407 - 362

CONNECTICUT RIVER BASIN FLOOD PLAIN MANAGEMENT STUDY

PLAN OF STUDY

APRIL 1977

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MA. 02154

128

TABLE OF CONTENTS

Section	Description	Page
A	AUTHORITY FOR STUDY	1
	1. Background	1
	2. Authority	1
B	PURPOSE OF PLAN OF STUDY	2
	3. Purpose	2
C	PHYSICAL CONDITIONS	3
	4. The Study Areas	3
	5. Climate and Precipitation	5
	6. Hydrology	5
	7. Land Use	6
D	SOCIO-ECONOMIC CONSIDERATIONS	8
	8. Population	8
	9. Economics	8
E	LOCAL INTERESTS	9
	10. Local Concerns	9
	11. Public Participation	10
F	INVESTIGATIONS AND REPORTS	10
	12. Prior Investigations and Reports	10
G	SCOPE OF STUDY	11
	13. Study Objectives	11
H	CONSTRAINTS AND CONTROLS	13
	14. General	13

TABLE OF CONTENTS (Contd)

Section	Description	Page
I	COOPERATION AND COORDINATION	13
	15. Local Cooperation	13
	16. Local Coordination	14
J	PUBLIC PARTICIPATION	15
	17. Public Involvement Strategy	15
K	SUBMISSION OF REPORTS	16
	18. Plan of Survey	16
	19. Final Survey Report	16
	20. Other Reports	16
L	ESTIMATES OF COSTS	16
	21. General	16
M	RECOMMENDATION	16
	22. Recommendation	16

FIGURES

No.	Description	Follows Page
1	STUDY AREA	4
2	KEENE, N. H. STUDY AREA	4
3	NORTHAMPTON, MA. STUDY AREA	5
4	CONNECTICUT STUDY AREA	5

APPENDICES

No.	Description
A	SECTION 73 OF PUBLIC LAW 93-251
B	CONNECTICUT RIVER BASIN FLOOD MANAGEMENT STUDY WORK SEQUENCE DIAGRAM

A. AUTHORITY FOR STUDY

1. Background

There have been at least 20 major floods along the main stem of the Connecticut River since the earliest recorded flood of March 1639. Floods have occurred in all months of the year, however, the greatest floods have occurred in either spring or fall, due to heavy rainfall, snowmelt, or a combination of both. An interesting aspect of the Connecticut River floods is that the three greatest floods recorded at Hartford, Connecticut - March 1936, September 1938 and August 1955 - occurred within a 19 year period.

The Corps of Engineers has been involved with flood control on the Connecticut River since the passage of House Document 308, 69th Congress on 21 January 1927 which directed the Corps to study and make recommendations to alleviate the potential flood situation on several major river systems in the United States. The Connecticut River was one of the river systems selected for study. To date, through responses to various Congressional resolutions ranging from site specific to basin wide studies, 16 flood control dams and reservoirs and 15 major local protection projects have been erected. These projects, along with an elaborate flood warning system and the National Flood Insurance Program provide inhabitants of the basin with a high degree of flood protection. The Corps of Engineers, until the early 1970's, had advocated that 7 more flood control reservoirs be constructed and certain complementary non-structural measures such as flood plain zoning be added to complete the basin-wide plan. The Basin States have recently withdrawn their support of these new reservoirs because of the ramifications of the National Environmental Policy Act (NEPA) enacted in 1969. Subsequent to, and as a consequence of, NEPA, the New England River Basins Commission (NERBC) chaired a supplemental flood control study in the Connecticut River Basin. The recommendations of this study were to consider raising existing main stem local protection projects to higher levels; and, to institute measures, generally of a non-structural nature, in certain other basin communities. The Corps of Engineers advocates this general approach to flood damage reduction within the Connecticut River Basin.

2. Authority

Authority for this study is provided by the United States Senate Resolution Committee on Public Works, adopted 11 May 1962:

"That the Board of Engineers for Rivers and Harbors, created under Section 3 of the Rivers and Harbors Act, approved 12 June 1920 be, and is hereby, requested to review the reports on the Connecticut River, Massachusetts, New Hampshire, Vermont, and Connecticut, published as House Document 455, 75th Congress, Second Session, and other reports, with a view to determining the advisability of modifying the existing project at the present time, with particular reference to developing a comprehensive plan of improvement for the basin in the interests of flood control, navigation, hydroelectric power development, water supply, and other purposes, coordinated with related land resources."

The above Senate resolution provided the principal authority and direction to proceed with a comprehensive study on the Connecticut River Basin. Approximately 3 years later, 22 July 1965, Congress approved the Water Resources Planning Act which provides for the optimum development of the nation's natural resources through the coordinated planning of water and related land resources through the establishment of a Water Resources Council and River Basins Commission, as well as providing financial assistance to the States in order to increase State participation in such planning.

Section 73 of Public Law 93-251 provides further guidance in the area of project formulation and cost sharing for non-structural flood damage reduction measures. Section 73 is reprinted in Appendix A.

B. PURPOSE OF THE PLAN OF STUDY

3. Purpose

This Plan of Study provides an outline for study procedures, study activities and costs, interagency coordination and a public involvement program. It will be used as a guide to develop feasible, implementable, flood damage reduction measures for the selected pilot-study communities, and assist in determining appropriate Federal participation in accordance with Section 73. This document is intended to be a dynamic management tool to guide planners during the conduct of the study. Accordingly, it may be changed during the course of the study to reflect the revisions or refinements made necessary by the findings of the study.

C. PHYSICAL CONDITIONS

4. The Study Areas

Eleven communities were considered as possible candidates for study by the Corps of Engineers. They were specifically identified in Congressional testimony and two additional communities were requested by the State of Connecticut for inclusion as pilot study communities. A total of seven communities have been selected for authorization studies at this time. The Corps of Engineers will study portions of six communities among three states - Connecticut, Massachusetts and New Hampshire - and the Soil Conservation Service of the U. S. Department of Agriculture will study the seventh - Brattleboro, Vermont - under existing authority of P. L. 83-566. The three areas selected for study by the Corps of Engineers are depicted on Figure 1 and include the "Meadows" area of Connecticut (which lies in the four communities of East Hartford, Glastonbury, Rocky Hill and Wethersfield); the Oxbow area of Massachusetts (Northampton); and, the large flat flood plain of Keene, New Hampshire, through which a major tributary of the Connecticut River - the Ashuelot River - flows.

Keene, New Hampshire is located in the southwestern portion of the state and can be visualized topographically as a cup, open on one side, with the heavily built-up area of the city on the bottom of the cup. The tributaries of the Ashuelot River originate on the steep sides of the cup, and the Ashuelot River flows through the heavily built-up portion of the city. Because of the topographic configuration of Keene's flood plain, the flat gradient of the Ashuelot River through Keene and its relatively low discharge capacity, ponding occurs for several days after a flood. Keene's inclusion in this particular study is based upon the problems revealed through past experience and the knowledge of flooding conditions in the city. Figure 2 depicts Keene's flood plains.

Northampton, Massachusetts is located in the western portion of the state on the west bank of the Connecticut River. Historically, Mill River had provided the power for industry, and, therefore, has become the center for the three built-up areas of the city; Leeds, Florence and the central business district. The banks of the Connecticut River have been in agricultural usage since the founding of the community, presently, however, LaFleur Airport, the tri-county fairgrounds, some commercial and residential establishments have also been constructed within the Connecticut River's flood plain. A series of local protection dikes was constructed by the Army Corps of Engineers in 1941 in addition to the upstream impoundments to protect the center of the city from high flood stages on the Connec-

ticut River. No such flood impoundments exist on the Mill River, however, even though the Soil Conservation Service has recommended three such impoundments be implemented. The variety, type and number of structures within the estimated Intermediate Regional Flood plains (IRF) on the Mill and Connecticut Rivers led to the selection of Northampton, Massachusetts as a study area. Figure 3 depicts these flood plains within Northampton.

As previously mentioned, the "Meadows" area of Connecticut lies within four communities - East Hartford, Glastonbury, Rocky Hill and Wethersfield. The meadows are typically flat, and between elevations 10 and 20 feet mean sea level. The diversity of development in and around the meadows flood plain ranges from intense residential in the Keeney Cove portions of East Hartford and Glastonbury to the intense agricultural usage in South Glastonbury. All of these communities are suburbs of, and feel the growth pressures generated by Hartford. These communities have various zoning ordinances and priorities for growth expansion and location. For all of these reasons it was initially decided to select these communities for study so that the "Meadows" area could be investigated as a whole. Local interest, however, has led to the addition of the Hockanum River flood plain in East Hartford to the Connecticut River flood plains for study. Figure 4 depicts the flood plains in the Connecticut Study area.

Six other communities were considered but not included in the present study. The communities of Chicopee, South Hadley, Springfield and West Springfield, Massachusetts were testified for as candidate communities but field examinations determined that too few structures in each of these communities were located within the 100-year flood plain to warrant further consideration as pilot study communities. The communities of South Windsor and Windsor, Connecticut were deferred because the State's prime concern is over the possibility of higher flood stages in these communities caused by raising the existing East Hartford local protection dikes.

A separate study of the advisability of raising the East Hartford dikes will be conducted during the same period as this study. The dike raising study will examine the effects of raising the dikes on communities downstream and upstream including South Windsor and Windsor.

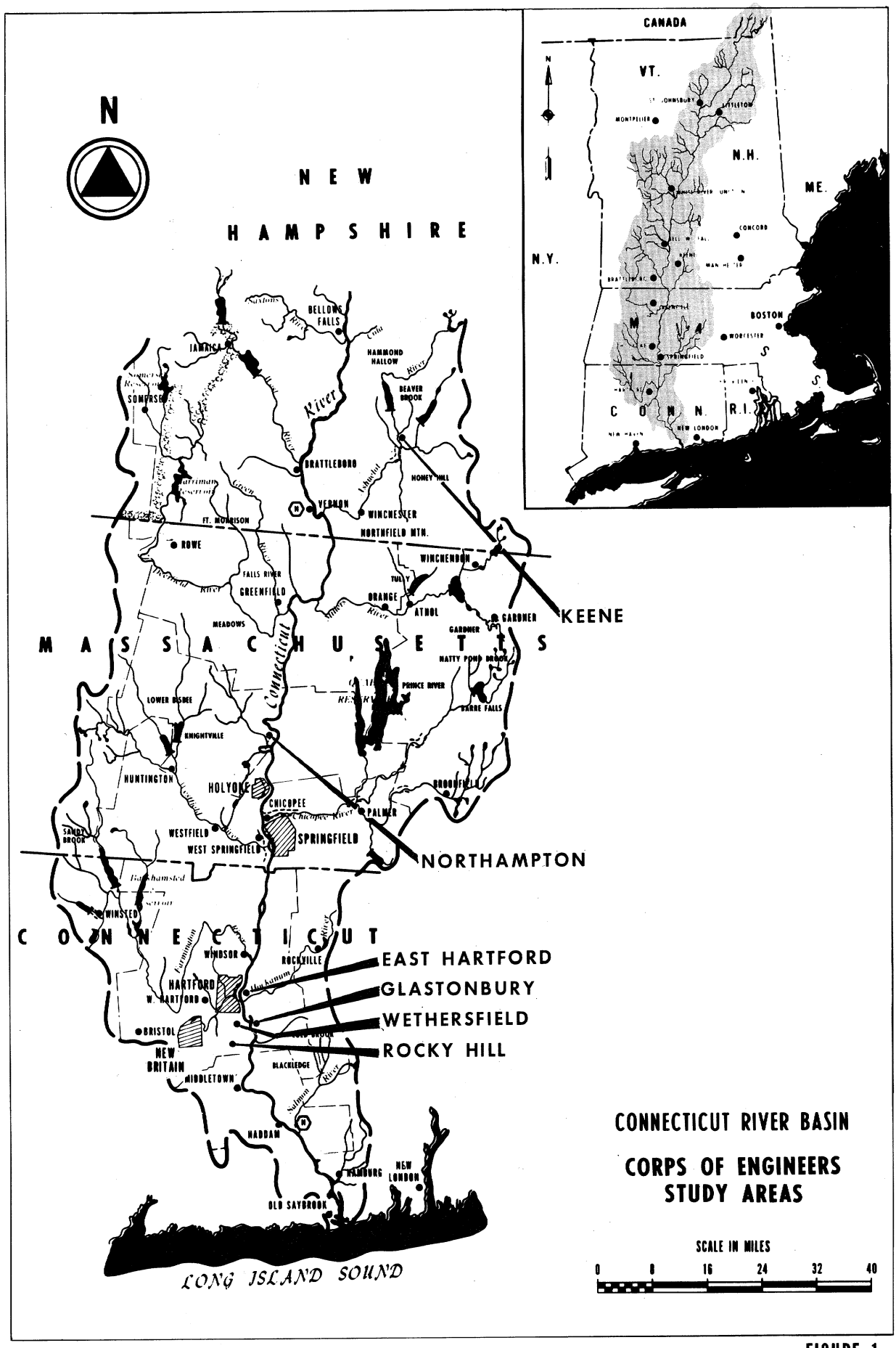
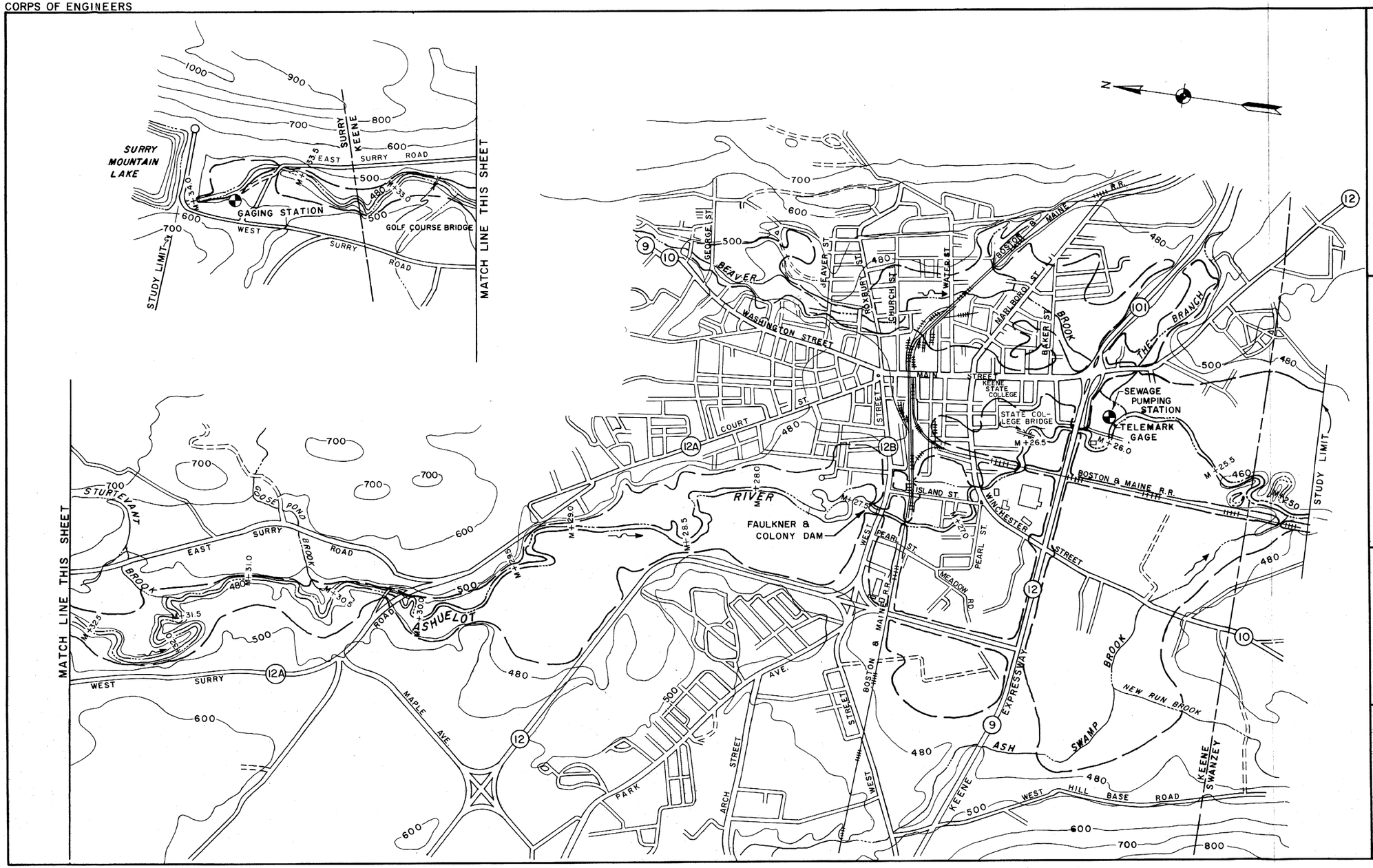

N
NEW HAMPSHIRE
MASSACHUSETTS
CONNECTICUT
LONG ISLAND SOUND
CANADA
VT.
N.H.
ME.
N.Y.
MASS.
CONN.
R.I.
BOSTON
CONCORD
MONTPELIER
BELLOWS FALLS
JAMAICA
SOMERS
HAMMOND HALLOW
BEAVER BROOK
BRATTLEBORO
HONEY HILL
VERNON
WINCHESTER
FT. MORRISON
NORTHFIELD MTN.
ROWE
WINCHENDON
FALLS RIVER
GREENFIELD
TULLY
ORANGE
ATHOL
GARDNER
KEENE
MEADOWS
NATTY POND BROOK
PRINCE RIVER
LOWER DUDEE
KNIGHTVILLE
HUNTINGTON
HOLYOKE
CHICOPEE
PALMER
BROOKFIELD
WESTFIELD
WEST SPRINGFIELD
SPRINGFIELD
NORTHAMPTON
WINSTED
WINDSOR
ROCKVILLE
EAST HARTFORD
HARTFORD
W. HARTFORD
GLASTONBURY
WETHERSFIELD
BRISTOL
ROCKY HILL
NEW BRITAIN
BLACKLEDGE
MIDDLETOWN
HADDAM
NEW LONDON
OLD SAYBROOK
CONNECTICUT RIVER BASIN
CORPS OF ENGINEERS STUDY AREAS
SCALE IN MILES
0 8 16 24 32 40

FIGURE 1



LEGEND

OVERFLOW LIMITS

INTERMEDIATE REGIONAL FLOOD (STANDARD PROJECT FLOOD COVERS APPROXIMATELY THE SAME AREA)

M + 26 MILES ABOVE MOUTH

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

KEENE CITY LIMITS

CHANNEL

NOTES:

1. MAP BASED ON U.S.G.S. 15 MIN. KEENE QUADRANGLE SHEET, 1958. MINOR ADDITIONS AND ADJUSTMENTS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT.
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.
4. MINIMUM CONTOUR INTERVAL IS 20 FT.

SCALE IN MILES

0.2 0.0 0.2 0.4

CONNECTICUT RIVER BASIN FLOOD PLAIN MANAGEMENT STUDY

KEENE, N.H. STUDY AREA

DECEMBER 1976

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

FIGURE 2

5. Climate and Precipitation

The communities under study all lie within the realm of prevailing westerlies and, therefore, come under the influence of cyclonic storms which traverse from the west and southwest. In the winter months, highs from Canada introduce arctic air into the basin, while during the summer months, west to southwest airflows bring the hot, dry weather which is responsible for occasional summer drought.

Precipitation, temperature and mean snowfall are listed in the following table for three pilot study areas.

6. Hydrology

The U.S. Geological Survey maintains records at gaging stations located throughout the Connecticut River Basin. There are presently discharge data available from more than 100 such stations within the basin (some stations have been discontinued). The average annual runoff for the basin is approximately 23 inches, or just over half of the average annual precipitation. The Corps of Engineers has flow recording stations at its 16 existing flood control dams and reservoirs which are located on tributaries of the main stem Connecticut River. The USGS gaging stations are located above and below the Connecticut and Massachusetts study areas, and five are located within the Ashuelot River watershed. Data from these gaging stations have been used to calculate the various frequency flooding events along the main stem Connecticut River and the Ashuelot River. Flood profiles along these two rivers are also available. The Mill River in Northampton, Massachusetts has been studied by the USDA Soil Conservation Service, and, therefore, similar information on the Mill River is also available. Detailed hydrologic and hydraulic data are only required, therefore, on the Hockanum River in East Hartford, Connecticut and Beaver Brook in Keene, New Hampshire.

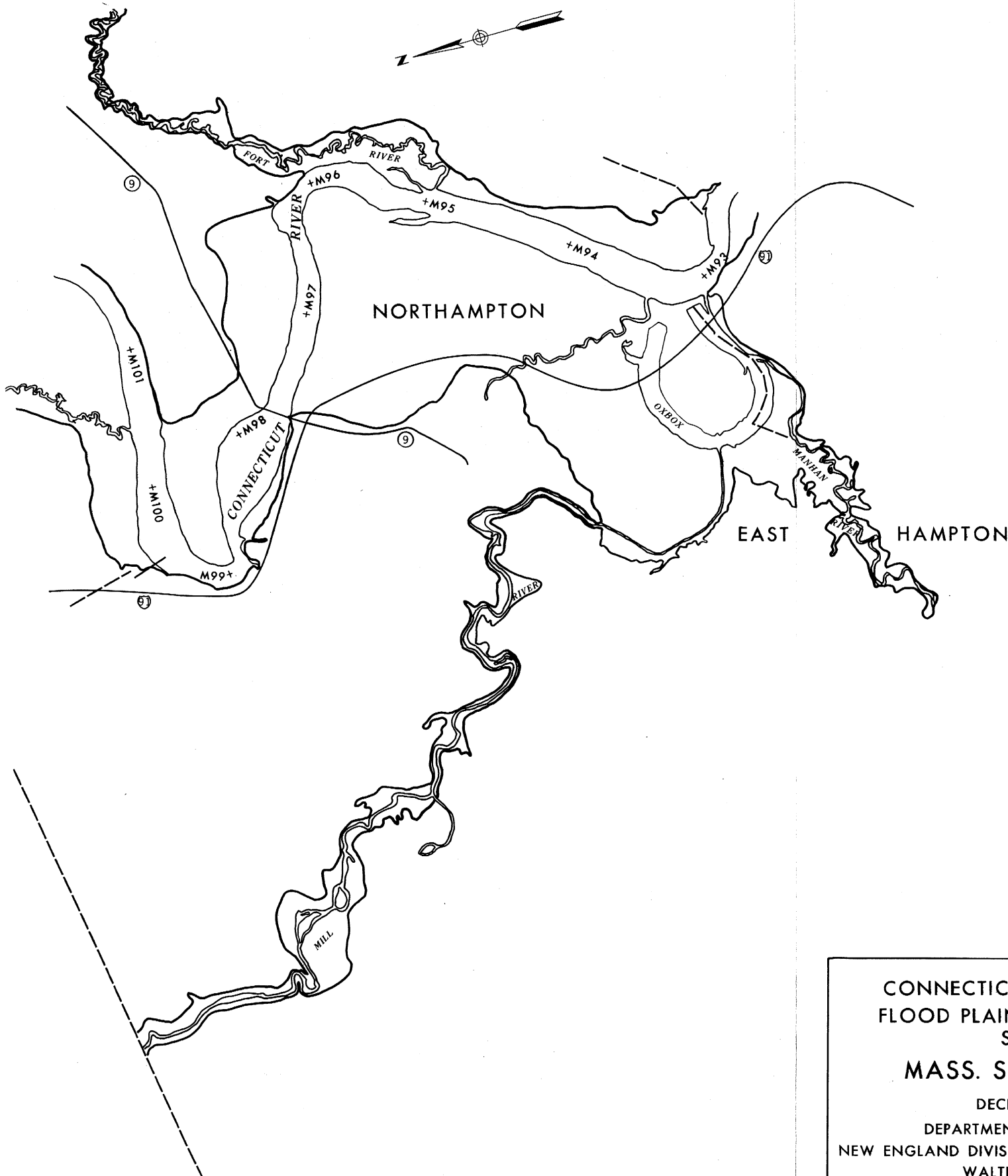
It is estimated that the combined effect of nine existing flood control reservoirs above the Northampton, Massachusetts study area would lower potential flood stages between two and four feet along the main stem Connecticut River in that area.

The combined effect of all the 16 major existing Corps of Engineers flood control dams is felt by the four study area communities of Connecticut. The effect of these dams is to lower a Standard Project Flood between four and four and a half feet in this area.

Climate Data at Pilot Study Areas
Within the Connecticut River Basin

(All figures are mean Annual based on 30 years data 1931-1960)

Area	Climate Data	Elev. MSL	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Keene	Prec. (In.)	-	3.35	2.54	3.36	3.62	3.60	3.81	3.70	3.21	3.86	2.79	3.74	3.13	40.71
	Temp (°F)	490	22.8	24.2	32.9	45.1	56.4	65.1	69.8	67.8	60.4	49.8	38.5	26.1	46.6
	Snow (In.)	-	17.6	14.4	11.9	3.0	T	0	0	0	0	0.1	3.1	10.2	60.3
Amherst	Prec. (In.)	-	3.40	2.65	3.76	3.70	3.78	4.05	3.83	3.86	4.33	3.05	3.80	3.35	43.56
	Temp (°F)	217	25.1	26.1	35.0	46.7	58.0	66.8	71.7	69.6	62.0	51.8	40.4	28.3	48.5
	Snow (In.)	-	12.6	13.9	8.3	2.0	T	T	0	0	0	T	2.2	8.9	47.9
Hartford	Prec. (In.)	-	3.58	2.94	3.80	3.73	3.41	3.70	3.61	4.01	3.65	3.18	3.84	3.47	42.92
	Temp (°F)	169	26.6	27.8	35.7	47.7	58.8	67.6	72.2	70.2	62.3	52.3	41.2	29.5	49.3
	Snow (In.)	-	11.4	10.0	9.0	1.5	0	T	0	T	0	T	1.1	7.2	40.2



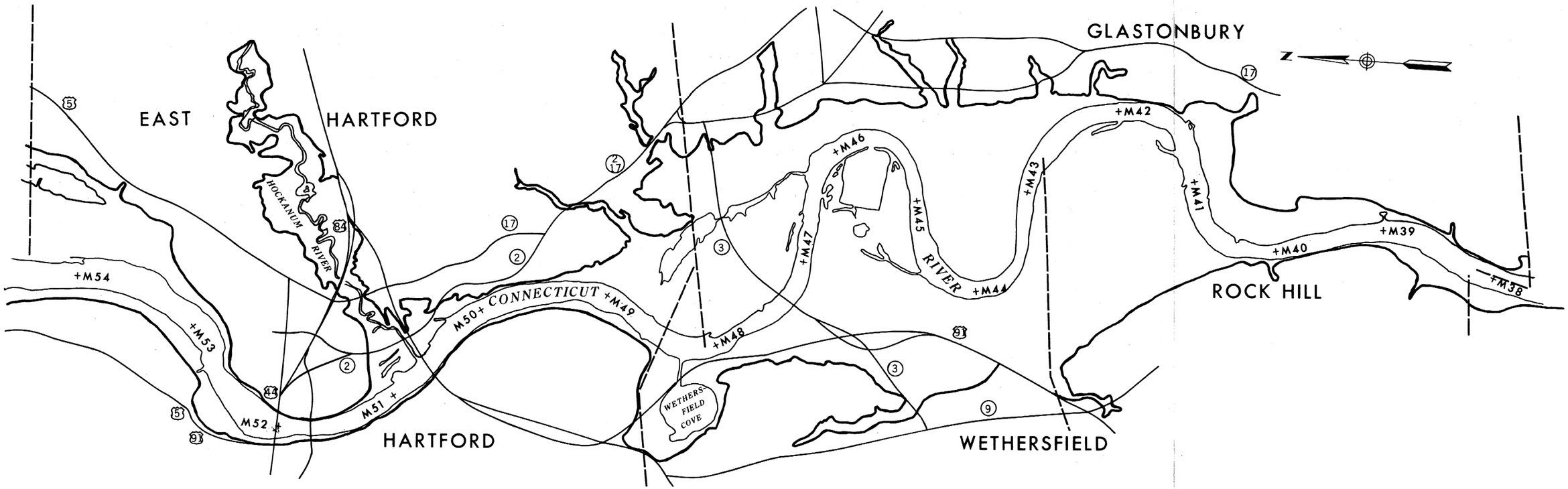
CONNECTICUT RIVER BASIN
FLOOD PLAIN MANAGEMENT
STUDY

MASS. STUDY AREA

DECEMBER 1976

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

FIGURE 3



CONNECTICUT RIVER BASIN
FLOOD PLAIN MANAGEMENT
STUDY

CONN. STUDY AREA

DECEMBER 1976

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

FIGURE 4

The Surry Mountain and Otter Brook Dams together control runoff from 147 square miles of the total 421 square mile watershed of the Ashuelot River. The effect of this control at Keene, New Hampshire (drainage area of 310 square miles) would be to reduce the Standard Project Flood an estimated 3.9 feet. This reduction would be felt along the approximately 2.2 mile flood plain in Keene.

7. Land Use

Land usage within the community flood plains under study varies from predominantly agricultural to densely populated residential, commercial and industrial.

Based upon 1970 housing and population census data and the field identification of structures estimated to be within the IRF plain in the six communities comprising the study area, the following population densities have been calculated:

Community	Number of Residential Structures Within IRF Floodplain	Average Community Persons/ Residence	Estimated Population Within IRF	Area Within IRF (Sq. Mi.)	Population Density Persons/ (Sq. Mi.)
East Hartford	305*	3.05	930*	2.13*	437
Glastonbury	40	3.35	134	2.50	54
Rocky Hill	8	3.43	27	1.70	16
Wethersfield	12	3.16	38	0.18	211
Sub Area Total/ Average	365	3.09	1129	6.51	173
Northampton	100	3.32	332	4.70	58
Keene	750	3.00	2250	5.50	409**
Total/Average	1215	3.05	3711	17.21	216

It is interesting to note that only Rocky Hill, Connecticut has a flood plain population density less than the national population density average approximately 50. Keene, New Hampshire and East Hartford and Wethers-

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* Does not include areas protected by existing local protection dikes, areas between the dikes and the Connecticut River; nor the Hockanum River's IRF flood plain.

** Population density shown may be lower than actual due to Keene State College students.

field, Connecticut have flood plain population densities which are greater than the New England average population density of approximately 170. Thus, the areas selected for study correlate well with the national average density figures (Northampton, Massachusetts and Glastonbury, Connecticut), and the New England average density figures (Connecticut study area). Additionally, a high population density area (Keene, New Hampshire) has also been included for study, thereby ensuring inclusion of as wide a density range as possible in the results.

D. SOCIO-ECONOMIC CONSIDERATIONS

8. Population

The 1970 census of population indicates that in the Connecticut study area there are a total of 116,000 people, of which an estimated 1,100 or one percent, reside in the main stem Connecticut River IRF flood plain. It has been estimated that this population figure would increase to 136,000 by the year 1980, to 147,000 by the year 1990, and to 155,000 by the year 2000.

Northampton, Massachusetts had a reported 1970 population of 29,664 of which one percent, or 330 are estimated to live within the IRF flood plains of the Connecticut and Mill Rivers. It has been estimated that this population will decrease to 29,200 by the year 1980, and continue to decrease to 28,800 by the year 1990, but is estimated to increase to 30,300 by the year 2000.

Keene, New Hampshire reported a 1970 population of 20,467 of which an estimated 2,250 or 11.0 percent live within the IRF flood plain of the Ashuelot River and Beaver Brook. Keene's population is estimated, by the New Hampshire office of Comprehensive Planning, to increase to 23,150, 25,500 and 27,000 by the years 1980, 1990 and 2000 respectively.

9. Economics

The economic base of each of the study areas varies significantly. The Connecticut area represents a large urban area, as well as its suburban and agricultural fringe. There is a wide diversification of manufacturing, widespread commercial activities, and tobacco farming. Additionally, East Hartford and Hartford represent a major transportation center because of the intersection of three major interstate highways, I-84, I-86 and I-91.

Northampton, Massachusetts has a diverse manufacturing base, although agriculture - with many farms along the Connecticut River - and, education - with Smith College in Northampton and the University of Massachusetts, Amherst College, Hampshire College and Mt. Holyoke College nearby - both contribute to the economic base of the community.

Keene, New Hampshire has traditionally been the economic center of its region and carries this tradition forward with a fairly stable, industrialized economic base. Keene State College provides additional economic diversity as do the more than 200 professional offices within the city.

According to the 1972 OBERS Series E * projections, per capita incomes for all of the study areas are estimated to be above the national average to the year 2020, with the Hartford area projected to have the highest per capita incomes relative to the national average. Thus, the study areas represent a variety of socio-economic conditions.

E. LOCAL INTERESTS

10. Local Concerns

The "Rivers Reach" published by the New England River Basins Commission strongly recommends that further flood damage reduction measures be instituted. The report recognizes that the existing system of reservoirs, local protection works and flood warning facilities provide a high level of protection, but there are areas which are still subject to flooding. Further pressures of urbanization in the future may cause now undeveloped flood prone land to become developed. The "Rivers Reach" advocates a community-by-community approach to solving flood problems. The community itself is expected to take the initiative, participate in the planning, make the go, no-go decisions and see the plan through to completion.

Based on this philosophy, it behooves the concerned people to get involved in the study at an early stage.

The "Rivers Reach" specifically recommended that Level "C" authorization studies be undertaken in the communities of East Hartford, Glastonbury, Rocky Hill, Wethersfield, Connecticut; Springfield, West Springfield, Chicopee, Northampton, Massachusetts; Keene, New Hampshire and Brattleboro, Vermont. This recommendation is the basis of the Corps

* The OBERS Projections are planning tools which extrapolate historic economic and population growth rates to future years. OBERS Series E Projections assumes a population growth rate which will eventually result in no future population growth except for immigration.

appeal to Congress for Level "C" study funding. That appeal is further supported by letters, and statements issued by the communities involved during the course of the New England River Basin Commission chaired Connecticut River Supplemental Study.

Following the recommendations of the "Rivers Reach", Congressional testimony for Level "C" studies for the 11 communities within the basin was given, and letters indorsing these studies were received from some of these communities.

11. Public Participation

Initial public meetings will be held in each of the study areas to insure coordination and consideration of local interests. Informal progress meetings will be held during the course of the study to keep interested citizens informed of the pace and course of the work. Formal public meetings will be scheduled in accordance with regulations established by the Office of Chief of Engineers. Public participation procedures are amplified in Section J of the Plan of Study.

F. INVESTIGATIONS AND REPORTS

12. Prior Investigations and Reports

Numerous studies and reports through the years have shaped the flood damage reduction system that exists in the basin today. The following are the most significant and deal with the comprehensive basin-wide aspect of flood control.

Public Law 75-761 enacted in 1938 authorized a system of 20 flood control reservoirs and 7 mainstem local protection projects. Ten alternate flood control reservoir sites were also authorized at the time. PL 75-761 authorized the system as described in detail in House Document 75-455. The reservoirs were to reduce flood stages along tributary streams as well as the mainstem of the Connecticut River. The local protection works were to secure the urbanized mainstem communities from these reduced flood stages. Immediate construction of the local protection projects was ordered so that the vulnerable urban communities could be provided a degree of protection quickly; realizing that the reservoirs would take longer to build since interstate agreements would be a prerequisite. The mainstem local protection projects were all constructed in the early 1940's. Six reservoirs were also constructed in the 1940's and 1950's.

Tropical storm Diane and its associated flood of August 1955 caused considerable damage in the lower basin and provided the impetus to construct 10 more flood water retarding reservoirs. The system as it stands today provides a high level of protection on many tributaries and on the mainstem of the Connecticut River.

The Federal-State-NERBC Coordinating Committee of the Connecticut River Basin, Comprehensive Water and Related Land Resources Investigation, in 1970, reported that there was still a significant flood potential in the basin. Some of the threat was from tributary and mainstem overbank flow but there was also a threat that a major flood might overtop local protection projects in six mainstem urban communities. While 16 reservoirs had been constructed, the degree of flood stage reduction prescribed in HD 75-455 had not been achieved. The Coordinating Committee recommended seven new reservoirs and complementary non-structural measures which were to have completed the system.

Subsequent to the publication of the Coordinating Committee report, State support of the reservoirs in the plan was withdrawn. NERBC chaired a Connecticut River Supplemental Study to reconsider the need for protection and to reinvestigate alternative means of providing protection. The need for protection was confirmed and NERBC in the River's Reach found that the protection could be provided by 1) raising the dikes in the six urban mainstem communities, and, 2) by instituting the necessary flood damage reduction measures for the rest of the watershed on a community by community case basis. This plan of study addresses this latter issue for six selected communities.

G. SCOPE OF STUDY

13. Study Objectives

The objectives of this study as stated generally in the second section of this document provide for the following work items:

A. Background data required for each pilot study area will be needed and will consist of:

1. Location of each structure within the 100 year flood plain

2. Ground and first floor elevation of each structure within the 100 year flood plain

3. Determine assessed value and estimate the market value of each identified structure.

4. Visual description of each structure, including such physical characteristics as basement; number of stories; number of families; type of construction; style of structure; and, general outward appearances.

5. Damage surveys will be required to calculate average annual damages and to determine closeness of fit with pre-established stage-damage curves for structure types.

6. Hydrologic and hydraulic studies and surveys on the Hockanum River in East Hartford, Connecticut; and on Beaver Brook in Keene, New Hampshire must be done.

7. Stage-frequency curves will be drawn for events up to, and including, the 100-year event, on the main stem Connecticut River in Northampton, Massachusetts and in East Hartford, Glastonbury, Rocky Hill and Wethersfield, Connecticut. Similar curves will be developed for the Ashuelot River and Beaver Brook in Keene, New Hampshire; the Mill River in Northampton, Massachusetts; and the Hockanum River in East Hartford, Connecticut.

8. Environmental, social and archeological impacts will be addressed, as and if they are encountered in the study.

B. Once the required data has been assembled, future growth estimates will be made in cognizance of the implementation of the National Flood Insurance Program. Estimates of existing and future damages will be made and will form the baseline without-plan condition. To assist in assessing the average annual damages, a computer program will be used to develop stage damage curves per structure type and a cumulative stage damage curve per study area.

C. Alternatives will be formulated, assessed and evaluated in accordance with established Corps of Engineers policies and procedures as well as the Principle and Standards established by the Water Resources Council for planning for water and related land resource studies. These alternatives would include, as a minimum, the following:

1. Flood water impoundments
2. Dikes or floodwalls
3. Flood proofing measures
4. Acquisition and relocation
5. Flood warning and evacuation
6. Zoning and building code requirements

D. Plan selection will be based on economic, environmental, social and cultural considerations. A plan will be selected which will fulfill the study objectives, be economically justified, have minimal environmental and cultural impacts and be socially and politically acceptable. The selected plan will include institutional arrangements such as federal and local responsibilities and operation and maintenance of the plan.

E. An effective public participation program will be carried on throughout the study so that a mutually acceptable plan can be presented.

F. Appendix B consists of a work sequence diagram which illustrates, in a block diagram format, the particular planning processes which will be followed during the preparation of these reports.

G. The goal of this study is to develop a plan of improvement and cost sharing which will be submitted to the Congress for authorization.

H. CONSTRAINTS AND CONTROLS

14. General

To date this study is funded to the extent of the completion of this Plan of Survey and preliminary planning. Based on scheduled funding the study will be completed by June 1980. Reports on the Connecticut and Massachusetts study areas are scheduled for June 1979 and New Hampshire study area is due in June 1980. Studies will be continued only so long as a possibility remains that a workable and environmentally and socially acceptable plan of improvement can be recommended.

I. COOPERATION AND COORDINATION

15. Local Cooperation

Local cooperation requirements for Federal participation in construction of any project will be detailed in conformance to the policy expressed in EM 1120-2-101. It is expected that local interests will be required to give assurances satisfactory to the Secretary of the Army that they will:

a. Provide without cost to the United States all lands, easements, and rights-of-way necessary for construction of the project;

b. Hold and save the United States free from damages due to the construction works;

c. Maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of the Army;

d. Provide without cost to the United States all alterations and replacements of existing utilities including bridges, highways, sewers and railroad modifications and relocations other than railroad bridges and their approaches, which may be required for the construction of the project;

e. Prescribe and enforce regulations to prevent encroachment on both the improved and unimproved channel;

f. Prohibit encroachment on ponding areas, and if the capacity of these areas is impaired, promptly provide substitute ponding capacity or equivalent pumping capacity without cost to the United States; and

g. Comply with the requirement specified in Section 210 and 305 of Public Law 91-646, 91st Congress, approved 2 January 1971, entitled, "Uniform Relocation Assistance and Real Property Policies Act of 1970".

16. Local Coordination

A public involvement program will be an integral part of the planning process in the Connecticut River Flood Plain Management study. For the purposes of this study, the public is defined as any non-Corps of Engineers entity. Public involvement in this study will be a continuous, two-way communication process which will involve:

a. Promoting full public understanding of the manner and means by which problems and needs are investigated and solutions are proposed;

b. Keeping the public fully informed regarding the status and progress of studies and the results and implications of planning activities; and

c. Actively soliciting from the public; their opinions and perceptions of problems, issues, concerns and objectives; their preferences regarding resource use and alternative development or management strategies; and any other information and assistance relevant to the planning process. While input from the public is essential, it in no way, relieves the Corps of Engineers of its responsibility for the professional-technical adequacy of the resultant plans. In the final analysis, the results of this study will reflect a combination of both professional expertise and public inputs derived from a multiplicity of sources.

J. PUBLIC PARTICIPATION

17. Public Involvement Strategy

a. The basic structure of the public involvement program consists of techniques for continuing communication with an emphasis on information and education, and periodic meetings and workshops associated with each of the major phases of the planning process. Continuing communication endeavors will include press releases, newsletters, speeches and exhibits, while the participatory events involve public meetings, seminars and workshops.

As the study progresses, status reports will be prepared to keep the public informed of the progress of the study. In addition, press releases will be given to local newspapers and newsletters of the various special interest groups in the study area. Speeches and exhibits will be presented to interested groups in the study area.

Three formal public meetings are presently planned for this study. Initial public meetings will be held to inform the public of the study and to solicit their views on the needs in the study area. Public meetings will also be conducted during the formulation phase of the study and just prior to the conclusion of the study. In addition, it is planned to conduct a number of informational workshops and seminars.

b. Federal and possibly certain State agencies will be enlisted to assist with portions of the work, and to review work done by the Corps. The New England River Basins Commission, U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, and Federal Flood Insurance Administration will obviously have significant input into the study. Appropriate State agencies will be urged to participate or at least keep abreast of the work and offer their suggestions and criticism.

K. SUBMISSION OF REPORTS

18. Plan of Survey

This report constitutes the Plan of Survey.

19. Final Survey Report

The submission of the survey report will be determined by the allocation of funds made available as discussed in Section H, "Constraints and Controls". Final drafts are scheduled for public review in February 1979 and February 1980. A final submission of these reports will be made to the Office of the Chief of Engineers in June 1979, and June 1980.

20. Other Reports

Interim reports and Environmental Impact Statements will be submitted during the course of investigations, if found necessary.

I. ESTIMATES OF COSTS

21. General

The preparation of budgetary data for the Connecticut River Flood Plain Management study is predicated upon the estimated amount of money needed to complete the work items considered necessary for a Level C study. The total estimated funds required to complete the study are $450,000. The distribution of funds will provide for an assessment of the problem, the need for corrective measures and the assembly of basic data in FY 1977, with the development of alternative solutions in FY 1978, and the selection of the final alternatives in FY 1979.

M. RECOMMENDATION

22. Recommendation

Approval of this Plan of Survey on investigating flood plain mangement control measures within three pilot study areas in the Connecticut River Basin is recommended.

APPENDIX A

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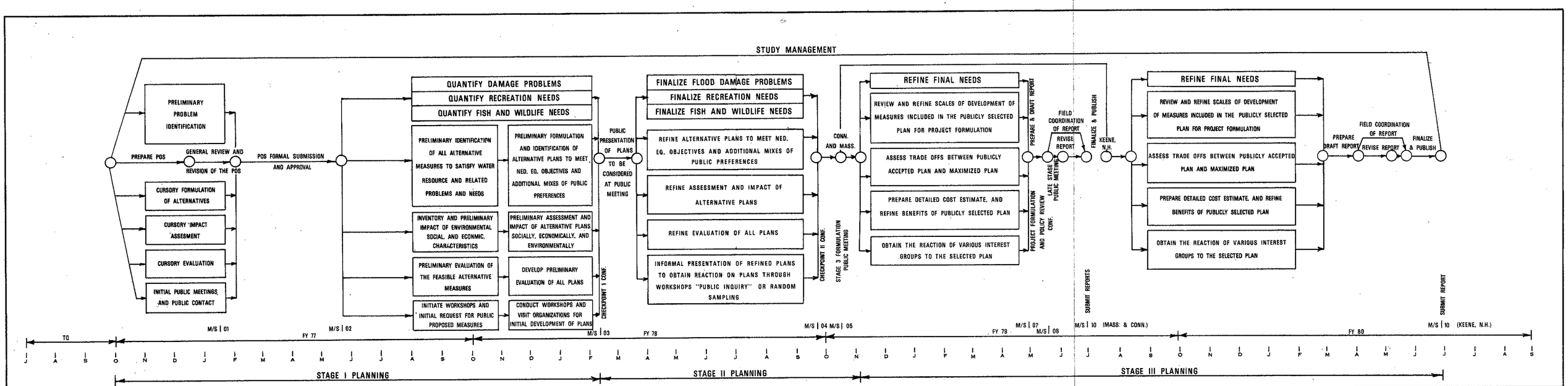
Sec. 73. (a) In the survey, planning, or design by any Federal agency of any project involving flood protection, consideration shall be given to nonstructural alternatives to prevent or reduce flood damages including, but not limited to, floodproofing of structures; flood plain regulation; acquisition of flood plain lands for recreational, fish and wildlife, and other public purposes; and relocation with a view toward formulating the most economically, socially, and environmentally acceptable means of reducing or preventing flood damages.

(b) Where a nonstructural alternative is recommended, non-Federal participation shall be comparable to the value of lands, easements, and rights-of-way which would have been required of non-Federal interests under Section 3 of the Act of June 27, 1936 (Public Law Numbered 738, Seventy-fourth Congress), for structural protection measures, but in no event shall exceed 20 per centum of the project costs.

APPENDIX B



CONNECTICUT RIVER BASIN

FLOOD PLAIN MANAGEMENT STUDY

WORK SEQUENCE DIAGRAM

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