

FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 4



CUMBERLAND COUNTY, MAINE (ALL JURISDICTIONS)

COMMUNITY NAME	NUMBER	COMMUNITY NAME	NUMBER
BALDWIN, TOWN OF	230200	POWNAI, TOWN OF	230204
BRIDGTON, TOWN OF	230041	RAYMOND, TOWN OF	230205
BRUNSWICK, TOWN OF	230042	SCARBOROUGH, TOWN OF	230052
CAPE ELIZABETH, TOWN OF	230043	SEBAGO, TOWN OF	230206
CASCO, TOWN OF	230044	SOUTH PORTLAND, CITY OF	230053
CHEBEAGUE ISLAND, TOWN OF	231037	STANDISH, TOWN OF	230207
CUMBERLAND, TOWN OF	230162	WESTBROOK, CITY OF	230054
FALMOUTH, TOWN OF	230045	WINDHAM, TOWN OF	230189
FREEPORT, TOWN OF	230046	YARMOUTH, TOWN OF	230055
FRYE ISLAND, TOWN OF	231036		
GORHAM, TOWN OF	230047		
GRAY, TOWN OF	230048		
HARPSWELL, TOWN OF	230169		
HARRISON, TOWN OF	230049		
LONG ISLAND, TOWN OF	231035		
NAPLES, TOWN OF	230050		
NEW GLOUCESTER, TOWN OF	230201		
NORTH YARMOUTH, TOWN OF	230202		
PORTLAND, CITY OF	230051		

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FLOOD INSURANCE STUDY REPORT CUMBERLAND COUNTY, MAINE

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, 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 Cumberland County, Maine.

The jurisdictions that are included in this project area, along with the Community Identification Number (CID) for each community and the United States Geological Survey (USGS) 8-digit Hydrologic Unit Code (HUC-8) sub-basins affecting each, are shown in Table 1. The 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
Baldwin, Town of	230200	01060001 01060002	23005C0195F 23005C0213F 23005C0406F 23005C0407F 23005C0408F 23005C0409F 23005C0416F 23005C0417F	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Baldwin, Town of - continued	230200	01060001 01060002	23005C0426F 23005C0427F 23005C0428F ¹ 23005C0429F ¹ 23005C0431F ¹ 23005C0432F 23005C0433F 23005C0434F 23005C0436F 23005C0437F 23005C0441F 23005C0442F	
Bridgton, Town of	230041	01060001 01060002	23005C0015F ¹ 23005C0055F 23005C0056F ¹ 23005C0057F 23005C0058F 23005C0059F 23005C0065F 23005C0070F 23005C0076F 23005C0077F 23005C0078F 23005C0079F 23005C0081F 23005C0083F 23005C0086F 23005C0087F 23005C0090F 23005C0091F 23005C0092F 23005C0093F 23005C0094F 23005C0185F ¹ 23005C0203F 23005C0204F 23005C0205F 23005C0206F 23005C0208F	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Brunswick, Town of	230042	01040002 01060001	23005C0330F ¹ 23005C0331F 23005C0333F 23005C0334F 23005C0340F 23005C0346F 23005C0347F 23005C0348F 23005C0349F 23005C0359F 23005C0361F 23005C0362F 23005C0363F 23005C0364F 23005C0366F 23005C0367F 23005C0368F 23005C0369F 23005C0378F 23005C0386F 23005C0388F 23005C0556F 23005C0557F 23005C0558F 23005C0559F 23005C0576F 23005C0577F 23005C0578F 23005C0579F 23005C0581F 23005C0582F 23005C0583F	
Cape Elizabeth, Town of	230043	01060001	23005C0713F 23005C0714F 23005C0807F 23005C0809F 23005C0817F	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Cape Elizabeth, Town of - continued	230043	01060001	23005C0826F 23005C0827F 23005C0828F 23005C0829F 23005C0836F 23005C0837F	
Casco, Town of	230044	01040002 01060001	23005C0117F 23005C0118F 23005C0119F 23005C0136F 23005C0138F 23005C0139F 23005C0227F 23005C0229F 23005C0231F 23005C0232F 23005C0233F 23005C0234F 23005C0237F 23005C0239F ¹ 23005C0241F 23005C0242F 23005C0243F 23005C0244F 23005C0251F 23005C0252F 23005C0253F 23005C0261F 23005C0456F	
Chebeague Island, Town of	231037	01060001	23005C0544F 23005C0563F 23005C0564F 23005C0706F 23005C0707F 23005C0708F 23005C0709F 23005C0726F 23005C0727F	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Chebeague Island, Town of - continued	231037	01060001	23005C0728F 23005C0729F 23005C0733F 23005C0736F 23005C0737F	
Cumberland, Town of	230162	01060001	23005C0504F 23005C0506F 23005C0508F 23005C0509F 23005C0512F 23005C0516F 23005C0517F 23005C0518F 23005C0519F 23005C0536F 23005C0537F 23005C0538F 23005C0539F 23005C0543F 23005C0701F 23005C0702F 23005C0706F 23005C0707F	
Falmouth, Town of	230045	01060001	23005C0511F 23005C0512F 23005C0513F 23005C0514F 23005C0516F 23005C0518F 23005C0519F 23005C0538F 23005C0676F 23005C0677F 23005C0681F 23005C0682F 23005C0683F 23005C0684F 23005C0701F 23005C0702F	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Falmouth, Town of - continued	230045	01060001	23005C0703F 23005C0704F 23005C0706F 23005C0708F 23005C0711F 23005C0712F	
Freeport, Town of	230046	01040002 01060001	23005C0320F 23005C0340F 23005C0348F 23005C0531F 23005C0532F 23005C0533F 23005C0534F 23005C0542F 23005C0551F 23005C0552F 23005C0553F 23005C0554F 23005C0556F 23005C0557F 23005C0558F 23005C0559F 23005C0561F 23005C0562F 23005C0564F 23005C0566F 23005C0568F	
Frye Island, Town of	231036	01060001	23005C0456F 23005C0457F 23005C0458F 23005C0459F	
Gorham, Town of	230047	01060001	23005C0469F 23005C0479F 23005C0486F 23005C0487F 23005C0488F 23005C0489F 23005C0631F 23005C0632F	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Gorham, Town of - continued	230047	01060001	23005C0633F 23005C0634F 23005C0642F 23005C0651F 23005C0652F 23005C0653F 23005C0654F 23005C0656F 23005C0658F 23005C0659F 23005C0661F 23005C0662F 23005C0663F ¹ 23005C0664F 23005C0666F 23005C0667F 23005C0668F 23005C0669F 23005C0777F 23005C0781F	
Gray, Town of	230048	01060001	23005C0259F 23005C0264F 23005C0266F 23005C0267F 23005C0268F 23005C0269F 23005C0280F 23005C0286F 23005C0287F 23005C0288F 23005C0289F 23005C0291F 23005C0292F 23005C0293F 23005C0294F 23005C0481F 23005C0482F 23005C0501F 23005C0502F	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Gray, Town of - continued	230048	01060001	23005C0503F 23005C0504F 23005C0506F 23005C0507F 23005C0508F	
Harpwell, Town of	230169	01060001	23005C0558F 23005C0559F 23005C0564F 23005C0566F 23005C0567F 23005C0568F 23005C0569F 23005C0576F 23005C0577F 23005C0578F 23005C0579F 23005C0581F 23005C0582F 23005C0583F 23005C0584F 23005C0586F 23005C0587F 23005C0588F 23005C0589F 23005C0591F 23005C0592F 23005C0593F 23005C0594F 23005C0727F 23005C0729F 23005C0731F 23005C0732F 23005C0733F 23005C0734F 23005C0751F 23005C0752F 23005C0753F	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Harpswell, Town of - continued	230169	01060001	23005C0754F 23005C0756F 23005C0757F 23005C0758F 23005C0759F	
Harrison, Town of	230049	01060001	23005C0015F ¹ 23005C0017F 23005C0018F 23005C0019F 23005C0036F 23005C0038F 23005C0039F 23005C0077F 23005C0079F 23005C0081F 23005C0082F ¹ 23005C0083F 23005C0084F 23005C0091F 23005C0092F 23005C0094F 23005C0101F 23005C0102F 23005C0103F 23005C0111F 23005C0112F 23005C0113F	
Long Island, Town of	231035	01060001	23005C0704F 23005C0706F 23005C0708F 23005C0709F 23005C0712F 23005C0716F 23005C0717F 23005C0718F 23005C0719F 23005C0728F 23005C0736F 23005C0738F	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Naples, Town of	230050	01060001	23005C0093F 23005C0094F 23005C0111F 23005C0112F 23005C0113F 23005C0114F 23005C0118F 23005C0204F 23005C0206F 23005C0207F 23005C0208F 23005C0209F 23005C0216F 23005C0217F 23005C0226F 23005C0227F 23005C0228F 23005C0229F 23005C0231F 23005C0233F 23005C0236F 23005C0237F	
New Gloucester, Town of	230201	01040002 01060001	23005C0144F ¹ 23005C0165F ¹ 23005C0170F 23005C0257F 23005C0259F 23005C0280F 23005C0281F 23005C0282F 23005C0283F 23005C0284F 23005C0287F 23005C0291F 23005C0292F 23005C0294F 23005C0305F 23005C0315F	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
North Yarmouth, Town of	230202	01060001	23005C0294F 23005C0315F 23005C0506F 23005C0507F 23005C0508F 23005C0509F 23005C0517F 23005C0526F 23005C0527F 23005C0528F 23005C0529F 23005C0531F 23005C0533F 23005C0536F 23005C0537F	
Portland, City of	230051	01060001	23005C0677F 23005C0679F 23005C0681F 23005C0682F 23005C0683F 23005C0684F 23005C0687F 23005C0688F 23005C0689F 23005C0691F 23005C0692F 23005C0693F 23005C0694F 23005C0703F 23005C0704F 23005C0709F 23005C0711F 23005C0712F 23005C0713F 23005C0714F 23005C0716F 23005C0717F 23005C0718F 23005C0719F	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Portland, City of - continued	230051	01060001	23005C0728F 23005C0729F 23005C0736F 23005C0737F 23005C0738F 23005C0827F	
Pownal, Town of	230204	01060001	23005C0305F 23005C0310F 23005C0315F 23005C0320F 23005C0340F 23005C0527F 23005C0531F 23005C0532F 23005C0533F	
Raymond, Town of	230205	01040002 01060001	23005C0139F 23005C0143F ¹ 23005C0242F 23005C0243F 23005C0244F 23005C0251F 23005C0252F 23005C0253F 23005C0254F 23005C0256F 23005C0257F 23005C0258F 23005C0259F 23005C0261F 23005C0262F 23005C0263F 23005C0264F 23005C0266F 23005C0267F 23005C0268F 23005C0280F 23005C0456F 23005C0457F	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Raymond, Town of - continued	230205	01040002 01060001	23005C0459F 23005C0476F 23005C0477F 23005C0478F	
Scarborough, Town of	230052	01060001	23005C0663F ¹ 23005C0664F 23005C0668F 23005C0669F 23005C0688F 23005C0689F 23005C0776F 23005C0777F 23005C0779F 23005C0781F 23005C0782F 23005C0783F ¹ 23005C0784F 23005C0792F 23005C0801F 23005C0802F 23005C0803F 23005C0804F 23005C0806F 23005C0807F 23005C0808F 23005C0809F 23005C0811F 23005C0812F 23005C0814F 23005C0816F 23005C0817F 23005C0818F 23005C0836F	
Sebago, Town of	230206	01060001 01060002	23005C0195F 23005C0203F 23005C0204F 23005C0208F 23005C0211F 23005C0212F	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Sebago, Town of	230206	01060001 01060002	23005C0213F 23005C0214F 23005C0216F 23005C0217F 23005C0218F 23005C0219F 23005C0236F 23005C0237F 23005C0238F 23005C0239F ¹ 23005C0243F 23005C0426F 23005C0427F 23005C0431F ¹ 23005C0432F 23005C0434F 23005C0451F 23005C0452F ¹ 23005C0453F 23005C0456F	
South Portland, City of	230053	01060001	23005C0688F 23005C0689F 23005C0693F 23005C0694F 23005C0711F 23005C0713F 23005C0714F 23005C0802F 23005C0806F 23005C0807F 23005C0826F	
Standish, Town of	230207	01060001 01060002	23005C0434F 23005C0441F 23005C0442F 23005C0443F 23005C0444F 23005C0451F 23005C0452F ¹	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Standish, Town of - continued	230207	01060001 01060002	23005C0453F 23005C0454F 23005C0456F 23005C0457F 23005C0458F 23005C0459F 23005C0461F 23005C0462F 23005C0463F 23005C0464F 23005C0466F 23005C0467F 23005C0468F 23005C0469F 23005C0476F 23005C0477F 23005C0478F 23005C0479F 23005C0486F 23005C0487F 23005C0488F 23005C0607F 23005C0608F 23005C0609F 23005C0626F 23005C0627F 23005C0628F 23005C0629F 23005C0631F 23005C0632F 23005C0633F 23005C0640F	
Westbrook, City of	230054	01060001	23005C0513F 23005C0514F 23005C0659F 23005C0667F 23005C0669F 23005C0676F 23005C0677F 23005C0678F	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Westbrook, City of - continued	230054	01060001	23005C0679F 23005C0681F 23005C0686F 23005C0687F 23005C0688F 23005C0689F	
Windham, Town of	230189	01060001	23005C0264F 23005C0268F 23005C0476F 23005C0477F 23005C0479F 23005C0481F 23005C0482F 23005C0483F 23005C0484F 23005C0487F 23005C0489F 23005C0491F 23005C0492F 23005C0493F 23005C0494F 23005C0501F 23005C0503F 23005C0504F 23005C0511F 23005C0512F 23005C0513F 23005C0652F 23005C0656F 23005C0657F 23005C0658F 23005C0659F 23005C0676F 23005C0678F	
Yarmouth, Town of	230055	01060001	23005C0528F 23005C0529F 23005C0533F 23005C0534F	

Table 1: Listing of NFIP Jurisdictions (continued)

Community	CID	HUC-8 Sub-Basin(s)	Located on FIRM Panel(s)	If Not Included, Location of Flood Hazard Data
Yarmouth, Town of - continued	230055	01060001	23005C0536F 23005C0537F 23005C0539F 23005C0541F 23005C0542F 23005C0543F 23005C0544F 23005C0561F 23005C0562F 23005C0563F 23005C0564F 23005C0706F 23005C0707F	

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 Cumberland County became effective on 6/20/2024. Refer to Table 27 for information about subsequent revisions to the FIRMs.

Selected FIRM panels for the community may contain information (such as floodways and cross sections) that was previously shown separately on the corresponding Flood Boundary and Floodway Map (FBFM) panels. In addition, former flood hazard zone designations have been changed as follows:

<u>Old Zone</u>	<u>New Zone</u>
A1 through A30	AE
V1 through V30	VE
B	X (shaded)
C	X (unshaded)

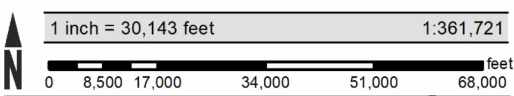
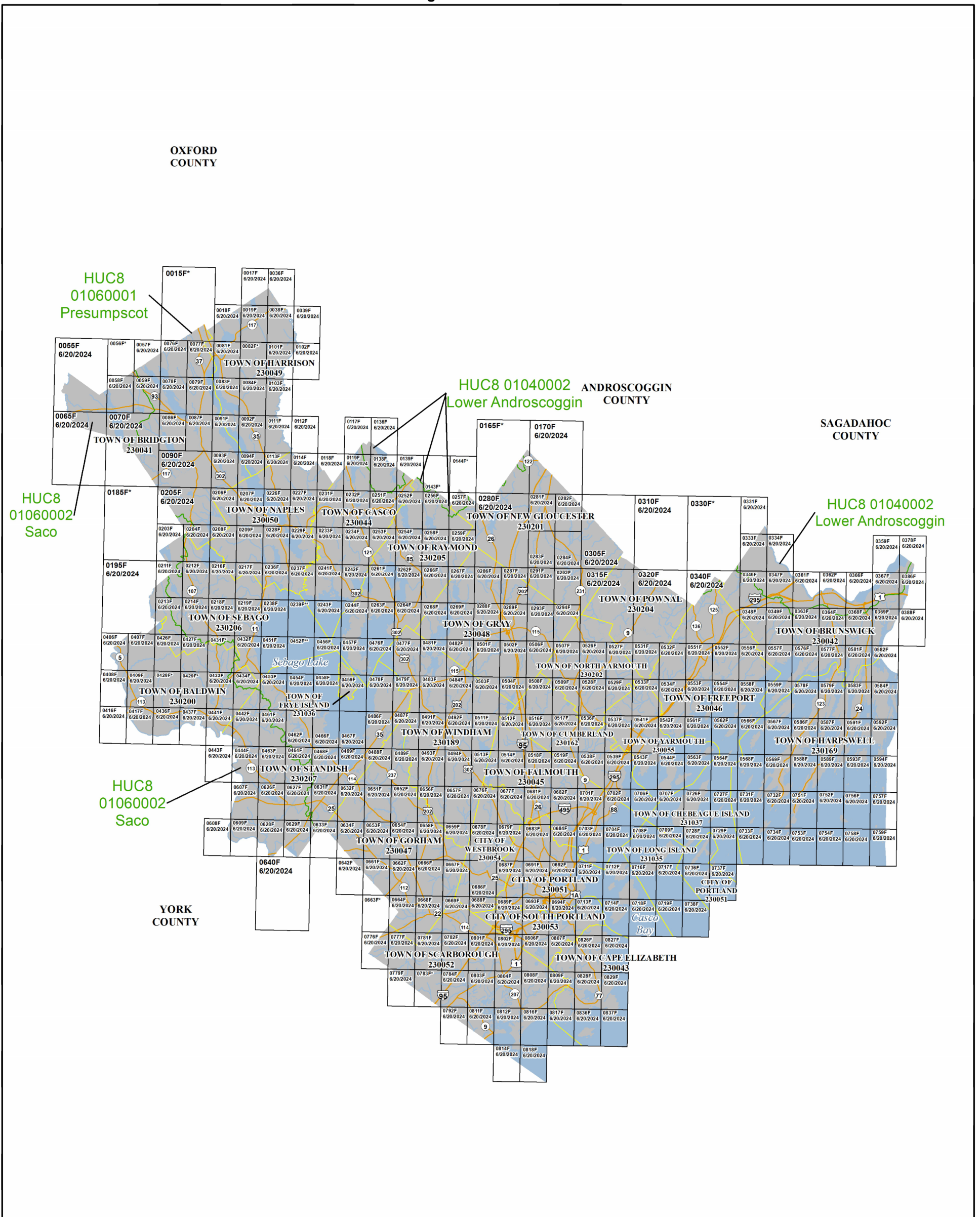
- FEMA does not impose floodplain management requirements or special insurance ratings based on Limit of Moderate Wave Action (LiMWA) delineations at this time. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. If the LiMWA is shown on the FIRM, it is being provided by 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.

- 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 Cumberland 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, and flooding sources.

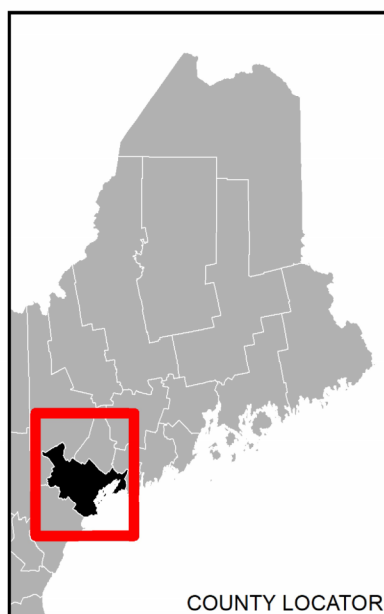
Figure 1: FIRM Index



Map Projection:
 Universal Transverse Mercator Zone 19 North;
 North American Datum 1983

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

SEE FLOOD INSURANCE STUDY FOR ADDITIONAL INFORMATION



COUNTY LOCATOR

NATIONAL FLOOD INSURANCE PROGRAM
 FLOOD INSURANCE RATE MAP INDEX

CUMBERLAND COUNTY, MAINE (All Jurisdictions)

PANELS PRINTED:

- 0017, 0018, 0019, 0036, 0038, 0039, 0055, 0057, 0058, 0059, 0065, 0070, 0076, 0077, 0078, 0079, 0081, 0083, 0084, 0086, 0087, 0090, 0091, 0092, 0093, 0094, 0101, 0102, 0103, 0111, 0112, 0113, 0114, 0117, 0118, 0119, 0136, 0138, 0139, 0170, 0195, 0203, 0204, 0205, 0206, 0207, 0208, 0209, 0211, 0212, 0213, 0214, 0216, 0217, 0218, 0219, 0226, 0227, 0228, 0229, 0231, 0232, 0233, 0234, 0236, 0237, 0238, 0241, 0242, 0243, 0244, 0251, 0252, 0253, 0254, 0256, 0257, 0258, 0259, 0261, 0262, 0263, 0264, 0266, 0267, 0268, 0269, 0280, 0281, 0282, 0283, 0284, 0286, 0287, 0288, 0289, 0291, 0292, 0293, 0294, 0305, 0310, 0315, 0320, 0331, 0333, 0334, 0340, 0346, 0347, 0348, 0349, 0359, 0361, 0362, 0363, 0364, 0366, 0367, 0368, 0369, 0378, 0386, 0388, 0406, 0407, 0408, 0409, 0416, 0417, 0426, 0427, 0432, 0433, 0434, 0436, 0437, 0441, 0442, 0443, 0444, 0451, 0453, 0454, 0456, 0457, 0458, 0459, 0461, 0462, 0463, 0464, 0466, 0467, 0468, 0469, 0476, 0477, 0478, 0479, 0481, 0482, 0483, 0484, 0486, 0487, 0488, 0489, 0491, 0492, 0493, 0494, 0501, 0502, 0503, 0504, 0506, 0507, 0508, 0509, 0511, 0512, 0513, 0514, 0516, 0517, 0518, 0519, 0526, 0527, 0528, 0529, 0531, 0532, 0533, 0534, 0536, 0537, 0538, 0539, 0541, 0542, 0543, 0544, 0551, 0552, 0553, 0554, 0556, 0557, 0558, 0559, 0561, 0562, 0563, 0564, 0566, 0567, 0568, 0569, 0576, 0577, 0578, 0579, 0581, 0582, 0583, 0584, 0586, 0587, 0588, 0589, 0591, 0592, 0593, 0594, 0607, 0608, 0609, 0626, 0627, 0628, 0629, 0631, 0632, 0633, 0634, 0640, 0642, 0651, 0652, 0653, 0654, 0656, 0657, 0658, 0659, 0661, 0662, 0664, 0666, 0667, 0668, 0669, 0676, 0677, 0678, 0679, 0681, 0682, 0683, 0684, 0686, 0687, 0688, 0689, 0691, 0692, 0693, 0694, 0701, 0702, 0703, 0704, 0706, 0707, 0708, 0709, 0711, 0712, 0713, 0714, 0716, 0717, 0718, 0719, 0726, 0727, 0728, 0729, 0731, 0732, 0733, 0734, 0736, 0737, 0738, 0751, 0752, 0753, 0754, 0756, 0757, 0758, 0759, 0776, 0777, 0779, 0781, 0782, 0784, 0792, 0801, 0802, 0803, 0804, 0806, 0807, 0808, 0809, 0811, 0812, 0814, 0816, 0817, 0818, 0826, 0827, 0828, 0829, 0836, 0837



FEMA

MAP NUMBER
 23005CIND0A

EFFECTIVE DATE
 June 20, 2024

* PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS
 ** PANEL NOT PRINTED - AREA WITHIN ZONE AE (EL 267)

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

<p style="text-align: center;">NOTES TO USERS</p> <p>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.</p> <p>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.</p> <p>For community and countywide map dates, refer to Table 27 in this FIS Report.</p> <p>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.</p>
<p>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.</p> <p>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.</p> <p>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.</p>

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 Universal Transverse Mercator (UTM) Zone 19N. The horizontal datum was the North American Datum of 1983 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 this FIRM provided in digital format by State of Maine, Maine office of GIS (MeGIS). This information was derived from MeGIS, dated 2009 and 2012. 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 Cumberland County, Maine, corresponding revisions to the FIRM Index will be 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.

Figure 2. FIRM Notes to Users

SPECIAL NOTES FOR SPECIFIC FIRM PANELS

This Notes to Users section was created specifically for Cumberland County, Maine, effective Date June 20, 2024.

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.

STATE OF MAINE FLOODWAY NOTE: Under the Maine Revised Statutes Annotated (M.R.S.A) Title 38 § 439-A, 7C where the floodway is not designated on the Flood Insurance Rate Map, the floodway is considered to be the channel of a river or other water course and the adjacent land areas to a distance of one-half the width of the floodplain, as measured from the normal high water mark to the upland limit of the floodplain, unless a technical evaluation certified by a registered professional engineer is provided demonstrating the actual floodway based upon approved FEMA modeling methods.

COASTAL STRUCTURES: Only coastal structures that are certified to provide protection from the 1-percent-annual chance flood are shown on the panels. However, all structures taken into consideration for the purpose of coastal flood hazard analysis and mapping are present in the DFIRM database in S_Gen_Struct.

FLOOD RISK REPORT: A Flood Risk Report (FRR) may be available for many of the flooding sources and communities referenced in this FIS Report. The FRR is provided to increase public awareness of flood risk by helping communities identify the areas within their jurisdictions that have the greatest risks. Although non-regulatory, the information provided within the FRR can assist communities in assessing and evaluating mitigation opportunities to reduce these risks. It can also be used by communities developing or updating flood risk mitigation plans. These plans allow communities to identify and evaluate opportunities to reduce potential loss of life and property. However, the FRR is not intended to be the final authoritative source of all flood risk data for a project area; rather, it should be used with other data sources to paint a comprehensive picture of flood risk.

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 Cumberland County.

Figure 3: Map Legend for FIRM

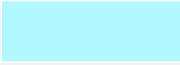
<p>SPECIAL FLOOD HAZARD AREAS: <i>The 1% annual chance flood, also known as the base flood or 100-year flood, has a 1% chance of happening or being exceeded each year. Special Flood Hazard Areas are subject to flooding by the 1% annual chance flood. The Base Flood Elevation is the water surface elevation 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.</i></p>	
	<p>Special Flood Hazard Areas subject to inundation by the 1% annual chance flood (Zones A, AE, AH, AO, AR, A99, V and VE)</p>
<p>Zone A</p>	<p>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.</p>
<p>Zone AE</p>	<p>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.</p>
<p>Zone AH</p>	<p>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.</p>
<p>Zone AO</p>	<p>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.</p>
<p>Zone AR</p>	<p>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.</p>
<p>Zone A99</p>	<p>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.</p>
<p>Zone V</p>	<p>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.</p>
<p>Zone VE</p>	<p>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.</p>

Figure 3: Map Legend for FIRM


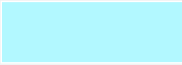




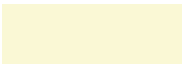
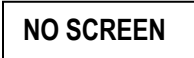
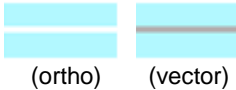



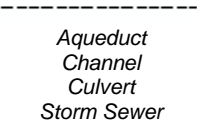
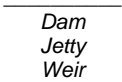






	Regulatory Floodway determined in Zone AE.
	Non-encroachment zone (see Section 2.4 of this FIS Report for more information)
OTHER AREAS OF FLOOD HAZARD	
	Shaded Zone X: Areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with 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.
	Area with Flood Risk due to Levee: Areas where a non-accredited levee, dike, or other flood control structure is shown as providing protection to less than the 1% annual chance flood.
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	
	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	
	Channel, Culvert, Aqueduct, or Storm Sewer
	Dam, Jetty, Weir

Figure 3: Map Legend for FIRM

	Levee, Dike, or Floodwall
	Bridge
REFERENCE MARKERS	
	River mile Markers
CROSS SECTION & TRANSECT INFORMATION	
	Lettered Cross Section with Regulatory Water Surface Elevation (BFE)
	Numbered Cross Section with Regulatory Water Surface Elevation (BFE)
	Unlettered Cross Section with Regulatory Water Surface Elevation (BFE)
	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.
	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	
	River, Stream or Other Hydrographic Feature
	Interstate Highway
	U.S. Highway
	State Highway

Figure 3: Map Legend for FIRM

	County Highway
	Street, Road, Avenue Name, or Private Drive if shown on Flood Profile
	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
4276⁰⁰⁰mE	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 Cumberland 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 Cumberland County, 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
Androscoggin River	Brunswick, Town of	Cumberland-Sagadahoc county boundary	Approximately 1.38 miles upstream of dam in Town of Brunswick	01040002	6.8		Y	AE	1980
Atlantic Ocean	Cape Elizabeth, Town of; Scarborough, Town of	Shoreline at 001 (001-032)	Shoreline at 032 (001-032)	01060001	110.3		N	VE, AE, AO	2013, 2016
Bay of Naples	Naples, Town of	Within the Town of Naples	Within the Town of Naples	01060001		1.2	N	AE	1979
Breakneck Brook	Baldwin, Town of	Confluence with Saco River	Approximately 80 feet upstream of Douglas Hill Road	01060002	3.6		Y	AE	1978
Capisic Brook	Portland, City of	Confluence with Fore River	Approximately 235 feet downstream of Capisic St	01060001	0.4		Y	AE	1995
Capisic Brook	Portland, City of	Approximately 235 feet downstream of Capisic St	Warren Avenue in the City of Portland	01060001	2.1		N	AE	1995
Casco Bay	Portland, City of; South Portland, City of; Brunswick, Town of; Cape Elizabeth, Town of; Chebeague Island, Town of; Cumberland, Town of; Falmouth, Town of; Freeport, Town of; Harpswell, Town of; Long Island, Town of; Yarmouth, Town of	Shoreline at 033 (033-131, 134-149, 151-152, and 154-161)	Shoreline at 161 (033-131, 134-149, 151-152, and 154-161)	01060001	374.3		N	VE, AE, AH, AO	2013, 2016

Table 2: Flooding Sources Included in this FIS Report (continued)

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
Clark Brook	Westbrook, City of	Confluence with Stroudwater River	Approximately 1.06 miles upstream from its confluence with Tributary to Clark Brook	01060001	1.3	*	Y	AE	1978
Colley Wright Brook	Windham, Town of	Approximately 5,600 feet upstream of Montgomery Rd	Approximately 530 feet downstream of Chute Rd	01060001	0.4	*	N	AE	2006
Collyer Brook	Gray, Town of	Confluence with Royal River (Upstream)	North Raymond Rd in Town of Gray	01060001	8.1	*	Y	AE	1980
Corn Shop Brook	Bridgton, Town of	Confluence with Stevens Brook	Approximately 50 feet upstream of Park Street	01060001	0.2	*	Y	AE	1980
Crescent Lake	Casco, Town of; Raymond, Town of	Within the towns of Casco and Raymond	Within the towns of Casco and Raymond	01060001	*	1.1	N	AE	1979
Crooked River	Casco, Town of; Naples, Town of	Confluence with Songo River	Approximately 1.40 miles upstream of Edes Falls Dam	01060001	6.7	*	Y	AE	1979
Crooked River (Town of Harrison)	Harrison, Town of	Approximately 660 feet downstream of Scribner's Mill Bridge	Approximately 1,200 feet upstream of State Route 117	01060001	7.0	*	N	AE	2007
Crystal Lake	Gray, Town of	Within the Town of Gray	Within the Town of Gray	01060001	*	1.0	N	AE	1980
Crystal Lake Brook	Harrison, Town of	Confluence with Long Lake	Crystal Lake Dam in the Town of Harrison	01060001	0.1	*	Y	AE	1979
Ditch Brook	Windham, Town of	Varney's Mill Dam	Mill Pond Dam in the Town of Windham	01060001	2.4	*	Y	AE	1980
Dug Hill Brook	Baldwin, Town of	Confluence with Saco River	Approximately 1,550 feet upstream of State Route 5	01060002	0.7	*	Y	AE	1978

Table 2: Flooding Sources Included in this FIS Report (continued)

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
East Branch Capisic Brook	Portland, City of	Confluence with Capisic Brook	Approximately 2,000 feet upstream from the confluence of Capisic Brook	01060001	0.4	*	N	AE	1995
Eddy Brook	Gray, Town of	Confluence with Collyer Brook	Town of Gray corporate limits	01060001	0.3	*	Y	AE	1980
Fall Brook	Portland, City of	Confluence with Back Cove	Approximately 70 feet downstream of Lyseth Moore Dr	01060001	2.5	*	Y	AE	2013
Forest Lake	Cumberland, Town of; Gray, Town of; Windham, Town of	Within the towns of Cumberland, Gray, and Windham	Within the towns of Cumberland, Gray, and Windham	01060001	*	0.3	N	AE	2001
Harpswell Sound	Brunswick, Town of; Harpswell, Town of	Shoreline at 132 (132, 133)	Shoreline at 133 (132, 133)	01060001	30.8	*	N	VE, AE	2013, 2016
Highland Lake	Bridgton, Town of	Within the Town of Bridgton	Within the Town of Bridgton	01060001	*	2.1	N	AE	1980
Highland Lake	Falmouth, Town of; Windham, Town of	Within the Town of Falmouth and Windham	Within the Town of Falmouth and Windham	01060001	*	1.0	N	AE	1980
Hobbs Brook	Falmouth, Town of	Corporate limits of Falmouth	State Route 100	01060001	0.4	*	N	AE	2006
Hobbs Brook	Falmouth, Town of	Schuster Road	Approximately 820 feet upstream of Schuster Road	01060001	0.1	*	N	AE	2006
Jackson Brook	South Portland, City of	State Route 9	Approximately 3,600 feet downstream of the Maine Turnpike	01060001	2.3	*	Y	AE	1980
Little Sebago Lake	Gray, Town of; Windham, Town of	Entire Shoreline	Entire Shoreline	01060001	*	3.3	N	AE	1980
Long Creek	South Portland, City of	Confluence of Fore River	State Route 9	01060001	1.5	*	Y	AE	1980

Table 2: Flooding Sources Included in this FIS Report (continued)

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
Long Lake	Bridgton, Town of; Harrison, Town of; Naples, Town of	Entire Shoreline	Entire Shoreline	01060001	*	8.3	N	AE	1979
Milliken Brook	Windham, Town of	Approximately 30 feet upstream of Inkhorn Brook Rd	Approximately 70 feet downstream of Anderson Rd	01060001	0.4	*	N	AE	2006
Mill Brook	Westbrook, City of	Confluence with Presumpscot River	Austin Street in the Town of Westbrook	01060001	1.6	*	Y	AE	1978
Minnow Brook	Westbrook, City of	Confluence with Presumpscot River	Approximately 1.36 miles upstream of Brook St	01060001	2.2	*	Y	AE	1978
Nasons Brook	Portland, City of	Confluence with Capisic Brook	Approximately 25 feet upstream of the Portland Railroad Terminal	01060001	1.8	*	Y	AE	1979
North Branch Little River	Gorham, Town of	Approximately 620 feet downstream of the confluence with Westcott Brook	Confluence with Westcott Brook	01060001	0.2	*	Y	AE	2006
Panther Pond	Raymond, Town of	Within the Town of Raymond	Within the Town of Raymond	01060001	*	2.2	N	AE	1979
Pettingill Pond	Windham, Town of	Within the Town of Windham	Within the Town of Windham	01060001	*	0.1	N	AE	2001
Pigeon Brook	Baldwin, Town of	Confluence with Saco River	Approximately 300 feet upstream of State Route 113	01060002	1.9	*	Y	AE	1978
Pigeon Brook Tributary	Baldwin, Town of	Confluence with Pigeon Brook	Approximately 80 feet upstream of Pigeon Brook Rd	01060002	0.9	*	Y	AE	1978
Piscataqua River	Falmouth, Town of	Approximately 1,000 feet upstream of State Route 100 in the Town of Falmouth	Approximately 3,625 feet upstream of State Route 100 in the Town of Falmouth	01060001	0.5	*	N	AE	2005

Table 2: Flooding Sources Included in this FIS Report (continued)

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
Piscataqua River	Falmouth, Town of	Confluence with Presumpscot River	Approximately 800 feet upstream of State Route 100	01060001	2.4	*	Y	AE	1980
Pleasant River	Gray, Town of	Town of Gray corporate limits	Downstream end of Interstate 95	01060001	4.1	*	Y	AE	1980
Presumpscot River	Falmouth, Town of; Portland, City of; Westbrook, City of	Highway 295 in Falmouth	City of Westbrook/ Town of Gorham corporate limits	01060001	10.5	*	Y	AE	1978
Presumpscot River	Gorham, Town of; Windham, Town of	City of Westbrook/Town of Gorham corporate limits	Approximately 280 feet upstream of Town of Standish/Gorham/ Windham corporate limits	01060001	11.7	*	Y	AE	1979
Quahog Bay	Harpswell, Town of	Shoreline at 150 (150, 153)	Shoreline at 153 (150, 153)	01060001	5.9	*	N	AE, VE	2013, 2016
Quaker Brook	Baldwin, Town of	Confluence with Saco River	Approximately 455 feet upstream of State Route 113	01060002	1.0	*	Y	AE	1978
Red Brook	South Portland, City of	Confluence with Jackson Brook	Corporate limits with the Town of Scarborough	01060001	1.6	*	Y	AE	1980
Royal River (Downstream)	Yarmouth, Town of	Confluence with Casco Bay	Approximately 1,180 feet upstream of Railroad	01060001	2.0	*	Y	AE	1980
Royal River (Upstream)	Gray, Town of; New Gloucester, Town of; North Yarmouth, Town of	Town of North Yarmouth corporate limits	Town of New Gloucester corporate limits	01060001	21.2	*	Y	AE	1980
Saco River	Standish, Town of	York-Cumberland County Boundary	Upstream Town of Standish corporate limits	01060002	10.8	*	Y	AE	1979

Table 2: Flooding Sources Included in this FIS Report (continued)

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
Saco River	Baldwin, Town of	Downstream Town of Baldwin corporate limits	Cumberland-Oxford County Boundary lines	01060002	12.9	*	Y	AE	1978
Saco River Left Channel	Standish, Town of	Cataract Dam	Confluence with the Saco River in the Town of Standish	01060001	0.4	*	Y	AE	1979
Sebago Lake	Casco, Town of; Frye Island, Town of; Naples, Town of; Raymond, Town of; Sebago, Town of; Standish, Town of; Windham, Town of	Entire Shoreline	Entire Shoreline	01060001	*	47.7	N	AE	1979/1980
Songo River	Casco, Town of	Confluence with Sebago Lake	Confluence with Crooked River	01060001	2.2	*	Y	AE	1979
Songo River	Naples, Town of	Confluence with Crooked River	Bay of Naples outlet	01060001	1.1	*	N	AE	1979
Stevens Brook	Bridgton, Town of	Kansas Road	Highland Lake Dam in the Town of Bridgton	01060001	1.6	*	Y	AE	1980
Stroudwater River	Portland, City of	Confluence with Fore River	Approximately 3,800 feet upstream of Congress St	01060001	1.0	*	Y	AE	1979
Stroudwater River	Westbrook, City of	City of Westbrook corporate limits	Town of Gorham corporate limits	01060001	3.8	*	Y	AE	1978
Thayer Brook	Gray, Town of	Confluence with Pleasant River	Approximately 80 feet downstream of US Route 202	01060001	2.0	*	Y	AE	1980
Tributary 1 to Presumpscot River	Standish, Town of	Town of Gorham/Town of Standish corporate limits	Approximately 50 feet downstream of State Route 35	01060001	0.8	*	N	AE	2005
Tributary 2 to Presumpscot River	Standish, Town of	Confluence with Tributary 1 to Presumpscot River	Approximately 1,930 feet upstream of Lucky's Run	01060001	0.4	*	N	AE	2002

Table 2: Flooding Sources Included in this FIS Report (continued)

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	Gray, Town of	Confluence with Thayer Brook	Approximately 100 feet downstream of US Route 202	01060001	0.3	*	Y	AE	1980
Tributary to Clark Brook	Westbrook, City of	Confluence with Clark Brook	Approximately 3,500 feet downstream of the confluence with Clark Brook	01060001	0.7	*	Y	AE	1978
Trout Brook	South Portland, City of	Confluence with Fore River	Approximately 650 feet upstream of Spurwink Ave	01060001	1.4	*	Y	AE	1980
Unnamed Tributary to Colley Wright Brook	Windham, Town of	Approximately 140 feet downstream of Albion Rd	Approximately 1,200 feet upstream of Albion Rd	01060001	0.2	*	N	AE	2006
Unnamed Tributary to Presumpscot River	Westbrook, City of	Confluence with Presumpscot River	Cumberland St in City of Westbrook	01060001	0.4	*	N	AE	2005
Unnamed Tributary to Rich Mill Brook	Standish, Town of	Approximately 850 ft downstream of Maine Central Railroad	Approximately 2,000 upstream of Maine Central Railroad	01060002	0.6	*	N	AE	2006
Unnamed Tributary to Tucker Brook	Standish, Town of	Approximately 1,000 ft downstream of Maine Central Railroad	Approximately 2,800 upstream of Maine Central Railroad	01060002	0.7	*	N	AE	2006
West Branch Capisic Brook	Portland, City of	Confluence with Capisic Brook	Maine Turnpike in the City of Portland	01060001	0.5	*	N	AE	1995
Westcott Brook	Gorham, Town of	Confluence with North Branch Little River	Plummer Road	01060001	0.3	*	Y	AE	2006
Willet Brook	Bridgton, Town of	Confluence with Stevens Brook	Approximately 20 feet upstream of Willett Road	01060001	0.8	*	Y	AE	1980

Table 2: Flooding Sources Included in this FIS Report (continued)

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; Bunganuc Stream; Cole Brook; Day Brook, Jackson Brook; Mare Brook; Mill Creek; Miller Creek; Nonesuch River; Red Brook; Runaround Brook; Trout Brook; Willet Brook; Willow Brook; Cousins River, Crooked River (Town of Harrison), Northwest River, Piscataqua River, Presumpscot River, Royal River (Downstream), Royal River (Upstream), Stroudwater River and their tributaries; tributaries to East Branch Piscataqua River, Harraseeket River and Saco River	Refer to FIRM	Refer to FIRM	Refer to FIRM	01040002 01060001 01060002	350.4	10.2	N	A	2013

Table 2: Flooding Sources Included in this FIS Report (continued)

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
(continued) Numerous tributaries to lakes and ponds (Highland Lake; Little Sebago Lake, Long Lake; Panther Pond, Raymond Pond, Sebago Lake); numerous named ponds; unnamed tributaries, or local ponding areas	Refer to FIRM	Refer to FIRM	Refer to FIRM	01040002 01060001 01060002	350.4	10.2	N	A	2013
Meador Brook, East Branch Piscataqua River, West Branch Piscataqua River	Refer to FIRM	Refer to FIRM	Refer to FIRM	01060001		0.89	N	A	2012

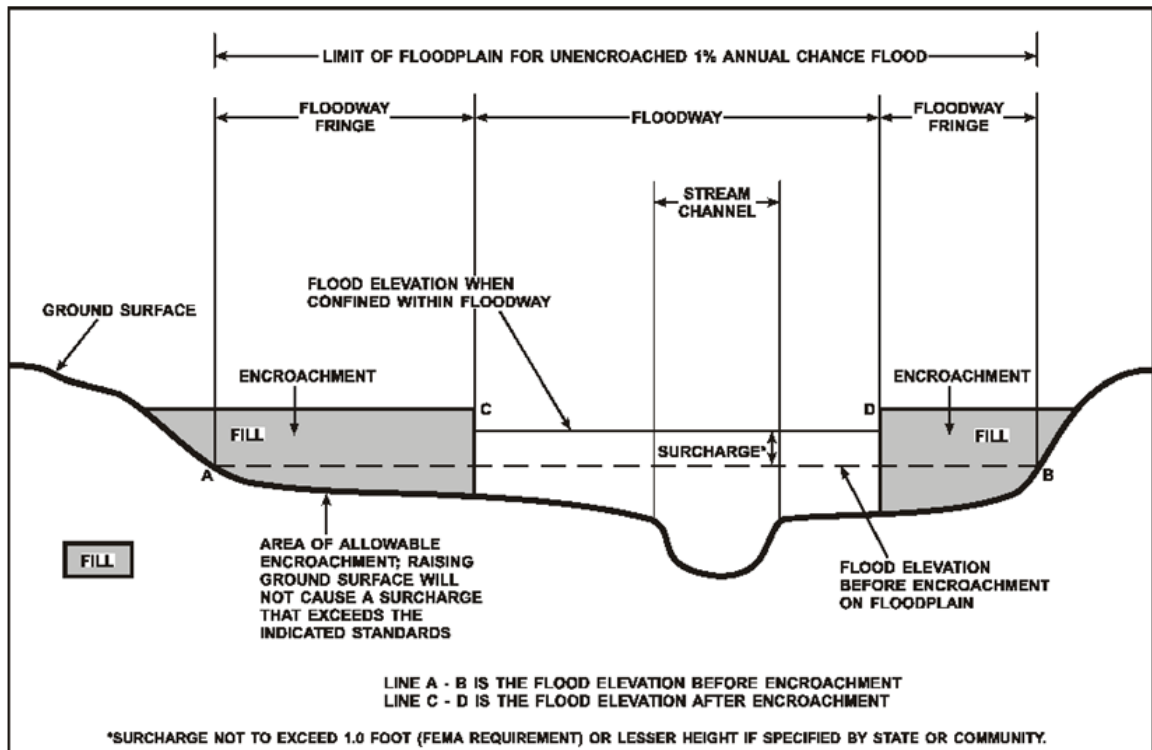
2.2 Floodways

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 1% 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

Some States and communities use non-encroachment zones to manage floodplain development. For flooding sources with medium flood risk, field surveys are often not collected and surveyed bridge and culvert geometry is not developed. Standard hydrologic and hydraulic analyses are still performed to determine BFEs in these areas. However, floodways are not typically determined, since specific channel profiles are not developed. To assist communities with managing floodplain development in these areas, a "non-encroachment zone" may be provided. While not a FEMA designated floodway, the non-encroachment zone represents that area around the stream that should be reserved to convey the 1% annual chance flood event. As with a floodway, all surcharges must fall within the acceptable range in the non-encroachment zone.

General setbacks can be used in areas of lower risk (e.g. unnumbered Zone A), but these are not considered sufficient where unnumbered Zone A is replaced by Zone AE. The NFIP requires communities to ensure that any development in a non-encroachment area causes no increase in BFEs. Communities must generally prohibit development within the area defined by the non-encroachment width to meet the NFIP requirement.

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.

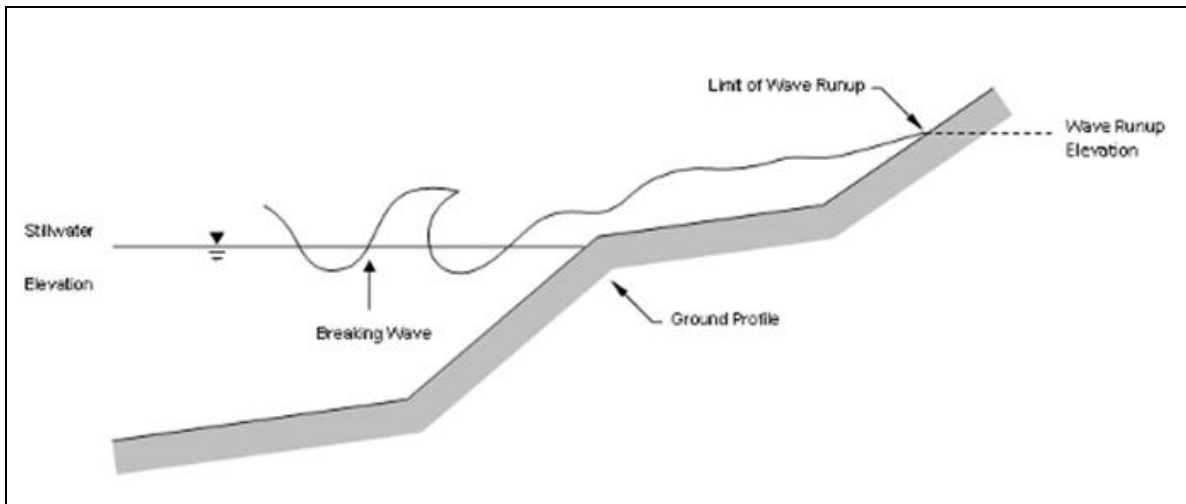
- *Wave setup* is the increase in stillwater elevation at the shoreline caused by the reduction of waves in shallow water. It occurs as breaking wave momentum is transferred to the water column.

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

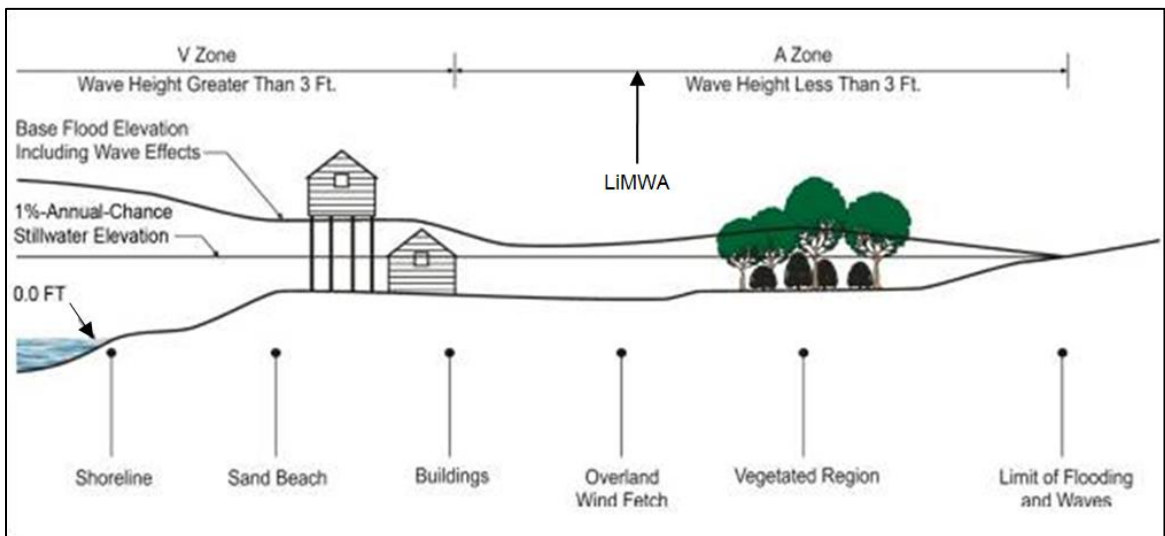
areas of greatest risk are shown as VE on the FIRM. Zone VE is further subdivided into elevation zones and shown with BFEs on the FIRM.

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 Cumberland County.

Table 3: Flood Zone Designations by Community

Community	Flood Zone(s)
Baldwin, Town of	A, AE, X
Bridgton, Town of	A, AE, X
Brunswick, Town of	A, AE, VE, X

Table 3: Flood Zone Designations by Community (continued)

Community	Flood Zone(s)
Cape Elizabeth, Town of	A, AE, AO, VE, X
Casco, Town of	A, AE, X
Chebeague Island, Town of	AE, VE, X
Cumberland, Town of	A, AE, VE, X
Falmouth, Town of	A, AE, VE, X
Freeport, Town of	A, AE, VE, X
Frye Island, Town of	AE, X
Gorham, Town of	A, AE, X
Gray, Town of	A, AE, X
Harpswell, Town of	AE, VE, X
Harrison, Town of	A, AE, X
Long Island, Town of	AE, VE, X
Naples, Town of	A, AE, X
New Gloucester, Town of	A, AE, X
North Yarmouth, Town of	A, AE, X
Portland, City of	A, AE, AH, AO, VE, X
Pownal, Town of	A, X
Raymond, Town of	A, AE, X
Scarborough, Town of	A, AE, VE, X
Sebago, Town of	A, AE, X
South Portland, City of	A, AE, VE, X
Standish, Town of	A, AE, X
Westbrook, City of	A, AE, X
Windham, Town of	A, AE, X
Yarmouth, Town of	A, AE, VE, 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)
Saco	01060002	Saco River	This watershed intersects some of the towns on the southwest boundary of Cumberland county. It accounts for the Saco River and it's tributaries in Baldwin and Standish.	1,701
Lower Androscoggin	01040002	Lower Androscoggin River	This watershed intersects some of the towns on the northeast boundary of Cumberland county. The Androscoggin River in Brunswick is covered by this subbasin.	2,157
Presumpscot	01060001	Presumpscot River	Largest watershed within Cumberland County, fully encompassing 19 out of 28 towns in the county.	1,424

4.2 Principal Flood Problems

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

Table 5: Principal Flood Problems

Flooding Source	Description of Flood Problems
Androscoggin River	Combination of heavy spring rains and melting snow
Breakneck Brook	A major flood on Breakneck Brook occurred in 1939 as a result of a localized storm centered over the drainage basin. A total of \$105,000 in damages to bridges, roads, and private property occurred during this flood.
Collyer Brook	USGS stream gage no. 01059800 is located on Collyer Brook in Gray and has records dating from September 1964. The highest recorded discharge at this gage was 1,220 cfs on December 27, 1969. Due to its short period of record, an adequate frequency analysis could not be made for this gage; however, based on the TR-20 watershed model, the December 27, 1969 discharge had a recurrence interval of approximately 30 years.
Corn Shop Brook	Flooding on Highland and Long Lakes in Bridgton damaged residences, seasonal homes, businesses, property, and roads. On Corn Shop Brook, flooding resulted in damage to numerous businesses, several residences, public buildings, roads, and bridges.

Table 5: Principal Flood Problems (continued)

Flooding Source	Description of Flood Problems
Crooked River	A substantial number of seasonal homes have been constructed within the floodplains of the Crooked and Songo Rivers. Many of these properties sustain damage from relatively frequent floods. Major floods have occurred in 1896, 1936, 1942, and 1953.
Presumpscot River	Because of the small drainage area and short reaches between dams, the Presumpscot River can rise from normal to flood flow in a short period of time. Once flood discharges are attained, high flows can persist for several days while the many ponds behind dams in the basin are drained to normal levels.
Royal River (Downstream)	The flood of record occurred on March 13, 1977, and had a peak discharge of 11,500 cfs and an estimated recurrence interval in excess of 1-percent-annual-chance.
Royal River (Upstream)	The major flood related damage along the Royal River (Upstream) in North Yarmouth and Gray has been to a brickyard, several homes, farmland, roads, and bridges.
Saco River	In Standish, major floods on the Saco River have occurred in the spring, usually the result of heavy rainfall combined with snowmelt. Although flooding has occurred during other months, 10 of the 14 highest floods on record occurred during March, April, or May. Heavy rainfall associated with hurricanes moving up the coast of Maine has caused flooding in the fall. The most severe flooding occurs in the early spring as a result of snowmelt and heavy rain in conjunction with ice jams. Additional floods, generally less severe, also occur in late summer as a result of hurricanes and tropical storms.
Stevens Brook	Major floods occurred on Stevens Brook in 1896, 1936, and 1953. The most destructive flood is that of March 1953. Under present conditions, the 1953 flood was estimated to have a recurrence interval of approximately 1-percent-annual-chance.
Willet Brook	Major floods occurred on Willett Brook in 1896, 1936, and 1953. The most destructive flood is that of March 1953. Under present conditions, the 1953 flood was estimated to have a recurrence interval of approximately 1-percent-annual-chance.

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

**Table 6: Historic Flooding Elevations
[Not Applicable to this Flood Risk Project]**

4.3 Non-Levee Flood Protection Measures

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

Table 7: Non-Levee Flood Protection Measures

Flooding Source	Structure Name	Type of Measure	Location	Description of Measure
Androscoggin River	Central Maine Power Company Dam	Dam	Brunswick	N/A
Androscoggin River	N/A	Dam	Along the shore of the Androscoggin River in Harpswell	N/A
Capisc Brook	N/A	Dam	Various Locations	N/A
Collyer Brook	Old Mill Dam	Dam	Gray	N/A
Collyer Brook	Pineland Dam	Dam	Gray	N/A
Crooked River	Edes Falls Dam	Dam	Naples	N/A
Crystal Lake Brook	Crystal Lake Dam	Dam	Harrison	N/A
Ditch Brook	Collins Pond Dam	Dam	Windham	N/A
Ditch Brook	Mill Pond Dam	Dam	Windham	N/A
Ditch Brook	Varney's Mill Dam	Dam	Windham	N/A
Jackson Brook	Clark Pond Dam	Dam	South Portland	N/A
Little Sebago Lake	Little Sebago Lake Dam	Dam	Windham	N/A
Presumpscot River	Abandoned Dam	Dam	Falmouth	N/A
Presumpscot River	Dundee Dam	Dam	Gorham	N/A
Presumpscot River	Little Falls Dam	Dam	Gorham, Windham	N/A
Presumpscot River	Newhall Dam	Dam	Gorham, Windham	N/A
Presumpscot River	North Gorham Dam	Dam	Gorham, Windham	N/A
Presumpscot River	Power Station Dam	Dam	Windham	N/A
Presumpscot River	South Windham Dam	Dam	Gorham, Windham	N/A
Royal River	N/A	Dam	Various Locations	N/A

Table 7: Non-Levee Flood Protection Measures (continued)

Flooding Source	Structure Name	Type of Measure	Location	Description of Measure
Saco River	Bonnie Eagle Dam	Dam	Standish	N/A
Saco River	Bonny Eagle Hydro Station Dam	Dam	Standish	N/A
Saco River	Hiram Falls Dam	Dam	Baldwin	N/A
Sebago Lake	Sebago Lake Dam	Dam	Standish	N/A
Songo River	Songo Lock Dam	Dam	Naples	N/A
Stevens Brook	Bisbee Mill Dam	Dam	Bridgton	N/A
Stevens Brook	Highland Lake Dam	Dam	Bridgton	N/A
Stevens Brook	Tannery Dam	Dam	Bridgton	N/A
Stevens Brook	N/A	Dam	Downstream of Highland Lake Dam	N/A
Stroudwater River	N/A	Dam	Just before Fore River in Scarborough	N/A

4.4 Levees

This section is not applicable to this Flood Risk Project.

Table 8: Levees

[Not Applicable to this Flood Risk Project]

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.

Pre-countywide Analyses

Flood discharge estimates for Stevens, Willett, and Corn Shop Brooks in Bridgton (FEMA 1981a), Songo River and Crooked River in Casco and Naples (FEMA 1980b and FEMA 1981c), Pleasant River, Collyer Brook, Thayer Brook, Little Sebago Lake, Tributary A and Eddy Brook in Gray (FEMA 1981g), and Crystal Lake Brook in Harrison (FEMA 1981b), Royal River (upstream) in New Gloucester, North Yarmouth and Gray (FEMA 1981d, FEMA 1981e, and FEMA 1981g), Capisic Brook, East Branch Capisic Brook and West Branch Capisic Brook in the City of Portland (FEMA 1988) were generated from the U.S. Department of Agriculture, Natural Resources Conservation Service (USDA NRCS) TR-20 hydrologic evaluation model (USDA NRCS 1991). This model utilizes such variables as rainfall-frequency data, soil type, antecedent moisture condition, land use, time of concentration, and drainage area.

Those for the Royal River (downstream) were correlated with statistical analyses of USGS stream gage no. 0106000 at Yarmouth, Maine (FEMA 1984e). The discharges used for the Pleasant River basin and Little Sebago Lake were checked against the USGS regression equation for Maine (USGS 1975).

For the Stroudwater River, discharges were obtained from the USDA NRCS flood hazard analyses for the river (FEMA 1988). The 10-, 1-, and 0.2-percent-annual-chance discharges were given, and the 2-percent-annual-chance discharge was interpolated.

Discharges for several flooding sources within Cumberland were determined using a regional equation developed by USGS. Peak discharges developed for the 10-, 2-, 1-,

and 0.2-percent-annual-chance floods at the USGS gaging stations by a log-Pearson Type III analysis were transposed to other stations by the following formula:

$$Q/Q_g = (A/A_g)^{0.8}$$

where Q and Q_g are the discharges at the station and the gage, respectively, and A and A_g are the drainage areas at these locations (WRC 1976).

Below is a compilation of the flooding sources that used the log-Pearson Type III analysis and formula described above:

Discharges for Capisic Brook, from its confluence with the Fore River to Warren Avenue and Nasons Brook were determined using the regional equation developed by USGS (FEMA 1988). The 10-, 2-, and 1-percent-annual-chance discharges at several stations on the streams were calculated. The 0.2-percent-annual-chance discharge at each station was extrapolated from a log-normal plot of the three calculated flow values.

In Baldwin, a USGS gage (no. 01066000) located at Cornish, Maine, on the Saco River, was used to establish the peak discharge-frequency relationships. These discharges are based on statistical analysis of discharge records covering a 60-year record (USGS 1960 and USGS 1976a). Values of the 10-, 2-, 1-, and 0.2-percent-annual-chance peak discharges were obtained from a log-Pearson Type III distribution of annual peak flow data in accordance with the U.S. Water Resources Council Bulletin No. 17 (WRC 1976). Flood discharges for the remaining streams in Baldwin were based on the USGS Open-File Report 75-292, "A Technique for Estimating the Magnitude and Frequency of floods in Maine," which is a regional method based on regression analysis (USGS 1975).

In Yarmouth, for the riverine portion of the Royal River (downstream), peak discharges were developed from a weighted combination of the Maine Regional Equation prepared by USGS and flows obtained from the gaging station (No. 010600000, 30 years of record) (USGS 1975). The 10-, 2-, and 1-percent-annual-chance peak flows at several stations on the river were calculated. The 0.2-percent-annual-chance discharge at each station was extrapolated from a log-normal plot of the three calculated flow values. A log-Pearson Type III distribution of annual peak flow data was used to obtain 10-, 2-, 1-, and 0.2-percent-annual-chance peak discharges from the gage (WRC 1976). The flows from the gage were transposed to points along the Royal River (downstream).

Values of the 10-, 2-, 1-, and 0.2-percent-annual-chance peak discharges at the outlet of Sebago Lake in Windham were obtained from a log-Pearson Type III distribution of annual peak flow data according to the Water Resources Council Bulletin 17A (FEMA 1981h and WRC 1977). Using the methods outlined in USGS Open-File Report 75-292, the Presumpscot River flows were adjusted for a drainage area increase below the confluence with the Pleasant River and below the confluence of the Little River (USGS 1975). The values of the peak flows at the 10-, 2-, 1-, and 0.2-percent-annual-chance recurrence intervals at each point of interest were obtained using equations outlined in Open-File Report 75-292 (USGS 1975).

In Brunswick, the stream gaging station on the Androscoggin River at Auburn (no. 01059000, with 49 years of record) was used to aid in defining frequency-discharge relationships for the river (FEMA 1986).

Peak discharges for Trout Brook, Long Creek, Jackson Brook, Red Brook and Piscataqua River were developed using the regional equation prepared by USGS as well (FEMA 1984d and USGS 1975). The 10-, 2-, and 1-percent-annual-chance peak flows at several locations on Trout Brook and Piscataqua River were calculated. The 0.2-percent-annual-chance discharge was extrapolated from a log-normal plot of the three calculated flow values.

Discharges for the Presumpscot River in Falmouth and Portland were taken from the FIS for the City of Westbrook and transposed by the drainage area discharge ratio (FEMA 1980f).

Peak discharges for the 10-, 2-, 1-, and 0.2-percent-annual-chance floods at the spillway of Highland Lake (Town of Falmouth) were determined by hydrologic routing methods (FEMA 1984a). In the routing, it was assumed that the lake was full to the top of the spillway before the storm runoff began entering the lake. This assumption was made because the lake is not regulated to control floods, and it was desired to start with the worst possible conditions. Calculations were made to determine a lake storage curve, a rating curve for the spillway, and an inflow hydrograph. From these working curves, discharges for the 10-, 2-, 1-, and 0.2-percent-annual-chance floods were developed.

In Gorham, the principal source of data for the Presumpscot River is streamflow records published by USGS (station no. 01064000, January 1887 to 1977). In addition, USGS has operated a gage at West Falmouth since October 1975 (station no. 01064140). This station was operating in March 1977 when other USGS gaging stations in the area recorded peak flows with a 0.2-percent-annual-chance recurrence interval.

In Raymond, Sebago, and Windham, the principal source of data for Sebago Lake was the record of lake elevations maintained by S.D. Warren Company for 106 years (1872 to 1977).

Values of the 10-, 2-, 1-, and 0.2-percent-annual-chance peak stages for Sebago Lake were obtained by graphical methods. These values of peak stages were plotted using the Weibull formula:

$$\text{PLOTTING POSITION (exceedence probability)} = M/(N+1),$$

where M is the rank of the event and N is the number of events. The values were plotted against the annual maximum lake elevations and a curve was fitted to the data. The peak stage values at the needed recurrence intervals were selected from this curve. .

The source of data for Panther Pond was also records of lake elevations for 38 years (1920 to 1958). The dam at the outlet of Panther Pond also controls the water-surface elevation of Crescent Lake. Values of peak flows at the outlet of Panther Pond and Crescent Lake were determined by using equations developed by R.A. Morrill (FEMA 1980c). These equations relate flood flows to drainage area, main channel slope, and storage area. This method was also adopted for calculating flow for the 0.2-percent-annual-chance recurrence interval.

The estimated flood flows were then used to compute the head on the Panther Pond outlet dam. The geometric features of the dam were surveyed, and all data needed to compute heads were obtained in the field. The formula for computing flow over a broad-crested weir: $Q = CLH^{3/2}$ was assumed to be valid for computing flow over the spillway. For flow through the deep control gate, fully opened, the equation used was: $Q = CA \sqrt{2gH}$. In the first formula, Q is discharge in cubic feet per second, C is the coefficient of discharge, L is the length of weir in feet, and H is the head on the dam, in feet (FEMA 1980c). In the second formula, A is the area of the gate-opening, in square feet; g = acceleration of gravity, in feet per second squared; H is the head of water on the gate, in feet; and C is the coefficient of discharge (H.W. King 1954). The peak stage values at the needed recurrence intervals were then computed. The values determined were checked against values determined by formulas given in Bulletin 17A of the Water Resources Council (WRC 1977). It should be noted that the values used in this check were taken from data on maximum month-end lake elevations.

In Westbrook, discharges from Sebago Lake to the Presumpscot River have been recorded continuously since 1887 by the S.D. Warren Company and published by USGS. In 1975, USGS installed a stream gage on the Presumpscot River in Falmouth at the Maine Turnpike bridge crossing, just downstream of the study area. The only other flow data available for the lower Presumpscot River are miscellaneous peak discharges computed at the Cumberland Mills Dam in Westbrook. Extensive regulation of Sebago Lake has greatly attenuated peak flows from the upper 436 square miles of the Presumpscot River watershed. Runoff from the lower 154-square mile drainage area is the primary contributor to flood flows in Westbrook. The Royal River (downstream) at Yarmouth, Maine, located adjacent to the Presumpscot River basin, has a drainage area of 141 square miles and is considered somewhat indicative of the runoff characteristics of the lower Presumpscot River. Analysis of 28 years of USGS flow data for this stream was therefore used as a basis for estimating discharge frequencies for the lower Presumpscot River. A frequency curve was developed for the Royal River (downstream) using a standard log-Pearson Type III statistical distribution (WRC 1976). Discharge frequencies for the Presumpscot River watershed, between Sebago Lake and Cumberland Mills Dam, were developed by multiplying the Royal River (downstream) curve by the ratio of peak flows experienced at Cumberland Mills Dam and the Royal River (downstream) during the floods of March 1936, September 1954, and March 1977.

An assumed coincident baseflow contribution of 600 cfs from Sebago Lake was then added to the Presumpscot River discharges, reflecting the desynchronization accomplished through regulation at the Eel Weir Canal by the S.D. Warren Company. Frequency data for the Presumpscot River were then transferred downstream to the Falmouth town line by ratio of net drainage areas taken to the 0.7 exponential power, assuming the same continuous baseflow contribution of 600 cfs from Sebago Lake. The resulting peak discharges exceeded those values of the "Floodplain Information, Presumpscot River Study" U.S. Army Corps of Engineers (USACE 1975a), by approximately 20 percent, due mainly to the inclusion of the significant March 1977 event in the discharge-frequency analysis.

It was found that water levels along Mill Brook were nearly equal to those near the mouth and the lower portion of the Scarborough River. Calculated storm levels decreased approximately three-fourths of a foot in the upper portions of the Scarborough, Dunstan, and Nonesuch Rivers. The calculations made above neglected

any freshwater inflow at the upstream boundary of the Scarborough and Nonesuch Rivers. However, both these rivers drain a substantial area, and a second set of calculations was made, which included freshwater inflow of 2,000 cfs at the upstream boundary of both rivers. This flow value was taken from a study by USDA NRCS and corresponds roughly to the 1-percent-annual-chance flood (USDA NRCS 1975a). The addition of freshwater inflow indicated the flood level in the upper portions of the Scarborough and Nonesuch Rivers to be approximately one-fourth of a foot less than the level at the open coast.

The freshwater inflow quantity of 2,000 cfs is based on calculations that are only approximate. Nevertheless, it can be inferred from the results of the modeling that the flood elevation throughout the estuary portion of the Scarborough River-Nonesuch River system is essentially uniform.

There being no discharge records for either Mill Brook or Minnow Brook in Westbrook, the runoff characteristics of the watersheds were assumed to be equivalent to those for the lower Presumpscot River basin as a whole, and flows were determined on a direct drainage area relationship. In the case of Mill Brook, the additional effect of storage at Highland Lake (Town of Falmouth) in the upper watershed was also considered in the selection of peak flows from the lower 4.5 square mile drainage area. Several significant flood events were recently recorded on the Stroudwater River by USGS, suggesting the need for some modification of the discharge-frequency relationship previously published in the "Flood Hazard Analysis Stroudwater River Study" (USDA NRCS 1975b). The discharges developed by USDA NRCS for the 1-percent-annual-chance frequency flood were retained, but values in the more frequent range were increased due to the recent frequency of high flows, particularly the events of April 1975, April 1976, and March 1977. Discharges for the ungaged Clark Brook and Tributary to Clark Brook were established on the basis of the Stroudwater River discharge-frequency curve, making appropriate adjustments for differences in drainage areas.

In Standish, computation of flow past the hydropower plant at West Buxton in York County was the principal source of data for defining discharge-frequency relationships for the Saco River and the Saco River Left Channel (FEMA 1980e). Records of annual maximum daily discharge were furnished by the Central Maine Power Company. These discharges were computed from records of flow over dam, through gates, and through wheels of the power plant. The data covers a period of 64 years (1908 to 1916 and 1920 to 1977).

Values of the 10-, 2-, 1-, and 0.2-percent-annual-chance peak discharges for Saco River and Saco River Left Channel in Standish were obtained from a log-Pearson Type III distribution of these annual maximum daily flow data (WRC 1977). The results from this analysis were increased by 1.7 percent to simulate instantaneous peak discharge. The 1.7 percent factor was determined to be the average amount by which instantaneous peak flows exceeded concomitant daily flows at West Buxton and was based on a comparison of 59 events. The instantaneous peak discharges were computed from flow through wheels and gates and flow over spillways. Because of the difference in drainage area from West Buxton (1,571 square miles) to the Buxton-Standish-Limington Town line (1,330 square miles), further adjustments in the peak flows were required to estimate flow at various points along the studied reach.

USGS has kept discharge records of the Saco River at Cornish, Maine (station no. 01066000) since 1916. The drainage area at Cornish is 1,298 square miles. The adjusted flows for the Saco River used in this report were prorated values based on the difference in drainage area between Cornish and West Buxton.

At the southern corporate limits of Standish, the Saco River is divided into two channels, the Saco River and the Saco River Left Channel. The total discharge is divided between the two channels. The Bonny Eagle Hydrologic Dam on the Saco River limits the maximum discharge that will be carried by the Saco River and, through the use of a rating curve, the maximum discharge that the Bonny Eagle Hydrologic Dam can carry was determined to be 4,000 cfs. A maximum discharge of 4,000 cfs was used for all floods for the Saco River, and the remaining discharge was routed through the Saco River Left Channel.

The drainage area for the Presumpscot River at Cumberland Mills Dam and at Westbrook-Falmouth Boundary is 436 square miles above Sebago Lake. The drainage area for Mill Brook at its mouth is 7.9 square miles above Highland Lake (Town of Falmouth).

For Windham, the principal source of data for the Presumpscot River was records published by USGS (gage no. 01064000, Presumpscot River at the outlet of Sebago Lake, Maine, January 1887 to 1977). In addition, USGS has operated a gage at West Falmouth since 1975 (gage no. 01064140).

Countywide Analyses

For this countywide study, no new detailed riverine Hydrologic Analyses were conducted. All previously studied area were re-delineated using LiDAR information. For details, please refer to the Floodplain and Floodway information.

For this countywide study, all existing approximate analysis reaches were restudied by approximate methods by Atkins in 2013 (Atkins 2013) and Ransom Consulting Engineers and Scientists in 2012 (Ransom 2012). For the Atkins study, the discharges were computed using the SCS TR20 method using Runoff Curve numbers. The reaches covered all existing pre-countywide study reaches.

In the Town of Falmouth, Meader Brook, West Branch Piscataqua, and East Branch of Piscataqua were studied by approximate methods by Ransom Consulting Engineers and Scientists (Ransom 2012). Discharges were calculated using the SCS TR20 method using Runoff Curve numbers and Times of Concentrations for subwatersheds, using 1-percent-annual-chance rainfall distribution for a 24-hour storm. Non-steady flow simulations were used to account for storage and timing differences of peak passage within the watershed. The Cornell University "Extreme Precipitation in New York and New England" website (Cornell 2012) was accessed in 2012 to obtain the 1-percent-annual-chance, 24-hour rainfall.

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	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Androscoggin River	At the water quality monitoring station near the State Route 201 bridge in Brunswick	3,410	65,390	93,390	106,960	143,070
Breakneck Brook	Confluence of Saco River	5.5	615	1,095	1,350	2,075
Breakneck Brook	At 0.9 mile upstream of confluence with Saco River	4.4	550	950	1,225	1,900
Breakneck Brook	At 1.6 miles upstream of confluence with Saco River	3.6	475	850	1,100	1,730
Breakneck Brook	At 3.5 miles upstream of Saco River	1.4	340	630	795	1,320
Capisic Brook	At its confluence with the Fore River	5.1	620	890	1,020	1,310
Capisic Brook	At upstream of confluence of Nasons Brook	2.8	539	804	935	1,337
Capisic Brook	At Essex Road (extended) in Portland	1.9	498	724	835	1,075
Clark Brook	At mouth in Westbrook	1.0	295	350	375	515
Colley Wright Brook	Downstream of Chute Road	3.8	*	*	5,420	*
Collyer Brook	At the confluence with the Royal River (Upstream)	19.6	1,400	2,250	2,630	3,750
Collyer Brook	At Merrill Road in Gray	19.1	1,350	2,180	2,550	3,640
Collyer Brook	At Megquier Road in Gray	14.5	940	1,610	1,860	2,890
Collyer Brook	At U. S. Route 202 in Gray	13.8	870	1,480	1,750	2,530
Collyer Brook	At Mayall Road in Gray	9.3	700	1,100	1,280	1,820

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Collyer Brook	At Weymouth Road in Gray	8.5	630	1,000	1,160	1,640
Collyer Brook	At the Maine Turnpike in Gray	6.8	490	770	890	1,260
Collyer Brook	At State Route 26 in Gray	3.2	190	300	340	470
Collyer Brook	At North Raymond Road in Gray	1.8	80	120	130	170
Corn Shop Brook	At Main Street in Bridgton	0.7	90	190	290	900
Crooked River	At 540 feet above confluence with the Songo River	151.5	6,100	9,500	11,000	*
Crooked River	At upstream Casco corporate limits	147.5	6,100	9,500	11,000	14,800
Crooked River (Town of Harrison)	At Scribner's Mill	107.6	6,200	9,700	11,200	14,500
Crystal Lake Brook	At State Routes 35 & 117 bridge over Crystal Lake Brook	8.7	40	95	125	290
Ditch Brook	At crossing of Varney's Mill Road in Windham	20.3	535	821	988	1,380
Ditch Brook	At outlet of Little Sebago Lake	18.9	535	821	988	1,380
Dug Hill Brook	At the Confluence with Saco River	3.2	315	560	700	1,130
East Branch Capisic Brook	At its confluence with Capisic Brook	0.4	191	315	370	521
Eddy Brook	At the confluence with Collyer Brook	4.3	190	360	450	710
Fall Brook	Near its confluence with Back Cove	1.5	1,070	1,453	1,619	2,287
Fall Brook	Upstream of Washington Avenue in Portland	1.3	886	1,197	1,331	1,891
Fall Brook	At Ray Street in Portland	1.0	681	900	996	1,416

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Jackson Brook	At upstream of Red Brook	3.5	320	490	580	780
Jackson Brook	At Gorham Road in South Portland	2.8	230	370	440	610
Jackson Brook	At pipeline crossing in South Portland	2.6	170	300	360	530
Jackson Brook	At Foden Road in South Portland	2.2	150	250	310	470
Little Sebago Lake	At its outlet	18.9	100	130	140	180
Long Creek	At its confluence with the Fore River	8.0	500	770	900	1,220
Long Creek	At downstream of Red Brook	6.9	450	700	840	1,150
Milliken Brook	At crossing of Anderson Road	0.5	*	*	350	*
Mill Brook	At mouth	4.5	480	630	700	860
Minnow Brook	At mouth	1.3	340	460	520	660
Nasons Brook	At Upstream of the confluence of Capisic Brook	1.4	180	270	330	440
Nasons Brook	At Near Portland Terminal Railroad culvert in Portland	1.2	125	195	225	310
North Branch Little River	Above confluence with Branch Brook	12	1,070	1,650	1,930	2,630
Pigeon Brook	At the Confluence with Saco River	4.3	570	1,005	1,250	2,000
Pigeon Brook	At the Confluence of Pigeon Brook Tributary	1.4	285	510	640	1,040
Pigeon Brook Tributary	At the Confluence with Pigeon Brook	2.9	325	580	725	1,170
Piscataqua River	At the confluence with the Presumpscot River	41.2	2,020	3,220	3,850	5,380

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Piscataqua River	At upstream of the East Branch Piscataqua River	21.0	1,170	1,910	2,310	3,290
Piscataqua River	At upstream of the Tributary which flows through the corner of West Falmouth	19.6	1,120	1,830	2,210	3,150
Piscataqua River	At State Route 100 in Falmouth	18.6	1,070	1,750	2,210	3,010
Pleasant River	At the downstream Gray corporate limits	13.7	1,210	1,990	2,280	3,150
Pleasant River	At Lawrence Road in Gray	12.3	1,140	1,900	2,180	3,030
Pleasant River	At Windham Center Road in Gray	5.0	520	860	980	1,360
Pleasant River	At Hunts Hill Road in Gray	4.7	500	830	950	1,310
Presumpscot River	At Martin Point Bridge in Falmouth	638.1	9,800	13,600	15,300	19,700
Presumpscot River	At downstream of the confluence of the Piscataqua River	632.2	9,800	13,600	15,300	19,700
Presumpscot River	At upstream of the confluence of the Piscataqua River	590.9	9,300	12,900	14,500	18,600
Presumpscot River	At the Windham-City of Westbrook boundary	574	8,500	11,800	13,300	17,000
Presumpscot River	Above mouth of the Little River	516	6,500	9,200	10,800	15,200
Presumpscot River	At the Little Falls Dam in Gorham	508	6,000	8,200	10,000	14,000
Presumpscot River	At Newhall Dam	502	5,870	8,020	9,780	13,700
Presumpscot River	At above mouth of Pleasant River in Gorham	452	2,740	4,940	6,210	10,200
Presumpscot River	At Eel Weir Dam in Gorham	441	2,690	4,840	6,090	10,000

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Presumpscot River	At the Windham-Standish boundary	437	1,980	4,130	5,380	9,290
Presumpscot River	At Westbrook-Falmouth Boundary	154	9,300	12,900	14,500	18,600
Presumpscot River	At Cumberland Mills Dam	134	8,500	11,800	13,300	17,000
Quaker Brook	At the Confluence with Saco River	12.5	830	1,390	1,695	2,880
Red Brook	At its confluence with Jackson Brook	3.4	210	350	430	620
Red Brook	At Maine Turnpike exit ramp	3.2	190	320	390	560
Red Brook	At the upstream South Portland corporate limits	2.8	160	280	340	490
Royal River (Downstream)	At USGS gage No. 010600000	142	6,085	9,060	10,530	14,540
Royal River (Upstream)	At the Gray downstream corporate limits	72.8	3,390	4,670	5,310	7,170
Royal River (Upstream)	At Depot Road in Gray	69.1	3,270	4,570	5,220	7,110
Royal River (Upstream)	At the Main Central Railroad in Gray	49	2,650	3,750	4,310	5,940
Royal River (Upstream)	At the Gray upstream corporate limits	48.4	2,610	3,710	4,270	5,890
Royal River (Upstream)	At Morse Road in New Gloucester	48.3	2,610	3,710	4,270	5,940
Royal River (Upstream)	At Penny Road in New Gloucester	45.1	2,450	3,530	4,060	5,890
Royal River (Upstream)	At State Route 231 in New Gloucester	38.1	2,100	3,110	3,620	5,090

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Royal River (Upstream)	At Canadian National Railroad in New Gloucester	29.2	1,320	2,090	2,460	3,580
Royal River (Upstream)	At Cobbs Bridge Road in New Gloucester	28.5	1,270	2,020	2,390	3,490
Royal River (Upstream)	At the New Gloucester upstream corporate limits	26.1	1,110	1,810	2,150	3,190
Royal River (Upstream)	At the North Yarmouth downstream corporate limits	136.4	6,490	8,930	10,170	13,900
Royal River (Upstream)	At State Route 9 in North Yarmouth	132	6,540	8,850	10,020	13,820
Royal River (Upstream)	At State Route 231 in North Yarmouth	77.7	3,560	4,800	5,420	7,250
Royal River (Upstream)	At Mill Road in North Yarmouth	73.8	3,430	4,700	5,330	7,190
Royal River (Upstream)	At the North Yarmouth upstream corporate Limits	72.8	3,390	4,670	5,310	7,170
Saco River	At Bonny Eagle Dam	1,560	25,300	37,700	43,800	60,600
Saco River	At the Hollis-Limington-Standish corporate limits	1,550	25,200	37,500	43,600	60,200
Saco River	At the upstream confluence of Little Ossipee River	1,352	23,600	34,600	39,800	53,800
Saco River	At the Baldwin corporate limits	1,340	23,590	34,560	39,835	53,755
Saco River	At the Baldwin-Limington-Standish corporate limits	1,330	23,600	34,600	39,800	53,800
Saco River	At the confluence of Pigeon Brook	1,313	23,065	33,790	38,950	52,560

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Saco River And Saco River Left Channel	At the Buxton-Hollis-Standish corporate limits	1,560	25,400	37,900	40,000	61,000
Songo River	At 5,000 feet upstream of confluence with Sebago Lake	292	6,300	10,000	11,500	15,200
Songo River	At downstream of Songo Locks Dam	270.9	6,300	10,000	11,500	15,200
Stevens Brook	At Smith Avenue in Bridgton	42	1,440	2,590	3,070	4,380
Stevens Brook	At 1,100 feet upstream of Depot Street in Bridgton	41	1,410	2,520	2,910	3,670
Stevens Brook	At 75 feet upstream of Beacon Street in Bridgton	20.7	330	620	740	1,320
Stroudwater River	At Mouth	27.7	2,960	3,540	3,760	5,200
Stroudwater River	At the upstream Portland corporate limits	27.2	1,885	3,100	3,735	5,160
Stroudwater River	At Spring Street Bridge in Westbrook	25.1	2,760	3,310	3,510	4,860
Thayer Brook	At Libby Road in Gray	5.6	520	900	1,050	1,500
Thayer Brook	At U.S. Route 202 in Gray	3.2	300	540	630	920
Tributary 1 to Presumpscot River	Approximately 800 feet downstream of Standish Corporate Limits	330	*	*	380	*
Tributary 1 to Presumpscot River	Approximately 250 feet upstream of community limits	500	*	*	210	*
Tributary 1 to Presumpscot River	Just downstream of confluence with Tributary 2 to Presumpscot River	430	*	*	176	*

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Tributary 1 to Presumpscot River	370 feet upstream of confluence with Tributary 2 to Presumpscot River	178	*	*	92	*
Tributary 1 to Presumpscot River	Approximately 1,600 feet upstream of confluence with Tributary 2 to Presumpscot River	178	*	*	176	*
Tributary 2 to Presumpscot River	Just downstream of confluence with Tributary 1 to Presumpscot River	430	*	*	176	*
Tributary 2 to Presumpscot River	Approximately 2,200 feet upstream of confluence with Tributary 1 to Presumpscot River	251	*	*	87	*
Tributary A	At Farm Road in Gray	1.0	90	160	190	270
Tributary To Clark Brook	At mouth	0.5	165	200	210	290
Trout Brook	At its confluence with the Fore River	2.6	290	440	510	690
Trout Brook	At upstream of Kimball Brook	2.0	210	330	390	530
Trout Brook	At Fessenden Avenue in South Portland	1.8	170	270	320	450
Trout Brook	At Sawyer Street in South Portland	1.7	120	220	270	390
Trout Brook	At the Cape Elizabeth/South Portland corporate limits	1.3	94	170	200	310
Trout Brook	At Spurwink Avenue in South Portland	1.0	85	150	180	270
Unnamed Tributary To Rich Mill Brook	2,000 feet upstream of Maine Central Railroad	0.3	*	*	51	*

Table 9: Summary of Discharges (continued)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Unnamed Tributary To Tucker Brook	2,800 feet upstream of Maine Central Railroad	0.4	*	*	43	*
West Branch Capisic Brook	At its confluence with Capisic Brook	0.6	340	447	485	601
Westcott Brook	At mouth	3.1	359	578	684	956
Willett Brook	At the confluence with Stevens Brook	20.2	1,350	2,440	2,890	4,130
Willett Brook	At Willet Road in Bridgton	19.9	1,330	2,400	2,850	4,070

*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	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Barker Pond	Town of Sebago	*	*	497.0	*
Bay of Naples	Town of Naples	272.6	273.6	273.8	274.5
Bonny Eagle Pond	Town of Standish	*	*	268.4	*
Collins Pond	Town of Windham	271.4	271.8	272.0	272.4
Cresent Lake	Entire shoreline	277.7	278.3	278.4	278.6
Crystal Lake (Town of Gray)	Entire shoreline	311.6	311.7	311.8	311.9
Crystal Lake (Town of Harrison)	Entire shoreline	298.3	399.3	299.4	300.6
Forest Lake	Entire shoreline	*	*	278.2	*
Highland Lake (Town of Bridgetown)	Town of Bridgton	426.8	427.2	427.3	427.7
Highland Lake (Town of Falmouth)	Town of Falmouth	192.0	192.5	192.7	193.1
Kezar Pond	Town of Bridgeton	*	*	384.0	*
Little Sebago Lake	Entire shoreline	286.5	286.9	287.0	287.4
Long Lake	Town of Naples	272.6	267.0	267.1	267.4
Long Lake	Entire shoreline within Bridgton	272.6	273.4	273.8	274.5
Long Lake	Entire shoreline within Harrison	272.6	273.4	273.8	274.5
Mill Pond	Town of Windham	283.5	284.4	284.8	285.8
Panther Pond	At Outlet in Town of Raymond	277.7	278.3	278.4	278.6
Pettingill Pond	Town of Windham	*	*	299.1	*

Table 10: Summary of Non-Coastal Stillwater Elevations (continued)

Flooding Source	Location	Elevations (feet NAVD88)			
		10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Sebago Lake	At outlet in the Town of Standish, and the Town of Windham	266.7	267.0	267.1	267.4

*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
Presumpscot River	01064000	USGS	Presumpscot River	1,146	1887	1977
Presumpscot River	01064140	USGS	West Falmouth, ME	N/A	1975	1977
Royal River (downstream)	01060000	USGS	Yarmouth, ME	365	30 years	
Saco River	01066000	USGS	Cornish, ME	3,355	60 years	

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.

Pre-countywide Analyses

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

Elevations on Long Lake were obtained through a log-Pearson Type III method of analysis (WRC 1977) of 40 years of stage-storage records at the Songo Locks in Naples, Maine (FEMA 1981c). The Water Surface Profile (WSP) WSP-2 program was used to compute water-surface profiles from the Songo Locks to the Bay of Naples on which the same elevation as Long Lake is maintained (USDA NRCS 1976).

Elevations on Crystal Lake (Town of Harrison) were taken directly from the results of the USDA NRCS TR-20 hydrologic evaluation (USDA NRCS 1965), which uses known discharge-elevation relationships to route floods through dams.

In Baldwin, starting water-surface elevations for all streams were calculated using the slope-area method. Water-surface elevations of floods of the selected recurrence intervals were computed through the use of the USACE HEC-2 step-backwater computer program (USACE 1978). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. The approximate zone on Pigeon Brook Tributary above Chase Siding Road was determined using the 1-percent-annual-chance brook elevation. The flood above Chase Siding Road was assumed to be a level backwater at that elevation.

In Bridgton, water-surface elevations of floods of the selected recurrence intervals were computed using the USDA NRCS WSP-2 computer program (FEMA 1981a and USDA NRCS 1976).

Elevations for the streams studied by detailed methods were started from critical depth calculations at the old Central Maine Power Company dam downstream of Kansas Road.

Water-surface elevations on Long Lake and Highland Lake (Town of Bridgetown) were obtained through a log-Pearson Type III method using 40 years of stage-storage records at the Songo Locks in Naples (FEMA 1981c and WRC 1977). The WSP-2 program was used to compute water-surface profiles from the Songo Locks to the Bay of Naples, which maintains the same elevation as Long Lake.

Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-2 step-backwater computer program (USACE 1978). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations for the Androscoggin River were calculated using the mean high tide for Merrymeeting Bay.

In Cape Elizabeth, water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-2 step-backwater computer program (USACE 1978). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations for Trout Brook were obtained from the FIS for the City of South Portland (FEMA 1984d).

In Casco, water-surface elevations for the selected recurrence intervals on the Songo River and Crooked River were computed by the USDA NRCS WSP-2 computer program (USDA NRCS 1976), starting from critical depth at Sebago Lake.

In Falmouth water-surface elevations of floods of the selected recurrence intervals were computed through the use of the USACE HEC-2 step-backwater computer program (USACE 1978). Starting water-surface elevations for the Presumpscot River were based on the mean tide elevation. Starting water-surface elevations for the Piscataqua River were calculated using the slope/area method.

At various locations along the Presumpscot and Piscataqua Rivers, the analysis indicates that flow would be supercritical flow. Because of the inherent instability of supercritical flow, critical depth was assumed at those locations when establishing the profile elevations for this study.

In Gorham, water-surface elevations of floods of the selected recurrence intervals were computed through the use of the USGS E431 step-backwater computer program (USGS 1976b). Starting water-surface elevations for the profile determination of the Presumpscot River were taken from the FIS for the City of Westbrook (FEMA 1980f). These elevations were verified by ratings developed for flow over dams. Starting elevations upstream of each of the four dams were determined from the stage-discharge relationships, which USGS computed. USGS made direct readings of the pond elevations upstream from the dams, surveyed the dams, and recorded their physical dimensions. Reference points were set in the forebays of the dams so the head on the dams could be computed for observed and measured flows.

Current meter measurements were made to determine the flow of the Presumpscot River at each of the dams. A relationship between stages and discharges was made for each. These ratings were extended on the basis of the standard flow over dam formula (Francis Formula, $Q = CLH^{3/2}$) (Francis, J.B. 1909). The discharge is Q , C is the coefficient of discharge, L is the length of the dam perpendicular to the direction of the flow, and H is the head of the dam.

The coefficient of discharge was determined using the tables and graphs presented in a USGS publication, which lists "C" values for various dam types (USGS 1968). The actual "C" value used in the Francis Formula to compute the flood elevation was based on both of these "C" determinations. Ratings were verified by historic flood elevations.

For the streams studied by approximate methods in Gorham, the 1-percent-annual-chance flood elevations were estimated using the regional stage-frequency relationship by USGS hydrologists at the Augusta, Maine, office (FEMA 1981f). This relationship indicates that the 1-percent-annual-chance flood is about 10 feet higher than the stream elevation mapped on USGS topographic maps.

In Gray, water-surface elevations for the selected recurrence intervals were computed by the TR-20 model for Little Sebago Lake and Crystal Lake (Town of Gray), and by the USDA NRCS WSP-2 computer program for each of the streams studied in detail (USDA NRCS 1976 and USDA NRCS 1965).

Starting water-surface elevations for the Royal River (upstream) in Gray were determined using a critical depth elevation at a dam immediately below Elm Street, downstream in the Town of Yarmouth. The Collyer Brook starting water-surface elevations were a continuation of the Royal River (upstream) water-surface profile. The Pleasant River starting water-surface elevations were determined using critical depth taken downstream in the Town of Windham. The starting water-surface elevations for Eddy Brook are a continuation of the water-surface profile of Collyer Brook. Thayer Brook starting water-surface elevations are a continuation of the water-surface profiles of the Pleasant River; the starting elevations for Tributary A are a continuation of the water-surface profile for Thayer Brook.

In Harrison, water-surface elevations for the selected recurrence intervals were computed by the USDA NRCS WSP-2 computer program (USDA NRCS 1976). The water-surface elevation of Long Lake was used as the starting water-surface elevation for Crystal Lake Brook.

In Naples, water-surface elevations for the selected recurrence intervals on Sebago Lake were furnished by USGS. USGS determined the water-surface elevations by using 40 years (1920 to 1960) of gaging station information from the Sebago Lake dam gage. Water-surface elevations for the Bay of Naples, Long Lake, and the Songo River above Songo Lock were computed through the use of a log-Pearson Type III analysis (WRC 1967) on 40 years of records, 1920 to 1960, from the Songo Lock gaging station.

In Naples, water-surface elevations for the Songo River and Crooked River were computed through the use of the USDA NRCS WSP-2 computer program starting from critical depth at Sebago Lake (USDA NRCS 1976).

In New Gloucester, water-surface elevations of floods of the selected recurrence intervals were computed through the use of the USDA NRCS WSP-2 computer program (USDA NRCS 1976). Critical depth at a dam downstream in the Town of Yarmouth was assumed as starting water-surface elevations for the Royal River (upstream).

In North Yarmouth, water-surface elevations of floods of the selected recurrence intervals were computed using the USDA NRCS WSP-2 computer program (USDA NRCS 1976). Starting water-surface elevations for the Royal River (upstream) were started from critical depth at a dam immediately below Elm Street, downstream in the Town of Yarmouth.

In Portland, for the 1986 FIS, water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-2 step-backwater computer program (USACE 1978). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations for the Presumpscot River were obtained from the previous FIS for the Town of Falmouth (FEMA 1984a). Starting water-surface elevations for the Stroudwater River, Capisic Brook, and Nasons Brook were determined using the mean tide elevation.

For the 1992 Portland revision, water-surface elevations of floods of the selected recurrence intervals were computed for Capisic Brook, East Branch Capisic Brook, and West Branch Capisic Brook, using the NRCS WSP-2 step-backwater computer program (USACE 1978 and USDA NRCS 1976).

Delineation of flooding for small portions of Mackworth and Hope Islands was taken from the FISs for the Towns of Falmouth and Cumberland, respectively (FEMA 1984a and FEMA 1985b).

In Sebago, analyses of elevations of Sebago Lake were based on 106 years (1872 to 1977) of lake stage data furnished by the S.D. Warren Company of Westbrook, Maine.

In South Portland, water-surface elevations of floods of the selected recurrence intervals were computed using the USACE HEC-2 step-backwater computer program (USACE 1978). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Flooding from Long Creek was found to be completely controlled by tidal flooding from the Fore River. Starting water-surface elevations for Long Creek, Jackson Brook, and Trout Brook were based on mean high tide elevations. Starting water-surface elevations for Red Brook were taken at its confluence with Jackson Brook, assuming coincident peaks.

In Standish, water-surface elevations for the selected recurrence interval floods were computed through use of the USGS E431 step-backwater computer program (USGS 1976b). The starting water-surface elevations used for the Saco River and the Saco River Left Channel profile determination were taken from the FIS for the adjacent community of Buxton (FEMA). The starting elevations upstream of Bonny Eagle Power Station were determined from a spillway discharge rating furnished by Central Maine Power Company. This rating is a stage discharge table that gives flows for peak discharges, including an allowance for water passing the plant while normal power is being generated. Peak discharges obtained were in agreement with flows obtained at the USGS gaging station on the Saco River at Cornish, Maine (station no. 00106600) after an allowance for inflow was made. There is a difference in drainage area of only 262 square miles between the reservoir and gage.

In Westbrook, starting water-surface elevations were determined for the Stroudwater River and the Presumpscot River using previously published elevation discharge relationships (FEMA 1980f). Starting water-surface elevations for Minnow Brook and Mill Brook were determined at their respective mouths at the Presumpscot River. Starting water-surface elevations for Clark Brook were determined at its confluence with the Stroudwater River. Starting water-surface elevations for Tributary to Clark Brook were determined at its confluence with Clark Brook. Flood profiles were computed for all the streams using USACE's HEC-2 computer program (USACE 1978). Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

In Windham, water-surface elevations of floods of the selected recurrence intervals were computed through the use of the USGS E431 step-backwater computer program (USGS 1976b). The starting water-surface elevations used for the profile determination of the Presumpscot River were taken from the FIS for the City of Westbrook (FEMA 1980f). These elevations were verified by ratings developed for flow over dams. Starting water-surface elevations upstream of each of the four dams on the Presumpscot River and upstream of the three dams on Ditch Brook were determined from stage-discharge relationships. For the stage-discharge relationships, USGS personnel made direct readings from the dams, surveyed the dams, and recorded their physical dimensions. Reference points were set in the forebays of the dams so the head on the dams could be computed for observed and measured flows.

Furnished records of discharge measurements or current-meter measurements were made to determine the flow of the streams at each of the dams. These ratings were extended on the basis of the standard flow over dam formula (Francis Formula, $Q = CLH^{3/2}$) (Francis, J.B. 1909). The discharge being studied is Q , C is the coefficient of discharge, L is the length of the dam perpendicular to the direction of the flow, and H is the head on the dam.

The coefficient of discharge was also determined using the tables and graphs in a USGS publication that lists "C" values for various dam types (FEMA 1981h). The actual "C" value used in the Francis Formula to compute the flood elevations was based on both of these "C" determinations. Ratings were verified by historic flood elevations.

In the area of Elm Street on the Royal River (downstream) in Yarmouth, there is a diversionary channel bypassing the main dam below the Main Street Bridge. A divided flow analysis was performed between the diversion and the main channel by equalizing head losses over the divided flow region. The diversion carries a small percentage of the total discharge and, therefore, the water-surface elevations on the main channel are only slightly affected by including a divided flow analysis.

At various locations along the Royal River (downstream), the analysis indicates that flow would be supercritical. Because of the inherent instability of supercritical flow, critical depth was assumed at those locations when establishing the profile elevations for this study.

The overbank portions of the cross section data for the Androscoggin River, Presumpscot River, Piscataqua River, Saco River, Saco River Left Channel, Royal River (downstream), Songo River, Highland Lake (Town of Falmouth) and Trout Brook were obtained from topographic maps compiled from aerial photographs (USACE 1975b, J.W. Sewall 1979a through 1979c, USACE 1970, and Hansa 1978b). The below-water sections were obtained by field measurement. Cross sections were located at close intervals above and below bridges in order to compute the significant backwater effects of these structures. In long reaches between structures, appropriate valley cross sections were also surveyed. All bridges and culverts were field surveyed to obtain elevation data and structural geometry.

Cross sections for the Crooked River were obtained from aerial photographs (USDA NRCS 1971). The below-water sections, bridges, dams, and culverts were obtained from field surveys.

Cross sections for the backwater analyses in Falmouth were located at close intervals above and below bridges in order to compute the significant backwater effects of these structures. In long reaches between structures, appropriate valley cross sections were also surveyed.

Cross sections on Crystal Lake Brook were obtained from field surveys.

Cross section data in New Gloucester were obtained from field surveys. All bridges and culverts were field surveyed to obtain elevation data and structural geometry.

Overbank portions of cross section data in Portland were obtained from topographic maps (J.W. Sewall 1979d); below-water sections were obtained by field survey. Cross sections were located at close intervals above and below bridges in order to compute the significant backwater effects of these structures. In long reaches between structures, appropriate valley cross sections were also surveyed.

Cross sections for the backwater analysis of Ditch Brook were obtained using maps based on aerial photographs at a scale of 1"=800 feet (Hansa 1978b). The below-water sections were obtained by field measurement. All bridges, dams, and culverts were field checked to obtain elevation data and structural geometry.

Countywide Analyses

For this countywide revision, no new detailed riverine Hydraulic Analyses were conducted. All previously studied area were re-delineated using LiDAR information. For details, please refer to the Floodplain and Floodway information.

All existing approximate analysis reaches were restudied by approximate methods by Atkins in 2013 (Atkins 2013) and Ransom Consulting Engineers and Scientists in 2012 (Ransom 2012). In the Town of Falmouth, Meader Brook, West Branch Piscataqua, and East Branch of Piscataqua were studied by approximate methods by Ransom Consulting Engineers and Scientists (Ransom 2012). All other reaches were studied by Atkins. For both studies, HEC-RAS (USACE 2012) was used to determine the extent of the 1-percent-annual-chance flood. Major bridges and culverts impacting storage were considered in this approach. The reaches covered all existing pre-countywide study reaches.

The Androscoggin River has been redelineated using the LiDAR elevation data obtained for the coastal analyses (Sanborn Map Company, Inc. 2006).

Based on the results of the revised coastal analysis, the backwater elevations are revised where necessary. The flooding sources of Androscoggin River, Capisic Brook, Fall Brook, Long Creek, Presumpscot River, Royal River (downstream), Stroudwater River, and Trout Brook were revised for backwater elevations.

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 in 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.

Table 12: Summary of Hydrologic and Hydraulic Analyses

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Androscoggin River	Cumberland-Sagadahoc county boundary	Approximately 1.38 miles upstream of dam in Town of Brunswick	stream gaging station on Androscoggin River at Auburn (no. 01059000)	USACE HEC-2 step-backwater	1980	AE w/ Floodway	Starting water-surface elevations calculated using the mean high tide for Merrymeeting Bay. Redelineated in 2013
Bay of Naples	Within the Town of Naples	Within the Town of Naples	log-Pearson Type III analysis	USDA NRCS WSP-2	1979	AE	Redelineated in 2013
Breakneck Brook	Confluence with Saco River	Approximately 80 feet upstream of Douglas Hill Road	regional regression analysis, USGS Open-File Report 75-292	USACE HEC-2 step-backwater	1978	AE w/ Floodway	Redelineated in 2013
Capisic Brook	Confluence with Fore River	Approximately 235 feet downstream of Capisic St	USDA NRCS TR-20	NRCS WSP-2 step-backwater	1995	AE w/ Floodway	Regional equation developed by USGS. Redelineated in 2013
Capisic Brook	Approximately 235 feet downstream of Capisic St	Warren Avenue in the City of Portland	USDA NRCS TR-20	NRCS WSP-2 step-backwater	1995	AE	Regional equation developed by USGS. Redelineated in 2013
Clark Brook	Confluence with Stroudwater River	Approximately 1.06 miles upstream from its confluence with Tributary to Clark Brook	USDA NRCS discharge-frequency curve	USACE HEC-2	1978	AE w/ Floodway	Based on Stroudwater River updates. Redelineated in 2013
Colley Wright Brook	Approximately 5,600 feet upstream of Montgomery Rd	Approximately 530 feet downstream of Chute Rd	USDA NRCS TR-55	N/A	2006	AE	LOMR 06-01-B562P. Redelineated in 2013
Collyer Brook	Confluence with Royal River (Upstream)	North Raymond Rd in Town of Gray	USDA NRCS TR-20	USDA NRCS WSP-2	1980	AE w/ Floodway	Redelineated in 2013

Table 12: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Corn Shop Brook	Confluence with Stevens Brook	Approximately 50 feet upstream of Park Street	USDA NRCS TR-20	USDA NRCS WSP-2	1980	AE w/ Floodway	Redelineated in 2013
Crescent Lake	Within the towns of Casco and Raymond	Within the towns of Casco and Raymond	equations developed by R.A. Morrill	N/A	1979	AE	Redelineated in 2013
Crooked River	Confluence with Songo River	Approximately 1.40 miles upstream of Edes Falls Dam	USDA NRCS TR-20	USDA NRCS WSP-2	1979	AE w/ Floodway	starting from critical depth at Sebago Lake. Redelineated in 2013
Crooked River (Town of Harrison)	Approximately 660 feet downstream of Scribner's Mill Bridge	Approximately 1,200 feet upstream of State Route 117	Regression equations	HEC-RAS 3.1.3 step-backwater	2007	AE	Redelineated in 2013
Crystal Lake	Within the Town of Gray	Within the Town of Gray	USDA NRCS TR-20	USDA NRCS TR-20	1980	AE	Redelineated in 2013
Crystal Lake Brook	Confluence with Long Lake	Crystal Lake Dam in the Town of Harrison	USDA NRCS TR-20 hydrologic evaluation	USDA NRCS WSP-2	1979	AE w/ Floodway	Redelineated in 2013
Ditch Brook	Varney's Mill Dam	Mill Pond Dam in the Town of Windham	N/A	USGS E431 step-backwater	1980	AE w/ Floodway	Redelineated in 2013
Dug Hill Brook	Confluence with Saco River	Approximately 1,550 feet upstream of State Route 5	regional regression analysis, USGS Open-File Report 75-292	USACE HEC-2 step-backwater	1978	AE w/ Floodway	Redelineated in 2013
East Branch Capisic Brook	Confluence with Capisic Brook	Approximately 2,000 feet upstream from the confluence of Capisic Brook	USDA NRCS TR-20	NRCS WSP-2 step-backwater	1995	AE	Redelineated in 2013
Eddy Brook	Confluence with Collyer Brook	Town of Gray corporate limits	USDA NRCS TR-20	USDA NRCS WSP-2	1980	AE w/ Floodway	Redelineated in 2013

Table 12: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Fall Brook	Confluence with Back Cove	Approximately 70 feet downstream of Lyseth Moore Dr	HEC-HMS	HEC-RAS	2013	AE w/ Floodway	LOMR 13-01-1727P
Forest Lake	Within the towns of Cumberland, Gray, and Windham	Within the towns of Cumberland, Gray, and Windham	USGS regression equation	HEC-RAS	2001	AE	The inflow hydrograph was routed through Forest Lake using a level pool reservoir routing technique (Chow, 1964). The starting water surface elevations were based on steady state mean April flow conditions.
Highland Lake	Within the Town of Bridgton	Within the Town of Bridgton	log-Pearson Type III	USDA NRCS WSP-2	1980	AE	Redelineated in 2013
Highland Lake	Within the Town of Falmouth and Windham	Within the Town of Falmouth and Windham	hydrologic routing methods	N/A	1980	AE	At spillway. Redelineated in 2013
Hobbs Brook	Corporate limits of Falmouth	State Route 100	N/A	N/A	2006	AE	LOMR 09-01-0124P. Redelineated in 2013
Hobbs Brook	Schuster Road	Approximately 820 feet upstream of Schuster Road	N/A	N/A	2006	AE	LOMR 06-01-B534P. Redelineated in 2013
Jackson Brook	State Route 9	Approximately 3,600 feet downstream of the Maine Turnpike	regional equation prepared by USGS	USACE HEC-2 step-backwater	1980	AE w/ Floodway	Redelineated in 2013
Little Sebago Lake	Entire Shoreline	Entire Shoreline	regression equations	USDA NRCS TR-20	1980	AE	Redelineated in 2013
Long Creek	Confluence of Fore River	State Route 9	regional equation prepared by USGS	USACE HEC-2 step-backwater	1980	AE w/ Floodway	Redelineated in 2013
Long Lake	Entire Shoreline	Entire Shoreline	log-Pearson Type III analysis	USDA NRCS WSP-2	1979	AE	Redelineated in 2013
Milliken Brook	Approximately 30 feet upstream of Inkhorn Brook Rd	Approximately 70 feet downstream of Anderson Rd	HEC-HMS 2.2.2	HEC-RAS 3.1.3	2006	AE	LOMR 06-01-B717P. Redelineated in 2013

Table 12: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Mill Brook	Confluence with Presumpscot River	Austin Street in the Town of Westbrook	direct drainage area relationship	USACE HEC-2	1978	AE w/ Floodway	No discharge records available; runoff characteristics of the watersheds were assumed to be equivalent to those for the lower Presumpscot River basin as a whole. Redelineated in 2013
Minnow Brook	Confluence with Presumpscot River	Approximately 1.36 miles upstream of Brook St	direct drainage area relationship	USACE HEC-2	1978	AE w/ Floodway	Redelineated in 2013
Nasons Brook	Confluence with Capisic Brook	Approximately 25 feet upstream of the Portland Railroad Terminal	regional equation developed by USGS	USACE HEC-2 step-backwater	1979	AE w/ Floodway	Redelineated in 2013
North Branch Little River	Approximately 620 feet downstream of the confluence with Westcott Brook	Confluence with Westcott Brook	N/A	N/A	2006	AE w/ Floodway	LOMR 07-01-0160P. Redelineated in 2013
Panther Pond	Within the Town of Raymond	Within the Town of Raymond	equations developed by R.A. Morrill	N/A	1979	AE	Redelineated in 2013
Pettingill Pond	Within the Town of Windham	Within the Town of Windham	USGS regression equation	HEC-RAS	2001	AE	The inflow hydrograph was routed through Pettingill Pond using a level pool reservoir routing technique (Chow, 1964). The starting water surface elevations were based on steady state mean April flow conditions.
Pigeon Brook	Confluence with Saco River	Approximately 300 feet upstream of State Route 113	regional regression analysis, USGS Open-File Report 75-292	USACE HEC-2 step-backwater	1978	AE w/ Floodway	Redelineated in 2013

Table 12: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Pigeon Brook Tributary	Confluence with Pigeon Brook	Approximately 80 feet upstream of Pigeon Brook Rd	regional regression analysis, USGS Open-File Report 75-292	USACE HEC-2 step-backwater	1978	AE w/ Floodway	Redelineated in 2013
Piscataqua River	Approximately 1,000 feet upstream of State Route 100 in the Town of Falmouth	Approximately 3,625 feet upstream of State Route 100 in the Town of Falmouth	regional equation prepared by USGS	N/A	2005	AE	LOMR 05-01-0278P. Redelineated in 2013
Piscataqua River	Confluence with Presumpscot River	Approximately 800 feet upstream of State Route 100	regional equation prepared by USGS	USACE HEC-2 step-backwater	1980	AE w/ Floodway	Redelineated in 2013
Pleasant River	Town of Gray corporate limits	Downstream end of Interstate 95	USDA NRCS TR-20	USDA NRCS WSP-2	1980	AE w/ Floodway	Redelineated in 2013
Presumpscot River	Highway 295 in Falmouth	City of Westbrook/Town of Gorham corporate limits	drainage area discharge ratio	USACE HEC-2 step-backwater	1978	AE w/ Floodway	Discharges estimated by multiplying the Royal River (downstream) using a log-Pearson Type III curve, taken from the FIS for the City of Westbrook and transposed. Redelineated in 2013
Presumpscot River	City of Westbrook/Town of Gorham corporate limits	Approximately 280 feet upstream of Town of Standish/ Gorham/Windham corporate limits	USGS Open-File Report 75-292	USGS E431 step-backwater	1979	AE w/ Floodway	USGS (gage no. 01064000, Presumpscot River at the outlet of Sebago Lake. Redelineated in 2013
Quaker Brook	Confluence with Saco River	Approximately 455 feet upstream of State Route 113	regional regression analysis, USGS Open-File Report 75-292	USACE HEC-2 step-backwater	1978	AE w/ Floodway	Redelineated in 2013
Red Brook	Confluence with Jackson Brook	Corporate limits with the Town of Scarborough	regional equation prepared by USGS	USACE HEC-2 step-backwater	1980	AE w/ Floodway	Redelineated in 2013

Table 12: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Royal River Downstream	Confluence with Casco Bay	Approximately 1,180 feet upstream of Railroad	USGS Maine Regional Equation	divided flow analysis	1980	AE w/ Floodway	Correlated with statistical analyses of USGS stream gage no. 0106000. Redelineated in 2013
Royal River Upstream	Town of North Yarmouth corporate limits	Town of New Gloucester corporate limits	USDA NRCS TR-20	USDA NRCS WSP-2	1980	AE w/ Floodway	Redelineated in 2013
Saco River	York-Cumberland County Boundary	Upstream Town of Standish corporate limits	log-Pearson Type III distribution	USGS E431 step-backwater	1979	AE w/ Floodway	Redelineated in 2013
Saco River	Downstream Town of Baldwin corporate limits	Cumberland-Oxford County Boundary lines	log-Pearson Type III, U.S. Water Resources Council Bulletin No. 17	USACE HEC-2 step-backwater	1978	AE w/ Floodway	USGS gage (no. 01066000) located at Cornish, Maine, on the Saco River, was used to establish the peak discharge-frequency relationships. Redelineated in 2013
Saco River Left Channel	Cataract Dam	Confluence with the Saco River in the Town of Standish	log-Pearson Type III distribution	USGS E431 step-backwater	1979	AE w/ Floodway	Redelineated in 2013
Sebago Lake	Entire Shoreline	Entire Shoreline	Weibull formula	USGS E431 step-backwater	1979/1980	AE	Hydrology furnished by USGS. S.D. Warren Company for 106 years (1872 to 1977). 40 years of record at Sebago Lake Dam gage. Redelineated in 2013
Songo River	Confluence with Sebago Lake	Confluence with Crooked River	USDA NRCS TR-20	USDA NRCS WSP-2	1979	AE w/ Floodway	starting from critical depth at Sebago Lake. Redelineated in 2013
Songo River	Confluence with Crooked River	Bay of Naples outlet	USDA NRCS TR-20	USDA NRCS WSP-2	1979	AE	starting from critical depth at Sebago Lake. Redelineated in 2013
Stevens Brook	Kansas Road	Highland Lake Dam in the Town of Bridgton	USDA NRCS TR-20	USDA NRCS WSP-2	1980	AE w/ Floodway	Redelineated in 2013
Stroudwater River	Confluence with Fore River	Approximately 3,800 feet upstream of Congress St	USDA NRCS flood hazard analyses	USACE HEC-2 step-backwater	1979	AE w/ Floodway	Redelineated in 2013

Table 12: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Stroudwater River	City of Westbrook corporate limits	Town of Gorham corporate limits	USDA NRCS discharge- frequency relationship	USACE HEC-2	1978	AE w/ Floodway	Redelineated in 2013
Thayer Brook	Confluence with Pleasant River	Approximately 80 feet downstream of US Route 202	USDA NRCS TR-20	USDA NRCS WSP-2	1980	AE w/ Floodway	Redelineated in 2013
Tributary 1 to Presumpscot River	Town of Gorham/Town of Standish corporate limits	Approximately 50 feet downstream of State Route 35	HEC-HMS 2.2.2	HEC-RAS 3.1.3	2005	AE	Peak runoff rates for downstream taken from the portion of LOMR 03-01- 001P not superseded by LOMR 05-01- A566P. Redelineated in 2013
Tributary 2 to Presumpscot River	Confluence with Tributary 1 to Presumpscot River	Approximately 1,930 feet upstream of Lucky's Run	USDA NRCS TR-20	N/A	2002	AE	LOMR 03-01-001P. Redelineated in 2013
Tributary A	Confluence with Thayer Brook	Approximately 100 feet downstream of US Route 202	USDA NRCS TR-20	USDA NRCS WSP-2	1980	AE w/ Floodway	Redelineated in 2013
Tributary to Clark Brook	Confluence with Clark Brook	Approximately 3,500 feet downstream of the confluence with Clark Brook	USDA NRCS discharge- frequency curve	USACE HEC-2	1978	AE w/ Floodway	Based on Stroudwater River updates. Redelineated in 2013
Trout Brook	Confluence with Fore River	Approximately 650 feet upstream of Spurwink Ave	regional equation prepared by USGS	USACE HEC-2 step-backwater	1980	AE w/ Floodway	Redelineated in 2013
Unnamed Tributary to Colley Wright Brook	Approximately 140 feet downstream of Albion Rd	Approximately 1,200 feet upstream of Albion Rd	HEC-HMS	HEC-RAS	2006	AE	LOMR 06-01-B270P. Redelineated in 2013
Unnamed Tributary to Presumpscot River	Confluence with Presumpscot River	Cumberland St in City of Westbrook	N/A	N/A	2005	AE	LOMR 05-01-0338P. Redelineated in 2013

Table 12: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Unnamed Tributary to Rich Mill Brook	Approximately 850 ft downstream of Maine Central Railroad	Approximately 2,000 upstream of Maine Central Railroad	N/A	HEC-RAS	2006	AE	LOMR 06-01-B168P. Redelineated in 2013
Unnamed Tributary to Tucker Brook	Approximately 1,000 ft downstream of Maine Central Railroad	Approximately 2,800 upstream of Maine Central Railroad	N/A	HEC-RAS	2006	AE	LOMR 06-01-B168P. Redelineated in 2013
West Branch Capisic Brook	Confluence with Capisic Brook	Maine Turnpike in the City of Portland	USDA NRCS TR-20	NRCS WSP-2 step-backwater	1995	AE	Redelineated in 2013
Westcott Brook	Confluence with North Branch Little River	Plummer Road	N/A	N/A	2006	AE w/ Floodway	LOMR 07-01-0160P. Redelineated in 2013
Willet Brook	Confluence with Stevens Brook	Approximately 20 feet upstream of Willett Road	USDA NRCS TR-20	USDA NRCS WSP-2	1980	AE w/ Floodway	Redelineated in 2013

Table 12: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
Alewife Brook; Bunganuc Stream; Cole Brook; Day Brook, Jackson Brook; Mare Brook; Mill Creek; Miller Creek; Nonesuch River; Red Brook; Runaround Brook; Trout Brook; Willet Brook; Willow Brook; Cousins River, Crooked River (Town of Harrison), Northwest River, Piscataqua River, Presumpscot River, Royal River (Downstream), Royal River (Upstream), Stroudwater River and their tributaries; tributaries to East Branch Piscataqua River, Harraseeket River and Saco River	Refer to FIRM	Refer to FIRM	regression equations	HEC-RAS	2013	A	

Table 12: Summary of Hydrologic and Hydraulic Analyses (continued)

Flooding Source	Study Limits Downstream Limit	Study Limits Upstream Limit	Hydrologic Model or Method Used	Hydraulic Model or Method Used	Date Analyses Completed	Flood Zone on FIRM	Special Considerations
(continued) Numerous tributaries to lakes and ponds (Highland Lake; Little Sebago Lake, Long Lake; Panther Pond, Raymond Pond, Sebago Lake); numerous named ponds; unnamed tributaries, or local ponding areas	Refer to FIRM	Refer to FIRM	regression equations	HEC-RAS	2013	A	
Meader Brook, East Branch Piscataqua River, and West Branch Piscataqua River	Refer to FIRM	Refer to FIRM	regression equations	HEC-RAS	2012	A	