FLOOD INSURANCE STUDY

VOLUME 1 OF 6

ERIE COUNTY, NEW YORK
(ALL JURISDICTIONS)

Community Name	Community Number	Community Name	Community Number	Community Name	Community Number
Akron, Village of	361553	Depew, Village of	360236	Marilla, Town of	360250
Alden, Town of	360225	East Aurora, Village of	365335	Newstead, Town of	360251
Alden, Village of	360224	Eden, Town of	360238	North Collins, Town of[1]	360252
Amherst, Town of	360226	Elma, Town of	360239	North Collins, Village of[1]	360789
Angola, Village of	360982	Evans, Town of	360240	Orchard Park, Town of	360255
Aurora, Town of	360227	Farnham, Village of[1]	361588	Orchard Park, Village of	360254
Blasdell, Village of	361489	Gowanda, Village of	360075	Sardinia, Town of	360256
Boston, Town of	360228	Grand Island, Town of	360242	Sloan, Village of [1]	361589
Brant, Town of	360229	Hamburg, Town of	360244	Springville, Village of	360258
Buffalo, City of	360230	Hamburg, Village of	360243	Tonawanda, City of	360259
Cheektowaga, Town of	360231	Holland, Town of	360245	Tonawanda, Town of	360260
Clarence, Town of	360232	Kenmore, Village of [1]	361590	Wales, Town of	360261
Colden, Town of	360233	Lackawanna, City of	360247	West Seneca, Town of	360262
Collins, Town of	360234	Lancaster, Town of	360249	Williamsville, Village of	360263
Concord, Town of	360235	Lancaster, Village of	360248		

[1] No Special Flood Hazard Areas identified

REVISED:
To Be Determined

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
36029CV001B

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Selected Flood Insurance Rate Map (FIRM) panels for the communities within Erie County contain information that was previously shown separately on the corresponding Flood Boundary and Floodway Map panels (e.g., floodways, cross sections). In addition, former flood hazard zone designations have been changed as follows:

Old Zone	New Zone
A1 through A30	AE
V1 through V30	VE
B	X
C	X

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial Countywide FIS Effective Date: September 26, 2008

Revised Countywide FIS Dates: To Be Determined

ATTENTION: On FIRM panels 36029C0207G, 36029C0219G and 36029C0243G, the Ellicott Creek FCP @ Amherst Levee, the Cayuga Creek Right Bank Levees and Floodwall, and the Cayuga Creek Left Bank Levee and Floodwall, have not been demonstrated by the community or levee owner to meet the requirements of Section 65.10 of the NFIP regulations in 44 CFR as it relates to the levee's ability to provide 1-percent-annual-chance flood protection. The subject areas are identified on FIRM panels (with notes and bounding lines) and in the FIS report as potential areas of flood hazard data changes based on further review.

FEMA has updated levee analysis and mapping protocols. Until such time as FEMA is able to initiate a new flood risk project to apply the new protocols, the flood hazard information on the aforementioned FIRM panels that are affected by the Ellicott Creek FCP @ Amherst Levee, the Cayuga Creek Right Bank Levees and Floodwall, and the Cayuga Creek Left Bank Levee and Floodwall, are being added as a snapshot of the prior effective information presented on the FIRMs and FIS reports dated October 16, 1992 for the Town of Amherst, July 2, 1979 and January 1, 1979 for the Village of Lancaster, August 3, 1981 and February 3, 1981 for the Village of Depew, and March 15, 1984 for the Town of Cheektowaga. As indicated above, it is expected that affected flood hazard data within the subject area could be significantly revised. This may result in floodplain boundary changes, 1-percent-annual-chance flood elevation changes, and/or changes to flood hazard zone designations.

The effective FIRM panels (and the FIS) will again be revised to update the flood hazard information associated with the Ellicott Creek FCP @ Amherst, the Cayuga Creek Right Bank Levees and Floodwall, and the Cayuga Creek Left Bank Levee and Floodwall when FEMA is able to initiate and complete a new flood risk project to apply the new levee analysis and mapping procedures.

TABLE OF CONTENTS
Volume 1 (Date to Be Determined)

FIGURES

TABLE OF CONTENTS (Continued)
Volume 1 (Continued) (Date to Be Determined)

TABLES

Volume 2 (Date to Be Determined)

TABLES

TABLE OF CONTENTS (continued)

Volume 3 (Date to Be Determined)

EXHIBITS

Exhibit 1 – Flood Profiles

Volume 4 (Date to Be Determined)

Volume 5 (Date to Be Determined)

TABLE OF CONTENTS (continued)

Volume 5 (continued) (Date to Be Determined)

EXHIBITS

Exhibit 1 – Flood Profiles (continued)

Volume 6 (Date to Be Determined)

Exhibit 2 – Flood Insurance Rate Map

FLOOD INSURANCE STUDY
ERIE COUNTY, NEW YORK (ALL JURISDICTIONS)
(Date to Be Determined)

1.0 INTRODUCTION

1.1 Purpose of Study

This countywide Flood Insurance Study (FIS) investigates the existence and severity of flood hazards in, or revises and updates previous FISs/Flood Insurance Rate Maps (FIRMs) for the geographic area of Erie County, New York, including: the Cities of Buffalo, Lackawanna and Tonawanda, the Towns of Alden, Amherst, Aurora, Boston, Brant, Cheektowaga, Clarence, Colden, Collins, Concord, Eden, Elma, Evans, Grand Island, Hamburg, Holland, Lancaster, Marilla, Newstead, North Collins, Orchard Park, Sardinia, Tonawanda, Wales and West Seneca, and the Villages of Akron, Alden, Angola, Blasdell, Depew, East Aurora, Farnham, Gowanda, Hamburg, Kenmore, Lancaster, North Collins, Orchard Park, Sloan, Springville, and Williamsville (hereinafter referred to collectively as Erie County).

This FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This FIS has developed flood risk data for various areas of the county that will be used to establish actuarial flood insurance rates. This information will also be used by Erie County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and will also be used by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

Please note that on the effective date of this study, the Villages of Farnham, Kenmore, North Collins and Sloan and the Town of North Collins have no mapped Special Flood Hazard Areas (SFHA). This does not preclude future determinations of SFHAs that could be necessitated by changed conditions affecting the community (i.e. annexation of new lands) or the availability of new scientific or technical data about flood hazards.

Please note that the Village of Gowanda is a multi-county community geographically located in Erie and Cattaraugus Counties. It is shown in its entirety within this revised countywide FIS.

Please note that the Seneca Nation Tribe is a multi-county jurisdiction that is not included in this countywide study but is included in its entirety in its own FIS report.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

Please also note that FEMA has identified one or more levees in the Villages of Depew and Lancaster, and the Towns of Amherst and Cheektowaga, that have not been demonstrated by the community or levee owner(s) to meet the requirements of 44 CFR

Part Section 65.10 of the NFIP regulations (44 CFR 65.10) as it relates to the levee's capacity to provide 1-percent annual-chance flood protection. As such, there are temporary actions being taken until such time as FEMA is able to initiate a new flood risk project to apply the new levee analysis and mapping procedures. Please refer to the Notice to Flood Insurance Study Users page at the front of this FIS report for more information.

1.2 Authority and Acknowledgments

The sources of authority for this FIS are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

This FIS was prepared to include all communities within Erie County in a countywide format. Information on the authority and acknowledgments for each jurisdiction included in this countywide FIS, as compiled from their previously printed FIS reports, is shown below.

Pre-Countywide Analyses

Akron, Village of:	For the May, 1980 FIS, hydrologic and hydraulic analyses were prepared by DeLeuw, Cather and Company of New York, Inc., for the Federal Insurance Administration (FIA) under contract No. H-4552. The work was completed in May 1979. (Reference 104)
Alden, Town of:	For the December 1, 1980 FIS, hydrologic and hydraulic analyses were prepared by Parsons, Brinckerhoff, Quade and Douglas under subcontract to Goodkind and O'Dea, Inc., for the Federal Emergency Management Agency (FEMA) under Contract No. H-3831. The work was completed in December 1976. For the February 6, 1991 revision, hydrologic and hydraulic analyses were prepared by the U.S. Army Corps of Engineers (USACE) during the preparation of a Special Flood Hazard Evaluation Report for the Town of Alden. (References 42, 99)
Amherst, Town of:	For the June 18, 1984 FIS, hydrologic and hydraulic analyses were prepared by DeLeuw, Cather and Company of New York, Inc., for FEMA under Contract No. H-4552. The work was completed in April 1981. For the September 28, 1990 revision, the hydrologic and hydraulic analyses for Ellicott Creek, Gott Creek, and the Ellicott Creek Diversion channels were prepared by the USACE, Buffalo District and Pratt and Huth Associates. That work was completed in January 1990. For the October 16, 1992 revision, the hydrologic, hydraulic and floodway analyses for Tonawanda Creek, Black Creek and Ransom Creek were prepared by the USACE, Buffalo District for FEMA, under Inter-Agency Agreement No. EMW-89-E-2994, Project Order No. 1. In addition, the 1-

percent-annual-chance and 0.2-percent-annual-chance floodplain boundaries were revised due to updated topographic information prepared by Pratt and Huth Associates. The work was completed in June 1991. An additional floodway analysis for Black Creek and a portion of Ransom Creek was performed by Pratt and Huth Associates. That work was completed in March 1992. (References 35, 44, 53)

Angola, Village of: For the August 6, 2002 FIS, the hydrologic and hydraulic analyses for Big Sister Creek were developed by the USACE, Buffalo District and prepared by Leonard Jackson Associates, for FEMA under Contract No. EMW-96-CO-0026. The work was completed in October 2000. (Reference 19)

Aurora, Town of: For the October 1978 FIS, the hydrologic and hydraulic analyses were performed by Erdman, Anthony and Associates for the FIA under Contract No. H-3961. The work was completed in September 1977. (Reference 215)

Boston, Town of: For the March 30, 1981 FIS, the hydrologic and hydraulic analyses were performed by McPhee, Smith, Rosenstein Engineers, Private Consultants, for the FIA under Contract No. H-4647. The work was completed in December 1979. (Reference 96)

Buffalo, City of: For the September 28, 2007 FIS, the hydrologic and hydraulic analyses for Cazenovia Creek, Ellicott Creek and Spicer Creek were performed by Medina Consultants, P.C., for FEMA under Contract No. EMN-2003-CO-5005. The work was completed in September 2007. For the FIS revised August 23, 1999, the hydrologic and hydraulic analyses for Buffalo River were prepared by Leonard Jackson Associates for FEMA under Contract No. EMW-93-C-4145. That work was completed in October 1996. The hydrologic and hydraulic analyses for the remaining streams in the City of Buffalo were taken from the May 18, 1981 FIS. That work was prepared by Goodkind and O'Dea, Inc., for the FIA under Contract No. H-3831 and completed in February 1979. (References 28, 95)

Cheektowaga, Town of: For the March 15, 1984 FIS, the hydrologic and hydraulic analyses represent a revision of the original analyses by the USACE, Buffalo District for FEMA under Inter-Agency Agreement No. IAA-H-2-73, Project Order No. 4. The original study was completed in December 1979. The revised version was also prepared by the USACE,

Buffalo District under agreement with FEMA. This work was completed in June 1983. (Reference 61)

Clarence, Town of: For the October 1, 1981 FIS, the hydrologic and hydraulic analyses were prepared by DeLeuw, Cather and Company of New York, Inc., for FEMA under Contract No. H-4552. The work was completed in September 1980. For the March 5, 1996 revision, the hydrologic and hydraulic analyses for Tonawanda Creek and Black Creek were prepared by Leonard Jackson Associates for FEMA under Contract No. EMW-87-R-2448. The work was completed in March 1989. Revisions to the hydrologic and hydraulic analyses for Gott Creek, Gott Creek Tributary, Ransom Creek, Tonawanda Creek and Black Creek were conducted by Pratt & Huth in order to resolve an appeal received during the statutory 90-day appeal period. This work was completed in August 1993. Additional revisions to the hydrologic and hydraulic analyses for Tonawanda Creek and Black Creek were conducted by Pratt & Huth during the second statutory 90-day appeal period. This work was completed in August 1994. (References 32, 84)

Colden, Town of: For the January 1979 FIS, the hydrologic and hydraulic analyses were performed by Erdman, Anthony Associates for the FIA under Contract No. H-3961. The work was completed in October 1977. (Reference 212)

Collins, Town of: For the November 1976 FIS, the hydrologic and hydraulic analyses were conducted by the U.S. Geological Survey (USGS) at the request of the FIA, U.S. Department of Housing and Urban Development. The source of authority for the study is the National Flood Insurance Act of 1968, as amended. Authority and financing are contained in Inter-Agency Agreements IAA-H-20-74, Project Order No. 16 and IAA-H-17-75, Project Order No. 14. All cross sections and planimetric work maps, surveyed by the photogrammetric method, were collected and compiled by Kucera and Associates, Incorporated, Mentor, Ohio, under subcontract from the USGS. (Reference 225)

Concord, Town of: For the September 4, 1986 FIS, the hydrologic and hydraulic analyses were prepared by the USACE during a Special Flood Hazard Evaluation Report for Spring Brook in the Town of Concord and Village of Springville. The report was completed in November 1984. (Reference 49)

Depew, Village of: For the February 3, 1981 FIS, the hydrologic and hydraulic analyses were prepared by DeLeuw, Cather and

Company for the FIA under Contract No. H-4552. The work was completed in December 1979. (Reference 98)

East Aurora, Village of: For the June 29, 1979 FIRM, the hydrologic and hydraulic analyses were prepared by the USACE, Buffalo District, for FEMA under Inter-Agency Agreement No. IAA-H-15-72, Project Order No. 18. The work was completed in June 1972. For the August 6, 2002 revision, the hydrologic and hydraulic analyses for Tannery Brook were developed by the USACE and prepared by Leonard Jackson Associates for FEMA under Contract No. EMN-96-CO-0026. The work was completed in January 2001. (Reference 21)

Elma, Town of: For the December 1976 FIS and June 1, 1977 FIRM, the hydrologic and hydraulic analyses were prepared by the USACE for the FIA under Inter-Agency Agreement No. IAA-H-2-73, Project Order No. 4. For the June 22, 1998 revision, hydrologic and hydraulic analyses were prepared by Kozma Associates Consulting Engineers, P.C., for FEMA under Contract No. EMW-84-C-4379. The work was completed in July 1995. (References 30, 223)

Evans, Town of: For the November 1977 FIS, hydrologic and hydraulic analyses were prepared by the U.S. Geological Survey (USGS) for FEMA. The March 16, 1982 FIS analyses represent a revision of the original FIS also prepared by USGS under Inter-Agency Agreement Nos. IAA-H-20-74, Project Order No. 16 and IAA-H-17-75, Project Order Nos. 1 and 14. Hydrologic and hydraulic analyses of additional streams were prepared by McPhee, Smith, Rosenstein Engineers, Private Consultants, for FEMA under Contract No. H-4647. The work was completed in December 1979. For the February 2, 2002 revision, hydrologic and hydraulic analyses for Reisch Creek were prepared by Leonard Jackson Associates for FEMA under Contract No. EMW-93-C-4145. The work was completed in March 1999. (References 22, 83, 219)

Gowanda, Village of: For the December 1976 FIS, the hydrologic and hydraulic analyses were performed by the Water Resources Division of the USGS, for the FIA, under Inter-Agency Agreement Nos. IAA-H-20-74, Project Order No. 16; and IAA-H-17-75, Project Order Nos. 1 and 14. The work was completed in December 1976. (Reference 224)

Grand Island, Town of: For the July 1979 FIS, the hydrologic and hydraulic analyses were done by Erdman, Anthony, Associates, for the FIA, under Contract Number H-3961. That work,

which was completed in December 1977, covered all significant flooding sources affecting the Town of Grand Island. (Reference 205)

Hamburg, Town of: For the August 14, 1980 FIS and November 19, 1980 FIRM, the hydrologic and hydraulic analyses were prepared by McPhee, smith, Rosenstein Engineers for the FIA under Contract No. H-4647. The work was completed in December 1979. For the October 4, 1994 revision, the hydrologic and hydraulic analyses for Buttermilk Falls Creek were prepared by R & D Engineering, P.C., on behalf of the Town of Hamburg for FEMA. That work was completed in July 1992. For the December 20, 2001 revision, the hydrologic and hydraulic analyses for Foster Brook were prepared by Leonard Jackson Associates for FEMA under Contract No. EMW-93-C-4145 and included a June 17, 1999 Letter of Map Revision (LOMR) along an unnamed tributary. The work was completed May 5, 1999. (References 25, 33, 102)

Hamburg, Village of: For the July 20, 1981 FIS, the hydrologic and hydraulic analyses were prepared by McPhee, Smith Rosenstein Engineers for FEMA under Contract No. H-4647. The work was completed in December 1979. (Reference 80)

Holland, Town of: For the November 1978 FIS, the hydrologic and hydraulic analyses for that study were performed by Erdman, Anthony, Associates for the FIA, under Contract No. H-3961. That work, which was completed in September 1977, covered all significant flooding sources in the Town of Holland. (Reference 214)

Lackawanna, City of: For the January 1980 FIS, the hydrologic and hydraulic analyses were prepared by Parsons, Brinckerhoff, Quade and Douglas under subcontract to Goodkind and O'Dea, Inc., for FEMA under Contract No. H-3831. The work was completed in March 1977. (Reference 105)

Lancaster, Town of: For the June 1, 1981 FIS and December 1, 1981 FIRM, the hydrologic and hydraulic analyses were prepared by DeLeuw, Cather and Company of New York, Inc., for the FIA under Contract No. H-4552. he work was completed in March 1980. For the February 23, 2001 revision, the hydrologic and hydraulic analyses for Little Buffalo Creek, Ellicott Creek, Scajaquada Creek and Plum Bottom Creek were prepared by Leonard Jackson Associates for FEMA under Contract No. EMW-95-C-4692. The work was completed in January 1998. (References 26, 94)

Lancaster, Village of:	For the January 1979 FIS, the hydrologic and hydraulic analyses were performed by Erdman, Anthony Associates for the FIA under Contract No. H-3961. The work was completed in September 1977. (Reference 213)
Marilla, Town of:	For the March 1978 FIS, the hydrologic and hydraulic analyses were performed by Erdman, Anthony Associates for the FIA under Contract No. H-3961. The work was completed in July 1977. (Reference 218)
Newstead, Town of:	For the May 1980 FIS, the hydrologic and hydraulic analyses were prepared by DeLeuw, Cather and Company of New York, Inc., for FEMA under Contract No. H-4552. The work was completed in May 1979. For the May 4, 1992 revision, the hydrologic and hydraulic analyses were prepared by Leonard Jackson Associates for FEMA under Contract No. EMW-89-C-2822. The work was completed in May 1990. (References 43, 103)
Orchard Park, Town of:	For the September 16, 1982 FIS, the hydrologic and hydraulic analyses were prepared by McPhee, Smith Rosenstein Engineers for FEMA under Contract No. H-4647. The work was completed in December 1979. (Reference 74)
Orchard Park, Village of:	For the July 1, 1981 FIS, the hydrologic and hydraulic analyses were prepared by McPhee, Smith Rosenstein Engineers for FEMA under Contract No. H-4647. The work was completed in December 1979. (Reference 93)
Sardinia, Town of:	For the January 16, 2003 FIS, the hydrologic and hydraulic analyses were prepared by Leonard Jackson Associates for FEMA under Contract No. EMW-96-CO-0026. The work was completed in December 2000. (Reference 17)
Springville, Village of:	For the July 17, 1986 FIS, the hydrologic and hydraulic analyses were prepared by the USACE, Buffalo District, during preparation of a Special Flood Hazard Evaluation report for Spring Brook in the Town of Concord and Village of Springville. The report was completed in November 1984. (Reference 52)
Tonawanda, City of:	For the February 1979 FIS, the hydrologic and hydraulic analyses were performed by Erdman, Anthony, Associates for the FIA, under Contract No. H-3961. That work, which was completed in November 1977, covered all significant flooding sources affecting the City of Tonawanda. (Reference 210)

Tonawanda, Town of:	For the February 17, 1981 FIS, the hydrologic and hydraulic analyses were prepared by DeLeuw, Cather and Company of New York, Inc., for FEMA under Contract No. H-4552. The work was completed in November 1979. (Reference 97)
Wales, Town of:	For the February 1979 FIS, the hydrologic and hydraulic analyses were performed by Erdman, Anthony, Associates, for the FIA, under Contract No. H-3961. That work, which was completed in May 1977, covers all significant flooding sources in the Town of Wales. (Reference 211)
West Seneca, Town of:	For the August 1976 FIS, the hydrologic and hydraulic analyses were prepared by the USACE, Buffalo District for FEMA under Inter-Agency Agreement No. IAA-H-2-73, Project Order No. 2. For the September 3, 1992 revision, the hydrologic and hydraulic analyses were prepared by Kozma Associates Engineers, P.C., for FEMA under Contract No. EMW-86-C-2244. The work was completed in April 1990. (References 37, 226)
Williamsville, Village of:	For the September 1, 1981, FIS, the hydrologic and hydraulic analyses were prepared by DeLeuw, Cather and Company of New York, Inc., for FEMA, under Contract No. H-4552. That work was completed in September 1980. (Reference 79)

The authority and acknowledgements for the Towns of Brant, Eden, and North Collins and the Villages of Alden, Blasdell, Farnham, Kenmore, North Collins, and Sloan are not available because no FIS reports were published for those communities.

Initial Countywide Analyses (September 26, 2008)

For the initial countywide FIS dated September 26, 2008, the hydrologic and hydraulic analyses for the Cazenovia, Ellicott, and Spicer Creeks were prepared by T.Y. Lin International for FEMA, under Contract No. EMN-2003-CO-5005. The work was completed in September 2007. (Reference 14)

Base map information shown on the FIRM dated September 26, 2008 was provided in digital format by the New York State Office of Cyber Security & Critical Infrastructure Coordination. Files contained 2008 digital orthoimagery of Erie County, New York. Image pixel size is 1.0' and 2.0' GSD. Image horizontal accuracy is within 8' at the 95% confidence level. Each file contains an image covering 4000' by 6000' on the ground.

Base map information shown on the September 26, 2008 FIRM was provided in digital format by the New York State Office of Cyber Security. This information was provided as 4-Band RGB and NIR, with pixel size 1.0’ GSD from photography dated April 2011.

The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 18N. The horizontal datum was NAD 83, GRS80 spheroid.

Revised Countywide Analyses (Date TBD)

For this revised countywide FIS dated [date TBD], revised hydrologic and hydraulic analyses for the streams shown in Table 3 were prepared for FEMA by T.Y. Lin International under Contract No. EMN-2003-CO-0005. This work was completed in September 2009.

For this [Date TBD] revised countywide FIS, base map information was derived from multiple sources, including the New York State Office of Cyber Security and Critical Infrastructure Coordination, and the USDA's Farm Service Agency, Aerial Photography Field Office, dated 2015.

1.3 Coordination

Consultation Coordination Officer's (CCO) meetings may be held for each jurisdiction in this countywide FIS. An initial CCO meeting is held typically with representatives of FEMA, the community, and the study contractor to explain the nature and purpose of a FIS and to identify the streams to be studied by detailed methods. A final CCO meeting is held typically with representatives of FEMA, the community, and the study contractor to review the results of the study.

The dates of the initial and final CCO meetings held for the jurisdictions within Erie County which this FIS covers and the incorporated communities within those boundaries are shown in Table 1, "Initial and Final CCO Meetings."

TABLE 1 – INITIAL AND FINAL CCO MEETINGS

Community	Initial CCO Date	Final CCO Date
Akron, Village of	May 24, 1977	December 6, 1979
Alden, Town of	December 20, 1989[1]	February 26, 1990
Alden, Village of	*	*
Amherst, Town of	May 23, 1977	February 9, 1982
Angola, Village of	March 15, 2001[1]	July 12, 2001
Aurora, Town of	July 21, 1976	May 18, 1978
Blasdell, Village of	*	*
Boston, Town of	*	November 19, 1980
Brant, Town of	*	*
Buffalo, City of	September 25, 1975 November 1, 2007	November 5, 1980 January 9 & 10, 2008
Cheektowaga, Town of	June 19,1978	July 15, 1980

[1] Notified by Letter * No data available

TABLE 1 – INITIAL AND FINAL CCO MEETINGS (Continued)

Community	Initial CCO Date	Final CCO Date
Clarence, Town of	May 23, 1977 May 1986	May 11, 1981 June 2, 1992
Colden, Town of	March 17, 1976	June 20, 1978
Collins, Town of	*	September 15, 1975
Concord, Town of	*	September 9, 1985
Depew, Village of	May 25, 1977	July 15, 1980
East Aurora, Village of	March 15, 20011	July 12, 2001
Eden, Town of	*	*
Elma, Town of	* March 10, 1993	August 25, 1975 *
Evans, Town of	* *	May 12, 1981 December 19, 2000
Farnham, Village of	*	*
Gowanda, Village of	*	November 24, 1975
Grand Island, Town of	April 7, 1976	September 27, 1978
Hamburg, Town of	* October 9, 1992[1]	April 8, 1980 November 2, 2000
Hamburg, Village of	*	April 8, 1980
Holland, Town of	July 21, 1976	May 18, 1978
Kenmore, Village of	*	*
Lackawanna, City of	September 26, 1975	August 13, 1979
Lancaster, Town of	May 25, 1977 April 21, 1994	October 28, 1980 *
Lancaster, Village of	July 20, 1976	June 20, 1978
Marilla, Town of	March 16, 1976	*
Newstead, Town of	May 24, 1977 March 1988	December 5, 1979 June 3, 1991
North Collins, Town of	*	*
North Collins, Village of	*	*
Orchard Park, Town of	*	February 10, 1981
Orchard Park, Village of	*	February 10, 1981
Sardinia, Town of	March 15, 2001[1]	January 29, 2002

[1] Notified by Letter * No data available

TABLE 1 – INITIAL AND FINAL CCO MEETINGS (Continued)

Community	Initial CCO Date	Final CCO Date
Sloan, Village of	*	*
Springville, Village of	*	September 3, 1985
Tonawanda, City of	March 17, 1976	August 14, 1978
Tonawanda, Town of	May 23, 1977	September 3, 1980
Wales, Town of	March 16, 1976	August 14, 1978
West Seneca, Town of	October 11, 1990[1]	January 7, 1991
Williamsville, Village of	May 23, 1977	April 13, 1981

[1] Notified by Letter * Data not available

For the September 26, 2008 initial countywide FIS, initial CCO meetings were held on March 15 and 16, 2006. The meetings were attended by representatives of Erie County, several communities in Erie County, Medina Consultants, and FEMA. No final CCO meeting was held for the initial countywide study.

For the [date TBD] revised countywide FIS, initial CCO meetings were held March 2-4, 2010. These meetings were attended by representatives of the municipalities, NYSDEC, FEMA, T.Y. Lin International and RAMPP. No final CCO meeting was held for this countywide study.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Erie County, New York.

All or portions of the flooding sources listed in Table 2, "Flooding Sources Studied by Detailed Methods," were studied by detailed methods. Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2).

TABLE 2 - FLOODING SOURCES STUDIED BY DETAILED METHODS

Berricks Creek
Big Sister Creek
Black Creek
Buffalo Creek
Buffalo River
Buttermilk Falls Creek
Cattaraugus Creek
Cayuga Creek
Cazenovia Creek
Cazenovia Creek East Branch
Cazenovia Creek West Branch
Little Sister Creek Tributary 2
Muddy Creek
Murder Creek
Niagara River – Tonawanda Channel
Pike Creek
Plum Bottom Creek
Plum Bottom Creek North Branch
Pond Brook
Ransom Creek
Reisch Creek
Rush Creek

TABLE 2 - FLOODING SOURCES STUDIED BY DETAILED METHODS
(Continued)

Clear Creek
Delaware Creek
Ebenezer Brook
Eighteenmile Creek
Eighteenmile Creek North Branch
Eighteenmile Creek South Branch
Ellicott Creek
Ellicott Creek – North Diversion Channel
Ellicott Creek – Pfohl Park Diversion Channel
Ellicott Creek – Upper Diversion Channel
Fern Brook
Foster Brook
Gott Creek
Gott Creek Tributary
Grannis Creek
Gun Creek
Hampton Brook
Hosmer Brook
Hunter Creek
Lake Erie
Ledge Creek
Little Buffalo Creek
Little Buffalo Creek Tributary
Little Sister Creek
Scajaquada Creek
Scajaquada Creek North Branch
Scajaquada Creek Tributary T-1
Slate Bottom Creek
Slate Bottom Creek North Branch
Smokes Creek
Smokes Creek Northeast Branch
Smokes Creek Northwest Branch
Smokes Creek South Branch
Smokes Creek South Branch South Tributary
Smokes Creek South Branch Tributary 1
Smokes Creek South Branch Tributary 2
Spicer Creek
Spring Brook
Spring Creek
Tannery Brook
Thatcher Brook
Tonawanda Creek
Tributary 1 to Niagara River- Tonawanda Channel
Waterfalls Village Creek
Woods Creek
Woods Creek Tributary 1
Woods Creek Tributary 3

For the [date TBD] countywide FIS, selected streams throughout Erie County were restudied using detailed methods. The streams and the limits of detailed study are shown in Table 3 – "Scope of Revision for [date TBD] Countywide FIS."

TABLE 3 – SCOPE OF REVISION FOR [DATE TBD] COUNTYWIDE FIS

Stream Name	Limits of Detailed Study
Cayuga Creek	Within the Towns of Cheektowaga, Lancaster, and West Seneca and the Villages of Depew and Lancaster
Eighteenmile Creek	Within the Town of Hamburg
Ellicott Creek	Within the Towns of Amherst and Tonawanda
Ransom Creek	Within the Towns of Amherst and Clarence
Scajaquada Creek	Within the City of Buffalo
Slate Bottom Creek	Within the Towns of Cheektowaga, Elma, and Lancaster
Tonawanda Creek	Within the Town of Tonawanda

Table 4, "Stream Name Changes," lists streams that have names in this countywide FIS other than those used in previously printed FISs for the communities in which they are located.

TABLE 4 – STREAM NAME CHANGES

Community	Old Name	New Name
Aurora, Town of	Cazenovia Creek (Upstream Portion)	Cazenovia Creek West Branch
Aurora, Town of and Aurora, Village of	East Branch Cazenovia Creek	Cazenovia Creek East Branch
Aurora, Town of and Aurora, Village of	West Branch Cazenovia Creek	Cazenovia Creek West Branch
Clarence, Town of	Tributary to Gott Creek	Gott Creek Tributary
Depew, Village of	North Branch Scajaquada Creek	Scajaquada Creek North Branch
Elma, Town of and Lancaster, Town of	South Branch Slate Bottom Creek	Slate Bottom Creek
Evans, Town of	Tributary No. 2 to Little Sister Creek	Little Sister Creek Tributary 2
Hamburg, Town of	North Branch Eighteenmile Creek	Eighteenmile Creek North Branch
Hamburg, Town of	South Branch Eighteenmile Creek	Eighteenmile Creek South Branch
Hamburg, Town of	Tributary to South Branch of Smokes Creek	Smokes Creek South Branch Tributary 1
Hamburg and Orchard Park, Towns of; Lackawanna, City of and Orchard Park, Village of	South Branch Smokes Creek	Smokes Creek South Branch
Lancaster, Town of	North Branch Slate Bottom Creek	Slate Bottom Creek North Branch
Lancaster, Town of	North Branch Plum Bottom Creek	Plum Bottom Creek North Branch
Marilla, Town of	Tributary to Little Buffalo Creek	Little Buffalo Creek Tributary
Wales, Town of	East Branch Cazenovia Creek	Cazenovia Creek East Branch

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction.

For previous FIS reports, numerous flooding sources in the county were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and Erie County.

This FIS also incorporates the determinations of letters issued by FEMA resulting in map changes (Letter of Map Revision [LOMR], Letter of Map Revision - based on Fill [LOMR-F], and Letter of Map Amendment [LOMA], as shown in Table 5, "Letters of Map Change."

TABLE 5 – LETTERS OF MAP CHANGE

Community	Flooding Source(s) Project Identifier	Date Issued	Type
Amherst, Town of	Ellicott Creek Floodway Revision	08/17/1995	LOMR
Cheektowaga, Town of	Scajaquada Creek LOMR	03/14/1995	LOMR
Cheektowaga, Town of	Scajaquada Creek T-1 LOMR	01/26/2002	LOMR
East Aurora, Village of	Cazenovia Creek East Branch BFE Revision	09/03/1991	LOMR
Hamburg, Town of	Rush Creek Tributary – Zone A Revision	12/17/1999	LOMR
Hamburg, Town of	Buttermilk Falls Creek BFE Revision	06/03/2003	LOMR
Lancaster, Town of	Cayuga Creek LOMR Revision	05/17/2005	LOMR
Lancaster, Town of	Slate Bottom Creek North Branch LOMR Revision	08/28/2008	LOMR
Orchard Park, Town of	Smokes Creek Northwest Branch BFE Revision	03/27/1998	LOMR
Orchard Park, Village of	Smokes Creek Northwest Branch BFE Revision	03/27/1998	LOMR

2.2 Community Description

Erie County is located in the extreme western part of New York State. It is bordered by Niagara County to the north, Genesee County, Wyoming County and the Tonawanda Reservation to the east, Cattaraugus County to the south, Cattaraugus Reservation to the southwest, and Lake Erie and the Niagara River to the west.

According to the 2010 U.S. Census, the land area in Erie County was 1,043 square miles and the estimated population of Erie County was 925,528 in 2017 (Reference 280).

Erie County is located in two physiographic regions: the Allegany Plateau, characterized by the upland, sloping topography to the south and the Erie-Ontario Lowlands of lake plain to the north. Glaciers have covered this area several times leaving deposits of glacial till as they receded. (FEMA, Town of Orchard Park, 1982). Surface soils within the County are non-sorted rock materials; imbedded sand and gravel, as well as imbedded clay, silt and fine sand. They reflect the texture of the glacial till, outwash and lake deposits from which they come. Generally, soils are shallow and fairly well-drained (FEMA, Village of Depew, 1981). Soils for a thin mantle over the bedrock, which is generally found at depths greater than five feet. Heavy wooded areas can be found along steep hillsides and farming occurs on the gently rolling hilltop areas and in the broad valleys. Many farms are now overgrown, as a once agricultural area has rapidly become urbanized (FEMA, Town of West Seneca, 1992).

Erie County experiences a fairly humid, continental-type climate, but with a definite "maritime" flavor due to strong modification from the Great Lakes. Winters are generally cloudy, cold and snowy. The lake snow machine can start as early as mid-November. The average date of the last frost is near the end of April in the City of Buffalo and in mid-May inland. Spring comes slowly to the Buffalo area; the ice pack on Lake Erie does not

disappear until mid-April. Summers are pleasant, sunshine is plentiful, temperatures are warm and humidity levels are moderate. Autumn is pleasant, but rather brief. The first frost can be expected in late September inland and mid-October in the City of Buffalo (National Weather Service).

The Village of Akron is located northeast of Buffalo, NY, adjacent to the Tonawanda Reservation of the Seneca. According to the 2010 U.S. Census, the land area in Erie County was 2.0 square miles and the population was 2,868 (Reference 280).

The Town of Alden is located in northeastern Erie County, east of Buffalo. According to the 2010 U.S. Census, the land area of the community was 34.5 square miles and the population was 10,865 (Reference 280).

The Village of Alden is centrally located within the Town of Alden in northeastern Erie County, east of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 2.7 square miles and the population was 2,605 (Reference 280).

The Town of Amherst is located in northern Erie County and is the most populated town in upstate New York. It is the largest suburb of Buffalo. According to the 2010 U.S. Census, the land area of the community was 53.2 square miles and the population was 122,366 (Reference 280).

The Village of Angola is located in southwestern Erie County approximately 2 miles east of Lake Erie and 22 miles southwest of downtown Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 1.4 square miles and the population was 2,127 (Reference 280).

The Town of Aurora is located in central Erie County southeast of Buffalo. According to the 2010 U.S. Census, the land area of the community was 36.4 square miles and the population was 13,782 (Reference 280).

The Village of Blasdell is located in west-central Erie County in the northern part of the Town of Hamburg. It is bordered on the north by the City of Lackawanna and is directly south of Buffalo. According to the 2010 U.S. Census, the land area of the community was 1.1 square miles and the population was 2,553 (Reference 280).

The Town of Boston is located in south-central Erie County and is southeast of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 35.8 square miles and the population was 8,023 (Reference 280).

The Town of Brant is located in southwestern Erie County and is southwest of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 24.3 square miles and the estimated population was 2,065 (Reference 280).

The City of Buffalo is the second largest city in the state of New York and serves as the county seat of Erie County. Buffalo is located in northwestern Erie County on the eastern shore of Lake Erie, at the head of the Niagara River, and is 16 miles south of Niagara Falls. Buffalo is also a major gateway for commerce and travel for the Canada–United States border, forming part of the bi-national Buffalo Niagara Region. According to the

2010 U.S. Census, the land area of the community was 40.4 square miles and the population was 261,310 (Reference 280).

The Town of Cheektowaga is located in north-central Erie County and is the second largest suburb of Buffalo. According to the 2010 U.S. Census, the land area of the community was 29.4 square miles and the population was 88,226 (Reference 280).

The Town of Clarence is located in northeastern Erie County. According to the 2010 U.S. Census, the land area of the community was 53.5 square miles and the population was 30,673 (Reference 280).

The Town of Colden is located in southeastern Erie County. According to the 2010 U.S. Census, the land area of the community was 35.6 square miles and the estimated population was 3,265 (Reference 280).

The Town of Collins is located in southern Erie County. According to the 2010 U.S. Census, the land area of the community was 48.0 square miles and the population was 6,601 (Reference 280).

The Town of Concord is located in southeastern Erie County. According to the 2010 U.S. Census, the land area of the community was 69.9 square miles and the estimated population was 8,494 (Reference 280).

The Village of Depew is located in north-central Erie County. According to the 2010 U.S. Census, the land area of the community was 5.1 square miles and the population was 15,303 (Reference 280).

The Village of East Aurora is located in central Erie County, southeast of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 2.5 square miles and the population was 6,236 (Reference 280).

The Town of Eden is located in south-central Erie County, south of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 39.8 square miles and the estimated population was 7,688 (Reference 280).

The Town of Elma is located in south-central Erie County, southeast of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 34.5 square miles and the population was 11,317 (Reference 280).

The Town of Evans is located along the coast of Lake Erie in southwestern Erie County, south of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 41.5 square miles and the estimated population was 16,356 (Reference 280).

The Village of Farnham is located in southwestern Erie County, north of the Cattaraugus Reservation and southeast of Evangola State Park. According to the 2010 U.S. Census, the land area of the community was 1.2 square miles and the population was 382 (Reference 280).

The Village of Gowanda is located in southwestern Erie County. It is a multi-county community located partly in Erie County and partly in Cattaraugus County, NY. According to the 2010 U.S. Census, the land area of the community was 1.6 square miles and the population was 2,709 (Reference 280).

The Town of Grand Island is located in northwestern Erie County, on the United States-Canada border, northwest of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 28.3 square miles and the population was 20,374 (Reference 280).

The Town of Hamburg is located in western Erie County, south of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 41.3 square miles and the population was 56,936 (Reference 280).

The Village of Hamburg is located in western Erie County, south of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 2.5 square miles and the estimated population was 9,409 (Reference 280).

The Town of Holland is located in southeastern Erie County, southeast of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 35.8 square miles and the population was 3,401 (Reference 280).

The Village of Kenmore is located in northwestern Erie County and is bordered on the south by Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 1.4 square miles and the population was 15,423 (Reference 280).

The City of Lackawanna is located in western Erie County, just south of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 6.6 square miles and the population was 18,141 (Reference 280).

The Town of Lancaster is located in north-central Erie County, 14 miles east of downtown Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 37.7 square miles and the estimated population was 41,604 (Reference 280).

The Village of Lancaster is located in north-central Erie County, east of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 2.7 square miles and the population was 10,352 (Reference 280).

The Town of Marilla is located in southeastern Erie County, south of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 27.5 square miles and the estimated population was 5,327 (Reference 280).

The Town of Newstead is the most northeastern town in Erie County, northeast of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 50.8 square miles and the estimated population was 8,594 (Reference 280).

The Town of North Collins is located in southern Erie County. According to the 2010 U.S. Census, the land area of the community was 42.9 square miles and the estimated population was 3,523 (Reference 280).

The Village of North Collins is located in southern Erie County. According to the 2010 U.S. Census, the land area of the community was 0.8 square miles and the population was 1,232 (Reference 280).

The Town of Orchard Park is located in west-central Erie County, southeast of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 38.4 square miles and the population was 29,054 (Reference 280).

The Village of Orchard Park is located in west-central Erie County, southeast of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 1.3 square miles and the population was 3,246 (Reference 280).

The Town of Sardinia is located in southeastern Erie County. According to the 2010 U.S. Census, the land area of the community was 50.2 square miles and the population was 2,775 (Reference 280).

The Village of Sloan is located in northwestern Erie County, southeast of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 0.8 square miles and the population was 3,661 (Reference 280).

The Village of Springville is located in southern Erie County. According to the 2010 U.S. Census, the land area of the community was 3.7 square miles and the population was 4,596 (Reference 280).

The City of Tonawanda is located in northwestern Erie County, north of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 3.8 square miles and the population was 15,130 (Reference 280).

The Town of Tonawanda is located in northwestern Erie County, north of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 18.7 square miles and the population was 73,567 (Reference 280).

The Town of Wales is located in southeastern Erie County, southeast of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 35.6 square miles and the population was 3,005 (Reference 280).

The Town of West Seneca is located in west-central Erie County, and is a suburb of Buffalo, NY. According to the 2010 U.S. Census, the land area of the community was 21.4 square miles and the population was 44,711 (Reference 280).

The Village of Williamsville is located in northeastern Erie County. According to the 2010 U.S. Census, the land area of the community was 1.2 square miles and the population was 5,300 (Reference 280).

2.3 Principal Flood Problems

Flooding can occur in Erie County during any season of the year, but it most likely occurs in the late winter – early spring months when melting snow may combine with intense rainfall to produce increased runoff. Ice jams and debris have often increased

flood heights by impeding water flow at bridges and culverts. Floods can result from collusion over the watershed of a large mass of warm moisture-laden air from the north; from sharp rises in temperature in the spring that melt the snow cover of the basin and are followed by rains; and from localized thunderstorms (Olean Times Herald, 2009).

Recent Flooding Events

In November 2014, up to six feet of snow fell during two lake effect events. The snow then melted as temperatures climbed into the sixties. Snow-water equivalents ranged from four to six inches. The melting snow combined with limited rainfall to produce some urban and river flooding in Erie County and Genesee County, New York. In Erie County, the flooding mainly affected Cayuga Creek at Lancaster and Ellicott Creek at Williamsville. Urban flooding also closed roads in Elma, Boston, Hamburg, and Angola.

On February 20th, 2014, a strong storm lifted across the Upper Great Lakes which brought warmer temperatures and some rain to the region. The steadiest rains fell in the Buffalo Creek basin, where one to two inches of rainfall combined with snow-melt to cause flooding on several creeks. This flooding was due to both, high flows and ice jams. In Erie County, the flooding mainly affected West Seneca and Gardenville. In West Seneca, the Lexington Green neighborhood was flooded. An ice jam on Buffalo Creek caused the waters to rise. Buffalo Creek at Gardenville peaked more than a foot and a half above flood stage, but once the ice jam broke, the water receded about three feet in about 45 minutes.

In late June 2013, a complex area of low pressure lifted across New York and then stalled near Quebec. The low brought periods of rain with embedded heavier showers and thunderstorms. Lockport, in Niagara County, received the brunt of the flooding, where five inches of rain fell, overwhelming the City's sewer and water treatment plants. The flooding damaged many city streets and affected over 600 homes and dozens of small businesses in Lockport. The heavy rain extended into northern Erie County where numerous roads were also flooded. Major arteries including Maple and Niagara Falls Boulevard were inundated.

In August 2009, devastating storms struck the southern area of Erie County, particularly in the Village of Gowanda. At USGS Gage No. 04213500 (Cattaraugus Creek at Gowanda, New York), a flow of 32,300 cubic feet per second (cfs) was recorded, the highest flow on record for that gage. (USGS, Ret. September 2009). One death was attributed to the storm, and debris and high water damaged the Village's primary water supply. Several roads and culverts were washed out and the New York and Lake Erie Railroad was temporarily suspended due to a washout of track. A federal disaster was declared on September 1, 2009.

In January 2008, an unnamed storm with severely strong sustained winds of 30-40 miles per hour (mph) and gusts to 60 mph caused a significant storm surge on Lake Erie and the upper Niagara River. Coastal flooding occurred in several areas in the City of Buffalo. The URS Group, Inc. was contracted by FEMA under Task Order HSFEHQ-07-J-0013 of the Hazard Mitigation Technical Assistance Program (HMTAP) to collect high water marks (HWMs) within the City of Buffalo (FEMA, March 2008). The results of this effort are shown in Table 6, "Summary of January 2008 High Water Mark Survey Results".

TABLE 6 – SUMMARY OF JANUARY 2008 HIGH WATER MARK SURVEY RESULTS

HWM ID	HWM Street Address	Survey Elevation (feet NAVD)	Survey Latitude	Survey Longitude
213-UNY-01-001	Retaining wall at La Salle Park	580.0	42.88715	-78.89009
213-UNY-01-002	Debris line at end of 116 South Street	579.4	42.86426	-78.86210
213-UNY-01-003	Tree at 41 South Street	579.5	42.86485	-78.86501
213-UNY-01-004	Tree at 30 Kentucky Street	579.0	42.86418	-78.86603
213-UNY-01-005	Buffalo-Ohio Park	580.2	42.86617	-78.86835
213-UNY-01-006	Fence at Marine Supplies Store at South Marine entrance gate	580.5	42.84064	-78.85871
213-UNY-01-007	Boat dock at ice fishing behind Olson Bro. Marine	580.2	42.85190	-78.86525
213-UNY-01-008	Rocks at Maritime Center	580.1	42.85734	-78.87542
213-UNY-01-009	Boat dock at Erie Basin	578.7	42.87995	-78.88704
213-UNY-01-010	Sign post at La Salle Park	580.2	42.88749	-78.89010
213-UNY-01-011	West Side Row Club	579.3	42.90025	-78.90176
213-UNY-01-012	Peace Bridge - R.Rich / Island Park	577.6	42.91292	-78.90274
213-UNY-01-014	Ice line on utility pole	579.3	42.86448	-78.86289

Federal disasters were also declared for storms that occurred in October 2006, May-June of 2004 and May-September of 2000.

Historic Flooding Events

For each selected community within Erie County that has a previously printed FIS report, the principal flooding problems described in those reports have been compiled and are summarized below.

In the Village of Akron, low lying areas are subject to periodic flooding from the overflow of Murder Creek. Most major floods occurred in the late winter or early spring. Few damaging floods have been produced by precipitation alone, though floods have often been caused by melting snow combined with moderate amounts of rainfall. (FIA, Village of Akron, 1980)

In the Town of Alden, flooding occurs along Ellicott Creek and Cayuga Creek. The greatest flood of record in the area occurred in March 1936 and caused heavy damage by washing out road and bridges, which have since been replaced with more adequate structures. An intense rainstorm which brought more than 6 inches of rainfall occurred in July 1963. (FEMA, Town of Alden, 1991).

In the Town of Amherst, a flood of record occurred in March 1960. This flood inundated a total of 3,220 acres, most located within the Town, and was approximately a 5-percent-annual-chance flood. The areas subject to the most severe flood damage were located on the downstream portions of Ellicott Creek, from Maple Road to Niagara Falls Boulevard. Numerous homes have been constructed in the floodplains of streams within the Town. During periods of high flow on Ransom Creek, the last four miles of the stream have inadequate channel capacity and do not flow with enough velocity to handle the discharges, and the creek may overflow its banks. The channel capacity of Black Creek is also often inadequate during periods of heavy flow, and the stream flows slowly and overflows its banks. Drainage divides between Tonawanda Creek, Ransom Creek, Black Creek and Gott Creek are low and their flood flows merge together. As a result, tributaries carry a large portion of major flood overflows from Tonawanda Creek. The channels of Black Creek and Ransom Creek are adequate to convey flood runoff from their own watershed areas, but the added flow from Tonawanda Creek frequently inundates land along Black Creek, Ransom Creek and Gott Creek. During the March 1960 flood, the overlap of floodplains reached a maximum width of approximately four miles. A large portion of losses due to flood damage were agricultural. (FEMA, Town of Amherst, 1992).

In the Village of Angola, flooding has occurred during winter and spring months and is usually the result of spring rains and/or snowmelt. (FEMA, Village of Angola, 2002).

In the Town of Aurora, flooding occurs on the Cazenovia Creek and its branches as a result of discharges in excess of channel capacity, restrictive bridges and ice jams. However, flood damages have been minor because of the hydraulic characteristics of the channels and limited development within the floodplains. On September 27, 1967, flooding occurred along the West Branch of Cazenovia Creek from West Falls in the Town of Aurora to Glenwood in the Town of Colden as a result of locally heavy rainfall. Basements of several structures were flooded. (USHUD, Town of Aurora, 1978).

In the Town of Boston, no significant flooding records exist. The floodplains in the Town of Boston are undeveloped and no damage has occurred to property in the Town. (FIA, Town of Boston, 1981).

In the City of Buffalo, low-lying areas are subject to flooding from Buffalo River, Cazenovia Creek and Scajaquada Creek. The most severe flooding occurs in early spring as a result of snowmelt and heavy rains. Under 1-perent-annual-chance flooding conditions, flooding may be anticipated in Cazenovia Park and in areas adjacent to the confluence of the Buffalo River and Cazenovia Creek. Along Cazenovia Creek, the most severe storm on record in the city was March 1955, which was equivalent to a 4-percent-annual-chance storm event. Other major floods occurred along Cazenovia Creek in January 1962, March 1964, February 1975, December 1969, January 1970 and March 1972. Along the Buffalo River, at the South Springs Subdivision of Mineral Spring Road, which is an area susceptible to flooding, high-water marks were recorded in 1956 and 1959. Along Scajaquada Creek, the most severe storm on record occurred August 7, 1963. The flood had a magnitude comparable to a 2-percent-annual-chance event. In September 1967, a flood with a magnitude comparable to a 10-percent-annual-chance flood occurred. Flooding in this area is more apt to occur as a result of sudden summer thunderstorms than from any combination of winter weather conditions. Under high-water conditions, flooding occurs approximately six to eight times per year along the

banks of Scajaquada Creek and in low-lying areas such as parts of Delaware Park and Forest Lawn Cemetery. This is due in part to debris clogging sewer line, and in part to storm runoff entering the Scajaquada Drain. In higher areas, while the creek would expand in width, relatively little flooding would affect developed areas. Many flood problems in the City of Buffalo are associated with overflows of the sewer drainage system. The bulk of the city's combined sewer system can handle the peak runoff from a 50-percent-annual-chance flood event to a 5-percent-annual-chance flood event without flooding. However, the area of South Buffalo has a sewer system that is unable to handle even a 100-percent-annual-chance flood. (FEMA, All Jurisdictions, 2008; City of Buffalo, 1999).

In the Town of Cheektowaga, flooding along Ellicott Creek and Scajaquada Creek and its tributaries is a result of discharges in excess of channel capacity and restrictive bridges. Large magnitude floods, which would cause extensive damage due to present development, occurred along Ellicott Creek in March 1916, January 1929, March 1936 and March 1960. Flooding has occurred along Scajaquada Creek in February and July 1945, January 1946, September 1967 and August 1975. A flood of record occurred on August 7, 1963 and was estimated to have a magnitude comparable to a 100-percent-annual-chance flood event. Flood discharges exceeding channel capacity affect residential, commercial and public properties along Cayuga Creek, primarily in the area near Union Road Bridge. Damages due to flooding in this area have been minimized due to channel improvements. Damaging floods have occurred along Cayuga Creek in March 1942, March 1955, March 1956, January 1959 and August 1975. A flood of record for Cayuga Creek occurred in June 1937. (FEMA, Town of Cheektowaga, 1984).

In the Town of Clarence, low-lying areas are subject to periodic flooding cause by the overflow from the narrow, winding and obstructed channel of Tonawanda Creek, and complicated by overflow and overland flooding into Black Creek and the lower portion of Ransom Creek. The larger floods in the Tonawanda Creek watershed have been caused by melting snow with moderate amounts of rainfall. Major flood events occurred during March and April of 1960. Other flooding events occurred in March 1902, March 1916, March 1956, January 1957 and January 1959. (FEMA, Town of Clarence, 1996).

In the Town of Colden, flooding is a result of discharges in excess of channel capacity, restrictive bridges and ice jams. However, flood damages have been minor because of the hydraulic characteristics of the channels and limited development of the floodplains. On March 1, 1955, heavy rainfall sent many streams in the Town over their banks. State Route 240 along Cazenovia Creek West Branch was awash at two points approximately one mile north of the Town. On September 28, 1967, a locally heavy rainstorm cause flooding along Cazenovia Creek West Branch. The discharge due to heavy rainfall was augmented by the failure of several pond embankments, including one 3-acre pond in the Town of Concord. Damage was reported to three commercial and eight residential structures in the hamlets of Colden and Glenwood. The Town of Colden office building sustained major damage; floodwaters reached an elevation of two feet above the floor joists. A section of State Route 240 south of the Hamlet of Colden was washed out. The flooding was a result of floodwaters overtopping the stream bank at a sharp bend in the channel downstream of the Chessie System Bridge. Some channel work has been done along this section of stream. (USHUD, Town of Colden, 1979).

In the Town of Collins, Clear Creek flows in meandering, shifting channels with steep profiles, and between high and low banks. Flooding problems may occur along U.S. Highway 62 at all three stream crossings, when maximum carrying capacities of the bridge opening are exceeded; or ice and debris jams take place. In addition a flooding problem exists at School Street and also at Collins Center Zoar Road due to a low place in the road which results in road overflow and flooding of residential dwellings on the left bank. (USHUD, Town of Collins, 1976).

In the Village of Depew, floods occurring in August 1963, September 1967 and August 1975 all caused substantial damage, though not in the Village of Depew, with August 1963 being the most severe. The intensity of rainfall during this storm period was in excess of the estimated 1-percent-annual-chance flood event. Flooding occurs almost annually along Cayuga Creek. Along Cayuga Creek, significant storm events occurred in June 1937, March 1942, March 1955, March 1956, January 1959, March 1972, June 1972 and August 1975. The storm of record occurred in June 1937, with the discharge estimated to be comparable to that of a 0.2-percent-annual-chance flood event. (FIA, Village of Depew, 1981).

In the Town of Evans, flooding along Little Sister Creek is confined to stream overflow in low-lying areas, which are sparsely developed. Ice jam flooding occurs at State Route 5 just south of Backus Road. Major floods on Little Sister Creek primarily occur in the late winter or early spring. Road overflow and excessive backwater at road and driveway culverts, such as the State Route 5 culvert, constitute the major flooding problems on Fern Brook and Reisch Creek. Discharges as low as the 10-percent-annual-chance recurrence interval cause road overflow at Kennedy Road along Fern Brook and at numerous secondary road crossings in Highland-on-the-Lake. Flooding along Pike Creek is due to the low-lying relief and shallow slope of the channel, which creates insufficient hydraulic capacity. (FEMA, Town of Evans, 2002).

In the Village of Gowanda, the deeply entrenched channel of Cattaraugus Creek can handle flows greater than the 0.2-percent-annual-chance flood. Thatcher Brook and Grannis Creek, however, create major flood problems in their lower reaches. The main channels of these streams as they pass through more developed sections of the Village have been formed so that when the stage exceeds bankful, flow is lost over the left bank on Grannis Creek and over the right bank on Thatcher Brook. That part of the floodplain which receives this overbank flow is a heavily developed area; therefore flood damage is extensive. An unnamed tributary located north of Cattaraugus Creek and flowing in a westerly direction adds to the flooding problems in the Village. (USHUD, Village of Gowanda, 1976).

In the Town of Grand Island, flood problems have been associated with high-water elevations and ice jams on the Niagara River. Strong winds blowing across Lake Erie from the southwest cause “wind-upset” on the lake and high water elevations on the river. Large ice jams occur on the river in the spring when the ice breaks up on the lake and flows down the river. (USHUD, Town of Grand Island, 1979)

In the Town of Hamburg, the Lake Erie shoreline is a major area of flooding, due to wave action and high winds. This is particularly noticeable at the Hoover Beach area. Waves have been recorded over the tops of houses there and have reached State Route 5. Ice from the lake can be thrown against the shore, causing damage and hazardous conditions.

Much of the shoreline has high bluffs, which experience serious erosion during storms. Lake Erie also causes streams that feed it to back up. The streamflow spreads out in low-lying areas, especially Woodlawn and Hoover Beach. Flooding problems are also created along most streams that cross the railroad near the lake. The underpass structures are generally severely restrictive to flow due to their small size. This causes water to back up and flood areas that normally would not be inundated. The culvert for Foster Brook under State Route 5 also creates flooding in the area. The road grades up from the south and is quite high above the creek. As the water backs up behind the culvert it flows around State Route 5 at the bottom of the incline and flows to the lake, flooding homes along the beach. The floodwaters converge on the floodplain of Waterfalls Village Creek, creating a large area that is inundated. (FEMA, Town of Hamburg, 2000)

In the Village of Hamburg, four bridges at the upstream end of Berricks Creek tend to restrict flow of the creek and create flooding problems; consequently, even the 10-percent-annual-chance flood event overtops the roadways for these structures. These four structures are Brookwood Drive, Sunset Drive, Kenton Place and a footbridge just downstream of Sunset Drive. (FEMA, Village of Hamburg, 1981).

In the Town of Holland, flooding in the area can occur along Cazenovia Creek East Branch, Hunter Creek, Buffalo Creek and Gears Gulf. Flooding occurs as a result of discharges in excess of channel capacity, restrictive bridges and ice jams. Flood damages have been minor because of hydraulic characteristics of the channel and limited development of the floodplains. (USHUD, Town of Holland, 1978).

In the City of Lackawanna, flooding along Smokes Creek, Smokes Creek South Branch and the Lake Erie shoreline occurs when heavy rains, sometimes associated with thaws, and high winds cause the water levels in Lake Erie and the streams to rise. Ice jams are significant factors in floods in the City. (FIA, City of Lackawanna, 1980).

In the Town of Lancaster, agricultural lands and woodlands that have been rapidly urbanized without adequate drainage systems have led to flooding of Ellicott Creek downstream in the Town of Amherst. A storm of record occurred in March 1960. Other large storm events occurred in March 1916, January 1929, March 1936, June 1937, March 1940, March 1954, March 1956, January 1959 and March 1963. The flood of March 1960 was estimated to be comparable to a 5-percent-annual-change flood event. Low-lying areas along Scajaquada Creek have been subject to flooding, with large storm events occurring in August 1963, September 1967, August 1975 and September 1977. Housing and highway developments have obscured original drainage patters, eliminating some of the natural watercourses and combining or altering others. Flood problems are due primarily to rapid runoff during intense rainstorms with resulting flows in excess of channel capacities. The flood of August 1963 was estimated to have a recurrence interval comparable to a 2.5-percent-annual-chance flood. Along Cayuga Creek, flooding occurs nearly annually. Most of the floods are cause by rapid thawing of snow cover and often accompanied by rainfall. Ice jams, vegetative growth and debris contribute to flooding by clogging bridge openings and culverts in the stream channel. Significant storm events occurred in June 1937, March 1942, March 1955, March 1956, January 1959, March 1972, June 1972, August 1975 and September 1979. The June 1937 flood was estimated to be a 0.2-percent-annual-chance flood event. Plum Bottom Creek and Plum Bottom Creek North Branch are tributaries to Cayuga Creek, joining Cayuga Creek just inside the western corporate limits of the Village of Lancaster. Plum Bottom Creek and Plum

Bottom Creek North Branch flood nearly annually as well. Significant storm events have occurred in June 1937, March 1942, March 1955, March 1956, January 1959, March 1972, June 1972 and August 1975. Slate Bottom Creek is a tributary to Cayuga Creek joining downstream west of Union and French Roads by the New York Central Railroad. Significant storm events occurred in June 1937, March 1942, March 1955, March 1956, January 1959, March 1972, June 1972 and August 1975. (FEMA, Town of Lancaster, 2001)

In the Town of Marilla, sources of flooding include Cayuga Creek, Buffalo Creek, Little Buffalo Creek and its tributary. Flooding occurs as a result of discharges in excess of channel capacity, restrictive bridges and ice jams. However, flood damages have been minor because of the hydraulic characteristics of the streams and limited development of the floodplains. (USHUD, Town of Marilla, 1978).

In the Town of Newstead, low-lying areas are subject to periodic flooding caused by the overflow of Beeman Creek, Ledge Creek, Murder Creek, Ransom Creek and Tonawanda Creek. Most major floods occur in the late winter or early spring. A flood of record occurred on March 31, 1960. At Hopkins Road on Tonawanda Creek, the peak discharge was associated with a 10-percent-annual-chance recurrence interval. Other large storm events occurred in March 1902, March 1916, March 1942, March 1956 and January 1957. (FEMA, Town of Newstead, 1991).

In the Town of Orchard Park, developed floodplain areas are primarily inundated due to bridge structures in the area. Along Milestrip Road there are a few private driveway bridges that constrict flood flows. The culverts at Highland Avenue and South Freeman Road frequently back up and cause flood problems. Damage has been reported at the subdivision downstream of South Freeman Road. Ice jams can also cause problems within the Town, primarily at Lake Avenue bridge. Flooding from Smokes Creek Northwest Branch occurs north of the bridge, but damage has been minimal. Flooding caused by ice jams occurs at the end of Lakewood Drive, covering recreational land. (FEMA, Town of Orchard Park, 1982).

In the Village of Orchard Park, there is a large tract of homes located between Forest Drive and Highland Avenue at the end of Woodview Drive on Smokes Creek Northwest Branch which experiences flooding. Many of these homes are well within floodplains, sitting in low-lying areas. Ice jams, which aggravate flood problems, have occurred at both Forest Drive and Highland Avenue culverts. The spillway at Freeman Road fails to handle large storm flows. The water foes around the spillway and flows over Freeman Road but does not inundate any houses. The spillway at Green Lake also has problems handling large flows. The water goes around the side of the lake and floods several houses at the end of Woodland Drive. (FIA, Village of Orchard Park, 1981).

In the City of Tonawanda, Flooding along the Niagara River is caused by the wind upset-effect from high westerly or southwesterly winds moving across Lake Erie, and large ice jams. Due to the flat slopes of the stream, the effect of high water-surface elevations on the Niagara River extends through the City of Tonawanda and Town of Grand Island. Serious flooding from the Niagara River occurred in March 1955, when a combination of high water and an ice jam caused extensive damage (The Buffalo Evening News, 1955). In the Town of Grand Island, the most notable flooding occurred near Ferry Village and on Baseline Road between East River Road and Hutch Road. In the City of Tonawanda,

flooding was near the mouth of Tonawanda Creek was flooded, forcing the closing of an industrial plant.

In the Town of Tonawanda, low-lying areas have been subject to frequent and great depths of flooding. Flood hazards have been lessened since the construction of a diversion channel from Ellicott Creek to Tonawanda Creek, which was constructed in the summer of 1965 and is located upstream of Niagara Falls Boulevard. Only minor damages have been sustained within Ellicott Creek. A storm of record occurred in March 1960, inundating parts of the Town. Other significant storms occurred in March 1916, January 1929, March 1936, June 1937, March 1940, March 1954, March 1956, January 1959 and March 1963. The storm event of March 1960 had a peak discharge associated with approximately a 5-percent-annual-chance flood. The storm event of March 1936 was estimated to be a 2-percent-annual-chance flood. (FIA, Town of Tonawanda, 1981).

In the Town of Wales, flooding occurs as a result of discharges in excess of channel capacity, restrictive bridges and ice jams. However, flood damages have been minor because of hydraulic characteristics of the channels and limited development of the floodplains. (USHUD, Town of Wales, 1979).

In the Village of Williamsville, low-lying areas have been subject to frequent flooding in late winter or early spring, caused by melting snow combined with moderate amounts of rainfall. (FEMA, Village of Williamsville, 1981).

2.4 Flood Protection Measures

In August 1986, Section 65.10 of the NFIP Regulations was published, outlining criteria and documentation needed for a levee or flood control structure to be shown on the FIRM as accredited and providing protection from the 1-percent-annual-chance flood. These include general elevation requirements, design and stability requirements, operations plans, maintenance plans and certification, among other criteria. There are two flood control structures within Erie County that currently have flood hazard data republished from the previous effective FIRM. The flood control structures are along Cayuga Creek and Ellicott Creek.

Within the Villages of Depew and Lancaster, and the Towns of Amherst and Cheektowaga, there one or more levees that have not been demonstrated by the community or levee owner(s) to meet the requirements of 44 CFR Part 65.10 of the NFIP regulations as it relates to the levees' capacity to provide 1-percent-annual-chance flood protection. Please refer to the Notice to Flood Insurance Study Users page at the front of this FIS report for more information.

In the Village of Akron, a concrete overflow dam has been constructed in Akron Falls Park at Parkview Drive. However, its presence is more for recreational purposes than for flood control. No other flood protection measures have been undertaken that would affect flooding on Murder Creek within the Village. (FIA, Village of Akron, 1980).

In the Town of Alden, no structural flood protection measures exist. However, a town ordinance passed in 1973 defines the floodplains and controls any encroachment thereon. No commercial or residential development is permitted in the floodplain. (FEMA, Town of Alden, 1991).

In the Town of Amherst, various flood protection measures have been taken to reduce future flood damage. In 1900, the State of New York cleared the channels of Gott Creek, Ransom Creek and Black Creek. The channels of Ransom Creek and Black Creek were again cleared in the 1950s. In 1932, the Town made channel improvements consisting of cleaning, deepening and widening Ellicott Creek upstream of the Williamsville corporate limits for a distance of approximately 2,800 feet. In 1958 and 1959, the USACE cleared and snagged a six-mile portion of Ellicott Creek between Sheridan Drive and a point approximately 2,700 feet downstream of Sweet Home Road. In 1965, Erie County completed construction of a diversion channel in Ellicott Creek Park in the Town of Tonawanda from Ellicott Creek to Tonawanda Creek. Although the improvement was not constructed in the Town, the diversion channel reduces flooding with the Town of Amherst. The USACE has constructed diversion channels along Ellicott Creek through Amherst and has completed major improvements to the stream channel. The Town of Amherst has also completed channel improvements to Gott Creek within the Town. Non-structural flood protection measures have also been used to reduce the risk of flood damage within the Town. (FEMA, Town of Amherst, 1992).

In the Town of Aurora, the dam at West Falls had been reconstructed after the flood of September 1967. The new configuration of the dam is meant to prevent similar consequences as the September 1967 flood. (USHUD, Town of Aurora, 1978).

In the Town of Boston, there are two small dams along Eighteenmile Creek; however, they do not afford protection from sizeable flooding because the water either passes over or around these structures. (FIA, Town of Boston, 1981).

In the City of Buffalo, most of the shoreline along Niagara River and Lake Erie is protected by breakwaters. The outer harbor breakwater protects Buffalo Harbor by alleviating the severity of flooding on Lake Erie. The other breakwater, which is further north and parallels the lake's eastern shore, separates Black Rock Canal from the Niagara River. Parts of Buffalo River and Cazenovia Creek are manmade channels that are able to convey the 1-percent-annual-chance flood discharge. Along many portions of these two waterways, the side walls of the channel are concrete-lined so as to reduce water-surface elevations by increasing water velocities. The Buffalo River channel has also been dredged from the river's mouth to the CONRAIL bridge. A stretch of slope-walled sheet piles were constructed to deflect ice along Cazenovia Creek. The City of Buffalo also maintains and operates an amphibious vehicle to break up ice jams. The city has constructed levees and excavated and widened the creek channel to reduce flooding near the Cazenovia Street bridge and in Cazenovia Park. The levees that exist in the City of Buffalo do not meet FEMA specifications for providing protection from the 1-percent-annual-chance flood event. (FEMA, All Jurisdictions, 2008; City of Buffalo, 1999).

In the Town of Cheektowaga, zoning ordinances and building codes have been established by the Town to restrict development within the floodplains of Cayuga Creek and Ellicott Creek. Additionally, Slate Bottom Creek has been relocated, widened and deepened to allow for increased discharge due to extensive development in the area bordered by French Road, Lossen Road and Conrail. Scajaquada Creek and portions of its tributaries have been improved to provide additional protection of the development within their respective floodplains. There are flood protections structures located along the left and right banks of

Scajaquada Creek within the Town, as well as a T-wall flood protection structure located on Cayuga Creek near Union Road. (FEMA, Town of Cheektowaga, 1984).

In the Village of Depew, the Scajaquada Creek channel between George Urban Boulevard and Forestview Drive was cleaned and widened in 1975. In 1949 the USACE constructed a flood control project along Cayuga Creek, partially within the Village. It included channel enlargement and straightening, construction of an earthen berm, elevating the Broadway Street bridge and miscellaneous storm sewer alterations. This project was designed to pass 18,000 cubic feet per second (cfs) of floodwaters, as was experienced in the 1937 flood. Additionally, the Village of Depew has implemented floodplain zoning in new development areas. (FIA, Village of Depew, 1981).

In the Village of East Aurora, a dam exists at Mill Road along Cazenovia Creek East Branch. (FEMA, Village of East Aurora, 2002).

In the Town of Elma, the U.S. Soil Conservation Service (SCS) constructed bank protection at a number of bends along Buffalo Creek to reduce erosion. In the summer of 1963, Erie County excavated a portion of the channel of Buffalo Creek from 300 feet upstream of Winspear Road to 1,100 feet upstream of Winspear Road. The channel was designed to concentrate the flow, thereby reducing ice formation at this location. Additionally, the Town of Elma has non-structural flood protection measures in place that consist of town ordinances restricting development within the floodplain. (FEMA, Town of Elma, 1998).

In the Village of Gowanda, a number of flood protection projects were completed between 1940 and 1973. On Cattaraugus Creek a section of the power dam upstream of the railroad was removed in 1953. Dredging of a new channel between the Erie Railroad and Main Street bridges was performed by Gowanda County in 1956. Gowanda had a retaining wall constructed in 1957 at the intersection of Commercial Street and South Water Street. There was also a channel cut for Cattaraugus Creek downstream of Thatcher Brook in 1958. A new Main Street bridge was constructed by New York State in 1962. In 1964 the Village and New York State had bank protection constructed between the Main Street and Aldrich Street bridges. Shortly after the June 1940 flood, improvements were made to Thatcher Brook. The Johnson and Chapel Street bridges were raised and the channel was cleaned out. North of Hill Street there is a weir which allows debris carried by high velocities to settle out and prevent jamming at the bridges downstream. At various location concrete and sheet pile retaining walls have been constructed for bank protection. The settling basin north of Hill Street, the channel, and bridge openings are cleaned our periodically as needed under a maintenance program. After Tropical Storm Agnes in 1972, the Soil Conservation Service did flood damage repair and improvements in the channels of Thatcher Brook and Grannis Creek.

In the Town of Hamburg, retention basins have been installed to retain excessive storm drainage in some areas of town. This helps reduce the peak flooding during storms and to compensate the increase in runoff caused by development. Additionally, the Town has a zoning ordinance in place restricting development in the floodplain. (FEMA, Town of Hamburg, 2001).

In the Village of Hamburg, the channel of Berricks Creek has been straightened and made trapezoidal in shape, and the banks have been lined with short grass. In addition, an

underground tile pipe was added to carry the low flows. The floodplain is very narrow as a result of these improvements; only a few houses are adjacent to the streams. (FEMA, Village of Hamburg, 1981).

In the City of Lackawanna, Smokes Creek and Smokes Creek South Branch were improved in 1965 by the USACE. The project plan was designed to provide a non-damaging channel capacity of 2,500 cfs in the channels upstream of the confluence and 5,000 cfs on the main stem at the confluence. Additionally, zoning regulations restricting construction in the floodplain have been in effect for years. (FIA, City of Lackawanna, 1980).

In the Town of Lancaster, improvement has been made to the channel of Scajaquada Creek thereby increasing channel capacity and minimizing flooding along the source. The channel of Scajaquada Creek has been increased in size along the entire 3.6-mile length through projects of the Works Progress Administration and the Town of Cheektowaga. Portions of Slate Bottom Creek North Branch and Slate Bottom Creek were cleaned by the Town in 1980. No work has been performed along Plum Bottom Creek to alleviate flooding from this stream within the Town of Lancaster. (FEMA, Town of Lancaster, 2001).

In the Village of Lancaster, various projects have been undertaken to reduce flood damages along Cayuga Creek. In 1942 and 1949, channel improvements were completed in the villages of Lancaster and Depew. In 1951, construction of flood control structures was completed in the Village. In 1946, the SCS started a program of farmland treatment to reduce runoff and erosion. The conservation practices instituted by this program are still being used by many landowners. Elsewhere in the Village, channel improvements and cleaning of existing culverts have aided in reducing flooding. (USHUD, Village of Lancaster, 1979).

In the Town of Orchard Park, zoning ordinances are in place to restrict construction within the floodplain. Within the Town, there is only one structure that reduces flooding, the Quaker Lake spillway, located south of Big Tree Road on Smokes Creek Northeast Branch. It provides a limited amount of protection downstream of the spillway by reducing flood flows. (FEMA, Town of Orchard Park, 1982).

In the Village of Orchard Park, zoning ordinances are in place that restricts construction within the floodplain. Within the Village, the spillways at Freeman Road and Green Lake offer a minimum amount of flood protection. They provide for some hydraulic retention and thus reduce the flow downstream of the spillways. These structures are not effective in containing the 1-percent-annual-chance or 0.2-percent-annual-chance flows. (FIA, Village of Orchard Park, 1981).

In the Town of Tonawanda, construction of a diversion channel in Ellicott Creek Park from Ellicott Creek to Tonawanda Creek was completed in 1965. This channel has lessened the flood hazards from Ellicott Creek within the Town. (FIA, Town of Tonawanda, 1981).

In the Town of Wales, a reservoir on Buffalo Creek has been studied as a possible flood protection measure; however the reservoir was found to not be economically feasible at the time.

In the Town of West Seneca, a floodplain management ordinance is in effect that restricts construction within the floodprone areas. A flood control structure was built along the

Buffalo River south of Casimer Street; however it does not provide protection against the 1-percent-annual-chance flood event. (FEMA, Town of West Seneca, 1992).

In the Village of Williamsville, several improvements since 1929 to the channel have been made, however, no physical work has been done to Ellicott Creek to protect the village from flooding. The 1929 improvements consisted of: a new channel, 1,100 feet long with a bottom width of 70 feet; cleaning, deepening, and widening of the existing channel upstream of the new channel for a distance of 1,400 feet; and the construction of a small gate-controlled dam at the lower end of the new channel. These improvements were made within the village, just upstream of Williamsville (Glen) Falls.

The study area of Erie County is located within the effective range of the Weather Surveillance Radar operating continuously at the Environmental Science Services Administration Weather Bureau Station at the Buffalo Airport. This equipment provides for early detection and plotting of heavy precipitation and makes possible immediate radio and television broadcasts of information concerning the predicted path and amount of rainfall from a given storm.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this FIS. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1-percent chance of annual exceedance) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the county at the time of completion of this FIS. Maps and flood elevations will be amended periodically to reflect future changes.

Note: Within the Villages of Depew and Lancaster, and the Towns of Amherst and Cheektowaga, there are one or more levees that have not been demonstrated by the community or levee owner(s) to meet the requirements of 44 CFR Part 65.10 of the NFIP regulations as it relates to the levees' capacity to provide 1-percent annual-chance flood protection. Please refer to the Notice to Flood Insurance Study Users page at the front of this FIS report for more information.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for the flooding sources studied in detail affecting the county.

Precountywide Analyses

For each selected community within Erie County that has a previously printed FIS report, the hydrologic analyses described in those reports have been compiled and are summarized below.

Elevation-frequency relationships for Lake Erie were obtained from a study conducted by the USACE in 1988 (USACE, 1988). This study was a revision on the original 1977 report (USACE, 1977). In the revised study, gage information from 13 continuously reporting gage stations were used:

- Buffalo, Gage No. 3020, with record from 1990 – 1986;
- Barcelona, Gage No. 3032, with record from 1961 – 1986;
- Erie, Gage No. 3038, with record from 1959 – 1986;
- Cleveland, Gage No. 3063, with record from 1904 – 1986;
- Marblehead, Gage No. 3079, with record from 1960 – 1986;
- Toledo, Gage No. 3085, with record from 1941 – 1986;
- Fermi, Gage No. 3090, with record from 1964 – 1986;
- Gibraltar, Gage No. 4020, with record from 1941 – 1986;
- Kingsville (Canada), Gage No. 02GH070, with record from 1962 – 1986;
- Erieau (Canada), Gage No. 02FG0002, with record from 1957 – 1986;
- Port Stanley (Canada), Gage No. 02GC027, with record from 1926 – 1986;
- Port Dover (Canada), Gage No. 02GC028, with record from 1958 – 1986;
- Port Colbourne (Canada), Gage No. 02HA017, with record from 1911 – 1986.

For the updated Lake Erie study, both the log-Pearson Type III and Pearson Type III distributions were investigated. Comparison of the two methods resulted in nearly identical skew values, and logarithmic transformation was not needed, therefore a Pearson Type III frequency distribution was used. A skew value of 0.2 was utilized for Lake Erie. Flood levels for open-coast Lake Erie were computed for each station taking into consideration years of gage record, physical environment and shoreline configuration. In the USACE study, stillwater elevations for Lake Erie within Erie County were divided into five sections: Section A, Section B, Section C, Section D and Section E. The stillwater elevations for these sections are shown in Table 7, "Summary of Stillwater Elevations".

TABLE 7 - SUMMARY OF STILLWATER ELEVATIONS

FLOODING SOURCE AND LOCATION	STILLWATER ELEVATION (feet NAVD)			
	10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
LAKE ERIE				
Section A	579.2	580.6	581.1	582.2
Section B	578.6	580.0	580.4	581.5
Section C	578.1	579.4	579.7	580.8
Section D	577.6	578.9	579.1	580.2
Section E	577.1	578.4	578.6	579.7

For streams studied by detailed methods in Erie County, several different methodologies were used for hydrologic analyses.

For Berricks Creek in the Town of Hamburg and Village of Hamburg, discharges for the reach downstream of the New York State Thruway were determined using the method presented in the New York State (NYS) Water Resources Commission Study (Erie and Niagara Counties Regional Planning Board, 1968) establishes regional curves developed from stream gage data and correlate drainage area to stream flow.

For Berricks Creek upstream of the New York State Thruway, peak discharges were determined using the Rational Method, where Q (flow) = C (Land use variable) * I (precipitation intensity) * A (drainage area) (American Society of Civil Engineers, 1889).

For Big Sister Creek in the Town of Evans and Village of Angola, peak discharges were determined utilizing USGS Water-Supply Paper 1677 (USGS, 1965), which uses the following equation to correlate discharges at the mouth of a stream to discharges at selected locations upstream:

$$(Q_{site} / Q_{mouth}) = (D_{site} / D_{mouth})^{a},$$

where a is an exponent defined by USGS. A total drainage area computed at the mouth of Big Sister Creek was 49.2 square miles. Discharges were also calculated in this way at a point just upstream on an unnamed tributary in the Town of Evans.

For Black Creek in the towns of Amherst and Clarence, a basin study for the Black Creek / Ransom Creek watershed showed that areas adjacent to Black Creek can experience flooding from its own runoff and overflow from Tonawanda Creek. Peak discharges were calculated for both scenarios; Black Creek was studied independently using a regional frequency analysis developed by the USACE (USACE, January 1990), and the Tonawanda Creek overflow was determined using a HEC-1 balanced hydrograph (USACE, December 1988).

For Buffalo Creek in the Town of Marilla, a regional drainage area / mean annual discharge curve was established utilizing the Water Resources Council (WRC) Bulletin 17 (WRC, 1976), by using gage data from a gage located on Buffalo Creek at Gardenville, New York, with a drainage area of 145 square miles and records dating to 1939. Additionally, information taken from a gage located at Wales Hollow, New York along Buffalo Creek was weighted against the original curve to develop an analysis more representative of the drainage area in question. For Buffalo Creek in the towns of Wales and West Seneca, peak discharges were determined in accordance with Water Resources Investigations (WRI) 79-83 (USGS, 1979), for ungaged sites on gaged streams, on the Buffalo River. For the western region of New York, the following equation is used:

$$Q = K(DA)^{x} (St + 10)^{-y},$$

Where Q is the stream discharge; DA is the drainage area; St is the percent of total drainage area stored in lakes, ponds and swamps; and K, x and y are variables of the frequency. For Buffalo Creek, a value of 49,900 was used for K; a value of 0.733 was used for x; and a value of 2.03 was used for y. Calculated peak discharges were then adjusted using regression equations calculated at the gage station at Gardenville.

For the Buffalo River, within the City of Buffalo and Town of West Seneca, peak discharges were determined using the procedures and regression equations outlined in the WRI 79-83 for ungaged sites on gaged streams, using the equation above for western New York.

For Buttermilk Falls Creek in the Town of Hamburg, peak discharges were calculated using the methods outlined in the NYS Water Resources Commission study described above.

For Cattaraugus Creek in the Village of Gowanda, peak discharges were calculated using a standard log-Pearson Type III method, as outlined by the Water Resources Council (WRC, 1967).

For Cayuga Creek in the Village of Alden, the peak discharge-frequency relationships of nine USGS gaging stations on Cattaraugus Creek, Eighteenmile Creek, Smoke Creek, Buffalo Creek, Little Buffalo Creek, Cayuga Creek, Cazenovia Creek and Scajaquada Creek were determined using Water Supply Paper 1677 (USGS, 1965) and WRC Bulletin 17B (USGS, September 1981), using a standard log-Pearson Type III method, as recommended by the Water Resources Council. The length of record for these stations ranges from 11 to 35 years, with the longest record along Cayuga Creek near Lancaster. A set of regional flood frequency curves was then established for Cayuga Creek by correlating peak discharge and drainage area information at this gaging station.

For Cayuga Creek in the Village of Depew and towns of Lancaster and Marilla, peak discharges were obtained from a USACE, Buffalo District report as part of an area water resources management study (USACE, March 1978 and March 1976). In the Town of West Seneca, peak discharges for Cayuga Creek were determined using WRI 79-83.

For Cazenovia Creek in the Town of Aurora, discharge-frequency relationships were established using five USGS gaging stations, including Cayuga Creek near Lancaster, Cazenovia Creek at Ebenezer and Buffalo Creek at Gardenville. Flood flow frequencies were determined by the USACE, Buffalo District using Water Resources Bulletin 17. In the City of Buffalo, a similar analysis was done; however this one included nine USGS gaging stations and performed a log-Pearson Type III analysis. The regional equations determined in that study were also extended to cover watershed with drainage areas of less than 15 square miles. In the Town of West Seneca, Cazenovia Creek was studied using WRI 79-83 as described above.

For Cazenovia Creek East Branch in the towns of Aurora and Holland; and Cazenovia Creek West Branch in the towns of Aurora and Colden, discharge-frequency relationships were established using five USGS gaging stations, including Cayuga Creek near Lancaster, Cazenovia Creek at Ebenezer and Buffalo Creek at Gardenville. Flood flow frequencies were determined by the USACE, Buffalo District using Water Resources Bulletin 17.

For Clear Creek in the Town of Collins, a flood-frequency curve was developed using the USGS Publication "Magnitude and Frequency of Floods in the United States, Part 4" (USGS, undated). Discharges for the 1- and 0.2-percent-annual-chance floods were determined by straight-line extrapolation of the frequency curve above a frequency of 2%. Discharges were computed at the downstream end of the study reach (drainage area 28.8 square miles), for the 10-, 2-, 1- and 0.2-percent-annual-chance frequencies. At points

upstream from the downstream end of the study reach, where tributaries entered the stream, discharges were obtained using the following formula:

$$Q_{site} = Q_{mile}\ (7.08)\ (D_{site}/D_{mile\ 7.08})^{a},$$

where Q = discharge, D = drainage area, a = exponent defined by USGS Water-Supply Paper 1677.

For Delaware Creek in the Town of Evans, peak discharges were determined using regional regression equations. Although Delaware Creek has an active gaging station, at the time of study it was determined the period of record was too short and that much of the data collected was during a drought in the 1960s.

For Ebenezer Brook in the Town of West Seneca, peak discharges were determined using WRI 79-83 as described above.

For Eighteenmile Creek in the Town of Boston, peak discharges were determined by USGS using a log-Pearson Type III analysis (USGS, unpublished) to correlate stream flow with storm events. In the Town of Hamburg, peak discharges for Eighteenmile Creek, Eighteenmile Creek North Branch and Eighteenmile Creek South Branch were determined using drainage area proportioning and a coefficient determined by McPhee, Smith, Rosenstein Engineers (Johnstone and Cross, 1949).

For Ellicott Creek in the Town of Alden, peak discharge-frequency relationships of six USGS gaging stations on Ellicott Creek, Tonawanda Creek and Little Tonawanda Creek were established using a log-Pearson Type III analysis. The length of record ranged from 10 to 61 years. A set of regional frequency curves was established and peak discharges were derived from them. In the towns of Lancaster and Tonawanda, peak discharges for Ellicott Creek were obtained from a USACE report (USACE, Revised April 1978). A Beard-type statistical discharge-frequency curve was computed from the annual peak discharges of the Williamsville gage on Ellicott Creek at Wehrle Drive. To compensate for the shore period of record (1955-1968), Beard-type generalized frequency curves were developed using peak discharge information from three western New York gaging stations with basin characteristics similar to Ellicott Creek: Canaseraga Creek near Dansville, New York; Little Tonawanda Creek at Linden, New York and Tonawanda Creek at Alabama, New York.

For the Ellicott Creek diversions channels – North Diversion Channel, Pfohl Park Diversion Channel and Upper Diversion Channel, located in the Town of Amherst, hydrologic data was taken from a design report prepared by the USACE, Buffalo District in conjunction with the Ellicott Creek flood control project (USACE, April 1978). The original discharge-frequency curves for Ellicott Creek were developed in 1968, using regional regression equations based on discharge records and watershed characteristics of three western New York streams in addition to Ellicott Creek. These curves were later verified through a new regional analysis. The discharges presented in the first revision were calculated with an adjustment for expected probability; values were also adjusted by five percent to account for future urbanization in the watershed. Expected probability is a USGS Bulletin 17B (USGS, September 1981) option, adopted as standard procedure by the USACE for flood control design, that increases the 1- and 0.2-percent-annual-chance peak discharges by 10 and 20 percent, respectively.

For Fern Brook in the Town of Evans, peak discharges were developed using information presented by the Erie-Niagara Planning Board (Erie-Niagara Basin Regional Water Resources, 1968). Discharges of the 1- and 0.2-percent-annual-chance flood events were obtained by straight-line extrapolation.

For Foster Brook in the Town of Hamburg, USGS regional regression equations were used to determine peak discharges for the floods of selected recurrence intervals USGS, 1991).

For Gott Creek in the Town of Amherst, hydrologic data was obtained from a USACE study for the Tonawanda Creek watershed (USACE, 1978). This report included a regression analysis of gaged information on hydrologically similar drainage basins within the Tonawanda Creek watershed. The analysis followed a standard log-Pearson Type III method as outlined by the Water Resources Council (USGS, Revised September 1981) and USACE HEC-46 (USACE, 1972). The USACE publication established separate peak discharges, standard deviations and skew coefficient equations for portions of Tonawanda Creek and its tributaries. In the Town of Clarence, peak discharges for Gott Creek and Gott Creek Tributary were calculated using a USACE report on water resources and land management for the Buffalo Metropolitan area (USACE, October 1990).

For Grannis Creek in the Village of Gowanda, flood-frequency discharges were developed using a rainfall-runoff relationship determined by the SCS (SCS, Revised 1973). The rainfall frequency was developed by the National Weather Service and extends through the 1-percent-annual-chance interval. The 0.2-percent-annual-chance interval was determined by straight-line extrapolation.

For Gun Creek in the Town of Grand Island, peak flows were determined using the BPR Publication "Peak Rates of Runoff from Small Watersheds" (U.S. Department of Commerce, 1961).

For Hampton Brook in the Town of Hamburg, peak discharges were determined using the NYS Water Resources Commission study (Erie and Niagara Counties Regional Planning Board, 1968) mentioned above, in which regional curves were developed from stream gage data correlating drainage area to stream flow.

For Hosmer Brook in the Town of Sardinia, hydrologic data was developed for two reaches. Peak discharges were calculated using the regression equations of WRI 90-4197 (USGS, 1991). Watershed characteristics including contributing drainage area (in square miles), main channel slope (in feet per mile) and storage area (percent) were developed using USGS Quadrangle maps and the guidelines of the National Handbook of Recommended Methods for Water Data Acquisition (USGS, 1977).

For Hunter Creek in the Town of Wales, peak discharge-frequency relationships for floods of the selected recurrence intervals were determined using a weighted gage analysis (weighted against the regional curve) using USGS gage data at Colegrave, New York. Drainage areas were determined at selected locations along the stream, and peak discharges were calculated using a generalized skew coefficient of -0.10 and the mean annual discharge and standard deviation calculated in the regional analysis.

For Ledge Creek in the Town of Newstead, two regional methods were used to compute peak discharges. A USGS analysis utilizing gage data throughout New York State to

formulate regression equations for use on ungaged streams (USGS, 1979), which utilized the parameters of drainage area, channel slope and impervious area in the regression equations. Peak discharges were also computed using an SCS method (USGS, January 1975).

For Little Buffalo Creek in the towns of Elma and Lancaster, peak discharges were calculated using the regression equations of WRI 90-4197 (USGS, 1991) and WRC Bulletin "Guidelines for Determining Flood Flow Frequency" (USGS, September 1981). For Hydrologic Region No. 6 of New York State, the following equation was used:

$$Q = K(DA)^{w} (SL)^{x} (ST+1)^{y} (P-20)^{z},$$

Where Q is stream discharge; DA is drainage area (in square miles); SL is main channel slope (in feet per mile); ST is basin storage (percent) and P is mean annual precipitation (in inches), and K, w, x, y and z are functions of the frequency. The following were used:

STORM EVENT	K	w	x	y	z
10-percent-annual-chance	16.2	0.869	0.334	-0.217	0.379
2-percent-annual-chance	22.1	0.869	0.374	-0.224	0.356
1-percent-annual-chance	24.1	0.870	0.385	-0.228	0.359
0.2-percent-annual-chance	27.5	0.872	0.406	-0.244	0.380

The peak discharges of Little Buffalo Creek calculated by the above regression equation and the peak discharges estimated as weighted peak discharges for USGS Gaging Station No. 04214980 at East Lancaster, New York, were used to adjust the peak discharges calculated by the regression equations at ungaged sites. For Little Buffalo Creek and Little Buffalo Creek Tributary in the Town of Marilla, discharge-frequency relationships were established using five USGS gaging stations, including Cayuga Creek near Lancaster, Cazenovia Creek at Ebenezer and Buffalo Creek at Gardenville. Flood flow frequencies were determined by the USACE, Buffalo District using Water Resources Bulletin 17.

For Little Sister Creek and Little Sister Creek Tributary 2 in the Town of Evans, peak discharges were developed using information presented by the Erie-Niagara Planning Board (Erie and Niagara Counties Regional Planning Board, 1968). Discharges of the 1- and 0.2-percent-annual-chance floods were obtained by straight line extrapolation.

For Muddy Creek in the Town of Evans, peak discharges were determined using a flood-frequency curve established in the USGS Water-Supply Paper 1677 (USGS, 1965).

For Murder Creek in the Village of Akron, peak discharges were obtained from a USACE report on flood management in the Tonawanda Creek watershed (USACE, 1978). The study included a regression analysis of gaged data from hydrologically similar drainage basins within the watershed. A standard log-Pearson Type III analysis was performed in accordance with WRC Bulletin No. 17 and USACE publication on peak discharges, standard deviation and skew coefficients for different reaches and selected tributaries of Tonawanda Creek. For Murder Creek in the Town of Newstead, a log-Pearson Type III analysis was also performed using gage data obtained from USGS Gage No. 04217700 at Pembroke, New York.

For Pike Creek in the Town of Evans, peak discharges were developed using information presented by the Erie-Niagara Planning Board (Erie and Niagara Counties Regional Planning Board, 1968). Discharges of the 1- and 0.2-percent-annual-chance floods were obtained by straight line extrapolation.

For Plum Bottom Creek, Plum Bottom Creek North Branch and Plum Bottom Creek South Branch, located in the Town of Lancaster, hydrologic data was obtained from a USACE report on flood management in the Cayuga Creek watershed (USACE, March 1978). The study included a regional analysis of gaged information on the Buffalo River, Cazenovia Creek and Cayuga Creek. The analysis followed the standard log-Pearson Type III method (WRC, March 1976) and the HEC-1 computer program (USACE, October 1976). Discharges for all three streams were determined from the means annual discharge-standard deviation-drainage area and discharge-drainage area frequency relationships for Cayuga Creek. For the portion of Plum Bottom Creek, having a drainage area of less than one square mile, a standard log-Pearson Type III analysis and HEC-1 model were utilized. For the portion of Plum Bottom Creek located in the Village of Lancaster, a flood-flow frequency analysis performed by the USACE, which utilized a log-Pearson Type III analysis on gage data available from five gaging stations on streams within the drainage basin.

For Pond Brook in the Town of Elma, peak discharges were calculated using the regression equations of WRI 90-4197 (USGS, 1991) and WRC Bulletin "Guidelines for Determining Flood Flow Frequency" (USGS, September 1981). For Hydrologic Region No. 6 of New York State, the following equation was used:

$$Q = K(DA)^{w} (SL)^{x} (ST+1)^{y} (P-20)^{z},$$

Where Q is stream discharge; DA is drainage area (in square miles); SL is main channel slope (in feet per mile); ST is basin storage (percent) and P is mean annual precipitation (in inches), and K, w, x, y and z are functions of the frequency. The following values were used:

STORM EVENT	K	w	x	y	z
10-percent-annual-chance	16.2	0.869	0.334	-0.217	0.379
2-percent-annual-chance	22.1	0.869	0.374	-0.224	0.356
1-percent-annual-chance	24.1	0.870	0.385	-0.228	0.359
0.2-percent-annual-chance	27.5	0.872	0.406	-0.244	0.380

For the March 5, 1996 revised FIS for the Town of Clarence, New York, peak discharges were calculated for Ransom Creek using the USACE publication Buffalo Metropolitan Area, New York Water Resources Management Final Report on Water Resources and Related Land Management – Supporting Documentation.

For Reisch Creek in the Town of Evans, USGS regression equations were utilized to determine peak discharges (USGS, 1991).

For Rush Creek in the Town of Hamburg, peak discharges were determined using the NYS Water Resources Commission study mentioned above, in which regional curves were developed from stream gage data correlating drainage area to stream flow.

For Scajaquada Creek and Scajaquada Creek Tributary T-1 in the town of Cheektowaga, peak discharges were determined using a standard log-Pearson Type III analysis. In the Village of Depew and Town of Lancaster, peak discharges for Scajaquada Creek and Scajaquada Creek North Branch were determined using a USACE report (USACE, March 1976). In this report, a Beard-type statistical discharge-frequency curve was computed from the annual maximum instantaneous discharge at the Pine Ridge gage (USGS No. 04216200) on the main stem of Scajaquada Creek. Snyder's method was utilized to determine the full effects of urbanization (Snyder, 1958).

For Slate Bottom Creek and Slate Bottom Creek North Branch in the towns of Elma and Lancaster, hydrologic data was obtained from the USACE report on flood management in the Cayuga Creek watershed (USACE, March 1978). In that report, a regional analysis of gaged information on the Buffalo River, Cazenovia Creek and Cayuga Creek was performed. The analysis followed the standard log-Pearson Type III method (WRC, 1976) and used HEC-1 computer models (USACE, October 1976). Partial duration adjustments were made for the Cayuga Creek gage.

For Smokes Creek in the City of Lackawanna and Town of West Seneca, Smokes Creek Northeast Branch and Smokes Creek Northwest Branch in the Town of Orchard Park, Smokes Creek South Branch in the Towns of Hamburg and Orchard Park, the City of Lackawanna and the Village of Orchard Park, peak discharges were established using gage data from nine USGS gages along Cattaraugus Creek, Eighteenmile Creek, Smoke Creek, Little Buffalo Creek, Cayuga Creek, Cazenovia Creek and Scajaquada Creek to perform a log-Pearson Type III analysis (USGS, 1967 and 1965). A set of regional flood-frequency curves was determined by correlating peak discharge and drainage area information from the gaging stations. The peak discharges estimated from the extended regional curves check closely with the peak discharges estimated with the Bureau of Public Roads method (U.S. Department of Commerce, 1963). This analysis was also used to determine peak discharges for Smokes Creek South Branch South Tributary in the town of Orchard Park.

For Smokes Creek South Branch Tributary 1 in the Town of Hamburg, peak discharges were determined using the rational method (ASCE, 1889). This method is a function of the drainage area, the runoff coefficient, and the mean rainfall intensity.

For the 1982 FIS for the Town of Orchard Park, peak discharges for Smokes Creek South Branch Tributary 2 were obtained by use of the method presented in the FIS for the City of Lackawanna, New York. In the study, gaged streams were analyzed using the standard log-Pearson Type III method to determine the peak discharge relationships. Regional flood frequency curves were then developed which relate peak discharges to the drainage areas of the studied streams. These curves can thus be used to determine the peak discharges for ungagged streams in the region by finding their drainage area. A summary of drainage area-peak discharge relations is presented in the Summary of Discharges table.

For Spicer Creek in the Town of Grand Island, stage-frequency relationships were obtained using information supplied by the USACE, Buffalo District. From the maximum annual

instantaneous peaks, statistical analyses were made for the gages using non-log Pearson Type III distribution.

For Spring Brook in the Town of Concord and Village of Springville, peak discharges were taken from a USACE Special Flood Hazard Evaluation Report (USACE, November 1984), in which a standard log-Pearson Type III analysis was performed as outlined in WRC Bulletin 17B (USGS, September 1981).

For Spring Creek in the Village of Lancaster, peak discharges were determined using procedures outline in WRC Bulletin 17 (WRC, March 1976).

For Tannery Brook in the Town of East Aurora, peak discharge-frequency relationships were determined using the SCS software TR-55 (USDA, 1975).

For Thatcher Brook in the Village of Gowanda, flood-frequency discharges were developed using a rainfall-runoff relationship determined by the SCS (SCS, Revised 1973). The rainfall frequency was developed by the National Weather Service and extends through the 1-percent-annual-chance interval. The 0.2-percent-annual-chance interval was determined by straight-line extrapolation.

For Tributary No. 1 to Niagara River - Tonawanda Channel in the Town of Grand Island, peak flows were determined using the BPR Publication "Peak Rates of Runoff from Small Watersheds". (U.S. Department of Commerce, 1961).

For Tonawanda Creek in the towns of Amherst and Clarence and the City of Tonawanda, the peak discharges were calculated using a regional frequency analysis and runoff models using HEC-1 which were developed by the USACE, Buffalo District for the Buffalo River / Lower Tonawanda Creek Study (USACE, January 1990).

For Tonawanda Creek in the Town of Grand Island and City of Tonawanda, statistical analyses of seven gages were made using a non-log Pearson Type III distribution (WRC, March 1976). Using a skew of 0.0 and standard deviation computed for each gage, stage elevations were computed for the selected recurrence intervals. Profiles for the Niagara River – Tonawanda Channel were established by connecting the respective stage elevations at the various gages, yielding these results:

Location	Distance*	Stage Elevations (Feet NAVD)				
		50%	10%	2%	1%	0.2%
At Woods Creek	26,500	565.6	566.8	567.5	567.7	567.2
At Gun Creek	45,200	567.0	568.2	568.9	569.1	569.6
At Spicer Creek	57,900	568.0	569.2	569.8	570.0	570.6
At Tributary 1	82,000	568.8	569.8	570.4	570.7	571.2

* Feet above Niagara Falls.

For Waterfalls Village Creek in the Town of Hamburg, peak discharges were determined using the NYS Water Resources Commission study mentioned above, in which regional curves were developed from stream gage data correlating drainage area to stream flow.

For Woods Creek, Woods Creek Tributary 1 and Woods Creek Tributary 3 in the Town of Grand Island, peak flows were determined using the BPR Publication "Peak Rates of Runoff from Small Watersheds" (U.S. Department of Commerce, 1961).

Initial Countywide FIS (September 26, 2008)

For revised portions of Cazenovia Creek within the City of Buffalo, Ellicott Creek within the Village of Williamsville, Spicer Creek within the Town of Grand Island, and Tonawanda Creek within the Town of Tonawanda, all discharges were calculated in accordance with the procedures outlined in the publication by USGS entitled "Nationwide Summary of U.S. Geological Survey Regional Regression Equations for Estimating Magnitude and Frequency of Floods for Ungaged Sites, 1993" also referred to as Water-Resources Investigations (WRI) Report 94-4002 (USGS, 1994).

Revised Countywide FIS [To Be Determined]

For the stream reaches listed in Table 3, all discharges for the streams mentioned above were calculated in accordance with the procedures outlined in the publication by USGS entitled "Nationwide Summary of U.S. Geological Survey Regional Regression Equations for Estimating Magnitude and Frequency of Floods for Ungaged Sites, 1993" also referred to as Water-Resources Investigations (WRI) Report 94-4002 (USGS, 1994).

Flow locations were selected at various points along the reaches of the stream. Locations were first selected based on prior documented FIS flow locations for prior studies of the drainage basin and on USGS gage locations. As needed, additional flow locations were added along the stream to provide a uniform drainage analysis of the study area.

Based on WRI 94-4002, some of the variables governing the peak stream flows for each of the flow locations are drainage area (DA), basin storage (ST), mean annual precipitation (MAP), main channel slope (SL), average main channel elevation (EL), basin shape index (SH), 2-hour/2-year rainfall intensity (RI2), basin development factor (BDF), and impervious surface percentage (IA). With the flow locations selected, the DA of the prior documented FIS and USGS locations were reviewed and utilized in this study. The DA for the additional flow locations were calculated based on the USGS 7 ½ minute quadrangle maps.

The ST is the percentage of the drainage area occupied by lakes and swamps. This was estimated based by visual inspection of USGS 7 ½ minute quadrangle maps and available New York orthophotography. The MAP was calculated based on the New York Mean Annual Precipitation 1961-1990 map (NOAA, Ret. 2007), which maps the variations in rainfall across western and central regions of New York.

The SL and EL were measured between points which are 10 percent and 85 percent of the main channel length upstream from the study site. These were measured based on the USGS 7 ½ minute quadrangle maps. The SH was calculated as the ratio of the square of main channel stream length upstream to DA. The channel length was measured based on the USGS 7 ½ minute quadrangle maps.

The RI2 was estimated from U.S. Weather Bureau (USWB) Technical Paper 40 (U.S. Department of Commerce, 1963), which maps the variations in rainfall across the country.

The BDF is the basin development factor, an index of the prevalence of the urban drainage improvements. Both the BDF and IA were estimated based on visual inspection of USGS 7 ½ minute quadrangle maps, available New York orthophotography, and field visits.

There are 12 USGS gages along the main stems of this study: five gages on Tonawanda Creek, three gages on Ellicott Creek, one gage on Cayuga Creek, one gage on Cazenovia Creek, one gage on Eighteenmile Creek, and one gage on Scajaquada Creek.

Information was available for all gage locations; however, only five (5) gages were utilized due to their close proximity to the study sites. These gages are as follows:

- USGS 04215000 near Lancaster NY (active) located on Cayuga Creek has 67 years of record;
- USGS 04215500 at Ebenezer NY (active) located on Cazenovia Creek has 66 years of record;
- USGS 04214200 at North Boston NY (discontinued) located on Eighteenmile Creek has 14 years of record;
- USGS 04218518 below Williamsville NY (active), combined with USGS 04218500 at Williamsville NY (discontinued), located on Ellicott Creek has 52 years of combined record. USGS 04218500 record is transferred to USGS 04218518 via the use of the 100-year NY Region 7 drainage area equation;
- USGS 04218000 at Rapids NY located on Tonawanda Creek with 44 years of record. Peak flows for water year 1936, 1945, 1950, and 1954 were interpolated via the use of a best curve-fit.

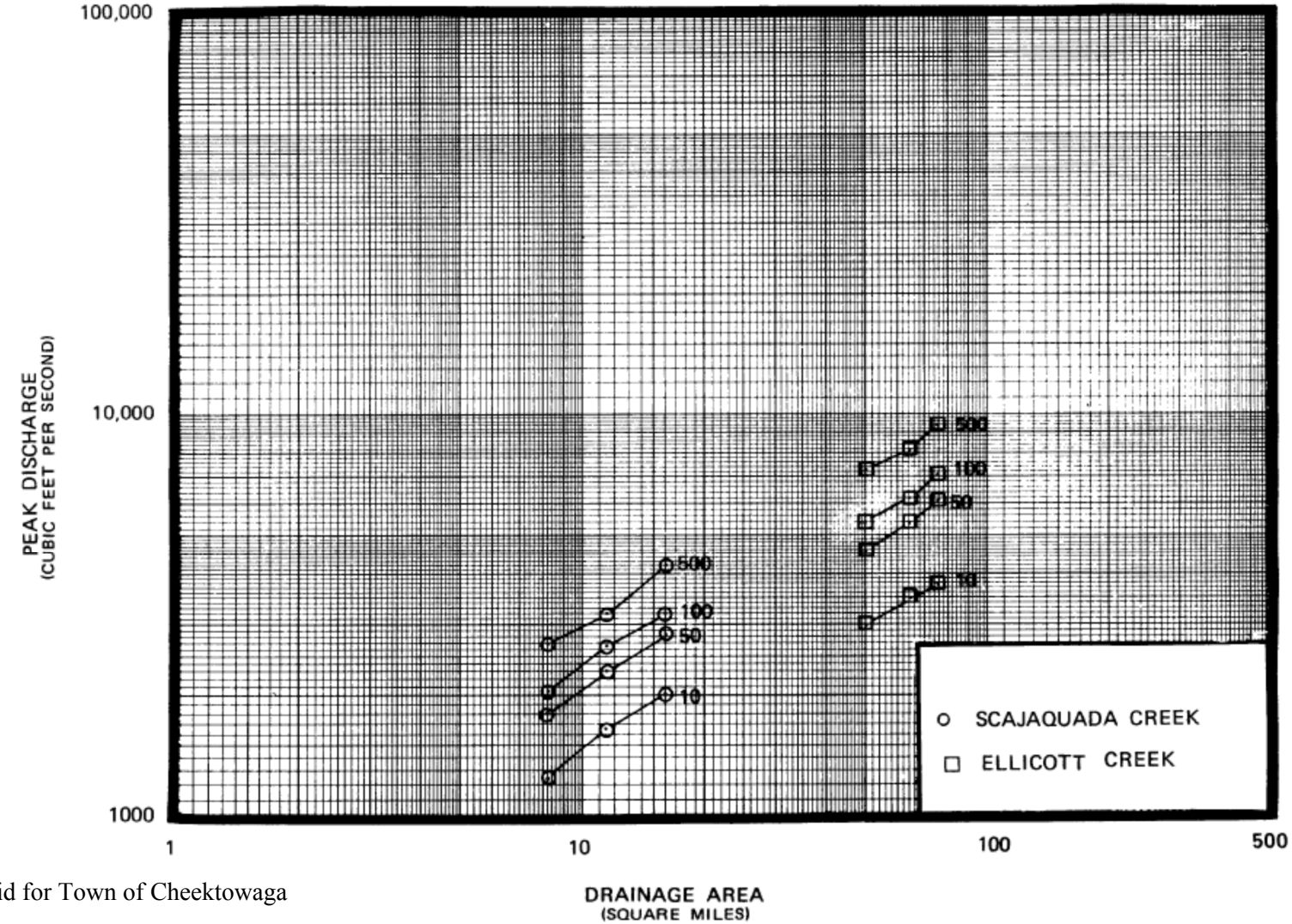
The historical annual peak streamflow data, current to year 2005, was downloaded from the USGS web site in the form of a WATSTORE file. Provisional data for water year 2006 was obtained directly from the USGS Ithaca, NY office. A PeakFQ analysis was run in accordance with the "User's Manual for Program PeakFQ, Annual Flood Frequency Analysis Using Bulletin 17B Guidelines" (USGS, 2006). The generalized skew coefficient and standard error values for each gage location where obtained from WRI 00-4022 (USGS, 2000). PeakFQ discharges for USGS 04214200 were obtained from USGS Special Investigations Report (SIR) 2006-5112 (USGS, 2006).

A regression analysis was then performed at each of the flow locations in accordance with WRI 94-4002 to calculate flood discharges. The regression analysis was performed utilizing the National Flood Frequency Program (NFF) (USGS, 2002) to calculate discharges for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood. This program employs the New York regional rural regressions equations as established in WRI 90-4197 (USGS, 1991). For urban settings, this program employs the nationwide urban equations as established in USGS Water-Supply Paper (WSP) 2207 (USGS, 1983).

The governing variables along with the PeakFQ discharges were inputted into the NFF program. At a gage location, the PeakFQ discharges were weighted against the rural regression analysis of that gage location. For each flow location within 50% of the drainage area upstream or downstream of a gage location, the calculated gage flow was weighted against the calculated rural regression analysis. For urbanized areas, these weighted values were inputted into the urban regression equations to account for added flows due to urban development. For flow locations outside of the 50% range of a gage

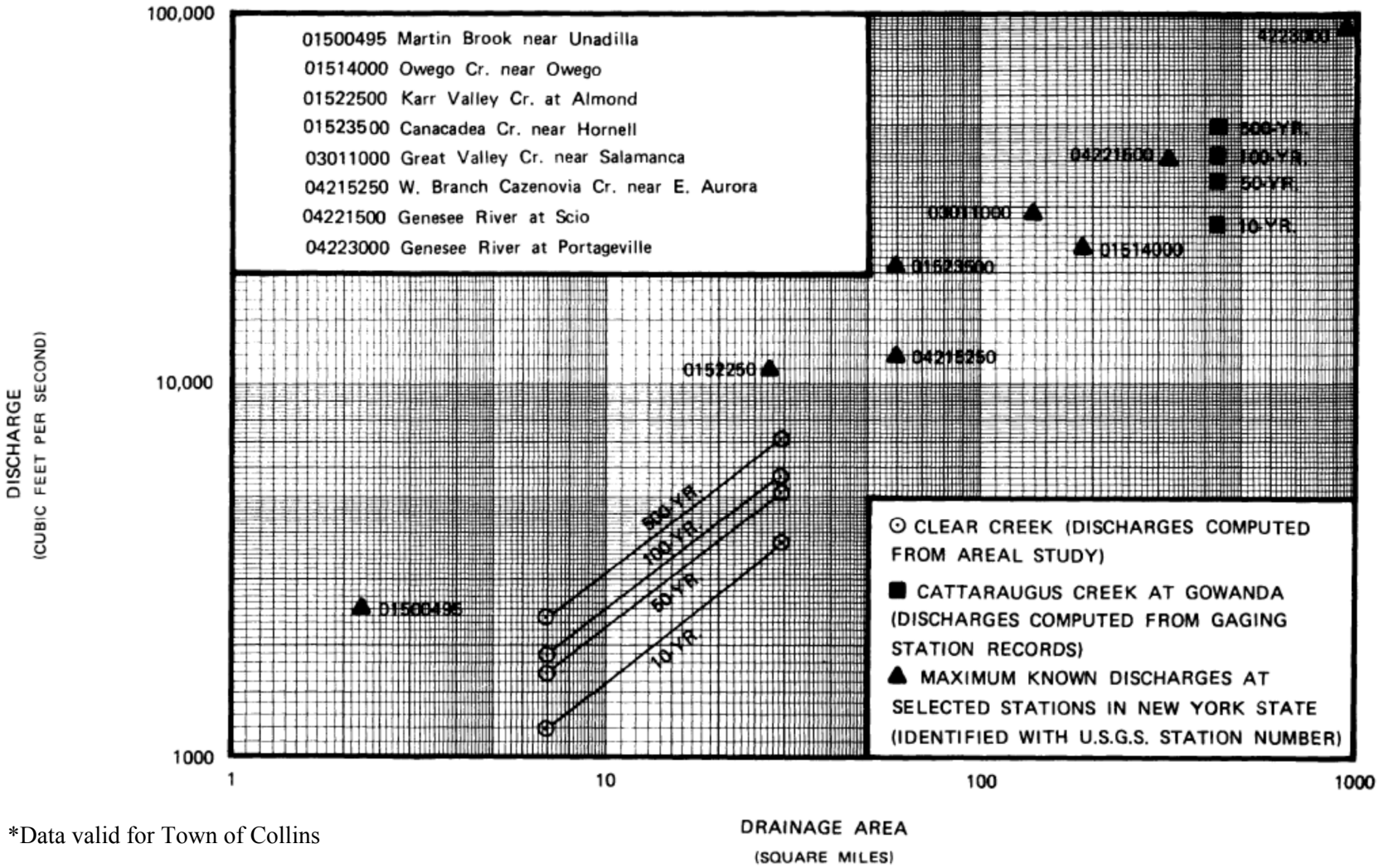
location, the calculated rural regression flows were utilized. Similarly, these rural values were input into the urban regression equations to account for urban development where applicable. Differences between the WRI Report 90-4197 and SIR 2006-5112 regression equations are within reasonable tolerances. The general differences of these equations were discussed via phone conversations with USGS-NY. The consensus is that both share similar methodologies and techniques but differ in user interface. The SIR 2006-5112 equations require the utilization of ArcGIS software to perform required variable iterations and equation calculations. The complexity of this tool does not allow for manual checks to ensure consistent results. According to USGS-NY, the WRI Report 90-4197 equations are still valid for use whether such software is made available or not. As such, this study employs the WRI Report 90-4197 equations and referrers to the SIR 2006-5112 as needed.

A summary of the drainage area-peak discharge relationships for all streams studied by detailed methods is shown in Table 8, "Summary of Discharges." Frequency-discharge and drainage area curves were developed for portions of Buffalo Creek, Buffalo River, Cattaraugus Creek, Cayuga Creek, Cazenovia Creek, Clear Creek, Ellicott Creek and Scajaquada Creek and are shown in Figures 1 through 5.



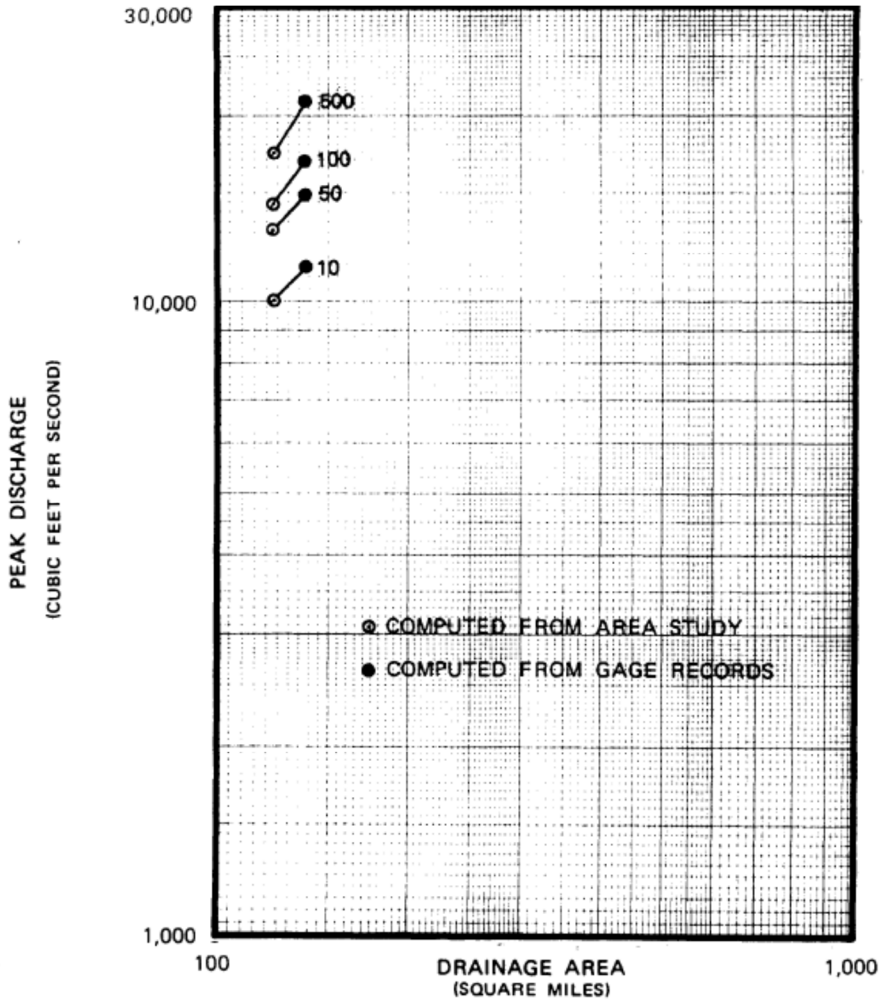
*Data valid for Town of Cheektowaga

FIGURE 1	FEDERAL EMERGENCY MANAGEMENT AGENCY ERIE COUNTY, NEW YORK (ALL JURISDICTIONS)	FREQUENCY-DISCHARGE, DRAINAGE AREA CURVES ELLICOTT CREEK, SCAJAQUADA CREEK



*Data valid for Town of Collins

FIGURE 2	FEDERAL EMERGENCY MANAGEMENT AGENCY ERIE COUNTY, NEW YORK (ALL JURISDICTIONS)	FREQUENCY-DISCHARGE, DRAINAGE AREA CURVES CLEAR CREEK, CATTARAUGUS CREEK



*Data valid for Town of Elma

FIGURE 3	FEDERAL EMERGENCY MANAGEMENT AGENCY ERIE COUNTY, NEW YORK (ALL JURISDICTIONS)	FREQUENCY-DISCHARGE, DRAINAGE AREA CURVES CAZENOVIA CREEK

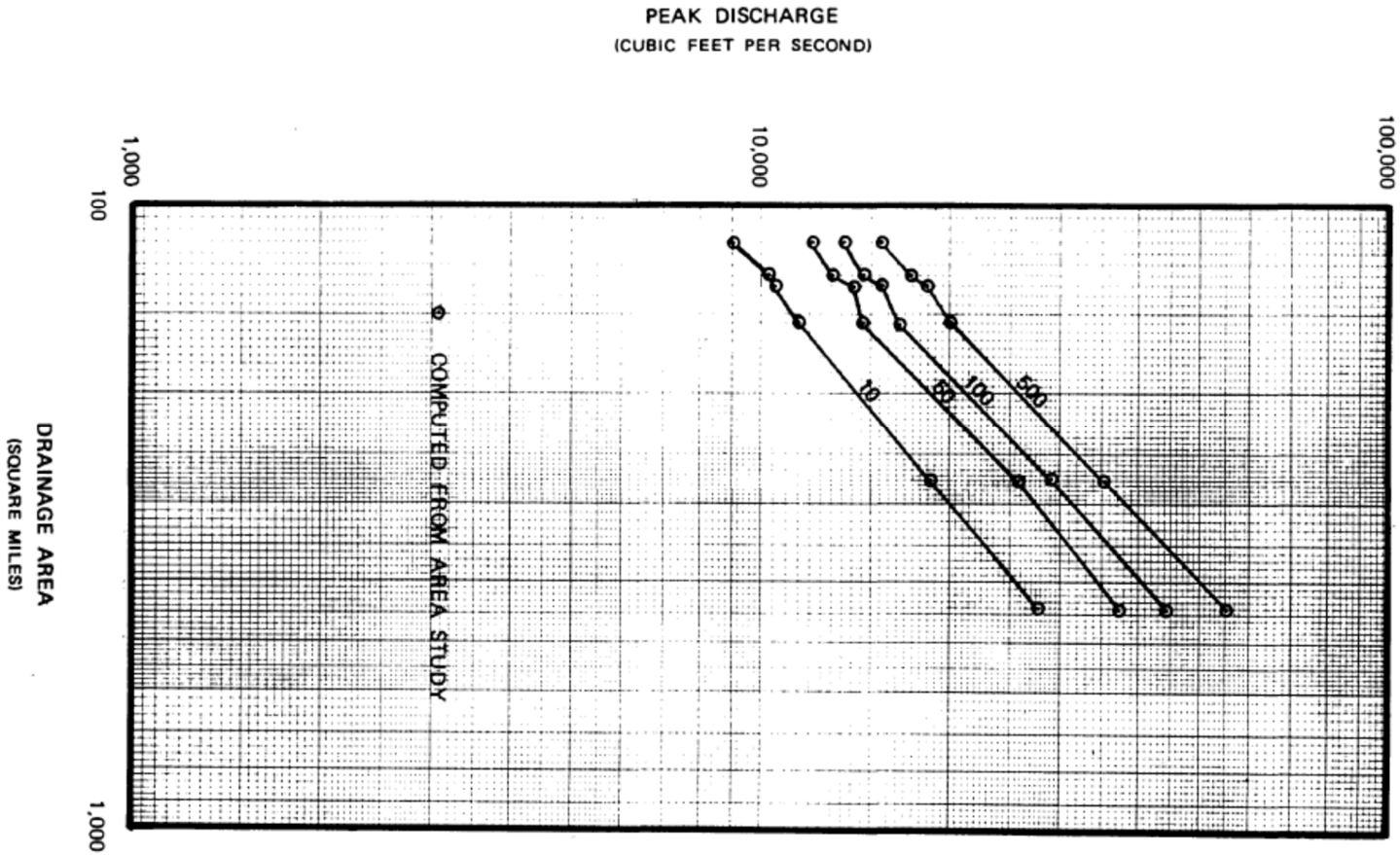


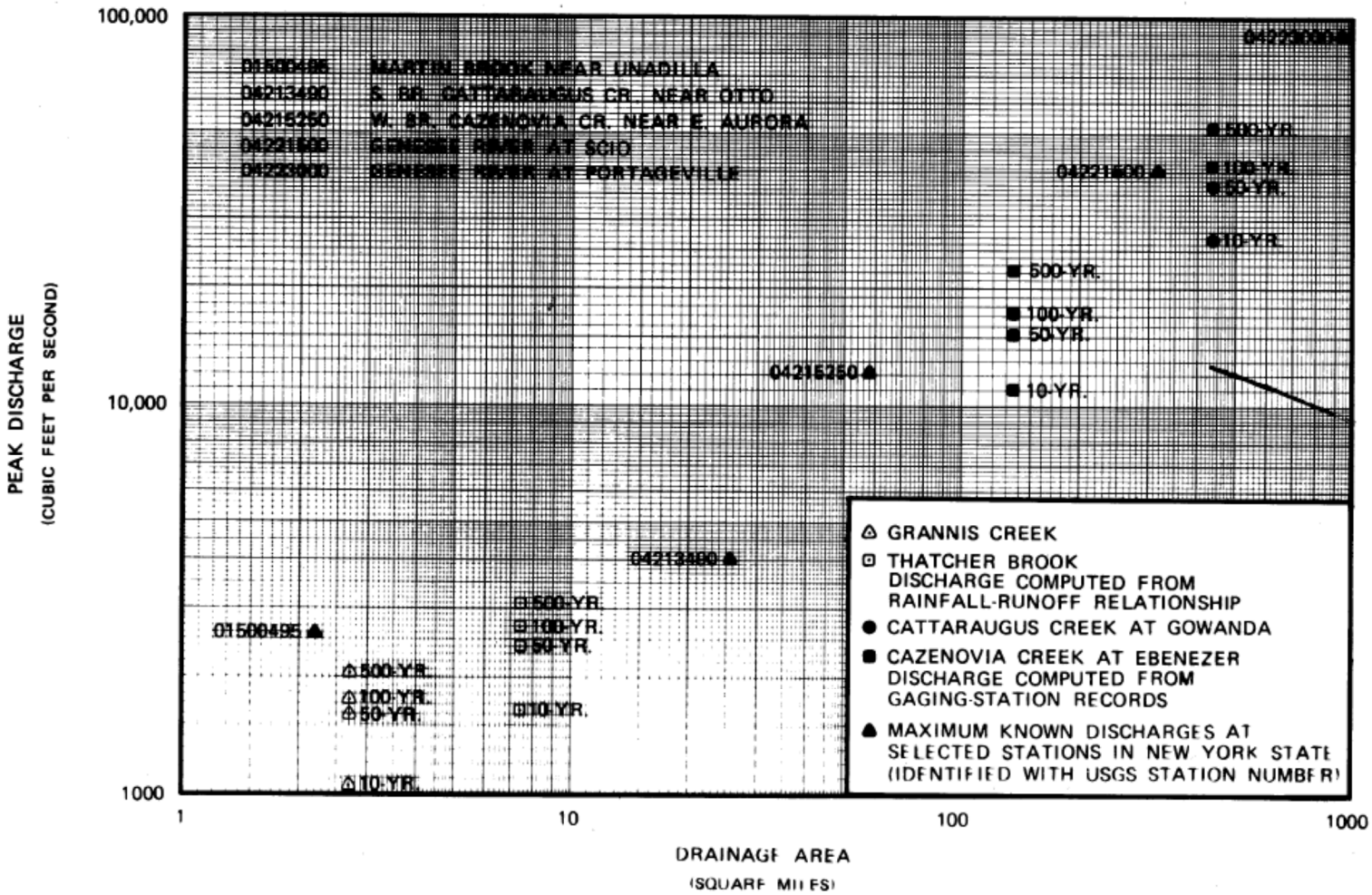
FIGURE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ERIE COUNTY, NEW YORK
(ALL JURISDICTIONS)

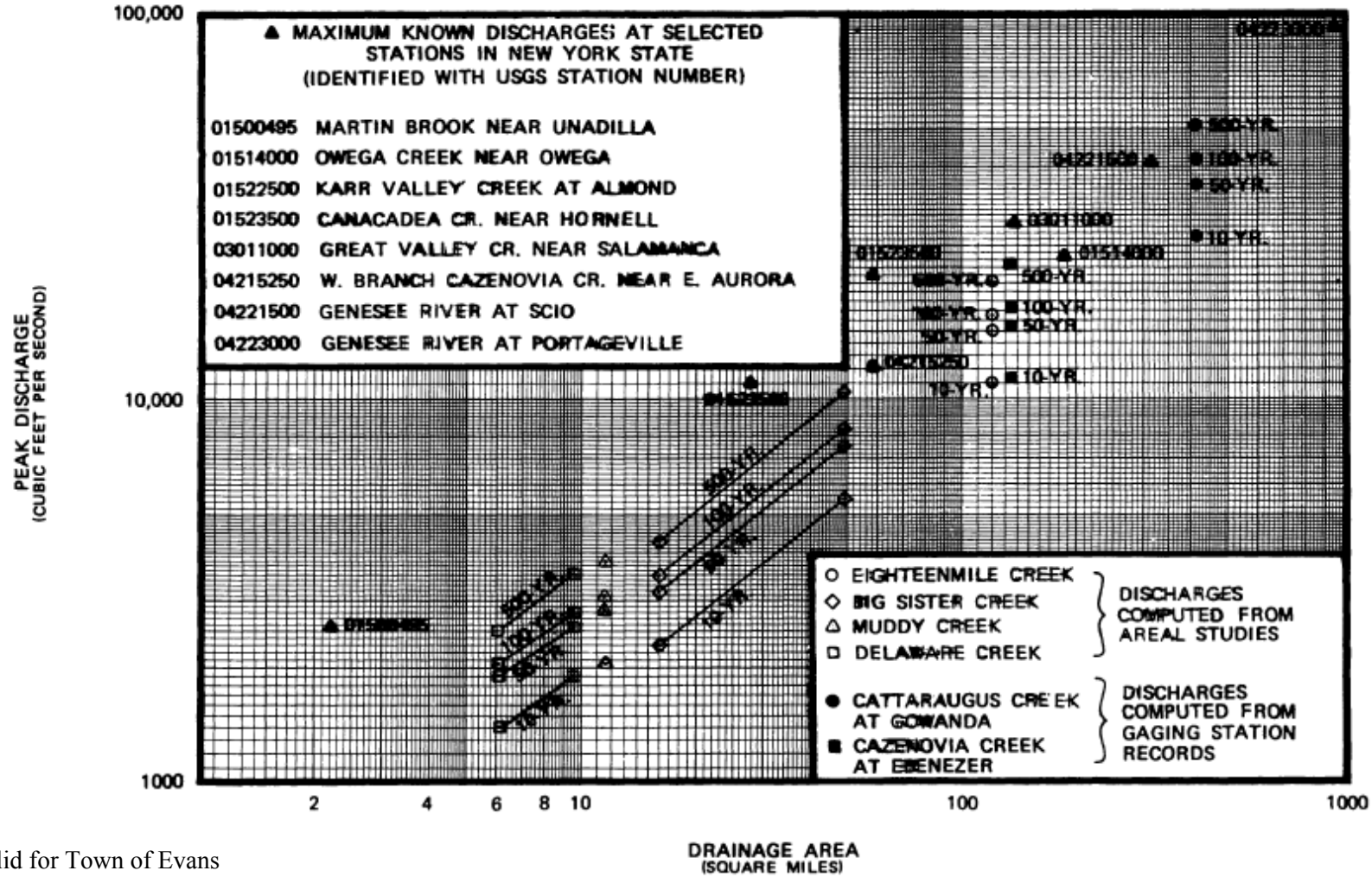
FREQUENCY-DISCHARGE, DRAINAGE AREA CURVES

BUFFALO CREEK



*Data valid for Village of Gowanda

FIGURE 5	FEDERAL EMERGENCY MANAGEMENT AGENCY ERIE COUNTY, NEW YORK (ALL JURISDICTIONS)	FREQUENCY-DISCHARGE, DRAINAGE AREA CURVES CATTARAUGUS CREEK, GRANNIS CREEK, THATCHER BROOK



*Data valid for Town of Evans

FIGURE 6	FEDERAL EMERGENCY MANAGEMENT AGENCY ERIE COUNTY, NEW YORK (ALL JURISDICTIONS)	FREQUENCY-DISCHARGE, DRAINAGE AREA CURVES BIG SISTER CREEK, DELAWARE CREEK, EIGHTEENMILE CREEK AND MUDDY CREEK

TABLE 8 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
Berricks Creek					
At confluence with Lake Erie	3.6	770	1,060	1,170	1,460
Approximately 400 ft upstream of Sunset Drive	1.0	290	510	570	830
At Sunset Drive	0.3	170	210	245	340
Big Sister Creek					
At confluence with Lake Erie	49.2	5,500	7,500	8,400	10,400
Upstream of confluence with Unnamed Tributary	45.8	4,400	6,100	6,800	8,300
Black Creek					
At confluence of Ransom Creek	13.6	2,660	4,660	5,140	6,800
At Town of Amherst / Town of Clarence corporate limits	12.9	*	*	5,120	*
Buffalo Creek					
Upstream of confluence of Cayuga Creek	146.0	*	*	16,000	*
Approximately 100 ft downstream of towns of Elma, Marilla corporate limit	106.0	9,200	12,000	13,100	15,800
Approximately 1,300 ft upstream of towns of Elma, Marilla corporate limit	104.0	9,000	11,700	12,800	15,400
Approximately 5,050 ft upstream of towns of Elma, Marilla corporate limit	102.0	8,900	11,500	12,600	15,200
Approximately 400 ft upstream of towns of Marilla, Wales corporate limit	100.0	8,700	11,400	12,400	14,900
At Strykersville Road	81.0	7,300	9,600	10,500	12,700
Approximately 300 ft upstream of confluence with Stony Bottom Creek	74.0	6,800	8,900	9,800	11,800
Upstream limit of study	57.0	5,500	7,200	8,000	9,700
Buffalo River					
At mouth	431.5	*	*	37,290	*

*Data not available

TABLE 8 - SUMMARY OF DISCHARGES
(continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
Buffalo River - continued					
Downstream of confluence of Cazenovia Creek	417.2	*	*	37,290	*
Upstream of confluence of Cazenovia Creek	280.0	*	*	21,530	*
At City of Buffalo / Town of West Seneca corporate limits	276.7	*	*	21,530	*
Buttermilk Falls Creek					
At North Creek Road	1.4	380	520	570	720
Just upstream of Lakeview Road	0.8	60	120	140	200
Approximately 1,040 ft upstream of Lakeview Road	0.6	10	40	80	120
Approximately 1,620 ft downstream of Heltz Road	0.6	80	150	180	250
Just downstream of Heltz Road	0.3	50	100	120	180
Cattaraugus Creek [1]	*	*	*	*	*
Cayuga Creek					
Above confluence with Buffalo Creek	128.0	9,510	13,200	14,900	19,000
At Transit Road	112.0	9,260	12,600	14,100	17,700
At Village of Depew / Village of Lancaster corporate limits	111.0	9,230	12,600	14,100	17,600
Above Como Dam	101.0	8,730	11,700	13,000	16,100
At USGS Gage No. 04215000 near Lancaster, NY	96.4	8,460	11,300	12,500	15,400
Upstream of confluence with Little Buffalo Creek	69.5	6,099	8,147	9,012	11,103
At Town of Alden / Town of Lancaster corporate limits	59.1	4,950	7,020	7,970	10,300
Upstream of Two Rod Road and unnamed tributary	56.0	5,250	7,450	8,450	10,900
At towns of Alden, Marilla corporate limits	55.0	5,300	7,000	7,700	9,400
Approximately 8,775 ft upstream of towns of Alden, Marilla corporate limits	50.0	4,900	6,500	7,200	8,700

*Data not available [1] See Figure 2

TABLE 8 - SUMMARY OF DISCHARGES
(continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
Cayuga Creek (continued)					
Approximately 10, 575 ft upstream of towns of Alden, Marilla corporate limits	48.0	4,700	6,300	7,000	8,500
Cazenovia Creek					
At confluence with Buffalo River	137.2	11,700	14,800	16,400	20,200
At abandoned railroad bridge	136.1	*	*	15,760	*
Upstream of confluence of Ebenezer Brook	134.2	*	*	15,610	*
Approximately 1,325 ft downstream of Big Tree Road (at Route 20A bridge)	116.0	9,900	12,800	14,800	16,800
Approximately 800 ft upstream of confluence with Cazenovia Creek West Branch	60.0	5,100	6,700	7,300	8,700
Approximately 800 ft upstream of confluence with Cazenovia Creek East Branch	56.0	4,800	6,100	6,700	8,100
Cazenovia Creek East Branch					
At Center Street Dam	46.0	4,580	6,080	6,720	8,181
Approximately 39,000 ft upstream of Town of Aurora / Town of Elma corporate limits	44.0	4,410	5,870	6,480	7,900
Approximately 57,700 ft upstream of Town of Aurora / Town of Elma corporate limits	40.0	4,080	5,440	6,010	7,340
Approximately 1,200 ft downstream of Emery Road (Route 67) Bridge	37.0	3,820	5,110	5,650	6,910
Approximately 800 ft downstream from Route 16 Bridge	34.0	3,560	4,770	5,280	6,470
Just downstream from Cross-Section F	29.0	3,120	4,200	4,660	5,710
Approximately 150 ft downstream from North Canada Street Bridge	23.0	2,580	3,490	3,870	4,770

*Data not available

TABLE 8 - SUMMARY OF DISCHARGES
(continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
Cazenovia Creek East Branch (continued)					
Just downstream from Cross-Section N	19.0	2,200	2,990	3,330	4,110
Approximately 200' downstream from Cross-Section S	15.0	1,810	2,470	2,760	3,420
Cazenovia Creek West Branch					
At Town of Aurora / Town of Colden corporate limits (At West Falls Dam)	48.0	4,750	6,300	6,950	8,450
Approximately 1,600 feet downstream of State Route 240 in Hamlet of Colden	29.0	3,120	4,200	4,660	5,710
Approximately 1,900 feet downstream of Murray Road	22.0	2,480	3,370	3,740	4,610
Clear Creek [1]	*	*	*	*	*
Delaware Creek [2]	*	*	*	*	*
Ebenezer Brook					
Upstream of confluence with Cazenovia Creek	1.4	*	*	585	*
Eighteenmile Creek					
At confluence with Lake Erie	120.0	11,000	15,000	16,500	20,000
Upstream of confluence of Eighteenmile Creek South Branch	64.8	4,920	6,990	7,960	10,300
Upstream of Creek Road	62.3	4,740	6,720	7,660	9,950
At town of Boston / Town of Hamburg corporate limits	39.0	4,640	5,880	6,380	7,430
Upstream of USGS gaging station in Town of Boston	36.9	4,430	5,620	6,100	7,100
Upstream of confluence of Irish Gulf	31.1	3,730	4,730	5,130	5,970
Upstream of confluence of Anthony Gulf	27.4	3,290	4,170	4,530	5,270
Upstream of Pfarner Road	21.4	2,590	3,280	3,560	4,140
Upstream of confluence with Landon Brook	14.1	1,720	2,190	2,370	2,760

*Data not available [1] See Figure 2 [2] See Figure 6

TABLE 8 - SUMMARY OF DISCHARGES
(continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
Eighteenmile Creek North Branch					
At confluence with Eighteenmile Creek	3.7	340	460	510	640
Eighteenmile Creek South Branch					
At confluence with Eighteenmile Creek	0.8	210	340	380	540
Ellicott Creek					
At Niagara Falls Boulevard	104.0	6,010	8,110	9,430	11,000
Approximately 800 feet south of Maple Road	81.0	4,250	6,500	7,500	10,000
At Sheridan Drive	77.6	4,000	6,150	7,130	9,510
At Wehrle Drive	72.4	3,810	5,870	6,790	9,060
At Stoney Road	67.4	3,630	5,580	6,470	8,620
At Town of Alden / Town of Lancaster corporate limits	60.0	3,500	4,800	5,400	6,750
Upstream of confluence of Spring Creek	27.6	2,300	3,150	3,700	4,500
Ellicott Creek – North Diversion Channel					
Approximately 3,485 feet upstream of Niagara Falls Boulevard	101.7	3,475	5,280	6,000	8,050
Ellicott Creek – Pfohl Park Diversion Channel					
Approximately 4,910 feet downstream of Millersport Highway bridge	97.0	2,000	3,960	4,650	7,000
Ellicott Creek – Upper Diversion Channel					
Approximately 1,200 feet north of Maple Road	81.2	1,700	3,450	4,300	5,830
Fern Brook					
At confluence with Lake Erie	1.7	440	600	660	820
At Pleasant Avenue	0.6	110	200	230	350
Foster Brook					
At confluence with Lake Erie	3.9	410	610	700	900
Upstream of Southwestern Boulevard	1.5	145	210	240	300
Gott Creek					
At confluence with Ransom Creek	15.2	640	880	990	1,240

TABLE 8 - SUMMARY OF DISCHARGES
(continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
Gott Creek (continued)					
At Transit Road	14.4	620	840	950	1,210
At Newhouse Road	10.7	540	755	850	1,080
At confluence of Gott Creek Tributary	6.1	330	470	530	675
Gott Creek Tributary					
At confluence with Gott Creek	3.3	195	280	320	410
Grannis Creek [3]	*	*	*	*	*
Gun Creek					
At confluence with Niagara River – Tonawanda Channel	3.3	250	360	420	550
At Ransom Road bridge	2.2	170	250	280	375
Hampton Brook					
At confluence with Eighteenmile Creek	6.7	1,220	1,680	1,850	2,310
Hosmer Brook					
At confluence with Cattaraugus Creek	9.2	*	*	1,690	2,260
Just upstream of Genesee Road	7.5	*	*	1,500	2,020
Hunter Creek					
At mouth	18.0	2,100	2,900	3,200	3,900
Ledge Creek					
Upstream of confluence of Murder Creek	8.0	*	*	965	*
Little Buffalo Creek					
At confluence with Cayuga Creek	26.9	2,060	3,270	3,650	5,190
At confluence with Little Buffalo Creek Tributary 1	25.1	2,260	3,040	3,550	4,870
At USGS Gaging station in Town of Lancaster	24.0	1,770	2,880	3,380	4,670
At confluence with Tributary 4	23.3	1,740	2,830	3,310	4,560
At Town of Elma / Town of Lancaster corporate limits	23.0	1,680	2,710	3,160	4,340

*Data not available [3] See Figure 5

TABLE 8 - SUMMARY OF DISCHARGES
(continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
Little Buffalo Creek (continued)					
Approximately 500 ft downstream from crossing of power lines	19.8	1,660	2,630	3,060	4,140
At downstream limit of detailed study in Town of Marilla	17.0	2,000	2,700	3,000	3,800
Approximately 700 ft upstream of downstream limit of detailed study in Town of Marilla	16.0	1,900	2,600	2,900	3,600
Approximately 5,075 ft upstream of downstream limit of detailed study in Town of Marilla	14.0	1,700	2,350	2,600	3,250
Approximately 5,265 ft upstream of downstream limit of detailed study in Town of Marilla	12.0	1,500	2,100	2,300	2,900
Little Buffalo Creek Tributary					
At confluence with Little Buffalo Creek	0.5	190	255	285	350
Little Sister Creek					
At confluence with Lake Erie	9.3	1,570	2,160	2,380	2,970
At Delameter Road	5.6	1,060	1,460	1,610	2,010
Little Sister Creek Tributary 2					
At confluence with Little Sister Creek	1.9	480	660	730	910
At Norfolk and Western Railway	0.6	120	220	240	370
Muddy Creek [2]	11.7	*	*	*	*
Murder Creek					
Upstream of confluence of Ledge Creek	75.0	*	*	3,635	*
At Brooklyn Street / Maple Road	55.0	2,030	2,710	2,990	3,650
Approximately 1,600 ft upstream of Crittenden Road	48.0	1,790	2,400	2,660	3,250

*Data not available [2] See Figure 6

TABLE 8 - SUMMARY OF DISCHARGES
(continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
Niagara River – Tonawanda Channel	*	*	*	*	*
Pike Creek					
At confluence with Lake Erie	6.0	1,130	1,560	1,720	2,140
Approximately 300 feet upstream of Norfolk and Western Railway	3.3	720	1,000	1,100	1,380
Plum Bottom Creek					
At confluence with Cayuga Creek	8.0	1,080	1,490	1,670	2,100
At Town of Lancaster / Village of Lancaster corporate limits	5.8	850	1,190	1,330	1,680
At confluence of Plum Bottom Creek North Branch	2.3	380	540	620	800
At confluence of unnamed tributary	1.4	275	390	450	580
At confluence with Plum Bottom Creek	3.5	540	760	860	1,100
Plum Bottom Creek North Branch					
At Cemetery Road	3.2	500	700	800	1,020
Pond Brook					
At confluence with Buffalo Creek	6.3	490	700	800	1,010
Upstream of Woodward Road	5.7	440	630	720	910
Ransom Creek					
At confluence with Tonawanda Creek	59.5	2,500	3,460	3,900	5,340
At Hopkins Road	45.7	2,300	3,190	5,120	7,910
Upstream of confluence of Black Creek	30.5	1,640	2,300	2,590	3,270
Upstream of confluence of Gott Creek	18.1	1,030	1,450	1,630	2,050
At Transit Road	17.0	971	1,360	1,540	1,930
At Goodrich Road	14.0	933	1,330	1,510	1,920

*Data not available

TABLE 8 - SUMMARY OF DISCHARGES
(continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
Reisch Creek					
At confluence with Lake Erie	1.3	230	340	390	520
At Prescott Drive	0.9	170	250	290	390
At Lake Shore Road	0.7	140	210	240	320
Rush Creek					
At Highland Avenue (extended)	5.1	1,260	1,740	1,910	2,390
Upstream of Tomaka Drive Tributary	4.9	960	1,320	1,450	1,820
At Tributary to Rush Creek	2.5	580	800	880	1,100
Scajaquada Creek					
At mouth	28.6	4,250	5,330	6,100	6,950
Upstream of Dick Road Bridge	6.9	1,080	1,570	1,780	2,340
At Conrail Bridge No. 1	4.4	730	1,050	1,150	1,530
Approximately 1,600 feet upstream of Grant Street	2.2	400	580	630	820
At Central Avenue	1.7	300	430	470	630
Approximately 2,300 feet upstream of Seneca Place	1.0	180	260	290	390
At Stonehedge Drive	0.2	57	75	80	89
Scajaquada Creek North Branch					
At George Urban Boulevard	1.4	250	360	410	550
Approximately 900 feet upstream of French Road	1.1	200	290	330	440
Scajaquada Creek Tributary T-1	*	*	*	*	*
Slate Bottom Creek					
At mouth	11.6	1,760	2,360	2,710	3,200
Downstream of confluence with Slate Bottom Creek North Branch	6.1	937	1,270	1,450	1,730
At confluence with Slate Bottom Creek North Branch	4.1	770	1,020	1,130	1,350
Downstream of Aurora Street	3.7	657	895	1,020	1,220
Upstream of Aurora Street and Unnamed Tributary	3.0	549	759	861	1,040
At Lake Avenue	2.2	410	571	648	785

*Data not available

TABLE 8 - SUMMARY OF DISCHARGES
(continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
Slate Bottom Creek North Branch					
At confluence with Slate Bottom Creek	2.0	380	520	590	720
Approximately 1,600 feet downstream of Aurora Road	1.6	300	420	480	600
Approximately 1,200 feet upstream of Aurora Road	1.0	190	280	320	420
Smokes Creek					
At mouth	33.3	3,330	4,700	5,300	7,000
Upstream of confluence with Smokes Creek South Branch	15.7	1,800	2,600	2,900	3,900
Upstream of City of Lackawanna / Town of West Seneca corporate limits	14.6	1,700	2,450	2,750	3,700
Smokes Creek Northeast Branch					
At confluence with Smokes Creek Northwest Branch	4.9	1,130	1,530	1,840	2,360
At Big Tree Road	2.8	760	1,030	1,180	1,470
At Transit Road	1.4	480	650	740	930
Smokes Creek Northwest Branch					
At Town of Orchard Park corporate limits	12.1	1,700	2,600	3,000	4,400
At confluence with Smokes Creek Northeast Branch	5.9	1,020	1,550	1,830	2,550
At Freeman Pond Spillway	4.5	830	1,300	1,500	2,040
At Chessie System Railroad	2.1	480	760	860	1,140
At Ellicott Road	1.1	320	500	560	730
Smokes Creek South Branch					
At mouth	15.8	1,800	2,600	2,900	3,900
At confluence with Smokes Creek	13.4	1,600	2,300	2,600	3,500

*Data not available

TABLE 8 - SUMMARY OF DISCHARGES
(continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
Smokes Creek South Branch (continued)					
At Town of Hamburg / Town of Orchard Park corporate limits	11.0	1,310	1,900	2,150	2,900
Upstream of Smokes Creek South Branch Tributary	7.0	910	1,320	1,500	2,000
Upstream of Smokes Creek South Branch Tributary	3.9	560	820	920	1,250
At Big Tree Road	3.3	490	710	800	1,080
Upstream of Green Lake Tributary	2.7	410	610	700	920
Smokes Creek South Branch South Tributary					
At confluence with Smokes Creek South Branch	3.0	460	650	750	1,000
Smokes Creek South Branch Tributary 1					
At confluence with Smokes Creek South Branch	2.4	360	550	630	860
At Taylor Road	1.5	250	360	420	580
Smokes Creek South Branch Tributary 2					
At confluence with Smokes Creek South Branch	0.8	240	420	480	700
Spicer Creek					
At mouth	3.0	229	324	365	460
At Whitehaven Road	2.2	208	296	335	427
At Harvey Road	1.8	189	273	309	396
Spring Brook					
At South Buffalo Street	8.1	400	*	650	850
At Middle Road	6.1	320	*	530	700
Spring Creek					
At confluence with Plum Bottom Creek	1.0	190	280	320	420

*Data not available

TABLE 8 - SUMMARY OF DISCHARGES
(continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
Tannery Brook					
At upstream face of Main Street crossing	2.9	480	1,210	1,620	3,250
At downstream face of Main Street crossing	2.1	390	950	1,260	2,500
Thatcher Brook [3]	*	*	*	*	*
Tonawanda Creek					
At mouth	635.0	16,800	21,300	23,200	27,600
At Twin Cities Memorial Highway	525.0	11,700	15,900	17,150	22,000
Upstream of confluence of Bull Creek	504.0	12,400	16,200	17,800	21,390
At upstream confluence of Ransom Creek	435.0	9,400	10,900	11,500	13,300
Upstream of confluence of Mud Creek	349.0	5,600	6,500	6,600	7,000
At most upstream crossing of Rapids Road	331.0	*	*	8,950	*
Tributary 1 to Niagara River - Tonawanda Channel					
At confluence with Niagara River – Tonawanda Channel	1.2	90	130	150	190
Waterfalls Village Creek					
At confluence with Lake Erie	1.0	300	420	460	580
Woods Creek					
At confluence with Niagara River – Tonawanda Channel	7.5	470	700	800	1,050
At confluence with Woods Creek Tributary 2	3.5	210	310	350	470
Downstream of confluence with Woods Creek Tributary 3	1.9	105	155	180	235
At Stony Point Road bridge	1.5	70	110	130	165

*Data not available [3] See Figure 5

TABLE 8 - SUMMARY OF DISCHARGES
(continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
Woods Creek Tributary 1					
At confluence with Woods Creek	2.8	150	220	260	350
Woods Creek Tributary 3					
At confluence with Woods Creek	0.3	35	45	50	70

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the source studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data Tables in the FIS report. For construction and/or floodplain management purposes, users are encouraged to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Pre-Countywide Analyses

The included jurisdictions within Erie County, which consist of the cities of Buffalo and Lackawanna, the towns of Alden, Amherst, Aurora, Boston, Cheektowaga, Colden, Concord, Elma, Evans, Hamburg, Lancaster, Marilla, Newstead, Orchard Park, Sardinia, Tonawanda and West Seneca, and the villages of Akron, Depew, East Aurora, Hamburg, Lancaster, Orchard Park, Springville and Williamsville, and with the exceptions of the towns of Brant and Eden, as well as the villages of Alden, Blasdell and North Collins, has a previously printed FIS report. The hydraulic analyses described in those reports have been compiled and are summarized below.

For streams studied by detailed methods, water-surface elevations of floods of the selected recurrence intervals were predominantly computed through the use of the USACE HEC-2 step-backwater program (USACE, 1976; 1974; 1991). Cross sections for the backwater analyses of the streams studied in detail were field-surveyed and located at close intervals above and below bridges and culverts, in order to compute the significant backwater effects of these structures in highly urbanized areas.

For Berricks Creek in the Town and Village of Hamburg, starting water-surface elevations were determined using the slope/area method and water-surface profiles for floods of the selected recurrence intervals were computed using HEC-2.

For Big Sister Creek in the Town of Evans, water-surface profiles were computed through the use of three different methods. For reaches, including bridges, exhibiting subcritical (tranquil) flow, the USGS E431 step-backwater program was used (USGS,

1976). At cross-sections where flow was supercritical (rapid), water-surface elevations were computed using critical depth computations. Finally, where the profile through bridges and culverts passed through critical depth, the USGS A526 culvert computer program (USGS, 1976) was used to determine water-surface elevations upstream from the structure. When warranted, flow over roads at these bridges and culverts were computed manually. Starting water-surface elevations were based on known elevations of Lake Erie at the confluence. In the Village of Angola, water-surface elevations were determined using HEC-2, and the starting water-surface elevations were taken from the profiles for the Town of Evans.

For Black Creek in the Town of Amherst, water-surface profiles were computed using HEC-2. Because overflows from Tonawanda Creek enter Ransom Creek through Black Creek, Black Creek was modeled as a continuation of Ransom Creek and no starting water-surface elevations were computed for Black Creek. Interbasin flow between Ransom Creek, Black Creek, Gott Creek and Tonawanda Creek causes many shallow flooding areas within Amherst. In these areas, determinations of water-surface elevations through the use of HEC-2 were not possible. These areas are subject to ponding of flood waters stemming from relatively flat terrain and/or weir flow over roadways. Flood elevations were determined using engineering judgment in these areas. These areas are located south of French Road between Dodge and Hopkins Roads; south of Schoelles Road between Hopkins Road, French Road and Campbell Boulevard; west of Sweet Home Road between Irwin Place, Niagara Falls Boulevard and Cascade Drive; and north of Ellicott Creek Road and Dodge Road between Sweet Home Road, Tonawanda Creek Road and Campbell Boulevard.

For Buffalo Creek, water-surface profiles were computed using HEC-2. In the Town of West Seneca, starting water-surface elevations were derived from a previous study (Federal Emergency Management Agency, September 1992). In the Town of Elma, starting water-surface elevations were determined from frequency-discharge curves using USGS stream gage records for streams with similar basin characteristics. In the Town of Marilla, starting water-surface elevations were coordinated with previous studies (USACE, 1966; USHUD, August 1976, December 1976). In the Town of Wales, starting water-surface elevations were determined using the slope/area method.

For Buffalo River, water-surface profiles were computed using HEC-2. Starting water-surface elevations were derived from the 50-percent-annual-chance water-surface elevations on Niagara River, which were estimated using an analysis based on flood-stage records obtained from the USACE at the American Falls, Niagara Intake, LaSalle Yacht Club, Tonawanda Island, Black Rock, Peace Bridge and Buffalo gaging stations along Niagara River (USACE, unpublished). In the Town of West Seneca, starting water-surface elevations were determined from a previous study (USHUD, August 1976).

For Buttermilk Falls Creek in the Town of Hamburg, water-surface profiles were computed using HEC-2. Starting water-surface elevations were taken from a known water-surface elevation.

For Cattaraugus Creek in the Village of Gowanda, water-surface profiles were computed using the USGS E-431 step-backwater program (USGS, 1971).

For Cayuga Creek, water-surface profiles were computed using HEC-2. In the towns of Cheektowaga and West Seneca, the starting water-surface elevation was assumed to be that calculated for Buffalo River and Buffalo Creek at the confluence of these two streams due to the high probability of the peak discharges occurring simultaneously due to their similar basin characteristics. In the Village of Depew, starting water-surface elevations were obtained from the profiles in Cheektowaga. In the Village of Lancaster and Town of Alden, starting water-surface elevations were determined using the slope/area method. In the Town of Marilla, starting water-surface elevations were coordinated with previous studies (USACE, 1966; USHUD, August 1976, December 1976).

For Cazenovia Creek in the towns of Aurora and Elma, water-surface profiles were computed using HEC-2. In the Town of Elma, starting water-surface elevations were determined from discharge-frequency curves using USGS stream gage records for streams with similar basin characteristics. In the Town of Aurora, starting water-surface elevations were coordinated with previous studies.

For Cazenovia Creek East Branch in the towns of Aurora, Holland and Wales, water-surface profiles were computed using HEC-2. Starting water surface elevations were coordinated with previous studies.

For Cazenovia Creek West Branch in the towns of Aurora and Colden, water-surface profiles were computed using HEC-2. Starting water surface elevations for the portion of the stream within the Town of Colden were taken from the 1978 Town of Aurora FIS. For the portion of the stream in the Town of Aurora, starting water surface elevations were coordinated with previous studies or determined using the slope/area method.

For Clear Creek in the Town of Collins, water-surface profiles were computed through the use of the USGS E-431 step-backwater computer program (USGS, 1971) and the USGS culvert computer A-526 (WRI, 1970). Starting water-surface elevations were determined using the slope/area method.

For Delaware Creek in the Town of Evans, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined using the slope/area method.

For Ebenezer Brook in the Town of West Seneca, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined using the slope/area method.

For Eighteenmile Creek, in the towns of Evans and Hamburg, water-surface profiles were computed through the use of three different methods. For reaches, including bridges, exhibiting subcritical (tranquil) flow, the USGS E431 step-backwater program was used (USGS, 1976). At cross-sections where flow was supercritical (rapid), water-surface elevations were computed using critical depth computations. Finally, where the profile through bridges and culverts passed through critical depth, the USGS A526 culvert computer program (USGS, 1976) was used to determine water-surface elevations upstream from the structure. When warranted, flow over roads at these bridges and culverts were computed manually. Starting water-surface elevations were based on known elevations of Lake Erie at the confluence. In the Town of Boston, water-surface

profiles were computed using HEC-2. Starting water-surface elevations were obtained from the profiles for Eighteenmile Creek in the Town of Hamburg FIS.

For Eighteenmile Creek North Branch in the Towns of Hamburg and Orchard Park, water-surface profiles were computed using HEC-2. Starting water-surface elevations were calculated using the slope/area method.

For Eighteenmile Creek South Branch in the Towns of Hamburg and Orchard Park, water-surface profiles were computed using HEC-2. Starting water-surface elevations were calculated using the slope/area method.

For Ellicott Creek, except in the towns of Amherst and Tonawanda, water-surface profiles were computed using HEC-2. In the City of North Tonawanda, starting water-surface elevations were taken from stage-frequency curves derived for the Niagara River. In the Town of Cheektowaga, starting water-surface elevations were obtained from the profiles for Ellicott Creek in the Town of Amherst FIS. In the Town of Lancaster, starting water-surface elevations were obtained from the profiles for Ellicott Creek in the Town of Cheektowaga FIS. In the Town of Alden, starting water-surface elevations were determined from a USACE report on floodplain information for Ellicott Creek (USACE, 1972) for the 2- and 1-percent-annual-chance floods. For the 10- and 0.2-percent-annual-chance floods, starting water-surface elevations were determined using the slope/area method.

For the Ellicott Creek Diversion Channels in the Town of Amherst, water-surface profiles were computed using HEC-2. Starting water-surface elevations were derived from a rating curve developed by the USACE (USACE, 1978).

For Fern Brook in the Town of Evans, water-surface profiles were computed using HEC-2. Starting water-surface elevations were taken from known water-surface elevations of Lake Erie at the confluence.

For Foster Brook in the Town of Hamburg, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined using the slope/area method.

For Gott Creek in the Towns of Amherst and Clarence, water-surface profiles were computed using HEC-2. In the Town of Amherst, starting water-surface elevations were determined from the hydraulic computations on Ransom Creek and by the slope/area method. In the Town of Clarence, starting water-surface elevations were obtained from the profiles for Gott Creek in the Town of Amherst FIS.

For Gott Creek Tributary in the Town of Clarence, water-surface profiles were computed using HEC-2. Starting water-surface elevations were obtained from elevations computed for the 1992 Town of Amherst FIS.

For Grannis Creek in the Village of Gowanda, water-surface profiles were computed using the USGS E-431 step-backwater program (USGS, 1971).

For Gun Creek in the Town of Grand Island, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined using the profiles for Niagara River – Tonawanda Channel.

For Hampton Brook in the Town of Hamburg, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined using the slope/area method.

For Hosmer Brook in the Town of Sardinia, water-surface profiles for the 1- and 0.2-percent-annual-chance flood events were computer using HEC-2. No profiles were computed for the 10- and 2-percent-annual-chance flood events. Starting water-surface elevations were determined using the slope/area method.

For Hunter Creek in the Town of Wales, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined using the slope/area method.

For Ledge Creek in the Town of Newstead, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined using critical depth.

For Little Buffalo Creek in the towns of Lancaster, Elma and Marilla, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined using the slope/area method in each community's study.

For Little Buffalo Creek Tributary in the Town of Marilla, water-surface profiles were computed using HEC-2 and starting water-surface elevations were determined using the slope/area method.

For Little Sister Creek and Little Sister Creek Tributary 2 in the Town of Evans, water-surface profiles were computed using HEC-2. Starting water-surface elevations for Little Sister Creek were based on known elevations of Lake Erie at its confluence. Starting water-surface elevations for Little Sister Creek Tributary 2 were determined using the slope/area method.

For Muddy Creek in the Town of Evans, water-surface profiles were computed through use of three different methods. For reaches (including bridges) exhibiting subcritical (tranquil) flow, the USGS E431 step-backwater program was used (USGS, 1976). At cross-sections where flow was supercritical (rapid), water-surface elevations were based on critical depth computations. These sections were located at naturally constricted reaches of the stream and at reaches of steep slope. Where the water-surface profiles through bridges and culverts passed through critical depth, the USGS A526 culvert computed program was used to determine the water-surface elevations upstream from the structure (USGS, 1976). Starting water-surface elevations were taken from known elevations of Lake Erie at its confluence.

For Murder Creek in the Town of Newstead and Village of Akron, water-surface profiles were computed using HEC-2. In the Town of Newstead, starting water-surface elevations were determined using the slope/area method. In the Village of Akron, starting water-surface elevations were taken from the May 1980 FIS for the Town of Newstead, which was later superseded by the May 4, 1992 FIS.

For the Niagara River – Tonawanda Channel in the Towns of Grand Island and Tonawanda and in the City of Tonawanda, water-surface profiles were computed using HEC-2. Starting water surface elevations were taken from stage-frequency curves developed for the Niagara River.

For Pike Creek in the Town of Evans, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined using the slope/area method.

For Plum Bottom Creek in the Town and Village of Lancaster, as well as Plum Bottom Creek North Branch in the Town of Lancaster, water-surface profiles were computed using HEC-2. Starting water-surface elevations for Plum Bottom Creek in the Village of Lancaster were determined using the slope/area method. In the Town of Lancaster, starting water-surface elevations for Plum Bottom Creek were taken from the profiles for the Village of Lancaster, and starting water-surface elevations for Plum Bottom Creek North Branch were obtained from the profiles for Plum Bottom Creek.

For Pond Brook in the Town of Elma, water-surface profiles were calculated using HEC-2. Starting water-surface elevations were determined using the slope/area method.

For Ransom Creek in the Towns of Amherst and Clarence, water-surface profiles were computed using HEC-2. Starting water-surface elevations for Ransom Creek were taken from Tonawanda Creek or were determined by the slope/area method.

For Reisch Creek in the Town of Evans, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined assuming critical depth.

For Rush Creek in the Town of Hamburg, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined using the slope/area method.

For Scajaquada Creek in the Town of Cheektowaga, water-surface profiles were computed using HEC-2, however, instead of the 0.2-percent-annual-chance flood, the Standard Project Flood (SPF) was computed. The SPF is defined as the largest flood that can be expected from the most severe combination of meteorological and hydrological conditions that is considered reasonably characteristic of the geographical region involved. The 0.2-percent-annual-chance flood was interpolated between the 1-percent-annual-chance flood and the SPF. Starting water-surface elevations were obtained from a rating curve which was computed with records from the gaging station at Pine Ridge Road. For Scajaquada Creek in the Village of Depew and Town of Lancaster, water-surface profiles were computed using HEC-2. Starting water-surface elevations in the Village of Depew were taken from the profiles from the Town of Cheektowaga FIS (FEMA, March 1984). Starting water-surface elevations in the Town of Lancaster were determined using the profiles from the Village of Depew FIS (FIA, February 1981).

For Scajaquada Creek North Branch in the Village of Depew, water-surface profiles were calculated using HEC-2. Starting water-surface elevations were determined from the Scajaquada Creek profiles.

For Scajaquada Creek Tributary T-1in the Town of Cheektowaga, water-surface profiles were calculated using HEC-2. Starting water-surface elevations were determined from the Scajaquada Creek profiles.

For Slate Bottom Creek in the T owns of Cheektowaga, Lancaster, and Elma, water-surface profiles were computed using HEC-2. Starting water-surface elevations for Slate Bottom Creek within the Towns of Lancaster and Elmer were determined using the profiles for Slate Bottom Creek in the March 15, 1984 Town of Cheektowaga FIS, which have been superseded by the profiles in the 2008 initial countywide FIS. Starting water-surface elevations in the Town of Elma were determined using profiles from the Town of Lancaster FIS. Starting water-surface elevations for Slate Bottom Creek in the Town of Cheektowaga were determined using profiles from Cayuga Creek.

For Slate Bottom Creek North Branch in the Town of Lancaster, water-surface elevations were calculated using HEC-2. Starting water-surface elevations were determined using the profiles for Slate Bottom Creek in the March 15, 1984 Town of Cheektowaga FIS, which have been superseded by the profiles in this All Jurisdictions report.

For Smokes Creek in the City of Lackawanna, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined using the elevation of Lake Erie at its confluence for the 50-percent-annual-chance storm event.

For Smokes Creek Northeast Branch in the Town of Orchard Park, and for Smokes Creek Northwest Branch in the Town and Village of Orchard Park, water-surface profiles were computed using HEC-2. The starting water-surface elevations for Smokes Creek Northeast Branch were determined using the slope/area method. In the Town of Orchard Park, starting water-surface elevations for Smokes Creek Northwest Branch were determined using profiles from the Town of West Seneca FIS. In the Village of Orchard Park, starting water-surface elevations were determined using profiles from the Town of Orchard Park FIS.

For Smokes Creek South Branch in the City of Lackawanna and Town of Hamburg, water-surface profiles were computed using HEC-2. In the City of Lackawanna, starting water-surface elevations were determined using the profiles for Smokes Creek the confluence. In the Town of Hamburg, starting water-surface elevations were determined using the profiles from the City of Lackawanna FIS. In the Town of Orchard Park, starting water-surface elevations were determined using the profiles from the Town of Hamburg FIS. In the Village of Orchard Park, starting water-surface elevations were determined using profiles from the Town of Orchard Park FIS.

For Smokes Creek South Branch Tributary 1 in the towns of Hamburg and Orchard Park, water-surface profiles were computed using HEC-2 and starting water-surface elevations were determined using the slope/area method. For Smokes Creek South Branch South Tributary and Smokes Creek South Branch Tributary 1 in the Town of Orchard Park, water-surface profiles were computed using HEC-2 and starting water-surface elevations were determined using the slope/area method.

For Spicer Creek in the Town of Grand Island, water-surface profiles were computed using HEC-2 and starting water-surface elevations were determined using the water surface elevations on the Niagara River.

For Spring Brook in the Village of Springville and the Town of Concord, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined assuming critical depth in each community.

For Spring Creek in the Town of Lancaster, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined using the slope/area method.

For Tannery Brook in the Village of East Aurora, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined using the slope/area method.

For Thatcher Brook in the Village of Gowanda, water-surface profiles were computed using the USGS E-431 step-backwater program (USGS, 1971).

For Tonawanda Creek in the towns of Amherst and Clarence, water-surface profiles were computed using HEC-2. In the Town of Amherst, starting water-surface elevations were determined using a rating curve developed by the USACE for the Tonawanda Creek stages at its confluence. In the Town of Clarence, starting water-surface elevations were determined using the profiles from the Town of Amherst FIS.

For Tributary 1 to Niagara River - Tonawanda Channel, water-surface profiles were computed using HEC-2. Starting water-surface elevations were taken from the profiles for Niagara River – Tonawanda Channel.

For Waterfalls Village Creek in the Town of Hamburg, water-surface profiles were computed using HEC-2. Starting water-surface elevations were determined using the slope/area method.

For Woods Creek, Woods Creek Tributary 1 and Woods Creek Tributary 3 in the Town of Grand Island, water-surface profiles were computed using HEC-2. Starting-water surface elevations were determined from the profiles for the Niagara River-Tonawanda Channel for Woods Creek. Water-surface profiles for the tributaries were determined from the profiles for Woods Creek.

Initial Countywide FIS (September 26, 2008)

For revised portions of Cazenovia Creek within the City of Buffalo, Ellicott Creek within the Village of Williamsville, Spicer Creek within the Town of Grand Island, and Tonawanda Creek within the Town of Tonawanda, water-surface profiles were computed using HEC-RAS. Channel conditions varied from clean, slightly rocky bottom in the uplands to slightly weedy, flat, and muddy bottom along the flat area near Lake Erie. Manning's "n" values were assigned in the HEC-RAS models based on the information obtained in aerial surveys and site inspections. In some places, the rivers have been channelized with concrete walls and/or bottoms. In these locations, the "n" value is 0.013.

Revised Countywide FIS (Date to Be Determined)

For this revised [date to be determined] countywide FIS, the following streams were restudied: Cayuga Creek (within the Towns of Cheektowaga, Lancaster, and West Seneca and the Villages of Depew and Lancaster); Eighteenmile Creek (within the Town of Hamburg) Ellicott Creek (within the Towns of Amherst and Tonawanda); Ransom Creek (within the Towns of Amherst and Clarence); Scajaquada Creek (within the City of Buffalo); Slate Bottom Creek (within the Towns of Cheektowaga, Elma, and Lancaster); and Tonawanda Creek (within the Town of Tonawanda). Information on the methods used to determine peak discharge/water-surface elevation relationships for these restudied streams is shown below.

The streams newly studied by detailed methods are located primarily in the northern region of Erie County. For these streams, cross sections were obtained from contour data developed from Light Detection and Ranging (LiDAR) data collected in Spring 2008 with two-foot contour accuracy. Below-water cross sections were obtained by field surveys. All bridges, wing dams and miscellaneous structures were field surveyed to obtain elevation data and structural geometry. As-build drawings provided by USACE and New York State Department of Transportation (NYSDOT) were utilized to supplement survey data where needed. Water-surface elevations for the floods of selected recurrence intervals were computed through the use of HEC-RAS (version 3.1.3 and 4.0) step-backwater computer program (USACE, 2005). The channel and overbank roughness values were assigned in HEC-RAS based on the information obtained from survey, aerial imagery, site inspection and engineering judgment.

Channel roughness factors (Manning's "n") used in the hydraulic computations have been compiled from the previous FIS texts. These computations were checked by field observation of the streams and floodplain areas at selected cross sections. The roughness factors were estimated at each cross section using the Soil Conservation Service procedure. Roughness factors for all streams studied by detailed methods are shown in Table 9, "Manning's "n" Values."

Starting water surface elevations for Cayuga, Cazenovia, Eighteenmile, Scajaquada, Slate Bottom, and Spicer Creeks were established using normal depth computations in HEC-RAS. Known water surface elevations were used as the starting water surface elevations for Ellicott, Ransom, and Tonawanda Creeks.

TABLE 9 – MANNING'S "n" VALUES

Stream	Channel "n"	Overbank "n"
Berricks Creek	0.018-0.035	0.050-0.100
Big Sister Creek	0.030-0.070	0.050-0.090
Black Creek	0.030-0.080	0.040-0.100
Buffalo Creek	0.021-0.040	0.035-0.100
Buffalo River	0.021-0.040	0.070-0.100
Buttermilk Falls Creek	0.020-0.037	0.070-0.090
Cattaraugus Creek	0.032-0.070	0.031-0.120
Cayuga Creek	0.014-0.100	0.030-0.150
Cazenovia Creek	0.013-0.050	0.013-0.100

TABLE 9 – MANNING'S "n" VALUES (Continued)

Stream	Channel "n"	Overbank "n"
Cazenovia Creek East Branch	0.035	0.050-0.100
Cazenovia Creek West Branch	0.035	0.050-0.100
Clear Creek	0.032-0.045	0.034-0.065
Delaware Creek	0.025-0.070	0.050-0.080
Ebenezer Brook	0.030-0.40	0.070-0.080
Eighteenmile Creek	0.020-0.080	0.030-0.120
Eighteenmile Creek North Branch	0.020-0.035	0.050-0.100
Eighteenmile Creek South Branch	0.020-0.035	0.040-0.050
Ellicott Creek	0.021-0.100	0.030-0.150
Ellicott Creek – North Diversion Channel	0.027	0.060
Ellicott Creek – Pfohl Diversion Channel	0.027	0.060
Ellicott Creek – Upper Diversion Channel	0.027	0.060
Fern Brook	0.020-0.045	0.060-0.080
Foster Brook	0.022-0.035	0.050-0.090
Gott Creek	0.035-0.045	0.060-0.120
Gott Creek Tributary	0.045	0.075
Grannis Creek	0.032-0.045	0.035-0.120
Gun Creek	*	*
Hampton Brook	0.030	0.100
Hosmer Brook	0.030-0.040	0.070
Hunter Creek	0.035	0.035-0.200
Ledge Creek	0.025-0.035	0.080-0.120
Little Buffalo Creek	0.015-0.040	0.030-0.100
Little Buffalo Creek Tributary	0.035	0.035-0.100
Little Sister Creek	0.030-0.050	0.050-0.070
Little Sister Creek Tributary 2	0.025-0.080	0.060-0.090
Muddy Creek	0.030-0.050	0.050-0.070
Murder Creek	0.037-0.055	0.047-0.200
Niagara River – Tonawanda Channel	*	*
Pike Creek	0.022-0.070	0.060-0.090
Plum Bottom Creek	0.021-0.100	0.048-0.120
Plum Bottom Creek North Branch	0.040-0.050	0.070-0.120
Pond Brook	0.030-0.035	0.070-0.100
Ransom Creek	0.040-0.100	0.030-0.100
Reisch Creek	0.020-0.050	0.050-0.080
Rush Creek	0.017-0.036	0.035-0.100
Scajaquada Creek	0.013-0.040	0.013-0.100
Scajaquada Creek North Branch	0.030-0.045	0.070-0.150
Scajaquada Creek Tributary T-1	*	*
Slate Bottom Creek	0.040-0.045	0.030-0.300
Slate Bottom Creek North Branch	0.035-0.055	0.060-0.120
Smokes Creek	0.030	0.075-0.090
Smokes Creek Northeast Branch	0.020-0.035	0.050-0.100
Smokes Creek Northwest Branch	0.020-0.035	0.050-0.100
Smokes Creek South Branch	0.020-0.037	0.035-0.100

* Data not available

TABLE 9 – MANNING'S "n" VALUES (Continued)

Stream	Channel "n"	Overbank "n"
Smokes Creek South Branch South Tributary	0.030-0.032	0.050-0.100
Smokes Creek South Branch Tributary 1	0.020-0.035	0.045-0.100
Smokes Creek South Branch Tributary 2	0.032-0.035	0.050-0.080
Spicer Creek	0.030-0.100	0.030-0.300
Spring Brook	0.040	0.040-0.060
Spring Creek	0.035-0.100	0.035-0.060
Tannery Brook	0.025-0.045	0.070
Thatcher Brook	0.032-0.045	0.031-0.100
Tonawanda Creek	0.023-0.055	0.030-0.150
Tributary 1 to Niagara River - Tonawanda Channel	0.035	0.035-0.080
Waterfalls Village Creek	0.024-0.035	0.040-0.120
Woods Creek	*	*
Woods Creek Tributary 1	*	*
Woods Creek Tributary 3	*	*

* Data not available

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway was computed (Section 4.2), selected cross sections are also shown on the FIRM (Exhibit 2).

All qualifying bench marks within a given jurisdiction that are cataloged by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS) as First or Second Order Vertical and have a vertical stability classification of A, B, or C are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier.

Bench marks cataloged by the NGS and entered into the NSRS vary widely in vertical stability classification. NSRS vertical stability classifications are as follows:

- Stability A: Monuments of the most reliable nature, expected to hold position/elevation well (e.g., mounted in bedrock)
- Stability B: Monuments which generally hold their position/elevation well (e.g., concrete bridge abutment)
- Stability C: Monuments which may be affected by surface ground movements (e.g., concrete monument below frost line)
- Stability D: Mark of questionable or unknown vertical stability (e.g., concrete monument above frost line, or steel witness post)

In addition to NSRS bench marks, the FIRM may also show vertical control monuments established by a local jurisdiction; these monuments will be shown on the FIRM with the appropriate designations. Local monuments will only be placed on the FIRM if the community has requested that they be included, and if the monuments meet the aforementioned NSRS inclusion criteria.

To obtain current elevation, description, and/or location information for bench marks shown on the FIRM for this jurisdiction, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their Web site at www.ngs.noaa.gov.

It is important to note that temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with this FIS and FIRM. Interested individuals may contact FEMA to access this data.

3.3 Vertical Datum

All FISs and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FISs and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the finalization of the North American Vertical Datum of 1988 (NAVD88), many FIS reports and FIRMs are being prepared using NAVD88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. Structure and ground elevations in the community must, therefore, be referenced to NAVD88. It is important to note that adjacent communities may be referenced to NGVD29. This may result in difference in Base Flood Elevations (BFEs) across the corporate limits between the communities. The conversion factor used for Erie County is -0.50 feet for conversion from NGVD29 to NAVD88.

The BFEs shown on the FIRM represent whole-foot rounded values. For example, a BFE of 102.4 will appear as 102 on the FIRM and 102.6 will appear as 103. Therefore, users that wish to convert the elevations in this FIS to NGVD 29 should apply the stated conversion factor(s) to elevations shown on the Flood Profiles and supporting data tables in the FIS report, which are shown at a minimum to the nearest 0.1 foot.

For more information on NAVD88, see Converting the National Flood Insurance Program to the North American Vertical Datum of 1988, FEMA Publication FIA-20/June 1992, or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent-annual-chance flood elevations; delineations of the 1- and 0.2-percent-annual-chance floodplains; and 1-percent-annual-chance floodway. This information is presented on the FIRM and in many components of the FIS, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation

tables. Users should reference the data presented in the FIS as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the county. For the streams studied in detail, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section.

Base map information shown on the FIRM was provided in digital format by the New York State Office of Cyber Security & Critical Infrastructure Coordination. Files contained 2008 digital orthoimagery of Erie County, New York. Image pixel size is 1.0 foot and 2.0 feet GSD. Image horizontal accuracy is within 8 feet at the 95% confidence level. Each file contains an image covering 4000 feet by 6000 feet on the ground. The projection used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 18N. The horizontal datum was NAD 83, GRS80 spheroid.

For each stream studied by detailed methods, the existing 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross-section.

For detailed streams studied prior to the 2008 initial countywide FIS, boundaries between cross-sections were interpolated using topographic maps at various scales and contour intervals (Reference 14). For streams studied for the 2008 initial countywide FIS, boundaries between cross-sections were interpolated using ortho-imagery and LiDAR data. (Reference 14). For areas of redelineation and for streams studied for this revised countywide FIS, boundaries between cross-sections were interpolated using topographic data developed from 2008 LiDAR data provided by Sanborn Mapping Company. The 1-percent and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zone A, AE and X); and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1-percent and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For this [Date TBD] revised countywide FIS, base map information was derived from multiple sources, including the New York State Office of Cyber Security and Critical Infrastructure Coordination, and the USDA's Farm Service Agency, Aerial Photography Field Office, dated 2015.

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM (Exhibit 2).

Within the Villages of Depew and Lancaster, and the Towns of Amherst and Cheektowaga, there are one or more levees that have not been demonstrated by the community or levee owner(s) to meet the requirements of 44 CFR Part 65.10 of the NFIP regulations as it relates to the levees' capacity to provide 1-percent-annual-chance flood protection. As such, the floodplain boundaries in this area were taken directly from the previously effective FIRM and are subject to change. Please refer to the Notice to Flood Insurance Study Users page at the front of this FIS report for more information on how this may affect the floodplain boundaries shown on the FIRM.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this FIS are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this FIS were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain.

Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 10). The computed floodways are shown on the FIRM (Exhibit 2). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

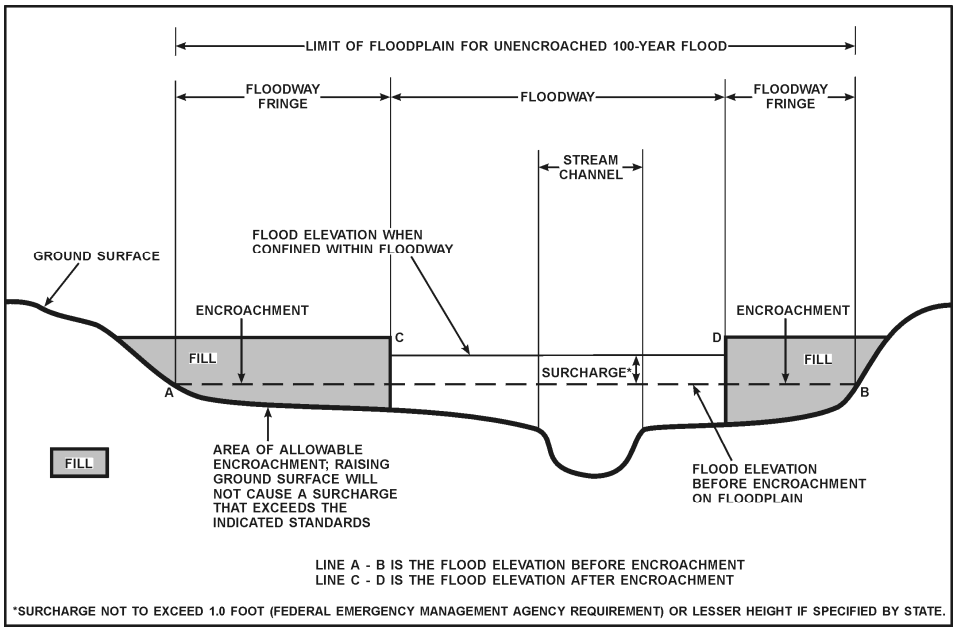
Portions of the floodway for Cattaraugus Creek and Tonawanda Creek extend beyond the County boundary. The Niagara River – Tonawanda Channel does not have a floodway.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage, and heightens potential flood hazards by further increasing velocities. A listing of stream velocities at selected cross sections is provided in Table 10, "Floodway Data." In order to reduce the risk of property damage in areas where the stream velocities are high, the community may wish to restrict development in areas outside the floodway.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent-annual-chance flood by more than 1.0 foot at any point. Typical relationships

between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 7.

Figure 7 - Floodway Schematic



FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Berricks Creek								
A	240	38	141	8.3	581.1	580.3[2]	580.8[2]	0.5
B	420	24	100	11.7	592.0	592.0	592.0	0.0
C	695	47	397	2.9	608.7	608.7	609.0	0.3
D	1090	46	309	3.8	608.7	608.7	609.0	0.3
E	1590	36	124	9.5	608.7	608.7	608.8	0.1
F	1705	47	314	3.7	613.8	613.8	613.8	0.0
G	1810	43	408	2.9	616.8	616.8	616.8	0.0
H	2060	87	705	1.7	616.9	616.9	616.9	0.0
I	2310	52	468	2.5	616.9	616.9	616.9	0.0
J	2747	70	917	1.3	629.4	629.4	629.9	0.5
K	2923	45	1028	1.1	638.3	638.3	638.9	0.6
L	3040	32	644	1.8	639.0	639.0	639.6	0.6
M	3178	102	1607	0.7	639.1	639.1	639.7	0.6
N	3193	135	1512	0.8	639.1	639.1	639.7	0.6
O	3540	130	2174	0.5	639.1	639.1	639.7	0.6
P	4690	104	891	1.3	639.1	639.1	639.7	0.6
Q	7565	52	129	9.1	666.1	666.1	666.1	0.0
R	7671	62	224	5.2	667.8	667.8	667.8	0.0
S	8535	60	236	5.0	676.7	676.7	677.7	1.0
T	8601	150	513	2.3	686.9	686.9	687.0	0.1
U	8812	250	2728	0.4	687.0	687.0	687.1	0.1
V	9174	43	219	5.3	687.0	687.0	687.1	0.1
W	9264	30	143	8.2	687.0	687.0	687.1	0.1
X	9495	55	362	1.9	691.7	691.7	691.7	0.0
Y	9790	45	124	5.7	692.4	692.4	692.8	0.4
Z	9930	33	134	5.2	695.8	695.8	695.8	0.0

[1] Feet above confluence with Lake Erie
[2] Elevation computed without consideration of backwater effects from Lake Erie

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ERIE COUNTY, NEW YORK (ALL JURISDICTIONS)

FLOODWAY DATA

BERRICKS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Berricks Creek (Continued)								
AA	10460	35	91	7.7	700.5	700.5	700.6	0.1
AB	11720	40	109	6.4	717.0	717.0	717.6	0.6
AC	14000	30	73	7.8	747.7	747.7	747.9	0.2
AD	14390	68	343	1.7	753.3	753.3	753.3	0.0
AE	14740	15	62	9.2	753.3	753.3	753.7	0.4
AF	14960	33	204	2.8	757.4	757.4	757.4	0.0
AG	15880	21	114	5.0	758.1	758.1	759.1	1.0
AH	16570	20	104	5.5	761.1	761.1	761.9	0.8
AI	17650	30	117	3.4	767.2	767.2	767.6	0.4
AJ	18020	29	147	2.7	769.9	769.9	769.9	0.0
AK	18376	21	72	3.4	773.7	773.7	774.1	0.4
AL	18641	16	47	5.2	773.8	773.8	774.7	0.9
Big Sister Creek								
A	3990	390	2060	4.1	583.1	583.1	583.3	0.2
B	4590	230	1610	5.2	583.3	583.3	583.5	0.2
C	5050	200	1300	6.5	583.7	583.7	584.0	0.3
D	5620	200	1120	7.5	584.4	584.4	584.9	0.5
E	6080	200	1060	7.9	585.4	585.4	586.1	0.7
F	6660	200	780	10.8	587.3	587.3	587.7	0.4
G	7440	280	1540	5.4	590.5	590.5	591.5	1.0
H	7800	320	1920	4.4	591.3	591.3	592.3	1.0
I	8780	180	1270	6.6	595.8	595.8	596.8	1.0
J	9450	220	1380	6.1	597.2	597.2	598.2	1.0
K	9950	410	2160	3.9	598.1	598.1	599.1	1.0

[1] Feet above confluence with Lake Erie

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ERIE COUNTY, NEW YORK (ALL JURISDICTIONS)

FLOODWAY DATA

BERRICKS CREEK - BIG SISTER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Big Sister Creek (Continued)								
L	10600	210	1240	6.8	599.5	599.5	600.1	0.6
M	10970	150	940	8.9	600.3	600.3	601.0	0.7
N	11570	150	820	10.2	602.6	602.6	603.4	0.8
O	11770	150	1000	8.4	604.6	604.6	604.7	0.1
P	12200	180	1120	7.5	606.2	606.2	606.2	0.0
Q	12660	100	780	10.8	606.5	606.5	607.0	0.5
R	12830	110	850	9.8	607.5	607.5	607.7	0.2
S	13160	120	930	9.0	609.4	609.4	609.4	0.0
T	13990	150	1030	8.2	614.1	614.1	615.0	0.9
U	14340	200	1280	6.6	615.6	615.6	616.0	0.4
V	14810	150	870	9.7	616.3	616.3	616.8	0.5
W	15300	140	1030	8.2	618.5	618.5	618.5	0.0
X	15860	150	1190	7.1	619.7	619.7	619.8	0.1
Y	16440	170	1250	6.7	620.5	620.5	620.8	0.3
Z	16940	180	1530	5.5	621.0	621.0	621.8	0.8
AA	17391	119	958	8.8	621.6	621.6	622.4	0.8
AB	18346	184	1669	5.0	629.5	629.5	630.4	0.9
AC	19840	103	1022	8.2	634.8	634.8	634.8	0.0
AD	20725	136	1460	5.8	635.9	635.9	636.2	0.3
AE	21200	130	1142	7.4	636.1	636.1	636.6	0.5
AF	22280	213	1660	5.1	638.4	638.4	639.4	1.0
AG	23155	126	1274	6.6	640.3	640.3	641.1	0.8
AH	24145	227	1922	3.5	642.8	642.8	643.7	0.9
AI	25335	166	1563	4.4	643.6	643.6	644.5	0.9
AJ	25920	190	1600	4.3	644.0	644.0	644.7	0.7

[1] Feet above confluence with Lake Erie

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ERIE COUNTY, NEW YORK (ALL JURISDICTIONS)

FLOODWAY DATA

BIG SISTER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Big Sister Creek (Continued)								
AK	26440	140	1270	5.4	644.3	644.3	645.0	0.7
AL	26920	140	1150	5.9	644.7	644.7	645.4	0.7
AM	27320	150	1280	5.3	645.2	645.2	645.9	0.7
AN	27960	120	1060	6.4	645.7	645.7	646.4	0.7
AO	28560	110	760	9.0	646.4	646.4	647.1	0.7
AP	29180	130	900	7.5	648.7	648.7	649.4	0.7
AQ	29810	90	610	11.2	650.2	650.2	650.9	0.7
AR	30200	120	890	7.6	652.7	652.7	653.4	0.7
AS	30640	130	970	7.0	653.5	653.5	654.3	0.8
AT	30980	100	750	9.1	654.0	654.0	654.8	0.8
AU	31550	220	2070	3.3	658.7	658.7	659.4	0.7
AV	31960	180	1990	3.4	658.9	658.9	659.6	0.7
AW	32270	140	1480	4.6	658.9	658.9	659.6	0.7
AX	32650	180	1740	3.9	659.1	659.1	659.8	0.7
AY	33090	140	1360	5.0	659.3	659.3	660.0	0.7
AZ	33510	120	980	6.9	659.6	659.6	660.2	0.6
BA	33910	200	1630	4.2	660.4	660.4	661.2	0.8
BB	34400	90	790	8.6	660.5	660.5	661.3	0.8
BC	34840	200	1350	5.0	662.0	662.0	662.8	0.8
BD	35310	140	940	7.2	662.6	662.6	663.4	0.8
BE	35710	60	440	15.4	663.3	663.3	663.9	0.6
BF	49300	100	670	6.9	711.2	711.2	711.8	0.6
BG	50020	80	460	10.0	712.6	712.6	713.0	0.4
BH	50660	60	500	9.3	714.9	714.9	715.0	0.1
BI	51120	110	550	8.3	716.3	716.3	716.4	0.1

[1] Feet above confluence with Lake Erie

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ERIE COUNTY, NEW YORK (ALL JURISDICTIONS)

FLOODWAY DATA

BIG SISTER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Big Sister Creek (Continued)								
BJ	51880	110	640	7.1	718.1	718.1	718.6	0.5
BK	52600	110	580	7.9	720.1	720.1	720.3	0.2
BL	52980	100	540	8.6	721.3	721.3	721.3	0.0
BM	53600	80	650	7.0	723.7	723.7	723.8	0.1
BN	54180	120	760	6.0	724.5	724.5	724.8	0.3
BO	54780	255	1100	4.2	725.5	725.5	726.1	0.6
BP	55320	228	1240	3.7	726.0	726.0	726.8	0.8
BQ	55980	130	700	6.6	726.7	726.7	727.5	0.8
BR	56640	220	1180	3.9	728.0	728.0	728.9	0.9
BS	56990	280	1250	2.8	728.5	728.5	729.5	1.0
BT	57560	350	2210	1.6	728.7	728.7	729.7	1.0
BU	58080	330	2000	1.8	728.8	728.8	729.8	1.0
BV	58470	250	1340	2.6	728.8	728.8	729.8	1.0
BW	58710	140	780	4.5	729.0	729.0	730.0	1.0
BX	59450	230	1360	2.6	729.5	729.5	730.5	1.0
BY	60300	140	650	5.4	730.3	730.3	731.2	0.9
BZ	60750	380	1280	2.7	732.2	732.2	732.7	0.5
CA	61630	220	940	3.7	732.8	732.8	733.5	0.7
CB	63010	130	780	4.5	734.0	734.0	734.7	0.7
CC	64000	220	970	3.6	734.7	734.7	735.5	0.8
CD	64840	200	1290	2.7	735.3	735.3	736.2	0.9
CE	65590	210	930	3.8	735.8	735.8	736.7	0.9
CF	66090	80	480	7.2	736.7	736.7	737.5	0.8

[1] Feet above confluence with Lake Erie

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ERIE COUNTY, NEW YORK (ALL JURISDICTIONS)

FLOODWAY DATA

BIG SISTER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Black Creek								
A	20650[1]	980	3614	1.5	581.4	581.4[3]	582.3[3]	0.9
B	26430[1]	949	2744	2.0	583.0	583.0[3]	583.9[3]	0.9
Buffalo Creek								
A	1990[2]	241	6125	5.1	593.2	593.2	594.2	1.0
B	6080[2]	278	2311	6.9	599.9	599.9	600.3	0.4
C	8380[2]	353	3385	4.7	606.8	606.8	606.8	0.0
D	11750[2]	102	1507	10.6	617.6	617.6	618.2	0.6
E	14475[2]	415	4115	3.9	623.4	623.4	624.2	0.8
F	17130[2]	355	2751	5.8	627.4	627.4	627.9	0.5
G	19395[2]	150	1518	10.5	631.0	631.0	631.9	0.9
H	21620[2]	412	3826	4.2	636.9	636.9	637.7	0.8
I	24940[2]	328	2054	7.8	642.0	642.0	642.8	0.8
J	26360[2]	525	3808	4.2	648.0	648.0	648.5	0.5
K	28610[2]	510	2940	5.4	652.1	652.1	652.8	0.7
L	29950[2]	199	2151	7.4	655.0	655.0	655.7	0.7
M	34067[2]	300	1553	10.5	670.5	670.5	670.6	0.1
N	39611[2]	250	1303	12.1	684.4	684.4	684.8	0.4
O	46053[2]	250	1399	12.3	701.5	701.5	701.9	0.4
P	51333[2]	250	1399	11.3	714.7	714.7	715.7	1.0
Q	63265[2]	300	1840	7.8	741.3	741.3	741.3	0.0
R	67489[2]	300	1449	9.9	753.7	753.7	753.7	0.0
S	75372[2]	250	1830	9.5	780.4	780.4	780.7	0.3
T	83025[2]	250	1217	11.3	798.5	798.5	798.7	0.2
U	88406[2]	250	2064	8.0	827.2	827.2	827.5	0.3
V	92511[2]	162	1619	8.1	832.9	832.9	833.9	1.0

[1] Feet above confluence of Ransom Creek and Tonawanda Creek
[2] Feet above confluence with Cayuga Creek
[3] Elevation computed using 1-percent annual chance discharge from Tonawanda Creek overflow

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ERIE COUNTY, NEW YORK (ALL JURISDICTIONS)

FLOODWAY DATA

BLACK CREEK - BUFFALO CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Buffalo Creek (Continued)								
W	95111[1]	136	1468	8.7	837.9	837.9	838.5	0.6
X	97409[1]	200	1850	7.1	842.3	842.3	842.9	0.6
Y	4890[2]	360	2048	8.7	881.7	881.7	881.7	0.0
Z	6090[2]	269	1882	11.1	885.6	885.6	885.6	0.0
AA	7880[2]	142	1251	10.1	889.2	889.2	889.6	0.4
AB	9730[2]	269	2563	6.8	895.6	895.6	895.9	0.3
AC	11390[2]	213	1584	9.4	897.8	897.8	898.4	0.6
AD	12660[2]	270	2640	4.5	901.9	901.9	902.1	0.2
AE	13860[2]	188	1403	11.3	903.1	903.1	903.2	0.1
AF	16310[2]	160	1328	8.3	910.0	910.0	910.1	0.1
AG	18810[2]	138	1213	9.7	914.4	914.4	914.9	0.5
AH	20298[2]	237	1423	9.5	918.4	918.4	918.7	0.3
AI	21568[2]	295	1963	7.6	920.5	920.5	920.7	0.2
AJ	22698[2]	196	1758	6.6	921.7	921.7	921.9	0.2
AK	24958[2]	933	3568	6.1	923.4	923.4	924.1	0.7
AL	27338[2]	833	5788	4.6	925.9	925.9	926.0	0.1
AM	29688[2]	733	4205	9.1	926.7	926.7	926.8	0.1
AN	31869[2]	152	1299	8.0	930.7	930.7	930.7	0.0
AO	34119[2]	197	1220	8.1	933.2	933.2	933.7	0.5
AP	36359[2]	210	1741	6.7	937.6	937.6	938.1	0.5
AQ	38309[2]	180	1565	7.5	940.5	940.5	940.9	0.4
AR	40409[2]	200	1492	8.1	942.8	942.8	943.5	0.7
AS	43459[2]	228	1639	7.6	947.2	947.2	948.0	0.8

[1] Feet above confluence with Cayuga Creek
[2] Feet above Town of Wales downstream corporate limit

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ERIE COUNTY, NEW YORK (ALL JURISDICTIONS)

FLOODWAY DATA

BUFFALO CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Buffalo River								
A	0	370	10974	3.4	581.1	576.5[2]	577.5[2]	1.0
B	2210	759	23010	1.6	581.1	576.8[2]	577.8[2]	1.0
C	4260	200	6781	5.5	581.1	576.9[2]	577.8[2]	0.9
D	6320	240	6652	5.6	581.1	577.6[2]	578.5[2]	0.9
E	9040	315	9837	3.8	581.1	578.4[2]	579.2[2]	0.8
F	10230	269	8189	4.6	581.1	578.5[2]	579.3[2]	0.8
G	12865	265	7474	5.0	581.1	579.0[2]	579.8[2]	0.8
H	15250	346	9710	3.8	581.1	579.6[2]	580.4[2]	0.8
I	17480	375	10005	3.7	581.1	579.8[2]	580.5[2]	0.7
J	19630	425	10619	3.5	581.1	580.5[2]	581.1[2]	0.6
K	22090	347	12039	3.1	581.1	581.0[2]	581.5[2]	0.5
L	24530	225	6669	5.6	581.2	581.2	581.7	0.5
M	26695	277	8372	4.5	581.8	581.8	582.3	0.5
N	29115	319	6289	5.9	582.9	582.9	583.2	0.3
O	30720	240	4098	5.3	584.0	584.0	584.2	0.2
P	32190	213	3975	5.4	585.9	585.9	586.0	0.1
Q	34260	350	5611	3.8	586.6	586.6	587.1	0.5
R	36990	138	3123	6.9	588.1	588.1	588.7	0.6
S	38570	322	7754	2.8	590.5	590.5	591.3	0.8
T	39600	806	12645	1.7	591.1	591.1	592.1	1.0
U	41430	307	5221	4.1	591.5	591.5	592.5	1.0
V	42925	233	2646	5.9	591.9	591.9	592.8	0.9

[1] Feet above confluence with Lake Erie
[2] Elevation computed without consideration of backwater effects from Lake Erie

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

ERIE COUNTY, NEW YORK (ALL JURISDICTIONS)

FLOODWAY DATA

BUFFALO RIVER