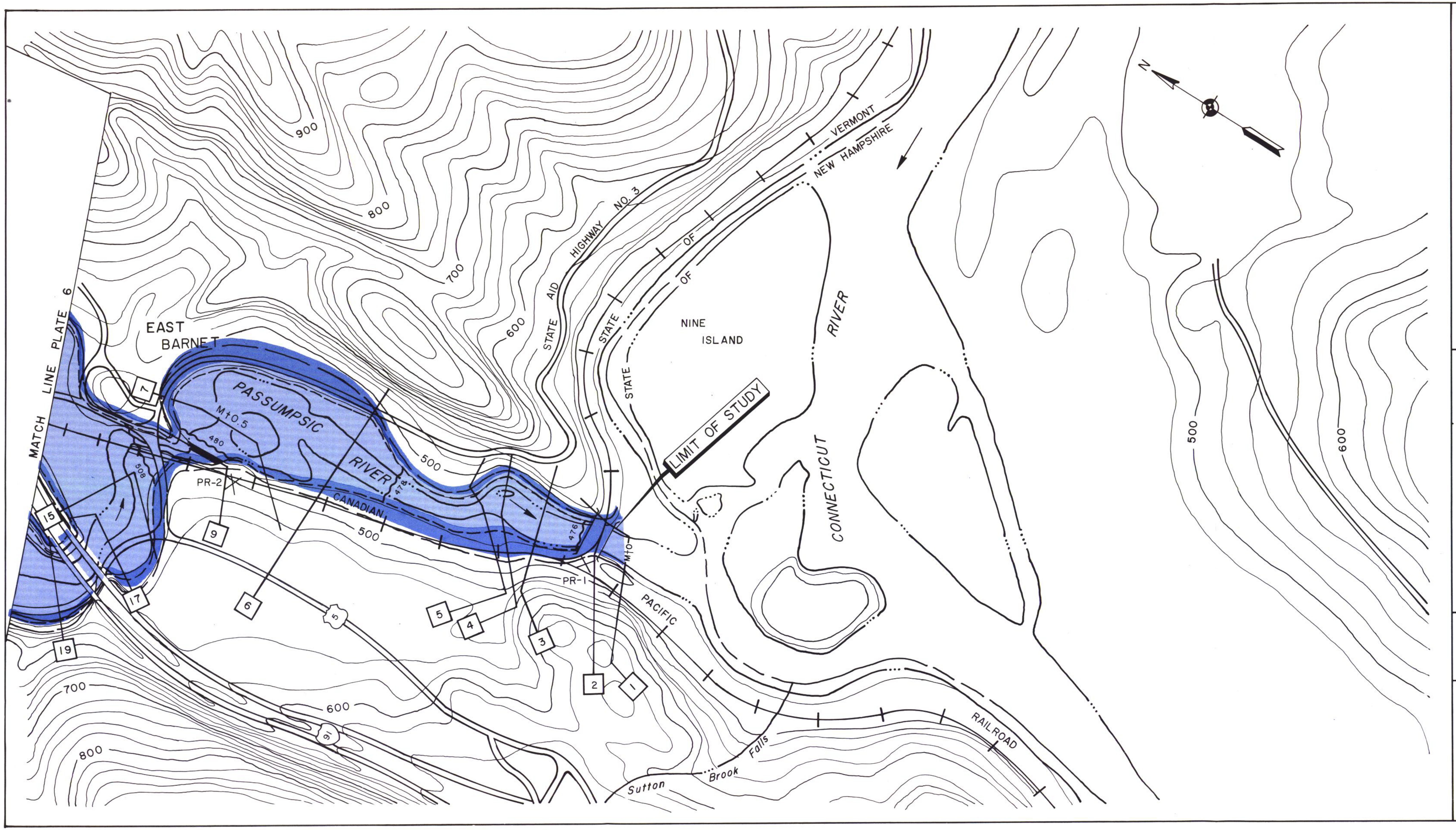
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS
APRIL 1978



FLOOD PLAIN INFORMATION
BARNET, VERMONT
PASSUMPSIC AND
STEVENS RIVERS AND
SOUTH PEACHAM BROOK

INDEX MAP—FLOODED AREAS

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS
APRIL 1978



LEGEND

OVERFLOW LIMITS

100 YEAR FLOOD — 500 YEAR FLOOD

M + 0.5 — MILES ABOVE MOUTH

700 — GROUND ELEVATION IN FEET (U.S.C.&G.S.) SEA LEVEL DATUM

CHANNEL

476 — 100 YEAR FLOOD ELEVATION LINE

PR-2 — ELEVATION REFERENCE MARKS

STATE LINE

5 — CROSS SECTION

5 — U.S. HIGHWAY

91 — INTERSTATE HIGHWAY

NOTES

1. MAP BASED ON U.S.G.S. 15 MIN. QUADRANGLE ST. JOHNSBURY, VT. – N.H. 1949. MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT (SEE PAGE 19).
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.
4. MINIMUM CONTOUR INTERVAL IS 20 FT.
5. SEE PLATE 13 FOR DESCRIPTION OF ELEVATION REFERENCE MARKS.
6. EFFECTS OF BACKWATER FLOODING FROM THE CONNECTICUT RIVER NOT INCLUDED IN THIS STUDY.

SCALE IN MILES

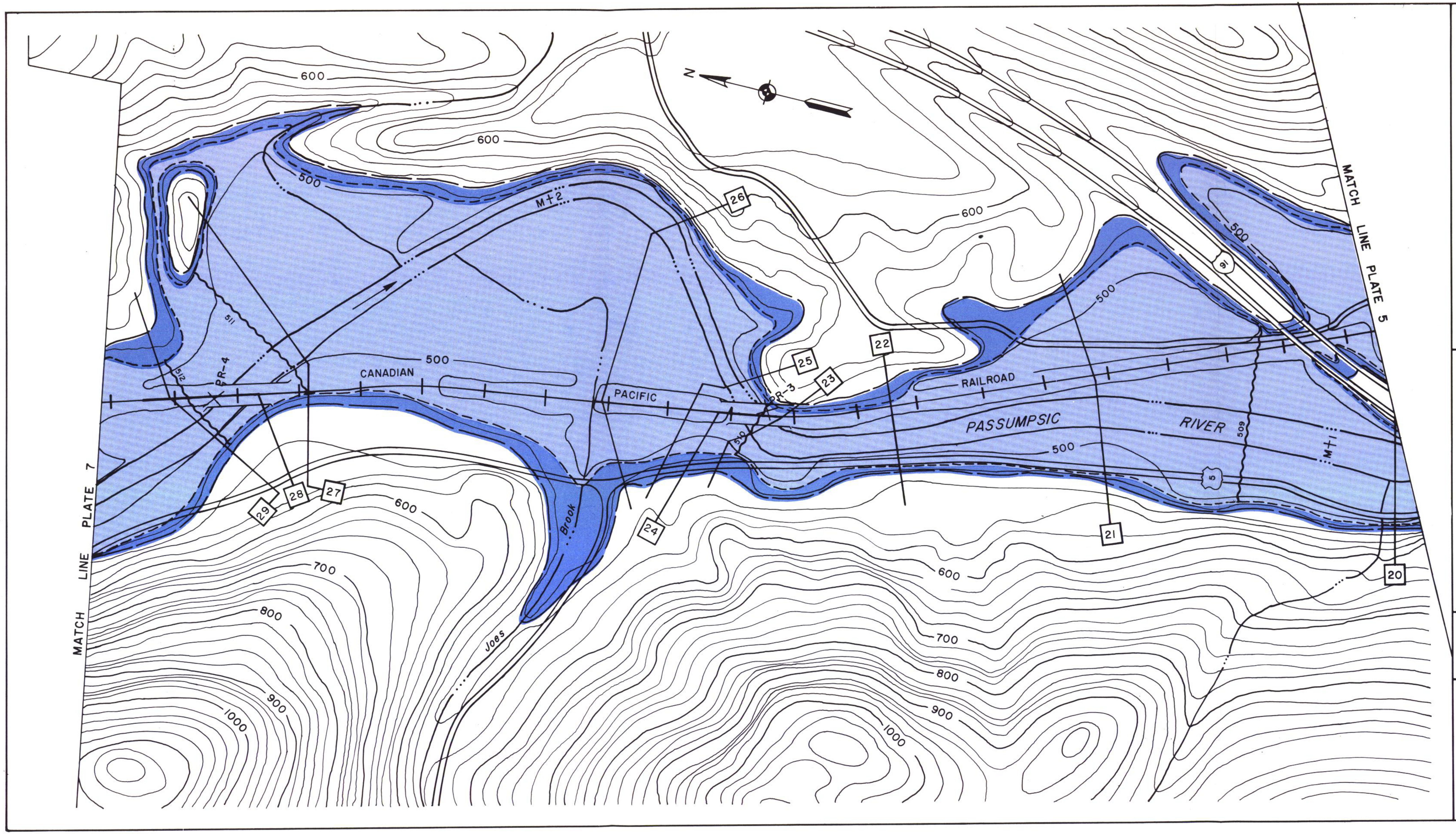
0 0.1 0.2

FLOOD PLAIN INFORMATION
BARNET, VERMONT
PASSUMPSIC RIVER

FLOODED AREAS

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1978



LEGEND

OVERFLOW LIMITS

100 YEAR FLOOD

500 YEAR FLOOD

M + 2 — MILES ABOVE MOUTH

700 — GROUND ELEVATION IN FEET (U.S.C.&G.S.) SEA LEVEL DATUM

CHANNEL

511 — 100 YEAR FLOOD ELEVATION LINE

PR-3. — ELEVATION REFERENCE MARKS

22 — CROSS SECTION

5 — U.S. HIGHWAY

91 — INTERSTATE HIGHWAY

NOTES

1. MAP BASED ON U.S.G.S. 15 MIN. QUADRANGLE ST. JOHNSBURY, VT. – N.H. 1949. MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT (SEE PAGE 19).
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.
4. MINIMUM CONTOUR INTERVAL IS 20 FT.
5. SEE PLATE 13 FOR DESCRIPTION OF ELEVATION REFERENCE MARKS.
6. ONLY BACKWATER FLOODING FROM THE PASSUMPSIC RIVER SHOWN ON TRIBUTARIES.

SCALE IN MILES

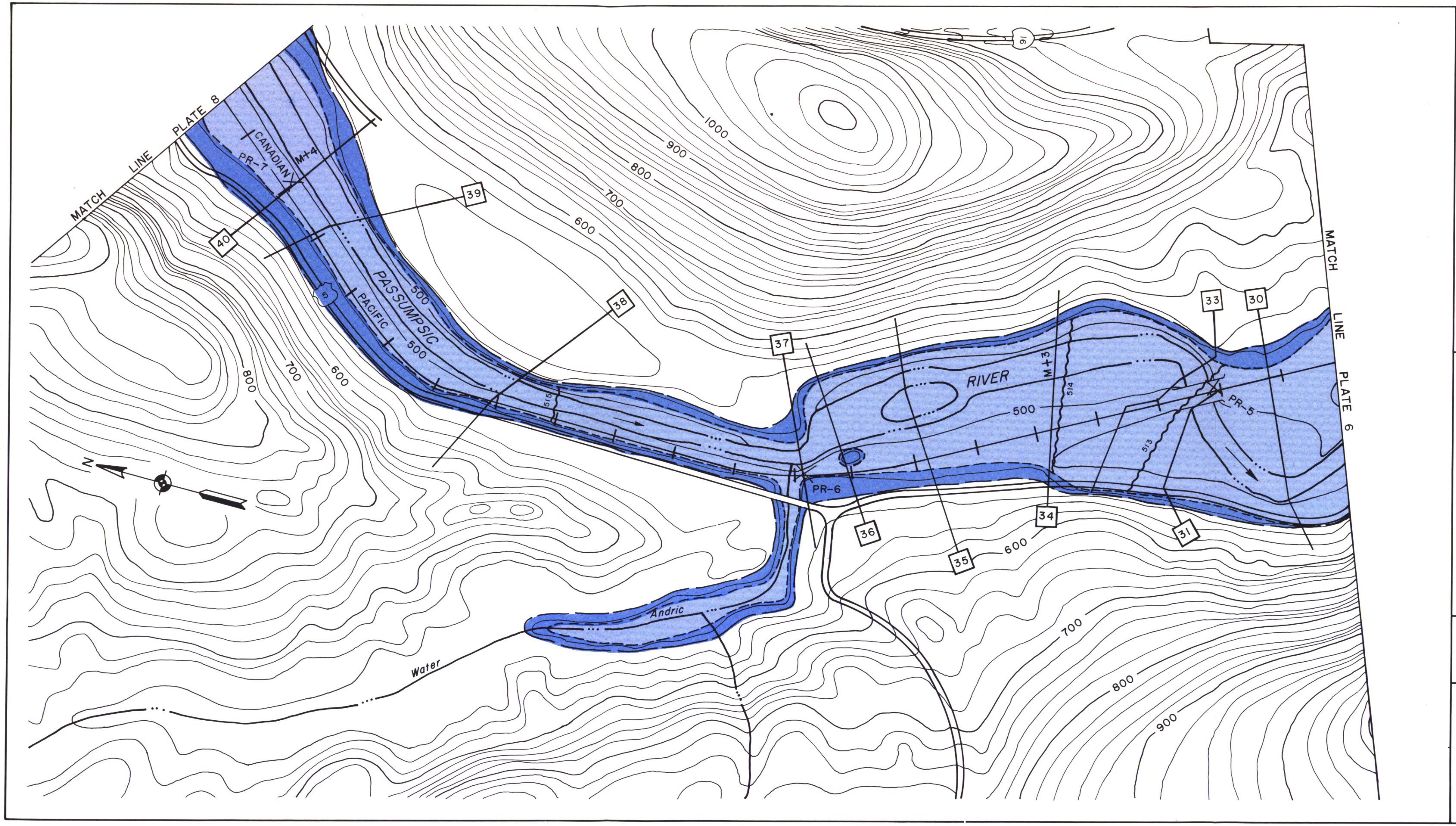
0 0.1 0.2

FLOOD PLAIN INFORMATION
BARNET, VERMONT
PASSUMPSIC RIVER

FLOODED AREAS

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1978



LEGEND

OVERFLOW LIMITS

100 YEAR FLOOD
500 YEAR FLOOD

M + 3 — MILES ABOVE MOUTH

700 — GROUND ELEVATION IN FEET (U.S.C.&G.S.) SEA LEVEL DATUM

CHANNEL

515 — 100 YEAR FLOOD ELEVATION LINE

PR-5 — ELEVATION REFERENCE MARKS

37 — CROSS SECTION

5 — U.S. HIGHWAY

91 — INTERSTATE HIGHWAY

NOTES

1. MAP BASED ON U.S.G.S. 15 MIN. QUADRANGLE ST. JOHNSBURY, VT. — N.H. 1949. MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT (SEE PAGE 19).
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.
4. MINIMUM CONTOUR INTERVAL IS 20 FT.
5. SEE PLATE 14 FOR DESCRIPTION OF ELEVATION REFERENCE MARKS.
6. ONLY BACKWATER FLOODING FROM THE PASSUMPSIC RIVER SHOWN ON TRIBUTARIES.

SCALE IN MILES

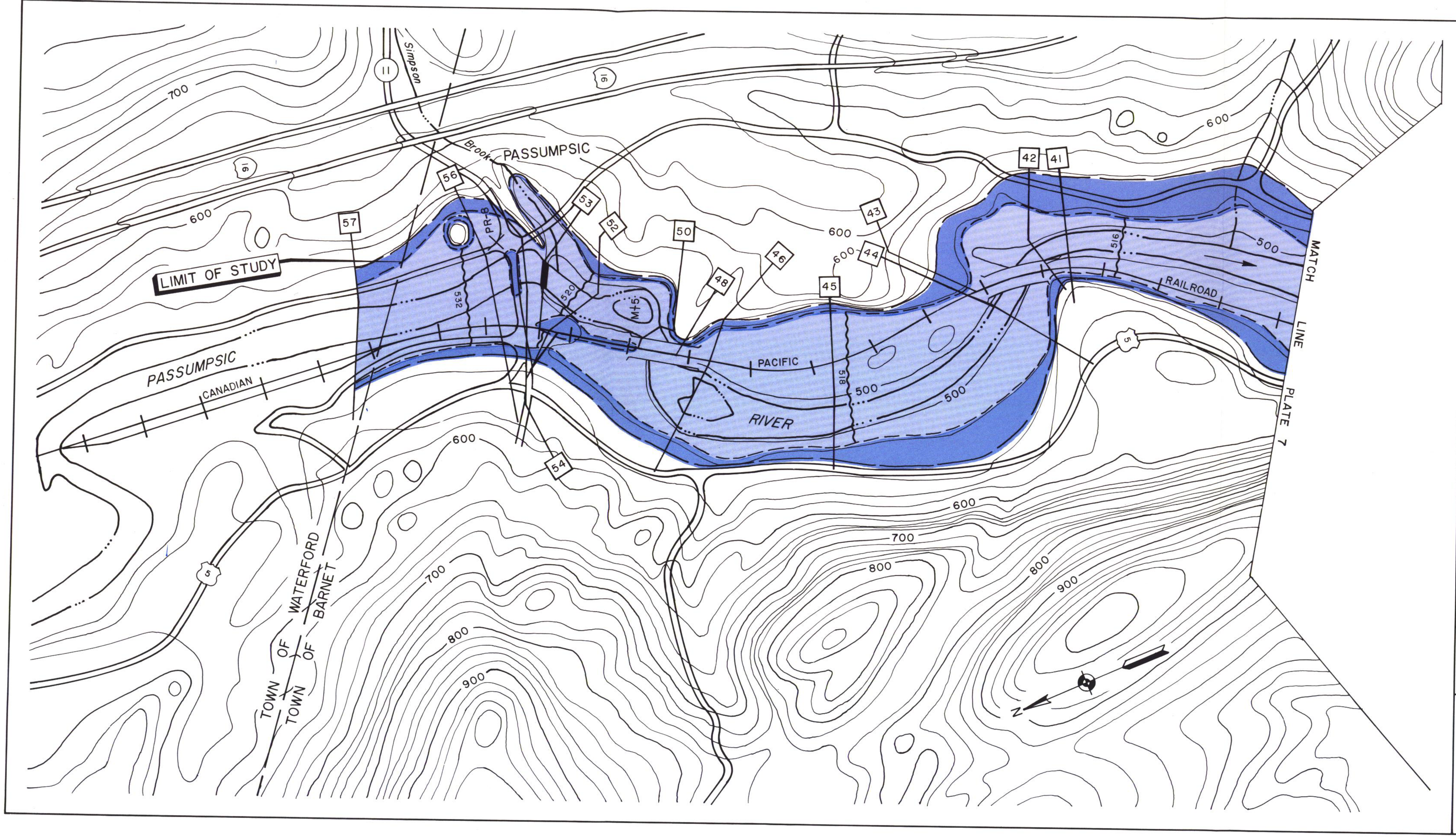
0 0.1 0.2

FLOOD PLAIN INFORMATION
BARNET , VERMONT
PASSUMPSIC RIVER

FLOODED AREAS

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1978



LEGEND

OVERFLOW LIMITS

100 YEAR FLOOD

500 YEAR FLOOD

M + 5 MILES ABOVE MOUTH

700 GROUND ELEVATION IN FEET (U.S.C.&G.S.) SEA LEVEL DATUM

CHANNEL

518 100 YEAR FLOOD ELEVATION LINE

PR-8 ELEVATION REFERENCE MARKS

TOWN LINE

50 CROSS SECTION

5 U.S. HIGHWAY

11 TOWN HIGHWAY

NOTES

1. MAP BASED ON U.S.G.S. 15 MIN. QUADRANGLE ST. JOHNSBURY, VT.– N.H. 1949. MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT (SEE PAGE 19).
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.
4. MINIMUM CONTOUR INTERVAL IS 20 FT.
5. SEE PLATE 14 FOR DESCRIPTION OF ELEVATION REFERENCE MARKS.
6. ONLY BACKWATER FLOODING FROM THE PASSUMPSIC RIVER SHOWN ON TRIBUTARIES.

SCALE IN MILES

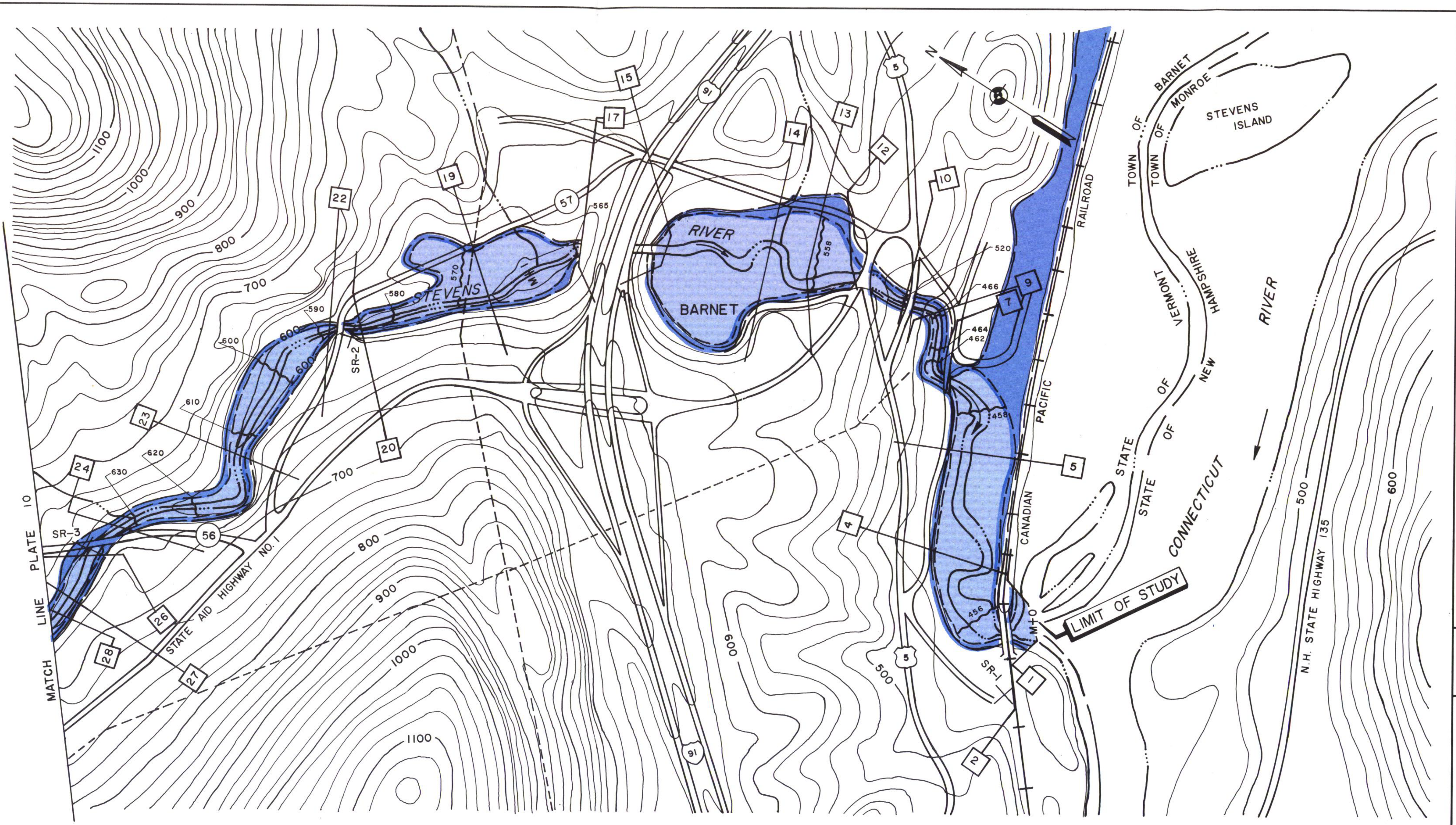
0 0.1 0.2

FLOOD PLAIN INFORMATION
BARNET, VERMONT
PASSUMPSIC RIVER

FLOODED AREAS

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1978



LEGEND

OVERFLOW LIMITS

100 YEAR FLOOD
500 YEAR FLOOD

M + 1 MILES ABOVE MOUTH

700 GROUND ELEVATION IN FEET (U.S.C.&G.S.) SEA LEVEL DATUM

CHANNEL

565 100 YEAR FLOOD ELEVATION LINE

SR-2 ELEVATION REFERENCE MARKS

STATE LINE

UTILITY TRANSMISSION LINE

5 CROSS SECTION

NOTES

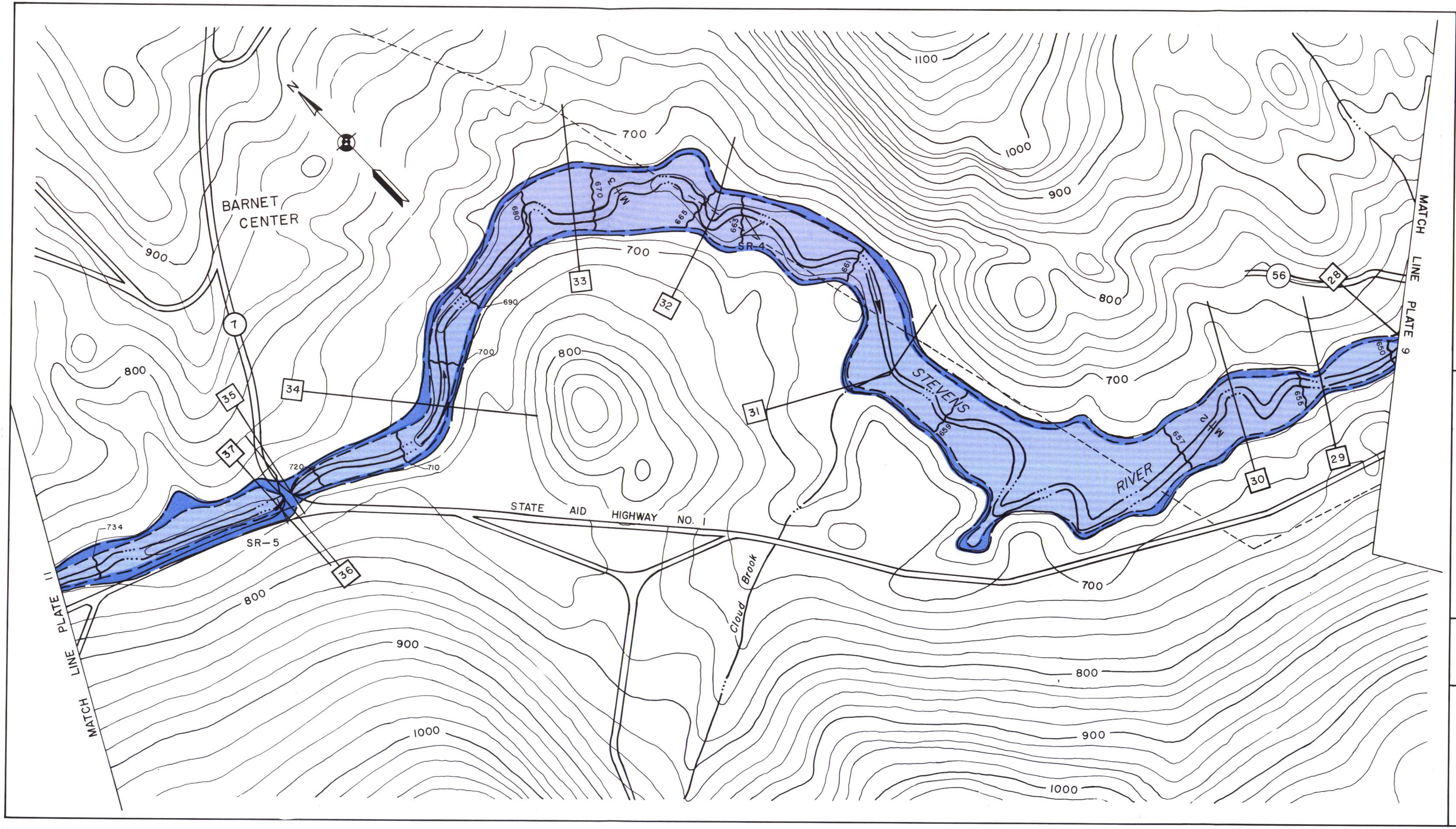
1. MAP BASED ON U.S.G.S. 15 MIN. QUADRANGLE ST. JOHNSBURY, VT.— N.H. 1949. MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT (SEE PAGE 19).
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.
4. MINIMUM CONTOUR INTERVAL IS 20 FT.
5. SEE PLATE 15 FOR DESCRIPTION OF ELEVATION REFERENCE MARKS.
6. EFFECTS OF BACKWATER FLOODING FROM THE CONNECTICUT RIVER NOT INCLUDED IN THIS STUDY.
7. ONLY BACKWATER FLOODING FROM THE STEVENS RIVER SHOWN ON TRIBUTARIES.

SCALE IN MILES

0 0.1 0.2

FLOOD PLAIN INFORMATION
BARNET , VERMONT
STEVENS RIVER
FLOODED AREAS

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION CORPS OF ENGINEERS
WALTHAM, MASS.
APRIL 1978



LEGEND

OVERFLOW LIMITS

100 YEAR FLOOD
500 YEAR FLOOD

M + 3 — MILES ABOVE MOUTH

700 — GROUND ELEVATION IN FEET (U.S.C.&G.S.) SEA LEVEL DATUM

CHANNEL

670 — 100 YEAR FLOOD ELEVATION LINE

SR – 4 — ELEVATION REFERENCE MARKS

UTILITY TRANSMISSION LINE

30 — CROSS SECTION

56 — TOWN HIGHWAY

NOTES

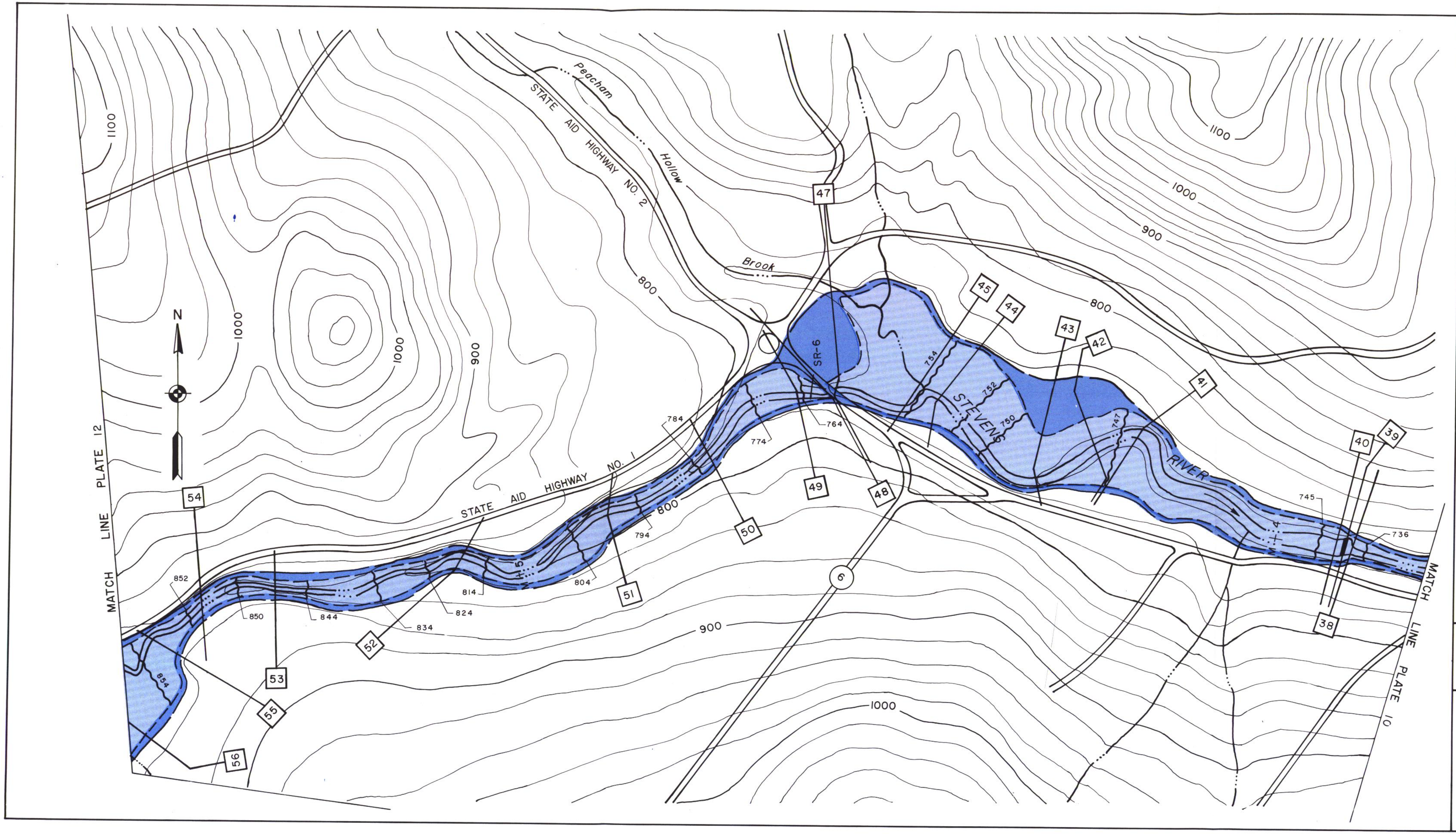
1. MAP BASED ON U.S.G.S. 15 MIN. QUADRANGLE ST. JOHNSBURY, VT. – N.H. 1949. MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT (SEE PAGE 19).
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.
4. MINIMUM CONTOUR INTERVAL IS 20 FT.
5. SEE PLATE 15 FOR DESCRIPTION OF ELEVATION REFERENCE MARKS.
6. ONLY BACKWATER FLOODING FROM THE STEVENS RIVER SHOWN ON TRIBUTARIES.

SCALE IN MILES

0 0.1 0.2

FLOOD PLAIN INFORMATION
BARNET, VERMONT
STEVENS RIVER
FLOODED AREAS

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION CORPS OF ENGINEERS
WALTHAM, MASS.
APRIL 1978



LEGEND

OVERFLOW LIMITS

100 YEAR FLOOD — 500 YEAR FLOOD

M + 5 — MILES ABOVE MOUTH

800 — GROUND ELEVATION IN FEET (U.S.C.&G.S.) SEA LEVEL DATUM

CHANNEL

750 — 100 YEAR FLOOD ELEVATION LINE

SR–6 — ELEVATION REFERENCE MARKS

43 — CROSS SECTION

6 — TOWN HIGHWAY

NOTES

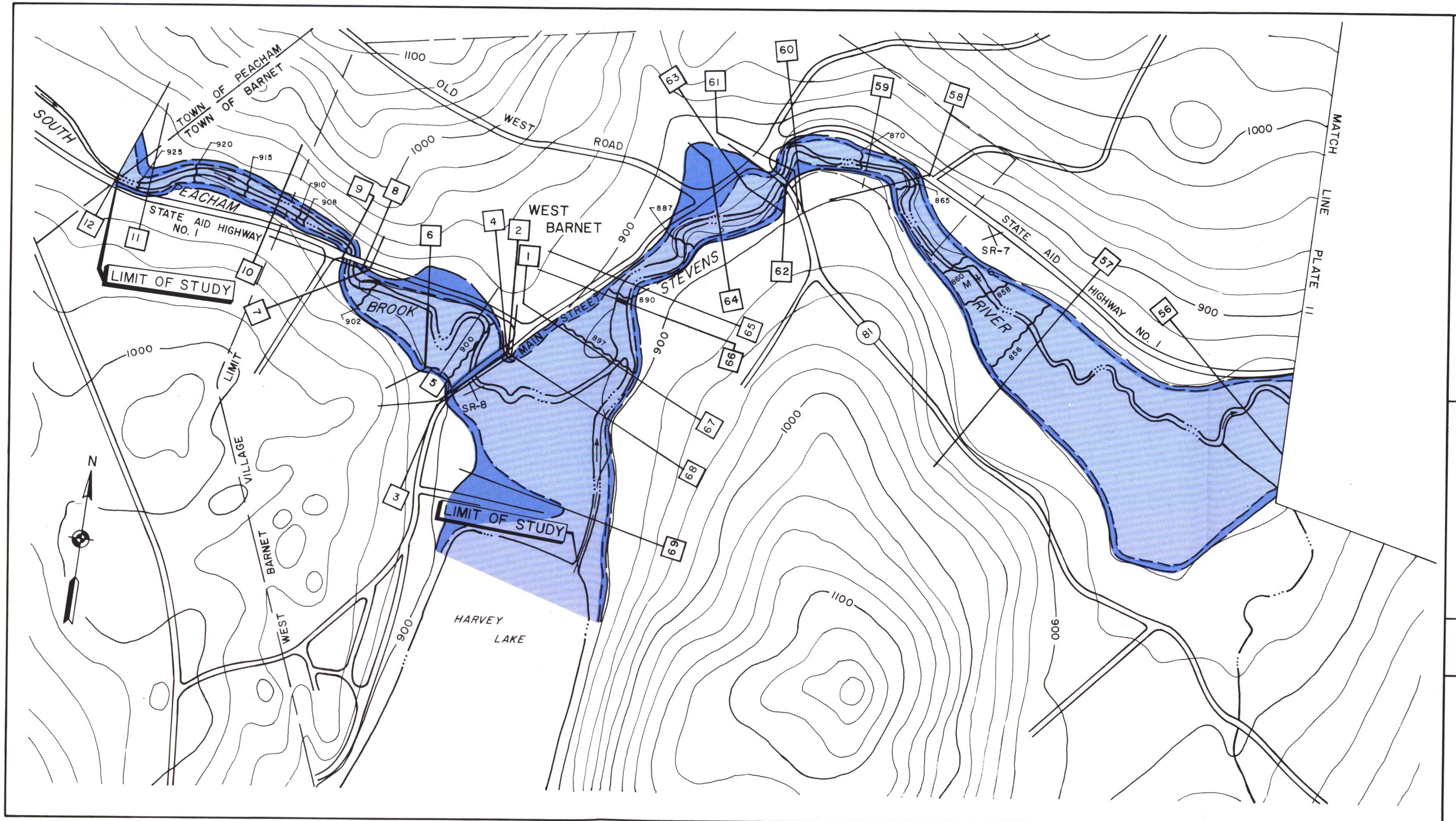
1. MAP BASED ON U.S.G.S. 15 MIN. QUADRANGLE ST. JOHNSBURY, VT. – N.H. 1949. MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT (SEE PAGE 19).
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.
4. MINIMUM CONTOUR INTERVAL IS 20 FT.
5. SEE PLATE 15 FOR DESCRIPTION OF ELEVATION REFERENCE MARKS.
6. ONLY BACKWATER FLOODING FROM THE STEVENS RIVER SHOWN ON TRIBUTARIES.

SCALE IN MILES

0 0.1 0.2

FLOOD PLAIN INFORMATION
BARNET, VERMONT
STEVENS RIVER
FLOODED AREAS

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION CORPS OF ENGINEERS
WALTHAM, MASS.
APRIL 1978



LEGEND

OVERFLOW LIMITS

100 YEAR FLOOD
500 YEAR FLOOD

M + 6 — MILES ABOVE MOUTH

900 — GROUND ELEVATION IN FEET (U.S.C.&G.S.) SEA LEVEL DATUM

CHANNEL

860 — 100 YEAR FLOOD ELEVATION LINE

SR-7 — ELEVATION REFERENCE MARKS

TOWN LINE

60 — CROSS SECTION

81 — TOWN HIGHWAY

NOTES

1. MAP BASED ON U.S.G.S. 15 MIN. QUADRANGLE ST. JOHNSBURY, VT. – N.H. 1949. MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT (SEE PAGE 19).
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.
4. MINIMUM CONTOUR INTERVAL IS 20 FT.
5. SEE PLATE 16 FOR DESCRIPTION OF ELEVATION REFERENCE MARKS.

SCALE IN MILES

0 0.1 0.2

FLOOD PLAIN INFORMATION
BARNET, VERMONT
STEVENS RIVER AND
SOUTH PEACHAM BROOK
FLOODED AREAS

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1978

PLATE 12

REFERENCE MARK NO.	PLATE NUMBER	ELEVATION *	DESCRIPTION OF LOCATION
			PASSUMPSIC RIVER
PR1	#5	487.49	At the mouth of the Passumpsic River in East Barnet, 100' West of the west end of the side railroad bridge over the Passumpsic River, 30' East of the main Canadian Pacific Railway, 30' North-west of a telephone pole, a chiseled square set in ledge.
PR2	#5	498.47	In East Barnet, set horizontally in the top of a flat projection of rock cut 500' South of a highway crossing and highway bridge over the Passumpsic River at East Barnet (formerly Inwood), about 0.1 mile East of U.S. Highway 5. It is 56' South of the north end of the cut through rock, 30' North of the south end and 15' below the top of the cut 8.2' West of and 1' lower than the west rail of the Canadian Pacific Railway tracks, about 10 inches above the ground.
PR3	#6	503.46	0.81 mile North along the Canadian Pacific Railway from the intersection of the Canadian Pacific Railway and State Aid Highway No. 3, at the railroad bridge over the Passumpsic River, on the southeast corner of the south bridge abutment, 10' East of the centerline of tracks, a chiseled square.
PR4	#6	506.87	1.42 miles North along the Canadian Pacific Railway from the intersection of the Canadian Pacific Railway and State Aid Highway No. 3, at the railroad bridge over the Passumpsic River, on the north bridge abutment, a chiseled square on the northwest corner.

*DATUM IS 1929 MEAN SEA LEVEL

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

FLOOD PLAIN INFORMATION
TOWN OF BARNET, VERMONT
ELEVATION REFERENCE MARKS
PASSUMPSIC AND STEVENS RIVERS
AND SOUTH PEACHAM BROOK
APRIL 1978

REFERENCE MARK NO.	PLATE NUMBER	ELEVATION*	DESCRIPTION OF LOCATION
PR5	#7	506.84	1.68 miles North along the Canadian Pacific Railway from the intersection of the Canadian Pacific Railway and State Aid Highway No. 3, at the railroad bridge over the Passumpsic River, on the South bridge abutment, 10' East of the centerline of tracks, a chiseled square on the southeast corner.
PR6	#7	513.30	2.14 miles North along the Canadian Pacific Railway from the intersection of the Canadian Pacific Railway and State Aid Highway No. 3, South of the mouth of Water Andric Brook, at the South end of a concrete retaining wall, a painted chiseled square.
PR7	#7	504.86	2.82 miles North along the Canadian Pacific Railway from the intersection of the Canadian Pacific Railway and State Aid Highway No. 3, at the Gaging Station, 50' East of the centerline of the railroad tracks, 15' northwest of the Gaging House, on a 5' x 5' concrete platform, a chiseled square on the most eastern corner.
PR8	#8	526.27	In Passumpsic, 19.6' North of centerline of Town Highway No. 11, 9.8' East of the rail; 1.2' West of retaining wall; 6.0' North of the southwest corner of retaining wall. Mark is covered.

* DATUM IS 1929 MEAN SEA LEVEL

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

FLOOD PLAIN INFORMATION
TOWN OF BARNET, VERMONT
ELEVATION REFERENCE MARKS

PASSUMPSIC AND STEVENS RIVERS
AND SOUTH PEACHAM BROOK
APRIL 1978

REFERENCE MARK NO.	PLATE NUMBER	ELEVATION*	DESCRIPTION OF LOCATION
			STEVENS RIVER
SR1	# 9	459.27	At Barnet, on the Canadian Pacific Railway, 193' East of the east end of the "Old Railroad Station", at a private road crossing, 30.7' Northeast of the centerline of the road, 12.0' Northeast of telegraph pole 8, 5.1' Northwest of R.O.W. fence, 8' North of metal witness post and sign, 0.5' below ground and opposite a milk plant to the northwest, a standard disk stamped "459.27 E 8 1927" set in top of a concrete post.
SR2	# 9	599.11	0.22 miles Easterly along Town Highway No. 57 from State Aid Highway No. 1, at the bridge over the Stevens River, on downstream end-top of pier, a chiseled square.
SR3	# 9	638.02	0.13 miles Northerly along Town Highway No. 56 from State Aid Highway No. 1, on the southwest abutment of the bridge over the Stevens River, a chiseled square.
SR4	#10	662.99	1.14 miles upstream along the centerline of Stevens River from SR3, on the right overbank, a spike set in a power pole.
SR5	#10	731.66	At the intersection of Town Highway No. 7 and State Aid Highway No. 1, on the bridge over the Stevens River, on the south abutment, a chisled square on the southwest corner.
SR6	#11	766.82	400' East along State Aid Highway No. 1 from the junction of State Aid Highway No. 2, at the concrete bridge over Stevens River, in the top of the North wing wall, a standard USGS disk stamped "767 MR 23 1933."

*DATUM IS 1929 MEAN SEA LEVEL

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

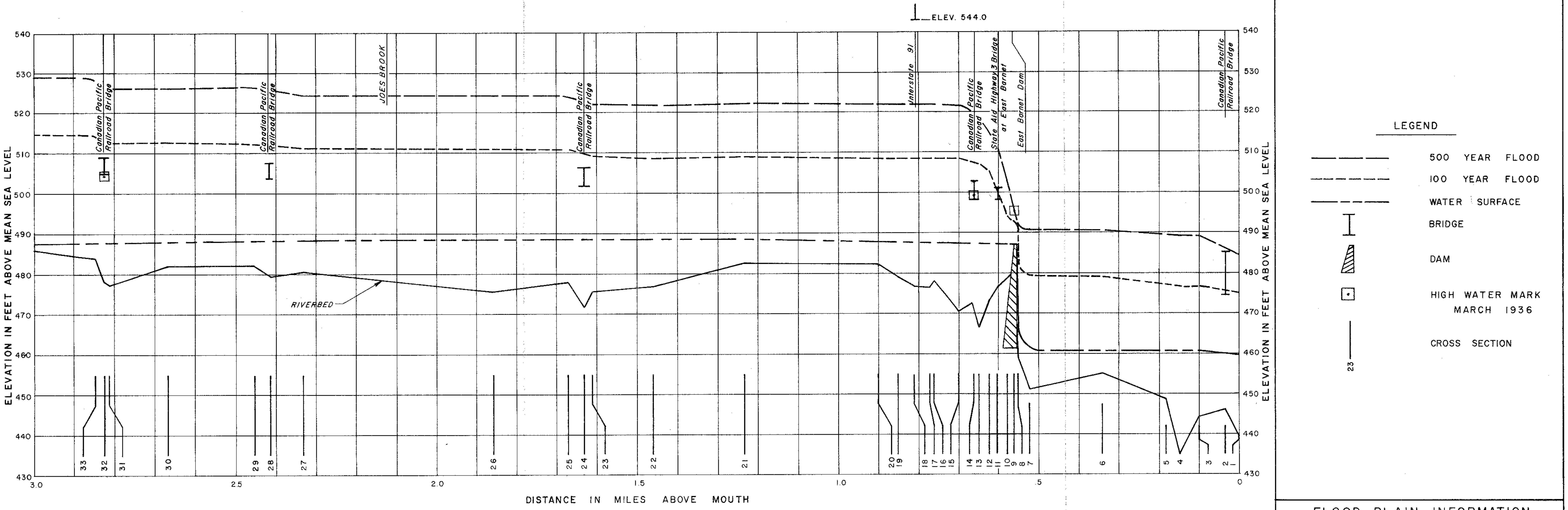
FLOOD PLAIN INFORMATION
TOWN OF BARNET, VERMONT
ELEVATION REFERENCE MARKS
PASSUMPSIC AND STEVENS RIVERS
AND SOUTH PEACHAM BROOK
APRIL 1978

REFERENCE MARK NO.	PLATE NUMBER	ELEVATION*	DESCRIPTION OF LOCATION
SR7	#12	889.88	1.18 miles West along State Aid Highway No. 1 from State Highway No. 2, the south side of road, a chiseled square on the east end of a concrete headwall.
SR8	#12	900.55	On the Town Highway No. 74 bridge over South Peacham Brook. on the southeast corner, a standard State of Vermont disk.

*DATUM IS 1929 MEAN SEA LEVEL

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

FLOOD PLAIN INFORMATION
TOWN OF BARNET, VERMONT
ELEVATION REFERENCE MARKS
PASSUMPSIC AND STEVENS RIVERS
AND SOUTH PEACHAM BROOK
APRIL 1978



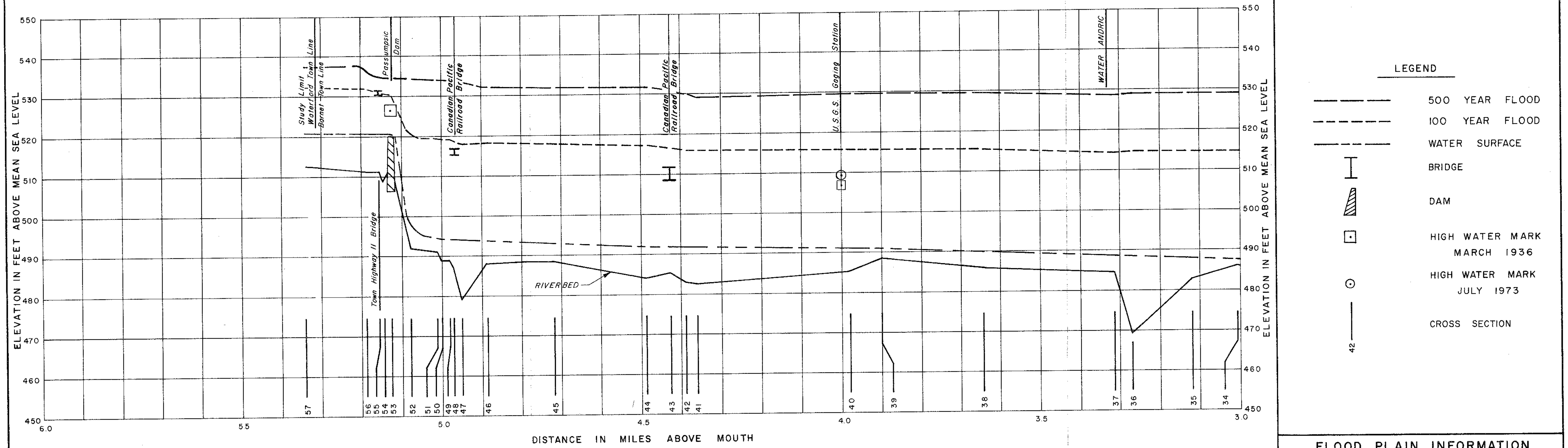
FLOOD PLAIN INFORMATION
BARNET, VERMONT

PASSUMPSIC RIVER

HIGH WATER PROFILES

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION CORPS OF ENGINEERS
WALTHAM, MASS.
APRIL 1978

PLATE 17

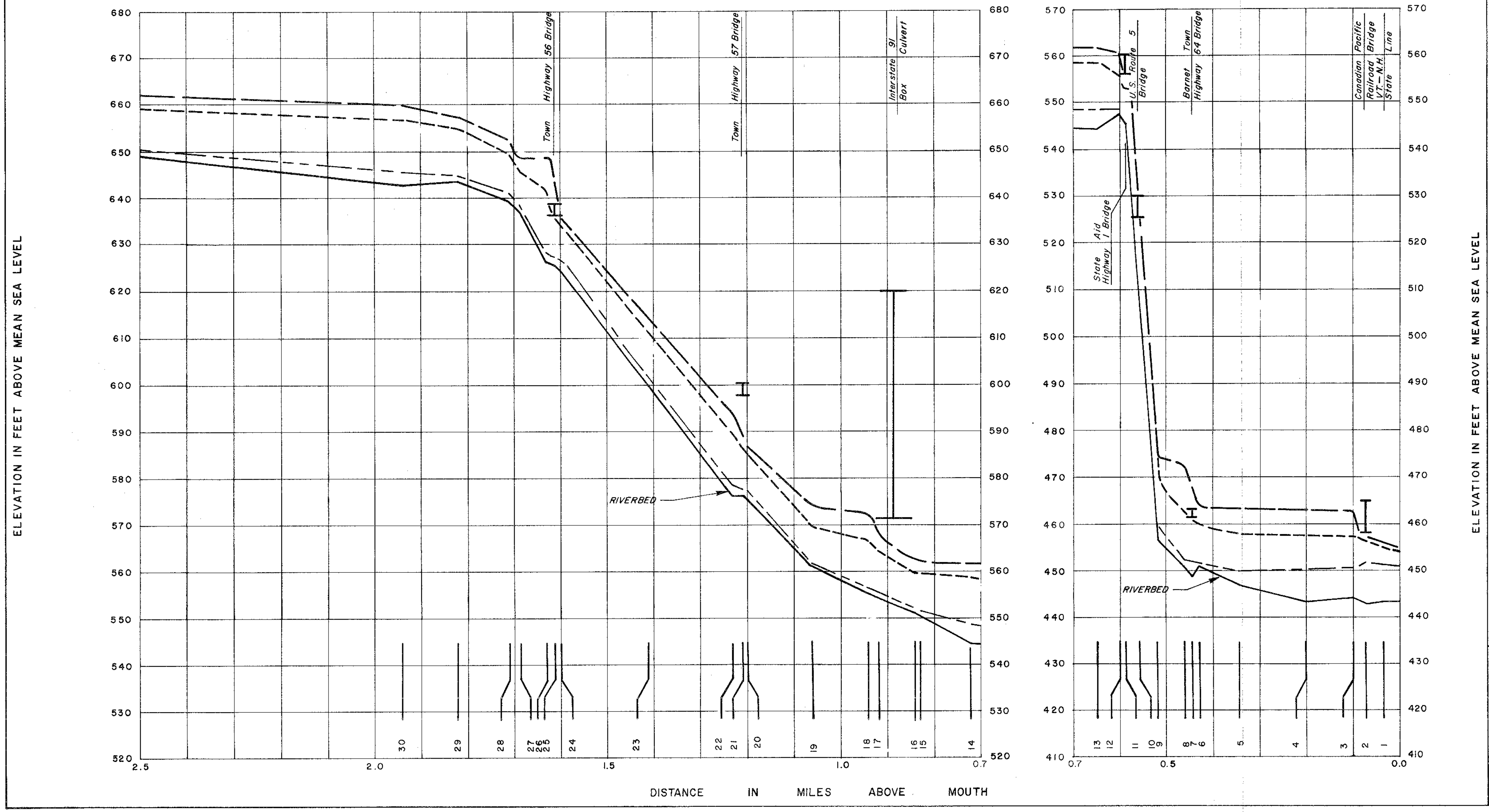


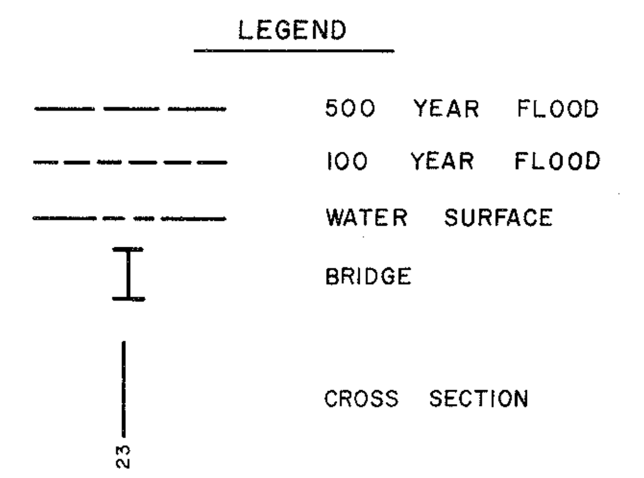
FLOOD PLAIN INFORMATION
BARNET, VERMONT
PASSUMPSIC RIVER

HIGH WATER PROFILES

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION CORPS OF ENGINEERS
WALTHAM, MASS.
APRIL 1978

PLATE 18



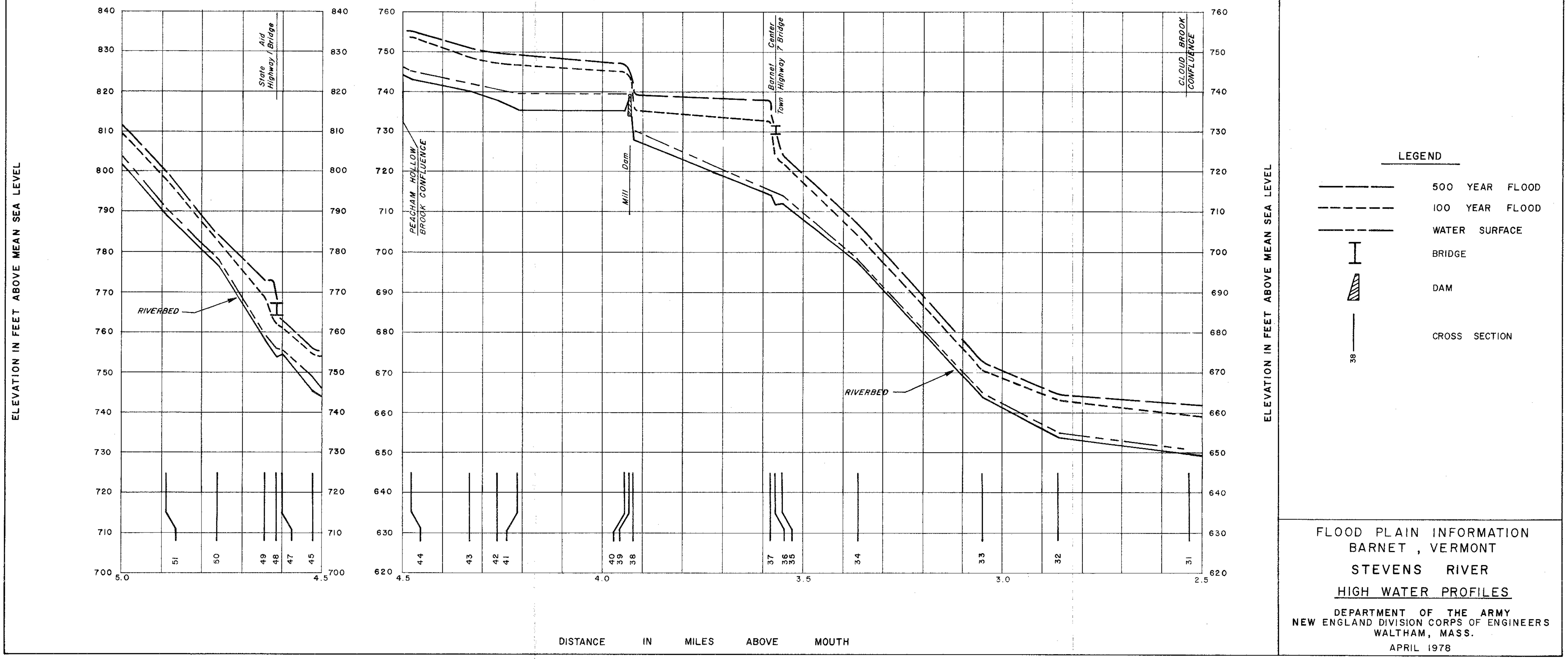


FLOOD PLAIN INFORMATION
BARNET, VERMONT

STEVENS RIVER

HIGH WATER PROFILES

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION CORPS OF ENGINEERS
WALTHAM, MASS.
APRIL 1978

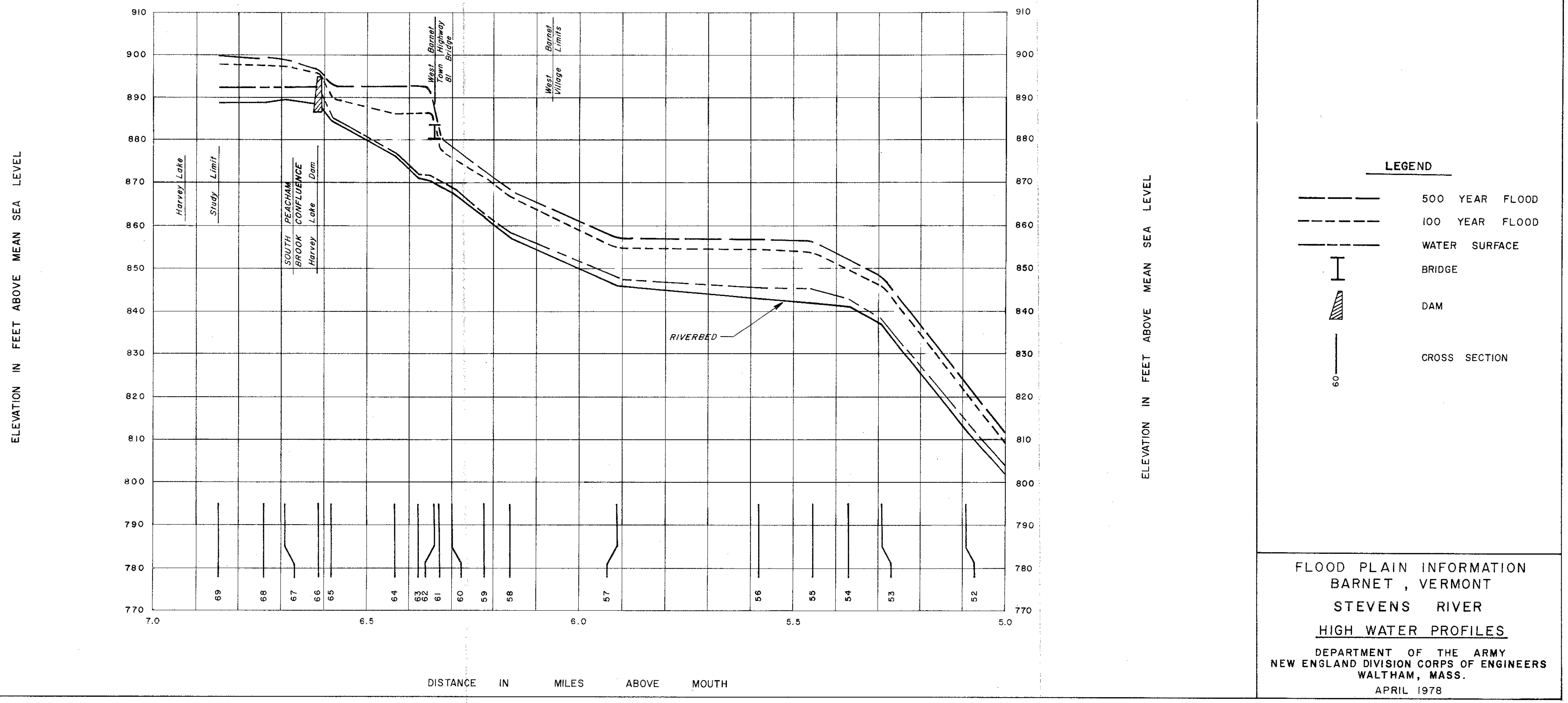


FLOOD PLAIN INFORMATION
BARNET , VERMONT

STEVENS RIVER

HIGH WATER PROFILES

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION CORPS OF ENGINEERS
WALTHAM, MASS.
APRIL 1978

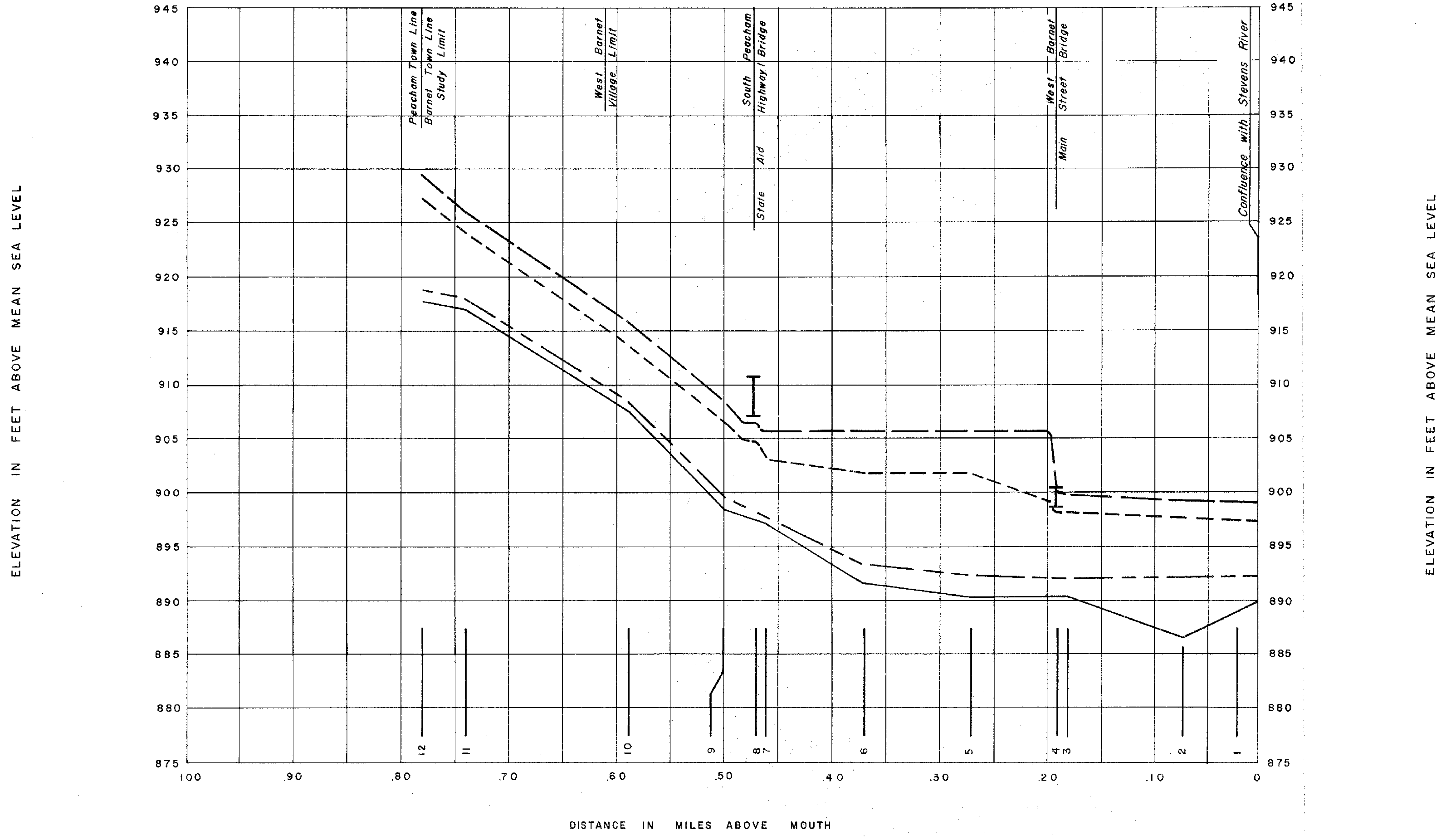


FLOOD PLAIN INFORMATION
BARNET, VERMONT

STEVENS RIVER

HIGH WATER PROFILES

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION CORPS OF ENGINEERS
WALTHAM, MASS.
APRIL 1978



LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

WATER SURFACE

BRIDGE

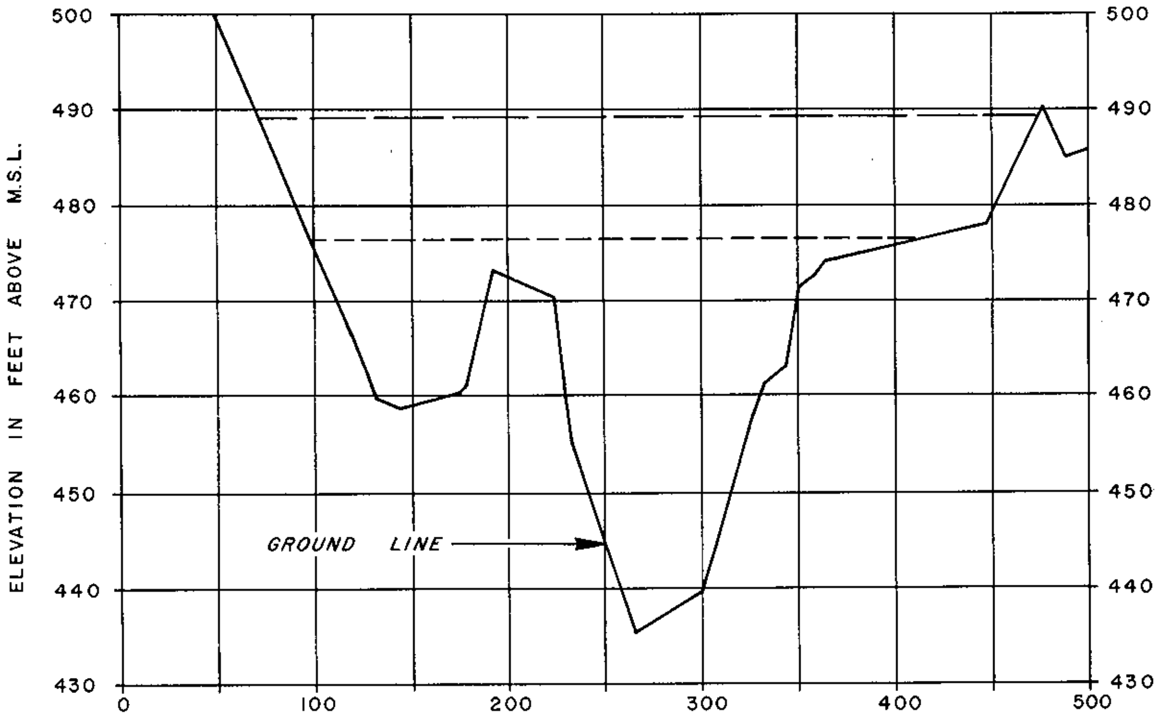
CROSS SECTION

FLOOD PLAIN INFORMATION
BARNET, VERMONT

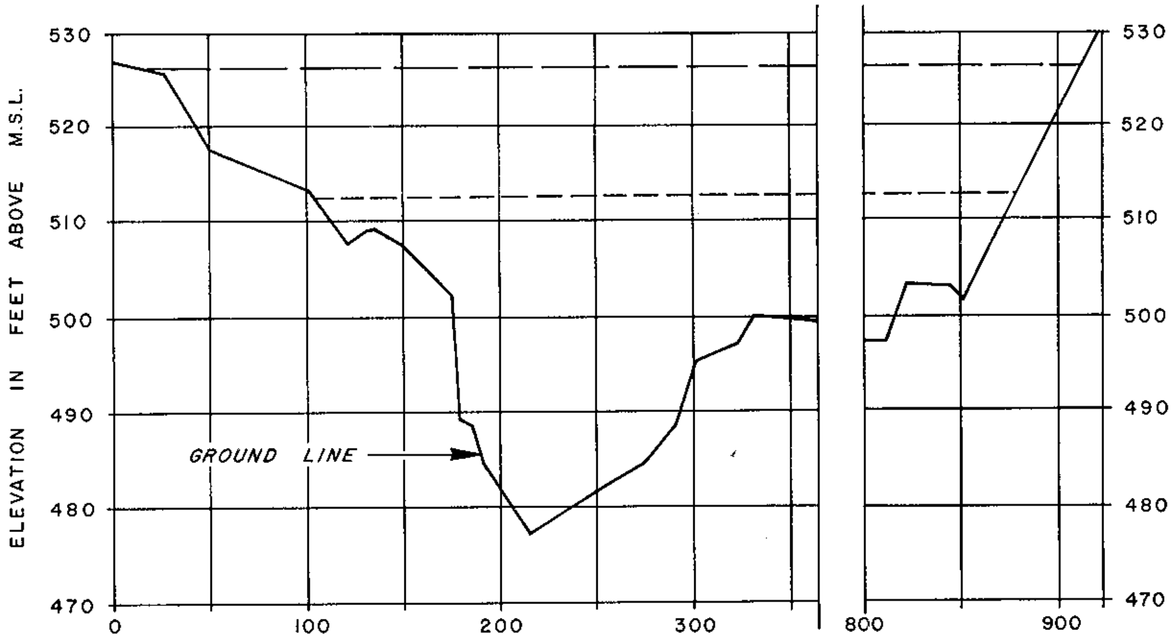
SOUTH PEACHAM BROOK

HIGH WATER PROFILES

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION CORPS OF ENGINEERS
WALTHAM, MASS.
APRIL 1978



SECTION NO. 4 – RIVER MILE 0.15



SECTION NO. 31 – RIVER MILE 2.82

LEGEND

—— — — —— 500 YEAR FLOOD

—— — — — — 100 YEAR FLOOD

NOTES:

1. ALL OTHER SECTIONS ON THE PASSUMPSIC RIVER NOT SHOWN IN THIS REPORT ARE ON FILE AT THE NEW ENGLAND DIVISION, CORPS OF ENGINEERS AND ARE AVAILABLE FOR INSPECTION UPON REQUEST.
2. SECTIONS TAKEN LOOKING DOWNSTREAM.
3. HORIZONTAL DISTANCES ARE IN FEET.

FLOOD PLAIN INFORMATION
BARNET, VERMONT

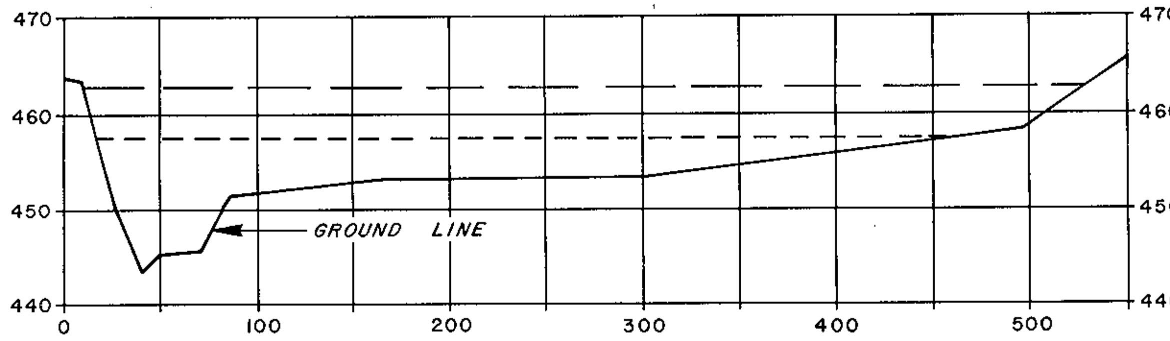
PASSUMPSIC RIVER

SELECTED CROSS SECTIONS

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

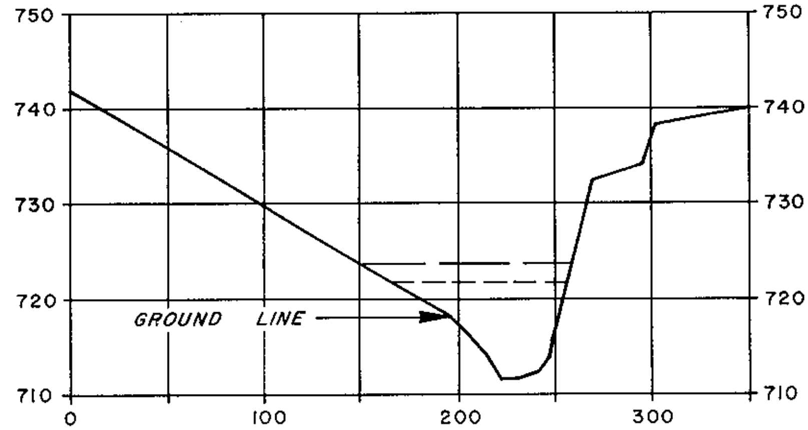
APRIL 1978

ELEVATION IN FEET ABOVE M.S.L.



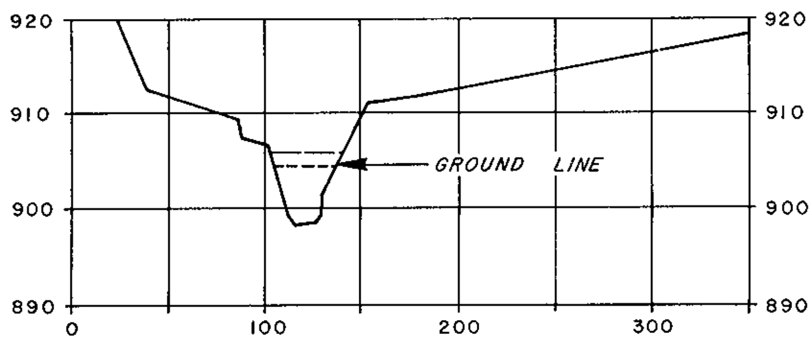
STEVENS RIVER

SECTION NO. 4 – RIVER MILE 0.20



STEVENS RIVER

SECTION NO. 35 – RIVER MILE 3.55



SOUTH PEACHAM BROOK

SECTION NO. 9 – RIVER MILE 0.50

LEGEND

— — — 500 YEAR FLOOD

– – – – 100 YEAR FLOOD

NOTES:

1. ALL OTHER SECTIONS ON THE STEVENS RIVER AND SOUTH PEACHAM BROOK NOT SHOWN IN THIS REPORT ARE ON FILE AT THE NEW ENGLAND DIVISION, CORPS OF ENGINEERS AND ARE AVAILABLE FOR INSPECTION UPON REQUEST.
2. SECTIONS TAKEN LOOKING DOWNSTREAM.
3. HORIZONTAL DISTANCES ARE IN FEET.

FLOOD PLAIN INFORMATION

BARNET, VERMONT

STEVENS RIVER AND

SOUTH PEACHAM BROOK

SELECTED CROSS SECTIONS

DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION, CORPS OF ENGINEERS

WALTHAM, MASSACHUSETTS

APRIL 1978