PDHonline Course L130 (5 PDH)

FEMA's Flood Insurance Study Report (FIS) - Understanding and Utilizing This Resource

Instructor: Jonathan Terry, P.L.S.

2020

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Welcome to:

FEMA's FIS Tutorial

Screen-captures of FEMA's well-thought-out and carefully presented tutorial on the:

Flood Insurance Study

FEMA FIS TUTORIAL IS FOUND ON THE WEB AT: http://www.fema.gov/media/fhm/fis/ot_fis.htm

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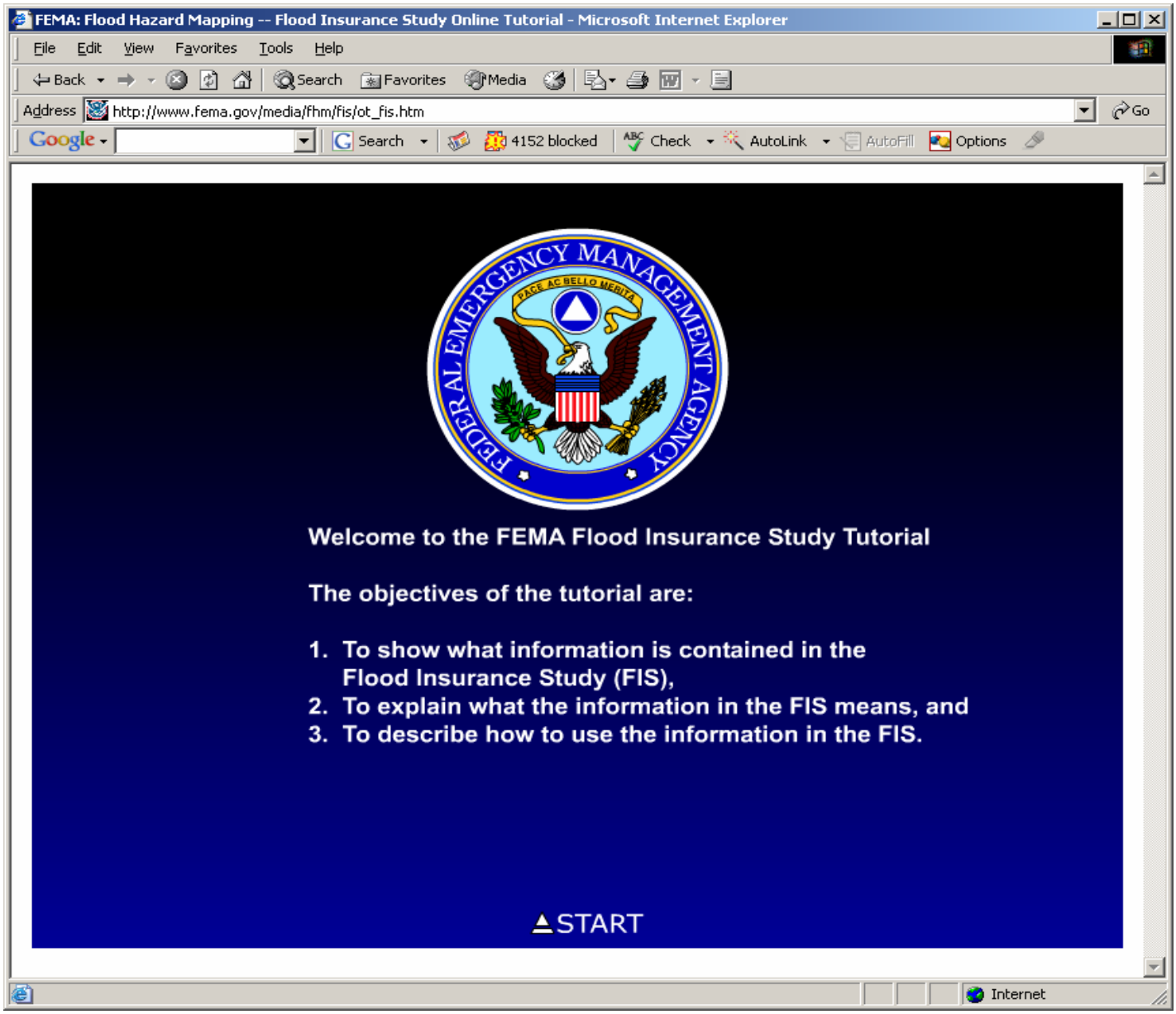
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FEDERAL EMERGENCY MANAGEMENT AGENCY
FACE AC BELLO MERITA
Welcome to the FEMA Flood Insurance Study Tutorial
The objectives of the tutorial are:
1. To show what information is contained in the Flood Insurance Study (FIS),
2. To explain what the information in the FIS means, and
3. To describe how to use the information in the FIS.
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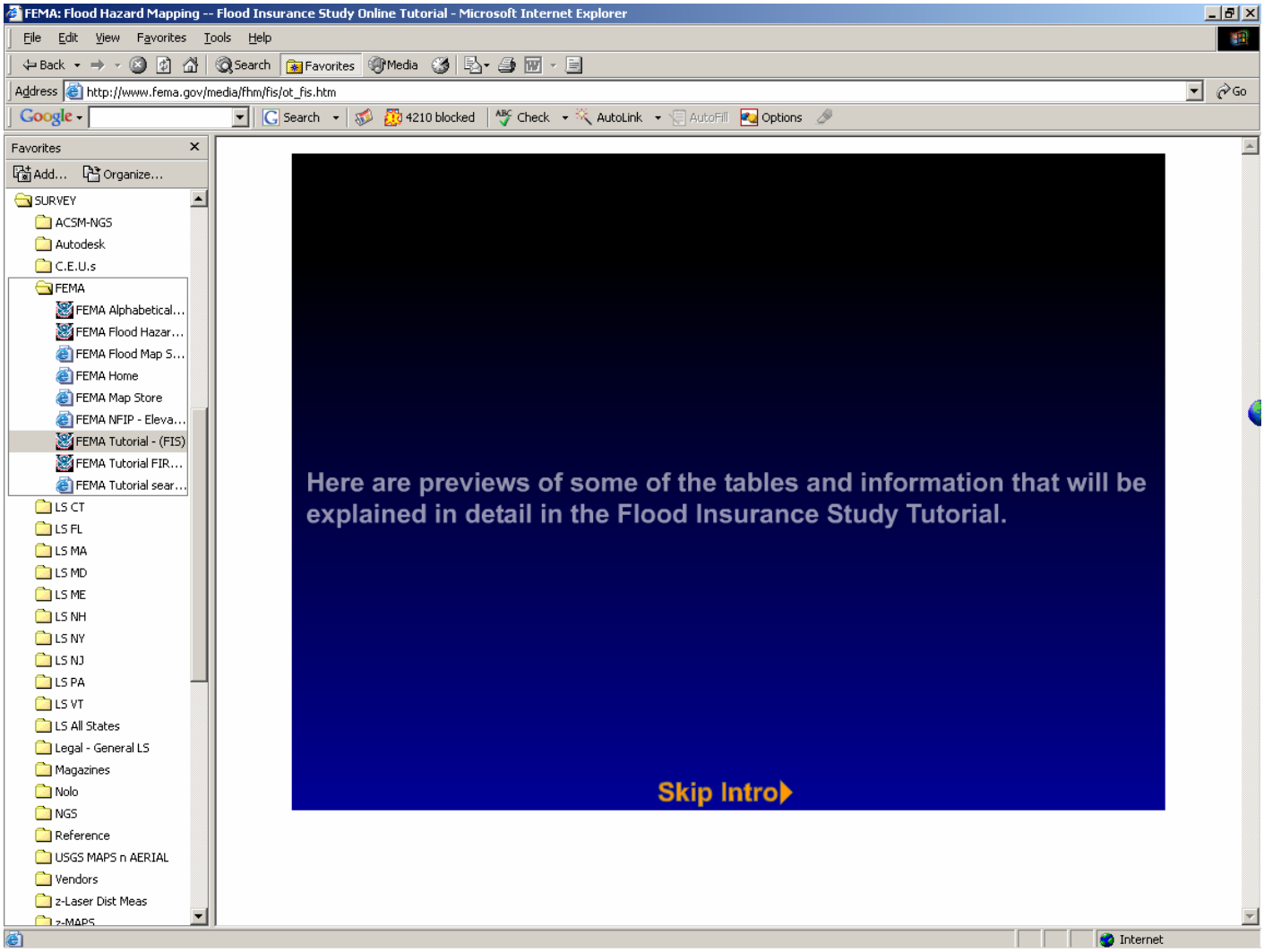
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ACSM-NGS
Autodesk
C.E.U.s
FEMA
FEMA Alphabetical...
FEMA Flood Hazar...
FEMA Flood Map S...
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FEMA Map Store
FEMA NFIP - Eleva...
FEMA Tutorial - (FIS)
FEMA Tutorial FIR...
FEMA Tutorial sear...
LS CT
LS FL
LS MA
LS MD
LS ME
LS NH
LS NY
LS NJ
LS PA
LS VT
LS All States
Legal - General LS
Magazines
Nolo
NGS
Reference
USGS MAPS n AERIAL
Vendors
z-Laser Dist Meas
z-MAPS
Here are previews of some of the tables and information that will be explained in detail in the Flood Insurance Study Tutorial.
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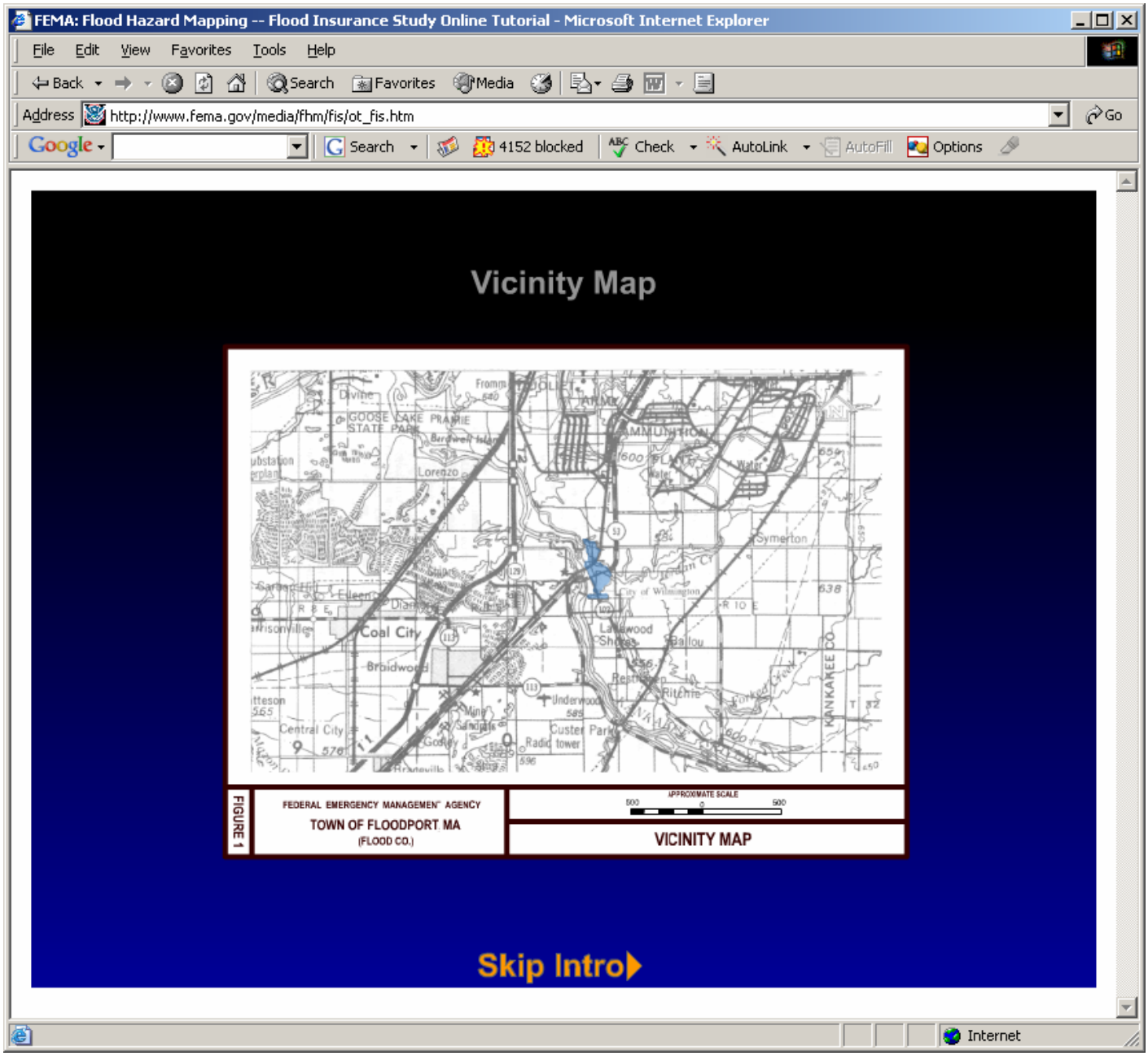
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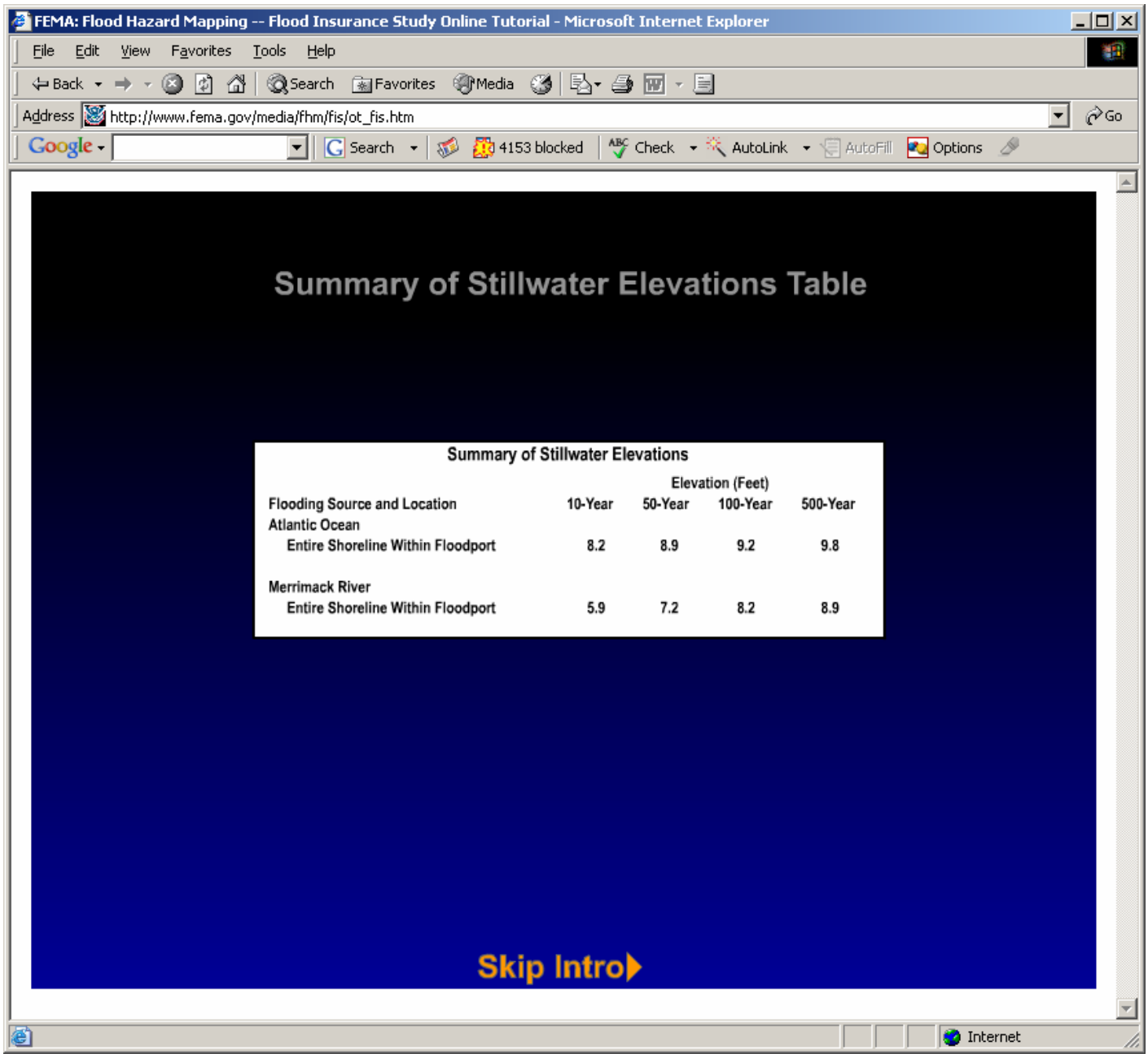
Vicinity Map
Coal City
Broadwood
Lorenzo
Symerton
Ballou
Ritchie
Underwood
Custer Park
Central City
KANKAKEE CO
FIGURE 1
FEDERAL EMERGENCY MANAGEMENT AGENCY
TOWN OF FLOODPORT, MA
(FLOOD CO.)
APPROXIMATE SCALE
500 0 500
VICINITY MAP
Skip Intro
Internet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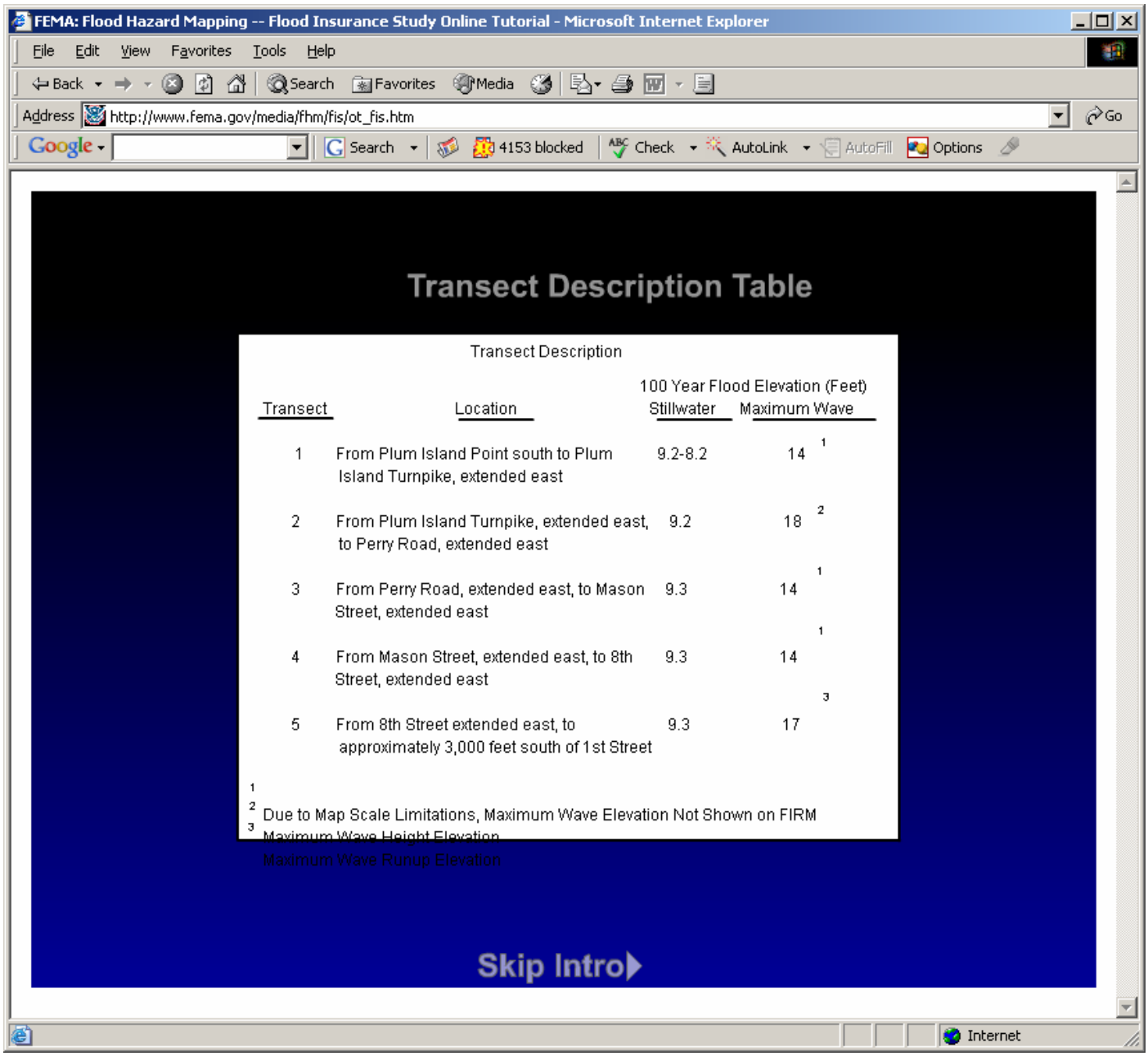
Summary of Stillwater Elevations Table
Summary of Stillwater Elevations
Elevation (Feet)
Flooding Source and Location 10-Year 50-Year 100-Year 500-Year
Atlantic Ocean
Entire Shoreline Within Floodport 8.2 8.9 9.2 9.8
Merrimack River
Entire Shoreline Within Floodport 5.9 7.2 8.2 8.9
Skip Intro
Internet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Transect Description Table
Transect Description
100 Year Flood Elevation (Feet)
Transect Location Stillwater Maximum Wave
1 From Plum Island Point south to Plum Island Turnpike, extended east 9.2-8.2 14 1
2 From Plum Island Turnpike, extended east, to Perry Road, extended east 9.2 18 2
3 From Perry Road, extended east, to Mason Street, extended east 9.3 14 1
4 From Mason Street, extended east, to 8th Street, extended east 9.3 14 1
5 From 8th Street extended east, to approximately 3,000 feet south of 1st Street 9.3 17 3
1
2 Due to Map Scale Limitations, Maximum Wave Elevation Not Shown on FIRM
3 Maximum Wave Height Elevation
Maximum Wave Runup Elevation
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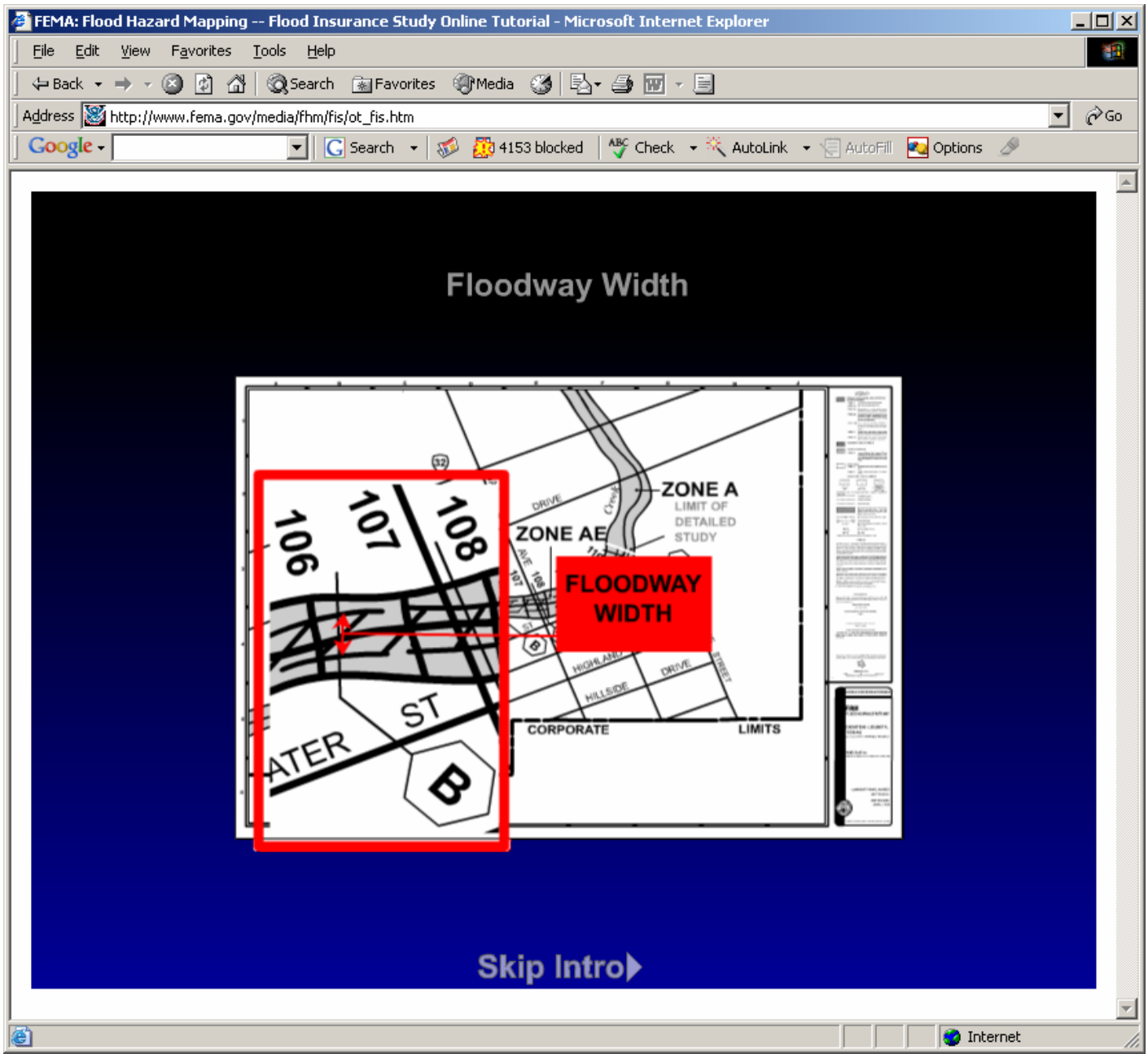
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Floodway Width
ZONE A
LIMIT OF DETAILED STUDY
ZONE AE
FLOODWAY WIDTH
106
107
108
ST
ATER
B
CORPORATE
LIMITS
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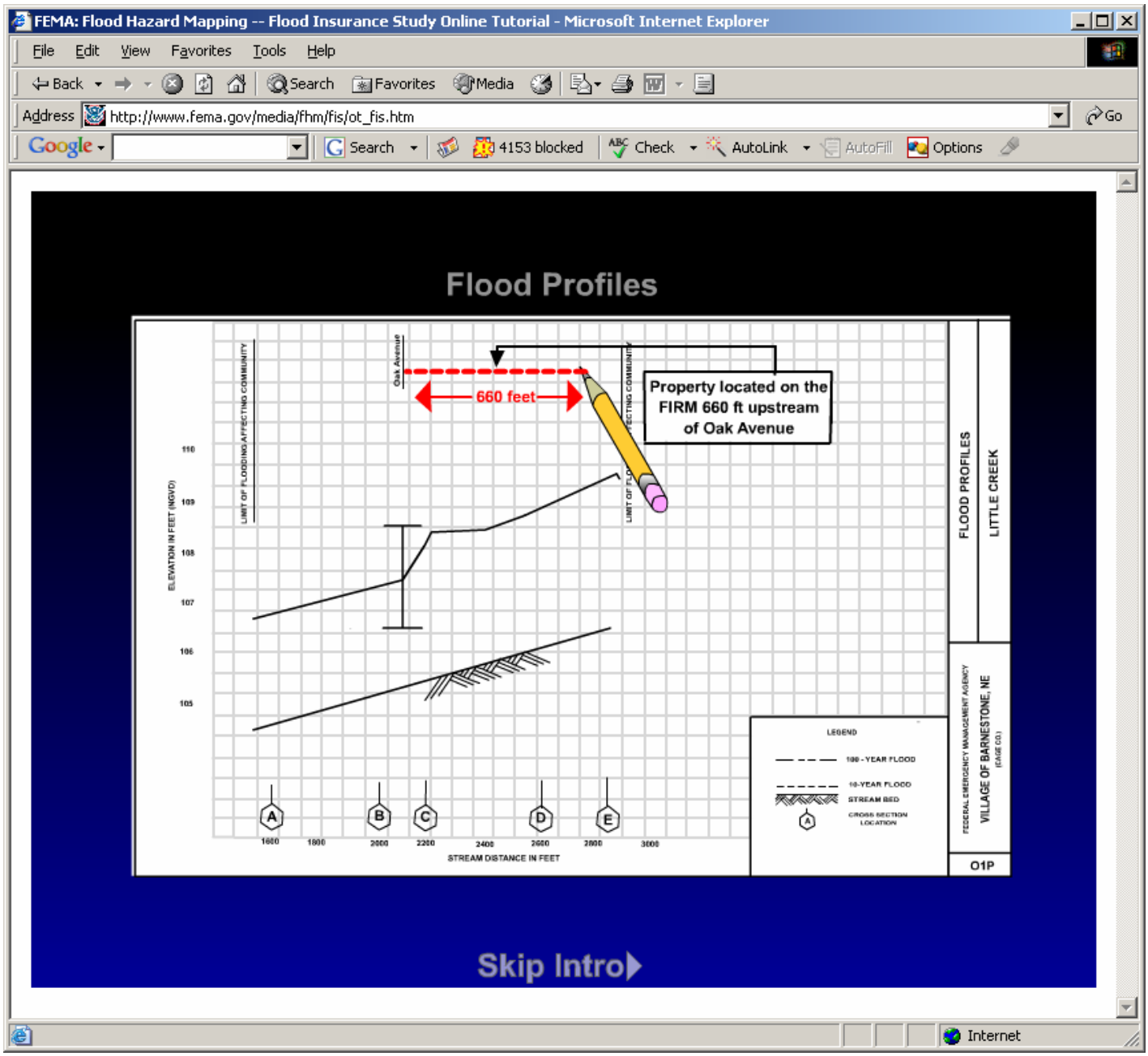
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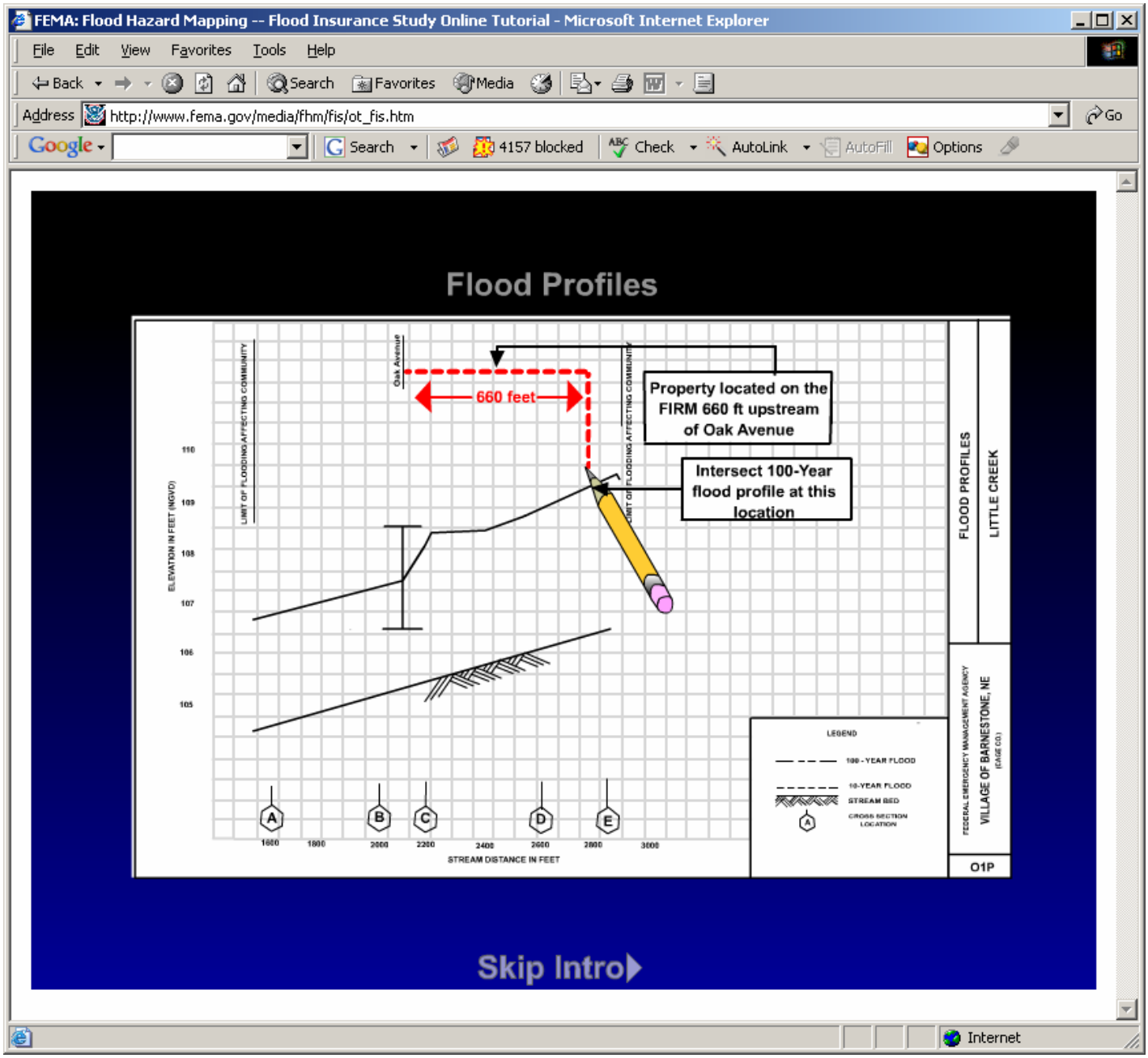
Flood Profiles
660 feet
Property located on the FIRM 660 ft upstream of Oak Avenue
Oak Avenue
LIMIT OF FLOODING AFFECTING COMMUNITY
ELEVATION IN FEET (NGVD)
STREAM DISTANCE IN FEET
LEGEND
100-YEAR FLOOD
10-YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
LITTLE CREEK
FEDERAL EMERGENCY MANAGEMENT AGENCY
VILLAGE OF BARNESTONE, NE
O1P
Skip Intro
Internet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Flood Profiles
660 feet
Property located on the FIRM 660 ft upstream of Oak Avenue
Intersect 100-Year flood profile at this location
Oak Avenue
LIMIT OF FLOODING AFFECTING COMMUNITY
ELEVATION IN FEET (NGVD)
STREAM DISTANCE IN FEET
LEGEND
100-YEAR FLOOD
10-YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
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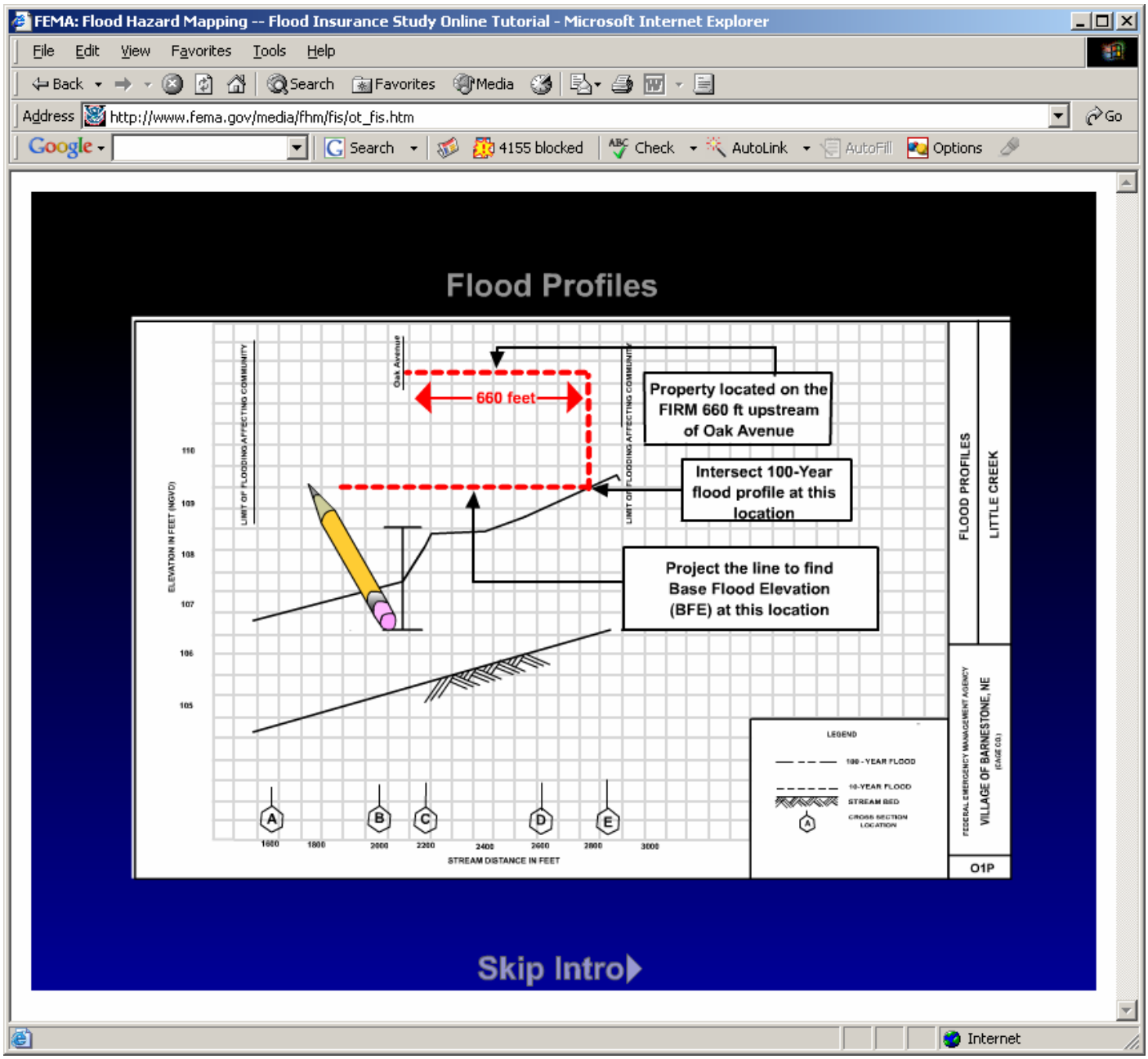
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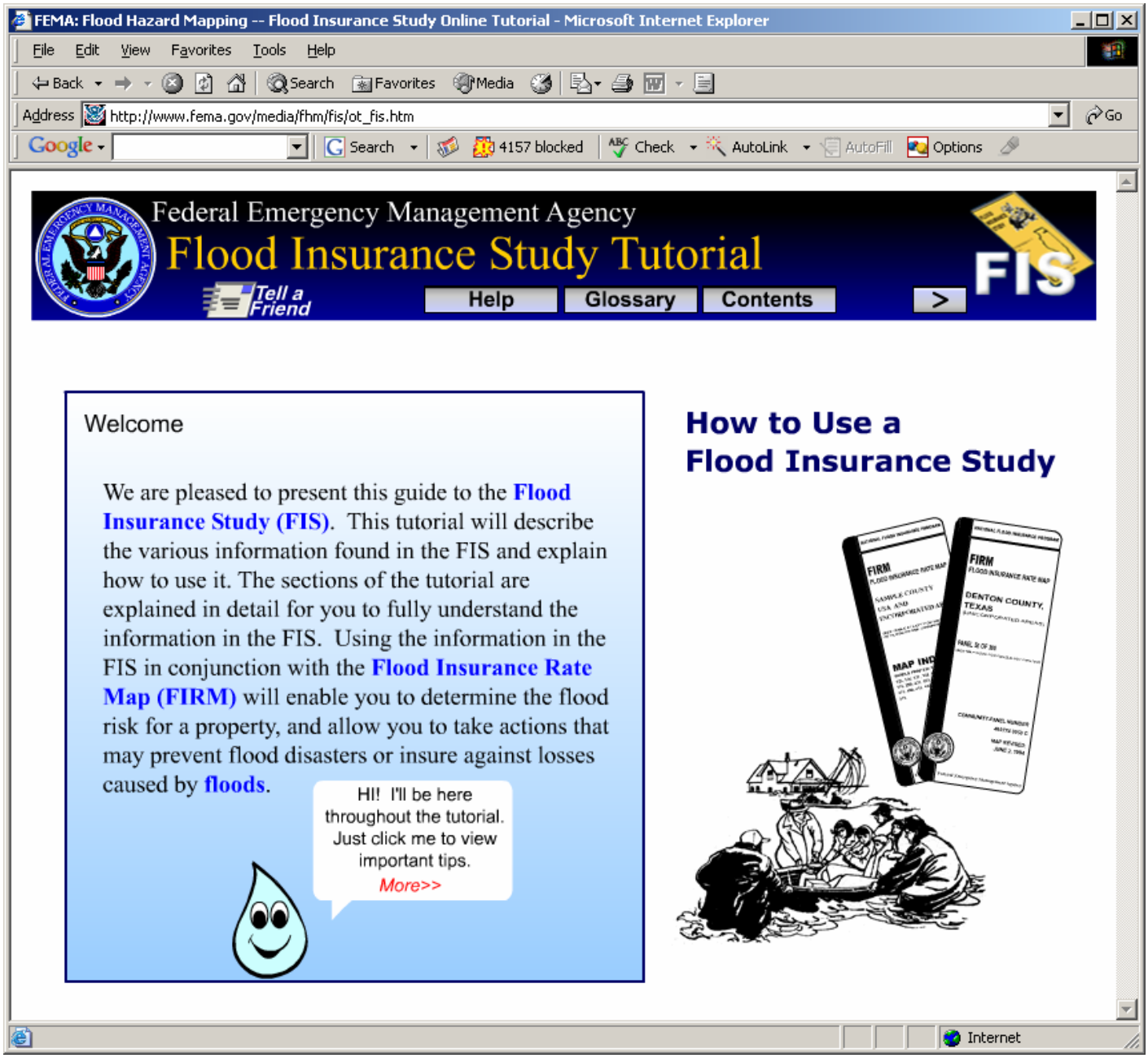
Flood Profiles
660 feet
Property located on the FIRM 660 ft upstream of Oak Avenue
Intersect 100-Year flood profile at this location
Project the line to find Base Flood Elevation (BFE) at this location
FLOOD PROFILES
LITTLE CREEK
VILLAGE OF BARNESTONE, NE
O1P
STREAM DISTANCE IN FEET
ELEVATION IN FEET (NGVD)
Skip Intro
Internet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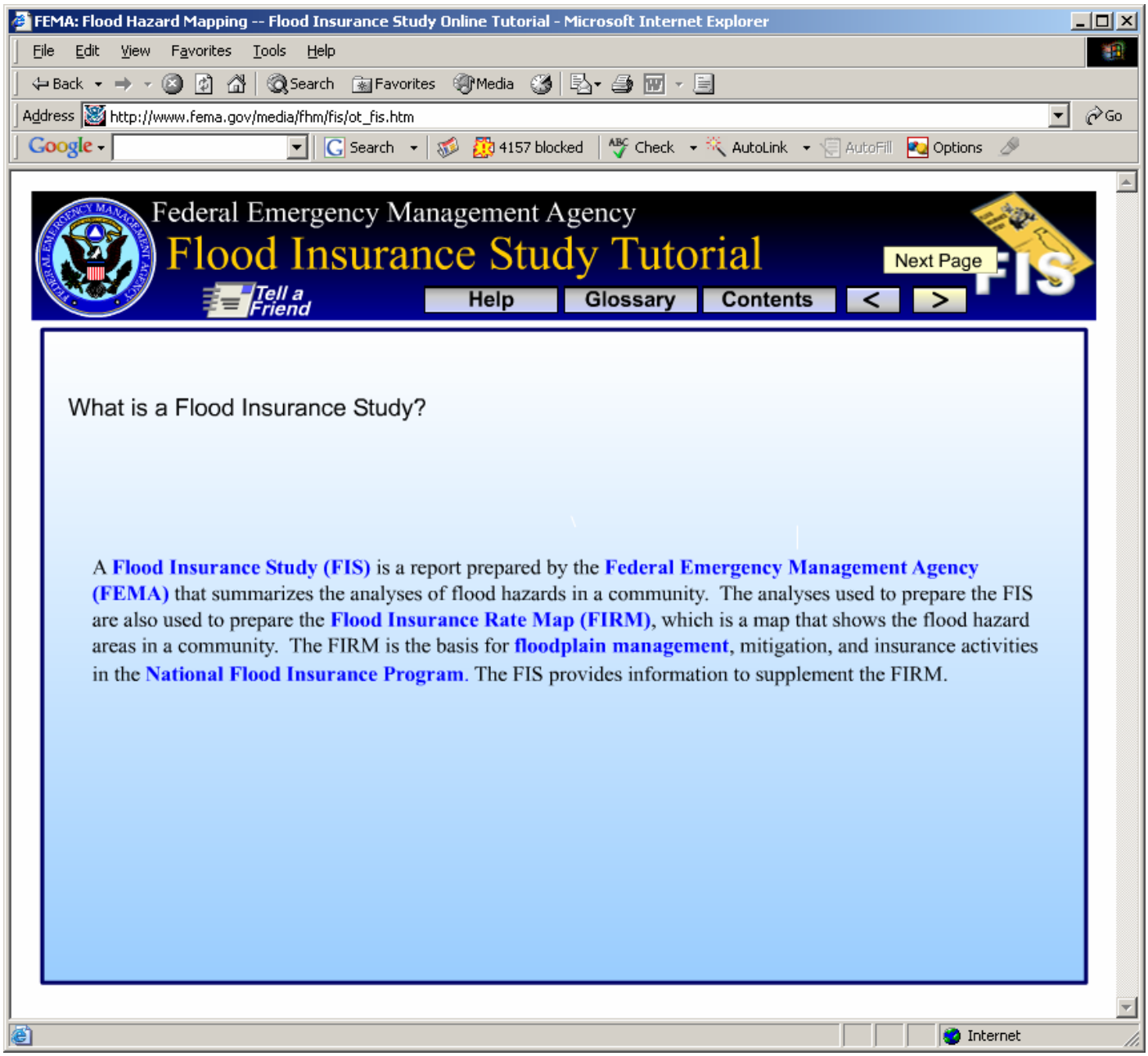
Welcome
We are pleased to present this guide to the Flood Insurance Study (FIS). This tutorial will describe the various information found in the FIS and explain how to use it. The sections of the tutorial are explained in detail for you to fully understand the information in the FIS. Using the information in the FIS in conjunction with the Flood Insurance Rate Map (FIRM) will enable you to determine the flood risk for a property, and allow you to take actions that may prevent flood disasters or insure against losses caused by floods.
HI! I'll be here throughout the tutorial. Just click me to view important tips.
More>>
How to Use a Flood Insurance Study
FIRM
DENTON COUNTY, TEXAS
Internet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What is a Flood Insurance Study?
A Flood Insurance Study (FIS) is a report prepared by the Federal Emergency Management Agency (FEMA) that summarizes the analyses of flood hazards in a community. The analyses used to prepare the FIS are also used to prepare the Flood Insurance Rate Map (FIRM), which is a map that shows the flood hazard areas in a community. The FIRM is the basis for floodplain management, mitigation, and insurance activities in the National Flood Insurance Program. The FIS provides information to supplement the FIRM.
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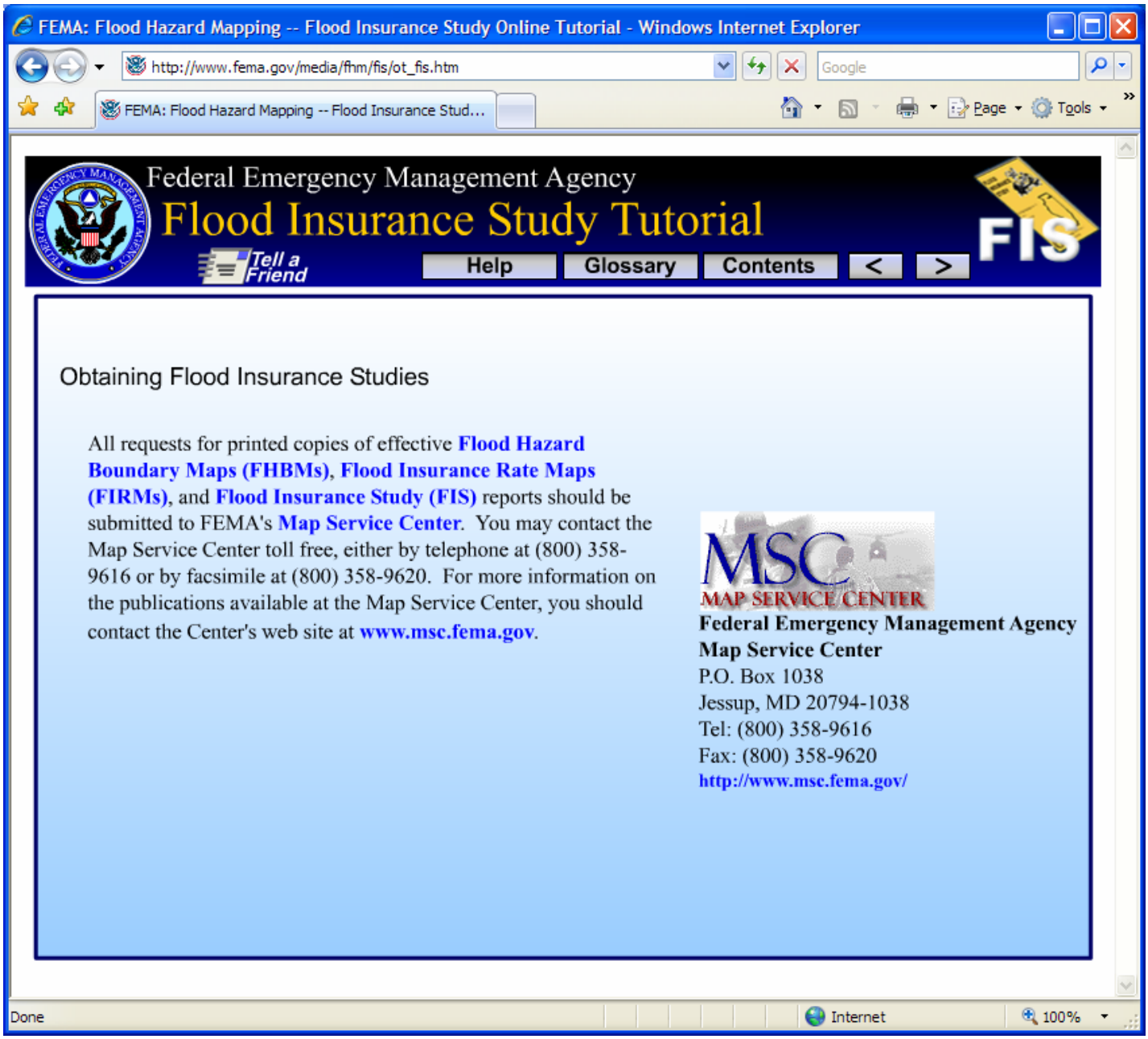
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Obtaining Flood Insurance Studies
All requests for printed copies of effective Flood Hazard Boundary Maps (FHBMs), Flood Insurance Rate Maps (FIRMs), and Flood Insurance Study (FIS) reports should be submitted to FEMA's Map Service Center. You may contact the Map Service Center toll free, either by telephone at (800) 358-9616 or by facsimile at (800) 358-9620. For more information on the publications available at the Map Service Center, you should contact the Center's web site at www.msc.fema.gov.
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MAP SERVICE CENTER
Federal Emergency Management Agency
Map Service Center
P.O. Box 1038
Jessup, MD 20794-1038
Tel: (800) 358-9616
Fax: (800) 358-9620
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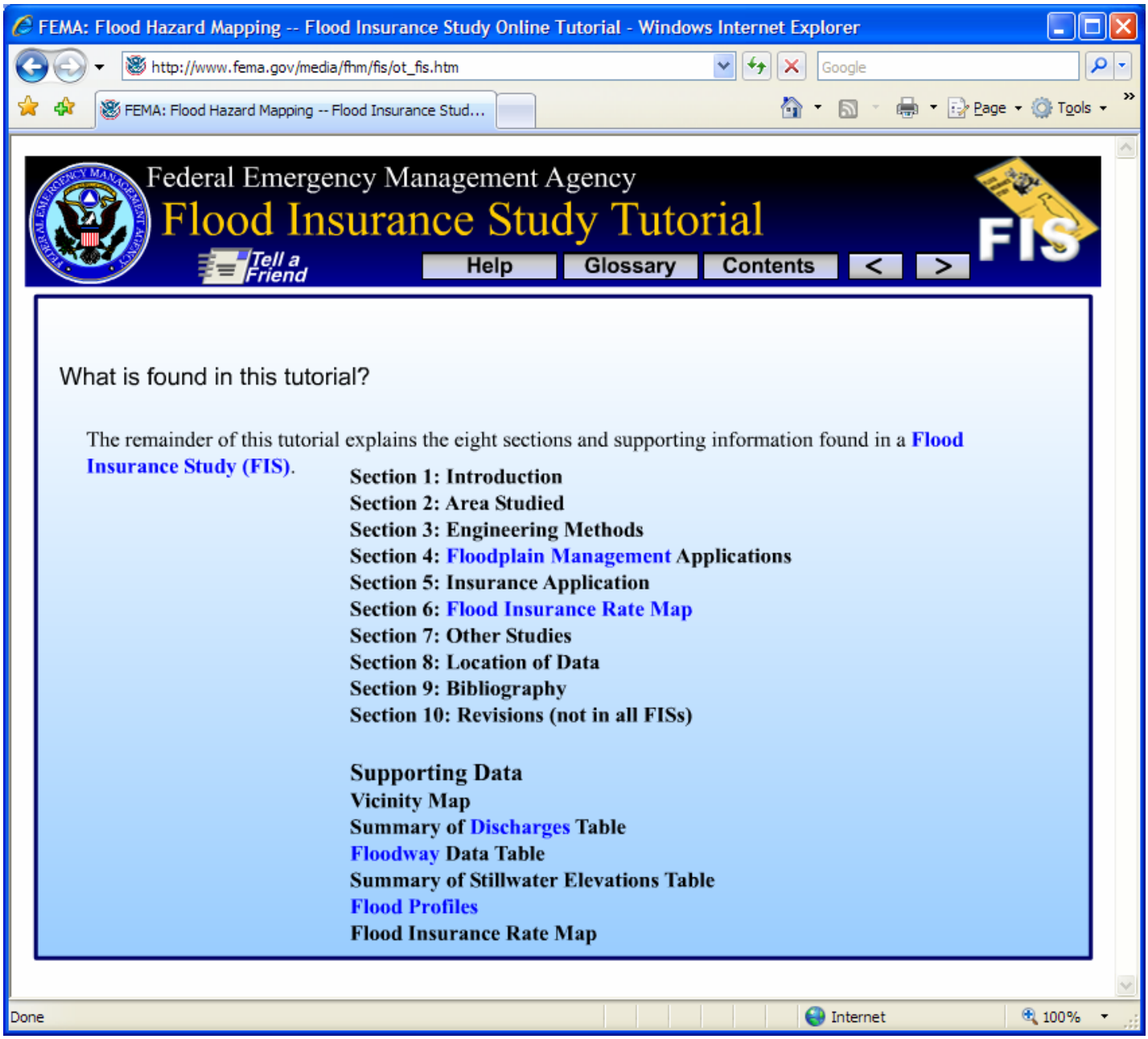
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What is found in this tutorial?
The remainder of this tutorial explains the eight sections and supporting information found in a Flood Insurance Study (FIS).
Section 1: Introduction
Section 2: Area Studied
Section 3: Engineering Methods
Section 4: Floodplain Management Applications
Section 5: Insurance Application
Section 6: Flood Insurance Rate Map
Section 7: Other Studies
Section 8: Location of Data
Section 9: Bibliography
Section 10: Revisions (not in all FISs)
Supporting Data
Vicinity Map
Summary of Discharges Table
Floodway Data Table
Summary of Stillwater Elevations Table
Flood Profiles
Flood Insurance Rate Map
Done
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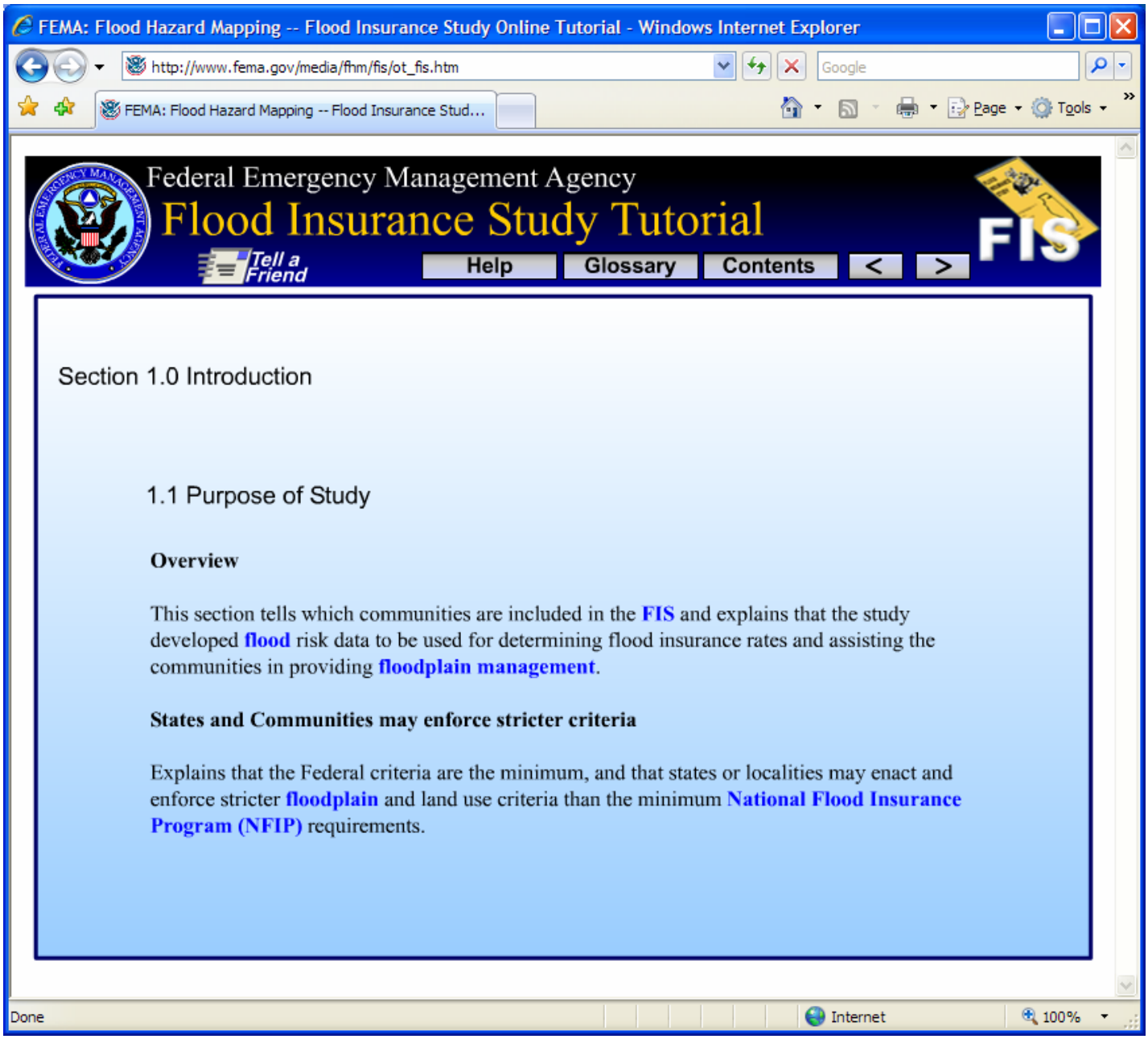
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Section 1.0 Introduction
1.1 Purpose of Study
Overview
This section tells which communities are included in the FIS and explains that the study developed flood risk data to be used for determining flood insurance rates and assisting the communities in providing floodplain management.
States and Communities may enforce stricter criteria
Explains that the Federal criteria are the minimum, and that states or localities may enact and enforce stricter floodplain and land use criteria than the minimum National Flood Insurance Program (NFIP) requirements.
Done
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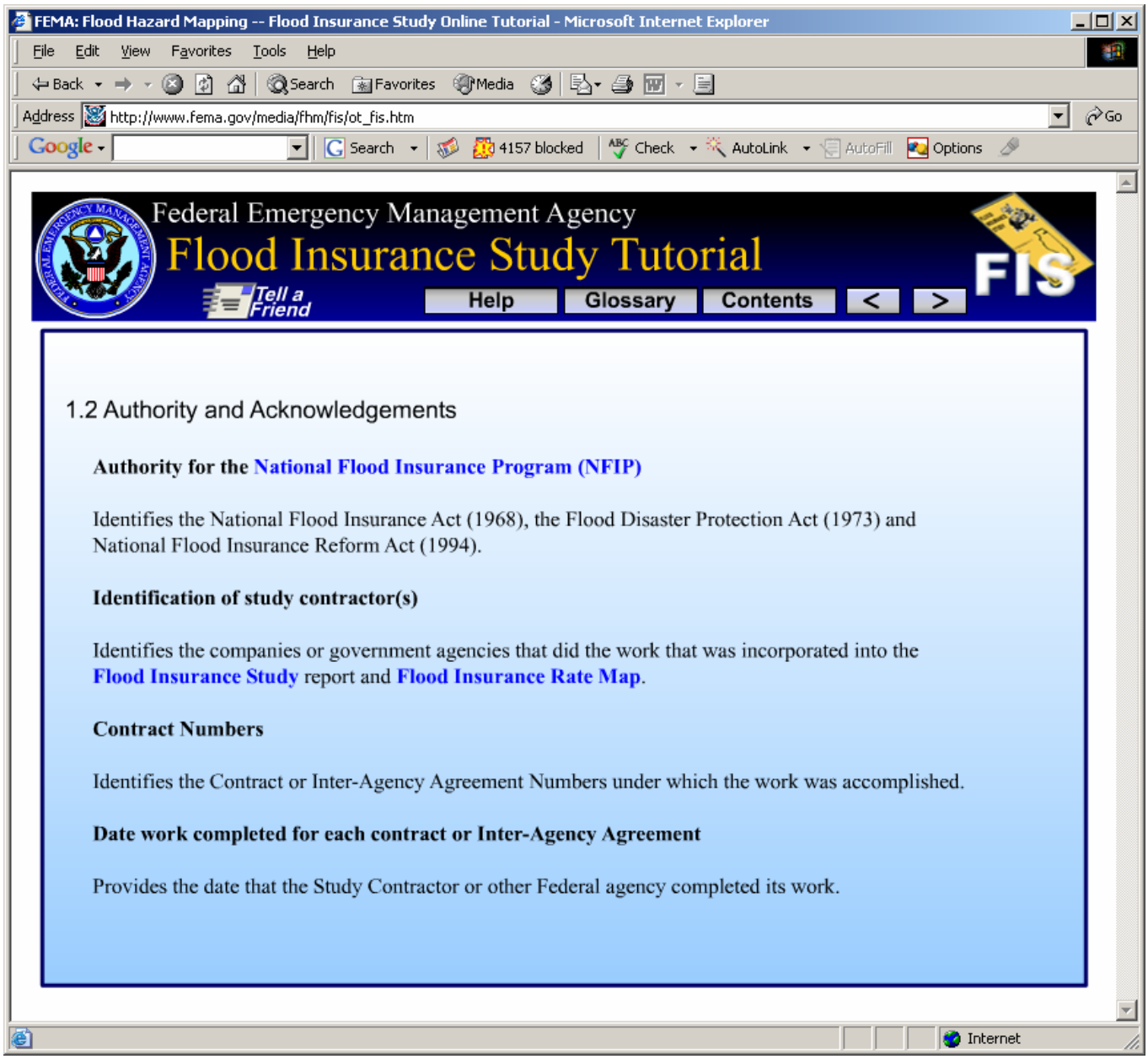
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1.2 Authority and Acknowledgements
Authority for the National Flood Insurance Program (NFIP)
Identifies the National Flood Insurance Act (1968), the Flood Disaster Protection Act (1973) and National Flood Insurance Reform Act (1994).
Identification of study contractor(s)
Identifies the companies or government agencies that did the work that was incorporated into the Flood Insurance Study report and Flood Insurance Rate Map.
Contract Numbers
Identifies the Contract or Inter-Agency Agreement Numbers under which the work was accomplished.
Date work completed for each contract or Inter-Agency Agreement
Provides the date that the Study Contractor or other Federal agency completed its work.
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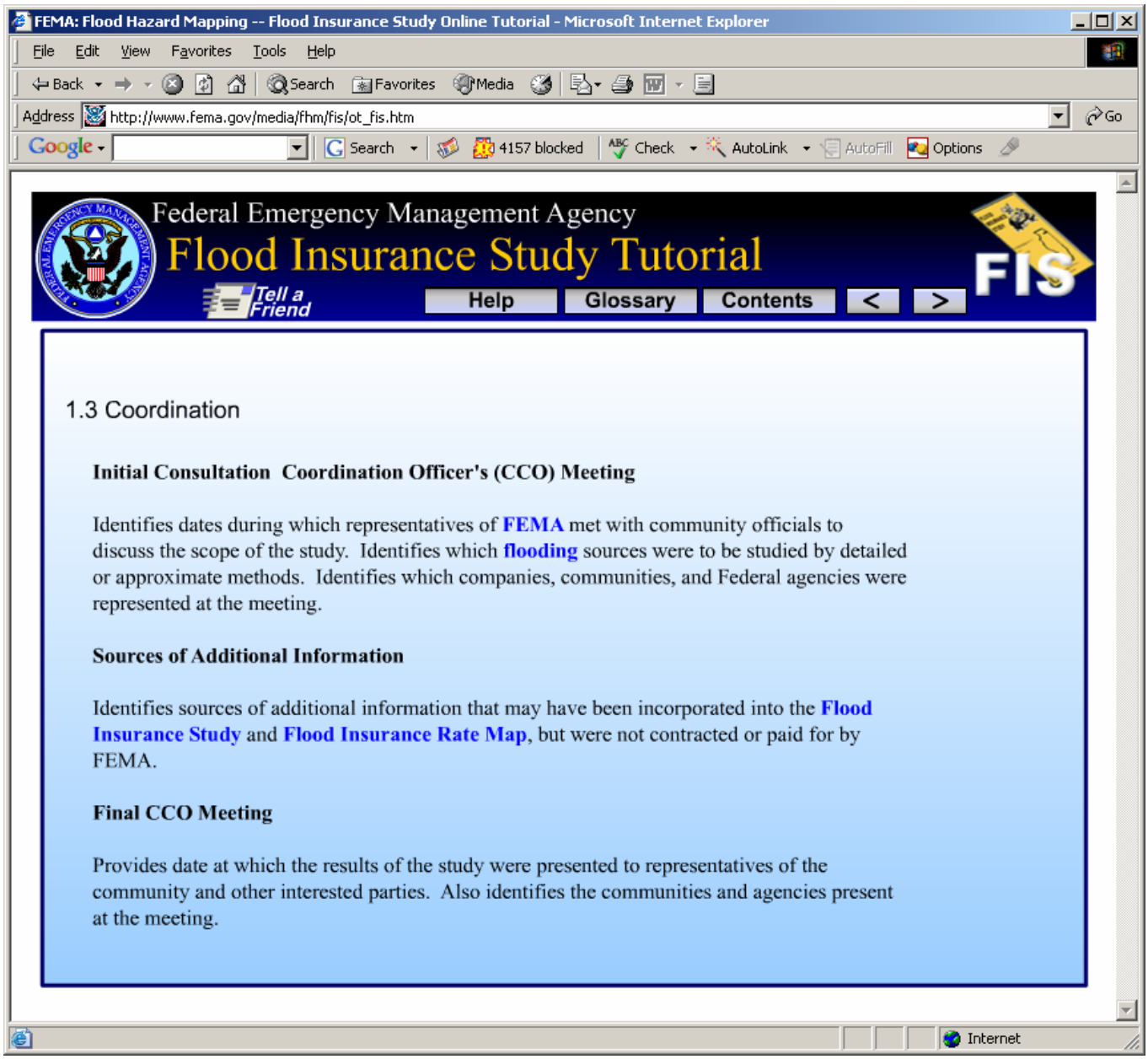
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1.3 Coordination
Initial Consultation Coordination Officer's (CCO) Meeting
Identifies dates during which representatives of FEMA met with community officials to discuss the scope of the study. Identifies which flooding sources were to be studied by detailed or approximate methods. Identifies which companies, communities, and Federal agencies were represented at the meeting.
Sources of Additional Information
Identifies sources of additional information that may have been incorporated into the Flood Insurance Study and Flood Insurance Rate Map, but were not contracted or paid for by FEMA.
Final CCO Meeting
Provides date at which the results of the study were presented to representatives of the community and other interested parties. Also identifies the communities and agencies present at the meeting.
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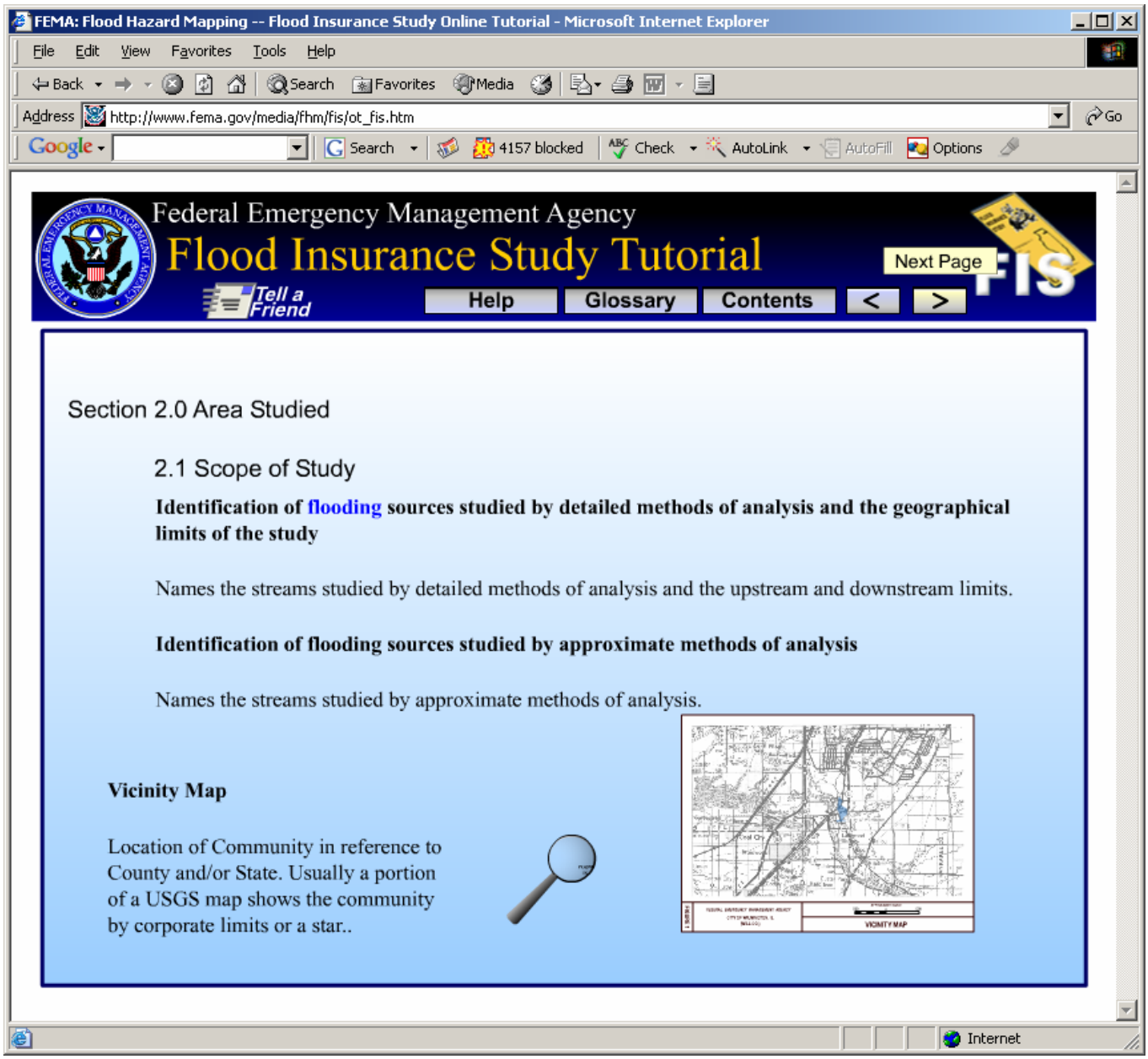
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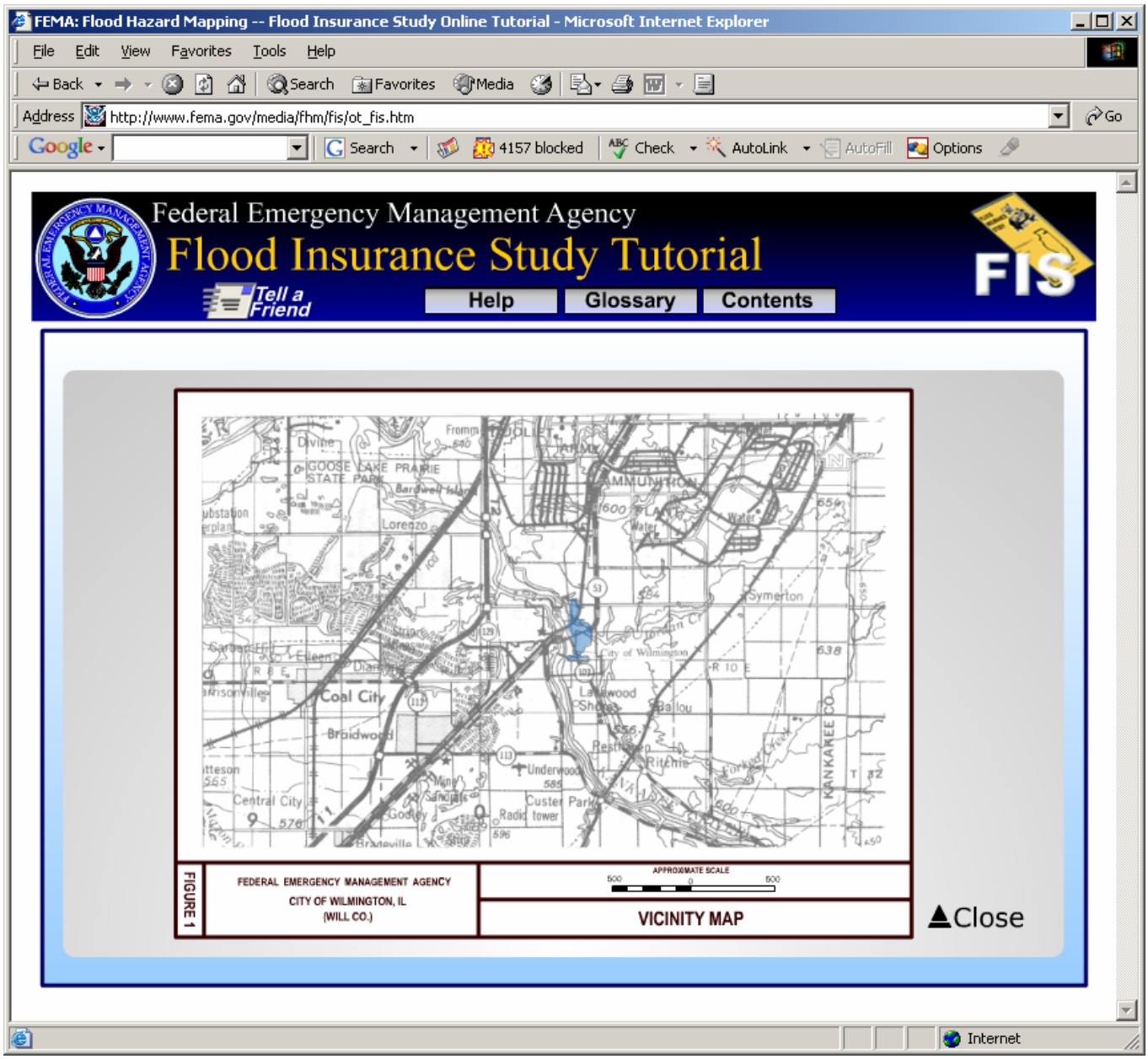
Section 2.0 Area Studied
2.1 Scope of Study
Identification of flooding sources studied by detailed methods of analysis and the geographical limits of the study
Names the streams studied by detailed methods of analysis and the upstream and downstream limits.
Identification of flooding sources studied by approximate methods of analysis
Names the streams studied by approximate methods of analysis.
Vicinity Map
Location of Community in reference to County and/or State. Usually a portion of a USGS map shows the community by corporate limits or a star..
VICINITY MAP
Internet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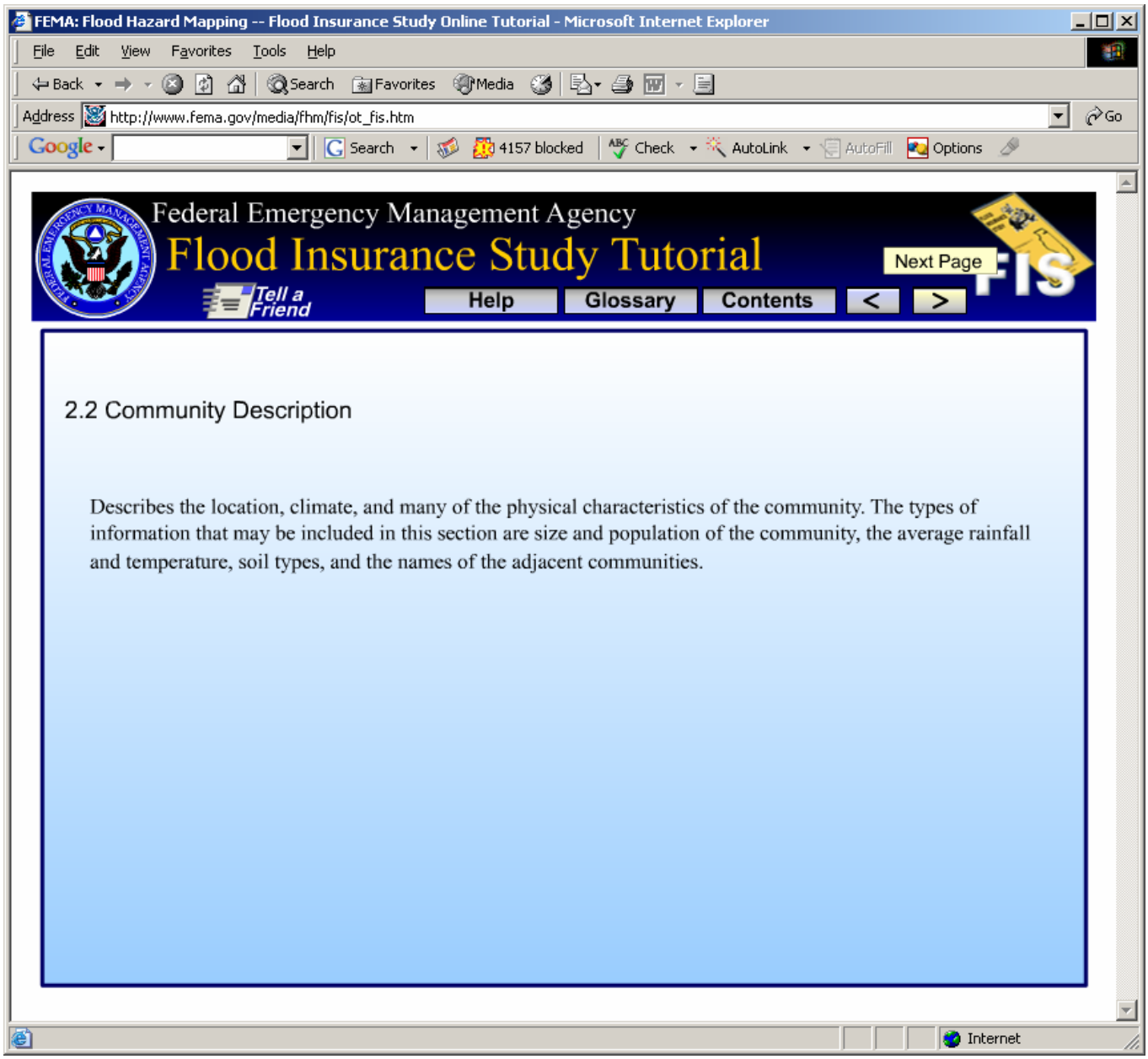
FIS
Divine
GOOSE LAKE PRAIRIE STATE PARK
Lorenzo
Symerton
Coal City
Braidwood
Underwood
Central City
Custer Park
Radio tower
Ritchie
KANKAKEE CO.
FIGURE 1
FEDERAL EMERGENCY MANAGEMENT AGENCY
CITY OF WILMINGTON, IL
(WILL CO.)
APPROXIMATE SCALE
500 0 500
VICINITY MAP
Close
Internet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2.2 Community Description
Describes the location, climate, and many of the physical characteristics of the community. The types of information that may be included in this section are size and population of the community, the average rainfall and temperature, soil types, and the names of the adjacent communities.
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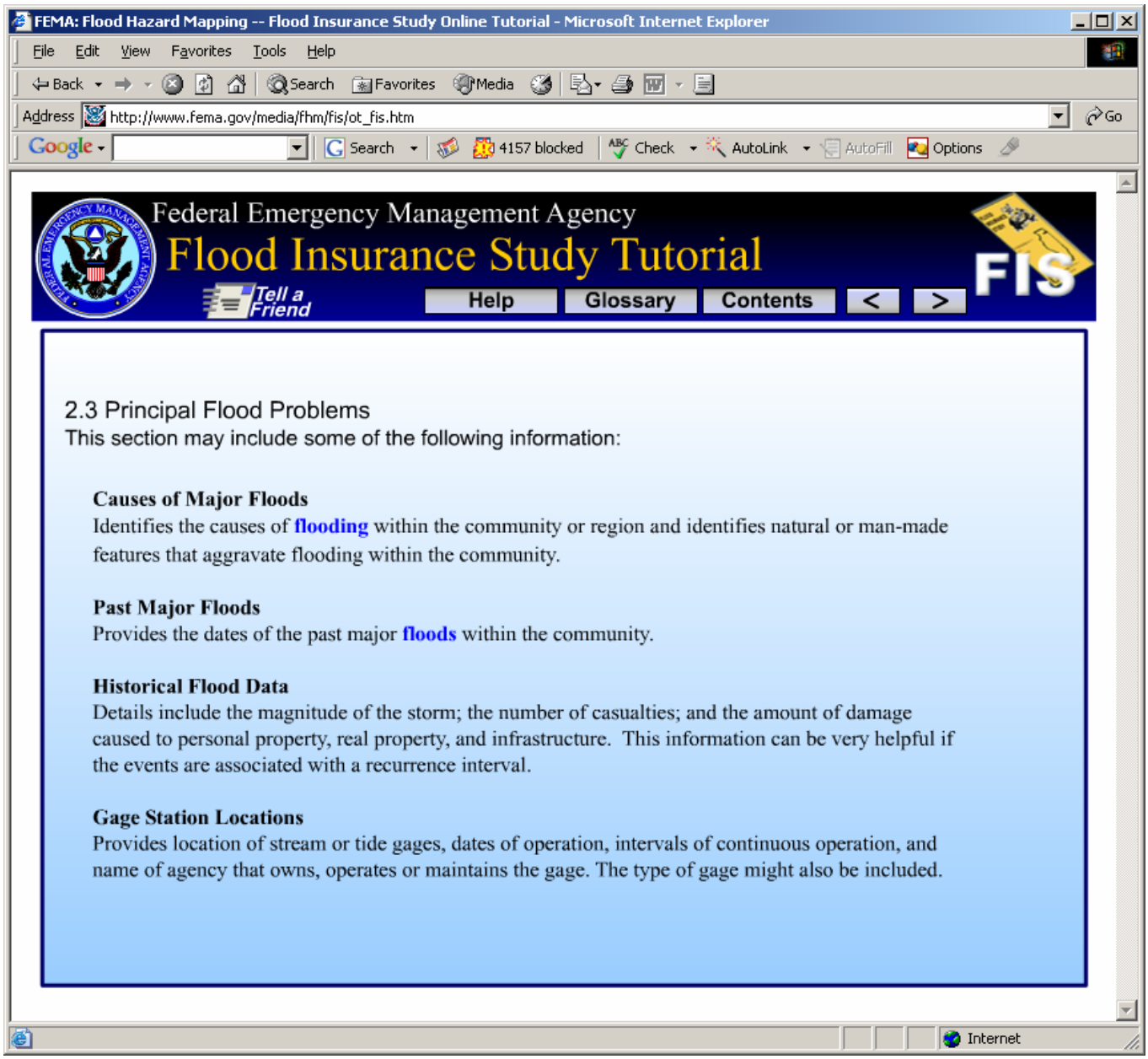
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2.3 Principal Flood Problems
This section may include some of the following information:
Causes of Major Floods
Identifies the causes of flooding within the community or region and identifies natural or man-made features that aggravate flooding within the community.
Past Major Floods
Provides the dates of the past major floods within the community.
Historical Flood Data
Details include the magnitude of the storm; the number of casualties; and the amount of damage caused to personal property, real property, and infrastructure. This information can be very helpful if the events are associated with a recurrence interval.
Gage Station Locations
Provides location of stream or tide gages, dates of operation, intervals of continuous operation, and name of agency that owns, operates or maintains the gage. The type of gage might also be included.
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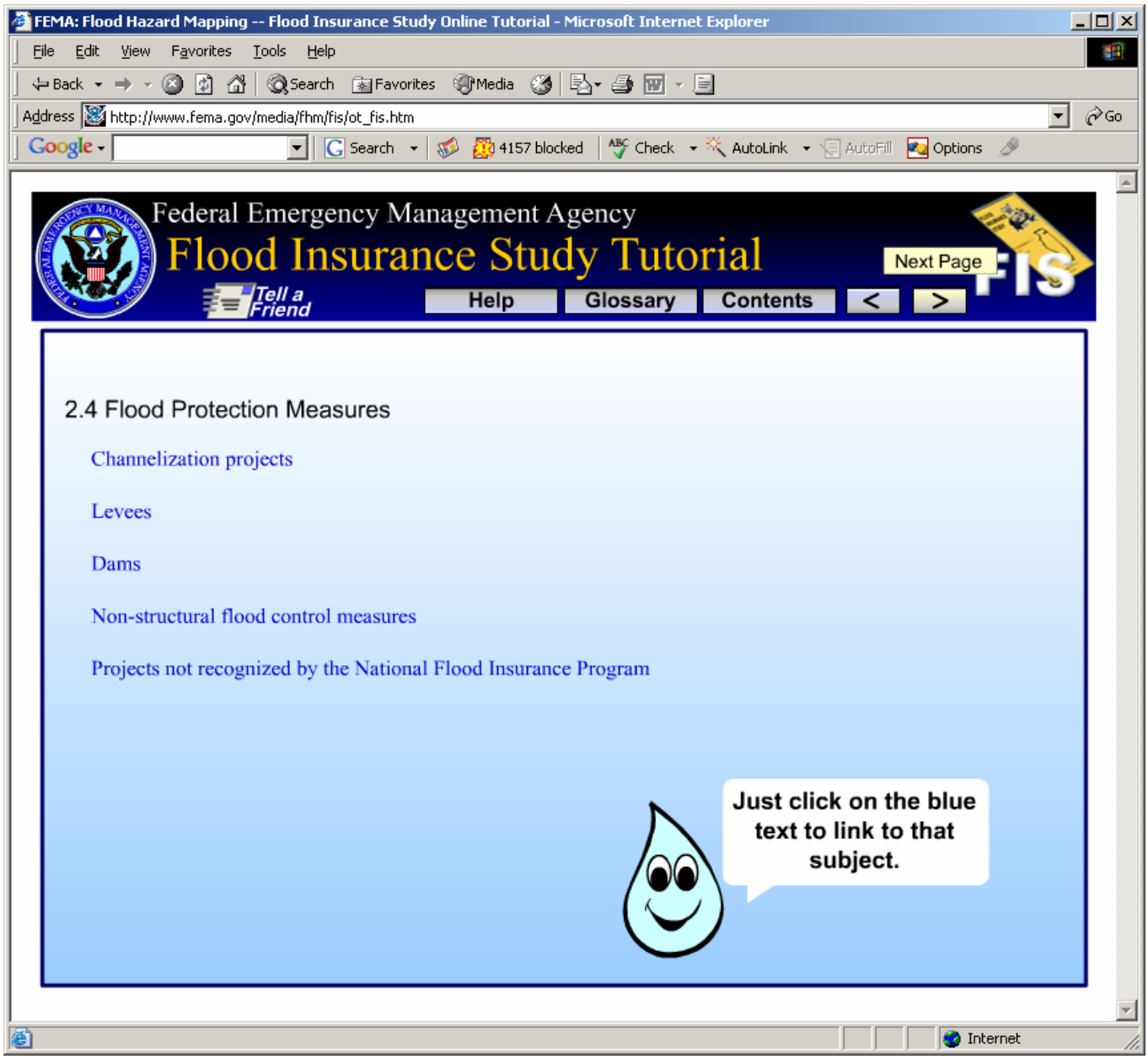
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2.4 Flood Protection Measures
Channelization projects
Levees
Dams
Non-structural flood control measures
Projects not recognized by the National Flood Insurance Program
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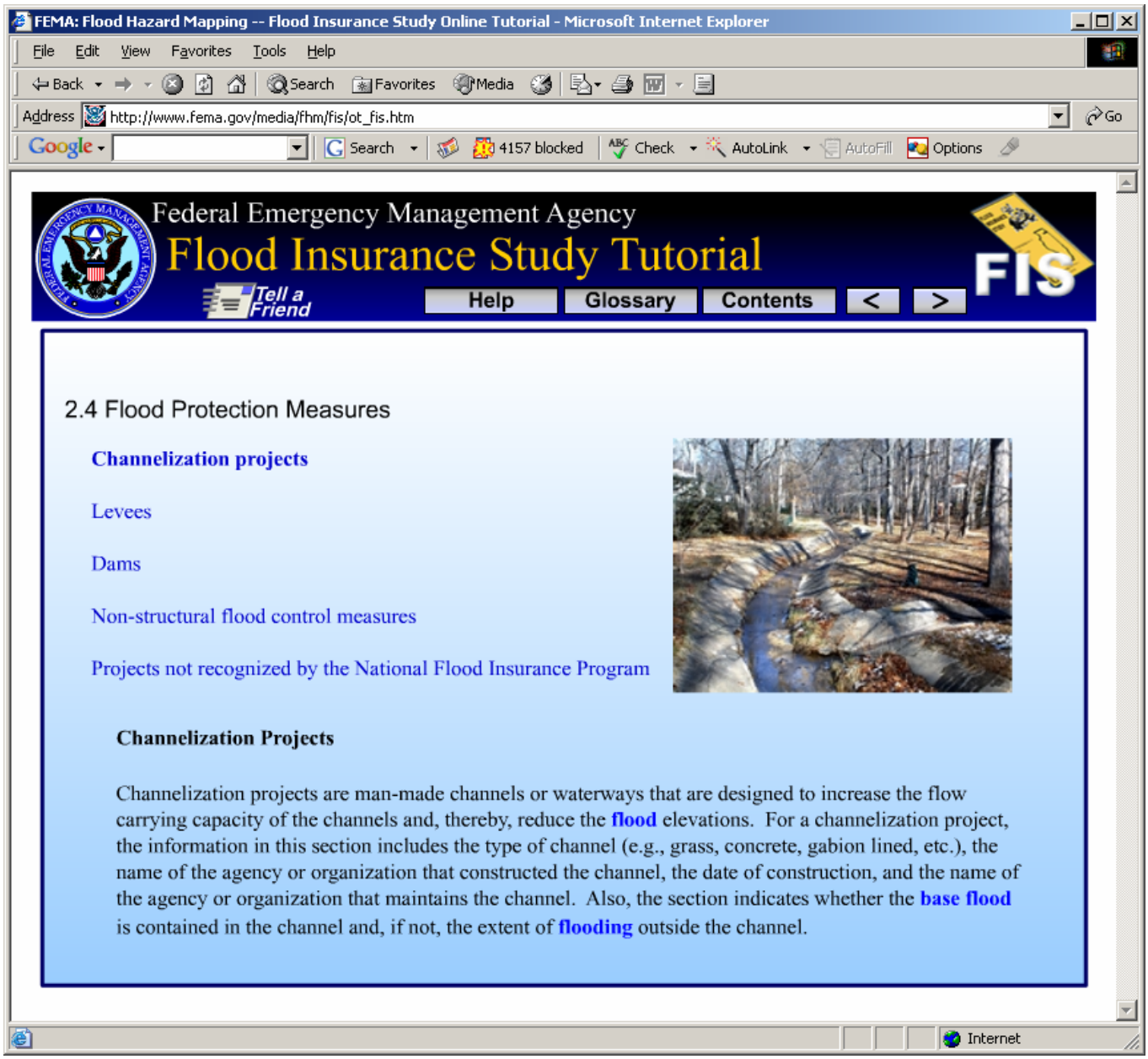
Internet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2.4 Flood Protection Measures
Channelization projects
Levees
Dams
Non-structural flood control measures
Projects not recognized by the National Flood Insurance Program
Channelization Projects
Channelization projects are man-made channels or waterways that are designed to increase the flow carrying capacity of the channels and, thereby, reduce the flood elevations. For a channelization project, the information in this section includes the type of channel (e.g., grass, concrete, gabion lined, etc.), the name of the agency or organization that constructed the channel, the date of construction, and the name of the agency or organization that maintains the channel. Also, the section indicates whether the base flood is contained in the channel and, if not, the extent of flooding outside the channel.
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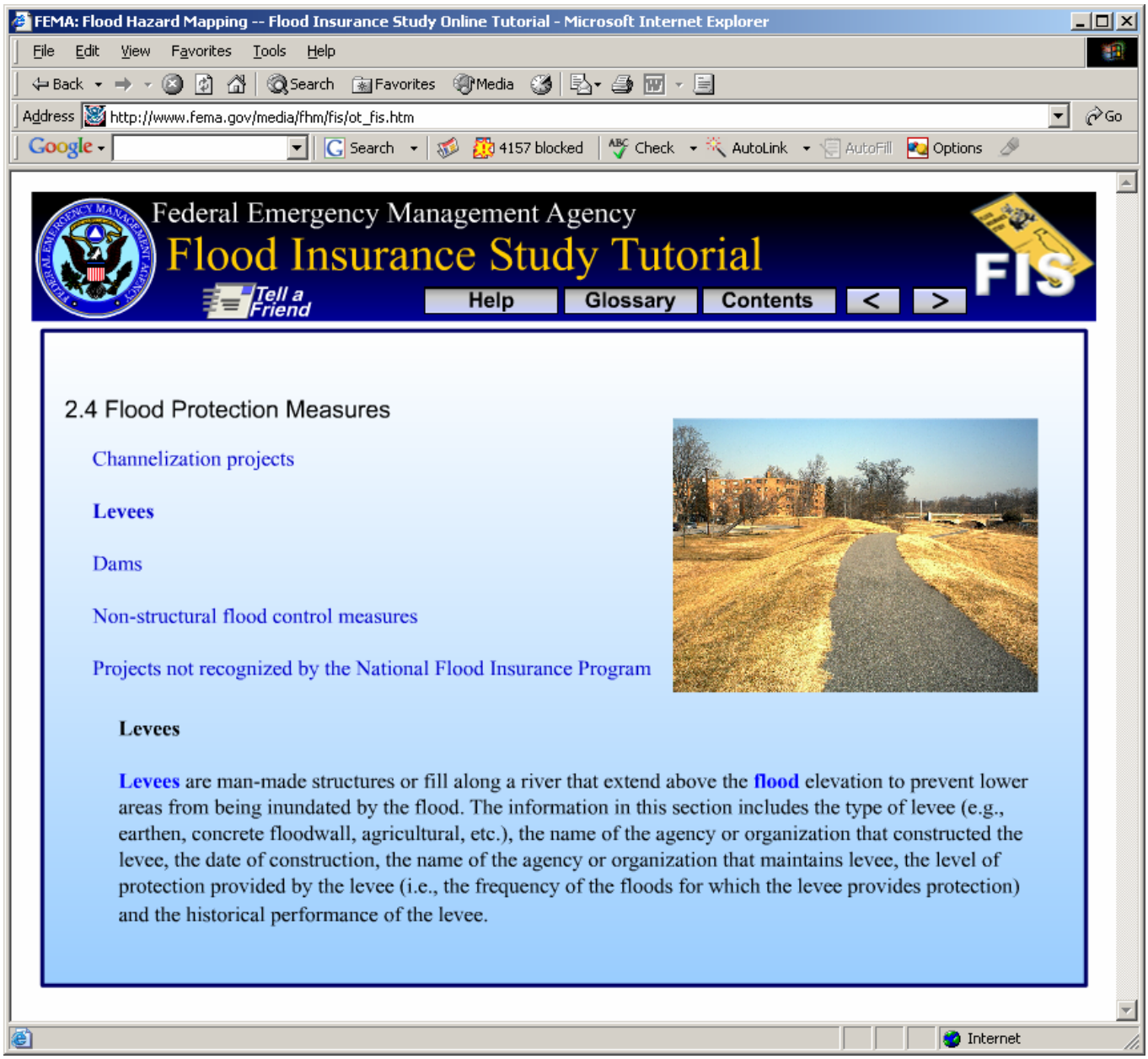
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2.4 Flood Protection Measures
Channelization projects
Levees
Dams
Non-structural flood control measures
Projects not recognized by the National Flood Insurance Program
Levees
Levees are man-made structures or fill along a river that extend above the flood elevation to prevent lower areas from being inundated by the flood. The information in this section includes the type of levee (e.g., earthen, concrete floodwall, agricultural, etc.), the name of the agency or organization that constructed the levee, the date of construction, the name of the agency or organization that maintains levee, the level of protection provided by the levee (i.e., the frequency of the floods for which the levee provides protection) and the historical performance of the levee.
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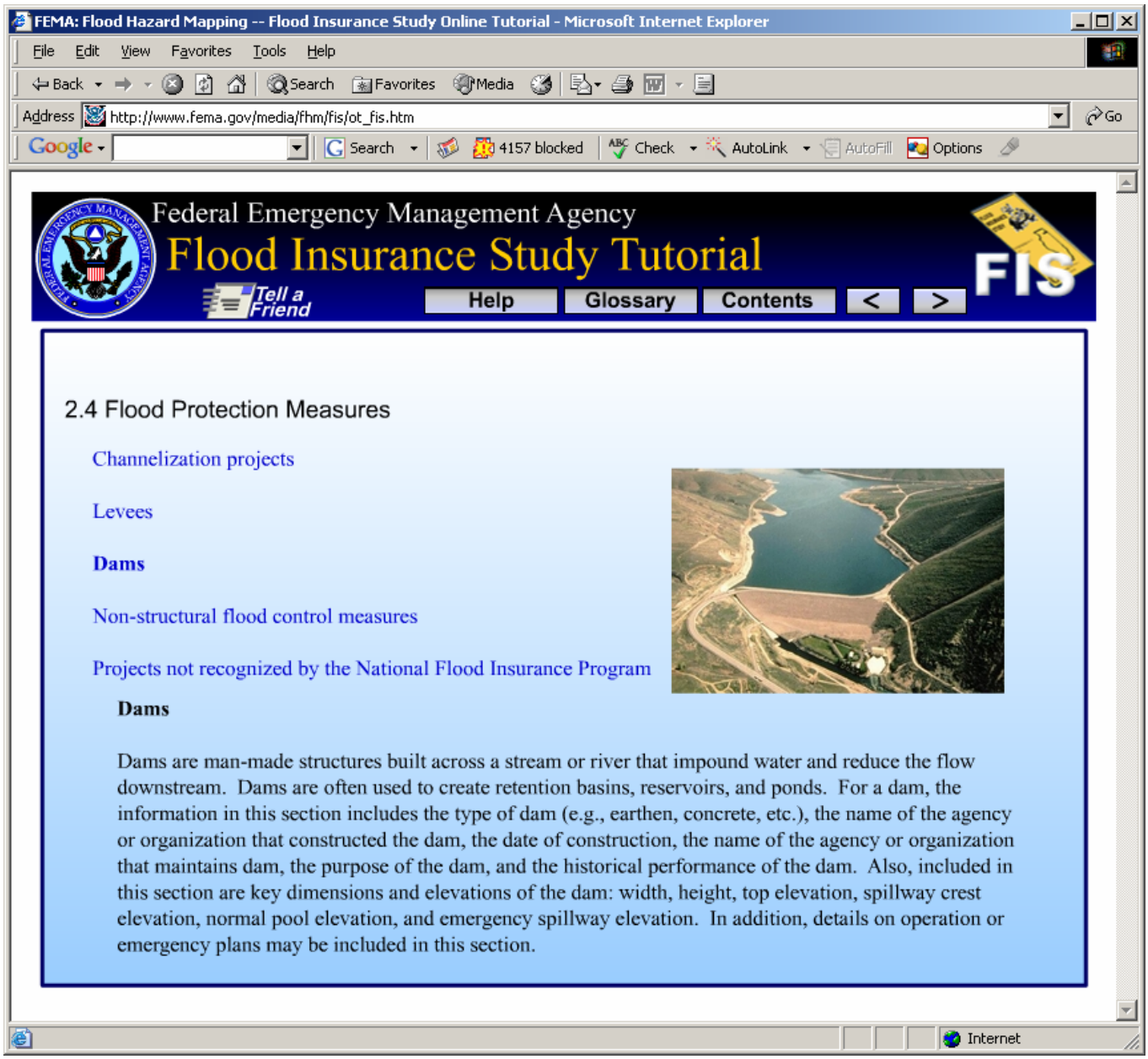
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2.4 Flood Protection Measures
Channelization projects
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Non-structural flood control measures
Projects not recognized by the National Flood Insurance Program
Dams
Dams are man-made structures built across a stream or river that impound water and reduce the flow downstream. Dams are often used to create retention basins, reservoirs, and ponds. For a dam, the information in this section includes the type of dam (e.g., earthen, concrete, etc.), the name of the agency or organization that constructed the dam, the date of construction, the name of the agency or organization that maintains dam, the purpose of the dam, and the historical performance of the dam. Also, included in this section are key dimensions and elevations of the dam: width, height, top elevation, spillway crest elevation, normal pool elevation, and emergency spillway elevation. In addition, details on operation or emergency plans may be included in this section.
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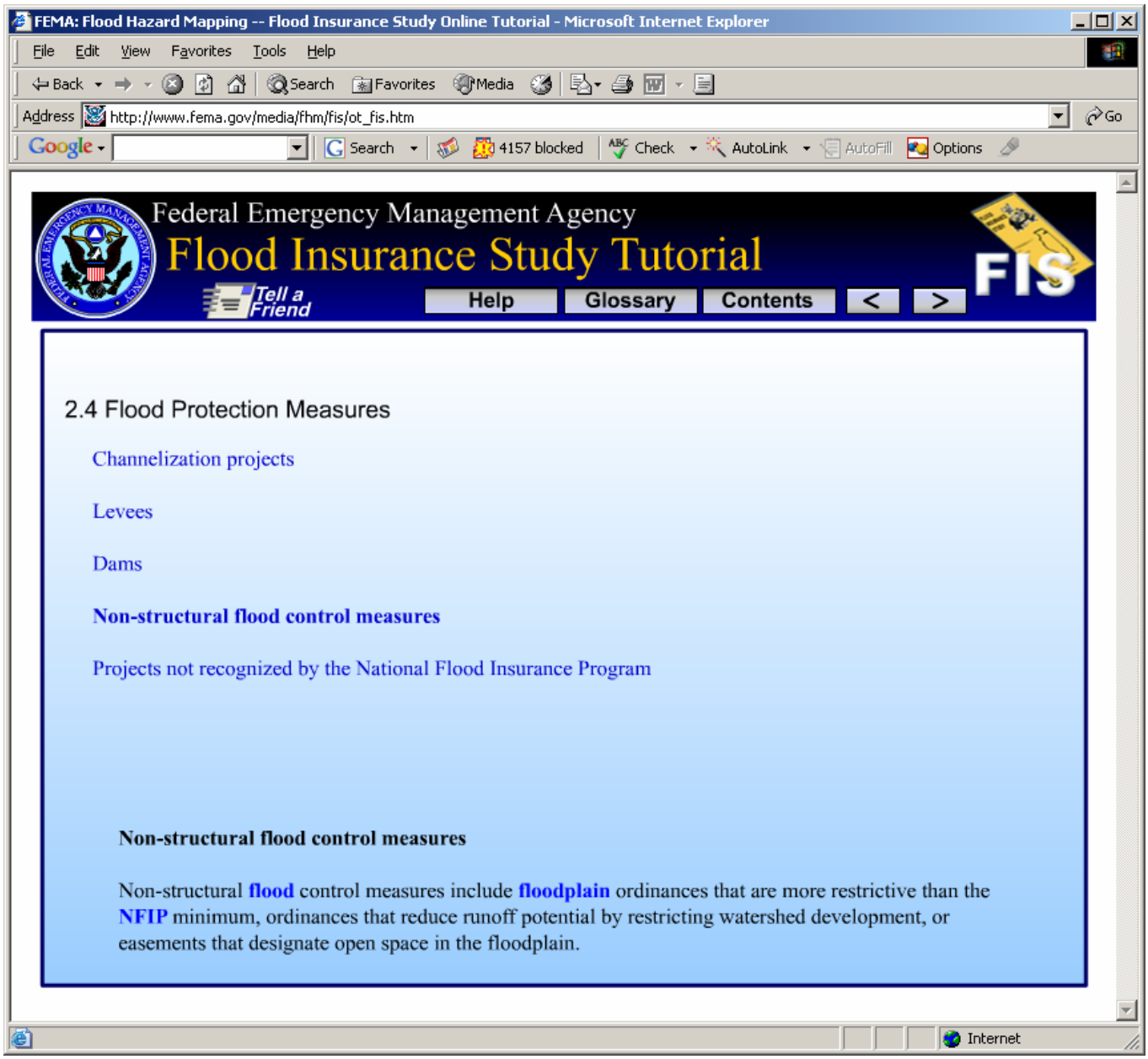
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2.4 Flood Protection Measures
Channelization projects
Levees
Dams
Non-structural flood control measures
Projects not recognized by the National Flood Insurance Program
Non-structural flood control measures
Non-structural flood control measures include floodplain ordinances that are more restrictive than the NFIP minimum, ordinances that reduce runoff potential by restricting watershed development, or easements that designate open space in the floodplain.
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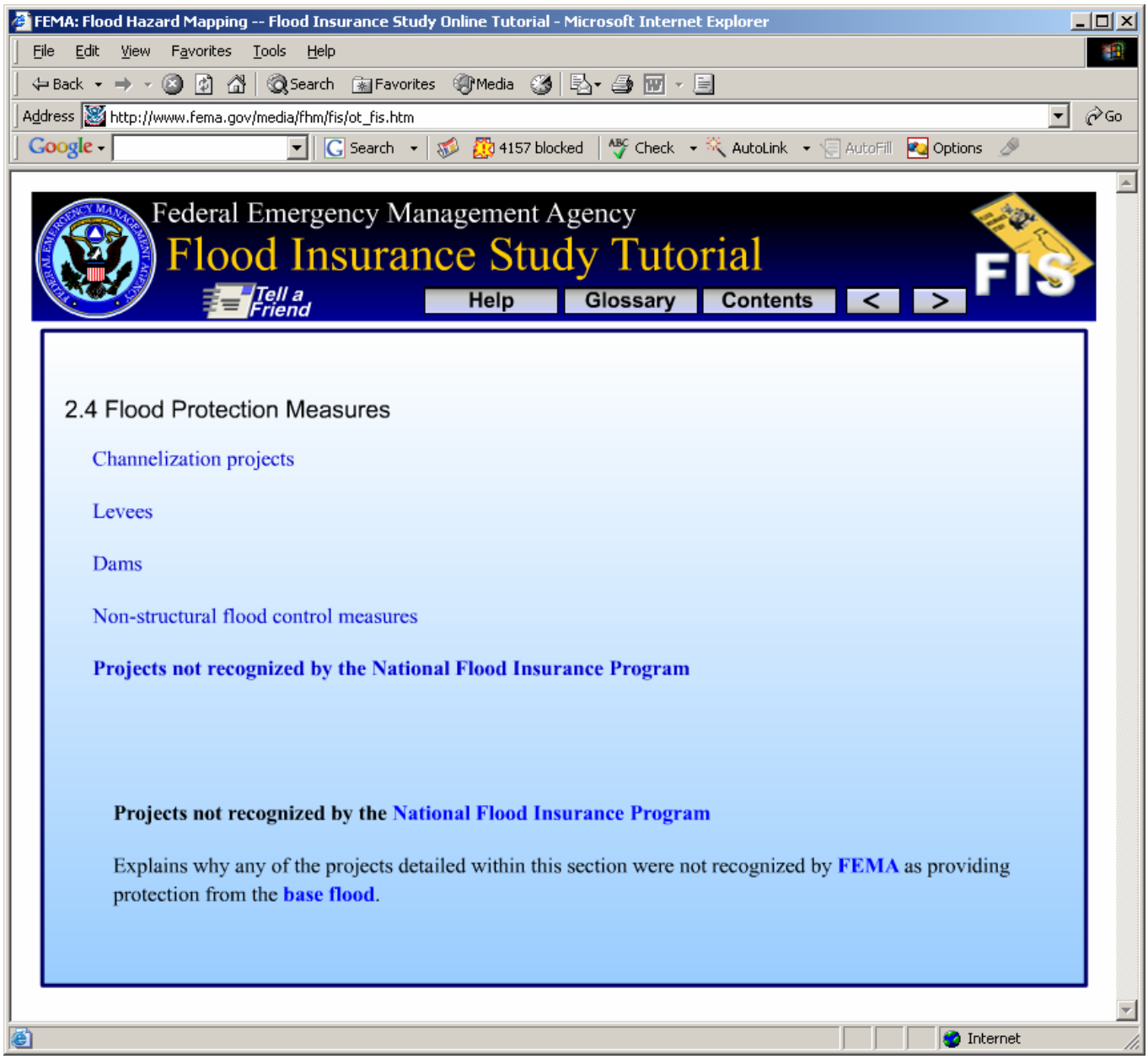
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2.4 Flood Protection Measures
Channelization projects
Levees
Dams
Non-structural flood control measures
Projects not recognized by the National Flood Insurance Program
Projects not recognized by the National Flood Insurance Program
Explains why any of the projects detailed within this section were not recognized by FEMA as providing protection from the base flood.
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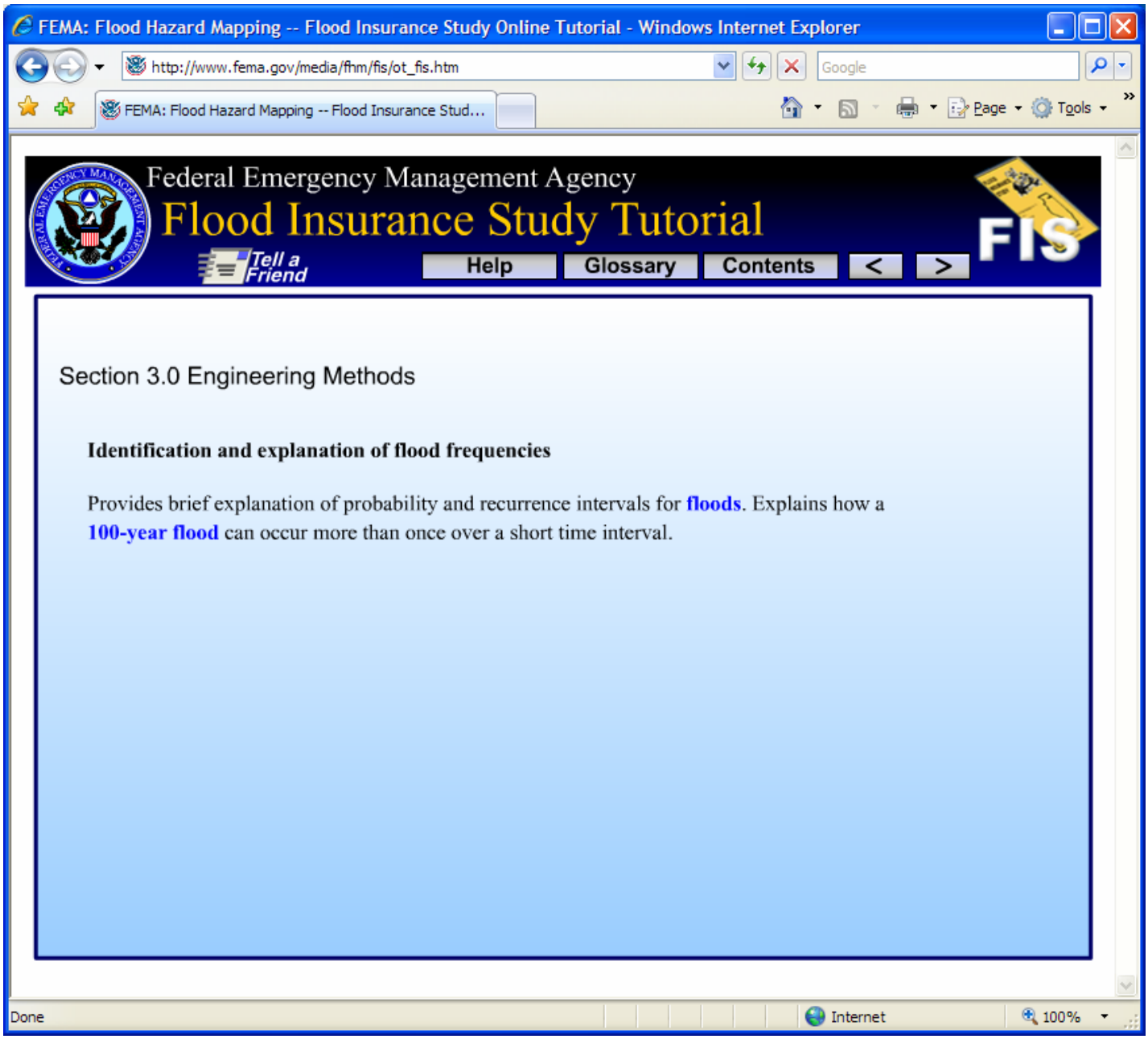
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Section 3.0 Engineering Methods
Identification and explanation of flood frequencies
Provides brief explanation of probability and recurrence intervals for floods. Explains how a 100-year flood can occur more than once over a short time interval.
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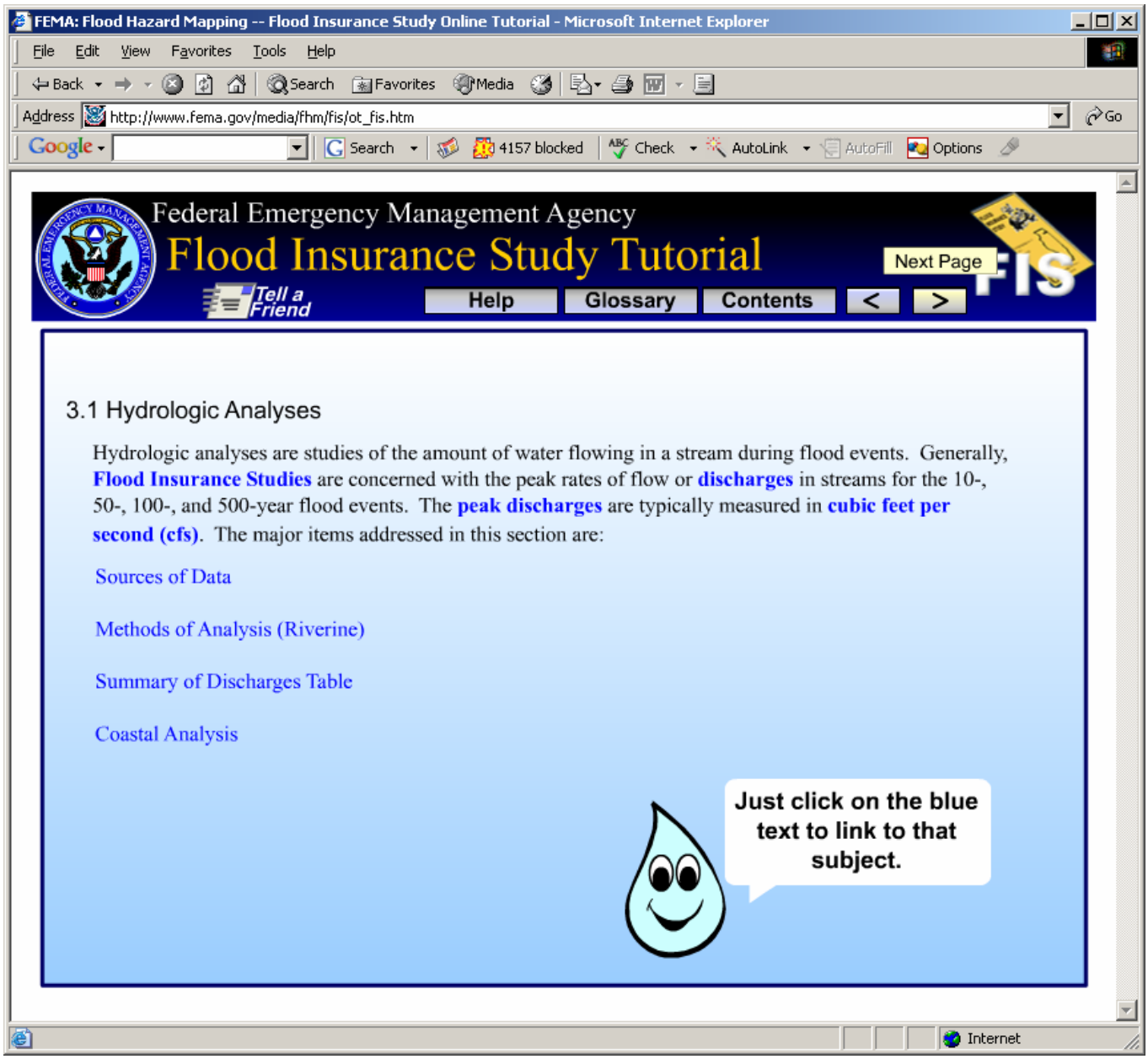
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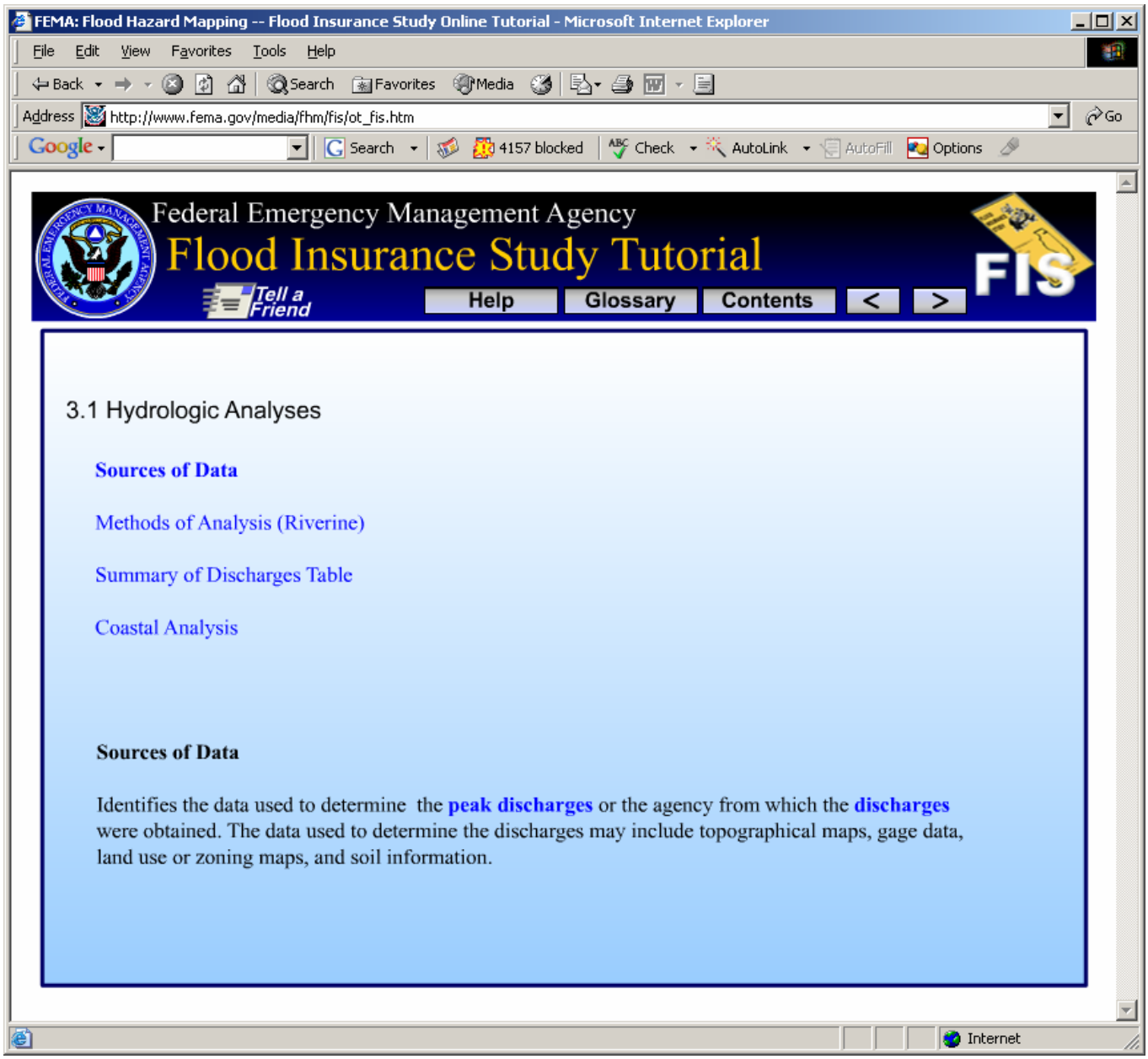
3.1 Hydrologic Analyses
Hydrologic analyses are studies of the amount of water flowing in a stream during flood events. Generally, Flood Insurance Studies are concerned with the peak rates of flow or discharges in streams for the 10-, 50-, 100-, and 500-year flood events. The peak discharges are typically measured in cubic feet per second (cfs). The major items addressed in this section are:
Sources of Data
Methods of Analysis (Riverine)
Summary of Discharges Table
Coastal Analysis
Just click on the blue text to link to that subject.
Internet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3.1 Hydrologic Analyses
Sources of Data
Methods of Analysis (Riverine)
Summary of Discharges Table
Coastal Analysis
Sources of Data
Identifies the data used to determine the peak discharges or the agency from which the discharges were obtained. The data used to determine the discharges may include topographical maps, gage data, land use or zoning maps, and soil information.
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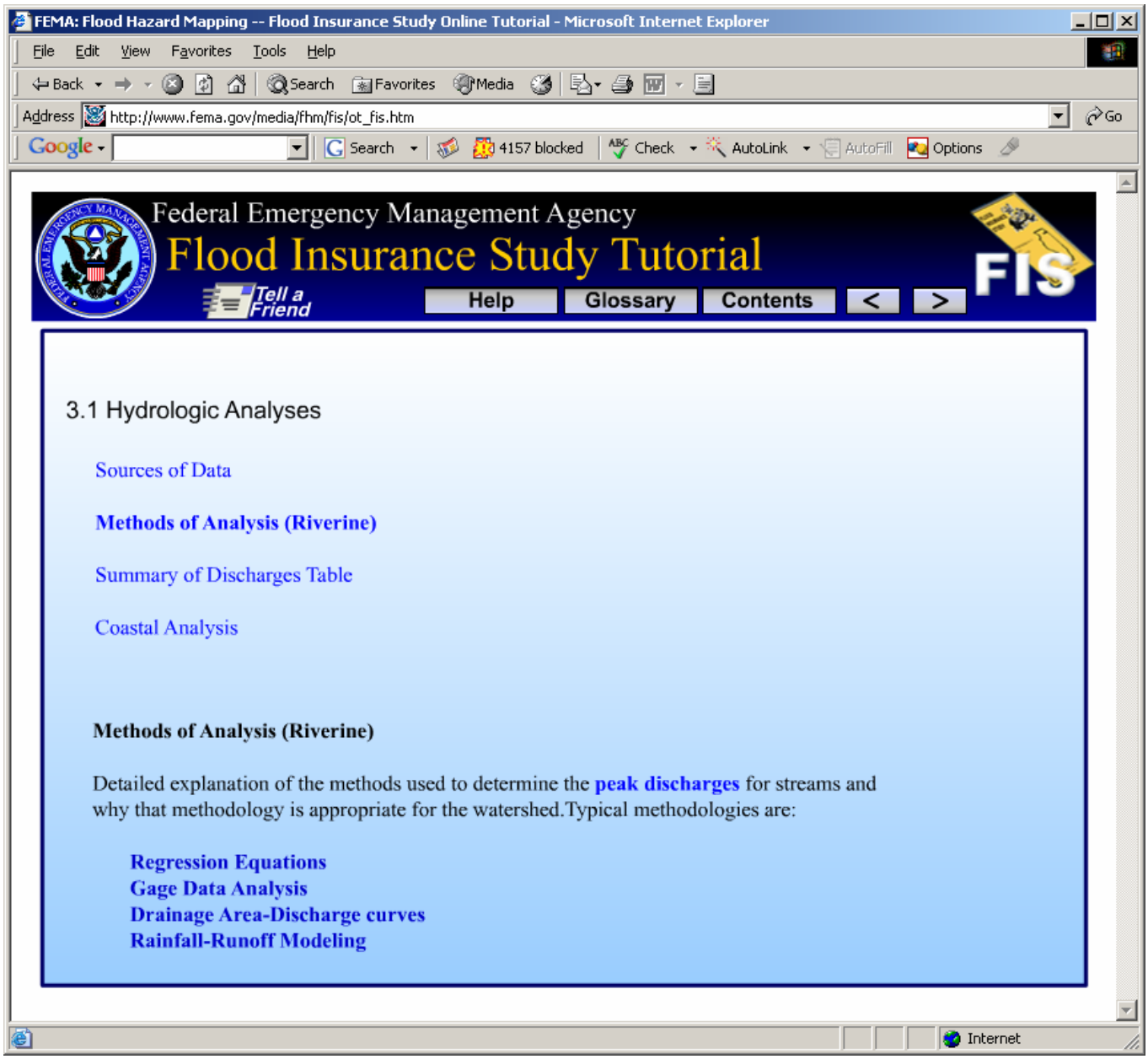
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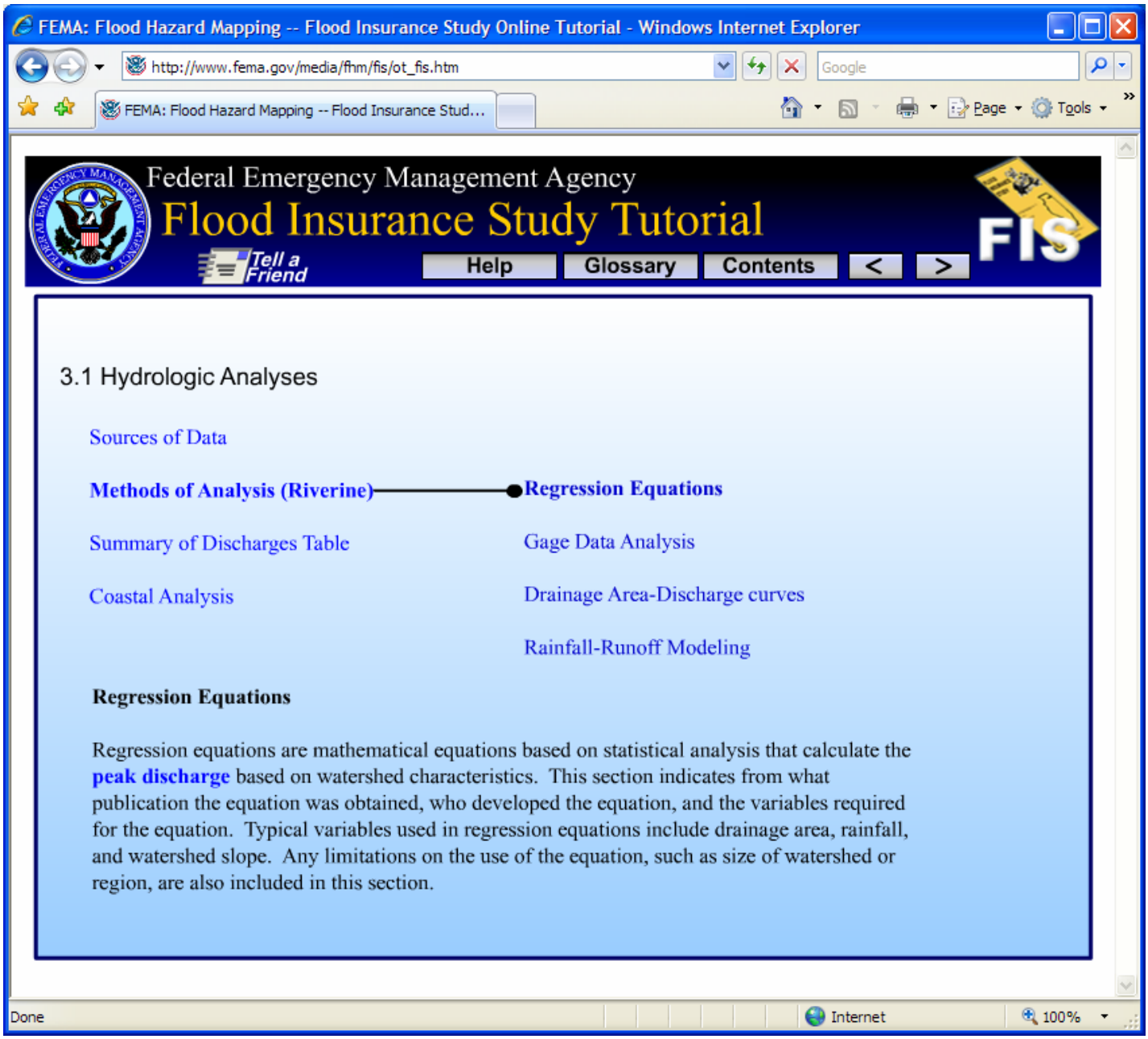
3.1 Hydrologic Analyses
Sources of Data
Methods of Analysis (Riverine)
Summary of Discharges Table
Coastal Analysis
Methods of Analysis (Riverine)
Detailed explanation of the methods used to determine the peak discharges for streams and why that methodology is appropriate for the watershed.Typical methodologies are:
Regression Equations
Gage Data Analysis
Drainage Area-Discharge curves
Rainfall-Runoff Modeling
Internet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3.1 Hydrologic Analyses
Sources of Data
Methods of Analysis (Riverine)
Regression Equations
Summary of Discharges Table
Gage Data Analysis
Coastal Analysis
Drainage Area-Discharge curves
Rainfall-Runoff Modeling
Regression Equations
Regression equations are mathematical equations based on statistical analysis that calculate the peak discharge based on watershed characteristics. This section indicates from what publication the equation was obtained, who developed the equation, and the variables required for the equation. Typical variables used in regression equations include drainage area, rainfall, and watershed slope. Any limitations on the use of the equation, such as size of watershed or region, are also included in this section.
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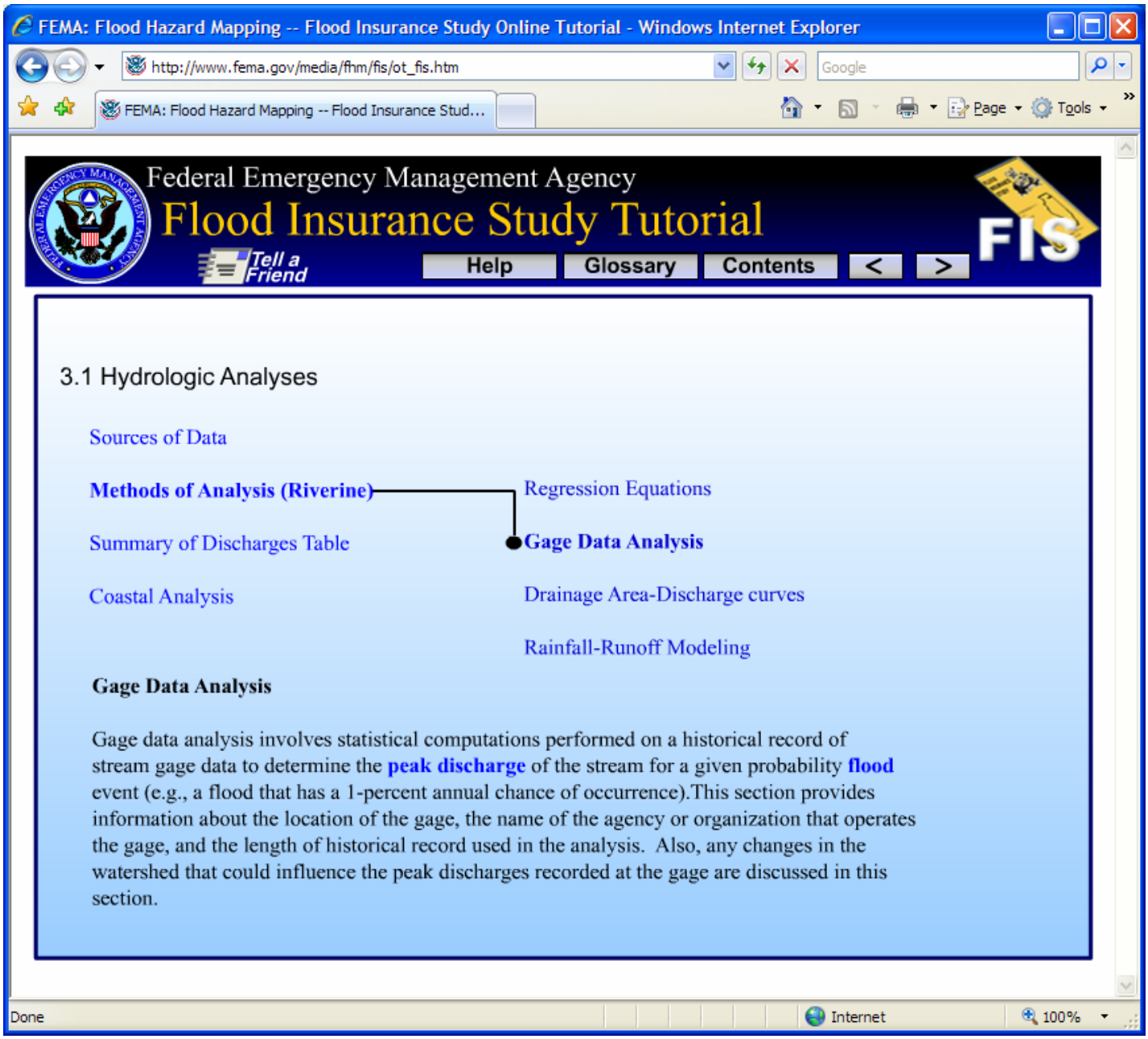
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Drainage Area-Discharge curves
Rainfall-Runoff Modeling
Gage Data Analysis
Gage data analysis involves statistical computations performed on a historical record of stream gage data to determine the peak discharge of the stream for a given probability flood event (e.g., a flood that has a 1-percent annual chance of occurrence).This section provides information about the location of the gage, the name of the agency or organization that operates the gage, and the length of historical record used in the analysis. Also, any changes in the watershed that could influence the peak discharges recorded at the gage are discussed in this section.
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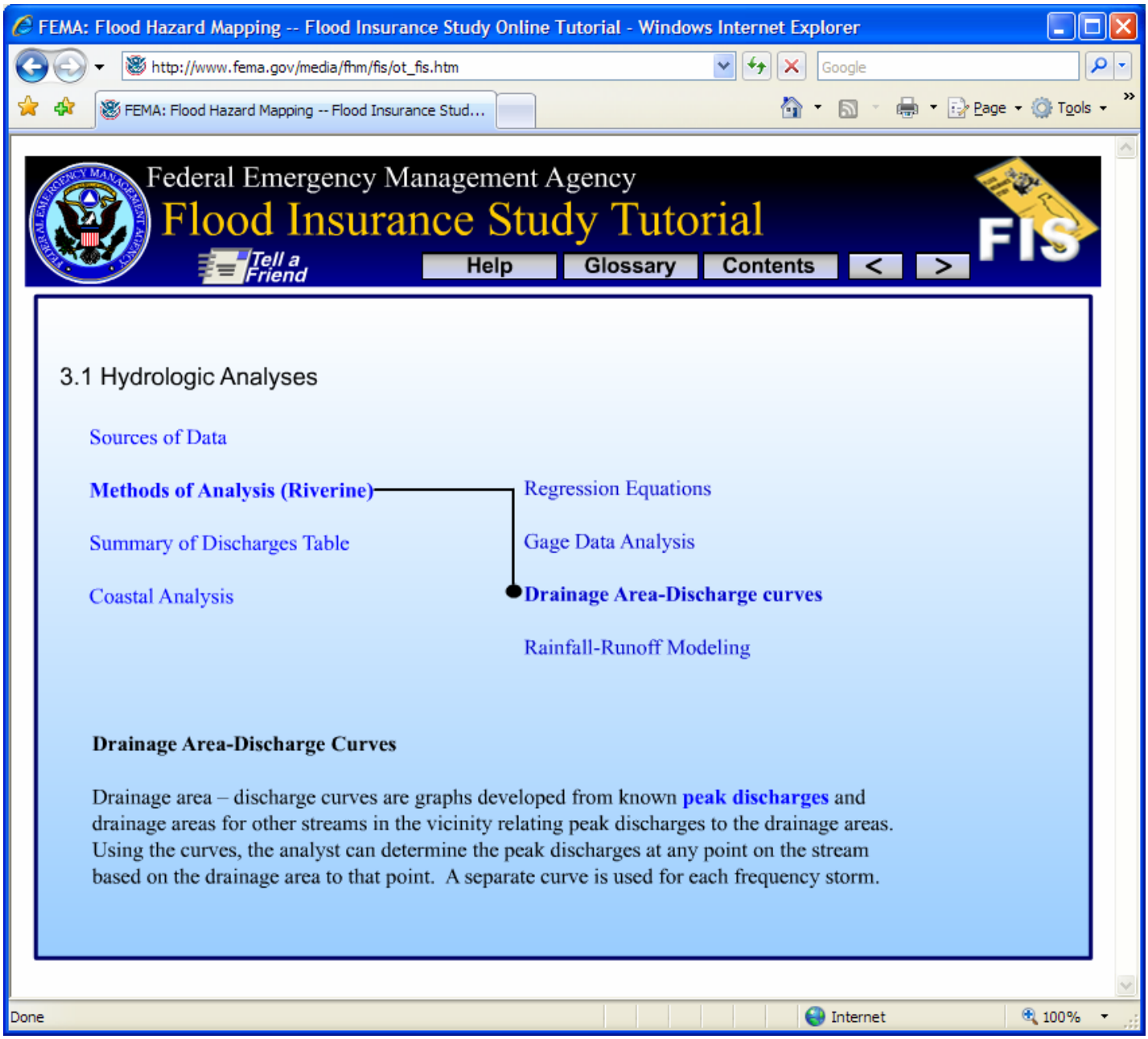
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Gage Data Analysis
Drainage Area-Discharge curves
Rainfall-Runoff Modeling
Drainage Area-Discharge Curves
Drainage area – discharge curves are graphs developed from known peak discharges and drainage areas for other streams in the vicinity relating peak discharges to the drainage areas. Using the curves, the analyst can determine the peak discharges at any point on the stream based on the drainage area to that point. A separate curve is used for each frequency storm.
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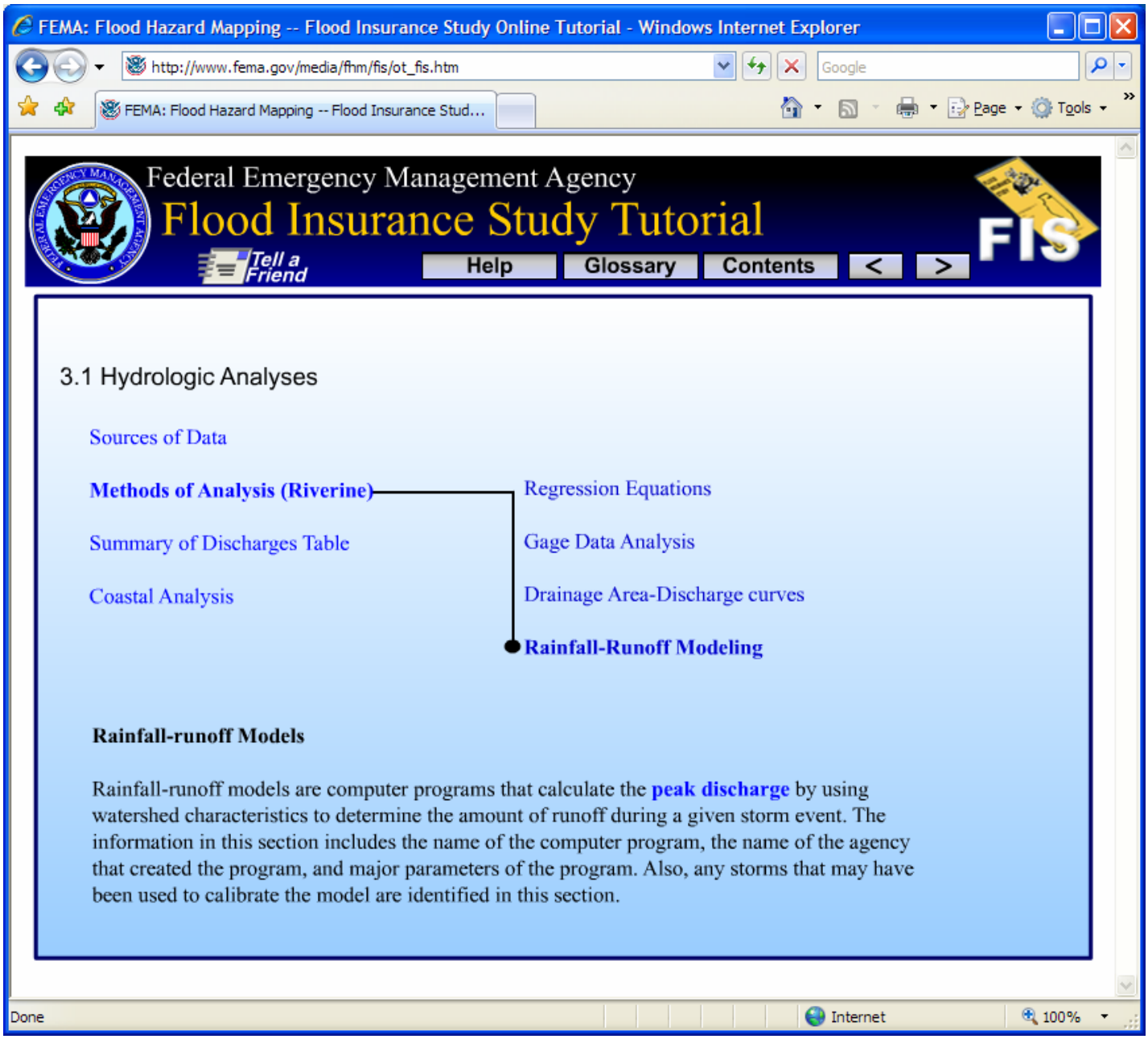
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3.1 Hydrologic Analyses
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Coastal Analysis
Drainage Area-Discharge curves
Rainfall-Runoff Modeling
Rainfall-runoff Models
Rainfall-runoff models are computer programs that calculate the peak discharge by using watershed characteristics to determine the amount of runoff during a given storm event. The information in this section includes the name of the computer program, the name of the agency that created the program, and major parameters of the program. Also, any storms that may have been used to calibrate the model are identified in this section.
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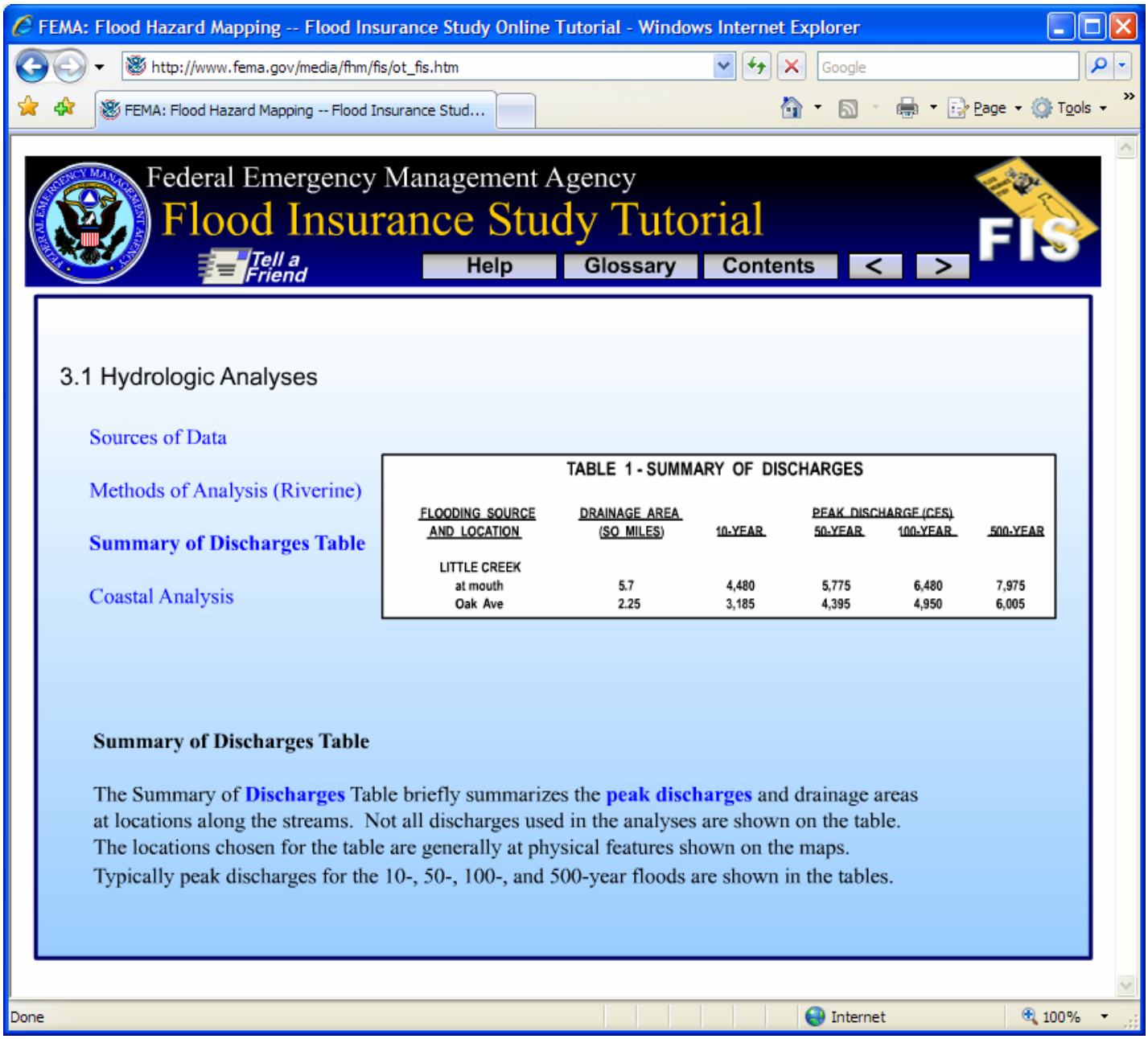
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3.1 Hydrologic Analyses
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Summary of Discharges Table
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TABLE 1 - SUMMARY OF DISCHARGES
FLOODING SOURCE AND LOCATION
DRAINAGE AREA (SQ MILES)
PEAK DISCHARGE (CFS)
10-YEAR
50-YEAR
100-YEAR
500-YEAR
LITTLE CREEK
at mouth 5.7 4,480 5,775 6,480 7,975
Oak Ave 2.25 3,185 4,395 4,950 6,005
Summary of Discharges Table
The Summary of Discharges Table briefly summarizes the peak discharges and drainage areas at locations along the streams. Not all discharges used in the analyses are shown on the table. The locations chosen for the table are generally at physical features shown on the maps. Typically peak discharges for the 10-, 50-, 100-, and 500-year floods are shown in the tables.
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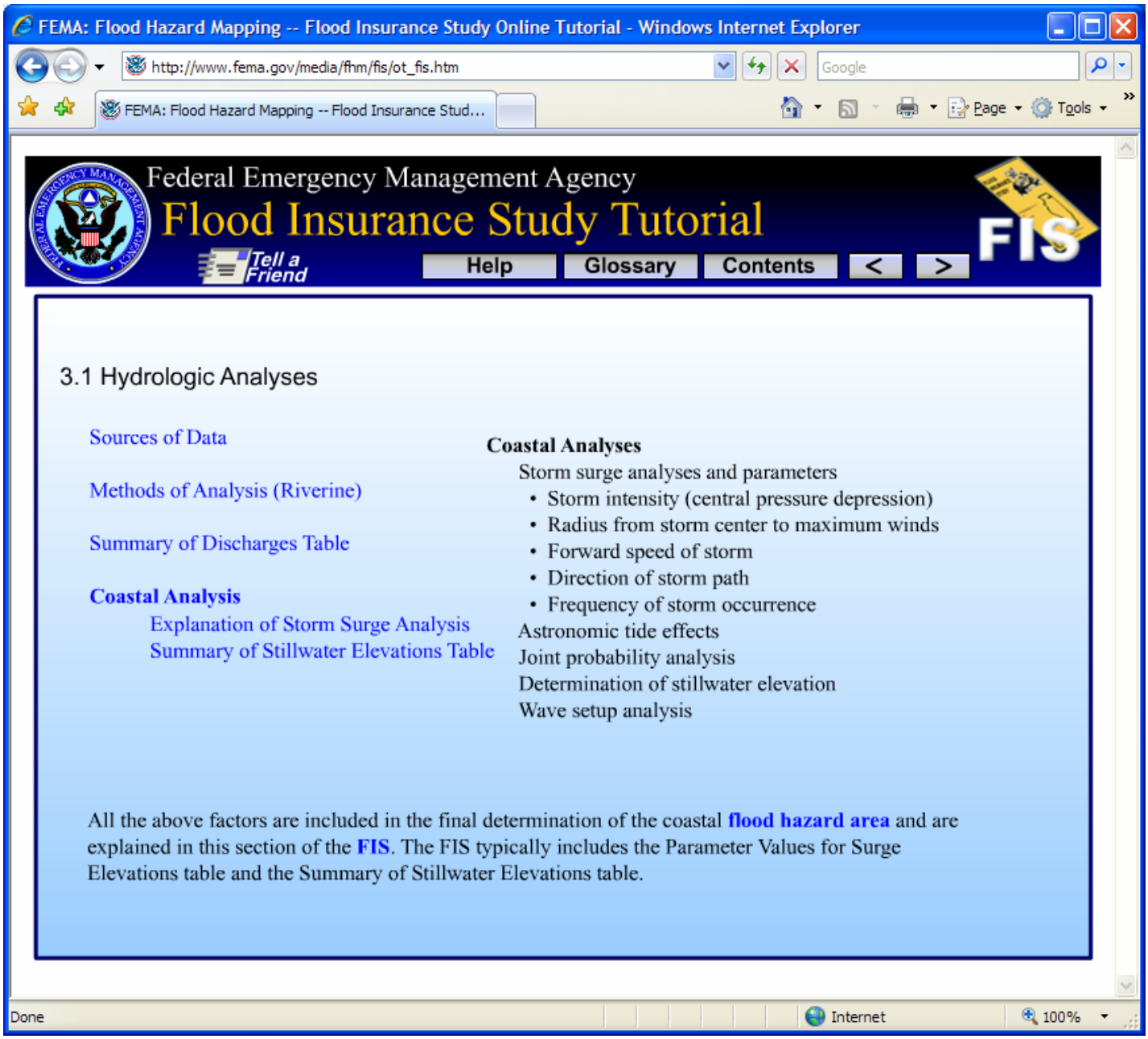
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Coastal Analysis
Explanation of Storm Surge Analysis
Summary of Stillwater Elevations Table
Coastal Analyses
Storm surge analyses and parameters
• Storm intensity (central pressure depression)
• Radius from storm center to maximum winds
• Forward speed of storm
• Direction of storm path
• Frequency of storm occurrence
Astronomic tide effects
Joint probability analysis
Determination of stillwater elevation
Wave setup analysis
All the above factors are included in the final determination of the coastal flood hazard area and are explained in this section of the FIS. The FIS typically includes the Parameter Values for Surge Elevations table and the Summary of Stillwater Elevations table.
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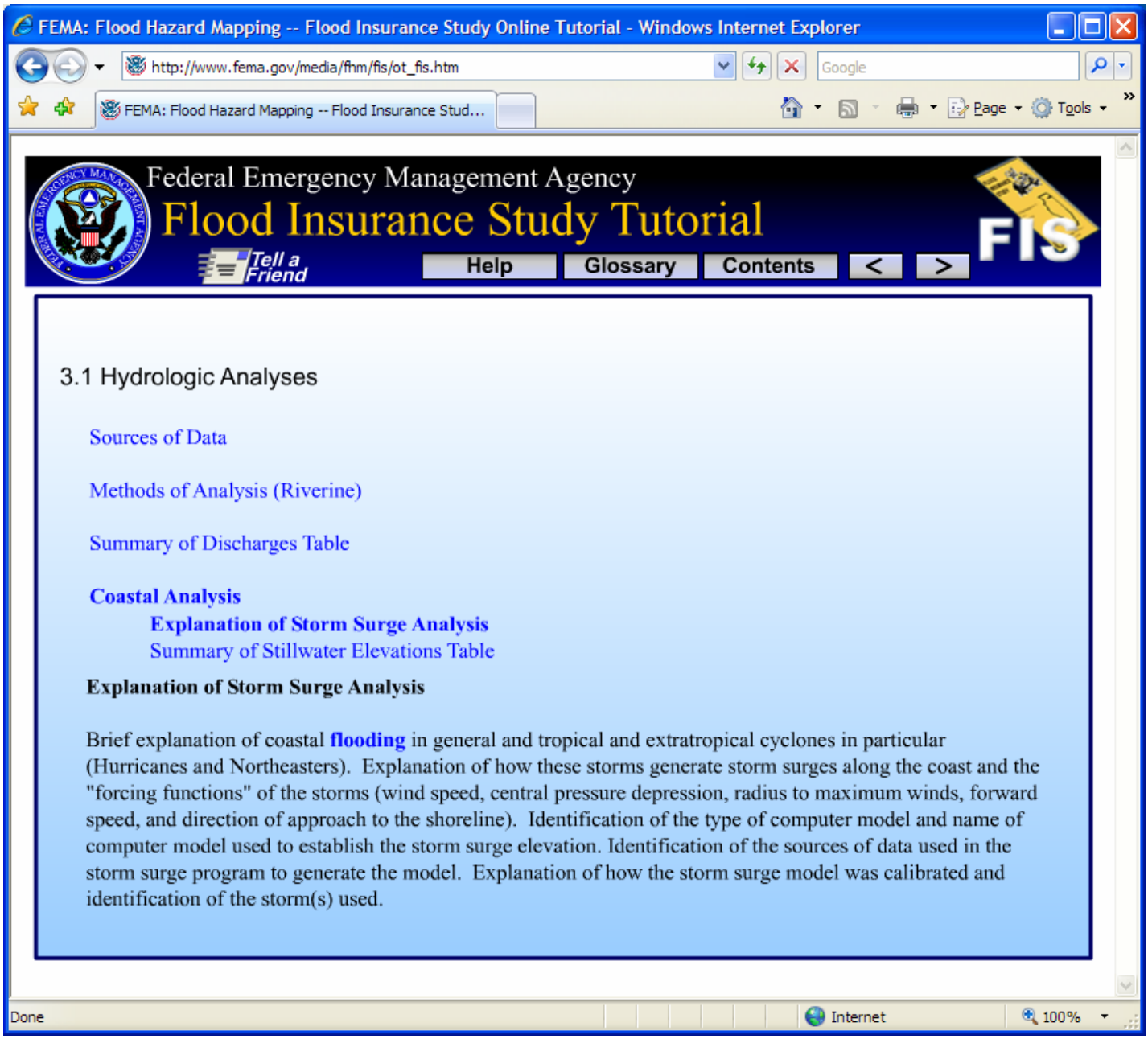
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Explanation of Storm Surge Analysis
Summary of Stillwater Elevations Table
Explanation of Storm Surge Analysis
Brief explanation of coastal flooding in general and tropical and extratropical cyclones in particular (Hurricanes and Northeasters). Explanation of how these storms generate storm surges along the coast and the "forcing functions" of the storms (wind speed, central pressure depression, radius to maximum winds, forward speed, and direction of approach to the shoreline). Identification of the type of computer model and name of computer model used to establish the storm surge elevation. Identification of the sources of data used in the storm surge program to generate the model. Explanation of how the storm surge model was calibrated and identification of the storm(s) used.
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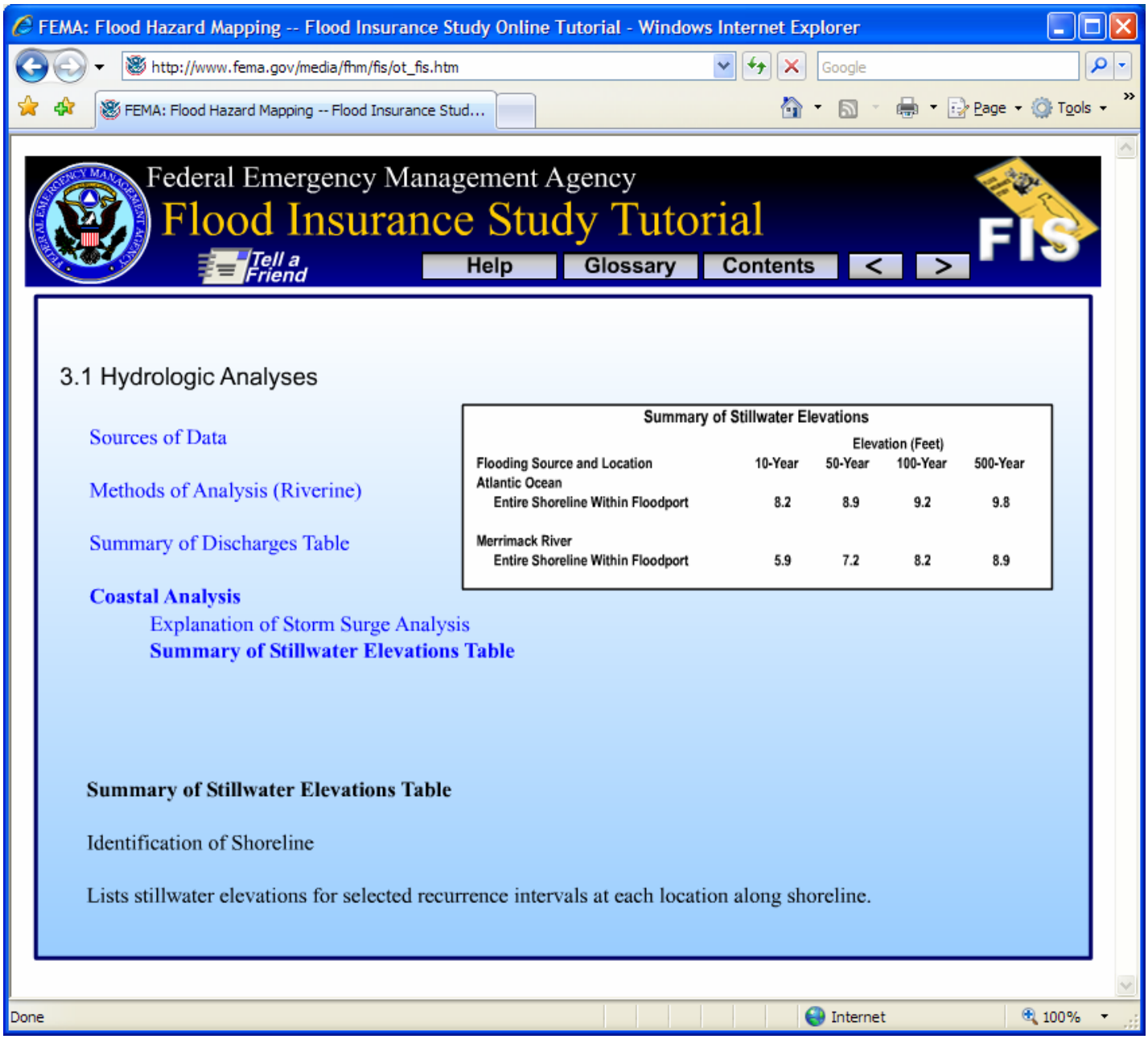
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Summary of Stillwater Elevations Table
Summary of Stillwater Elevations
Elevation (Feet)
Flooding Source and Location
10-Year
50-Year
100-Year
500-Year
Atlantic Ocean
Entire Shoreline Within Floodport
8.2
8.9
9.2
9.8
Merrimack River
Entire Shoreline Within Floodport
5.9
7.2
8.2
8.9
Summary of Stillwater Elevations Table
Identification of Shoreline
Lists stillwater elevations for selected recurrence intervals at each location along shoreline.
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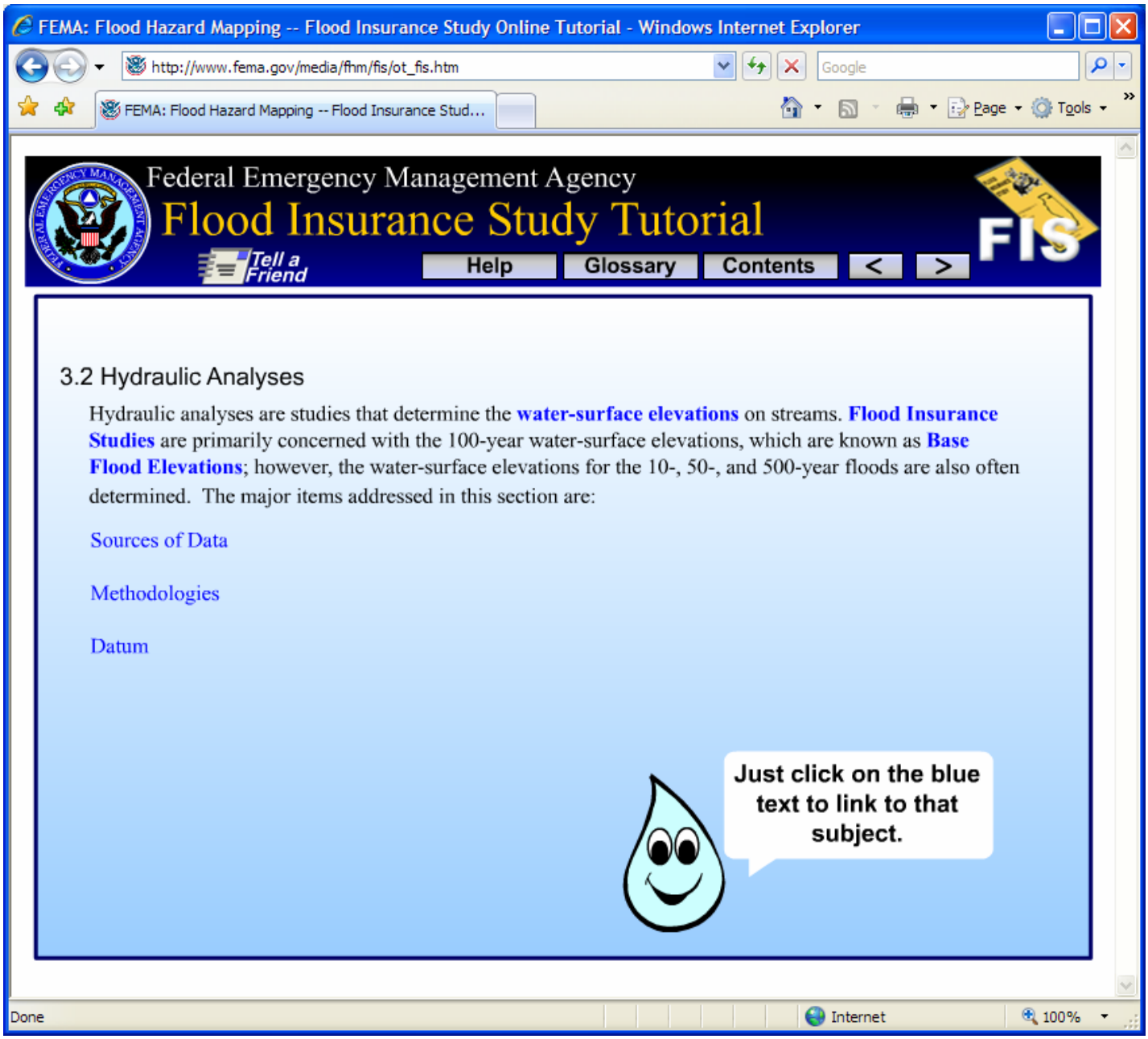
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3.2 Hydraulic Analyses
Hydraulic analyses are studies that determine the water-surface elevations on streams. Flood Insurance Studies are primarily concerned with the 100-year water-surface elevations, which are known as Base Flood Elevations; however, the water-surface elevations for the 10-, 50-, and 500-year floods are also often determined. The major items addressed in this section are:
Sources of Data
Methodologies
Datum
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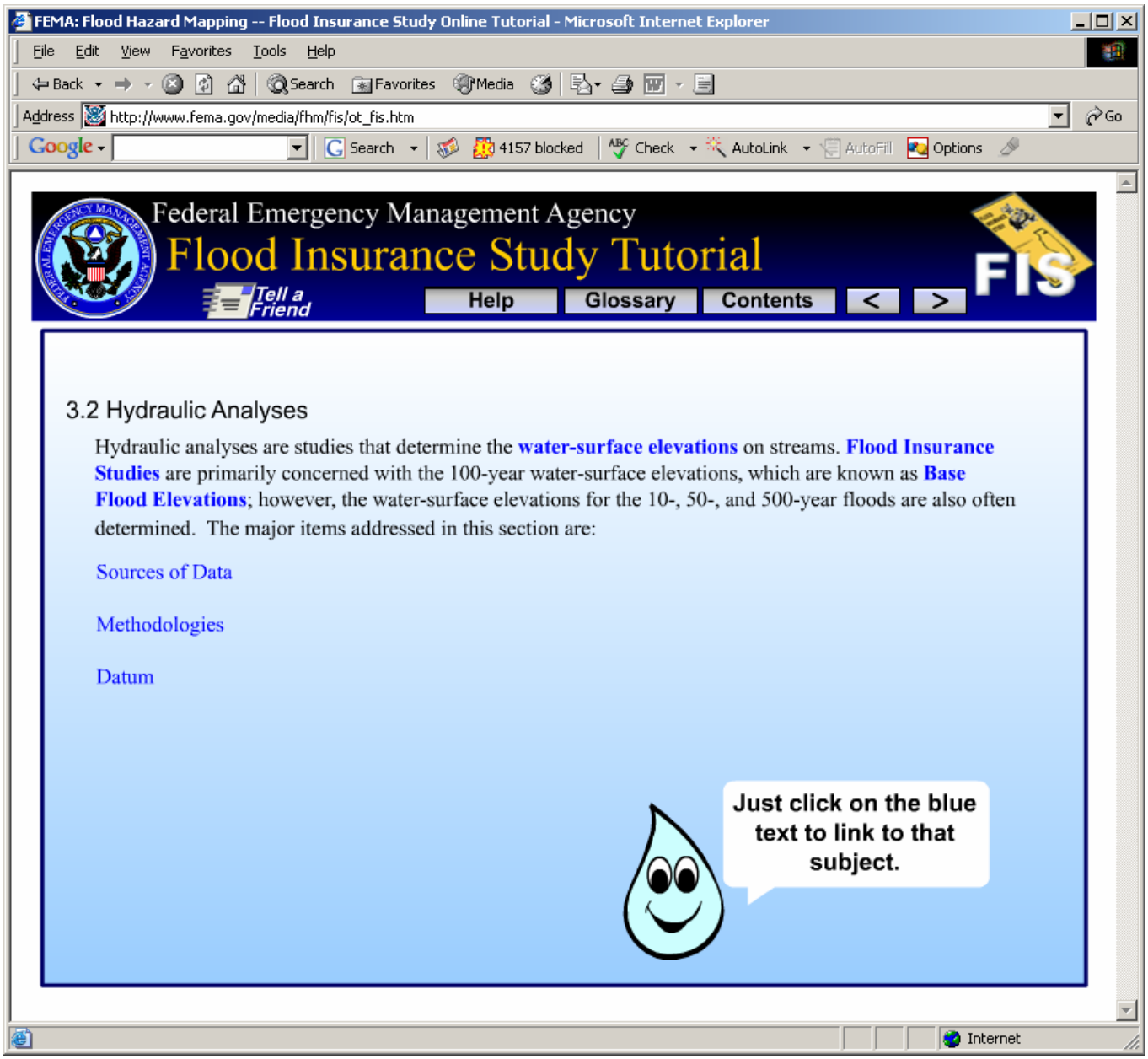
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Hydraulic analyses are studies that determine the water-surface elevations on streams. Flood Insurance Studies are primarily concerned with the 100-year water-surface elevations, which are known as Base Flood Elevations; however, the water-surface elevations for the 10-, 50-, and 500-year floods are also often determined. The major items addressed in this section are:
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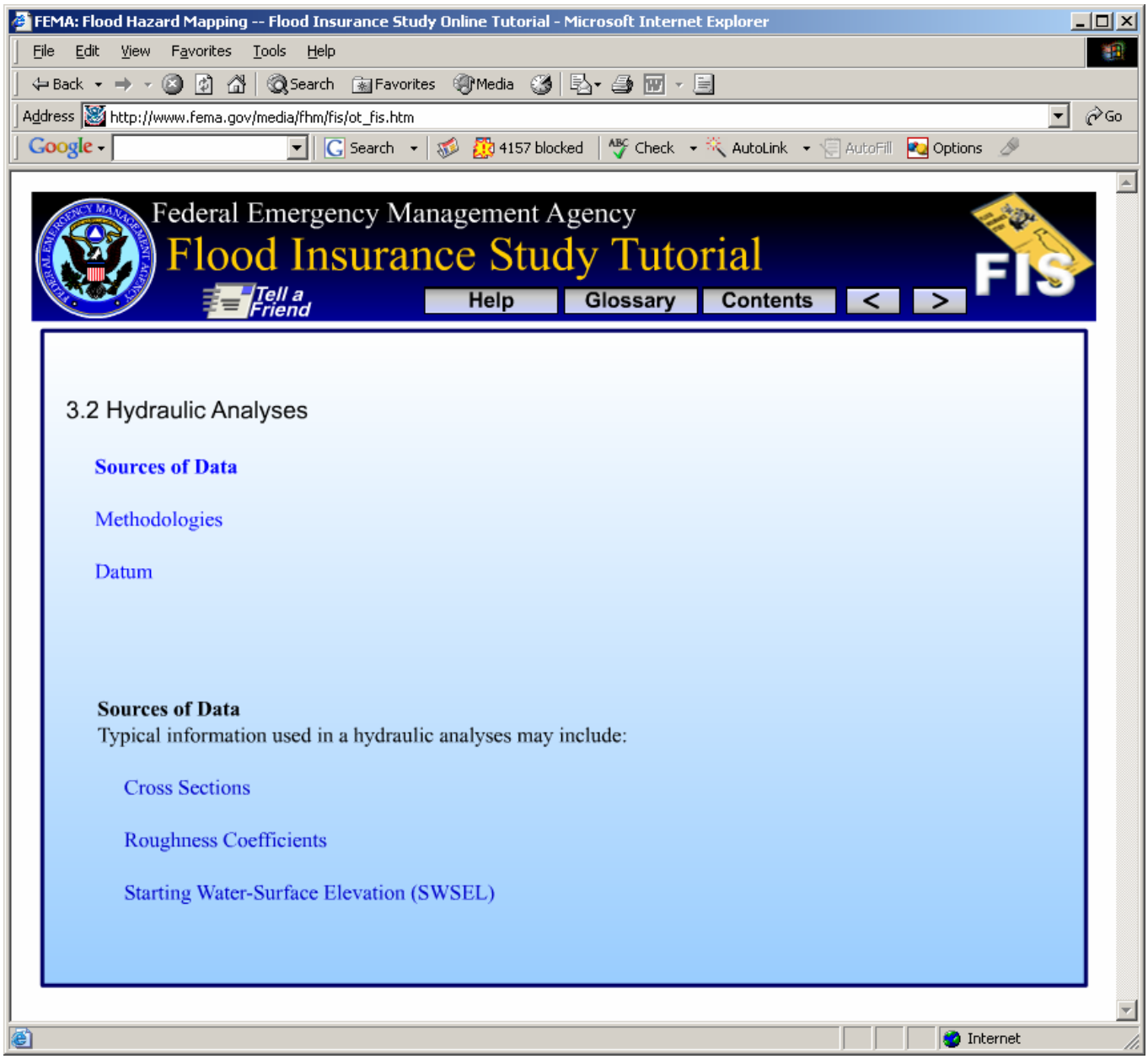
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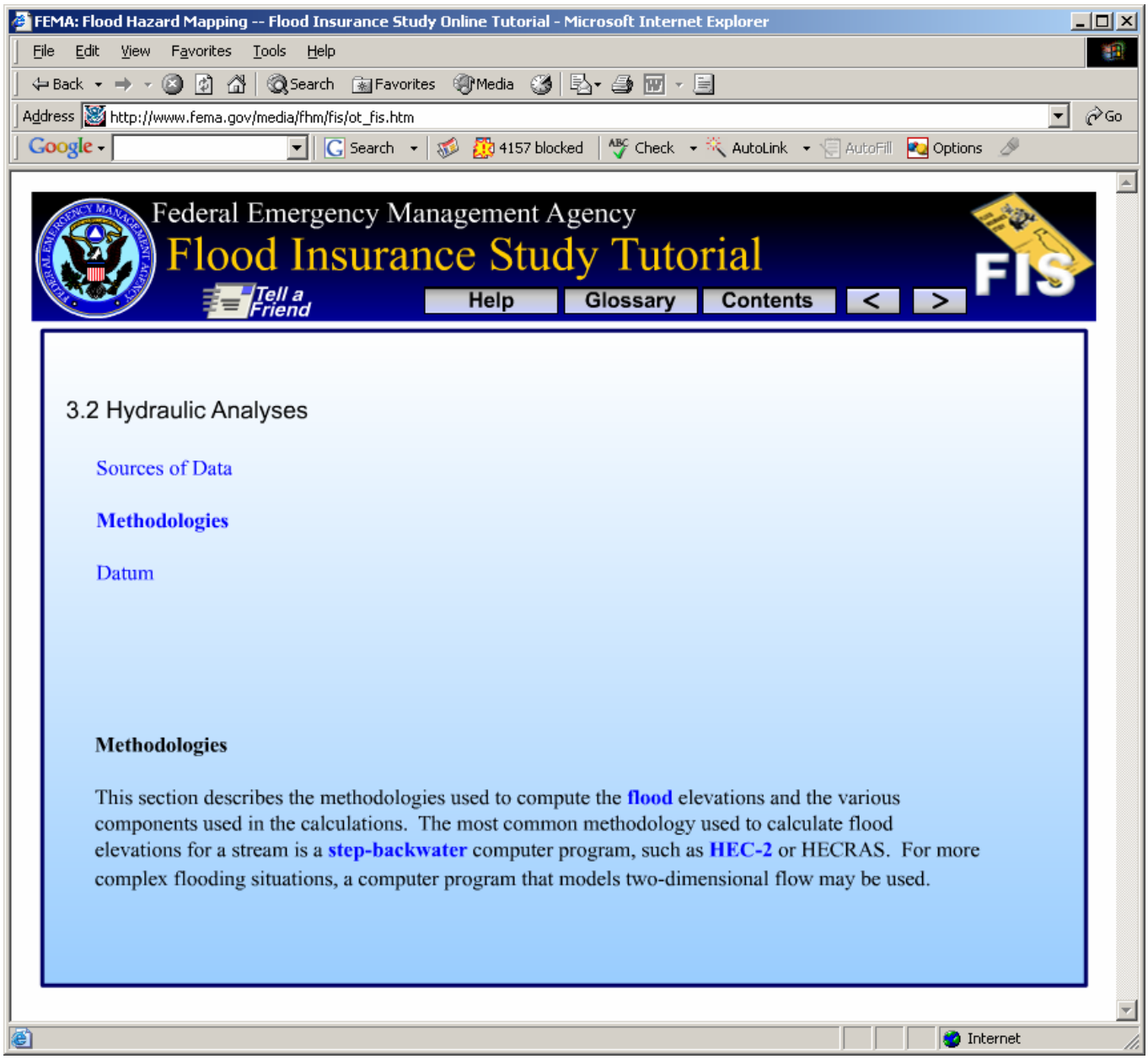
3.2 Hydraulic Analyses
Sources of Data
Methodologies
Datum
Sources of Data
Typical information used in a hydraulic analyses may include:
Cross Sections
Roughness Coefficients
Starting Water-Surface Elevation (SWSEL)
Internet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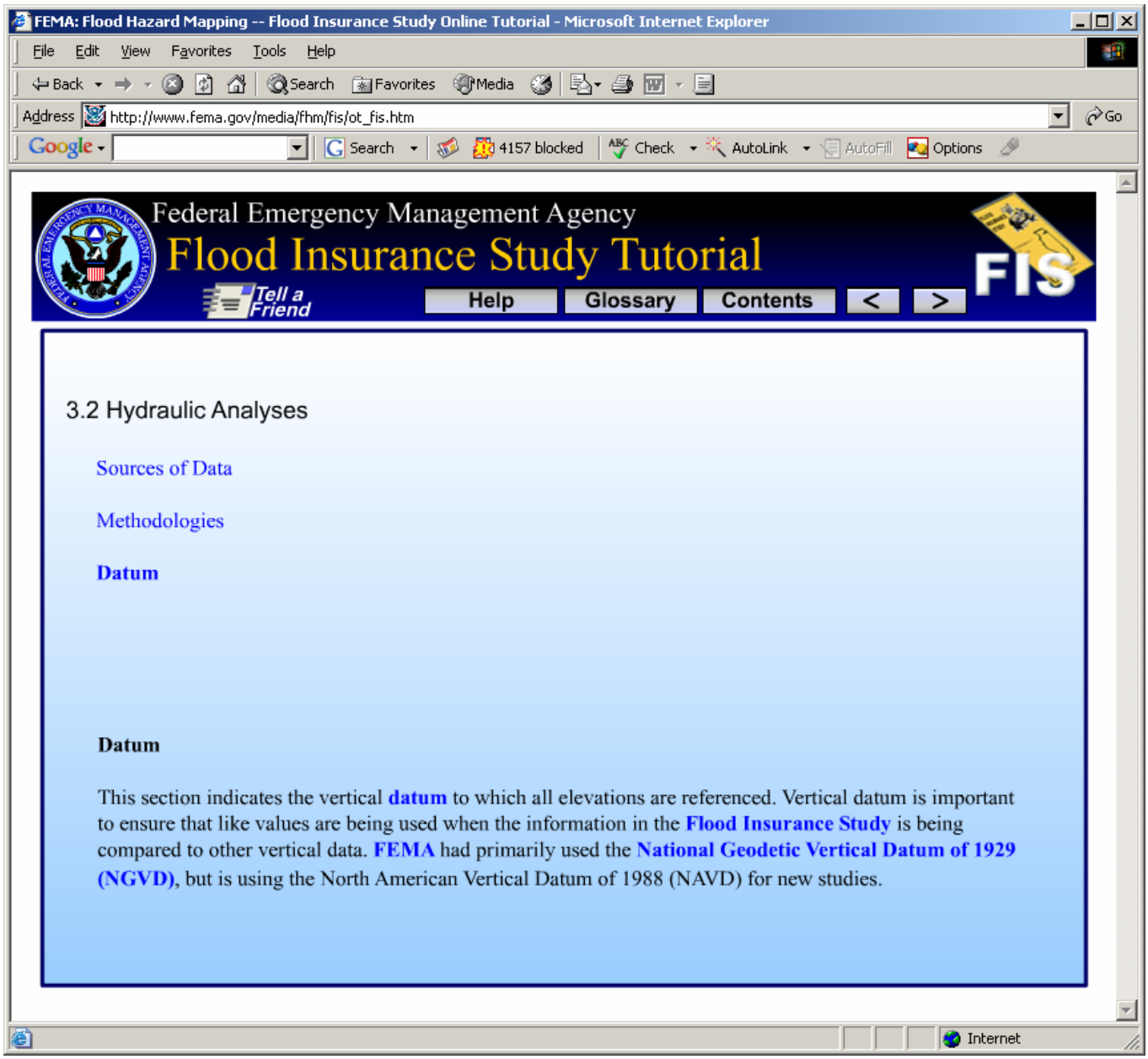
3.2 Hydraulic Analyses
Sources of Data
Methodologies
Datum
Methodologies
This section describes the methodologies used to compute the flood elevations and the various components used in the calculations. The most common methodology used to calculate flood elevations for a stream is a step-backwater computer program, such as HEC-2 or HECRAS. For more complex flooding situations, a computer program that models two-dimensional flow may be used.
Internet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3.2 Hydraulic Analyses
Sources of Data
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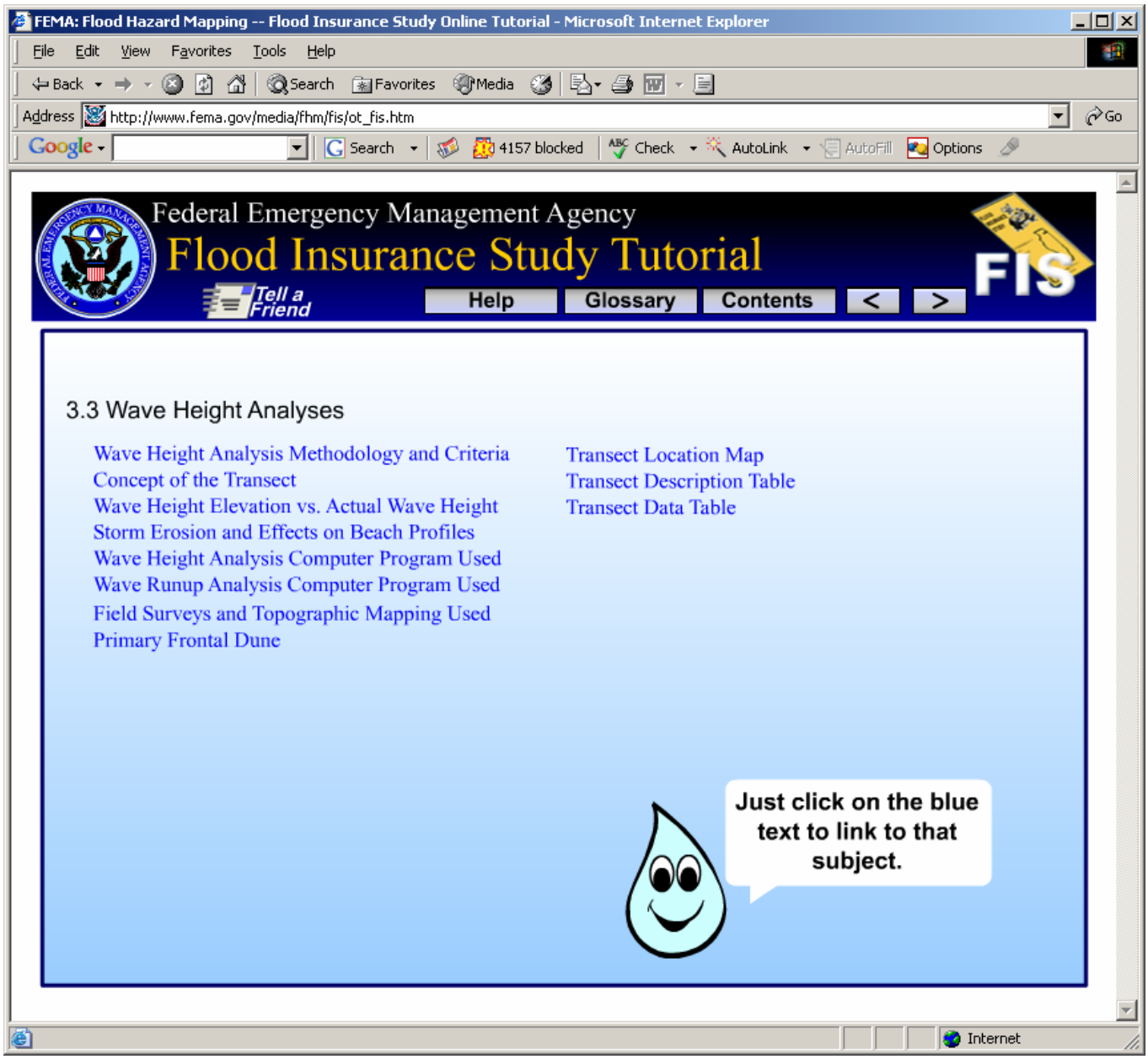
Datum
This section indicates the vertical datum to which all elevations are referenced. Vertical datum is important to ensure that like values are being used when the information in the Flood Insurance Study is being compared to other vertical data. FEMA had primarily used the National Geodetic Vertical Datum of 1929 (NGVD), but is using the North American Vertical Datum of 1988 (NAVD) for new studies.
Internet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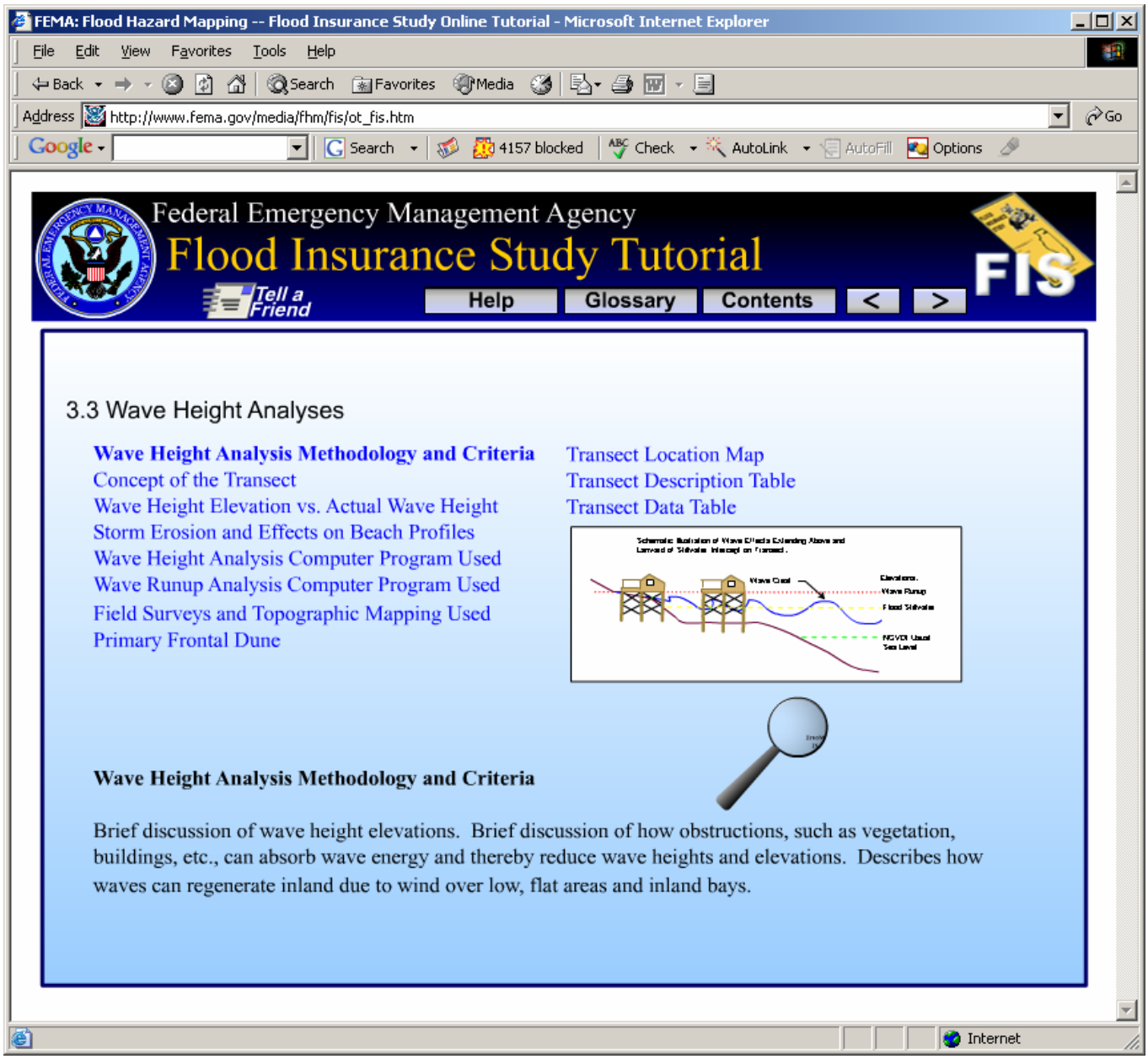
Wave Height Analysis Computer Program Used
Wave Runup Analysis Computer Program Used
Field Surveys and Topographic Mapping Used
Primary Frontal Dune
Transect Location Map
Transect Description Table
Transect Data Table
Just click on the blue text to link to that subject.
Internet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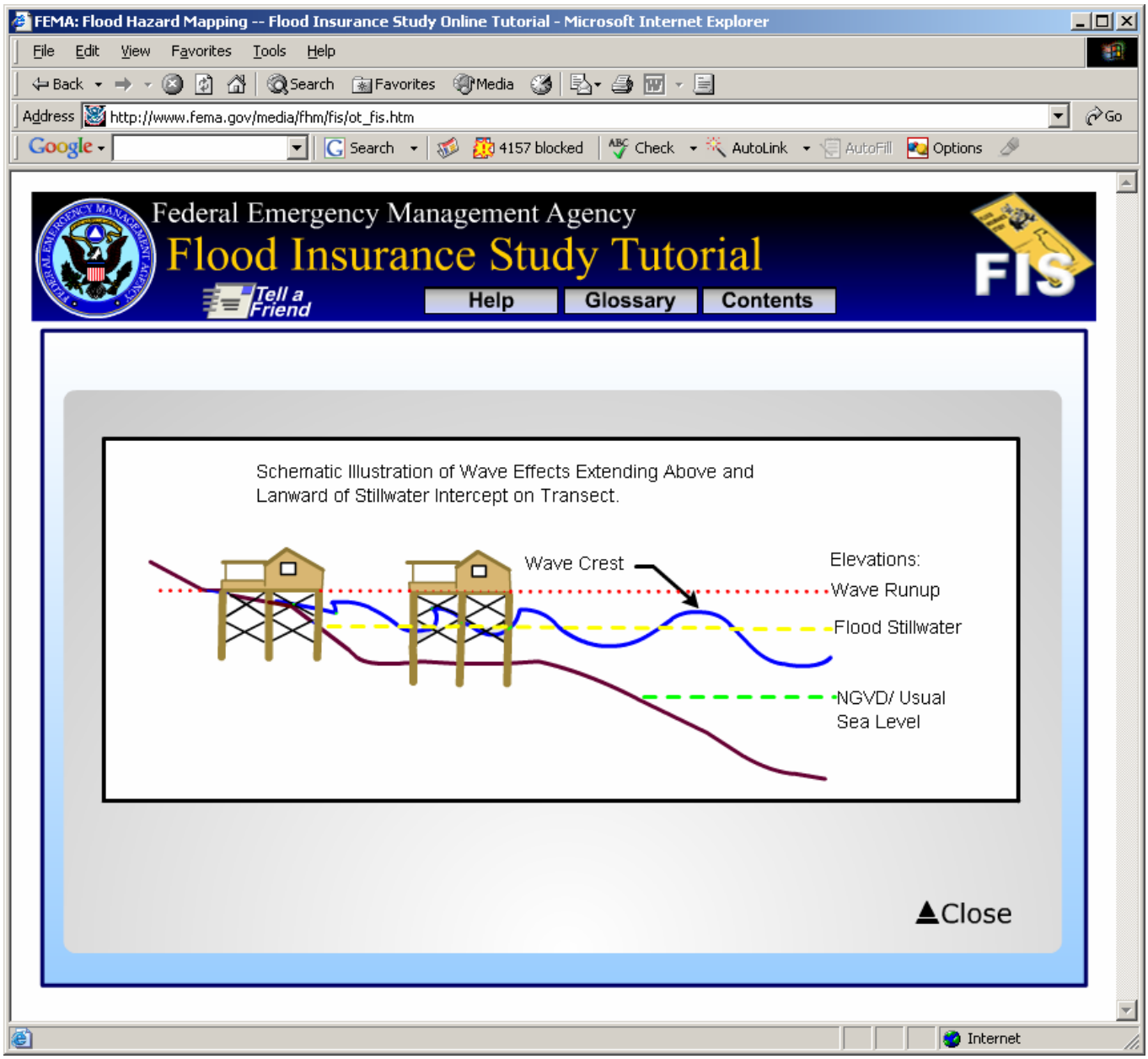
Transect Description Table
Transect Data Table
Wave Height Analysis Methodology and Criteria
Brief discussion of wave height elevations. Brief discussion of how obstructions, such as vegetation, buildings, etc., can absorb wave energy and thereby reduce wave heights and elevations. Describes how waves can regenerate inland due to wind over low, flat areas and inland bays.
Internet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Schematic Illustration of Wave Effects Extending Above and Lanward of Stillwater Intercept on Transect.
Wave Crest
Elevations:
Wave Runup
Flood Stillwater
NGVD/ Usual Sea Level
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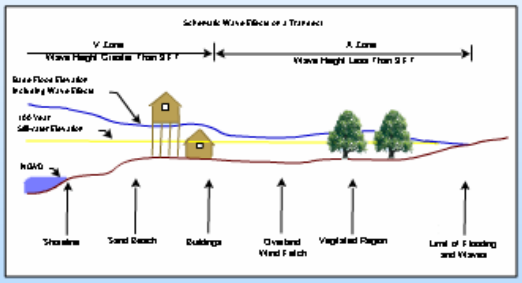
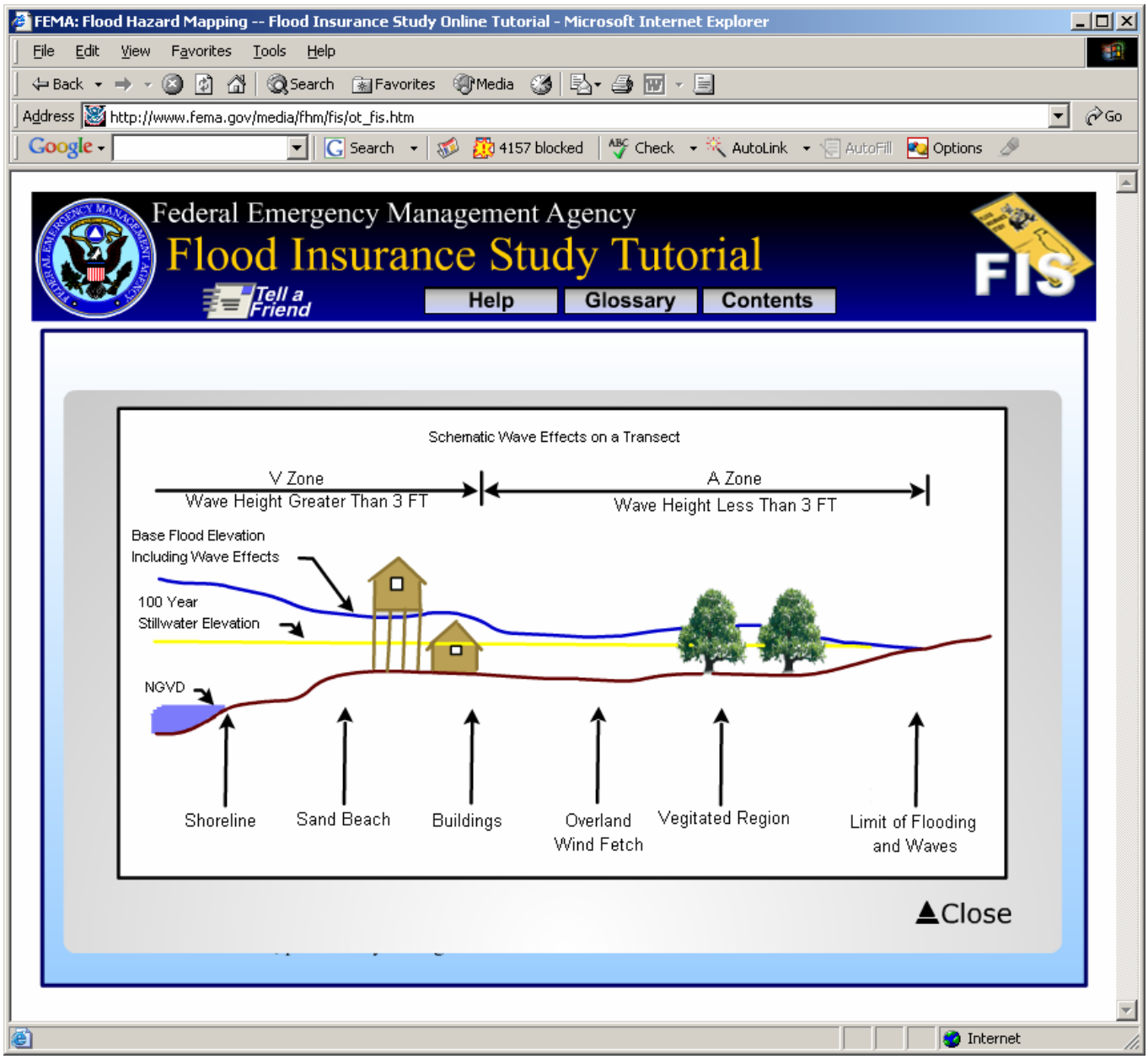
Transect Data Table



Concept of the Transect

Explains that the transect is a line perpendicular to the shoreline, similar to a **cross section**, that depicts beach elevations and obstructions. A transect represents a portion of a beach in which ground cover and ground elevations are similar, particularly during a storm event.

Internet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Base Flood Elevation
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Buildings
Overland
Wind Fetch
Vegitated Region
Limit of Flooding
and Waves
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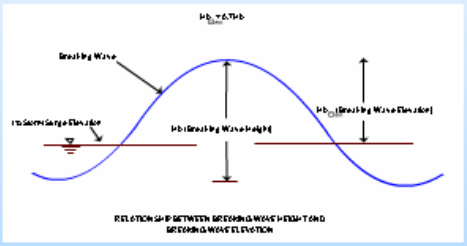
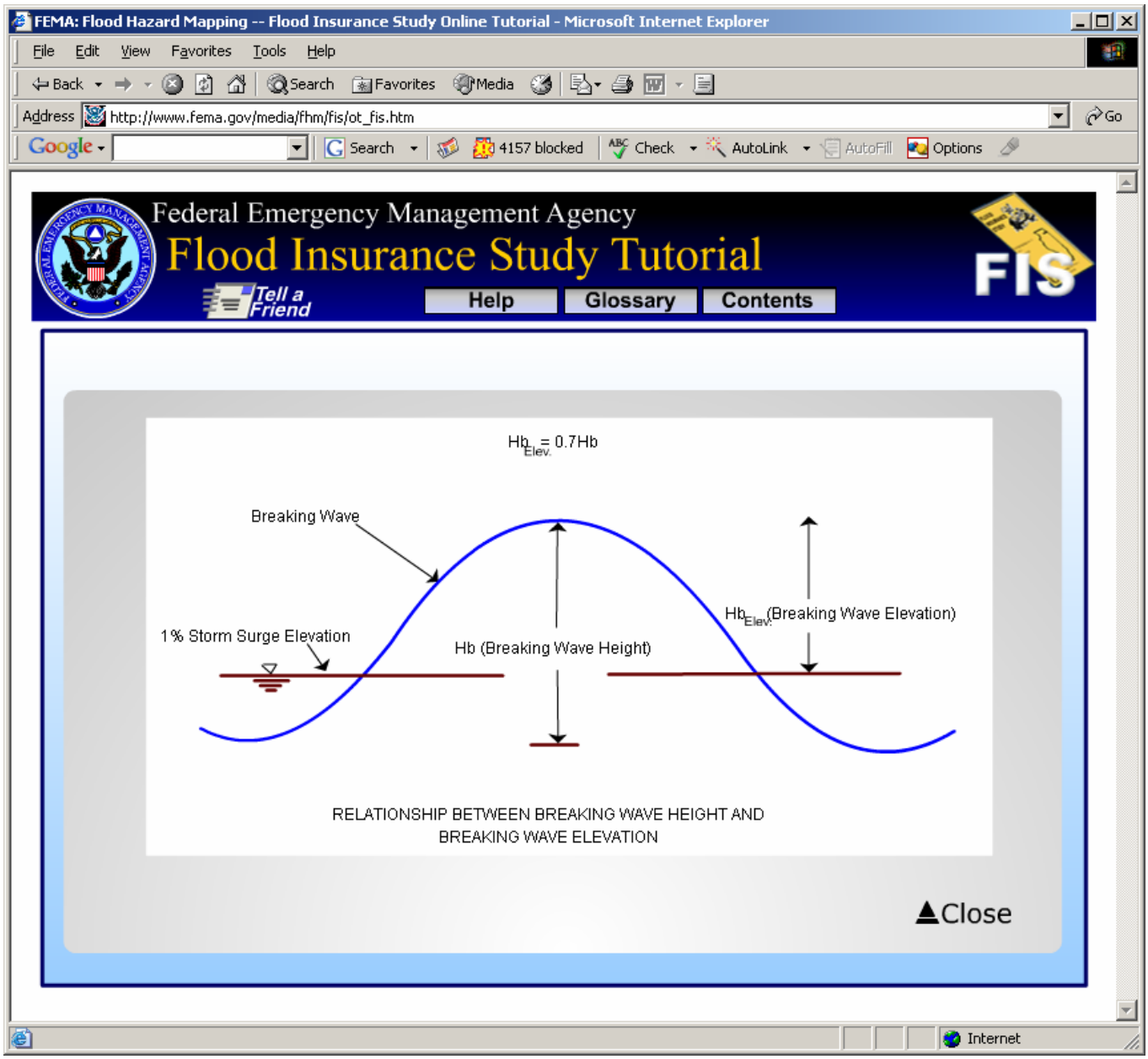
3.3 Wave Height Analyses



Wave Height Elevation vs. Actual Wave Height

Concept of the wave elevation being 70% of the wave total height.The total height of the wave is not added to the stillwater elevation, only the wave elevation.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Hb Elev. = 0.7Hb
Breaking Wave
1% Storm Surge Elevation
Hb (Breaking Wave Height)
Hb Elev. (Breaking Wave Elevation)
RELATIONSHIP BETWEEN BREAKING WAVE HEIGHT AND
BREAKING WAVE ELEVATION
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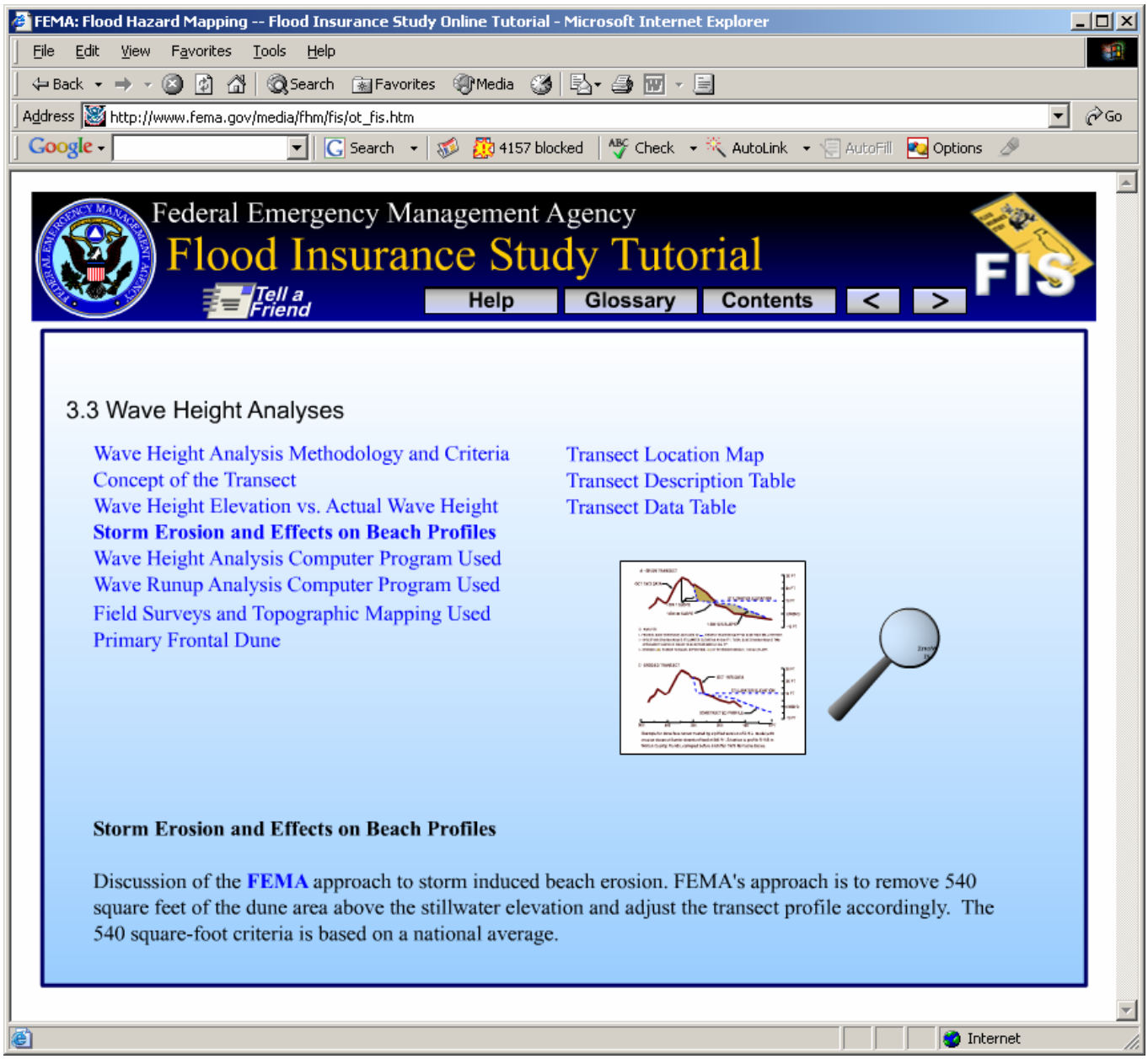
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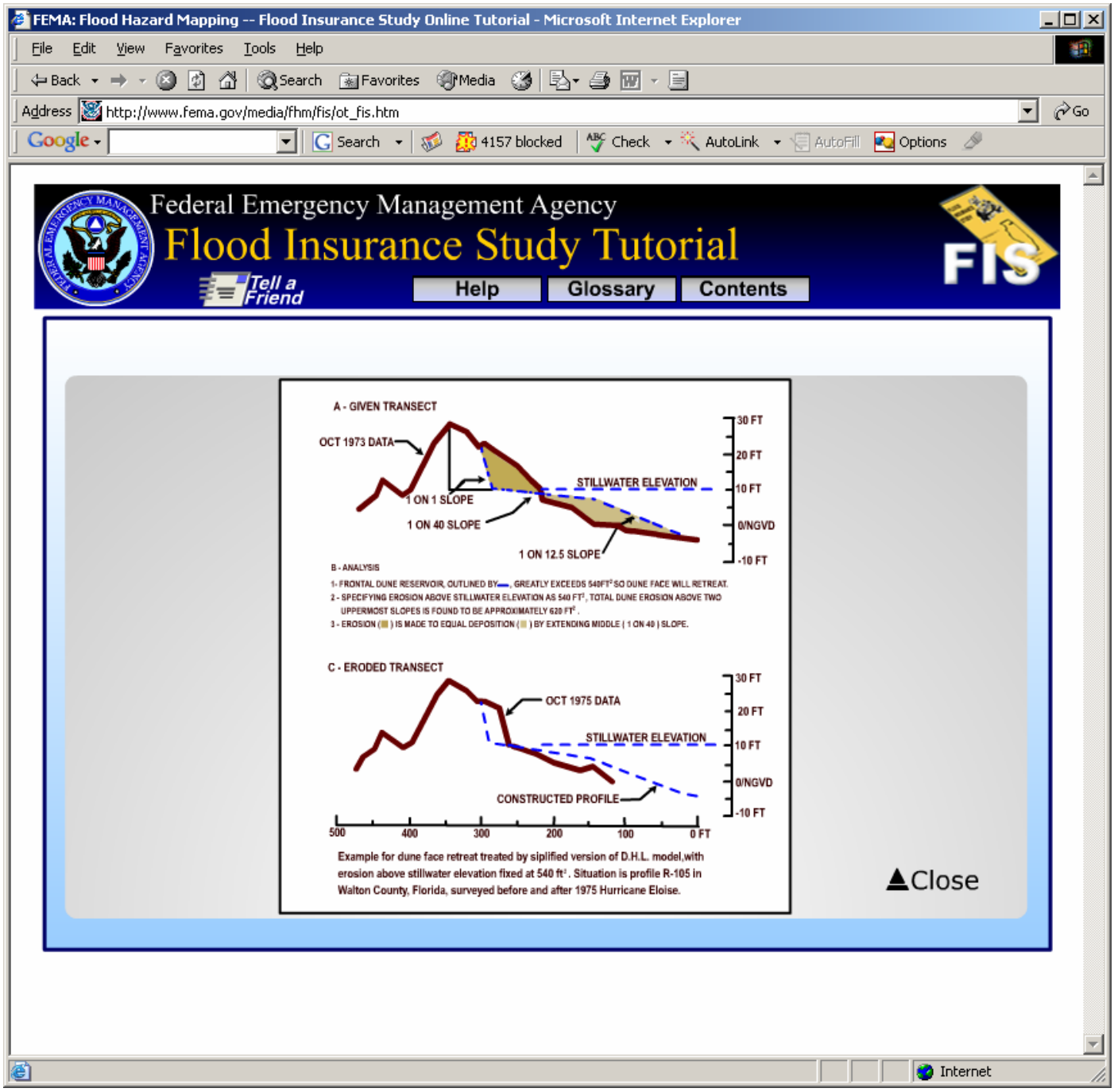
Storm Erosion and Effects on Beach Profiles
Discussion of the FEMA approach to storm induced beach erosion. FEMA's approach is to remove 540 square feet of the dune area above the stillwater elevation and adjust the transect profile accordingly. The 540 square-foot criteria is based on a national average.
Internet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A - GIVEN TRANSECT
OCT 1973 DATA
1 ON 1 SLOPE
1 ON 40 SLOPE
1 ON 12.5 SLOPE
STILLWATER ELEVATION
30 FT
20 FT
10 FT
0/NGVD
-10 FT
B - ANALYSIS
1- FRONTAL DUNE RESERVOIR, OUTLINED BY, GREATLY EXCEEDS 540FT² SO DUNE FACE WILL RETREAT.
2 - SPECIFYING EROSION ABOVE STILLWATER ELEVATION AS 540 FT², TOTAL DUNE EROSION ABOVE TWO UPPERMOST SLOPES IS FOUND TO BE APPROXIMATELY 620 FT².
3 - EROSION ( ) IS MADE TO EQUAL DEPOSITION ( ) BY EXTENDING MIDDLE (1 ON 40) SLOPE.
C - ERODED TRANSECT
OCT 1975 DATA
STILLWATER ELEVATION
CONSTRUCTED PROFILE
30 FT
20 FT
10 FT
0/NGVD
-10 FT
500
400
300
200
100
0 FT
Example for dune face retreat treated by siplified version of D.H.L. model,with erosion above stillwater elevation fixed at 540 ft². Situation is profile R-105 in Walton County, Florida, surveyed before and after 1975 Hurricane Eloise.
Close
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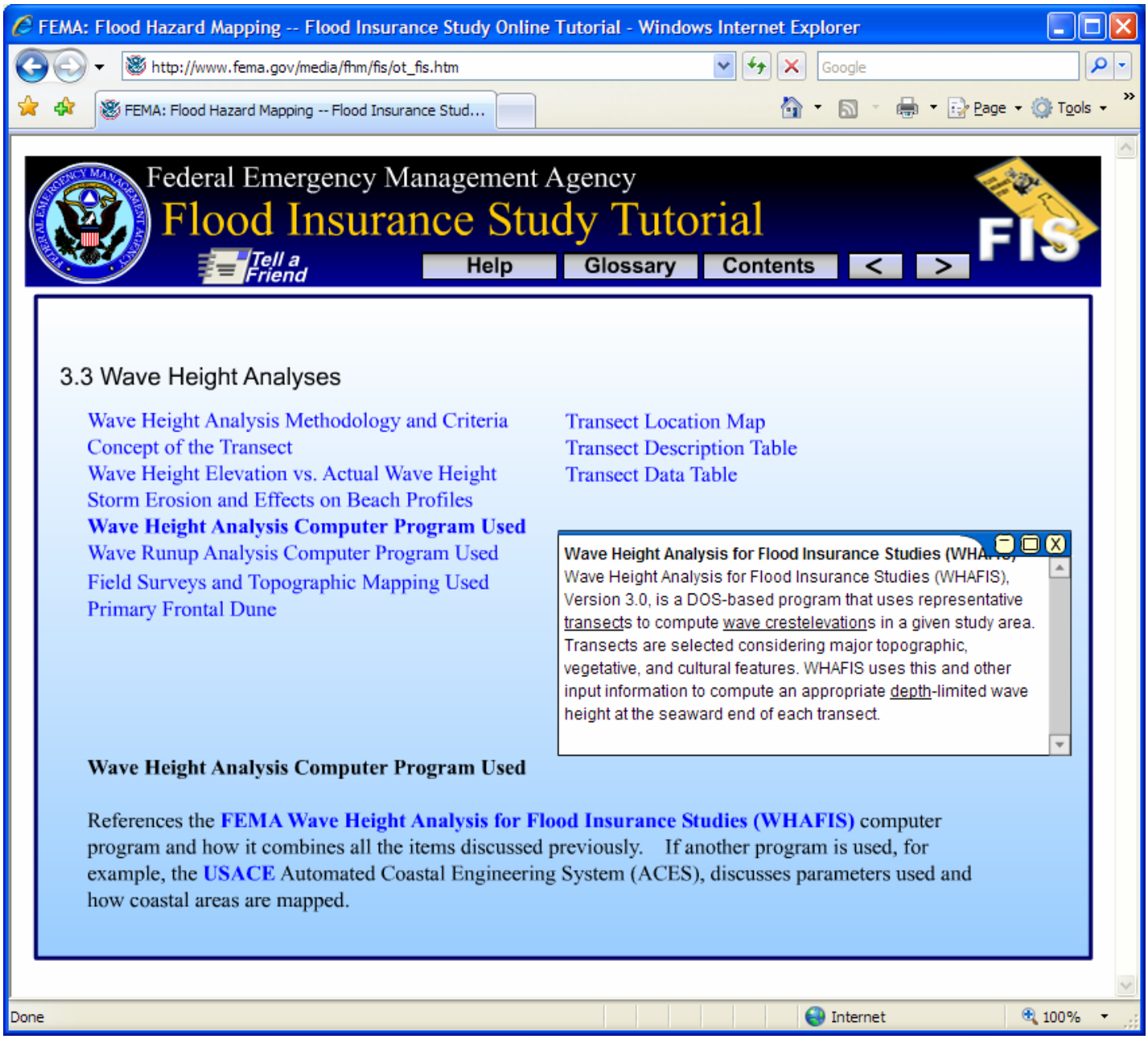
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Wave Height Analysis for Flood Insurance Studies (WHAFIS)
Wave Height Analysis for Flood Insurance Studies (WHAFIS), Version 3.0, is a DOS-based program that uses representative transects to compute wave crestelevations in a given study area. Transects are selected considering major topographic, vegetative, and cultural features. WHAFIS uses this and other input information to compute an appropriate depth-limited wave height at the seaward end of each transect.
Wave Height Analysis Computer Program Used
References the FEMA Wave Height Analysis for Flood Insurance Studies (WHAFIS) computer program and how it combines all the items discussed previously. If another program is used, for example, the USACE Automated Coastal Engineering System (ACES), discusses parameters used and how coastal areas are mapped.
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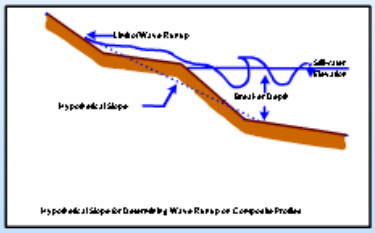
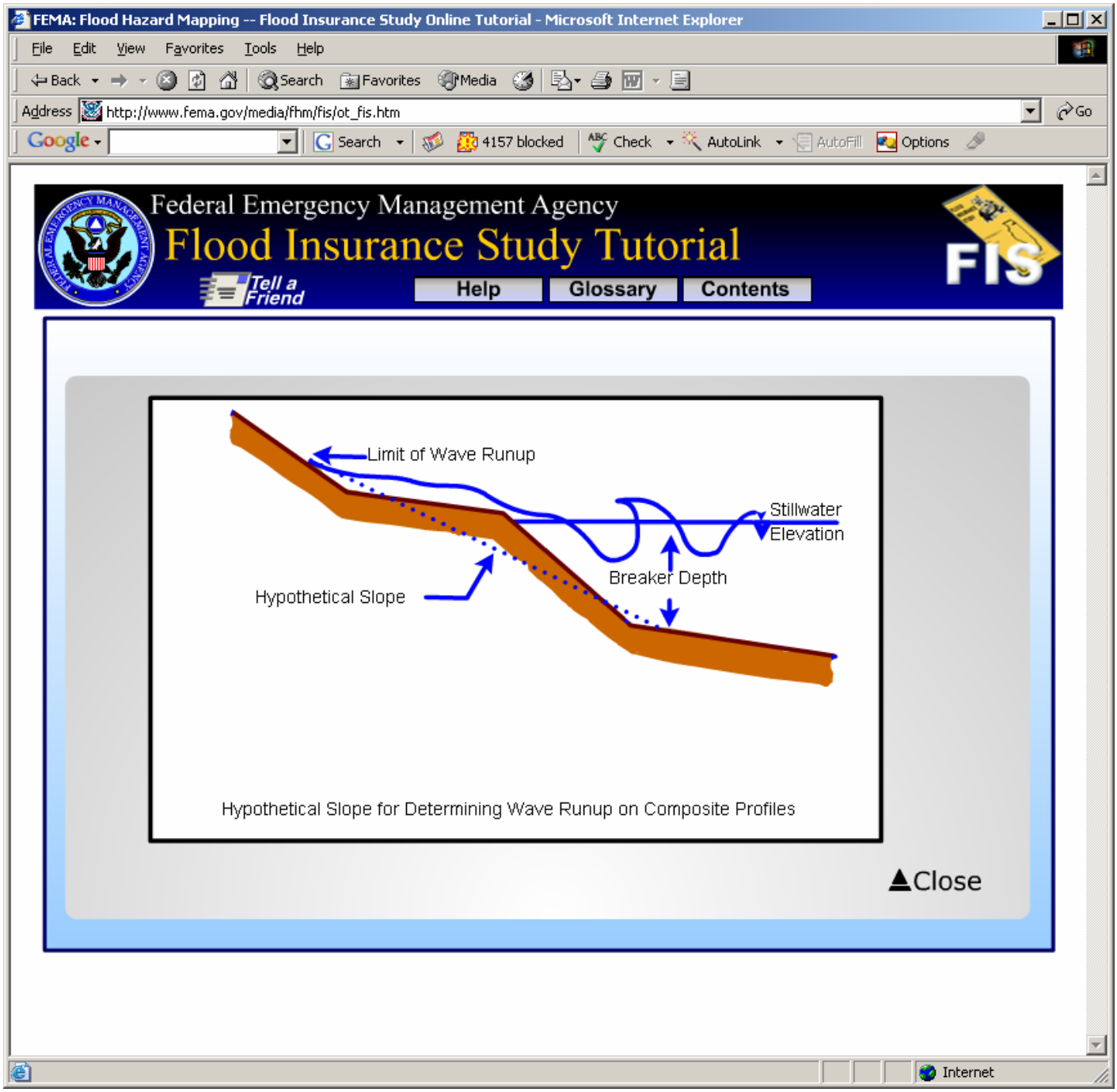


Wave Runup Analysis Computer Program Used

Concept of wave runup and conditions (e.g.,abrupt beach slope or bluff) where wave runup can occur. Identifies and describes wave runup program used and how results were incorporated into the **base flood elevations**.

Internet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Stillwater Elevation
Breaker Depth
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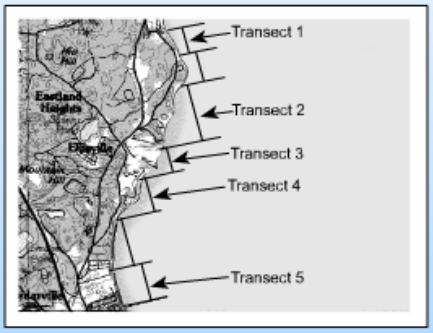
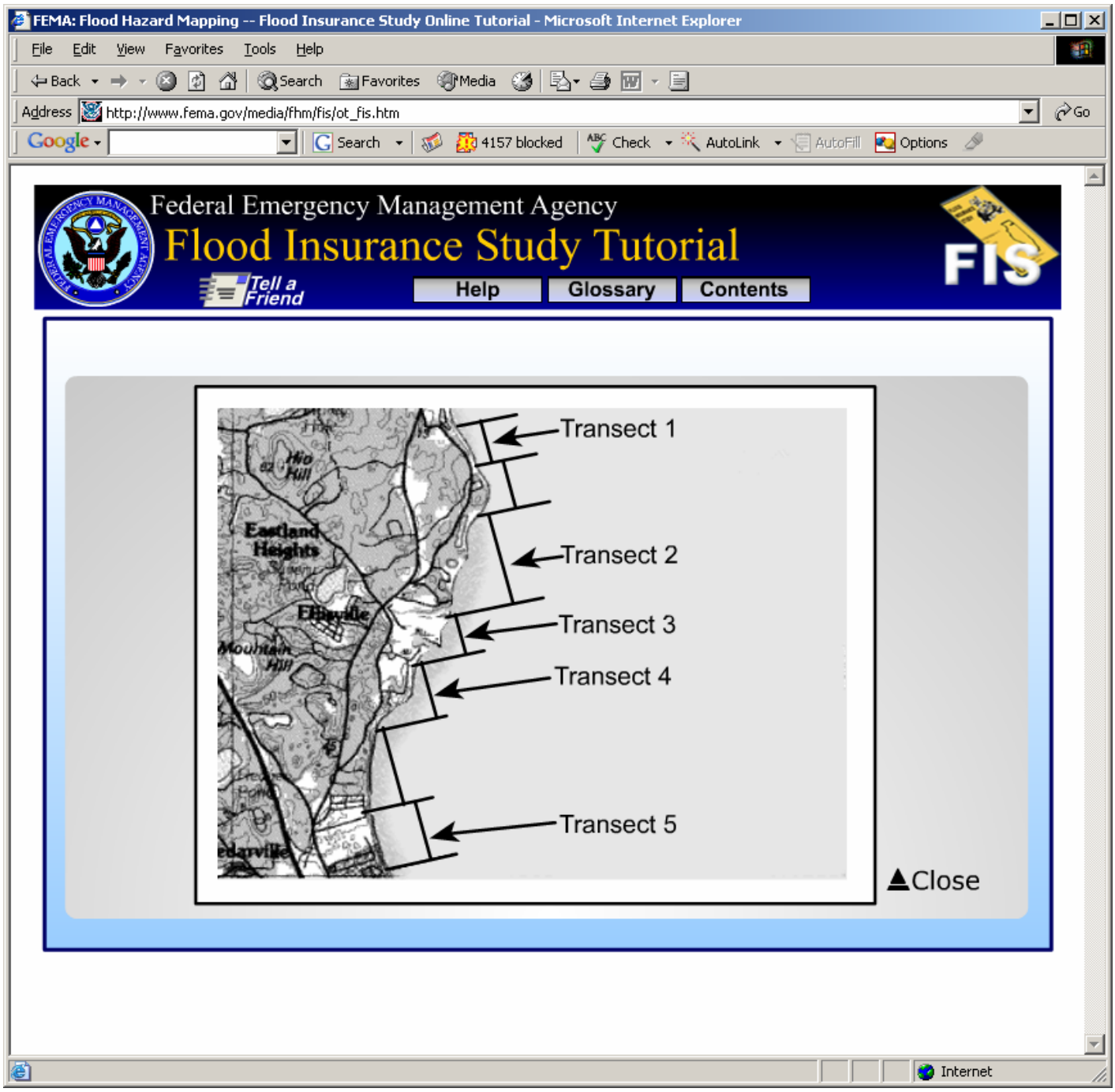


Field Surveys and Topographic Mapping Used

Identifies maps used to delineate the **flood zones** and the date transects were surveyed.

Internet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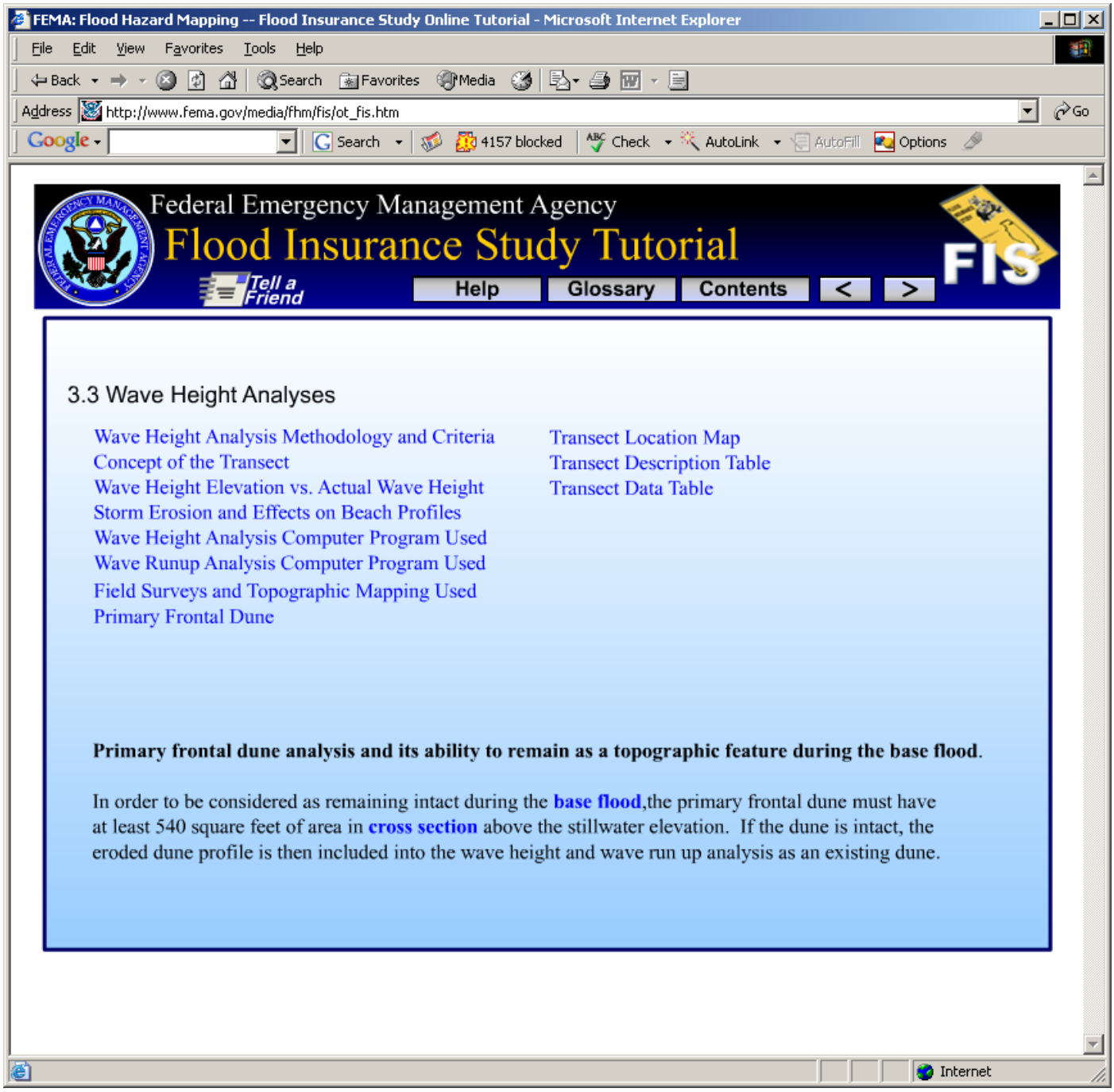
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Primary frontal dune analysis and its ability to remain as a topographic feature during the base flood.
In order to be considered as remaining intact during the base flood,the primary frontal dune must have at least 540 square feet of area in cross section above the stillwater elevation. If the dune is intact, the eroded dune profile is then included into the wave height and wave run up analysis as an existing dune.
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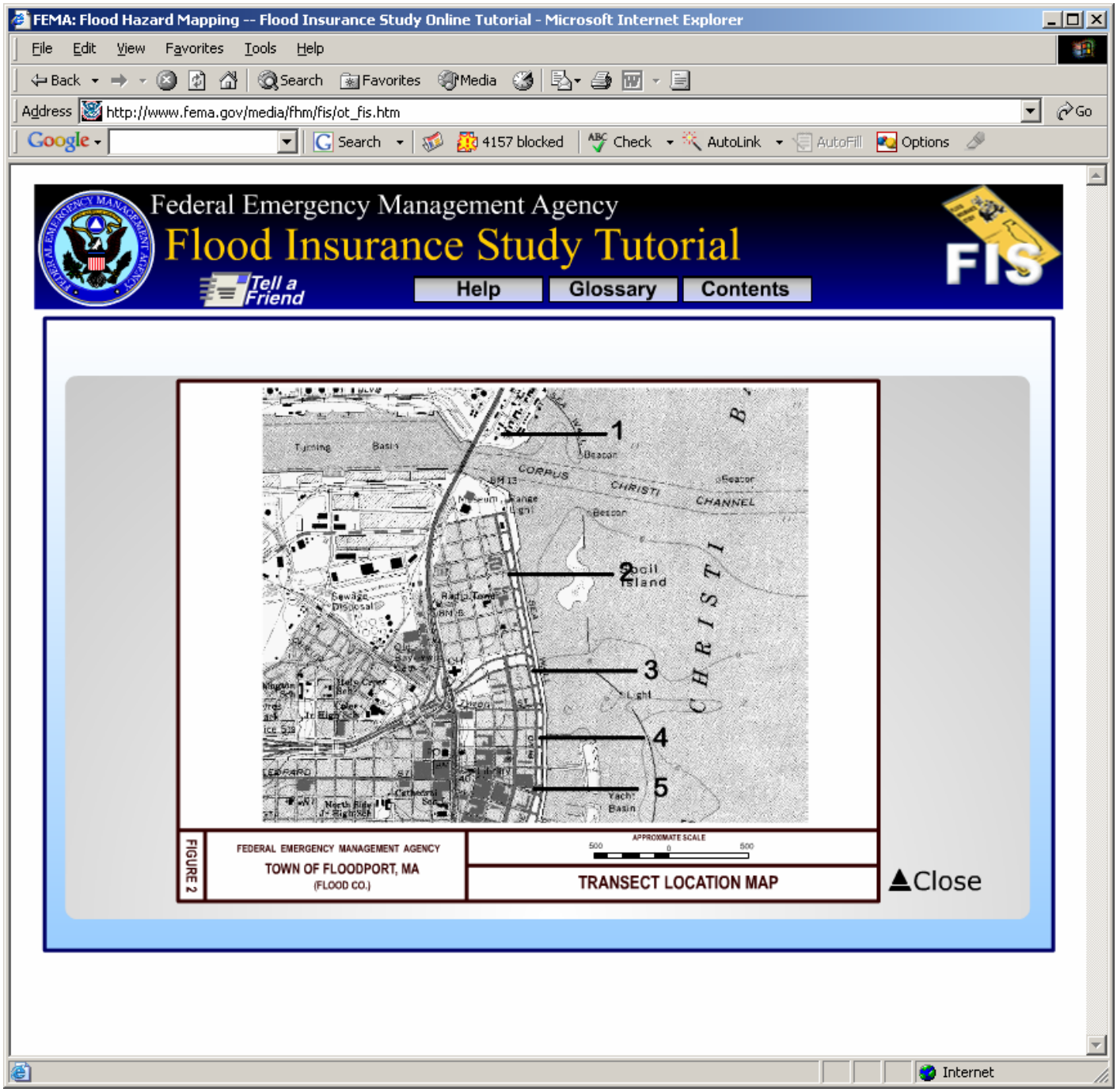
Transect Location Map

Location of Transects

Numbering of Transects

Internet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CHRISTI B
Turning Basin
Beacon
Range Light
Shell Island
Sewage Disposal
Radio Tower
Light
Yacht Basin
FIGURE 2
FEDERAL EMERGENCY MANAGEMENT AGENCY
TOWN OF FLOODPORT, MA
(FLOOD CO.)
APPROXIMATE SCALE
500 0 500
TRANSECT LOCATION MAP
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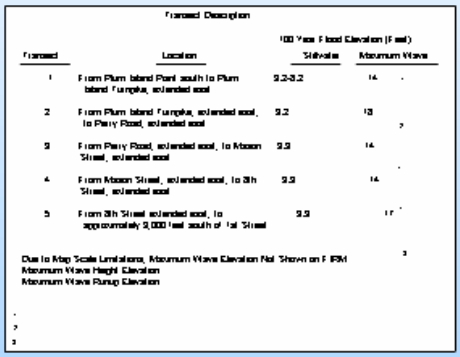


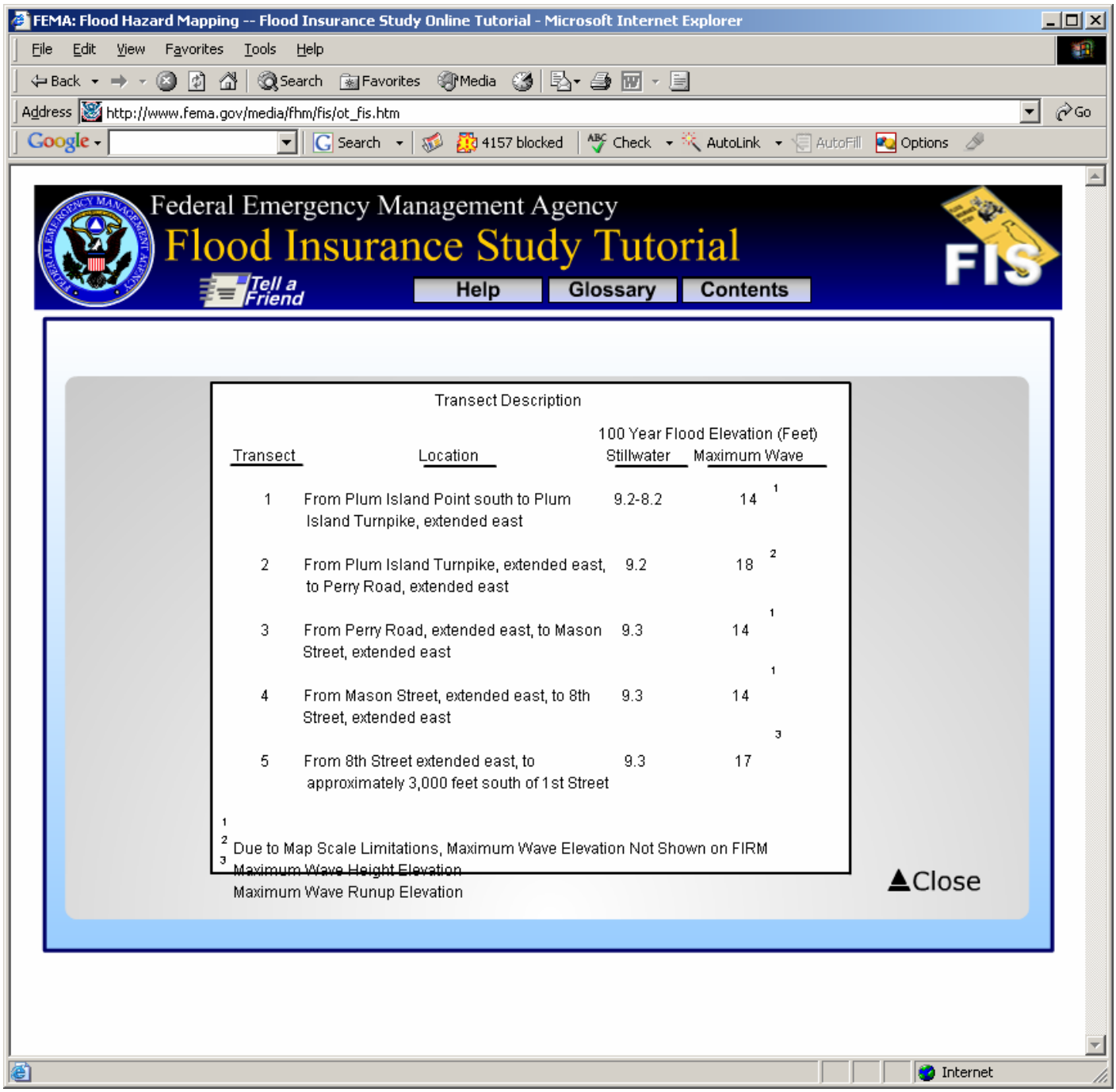
Transect Description Table

Transect Number

Description of Transect

Stillwater Elevation at each Transect

Maximum Wave or Runup Elevation at each Transect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Transect Description
100 Year Flood Elevation (Feet)
Transect
Location
Stillwater
Maximum Wave
1 From Plum Island Point south to Plum Island Turnpike, extended east 9.2-8.2 14 1
2 From Plum Island Turnpike, extended east, to Perry Road, extended east 9.2 18 2
3 From Perry Road, extended east, to Mason Street, extended east 9.3 14 1
4 From Mason Street, extended east, to 8th Street, extended east 9.3 14 1
5 From 8th Street extended east, to approximately 3,000 feet south of 1st Street 9.3 17 3
1
2 Due to Map Scale Limitations, Maximum Wave Elevation Not Shown on FIRM
3 Maximum Wave Height Elevation
Maximum Wave Runup Elevation
Close
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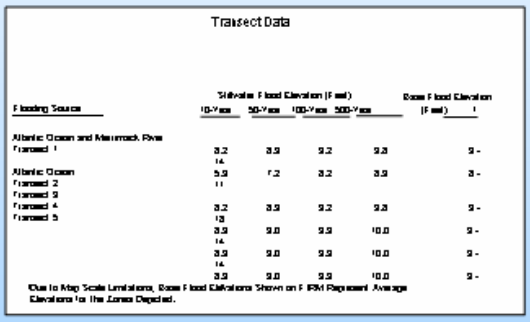


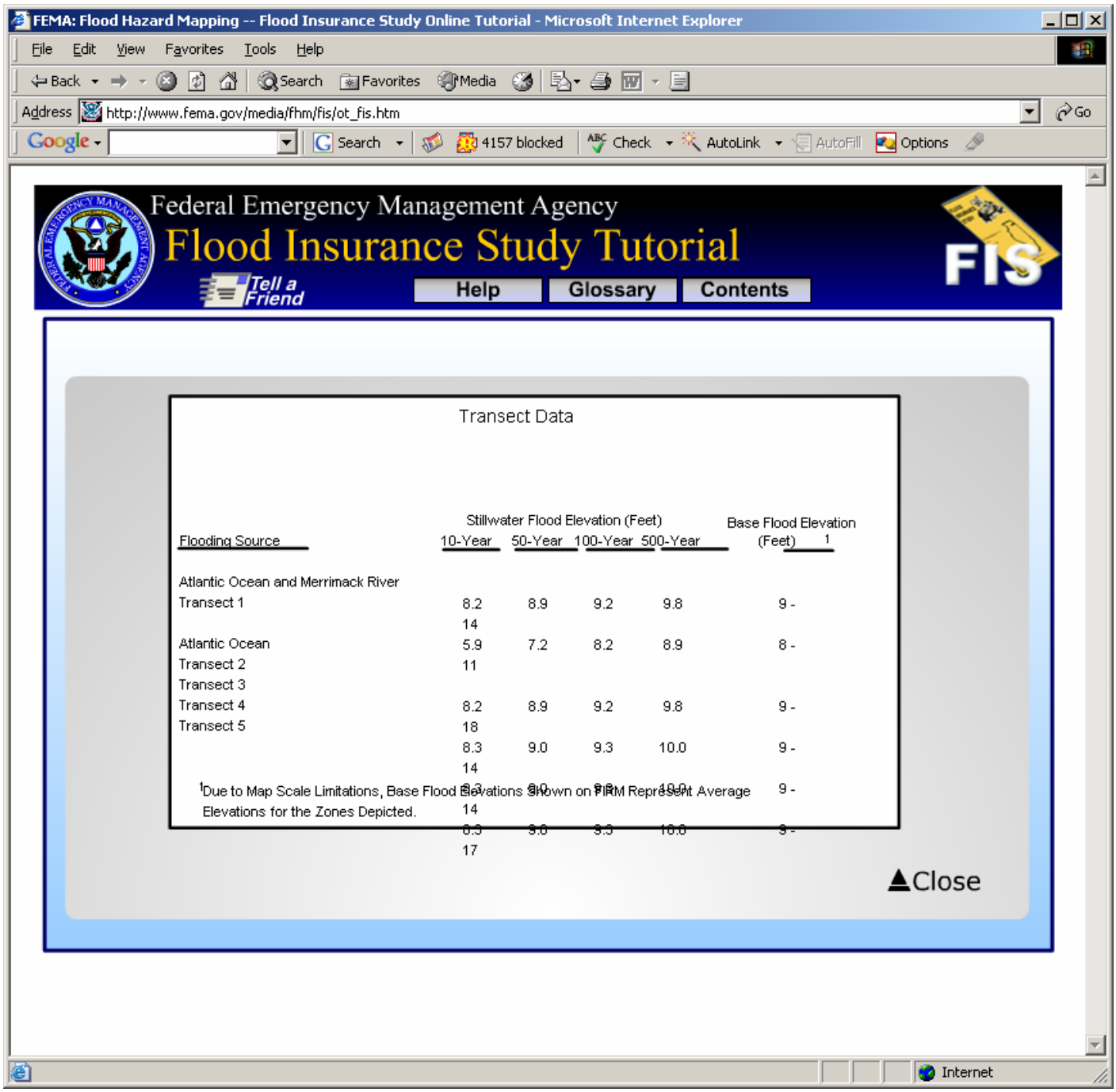
Transect Data Table

Flooding Source

Transect Number

Stillwater Elevations for All Recurrence Intervals

Range of Wave Height and Runup Elevations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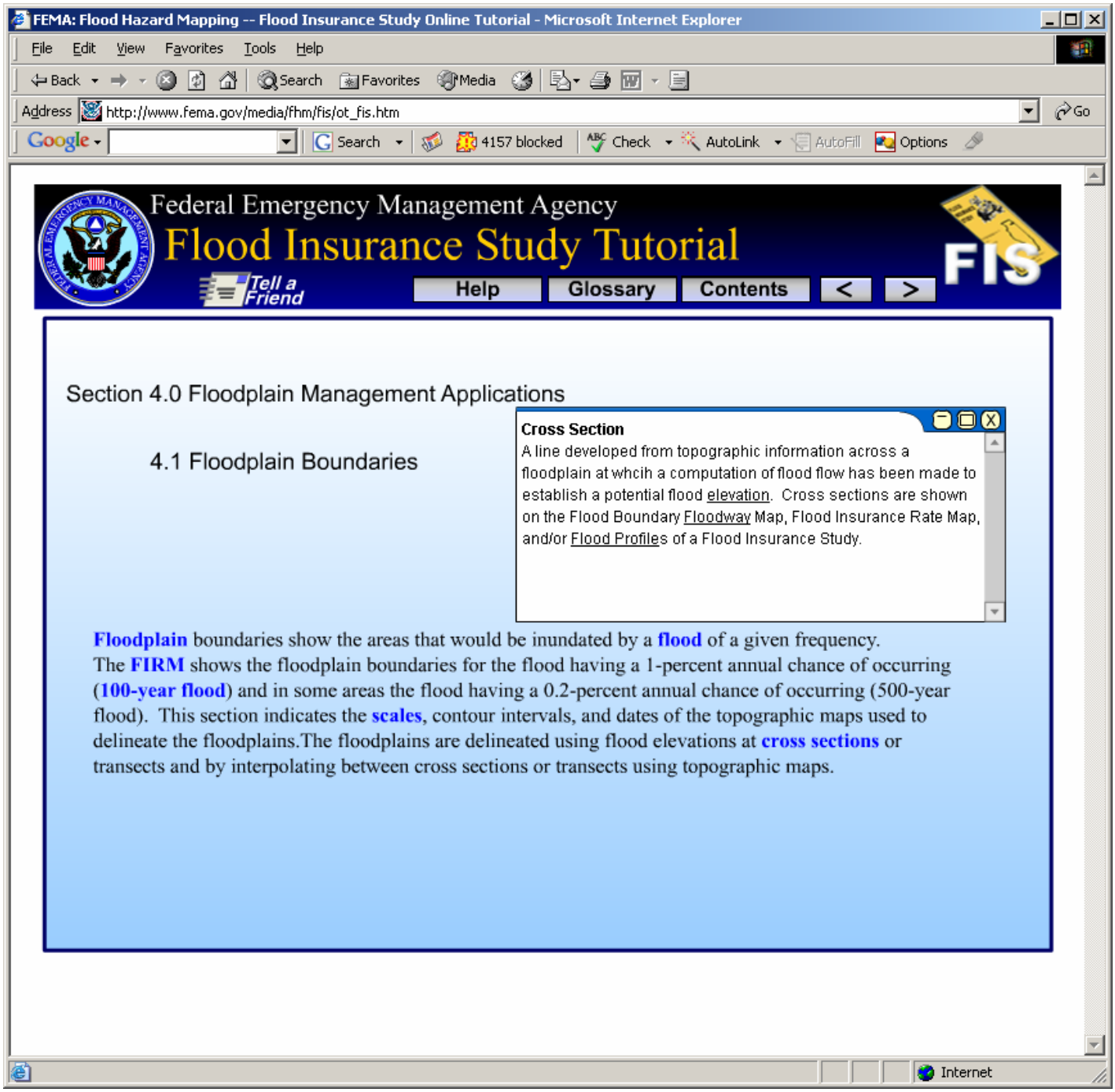
FIS
Transect Data
Flooding Source
Stillwater Flood Elevation (Feet)
10-Year
50-Year
100-Year
500-Year
Base Flood Elevation (Feet) 1
Atlantic Ocean and Merrimack River
Transect 1
8.2
8.9
9.2
9.8
9 -
14
Atlantic Ocean
5.9
7.2
8.2
8.9
8 -
Transect 2
11
Transect 3
Transect 4
8.2
8.9
9.2
9.8
9 -
Transect 5
18
8.3
9.0
9.3
10.0
9 -
14
9 -
14
9 -
17
1Due to Map Scale Limitations, Base Flood Elevations Shown on FIRM Represent Average Elevations for the Zones Depicted.
Close
Internet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Section 4.0 Floodplain Management Applications
4.1 Floodplain Boundaries
Cross Section
A line developed from topographic information across a floodplain at whcih a computation of flood flow has been made to establish a potential flood elevation. Cross sections are shown on the Flood Boundary Floodway Map, Flood Insurance Rate Map, and/or Flood Profiles of a Flood Insurance Study.
Floodplain boundaries show the areas that would be inundated by a flood of a given frequency. The FIRM shows the floodplain boundaries for the flood having a 1-percent annual chance of occurring (100-year flood) and in some areas the flood having a 0.2-percent annual chance of occurring (500-year flood). This section indicates the scales, contour intervals, and dates of the topographic maps used to delineate the floodplains.The floodplains are delineated using flood elevations at cross sections or transects and by interpolating between cross sections or transects using topographic maps.
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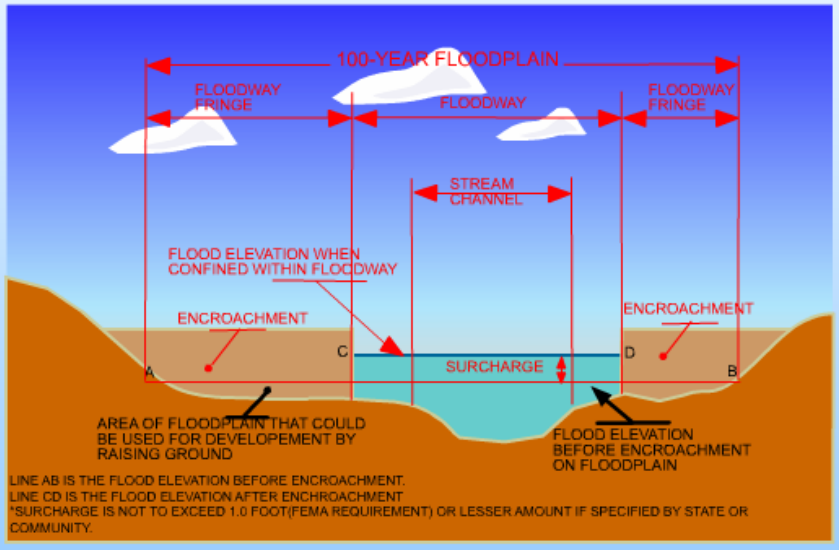
Floodway

Channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flooddischarge can be conveyed without increasing the elevation of the 100-year flood by more than a specified amount (1 foot in most states).

4.2 Floodways

This section defines the **floodway** and explains how it is used for **floodplain management**. Also, this section lists which streams have floodways and describes how the floodways were determined.



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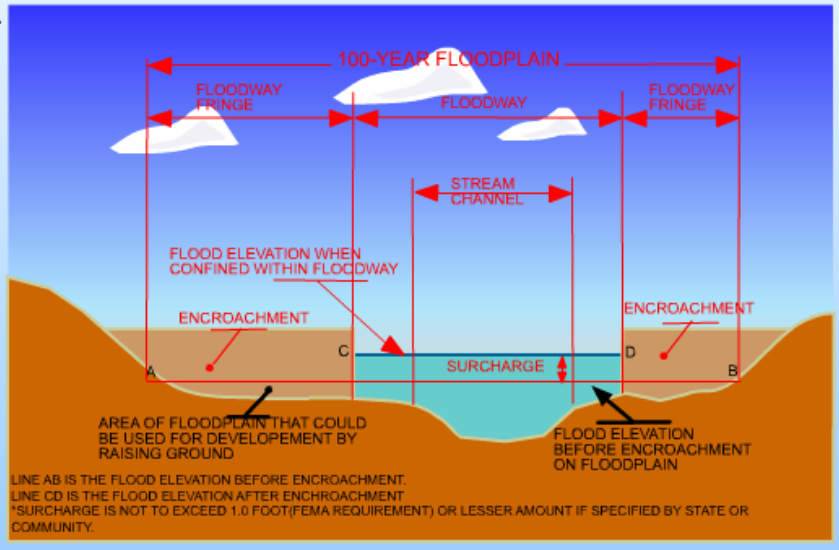
Floodplain Management
The operation of a program of corrective and preventative measures for mitigating flood damage, including, but not limited to, emergency preparedness plans, flood-control works, and floodplain management regulations.

4.2 Floodways

This section defines the **floodway** and explains how it is used for **floodplain management**. Also, this section lists which streams have floodways and describes how the floodways were determined.



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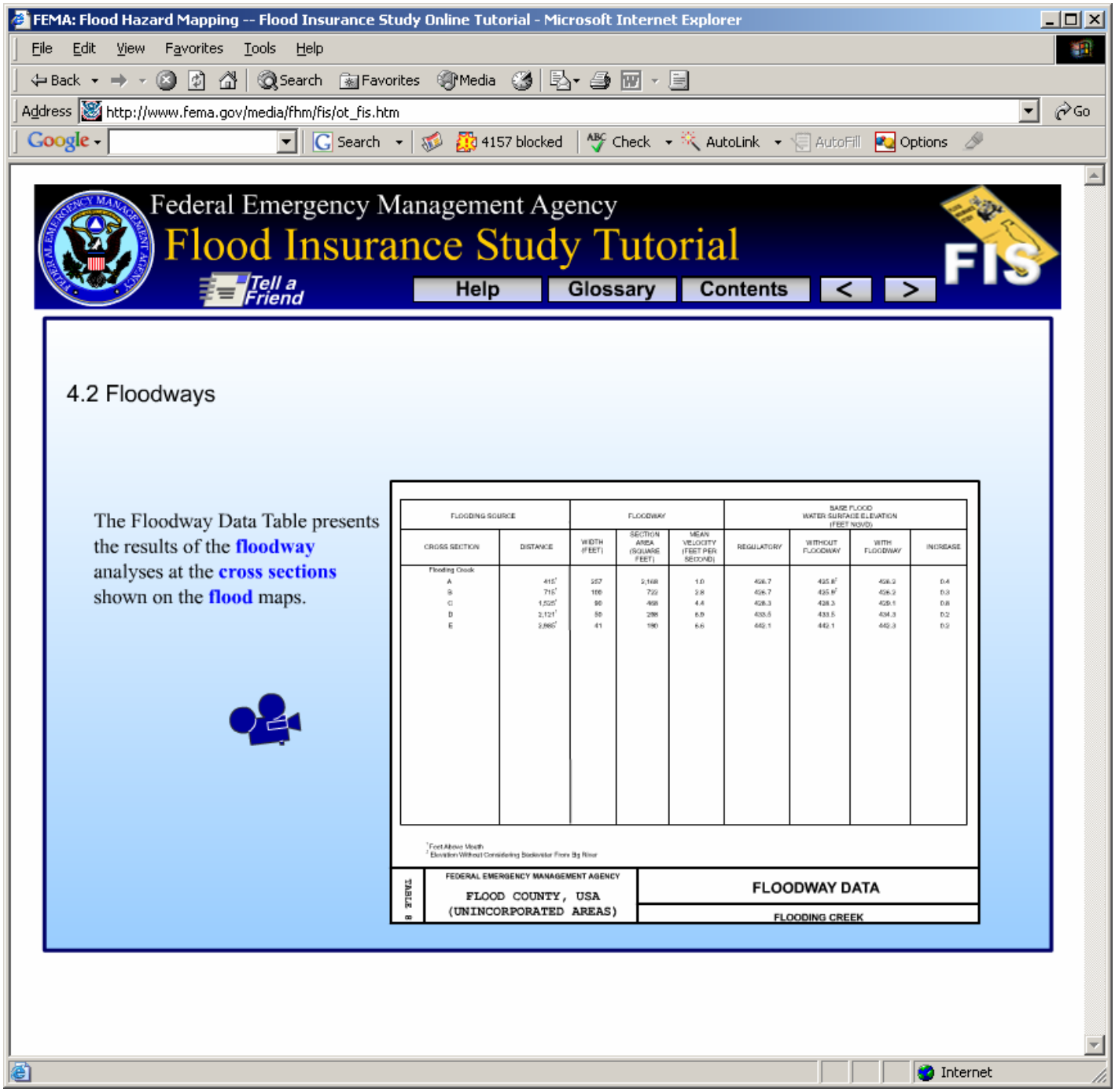
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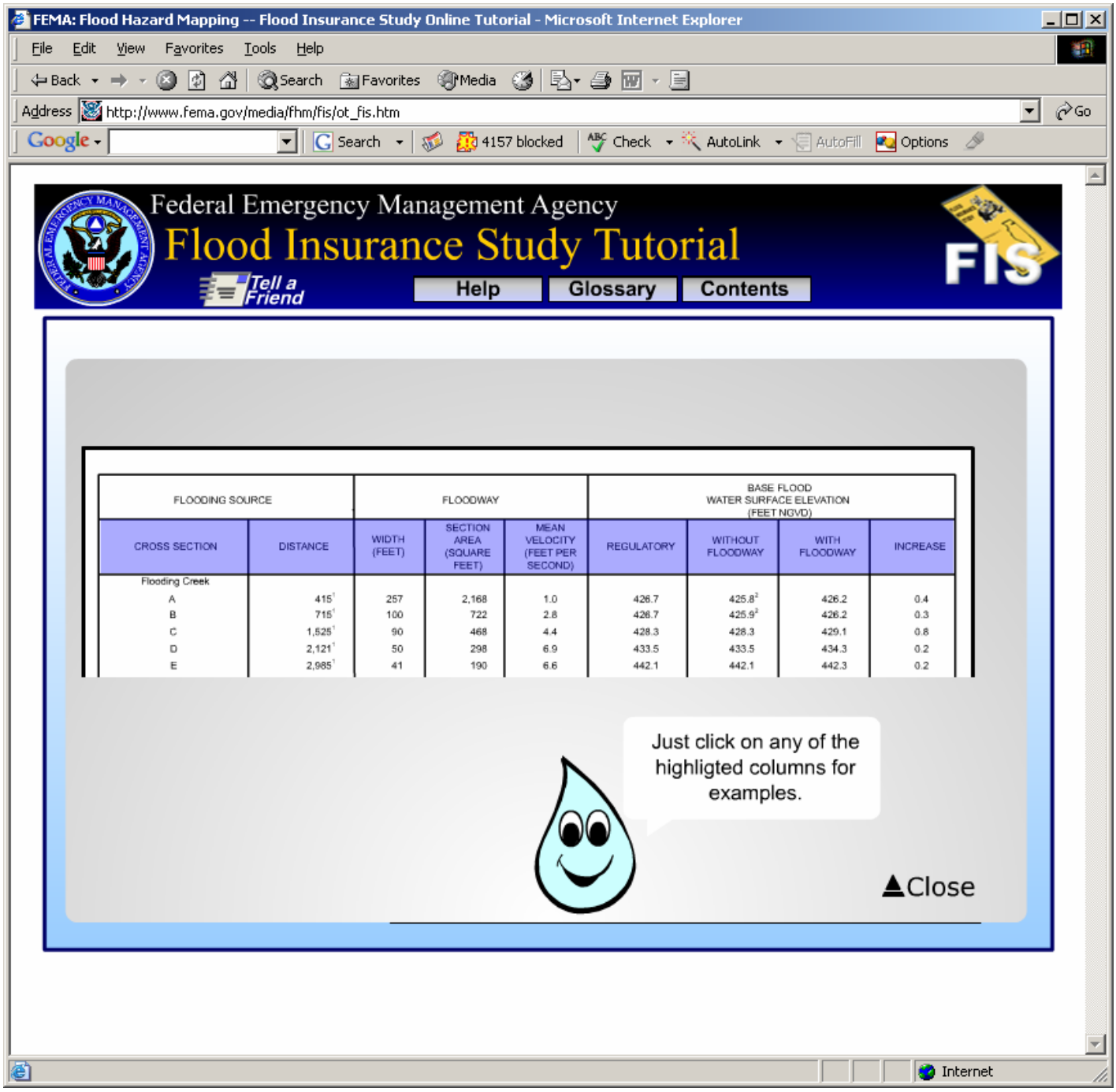
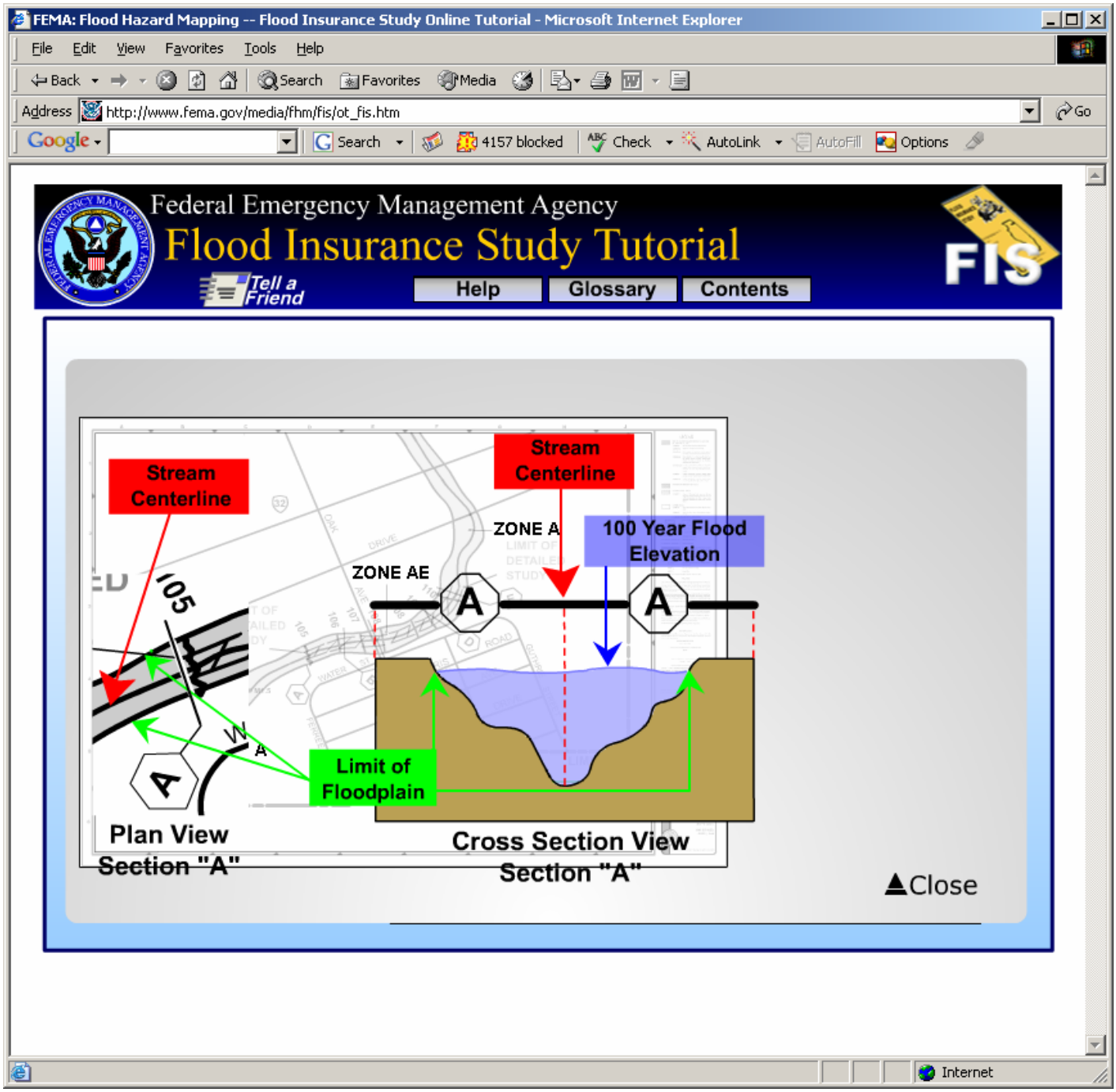
4.2 Floodways
The Floodway Data Table presents the results of the floodway analyses at the cross sections shown on the flood maps.
FLOODING SOURCE
FLOODWAY
BASE FLOOD WATER SURFACE ELEVATION (FEET NGVD)
CROSS SECTION
DISTANCE
WIDTH (FEET)
SECTION AREA (SQUARE FEET)
MEAN VELOCITY (FEET PER SECOND)
REGULATORY
WITHOUT FLOODWAY
WITH FLOODWAY
INCREASE
Flooding Creek
A
B
C
D
E
TABLE 8
FEDERAL EMERGENCY MANAGEMENT AGENCY
FLOOD COUNTY, USA
(UNINCORPORATED AREAS)
FLOODWAY DATA
FLOODING CREEK
Internet

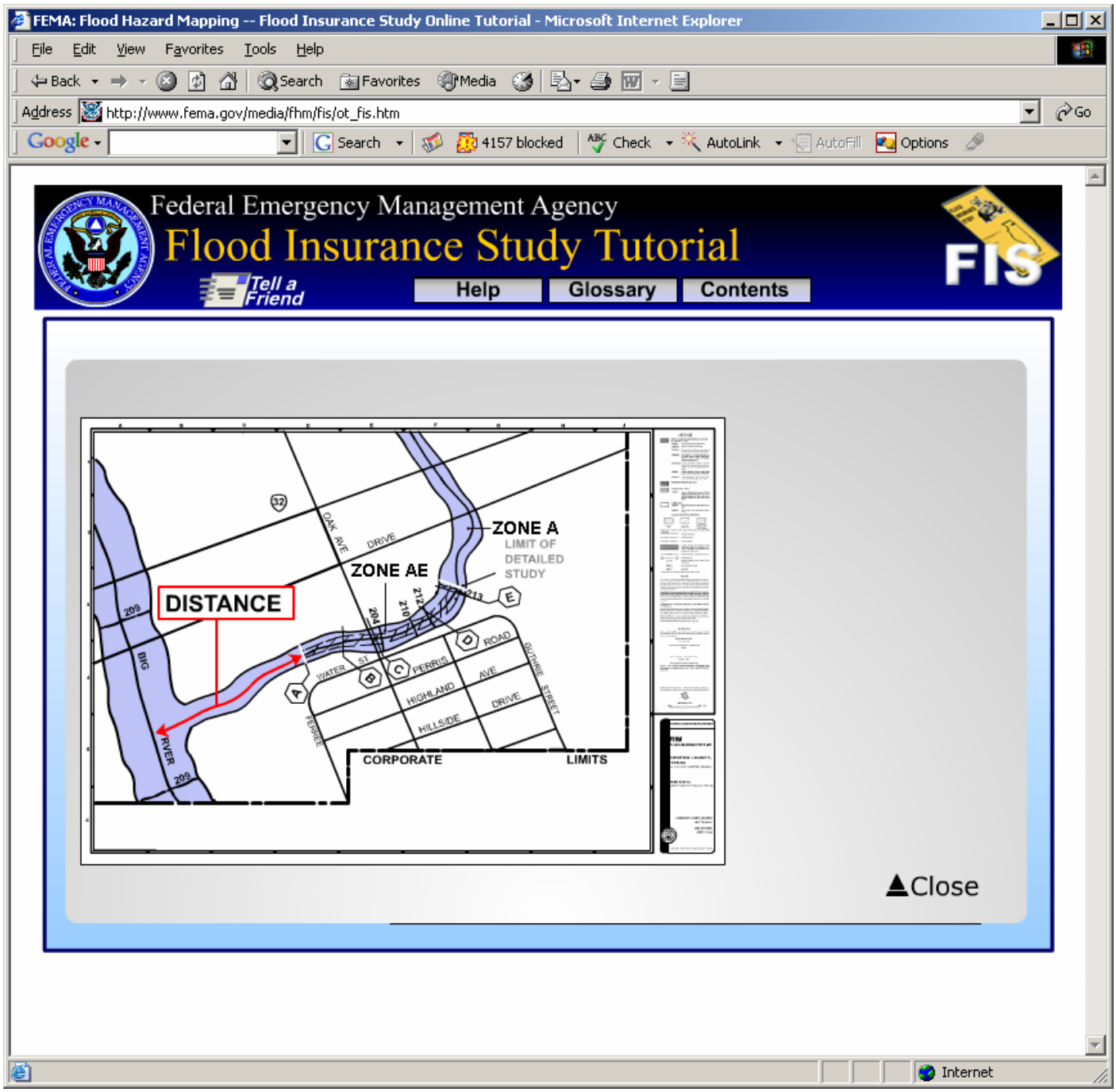
CLICKING ON THE **MOVIE CAMERA** ICON ON THE ABOVE SLIDE BRINGS UP THIS SLIDE:



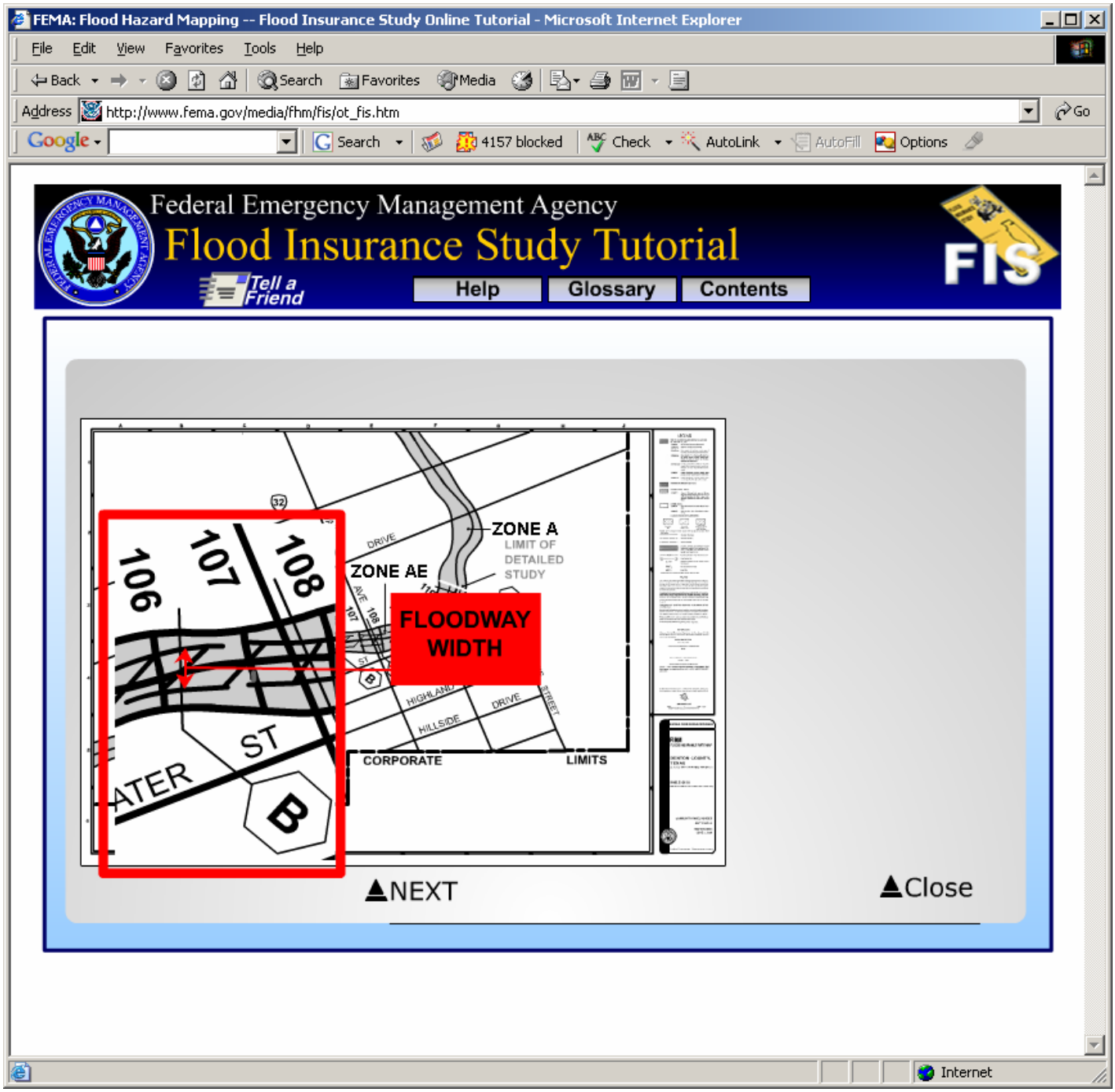
CLICKING ON **CROSS SECTION** HEADING BRINGS UP THIS SLIDE:



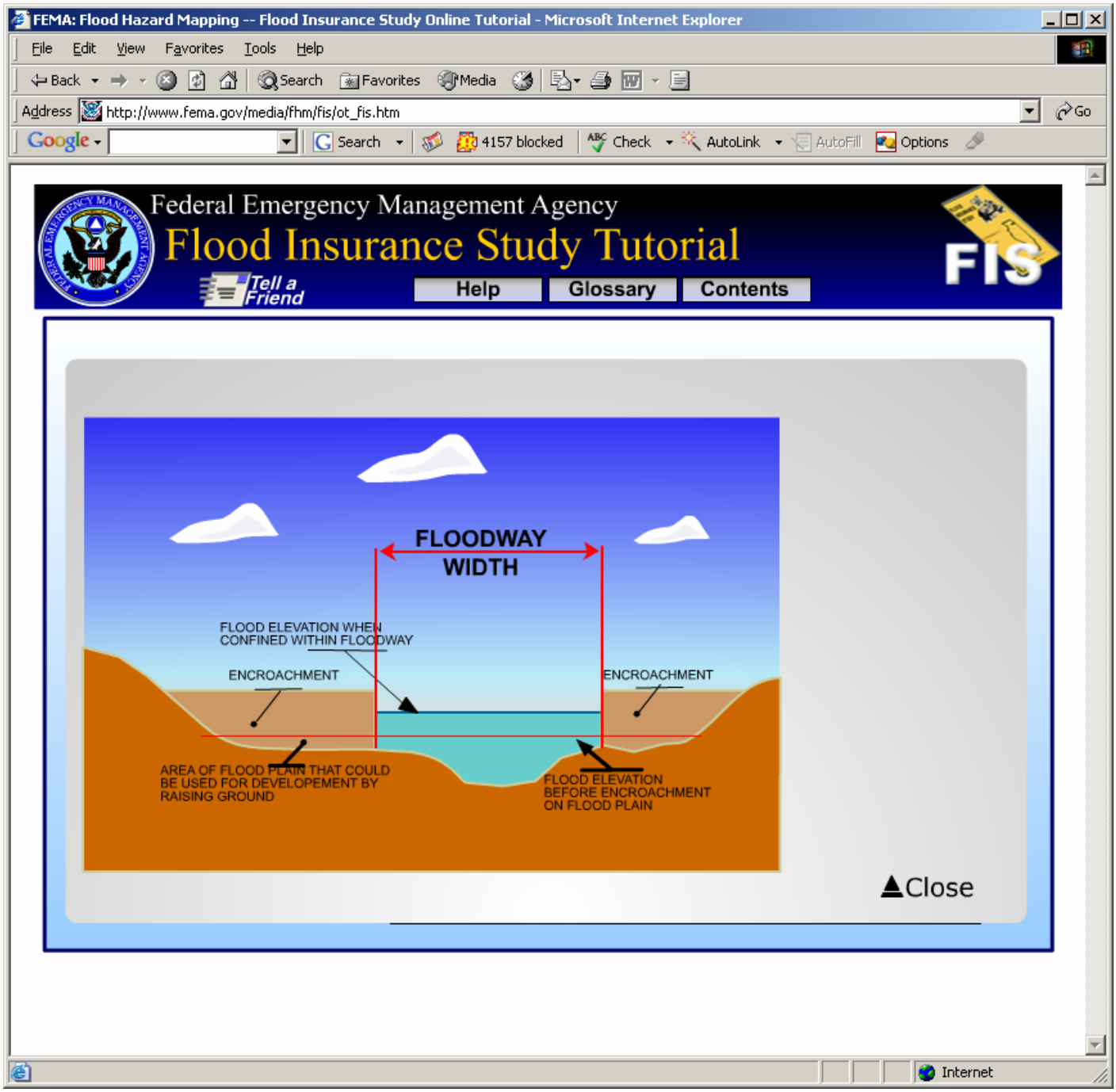
CLICKING ON **DISTANCE** HEADING BRINGS UP THIS SLIDE:



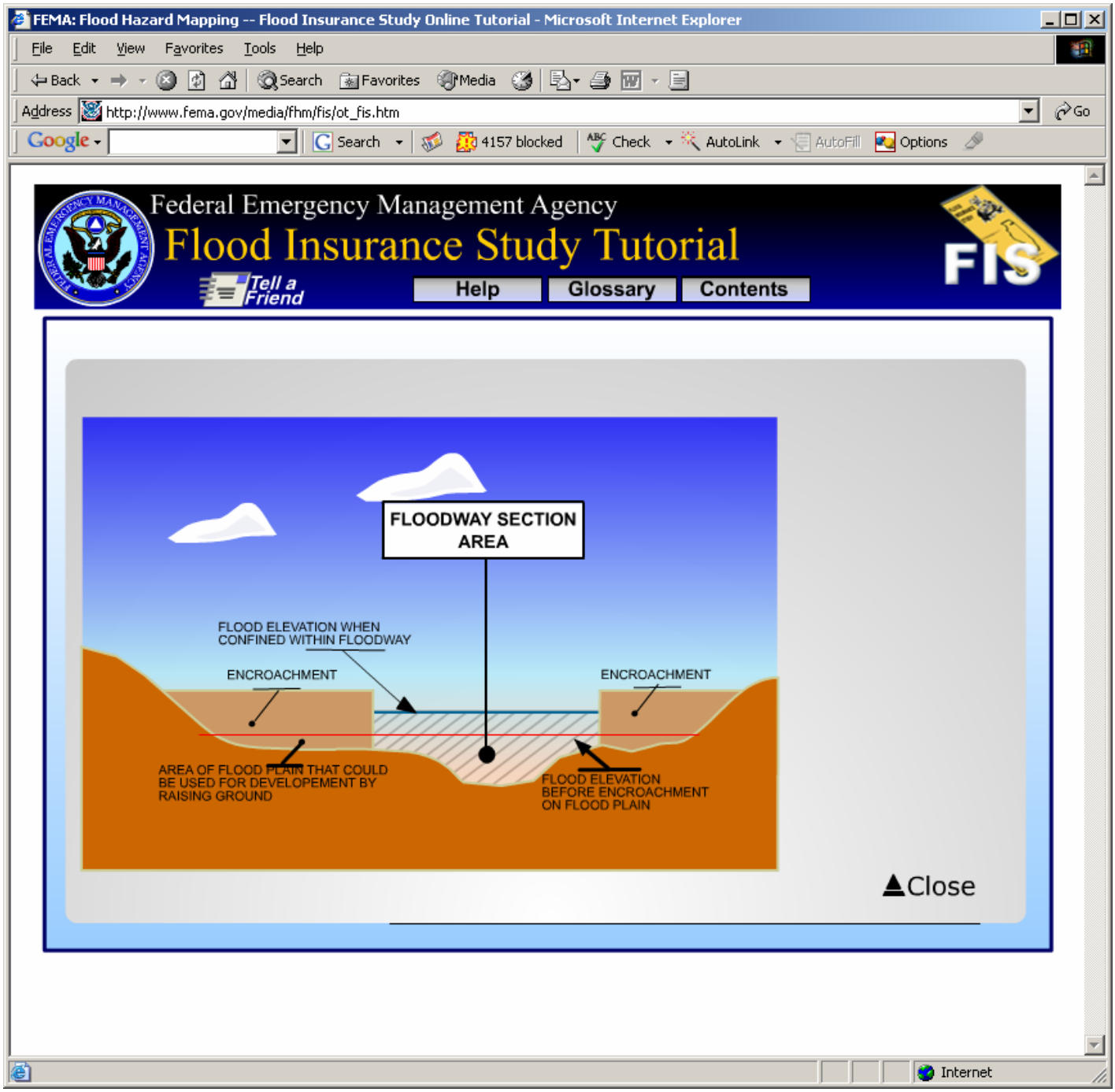
CLICKING ON **WIDTH - (FEET)** HEADING BRINGS UP THIS SLIDE:



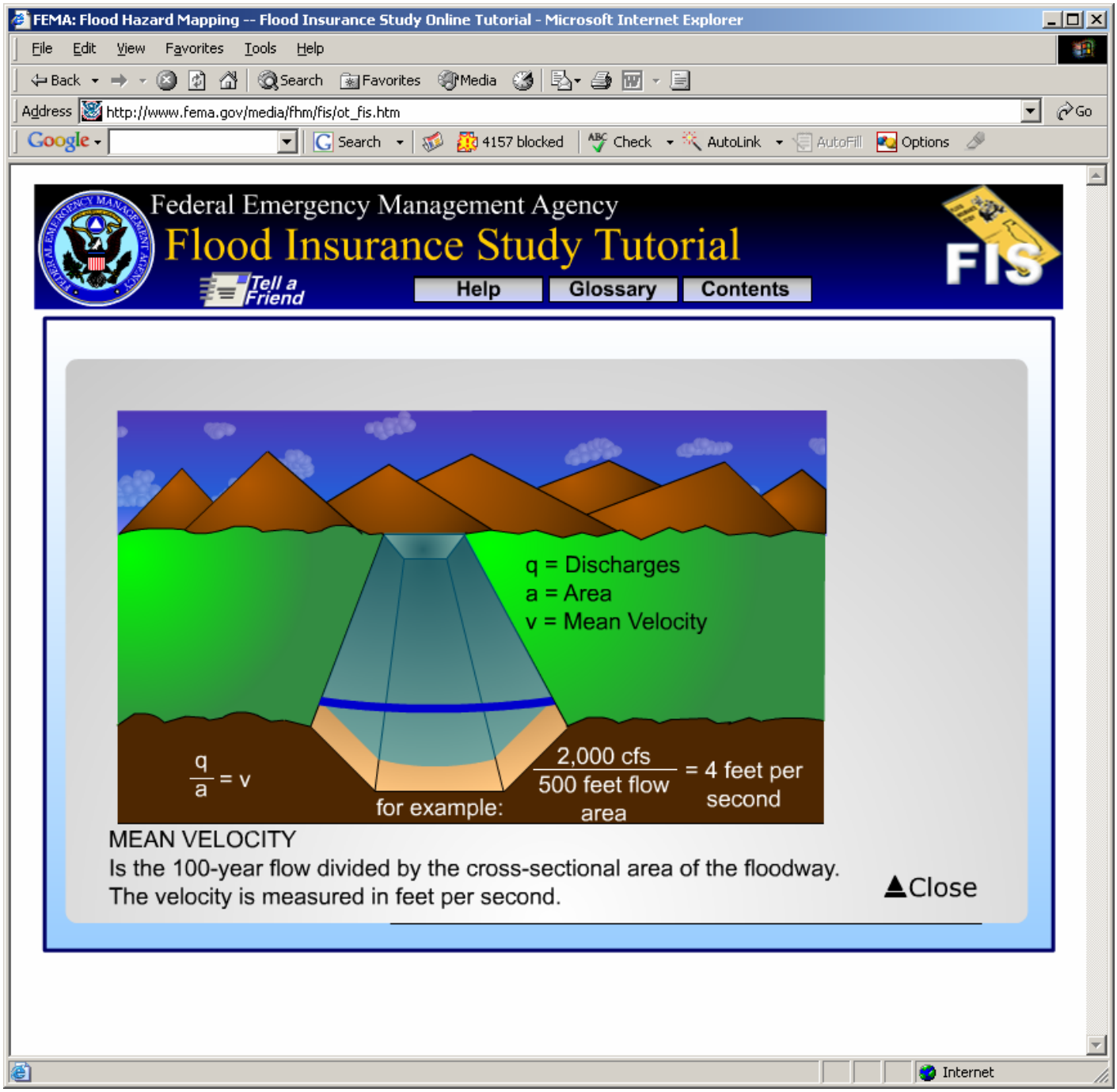
CLICKING "**NEXT**" ON THE ABOVE SLIDE BRINGS UP THIS SLIDE:



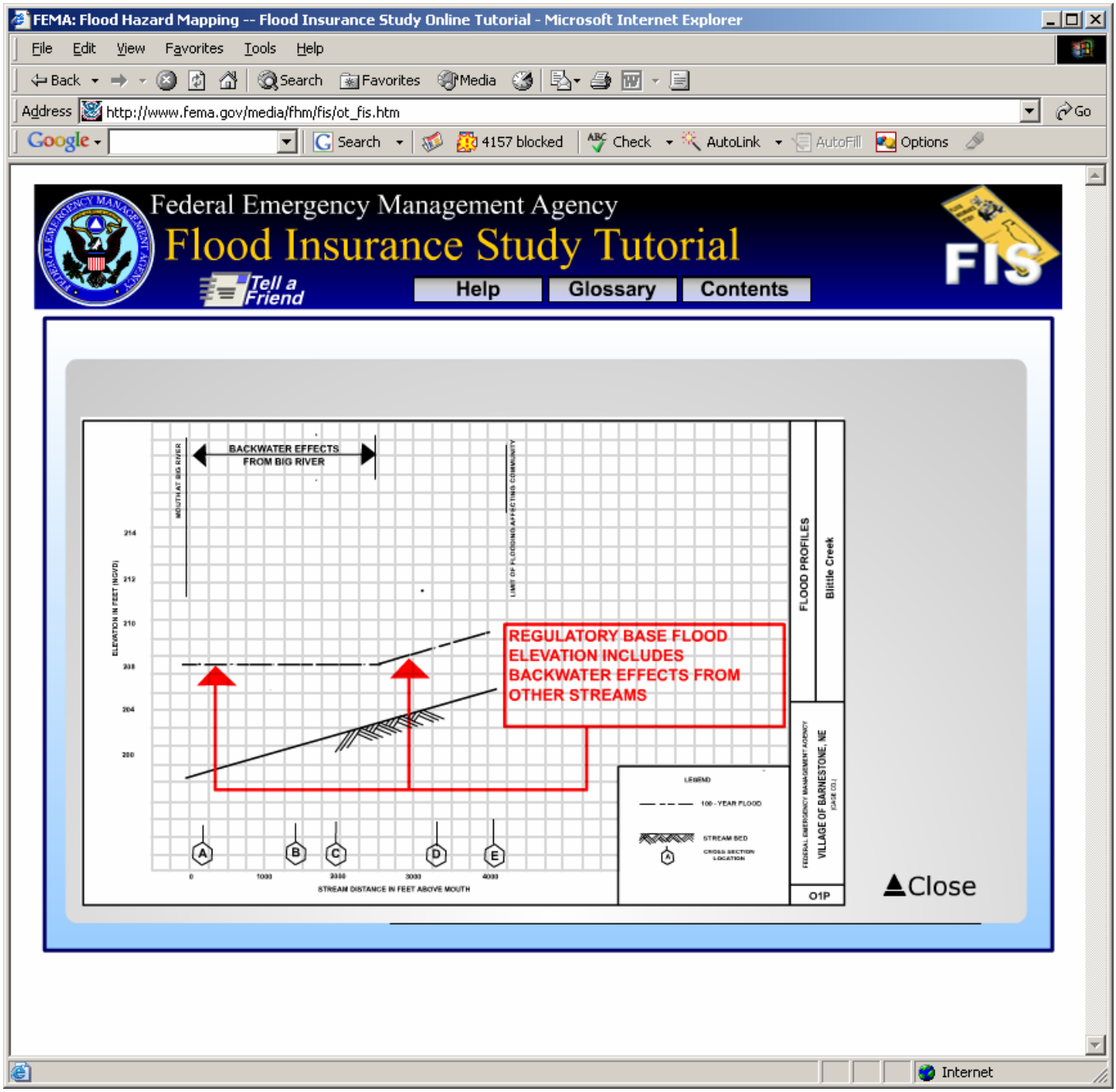
CLICKING ON **SECTION AREA (SQUARE FEET)** HEADING BRINGS UP THIS SLIDE:



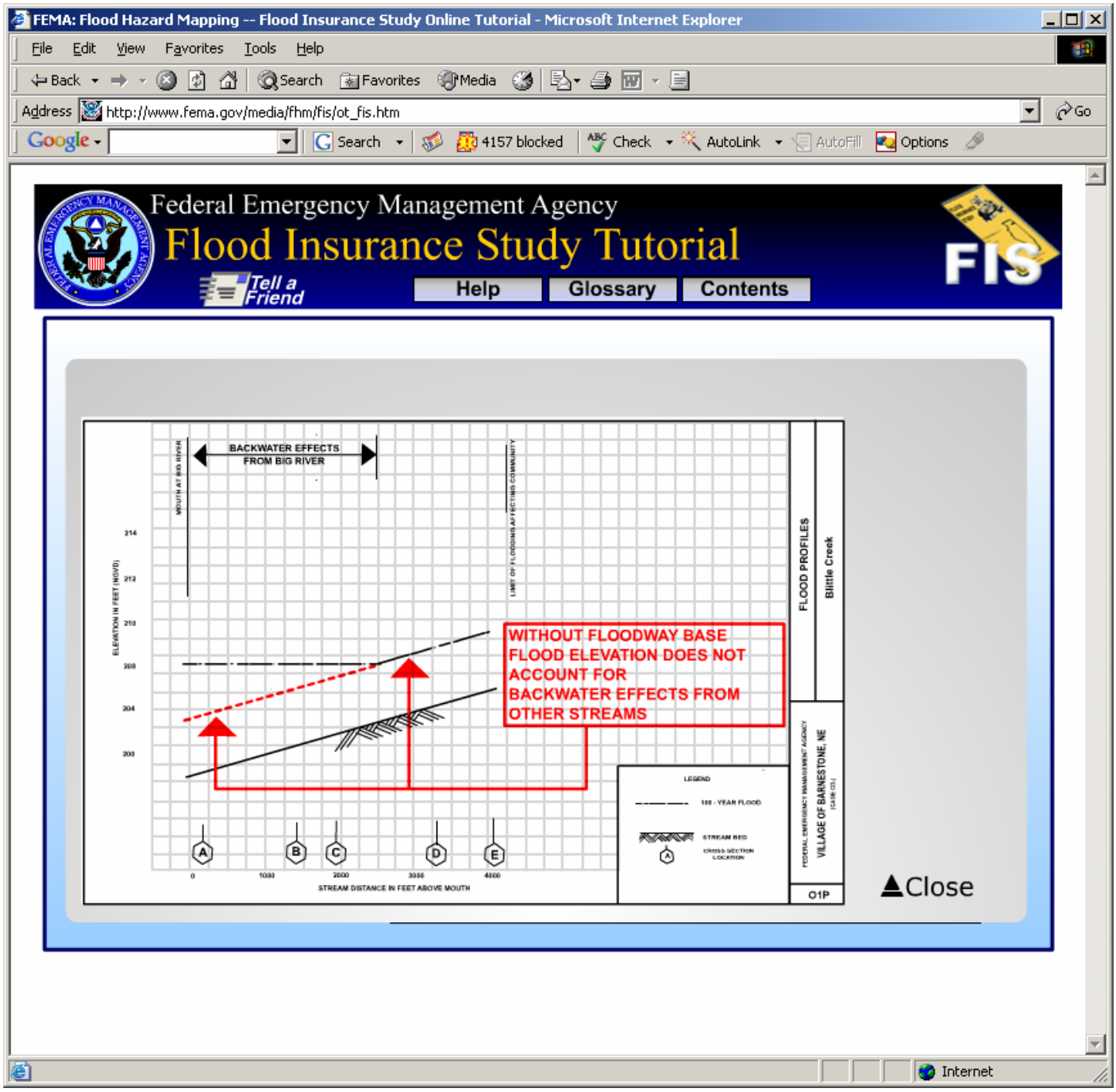
CLICKING ON **MEAN VELOCITY (FEET PER SECOND)** HEADING BRINGS UP THIS SLIDE:



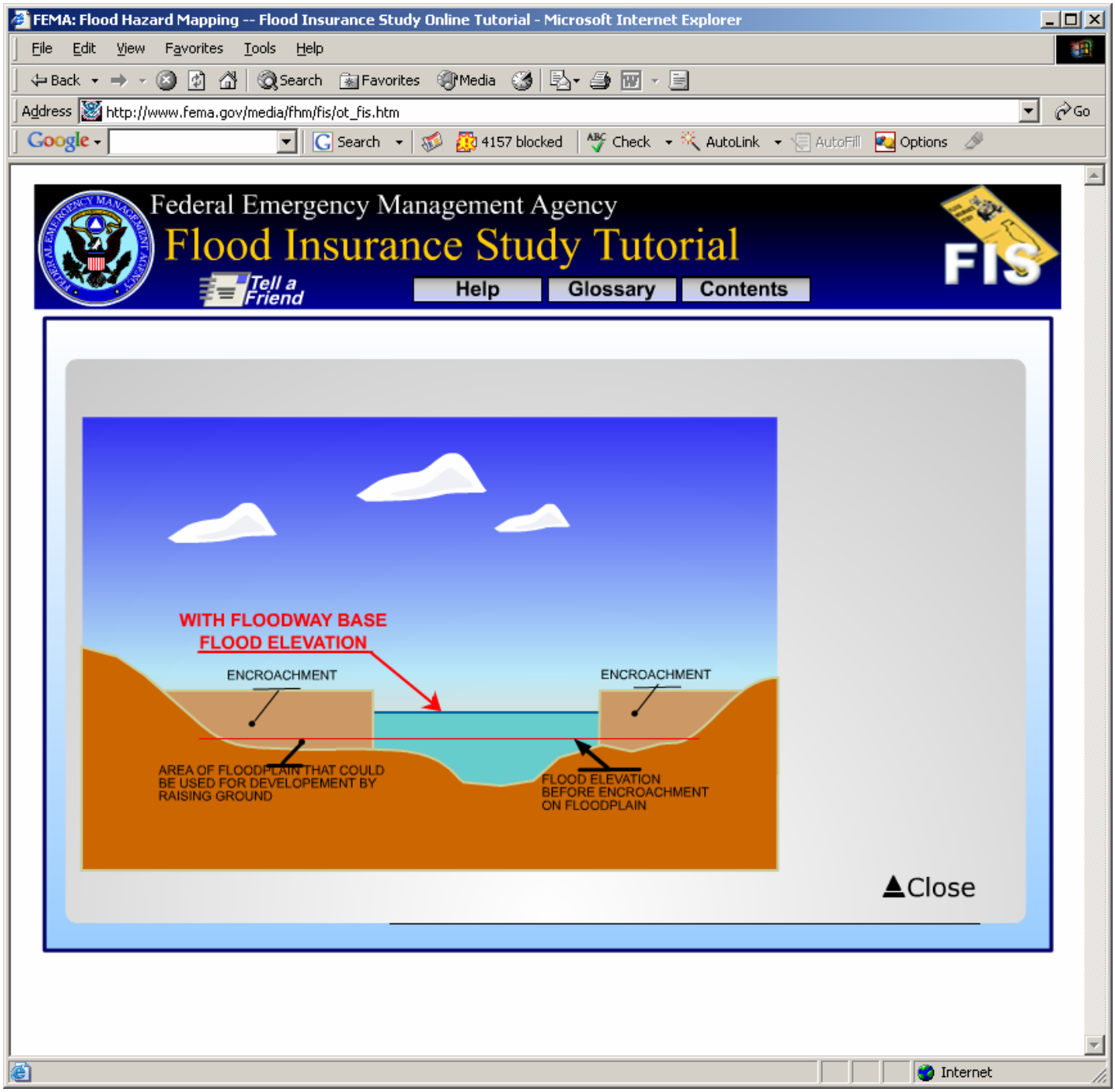
CLICKING ON **REGULATORY** HEADING BRINGS UP THIS SLIDE:



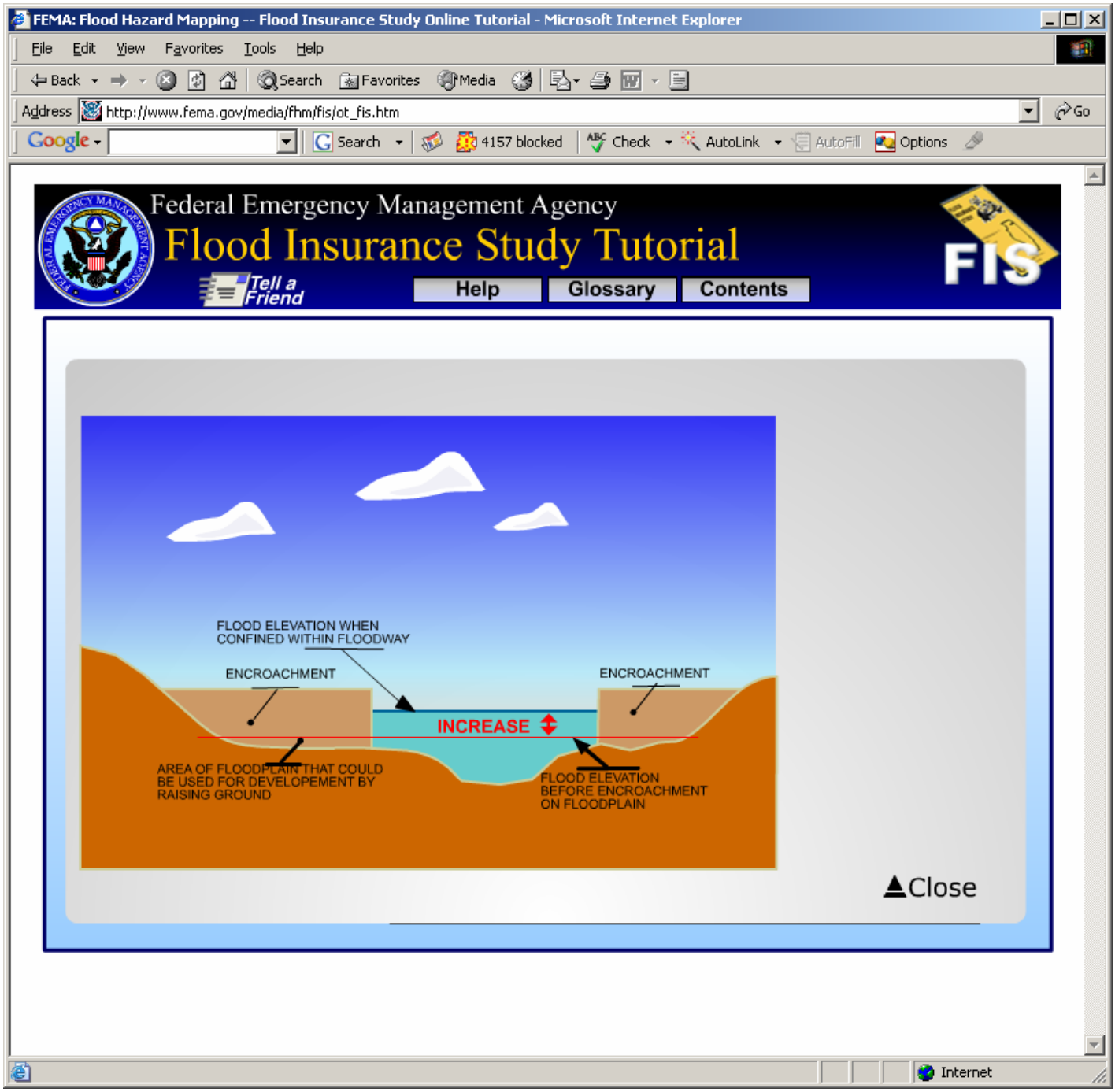
CLICKING ON **WITHOUT FLOODWAY** HEADING BRINGS UP THIS SLIDE:

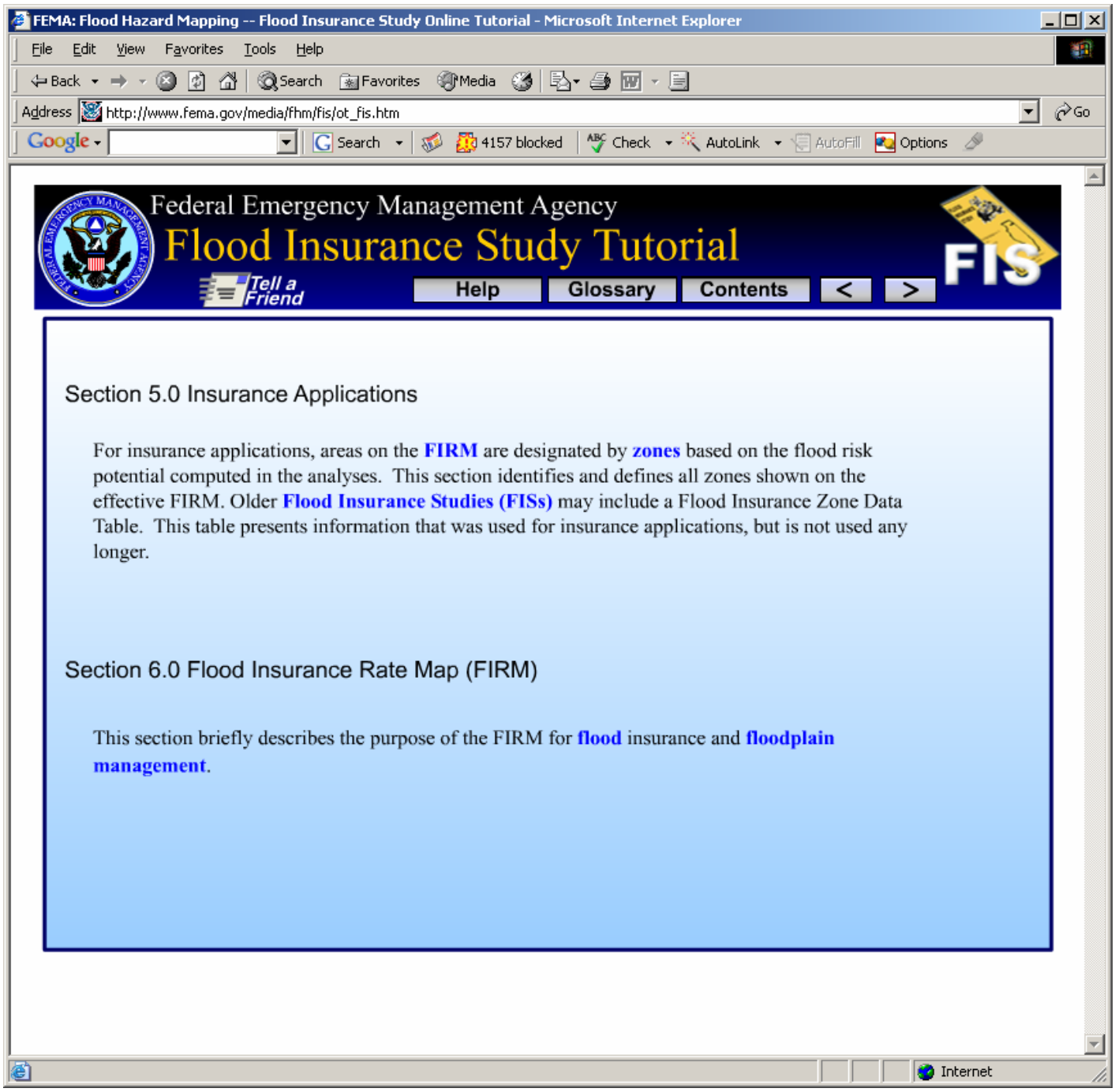


CLICKING ON **WITH FLOODWAY** HEADING BRINGS UP THIS SLIDE:



CLICKING ON **INCREASE** HEADING BRINGS UP THIS SLIDE:

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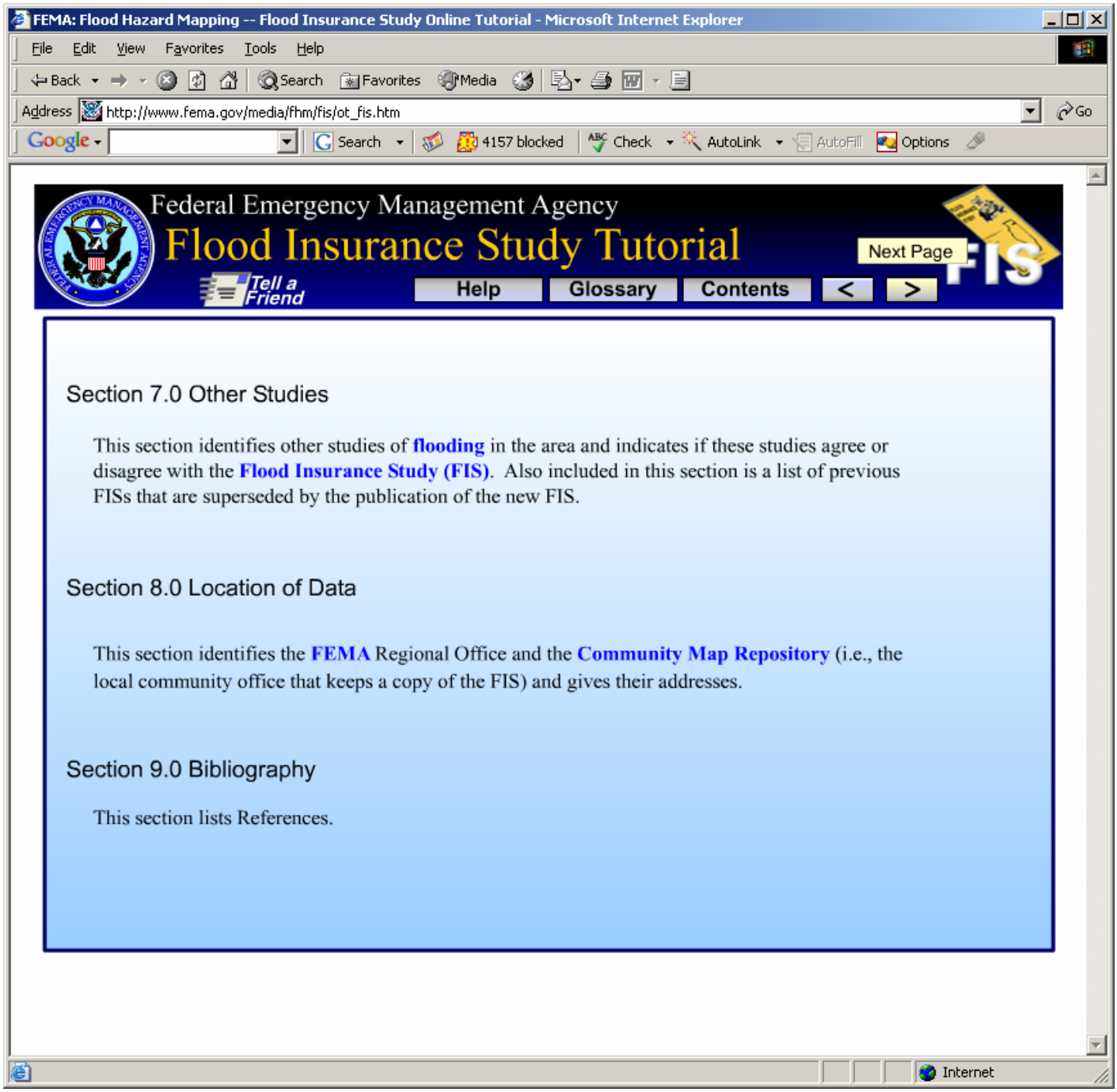
FIS
Section 5.0 Insurance Applications
For insurance applications, areas on the FIRM are designated by zones based on the flood risk potential computed in the analyses. This section identifies and defines all zones shown on the effective FIRM. Older Flood Insurance Studies (FISs) may include a Flood Insurance Zone Data Table. This table presents information that was used for insurance applications, but is not used any longer.
Section 6.0 Flood Insurance Rate Map (FIRM)
This section briefly describes the purpose of the FIRM for flood insurance and floodplain management.
Internet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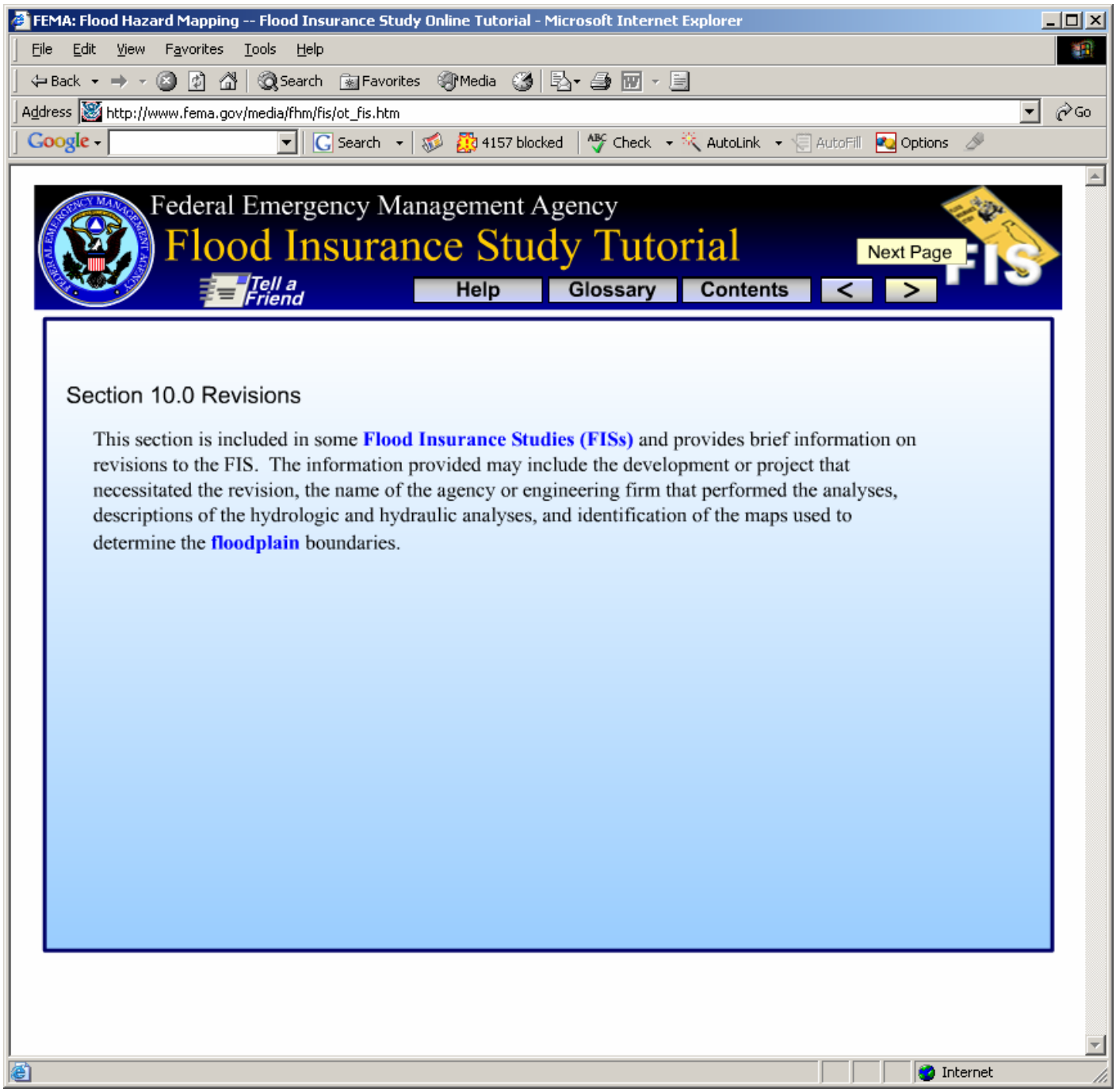
Section 7.0 Other Studies
This section identifies other studies of flooding in the area and indicates if these studies agree or disagree with the Flood Insurance Study (FIS). Also included in this section is a list of previous FISs that are superseded by the publication of the new FIS.
Section 8.0 Location of Data
This section identifies the FEMA Regional Office and the Community Map Repository (i.e., the local community office that keeps a copy of the FIS) and gives their addresses.
Section 9.0 Bibliography
This section lists References.
Internet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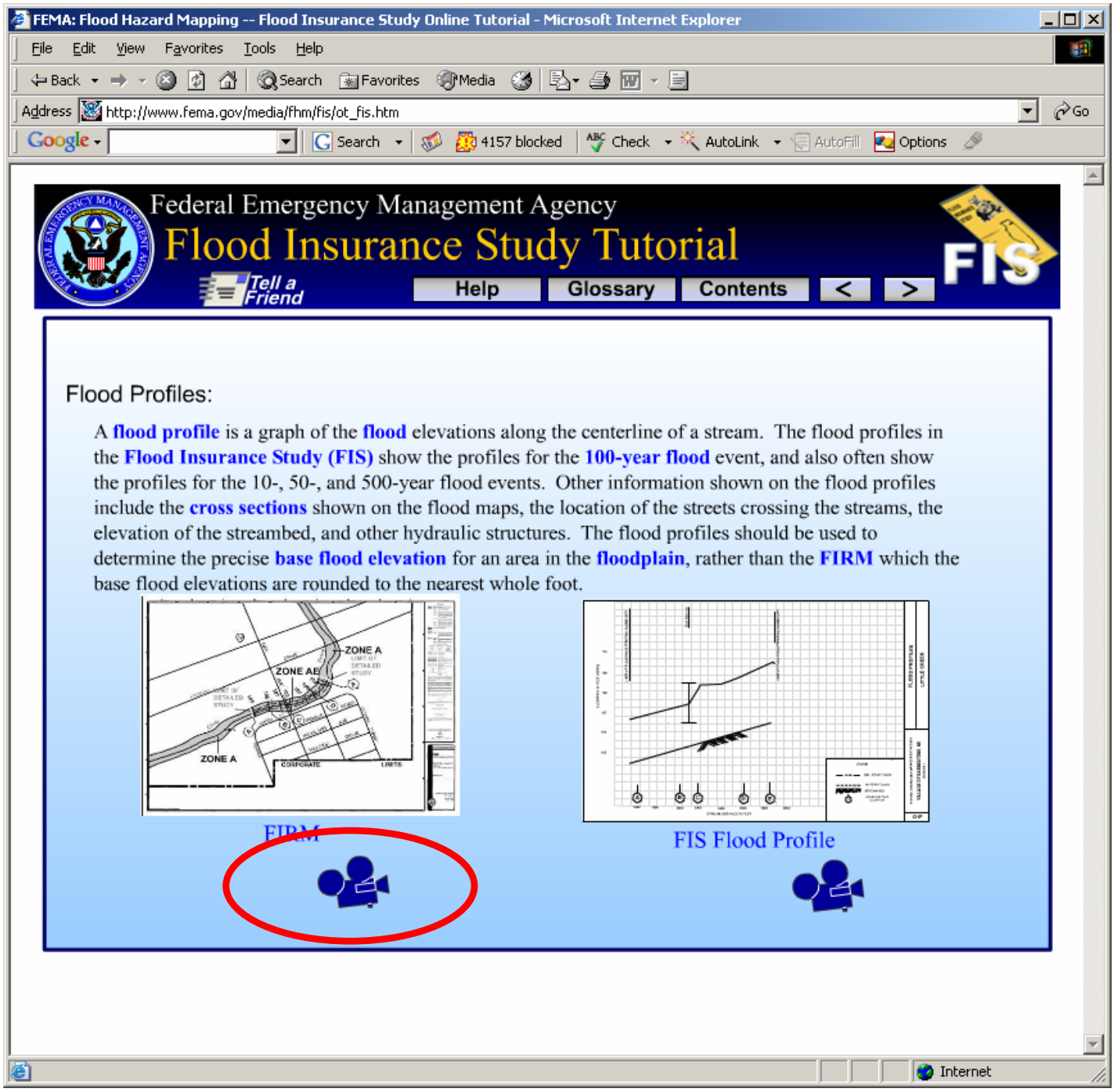
Section 10.0 Revisions
This section is included in some Flood Insurance Studies (FISs) and provides brief information on revisions to the FIS. The information provided may include the development or project that necessitated the revision, the name of the agency or engineering firm that performed the analyses, descriptions of the hydrologic and hydraulic analyses, and identification of the maps used to determine the floodplain boundaries.
Internet



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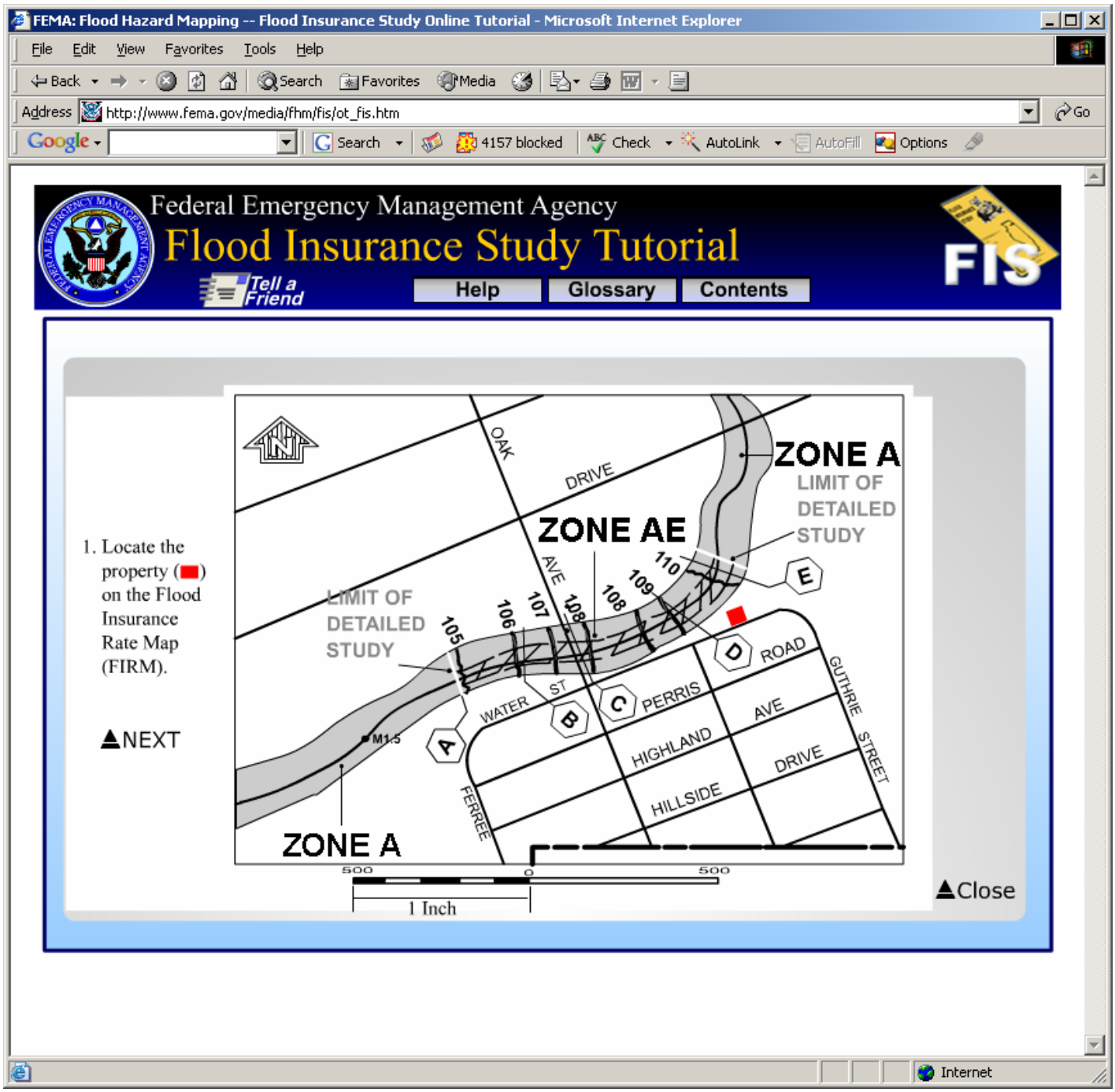
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1. Locate the property (■) on the Flood Insurance Rate Map (FIRM).
NEXT
OAK
DRIVE
ZONE AE
ZONE A
LIMIT OF DETAILED STUDY
AVE
105
106
107
108
109
110
E
D
ROAD
GUTHRIE
STREET
C
PERRIS
AVE
B
WATER
ST
A
M1.5
HIGHLAND
DRIVE
HILLSIDE
FERREE
ZONE A
500
0
500
1 Inch
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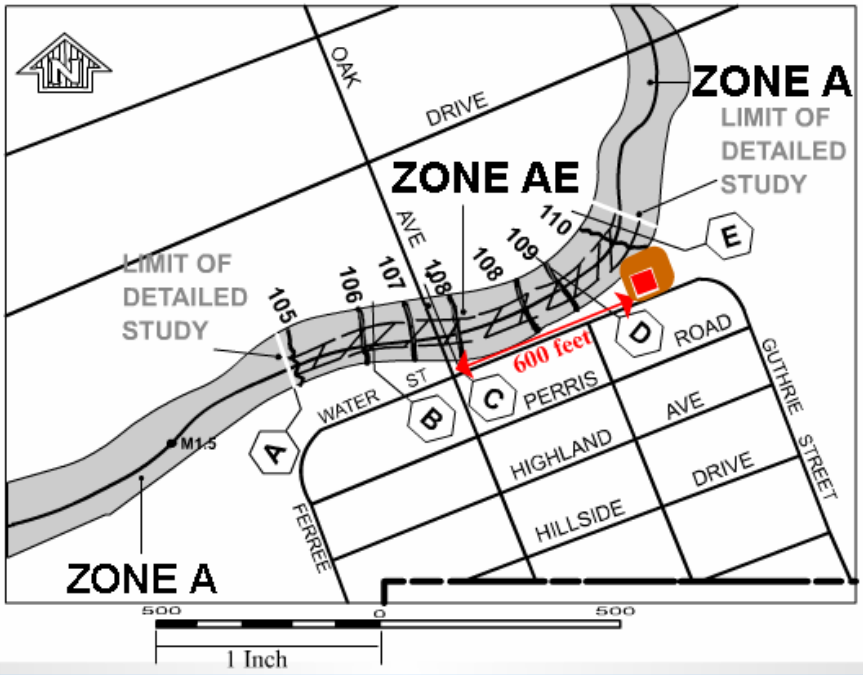
2. Locate the boundary of the property (■). This information might come from a property plat.

▲NEXT



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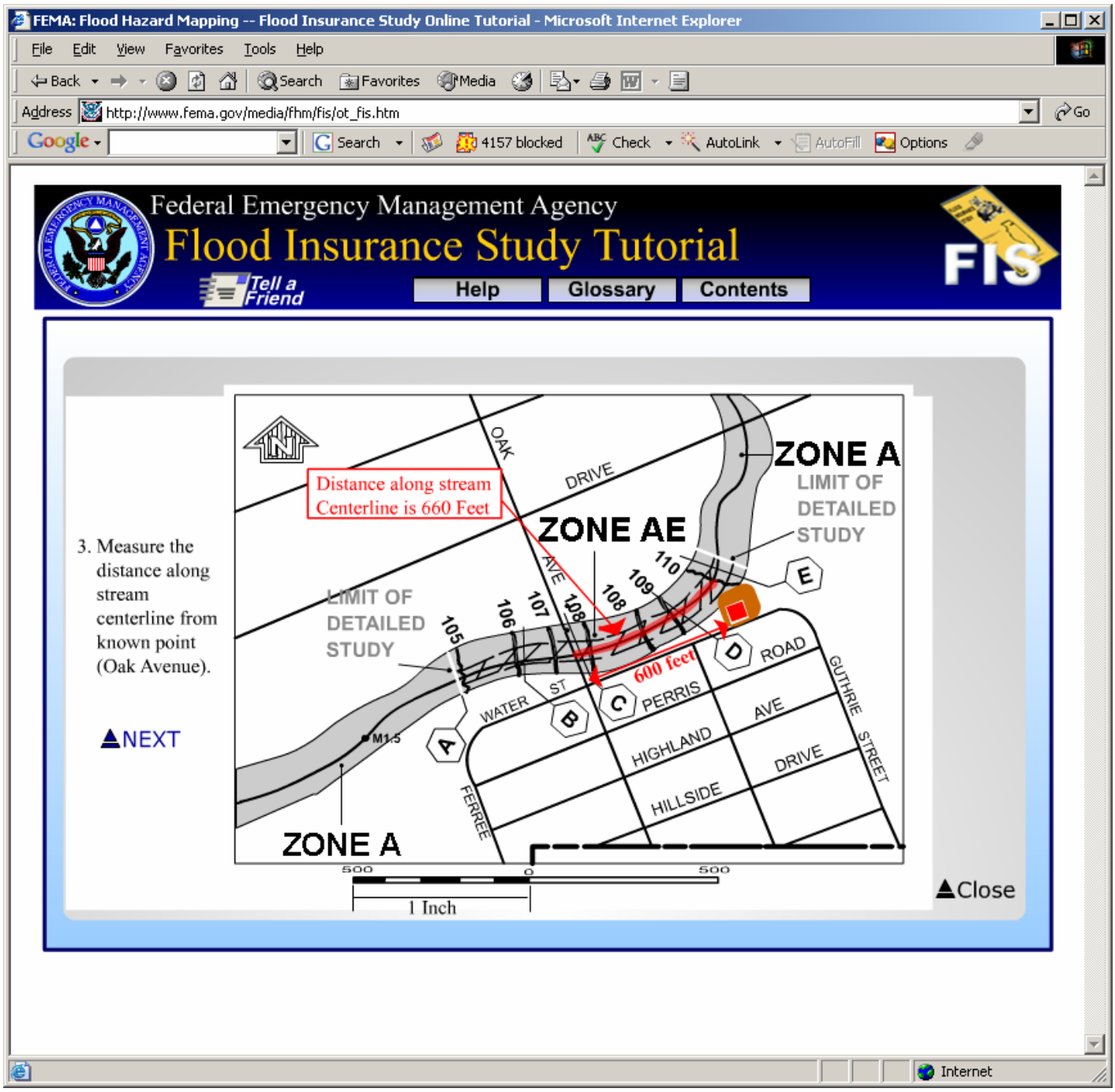
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3. Measure the distance along stream centerline from known point (Oak Avenue).
NEXT
Distance along stream Centerline is 660 Feet
OAK
DRIVE
ZONE AE
ZONE A
LIMIT OF DETAILED STUDY
LIMIT OF DETAILED STUDY
AVE
105
106
107
108
109
110
600 feet
A
B
C
D
E
WATER
ST
PERRIS
ROAD
AVE
GUTHRIE
STREET
HIGHLAND
DRIVE
HILLSIDE
FERREE
M1.5
ZONE A
500
0
500
1 Inch
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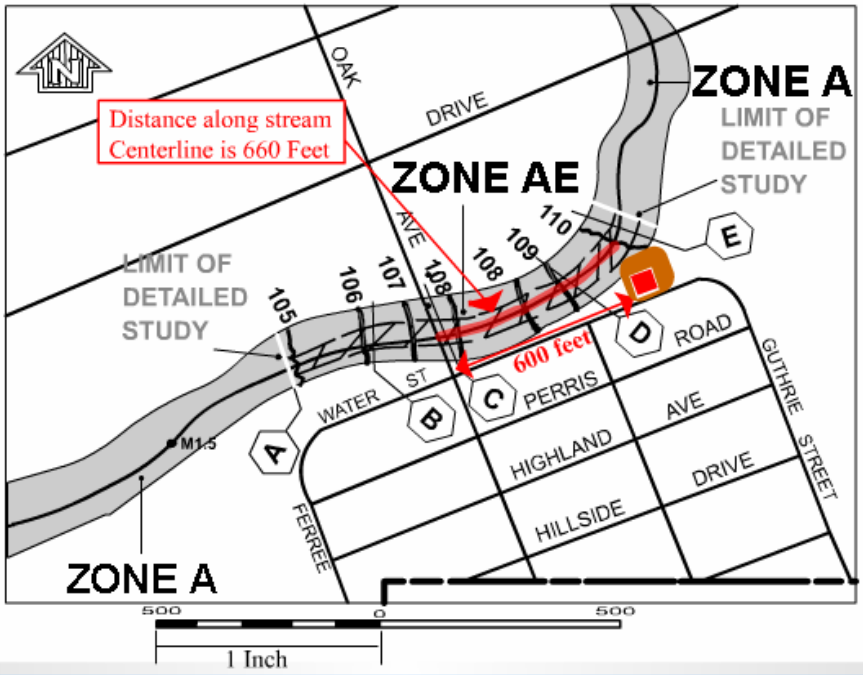
4. Close this window and go to the Flood Insurance Study (FIS) profile to determine the Base Flood Elevation.



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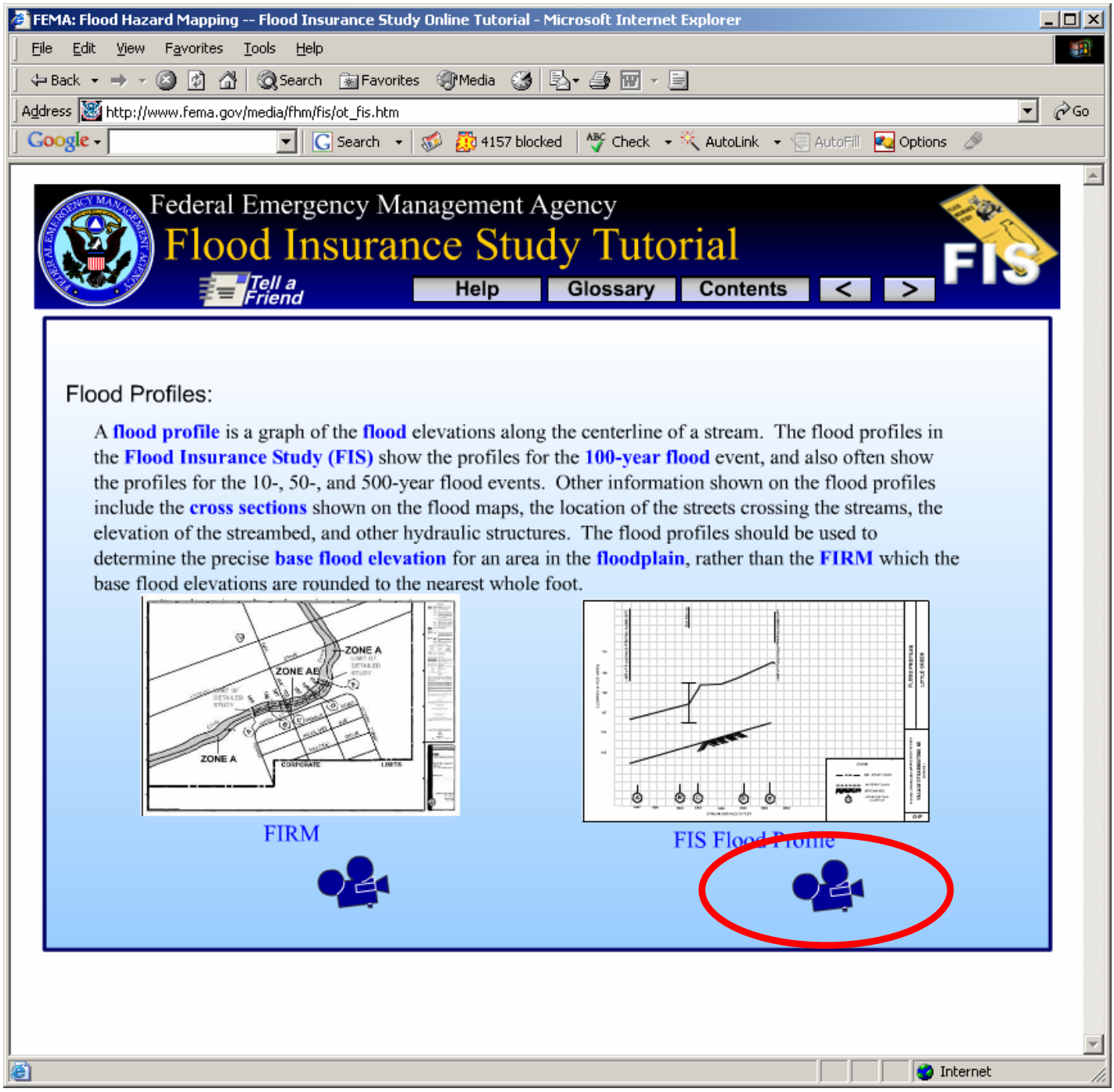

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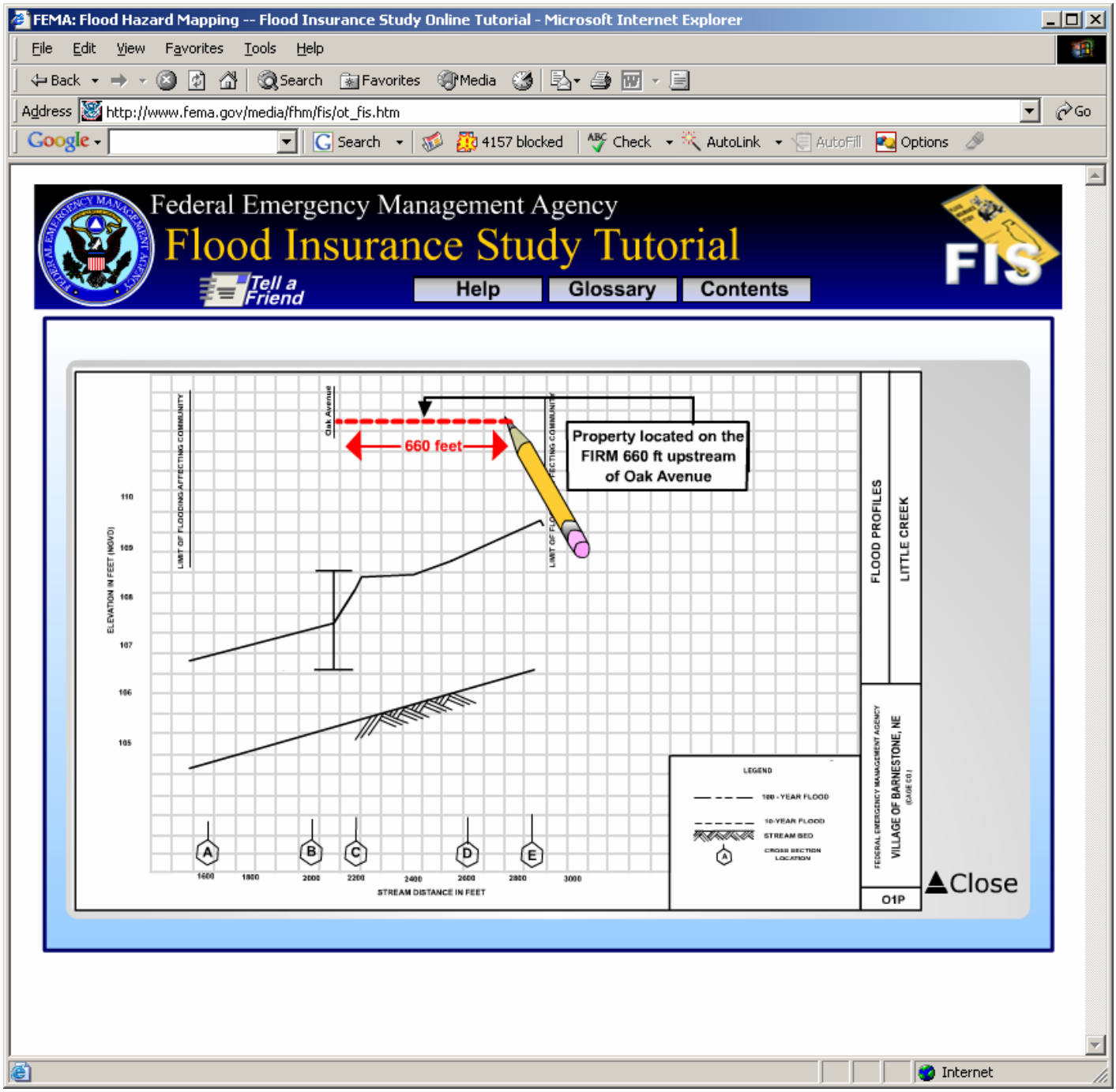
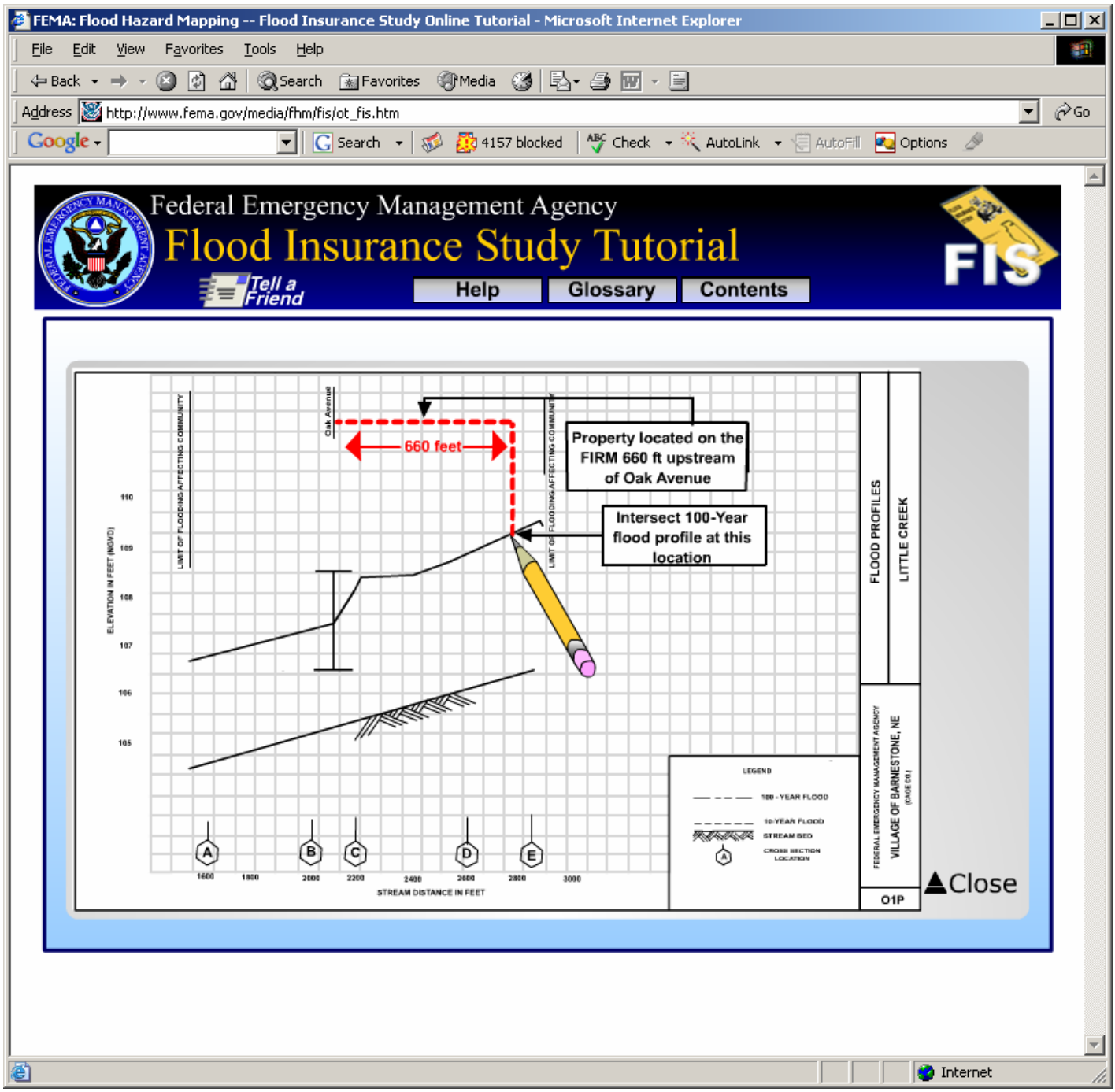
THE ANIMATION DRAWS THE RED LINES ON THE FOLLOWING 3 SLIDES

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660 feet
Property located on the FIRM 660 ft upstream of Oak Avenue
Intersect 100-Year flood profile at this location
Oak Avenue
LIMIT OF FLOODING AFFECTING COMMUNITY
ELEVATION IN FEET (NGVD)
STREAM DISTANCE IN FEET
LEGEND
100 - YEAR FLOOD
10-YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
LITTLE CREEK
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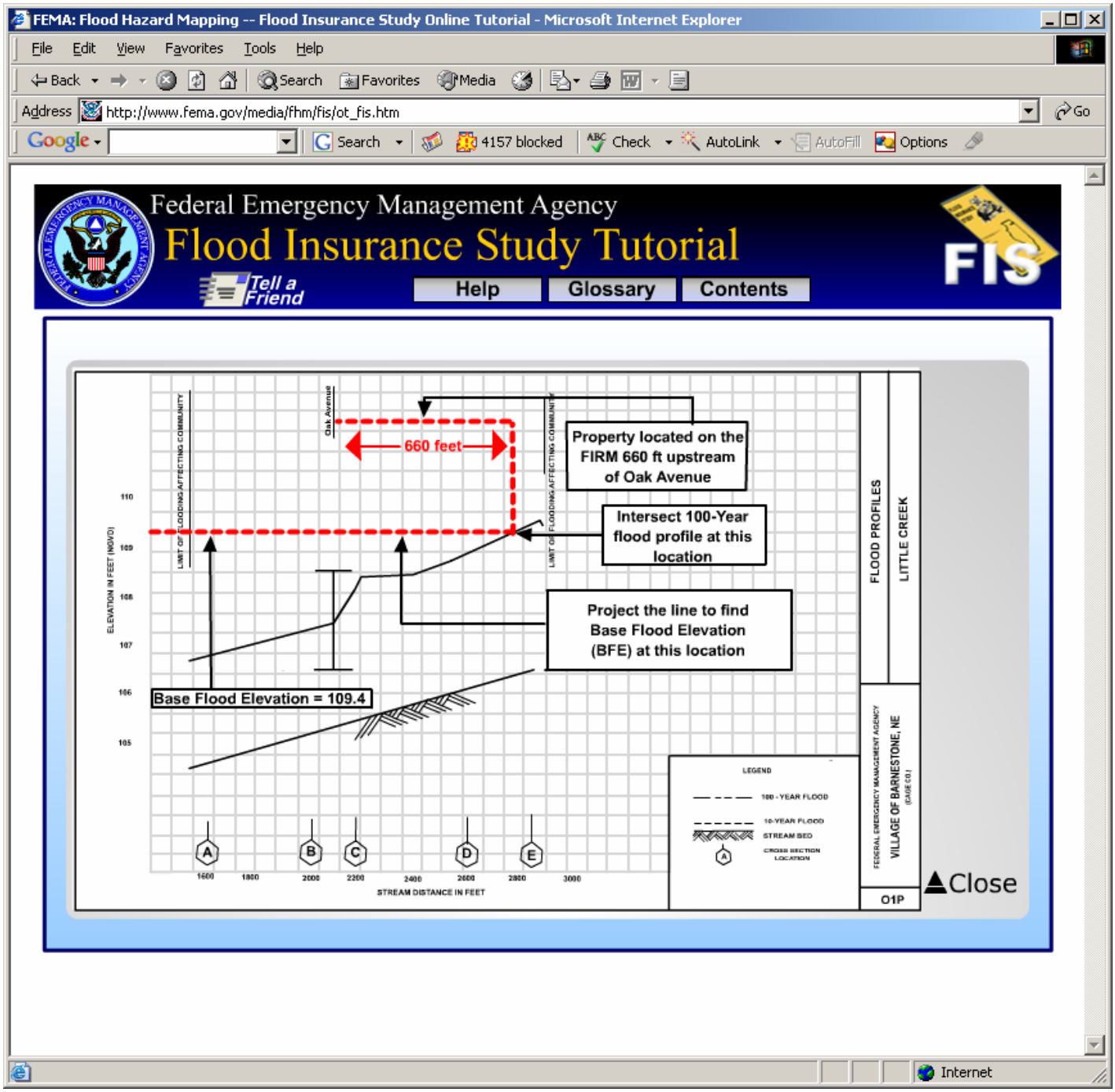
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660 feet
Property located on the FIRM 660 ft upstream of Oak Avenue
Intersect 100-Year flood profile at this location
Project the line to find Base Flood Elevation (BFE) at this location
Base Flood Elevation = 109.4
Oak Avenue
LIMIT OF FLOODING AFFECTING COMMUNITY
ELEVATION IN FEET (NGVD)
STREAM DISTANCE IN FEET
LEGEND
100 - YEAR FLOOD
10-YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
LITTLE CREEK
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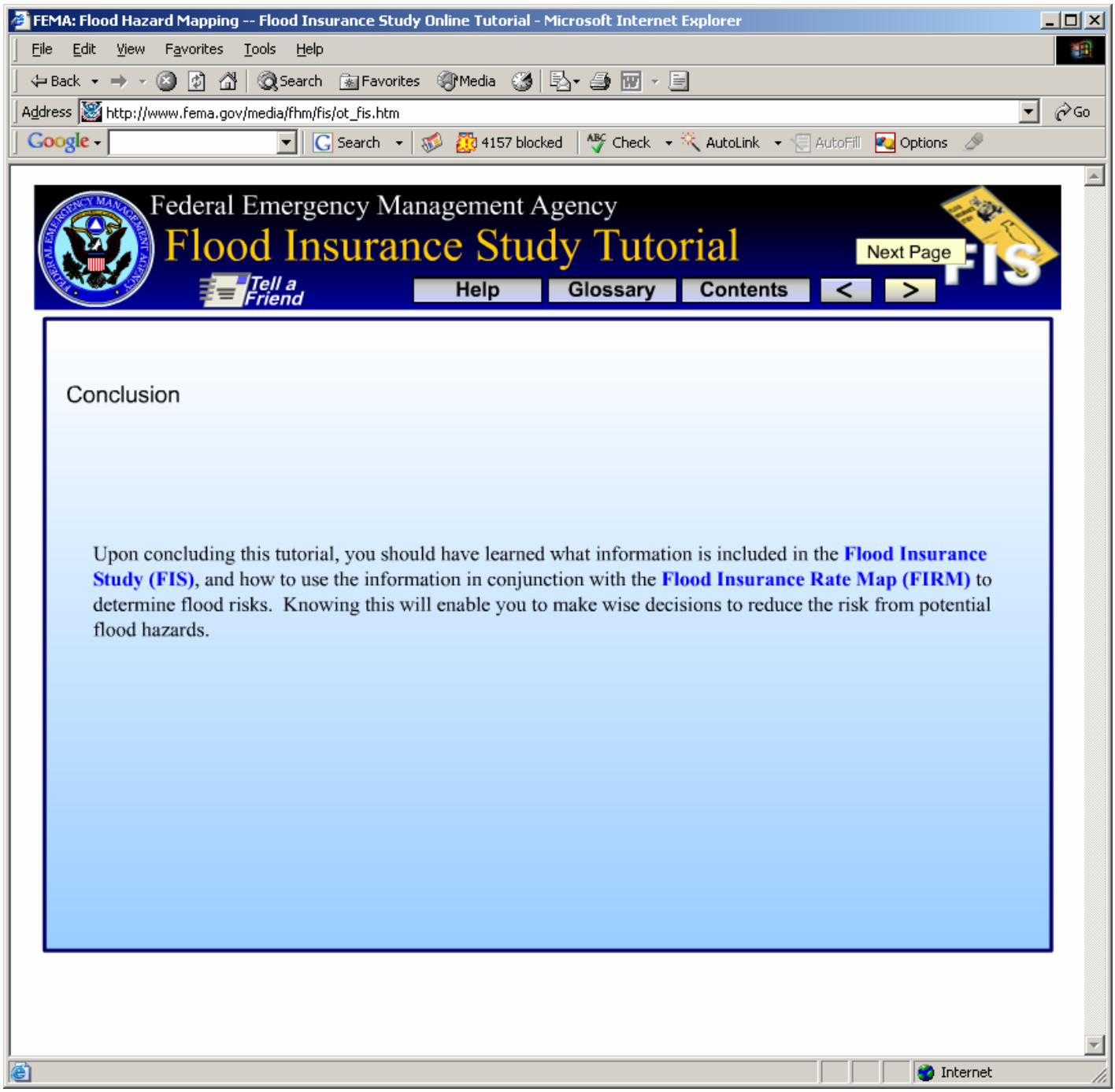
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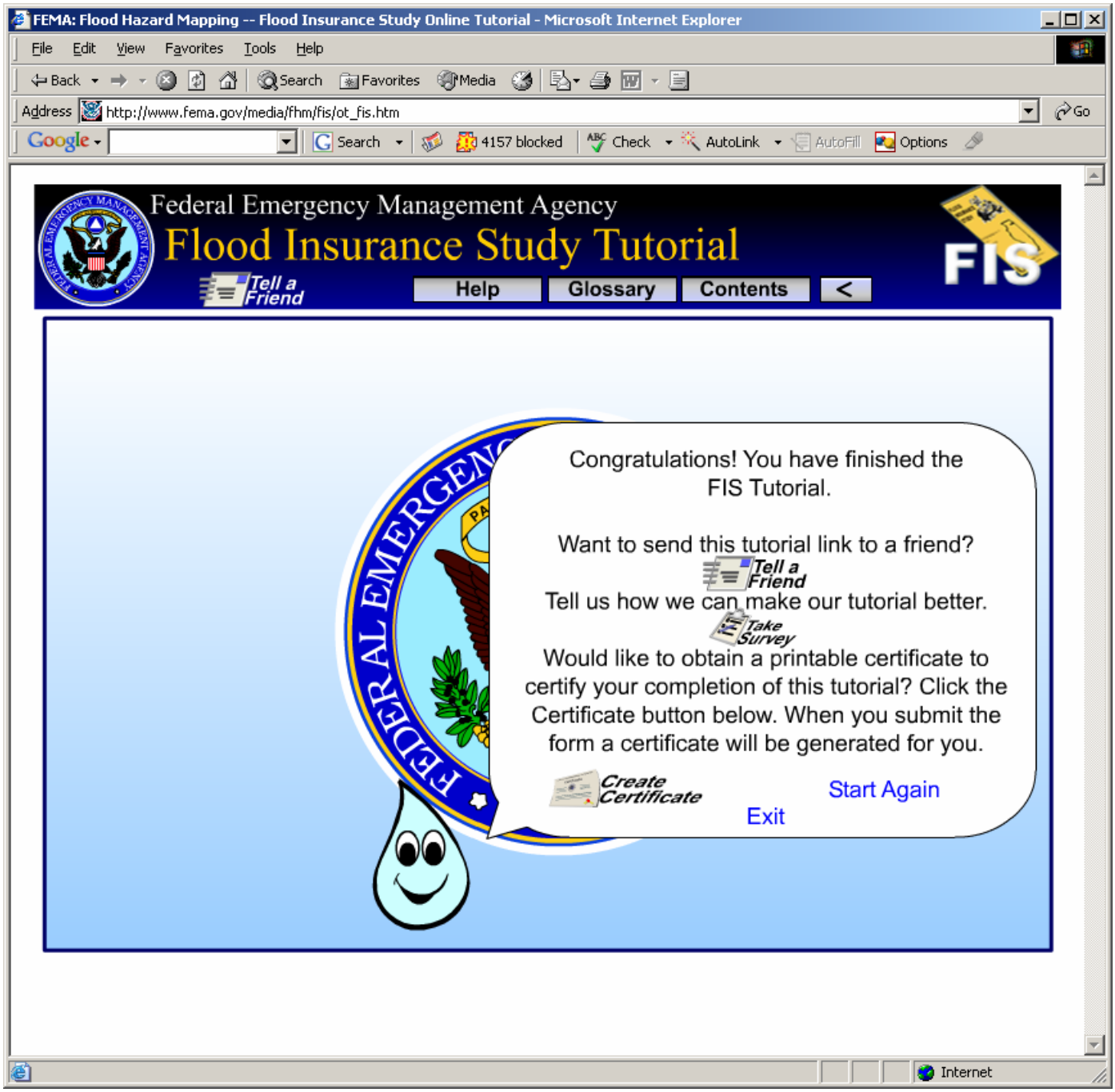
Conclusion
Upon concluding this tutorial, you should have learned what information is included in the Flood Insurance Study (FIS), and how to use the information in conjunction with the Flood Insurance Rate Map (FIRM) to determine flood risks. Knowing this will enable you to make wise decisions to reduce the risk from potential flood hazards.
Internet



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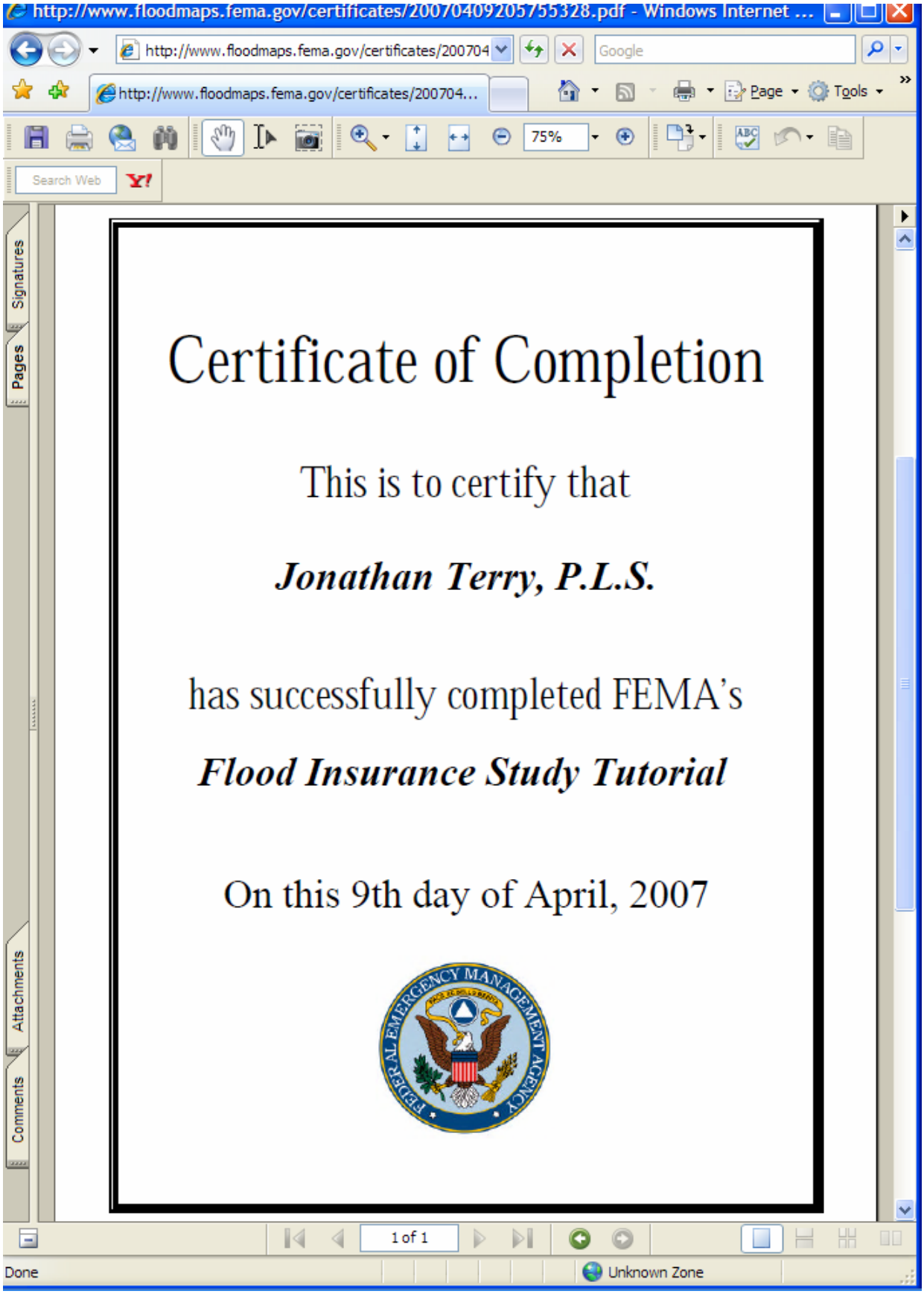
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This is to certify that
Jonathan Terry, P.L.S.
has successfully completed FEMA's
Flood Insurance Study Tutorial
On this 9th day of April, 2007
FEDERAL EMERGENCY MANAGEMENT AGENCY
1 of 1
Done
Unknown Zone

GLOSSARY ENTRIES PROVIDED ON THE TUTORIAL'S "GLOSSARY" PULL-DOWN MENU:

Base Flood
The flood having a 1-percent chance of being equaled or exceeded in any given year, also known as the 100-year flood. The base flood, which is the standard used by most Federal and state agencies, is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management and to determine the need for flood insurance. A structure located within a special flood hazard area on a NFIP map has a 26-percent chance of suffering flood damage during the term of a 30-year mortgage.

Base Flood Elevation (BFE)
The height of the base flood usually in feet, in relation to the National Geodetic Vertical Datum of 1929, the North American Vertical Datum of 1988, or other datum referenced in the Flood Insurance Study report, or depth of the base flood, usually in feet, above the ground surface.

Cross Section
A line developed from topographic information across a floodplain at which a computation of flood flow has been made to establish a potential flood elevation. Cross-sections are shown on the Flood Boundary Floodway Map, Flood Insurance Rate Map, and-or Flood Profiles of a Flood Insurance Study.

Cubic feet per second (cfs)
Typical units used to express the rate of flow of surface water in open channels. One cf is approximately equal to 7.5 gallons per second.

Datum
A fixed starting point of a scale.

Discharge
The volume of water that passes a given location within a given period of time. Usually expressed in cubic feet per second (cfs).

Federal Emergency Management Agency (FEMA)
An independent agency of the Federal government, founded in 1979, which reports directly to the President. FEMA is responsible for identifying and mitigating natural and man-made hazards. The agency's mission is:

> *To reduce loss of life and property and protect our nation's critical infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response, and recovery.*

Flood (also Flooding)
A general and temporary condition of partial or complete inundation of normally dry land areas. For flood insurance claim purposes, two or more structures must be inundated before flood damage will be covered

Flood Boundary Floodway Map (FBFM)
A pre-Map Initiatives floodplain management map that delineates the 100-year (1 percent annual chance) and 500-year (0.2 percent annual chance) floodplains, floodway, and cross sections.

Flood Insurance Rate Map (FIRM)
A map on which the 100-year (1% annual chance) and the 500-year (0.2% annual chance) floodplains, Base Flood Elevations, and risk premium zones (and floodway information on Map Initiatives FIRMs) are delineated to enable insurance agents to issue an accurate flood insurance policies to homeowners in communities participating in the National Flood Insurance Program.

Flood Insurance Study (FIS)
An examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water-surface elevations. The resulting reports are used to develop Flood Insurance Rate Maps. Also known as a flood elevation study.

Flood Profile
A cross-sectional drawing showing the contiguous cross-sections along a stream, with ground elevations and potential flood elevations plotted.

Floodplain Management
The operation of the program of corrective and preventive measures for mitigating flood damage, including, but not limited to, emergency preparedness plans, flood-control works, and floodplain management regulations.

Floodplain or Flood Hazard Area
Floodplain, Flood Hazard Area or Flood-Prone Area
Any land area susceptible to inundation by water from any source.

Floodway
Channel of the stream plus any adjacent floodplain areas that must be kept free of encroachment so that a 100-year flood discharge can be conveyed without increasing the elevation of the 100-year flood by more than a specified amount (1 foot in most states).

HEC-2
A step backwater program developed by the US Army Corps of Engineers Hydrologic Engineering Center for use in calculating water-surface profiles for steady, gradually varied flow in natural or man-made channels.

Levee
A man-made structure, usually an earthen embankment, designed to contain, control or divert the flow of water in order to provide flood protection.

Manning's "n" Roughness Coefficient
Coefficient used to account for the friction caused by friction, vegetative, and/or man-made surfaces within a floodplain cross-section. The coefficient, n, is commonly used to represent flow resistance for hydraulic computations of flow and open channels. The procedure for selecting n values is subjective and requires judgment and skill that is developed primarily through experience. The expertise necessary for proper selection of n values can be obtained in part by examining characteristics of channels that have known or verified roughness coefficients. A table of Manning n values is available from t;H; pull-down menu in the Quick-2 program.

Map Repository
The location where a community's flood maps are kept; usually the local zoning and planning office.

Maps Service Center (MSC)
The Maps Service Center (MSC) distributes National Flood Insurance Program (NFIP) products including: Digital Flood Insurance Rate Maps (DFIRM), Flood Insurance Rate Maps (FIRM), Flood Insurance Studies (FIS), Digital Q3 flood data, Community Status Book, Flood Map Status Information Service (FMSIS), and Letters of Map Change (LOMC).

National Flood Insurance Program (NFIP)
Federal insurance program under which flood-prone areas are identified and flood insurance is made available to residents of participating communities that agree to adopt and enforce floodplain management ordinances to reduce future flood damage.

Normal Depth
The depth expected for a stream when the flow is uniform, steady, one-dimensional, and is not affected by downstream obstructions or flow changes. This is the usual calculation that is utilized to determine Base Flood Elevations for property or structures in approximate Zone A areas.

Overbank
The area of the cross section that is found outside of the channel bank stations on either side of the stream channel.

Peak Discharge
The peak volume of water that passes a given location within a given period of time. Usually expressed in cubic feet per second (cfs).

Perpendicular to Flow Path
Cross section should be plotted so that they are oriented in a manner that is perpendicular to the flow Path. Plotting cross-sections in this manner requires that the user examine the topography to determine the direction in which the water is most likely to flow in relation to different points along the proposed cross-section line. Typically, this can be achieved by ensuring that the cross-section line crosses each contour on the topographic map at or near a 90° angle.

Scale
A representative fraction of map distance to ground distance. Example: 1:12,000 is the representative fraction in which one unit of measure on the map is equal to 12,000 of the same units of measure on the ground. Federal Emergency Management Agency map scales are expressed in a ratio of map distance equal to a given number or feet on the ground.

Step-Backwater Analysis
Method used in Quick-2 (and other modeling programs) to analyze multiple cross-sections. Water-surface elevations are determined for all sections based on a given discharge. The initial water-surface elevation is automatically determined by the normal depth method or by a direct input of a water-surface elevation or depth.

Water-Surface Elevation
The height, in relation to the National Geodetic Vertical Datum of 1929 (or other datum, where specified) of floods of various magnitudes and frequencies in the identified floodplains of coastal or riverine areas.

Zone
A geographical area shown on Flood Hazard Boundary Map (FHBM) or a Flood Insurance Rate Map (FIRM) that reflects the severity or type of flooding in the area.

The following are not given in the FIS tutorial but are included here for your information:

Zone A
The flood insurance rate zone that corresponds to the 100-your floodplains that is determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no Base Flood Elevations or depths are shown within this zone. Mandatory flood insurance purchase requirements apply.

Zone A99
The flood insurance rate zone that corresponds to areas of the 100-year floodplains that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No Base Flood Elevations or depths are shown within the zone. Mandatory flood insurance purchase requirements apply.

Zone AE
[Note: In the tutorial, the following definition for Zone AE is accessed through clicking a link titled, "Zone AE and A1-A30.]
The flood insurance rate zone that corresponds to the 100-year floodplains that is determined in the Flood Insurance Study by detailed methods. In most instances, Base Flood Elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply.

Zone AH
The flood insurance rate zone that corresponds to the areas of the 100-year shallow flooding with a constant water-surface elevation (usually areas of ponding) where average depths are between 1 and 3 feet. The Base Flood Elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply.

Zone AO
The flood insurance rate zone that corresponds to the area of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. The depth should be averaged along the cross-section and then along the direction of flow to determine the extent of the zone. Average flood depths derived from the detailed hydraulic analyses are shown within this zone. In addition, alluvial fan flood hazards are shown as Zone AO on the Flood Insurance Rate Map. Mandatory flood insurance purchase requirements apply.

Zone AR
The flood insurance rate zone that results from the decertification of a previously accepted flood protection system that is being restored to provide protection from the 100-year or greater flood event.

Zone D
Designation on National Flood Insurance Program maps used for areas where there are possible, but undetermined, flood hazards. In areas designated as Zone D, no analysis of flood hazards has been conducted. Mandatory flood insurance purchase requirements do not apply, but coverage is available. The flood insurance rates for properties in Zone D are commensurate with the uncertainty of the flood risk.