WV FLOOD TOOL: LIDAR FOR LOMA INSTRUCTIONS

Drafted by Kurt Donaldson 11/14/2020

Background Information

HOW DO I CHANGE MY FLOOD ZONE DESIGNATION?

Letters of Map Amendment (LOMAs) enable property owners to request changes or updates to their property's flood risk status to FEMA. Learn more about how to request a change to your flood zone designation at FEMA's website. Typically, this flood zone change request using the WV Flood Tool applies to property owners at the floodplain boundary fringe (not in the floodway) of high-risk AE or Approximate A Flood Zones, for existing buildings or lots not elevated on fill, and where there is more than two feet difference between the Base Flood Elevation (BFE) and Lowest Adjacent Grade (LAG).

LiDAR FOR MAP AMENDMENTS

LiDAR data can replace the requirement to submit elevation information certified by a licensed land surveyor or professional engineer, which can create a cost savings for property owners. However, when the LAG is close to the BFE, LiDAR data may not be accurate enough and require certified elevations to capture the full risk of the building. The WV Flood Tool can be used to submit LOMAs where accurate LIDAR-derived elevation contours and point data are available. Generally, if there is **two feet** or more difference between the BFE and LAG, then the homeowner or community should investigate using the WV Flood Tool's Print LOMA Map function to generate a LOMA for submission to FEMA at **no charge**.

DOES MY COMMUNITY HAVE LIDAR?

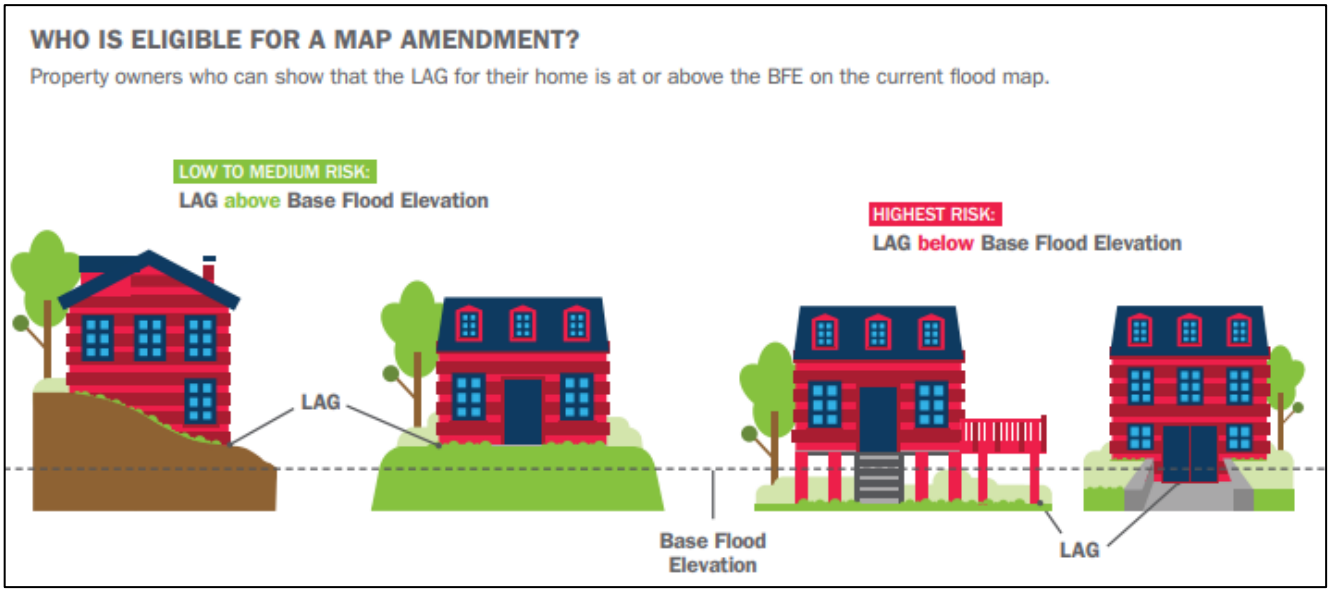
Not all communities have LiDAR data available. Talk to your floodplain administrator to find out if your community has LiDAR data. To be used in a LOMA request, LiDAR data must meet or exceed the U.S. Geological Survey (USGS) Quality Level 3 accuracy requirement. To learn more about this requirement, view the WV LiDAR Quality Level Map and Elevation Source Metadata for the WV Flood Tool.

ONLINE LOMC

The Online LOMC web application allows homeowners or their designated representatives to easily request a Letter of Map Change (LOMC). Use this site if your property was inadvertently included in a flood zone, or if the addition of fill elevated your property so that it is above the flood zone. The Online LOMC tool is an alternative to the MT-1 and MT-2 paper forms and/or MT-EZ paper form. Anyone, including communities, home or property owners, their representatives, and professional surveyors and engineers, may submit a LiDAR LOMA request using the Online LOMC if the application meets the LOMA submission requirements listed in the next section.

WHO IS ELIGIBLE FOR A MAP AMENDMENT?

Property owners who can the show the LAG of their home is at or above the BFE on the current flood map.



Source: [How to Request a Map Amendment (Nov. 2018)]

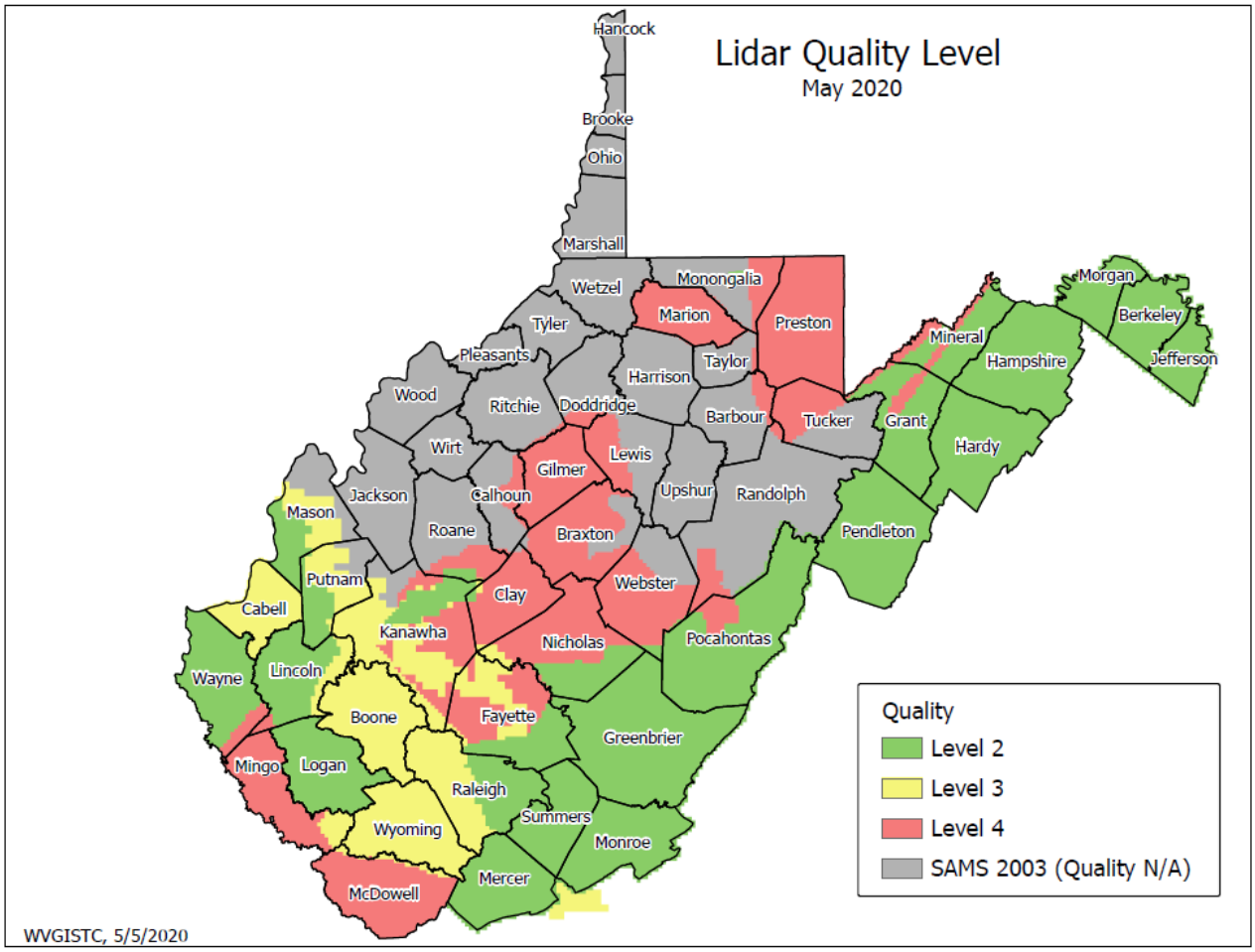
WHEN CAN LIDAR NOT BE USED

There are situations when LiDAR cannot be used in a LOMA request. These include applications involving the following:

- Buildings or lots elevated using fill
- Buildings or lots in the regulatory floodway or Zone AO
- Buildings under construction. LiDAR would need to show that the lot or portion of the lot on which building will be located is above the Base Flood Elevation (BFE)
- Conditional determinations
- Electronic LOMAs (eLOMAs)
- Potential violations identified through the LOMA process
- Physical changes to the flooding source/Special Flood Hazard Area that require revisions to the Flood Insurance Rate Map
- Requests to supersede previously issued LOMAs based on certified elevation data

STEP-BY-STEP INSTRUCTIONS

1) **Determine LiDAR Coverage:** Determine if your community has LiDAR of Quality 3 (QL3) accuracy or better. Refer to the WV LiDAR Quality Level Map that show QL3 or QL2 coverage. All the LiDAR QL2 areas in West Virginia except for Logan County have high-resolution 1-foot or 2-foot contours displayed at the 1:564 and 1:282 map scales. When a user queries a location in the WV Flood Tool, the LiDAR Elevation Source Metadata project name and acquisition year are displayed to the right of the elevation value in the Flood Query Results Panel from which the LiDAR source, accuracy, and date can be identified. In 2021, FEMA-purchased QL2 LiDAR should be available for the entire State.



2) **Select WV Flood Tool's Print LOMA Tool:** Select the Print Function on the toolbar of the WV Flood Tool and then the FEMA Floodplain LOMA Map option. Refer to the LiDAR for LOMA Guide for more illustrations and depictions.

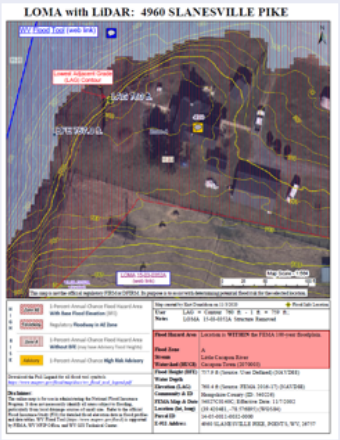
LiDAR LOMA Submission – 4 Steps

1) Determine if your community has QL2 or QL3 LiDAR

2) Print **LOMA Map** using **WV Flood Tool**

Supporting document for Online LOMC application

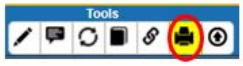
- Identify published building-level risk assessments for potential Mapped Out structures
- Determine LOMA Type: Structure or Lot
- Determine BFE
- Determine LAG/LLE
- Add Annotation
- Print and Download LOMA Map
- Save to PDF File

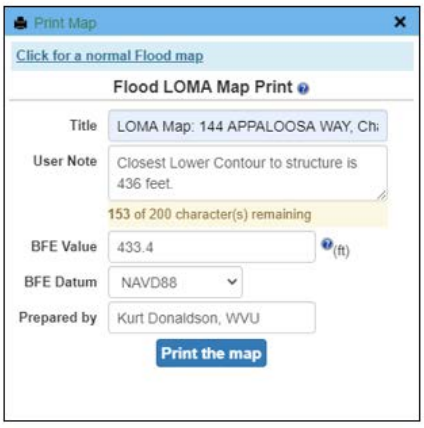


3) Further Edit/Annotate Print LOMA (optional)

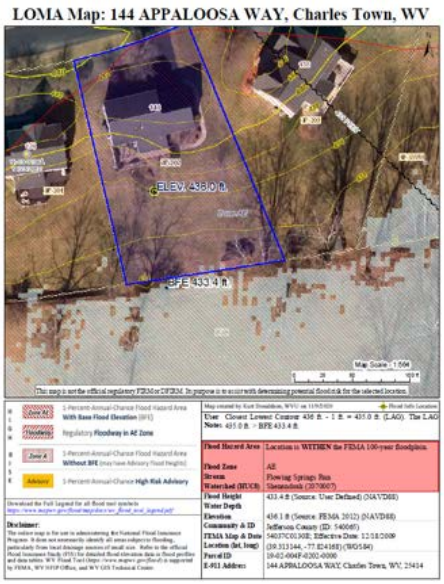
4) Submit LiDAR LOMA Map using FEMA's **Online LOMC** Portal (no fee charged)

Print LOMA Map with WV Flood Tool

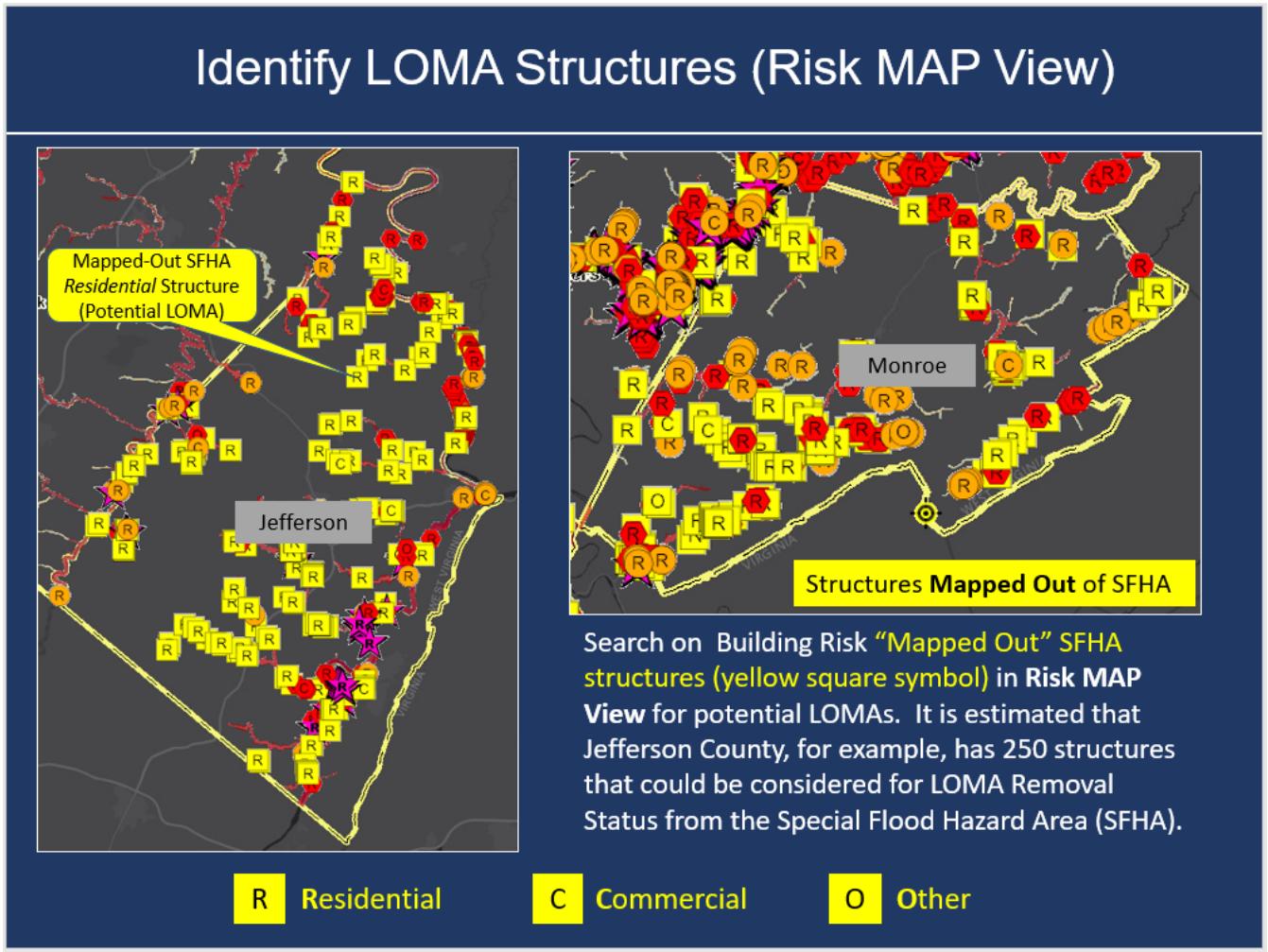




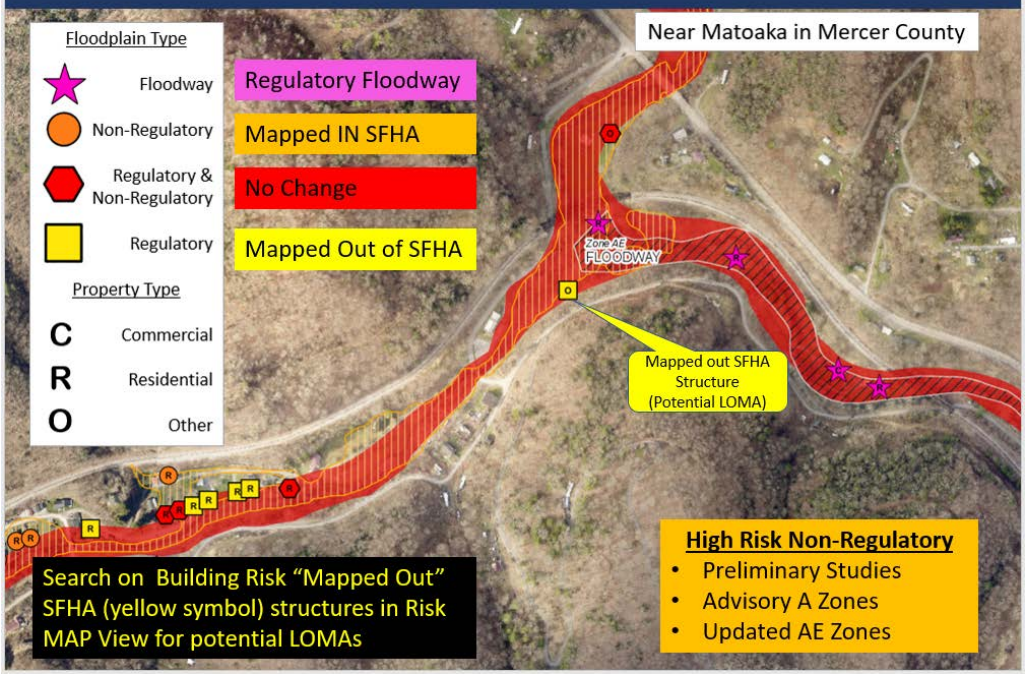
Use the WV Flood Tool's **Print Tool** (**LOMA Option**) to generate LOMA Maps



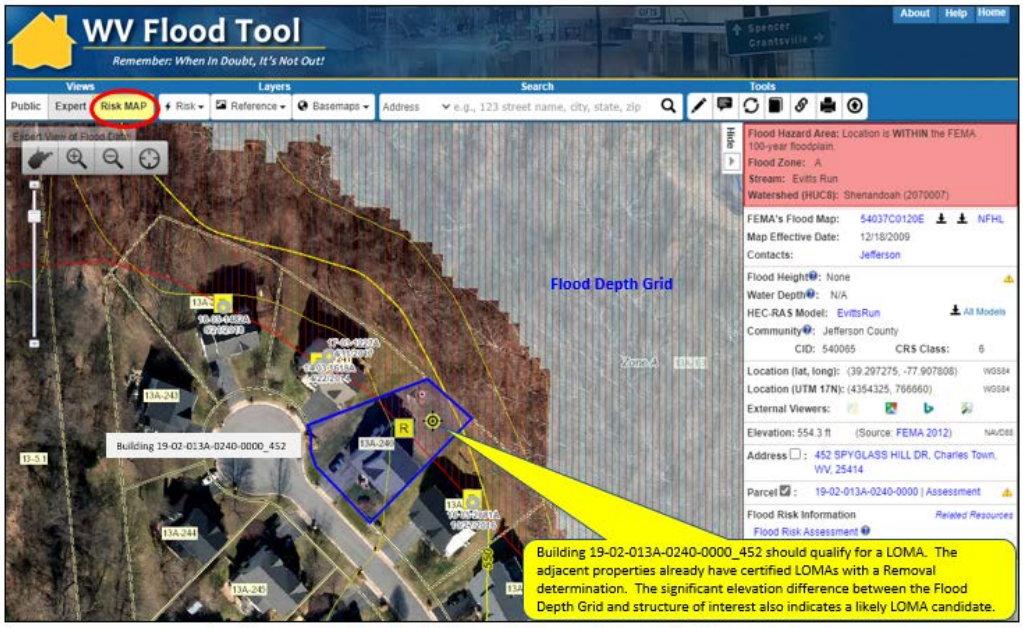
a) **Identify Potential Mapped Out Structures:** Use the EXPERT or RISKMAP Views. Remember that changing between views in the WV Flood Tool resets all the default layers. Ensure the Best Leaf-Off Aerial Imagery is selected as the base map. Look for areas where the model-backed 1% annual chance Water Depth (blue shaded raster) is not near a mapped structure. In the RISKMAP View, for potential LOMAs, consider the "Mapped Out SFHA" (yellow square symbol) structures which indicate Building Risk for Future Map Conditions (or changes to future flood zone designations). The Mapped-Out SFHA structures are only calculated with model-backed depth grids and not Hazus-derived depth grids. Do not consider mapped-out structures that have a Verified LOMA with certified elevation data.



Future Map Conditions (Potential LOMAs) C R O



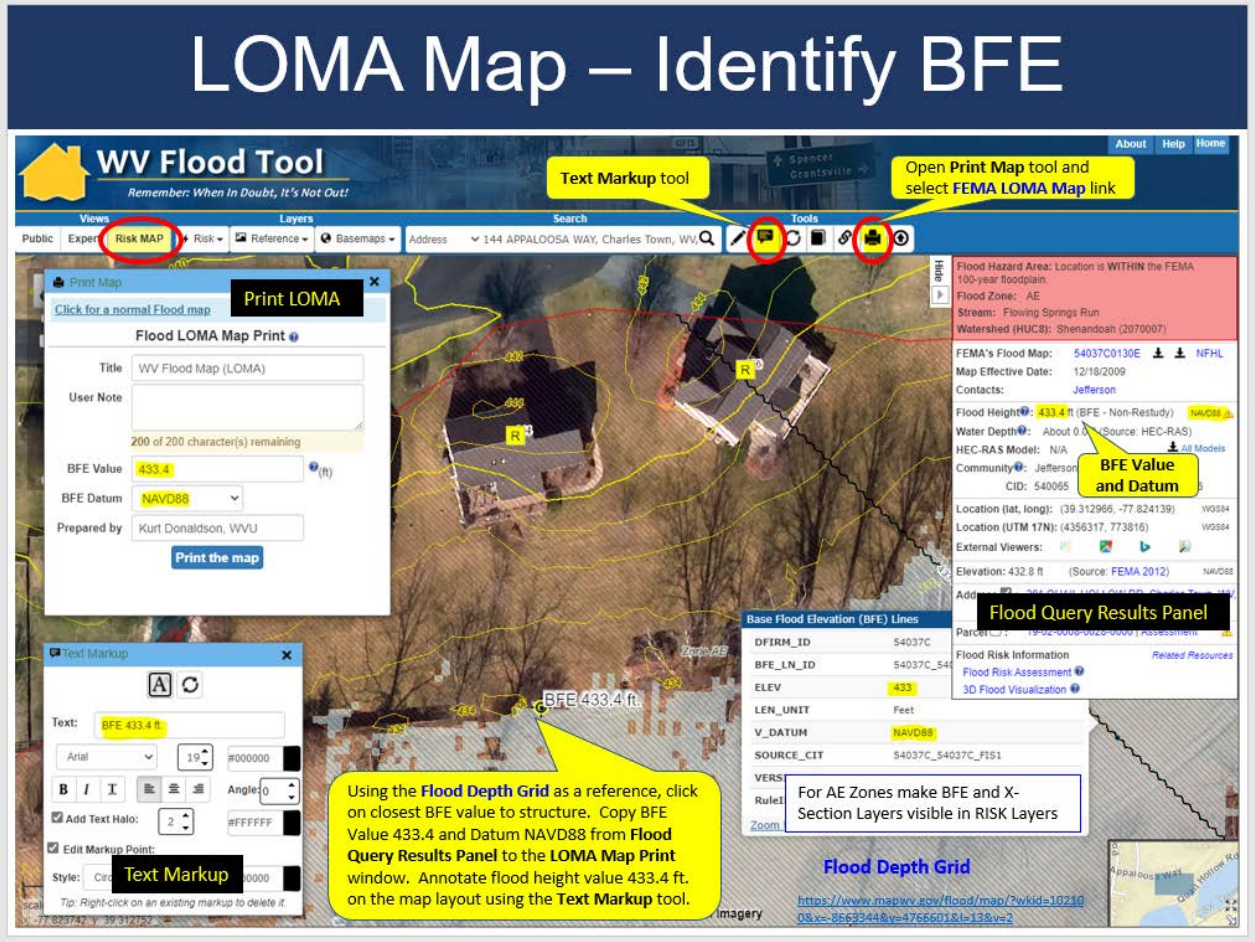
Identify Potential LOMAs (Risk MAP View)



https://www.mapwv.gov/flood/map/?wkid=102100&x=-8672657&y=4764344&l=12&v=2

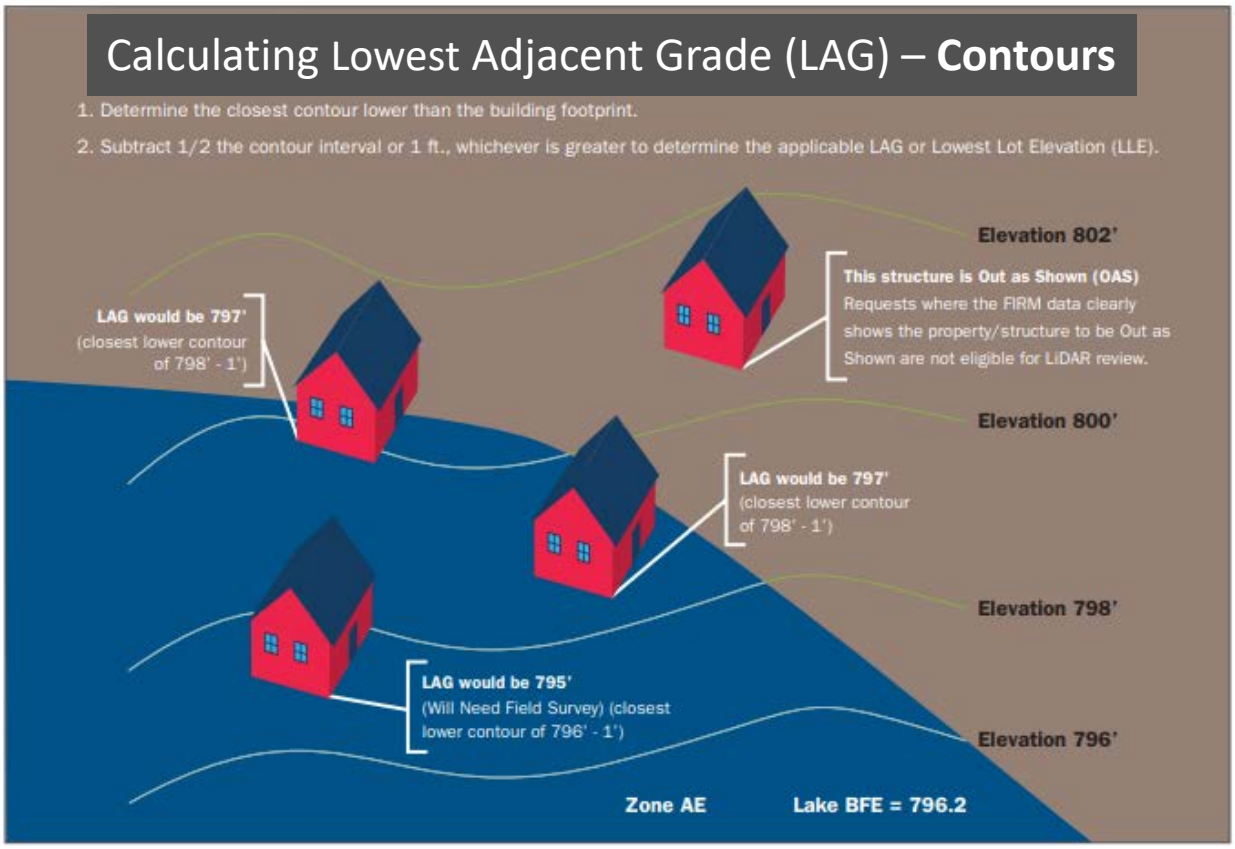
b) **Determine LOMA type:** Structure or Lot type. Remember that LiDAR LOMAs cannot be submitted for structures or lots elevated on fill.

c) **Determine BFE:** Determine the Base Flood Elevation (BFE) of the flooding source closest to the structure. If the property is in an AE Zone, then make sure the X-Sections and BFEs are visible. Identify the BFE value from the Flood Height of the Flood Query Results Panel or the Cross-Sections. In the Print LOMA popup window, enter the BFE Value to the nearest tenth of a foot (0.01). Next enter the Vertical Datum (NAVD88 or NGVD29) which is displayed to the right of the Flood Height value in the Flood Results Query Panel. Use the Text Markup tool to annotate the BFE value on the map. A NAVD88 Ground Elevation is converted to a match a NGVD29 BFE so the ground elevation and flood height elevations are the same for the LOMA submission. IMPORTANT: When submitting LOMA applications, the BFE and LAG Vertical Datums must be the same! See [WV Vertical Datum Conversions] for more information.



d) **Determine LAG/LLE:** The lowest adjacent grade (LAG) for a building, or the lowest lot elevation (LLE) for a lot, will be compared to the Base Flood Elevation (BFE) to determine the flood zone designation (e.g., A, AE, X shaded). If the LAG/LLE is at or above the BFE on the current flood map, FEMA can issue a removal determination. For buildings or lots that cannot be removed from the high-risk flood zone using LiDAR, certified elevation data will be required for a standard LOMA determination.

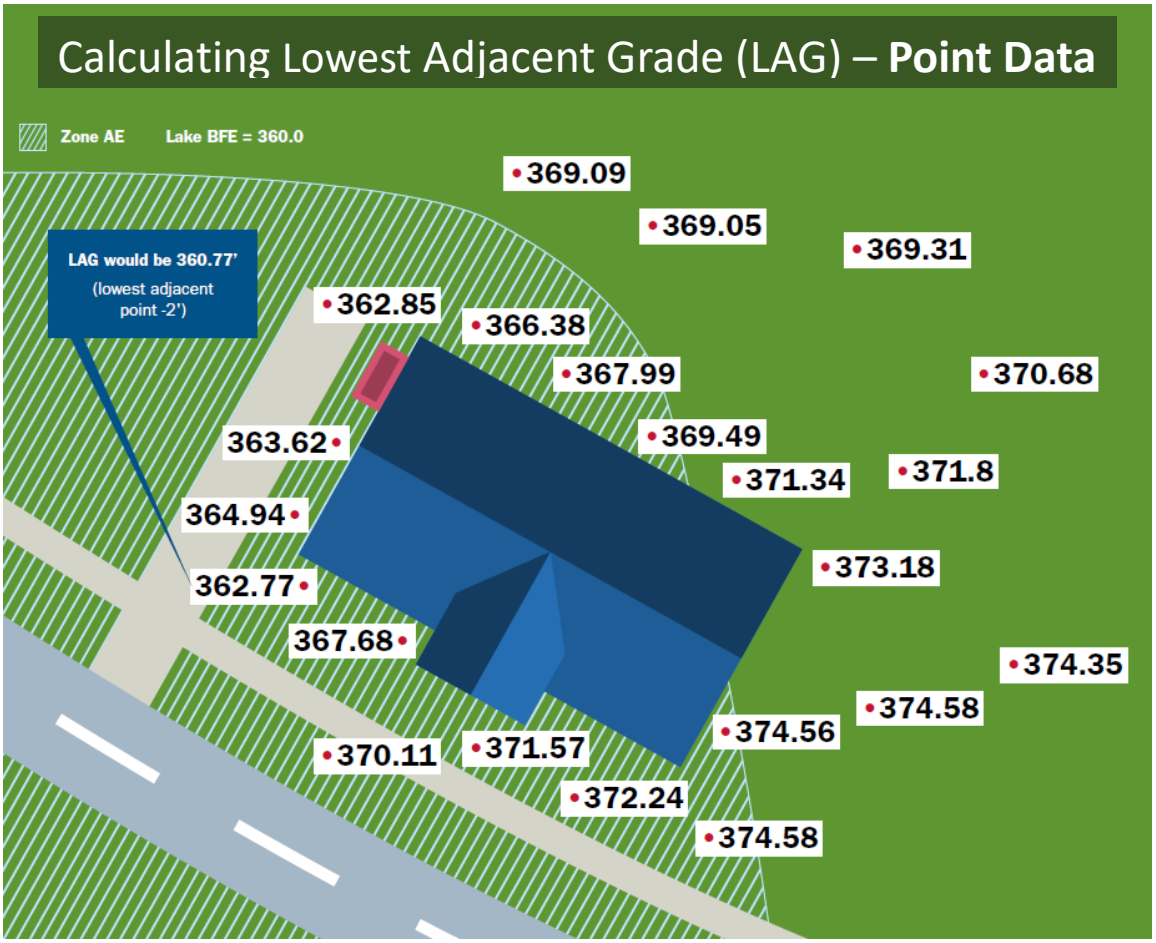
i) **Using LiDAR Contours:** For LOMA submittals that include LiDAR data contours, FEMA will subtract half the contour interval or 1 foot, whichever is greater, from the lowest contour closest to (but not going through) the building (to determine the LAG) or the lot (to determine the LLE)[1]. Determine the Lowest Adjacent Grade (LAG) or Lowest Lot Elevation (LLE) using the 1-ft. or 2-ft. LiDAR-Derived Contours. Ensure the Contours Layer in the Reference Layers is visible. High-resolution contours are displayed only at the highest two zoom levels of 1:564 and 1:282 map scales. Use the Text Markup tool to annotate the **Closest Lower Contour** on the map. Submit the LAG/LLE elevation values to the nearest tenth of the foot (0.1). If high-resolution contours do not exist, then use the LiDAR Point Data method described in the following section to determine the LAG.



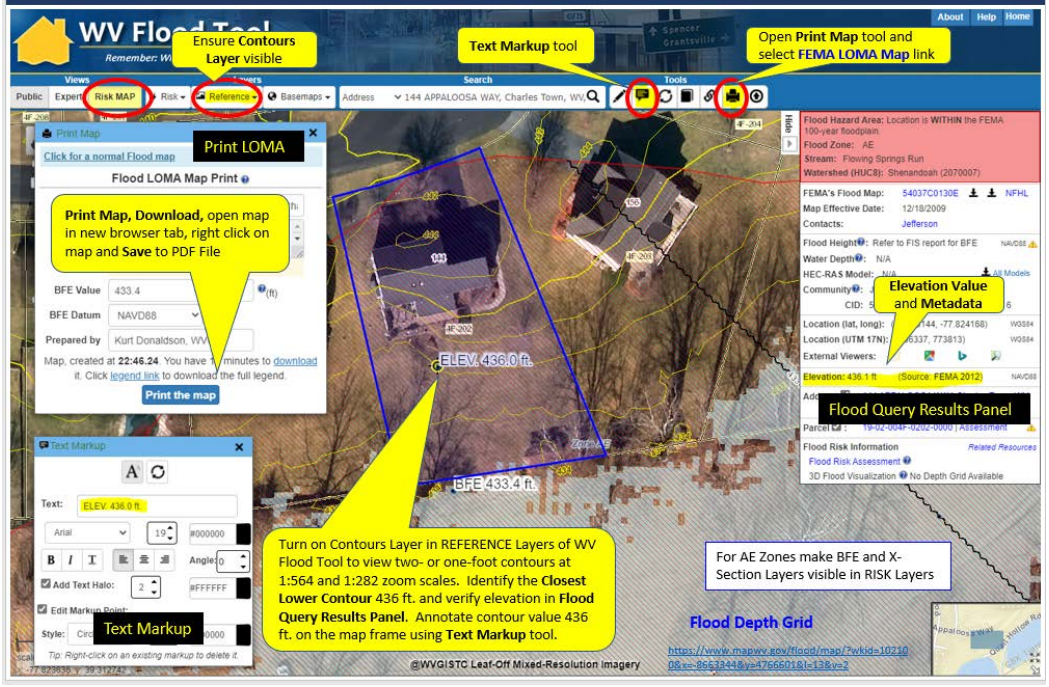
[1] Note: For West Virginia, users will always subtract 1 foot from the Closest Lower Contour to determine the LAG

ii) **Using LiDAR Point Data:** For submittals that include LiDAR point data, FEMA will subtract 2 feet from the lowest point closest to the building (to determine the LAG) or the lowest point on the lot (to determine the LLE). Multiple points must cover the building/lot for this method. Use the Text Markup tool to annotate the **Lowest Adjacent Point** value on the map. Submit the LAG/LLE elevation values to the nearest tenth of the foot (0.1).

Where LiDAR contours are not available, in lieu of the LiDAR contours noted above, the overlay exhibit may depict the point cloud, with elevations labeled, that would be used to determine the LAG or LLE. The point density must be sufficient, and the labeled elevations need to be uniformly spaced throughout the subject property to adequately portray changes in elevations.



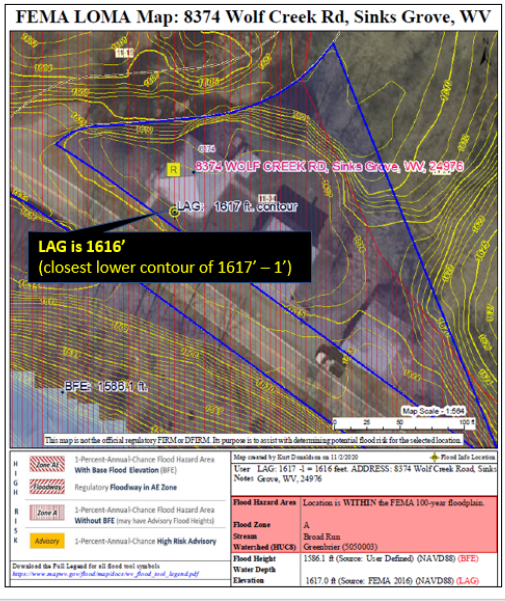
LOMA Map – Identify LAG

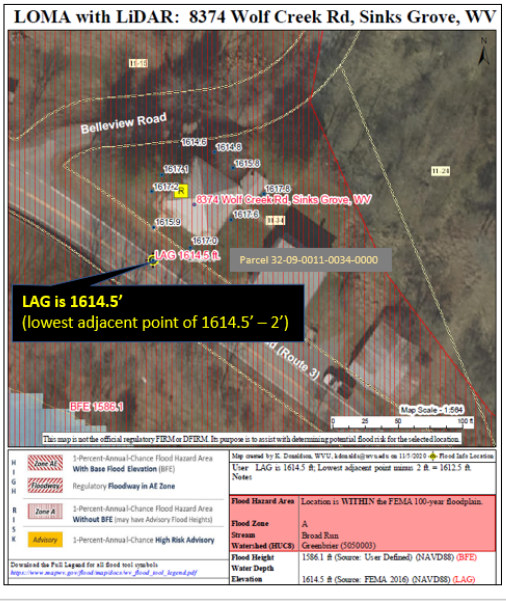


WV Flood Tool (LAG Methods)

Contours
(Elevation Contours Reference Layer)

Point Data
(Flood Query Results Panel)



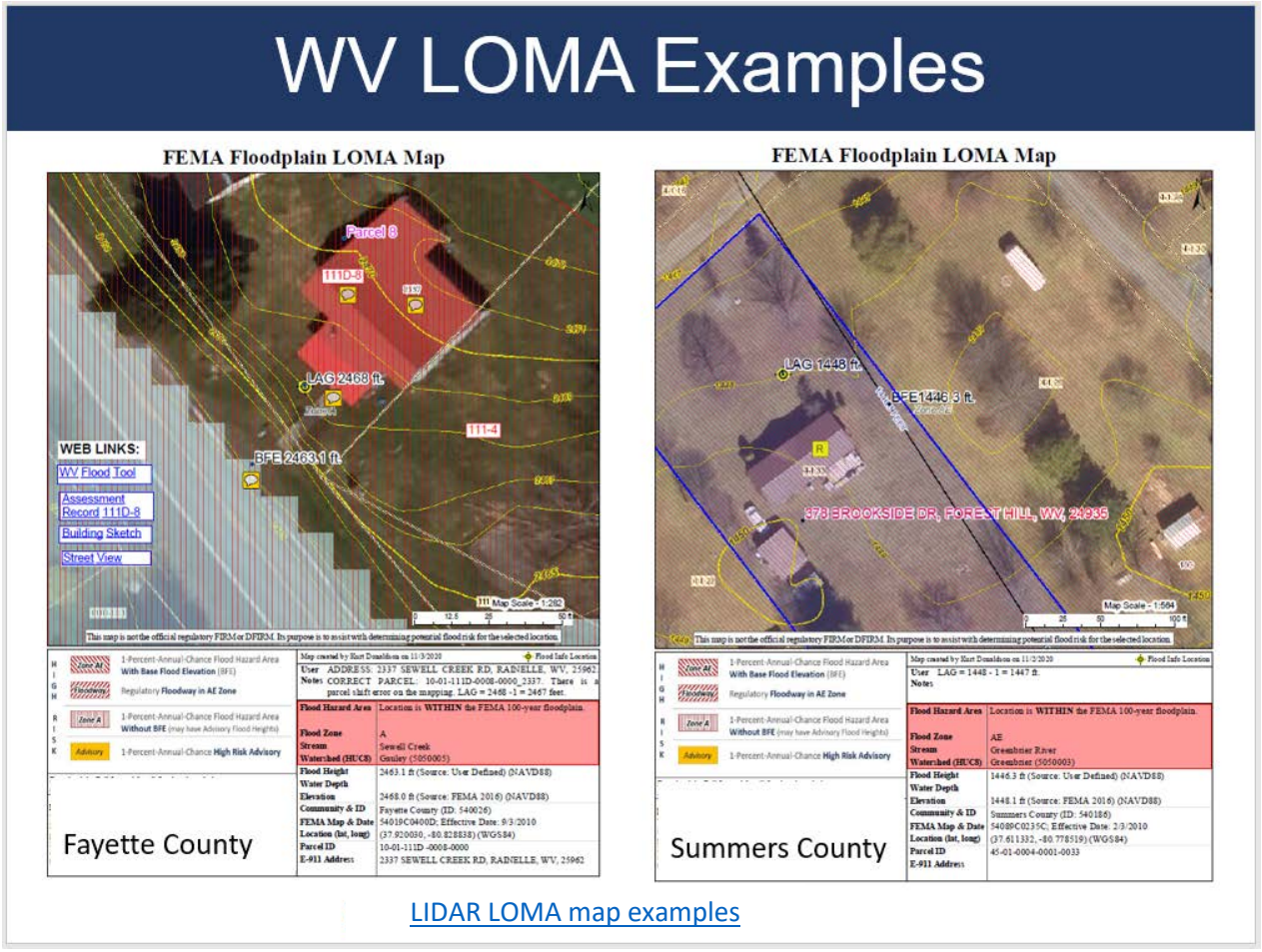


e) **Add Annotation:** Users can add a customized title and user notes in the Print LOMA popup window to display on the PDF LOMA map. Use the Text Markup tool for annotation on the map; ant the Text Markup tool to annotate the BFE value on the map. To erase all text markups, select the Clear tool. To erase single features, right click on the annotation to delete; however, the delete function will not work if the parcel selection is on.

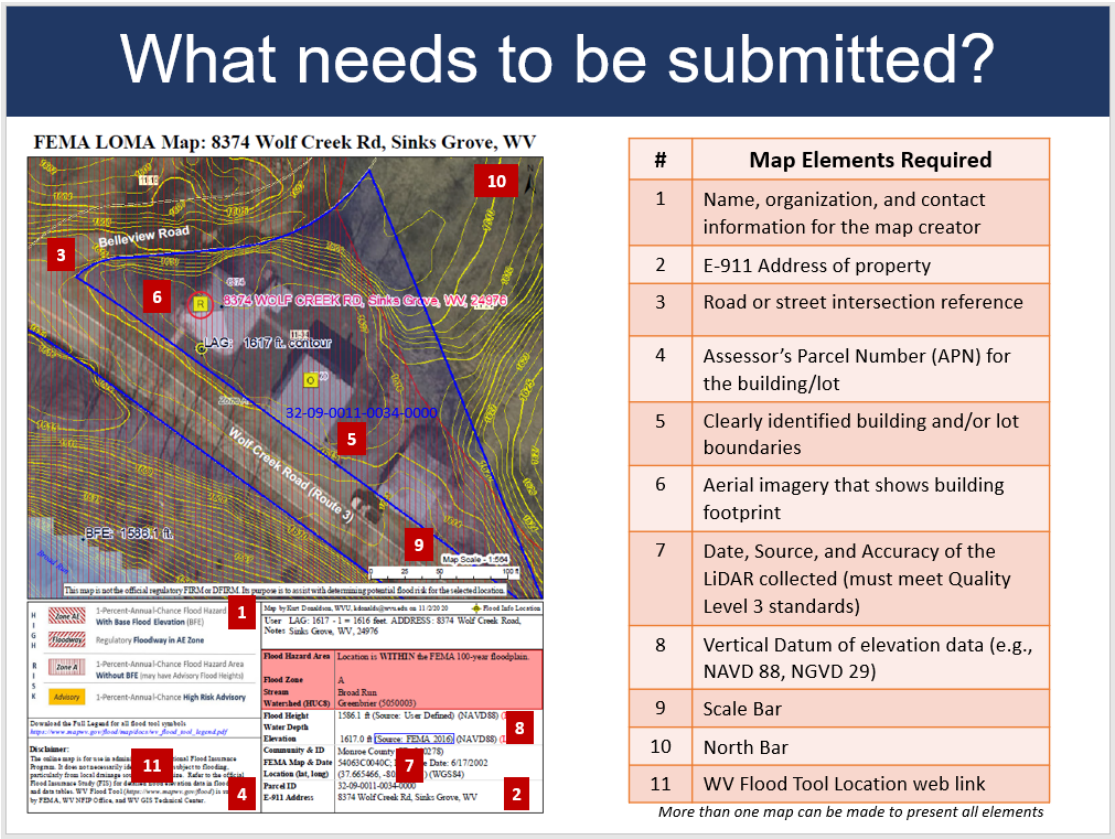
f) **Print and Download LOMA Map:** Select the "Print Button" to generate and download the online PDF LiDAR LOMA Map. Review and make corrections. Download the PDF LOMA Map to view in your web browser. Follow the same procedures each time of printing and downloading the map after an edit or format change has been made to the layout.

g) **Save to PDF LOMA File:** Right click on the LiDAR LOMA Map in your web browser and Save the LOMA Map to a file. For the LiDAR LOMA PDF file name, include the unique Building Identifier for a structure LOMA and the unique Parcel Identifier for the lot LOMA. This information can be copied from the WV Flood Tool.

3) **Further Edit/Annotate Print LOMA (optional):** Import the Print LOMA file into Adobe Acrobat (preferred) or other editing software to add or edit annotation. Ensure the property information is correctly identified on the Print LOMA.



4) **Submit LiDAR LOMA Map:** Submit the Print LOMA file and elevation information using FEMA's Online Letter of Map Change submission process. Process multiple maps to ensure all the required elements and parcel/street information are captured. Below are the major processing steps:
   a) Flood Determination Details (Single Structure, Single Lot, Multiple Structures, Multiple Lots; a survey is required for portions of lots)
   b) Community Details
   c) E-911 Street Address & Legal Description of Property. Make sure the authoritative E-911 address is utilized and not the Assessor's Parcel Address (which is often incomplete or inaccurate). In the property description, ensure the full building identifier or parcel identifier are the complete spatial identifiers prescribed for West Virginia properties.
   d) Fill Information (Choose *No*)
   e) LOMC Type (Choose *LOMA*)
   f) Processing Fee (Choose *No Fee Required*)
   g) Applicant Name, Mailing Address, Contact Information
   h) Upload Supporting Documents. If you do not upload the appropriate supporting documents, you will not be able to continue the LOMC application process.
      i) Map Documents (click links for examples)
         (1) PDF **LOMA Map** with BFE and LAG
         (2) **Street Reference Map** for property location
      ii) **Tax Assessor's Map** or suitable map document (WV Flood Tool parcel map should suffice)Property Deed or Plat Map: Upload either a Copy of the **Property Deed** (with recordation data and stamp of the Recorder's Office) OR a Copy of the Subdivision **Plat Map** for property (with recordation data and stamp of the Recorder's Office) as separate files.



#	Map Elements Required
1	Name, organization, and contact information for the map creator
2	E-911 Address of property
3	Road or street intersection reference
4	Assessor's Parcel Number (APN) for the building/lot
5	Clearly identified building and/or lot boundaries
6	Aerial imagery that shows building footprint
7	Date, Source, and Accuracy of the LiDAR collected (must meet Quality Level 3 standards)
8	Vertical Datum of elevation data (e.g., NAVD 88, NGVD 29)
9	Scale Bar
10	North Bar
11	WV Flood Tool Location web link

More than one map can be made to present all elements

Assistance: As a guide, refer to LIDAR LOMA map examples created using the WV Flood Tool. Contact the WV GIS Technical Center for technical assistance.

FEMA: To speak with a Map Specialist about the amendment process, contact the FEMA Map Information eXchange (FMIX) at 877-FEMA-MAP (877-336-2627) or FEMAMapSpecialist@riskmapcds.com

WV Flood Tool (www.mapwv.gov/flood)
WVU GIS Technical Center, West Virginia University

Kurt Donaldson, GIS Manager
kurt.donaldson@mail.wvu.edu, phone: (304) 293-9467

Maneesh Sharma, GIS Analyst
Maneesh.Sharma@mail.wvu.edu, phone (304) 293-9466

Eric Hopkins, GIS Analyst
Eric.Hopkins@mail.wvu.edu, phone: (304) 293-9463

RESOURCES

- West Virginia
  - WV Flood Tool LiDAR for LOMA Guide | Instructions
  - WV LiDAR for LOMA Examples
  - WV LiDAR Quality Level Map
  - WV Elevation Source Metadata
  - WV FEMA-Purchased LiDAR Status Map
  - WV Building and Property Identifiers
  - WV Vertical Datums

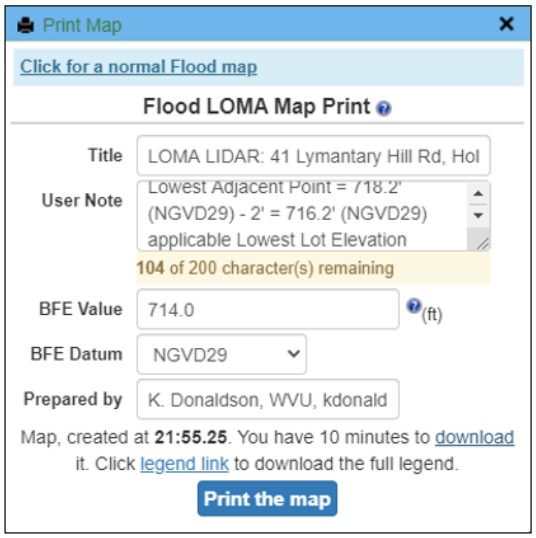
- FEMA
  - FEMA Online Letter of Map Change (LOMC) Website
  - How to Request a Letter of Map Amendment (LOMA) or Letter of Map Revision Based on Fill (LOMR-F)
  - Region V LiDAR LOMA Fact Sheet (2018)
  - Guidance for Flood Risk Analysis and Mapping MT-1 Technical Guidance (November 2019), Light Detection and Ranging (LiDAR) Letter of Map Amendment (page 44)

APPENDIX A: WV Flood Tool's LOMA implementation compared to Region V Counties (Minnesota)

The WV Flood Tool's LIDAR for LOMA implementation is similar to select Minnesota counties in FEMA Region V but with additional enhancements:

- *Statewide Geographic Extent:* A statewide, standardized implementation of the LiDAR for LOMA TOOL. The tool can be used by all counties in West Virginia when complete FEMA-purchased QL2 LiDAR coverage is attained and processed for the WV Flood Tool.
- *LAG Determination Methods:* Supports both Contour and Point LiDAR methods for determining the Lowest Adjacent Grade. In the WV Flood Tool, one or two-foot contours are displayed in the REFERENCE Layers at the highest zoom scales (1:564 and 1:282 map scales) and LiDAR points are presented on the FLOOD QUERY RESULTS PANEL. Leaf-off aerial imagery typically at 4-inch cell resolution is also available at the highest zoom scales.
- *NGVD29 Base Flood Elevation Datum Conversion:* The LOMA Map Print Tool converts the Ground Elevation NAVD88 to NGVD29 so the BFE and LAG/LLE are the same vertical datum
- *Annotation:* The Measure Tool allows for text markup of BFE, LAG, and other annotations on the map layout.
- *LOMA Candidate Identification:* The building-level risk assessments and base flood depth grid provide easy references for users to identify potential LOMAs.

NGVD 29 Datum Conversion



Flood Hazard Area	Location is **WITHIN** the FEMA 100-year floodplain.
Flood Zone	AE
Stream	Copperas Mine Fork
Watershed (HUC8)	Upper Guyandotte (5070101)
Flood Height	714.0 ft (Source: User Defined) (NGVD29)
Water Depth	About 1.0 ft (Source: HAZUS)
Elevation	718.2 ft (Source: Logan 2018) (NGVD29) (0.67 CF)
Community & ID	Loga
FEMA Map & Date	5404
Location (lat, long)	(37.8
Parcel ID	23-03-0010-0140-0000
E-911 Address	41 LYMANTARY HILL RD, HOLDEN, WV, 25601

The Print LOMA function converts the Ground Elevation from NAVD88 to NGVD29 to match the BFE NGVD29 Vertical Datum

NGVD29 Base Flood Elevations: The LOMA Map Print Tool converts the Ground Elevation NAVD88 to NGVD29 so the BFE and LAG/LLE are the same vertical datum

Lowest Adjacent Point 717.5 ft (NAVD88) + 0.67 ft. Conversion Factor = 718.2 ft. (NGVD29)

RESOURCES:

- FEMA Region V Fact Sheet
  https://greatlakescoast.org/pubs/factSheets/Region_V_LiDAR_LOMA_FS_v3_012219_FINAL.pdf

- Examples of Minnesota web application Print LOMA Tool features:
  - **Anoka County**, Minnesota:
    http://gis.anokacountymn.gov/flood/

  - **Hennepin County** Natural Resources Interactive Map
    1) https://gis.hennepin.us/naturalresources/map/
    2) https://gis.hennepin.us/NaturalResources/map/default.aspx?C=440980.63442474947,4979864.386330494&L=9&T=road&D=true&IMG=2015&LID=2&PID=0611724410004&VIS=5,27,24,8&I=440972.142523,4979872.800097321

APPENDIX B: FEMA Processing of Contour or LiDAR Point Submittals

5.3. Processing Procedures

LIDAR-based submissions will be reviewed based on the following criteria:

- The LOMA analyst will review the submitted exhibit to determine the location of the structure/property in question and identify the elevation data to be assessed.
- Contour submittals: The analyst will identify the lowest contour immediately adjacent to the subject (but not going through it) and subtract one-half the contour interval or 1 foot, whichever is greater, from the lowest contour closest to the structure or property (see Figure 23) to determine the applicable LAG elevation or LLE. This elevation will be compared to the BFE.
- LiDAR point submittals: The analyst will identify the lowest point immediately adjacent to the structure or on the property and subtract 2 feet to determine the LAG or the LLE.
- If the comparison of the LAG or LLE to the BFE results in a removal and all other required data was submitted, a determination can be issued. The LAG/LLE, and possibly the BFE as well, will not be published with the determination. If additional data is required to process the request (i.e., submittal form, deed, plat), it will be requested to complete the determination.
- If the comparison of the LAG/LLE to the BFE results in a non-removal, certified elevations will be requested in addition to any other data needed for the request.

5.4. BFE Development Procedures

For properties in flood zones without published BFEs, the applicant should provide any data that is available to determine the BFE. When data is not available, FEMA will determine the BFE based on the best available data. It should be noted that these BFE determinations are often conservative, and any information that is provided may assist in determining the BFE.

5.5. Disclaimer

All cases issued using LiDAR in lieu of certified elevations will include the following disclaimer:

> This determination is based on LiDAR topographic data showing the elevation of the subject property. The elevation data that were used are not certified by a Licensed Land Surveyor or Professional Engineer, but they meet or exceed FEMA requirements. This determination is subject to change if more detailed data becomes available.

Guidance for Flood Risk Analysis and Mapping MT-1 Technical Guidance (November 2019), LiDAR LOMA Section 5.0, pages 47-48