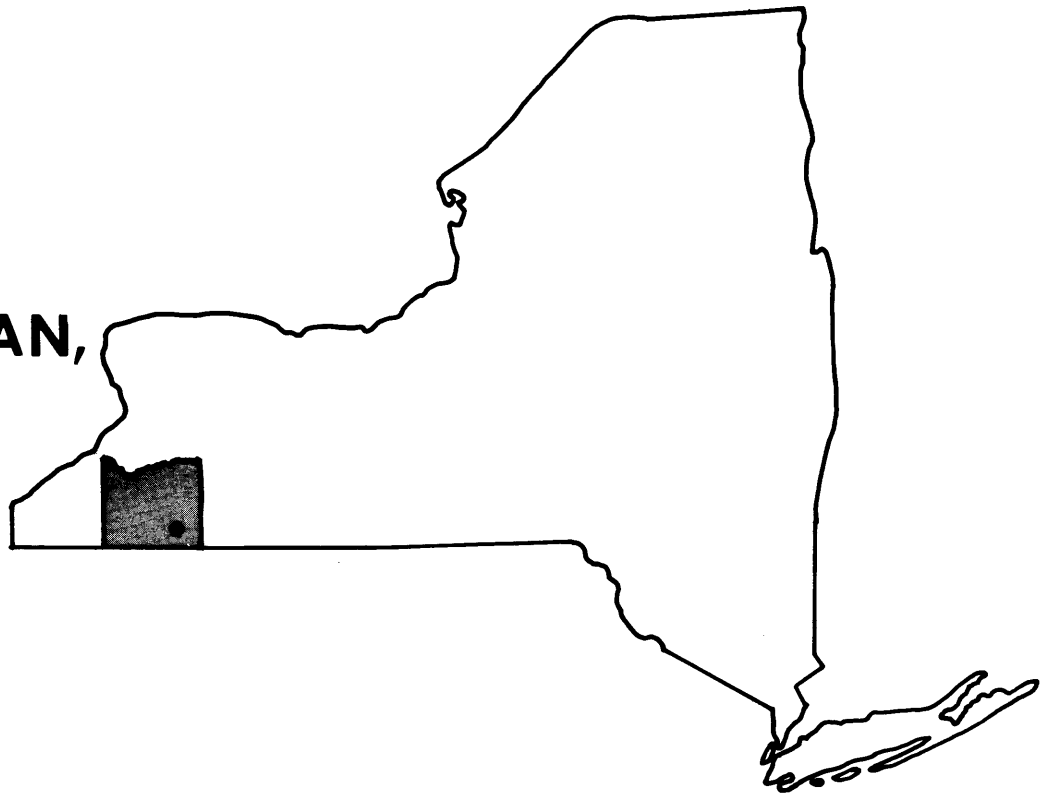
FLOOD INSURANCE STUDY



CITY OF OLEAN, NEW YORK
CATTARAUGUS COUNTY

MAY 1978

U.S. DEPARTMENT of HOUSING & URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

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PUBLISHED SEPARATELY:

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the City of Olean, Cattaraugus County, New York, and to aid in the administration of the National Flood Insurance Act of 1968, and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert Olean to the regular program of flood insurance by the Federal Insurance Administration (FIA). Further use of this information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

An initial Consultation and Coordination (CCO) meeting was held on July 29, 1975, with representatives of the FIA, the City of Olean, the Cattaraugus County Planning Board, the New York State Department of Environmental Conservation (DEC), the U. S. Army Corps of Engineers (COE), and the Soil Conservation Service (SCS) of the U. S. Department of Agriculture to explain the purpose of the Flood Insurance Study and to identify the flooding sources to be studied.

A search for basic data was made at all levels of government. Existing hydrologic information was exchanged in order to minimize duplication of effort. The COE and SCS were contacted for information which served as part of the input for the hydraulic analysis. The U. S. Geological Survey (USGS) was contacted to obtain contour maps showing drainage boundaries. Flow data records for the Allegheny River were available from the National Weather Service/City of Olean recording gage at Olean and from USGS gaging stations at Salamanca, New York, and Eldred, Pennsylvania.

On November 3, 1975, a CCO meeting was held with officials of the city to obtain additional local input. The final CCO meeting was held on January 26, 1977, where the final draft of the Flood Insurance Study was presented for further local comment. Representatives of the City of Olean, the COE, the SCS, the Cattaraugus County Planning Department, the FIA, the DEC, local businessmen and citizens, attended the meeting. As a result of this meeting, an area

along the south side of Twomile Creek (19th, 21st and 24th Streets) was changed from a "Zone A" designation to "Zone B" due to the shallow 100-year flooding in this area. Another change was a decrease in the area of 100-year flooding along the upstream section of Twomile Creek as a result of new topographic information supplied by the Felmont Oil Corporation.

1.3 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by the New York State Department of Environmental Conservation for the Federal Insurance Administration, under Contract No. H-3856. This work, which was completed in March 1977, covered all significant flooding sources in the City of Olean.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Olean. The area of study is shown on the Vicinity Map (Figure 1).

The limits of the detailed studies in the community were determined by the FIA after consultation with the community. Streams studied in detail include the Allegheny River along its entire length through the city, Olean Creek from its confluence with the Allegheny River to the northern corporate limits, Kings Creek from its confluence with the Allegheny River to the northeastern corporate limits, and Twomile Creek from the western corporate limits to the northern corporate limits.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, areas of projected development and proposed construction for the next five years, through June 1982. The scope and methods of study were proposed to and agreed upon by the FIA.

2.2 Community Description

The City of Olean is located in the southeast area of Cattaraugus County, in southwestern New York State. The city is surrounded on

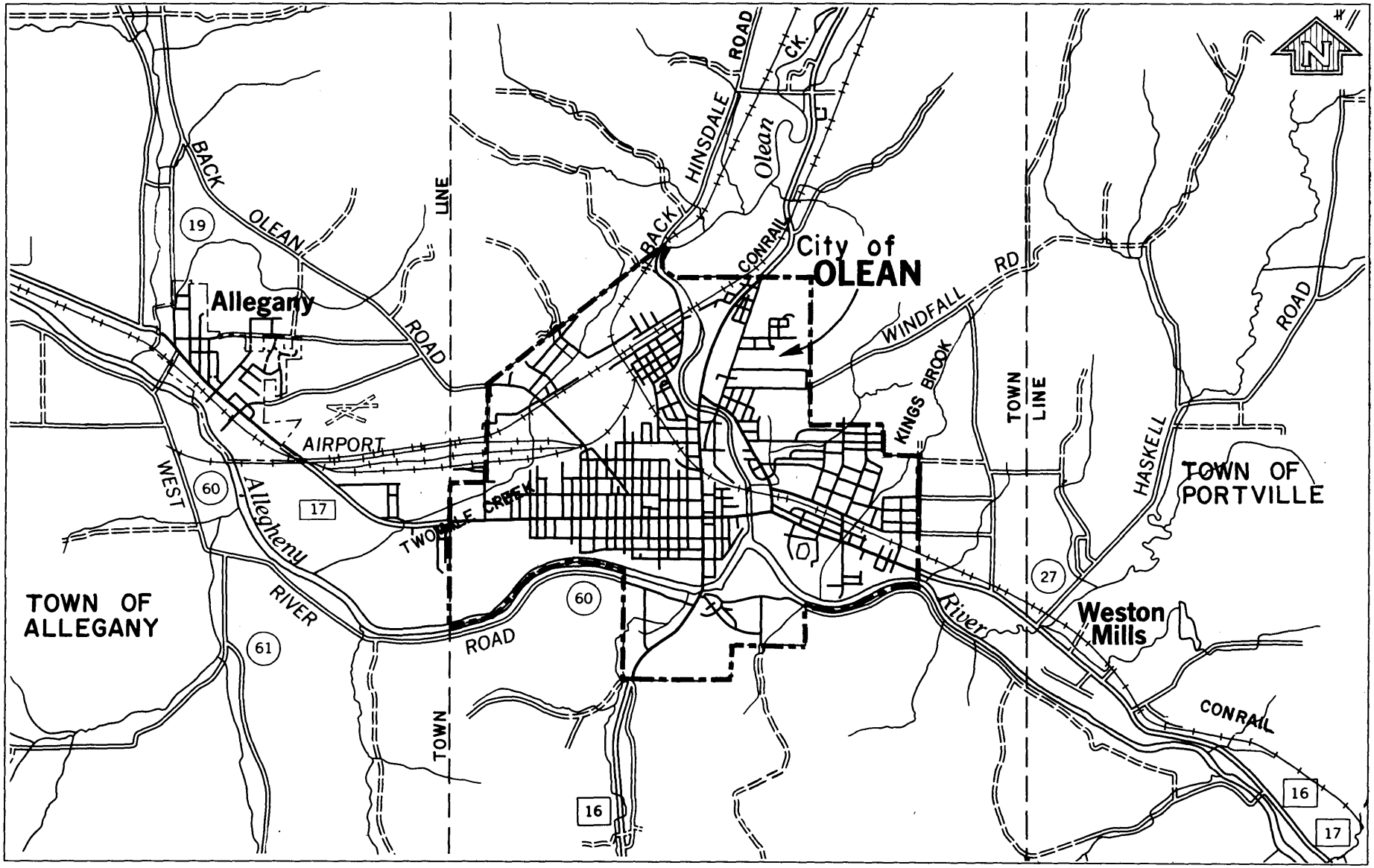


FIGURE 1

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF OLEAN, NY
(CATTARAUGUS CO.)

APPROXIMATE SCALE
1 0 1 2 3 MILES

VICINITY MAP

all sides by the Town of Olean except for a small portion of the western boundary which is adjacent to the Town of Allegany. The city has an area of 6.0 square miles with a population which declined from 21,868 in 1960 to 19,169 in 1970 (Reference 1).

The developed areas of the community lie in the low, flat valley regions of the Allegheny River and Olean Creek. Elevations range from 1,400 feet in the valley near the Allegheny River to 2,100 feet in some upland fringe areas of the city. Olean is predominately residential with small industrial and commercial areas interspersed. The flood plains are highly urbanized requiring flood control measures for protection.

The climate is characteristic of temperate continental with temperatures of 23°F in January and 70°F in July. Precipitation averages 37 inches per year with 21 inches of runoff (Reference 2). The physiography of the area is composed of maturely dissected plateaus designated as the Northwestern Appalachian Plateau Border and the Allegheny Plateau. Soils range from gravelly loam to clay but are predominately silty loam. Vegetation in the region consists of original, second, and third growth forests of Yellow Birch, Beech, and Hard Maple.

The Allegheny River begins in the State of Pennsylvania, flows into and through a portion of southwestern New York State including the City of Olean and on returning to Pennsylvania continues in a southwesterly direction to the City of Pittsburgh where it joins with the Monongahela River to become the Ohio River. Olean Creek is formed in the Town of Hinsdale, Cattaraugus County, by the confluence of Ischua and Oil Creeks and flows south to its confluence with the Allegheny River at Olean. Kings Brook begins in the uplands east of Olean and flows southwesterly through the eastern portion of the city to the Allegheny River. Twomile Creek begins just north of the city and flows across the western side of the city to the Allegheny River.

2.3 Principal Flood Problems

Low-lying areas of Olean are subject to periodic flooding caused by overflow of the Allegheny River, Olean Creek, Kings Brook and Twomile Creek. Most of these floods are the result of heavy rains accompanied by snow melt, however large floods may occur at any time.

The largest flood along the Allegheny River and Olean Creek was recorded by the COE in June 1972. Flood stage records and high

water marks have been accumulated by the COE for the 1967 and 1972 floods and high water profiles have been plotted (Reference 3). The estimated recurrence interval for the 1972 flood on the Allegheny River near the downstream corporate limits was 190 years; for the 1967 flood, the estimated frequency was 15 years. Following are the dates and discharges for the ten highest flooding events on the Allegheny River and the five highest on Olean Creek (References 3 and 4):

Allegheny River Near Downstream City Boundary
(Period of Record 1930-1976)

Date	Discharge
June 23, 1972	59,000
July 19, 1942	44,000*
March 9, 1956	31,000
May 29, 1946	30,000
September 29, 1967	29,400
March 23, 1948	27,450
November 17, 1950	26,250
January 22, 1959	26,000
April 7, 1947	25,400
April 5, 1940	22,900*

Olean Creek Near Upstream Town of Olean Boundary
(4.5 miles upstream from the mouth)
(Period of Record 1950-1976)

Date	Discharge
June 23, 1972	16,000*
September 29, 1967	15,800*
March 29, 1950	15,100*
January 23, 1959	12,160*
March 7, 1956	11,700*

*Estimated Discharge

Since the construction of the levee system in Olean, flood damage has been minimal and estimates of damages caused by flooding is not available for recent storms.

Flooding caused by the 1972 storm in the city is shown in Figures 2 and 3.

Figure 2 - City of Olean looking north (upstream) on Olean Creek (1972 Agnes Flood)

Figure 3 - Allegheny River looking upstream at the juncture of Olean Creek with the Allegheny River (1972 Agnes Flood)

2.4 Flood Protection Measures

A flood control levee system was completed along the north bank of the Allegheny River and on both banks of Olean Creek by the COE in 1952. The project, now maintained and operated by the State of New York, includes pumping stations at the mouths of Twomile Creek and Kings Brook which are used to remove interior runoff from behind the levees during periods of highwater on the Allegheny River. The Allegheny River levee system has a 100-year design frequency and the Olean Creek levee system has a 60- to 80-year design frequency; however, an additional three foot freeboard required by DEC specifications contained the flooding from the 1972 Tropical Storm Agnes on both the Allegheny River and Olean Creek.

In addition to the levee system, the State of New York has taken by fee or by determinant easement areas between the levees and the river, and areas subject to the 100-year flood or ponding. Land use in these areas is restricted to such activities as gravel excavation, recreation, and gardening.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Floods having recurrence intervals of 10, 50, 100 and 500 years have been selected as having special significance for flood plain management and for flood insurance premium rates. The analyses reported here reflect existing conditions in the drainage areas of the flooding sources.

3.1 Hydrologic Analyses

Hydrologic analyses were performed to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

On the Allegheny River, the peak discharge-frequency relationship was based primarily on a statistical analysis of the stage and discharge records at the National Weather Service recording gage at Olean (References 5 and 6). The gage is located at the Olean Sewage Disposal Plant and has been read daily since its installation in 1942.

Additional records were kept from 1909 to 1920 and from 1929 to 1938 by the National Weather Service.

Investigation of all other available hydrologic data was made to aid in the determination of historical peak flood discharges at Olean. A log-Pearson Type III distribution of the peak flow data as outlined by the Water Resources Council Bulletin No. 17 was used to obtain the values of the 10-, 50-, 100-, and 500-year peak discharges (Reference 7).

The Olean frequencies were adjusted to the values at the USGS gage at Salamanca, New York, located approximately 21.4 miles downstream of the Olean gage. A flow relation was developed by analyzing peak flows from 1930-1974 in order to take advantage of the Salamanca gages longer period of record (from 1903 to present). The frequency flows upstream of Olean Creek along the Allegheny River were hydrologically proportioned to be consistent with the flow frequency developed upstream at the USGS gage at Eldred, Pennsylvania, with a period of record from September 1939 to present (References 6 and 7).

For Olean Creek, Twomile Creek, and Kings Brook in the City of Olean a synthetic rainfall-runoff relationship method, based on a dimensionless unit hydrograph was used to develop flood flow-frequency relationships. The 24-hour rainfall amounts for frequencies up to 100 years, as obtained from the Rainfall Frequency Atlas (Reference 8) were plotted on log-normal paper and the rainfall amount for the 500-year frequency was extrapolated from the resulting graph. The drainage area of each stream was divided into subareas to evaluate the hydrologic effects of as many tributaries as would be significant.

The SCS computer program TR-20 was used to compute surface runoff (Reference 9). The program considers conditions affecting runoff such as land use, type of soil, shape and slope of watershed, and antecedent moisture condition. It develops a hydrograph and routes the hydrograph through stream channels and reservoirs. The program is designed to combine the routed hydrograph with those from other tributaries and print out the total composite hydrograph peak discharges, and times of occurrence at each desired point in the drainage area for each storm evaluated. From this data, frequency discharge-drainage area curves were plotted for each evaluation point.

Peak discharges for the 10-, 50-, 100- and 500-year floods of the streams studied by detailed methods are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
ALLEGHENY RIVER					
Downstream City Boundary	1,169	26,300	41,000	49,000	72,000
Upstream City Boundary	921	23,000	35,800	43,900	65,500
TWOMILE CREEK					
Cross Section 18B (Downstream City Boundary)	3.41	185	300	360	509
KINGS BROOK					
Cross Section 1A	1.43	247	371	429	566
OLEAN CREEK					
At Confluence with Allegheny River	204	11,500	17,500	20,500	29,000

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of these flooding sources.

Cross section data for the Allegheny River were obtained from a field survey done by the COE (Reference 10). Cross section data for Olean Creek, Twomile Creek and Kings Brook were obtained by field measurement. All bridges and culverts were surveyed to obtain elevation data and structural geometry in order to compute significant backwater effects of these structures. Cross sections were located at close intervals above and below bridges, at control sections along the stream lengths, and at significant changes in ground relief, land use, or land cover.

Roughness coefficients (Manning's "n") for the Allegheny River and Olean Creek were determined by field inspection and verification of the June 1972 and September 1967 flood profiles. Ground level photographs which consider channel conditions, overbank vegetation and land use (Reference 11). Roughness coefficients for Twomile Creek and Kings Brook were determined by field inspection and based

on procedures outlined in the National Engineering Handbook (Reference 12). Consideration was given to materials that compose the channel, surface irregularity, variation in size and shape of cross sections, characteristics of obstructions, vegetation, and degree of meandering. A summary of the range of roughness factors for channel and overbank areas follows:

Summary of Roughness Coefficients

Flooding Source	Range of Manning's "n"	
	Channel	Overbank
Allegheny River	0.035-0.055	0.060-0.095
Twomile Creek	0.045-0.070	0.060-0.100
Kings Brook	0.020-0.055	0.050-0.075
Olean Creek	0.031-0.040	0.050

Starting water-surface elevations on the Allegheny River were supplied by the COE (Reference 4). Starting water-surface elevations for Olean Creek were taken from the computed water-surface elevations for the Allegheny River. Manning's equation was applied to obtain the starting water-surface elevations for Twomile Creek. All elevations referenced are from National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as Sea Level Datum of 1929; elevation reference marks used in this study are shown on the maps.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. Water-surface elevations along the Allegheny River and Olean Creek were computed through use of the COE HEC-2 step-backwater computer program (Reference 13). Distance references used in the computer backwater analysis of the Allegheny River were based on the COE mile marker system. As a result there are discrepancies in lengths appearing in the computer output and the correct distances that appear on the mapping and the profiles in this respect. This level of accuracy is consistent with the general method of calculations used in the backwater determinations and the low energy differential occurring along the reaches under analysis. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a

floodway is computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Flood profiles on Twomile Creek and Kings Brook were calculated using the SCS WSP-2 Water-Surface Profiles Computer Program (Reference 14). The SCS program uses the standard step method, with some modifications, to compute profiles between valley sections. All profiles are computed in the upstream direction. Therefore, only subcritical flow, a condition normally characteristic of natural streams, can be analyzed. For any supercritical flows encountered the program will assume critical depth and resume computations. At any one restriction, WSP-2 can compute head losses through one bridge opening or up to five culvert openings with different configurations.

Flood elevations in the city are often raised by ice jams during spring thaws; the hydraulic analyses for this study, however, are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are thus considered valid only if hydraulic structures in general remain unobstructed and dams and other flood control structures described above operate properly and do not fail.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage State and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary and floodway map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each flooding source studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps developed by the SCS for this study from 1972 aerial photographs at a scale of 1"=400' with a contour interval of 5 feet (Reference 15). These maps were updated to 1976 conditions by

use of New York State Department of Transportation (DOT) corridor strip maps at the same scale and planimetric separates at a scale of 1"=200' and 1"=400' (Reference 16). In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations, and therefore, may not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The floodway presented for Twomile Creek and Kings Brook was computed using the "HUD-15" Computer Program (Reference 17). Where special topographic features required it, the floodway was adjusted more toward one side of the stream as necessary. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 2). No rise in water-surface elevation is desirable on the Allegheny River and Olean Creek where flood protection projects exist. Therefore, the floodway line is coincident with the 100-year flood boundary. The floodway line on the south side of the Allegheny River limits encroachment to areas of ponding or shallow flooding.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Allegheny River							
A	1,320[1]	1,785/1,720[3]	28,516	1.72	1,422.6	1,422.6	0.0[4]
B	5,702[1]	400/330[3]	10,536	4.65	1,423.7	1,423.7	0.0[4]
C	10,771[1]	535	12,372	3.96	1,425.3	1,425.3	0.0[4]
D	12,936[1]	1,885	30,725	1.43	1,425.7	1,425.7	0.0[4]
E	18,480[1]	2,180/230[3]	23,431	1.87	1,426.5	1,426.5	0.0[4]
Olean Creek							
A	315[2]	482	8,226	2.49	1,425.8	1,425.8*	0.0[4]
B	700[2]	324	5,012	4.09	1,425.9	1,425.9*	0.0[4]
C	1,135[2]	264	3,912	5.24	1,426.1	1,426.1*	0.0[4]
D	1,925[2]	190	2,712	7.56	1,426.1	1,426.1	0.0[4]
E	2,585[2]	298	4,020	5.10	1,427.0	1,427.0	0.0[4]
F	3,445[2]	281	3,920	5.23	1,427.3	1,427.3	0.0[4]
G	4,415[2]	249	3,648	5.62	1,427.6	1,427.6	0.0[4]
H	5,235[2]	202	3,015	6.80	1,428.2	1,428.2	0.0[4]
I	5,995[2]	319	4,201	4.88	1,429.0	1,429.0	0.0[4]
J	6,815[2]	227	3,106	6.60	1,429.2	1,429.2	0.0[4]
K	7,665[2]	260	3,748	5.47	1,429.8	1,429.8	0.0[4]

[1]FEET ABOVE CORPORATE LIMITS
[3]TOTAL WIDTH/WIDTH WITHIN CORPORATE LIMITS
[2]FEET ABOVE CONFLUENCE WITH THE ALLEGHENY RIVER
[4]WITHIN LIMITS OF OLEAN FLOOD PROTECTION PROJECT. NO RISE IN WATER SURFACE ELEVATION PERMITTED.
*ELEVATIONS COMPUTED WITHOUT CONSIDERING BACKWATER EFFECT OF ALLEGHENY RIVER

TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF OLEAN, NY
(CATTARAUGUS CO.)

FLOODWAY DATA

ALLEGHENY RIVER AND OLEAN CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Olean Creek (continued)							
L	8,685	372	5,366	3.82	1,430.4	1,430.4	0.0[3]
M	9,885	270	2,945	6.96	1,430.4	1,430.4	0.0[3]
N	10,185	320	6,406	3.20	1,431.4	1,431.4	0.0[3]
O	10,935	290	8,798	2.33	1,431.6	1,431.6	0.0[3]
P	12,575	1,494/120[2]	12,469	1.64	1,431.7	1,431.7	0.0[3]
Kings Brook							
A	1,875	62	147	2.91	1,419.2	1,418.2	1.0
B	2,200	14	89	4.79	1,424.1	1,423.1	1.0
C	2,500	14	58	7.30	1,425.7	1,424.7	1.0
D	2,875	14	57	7.37	1,427.6	1,426.6	1.0
E	3,150	60	184	2.53	1,435.0	1,434.0	1.0
F	3,265	30	74	5.53	1,436.5	1,435.5	1.0
G	3,600	24	77	5.17	1,440.2	1,439.2	1.0
H	4,105	36	165	2.39	1,450.3	1,449.3	1.0
I	4,605	30	109	3.54	1,454.9	1,453.9	1.0
J	5,595	37	71	5.29	1,469.3	1,468.3	1.0

[1]FEET ABOVE CONFLUENCE WITH THE ALLEGHENY RIVER
[2]TOTAL WIDTH/WIDTH WITHIN CORPORATE LIMITS
[3]WITHIN LIMITS OF OLEAN FLOOD PROTECTION PROJECT. NO RISE IN WATER SURFACE ELEVATION PERMITTED.

TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF OLEAN, NY
(CATTARAUGUS CO.)

FLOODWAY DATA

OLEAN CREEK AND KINGS BROOK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Kings Brook (continued)							
K	6,200	24	60	6.20	1,479.0	1,478.0	1.0
Twomile Creek							
A	5,555	63	234	1.50	1,414.2	1,413.2	1.0
B	5,890	428	1,820	0.19	1,414.3	1,413.3	1.0
C	6,405	153	1,404	0.25	1,414.6	1,413.6	1.0
D	6,780	125	276	1.26	1,415.0	1,414.0	1.0
E	7,015	223	915	0.38	1,415.2	1,414.2	1.0
F	7,810	150	751	0.47	1,415.2	1,414.2	1.0
G	8,415	267	1,025	0.34	1,415.2	1,414.2	1.0
H	9,225	130	1,414	0.25	1,416.3	1,415.3	1.0
I	9,345	322	1,313	0.27	1,416.4	1,415.4	1.0
J	9,655	210	805	0.44	1,416.5	1,415.5	1.0
K	9,930	260	1,116	0.31	1,417.0	1,416.0	1.0
L	10,390	216	452	0.76	1,417.3	1,416.3	1.0
M	10,545	219	817	0.42	1,417.3	1,416.3	1.0
N	10,795	62	281	1.23	1,417.5	1,416.5	1.0

[1]FEET ABOVE CONFLUENCE WITH THE ALLEGHENY RIVER

TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF OLEAN, NY
(CATTARAUGUS CO.)

FLOODWAY DATA

KINGS BROOK AND TWOMILE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Twomile Creek (continued)							
O	10,960	434	1,358	0.25	1,418.7	1,417.7	1.0
P	11,550	191	250	1.20	1,419.1	1,418.1	1.0
Q	12,495	97	227	1.32	1,420.0	1,419.0	1.0
R	13,710	40	161	0.80	1,421.0	1,420.0	1.0
S	13,840	84	207	0.62	1,421.3	1,420.3	1.0
T	14,440	46	119	1.08	1,423.1	1,422.1	1.0
U	15,345	63	117	1.10	1,424.8	1,423.8	1.0
V	15,540	86	365	0.35	1,426.7	1,425.7	1.0
W	16,000	155	386	0.33	1,426.8	1,425.8	1.0
X	16,795	72	157	0.82	1,427.1	1,426.1	1.0
Y	16,995	122	273	0.47	1,428.6	1,427.6	1.0

[1]FEET ABOVE CONFLUENCE WITH THE ALLEGHENY RIVER

TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF OLEAN, NY
(CATTARAUGUS CO.)

FLOODWAY DATA

TWOMILE CREEK

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Allegheny River							
Reach 1	01	-5.59	-1.81	+3.79	055	A11	Varies
Olean Creek							
Reach 1	01	-6.2	-2.1	+3.8	060	A12	Varies
Kings Brook							
Reach 1	01	-1.1	-0.4	+5.7	010	A2	Varies
Twomile Creek							
Reach 1	01	-0.5	-0.2	+9.6	005	A1	Varies
Reach 2	01	-1.5	-0.5	+3.8	015	A3	Varies

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO THE NEAREST FOOT–SEE MAP

TABLE 3

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

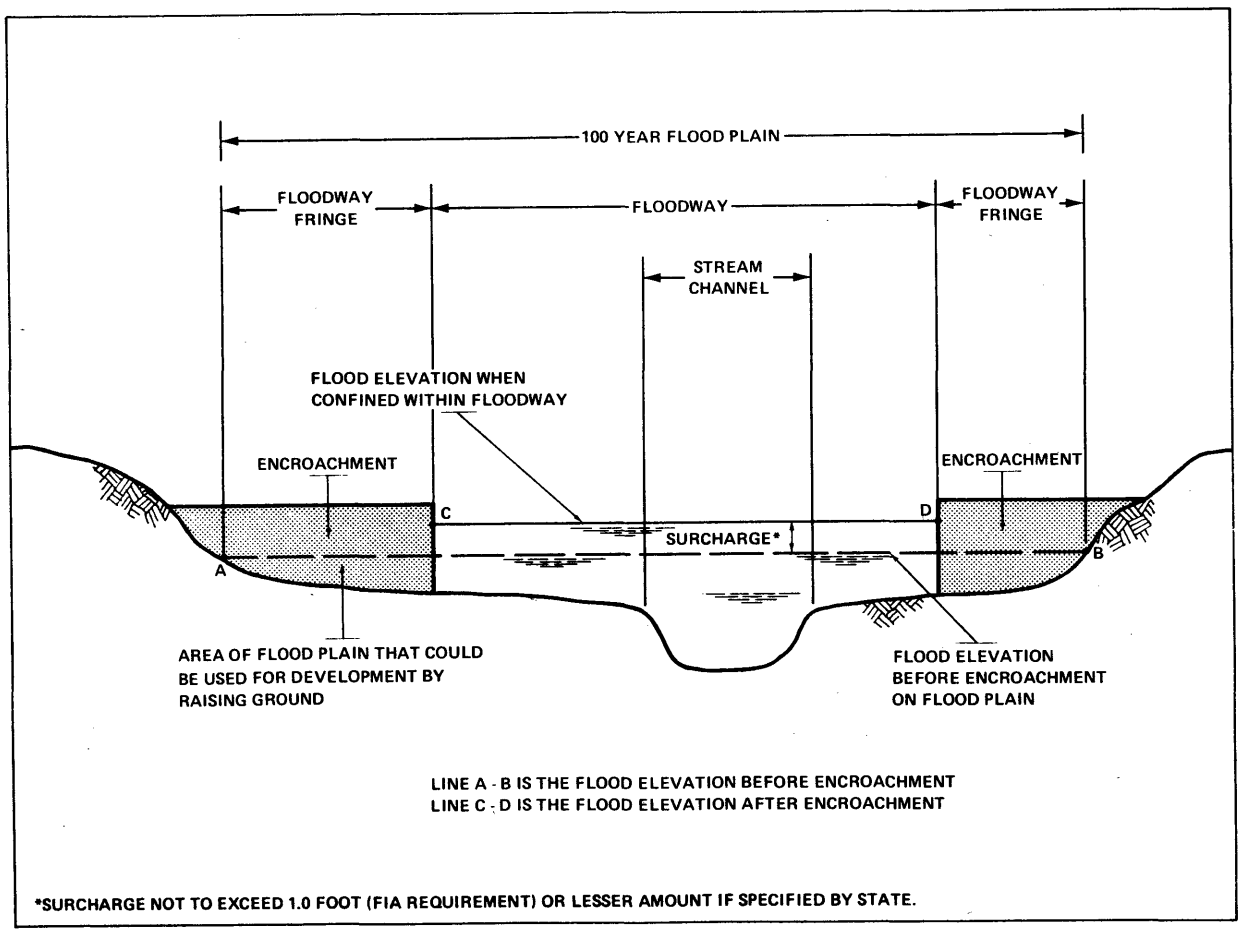
CITY OF OLEAN, NY
(CATTARAUGUS CO.)

FLOOD INSURANCE ZONE DATA

ALLEGHENY RIVER, OLEAN CREEK, KINGS BROOK AND TWOMILE CREEK

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were determined at each cross section; between cross sections, the boundaries were interpolated. In cases where the floodway and the 100-year flood boundaries are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 4.



FLOODWAY SCHEMATIC Figure 4

The Allegheny River forms part of the southern corporate limits and Olean Creek forms a small portion of the northeastern corporate limits. Consequently, parts of their floodway are located in the Town of Olean.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and the flood insurance zone designations for each flooding source affecting the City of Olean.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot

Five reaches meeting the above criteria were required for the flooding sources of the City of Olean. These included one of 20,500 feet on the Allegheny River, one reach of 12,400 feet on Olean Creek, one reach of 6,500 feet on Kings Brook, and two reaches of 3,600 feet and 8,000 feet on Twomile Creek. The locations of these reaches are shown on the Flood Profiles (Exhibit 1).

5.2 Flood Hazard Factors

The FHF is the FIA device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the

difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the City of Olean was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zones A1, A2, A3, A11 and A12:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or, areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Olean, is for insurance purposes, the principal result of the flood insurance study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

A Flood Plain Information Report for this reach of the Allegheny River and Olean Creek was prepared by the COE in August 1969 (Reference 4). The 100-year flood elevations for the Allegheny River contained in this report are substantially the same as those presented in the COE 1969 study. Minor water-surface elevation differences are attributable to the lengthened period of record and the incidence of the 1972 flood. The new elevations were prepared by the COE under subcontract obviating the necessity of resolving the small differences. Computed water-surface elevations for Olean Creek are also slightly higher than those presented in the 1969 study. The new elevations have been agreed upon by the COE and are attributable to the longer period of record utilized in this study.

Flood Insurance Studies are currently underway by the New York State Department of Environmental Conservation for other communities within the Allegheny Basin. The communities of the Town of Allegany and Town of Olean are contiguous to the City of Olean and are being studied at this time (References 18 and 19). Hydraulic determinations have been coordinated to insure agreement between communities.

This study is authoritative for purposes of the Flood Insurance Program and the data presented here either supersede or are compatible with previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic and other pertinent data used in this study can be obtained by contacting the office of the Federal Insurance Administration, Regional Director, 90 Church Street, Room 108, New York, New York 10007.

8.0 BIBLIOGRAPHY AND REFERENCES

1. New York State Legislative Manual, 1975.

2. U. S. Department of Commerce, National Oceanic and Atmospheric Administration, Local Climatological Data, New York, Annual Summary, 1975.

3. U. S. Army Corps of Engineers, Pittsburgh District, Final Post Flood Report on Storm and Flood of 20-26 June 1972, October 1974.

4. U. S. Army Corps of Engineers, Pittsburgh District, Flood Plain Information Report, Olean, New York, August 1969.

5. U. S. Department of the Interior, Geological Survey, Water Resources Data for New York and Pennsylvania, Part 1 - Surface Water Records, Annual 1976.

6. U. S. Department of the Interior, Geological Survey, Surface Water Supply of the United States, Part 3, Ohio River Basin, Periodic Summary, 1976.

7. Water Resources Council, "Guidelines for Determining Flood Flow Frequency," Bulletin No. 17, March 1976.

8. U. S. Department of Commerce, National Oceanic and Atmospheric Administration, Technical Paper No. 40: Rainfall Frequency Atlas of the United States, May 1961.

9. U. S. Department of Agriculture, Soil Conservation Service, Engineering Division, TR-20 Computer Program, May 1965.

10. U. S. Army Corps of Engineers, Cross section data for portions of the Allegheny River Basin (Unpublished), 1975.

11. U. S. Department of the Interior, Geological Survey, Geological Survey Water-Supply Paper 1849, Roughness Characteristics of Natural Channels by Harry H. Barnes, Jr., Washington, D. C., 1967.

12. U. S. Department of Agriculture, Soil Conservation Service, National Engineering Handbook, Section 4, Hydrology and Section 5, Hydraulics, Supplement B. August 1956 and August 1972.

13. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, October 1973.

14. U. S. Department of Agriculture, Soil Conservation Service, WSP-2 Water-Surface Profiles, Generalized Computer Program, May 1976.

15. U. S. Department of Agriculture, Soil Conservation Service, Topographic maps developed from aerial photographs, Scale 1"=400', Contour Interval 5 feet: Olean, New York, 1972.

16. New York State Department of Transportation, Planimetric maps, Scale 1"=200' and 1"=400' Contour Interval 5 feet: Olean, New York, 1976.

17. U. S. Department of Agriculture, Soil Conservation Service, Central Technical Unit, HUD-15 Computer Program, March 1974.

18. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of Allegany, Cattaraugus County, New York, 1977.

19. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of Olean, Cattaraugus County, New York, 1978.

Allegheny River Basin Regional Water Resources Planning Board, Alternatives for Water Resources Development and Management, March 1971.

Allegheny River Basin Regional Water Resources Planning Board, Draft of Comprehensive Water Resources Plan for the Allegheny River Basin, May 1975.

Beard, L. R., Statistical Methods in Hydrology, U. S. Army Corps of Engineers District, Sacramento, January 1972.

New York State Department of Environmental Conservation, Allegheny River Basin - Peak Flow Regionalized Analysis, December 1976 (Unpublished).

Potter, W. D., "Use of Indices in Estimating Peak Rates of Runoff," Public Roads, Vol. 28, No. 1 - pages 1-8, April 1954.

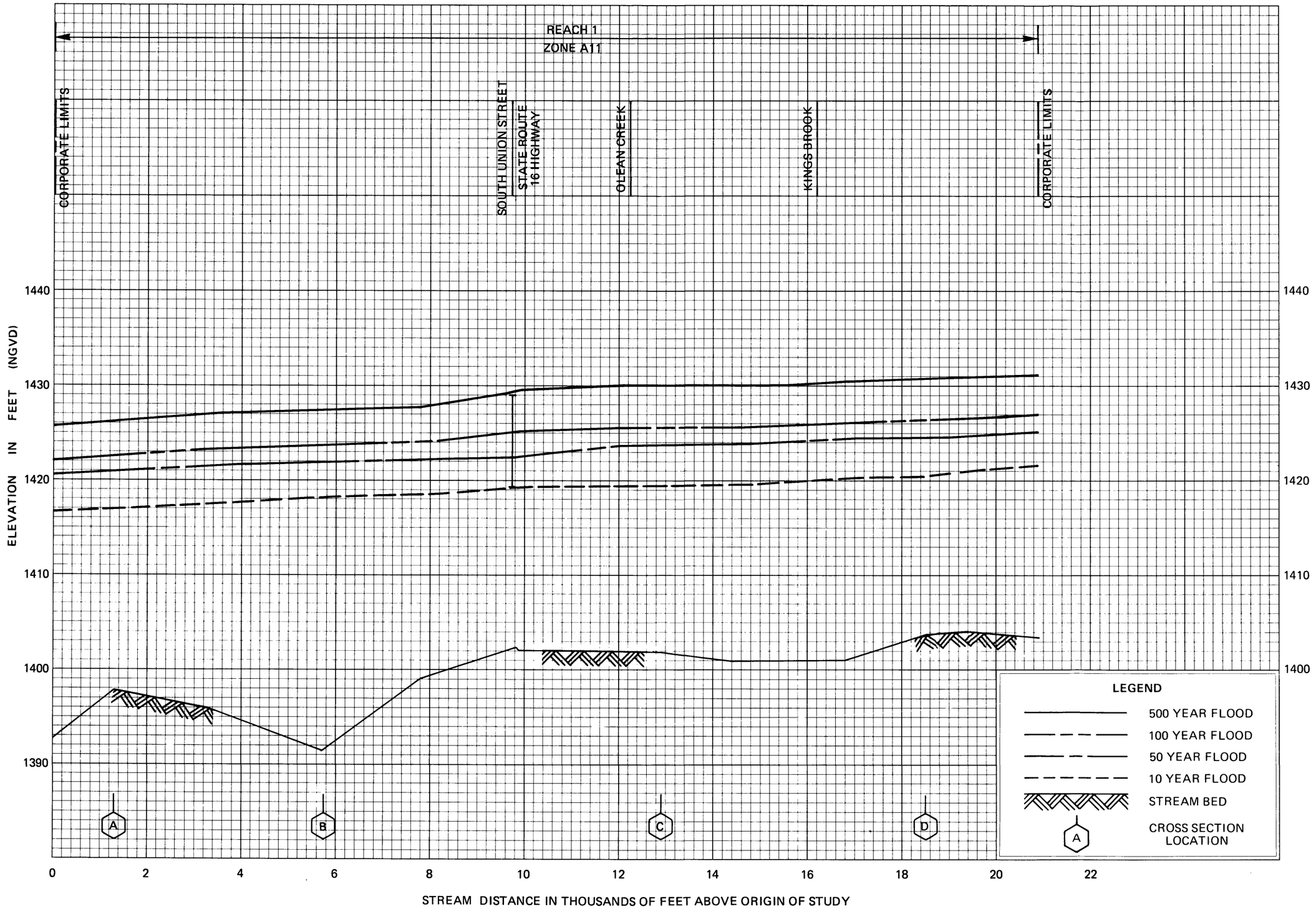
U. S. Department of Agriculture, Soil Conservation Service, A Method for Estimating Volume and Rate of Runoff in Small Watersheds, Technical Paper #SCS-TP-149 April 1973.

U. S. Department of Agriculture, Soil Conservation Service, Cornell University Agricultural Experiment Station, Generalized Soil Map of New York State, 1967.

U. S. Department of the Interior, Geological Survey, 7.5 Minute Series (Topographic) Maps, Scale 1:24,000, Contour Interval 20 feet: Olean, New York, 1961; Hinsdale, New York, 1962.

U. S. Department of the Interior, Geological Survey, Professional Paper 924, Magnitude and Frequency of Floods in the United States, 1975.

*U.S. GOVERNMENT PRINTING OFFICE: 1978 720-523/560 1-3



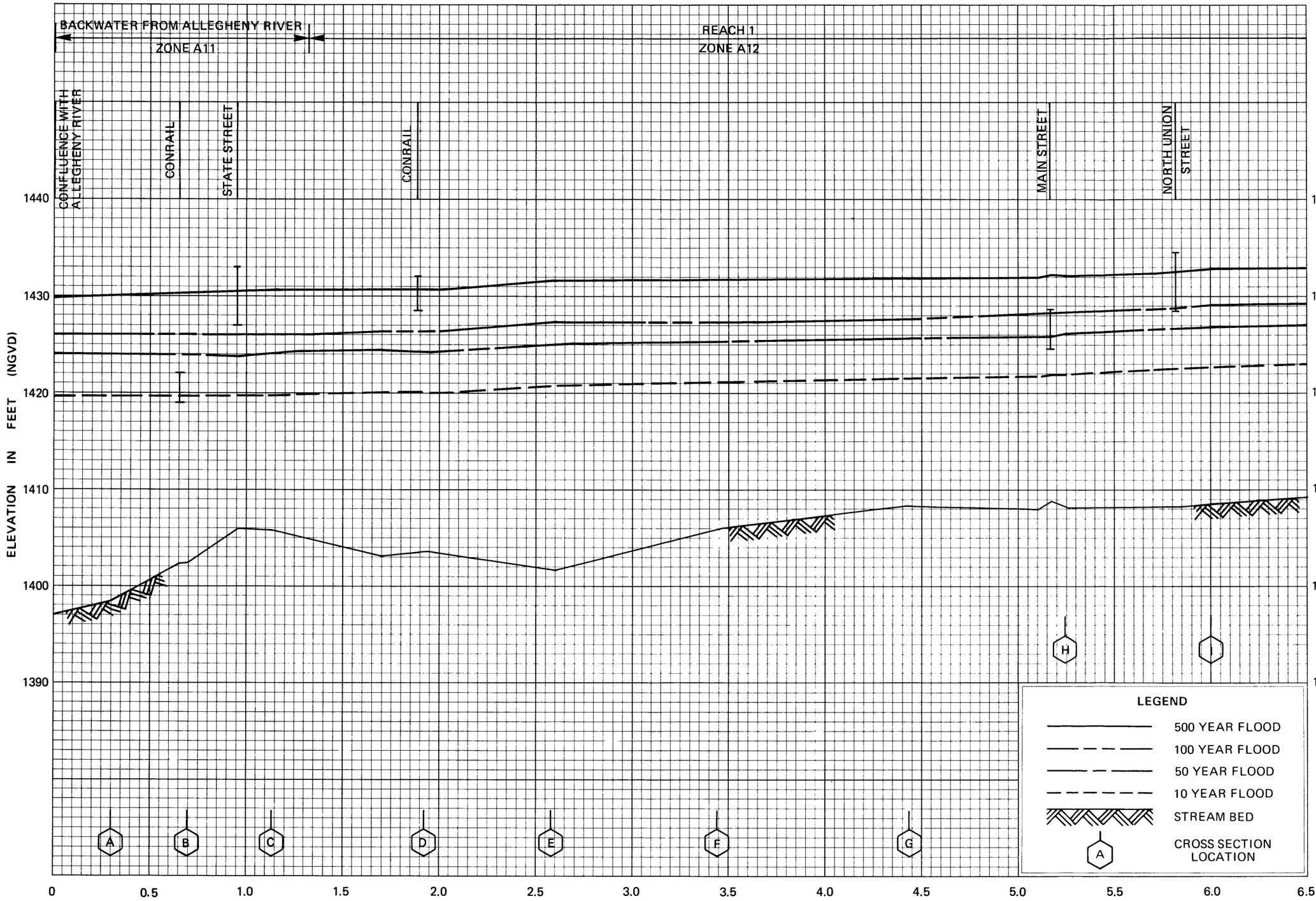
FLOOD PROFILES

ALLEGHENY RIVER

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF OLEAN, NY
(CATTARAUGUS CO.)

01P



FLOOD PROFILES

OLEAN CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF OLEAN, NY
(CATTARAUGUS CO.)

02P

REACH 1
ZONE A12

CONRAIL

CORPORATE LIMIT

STATE ROUTE 17

ELEVATION IN FEET (NGVD)

1450
1440
1430
1420
1410
1400

6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE WITH ALLEGHENY RIVER

J K L M N O P

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

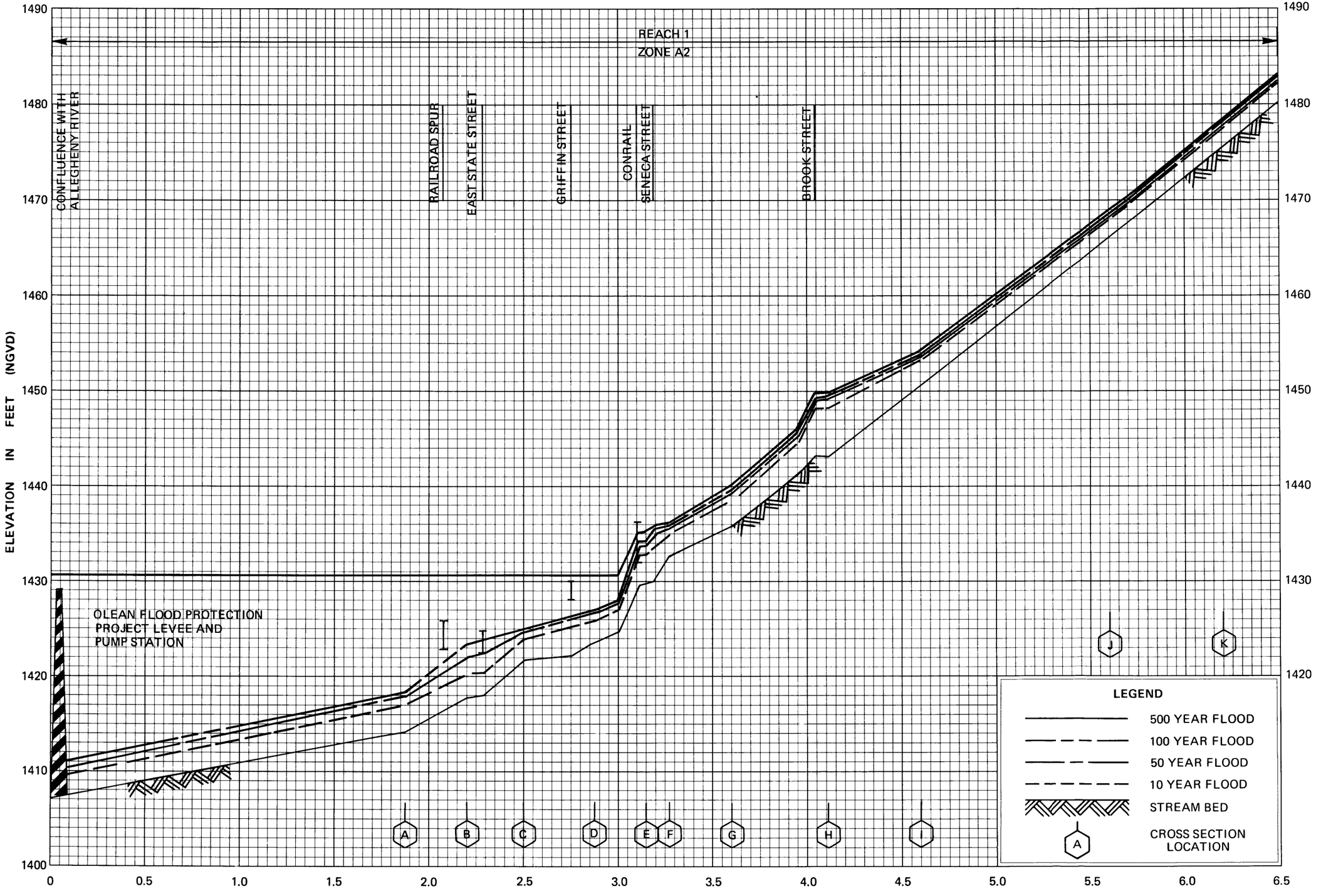
FLOOD PROFILES

OLEAN CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF OLEAN, NY
(CATTARAUGUS CO.)

03P



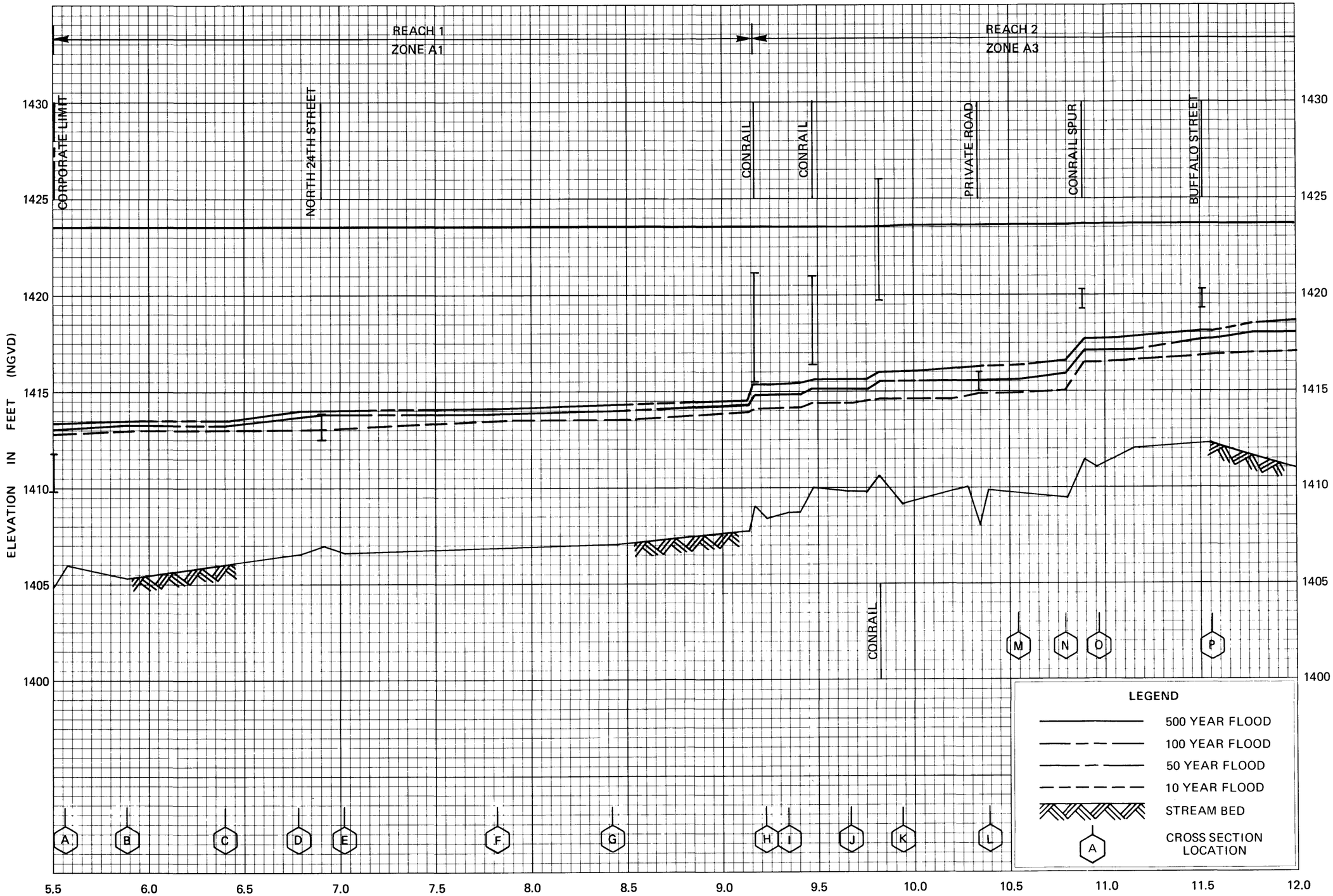
FLOOD PROFILES

KINGS BROOK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF OLEAN, NY
(CATTARAUGUS CO.)

04P



FLOOD PROFILES

TWOMILE CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF OLEAN, NY
(CATTARAUGUS CO.)

05P

REACH 2
ZONE A3

JOHNSON STREET
STATE ROUTE 17
PRIVATE ROAD
HOMER STREET (EXTENDED)
CORPORATE LIMIT

ELEVATION IN FEET (NGVD)

1435
1430
1425
1420
1415
1410

12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5 17.0 17.5

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE WITH ALLEGHENY RIVER

Q R S T U V W X Y

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

FLOOD PROFILES

TWOMILE CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF OLEAN, NY
(CATTARAUGUS CO.)

06P