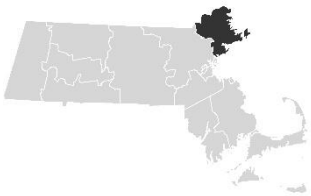
FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 6



ESSEX COUNTY, MASSACHUSETTS

(ALL JURISDICTIONS)

COMMUNITY NAME	NUMBER	COMMUNITY NAME	NUMBER
AMESBURY, CITY OF	250075	MIDDLETON, TOWN OF	250094
ANDOVER, TOWN OF	250076	NAHANT, TOWN OF	250095
BEVERLY, CITY OF	250077	NEWBURY, TOWN OF	250096
BOXFORD, TOWN OF	250078	NEWBURYPORT, CITY OF	250097
DANVERS, TOWN OF	250079	NORTH ANDOVER, TOWN OF	250098
ESSEX, TOWN OF	250080	PEABODY, CITY OF	250099
GEORGETOWN, TOWN OF	250081	ROCKPORT, TOWN OF	250100
GLOUCESTER, CITY OF	250082	ROWLEY, TOWN OF	250101
GROVELAND, TOWN OF	250083	SALEM, CITY OF	250102
HAMILTON, TOWN OF	250084	SALISBURY, TOWN OF	250103
HAVERHILL, CITY OF	250085	SAUGUS, TOWN OF	250104
IPSWICH, TOWN OF	250086	SWAMPSCOTT, TOWN OF	250105
LAWRENCE, CITY OF	250087	TOPSFIELD, TOWN OF	250106
LYNN, CITY OF	250088	WENHAM, TOWN OF	250107
LYNNFIELD, TOWN OF	250089	WEST NEWBURY, TOWN OF	250108
MANCHESTER-BY-THE-SEA, TOWN OF	250090		
MARBLEHEAD, TOWN OF	250091		
MERRIMAC, TOWN OF	250092		
METHUEN, CITY OF	250093		

REVISED: REVISED PRELIMINARY 05/26/2023

FLOOD INSURANCE STUDY NUMBER
25009CV001D

Version Number 2.6.3.6

FEMA

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FLOOD INSURANCE STUDY REPORT
ESSEX COUNTY, MASSACHUSETTS

SECTION 1.0 – INTRODUCTION

1.1 The National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a voluntary Federal program that enables property owners in participating communities to purchase insurance protection against losses from flooding. This insurance is designed to provide an alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods.

For decades, the national response to flood disasters was generally limited to constructing flood-control works such as dams, levees, sea-walls, and the like, and providing disaster relief to flood victims. This approach did not reduce losses nor did it discourage unwise development. In some instances, it may have actually encouraged additional development. To compound the problem, the public generally could not buy flood coverage from insurance companies, and building techniques to reduce flood damage were often overlooked.

In the face of mounting flood losses and escalating costs of disaster relief to the general taxpayers, the U.S. Congress created the NFIP. The intent was to reduce future flood damage through community floodplain management ordinances, and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for the protection.

The U.S. Congress established the NFIP on August 1, 1968, with the passage of the National Flood Insurance Act of 1968. The NFIP was broadened and modified with the passage of the Flood Disaster Protection Act of 1973 and other legislative measures. It was further modified by the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004. The NFIP is administered by the Federal Emergency Management Agency (FEMA), which is a component of the Department of Homeland Security (DHS).

Participation in the NFIP is based on an agreement between local communities and the Federal Government. If a community adopts and enforces floodplain management regulations to reduce future flood risks to new construction and substantially improved structures in Special Flood Hazard Areas (SFHAs), the Federal Government will make flood insurance available within the community as a financial protection against flood losses. The community's floodplain management regulations must meet or exceed criteria established in accordance with Title 44 Code of Federal Regulations (CFR) Part 60.3, *Criteria for Land Management and Use*.

SFHAs are delineated on the community's Flood Insurance Rate Maps (FIRMs). Under the NFIP, buildings that were built before the flood hazard was identified on the community's FIRMs are generally referred to as "Pre-FIRM" buildings. When the NFIP was created, the U.S. Congress recognized that insurance for Pre-FIRM buildings would be prohibitively expensive if the premiums were not subsidized by the Federal Government. Congress also recognized that most of these floodprone buildings were built by individuals who did not have sufficient knowledge of the flood hazard to make informed decisions. The NFIP requires that full actuarial rates reflecting the complete flood risk be charged on all buildings constructed or substantially improved on or after

the effective date of the initial FIRM for the community or after December 31, 1974, whichever is later. These buildings are generally referred to as "Post-FIRM" buildings.

1.2 Purpose of this Flood Insurance Study Report

This Flood Insurance Study (FIS) Report revises and updates information on the existence and severity of flood hazards for the study area. The studies described in this report developed flood hazard data that will be used to establish actuarial flood insurance rates and to assist communities in efforts to implement sound floodplain management.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive than the minimum Federal requirements. Contact your State NFIP Coordinator to ensure that any higher State standards are included in the community's regulations.

1.3 Jurisdictions Included in the Flood Insurance Study Project

This FIS Report covers the entire geographic area of Essex County, Massachusetts.

The jurisdictions that are included in this project area, along with the Community Identification Number (CID) for each community and the 8-digit Hydrologic Unit Codes (HUC-8) sub-basins affecting each, are shown in Table 1. The Flood Insurance Rate Map (FIRM) panel numbers that affect each community are listed. If the flood hazard data for the community is not included in this FIS Report, the location of that data is identified.

Table 1: Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Amesbury, City of	250075	01060003, 01070006	25009C0014F[1], 25009C0018G, 25009C0082G, 25009C0101G, 25009C0102G, 25009C0103G, 25009C0104G, 25009C0106G, 25009C0107G, 25009C0108G, 25009C0109G	
Andover, Town of	250076	01070006, 01090001	25009C0195G, 25009C0203G, 25009C0204G, 25009C0208G, 25009C0211G, 25009C0212G, 25009C0213F[1], 25009C0214G, 25009C0216G, 25009C0217G, 25009C0218G, 25009C0219G, 25009C0236G, 25009C0238G, 25009C0239G, 25009C0352F[1], 25009C0356G, 25009C0357G, 25009C0376G, 25009C0377G	
Beverly, City of	250077	01090001	25009C0408G, 25009C0409G, 25009C0416H, 25009C0417H, 25009C0428G, 25009C0429G, 25009C0433H, 25009C0436H, 25009C0437G, 25009C0441H	

Table 1: Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Boxford, Town of	250078	01070006, 01090001	25009C0226G, 25009C0227G, 25009C0229G, 25009C0231G, 25009C0233G, 25009C0234G, 25009C0241G, 25009C0242G, 25009C0244G, 25009C0253G, 25009C0254G, 25009C0261G, 25009C0262G, 25009C0263G, 25009C0264G, 25009C0401G	
Danvers, Town of	250079	01090001	25009C0384G, 25009C0392G, 25009C0401G, 25009C0402G, 25009C0403G, 25009C0404G, 25009C0406G, 25009C0408G, 25009C0411G, 25009C0412G, 25009C0416H	
Essex, Town of	250080	01090001	25009C0289H, 25009C0291G, 25009C0292G, 25009C0293H, 25009C0294H, 25009C0311G, 25009C0313G, 25009C0427G, 25009C0431H, 25009C0432H, 25009C0451H	
Georgetown, Town of	250081	01070006, 01090001	25009C0113G, 25009C0114G, 25009C0231G, 25009C0232G, 25009C0233G, 25009C0234G, 25009C0251G, 25009C0252G, 25009C0253G, 25009C0254G, 25009C0256H	
Gloucester, City of	250082	01090001	25009C0294H, 25009C0309G, 25009C0311G, 25009C0312G, 25009C0313G, 25009C0314G, 25009C0316G, 25009C0317G, 25009C0318H, 25009C0319H, 25009C0338H, 25009C0432H, 25009C0451H, 25009C0452H, 25009C0453H, 25009C0454H, 25009C0456H, 25009C0457G, 25009C0458G, 25009C0459G, 25009C0476G	
Groveland, Town of	250083	01070006, 01090001	25009C0092G, 25009C0093G, 25009C0094G, 25009C0113G, 25009C0114G, 25009C0231G, 25009C0232G, 25009C0233G, 25009C0251G	

Table 1: Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Hamilton, Town of	250084	01090001	25009C0267G, 25009C0268G, 25009C0269G, 25009C0286G, 25009C0288G, 25009C0289H, 25009C0293H, 25009C0406G, 25009C0407G, 25009C0426G, 25009C0427G, 25009C0429G, 25009C0431H, 25009C0433H	
Haverhill, City of	250085	01070006	25009C0058F[1], 25009C0059G, 25009C0066G, 25009C0067G, 25009C0068G, 25009C0069G, 25009C0078G, 25009C0080F[1], 25009C0083G, 25009C0084G, 25009C0086G, 25009C0087G, 25009C0088G, 25009C0089H, 25009C0091G, 25009C0092G, 25009C0093G, 25009C0094G, 25009C0111G, 25009C0226G, 25009C0227G, 25009C0231G	
Ipswich, Town of	250086	01090001	25009C0258G, 25009C0259G, 25009C0262G, 25009C0266G, 25009C0267G, 25009C0269G, 25009C0276H, 25009C0277G, 25009C0278H, 25009C0279G, 25009C0281G, 25009C0282G, 25009C0283G, 25009C0284G, 25009C0286G, 25009C0287H, 25009C0288G, 25009C0289H, 25009C0291G, 25009C0292G, 25009C0293H, 25009C0311G	
Lawrence, City of	250087	01070006	25009C0204G, 25009C0206G, 25009C0207G, 25009C0208G, 25009C0209G, 25009C0216G, 25009C0217G	
Lynn, City of	250088	01090001	25009C0394G, 25009C0413G, 25009C0414G, 25009C0507H, 25009C0526G, 25009C0527G, 25009C0528G, 25009C0529G, 25009C0531H, 25009C0533G	
Lynnfield, Town of	250089	01090001	25009C0379F[1], 25009C0383G, 25009C0387G, 25009C0389G, 25009C0391G, 25009C0392G, 25009C0393G, 25009C0394G, 25009C0413G	

Table 1: Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Manchester-by-the-Sea, Town of	250090	01090001	25009C0429G, 25009C0431H, 25009C0432H, 25009C0433H, 25009C0434H, 25009C0441H, 25009C0442G, 25009C0451H, 25009C0453H, 25009C0454H, 25009C0475G	
Marblehead, Town of	250091	01090001	25009C0419G, 25009C0438G, 25009C0439G, 25009C0443G, 25009C0532H, 25009C0551G, 25009C0552G	
Merrimac, Town of	250092	01070006	25009C0081G[1], 25009C0082G, 25009C0083G, 25009C0084G, 25009C0092G, 25009C0101G, 25009C0103G, 25009C0111G	
Methuen, City of	250093	01070006	25009C0066G, 25009C0068G, 25009C0069G, 25009C0088G, 25009C0185F[1], 25009C0201G, 25009C0202G, 25009C0203G, 25009C0204G, 25009C0206G, 25009C0207G, 25009C0208G, 25009C0211G, 25009C0226G	
Middleton, Town of	250094	01090001	25009C0243G, 25009C0244G, 25009C0263G, 25009C0381G, 25009C0382G, 25009C0383G, 25009C0384G, 25009C0401G, 25009C0402G, 25009C0403G	
Nahant, Town of	250095	01090001	25009C0529G, 25009C0533G, 25009C0537G, 25009C0541G, 25009C0542G	
Newbury, Town of	250096	01070006, 01090001	25009C0114G, 25009C0116G, 25009C0117H, 25009C0118H, 25009C0119G, 25009C0136G, 25009C0137G, 25009C0138G, 25009C0139G, 25009C0141G, 25009C0143G, 25009C0252G, 25009C0256H, 25009C0257H, 25009C0276H, 25009C0277G, 25009C0281G	
Newburyport, City of	250097	01070006, 01090001	25009C0104G, 25009C0108G, 25009C0109G, 25009C0116G, 25009C0117H, 25009C0128G, 25009C0129F, 25009C0133F, 25009C0136G, 25009C0137G, 25009C0141G	

Table 1: Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
North Andover, Town of	250098	01070006, 01090001	25009C0207G, 25009C0209G, 25009C0217G, 25009C0226G, 25009C0227G, 25009C0228G, 25009C0229G, 25009C0233G, 25009C0236G, 25009C0237G, 25009C0238G, 25009C0239G, 25009C0241G, 25009C0242G, 25009C0243G, 25009C0244G, 25009C0377G, 25009C0381G	
Peabody, City of	250099	01090001	25009C0383G, 25009C0384G, 25009C0391G, 25009C0392G, 25009C0394G, 25009C0411G, 25009C0412G, 25009C0413G, 25009C0414G, 25009C0416H, 25009C0418H, 25009C0527G	
Rockport, Town of	250100	01090001	25009C0309G, 25009C0317G, 25009C0319H, 25009C0328G, 25009C0336G, 25009C0337G, 25009C0338H, 25009C0339G, 25009C0476G, 25009C0500G	
Rowley, Town of	250101	01090001	25009C0119G, 25009C0138G, 25009C0139G, 25009C0143G, 25009C0252G, 25009C0253G, 25009C0254G, 25009C0256H, 25009C0257H, 25009C0258G, 25009C0259G, 25009C0262G, 25009C0266G, 25009C0276H, 25009C0277G, 25009C0278H, 25009C0281G	
Salem, City of	250102	01090001	25009C0414G, 25009C0416H, 25009C0417H, 25009C0418H, 25009C0419G, 25009C0436H, 25009C0437G, 25009C0438G, 25009C0439G, 25009C0441H, 25009C0442G, 25009C0443G, 25009C0527G, 25009C0531H, 25009C0532H, 25009C0552G	
Salisbury, Town of	250103	01060003, 01070006	25009C0018G, 25009C0019F[1], 25009C0050F[1], 25009C0106G, 25009C0107G, 25009C0109G, 25009C0126F, 25009C0127F, 25009C0128G, 25009C0129F, 25009C0133F	

Table 1: Listing of NFIP Jurisdictions

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Saugus, Town of	250104	01090001	25009C0393G, 25009C0394G, 25009C0506G, 25009C0507H, 25009C0508G, 25009C0509H, 25009C0517G, 25009C0526G, 25009C0528G, 25009C0529G, 25009C0536G	
Swampscott, Town of	250105	01090001	25009C0531H, 25009C0532H, 25009C0533G, 25009C0534G	
Topsfield, Town of	250106	01090001	25009C0261G, 25009C0262G, 25009C0263G, 25009C0264G, 25009C0266G, 25009C0267G, 25009C0268G, 25009C0269G, 25009C0401G, 25009C0402G, 25009C0406G	
Wenham, Town of	250107	01090001	25009C0406G, 25009C0407G, 25009C0408G, 25009C0409G, 25009C0426G, 25009C0427G, 25009C0428G, 25009C0429G, 25009C0433H	
West Newbury, Town of	250108	01070006, 01090001	25009C0084G, 25009C0092G, 25009C0094G, 25009C0103G, 25009C0104G, 25009C0108G, 25009C0111G, 25009C0112G, 25009C0113G, 25009C0114G, 25009C0116G, 25009C0118H	

[1] Panel Not Printed

1.4 Considerations for using this Flood Insurance Study Report

The NFIP encourages State and local governments to implement sound floodplain management programs. To assist in this endeavor, each FIS Report provides floodplain data, which may include a combination of the following: 10-, 4-, 2-, 1-, and 0.2-percent annual chance flood elevations (the 1% annual chance flood elevation is also referred to as the Base Flood Elevation (BFE)); delineations of the 1% annual chance and 0.2% annual chance floodplains; and 1% annual chance floodway. This information is presented on the FIRM and/or in many components of the FIS Report, including Flood Profiles, Floodway Data tables, Summary of Non-Coastal Stillwater Elevations tables, and Coastal Transect Parameters tables (not all components may be provided for a specific FIS).

This section presents important considerations for using the information contained in this FIS Report and the FIRM, including changes in format and content. Figures 1, 2, and 3 present information that applies to using the FIRM with the FIS Report.

- Part or all of this FIS Report may be revised and republished at any time. In addition, part of this FIS Report may be revised by a Letter of Map Revision (LOMR), which does not involve republication or redistribution of the FIS Report. Refer to Section 6.5 of this FIS Report for information about the process to revise the FIS Report and/or FIRM.

  It is, therefore, the responsibility of the user to consult with community officials by contacting the community repository to obtain the most current FIS Report components. Communities participating in the NFIP have established repositories of flood hazard data for floodplain management and flood insurance purposes. Community map repository addresses are provided in Table 30, "Map Repositories," within this FIS Report.

- New FIS Reports are frequently developed for multiple communities, such as entire counties. A countywide FIS Report incorporates previous FIS Reports for individual communities and the unincorporated area of the county (if not jurisdictional) into a single document and supersedes those documents for the purposes of the NFIP.

  The initial Countywide FIS Report for Essex County became effective on July 3, 2012. Refer to Table 27 for information about subsequent revisions to the FIRMs.

- FEMA does not impose floodplain management requirements or special insurance ratings based on Limit of Moderate Wave Action (LiMWA) delineations at this time. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. If the LiMWA is shown on the FIRM, it is being provided by FEMA as information only. For communities that do adopt Zone VE building standards in the area defined by the LiMWA, additional Community Rating System (CRS) credits are available. Refer to Section 2.5.4 for additional information about the LiMWA.

  The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Visit the FEMA Web site at www.fema.gov/national-flood-insurance-program-community-rating-system or contact your appropriate FEMA Regional Office for more information about this program.

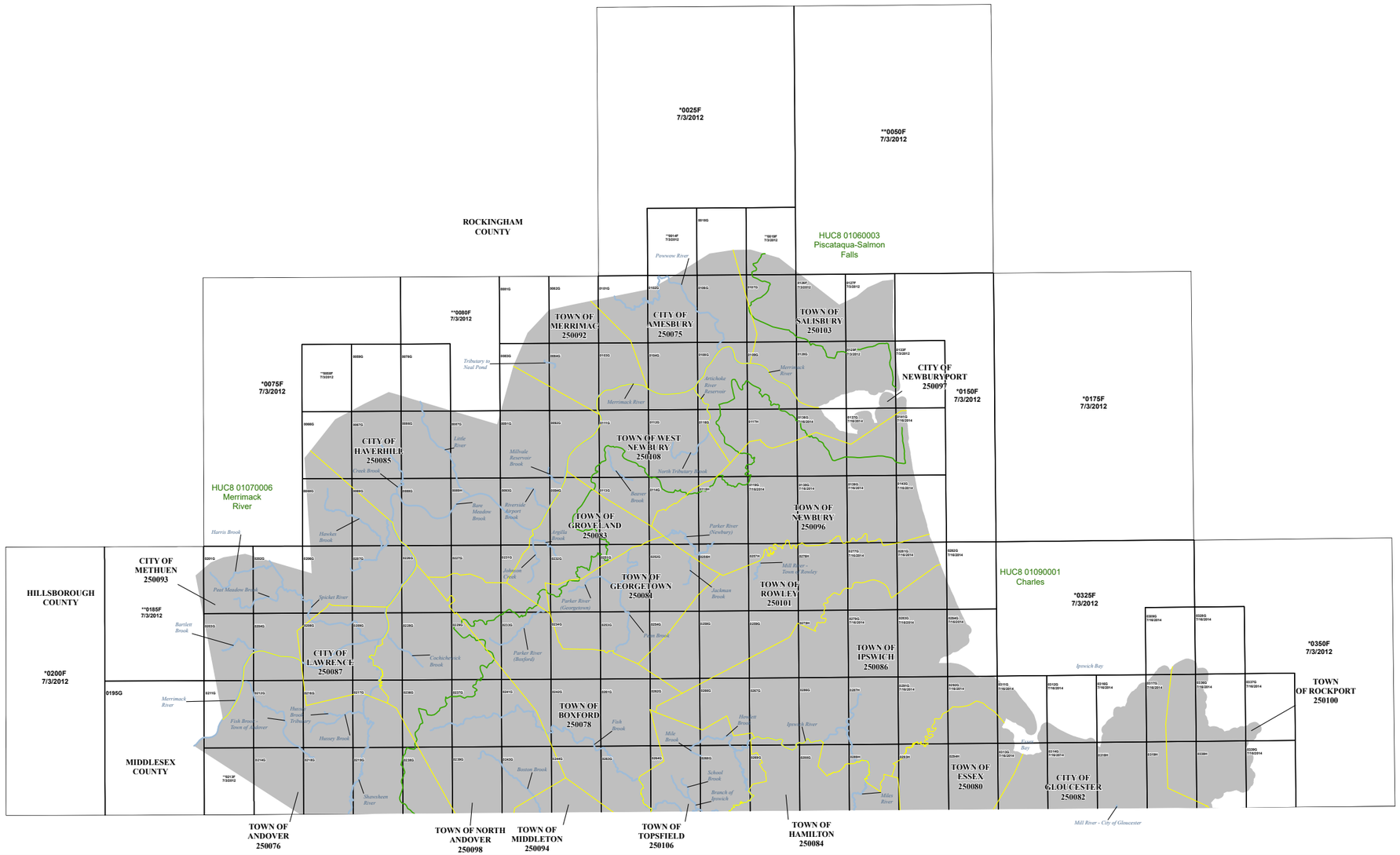
- Previous FIS Reports and FIRMs may have included levees that were accredited as reducing the risk associated with the 1% annual chance flood based on the information available and the mapping standards of the NFIP at that time. For FEMA to continue to accredit the identified levees, the levees must meet the criteria of the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10), titled "Mapping of Areas Protected by Levee Systems."

  Since the status of levees is subject to change at any time, the user should contact the appropriate agency for the latest information regarding levees presented in Table 8 of this FIS Report. For levees owned or operated by the U.S. Army Corps of Engineers (USACE), information may be obtained from the USACE national levee database (nld.usace.army.mil). For all other levees, the user is encouraged to contact the appropriate local community.

- FEMA has developed a *Guide to Flood Maps* (FEMA 258) and online tutorials to assist users in accessing the information contained on the FIRM. These include how to read panels and step-by-step instructions to obtain specific information. To obtain this guide and

other assistance in using the FIRM, visit the FEMA Web site at www.fema.gov/online-tutorials.

The FIRM Index in Figure 1 shows the overall FIRM panel layout within Essex County, and also displays the panel number and effective date for each FIRM panel in the county. Other information shown on the FIRM Index includes community boundaries, flooding sources, watershed boundaries, and United States Geological Survey (USGS) Hydrologic Unit Code – 8 (HUC-8) codes.



ATTENTION: The corporate limits shown on this FIRM Index are based on the best information available at the time of publication. As such, they may be more current than those shown on FIRM panels issued before TBD.

1 inch = 4 miles 1:242,000

N

feet
0 5,000 10,000 20,000 30,000 40,000 50,000 60,000

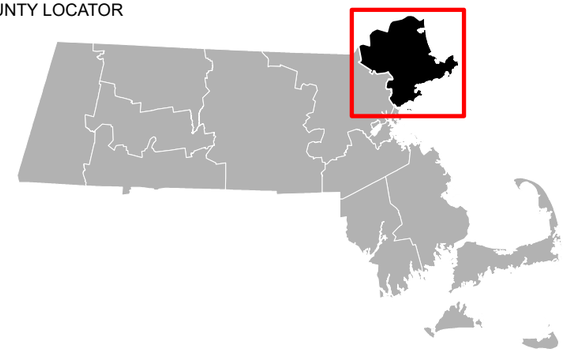
Map Projection:
NAD 1983 State Plane, Massachusetts Mainland, FIPS 2001, Feet;
Western Hemisphere; Vertical Datum: NAVD 88

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT
HTTPS://MSC.FEMA.GOV

SEE FLOOD INSURANCE STUDY
FOR ADDITIONAL INFORMATION

*PANEL NOT PRINTED - AREA OUTSIDE COUNTY BOUNDARY
**PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS

COUNTY LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP INDEX
(SHEET 1 OF 2)

ESSEX COUNTY, MASSACHUSETTS (ALL JURISDICTIONS)

PANELS PRINTED:

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REVISED PRELIMINARY 05/26/2023

MAP INDEX
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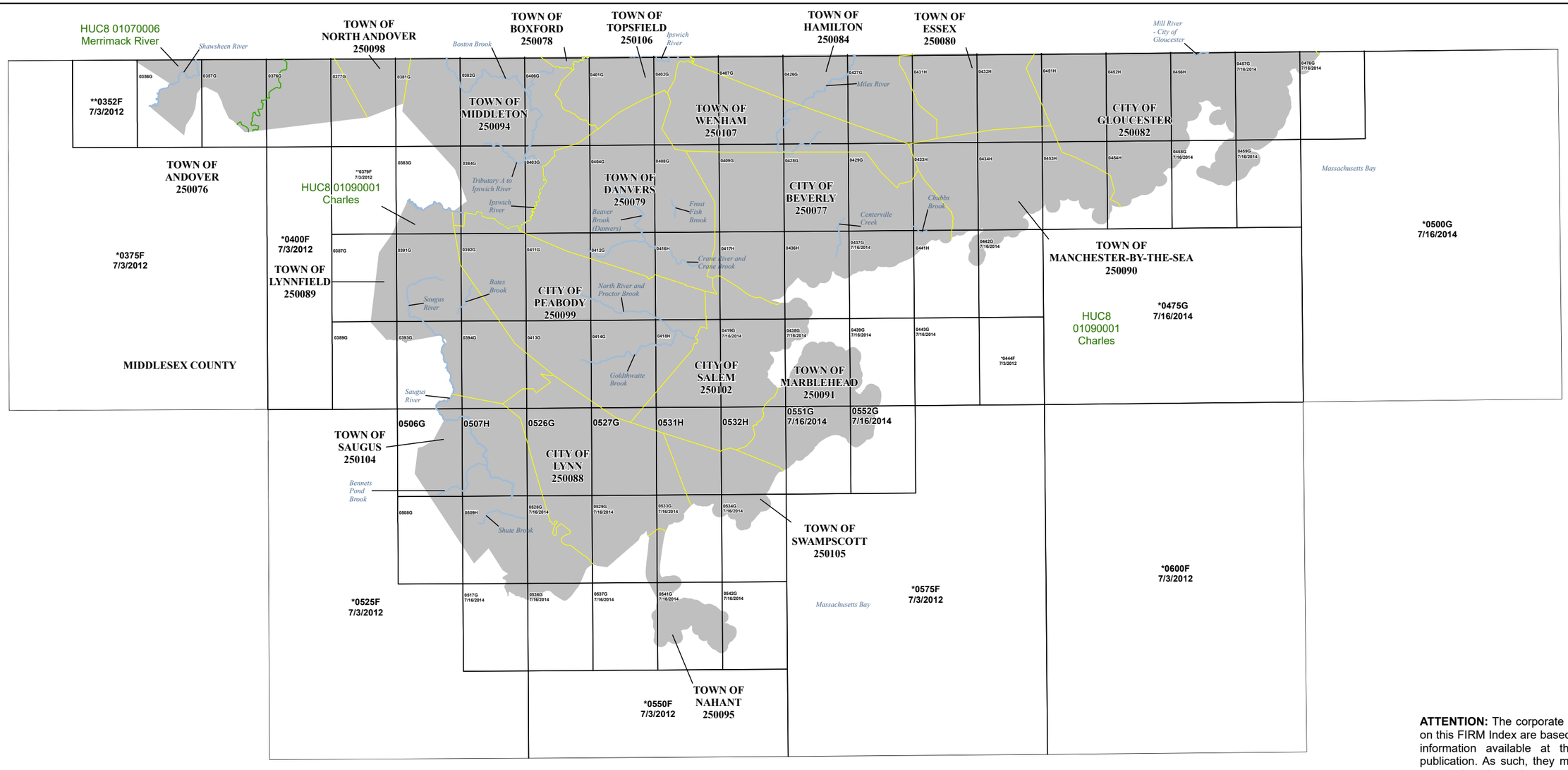
MAP REVISED



1 inch = 3 miles 1:167,000

N

feet

0 3,750 7,500 15,000 22,500 30,000 37,500 45,000

Map Projection:
NAD 1983 State Plane, Massachusetts Mainland, FIPS 2001, Feet; Western Hemisphere; Vertical Datum: NAVD 88

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT
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SEE FLOOD INSURANCE STUDY
FOR ADDITIONAL INFORMATION

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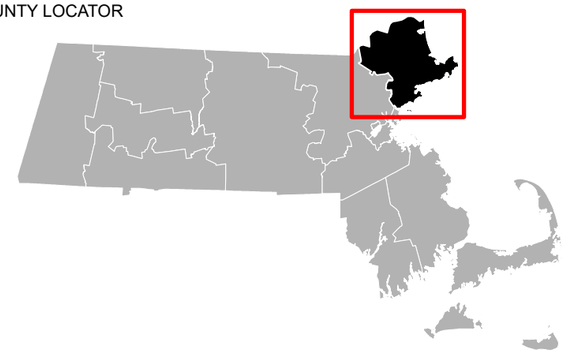
**PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS

COUNTY LOCATOR



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NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP INDEX
(SHEET 2 OF 2)

ESSEX COUNTY, MASSACHUSETTS (ALL JURISDICTIONS)

PANELS PRINTED:

0356, 0357, 0376, 0377, 0381, 0382, 0383, 0384, 0387, 0389, 0391, 0392, 0393, 0394, 0401, 0402, 0403, 0404, 0406, 0407, 0408, 0409, 0411, 0412, 0413, 0414, 0416, 0417, 0418, 0419, 0426, 0427, 0428, 0429, 0431, 0432, 0433, 0434, 0436, 0437, 0438, 0439, 0441, 0442, 0443, 0451, 0452, 0453, 0454, 0456, 0457, 0458, 0459, 0476, 0506, 0507, 0508, 0509, 0517, 0526, 0527, 0528, 0529, 0531, 0532, 0533, 0534, 0536, 0537, 0541, 0542, 0551, 0552

FEMA

REVISED PRELIMINARY 05/26/2023

MAP INDEX
25009CIND2D
MAP REVISED

Each FIRM panel may contain specific notes to the user that provide additional information regarding the flood hazard data shown on that map. However, the FIRM panel does not contain enough space to show all the notes that may be relevant in helping to better understand the information on the panel. Figure 2 contains the full list of these notes.

Figure 2: FIRM Notes to Users

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products, or the National Flood Insurance Program in general, please call the FEMA Mapping and Insurance eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Flood Map Service Center website or by calling the FEMA Mapping and Insurance eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to Table 27 in this FIS Report.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

PRELIMINARY FIS REPORT: FEMA maintains information about map features, such as street locations and names, in or near designated flood hazard areas. Requests to revise information in or near designated flood hazard areas may be provided to FEMA during the community review period, at the final Consultation Coordination Officer's meeting, or during the statutory 90-day appeal period. Approved requests for changes will be shown on the final printed FIRM.

The map is for use in administering the NFIP. It may not identify all areas subject to flooding, particularly from local drainage sources of small size. Consult the community map repository to find updated or additional flood hazard information.

BASE FLOOD ELEVATIONS: For more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, consult the Flood Profiles and Floodway Data and/or Summary of Non-Coastal Stillwater Elevations tables within this FIS Report. Use the flood elevation data within the FIS Report in conjunction with the FIRM for construction and/or floodplain management.

Coastal Base Flood Elevations shown on the map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Coastal flood elevations are also provided in the Coastal Transect Parameters table in the FIS Report for this jurisdiction. Elevations shown in the Coastal Transect Parameters table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on the FIRM.

Figure 2. FIRM Notes to Users

FLOODWAY INFORMATION: Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the FIS Report for this jurisdiction.

FLOOD CONTROL STRUCTURE INFORMATION: Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 4.3 "Non-Levee Flood Protection Measures" of this FIS Report for information on flood control structures for this jurisdiction.

PROJECTION INFORMATION: The projection used in the preparation of the map was Massachusetts State Plane (Mainland Zone), FIPS 2001**.** The horizontal datum was NAD83, GRS1980 spheroid**.** Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

ELEVATION DATUM: Flood elevations on the FIRM are referenced to the North American Vertical Datum of 1988**.** These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988**,** visit the National Geodetic Survey website at www.ngs.noaa.gov.

Local vertical monuments may have been used to create the map. To obtain current monument information, please contact the appropriate local community listed in Table 30 of this FIS Report.

BASE MAP INFORMATION: Base map information shown on the FIRM dated July 3, 2012 was provided by Massachusetts Geographic Information System (MassGIS). Orthoimagery is from 2005 and is at a scale of 1:5,000. Vector data are undated but were derived from orthoimagery. Panels dated July 16, 2014, use imagery from 2005, 2008, or 2010 provided by MassGIS or the National Agriculture Imagery Program (NAIP) at an unrecorded scale, with all vector data unchanged from the previous FIRM. Panels dated **December 31, 9999**, use imagery from 2019 provided by the U.S. Geological Survey at a resolution of 0.15 meter, transportation data from 2016 provided by the U.S. Census Bureau with undefined scale, and political boundaries from 2017 provided by MassGIS at a scale of 1:5,000. For information about base maps, refer to Section 6.2 “Base Map” in this FIS Report.

The map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables may reflect stream channel distances that differ from what is shown on the map.

Corporate limits shown on the map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after the map was published, map users should contact appropriate community officials to verify current corporate limit locations.

NOTES FOR FIRM INDEX

REVISIONS TO INDEX: As new studies are performed and FIRM panels are updated within Essex County, Massachusetts, corresponding revisions to the FIRM Index will be

Figure 2. FIRM Notes to Users

incorporated within the FIS Report to reflect the effective dates of those panels. Please refer to Table 27 of this FIS Report to determine the most recent FIRM revision date for each community. The most recent FIRM panel effective date will correspond to the most recent index date.

The corporate limits shown on the FIRM Index are based on the best information available at the time of publication. As such, they may be more current than those shown on FIRM panels issued before **December 31, 9999**.

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for Essex County, Massachusetts**,** effective **December 31, 9999.**

LIMIT OF MODERATE WAVE ACTION: Zone AE has been divided by a Limit of Moderate Wave Action (LiMWA). The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between Zone VE and the LiMWA (or between the shoreline and the LiMWA for areas where Zone VE is not identified) will be similar to, but less severe than, those in Zone VE.

ACCREDITED LEVEE SYSTEM: Check with your local community to obtain more information on the levee system(s) shown as providing flood hazard reduction on this panel. To mitigate flood hazards in residual risk areas, property owners and residents are encouraged to review the community's emergency preparedness plan and to consider flood insurance and floodproofing or other risk reduction measures. For more information on flood insurance, interested parties should visit www.fema.gov/flood-insurance.

Each FIRM panel contains an abbreviated legend for the features shown on the maps. However, the FIRM panel does not contain enough space to show the legend for all map features. Figure 3 shows the full legend of all map features. Note that not all of these features may appear on the FIRM panels in Essex County.

Figure 3: Map Legend for FIRM

SPECIAL FLOOD HAZARD AREAS: *The 1% annual chance flood, also known as the base flood or 100-year flood, has a 1% chance of happening or being exceeded each year. Special Flood Hazard Areas are subject to flooding by the 1% annual chance flood. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights. See note for specific types. If the floodway is too narrow to be shown, a note is shown.*

	Special Flood Hazard Areas subject to inundation by the 1% annual chance flood (Zones A, AE, AH, AO, AR, A99, V and VE)
Zone A	The flood insurance rate zone that corresponds to the 1% annual chance floodplains. No base (1% annual chance) flood elevations (BFEs) or depths are shown within this zone.
Zone AE	The flood insurance rate zone that corresponds to the 1% annual chance floodplains. Base flood elevations derived from the hydraulic analyses are shown within this zone.
Zone AH	The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the hydraulic analyses are shown at selected intervals within this zone.
Zone AO	The flood insurance rate zone that corresponds to the areas of 1% annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the hydraulic analyses are shown within this zone.
Zone AR	The flood insurance rate zone that corresponds to areas that were formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
Zone A99	The flood insurance rate zone that corresponds to areas of the 1% annual chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or flood depths are shown within this zone.
Zone V	The flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations are not shown within this zone.
Zone VE	Zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Base flood elevations derived from the coastal analyses are shown within this zone as static whole-foot elevations that apply throughout the zone.

Figure 3: Map Legend for FIRM

	Regulatory Floodway determined in Zone AE.
OTHER AREAS OF FLOOD HAZARD	
	Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile.
	Future Conditions 1% Annual Chance Flood Hazard – Zone X: The flood insurance rate zone that corresponds to the 1% annual chance floodplains that are determined based on future-conditions hydrology. No base flood elevations or flood depths are shown within this zone.
	Area with Reduced Flood Risk due to Levee: Areas where an accredited levee, dike, or other flood control structure has reduced the flood risk from the 1% annual chance flood. See Notes to Users for important information.
OTHER AREAS	
	Zone D (Areas of Undetermined Flood Hazard): The flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.
	Unshaded Zone X: Areas of minimal flood hazard.
FLOOD HAZARD AND OTHER BOUNDARY LINES	
(ortho) (vector)	Flood Zone Boundary (white line on ortho-photography-based mapping; gray line on vector-based mapping)
	Limit of Study
	Jurisdiction Boundary
	Limit of Moderate Wave Action (LiMWA): Indicates the inland limit of the area affected by waves greater than 1.5 feet
GENERAL STRUCTURES	
Aqueduct *Channel* *Culvert* *Storm Sewer*	Channel, Culvert, Aqueduct, or Storm Sewer
Dam *Jetty* *Weir*	Dam, Jetty, Weir

Figure 3: Map Legend for FIRM

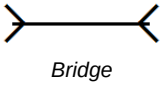
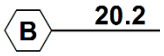
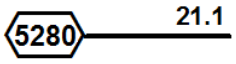
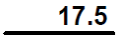
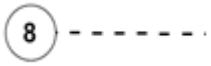
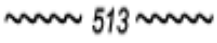
	Levee, Dike, or Floodwall
 *Bridge*	Bridge
REFERENCE MARKERS	
 22.0	River mile Markers
CROSS SECTION & TRANSECT INFORMATION	
 B 20.2	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
 5280 21.1	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
 17.5	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
 8	Coastal Transect
	Profile Baseline: Indicates the modeled flow path of a stream and is shown on FIRM panels for all valid studies with profiles or otherwise established base flood elevation.
	Coastal Transect Baseline: Used in the coastal flood hazard model to represent the 0.0-foot elevation contour and the starting point for the transect and the measuring point for the coastal mapping.
 513	Base Flood Elevation Line
ZONE AE (EL 16)	Static Base Flood Elevation value (shown under zone label)
ZONE AO (DEPTH 2)	Zone designation with Depth
ZONE AO (DEPTH 2) (VEL 15 FPS)	Zone designation with Depth and Velocity
BASE MAP FEATURES	
 *Missouri Creek*	River, Stream or Other Hydrographic Feature
 234	Interstate Highway
 234	U.S. Highway
 234	State Highway

Figure 3: Map Legend for FIRM

234	County Highway
MAPLE LANE	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
RAILROAD	Railroad
_____	Horizontal Reference Grid Line
___	Horizontal Reference Grid Ticks
+	Secondary Grid Crosshairs
Land Grant	Name of Land Grant
7	Section Number
R. 43 W. T. 22 N.	Range, Township Number
$^{42}76^{000m}$E	Horizontal Reference Grid Coordinates (UTM)
365000 FT	Horizontal Reference Grid Coordinates (State Plane)
80° 16' 52.5"	Corner Coordinates (Latitude, Longitude)

SECTION 2.0 – FLOODPLAIN MANAGEMENT APPLICATIONS

2.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1% annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2% annual chance (500-year) flood is employed to indicate additional areas of flood hazard in the community.

Each flooding source included in the project scope has been studied and mapped using professional engineering and mapping methodologies that were agreed upon by FEMA and Essex County as appropriate to the risk level. Flood risk is evaluated based on factors such as known flood hazards and projected impact on the built environment. Engineering analyses were performed for each studied flooding source to calculate its 1% annual chance flood elevations; elevations corresponding to other floods (e.g. 10-, 4-, 2-, 0.2-percent annual chance, etc.) may have also been computed for certain flooding sources. Engineering models and methods are described in detail in Section 5.0 of this FIS Report. The modeled elevations at cross sections were used to delineate the floodplain boundaries on the FIRM; between cross sections, the boundaries were interpolated using elevation data from various sources. More information on specific mapping methods is provided in Section 6.0 of this FIS Report.

Depending on the accuracy of available topographic data (Table 22), study methodologies employed (Section 5.0), and flood risk, certain flooding sources may be mapped to show both the 1% and 0.2% annual chance floodplain boundaries, regulatory water surface elevations (BFEs), and/or a regulatory floodway. Similarly, other flooding sources may be mapped to show only the 1% annual chance floodplain boundary on the FIRM, without published water surface elevations. In cases where the 1% and 0.2% annual chance floodplain boundaries are close together, only the 1% annual chance floodplain boundary is shown on the FIRM. Figure 3, "Map Legend for FIRM", describes the flood zones that are used on the FIRMs to account for the varying levels of flood risk that exist along flooding sources within the project area. Table 2 and Table 3 indicate the flood zone designations for each flooding source and each community within Essex County, Massachusetts, respectively.

Table 2, "Flooding Sources Included in this FIS Report," lists each flooding source, including its study limits, affected communities, mapped zone on the FIRM, and the completion date of its engineering analysis from which the flood elevations on the FIRM and in the FIS Report were derived. Descriptions and dates for the latest hydrologic and hydraulic analyses of the flooding sources are shown in Table 12. Floodplain boundaries for these flooding sources are shown on the FIRM (published separately) using the symbology described in Figure 3. On the map, the 1% annual chance floodplain corresponds to the SFHAs. The 0.2% annual chance floodplain shows areas that, although out of the regulatory floodplain, are still subject to flood hazards.

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. The procedures to remove these areas from the SFHA are described in Section 6.5 of this FIS Report.

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Alewife Brook 1	Essex, Town of; Hamilton, Town of; Manchester-by-the-Sea, Town of; Wenham, Town of	Limit of effective coastal flooding	State Route 128	01090001	4.5		N	A	4/30/2018
Alewife Brook 1 Tributary A	Essex, Town of	Confluence with Alewife Brook 1	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018
Alewife Brook 1 Tributary B	Essex, Town of	Confluence with Alewife Brook 1	Turf Meadow	01090001	1.4		N	A	4/30/2018
Alewife Brook 1 Tributary C	Essex, Town of; Hamilton, Town of	Confluence with Alewife Brook 1	Point of one square mile of drainage area	01090001	1.3		N	A	4/30/2018
Alewife Brook 1 Tributary D	Essex, Town of; Hamilton, Town of; Manchester-by-the-Sea, Town of	Confluence with Alewife Brook 1	Point of one square mile of drainage area	01090001	2.4		N	A	4/30/2018
Alewife Brook 1 Tributary D1	Essex, Town of	Confluence with Alewife Brook 1 Tributary D	Point of one square mile of drainage area	01090001	1.1		N	A	4/30/2018
Alewife Brook 1 Tributary D2	Essex, Town of; Hamilton, Town of	Confluence with Alewife Brook 1 Tributary D	Point of one square mile of drainage area	01090001	0.2		N	A	4/30/2018
Alewife Brook 1 Tributary D3	Essex, Town of	Confluence with Alewife Brook 1 Tributary D	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018
Alewife Brook 1 Tributary E	Hamilton, Town of	Confluence with Alewife Brook 1	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Alewife Brook 1 Tributary F	Hamilton, Town of	Confluence with Alewife Brook 1	Point of one square mile of drainage area	01090001	1.5		N	A	4/30/2018
Alewife Brook 1 Tributary G	Hamilton, Town of	Confluence with Alewife Brook 1	Gravelly Pond	01090001	0.4		N	A	4/30/2018
Alewife Brook 1 Tributary H	Wenham, Town of	Confluence with Alewife Brook 1	Point of one square mile of drainage area	01090001	0.4		N	A	4/30/2018

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Alewife Brook 2	Gloucester, City of; Rockport, Town of	Approximately 400 feet above Access Road	Point of one square mile of drainage area	01090001	2.0		N	A	4/30/2018
Argilla Brook	Groveland, Town of	Confluence with Johnson Creek	Center Street Bridge	01070006	1.2		Y	AE	4/1/1978
Argilla Brook	Groveland, Town of	Center Street	Point of one square mile of drainage area	01070006	1.9		N	A	6/4/2019
Argilla Brook Tributary A	Groveland, Town of	Confluence with Argilla Brook	Point of one square mile of drainage area	01070006	0.6		N	A	6/4/2019
Argilla Brook Tributary B	Groveland, Town of	Confluence with Argilla Brook	King Street	01070006	0.6		N	A	6/4/2019
Artichoke River Reservoir	Newburyport, City of; West Newbury, Town of	Confluence with Merrimack River	Confluence with North Tributary Brook	01070006	2.9		N	AE	1/1/1977
Artichoke River Reservoir Tributary A	Newbury, Town of; West Newbury, Town of	Confluence with Artichoke River Reservoir	Point of one square mile of drainage area	01070006	2.3		N	A	6/4/2019
Artichoke River Reservoir Tributary B	West Newbury, Town of	Confluence with Artichoke River Reservoir	Point of one square mile of drainage area	01070006	2.9		N	A	6/4/2019
Bachelder Brook	Ipswich, Town of; Rowley, Town of	Confluence with Mill River (Rowley)	Point of one square mile of drainage area	01090001	4.6		N	A	4/30/2018
Bachelder Brook Tributary A	Rowley, Town of	Confluence with Bachelder Brook	U.S. Route 1	01090001	0.5		N	A	4/30/2018
Bachelder Brook Tributary B	Rowley, Town of	Confluence with Bachelder Brook	State Route 133	01090001	1.5		N	A	4/30/2018
Bachelder Brook Tributary B1	Rowley, Town of	Confluence with Bachelder Brook Tributary B	Point of one square mile of drainage area	01090001	0.2		N	A	4/30/2018
Bachelder Brook Tributary C	Ipswich, Town of	Confluence with Bachelder Brook	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Bachelder Brook Tributary D	Ipswich, Town of; Rowley, Town of	Confluence with Bachelder Brook	Point of one square mile of drainage area	01090001	0.4		N	A	4/30/2018
Back River 1	Amesbury, City of; Salisbury, Town of	Confluence with Powwow River	County boundary	01070006	6.8		N	A	6/4/2019
Back River 1 Tributary A	Amesbury, City of	Confluence with Back River 1	Point of one square mile of drainage area	01070006	1.4		N	A	6/4/2019
Back River 1 Tributary B	Amesbury, City of; Salisbury, Town of	Confluence with Back River 1	Point of one square mile of drainage area	01070006	1.0		N	A	6/4/2019
Back River 1 Tributary C	Amesbury, City of	Confluence with Back River 1	County boundary	01070006	2.0		N	A	6/4/2019
Back River 2	Amesbury, City of	Confluence with Powwow River	Lake Attitash	01070006	1.0		N	A	6/4/2019
Back River 2	Merrimac, Town of	Lake Attitash	County boundary	01070006	2.5		N	A	6/4/2019
Back River 2 Tributary A	Merrimac, Town of	Lake Attitash	Point of one square mile of drainage area	01070006	1.4		N	A	6/4/2019
Baldpate Pond	Boxford, Town of; Georgetown, Town of	Entire shoreline	Entire shoreline	01090001		0.09	N	AE	3/1/1978
Bare Meadow Brook	Haverhill, City of; Methuen, City of	Confluence with Merrimack River	Approximately 400 feet above Hills Pond Dam	01070006	3.2		Y	AE	10/1/1983
Bare Meadow Brook Tributary A	Methuen, City of	Confluence with Bare Meadow Brook	Point of one square mile of drainage area	01070006	1.1		N	A	6/4/2019
Bare Meadow Brook Tributary A1	Methuen, City of	Confluence with Bare Meadow Brook Tributary A	Point of one square mile of drainage area	01070006	0.8		N	A	6/4/2019
Bartholowmew Pond	Peabody, City of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Bartlett Brook	Methuen, City of	Confluence with Merrimack River	Approximately 6,150 feet above North Lowell Street	01070006	1.6		Y	AE	10/1/1983

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Bartlett Brook	Methuen, City of	Approximately 6,150 feet above North Lowell Street	County boundary	01070006	4.1		N	A	6/4/2019
Bartlett Brook Tributary A	Methuen, City of	Confluence with Bartlett Brook	Point of one square mile of drainage area	01070006	1.1		N	A	6/4/2019
Bartlett Brook Tributary B	Methuen, City of	Confluence with Bartlett Brook	County boundary	01070006	3.8		N	A	6/4/2019
Bass River	Beverly, City of	Shoe Pond	Point of one square mile of drainage area	01090001	1.1		N	A	4/30/2018
Bates Brook	Lynnfield, Town of	Confluence with Saugus River	Pillings Pond	01090001	0.7		N	A	4/30/2018
Bates Brook	Lynnfield, Town of; Peabody, City of	Approximately 575 feet above Chatham Way	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Bates Brook	Lynnfield, Town of	Confluence with Pillings Pond	Approximately 575 feet above Chatham Way	01090001	0.9		Y	AE	1/1/1978
Bear Meadow Brook Tributary B1	Lynnfield, Town of	County boundary	Point of one square mile of drainage area	01090001	2.1		N	A	4/30/2018
Bear Pond	Andover, Town of	Entire shoreline	Entire shoreline	01090001		0.04	N	A	4/30/2018
Beaver Brook (Danvers)	Danvers, Town of	Nichols Street	Point of one square mile of drainage area	01090001	0.1		N	A	4/30/2018
Beaver Brook (Danvers)	Danvers, Town of	Sylvan Street Dam	Nichols Street	01090001	2.2		Y	AE	11/1/1978
Beaver Brook (West Newbury)	Groveland, Town of; Newbury, Town of; West Newbury, Town of	Confluence with Parker River	Middle Street	01090001	2.3		N	A	4/30/2018
Beaver Brook (West Newbury)	West Newbury, Town of	Middle Street	Approximately 4,400 feet above Tewksbury Street	01090001	1.4		Y	AE	1/1/1977

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Beaver Brook (West Newbury) Tributary A	West Newbury, Town of	Confluence with Beaver Brook	Point of one square mile of drainage area	01090001	1.1		N	A	4/30/2018
Beaverdam Brook	Lynnfield, Town of	Confluence with Saugus River	Main Street	01090001	2.6		Y	AE	1/1/1978
Beaverdam Brook Tributary A	Lynnfield, Town of	Confluence with Beaverdam Brook	Point of one square mile of drainage area	01090001	0.4		N	A	4/30/2018
Bennets Pond Brook	Saugus, Town of	Approximately 1,000 feet above Lewis O. Gray Drive	County boundary	01090001	0.7		N	A	4/30/2018
Bennets Pond Brook	Saugus, Town of	Confluence with Saugus River	Approximately 1,000 feet above Lewis O. Gray Drive	01090001	1.8		Y	AE	11/1/1980
Bennets Pond Brook Tributary A	Saugus, Town of	Confluence with Bennets Pond Brook	Point of one square mile of drainage area	01090001	0.7		N	A	4/30/2018
Birch Pond	Lynn, City of; Saugus, Town of	Entire shoreline	Entire shoreline	01090001		0.12	N	A	4/30/2018
Black Brook	Hamilton, Town of	Confluence with Ipswich River	Cutler Pond	01090001	4.1		N	A	4/30/2018
Black Brook Tributary A	Hamilton, Town of	Confluence with Black Brook	Point of one square mile of drainage area	01090001	1.1		N	A	4/30/2018
Black Brook Tributary B	Hamilton, Town of; Topsfield, Town of	Confluence with Black Brook	Point of one square mile of drainage area	01090001	1.7		N	A	4/30/2018
Black Brook Tributary B1	Hamilton, Town of	Confluence with Black Brook Tributary B	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Black Brook Tributary B2	Hamilton, Town of; Topsfield, Town of	Confluence with Black Brook Tributary B	Point of one square mile of drainage area	01090001	0.2		N	A	4/30/2018
Black Brook Tributary C	Hamilton, Town of	Confluence with Black Brook	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Black Brook Tributary D	Hamilton, Town of	Confluence with Black Brook	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018

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Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Boston Brook	Andover, Town of; North Andover, Town of	Approximately 4,000 feet above Hawkins Lane	Point of one square mile of drainage area	01090001	4.1		N	A	4/30/2018
Boston Brook	North Andover, Town of	Middleton/ North Andover corporate boundary	Approximately 4,000 feet above Hawkins Lane	01090001	2.7		Y	AE	10/1/1990
Boston Brook	Middleton, Town of	Confluence with Ipswich River	Middleton/ North Andover corporate boundary	01090001	4.1		Y	AE	10/1/1978
Boston Brook Tributary A	Boxford, Town of; Middleton, Town of	Confluence with Boston Brook	Point of one square mile of drainage area	01090001	2.7		N	A	4/30/2018
Boston Brook Tributary A1	Middleton, Town of; North Andover, Town of	Confluence with Boston Brook Tributary A	Point of one square mile of drainage area	01090001	1.2		N	A	4/30/2018
Boston Brook Tributary A1A	North Andover, Town of	Confluence with Boston Brook Tributary A1	Point of one square mile of drainage area	01090001	0.5		N	A	4/30/2018
Boston Brook Tributary B	North Andover, Town of	Confluence with Boston Brook	Point of one square mile of drainage area	01090001	0.2		N	A	4/30/2018
Boston Brook Tributary C	North Andover, Town of	Confluence with Boston Brook	State Route 114	01090001	2.7		N	A	4/30/2018
Boston Brook Tributary D	North Andover, Town of	Confluence with Boston Brook	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Boston Brook Tributary E	North Andover, Town of	Confluence with Boston Brook	Point of one square mile of drainage area	01090001	0.7		N	A	4/30/2018
Boston Brook Tributary F	North Andover, Town of	Confluence with Boston Brook	Point of one square mile of drainage area	01090001	1.1		N	A	4/30/2018
Boston Brook Tributary F1	North Andover, Town of	Confluence with Boston Brook Tributary F	Point of one square mile of drainage area	01090001	0.1		N	A	4/30/2018
Boston Brook Tributary G	North Andover, Town of	Confluence with Boston Brook	Point of one square mile of drainage area	01090001	1.0		N	A	4/30/2018

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Boston Brook Tributary H	Andover, Town of	Confluence with Boston Brook	State Route 125	01090001	0.4		N	A	4/30/2018
Brackett Pond	Andover, Town of	Entire shoreline	Entire shoreline	01090001		0.03	N	A	4/30/2018
Branch of Ipswich and Cleveland Brook	Topsfield, Town of	Confluence with Ipswich River	Approximately 300 feet above Washington Street	01090001	1.5		Y	AE	3/1/1989
Breeds Pond	Lynn, City of	Entire shoreline	Entire shoreline	01090001		0.31	N	A	4/30/2018
Browns Pond	Peabody, City of	Entire shoreline	Entire shoreline	01090001		0.04	N	A	4/30/2018
Bulford Brook	Georgetown, Town of	Confluence with Penn Brook	Approximately 2,400 feet above State Highway 133 (East Main Street)	01090001	0.5		Y	AE	3/1/1978
Bull Brook	Ipswich, Town of	High Street	Point of one square mile of drainage area	01090001	2.1		N	A	4/30/2018
Camp Brook	Haverhill, City of	County boundary	County boundary	01070006	1.4		N	A	6/4/2019
Camp Brook Tributary A	Haverhill, City of	Confluence with Camp Brook	Point of one square mile of drainage area	01070006	0.6		N	A	6/4/2019
Cape Pond	Rockport, Town of	Entire shoreline	Entire shoreline	01090001		0.09	N	A	4/30/2018
Captain Pond Brook	Haverhill, City of	County boundary	Point of one square mile of drainage area	01070006	0.8		N	A	6/4/2019
Captain Pond Brook Tributary A	Haverhill, City of	County boundary	Point of one square mile of drainage area	01070006	0.2		N	A	6/4/2019
Carlton Lane pond	North Andover, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Castle Neck River	Essex, Town of	Choate Street	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018
Cat Brook	Manchester-by-the-Sea, Town of	Confluence with Sawmill Brook 2	Point of one square mile of drainage area	01090001	1.0		N	A	4/30/2018
Causeway Brook	Manchester-by-the-Sea, Town of	Confluence with Sawmill Brook 2	Point of one square mile of drainage area	01090001	0.9		N	A	4/30/2018

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Cedar Pond	Lynn, City of	Entire shoreline	Entire shoreline	01090001		0.04	N	AE	5/1/1983
Cedar Pond 2	Wenham, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Centerville Creek	Beverly, City of	Approximately 75 feet above Common Lane	Point of one square mile of drainage area	01090001	0.1		N	A	4/30/2018
Centerville Creek	Beverly, City of	Approximately 350 feet below Hale Street	Approximately 75 feetabove Common Lane	01090001	1.5		Y	AE	7/1/1983
Chubbs Brook	Beverly, City of	Approximately 65 feet above State Highway 127 (Hale Street)	Point of one square mile of drainage area	01090001	1.4		N	A	4/30/2018
Chubbs Brook	Beverly, City of	Confluence with Chubb Creek	Approximately 65 feet above State Highway 127 (Hale Street)	01090001	0.5		Y	AE	7/1/1983
Chubbs Brook Tributary A	Beverly, City of	Confluence with Chubbs Brook	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018
Coastal Tributary A	Gloucester, City of; Manchester-by-the-Sea, Town of	Limit of effective coastal flooding	Point of one square mile of drainage area	01090001	1.8		N	A	4/30/2018
Coastal Tributary B	Manchester-by-the-Sea, Town of	Limit of effective coastal flooding	Point of one square mile of drainage area	01090001	1.6		N	A	4/30/2018
Coastal Tributary C	Manchester-by-the-Sea, Town of	Limit of effective coastal flooding	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Coastal Tributary D	Beverly, City of	Limit of effective coastal flooding	Point of one square mile of drainage area	01090001	0.5		N	A	4/30/2018
Cobbler Brook	Merrimac, Town of	Confluence with Merrimack River	Point of one square mile of drainage area	01070006	4.5		N	A	6/4/2019
Cobbler Brook Tributary A	Merrimac, Town of	Confluence with Cobbler Brook	Point of one square mile of drainage area	01070006	1.2		N	A	6/4/2019
Cochichewick Brook	North Andover, Town of	Confluence with Merrimack River	Stevens Pond	01070006	1.7		Y	AE	11/1/1980

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Cochichewick Brook	Boxford, Town of; North Andover, Town of	Stevens Pond	Point of one square mile of drainage area	01070006	4.4		N	A	6/4/2019
Cochichewick Brook Tributary A	North Andover, Town of	Confluence with Cochichewick Brook	Point of one square mile of drainage area	01070006	0.5		N	A	6/4/2019
Cochichewick Brook Tributary B	North Andover, Town of	Confluence with Cochichewick Brook	Point of one square mile of drainage area	01070006	3.3		N	A	6/4/2019
Cochichewick Brook Tributary C	North Andover, Town of	Confluence with Cochichewick Brook	Point of one square mile of drainage area	01070006	0.6		N	A	6/4/2019
Collins Pond	Andover, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Crane River and Crane Brook	Danvers, Town of	Confluence with Porter River	Approximately 650 feet above Border-to-Boston Bike Trail	01090001	3.5		Y	AE	11/1/1978
Creek Brook	Haverhill, City of	Confluence with Merrimack River	Crystal Lake	01070006	2.4		Y	AE	1/1/1981
Creek Brook	Haverhill, City of	Crystal Lake	County boundary	01070006	1.2		N	A	6/4/2019
Creek Brook Tributary A	Haverhill, City of	Confluence with Creek Brook	Interstate 495	01070006	0.8		N	A	6/4/2019
Creek Brook Tributary B	Haverhill, City of	Confluence with Creek Brook	Point of one square mile of drainage area	01070006	3.0		N	A	6/4/2019
Creek Brook Tributary B1	Haverhill, City of	Confluence with Creek Brook Tributary B	Point of one square mile of drainage area	01070006	0.3		N	A	6/4/2019
Creek Brook Tributary C	Haverhill, City of	Confluence with Creek Brook	Point of one square mile of drainage area	01070006	0.4		N	A	6/4/2019
Creek Brook Tributary D	Haverhill, City of	Confluence with Creek Brook	Point of one square mile of drainage area	01070006	0.2		N	A	6/4/2019
Creighton Pond	Middleton, Town of	Entire shoreline	Entire shoreline	01090001		0.03	N	A	4/30/2018
Dodge Road swamp	Rowley, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018

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Dow Brook	Ipswich, Town of	High Street	Point of one square mile of drainage area	01090001	1.9		N	A	4/30/2018
Dow Brook swamp	Ipswich, Town of; Rowley, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Duncan Drive swamp	North Andover, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
East Branch Cat Brook	Gloucester, City of; Manchester-by-the-Sea, Town of	Confluence with Cat Brook	Point of one square mile of drainage area	01090001	1.4		N	A	4/30/2018
Egypt River Tributary A	Ipswich, Town of; Rowley, Town of	Hammond Street	Point of one square mile of drainage area	01090001	0.7		N	A	4/30/2018
Emerson Brook	Middleton, Town of; North Andover, Town of	Approximately 20 feet above Liberty Street	Point of one square mile of drainage area	01090001	5.9		N	A	4/30/2018
Emerson Brook	Middleton, Town of	Confluence with Ipswich River	Approximately 20 feet above Liberty Street	01090001	0.5		Y	AE	10/1/1978
Emerson Brook Tributary A	Middleton, Town of	Confluence with Emerson Brook	County boundary	01090001	2.1		N	A	4/30/2018
Emerson Brook Tributary A1	Middleton, Town of	County boundary	Point of one square mile of drainage area	01090001	0.4		N	A	4/30/2018
Emerson Brook Tributary B	North Andover, Town of	Confluence with Emerson Brook	Point of one square mile of drainage area	01090001	1.4		N	A	4/30/2018
Farm Lane swamp	Georgetown, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Fernwood Lake	Gloucester, City of	Entire shoreline	Entire shoreline	01090001		0.04	N	A	4/30/2018
Fish Brook	Boxford, Town of; Topsfield, Town of	Confluence with Ipswich River	Confluence with Mosquito Brook	01090001	6.5		Y	AE	5/1/1989
Fish Brook (Andover)	Andover, Town of	Confluence with Merrimack River	Greenwood Road	01070006	4.1		Y	AE	7/1/1986

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Fish Brook (Andover)	Andover, Town of	Greenwood Road	Point of one square mile of drainage area	01070006	0.9		N	A	6/4/2019
Fish Brook (Andover) Tributary A	Andover, Town of	Confluence with Fish Brook (Andover)	Point of one square mile of drainage area	01070006	1.9		N	A	6/4/2019
Fish Brook (Andover) Tributary A1	Andover, Town of	Confluence with Fish Brook (Andover) Tributary A	Point of one square mile of drainage area	01070006	1.4		N	A	6/4/2019
Fish Brook (Andover) Tributary B	Andover, Town of	Confluence with Fish Brook (Andover)	Point of one square mile of drainage area	01070006	0.8		N	A	6/4/2019
Fish Brook Tributary A	Boxford, Town of; Topsfield, Town of	Confluence with Fish Brook	Point of one square mile of drainage area	01090001	1.1		N	A	4/30/2018
Fish Brook Tributary B	Boxford, Town of; Topsfield, Town of	Confluence with Fish Brook	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018
Fish Brook Tributary C	Boxford, Town of	Confluence with Fish Brook	Point of one square mile of drainage area	01090001	1.6		N	A	4/30/2018
Fish Brook Tributary D	Boxford, Town of	Confluence with Fish Brook	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018
Fish Brook Tributary E	Boxford, Town of	Confluence with Fish Brook	Point of one square mile of drainage area	01090001	1.7		N	A	4/30/2018
Fish Brook Tributary E1	Boxford, Town of	Confluence with Fish Brook Tributary E	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Fish Brook Tributary F	Boxford, Town of	Confluence with Fish Brook	Towne Pond	01090001	1.6		N	A	4/30/2018
Fish Brook Tributary F1	Boxford, Town of	Confluence with Fish Brook Tributary F	Point of one square mile of drainage area	01090001	0.1		N	A	4/30/2018
Fish Brook Tributary F2	Boxford, Town of	Confluence with Fish Brook Tributary F	Point of one square mile of drainage area	01090001	0.5		N	A	4/30/2018

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Fish Brook Tributary G	Boxford, Town of	Confluence with Fish Brook	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018
Fish Brook Tributary H	Boxford, Town of	Confluence with Fish Brook	Point of one square mile of drainage area	01090001	1.7		N	A	4/30/2018
Fish Brook Tributary H1	Boxford, Town of	Confluence with Fish Brook Tributary H	Point of one square mile of drainage area	01090001	0.2		N	A	4/30/2018
Fish Brook Tributary I	Boxford, Town of	Confluence with Fish Brook	Point of one square mile of drainage area	01090001	0.7		N	A	4/30/2018
Fish Brook Tributary I1	Boxford, Town of	Confluence with Fish Brook Tributary I	Point of one square mile of drainage area	01090001	1.2		N	A	4/30/2018
Fish Brook Tributary J	North Andover, Town of	Confluence with Fish Brook	Point of one square mile of drainage area	01090001	2.0		N	A	4/30/2018
Fish Brook Tributary J1	North Andover, Town of	Confluence with Fish Brook Tributary J	Point of one square mile of drainage area	01090001	1.8		N	A	4/30/2018
Fish Brook Tributary J2	North Andover, Town of	Confluence with Fish Brook Tributary J	Point of one square mile of drainage area	01090001	1.6		N	A	4/30/2018
Fish Brook Tributary J2A	North Andover, Town of	Confluence with Fish Brook Tributary J2	Point of one square mile of drainage area	01090001	0.1		N	A	4/30/2018
Fish Brook Tributary J3	North Andover, Town of	Confluence with Fish Brook Tributary J	Point of one square mile of drainage area	01090001	0.7		N	A	4/30/2018
Fish Brook Tributary J4	North Andover, Town of	Confluence with Fish Brook Tributary J	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Fishin Brook	Haverhill, City of	Confluence with Little River	Point of one square mile of drainage area	01070006	2.6		N	A	6/4/2019
Fiske Brook	Saugus, Town of	Approximately 820 feet above confluence with Shute Brook	Point of one square mile of drainage area	01090001	0.9		N	A	4/30/2018

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Fiske Brook	Saugus, Town of	Confluence with Shute Brook	Approximately 820 feet above confluence with Shute Brook	01090001	0.2		Y	AE	11/1/1980
Fiske Brook Tributary A	Saugus, Town of	Confluence with Fiske Brook	U.S. Route 1 culvert	01090001	0.5		N	A	4/30/2018
Flax Pond	Lynn, City of	Entire shoreline	Entire shoreline	01090001		0.14	N	AE	5/1/1983
Floating Bridge Pond	Lynn, City of	Entire shoreline	Entire shoreline	01090001		0.02	N	A	4/30/2018
Foote Brook	Haverhill, City of	County boundary	County boundary	01070006	1.7		N	A	6/4/2019
Forest River	Salem, City of	Limit of effective coastal flooding	Point of one square mile of drainage area	01090001	0.5		N	A	4/30/2018
Foster Pond	Swampscott, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Friend Court swamp	Wenham, Town of	Entire shoreline	Entire shoreline	01090001		0.02	N	A	4/30/2018
Frost Fish Brook	Danvers, Town of	Coolidge Road	Cabot Road	01090001	0.7		N	A	4/30/2018
Goldthwaite Brook	Peabody, City of	Approximately 100 feet above First Avenue	Point of one square mile of drainage area	01090001	0.8		N	A	4/30/2018
Goldthwaite Brook	Peabody, City of	Confluence with Proctor Brook	Approximately 100 feet above First Avenue	01090001	3.1		Y	AE	11/1/1978
Goose Cove Reservoir	Gloucester, City of	Limit of effective coastal flooding	Point of one square mile of drainage area	01090001	1.2		N	A	4/30/2018
Goose Cove Reservoir swamp	Gloucester, City of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Gravelly Brook	Ipswich, Town of; Topsfield, Town of	Confluence with Ipswich River	Point of one square mile of drainage area	01090001	1.6		N	A	4/30/2018
Great Swamp Brook	Georgetown, Town of; Rowley, Town of	Confluence with Mill River (Rowley)	Point of one square mile of drainage area	01090001	3.5		N	A	4/30/2018

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Great Swamp Brook Tributary A	Georgetown, Town of	Confluence with Great Swamp Brook	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Grover Street ponding	Beverly, City of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Harold Parker State Forest pond	Andover, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Harris Brook	Methuen, City of	Confluence with Spicket River	Approximately 75 feet above Hampshire Road	01070006	2.8		Y	AE	6/1/1978
Harris Brook	Methuen, City of	Approximately 75 feet above Hampshire Road	County boundary	01070006	3.0		N	A	6/4/2019
Harris Brook Tributary A	Methuen, City of	Confluence with Harris Brook	Forest Lake	01070006	0.4		N	A	6/4/2019
Hawkes Brook	Methuen, City of	Confluence with Bare Meadow Brook	Approximately 100 feet above North Street	01070006	3.5		Y	AE	10/1/1983
Hawkes Brook	Methuen, City of	Approximately 100 feet above North Street	Point of one square mile of drainage area	01070006	0.9		N	A	6/4/2019
Hawkes Brook 2	Lynnfield, Town of; Saugus, Town of	Confluence with Saugus River	Point of one square mile of drainage area	01090001	4.9		N	A	4/30/2018
Hawkes Brook 2 Tributary A	Saugus, Town of	Confluence with Hawkes Brook 2	Walden Pond	01090001	0.8		N	A	4/30/2018
Hawkes Brook Tributary A	Methuen, City of	Confluence with Hawkes Brook	Point of one square mile of drainage area	01070006	1.6		N	A	6/4/2019
Hawkes Brook Tributary B	Haverhill, City of; Methuen, City of	Confluence with Hawkes Brook	Point of one square mile of drainage area	01070006	1.2		N	A	6/4/2019
Howlett Brook and Pye Brook	Topsfield, Town of	Confluence with Ipswich River	Approximately 600 feet above State Highway 97 (Haverhill Road)	01090001	3.1		Y	AE	1/1/1992
Howlett Brook Tributary A	Topsfield, Town of	Confluence with Howlett Brook	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018

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Howlett Brook Tributary B	Ipswich, Town of; Topsfield, Town of	Confluence with Howlett Brook	Point of one square mile of drainage area	01090001	0.2		N	A	4/30/2018
Howlett Brook Tributary C	Ipswich, Town of; Topsfield, Town of	Confluence with Howlett Brook	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018
Howlett Brook Tributary D	Ipswich, Town of; Topsfield, Town of	Confluence with Howlett Brook	Point of one square mile of drainage area	01090001	3.0		N	A	4/30/2018
Howlett Brook Tributary E	Ipswich, Town of; Topsfield, Town of	Confluence with Howlett Brook	Point of one square mile of drainage area	01090001	0.4		N	A	4/30/2018
Howlett Brook Tributary F	Topsfield, Town of	Confluence with Howlett Brook	Point of one square mile of drainage area	01090001	0.4		N	A	4/30/2018
Hussey Brook	Andover, Town of	Confluence with Shawsheen River	Approximately 3,700 feet above Beacon Street	01070006	2.1		Y	AE	7/1/1986
Hussey Brook Tributary	Andover, Town of	Confluence with Hussey Brook	Approximately 200 feet above Beacon Street	01070006	0.5		Y	AE	7/1/1986
Hussey Brook Tributary	Andover, Town of	Approximately 200 feet above Beacon Street	Point of one square mile of drainage area	01070006	0.5		N	A	6/4/2019
Idlewild Brook	Hamilton, Town of	Confluence with Ipswich River	Point of one square mile of drainage area	01090001	2.5		N	A	4/30/2018
Ipswich River	Boxford, Town of; Danvers, Town of; Hamilton, Town of; Ipswich, Town of; Lynnfield, Town of; Middleton, Town of; Peabody, City of; Topsfield, Town of; Wenham, Town of	Approximately 300 feet above County Street	County boundary	01090001	37.8		Y	AE	6/1/2017
Ipswich River Tributary A	Hamilton, Town of	Confluence with Ipswich River	Point of one square mile of drainage area	01090001	2.2		N	A	4/30/2018

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Ipswich River Tributary A1	Hamilton, Town of	Confluence with Ipswich River Tributary A	Point of one square mile of drainage area	01090001	0.5		N	A	4/30/2018
Ipswich River Tributary B	Boxford, Town of; Middleton, Town of	Confluence with Ipswich River	Point of one square mile of drainage area	01090001	1.1		N	A	4/30/2018
Ipswich River Tributary C	Middleton, Town of	Confluence with Ipswich River	Point of one square mile of drainage area	01090001	1.5		N	A	4/30/2018
Jackman Brook	Georgetown, Town of	Jewett Street	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Jackman Brook	Georgetown, Town of	Parish Road	Jewett Street	01090001	1.2		Y	AE	3/1/1978
Jackman Brook Tributary A	Georgetown, Town of	Confluence with Jackman Brook	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Johnson Creek	Groveland, Town of	Confluence with Merrimack River	Washington Street	01070006	2.2		Y	AE	4/1/1978
Johnson Creek	Boxford, Town of; Groveland, Town of; Haverhill, City of	Washington Street	Point of one square mile of drainage area	01070006	4.7		N	A	6/4/2019
Johnson Creek Tributary A	Groveland, Town of; Haverhill, City of	Confluence with Johnson Creek	South Cross Road	01070006	1.5		N	A	6/4/2019
Johnson Creek Tributary B	Groveland, Town of	Confluence with Johnson Creek	Point of one square mile of drainage area	01070006	1.5		N	A	6/4/2019
Johnson Creek Tributary B1	Georgetown, Town of; Groveland, Town of	Confluence with Johnson Creek Tributary B	Point of one square mile of drainage area	01070006	0.5		N	A	6/4/2019
Johnson Creek Tributary C	Boxford, Town of; Groveland, Town of	Confluence with Johnson Creek	Point of one square mile of drainage area	01070006	1.2		N	A	6/4/2019
Johnson Creek Tributary D	Boxford, Town of	Confluence with Johnson Creek	Hoveys Pond	01070006	2.0		N	A	6/4/2019

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Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Johnson Creek Tributary E	Haverhill, City of	Confluence with Johnson Creek	Point of one square mile of drainage area	01070006	1.2		N	A	6/4/2019
Johnson Creek Tributary F	Boxford, Town of	Confluence with Johnson Creek	Point of one square mile of drainage area	01070006	1.0		N	A	6/4/2019
Johnson Creek Tributary G	Boxford, Town of; Haverhill, City of	Confluence with Johnson Creek	Point of one square mile of drainage area	01070006	1.1		N	A	6/4/2019
Johnson Creek Tributary H	Haverhill, City of	Confluence with Johnson Creek	Point of one square mile of drainage area	01070006	0.3		N	A	6/4/2019
Kellehers Pond	Beverly, City of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Kimball Brook	Ipswich, Town of	Confluence with Ipswich River	Point of one square mile of drainage area	01090001	1.8		N	A	4/30/2018
King George Drive swamp	Boxford, Town of; Georgetown, Town of	Entire shoreline	Entire shoreline	01090001		0.02	N	A	4/30/2018
Kingsbury Avenue pond	Boxford, Town of	Entire shoreline	Entire shoreline	01070006		0.01	N	A	6/4/2019
Lake Attitash	Amesbury, City of; Merrimac, Town of	Entire shoreline	Entire shoreline	01070006		0.75	N	AE	7/1/1980
Legg Hill pond	Marblehead, Town of; Salem, City of	Entire shoreline	Entire shoreline	01090001		0.02	N	A	4/30/2018
Lily Mere	Lynn, City of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Little River	Haverhill, City of	Confluence with Merrimack River	Approximately 5,000 feet above Rosemont Street	01070006	4.0		Y	AE	1/1/1981
Little River 1	Newbury, Town of; Newburyport, City of	Limit of effective coastal flooding	Point of one square mile of drainage area	01090001	1.2		N	A	4/30/2018
Little River 1 Tributary A	Newbury, Town of; Newburyport, City of	Confluence with Little River 1	Point of one square mile of drainage area	01090001	0.5		N	A	4/30/2018
Little River 1 Tributary B	Newbury, Town of	Confluence with Little River 1	Point of one square mile of drainage area	01090001	0.2		N	A	4/30/2018

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Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Little River 2	Gloucester, City of	Essex Avenue	Point of one square mile of drainage area	01090001	1.5		N	A	4/30/2018
Little River 2 Tributary A	Gloucester, City of	Confluence with Little River 2	Dykes Pond	01090001	0.9		N	A	4/30/2018
Little River Tributary A	Haverhill, City of	Confluence with Little River	Point of one square mile of drainage area	01070006	0.5		N	A	6/4/2019
Long Hill swamp	Beverly, City of; Wenham, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Lower Banjo Pond	Gloucester, City of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Lower Pond	Saugus, Town of	Entire shoreline	Entire shoreline	01090001		0.03	N	A	4/30/2018
Lynn Woods swamp	Lynn, City of; Lynnfield, Town of	Entire shoreline	Entire shoreline	01090001		0.02	N	A	4/30/2018
Main Street swamp	Wenham, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Meadow Brook Tributary A	Andover, Town of	County boundary	Point of one square mile of drainage area	01070006	1.8		N	A	6/4/2019
Meadow Brook Tributary A1	Andover, Town of	County boundary	Point of one square mile of drainage area	01070006	0.8		N	A	6/4/2019
Meadow Brook Tributary A2	Andover, Town of	Confluence with Meadow Brook Tributary A	Point of one square mile of drainage area	01070006	0.5		N	A	6/4/2019
Merrimack River	Andover, Town of; Methuen, City of	Lawrence/ Andover/ Methuen corporate limits	County boundary	01070006	5.4		Y	AE	10/1/1983

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Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Merrimack River	Amesbury, City of; Groveland, Town of; Haverhill, City of; Lawrence, City of; Merrimac, Town of; Methuen, City of; Newburyport, City of; North Andover, Town of; Salisbury, Town of; West Newbury, Town of	Newburyport Lighthouse	Lawrence/ Andover/ Methuen corporate limits	01070006	26.0		Y	AE	1/1/1977
Merrimack River Tributary A	Amesbury, City of	Confluence with Merrimack River	Point of one square mile of drainage area	01070006	1.4		N	A	6/4/2019
Merrimack River Tributary B	Haverhill, City of	Confluence with Merrimack River	Lake Saltonstall	01070006	1.0		N	A	6/4/2019
Merrimack River Tributary C	Haverhill, City of	Confluence with Merrimack River	Boston Road	01070006	0.7		N	A	6/4/2019
Merrimack River Tributary D	North Andover, Town of	Confluence with Merrimack River	Point of one square mile of drainage area	01070006	1.9		N	A	6/4/2019
Mile Brook	Topsfield, Town of	Confluence with Ipswich River	Approximately 300 feet below Boston Street	01090001	2.6		N	A	4/30/2018
Mile Brook	Topsfield, Town of	Approximately 300 feet below Boston Street	Divergence from Howlett Brook and Pye Brook	01090001	0.7		Y	AE	1/1/1992
Mile Brook Tributary A	Topsfield, Town of	Confluence with Mile Brook	State Route 97	01090001	1.5		N	A	4/30/2018
Mile Brook Tributary A1	Topsfield, Town of	Confluence with Mile Brook Tributary A	Point of one square mile of drainage area	01090001	1.1		N	A	4/30/2018
Mile Brook Tributary B	Topsfield, Town of	Confluence with Mile Brook	Point of one square mile of drainage area	01090001	0.2		N	A	4/30/2018

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Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Miles River	Beverly, City of; Wenham, Town of	Dodges Row	Point of one square mile of drainage area	01090001	3.3		N	A	4/30/2018
Miles River	Beverly, City of; Hamilton, Town of; Ipswich, Town of; Wenham, Town of	Confluence with Ipswich River	Dodges Row	01090001	10.5		Y	AE	5/1/2017
Miles River Tributary A	Hamilton, Town of; Ipswich, Town of	Confluence with Miles River	Point of one square mile of drainage area	01090001	2.8		N	A	4/30/2018
Miles River Tributary A1	Hamilton, Town of	Confluence with Miles River Tributary A	Point of one square mile of drainage area	01090001	1.5		N	A	4/30/2018
Miles River Tributary B	Ipswich, Town of	Confluence with Miles River	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018
Miles River Tributary C	Hamilton, Town of	Confluence with Miles River	Moulton Street	01090001	1.3		N	A	4/30/2018
Miles River Tributary D	Hamilton, Town of	Confluence with Miles River	Bay Road	01090001	1.1		N	A	4/30/2018
Miles River Tributary E	Hamilton, Town of	Confluence with Miles River	Point of one square mile of drainage area	01090001	1.0		N	A	4/30/2018
Miles River Tributary E1	Hamilton, Town of	Confluence with Miles River Tributary E	Point of one square mile of drainage area	01090001	0.2		N	A	4/30/2018
Miles River Tributary F	Hamilton, Town of	Confluence with Miles River	Point of one square mile of drainage area	01090001	1.5		N	A	4/30/2018
Miles River Tributary G	Wenham, Town of	Confluence with Miles River	Point of one square mile of drainage area	01090001	0.4		N	A	4/30/2018
Miles River Tributary G1	Wenham, Town of	Confluence with Miles River Tributary G	Main Street	01090001	0.4		N	A	4/30/2018
Miles River Tributary H	Wenham, Town of	Confluence with Miles River	Point of one square mile of drainage area	01090001	2.3		N	A	4/30/2018

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Miles River Tributary H1	Beverly, City of; Wenham, Town of	Confluence with Miles River Tributary H	Point of one square mile of drainage area	01090001	1.5		N	A	4/30/2018
Miles River Tributary H2	Wenham, Town of	Confluence with Miles River Tributary H	Point of one square mile of drainage area	01090001	0.5		N	A	4/30/2018
Miles River Tributary H3	Wenham, Town of	Confluence with Miles River Tributary H	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Miles River Tributary I	Beverly, City of; Wenham, Town of	Confluence with Miles River	Point of one square mile of drainage area	01090001	2.1		N	A	4/30/2018
Miles River Tributary J	Hamilton, Town of; Wenham, Town of	Confluence with Miles River	Point of one square mile of drainage area	01090001	1.2		N	A	4/30/2018
Miles River Tributary K	Beverly, City of; Wenham, Town of	Confluence with Miles River	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Miles River Tributary L	Beverly, City of	Confluence with Miles River	Point of one square mile of drainage area	01090001	1.8		N	A	4/30/2018
Miles River Tributary M	Wenham, Town of	Confluence with Miles River	Point of one square mile of drainage area	01090001	0.5		N	A	4/30/2018
Miles River Tributary N	Wenham, Town of	Confluence with Miles River	State Route 128	01090001	0.6		N	A	4/30/2018
Mill River (Gloucester)	Gloucester, City of	Dr. Osman Babson Road	Approximately 400 feet above Access Road	01090001	0.6		Y	AE	9/1/1983
Mill River (Rowley)	Georgetown, Town of; Rowley, Town of	Approximately 3,700 feet above Mill Dam	Point of one square mile of drainage area	01090001	8.1		N	A	4/30/2018
Mill River (Rowley)	Newbury, Town of; Rowley, Town of	Just below U.S. Route 1	Approximately 3,700 feet above Mill Dam	01090001	1.0		Y	AE	9/1/1980
Mill River (Rowley) Tributary A	Rowley, Town of	Confluence with Mill River (Rowley)	Point of one square mile of drainage area	01090001	1.6		N	A	4/30/2018

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Mill River (Rowley) Tributary B	Rowley, Town of	Confluence with Mill River (Rowley)	Point of one square mile of drainage area	01090001	3.4		N	A	4/30/2018
Mill River (Rowley) Tributary C	Rowley, Town of	Confluence with Mill River (Rowley)	Boxford Road	01090001	0.5		N	A	4/30/2018
Mill River (Rowley) Tributary D	Rowley, Town of	Confluence with Mill River (Rowley)	Point of one square mile of drainage area	01090001	0.2		N	A	4/30/2018
Mill River (Rowley) Tributary E	Boxford, Town of; Rowley, Town of	Confluence with Mill River (Rowley)	Point of one square mile of drainage area	01090001	1.3		N	A	4/30/2018
Mill River (Rowley) Tributary E1	Rowley, Town of	Confluence with Mill River (Rowley) Tributary E	Point of one square mile of drainage area	01090001	0.5		N	A	4/30/2018
Mill River (Rowley) Tributary F	Boxford, Town of; Rowley, Town of	Confluence with Mill River (Rowley)	Point of one square mile of drainage area	01090001	1.3		N	A	4/30/2018
Mill River (Rowley) Tributary F1	Boxford, Town of; Rowley, Town of	Confluence with Mill River (Rowley) Tributary F	Point of one square mile of drainage area	01090001	1.3		N	A	4/30/2018
Mill River (Rowley) Tributary F2	Boxford, Town of	Confluence with Mill River (Rowley) Tributary F	Point of one square mile of drainage area	01090001	0.4		N	A	4/30/2018
Mill River (Rowley) Tributary G	Boxford, Town of; Rowley, Town of	Confluence with Mill River (Rowley)	Point of one square mile of drainage area	01090001	0.8		N	A	4/30/2018
Mill River (Rowley) Tributary H	Georgetown, Town of	Confluence with Mill River (Rowley)	Point of one square mile of drainage area	01090001	0.5		N	A	4/30/2018

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Millvale Reservoir Brook	Haverhill, City of	Confluence with Merrimack River	Millvale Reservoir	01070006	1.0		Y	AE	1/1/1981
Millvale Reservoir Brook	Haverhill, City of; Merrimac, Town of	Millvale Reservoir	County boundary	01070006	5.9		N	A	6/4/2019
Millvale Reservoir Brook Tributary A	Haverhill, City of	Confluence with Millvale Reservoir Brook	Newton Road	01070006	3.1		N	A	6/4/2019
Millvale Reservoir Brook Tributary A1	Haverhill, City of	Confluence with Millvale Reservoir Brook Tributary A	Point of one square mile of drainage area	01070006	0.5		N	A	6/4/2019
Millvale Reservoir Brook Tributary A2	Haverhill, City of	Confluence with Millvale Reservoir Brook Tributary A	Point of one square mile of drainage area	01070006	1.1		N	A	6/4/2019
Millvale Reservoir Brook Tributary A3	Haverhill, City of	Confluence with Millvale Reservoir Brook Tributary A	Lake Pentucket	01070006	0.8		N	A	6/4/2019
Millvale Reservoir Brook Tributary B	Haverhill, City of	Confluence with Millvale Reservoir Brook	Point of one square mile of drainage area	01070006	1.0		N	A	6/4/2019
Millvale Reservoir Brook Tributary C	Haverhill, City of	Confluence with Millvale Reservoir Brook	Point of one square mile of drainage area	01070006	1.5		N	A	6/4/2019
Millvale Reservoir Brook Tributary C1	Haverhill, City of	Confluence with Millvale Reservoir Brook Tributary C	Point of one square mile of drainage area	01070006	0.7		N	A	6/4/2019
Millvale Reservoir Brook Tributary D	Haverhill, City of	Confluence with Millvale Reservoir Brook	Point of one square mile of drainage area	01070006	0.7		N	A	6/4/2019
Millvale Reservoir Brook Tributary E	Haverhill, City of	Confluence with Millvale Reservoir Brook	Point of one square mile of drainage area	01070006	0.5		N	A	6/4/2019
Millvale Reservoir Brook Tributary F	Haverhill, City of; Merrimac, Town of	Confluence with Millvale Reservoir Brook	County boundary	01070006	2.7		N	A	6/4/2019
Mosquito Brook	North Andover, Town of	Approximately 50 feet above Chestnut Street	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018

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Mosquito Brook	North Andover, Town of	Boxford/ North Andover corporate boundary	Approximately 50 feet above Chestnut Street	01090001	5.0		Y	AE	10/1/1990
Mosquito Brook Tributary A	Boxford, Town of; North Andover, Town of	Confluence with Mosquito Brook	Point of one square mile of drainage area	01090001	2.7		N	A	4/30/2018
Mosquito Brook Tributary B	Boxford, Town of; North Andover, Town of	Confluence with Mosquito Brook	Point of one square mile of drainage area	01090001	2.4		N	A	4/30/2018
Mosquito Brook Tributary B1	North Andover, Town of	Confluence with Mosquito Brook Tributary B	Point of one square mile of drainage area	01090001	0.1		N	A	4/30/2018
Mosquito Brook Tributary B2	North Andover, Town of	Confluence with Mosquito Brook Tributary B	Point of one square mile of drainage area	01090001	0.7		N	A	4/30/2018
Mosquito Brook Tributary B3	North Andover, Town of	Confluence with Mosquito Brook Tributary B	Point of one square mile of drainage area	01090001	0.5		N	A	4/30/2018
Mosquito Brook Tributary C	North Andover, Town of	Confluence with Mosquito Brook	Point of one square mile of drainage area	01090001	0.4		N	A	4/30/2018
Mosquito Brook Tributary D	North Andover, Town of	Confluence with Mosquito Brook	Point of one square mile of drainage area	01090001	0.5		N	A	4/30/2018
Muddy Brook	Rowley, Town of	Confluence with Mill River (Rowley)	Point of one square mile of drainage area	01090001	0.7		N	A	4/30/2018
Muddy Run	Ipswich, Town of	Limit of effective coastal flooding	Point of one square mile of drainage area	01090001	2.1		N	A	4/30/2018
Nichols Brook	Danvers, Town of; Middleton, Town of; Topsfield, Town of	Confluence with Ipswich River	Point of one square mile of drainage area	01090001	3.5		N	A	4/30/2018
Nichols Brook Tributary A	Middleton, Town of	Confluence with Nichols Brook	East Street	01090001	0.3		N	A	4/30/2018
Nichols Brook Tributary B	Topsfield, Town of	Confluence with Nichols Brook	Point of one square mile of drainage area	01090001	0.7		N	A	4/30/2018

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Nichols Creek	Amesbury, City of; Merrimac, Town of	Confluence with Merrimack River	Point of one square mile of drainage area	01070006	1.3		N	A	6/4/2019
Nichols Creek Tributary A	Amesbury, City of	Confluence with Nichols Creek	Interstate 495	01070006	2.0		N	A	6/4/2019
Norris Brook	Danvers, Town of; Lynnfield, Town of; Peabody, City of	Confluence with Ipswich River	Point of one square mile of drainage area	01090001	5.0		N	A	4/30/2018
North Beverly Drainage Ditch	Beverly, City of	Confluence with Bass River	Approximately 1,300 feet above Russell Street	01090001	0.6		N	AE	7/1/1983
North River and Proctor Brook	Peabody, City of	Grove Street	Approximately 120 feet above Peabody Road	01090001	3.7		Y	AE	11/1/1978
North Tributary Brook	West Newbury, Town of	Confluence with Artichoke River Reservoir	Approximately 6,000 feet above Garden Street	01070006	1.3		Y	AE	1/1/1977
North Tributary Brook	West Newbury, Town of	Approximately 6,000 feet above Garden Street	Point of one square mile of drainage area	01070006	1.1		N	A	6/4/2019
Oakwood Knoll swamp	Ipswich, Town of; Rowley, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Ox Pasture Brook	Rowley, Town of	Limit of effective coastal flooding	Point of one square mile of drainage area	01090001	3.1		N	A	4/30/2018
Ox Pasture Brook Tributary A	Rowley, Town of	Confluence with Ox Pasture Brook	Point of one square mile of drainage area	01090001	0.2		N	A	4/30/2018
Ox Pasture Brook Tributary B	Rowley, Town of	Confluence with Ox Pasture Brook	Point of one square mile of drainage area	01090001	0.5		N	A	4/30/2018
Parker River (Boxford)	Boxford, Town of; North Andover, Town of	Approximately 50 feet above State Route 133	Point of one square mile of drainage area	01090001	1.3		N	A	4/30/2018
Parker River (Boxford)	Boxford, Town of	Approximately 14,000 feet below Byfield Road	Approximately 50 feet above State Route 133	01090001	2.5		Y	AE	5/1/1989

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Parker River (Georgetown)	Georgetown, Town of; Groveland, Town of	Approximately 2,400 feet above Bailey Lane	Approximately 14,000 feet below Byfield Road	01090001	1.8		N	A	4/30/2018
Parker River (Georgetown)	Georgetown, Town of	Approximately 1,500 feet above Thurlow Street	Approximately 2,400 feet above Bailey Lane	01090001	4.0		Y	AE	3/1/1978
Parker River (Groveland)	Georgetown, Town of; Groveland, Town of; Newbury, Town of	Approximately 550 feet below Georgetown/ Newbury corporate limits	Approximately 1,500 feet above Thurlow Street	01090001	2.8		N	A	4/30/2018
Parker River (Newbury)	Newbury, Town of	Approximately 400 feet below Central Street	Approximately 550 feet below Georgetown/ Newbury corporate limits	01090001	3.1		Y	AE	1/1/2017
Parker River Diversion	Newbury, Town of	Confluence with Parker River	Diversion from Parker River	01090001	0.2		Y	AE	1/1/2017
Parker River Tributary A	Newbury, Town of	Limit of effective coastal flooding	Point of one square mile of drainage area	01090001	1.0		N	A	4/30/2018
Parker River Tributary B	Georgetown, Town of	Confluence with Parker River	Point of one square mile of drainage area	01090001	1.2		N	A	4/30/2018
Parker River Tributary C	Groveland, Town of	Confluence with Parker River	Point of one square mile of drainage area	01090001	0.2		N	A	4/30/2018
Parker River Tributary D	Groveland, Town of; West Newbury, Town of	Confluence with Parker River	Point of one square mile of drainage area	01090001	1.0		N	A	4/30/2018
Parker River Tributary E	Groveland, Town of	Confluence with Parker River	Point of one square mile of drainage area	01090001	2.6		N	A	4/30/2018
Parker River Tributary E1	Groveland, Town of	Confluence with Parker River Tributary E	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Parker River Tributary E2	Groveland, Town of	Confluence with Parker River Tributary E	Point of one square mile of drainage area	01090001	0.9		N	A	4/30/2018
Parker River Tributary E3	Groveland, Town of	Confluence with Parker River Tributary E	Point of one square mile of drainage area	01090001	0.8		N	A	4/30/2018

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Parker River Tributary F	Groveland, Town of	Confluence with Parker River	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018
Parker River Tributary G	Georgetown, Town of	Confluence with Parker River	Point of one square mile of drainage area	01090001	2.4		N	A	4/30/2018
Parker River Tributary G1	Georgetown, Town of	Confluence with Parker River Tributary G	Point of one square mile of drainage area	01090001	0.7		N	A	4/30/2018
Parker River Tributary H	Georgetown, Town of	Confluence with Parker River	Point of one square mile of drainage area	01090001	1.3		N	A	4/30/2018
Parker River Tributary H1	Georgetown, Town of	Confluence with Parker River Tributary H	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Parker River Tributary H2	Georgetown, Town of	Confluence with Parker River Tributary H	Point of one square mile of drainage area	01090001	0.4		N	A	4/30/2018
Parker River Tributary I	Boxford, Town of	Confluence with Parker River	Point of one square mile of drainage area	01090001	0.9		N	A	4/30/2018
Parker River Tributary J	Boxford, Town of	Confluence with Parker River	Point of one square mile of drainage area	01090001	0.9		N	A	4/30/2018
Parson's Hill swamp	Wenham, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Peat Meadow Brook	Methuen, City of	Confluence with Spicket River	Approximately 30 feet above Forest Street	01070006	2.6		Y	AE	10/1/1983
Penn Brook	Boxford, Town of; Georgetown, Town of	Approximately 450 feet above Newburyport Branch Railroad	Point of one square mile of drainage area	01090001	1.6		N	A	4/30/2018
Penn Brook	Georgetown, Town of	Confluence with Parker River	Approximately 450 feet above Newburyport Branch Railroad	01090001	2.9		Y	AE	3/1/1978
Perkins Row swamp	Topsfield, Town of	Entire shoreline	Entire shoreline	01090001		0.03	N	A	4/30/2018
Pillings Pond	Lynnfield, Town of	Entire shoreline	Entire shoreline	01090001		0.18	N	AE	1/1/1978

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Pond 1	Wenham, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	AH	2/15/2007
Pond 2	Wenham, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	AH	2/15/2007
Porter Lane swamp	Hamilton, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Porter River and Frost Fish Brook	Danvers, Town of	Approximately 1,500 feet above Kernwood Avenue	Coolidge Road	01090001	2.7		Y	AE	11/1/1978
Powwow River	Amesbury, City of	Lake Gardner Dam	State boundary	01070006	5.7		N	AE	9/1/1990
Powwow River	Amesbury, City of	Confluence with Merrimack River	Lake Gardner Dam	01070006	2.3		Y	AE	8/1/1978
Powwow River Tributary A	Amesbury, City of; Salisbury, Town of	Confluence with Powwow River	Interstate 495	01070006	1.7		N	A	6/4/2019
Powwow River Tributary A1	Amesbury, City of	Confluence with Powwow River Tributary A	Interstate 495	01070006	0.5		N	A	6/4/2019
Powwow River Tributary B	Amesbury, City of	Confluence with Powwow River	Point of one square mile of drainage area	01070006	1.5		N	A	6/4/2019
Powwow River Tributary C	Amesbury, City of	Confluence with Powwow River	Point of one square mile of drainage area	01070006	2.5		N	A	6/4/2019
Powwow River Tributary C1	Amesbury, City of	Confluence with Powwow River Tributary C	Point of one square mile of drainage area	01070006	0.5		N	A	6/4/2019
Pye Brook	Boxford, Town of; Topsfield, Town of	Approximately 600 feet above State Highway 97 (Haverhill Road)	Point of one square mile of drainage area	01090001	6.9		N	A	4/30/2018
Pye Brook Tributary A	Topsfield, Town of	Confluence with Pye Brook	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Pye Brook Tributary B	Ipswich, Town of; Rowley, Town of; Topsfield, Town of	Confluence with Pye Brook	Point of one square mile of drainage area	01090001	2.4		N	A	4/30/2018
Pye Brook Tributary B1	Ipswich, Town of; Rowley, Town of	Confluence with Pye Brook Tributary B	Point of one square mile of drainage area	01090001	0.9		N	A	4/30/2018

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Pye Brook Tributary B2	Ipswich, Town of; Topsfield, Town of	Confluence with Pye Brook Tributary B	Point of one square mile of drainage area	01090001	0.5		N	A	4/30/2018
Pye Brook Tributary C	Boxford, Town of; Topsfield, Town of	Confluence with Pye Brook	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Pye Brook Tributary D	Boxford, Town of	Confluence with Pye Brook	Stevens Pond	01090001	0.6		N	A	4/30/2018
Riverside Airport Brook	Haverhill, City of	Confluence with Merrimack River	Approximately 100 feet above Kenoza Street	01070006	1.2		Y	AE	1/1/1981
Rogers Brook	Andover, Town of	Confluence with Shawsheen River	Point of one square mile of drainage area	01070006	1.7		N	A	6/4/2019
Rubbly Road swamp	Wenham, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Rum Rock Lake	Rockport, Town of	Entire shoreline	Entire shoreline	01090001		0.02	N	A	4/30/2018
Salem Pond	Andover, Town of; North Andover, Town of	Entire shoreline	Entire shoreline	01090001		0.03	N	A	4/30/2018
Salem Road swamp	Topsfield, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Saugus River	Lynnfield, Town of; Saugus, Town of	Approximately 1,100 feet below Bridge Street	County boundary	01090001	8.9		Y	AE	6/1/2017
Saunders Lane swamp	Rowley, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Sawmill Brook 2	Manchester-by-the-Sea, Town of	Central Street	Point of one square mile of drainage area	01090001	3.4		N	A	4/30/2018
Sawmill Brook 2 Tributary A	Manchester-by-the-Sea, Town of	Confluence with Sawmill Brook 2	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Sawmill Brook 2 Tributary B	Essex, Town of; Manchester-by-the-Sea, Town of	Confluence with Sawmill Brook 2	Point of one square mile of drainage area	01090001	1.2		N	A	4/30/2018

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Sawmill Brook 2 Tributary C	Manchester-by-the-Sea, Town of	Confluence with Sawmill Brook 2	Point of one square mile of drainage area	01090001	0.9		N	A	4/30/2018
Sawmill Pond	Rockport, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
School Brook	Topsfield, Town of	Confluence with Branch of Ipswich and Cleveland Brook	Approximately 150 feet above State Highway 97 (High Street)	01090001	0.8		Y	AE	3/1/1989
School Brook Tributary A	Topsfield, Town of	Confluence with School Brook	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018
Shawsheen River	Andover, Town of; Lawrence, City of; North Andover, Town of	Confluence with Merrimack River	Approximately 5,000 feet above Interstate 93	01070006	11.7		Y	AE	5/1/2008
Shawsheen River Tributary A	Andover, Town of; Lawrence, City of; North Andover, Town of	Confluence with Shawsheen River	Point of one square mile of drainage area	01070006	0.7		N	A	6/4/2019
Shawsheen River Tributary B	Andover, Town of	Confluence with Shawsheen River	Point of one square mile of drainage area	01070006	0.6		N	A	6/4/2019
Shawsheen River Tributary C	Andover, Town of	Confluence with Shawsheen River	Point of one square mile of drainage area	01070006	1.2		N	A	6/4/2019
Shawsheen River Tributary D	Andover, Town of	Confluence with Shawsheen River	Point of one square mile of drainage area	01070006	3.0		N	A	6/4/2019
Shawsheen River Tributary D1	Andover, Town of	Confluence with Shawsheen River Tributary D	Point of one square mile of drainage area	01070006	1.2		N	A	6/4/2019
Shute Brook	Saugus, Town of	Entrance to Square One Mall culvert	County boundary	01090001	1.6		N	A	4/30/2018
Shute Brook	Saugus, Town of	Approximately 2,500 feet below Central Street (upstream face)	Approximately 250 feet above Pennybrook Road	01090001	1.4		Y	AE	11/1/1980

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Skug River	Andover, Town of; North Andover, Town of	County boundary	Point of one square mile of drainage area	01090001	4.2		N	A	4/30/2018
Skug River	Andover, Town of	Approximately 1,600 feet below State Highway 28	Approximately 1,000 feet above State Highway 28	01090001	0.5		Y	AE	11/1/2001
Skug River Tributary D	Andover, Town of	Confluence with Skug River	County boundary	01090001	1.3		N	A	4/30/2018
Skug River Tributary E	Andover, Town of	Confluence with Skug River	Field Pond	01090001	0.3		N	A	4/30/2018
Skug River Tributary F	Andover, Town of; North Andover, Town of	Confluence with Skug River	Point of one square mile of drainage area	01090001	1.5		N	A	4/30/2018
Skug River Tributary G	Andover, Town of	Confluence with Skug River	Point of one square mile of drainage area	01090001	0.7		N	A	4/30/2018
Skug River Tributary H	Andover, Town of; North Andover, Town of	Confluence with Skug River	Point of one square mile of drainage area	01090001	0.7		N	A	4/30/2018
Skug River Tributary I	Andover, Town of	Confluence with Skug River	Point of one square mile of drainage area	01090001	0.5		N	A	4/30/2018
Skug River Tributary J	Andover, Town of; North Andover, Town of	Confluence with Skug River	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018
Sluice Pond	Lynn, City of	Entire shoreline	Entire shoreline	01090001		0.07	N	AE	5/1/1983
Snows Brook	Haverhill, City of	Confluence with Little River	County boundary	01070006	3.3		N	A	6/4/2019
Snows Brook Tributary B	Haverhill, City of	County boundary	County boundary	01070006	1.2		N	A	6/4/2019
Snows Brook Tributary B1	Haverhill, City of	County boundary	Point of one square mile of drainage area	01070006	0.5		N	A	6/4/2019

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Soginese Creek	Essex, Town of	John Wise Avenue	Point of one square mile of drainage area	01090001	0.9		N	A	4/30/2018
Southeast North Andover swamp	Middleton, Town of; North Andover, Town of	Entire shoreline	Entire shoreline	01090001		0.02	N	A	4/30/2018
Spicket River	Lawrence, City of; Methuen, City of	Confluence with Merrimack River	County boundary	01070006	5.8		Y	AE	6/4/2019
Spicket River Tributary A	Lawrence, City of; Methuen, City of	Confluence with Spicket River	Point of one square mile of drainage area	01070006	2.2		N	A	6/4/2019
Stevens Pond	Saugus, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Stonecleave Road swamp	Boxford, Town of; North Andover, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Strongwater Brook	Peabody, City of	Pierpont Street	Point of one square mile of drainage area	01090001	0.6		N	A	4/30/2018
Strongwater Brook	Peabody, City of	Confluence with North River and Proctor Brook	Pierpont Street	01090001	0.4		Y	AE	11/1/1978
Suntaug Lake	Lynnfield, Town of; Peabody, City of	Entire shoreline	Entire shoreline	01090001		0.25	N	A	4/30/2018
Surrey Lane pond	Boxford, Town of; Topsfield, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Tanglewood Road swamp	Boxford, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Tapley Brook	Peabody, City of	Approximately 1,600 feet above Sidneys Pond Dam	Point of one square mile of drainage area	01090001	1.1		N	A	4/30/2018
Tapley Brook	Peabody, City of	Confluence with Goldthwaite Brook	Approximately 1,600 feet above Sidneys Pond Dam	01090001	0.7		Y	AE	11/1/1978
Tedesco Pond	Salem, City of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Tributary A to Ipswich River	Middleton, Town of	Approximately 1,050 feet above Pleasant Street	County boundary	01090001	1.6		N	A	4/30/2018
Tributary A to Ipswich River	Middleton, Town of	Confluence with Ipswich River	Approximately 1,050 feet above Pleasant Street	01090001	1.4		Y	AE	10/1/1978
Tributary to Neal Pond	Merrimac, Town of	Confluence with Millvale Reservoir Brook	Birch Meadow Road	01070006	1.1		N	A	6/4/2019
Tributary to Neal Pond	Merrimac, Town of	Birch Meadow Road	Birch Meadow Loop	01070006	0.5		Y	AE	7/1/1980
Tributary to Neal Pond Tributary A	Merrimac, Town of	Confluence with Tributary to Neal Pond	Point of one square mile of drainage area	01070006	0.5		N	A	6/4/2019
Trowbridge Circle swamp	Rowley, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Unnamed Tributary to Fish Brook	Topsfield, Town of	Confluence with Fish Brook	Approximately 1,500 feet above Boxford Road	01090001	0.8		N	AE	1/1/1992
Upper Banjo Pond	Gloucester, City of	Entire shoreline	Entire shoreline	01090001		0.02	N	A	4/30/2018
Upper Pond	Saugus, Town of	Entire shoreline	Entire shoreline	01090001		0.02	N	A	4/30/2018
Walker Creek	Gloucester, City of	Essex Avenue	Point of one square mile of drainage area	01090001	1.4		N	A	4/30/2018
Wenham Swamp	Danvers, Town of; Topsfield, Town of; Wenham, Town of	Confluence with Ipswich River	U.S. Route 1	01090001	4.1		N	A	4/30/2018
Wenham Swamp Tributary A	Danvers, Town of; Topsfield, Town of	Confluence with Wenham Swamp	Point of one square mile of drainage area	01090001	2.1		N	A	4/30/2018
Wenham Swamp Tributary A1	Topsfield, Town of	Confluence with Wenham Swamp Tributary A	Point of one square mile of drainage area	01090001	0.9		N	A	4/30/2018
Wenham Swamp Tributary B	Danvers, Town of; Wenham, Town of	Confluence with Wenham Swamp	Point of one square mile of drainage area	01090001	1.4		N	A	4/30/2018

Table 2: Flooding Sources Included in this FIS Report

Flooding Source	Community	Downstream Limit	Upstream Limit	HUC-8 Sub-Basin(s)	Length (mi) (streams or coastlines)	Area (mi^2) (estuaries or ponding)	Floodway (Y/N)	Zone shown on FIRM	Date of Analysis
Wheeler Brook	Georgetown, Town of	Confluence with Jackman Brook	Point of one square mile of drainage area	01090001	2.8		N	A	4/30/2018
Wheeler Brook Tributary A	Georgetown, Town of	Confluence with Wheeler Brook	Point of one square mile of drainage area	01090001	0.3		N	A	4/30/2018
Wildmeadow Road ponds	Boxford, Town of	Entire shoreline	Entire shoreline	01090001		0.01	N	A	4/30/2018
Wills Brook	Lynnfield, Town of	Confluence with Ipswich River	Point of one square mile of drainage area	01090001	1.4		N	A	4/30/2018
Wills Brook Tributary A	Lynnfield, Town of	Confluence with Wills Brook	Point of one square mile of drainage area	01090001	0.8		N	A	4/30/2018
Wills Brook Tributary B	Lynnfield, Town of	Confluence with Wills Brook	Point of one square mile of drainage area	01090001	0.7		N	A	4/30/2018
Wood Hill pond	Boxford, Town of	Entire shoreline	Entire shoreline	01090001		0.02	N	A	4/30/2018
World End Pond	Methuen, City of	Entire shoreline	Entire shoreline	01070006		0.15	N	AE	9/1/1995
World End Pond Tributary A	Methuen, City of	County boundary	Point of one square mile of drainage area	01070006	2.5		N	A	6/4/2019
World End Pond Tributary B	Methuen, City of	County boundary	Point of one square mile of drainage area	01070006	0.6		N	A	6/4/2019

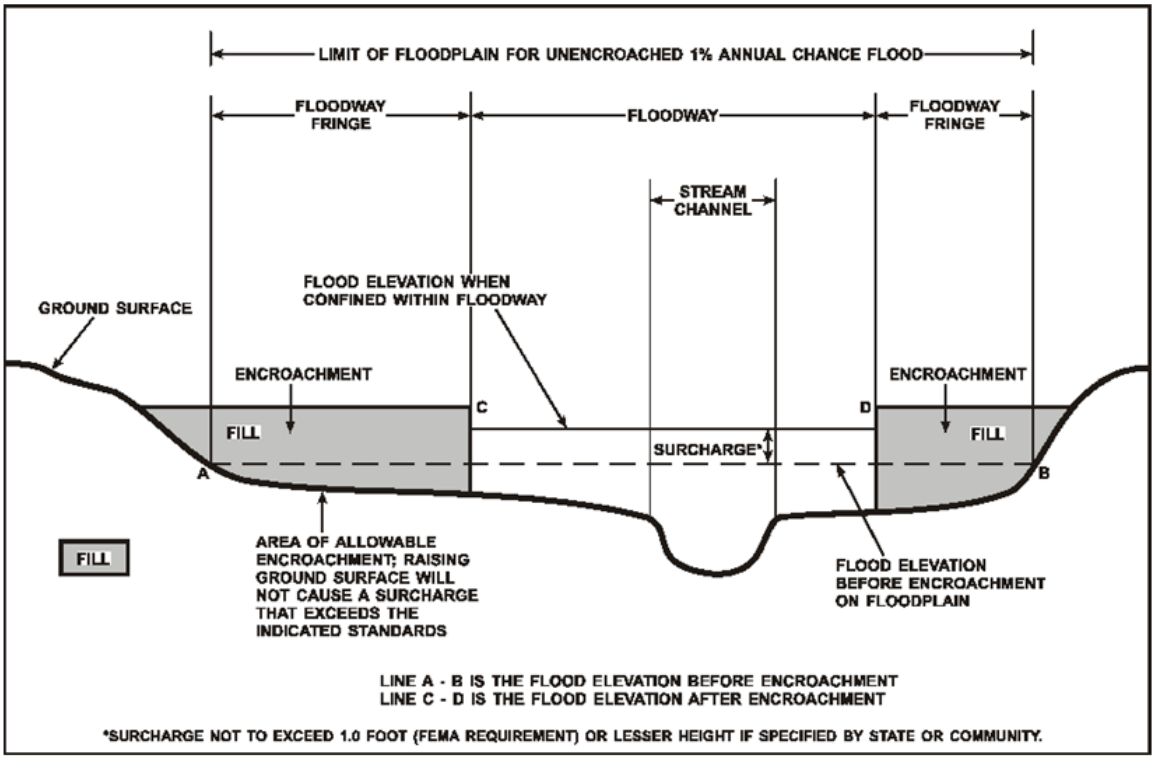
2.2 Floodways

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 balancing floodplain development against increasing flood hazard. With this approach, the area of the 1% annual chance floodplain on a river is divided into a floodway and a floodway fringe based on hydraulic modeling. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment in order to carry the 1% annual chance flood. The floodway fringe is the area between the floodway and the 1% annual chance floodplain boundaries where encroachment is permitted. The floodway must be wide enough so that the floodway fringe could be completely obstructed without increasing the water surface elevation of the 1% annual chance flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 4.

To participate in the NFIP, Federal regulations require communities to limit increases caused by encroachment to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this project are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway projects.

Figure 4: Floodway Schematic



Floodway widths presented in this FIS Report and on the FIRM were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. For certain stream segments, floodways were adjusted so that the amount of floodwaters conveyed on each side of the floodplain would be reduced equally. The results of the floodway computations have been tabulated for selected cross sections and are shown in Table 23, "Floodway Data."

All floodways that were developed for this Flood Risk Project are shown on the FIRM using the symbology described in Figure 3. In cases where the floodway and l% annual chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown on the FIRM. For information about the delineation of floodways on the FIRM, refer to Section 6.3.

2.3 Base Flood Elevations

The hydraulic characteristics of flooding sources were analyzed to provide estimates of the elevations of floods of the selected recurrence intervals. The Base Flood Elevation (BFE) is the elevation of the 1% annual chance flood. These BFEs are most commonly rounded to the whole foot, as shown on the FIRM, but in certain circumstances or locations they may be rounded to 0.1 foot. Cross section lines shown on the FIRM may also be labeled with the BFE rounded to 0.1 foot. Whole-foot BFEs derived from engineering analyses that apply to coastal areas, areas of ponding, or other static areas with little elevation change may also be shown at selected intervals on the FIRM.

Cross sections with BFEs shown on the FIRM correspond to the cross sections shown in the Floodway Data table and Flood Profiles in this FIS Report. BFEs are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM.

2.4 Non-Encroachment Zones

This section is not applicable to this Flood Risk Project.

2.5 Coastal Flood Hazard Areas

For most areas along rivers, streams, and small lakes, BFEs and floodplain boundaries are based on the amount of water expected to enter the area during a 1% annual chance flood and the geometry of the floodplain. Floods in these areas are typically caused by storm events. However, for areas on or near ocean coasts, large rivers, or large bodies of water, BFE and floodplain boundaries may need to be based on additional components, including storm surges and waves. Communities on or near ocean coasts face flood hazards caused by offshore seismic events as well as storm events.

Coastal flooding sources that are included in this Flood Risk Project are shown in Table 2.

2.5.1 Water Elevations and the Effects of Waves

Specific terminology is used in coastal analyses to indicate which components have been included in evaluating flood hazards.

The stillwater elevation (SWEL or still water level) is the surface of the water resulting from astronomical tides, storm surge, and freshwater inputs, but excluding wave setup contribution or the effects of waves.

- *Astronomical tides* are periodic rises and falls in large bodies of water caused by the rotation of the earth and by the gravitational forces exerted by the earth, moon and sun.
- *Storm surge* is the additional water depth that occurs during large storm events. These events can bring air pressure changes and strong winds that force water up against the shore.
- *Freshwater inputs* include rainfall that falls directly on the body of water, runoff from surfaces and overland flow, and inputs from rivers.

The 1% annual chance stillwater elevation is the stillwater elevation that has been calculated for a storm surge from a 1% annual chance storm. The 1% annual chance storm surge can be determined from analyses of tidal gage records, statistical study of regional historical storms, or other modeling approaches. Stillwater elevations for storms of other frequencies can be developed using similar approaches.

The total stillwater elevation (also referred to as the mean water level) is the stillwater elevation plus wave setup contribution but excluding the effects of waves.

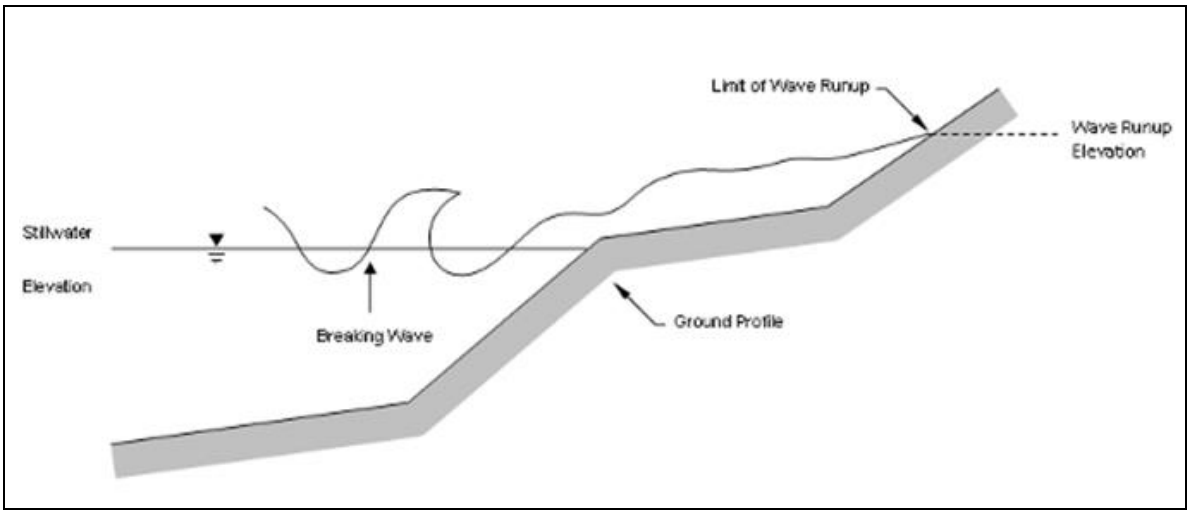
- *Wave setup* is the increase in stillwater elevation at the shoreline caused by the reduction of waves in shallow water. It occurs as breaking wave momentum is transferred to the water column.

Like the stillwater elevation, the total stillwater elevation is based on a storm of a particular frequency, such as the 1% annual chance storm. Wave setup is typically estimated using standard engineering practices or calculated using models, since tidal gages are often sited in areas sheltered from wave action and do not capture this information.

Coastal analyses may examine the effects of overland waves by analyzing storm-induced erosion, overland wave propagation, wave runup, and/or wave overtopping.

- *Storm-induced erosion* is the modification of existing topography by erosion caused by a specific storm event, as opposed to general erosion that occurs at a more constant rate.
- *Overland wave propagation* describes the combined effects of variation in ground elevation, vegetation, and physical features on wave characteristics as waves move onshore.
- *Wave runup* is the uprush of water from wave action on a shore barrier. It is a function of the roughness and geometry of the shoreline at the point where the stillwater elevation intersects the land.
- *Wave overtopping* refers to wave runup that occurs when waves pass over the crest of a barrier.

Figure 5: Wave Runup Transect Schematic



2.5.2 Floodplain Boundaries and BFEs for Coastal Areas

For coastal communities along the Atlantic and Pacific Oceans, the Gulf of Mexico, the Great Lakes, and the Caribbean Sea, flood hazards must take into account how storm surges, waves, and extreme tides interact with factors such as topography and vegetation. Storm surge and waves must also be considered in assessing flood risk for certain communities on rivers or large inland bodies of water.

Beyond areas that are affected by waves and tides, coastal communities can also have riverine floodplains with designated floodways, as described in previous sections.

Floodplain Boundaries

In many coastal areas, storm surge is the principle component of flooding. The extent of the 1% annual chance floodplain in these areas is derived from the total stillwater elevation (stillwater elevation including storm surge plus wave setup) for the 1% annual chance storm. The methods that were used for calculation of total stillwater elevations for coastal areas are described in Section 5.3 of this FIS Report. Location of total stillwater elevations for coastal areas are shown in Figure 8, "1% Annual Chance Total Stillwater Levels for Coastal Areas."

In some areas, the 1% annual chance floodplain is determined based on the limit of wave runup or wave overtopping for the 1% annual chance storm surge. The methods that were used for calculation of wave hazards are described in Section 5.3 of this FIS Report.

Table 25 presents the types of coastal analyses that were used in mapping the 1% annual chance floodplain in coastal areas.

Coastal BFEs

Coastal BFEs are calculated as the total stillwater elevation (stillwater elevation including storm surge plus wave setup) for the 1% annual chance storm plus the additional flood hazard from overland wave effects (storm-induced erosion, overland wave propagation, wave runup and wave overtopping).

Where they apply, coastal BFEs are calculated along transects extending from offshore to the limit of coastal flooding onshore. Results of these analyses are accurate until local topography, vegetation, or development type and density within the community undergoes major changes.

Parameters that were included in calculating coastal BFEs for each transect included in this FIS Report are presented in Table 16, "Coastal Transect Parameters." The locations of transects are shown in Figure 9, "Transect Location Map." More detailed information about the methods used in coastal analyses and the results of intermediate steps in the coastal analyses are presented in Section 5.3 of this FIS Report. Additional information on specific mapping methods is provided in Section 6.4 of this FIS Report.

2.5.3 Coastal High Hazard Areas

Certain areas along the open coast and other areas may have higher risk of experiencing structural damage caused by wave action and/or high-velocity water during the 1% annual chance flood. These areas will be identified on the FIRM as Coastal High Hazard Areas.

- *Coastal High Hazard Area (CHHA)* is a SFHA extending from offshore to the inland limit of the primary frontal dune (PFD) or any other area subject to damages caused by wave action and/or high-velocity water during the 1% annual chance flood.
- *Primary Frontal Dune (PFD)* is a continuous or nearly continuous mound or ridge of sand with relatively steep slopes immediately landward and adjacent to the beach. The PFD is subject to erosion and overtopping from high tides and waves during major coastal storms.

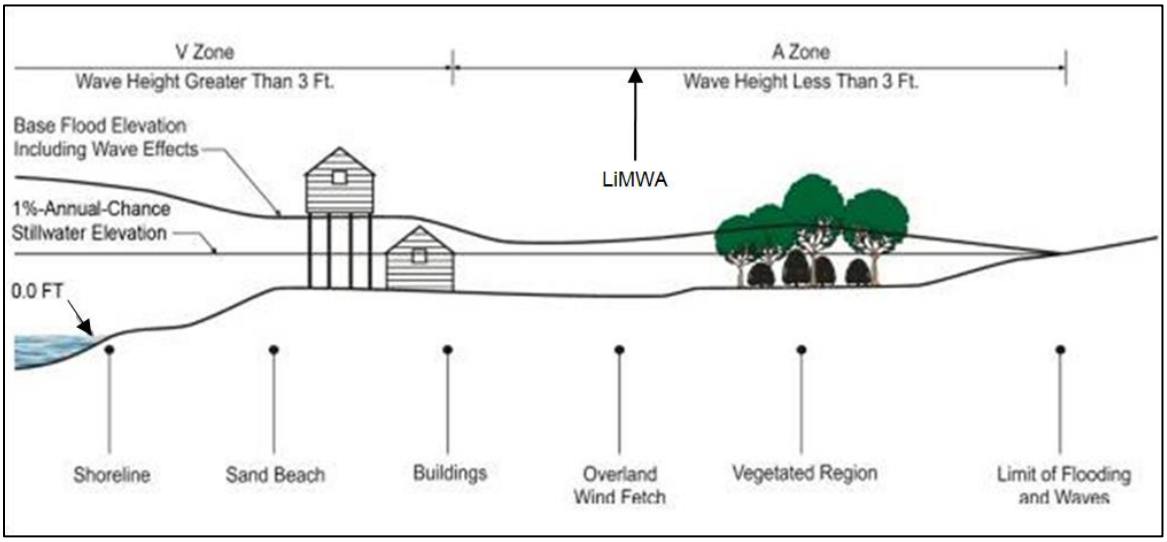
CHHAs are designated as "V" zones (for "velocity wave zones") and are subject to more stringent regulatory requirements and a different flood insurance rate structure. The areas of greatest risk are shown as VE on the FIRM. Zone VE is further subdivided into elevation zones and shown with BFEs on the FIRM.

The landward limit of the PFD occurs at a point where there is a distinct change from a relatively steep slope to a relatively mild slope; this point represents the landward extension of Zone VE. Areas of lower risk in the CHHA are designated with Zone V on the FIRM. More detailed information about the identification and designation of Zone VE is presented in Section 6.4 of this FIS Report.

Areas that are not within the CHHA but are SFHAs may still be impacted by coastal flooding and damaging waves; these areas are shown as "A" zones on the FIRM.

Figure 6, "Coastal Transect Schematic," illustrates the relationship between the base flood elevation, the 1% annual chance stillwater elevation, and the ground profile as well as the location of the Zone VE and Zone AE areas in an area without a PFD subject to overland wave propagation. This figure also illustrates energy dissipation and regeneration of a wave as it moves inland.

Figure 6: Coastal Transect Schematic



Methods used in coastal analyses in this Flood Risk Project are presented in Section 5.3 and mapping methods are provided in Section 6.4 of this FIS Report.

Coastal floodplains are shown on the FIRM using the symbology described in Figure 3, "Map Legend for FIRM." In many cases, the BFE on the FIRM is higher than the stillwater elevations shown in Table 16 due to the presence of wave effects. The higher elevation should be used for construction and/or floodplain management purposes.

2.5.4 Limit of Moderate Wave Action

Laboratory tests and field investigations have shown that wave heights as little as 1.5 feet can cause damage to and failure of typical Zone AE building construction. Wood-frame, light gage steel, or masonry walls on shallow footings or slabs are subject to damage when exposed to waves less than 3 feet in height. Other flood hazards associated with coastal waves (floating debris, high velocity flow, erosion, and scour) can also damage Zone AE construction.

Therefore, a LiMWA boundary may be shown on the FIRM as an informational layer to assist coastal communities in safe rebuilding practices. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The location of the LiMWA relative to Zone VE and Zone AE is shown in Figure 6.

The effects of wave hazards in Zone AE between Zone VE (or the shoreline where Zone VE is not identified) and the limit of the LiMWA boundary are similar to, but less severe than, those in Zone VE where 3-foot or greater breaking waves are projected to occur during the 1% annual chance flooding event. Communities are therefore encouraged to adopt and enforce more stringent floodplain management requirements than the minimum NFIP requirements in the LiMWA. The NFIP Community Rating System provides credits for these actions.

Where wave runup elevations dominate over wave heights, there is no evidence to date of significant damage to residential structures by runup depths less than 3 feet. Examples of these areas include areas with steeply sloped beaches, bluffs, or flood protection structures that lie parallel to the shore. In these areas, the FIRM shows the LiMWA immediately landward of the

VE/AE boundary. Similarly, in areas where the zone VE designation is based on the presence of a primary frontal dune or wave overtopping, the LiMWA is delineated immediately landward of the Zone VE/AE boundary.

SECTION 3.0 – INSURANCE APPLICATIONS

3.1 National Flood Insurance Program Insurance Zones

For flood insurance applications, the FIRM designates flood insurance rate zones as described in Figure 3, "Map Legend for FIRM." Flood insurance zone designations are assigned to flooding sources based on the results of the hydraulic or coastal analyses. Insurance agents use the zones shown on the FIRM and depths and base flood elevations in this FIS Report in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

The 1% annual chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (e.g. Zones A, AE, V, VE, etc.), and the 0.2% annual chance floodplain boundary corresponds to the boundary of areas of additional flood hazards.

Table 3 lists the flood insurance zones in Essex County.

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
Amesbury, City of	A, AE, X
Andover, Town of	A, AE, X
Beverly, City of	A, AE, AO, VE, X
Boxford, Town of	A, AE, X
Danvers, Town of	A, AE, X
Essex, Town of	A, AE, VE, X
Georgetown, Town of	A, AE, X
Gloucester, City of	A, AE, VE, X
Groveland, Town of	A, AE, X
Hamilton, Town of	A, AE, X
Haverhill, City of	A, AE, X
Ipswich, Town of	A, AE, VE, X
Lawrence, City of	A, AE, X
Lynn, City of	A, AE, AO, VE, X
Lynnfield, Town of	A, AE, X
Manchester-by-the-Sea, Town of	A, AE, AO, VE, X
Marblehead, Town of	A, AE, AO, VE, X
Merrimac, Town of	A, AE, X

Community	Flood Zone(s)
Methuen, City of	A, AE, X
Middleton, Town of	A, AE, X
Nahant, Town of	AE, AO, VE, X
Newbury, Town of	A, AE, AO, VE, X
Newburyport, City of	A, AE, AO, VE, X
North Andover, Town of	A, AE, X
Peabody, City of	A, AE, X
Rockport, Town of	A, AE, AO, VE, X
Rowley, Town of	A, AE, VE, X
Salem, City of	A, AE, VE, X
Salisbury, Town of	A, AE, AO, VE, X
Saugus, Town of	A, AE, X
Swampscott, Town of	A, AE, AO, VE, X
Topsfield, Town of	A, AE, X
Wenham, Town of	A, AE, AH, X
West Newbury, Town of	A, AE, X

SECTION 4.0 – AREA STUDIED

4.1 Basin Description

Table 4 contains a description of the characteristics of the HUC-8 sub-basins within which each community falls. The table includes the main flooding sources within each basin, a brief description of the basin, and its drainage area.

Table 4: Basin Characteristics

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
Charles Watershed	01090001	Atlantic Ocean	Coastal land along Massachusetts Bay drained by Charles River and other small coastal rivers and streams between the mouth of Merrimack River to the north and Cape Cod Bay drainages to the south	1,013

Table 4: Basin Characteristics

HUC-8 Sub-Basin Name	HUC-8 Sub-Basin Number	Primary Flooding Source	Description of Affected Area	Drainage Area (square miles)
Merrimack River Watershed	01070006	Merrimack River	Inland basins draining to Merrimack River from mouth at Atlantic Ocean to headwaters at confluence of Pemigewasset River and Winnipesaukee River, not including basins of Contoocook River, Nashua River, and Concord River	1,801
Piscataqua-Salmon Falls Watershed	01060003	Atlantic Ocean	Coastal land along Gulf of Maine drained by Piscataqua River, Salmon Falls River, and all other coastal streams between the mouths of Saco River to the north and Merrimack River to the south	1,684

4.2 Principal Flood Problems

Table 5 contains a description of the principal flood problems that have been noted for Essex County by flooding source.

Table 5: Principal Flood Problems

Flooding Source	Description of Flood Problems
Atlantic Ocean	The coastal communities in Essex County are primarily subject to coastal flooding caused by nor'easters and hurricanes. Nor'easters can occur at any time of the year but are more prevalent in the winter months, whereas hurricanes mostly occur in the late summer and early fall months. This coastal areas tend to be more impacted by nor'easters given that they face primarily to the east, but hurricanes and tropical storms still can affect the coastal low-lying area in these communities. A nor'easter typically travels southwest to northeast along the Atlantic coast, collecting moisture over the ocean and sending it inland via northeast winds. Nor'easters differ from hurricanes in that they cover a larger area, have less intense winds, and move more slowly. Where a hurricane may last for several hours, a nor'easter may last for several days. For this reason, northeasters often last long enough to be accompanied by at least one high tide, which results in the most severe flooding conditions. In addition to flooding, damaging waves may occur from tidal surge in coastal areas. These high levels result from a drop in the barometric pressure and from strong winds that can blow out of the northeast across the considerable fetch of the Atlantic Ocean. The Blizzard of 1978 is the most famous nor'easter that caused significant coastal flooding. Significant damage occurred to coastal homes, roads, and marinas. The Blizzard of 1978 is designated as a 1-percent annual chance coastal flood event. Some other notable nor'easters that resulted in damages in these coastal communities are the October 1991 nor'easter (often referred to as the Perfect Storm), January 2018 nor'easter, and March 2018 nor'easter. Hurricane Sandy in October 2012 did also cause some minor coastal flooding and damages.

Table 6 contains information about historic flood elevations in the communities within Essex County.

Table 6: Historic Flooding Elevations

[Not Applicable to this Flood Risk Project]

4.3 Dams and Other Flood Hazard Reduction Methods

Table 7 contains information about non-levee flood protection measures within Essex County such as dams, jetties, and or dikes. Levees are addressed in Section 4.4 of this FIS Report.

Table 7: Dams and Other Flood Hazard Reduction Methods

[Not Applicable to this Flood Risk Project]

4.4 Levee Systems

For purposes of the NFIP, FEMA only recognizes levee systems that meet, and continue to meet, minimum design, operation, and maintenance standards that are consistent with comprehensive floodplain management criteria. The Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10) describes the information needed for FEMA to determine if a levee system reduces the flood hazard from the 1-percent-annual-chance flood. This information must be supplied to FEMA by the community or other party when a flood risk study or restudy is conducted, when FIRMs are revised, or upon FEMA request. FEMA reviews the information for the purpose of establishing the appropriate flood hazard zone.

Levee systems that are determined to reduce the hazard from the 1-percent-annual-chance flood are accredited by FEMA. FEMA can also grant provisional accreditation to a levee system that was previously accredited on an effective FIRM and for which FEMA is awaiting data and/or documentation to demonstrate compliance with 44 CFR 65.10. These levee systems are referred to as Provisionally Accredited Levees, or PALs. Provisional accreditation provides communities and levee owners with a specified timeframe to obtain the necessary data to confirm the levee system's accreditation status. Accredited levee systems and PALs are shown on the FIRM using the symbology shown in Figure 3. If the required information for a PAL is not submitted within the required timeframe, or if information indicates that a levee system not longer meets 44 CFR 65.10, FEMA will consider the levee system as non-accredited and issue an effective FIRM showing the levee-impacted area as a SFHA or Zone D.

FEMA coordinated with the USACE, the local communities, and other organizations to compile a list of levee systems that exist within Middlesex County. Table 8, "Levee Systems," lists all accredited levees, PALs, and non-accredited levee systems shown on the FIRM for this FIS Report. Other categories of levees may also be included in the table. The Levee ID shown in this table may not match numbers based on other identification systems that were listed in previous FIS Reports. Levee systems identified in the table are displayed on the FIRM with notes to users to indicate their flood hazard mapping status.

Please note that the information presented in Table 8 is subject to change at any time. For that reason, the latest information regarding the levee systems presented in the table may be obtained

by accessing the National Levee Database. For additional information, contact the levee owner/sponsor or the local community shown in Table 30.

Table 8: Levee Systems

Community	Flooding Source	Levee Location	Levee Owner	USACE Levee	Levee ID	Covered Under PL84-99 Program?	FIRM Panel(s)
Haverhill, City of	Merrimack River	Left Bank	City of Haverhill	Yes	4305000025	Yes	25009C0089H

SECTION 5.0 – ENGINEERING METHODS

For the flooding sources in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded at least once on the average during any 10-, 25-, 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-, 25-, 50-, 100-, and 500-year floods, have a 10-, 4-, 2-, 1-, and 0.2% annual 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 that equals or exceeds the 100-year flood (1-percent chance of annual exceedance) during the term of a 30-year mortgage is approximately 26 percent (about 3 in 10); 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 community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

The engineering analyses described here incorporate the results of previously issued Letters of Map Change (LOMCs) listed in Table 26, "Incorporated Letters of Map Change", which include Letters of Map Revision (LOMRs). For more information about LOMRs, refer to Section 6.5, "FIRM Revisions."

5.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for each flooding source studied. Hydrologic analyses are typically performed at the watershed level. Depending on factors such as watershed size and shape, land use and urbanization, and natural or man-made storage, various models or methodologies may be applied. A summary of the hydrologic methods applied to develop the discharges used in the hydraulic analyses for each stream is provided in Table 12. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

A summary of the discharges is provided in Table 9. Frequency Discharge-Drainage Area Curves used to develop the hydrologic models may also be shown in Figure 7 for selected flooding sources. A summary of stillwater elevations developed for non-coastal flooding sources is provided in Table 10. (Coastal stillwater elevations are discussed in Section 5.3 and shown in Table 16.) Stream gage information is provided in Table 11.

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Argilla Brook	At Main Street	1.70	212	*	290	342	616
Argilla Brook	Approximately 2,100 feet above Main Street	1.40	193	*	262	300	565
Argilla Brook	At Center Street	0.90	174	*	233	277	516
Artichoke River Reservoir	At upper Artichoke Reservoir Dam	5.60	80	*	180	240	290
Bare Meadow Brook	At confluence with Merrimack River	7.70	350	*	580	710	1,090
Bare Meadow Brook	At confluence with Hawkes Brook	2.70	180	*	320	400	620
Bare Meadow Brook	450 feet below Oak Street	1.10	110	*	190	230	370
Bare Meadow Brook	At Hills Pond	0.20	34	*	61	80	123
Bartlett Brook	Approximately 3,800 feet above North Lowell Street	6.30	310	*	520	630	970
Bates Brook	Above confluence with Pillings Pond	1.10	50	*	112	120	132
Bates Brook	Above Private Driveway	0.70	125	*	230	275	345
Beaver Brook (Town of Danvers)	At mouth	2.20	170	*	270	320	470
Beaver Brook (Town of Danvers)	At Maple Street	1.70	150	*	240	290	430

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Beaver Brook (Town of Danvers)	Approximately 790 feet below Spring Street	1.30	140	*	220	260	390
Beaver Brook (Town of West Newbury)	At Middle Street	1.58	65	*	125	150	170
Beaver Brook (Town of West Newbury)	At confluence with Beaver Brook Tributary	0.72	25	*	55	70	80
Beaverdam Brook	At Main Street	1.50	80	*	100	105	112
Beaverdam Brook	At Chesterbrook Street	1.20	80	*	100	105	112
Bennetts Pond Brook	At confluence with Saugus River	3.32	374	*	539	618	828
Boston Brook	At confluence with Ipswich River	10.40	450	*	740	910	1,390
Boston Brook	At Liberty River	8.50	360	*	600	730	1,120
Boston Brook	Below Creighton Pond Tributary	7.30	330	*	560	680	1,040
Boston Brook	At downstream North Andover corporate limits	5.70	230	*	365	435	580
Boston Brook	At confluence with unnamed tributary below footpath	4.90	205	*	330	395	530
Boston Brook	At confluence with unnamed tributary	4.20	185	*	300	355	490
Branch of Ipswich and Cleveland Brook	At confluence with School Brook	0.40	70	*	110	130	170

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Bulford Brook	At East Main Street	0.49	5	*	7	9	14
Bulford Brook	Approximately 1,300 feet above East Main Street	0.35	4	*	6	8	13
Bulford Brook	Approximately 2,400 feet above East Main Street	0.23	4	*	6	8	12
Centerville Creek	At confluence with Massachusetts Bay	1.74	96	*	163	199	310
Chubbs Brook	At confluence with Chubb Creek	1.36	80	*	135	166	259
Cochichewick Brook	At confluence with Merrimack River	2.20	150	*	250	310	480
Crane River and Crane Brook	At mouth in Danvers	5.70	360	*	530	620	880
Crane River and Crane Brook	Approximately 80 feet below Sylvan Street Dam	2.90	190	*	300	350	500
Crane River and Crane Brook	At Boston and Maine Railroad near Pine Street	2.60	170	*	260	310	450
Crane River and Crane Brook	At Collins Street	2.10	140	*	220	260	390
Crane River and Crane Brook	Approximately 1,320 feet below Andover Street	1.60	110	*	180	210	310
Crane River and Crane Brook	At Andover Street	1.30	90	*	140	170	250
Crane River and Crane Brook	At Boston and Maine Railroad near Andover Street	1.10	80	*	130	150	230

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Creek Brook	At confluence with Merrimack River	4.00	250	*	430	530	820
Creek Brook	At Broadway Street	1.40	120	*	220	260	410
Emerson Brook	At confluence with Ipswich River	5.80	230	*	390	470	720
Fish Brook (Town of Andover)	At confluence with Merrimack River	5.90	265	*	450	545	840
Fish Brook	At confluence with Ipswich River	17.80	480	*	760	900	1,190
Fish Brook	Approximately 160 feet below I-95	15.80	450	*	700	830	1,065
Fish Brook	At Towne Road crossing in Boxford	9.60	300	*	510	600	790
Fiske Brook	At confluence with Shute Brook	1.12	157	*	237	278	391
Goldthwaite Brook	At confluence with Proctor Brook	4.93	350	*	530	630	910
Goldthwaite Brook	Below Allens Lane	4.53	310	*	490	580	840
Goldthwaite Brook	Below Boston and Maine Railroad	3.90	260	*	410	480	710
Goldthwaite Brook	1,750 feet below Summit Street	2.56	190	*	300	350	520
Goldthwaite Brook	180 feet above Summit Street	2.17	150	*	230	270	400
Goldthwaite Brook	Above granite slab bridge	1.93	130	*	200	240	350
Goldthwaite Brook	Above pond above Corvin Street	1.69	110	*	170	210	310
Goldthwaite Brook	Below First Avenue	1.34	73	*	110	140	200
Harris Brook	At confluence with Spicket River	4.80	200	*	330	400	600
Harris Brook	At Pelham Street	2.90	140	*	230	280	420

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Hawkes Brook	At confluence with Bare Meadow Brook	4.20	210	*	360	440	690
Hawkes Brook	3,750 feet above confluence with Bare Meadow Brook	3.90	160	*	280	340	520
Hawkes Brook	At Washington Street	3.30	150	*	250	300	470
Hawkes Brook	400 feet above Maple Street	1.30	90	*	150	180	280
Howett Brook and Pye Brook	At confluence with Ipswich River	8.70	275	*	450	535	730
Howett Brook and Pye Brook	At confluence with unnamed tributary above East Street	7.04	235	*	380	465	630
Howett Brook and Pye Brook	At divergence into Howlett and Mile Brooks	6.14	240	*	380	455	615
Hussey Brook	At confluence with Shawsheen River	2.10	130	*	225	280	435
Hussey Brook Tributary	At confluence with Hussey Brook	0.80	50	*	90	110	170
Ipswich River	At U.S. Route 1A	150.00	2,870	3,800	4,580	5,410	7,610
Ipswich River	Above confluence with Miles River	130	2,490	3,340	4,040	4,800	6,850
Ipswich River	At USGS streamgage 01102000	125	2,390	3,200	3,880	4,620	6,610
Ipswich River	Above confluence with Howlett Brook	112	2,160	2,880	3,470	4,110	5,820
Ipswich River	Above Diversion Channel	100	2,030	2,670	3,220	3,790	5,320
Ipswich River	Above confluence with Fish Brook	79.3	1,760	2,300	2,760	3,230	4,470

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Ipswich River	Above confluence with Boston Brook	62.9	1,480	1,940	2,330	2,720	3,760
Ipswich River	Above confluence with Middleton Pond outflow	53.5	1,140	1,500	1,800	2,110	2,960
Ipswich River	At USGS streamgage 01101500	44.5	809	1,060	1,270	1,500	2,130
Ipswich River	Above confluence with Eisenhaures Pond outflow	38.2	792	1,040	1,240	1,460	2,040
Ipswich River	Above confluence with Martins Brook	23.9	695	916	1,100	1,290	1,770
Ipswich River	Above confluence with Bear Meadow Brook	18.9	682	901	1,080	1,270	1,760
Ipswich River	Above confluence with unnamed tributary about 200 feet upstream of Interstate 93	14.5	576	763	917	1,080	1,500
Ipswich River	Above confluence with Lubbers Brook	8.54	378	502	605	712	994
Ipswich River	Above confluence with Maple Meadow Brook	2.44	157	211	256	303	427
Jackman Brook	At Georgetown/ Newbury corporate limits (Parish Road)	1.38	24	*	39	47	72
Jackman Brook	At Jackman Street	0.66	12	*	19	22	34
Jackman Brook	Approximately 1,200 feet above Jackman Street	0.45	8	*	13	15	24
Jackman Brook	At Jewett Street	0.24	4	*	7	8	13

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Johnson Creek	Approximately 430 feet below Haverhill/ Groveland corporate limits	6.00	511	*	731	877	1,623
Johnson Creek	At Main Street	4.30	225	*	350	410	720
Johnson Creek	At gravel road over dam	3.00	200	*	320	385	650
Johnson Creek	At Center Street	2.90	190	*	308	362	603
Johnson Creek	Approximately 620 feet above Center Street	2.20	164	*	270	315	525
Johnson Creek	At Salem Street	2.10	148	*	233	270	442
Johnson Creek	At Uptrack Road	1.70	110	*	170	200	310
Johnson Creek	At Washington Street	1.50	98	*	145	164	252
Little River	At Winter Street	37.00	1,160	*	1,920	2,330	3,520
Little River	Above I-95	27.70	980	*	1,640	1,990	3,030
Little River	Below Haverhill/ Plaistow corporate limits	20.80	660	*	1,065	1,275	1,865
Merrimack River	At Salisbury/ Amesbury/ Newburyport corporate limits	5010.00	61,000	*	92,000	115,000	172,100
Merrimack River	At Haverhill/ Methuen/ North Andover corporate limits	4980.00	61,100	*	92,100	115,100	172,100
Merrimack River	At USGS gage No. 1005	4672.00	58,000	*	90,000	111,000	156,000
Merrimack River	At Andover/ Tewksbury corporate limits	4644.00	58,000	*	90,000	111,000	156,000
Mile Brook	At U.S. Route 1	0.24	52	*	70	81	108

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Mile Brook	At dam approximately 1,000 feet below North Street	0.16	42	*	60	71	88
Miles River	At confluence with Ipswich River	17.1	498	657	787	923	1,270
Miles River	Above Long Causeway Brook	13.9	429	567	679	797	1,100
Miles River	Above unnamed tributary about 1,000 feet below private footbridge	11.1	386	511	613	720	998
Miles River	Above unnamed tributary about 200 feet below Myopia Hunt Club Road	8.90	329	437	525	617	857
Miles River	Above unnamed tributary about 750 feet below Larch Row	7.61	282	375	450	530	736
Miles River	Above outflow from Wenham Lake	5.02	225	300	362	426	595
Miles River	Above outflow from Norwood Pond and Beaver Pond	3.70	182	243	293	346	484
Mill River (City of Gloucester)	At tide gate under Washington street	2.27	139	*	238	292	455
Mill River (City of Gloucester)	Adjacent to intersection of Poplar Street and York Road	1.59	107	*	182	224	351
Mill River (Town of Rowley)	At U.S. Route 1	13.60	415	*	685	831	1,261
Millvale Reservoir Brook	At confluence with Merrimack River	8.60	240	*	400	490	790

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Millvale Reservoir Brook	At Millvale Road	6.70	160	*	270	350	620
Mosquito Brook	At downstream North Andover corporate limits	9.40	295	*	500	590	780
Mosquito Brook	At confluence with unnamed tributary below Boxford Street	7.50	275	*	435	520	700
Mosquito Brook	At confluence with unnamed tributary above of Boxford Street	5.10	210	*	340	405	540
Mosquito Brook	At confluence with tributary from Stiles Pond	3.10	155	*	245	295	400
Mosquito Brook	Approximately 1,240 feet above Foster Street	2.60	135	*	220	265	350
Mosquito Brook	At confluence with unnamed tributary below Salem Street	1.40	95	*	150	180	245
Mosquito Brook	At confluence with unnamed tributary below abandoned dam	0.80	60	*	100	120	165
North Beverly Drainage Ditch	Above Boston and Maine Railroad embankment	1.16	174	*	253	290	393
North River and Proctor Brook	At Salem corporate limits	9.96	640	*	990	1,140	1,620
North River and Proctor Brook	Above Strongwater Brook	8.86	580	*	880	1,030	1,470
North River and Proctor Brook	Above Goldthwaite Brook	3.52	240	*	360	420	610

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
North River and Proctor Brook	Above State Route 128	2.52	170	*	260	310	450
North River and Proctor Brook	Above Downing Road	2.10	150	*	240	280	420
North River and Proctor Brook	150 feet above Downing Road	1.48	140	*	220	260	380
North River and Proctor Brook	Below Albert Road	1.22	130	*	200	230	340
North Tributary Brook	At Pikes Bridge Road	1.35	70	*	125	150	170
Parker River (Town of Boxford)	At downstream corporate limits	3.60	170	*	270	325	460
Parker River (Town of Boxford)	Above Willow Road	2.70	140	*	225	271	460
Parker River (Town of Boxford)	Approximately 640 feet below Main Street	2.10	125	*	190	230	305
Parker River (Town of Georgetown)	Georgetown/ Groveland corporate limits	11.24	198	*	317	382	585
Parker River (Town of Georgetown)	At Thurlow Street	10.80	190	*	305	368	562
Parker River (Town of Georgetown)	At railroad track bed	9.94	175	*	280	338	517
Parker River (Town of Georgetown)	At Mill Street	9.83	155	*	245	285	450

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Parker River (Town of Georgetown)	At railroad track bed	6.73	120	*	200	255	395
Parker River (Town of Georgetown)	At Pond Street	6.59	116	*	186	224	343
Parker River (Town of Georgetown)	At railroad track bed	5.90	105	*	170	208	310
Parker River (Town of Georgetown)	At West Main Street	5.81	102	*	164	198	302
Parker River (Town of Georgetown)	At Bailey Lane	5.12	95	*	150	180	285
Parker River (Town of Georgetown)	Approximately 2,420 feet below Bailey Lane	4.71	83	*	133	160	245
Parker River (Town of Newbury)	At Central Street	24.9	605	819	1,000	1,200	1,760
Parker River (Town of Newbury)	At USGS streamgage 01101000	21.4	486	669	832	1,010	1,530
Peat Meadow Brook	At confluence with Spicket River	2.00	100	*	160	200	310
Peat Meadow Brook	At Interstate 93	1.50	80	*	140	170	270
Peat Meadow Brook	At Forest Street	0.20	20	*	30	40	70
Penn Brook	At North Street	3.10	55	*	87	105	161
Penn Brook	At Summer Street	2.96	52	*	83	101	154

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Penn Brook	At road to High School	2.84	50	*	80	97	148
Penn Brook	At Penn Brook Avenue	2.74	47	*	76	92	141
Penn Brook	At East Main Street	2.20	43	*	70	85	130
Penn Brook	Approximately 1,650 feet above East Main Street	2.04	41	*	66	80	122
Penn Brook	Approximately 1,680 feet below East Street	1.87	37	*	57	71	109
Penn Brook	At East Street	1.64	33	*	50	62	95
Penn Brook	At State Route 97	1.31	28	*	43	53	81
Penn Brook	At railroad track bed	1.28	23	*	36	44	67
Porter River and Frost Fish Brook	At mouth	12.50	720	*	1,070	1,240	1,750
Porter River and Frost Fish Brook	Above Waters River	10.30	600	*	900	1,050	1,490
Porter River and Frost Fish Brook	Above Crane River	4.40	260	*	410	490	720
Porter River and Frost Fish Brook	At U.S. Route 128	3.50	220	*	350	420	620
Porter River and Frost Fish Brook	At Conant Street	3.00	200	*	310	380	560
Porter River and Frost Fish Brook	At Coolidge Road	2.50	170	*	270	330	490
Powwow River	At Lake Gardner Dam	49.10	*	*	*	1,720	*

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Powwow River	At Tuxbury Pond Dam	45.90	*	*	*	1,640	*
Riverside Airport Brook	At confluence with Merrimack River	0.70	50	*	90	120	180
Saugus River	At USGS streamgage 01102345	24.9	846	1,210	1,520	1,870	2,790
Saugus River	Above Bennetts Pond Brook	20.8	724	1,010	1,250	1,520	2,230
Saugus River	Above Hawkes Brook	16.7	601	819	1,000	1,190	1,710
Saugus River	Above Mill River	12.3	438	580	697	819	1,140
Saugus River	Above Pillings Pond outflow	7.99	290	386	464	546	760
Saugus River	Above Beaverdam Brook	5.37	238	318	383	452	631
Saugus River	Above Reading Drainage Canal	1.43	62	84	102	121	171
School Brook	At confluence with Cleveland Brook	0.40	70	*	110	130	170
Shawsheen River	At confluence with Merrimack River	78.07	2,231	*	3,137	3,707	4,667
Shawsheen River	At Andover/ Lawrance corporate limits	75.34	2,149	*	3,026	3,577	4,506
Shawsheen River	At U.S. Route 128	71.09	2,008	*	2,834	3,350	4,212
Shawsheen River	At Interstate 93	60.84	1,854	*	2,618	3,093	3,898
Shute Brook	At confluence with Saugus River	3.22	470	*	664	757	1,000
Spicket River	At confluence with Merrimack River	77.3	1,820	2,270	2,620	2,950	3,700
Spicket River	Above unnamed tributary 2	73.9	1,740	2,170	2,510	2,830	3,570

Table 9: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)				
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Spicket River	Above unnamed tributary 1	71.1	1,670	2,090	2,410	2,730	3,470
Spicket River	Above Harris Brook	64.5	1,510	1,890	2,190	2,490	3,210
Spicket River	At USGS streamgage 01100561	61.8	1,440	1,810	2,100	2,390	3,100
Strongwater Brook	At confluence with Proctor Brook	1.08	77	*	120	140	210
Tapley Brook	At confluence with Goldthwaite Brook	1.34	81	*	135	165	250
Tributary A to Ipswich River	At confluence with Ipswich River	2.00	76	*	143	175	236
Tributary A to Ipswich River	At downstream end of Middleton Pond	1.60	41	*	85	111	170
Tributary to Neal Pond	At Birch Meadow Road No. 2	0.80	80	*	140	170	250
Unnamed Tributary to Fish Brook	At confluence with Fish Brook	0.33	*	*	*	70	*
Unnamed Tributary to Fish Brook	At Boxfield Road	0.25	*	*	*	29	*
Unnamed Tributary to Fish Brook	At Topsfield corporate limits	0.16	*	*	*	59	*

*Not calculated for this Flood Risk Project

Figure 7: Frequency Discharge-Drainage Area Curves

[Not Applicable to this Flood Risk Project]

Table 10: Summary of Non-Coastal Stillwater Elevations

Flooding Source	Location	Elevations (feet NAVD88)				
		10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Baldpate Pond	Boxford, Town of; Georgetown, Town of	92.6	*	93.1	93.5	93.6
Cedar Pond	Lynn, City of	98.2	*	*	99.7	*
Flax Pond	Lynn, City of	54.2	*	*	54.8	*
Lake Attitash	Amesbury, City of; Merrimac, Town of	96.9	*	97.2	97.3	98.0
Pond 1	Wenham, Town of	*	*	*	47.1	*
Pond 2	Wenham, Town of	*	*	*	53.6	*
Pillings Pond	Lynnfield, Town of	97.4	*	98.1	98.3	98.8
Sluice Pond	Lynn, City of	63.8	*	*	64.2	*
World End Pond	Methuen, City of	*	*	*	116.3	*

*Not calculated for this Flood Risk Project

Table 11: Stream Gage Information used to Determine Discharges

Flooding Source	Gage Identifier	Agency that Maintains Gage	Site Name	Drainage Area (Square Miles)	Period of Record	
					From	To
Parker River	01101000	USGS	Parker River at Byfield, MA	21.3	1946	2015
Ipswich River	01101500	USGS	Ipswich River at South Middleton, MA	44.5	1938	2015
Ipswich River	01102000	USGS	Ipswich River near Ipswich, MA	125	1931	2015
Saugus River	01102345	USGS	Saugus River at Saugus Ironworks at Saugus, MA	20.8	1994	2015
Spicket River	01100505	USGS	Spicket River at North Salem, NH	16.5	2001	2015
Spicket River	01100561	USGS	Spicket River near Methuen, MA	62.1	2001	2015

5.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Base flood elevations on the FIRM represent the elevations shown on the Flood Profiles and in the Floodway Data tables in the FIS Report. Rounded whole-foot elevations may be shown on the FIRM in coastal areas, areas of ponding, and other areas with static base flood elevations. These whole-foot elevations may not exactly reflect the elevations derived from the hydraulic analyses. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS Report in conjunction with the data shown on the FIRM. The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

For streams for which hydraulic analyses were based on cross sections, locations of selected cross sections are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 6.3), selected cross sections are also listed on Table 23, “Floodway Data.”

A summary of the methods used in hydraulic analyses performed for this project is provided in Table 12. Roughness coefficients are provided in Table 13. Roughness coefficients are values

representing the frictional resistance water experiences when passing overland or through a channel. They are used in the calculations to determine water surface elevations. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.