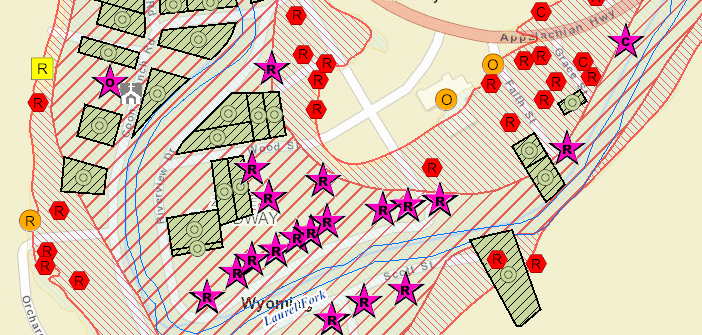
Support for Hazard Mitigation Plans

Flood Risk aSSESSMENT   
METHODOLOGY



**August 25, 2020**

Prepared by:  
  
Kurt Donaldson  
Maneesh Sharma **WV GIS Technical Center**  
Department of Geology & Geography  
330 Brooks Hall, PO Box 6300

West Virginia University

Morgantown, WV 26506



Special thanks for support from **FEMA, WV DHSEM,** and **DOGAMI**.



**CONTENT**

[Overview 1](#_Toc34388221)

[Building Inventory 2](#_Toc34388222)

[Water Depth Grids 2](#_Toc34388223)

[Flood Risk Assessment Products 3](#_Toc34388224)

[Community Exposure and Risk 3](#_Toc34388225)

[Building-Level Exposure 4](#_Toc34388226)

[Building-Level Flood Risk Assessment 5](#_Toc34388227)

[Mitigation Opportunities 6](#_Toc34388228)

[Community Engagement & Field Verification 6](#_Toc34388229)

[References 7](#_Toc34388230)

[Appendix A: Tables and Figures 8](#_Toc34388231)

[Appendix B: Glossary 42](#_Toc34388232)

**TABLES**

[Table 1. Flood Risk Products 8](#_Toc34388233)

[Table 2. Flood Risk Layers 11](#_Toc34388234)

[Table 3. Spatial Identifiers 19](#_Toc34388235)

[Table 4. Hazus Mode Inputs: Building Characteristics 20](#_Toc34388236)

[Table 5. Hazus Mode Inputs: Flood Water Depth 20](#_Toc34388237)

[Table 6. Hazus Mode Inputs: Building Point 20](#_Toc34388238)

[Table 7. RESIDENTIAL Basement Information from Assessment Records 21](#_Toc34388239)

[Table 8. COMMERCIAL Basement Information from Assessment Records 21](#_Toc34388240)

[Table 9. Foundation Type, Foundation Code, First Floor Height for Hazus Flood Model 22](#_Toc34388241)

[Table 10. Hazus Occupancy Class Descriptions 23](#_Toc34388242)

[Table 11. WV Assessment Land Use Codes 27](#_Toc34388243)

[Table 12. Average Mobile Home Appraisal Values by County 34](#_Toc34388244)

[Table 13. Data Issues and Quality Control Measures 36](#_Toc34388245)

[Table 14. Building Inventory Enhanced (BIE) Attributes 37](#_Toc34388246)

[Table 15. Hazus FAST Inputs. Building Input FAST (BIF) Attributes 39](#_Toc34388247)

[Table 16. Hazus FAST Outputs. Building FAST Outputs (BOF) 40](#_Toc34388248)

**FIGURES**

[Figure 1. Hazus Building-Level Flood Loss Estimates 1](#_Toc34388249)

[Figure 2. Flood Risk Products: Flood Risk Grids, Flood Zone Changes, Risk Per Structure 12](#_Toc34388250)

[Figure 3. Building-Level Flood Risk Products 13](#_Toc34388251)

[Figure 4. Building-Level Flood Risk Assessments Published to WV Flood Tool 14](#_Toc34388252)

[Figure 5. WV Flood Tool, WV Property Viewer, and Web Parcel Assessment Report 15](#_Toc34388253)

[Figure 6. Flood Risk Map 16](#_Toc34388254)

[Figure 7. Flood Risk Database 16](#_Toc34388255)

[Figure 8. Building-Level Flood Risk Assessment Cycle 17](#_Toc34388256)

[Figure 9. Building Inventory Workflow 17](#_Toc34388257)

[Figure 10. Hazus Flood Loss Flowchart 18](#_Toc34388258)

Methodology

# Overview

Funded by a FEMA Hazard Mitigation Grant Program (HMGP) and the State Hazard Mitigation Office, building-level flood risk assessments are being completed statewide for a 1% annual chance flood (100-year) event in support of local and state hazard mitigation plans. The building-level flood risk assessments utilize FEMA’s Flood Assessment Structure Tool (FAST), a GIS-based, open source utility designed by FEMA’s Hazus Program for estimating potential building losses from flood disasters. FAST was built from the ArcGIS Python script developed by Oregon’s Department of Geology and Mineral Industries (DOGAMI). A Hazus Level 2 advanced analysis increases the accuracy and precision of an analysis by incorporating user-supplied data relevant to the hazard. The flood model results support local hazard mitigation plans and other flood reduction efforts.

The Hazus utility employs a standardize methodology in which building and water depth inputs utilize Depth Damage Functions (DDFs) to calculate economic damage loss estimates. The proper Depth Damage Function (DDF) is assigned based on the Occupancy Type, Foundation Type, and Number of Stories of each structure. The First Flood Height for each structure point is subtracted from the Water Depth to calculate the Depth-in-Structure flood depth, in feet above ground level.



Figure 1. Hazus Building-Level Flood Loss Estimates. Source: FEMA.

The FAST performs a Hazus Flood Model analysis, using the most accurate 100-year depth grid available. It generates damage loss estimates for building, content, and inventory, building debris, and building repair/replacement times. Population displacement estimates are computed from the Residential Occupancy Types and census average household size. All building-level risk assessments are output to tabular reports, geodatabase, and the RiskMAP View of the WV Flood Tool.

The Hazus Program designed FAST to make flood risk assessments quicker, simpler, and more cost effective. FAST provides planners, analysts and policymakers with a free and user-friendly tool to characterize flood risk in their communities using completely open methods and technology.

# Building Inventory

Detailed building inventories are developed by pinpointing all primary structures in the high-risk effective and advisory floodplains. Historical and community assets (government buildings, churches) are also inventoried. Essential facilities are inventoried to the 0.2-pecent (500-year) annual chance flood event. Required building characteristics are Occupancy Class, Foundation Type, First Floor Height, Number of Stories, Area, and Replacement Cost. Default values are populated from the most current State Parcel Assessment Database which us updated annually, and then where necessary modified with user-defined values that override the Assessment Database values. User-defined values can be entered for the building address, parcel geometry and assessment identifiers, essential building characteristics, and base flood water depth. Building pictures can be linked to the risk assessment using the unique building identifier.

GIS Specialists use desktop mapping software to pinpoint the building location to the most restrictive flood zone, identify insurable primary structures, match building points to the correct building assessment records, complete missing building attributes, and modify default assessment building values with user-supplied values. The following GIS Reference Layers are used to improve the location accuracy and building attributes: E-911 Addresses, Parcels/Attributes, Aerial Imagery, Building Footprints, Street View Pictures, Elevation Certificates, and other building reference databases. All the building points in the Special Flood Hazard Area and High-Risk Advisory Zones are manually captured, processed, and then quality checked using nine square mile grids. Data error flags are recorded for missing assessment values, parcel misalignments, missing E-911 address numbers, etc. User-supplied values that override the default assessment values are recorded as red text in the building inventory tables. A unique building identifier is formed from concatenating the Parcel ID and Building Address Number.

# Water Depth Grids

The Water Depth Grid communicates information about the flood depth for a 1-percent (100-year) annual chance flood. Flood Depth Grids illustrate the flood depth, in feet above the ground surface, to demonstrate the variability of flood depths in flood prone areas. Officials can use depth grids to help individuals visualize the depth of flooding their home might experience; an easier concept than understanding a base flood elevation. The depth grid, combined with an inventory of the built environment, is used by the Hazus Flood Model to determine flood loss potential, by applying the appropriate depth- damage curves. For the Flood Model Analysis, Model-Backed Depth Grids created from engineering software like HEC-RAS are preferred over the less-accurate Hazus Depth Grids. In the WV Flood Tool, the Water Depth is displayed in the (1) Flood Results Query Panel, (2) Flood Risk Layers Menu, and (3) 3D Flood Visualization.

# Flood Risk Assessment Products

Flood Risk Products are presented at the building and community levels for each county. Primary products include a Flood Risk Report, Flood Risk Map, Flood Risk Database, Flood Risk Tables, Flood Risk Grids (Water Depth, Water Surface Elevation), Flood Zone Changes resulting from active or future flood map studies, and Building-Level Flood Risk Assessments. Building Exposure information like structure values, occupancy type, owner occupancy, and household population are tabulated per structure. The Hazus Flood Model calculates per structure Building Damage Loss Estimates, Debris Removal, and Restoration Time for a 1% annual chance flood event. The Population Displacement is computed per residential structure from the building inventory and census average household size which provide inputs for Short-Term Shelter Models. Other data layers and products which support floodplain management and risk assessments include dams, levees, landslides, high-water marks, LOMA verified points, elevation certificates, assessment reports, CRS program variables, and 3D flood visualizations. Building Flood Risk Products are viewable in both tabular or graphical formats. Building-level risk assessments are aggregated to the community-level, which in turn can be summarized at the regional and state levels. Risk assessment reports can also be generated at the stream and watershed levels.

Although the Flood Risk Reports and data are organized primarily at the community and building levels, users can access the detailed risk assessments of each structure by viewing the Flood Risk Tables or WV Flood Tool. Mitigation layers (e.g., buyout properties, open space preservation) provide information for communities to identify flood reduction activities. FEMA’s Community Engagement Prioritization Tool (CEP-Tool) will be used to rank communities by risk indicators and prioritize for engagement.

## Community Exposure and Risk

There are 287 communities (232 municipalities and 55 unincorporated counties), 11 planning regions, and 55 counties.

* Demographic / Social Vulnerability
  + Population Growth
  + Population in SFHA
  + Social Vulnerability (SOVI)
  + Ownership
  + Income
  + Age
* Land Use / Impervious Surfaces
* Historical Flooding
  + Presidential-Declared Disasters
  + Date of Last Disaster
  + High Water Marks
* Insurance Claims
* Insurance Policies
* Flood Zones
  + Stream Miles
  + Regulatory Floodway
  + High-Risk Advisory Zones (Advisory A, Updated AE, Preliminary NFHL)
  + Area in SFHA (aSFHA)
* Structures Summary
  + Buildings in SFHA (counts, values, occupancy class, etc.)
  + Facilities (Essential, Community, Government)
  + Historical
  + Repetitive Loss Structures
  + Dams and Levees
  + Transportation Infrastructure (Roads / Bridges)
* Flood Risk Assessment Summary
  + Building Damage
  + Debris Removal
  + Population Displaced
    - Short-Term Sheltering
    - Companion Pets

## Building-Level Exposure

The data variables below identify flood exposure to buildings and communities:

Flood Zones

* Regulatory / Non-Regulatory / Floodway
* High-Risk Advisory Zones / Future Map Conditions
  + Mapped-In SFHA
  + Mapped-Out SFHA
  + No Change SFHA
  + Floodway
* LOMA (Positional Accuracy Verified)
  + Structure Removal
  + Structure Non-Removal
  + Structure Out as Shown
* Flooding Source by Stream Name / Watershed
* Population in SFHA

Water Depth

* Water Depth
* Water Depth-in-Structure
* Water Surface Elevation

Structures

* Building Exposure
* Building Exposure Cost
* Building Occupancy Class (Residential/Commercial/Other)
* Building Owner Occupied / Rental
* Basement / Foundation Type
* First-Floor Height / Lowest Floor
* Building Year / Construction / New Development (Pre-FRIM, Post-FIRM)
* Essential Facilities / Community Assets
* Historical Structure
* Riparian Zone Structure

## Building-Level Flood Risk Assessment

Site-specific flood assessments are conducted for a 1% annual chance flood (100-year flood) event. FEMA’s OpenHazus Flood Assessment Structure Tool is employed for the Flood Analysis Model.

* Building Damage Percent (Hazus)
* Building Damage Loss U.S. Dollars (Hazus)
* Content and Inventory Loss (Hazus)
* Debris Removal (Hazus)
* Restoration Time (Hazus)
* Population Displacement

## Mitigation Opportunities

Factors to identify flood reduction measures and areas of mitigation interest:

* Open Space Preservation / Restore Floodplain to Natural Functions
  + Buyout Properties (Deed-Restricted)
  + Public Lands
  + Private Lands
  + Riparian Zones
* Natural Flood Zone Functions
  + Riparian Zones
  + Wetlands
  + Habitat
  + Permeable Surfaces
* Repetitive Loss Structures
* Community Rating System (CRS) Class
* Adoption of Higher Standards / Building Code Standards
* CAV/CAC Compliance of Last Visit
* Active or Mapping Studies
* Risk Communications

# Community Engagement & Field Verification

Field verification and outreach are an important component of the flood risk assessments in support of local hazard mitigation plans. Local officials, planners, emergency managers, or floodplain managers are the primary target audience for community engagement. The Flood Risk Products (Report, Map, Tables, Database) will be provided to each community to verify the risk assessment findings and identify potential mitigation actions. Reports will also be provided to the Regional Planning and Development Councils which are responsible for coordinating local hazard mitigation plans. The Flood Risk Report will provide links to FEMA and State Resource Guides that may include:

* *Reducing Damage from Localized Flooding: A Guide for Communities*
* *Community Rating System Coordinators Manual*
* *WV Floodplain Management Quick Guide*

Communities will be provided with a form or survey to provide feedback on the Flood Risk Report, Maps, and Tables. Important variables for the communities to validate include structure type (e.g., primary, accessory, seasonal, dilapidated) and the foundation type / first floor height of elevated structures. It would be beneficial if communities can provide Finished Construction Elevation Certificates, especially of elevated structures, to verify the first-floor heights, lowest floor elevation, and water depth-in-structure. The Building Inventory follows a cyclic workflow in that new structure-level flood risk assessments can be generated fairly quickly from edits to the building stock or flood depth grids, and then published to the RiskMAP View of the WV Flood Tool. Communities do not need mapping software since the Building-Level Flood-Risk Assessments can be viewed in a Spreadsheet Table with web links to the WV Flood Tool. Areas of Mitigation Interest should be identified by the communities and submitted to the State via the form or survey. The Areas of Mitigation Interest (AoMI) dataset should capture the mitigation interests of the community and provide targets for future mitigation action.

# References

Open-File Report O-18-04, **ArcGIS Python script alternative to the Hazus-MH Flood Model for User-Defined Facilities** by John M. Bauer; ArcGIS® Python® script, library, 28 p. user guide, <https://www.oregongeology.org/pubs/ofr/p-O-18-04.htm>

FEMA's Natural Hazards Risk Assessment Program (NHRAP), **Hazus Flood Model FEMA Standard Operating Procedure for Hazus Flood Level 2 Analysis**, 2018,<https://www.fema.gov/media-library-data/1530821743439-e16c13c1f6266bbe374dc00a00ac9910/Hazus_Flood_Model_SOP_level2analysis.pdf>

**FEMA’s Flood Assessment Structure Tool (FAST)**, <https://github.com/nhrap-hazus/FAST>, Hazus User Release Notes Fact Sheet, <https://www.fema.gov/media-library-data/1579211964765-77a8d16172c28267e657b2ad02eb8656/FAST_Factsheet.pdf>

# Appendix A: Tables and Figures

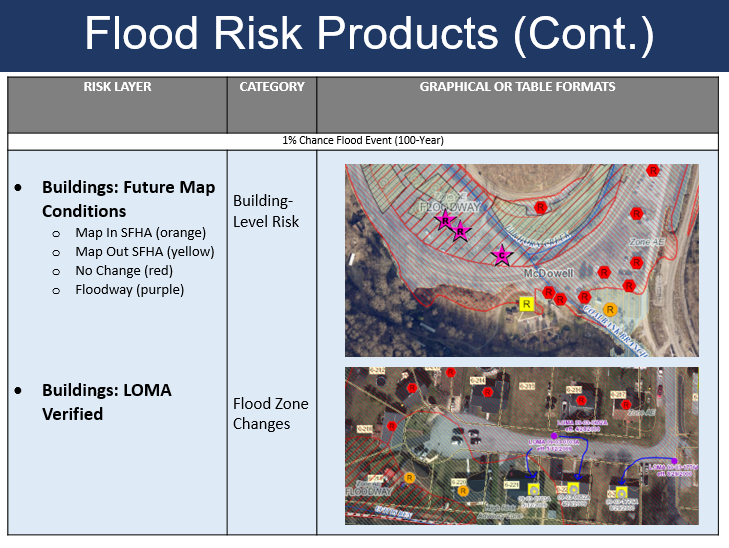
Table 1. Flood Risk Products

| **FLOOD RISK PRODUCT** | **DESCRIPTION** |
| --- | --- |
| Flood Risk Report | A narrative or a community’s flood risk assessment study to support the floodplain management and flood reduction activities. A Flood Risk Report is published for each county to supplement it Local Hazard Mitigation Plan. |
| Flood Risk Map | A map that illustrates the overall flood risk for a community. The map can be used as an outreach tool to communicate risk more clearly and to support mitigation planning. The Flood Risk Map is viewable as an interactive map on the WV Flood Tool or as a PDF print-ready static map. |
| Flood Risk Tables | Excel tables that list per structure the primary building exposure and flood risk assessment attributes for communities to verify. Specific tables for Essential Facilities, Buyout Properties, etc. are also provided to communities for verification. These tables can be used by communities to enhance floodplain management and risk reduction efforts. Share links are included in tables to link records to RiskMAP View of WV Flood Tool. |
| Flood Risk Database | Provides communities with geospatial information collected during the risk assessment process and offers effective ways to visualize and communicate flood risk. The Flood Risk Assessment GIS (FRAGIS) is the name for West Virginia’s flood risk geodatabase. |
| Flood Risk Community Engagement Form or Survey | Communities are provided with instructions on how to validate and provide feedback on Flood Risk Report, Maps, or Tables. Communities are encouraged to identify Areas of Mitigation Interest (AoMIs) for the State and FEMA to review. The Areas of Mitigation Interest (AoMI) dataset should capture the mitigation interests of the community and provide targets for future mitigation actions. |
| Flood Depth Grid | Communicates information about the flood depth for a 1-percent (100-year) annual chance flood. Flood Depth Grids illustrate the flood depth, in feet above the ground surface, to demonstrate the variability of flood depths in flood prone areas. Officials can use depth grids to help individuals visualize the depth of flooding their home might experience; an easier concept than understanding a base flood elevation. The depth grid, combined with an inventory of the built environment, is used by the Hazus Flood Model to determine flood loss potential, by applying the appropriate depth-damage curves. Model-backed DEMs are preferred over Hazus-generated depth grids for the Flood Models. In the WV Flood Tool, the Water Depth is displayed in the (1) Flood Results Query Panel, (2) Flood Risk Layers Menu, and (3) 3D Flood Visualization. |
| Water Surface Elevation Grid (Base Flood Elevation, Flood Height) | Provides the base flood elevations for A Zones. The Water Surface Elevation is an effective tool for evaluating risk when combined with the lowest floor or first-floor elevations for buildings. Base flood heights are important for floodplain management and mitigation activities in determining flood elevations in relation to structure (building, bridges, etc.) elevations. Remember that Flood heights measure elevations above sea level and correspond to a vertical elevation datum, whereas depth grids measure flooding above ground level. Where new mapping has occurred with updated topographic data, Advisory Base Flood elevations (or Advisory Flood Heights) are available for select communities The Water Surface Elevation is displayed in the Flood Results Query Panel of the WV Flood Tool. |
| Future Flood Zone Changes | High-risk advisory flood zones are generated from new model-backed flood studies or from redelineation mapping. Redelineation is the method of updating effective flood hazard boundaries to match updated topographic data based on the computed water surface elevations from effective models. The public should be informed that these non-regulatory zones will most likely become effective when new Flood Insurance Rate Maps (FIRM) are published, and thus any development in these zones should be regulated to the same standards as effective high-risk flood zones. High-risk advisory zones (Preliminary NFHL, Advisory A, Updated AE) are represented as orange-colored flood zones in the WV Flood Tool. In local floodplain ordinances, communities may choose to adopt high-risk advisory zones as "community-identified floodplains" and regulated the same as the Special Flood Hazard Area of the official FIRM. |
| Building-Level Flood Risk Assessment | Flood Risk Assessment datasets are developed by pinpointing all primary insurable structures in the Special Flood Hazard Area or 100-year floodplain. Historical and community assets (government buildings, churches) are also inventoried. Essential facilities are inventoried to the 0.2-pecent (500-year) annual chance flood event. Required building characteristics are Occupancy Class, Foundation Type, First Floor Height, Number of Stories, Area, and Replacement Cost. Default values are populated from the State Parcel Assessment Database and modified with user-defined values. Building pictures can be linked to the risk assessment using the unique building identifier.   1. Buildings Exposed to Flooding: An inventory of all buildings exposed to flooding. A replacement value is determined for each primary structure. 2. Buildings - Future Map Conditions: Buildings are classified according to LOMA’s verified for positional accuracy and non-regulatory flood zones. Categories are Mapped out SFHA (yellow), Mapped in SFHA (orange), No Change (red), and Regulatory Floodway (magenta star). The color symbols have land use category letters for **R**esidential, **C**ommercial, and **O**ther. Buildings “Mapped Out SFHA” should be considered for a LOMA Structure Removed status while Buildings “Mapped out SFHA” should be regulated to the 100-year floodplain standard until new effective maps are published. For buildings in the “Floodway” there should be no development unless a No-Rise Certificate is issued. 3. Buildings - New Development and Basement: The Building Year from Assessment Database is symbolized by FIRM (Pre-FIRM/Post-FIRM/Unknown) and Basement (Basement/No Basement) status. Note: A basement in the assessment database my not be a subgrade basement but a walkout basement. Hence, basement designations from the assessment records should be field verified. An audit of minus rated properties for Pre-FIRM and POST-FIRM structures should be performed and verified with Elevation Certificates or field surveys. 4. Building Damage Loss Estimates (Hazus): The Flood Risk Assessment dataset is generated from FEMA’s OpenHazus Flood Assessment Structure Tool (FAST) and presents loss estimates in dollar values and damage percent. The depth grid, combined with an inventory of the built environment, is used by the Hazus Flood Model to determine flood loss potential, by applying the appropriate depth-damage curves, for a 100-year flood event. Besides the Building Damage Percent/Dollars Loss, other model outputs of the FAST Utility site-specific risk assessment include the Contents Damage, Inventory Damage, Debris Removal, and Maximum Restoration Time. Population per building is derived from the assessment Occupancy Type Class (e.g., Residential Single Family, Residential Multi Family) and census average residential household size. Owner-occupied homes are determined from assessment fields Tax Class and Occupancy Class. |
| Other Risk Layers | Other risk layers displayed in the WV Flood Tool include Dams, Levees, Landslides (other natural hazard), and High-Water Marks. |
| CRS Program Variables | The building-level inventory provides key program variables for FEMA’s Community Rating System (CRS) Program: Buildings in the SFHA (bSF) and Area in the SFHA (aSFHA). |
| LOMA Verified | Verified positional accuracy of LOMAs. Current and historical LOMAs categorized as Structure Non-Removal, Removal, or Out as Shown. |
| Elevation Certificates | Elevation Certificates are useful for determining lowest floor elevations for BFE regulatory compliance and for determining first-floor heights for building-level risk assessments. |
| 3D Flood Visualizations | 3D Flood Visualizations are rendered from the base flood water depth and building type (residential one- or two-story homes, mobile home, commercial/industrial) to effectively communicate flood risk. By describing the depth-in-structure damage according to varying flood depths, visualizations are easier for non-technical users to understand flood risks to their property in feet of water rather than comprehending the base flood elevation (BFE). |
| Parcel Assessment Report | Detailed Parcel Assessment Reports provide information of all primary and secondary structures on a single parcel. The reports include parcel and E-911 addresses, building values, primary and secondary structure attributes, parcel history, etc. Both the E-911 site addresses, parcels, and assessment records are integrated from local sources into statewide databases that are beneficial for identifying property locations and building parameters (building cost, year, property class, etc.). The parcel geometry and assessment records are updated annually by the WV Property Tax Division and WV GIS Technical Center, while the statewide addressing and geocoding services are typically updated twice a year by the WV Division of Homeland Security and WV GIS Technical Center. |
| Mitigation Layer: Areas of Mitigation Interest | The Areas of Mitigation Interest (AoMI) dataset assists communities in determining specific actions to increase their resilience from floods. AoMI identifies currently planned mitigation activities as well as areas of potential future action. It encourages collaboration among communities within the project area by providing with them the basis to assess how various mitigation action scenarios can successfully reduce their collective flood risk. AoMIs are identified by communities as part of the State's Flood Risk Assessment. |
| Mitigation Layer: Open Space Preservation | Open Space Preservation layers restore the floodplain to its natural function and provides opportunities for credits from FEMA’s Community Rating System (CRS). Open Space Preservation layers include Deed Restricted Buyout Properties, Private Lands (Nature Preserves, Land Trust) and Public Lands (state and local lands). |

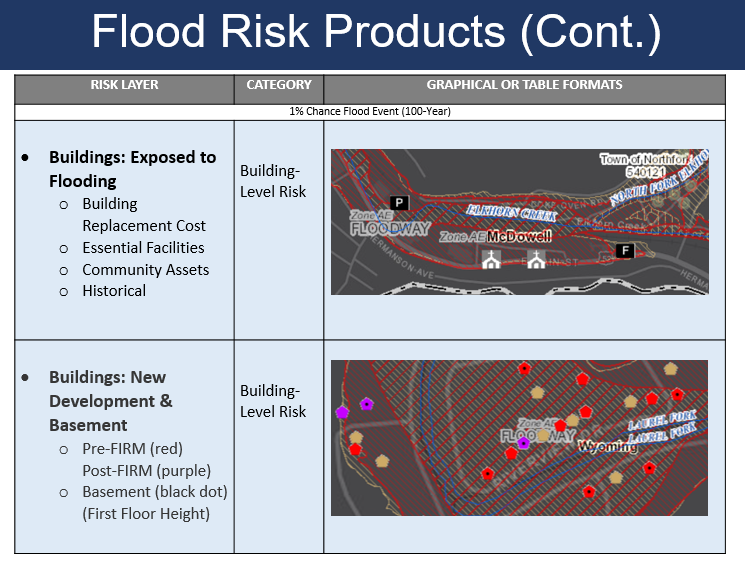
Table 2. Flood Risk Layers (Flood Risk Assessment GIS Geodatabase)

|  |  |  |
| --- | --- | --- |
| **RISK LAYER** | **CATEGORY** | **SOURCES** |
| 1% Chance Flood Event (100-Year) | | |
| * Flood Depth Grid   + Model-Backed   + Hazus | Flood Risk Grid | FEMA RiskMAP Restudies, Non-Restudies, Hazus |
| * Water Surface Elevation Grid   + Base Flood Elevations   + Advisory BFEs | Flood Risk Grid | FEMA Restudies, Non-Restudies |
| * Preliminary NFHL   + Changes Since Last FIRM (CSLF) | Flood Zone Changes | FEMA Preliminary NFHL |
| * High-Risk Advisory Flood Zones (Non-Regulatory) | Flood Zone Changes | Non-Restudies (Advisory A & Updated AE) |
| * Future Map Conditions for Buildings   + Map In SFHA   + Map Out SFHA   + No Change   + Floodway * LOMA Verified | Building-Level Risk  Flood Zone Changes | Enhanced Building Inventory, Non-Regulatory Flood Zones |
| * Buildings Exposed to Flooding   + Building Replacement Cost   + Essential Facilities   + Community Assets   + Historical Structures | Building-Level Risk | Inventories of buildings and facilities |
| * New Development & Basement   + Pre-FIRM / Post-FIRM   + Basement (First Floor Height) | Building-Level Risk | WV Building Inventory, WV Assessment Records, Building Pictures |
| * Building Damage Loss Estimate (Hazus)   + Percent Damage   + Dollars Loss | Building-Level Risk | Hazus Level 2 Analysis, Enhanced Building Inventory (or UDF), Depth Grids |
| No Specific Flood Probability Occurrence | | |
| * Levees (FEMA/USACE) * Dams (NID) | Critical Structures | FEMA / USACE |
| * Landslides | Other Natural Hazards | WV Landslide Inventory, LiDAR-Derived DEMs |

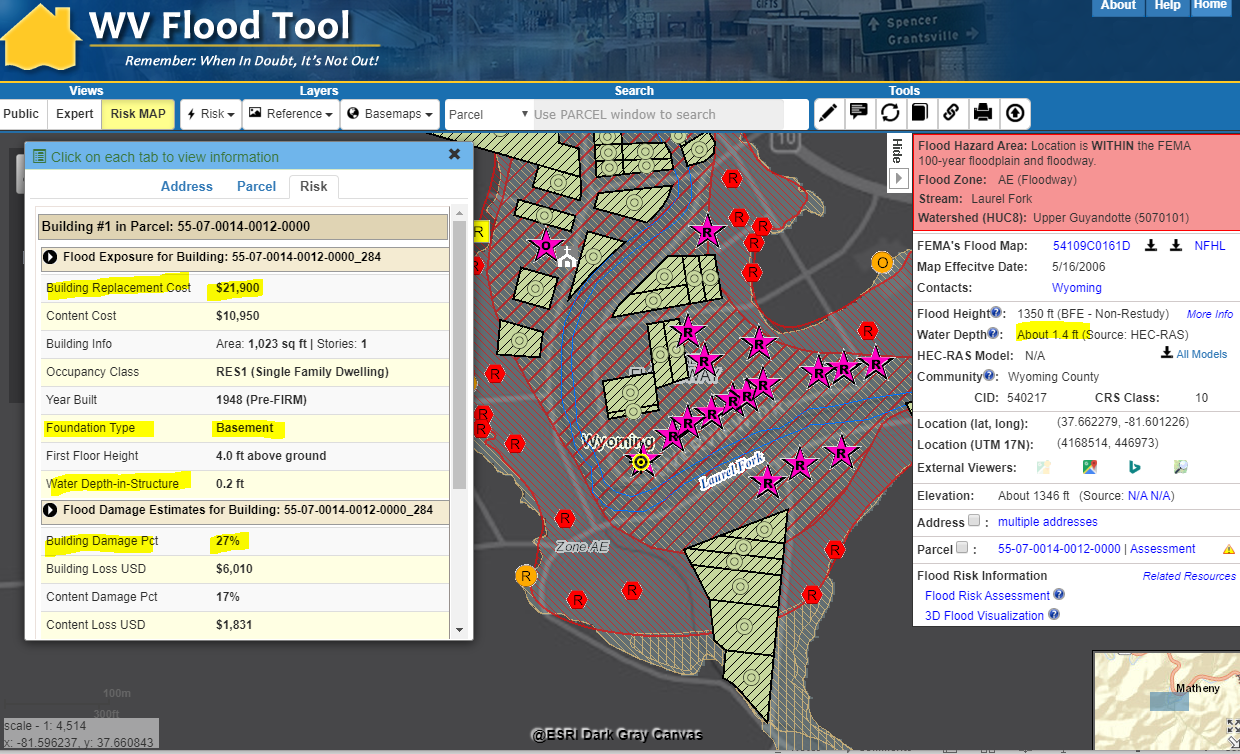
### Figure 2. Flood Risk Products: Flood Risk Grids, Flood Zone Changes, Risk Per Structure



### Figure 3. Building-Level Flood Risk Products



### Figure 4. Building-Level Flood Risk Assessments Published to WV Flood Tool



### Figure 5. WV Flood Tool, WV Property Viewer, and Web Parcel Assessment Report

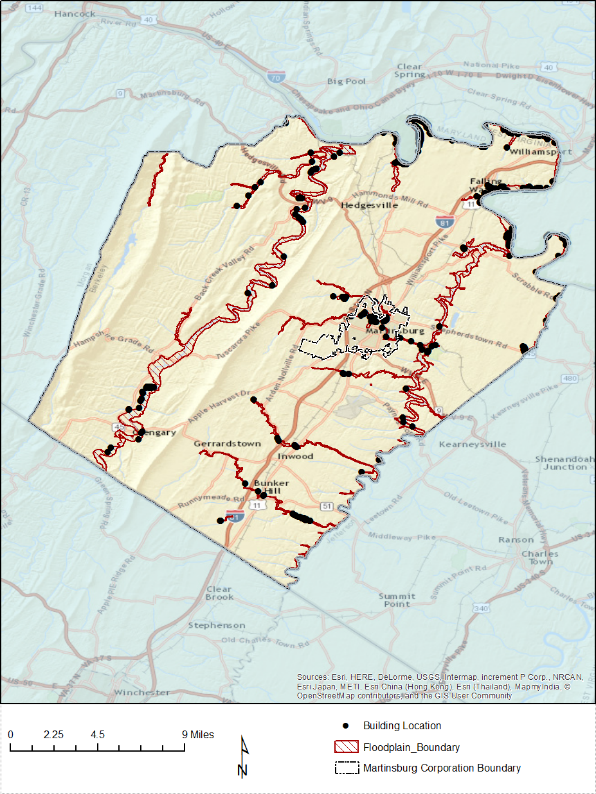
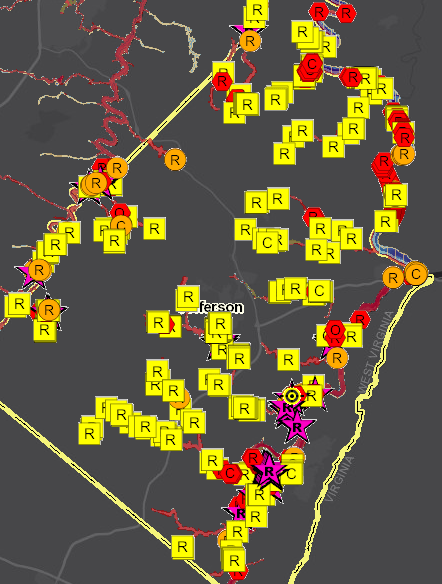
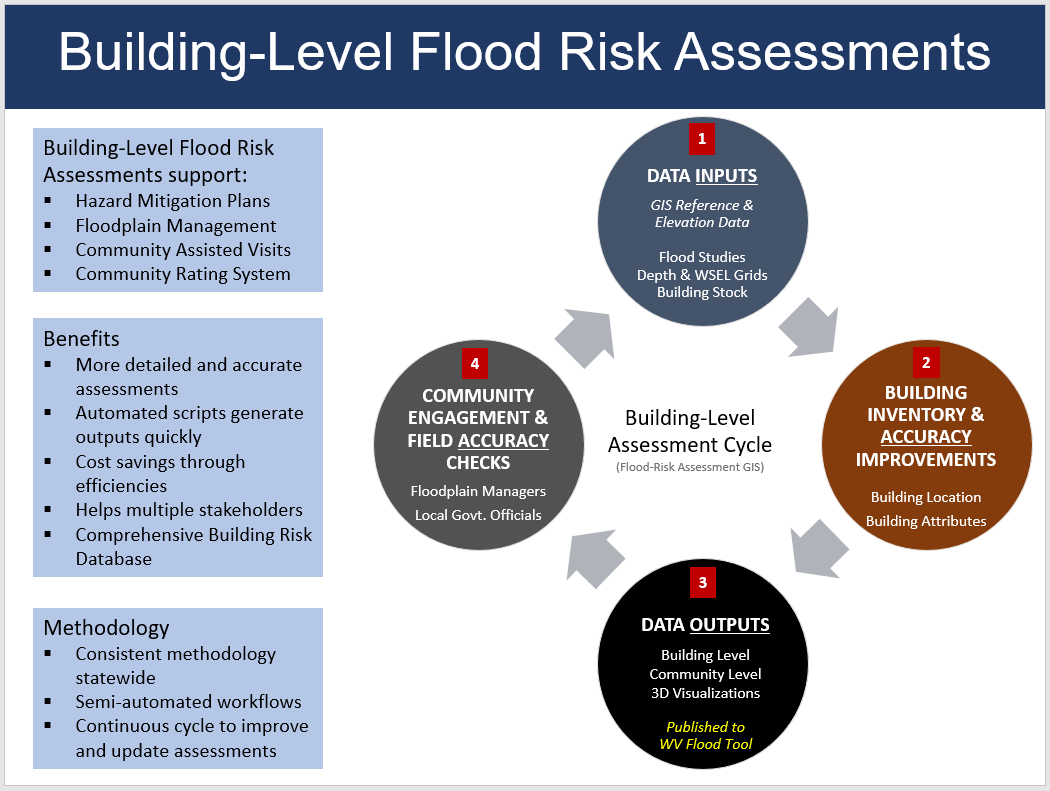
Figure 6. Flood Risk Map. Static Map and WV Flood Tool.

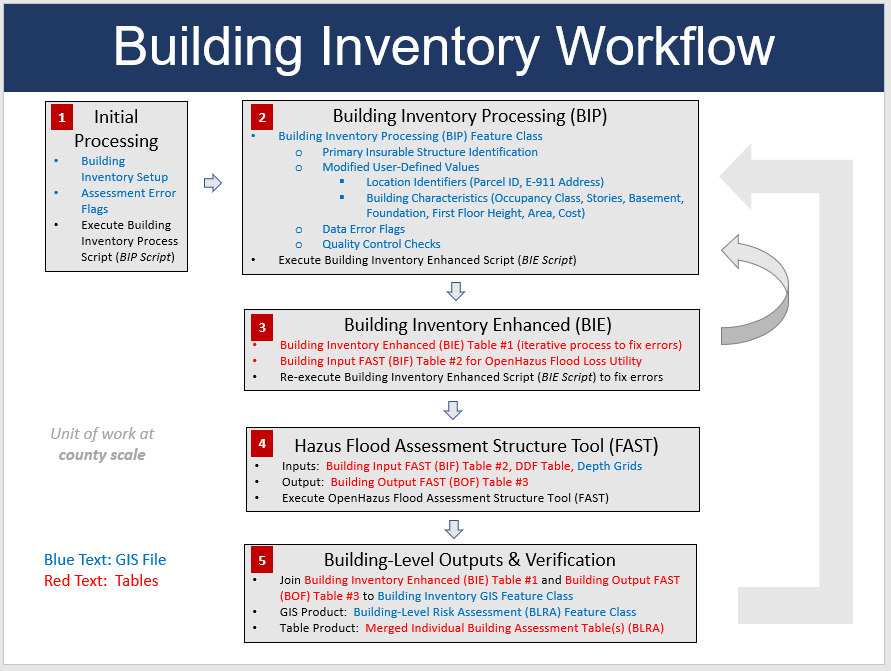
Figure 7. Flood Risk Database. Also known as Flood Risk Assessment GIS (FRAGIS).



### Figure 8. Building-Level Flood Risk Assessment Cycle



### Figure 9. Building Inventory Workflow



### Figure 10. Hazus Flood Loss Flowchart

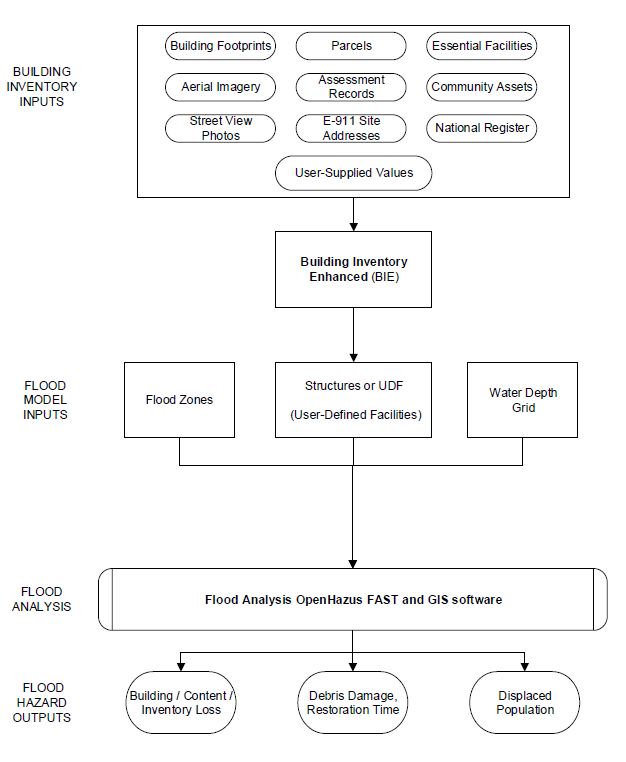


Table 3. Spatial Identifiers. The standardized Building Identifier is a combination of the 20-character parcel identifier and building address number.

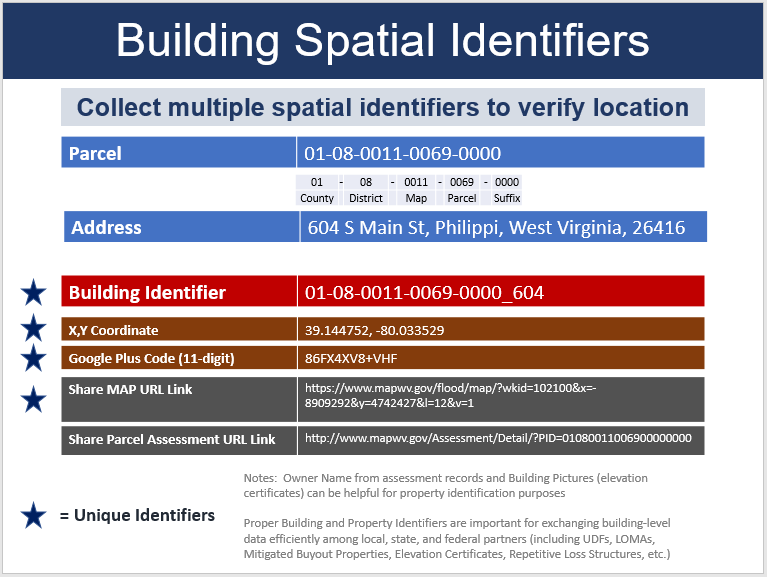
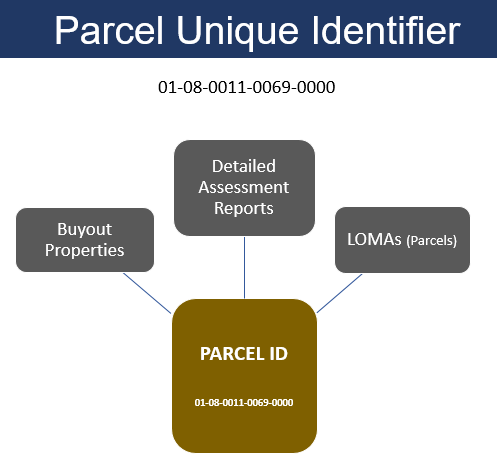
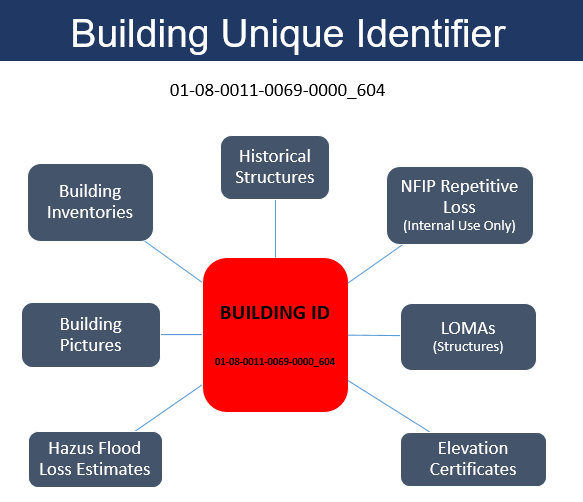


Table 4. Hazus Mode Inputs: Building Characteristics. User-defined modified values in red text.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Primary Assessment Source** | **Hazus Codes** | **Modified Values (User Defined)** | **Secondary Sources** | **Hazus Input** | **Notes** |
| Basement & Building Year | Foundation LUT (Pre-FIRM, Post-FIRM) | M-Foundation | Elevation Certificates, Building Pictures | **Foundation Type** | See Foundation Code LUT for descriptions |
| M-FFH | **First Floor Height** |  |
| Land Use | Occupancy Class LUT | M-OccupClass | Building Pictures, Business Directories | **Occupancy Class** | See Occupancy Class LUT for descriptions |
| Number of Stories |  |  | Building Pictures | **Number of Stories** | Unknown Stories value = 1 Story |
| Building Cost |  | M-Cost | Neighboring Parcels, RS Means, Insurance Databases | **Cost** | Unknown value for RES2 trailers: Single wide = $23K, Doublewide = $46K |
| Area |  | M-Area | Sketch Diagrams, Measure Tools | **Area** | Singlewide Area = 1,000 sq. ft.; Doublewide Area = 2,000 sq. ft. |

Table 5. Hazus Mode Inputs: Flood Water Depth

|  |  |  |  |
| --- | --- | --- | --- |
| **Depth Grid Source** | **Modified Values** | **Secondary Sources** | **Hazus Input** |
| HEC-RAS model-backed & Hazus | M-Depth | FIRM BFE, Elevation Certificate | **Water Depth** |

Table 6. Hazus Mode Inputs: Building Point

|  |  |  |
| --- | --- | --- |
| **Mapping Structure Point** | **Data Sources** | **Hazus Input Location** |
| Pinpoint primary building in most restrictive flood zone | Building Footprint, Parcel, Site Address, Aerial Imagery, Assessment Records, Verified LOMA, Essential Facility Databases, Business Directories | **Building Point** (Longitude, Latitude). Also known as Hazus User-Defined Facility (UDF) |

Table 7. RESIDENTIAL Basement Information from Assessment Records

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **WV CAMA Assessment Code** | **Residential Basement Type** | **Residential Assessment Description** | **Hazus Foundation Code** | **Hazus Foundation Description** |
| 1 | None | NONE to indicate slab construction or no basement | 7 | Slab-on-Grade |
| 2 | Crawl | CRAWL to indicate crawl space to 1/4 basement area | 5 | Crawlspace |
| 3 | Part | PART to indicate 1/4 to 3/4 basement area | 4 | Basement |
| 4 | Full | FULL to indicate 3/4 to full basement area | 4 | Basement |

Table 8. COMMERCIAL Basement Information from Assessment Records

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **WV CAMA Assessment Floor Level** | **Commercial Basement Type** | **Commercial Basement Description** | **Hazus Foundation Code** | **Hazus Foundation Description** |
|  | None | No "B" or "C" Level values indicate no basement. | 7 | Slab-on-Grade |
| C1 | Crawl | Crawl Space | 5 | Crawlspace |
| B1 | Basement | First Basement | 4 | Slab-on-Grade |
| B2-B5 | Sub- Basement | Second Basement. Up to 5 sub basements | 4 | Basement |

Table 9. Foundation Type, Foundation Code, First Floor Height for Hazus Flood Model

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Foundation Type | | | | First Floor Height | | | |
| **WV Assessment Record Values for BASEMENT** | **Foundation Type** | **Foundation Code** | **Modified-FdtnCode** | **Description** | **FirstFloorHt (PRE-FIRM) ft.** | **FirstFloorHt (POST-FIRM) ft.** | **Modified-FFH** |
|  | Pile | **1** | 1 | Piles support an elevated structure and consist of multiple columns driven into the ground and embedded several feet below grade. | 7.0 | 8.0 | <value> |
|  | Pier | **2** | 2 | This system is often used on manufactured housing and consists of multiple small piers or post that support the structure and are shallowly embedded into the ground. | 5.0 | 6.0 | <value> |
|  | Solid Wall | **3** | 3 | Load-bearing perimeter walls greater than 4 ft. in height, usually supported by shallow footings. | 7.0 | 8.0 | <value> |
| **FULL** or **PART** (Residential)  **FIRST BASEMENT**, **SUB BASEMENT** (Commercial) | Basement | **4** | 4 | Structure that has any floor beneath grade. | 4.0 | 4.0 | <value> |
| **CRAWL** (Residential)  **CRAWL SPACE** (Commercial) | Crawlspace | **5** | 5 | Short load bearing masonry or concrete wall. Default for Trailers RES2 Occupancy Class. If there is no Building Year then an average 3.5 feet is used for the First Floor Height. | 3.0 | 4.0 | <value> |
|  | Fill | **6** | 6 | Soil built up above the ground elevation. | 2.0 | 2.0 | <value> |
| **NONE** or blank | Slab-on-Grade | **7** | 7 | Concrete slab resting on the ground. Default if no basement value except for Trailers (RES2 Occupancy Class). | 1.0 | 1.0 | <value> |

Note: Basement values of assessment records for residential and commercial properties are used to generate Foundation Codes 4 (Basement),5 (Crawlspace), and 7 (No Basement).

Table 10. Hazus Occupancy Class Descriptions

| **Hazus Label** | **Occupancy Class** | **Standard Industrial Codes (SIC)** | **Description / Notes** |
| --- | --- | --- | --- |
| **Residential** | | | |
| RES1 | Single Family Dwelling |  |  |
| RES2 | Mobile Home |  | A titled owner of a mobile home, house trailer, or manufactured home has the option to convert their home to real property and obtain a deed in place of a certificate of title if it has been permanently affixed to real property. Owner-occupied property is designated as Tax Class = 2. The following default values are used for missing attributes. Foundation Type = Crawlspace; Single Wide Trailer: Avg. Value = $23,000 and Area = 1,000 sq. ft.; Double Wide Trailer: Value = $46,000 and Area = 2,000 sq. ft. |
| RES3A | Multi Family Dwelling – Duplex |  |  |
| RES3B | Multi Family Dwelling – 3-4 Units |  |  |
| RES3C | Multi Family Dwelling – 5-9 Units |  |  |
| RES3D | Multi Family Dwelling – 10-19 Units |  |  |
| RES3E | Multi Family Dwelling – 20-49 Units |  |  |
| RES3F | Multi Family Dwelling – 50+ Units |  |  |
| RES4 | Temporary Lodging | 70 | Hotels, motels, boarding houses, sports and recreation camps, recreational vehicle parks and campsites, lodging houses, and hotels open to the public operated by membership organizations for the benefit of constituents |
| RES5 | Institutional Dormitory |  |  |
| RES6 | Nursing Home | 8051, 8052, 8059 | Skilled or intermediate nursing care facilities providing continuous or non-continuous nursing and rehabilitative services to patients, personal care facilities providing inpatient nursing and rehabilitative services to people with special mental or physical condition |
| **Commercial** | | | |
| COM1 | Retail Trade | 52, 53, 54, 55, 56, 57, 59 | Establishments selling lumber and a general line of building materials, basic hardware lines, garden supplies, plants and mobile homes, department stores, supermarkets, grocery stores, food stores, fruit and vegetable markets, confectionary stores, dairy product stores, bakeries, motor vehicle and boat dealers, gasoline service stations, clothing, accessory and shoe stores, furniture and household appliance stores, electronics and computer software stores, drug stores, liquor stores, tobacco stores and stands, sporting goods and bicycle stores, book and stationary stores, jewelry stores, camera and photographic supply stores, toy and game shops, gift shops, luggage and leather goods stores, florists, etc. |
| COM2 | Wholesale Trade | 42, 50, 51 | Trucking with or without storage, courier services except by air, general, farm product and refrigerated warehousing and storage, terminal facilities for motor freight transportation, wholesale and distribution of motor vehicles and parts, furniture, electrical appliances, hardware, lumber and wood products, construction materials, office equipment, medical equipment and drugs, metals, coal, minerals, petroleum products, agricultural, industrial and construction machinery, livestock, groceries, food and beverages, paper, clothing, footwear and accessories, plastics, chemicals, etc. |
| COM3 | Personal and Repair Services | 72, 75, 76, 83, 88 | Laundry and dry-cleaning, photography, beauty and hair styling services, funeral services, tax return preparation services, rental vehicles, automobile parking services, automotive repair and paint shops, car washes, appliance and furniture repair shops, social services, job training and vocational rehabilitation services, child daycare services, and private households |
| COM4 | Business/Professional/Technical Services | 40, 41, 44, 45, 46, 47, 49, 61, 62, 63, 64, 65, 67, 73, 78 (except 7832), 81, 87, 89 | Railroads establishments, local and suburban transit, school buses, transportation terminals and service facilities, water transportation, air transportation, travel agencies, packing and crating, petroleum pipelines, electric services, water supply, sewerage systems, refuse systems, steam and air conditioning supply, irrigation systems, credit institutions and agencies, mortgage bankers and loan correspondents, dealers and flotation companies, security and commodity exchanges, investment advice, all types of insurance, building operators, real estate agents and managers, land or cemetery sub-dividers and developers, holding and investor companies, advertising agencies, building cleaning and maintenance services, heavy construction equipment rental, medical equipment rental, employment agencies, computer programming services, motion picture production, legal services, engineering and architectural services, research organizations, and management services |
| COM5 | Depository Institutions | 60 | Federal reserve banks, central reserve depository institutions, commercial banks, saving institutions, credit unions, branches of foreign banks, and non-deposit trust facilities |
| COM6 | Hospital | 8062, 8063, 8069 | General medical and surgical hospitals, psychiatric hospitals, and specialty hospitals |
| COM7 | Medical Office/Clinic | 80 (except 8051, 8052, 8059, 8062, 8063, 8069) | Offices and clinics of doctors of medicine, dentists, osteopathy, chiropractors, optometrists, podiatrists, health practitioners, medical and dental laboratories, home health care services, and kidney dialysis centers |
| COM8 | Entertainment & Recreation | 48, 58, 79 (except 7911), 84 | Radiotelephone, telephone, telegraph and other message communications, radio or television broadcasting stations, cable and other pay television services, eating and drinking places, theatrical producers, bands, orchestras, actors, and other entertainers, bowling centers, professional sports clubs and promoters, racing including track operations, physical fitness facilities, public golf courses, amusement parks and devices, and membership sports and recreation clubs |
| COM9 | Theaters | 7832, 7911 | Motion picture theaters except drive-in and dance studios, schools and halls |
| COM10 | Parking |  |  |
| **Industrial** | | | |
| IND1 | Heavy | 22, 24, 26, 32, 34, 35 (except 3571, 3572), 37 | Fabric, textile, carpets and rugs, logging, structural wood members, mobile homes, prefabricated wood or metal buildings and components, paper and cardboard products, sanitary food containers, plastics, foil and paper bags, glass products, cement, brick and structural clay tile, ceramic tiles, china bathroom accessories, kitchen articles, electrical supplies, wire products, cut stone and products, concrete products, lime, gypsum, mineral wool, metal products, turbines, agricultural, construction, mining and petroleum machinery, industrial patterns and machinery, power-driven hand tools, office machines, building equipment such as elevators, air conditioning and heating machinery, motor vehicles, aircrafts, ships and boats, and railroad equipment |
| IND2 | Light | 23, 25, 27, 30, 31, 36 (except 3671, 3672, 3674), 38, 39 | Clothing, footwear and accessories, household furniture, office and store furniture and fixtures, public building furniture, household appliances, printing and publishing, tires and other rubber products, plastics products, power generators and transformers, carbon and graphite products, lighting fixtures and equipment, audio and video equipment, electronic components, batteries, laboratory instruments, measuring and controlling devices, surgical and medical instruments, musical instruments, toys and games, sporting and athletic goods |
| IND3 | Food/Drugs/Chemicals | 20, 21, 28, 29 | Meat products, dairy and creamery, vegetables, canned, dried and frozen food, bakery products, confectionary products, table oils, beverages, pet food, tobacco products, manufactured ice, industrial chemicals, medicinal chemicals, detergents, perfumes and cosmetics, fertilizers, pesticides and other agricultural chemicals, adhesives, explosives, petroleum refining, asphalt, and lubricating oils |
| IND4 | Metals/Minerals Processing | 10, 12, 13, 14, 33 | Iron, copper, lead, zinc, gold, silver, ferroalloy, uranium, radium and vanadium mining services, steel, aluminum and copper works, surface and underground coal mining and services, petroleum and natural gas exploration and field services, stones, sand and gravel, clay, ceramic, refractory mineral and other nonmetallic mineral services |
| IND5 | High Technology | 3571, 3572, 3671, 3672, 3674 | Electronic computers, computer storage devices, electron tubes, printed circuit boards, semiconductors and related services |
| IND6 | Construction | 15, 16, 17 | General contractors of residential and non-residential buildings, operative builders, highway, street, bridge and tunnel construction, water and sewer pipelines, communications and power line construction, demolition and excavation work, masonry and stone work, concrete work, structural steel erection, plumbing, heating and air-conditioning, electrical work, carpentry work, glazing work, painting and paper hanging, water well drilling, and installation of building equipment |
| **Agriculture** | | | |
| AGR1 | Agriculture | 01, 02, 07, 08, 09 | Production of cereals, cotton, tobacco, sugarcane and sugar beets, vegetables, fruits, ornamental nursery products, cattle, hogs, sheep and goats, poultry, horses, dairy farms, soil preparation services, crop planting, protection and harvesting, crop preparation for market, veterinary services, farm labor contractors and management services, landscape counseling and planning, timber and forestry services, fishing and hunting |
| **Religion/Non-Profit** | | | |
| REL1 | Church/Membership Organizations | 86 | Professional and business membership organizations, labor unions, civic, social and fraternal associations, political organizations, and religious organizations |
| **Government** | | | |
| GOV1 | General Services | 43, 91, 92 (except 9221, 9224), 93, 94, 95, 96, 97 | United States postal service, executive offices, legislative bodies, courts, legal counsel and prosecution, correctional institutions, public order and safety, public finance, taxation and monetary policy, administration of educational, health, social and general economic programs, administration of veterans’ affairs, management of air, water and solid waste, conservation of land, minerals, wildlife and forests, administration of housing programs, urban planning and rural development, regulation and administration of transportation, communications and utilities, regulation of agricultural marketing, space research and technology, national security, and international affairs |
| GOV2 | Emergency Response | 9221, 9224 | Police and fire protection |
| **Education** | | | |
| EDU1 | Schools/Libraries | 82 (except 8221, 8222) | Elementary and secondary schools, libraries, data processing schools, business and secretarial schools, and educational services |
| EDU2 | Colleges/Universities | 8221, 8222 | Colleges, universities, professional schools, junior colleges, and technical institutes |

Table 11. WV Assessment Land Use Codes. 186 LUCs Classified to 33 Hazus Occupancy Class Types

|  |  |  | Flood Loss Estimation Models (Based on Structure Use) | | | | (Structure Construction Type) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **CAMA/ Assessment Land Use Code** | **Description** | **Hazus Occupancy Class Type Code** | **Hazus General Occupancy Class** | **Abbreviated General Occupancy Class** | **Hazus Population Displacement Models - People Occupied (Residence)** | **SDE Residential/ Non-Residential Structure Definition** |
| 1 | 100 | Residential Vacant | UNK | Unknown | UNK | No |  |
| 2 | 101 | Residential 1 Family | **RES1** | Residential | RES | Yes | **Residential** |
| 3 | 102 | Residential 2 Family | **RES3A** | Residential | RES | Yes | **Residential** |
| 4 | 103 | Residential 3 Family | **RES3B** | Residential | RES | Yes | Non-Residential |
| 5 | 104 | Residential 4 Family | **RES3B** | Residential | RES | Yes | Non-Residential |
| 6 | 105 | Mixed Residential/Commercial | **RES1** | Residential | RES | Yes | TBD |
| 7 | 106 | Condominium (common element) | **RES3A** | Residential | RES | Yes | **Residential** |
| 8 | 107 | Condominium (fee simple) | **RES3A** | Residential | RES | Yes | **Residential** |
| 9 | 108 | Mobile Home | **RES2** | Residential | RES | Yes | **Residential** |
| 10 | 109 | Auxiliary Improvement | UNK | Unknown | UNK | UNK |  |
| 11 | 110 | Salvage Value Building | **RES1** | Residential | RES | Yes | Non-Residential |
| 12 | 112 | Active Farm | **AGR1** | Agricultural | AGR | Yes | **Residential** |
| 13 | 113 | Inactive Farm | **AGR1** | Agricultural | AGR | Yes | **Residential** |
| 14 | 114 | Conservation easement perpetual | UNK | Unknown | UNK | UNK |  |
| 15 | 115 | Unsound Residential Structure | **RES1** | Residential | RES | No | **Residential** |
| 16 | 123 | Large Vac Tract - Unknown Potential | UNK | Unknown | UNK | No |  |
| 17 | 200 | Vacant Apartment Land | UNK | Unknown | UNK | Yes |  |
| 18 | 201 | Residen. Structure on Apartment land | **RES1** | Residential | RES | Yes | **Residential** |
| 19 | 211 | Apartment-Garden (1-3 stories) | **RES3B** | Residential | RES | Yes | Non-Residential |
| 20 | 212 | Apartment-High Rise | **RES3F** | Residential | RES | Yes | Non-Residential |
| 21 | 213 | Mobile Home Park | **RES2** | Residential | RES | Yes | Residential |
| 22 | 300 | Vacant Commercial Land | UNK | Unknown | UNK | No |  |
| 23 | 301 | Resid. Structure on Commercial Land | **COM1** | Commercial | COM | No | Non-Residential |
| 24 | 310 | Unsound Commercial Structure | **COM1** | Commercial | COM | No | Non-Residential |
| 25 | 314 | Hotel/Motel-High Rise | **RES4** | Residential | RES | Yes | Non-Residential |
| 26 | 315 | Hotel/Motel-Low Rise | **RES4** | Residential | RES | Yes | Non-Residential |
| 27 | 316 | Nursing Home | **RES6** | Residential | RES | Yes | Non-Residential |
| 28 | 318 | Boarding and Rooming Houses | **RES4 or RES5** | Residential | RES | Yes | Non-Residential |
| 29 | 319 | Mixed Commercial/Residential | **COM1** | Commercial | COM | UNK |  |
| 30 | 321 | Restaurant | **COM8** | Commercial | COM | No | Non-Residential |
| 31 | 323 | Food Stand | **COM8** | Commercial | COM | No | Non-Residential |
| 32 | 325 | Franchise Food | **COM8** | Commercial | COM | No | Non-Residential |
| 33 | 326 | Ice House | **COM8** | Commercial | COM | No | Non-Residential |
| 34 | 327 | Bar/Lounge | **COM8** | Commercial | COM | No | Non-Residential |
| 35 | 328 | Night Club/Dinner Theater | **COM9** | Commercial | COM | No | Non-Residential |
| 36 | 330 | Kwik Lube | **COM3** | Commercial | COM | No | Non-Residential |
| 37 | 331 | Auto Dealer-Full Service | **COM1** | Commercial | COM | No | Non-Residential |
| 38 | 332 | Auto Service Garage | **COM3** | Commercial | COM | No | Non-Residential |
| 39 | 333 | Service Station with Bays | **COM3** | Commercial | COM | No | Non-Residential |
| 40 | 334 | Service Station without Bays | **COM3** | Commercial | COM | No | Non-Residential |
| 41 | 335 | Truck Stop | **COM4** | Commercial | COM | No | Non-Residential |
| 42 | 336 | Car Wash-Manual | **COM3** | Commercial | COM | No | Non-Residential |
| 43 | 337 | Car Wash-Automatic | **COM3** | Commercial | COM | No | Non-Residential |
| 44 | 338 | Parking Garage/Deck | **COM10** | Commercial | COM | No | Non-Residential |
| 45 | 339 | Parking Miscellaneous | **COM10** | Commercial | COM | No | Non-Residential |
| 46 | 340 | Super Regional Shopping Mall | **COM1** | Commercial | COM | No | Non-Residential |
| 47 | 341 | Regional Shopping Mall | **COM1** | Commercial | COM | No | Non-Residential |
| 48 | 342 | Community Shopping Center | **COM1** | Commercial | COM | No | Non-Residential |
| 49 | 343 | Neighborhood Shopping Center | **COM1** | Commercial | COM | No | Non-Residential |
| 50 | 344 | Strip Shopping Center | **COM1** | Commercial | COM | No | Non-Residential |
| 51 | 345 | Discount Department Store | **COM1** | Commercial | COM | No | Non-Residential |
| 52 | 346 | Department Store/Anchor Store | **COM1** | Commercial | COM | No | Non-Residential |
| 53 | 347 | Supermarket | **COM1** | Commercial | COM | No | Non-Residential |
| 54 | 348 | Convenience Food Market | **COM1** | Commercial | COM | No | Non-Residential |
| 55 | 349 | Medical Office | **COM7** | Commercial | COM | No | Non-Residential |
| 56 | 351 | Bank | **COM5** | Commercial | COM | No | Non-Residential |
| 57 | 352 | Savings Institution | **COM5** | Commercial | COM | No | Non-Residential |
| 58 | 353 | Office Building-Low Rise (1-4 stories) | **COM4** | Commercial | COM | No | Non-Residential |
| 59 | 354 | Office Building-High Rise (>4 stories) | **COM4** | Commercial | COM | No | Non-Residential |
| 60 | 355 | Office Condominium | **COM4** | Commercial | COM | No | Non-Residential |
| 61 | 356 | Retail Condominium | **COM1** | Commercial | COM | No | Non-Residential |
| 62 | 361 | Funeral Home | **COM4** | Commercial | COM | No | Non-Residential |
| 63 | 362 | Veterinary Clinic | **AGR1** | Agricultural | AGR | No | Non-Residential |
| 64 | 363 | Legitimate Theater | **COM9** | Commercial | COM | No | Non-Residential |
| 65 | 364 | Motion Picture Theater | **COM9** | Commercial | COM | No | Non-Residential |
| 66 | 365 | Cinema/Theater | **COM9** | Commercial | COM | No | Non-Residential |
| 67 | 366 | Radio/TV/Motion Picture Studio | **COM8** | Commercial | COM | No | Non-Residential |
| 68 | 367 | Social/Fraternal Hall | **REL1** | Religious | REL | No | Non-Residential |
| 69 | 368 | Hangar | **COM4** | Commercial | COM | No | Non-Residential |
| 70 | 369 | Day Care Center | **COM3** | Commercial | COM | No | Non-Residential |
| 71 | 370 | Greenhouse/Florist | **COM1** | Commercial | COM | No | Non-Residential |
| 72 | 371 | Downtown Row Type | **COM4** | Commercial | COM | No | Non-Residential |
| 73 | 373 | Retail-Single Occupancy | **COM1** | Commercial | COM | No | Non-Residential |
| 74 | 374 | Retail-Multiple Occupancy | **COM1** | Commercial | COM | No | Non-Residential |
| 75 | 375 | Retail-Drive Up | **COM1** | Commercial | COM | No | Non-Residential |
| 76 | 381 | Bowling Alley | **COM8** | Commercial | COM | No | Non-Residential |
| 77 | 382 | Skating Rink | **COM8** | Commercial | COM | No | Non-Residential |
| 78 | 383 | Health Spa | **COM8** | Commercial | COM | No | Non-Residential |
| 79 | 384 | Swimming Pool-Indoor | **COM8** | Commercial | COM | No | Non-Residential |
| 80 | 385 | Tennis Club-Indoor | **COM8** | Commercial | COM | No | Non-Residential |
| 81 | 386 | Racquet Club-Indoor | **COM8** | Commercial | COM | No | Non-Residential |
| 82 | 387 | Country Club without Golf Course | **COM8** | Commercial | COM | No | Non-Residential |
| 83 | 388 | Club House | **COM8** | Commercial | COM | No | Non-Residential |
| 84 | 389 | Country Club with Golf Course | **COM8** | Commercial | COM | No | Non-Residential |
| 85 | 390 | Amusement Park | **COM8** | Commercial | COM | No | Non-Residential |
| 86 | 391 | Cold Storage Facility | **COM2** | Commercial | COM | No | Non-Residential |
| 87 | 392 | Lumber Storage Facility | **COM2** | Commercial | COM | No | Non-Residential |
| 88 | 393 | Comm Auxiliary Improvement | **COM1** | Commercial | COM | No | Non-Residential |
| 89 | 395 | Truck Terminal | **COM4** | Commercial | COM | No | Non-Residential |
| 90 | 396 | Mini Warehouse | **COM2** | Commercial | COM | No | Non-Residential |
| 91 | 397 | Office/Warehouse | **COM2** | Commercial | COM | No | Non-Residential |
| 92 | 398 | Warehouse | **COM2** | Commercial | COM | No | Non-Residential |
| 93 | 399 | Warehouse-Prefabricated | **COM2** | Commercial | COM | No | Non-Residential |
| 94 | 400 | Vacant Industrial Land | UNK | Unknown | UNK | No |  |
| 95 | 401 | Manufacturing | **IND2** | Industrial | IND | No | Non-Residential |
| 96 | 405 | Research & Development | **COM4** | Commercial | COM | No | Non-Residential |
| 97 | 411 | Aircraft Engine Plant | **IND1** | Industrial | IND | No | Non-Residential |
| 98 | 412 | Aluminum & Foil Mfg | **IND4** | Industrial | IND | No | Non-Residential |
| 99 | 413 | Asphalt Plant | **IND3** | Industrial | IND | No | Non-Residential |
| 100 | 414 | Automobile Parts Mfg | **IND1** | Industrial | IND | No | Non-Residential |
| 101 | 415 | Bakery | **IND3** | Industrial | IND | No | Non-Residential |
| 102 | 416 | Bottling Plant | **IND1** | Industrial | IND | No | Non-Residential |
| 103 | 417 | Broom Mfg | **IND2** | Industrial | IND | No | Non-Residential |
| 104 | 418 | Candy Mfg | **IND3** | Industrial | IND | No | Non-Residential |
| 105 | 419 | Cement Mfg | **IND1** | Industrial | IND | No | Non-Residential |
| 106 | 420 | Concrete Mfg | **IND1** | Industrial | IND | No | Non-Residential |
| 107 | 421 | Chemical Mfg | **IND3** | Industrial | IND | No | Non-Residential |
| 108 | 422 | Clay Mfg | **IND1** | Industrial | IND | No | Non-Residential |
| 109 | 423 | Clothing Mfg (exc Leather/Rubber) | **IND2** | Industrial | IND | No | Non-Residential |
| 110 | 424 | Coal Processing | **IND4** | Industrial | IND | No | Non-Residential |
| 111 | 425 | Compressor Station (not Pub.Util) | **IND4** | Industrial | IND | No | Non-Residential |
| 112 | 426 | Dairy | **IND3** | Industrial | IND | No | Non-Residential |
| 113 | 428 | Dental and Medical Lab | **IND3** | Industrial | IND | No | Non-Residential |
| 114 | 429 | Electronic Components Prods. Mfg | **IND5** | Industrial | IND | No | Non-Residential |
| 115 | 430 | Electronic Equipment Mfg | **IND5** | Industrial | IND | No | Non-Residential |
| 116 | 431 | Feed & Flower Mfg | **IND3** | Industrial | IND | No | Non-Residential |
| 117 | 432 | Foundry Products | **IND2** | Industrial | IND | No | Non-Residential |
| 118 | 433 | Food Processing | **IND3** | Industrial | IND | No | Non-Residential |
| 119 | 434 | Glass Mfg | **IND1** | Industrial | IND | No | Non-Residential |
| 120 | 435 | Glass Mfg-Special Tools | **IND1** | Industrial | IND | No | Non-Residential |
| 121 | 436 | Grain & Milling Products Mfg | **IND3** | Industrial | IND | No | Non-Residential |
| 122 | 437 | Ice Plant | **IND3** | Industrial | IND | No | Non-Residential |
| 123 | 438 | Leather Products Mfg | **IND2** | Industrial | IND | No | Non-Residential |
| 124 | 439 | Liquefied Natural Gas Plant | **IND4** | Industrial | IND | No | Non-Residential |
| 125 | 440 | Logging, Cutting of Timber | **IND1** | Industrial | IND | No | Non-Residential |
| 126 | 441 | Machinery & Equipment Mfg | **IND1** | Industrial | IND | No | Non-Residential |
| 127 | 442 | Meat Packing & Slaughterhouse | **IND3** | Industrial | IND | No | Non-Residential |
| 128 | 443 | Metal Working | **IND6** | Industrial | IND | No | Non-Residential |
| 129 | 444 | Mining, Deep | **IND4** | Industrial | IND | No | Non-Residential |
| 130 | 445 | Mining, Strip | **IND4** | Industrial | IND | No | Non-Residential |
| 131 | 446 | Natural Gas Extracting Facility | **IND4** | Industrial | IND | No | Non-Residential |
| 132 | 447 | Nickel Mfg | **IND4** | Industrial | IND | No | Non-Residential |
| 133 | 448 | Newspaper Plant | **IND2** | Industrial | IND | No | Non-Residential |
| 134 | 449 | Oil & Gas Pipeline (not Public Utility) | **COM4** | Commercial | COM | No | Non-Residential |
| 135 | 450 | Optical Mfg | **IND2** | Industrial | IND | No | Non-Residential |
| 136 | 451 | Paint Mfg | **IND3** | Industrial | IND | No | Non-Residential |
| 137 | 452 | Paper Finishing & Converting | **IND2** | Industrial | IND | No | Non-Residential |
| 138 | 453 | Petroleum Refinery | **IND3** | Industrial | IND | No | Non-Residential |
| 139 | 454 | Pipeline Mfg | **IND1** | Industrial | IND | No | Non-Residential |
| 140 | 455 | Plastics Products Mfg | **IND1** | Industrial | IND | No | Non-Residential |
| 141 | 456 | Plastics Products Mfg - Special Tools | **IND1** | Industrial | IND | No | Non-Residential |
| 142 | 457 | Print Shop | **IND2** | Industrial | IND | No | Non-Residential |
| 143 | 458 | Pulp & Paper | **IND1** | Industrial | IND | No | Non-Residential |
| 144 | 459 | Quarries Incl st&gr, ls, ss,sh,cl | **IND4** | Industrial | IND | No | Non-Residential |
| 145 | 460 | Railroad Car Mfg | **IND1** | Industrial | IND | No | Non-Residential |
| 146 | 461 | Rubber Mfg-Tire Recapping | **IND2** | Industrial | IND | No | Non-Residential |
| 147 | 462 | Shoe Mfg | **IND2** | Industrial | IND | No | Non-Residential |
| 148 | 463 | Steel Mill | **IND1** | Industrial | IND | No | Non-Residential |
| 149 | 464 | Steam Generating Plant | **IND1** | Industrial | IND | No | Non-Residential |
| 150 | 465 | Saw Mills-Permanent | **IND1** | Industrial | IND | No | Non-Residential |
| 151 | 466 | Saw Mills-Temporary | **IND1** | Industrial | IND | No | Non-Residential |
| 152 | 467 | Textile Mfg | **IND1** | Industrial | IND | No | Non-Residential |
| 153 | 468 | Tobacco Products Mfg | **IND3** | Industrial | IND | No | Non-Residential |
| 154 | 469 | Woodworking Shop | **IND1** | Industrial | IND | No | Non-Residential |
| 155 | 470 | Wire Products Mfg | **IND1** | Industrial | IND | No | Non-Residential |
| 156 | 471 | Jewelry/Musical Instruments | **IND2** | Industrial | IND | No | Non-Residential |
| 157 | 600 | Vacant Exempt Land | **UNK** | Unknown | UNK | No | Non-Residential |
| 158 | 601 | Cemetery | **UNK** | Unknown | UNK | No | Non-Residential |
| 159 | 602 | Post Office | **GOV1** | Governmental | GOV | No | Non-Residential |
| 160 | 603 | Federal/State Building | **GOV1** | Governmental | GOV | No | Non-Residential |
| 161 | 604 | Other Miscellaneous Exempt | UNK | Unknown | UNK | No | Non-Residential |
| 162 | 610 | Recreational/Health | **COM8** | Commercial | COM | No | Non-Residential |
| 163 | 611 | Library | **EDU1** | Educational | EDU | No | Non-Residential |
| 164 | 612 | School | **EDU1** | Educational | EDU | No | Non-Residential |
| 165 | 613 | College & University | **EDU2** | Educational | EDU | No | Non-Residential |
| 166 | 620 | Religious | **REL1** | Religious | REL | No | Non-Residential |
| 167 | 630 | Auditorium | **COM8** | Commercial | COM | No | Non-Residential |
| 168 | 640 | Hospital | **COM6** | Commercial | COM | No | Non-Residential |
| 169 | 660 | Police or Fire Station | **GOV2** | Governmental | GOV | No | Non-Residential |
| 170 | 670 | Correctional | **GOV1** | Governmental | GOV | No | Non-Residential |
| 171 | 680 | Cultural | **COM8** | Commercial | COM | No | Non-Residential |
| 172 | 690 | Rail/Bus/Air Terminal | **COM4** | Commercial | COM | No | Non-Residential |
| 173 | 700 | Utility Vacant Land | UNK | Unknown | UNK | No | Non-Residential |
| 174 | 701 | Water System | **COM4** | Commercial | COM | No | Non-Residential |
| 175 | 702 | Gas Distribution System | **COM4** | Commercial | COM | No | Non-Residential |
| 176 | 703 | Electric Company | **COM4** | Commercial | COM | No | Non-Residential |
| 177 | 704 | Telephone Company | **COM4** | Commercial | COM | No | Non-Residential |
| 178 | 705 | Railroad | **COM4** | Commercial | COM | No | Non-Residential |
| 179 | 706 | Pipeline | **COM4** | Commercial | COM | No | Non-Residential |
| 180 | 707 | Sewage Treatment | **COM4** | Commercial | COM | No | Non-Residential |
| 181 | 710 | Telephone Equipment Building | **COM8** | Commercial | COM | No | Non-Residential |
| 182 | 715 | Telephone Service Garage | **COM8** | Commercial | COM | No | Non-Residential |
| 183 | 720 | Radio/TV Transmitter Building | **COM8** | Commercial | COM | No | Non-Residential |
| 184 | 721 | Wireless Serv Facility on leased land | **COM8** | Commercial | COM | No | Non-Residential |
| 185 | 722 | Wireless Serv Facility with land | **COM8** | Commercial | COM | No | Non-Residential |
| 186 | 723 | Land leased to Wireless Service | **COM8** | Commercial | COM | No | Non-Residential |

Table 12. Average Mobile Home Appraisal Values by County. Computed from TY 2019 Assessment Records.

| **County** | **Count** | **Average Bldg. Appraisal** | **Min Bldg. Appraisal** | **Max Bldg. Appraisal** |  | **Single Wide** | **Double Wide** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Barbour | 702 | $15,587 | $400 | $130,100 |  | $16,000 | $32,000 |
| Berkeley | 3,393 | $18,707 | $100 | $180,400 |  | $19,000 | $38,000 |
| Boone | 1,871 | $33,459 | $300 | $193,700 |  | $33,000 | $66,000 |
| Braxton | 1,203 | $28,129 | $100 | $178,400 |  | $28,000 | $56,000 |
| Brooke | 330 | $21,420 | $200 | $102,200 |  | $21,000 | $42,000 |
| Cabell | 1,899 | $28,674 | $200 | $144,100 |  | $29,000 | $58,000 |
| Calhoun | 143 | $21,811 | $100 | $157,300 |  | $22,000 | $44,000 |
| Clay | 510 | $13,860 | $200 | $142,300 |  | $14,000 | $28,000 |
| Doddridge | 225 | $16,716 | $300 | $185,500 |  | $17,000 | $34,000 |
| Fayette | 1,390 | $16,466 | $100 | $152,300 |  | $16,000 | $32,000 |
| Gilmer | 270 | $20,539 | $100 | $171,900 |  | $21,000 | $42,000 |
| Grant | 835 | $24,609 | $100 | $178,400 |  | $25,000 | $50,000 |
| Greenbrier | 1,686 | $24,441 | $100 | $149,500 |  | $24,000 | $48,000 |
| Hampshire | 1,922 | $25,989 | $200 | $147,700 |  | $26,000 | $52,000 |
| Hancock | 311 | $12,246 | $200 | $183,900 |  | $12,000 | $24,000 |
| Hardy | 887 | $21,125 | $100 | $788,000 |  | $21,000 | $42,000 |
| Harrison | 2,139 | $41,536 | $100 | $258,100 |  | $42,000 | $84,000 |
| Jackson | 1,824 | $33,915 | $100 | $208,600 |  | $34,000 | $68,000 |
| Jefferson | 905 | $32,361 | $500 | $307,900 |  | $32,000 | $64,000 |
| Kanawha | 5,903 | $32,195 | $100 | $235,400 |  | $32,000 | $64,000 |
| Lewis | 649 | $13,273 | $100 | $60,600 |  | $13,000 | $26,000 |
| Lincoln | 1,839 | $23,160 | $100 | $222,000 |  | $23,000 | $46,000 |
| Logan | 2,421 | $20,570 | $100 | $105,100 |  | $21,000 | $42,000 |
| Marion | 1,420 | $24,879 | $100 | $163,600 |  | $25,000 | $50,000 |
| Marshall | 514 | $17,663 | $100 | $271,200 |  | $18,000 | $36,000 |
| Mason | 1,092 | $17,682 | $100 | $185,300 |  | $18,000 | $36,000 |
| McDowell | 1,050 | $14,360 | $100 | $74,000 |  | $14,000 | $28,000 |
| Mercer | 3,591 | $31,237 | $100 | $153,600 |  | $31,000 | $62,000 |
| Mineral | 999 | $20,437 | $100 | $140,600 |  | $20,000 | $40,000 |
| Mingo | 2,285 | $17,743 | $200 | $126,100 |  | $18,000 | $36,000 |
| Monongalia | 1,549 | $26,246 | $100 | $219,900 |  | $26,000 | $52,000 |
| Monroe | 929 | $23,875 | $100 | $197,800 |  | $24,000 | $48,000 |
| Morgan | 920 | $28,480 | $100 | $160,600 |  | $28,000 | $56,000 |
| Nicholas | 1,380 | $19,957 | $100 | $243,000 |  | $20,000 | $40,000 |
| Ohio | 292 | $19,748 | $200 | $98,700 |  | $20,000 | $40,000 |
| Pendleton | 467 | $19,737 | $100 | $304,000 |  | $20,000 | $40,000 |
| Pleasants | 205 | $16,768 | $100 | $92,700 |  | $17,000 | $34,000 |
| Pocahontas | 679 | $10,797 | $200 | $181,800 |  | $11,000 | $22,000 |
| Preston | 1,193 | $15,295 | $200 | $164,600 |  | $15,000 | $30,000 |
| Putnam | 1,359 | $15,197 | $400 | $305,000 |  | $15,000 | $30,000 |
| Raleigh | 3,955 | $31,491 | $100 | $205,300 |  | $31,000 | $62,000 |
| Randolph | 1,017 | $21,853 | $100 | $190,300 |  | $22,000 | $44,000 |
| Ritchie | 574 | $32,052 | $200 | $178,100 |  | $32,000 | $64,000 |
| Roane | 582 | $13,725 | $300 | $86,300 |  | $14,000 | $28,000 |
| Summers | 774 | $18,845 | $200 | $156,800 |  | $19,000 | $38,000 |
| Taylor | 702 | $46,681 | $100 | $238,500 |  | $47,000 | $94,000 |
| Tucker | 284 | $23,705 | $200 | $206,300 |  | $24,000 | $48,000 |
| Tyler | 423 | $26,439 | $100 | $170,900 |  | $26,000 | $52,000 |
| Upshur | 1,120 | $27,775 | $100 | $233,800 |  | $28,000 | $56,000 |
| Wayne | 2,158 | $18,928 | $100 | $181,500 |  | $19,000 | $38,000 |
| Webster | 880 | $19,763 | $100 | $102,600 |  | $20,000 | $40,000 |
| Wetzel | 403 | $17,675 | $100 | $144,300 |  | $18,000 | $36,000 |
| Wirt | 524 | $8,962 | $100 | $81,600 |  | $9,000 | $18,000 |
| Wood | 2,103 | $37,984 | $200 | $229,000 |  | $38,000 | $76,000 |
| Wyoming | 2,244 | $20,094 | $300 | $194,900 |  | $20,000 | $40,000 |
|  |  |  |  |  |  |  |  |
| Average |  | $22,670 | $156 | $186,656 |  | $23,000 | $46,000 |

Table 13. Data Issues and Quality Control Measures

|  |  |  |
| --- | --- | --- |
| **Data Category** | **Data Issue** | **Validation Check** |
| **Building Identifier** | Building Identifier not unique | BIE Table |
| **Building Identifier** | Building elements missing, incomplete, duplicate | BIE Table |
| **Building Identifier** | Parcel ID/Address No. don’t correspond correctly to Building-ID | BIE Table |
|  |  |  |
| **Parcel Geometry** | Parcel Geometry misalignment | GIS Map Check |
| **Parcel Geometry** | No GIS Parcel Geometry | GIS Map Check |
|  |  |  |
| **E-911 Address** | Site Address wrong | BIE Table, GIS |
| **E-911 Address** | Site Address for structure located outside of parcel | GIS Map Check |
| **E-911 Address** | No Site Address | BIE Table |
| **E-911 Address** | Missing any elements of Full Address (Address Number, Street Name, City, Zip) | BIE Table |
| **E-911 Address** | Duplicate Addresses | BIE Table |
|  |  |  |
| **Imagery** | Imagery - No building visible in imagery | GIS Map Check |
|  |  |  |
| Assessment Record | Neighboring parcel assessment record matches to parcel with structure. Ensure correct BIE foundation type, occupancy class, etc. from neighboring parcel are copied to parcel with structure. | BIE Table, GIS |
| Assessment Record | Missing key building attributes: Building Value, Occupancy Class, Foundation Code, Stories, Area | BIE Table |
| Assessment Record | Sort on highest building values - verify | BIE Table |
| Assessment Record | Verify with other Essential Facility and Community Asset geodatabases | BIE Table, GIS |
|  |  |  |
| Stream Name | Stream Name missing. Update Stream Query Layer. | BIE Table |
|  |  |  |
| Water Depth | Sort on highest water depth values - verify | BIE Table |
|  |  |  |
| Flood Zone | Building located in most restrictive flood zone | GIS Map Check |
| Flood Zone | Verify future map conditions of Non-Regulatory High-Risk Advisory Zones | GIS Map Check |
|  |  |  |
|  |  |  |
| Note: All user-supplied values should be red color in Building Inventory Enhanced File. Make sure corresponding Data Issue description codes are selected. | | |

Table 14. Building Inventory Enhanced (BIE) Attributes

| **Field Name** | **Description** | **Category** | **Sample Data Value** |
| --- | --- | --- | --- |
| Lat | Latitude | Identification | 39.463181 |
| Long | Longitude | Identification | -77.83959 |
| Plus\_Code | Google Plus Code (11-Digits) | Identification | 87F4F576+75F |
| Building\_ID | Unique Building Identifier | Identification | 02-08-0013-0013-0000\_801 |
| Building\_Type | Primary Building (P Code) | Identification | P |
| Full\_E-911\_Address | Complete E-911 Address | Identification | 801 TURNER RD, SHEPHERDSTOWN, WV, 25443 |
| GIS\_Parcel\_ID | GIS Parcel Identifier | Identification | 02-08-0013-0013-0000 |
| IAS\_ID | Assessment Record Override ID | Identification |  |
| WV\_Flood\_Tool\_Link | WV Flood Tool Link (RiskMAP View) | Identification | <https://mapwv.gov/flood/map/?wkid=102100&x=-8665063.574442726&y=4788237.0562021565&l=13&v=2> |
| WV\_Parcel\_Assessment\_Link | WV Detailed Assessment Report | Identification | <https://mapwv.gov/Assessment/Detail/?PID=02080013001300000000> |
| CID | FEMA Community Identifier | Community | 540065 |
| Community\_Name | Community Name | Community | Jefferson County |
| County | County Name | Community | JEFFERSON COUNTY |
| Incorporated\_Unincorporated | Incorporated or Unincorporated | Community | Unincorporated |
| Stream\_Name | Stream Name | Stream Info | Rockymarsh Run |
| Watershed\_HUC8 | Watershed Name (HUC-8) | Stream Info | Conococheague-Opequon (2070004) |
| Flood\_Zone\_Designation | Flood Zone Designation (MAP-IN, MAP-OUT) | Flood Zone | Effective 100 yr Zone A (N/A) |
| Floodway | Floodway (Y/N) | Flood Zone | No |
| FloodPlainType\_RiskLayer | Floodplain Risk Layer Symbol | Flood Zone | Effective A (N/A) |
| Non\_Regulatory | Non-Regulatory High Risk Advisory Zones | Flood Zone | Regulatory |
| FIRM\_Status | Pre-FIRM or Post-FIRM | Flood Zone | Pre-FIRM |
| Flood\_Depth\_Value | Flood Depth Value | Flood Zone | N/A |
| Flood\_Depth\_Source | Flood Depth Source | Flood Zone | N/A |
| WSEL\_Value | Water Surface Elevation | Flood Zone | N/A |
| WSEL\_Source | Water Surface Elevation Source | Flood Zone | N/A |
| Ground\_Elevation | Ground Elevation | Flood Zone | 405.5 |
| Ground\_Elevation\_Source | Ground Elevation Source | Flood Zone | 2012 FEMA Jefferson, Berkeley & Morgan Lidar |
| Full\_Owner\_Address | Assessment: Owner Address | Building Info | 801 TURNER RD, SHEPHERDSTOWN, WV 25443 |
| Owner\_Name\_s | Assessment: Owner Name | Building Info | MILLER LEIGHTON B BETTY V |
| Year\_Built | Assessment: Building Year | Building Info | 1885 |
| Grade | Assessment: Building Grade | Building Info | C |
| Property\_Class\_Code | Assessment: Property Class (R,F,C,I,A,U,X) | Building Info | F |
| Property\_Class\_Description | Assessment: Property Class Description | Building Info | Farm |
| Tax\_Class | Assessment: Tax Class (Owner-Occupied = 2) | Building Info | 2 |
| Land\_Use\_Code | Assessment: Land Use Code | Building Info | 112 |
| Land\_Use\_Description | Assessment: Land Use Description | Building Info | Active Farm |
| Hazard\_Occupancy\_Code | Assessment: Hazus Occupancy Class Code | Building Info | AGR1 |
| General\_Occupancy\_Code | Assessment: Hazus General Occupancy Class | Building Info | Agriculture |
| Stories | Assessment: Number of Stories | Building Info | 2 |
| Exterial\_Wall\_Type | Assessment: Exterior Wall (Residential or Commercial) | Building Info | Aluminum |
| Architectural\_Style | Assessment: Architectural Style (Residential) | Building Info | Conventional |
| Structure\_Area | Assessment: Structure Area (R or C) | Building Info | 1864 |
| Basement\_Type | Assessment: Basement Type (R or C) | Building Info | Part |
| Foundation\_Type | Assessment: Foundation Type - Hazus LUT | Building Info | Basement |
| First\_Floor\_Height | Assessment: First Floor Height | Building Info | 4.0 |
| Dwelling\_Value | Assessment: Dwelling Value | Building Info | 97400 |
| Commercial\_Value | Assessment: Commercial Value | Building Info | 0 |
| OBY\_Value | Assessment: Out Buildings Value | Building Info | 8590 |
| Building\_Appraisal | Assessment: Building Appraisal Value | Building Info | 106000 |
| Building\_Value\_Source | Assessment: Building Value Source | Building Info | Assessment (IAS) |
| Total\_Structures | Assessment: Total Structures on Parcel | Building Info | 1 |
| Accessory\_Structures\_Count | Assessment: Owner Name | Building Info | 6 |
| Units | Assessment: Number of Untis | Building Info | 1 |
| Critical\_Infrastructure | Essential Facilities | Other |  |
| Governmental\_Building | Governmental Building (F, S, L) | Other |  |
| Historical\_Structure | Historical Structure (Yes or No) | Other |  |
| Federal\_Land | Federal Land (FED) | Other |  |
| Comments | General Comments | Other | Moved point to flood zone and updated parcel ID / building appraisal |
| Data\_Issue\_1 | Data Issue Flag 1 | Other |  |
| Data\_Issue\_2 | Data Issue Flag 2 | Other |  |
| Timestamp | Time Stamps | Other | 02/03/2020 |
| Average\_Household\_Size | Census Average Household Size | Population Displacement | 2.6 |
| Residential\_Units\_FLD | Number of Residential Units | Population Displacement | 0 |
| Displaced\_Population\_FLD\_BLD | Population Displaced Per Building | Population Displacement | 0 |

Table 15. Hazus FAST Inputs. Building Input FAST (BIF) Attributes

|  |  |  |  |
| --- | --- | --- | --- |
| Input Attribute | Data Type | Range or Length | Notes |
| UserDefinedFltyId | Text |  | Unique FAST identifier |
| **OccupancyClass** | Text | 5 | One of 33 Hazus-defined types, e.g., {RES1, RES2, COM3, IND4, AGR1, GOV2, REL1}. Script will skip row if not specified, or if an unrecognized value is provided. |
| **Cost** | Long | > 0 | Replacement Cost of Structure, in U.S. dollars. Records D51with '0' cost: the script will accept a zero value, but any estimated dollar damage to the structure will be 0. Consider correcting the UDF record or deleting it. |
| **NumStories** | Short | ≥ 1 | Number of Stories. Must be an integer. |
| **FoundationType** | Text | {1,2,3,4,5,6,7} | Foundation Type of the building. Text type, per Hazus-MH Flood Model convention. Must be an integer from 1 to 7, inclusively. |
| **FirstFloorHt** | Float | ≥ 0.0 | First Floor Height, in feet. Height can be specified in fractional feet. |
| **Area** | Long | > 0 | Total Area for the structure, in square feet. Used for Inventory Loss calculation when Inventory Cost is not supplied. Used for debris estimates. Must be greater than 0. |
| **Latitude** | Float |  | Latitude decimal degrees |
| **Longitude** | Float |  | Longitude decimal degrees |
| **Input Attribute** | Data Type | Range or Length | Notes |
| **UserDefinedFltyId** | Text |  | Unique FAST identifier |
| **OccupancyClass** | Text | 5 | One of 33 Hazus-defined types, e.g., {RES1, RES2, COM3, IND4, AGR1, GOV2, REL1}. Script will skip row if not specified, or if an unrecognized value is provided. |
| **Cost** | Long | > 0 | Replacement Cost of Structure, in U.S. dollars. Records D51with '0' cost: the script will accept a zero value, but any estimated dollar damage to the structure will be 0. Consider correcting the UDF record or deleting it. |
| **NumStories** | Short | ≥ 1 | Number of Stories. Must be an integer. |
| **FoundationType** | Text | {1,2,3,4,5,6,7} | Foundation Type of the building. Text type, per Hazus-MH Flood Model convention. Must be an integer from 1 to 7, inclusively. |
| **FirstFloorHt** | Float | ≥ 0.0 | First Floor Height, in feet. Height can be specified in fractional feet. |
| **Area** | Long | > 0 | Total Area for the structure, in square feet. Used for Inventory Loss calculation when Inventory Cost is not supplied. Used for debris estimates. Must be greater than 0. |
| **Latitude** | Float |  | Latitude decimal degrees |
| **Longitude** | Float |  | Longitude decimal degrees |

Table 16. Hazus FAST Outputs. Building FAST Outputs (BOF)

| Output Attribute | Data Type | Range or Length | Notes |
| --- | --- | --- | --- |
| **Depth\_Grid** | Float | ≥ 0.0 | Flood Depth Grid, in feet. |
| **Depth\_in\_Struc** | Float |  | Depth-in-Structure Adjusted flood depth grid at the UDF point, in feet. Simple calculation: If the Depth\_Grid is a NoData or -9999 value, value is -9999. Else value is Depth\_Grid − FirstFloorHt |
| flExp | Short | {0,1} | UDF is exposed to a flood. Simply 0 or 1. If the UDF is in a flood depth grid, then the value is 1, regardless of depth-in-structure. |
| SOID | Text | 5 | Specific Occupancy ID. The Hazus-MH Flood shorthand that compresses OccupancyClass, NumStories, and FoundationType into a concise 4- to 5-character code, e.g. R11N for a RES1, no basement, single story. Used to access the look-up tables where the user does not specify a DDF. XXXX for buildings not in the flood zone. |
| BDDF\_ID | Text | 3 | Building Depth Damage Function (DDF): If not provided by the user, defaults will be assigned based on Hazus methodology by computing Specific Occupancy ID based on Occupancy Type, Foundation Type, num stories and flood type. If populated by user, the script will check to ensure that only valid DDFs are used. |
| **BldgDmgPct** | Float | 0 – 100 | Building Damage Percentage. Interpolated from the lookup tables, depending on flood depth. Value ranges between 0 and 100. For UDFs outside the flood zone, the value is set to 0.0. |
| **BldgLossUSD** | Long | ≥ 0 | Loss, in US dollars, to the building. Formula: Cost × BldgDmgPct |
| **ContentCostUSD** | Long | ≥ 0 | Content Cost: Building Content Cost, in US dollars. If user supplied a ContentCost attribute, and the record’s value is non-null, the value is ContentCost. Otherwise, depending on OccupancyClass, it is calculated at 0.5, 1.0, or 1.5 times the user-supplied building Cost. See Hazus-MH Flood Technical Manual (FEMA, 2011). |
| CDDF\_ID | Text | 3 | Content Depth Damage Function ID. If not provided by the user, defaults will be assigned based on Hazus methodology by computing Specific Occupancy ID based on Occupancy Type, Foundation Type, num stories and flood type. If populated by user, the script will check to ensure that only valid DDFs are used. |
| **ContDmgPct** | Float | 0 – 100 | Building Content Damage Percentage. Interpolated from the lookup tables, depending on flood depth. Value ranges between 0 and 100. For UDFs outside the flood zone, the value is set to 0.0. |
| **ContentLossUSD** | Long | ≥ 0 | Loss, in US dollars, to the Building Content. Formula: ContDmgPct × ContentCostUSD |
| InventoryCostUSD | Long | ≥ 0 | Hazus estimates are provided based on Occupancy Class and Area unless provided by the user. Must be greater than or equal to 0. |
| IDDF\_ID | Text | 3 | Inventory Depth Damage Function ID. If not provided by the user, defaults will be assigned based on Hazus methodology by computing Specific Occupancy ID based on Occupancy Type, Foundation Type, num stories and flood type. If populated by user, the script will check to ensure that only valid DDFs are used. |
| **InvDmgPct** | Float | 0 – 100 | Building Inventory Damage Percentage. Interpolated from the lookup tables, depending on flood depth. Value ranges between 0 and 100. For UDFs outside the flood zone, the value is set to 0.0. Note that only certain types of OccupancyClass have a standard Inventory Loss function defined. |
| **InventoryLossUSD** | Long | ≥ 0 | Loss, in US dollars, to the Inventory Content. If user supplied an inventory cost attribute, the value is InvDmgPct × InventoryCostUSD. (Note the significant discrepancy between the computed values and Hazus 4.0 loss estimates. Hazus 4.0 does not correctly implement the Inventory Loss calculation at the UDF level.) |
| **Debris\_Tot** | Long | ≥ 0 | Total debris, in tons. Combines Finish, Structure, and Foundation debris estimates. Based on Occupancy Class, Square Footage, Foundation Type, and Depth-in-Structure. |
| Restor\_Days\_Min | Short | ≥ 0 | Restoration time, in days — Minimum bound. Note there is no direct Hazus equivalent. The name is identical to what is in the Hazus lookup table. Note that the restoration times assume, like the debris, that a ‘substantially damaged’ structure (one which experiences > 50% loss) is torn down and replaced. |
| **Restor\_Days\_Max** | Short | ≥ 0 | Restoration time, in days — Maximum bound. Note there is no direct Hazus equivalent. The name is identical to what is in the Hazus lookup table. Note that the restoration times assume, like the debris, that a ‘substantially damaged’ structure (one which experiences > 50% loss) is torn down and replaced. |
| GridName | Text | 50 | Name of flood depth grid. This may seem redundant, given the output file naming convention, but |

# Appendix B: Glossary

**1% Annual Chance Flood:** A one percent annual chance flood event (a.k.a. 100-year flood) has a one percent (1 in 100) chance of being equaled or exceeded during any given year. The one percent annual chance flood was selected in the early 1970s when the National Flood Insurance Program was tasked with mapping all floodplains in the U.S. It was considered a reasonable balance of protection and cost between the 0.5% (1 in 200) to 0.2% (1 in 500) variable reference used at the time by the U.S. Army Corps of Engineers for floodwater control structure design. The term 100 year (or 5 year or 500 year) refers to the expected frequency of return of a given flood event. The area of inundation associated with a given flood event is called the **floodplain** (e.g. 1% floodplain, etc.).

*Source:* [The 100 Year Flood Myth](https://training.fema.gov/hiedu/docs/hazrm/handout%203-5.pdf)*, Federal Emergency Management Agency, Region 10, handout.*

**CAMA/IAS:** Computer Assisted Mass Appraisal (CAMA) is the process of using a computer to assist in property tax appraisal and equity evaluation. Administered by the Tax Commissioner, the CAMA system for West Virginia is a centralized Oracle database also known as the Integrated Assessment System (IAS). A number of years ago the State Tax Department purchased real estate mass appraisal software called IAS. This software is installed on the network server in Charleston and is accessed through computers in each County Assessor's Office.