Using Digital Tools in Areas of Detailed Study

Advanced Floodplain Management | June 2024

FEMA

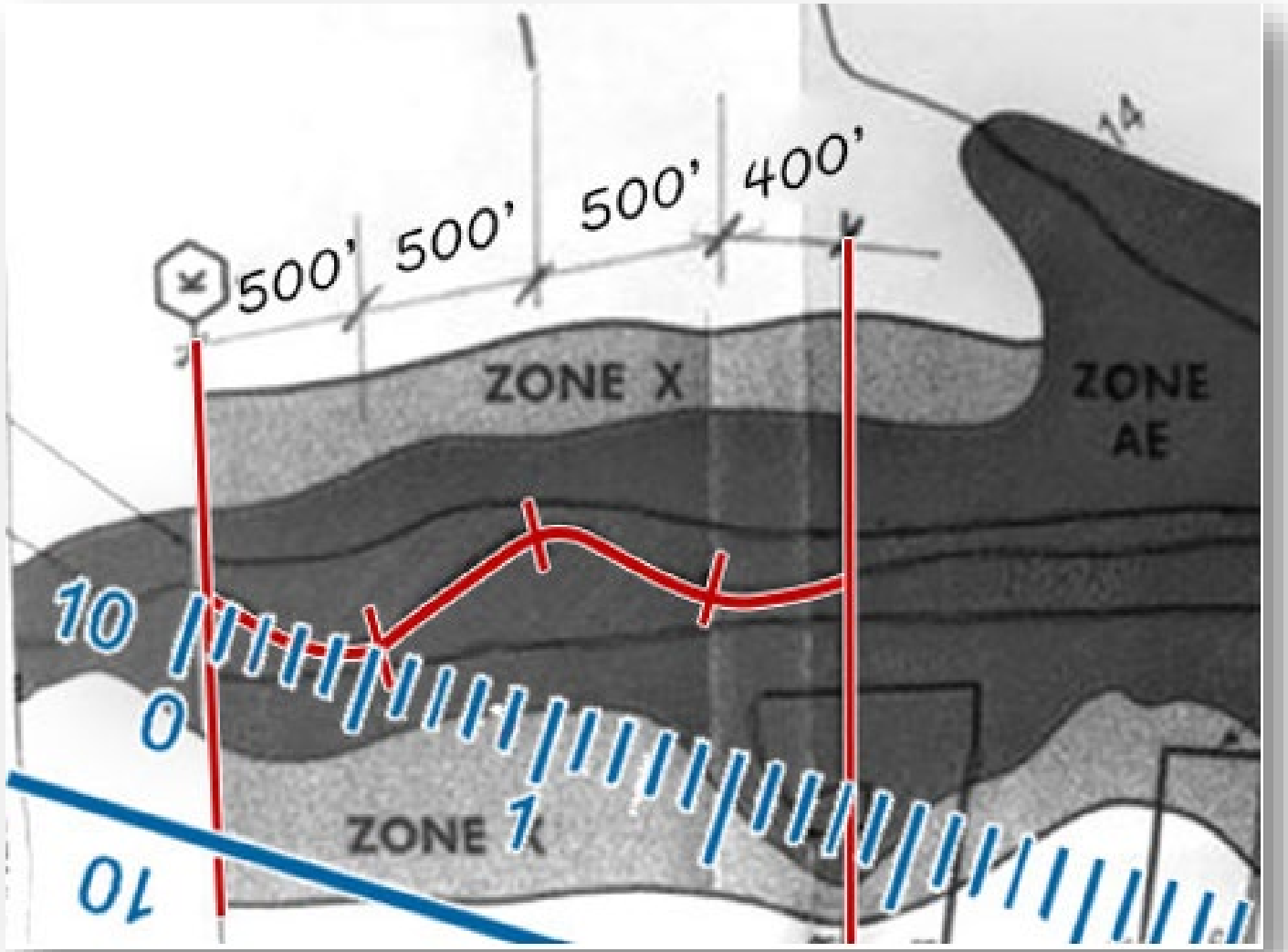
Learning objective

Learn how to utilize digital tools to acquire Base Flood Elevation (BFE) data from the Flood Insurance Study (FIS).

Previous Trainings

Trainings with paper-based exercises

- FEMA's four-day L/E-0273 *Managing Floodplain Development Through the NFIP* course, Unit 3
- FEMA's Independent Study courses *How to Read a FIRM* and *How to Use a FIS*
- FEMA's *NFIP 101* hosted online, on-demand with the Association of State Floodplain Managers (ASFPM), Unit 3



FEMA

Why should a community consider using digital tools?

Benefits of using digital tools

ACCURACY

CONSISTENCY

EFFICIENCY

ABILITY TO MAINTAIN RECORD OF READING

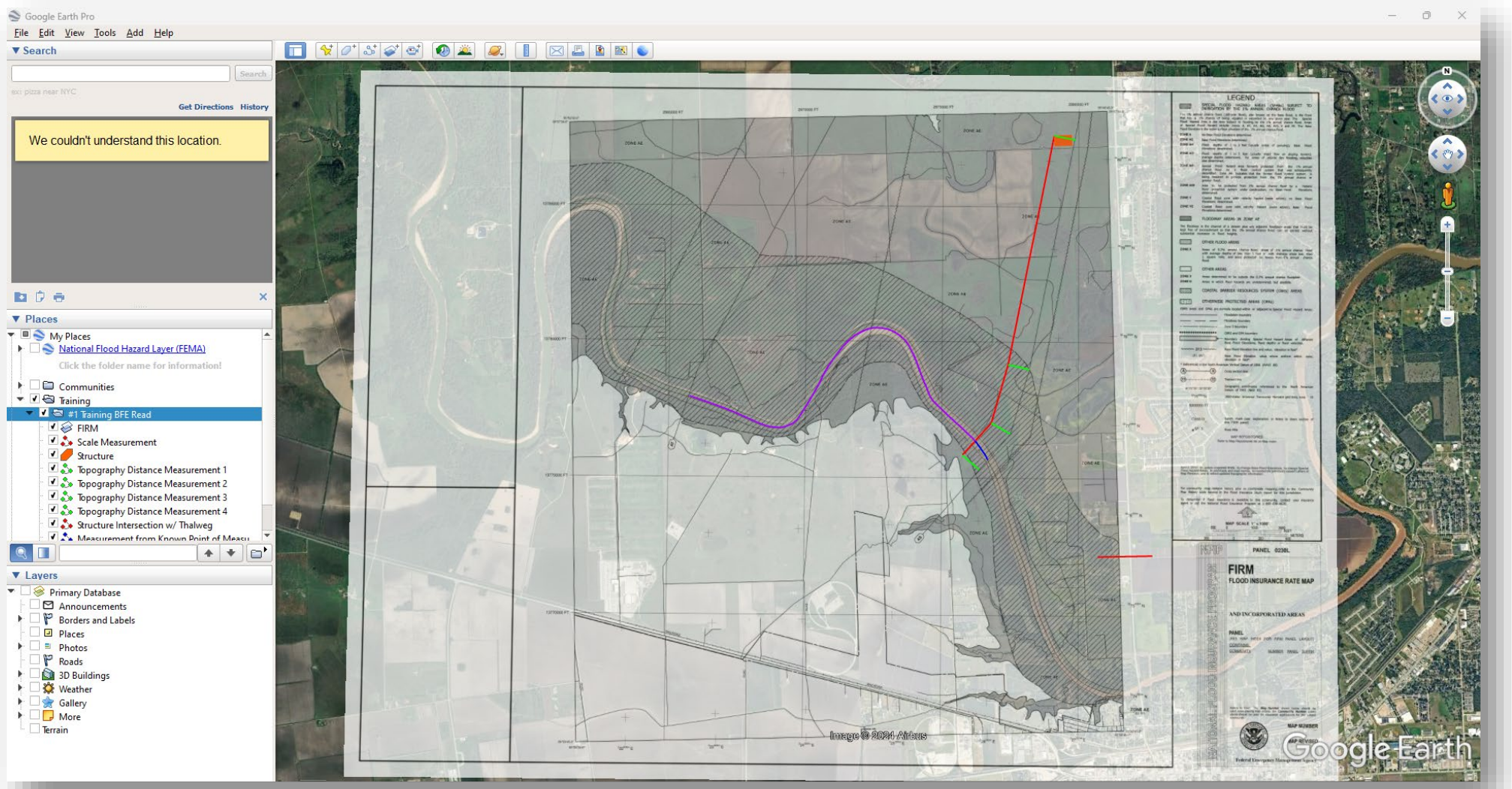
Required Tools

Digital tools

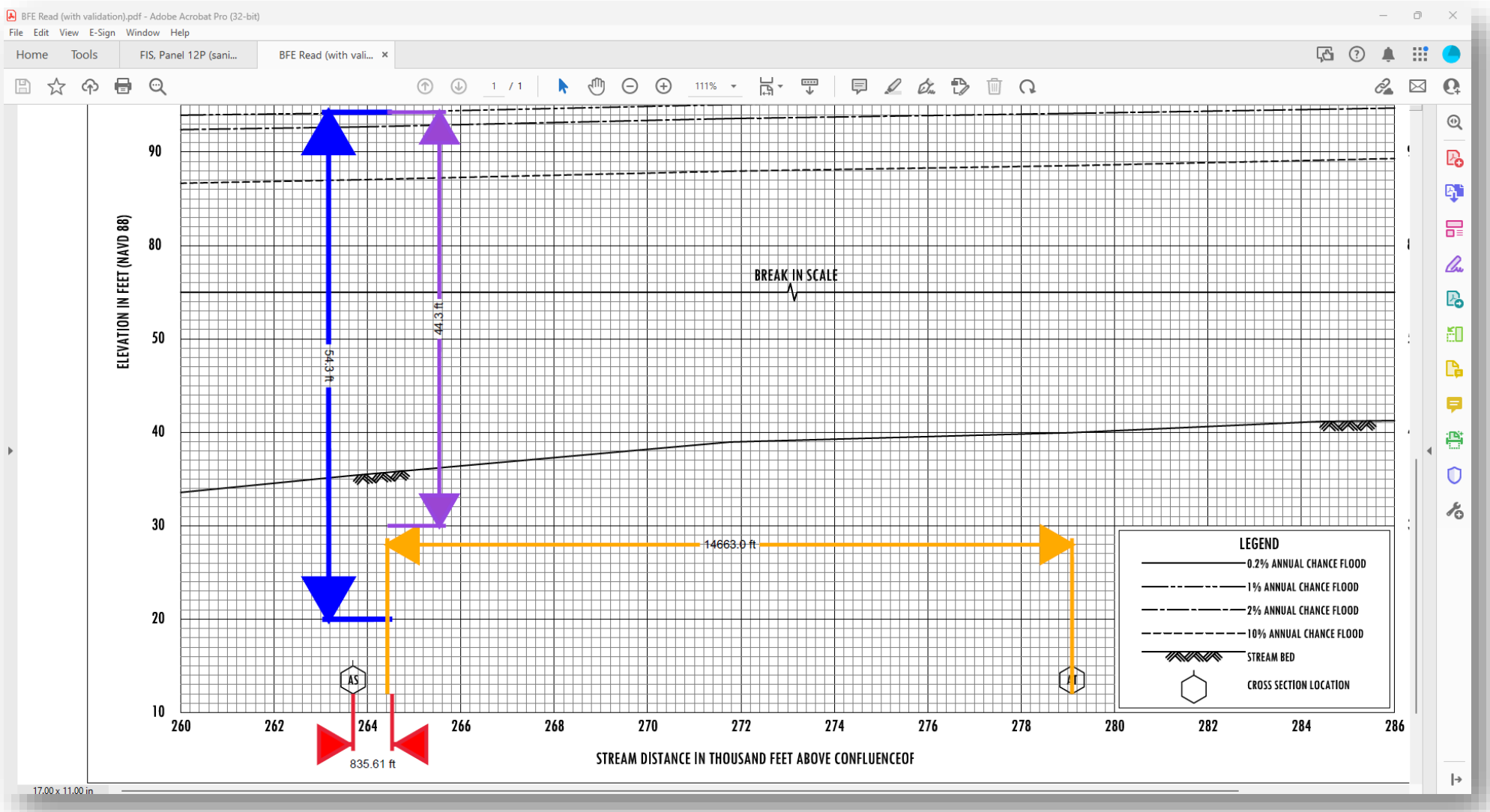
- FEMA Flood Map Service Center
- National Flood Hazard Layer (NFHL) Viewer
- Google Earth Pro
- Adobe Acrobat Pro
  - *Subscription required*

Finished Product

Digital FIRM map



Digital flood profile BFE read



Guided Walk Through: How to Obtain a BFE Using Digital Tools

Resources

- FEMA Flood Maps
- Guide: Flood Zones, Flood Maps
- Guidance for Floodway Analysis
- Elevation Certificate and Dry Floodproofing Certificate
- FEMA IS courses *How to Read a FIRM* and *How to Use a FIS*
- Zone A Manual
- Est BFE Viewer
- BLE Resources

Who are your FEMA and state contacts?

Arkansas

- State NFIP contact: Shawn Jackson, shawn.jackson@agriculture.arkansas.gov, (501) 582-3959
- FEMA contact: Pedro Perez, pedro.perez@fema.dhs.gov, (940) 383-7365

Louisiana

- State NFIP contact: Susan Veillon, susan.veillon@la.gov, (225) 379-3017
- FEMA Contacts: Justin McBride, justin.mcbride@fema.dhs.gov, (202) 664-9962
  Braydon Williams, braydon.williams@fema.dhs.gov, (202) 615-6352

Oklahoma

- State NFIP contact: Jon Phillips, jon.phillips@owrb.ok.gov, (405) 530-8902
- FEMA Contact: Darrin Dutton, darrin.dutton@fema.dhs.gov, (940) 383-7398

New Mexico

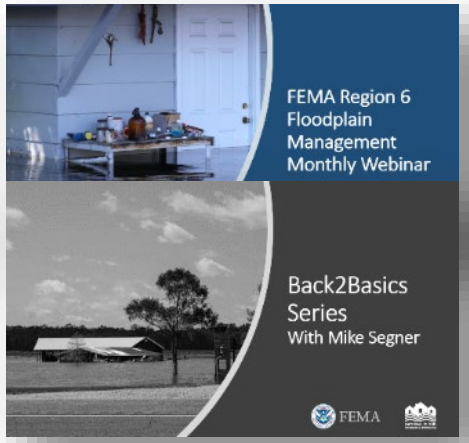
- State NFIP contact: Heath Dobrovolny, CFM, Heath.dobrovolny@dhsem.nm.gov, (580) 541-8183
- FEMA Contact: Tyler Thompson, tyler.thompson@fema.dhs.gov, (771) 208-9698

Texas

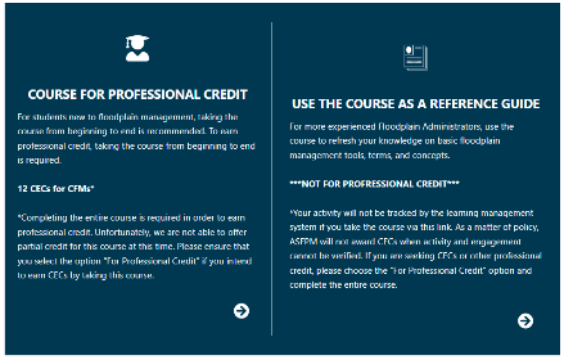
- State NFIP contact: Richie Hernandez, richie.hernandez@twdb.texas.gov, (512) 656-6081
- FEMA contacts: Brian Bartley, brian.bartley@fema.dhs.gov, (940) 383-7207
  Bradford Case, bradford.case@fema.dhs.gov, (202) 769-6745
  Keoka Jenkins, keoka.Jenkins@fema.dhs.gov, (202)368-9374

Training

- Register for future R6 floodplain trainings
- View past R6 recorded floodplain trainings
- Register for future R6 Virtual Brown Bag mapping trainings
- Take free, online training from FEMA's Emergency Management Institute
- Take the free, online FEMA NFIP 101 hosted by ASFPM: Use the Course as a Refresher or for 12 hours of CFM credit



IS-273	How to Read a Flood Insurance Rate Map (FIRM)
IS-274	How to Use a Flood Insurance Study (FIS)
IS-279.a	Introduction to Retrofitting Flood-Prone Residential Buildings
IS-280	Overview of: Engineering Principles and Practices for Retrofitting Flood-Prone Residential Structures, FEMA Publication 259, 3rd Edition
IS-285	Substantial Damage Estimation for Floodplain Administrators



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Training & Outreach Specialist
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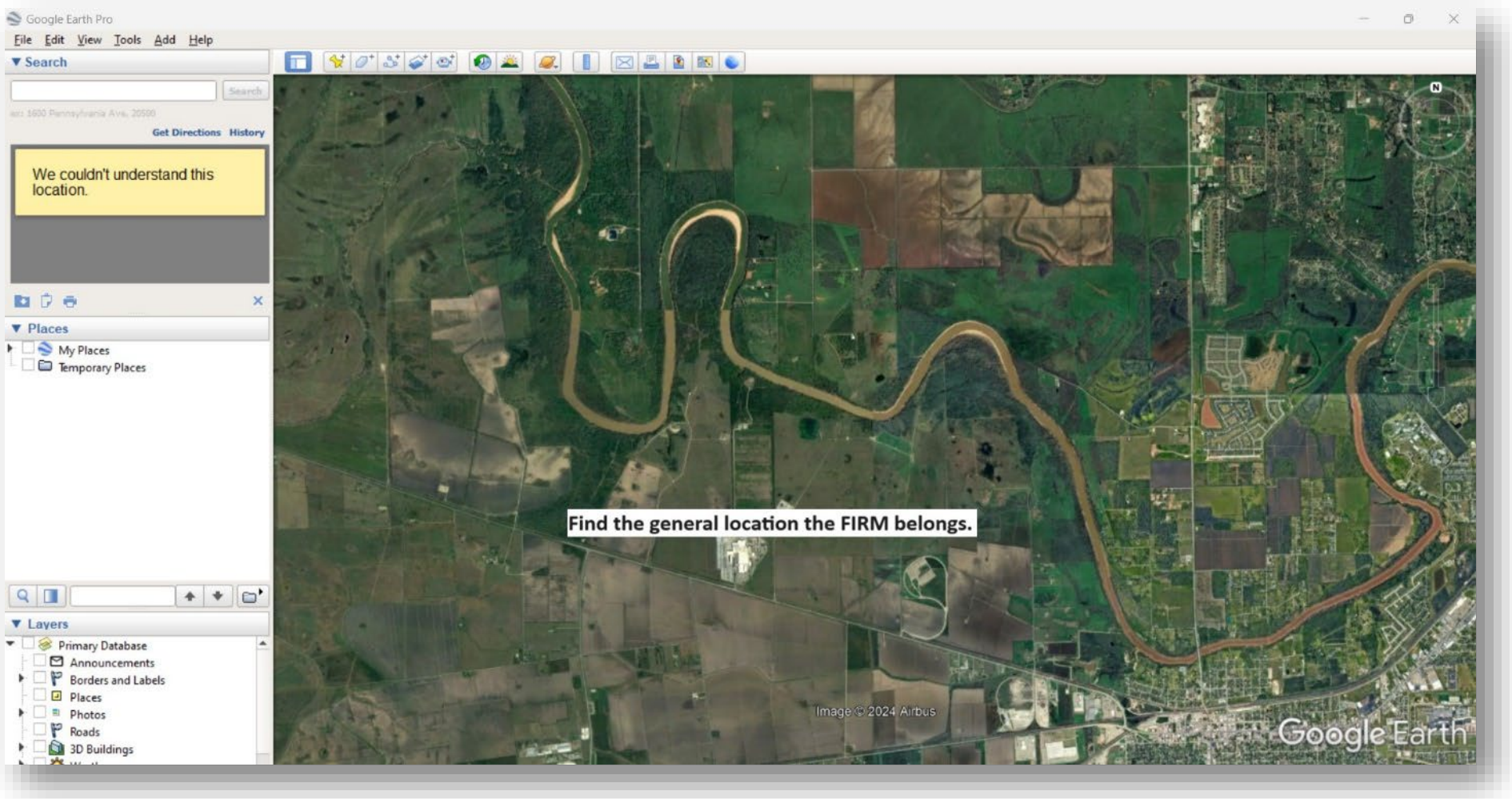
Step by Step: How to Obtain a BFE Using Digital Tools

Step 1

- Identify the location
- Identify the source of flooding
- Identify the FIRM(s)
- Identify the applicable FIS profile
- Download and save the FIRM(s)
- Download and save the FIS

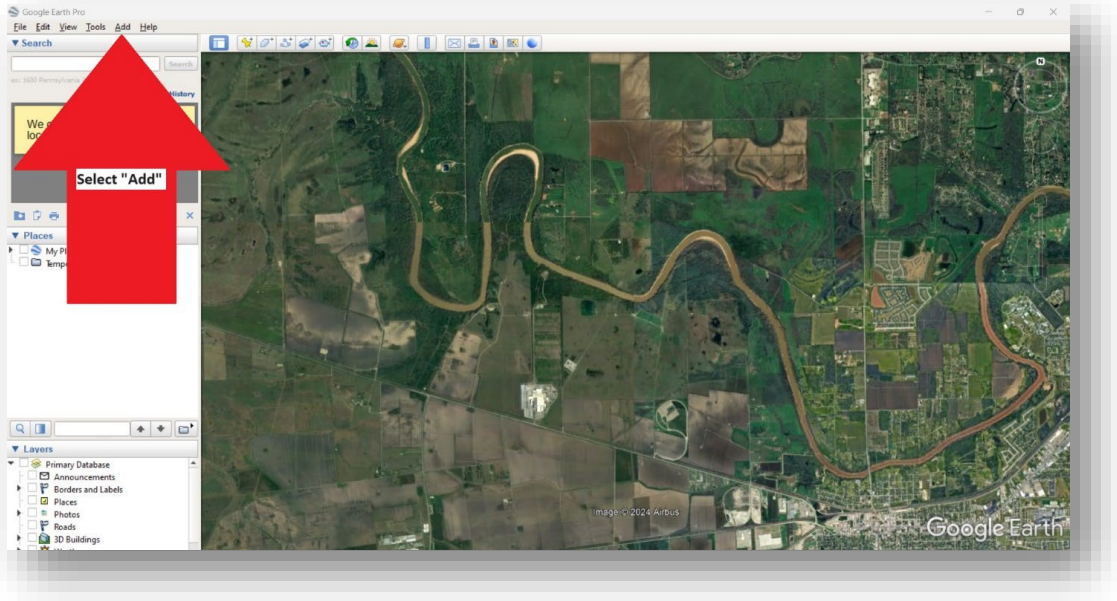
Step 2

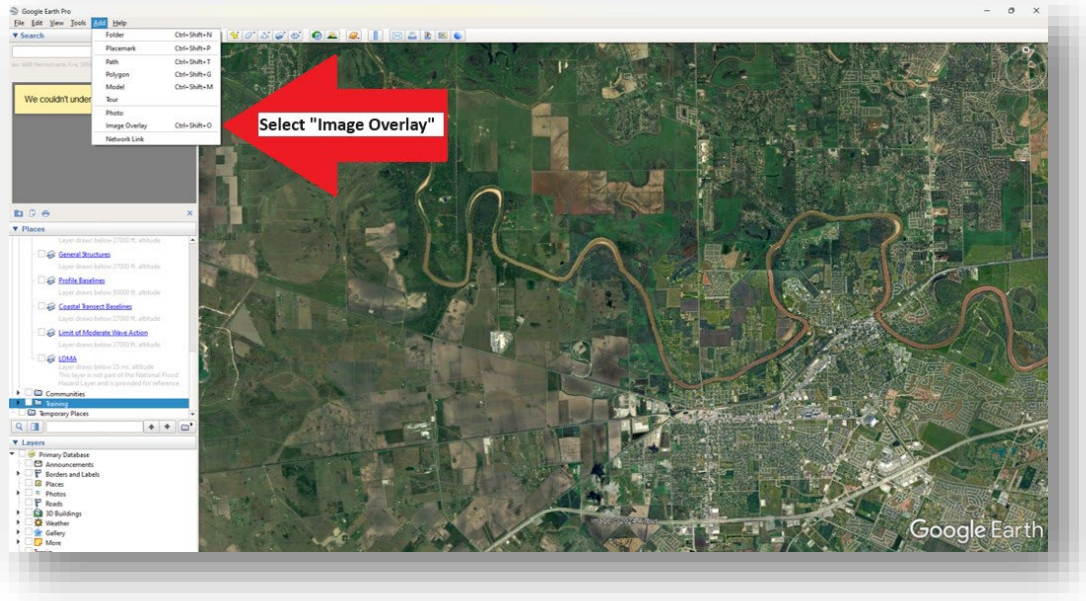
- Open Google Earth Pro
- Find the general location the FIRM panel belongs



Step 3

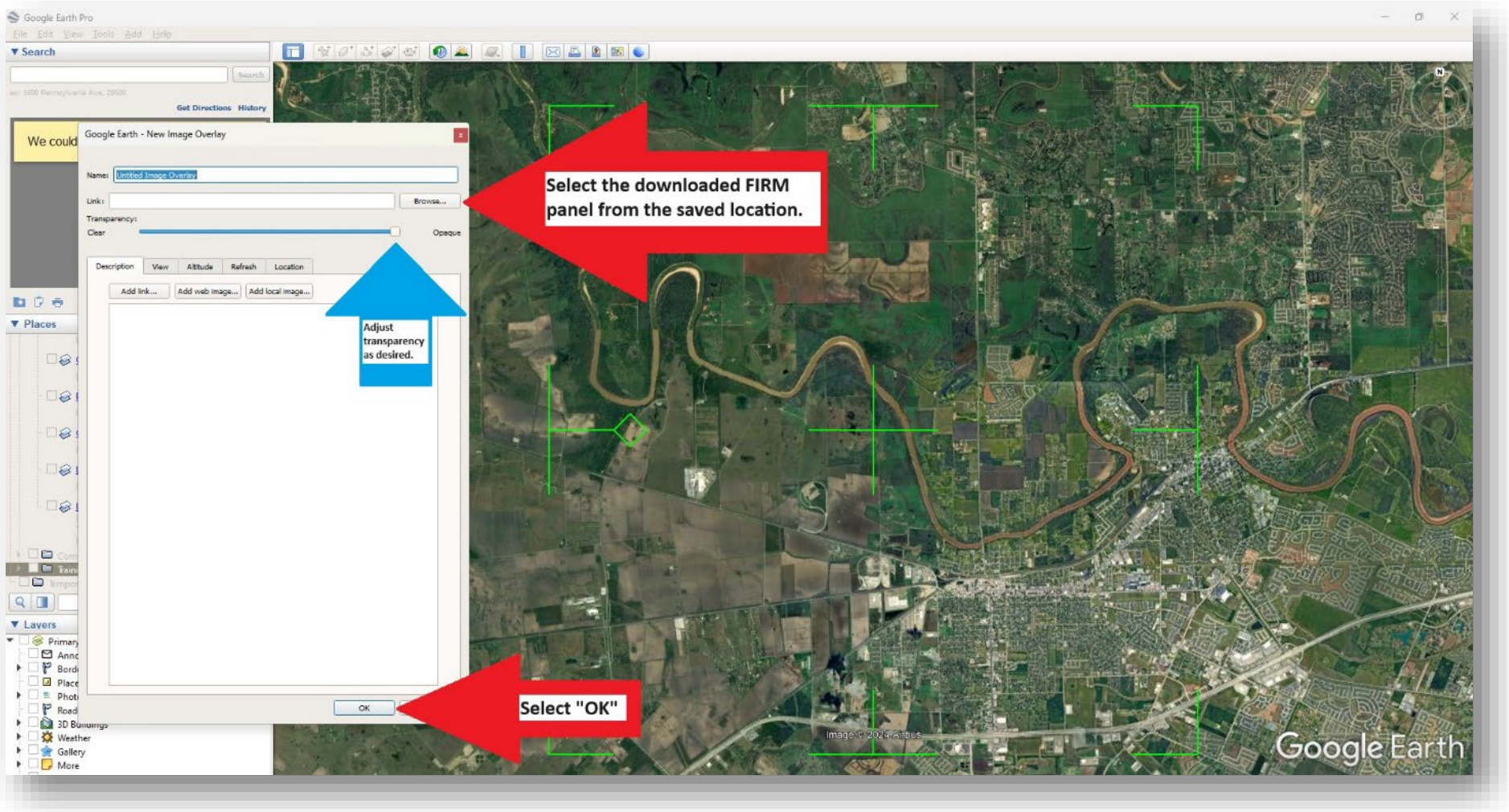
- Select “Add” drop down from the top and select “Image Overlay”





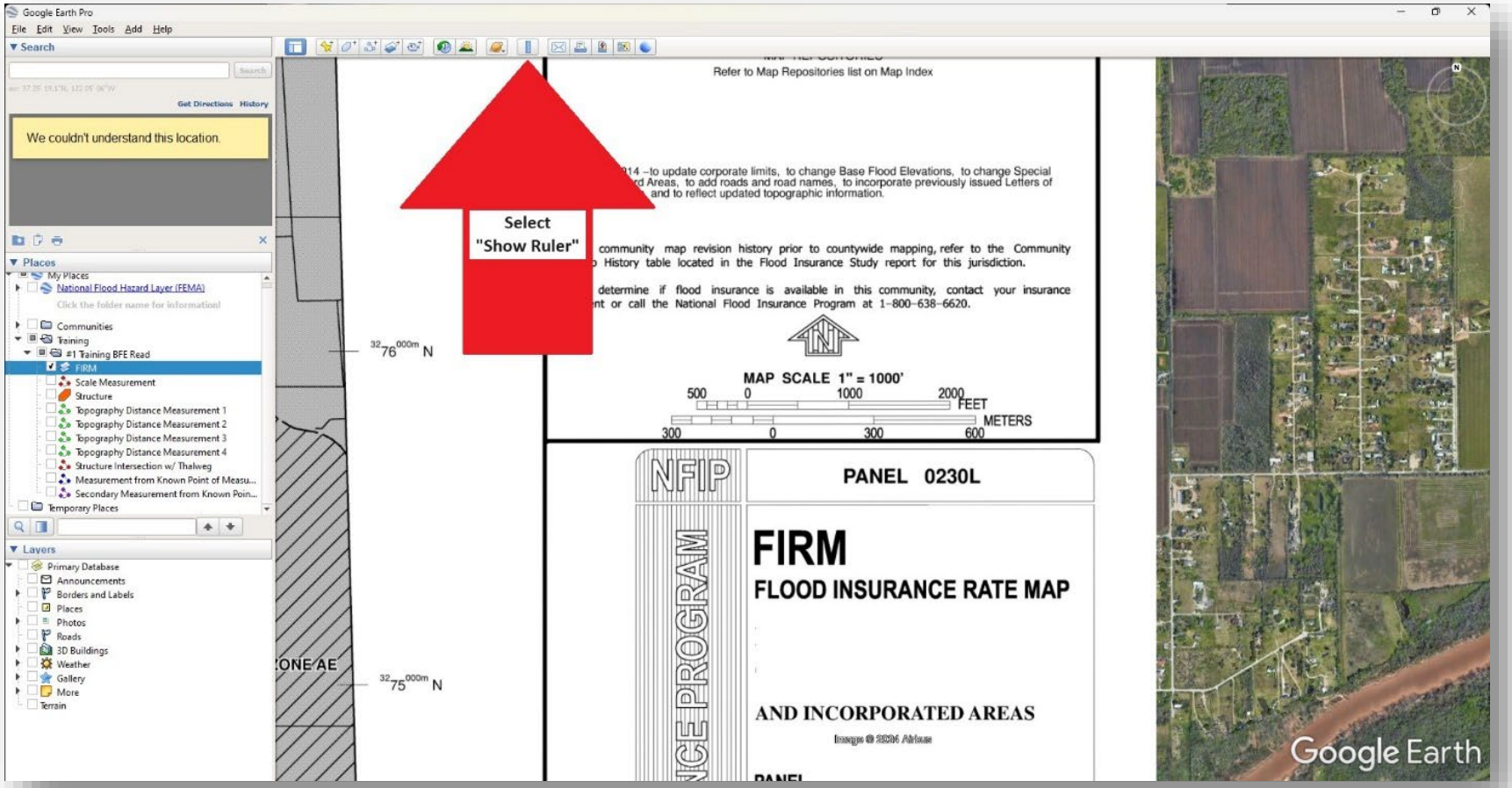
Step 4

- Select the downloaded FIRM panel from saved location
- Adjust transparency as desired and select “OK”



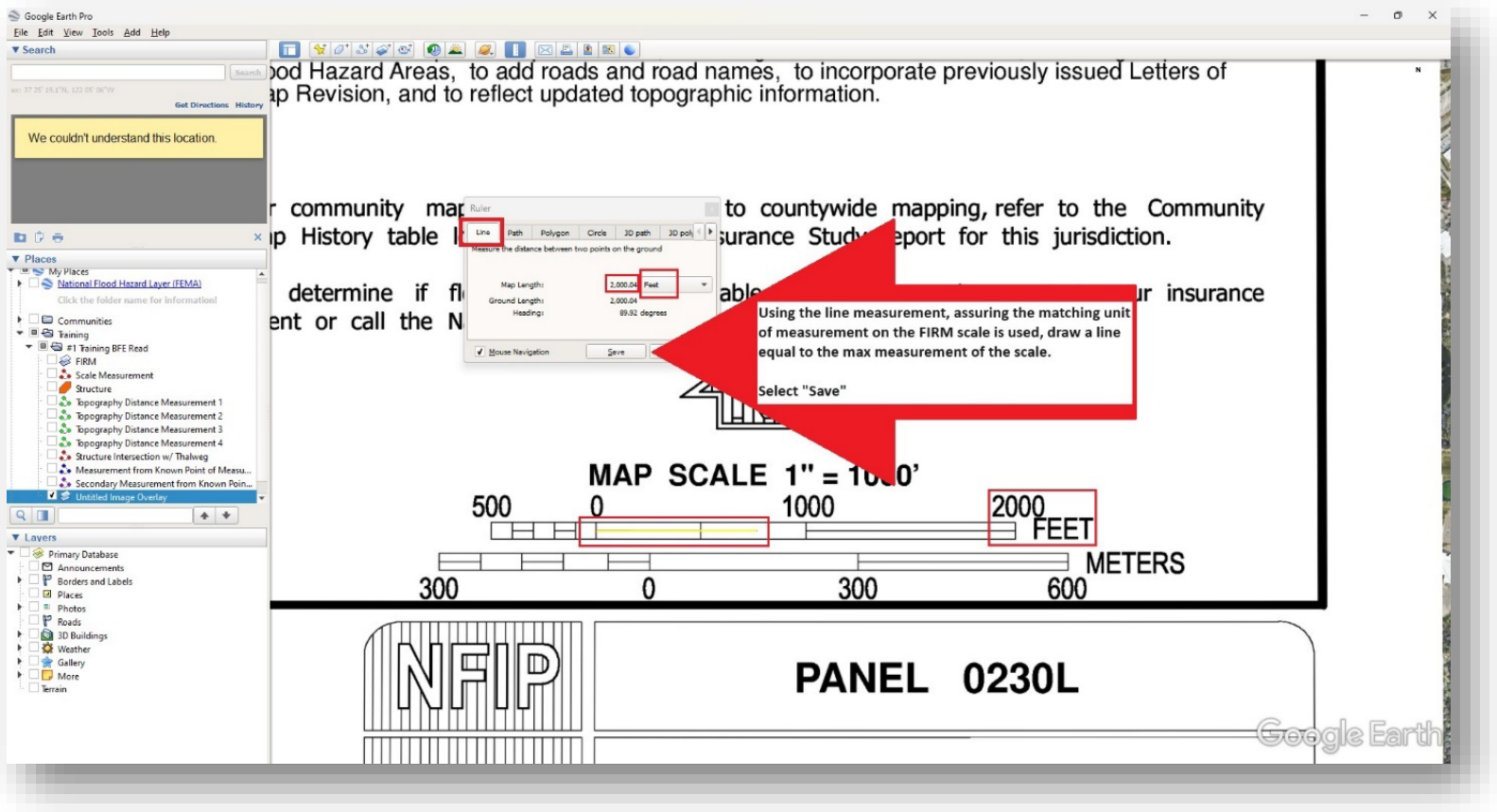
Step 5

- Select “Show Ruler”



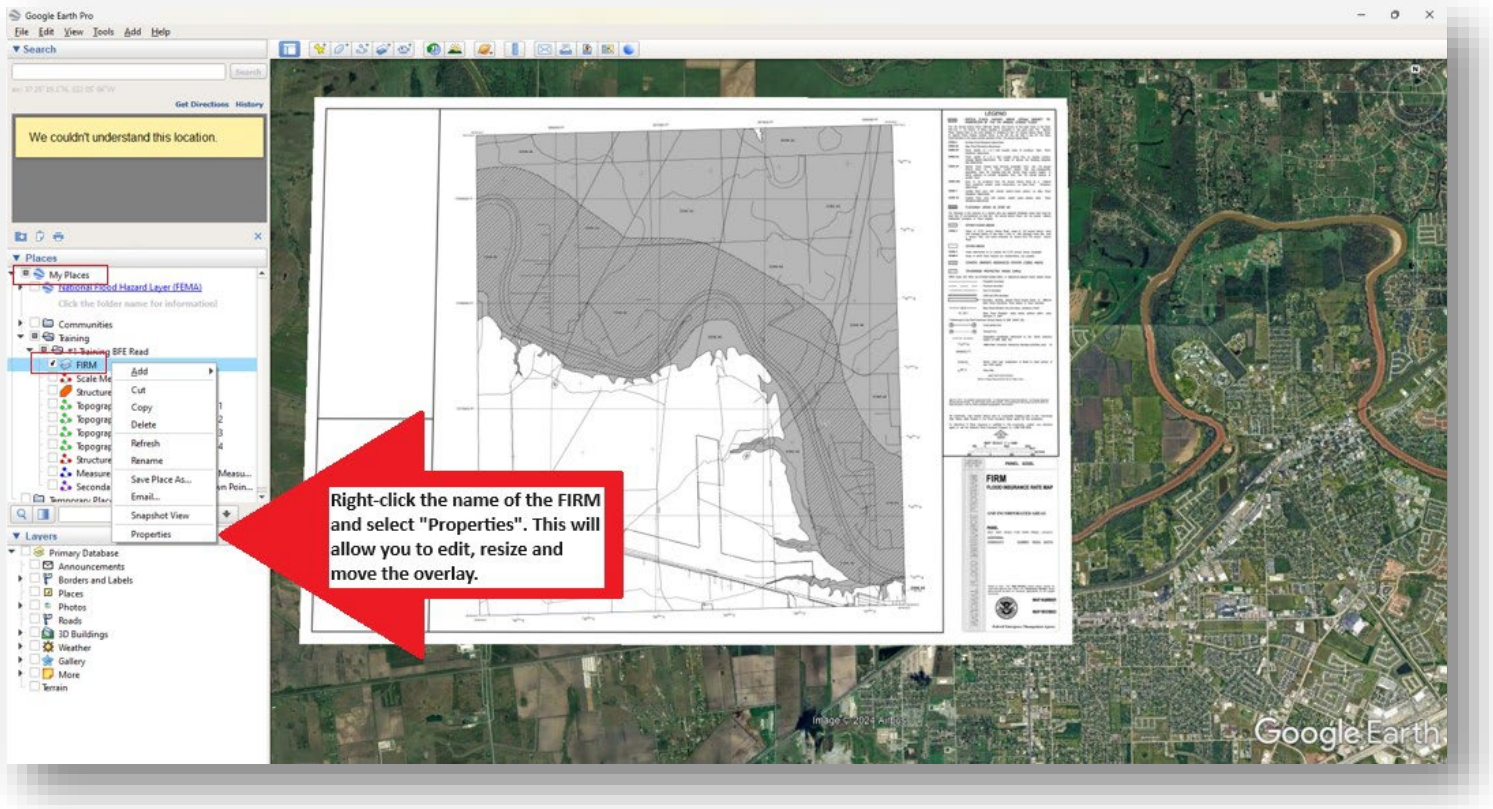
Step 6

- Select “Show Ruler” and “Line” (making sure the measurement corresponds with the map scale, which is typically in feet)
- Draw/measure a line equal to the max measurement on the FIRM scale
- Select “Save”

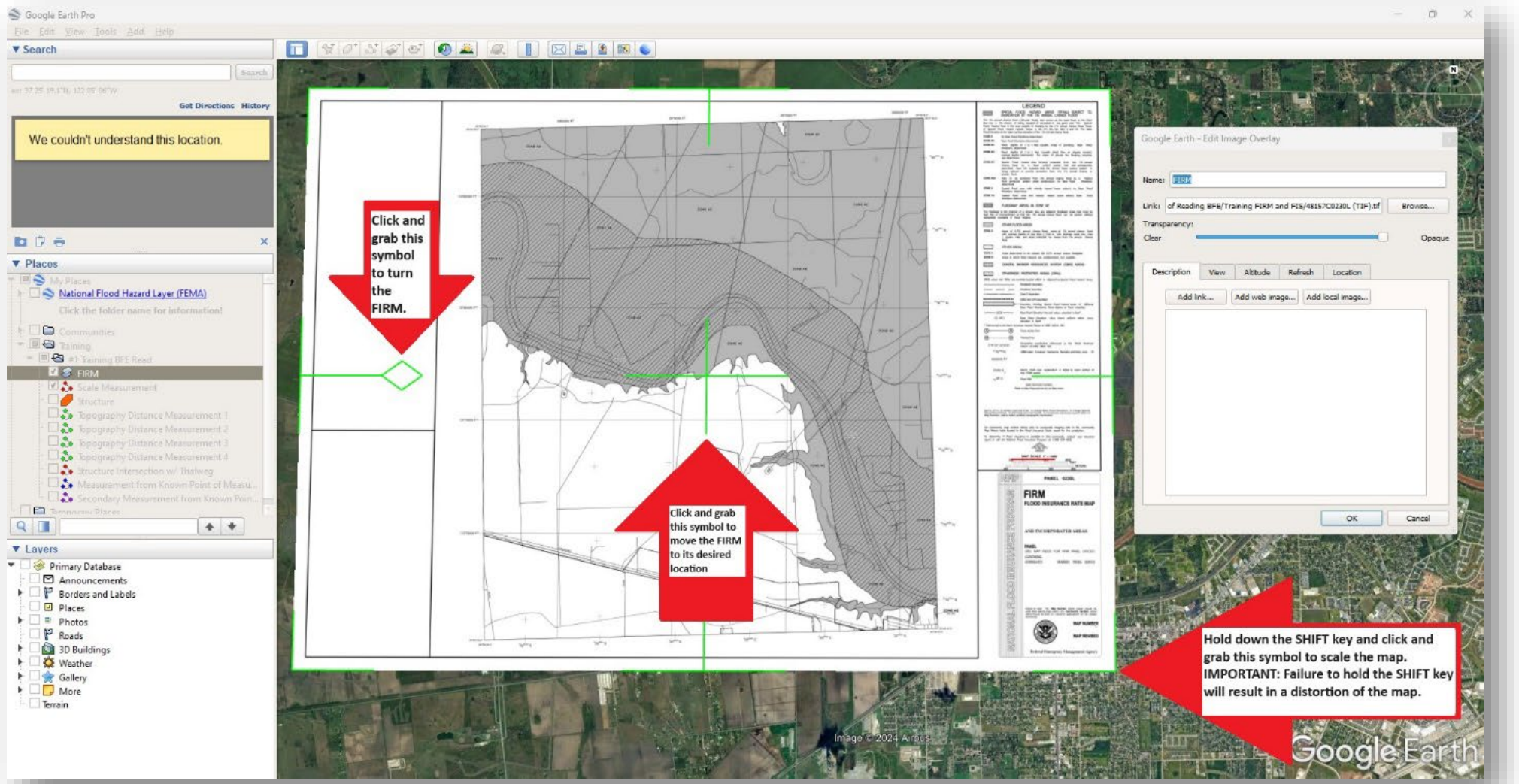


Step 7

- Locate the FIRM panel's location under "My Places" on the left side in Google Earth Pro (generally it will be titled "Untitled Image Overlay," unless you named it differently
- Right click the name, select "Properties" (this will allow you to edit, resize, and move the overlay)

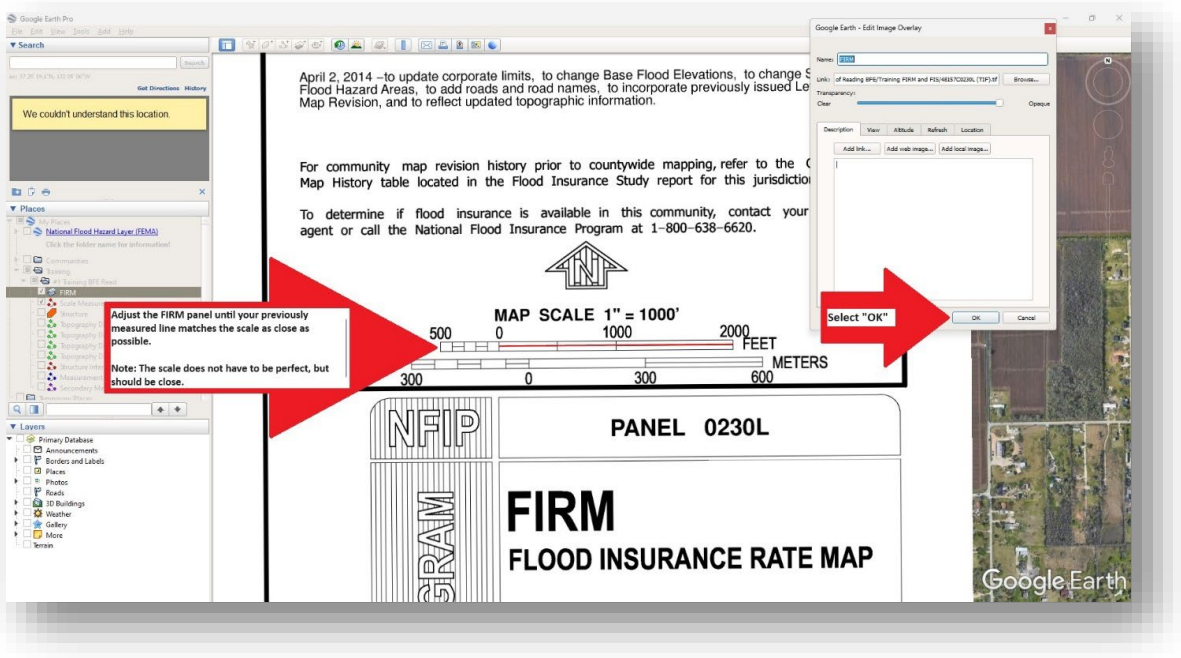


Step 7 cont...


Google Earth Pro
File Edit View Tools Add Help
Search
Get Directions History
We couldn't understand this location.
Places
National Flood Hazard Layer (FEMA)
Click the folder name for information!
Communities
Training
#1 Training BFE Read
FIRM
Scale Measurement
Structure
Topography Distance Measurement 1
Topography Distance Measurement 2
Topography Distance Measurement 3
Topography Distance Measurement 4
Structure Intersection w/ Thalweg
Measurement from Known Point of Measu...
Secondary Measurement from Known Poin...
Layers
Primary Database
Announcements
Borders and Labels
Places
Photos
Roads
3D Buildings
Weather
Gallery
More
Terrain
Click and grab this symbol to turn the FIRM.
Click and grab this symbol to move the FIRM to its desired location
Google Earth - Edit Image Overlay
Name: FIRM
Link: of Reading BFE/Training FIRM and FIS/48157C0230L (TIF).tif
Browse...
Transparency:
Clear
Opaque
Description View Altitude Refresh Location
Add link... Add web image... Add local image...
OK Cancel
FIRM
FLOOD INSURANCE RATE MAP
Hold down the SHIFT key and click and grab this symbol to scale the map.
IMPORTANT: Failure to hold the SHIFT key will result in a distortion of the map.
Image © 2024 Airbus
Google Earth

Step 8

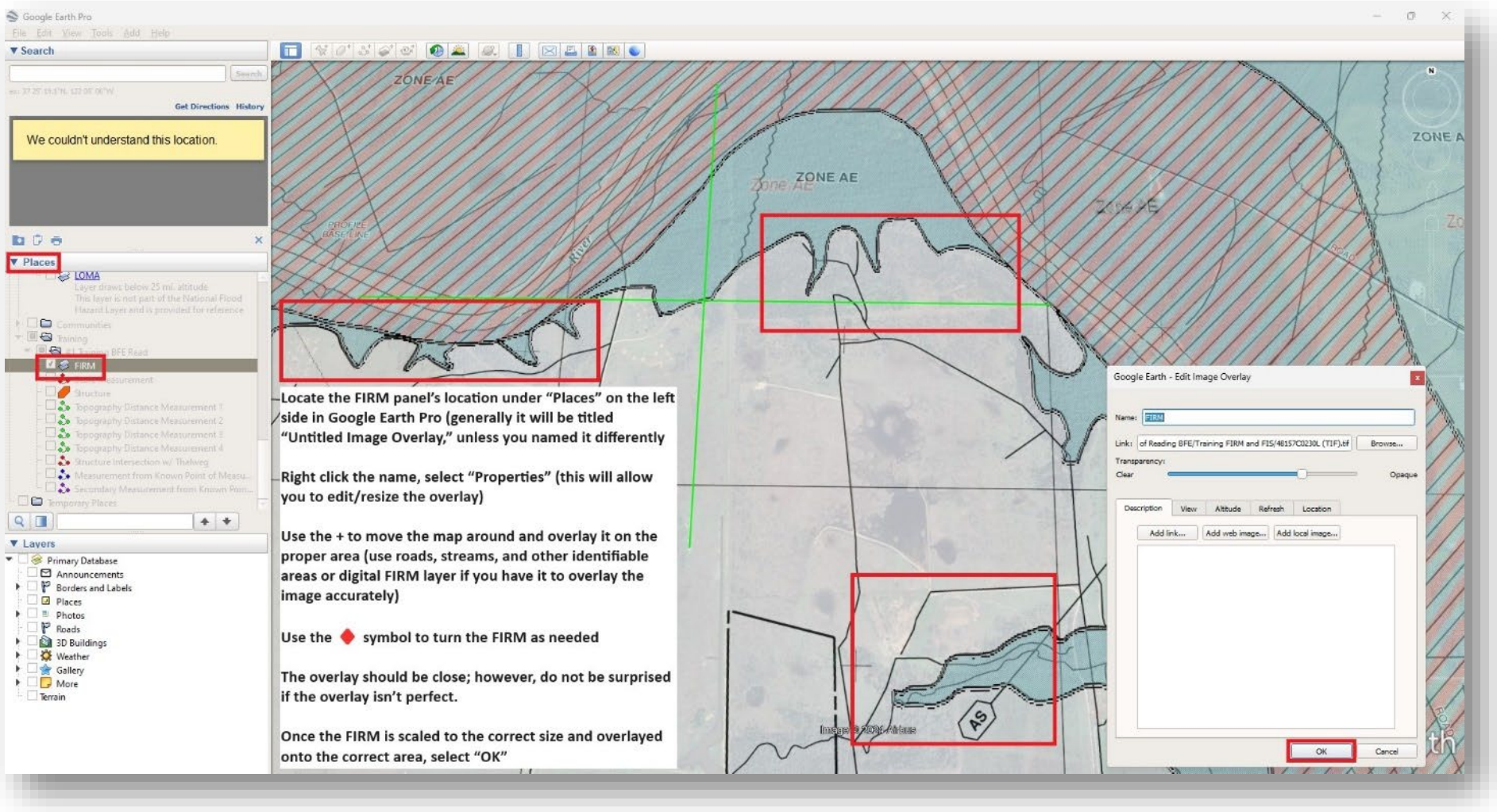
- **Holding down the SHIFT key on your keyboard**, select a corner of the overlay and stretch it until the drawn measure line completed previously closely matches the scale of the FIRM (failure to hold shift while scaling will result in a distortion of the map)
- Use the + to move the map around to overlay the measured line with the scale
- Once the map has been scaled to the correct size, select “OK” (this will save the scale)



Step 9

- Locate the FIRM panel's location under "Places" on the left side in Google Earth Pro (generally it will be titled "Untitled Image Overlay," unless you named it differently
- Right click the name, select "Properties" (this will allow you to edit/resize the overlay)
- Use the + to move the map around and overlay it on the proper area (use roads, streams, and other identifiable areas or digital FIRM layer if you have it to overlay the image accurately)
- Use the ♦ symbol to turn the FIRM as needed
- The overlay should be close; however, do not be surprised if the overlay isn't perfect.
- Once the FIRM is scaled to the correct size and overlayed onto the correct area, select "OK"

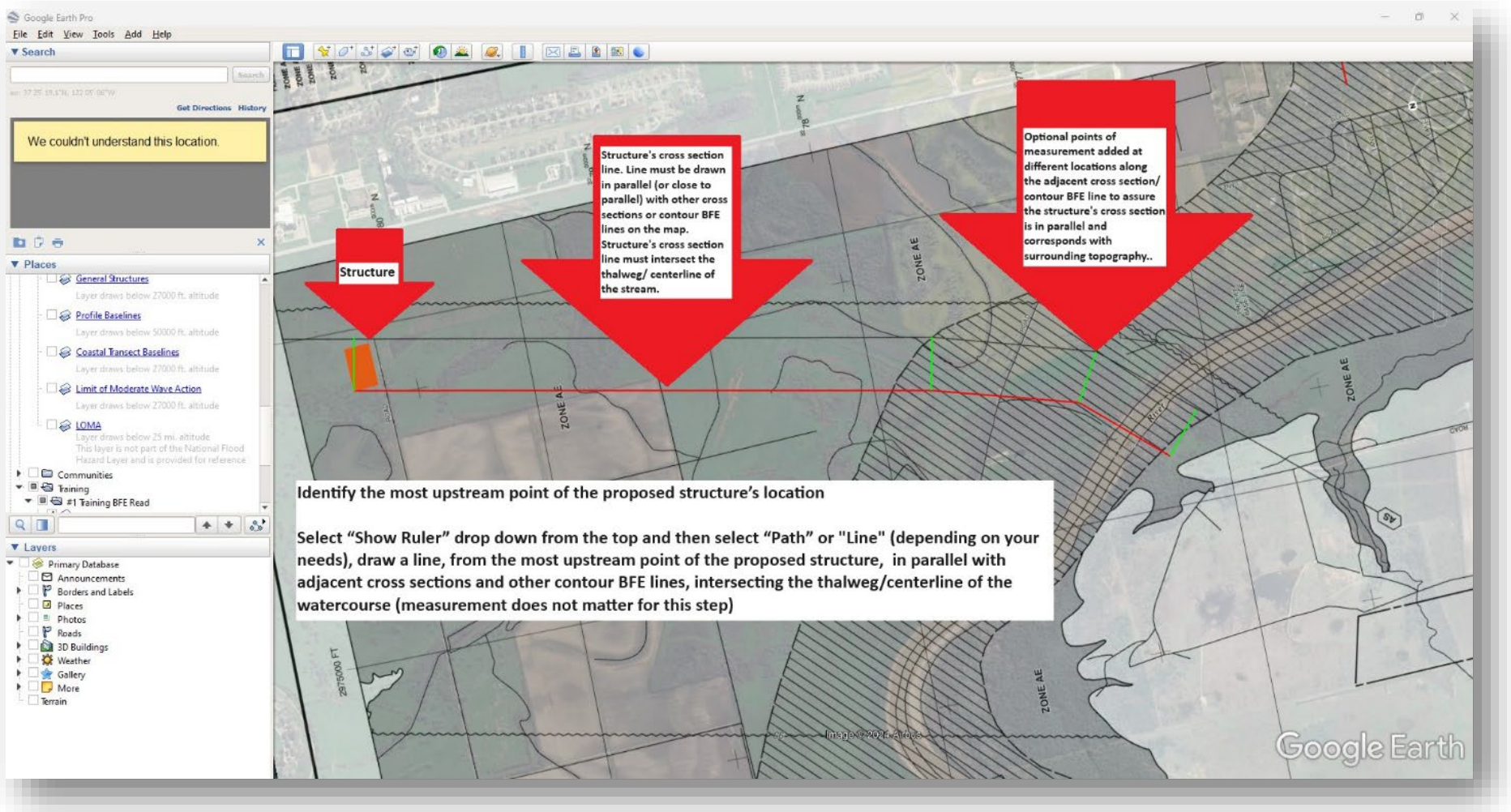
Step 9 cont...


Google Earth Pro
Search
We couldn't understand this location.
Places
FIRM
Layers
ZONE AE
Google Earth - Edit Image Overlay
Name: FIRM
Transparency:
Clear
Opaque
OK
Cancel
Locate the FIRM panel's location under "Places" on the left side in Google Earth Pro (generally it will be titled "Untitled Image Overlay," unless you named it differently
Right click the name, select "Properties" (this will allow you to edit/resize the overlay)
Use the + to move the map around and overlay it on the proper area (use roads, streams, and other identifiable areas or digital FIRM layer if you have it to overlay the image accurately)
Use the symbol to turn the FIRM as needed
The overlay should be close; however, do not be surprised if the overlay isn't perfect.
Once the FIRM is scaled to the correct size and overlayed onto the correct area, select "OK"

Step 10

- Identify the most upstream point of the proposed structure's location
- Select "Show Ruler" drop down from the top and then select "Path" or "Line" (depending on your needs), draw a line, from the most upstream point of the proposed structure, in parallel with adjacent cross sections and other contour BFE lines, intersecting the thalweg/centerline of the watercourse (measurement does not matter for this step)

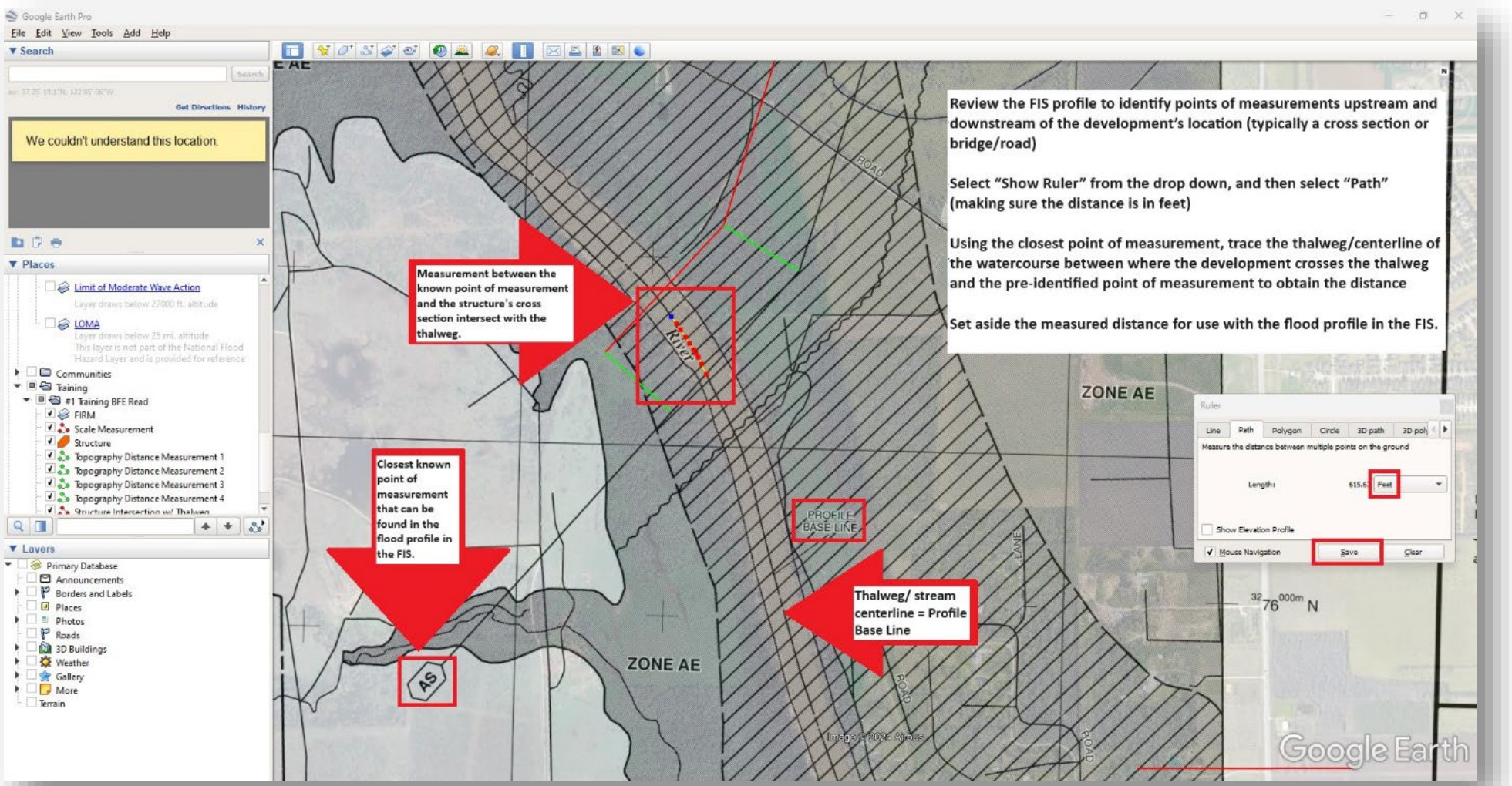
Step 10 cont...


Google Earth Pro
File Edit View Tools Add Help
Search
We couldn't understand this location.
Places
General Structures
Profile Baselines
Coastal Transect Baselines
Limit of Moderate Wave Action
LOMA
Communities
Training
#1 Training BFE Read
Layers
Primary Database
Announcements
Borders and Labels
Places
Photos
Roads
3D Buildings
Weather
Gallery
More
Terrain
Structure
Structure's cross section line. Line must be drawn in parallel (or close to parallel) with other cross sections or contour BFE lines on the map. Structure's cross section line must intersect the thalweg/ centerline of the stream.
Optional points of measurement added at different locations along the adjacent cross section/ contour BFE line to assure the structure's cross section is in parallel and corresponds with surrounding topography..
ZONE AE
Identify the most upstream point of the proposed structure's location
Select "Show Ruler" drop down from the top and then select "Path" or "Line" (depending on your needs), draw a line, from the most upstream point of the proposed structure, in parallel with adjacent cross sections and other contour BFE lines, intersecting the thalweg/centerline of the watercourse (measurement does not matter for this step)
Google Earth

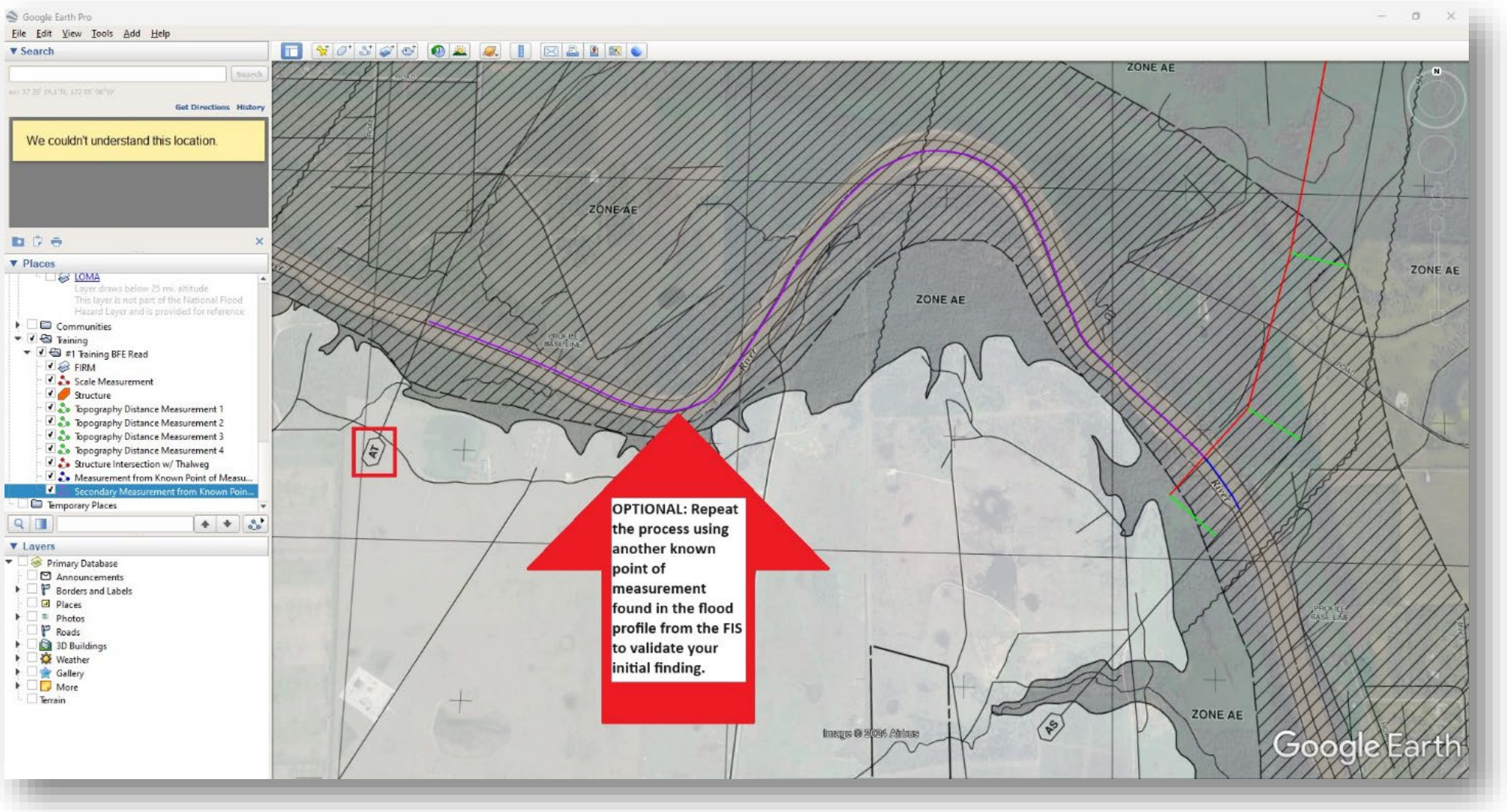
Step 11

- Review the FIS profile to identify points of measurements upstream and downstream of the development's location (typically a cross section or bridge/road)
- Select "Show Ruler" from the drop down, and then select "Path" (making sure the distance is in feet)
- Using the closest point of measurement, trace the thalweg/centerline of the watercourse between where the development crosses the thalweg and the pre-identified point of measurement to obtain the distance
- Set aside the measured distance for use with the flood profile in the FIS.

Step 11 cont...

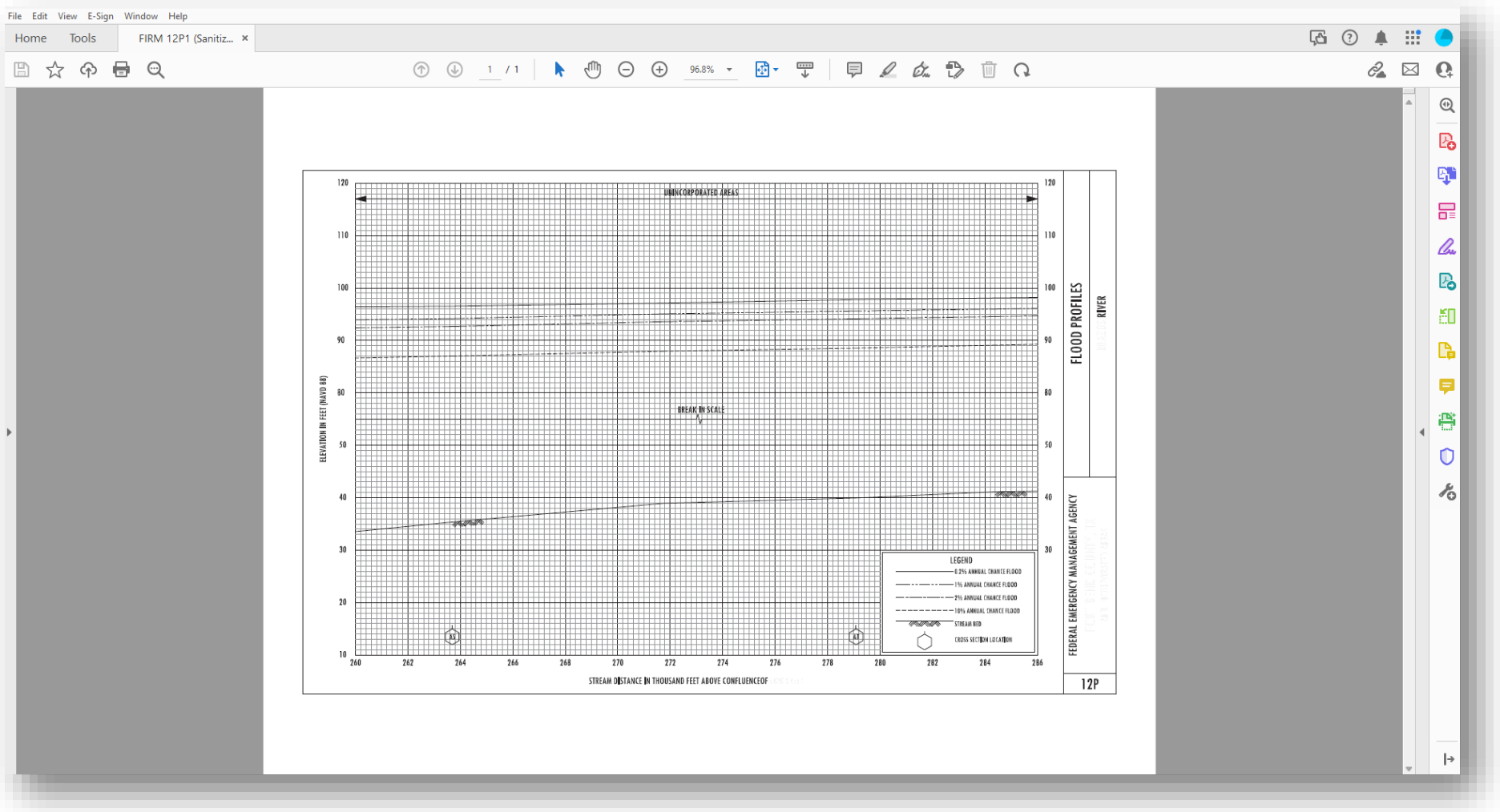

Review the FIS profile to identify points of measurements upstream and downstream of the development's location (typically a cross section or bridge/road)
Select "Show Ruler" from the drop down, and then select "Path" (making sure the distance is in feet)
Using the closest point of measurement, trace the thalweg/centerline of the watercourse between where the development crosses the thalweg and the pre-identified point of measurement to obtain the distance
Set aside the measured distance for use with the flood profile in the FIS.
Measurement between the known point of measurement and the structure's cross section intersect with the thalweg.
Closest known point of measurement that can be found in the flood profile in the FIS.
Thalweg/ stream centerline = Profile Base Line
ZONE AE
AS
PROFILE BASE LINE
River
ROAD
Google Earth
We couldn't understand this location.
Places
Layers
Ruler

Step 12 (Optional, but recommended)



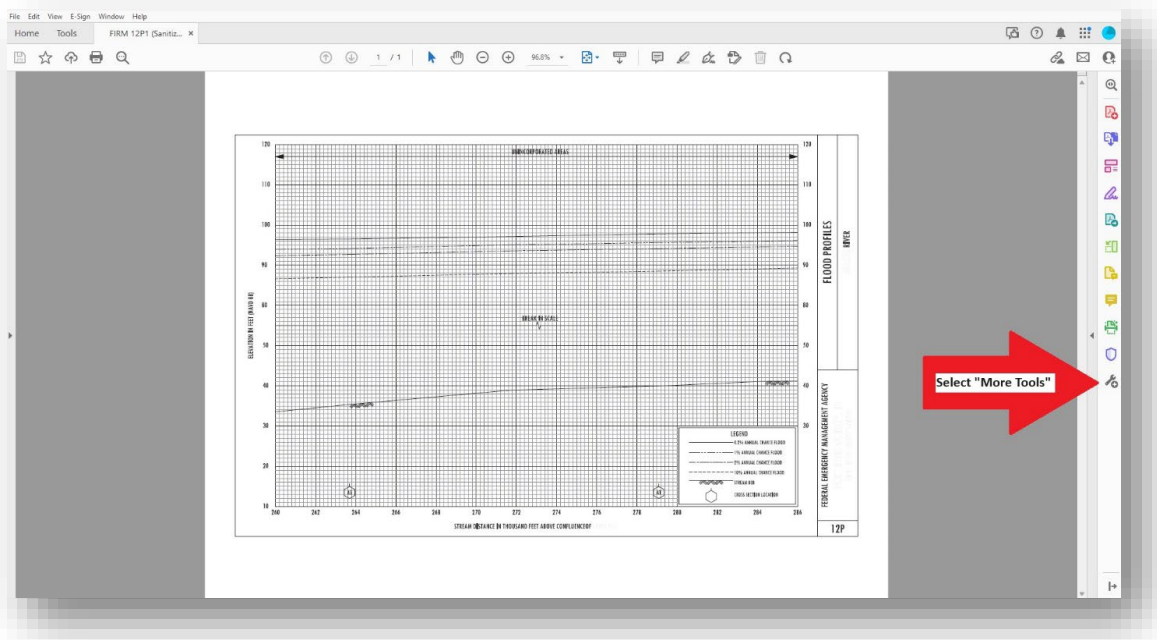
Step 13

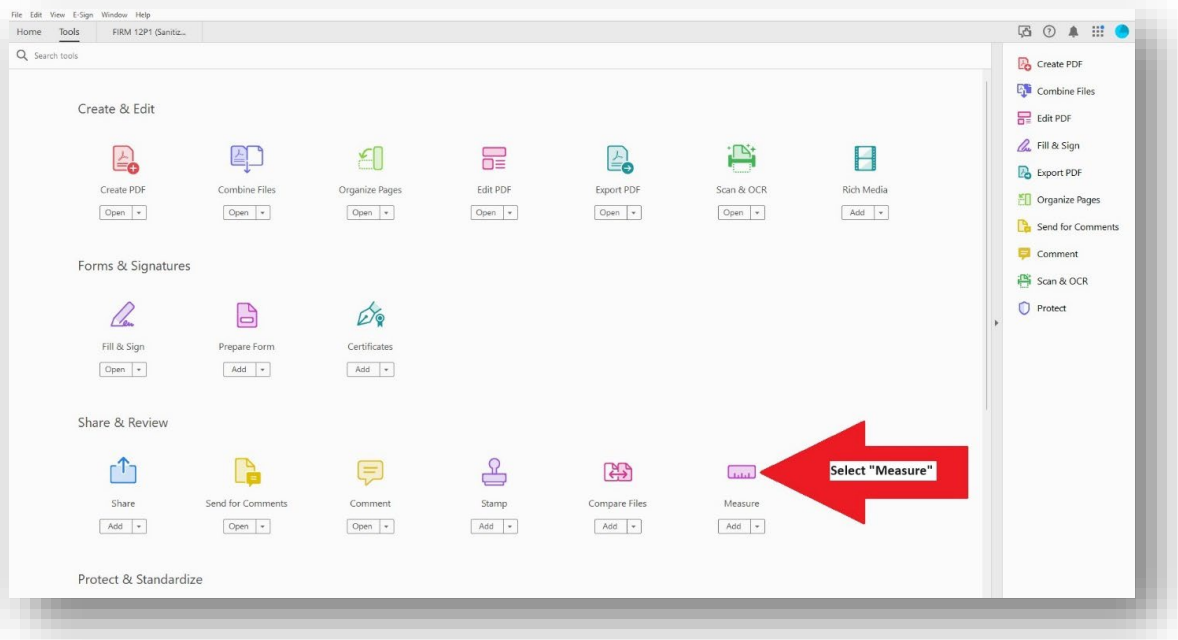
- Open the FIS in Adobe Acrobat Pro
- Locate the correct flood profile for the corresponding FIRM



Step 14

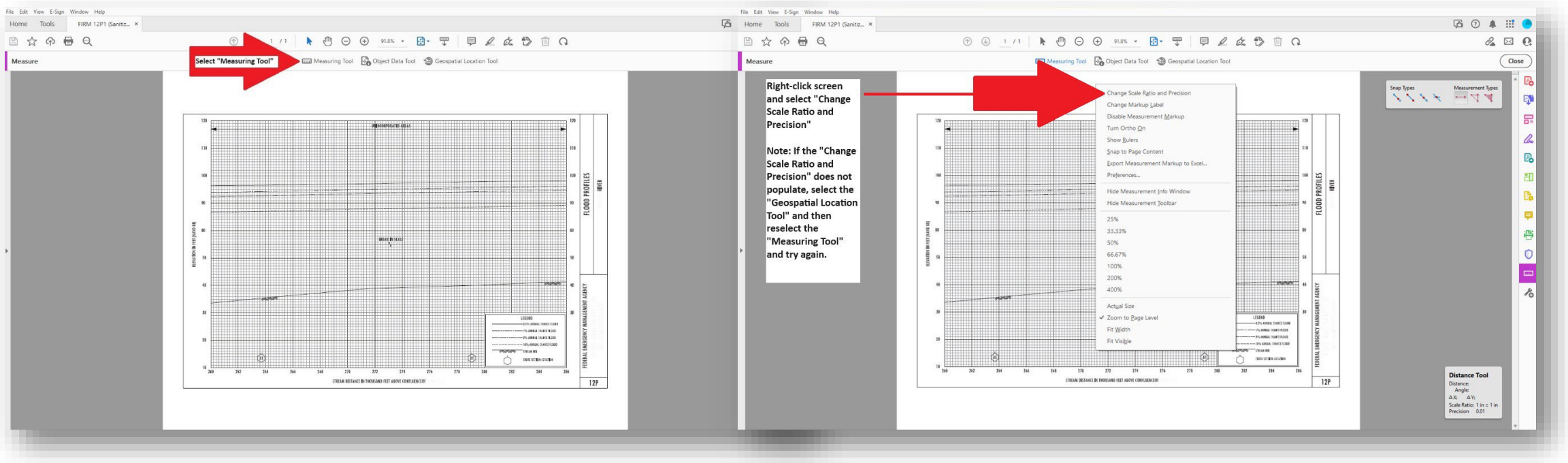
- Select “More Tools” and select “Measure”





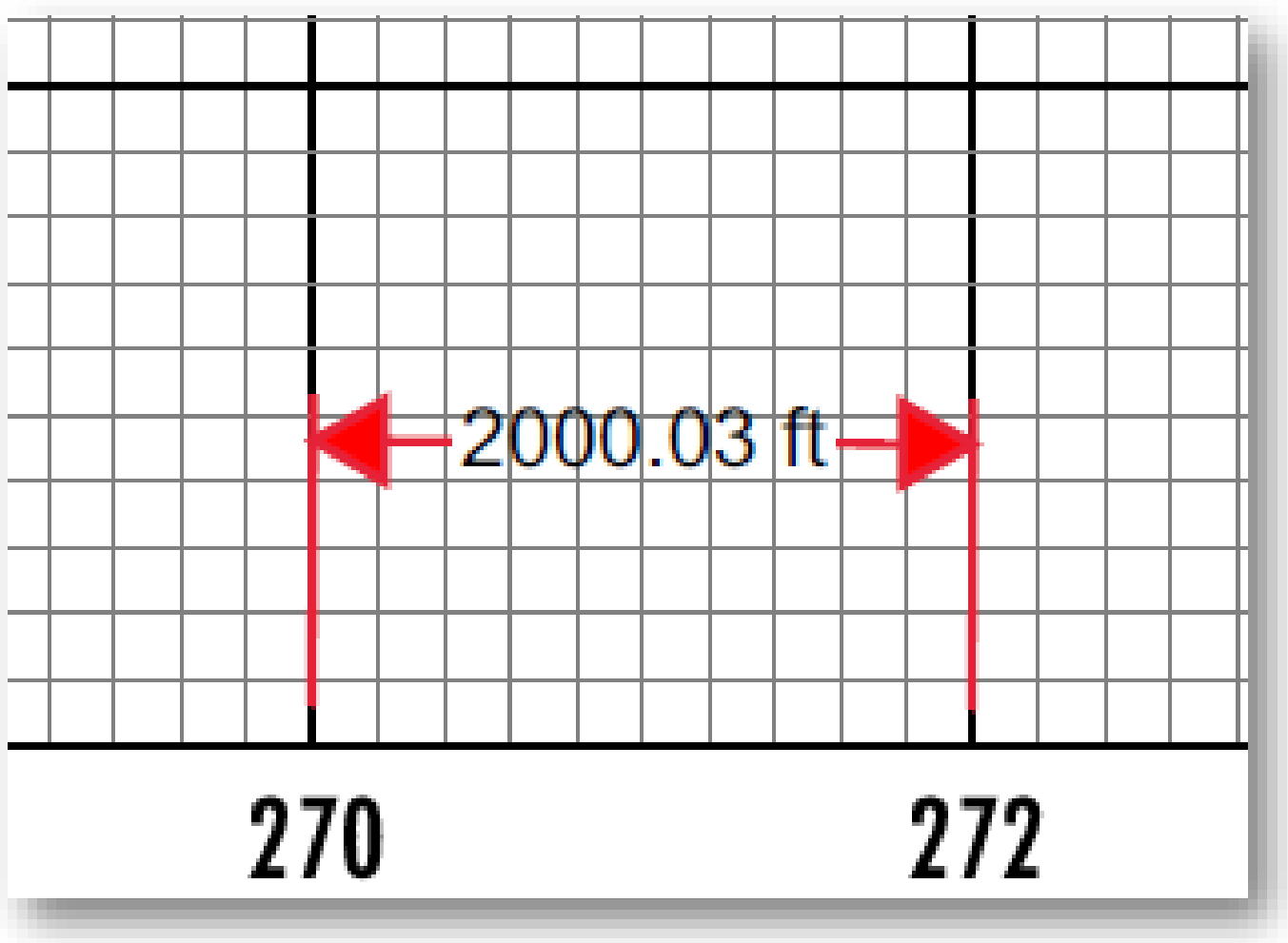
Step 15

- Select “Measuring Tool”, right-click the screen and select “Change Scale Ratio and Precision”

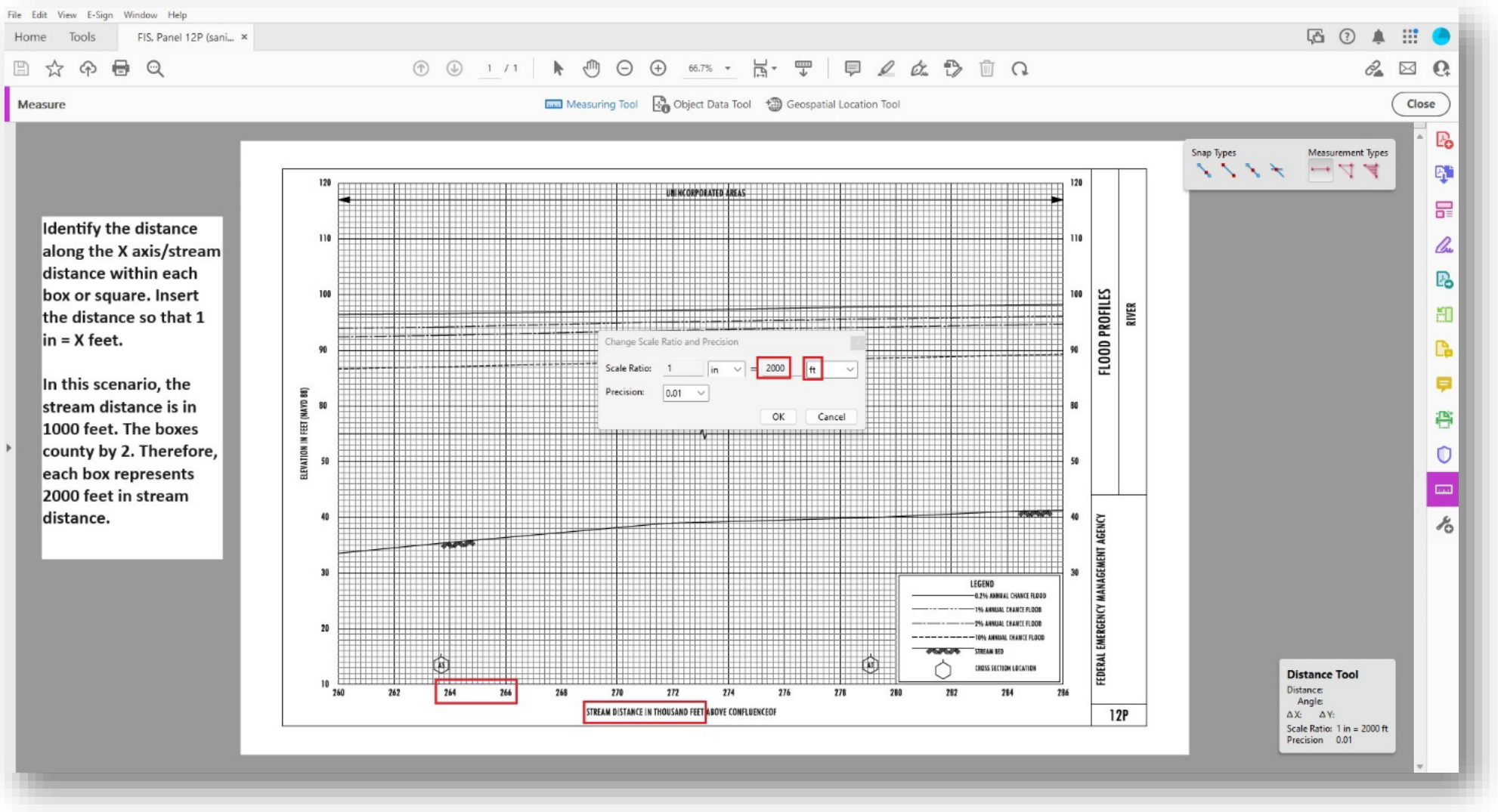


Step 16

- Identify the distance along the X axis/stream distance within each box or square
- Insert the distance so that 1 in = X feet
- Use the measuring tool to assure each box measures the correct amount

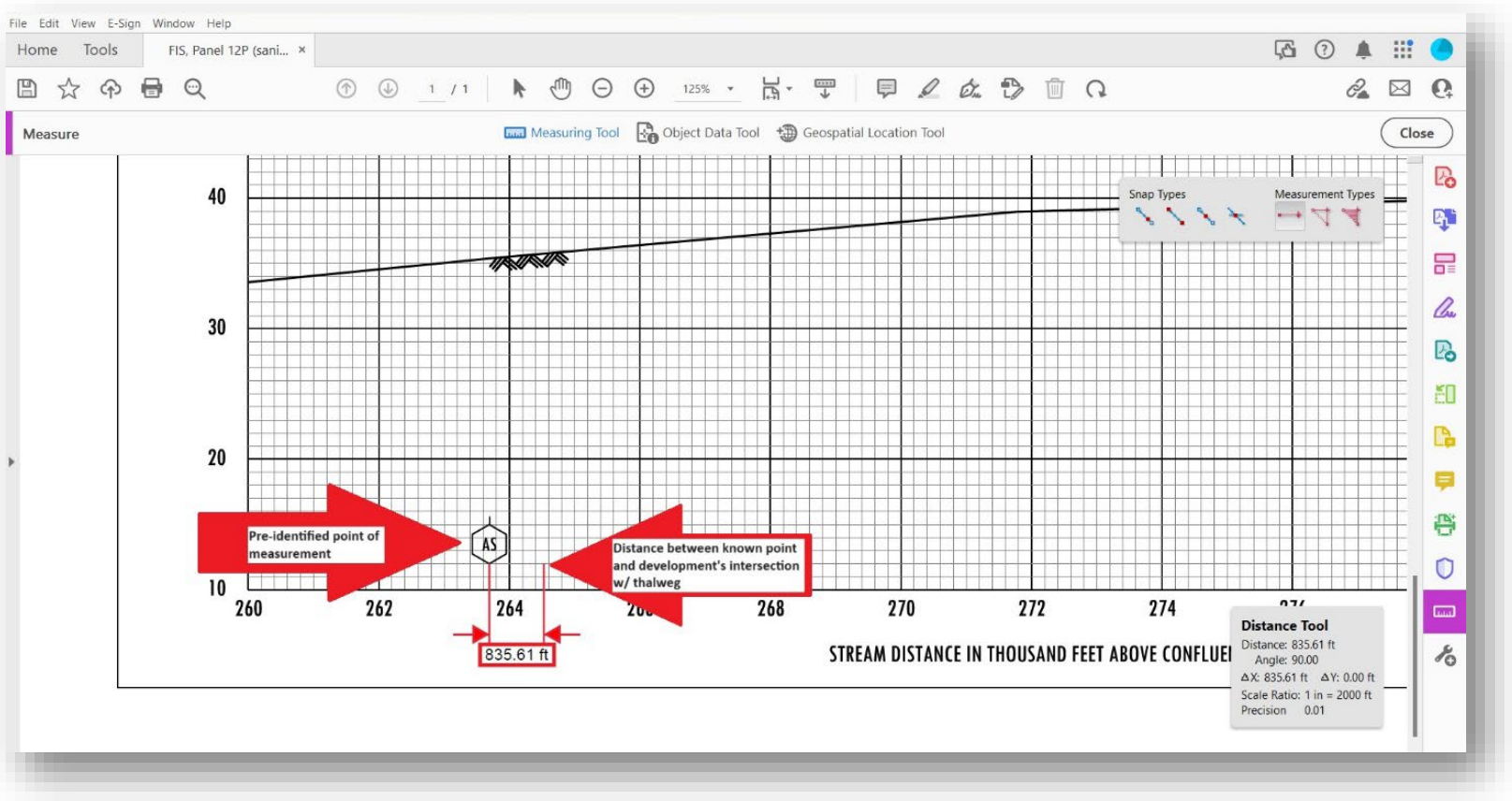


Step 16 cont...


Identify the distance along the X axis/stream distance within each box or square. Insert the distance so that 1 in = X feet.
In this scenario, the stream distance is in 1000 feet. The boxes county by 2. Therefore, each box represents 2000 feet in stream distance.
Measure
Measuring Tool
Object Data Tool
Geospatial Location Tool
Close
Snap Types
Measurement Types
Change Scale Ratio and Precision
Scale Ratio: 1 in = 2000 ft
Precision: 0.01
OK
Cancel
UNINCORPORATED AREAS
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN THOUSAND FEET ABOVE CONFLUENCEOF
LEGEND
FLOOD PROFILES
RIVER
FEDERAL EMERGENCY MANAGEMENT AGENCY
12P
Distance Tool
Distance:
Angle:
ΔX: ΔY:
Scale Ratio: 1 in = 2000 ft
Precision 0.01

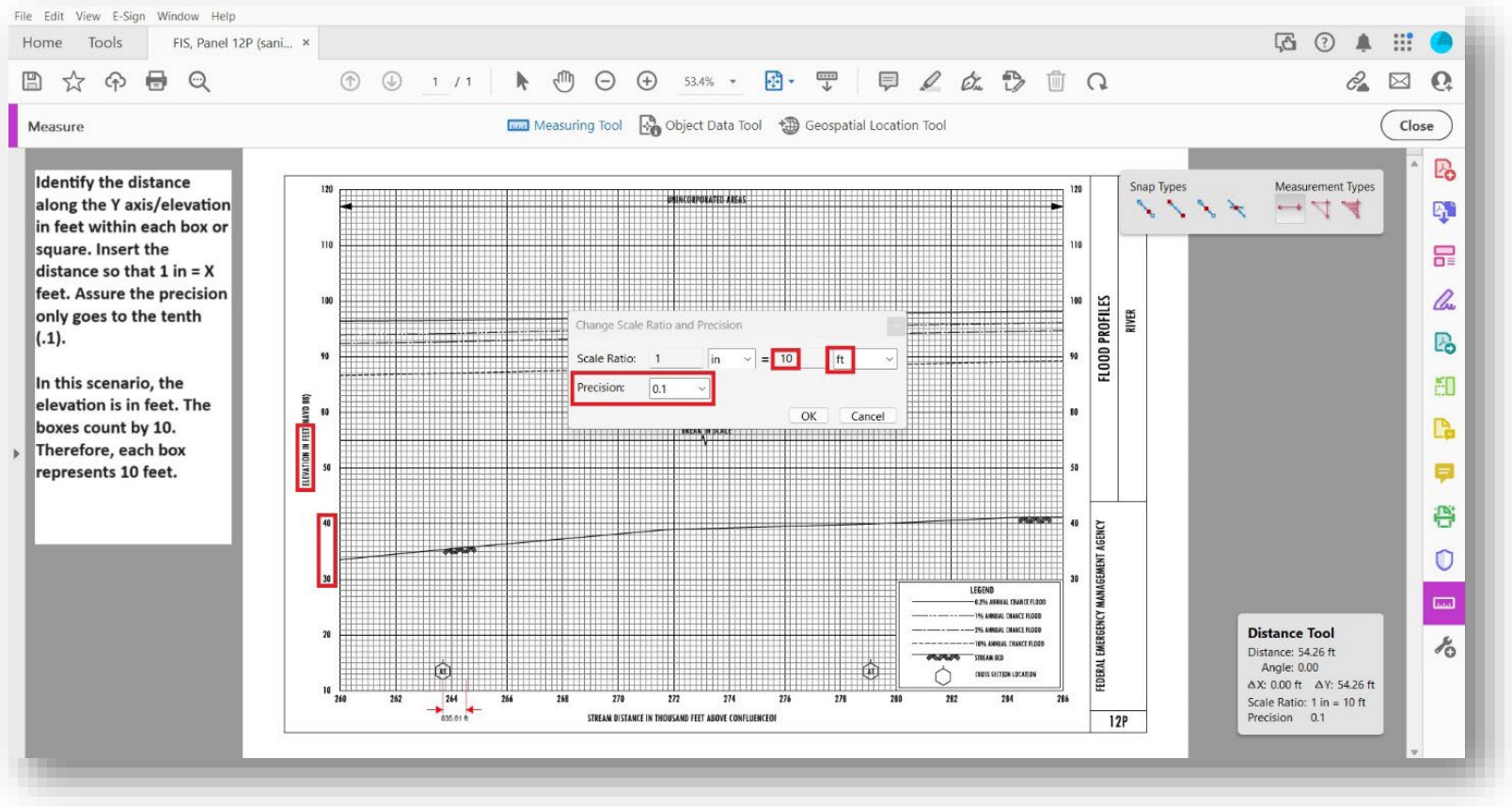
Step 17

- Starting from the pre-identified point of measurement, measure the distance previously measured on the FIRM onto the FIS profile to locate where the development lies left to right (or vice versa) along the thalweg



Step 18

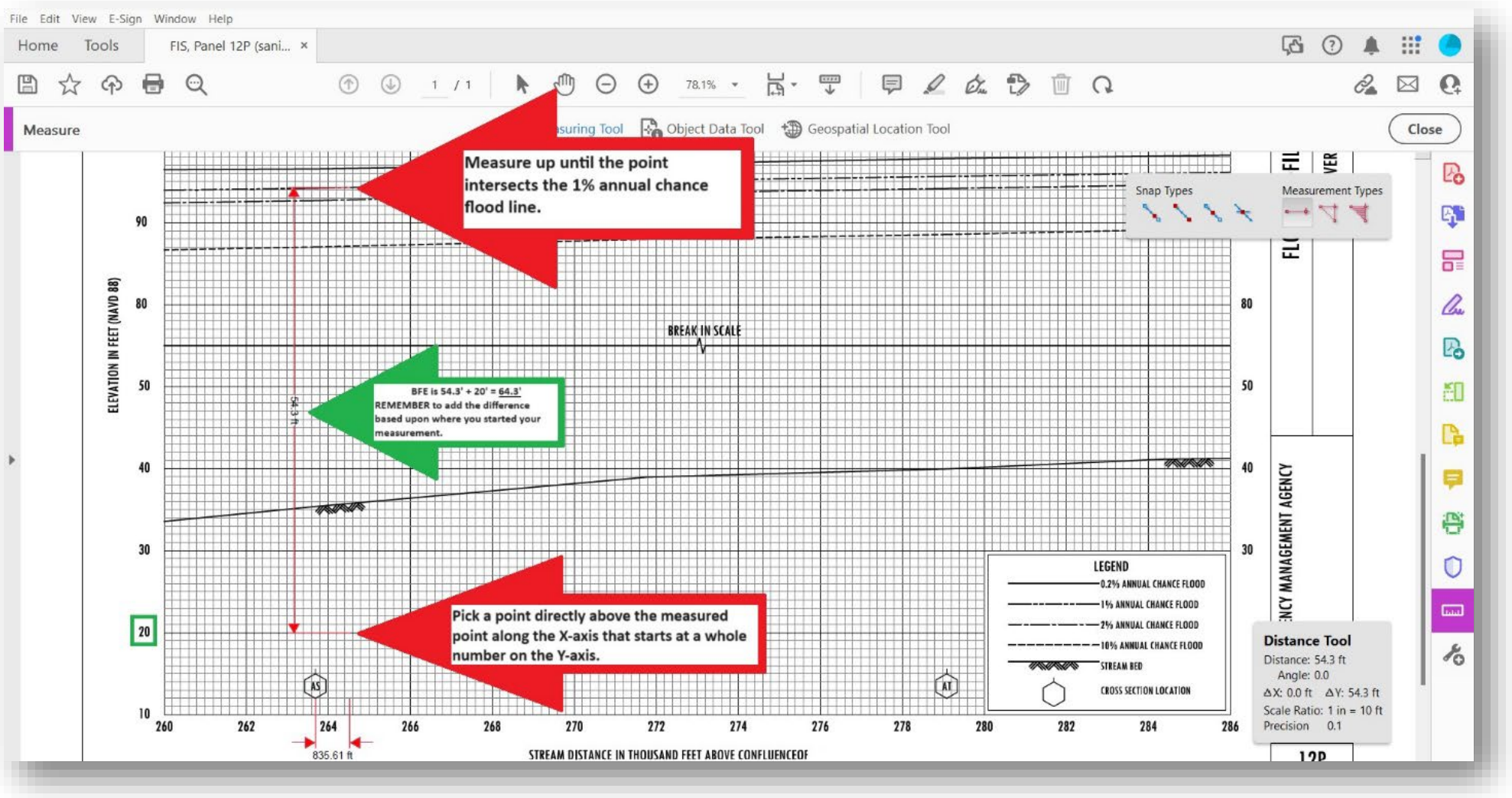
- Right-click the screen again and select “Change Scale Ratio and Precision”
- Identify the distance along the Y axis/elevation in feet within each box or square
- Insert the distance so that 1 in = X feet and change the precision to .1 or a tenth



Step 19

- Pick a point to begin your measurement in line with where the development is located (should be a whole number and at the top or bottom of a box)
- Measure up or down to where the line intersects the 1% annual chance flood
- Add or subtract the measurement from where you started your measurement from
- You have your BFE!
- Select “File,” then “Print,” and “Current” under pages to print and save the document with the permit.

Step 19 cont...


Measure up until the point intersects the 1% annual chance flood line.
BFE is 54.3' + 20' = 64.3'
REMEMBER to add the difference based upon where you started your measurement.
Pick a point directly above the measured point along the X-axis that starts at a whole number on the Y-axis.
ELEVATION IN FEET (NAVD 88)
STREAM DISTANCE IN THOUSAND FEET ABOVE CONFLUENCEOF
BREAK IN SCALE
835.61 ft
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
Distance Tool
Distance: 54.3 ft
Angle: 0.0
ΔX: 0.0 ft ΔY: 54.3 ft
Scale Ratio: 1 in = 10 ft
Precision 0.1
Snap Types
Measurement Types
Close

Step 20 (optional, but recommended)