

WV Silver Jackets Team

Building Level Risk Assessments

- Validate Primary Structures
- First Floor Heights
- New Development



High Risk Potential Dams

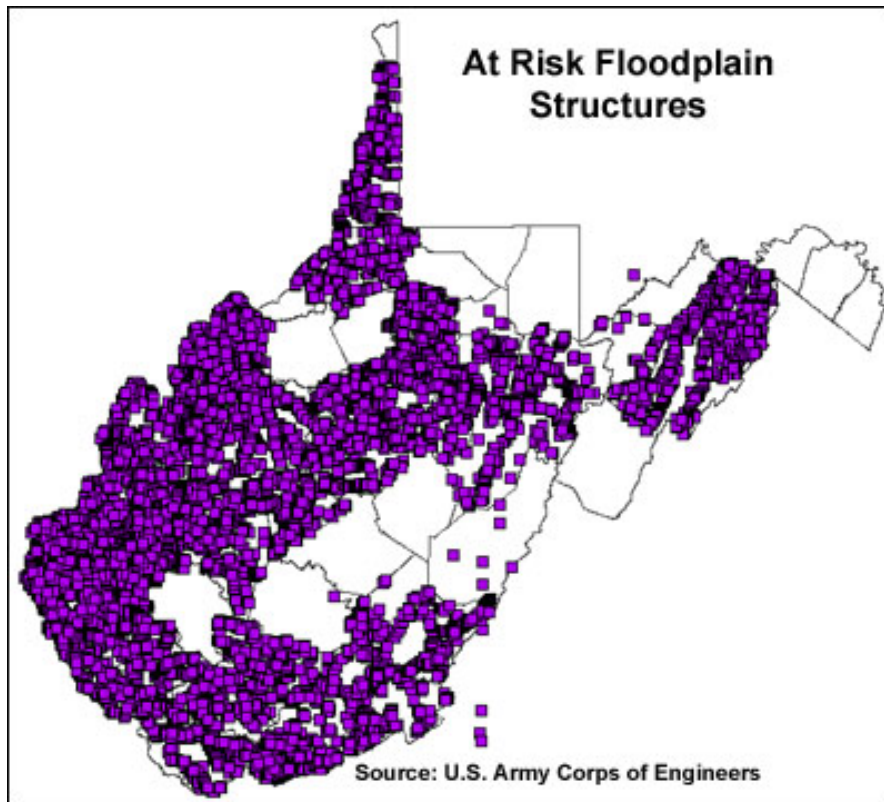
- Identify communities downstream of High-Risk dams

Dam Warning and Safety System

- Credits for FEMA's Community Rating System (CRS) Program

Silver Jackets: Activity 1

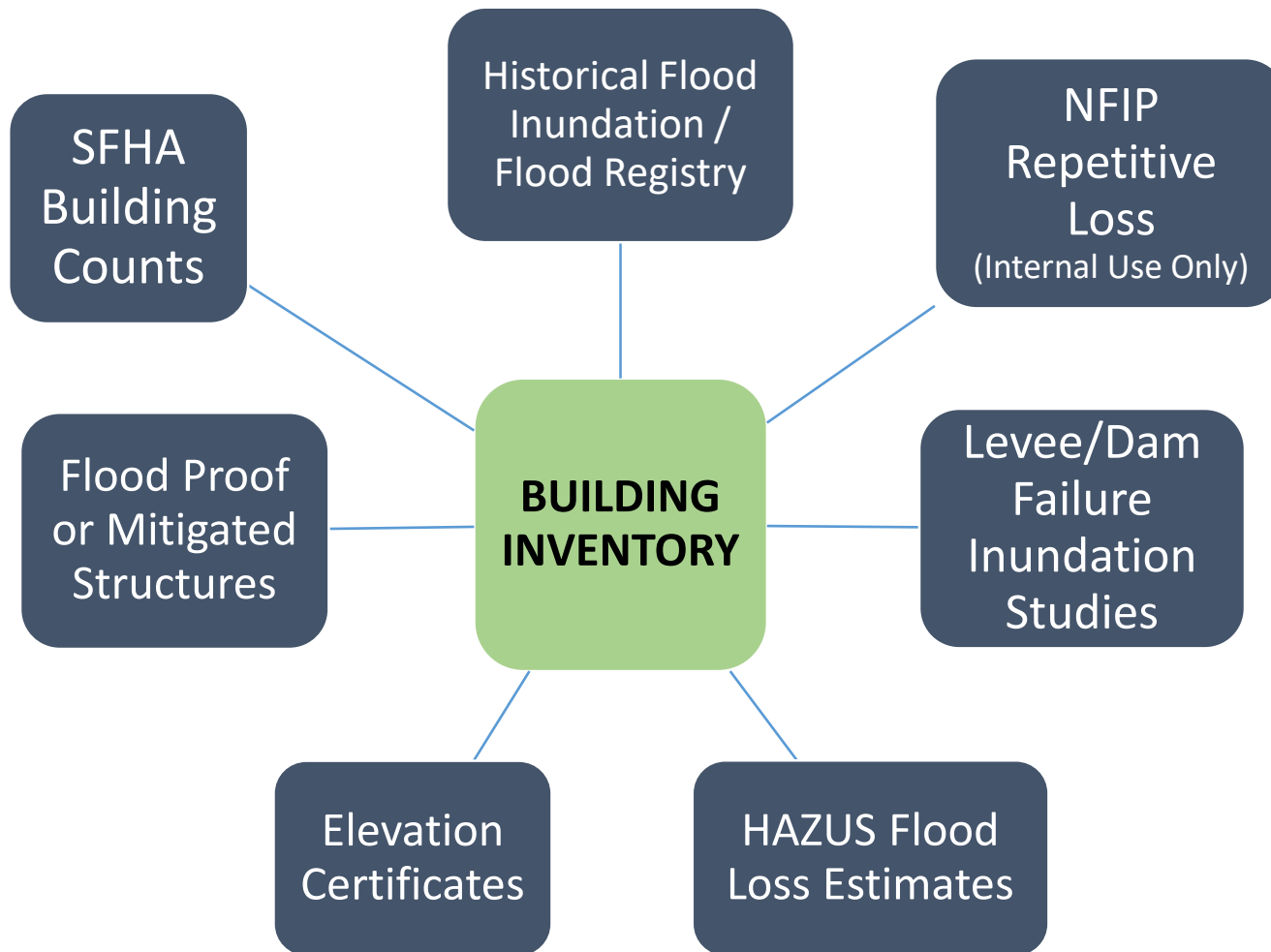
Building Inventories



Nearly 20 years ago more than **80,000 structures** in the floodplain were inventoried by the **Pittsburgh District Army Corps of Engineers** using statewide 1996-99 1-meter resolution Digital Orthophoto Quarter Quads. A combination of FEMA's Q3 and DFIRM floodplain data (available for 37 of the 55 counties) was overlaid onto DOQQ's.

<< USACE Inventoried Floodplain Structures >>
<http://wvgis.wvu.edu/data/dataset.php?ID=230>

Site-Specific Building Inventories



Building Inventories important for flood reduction activities

Statewide Building Inventories

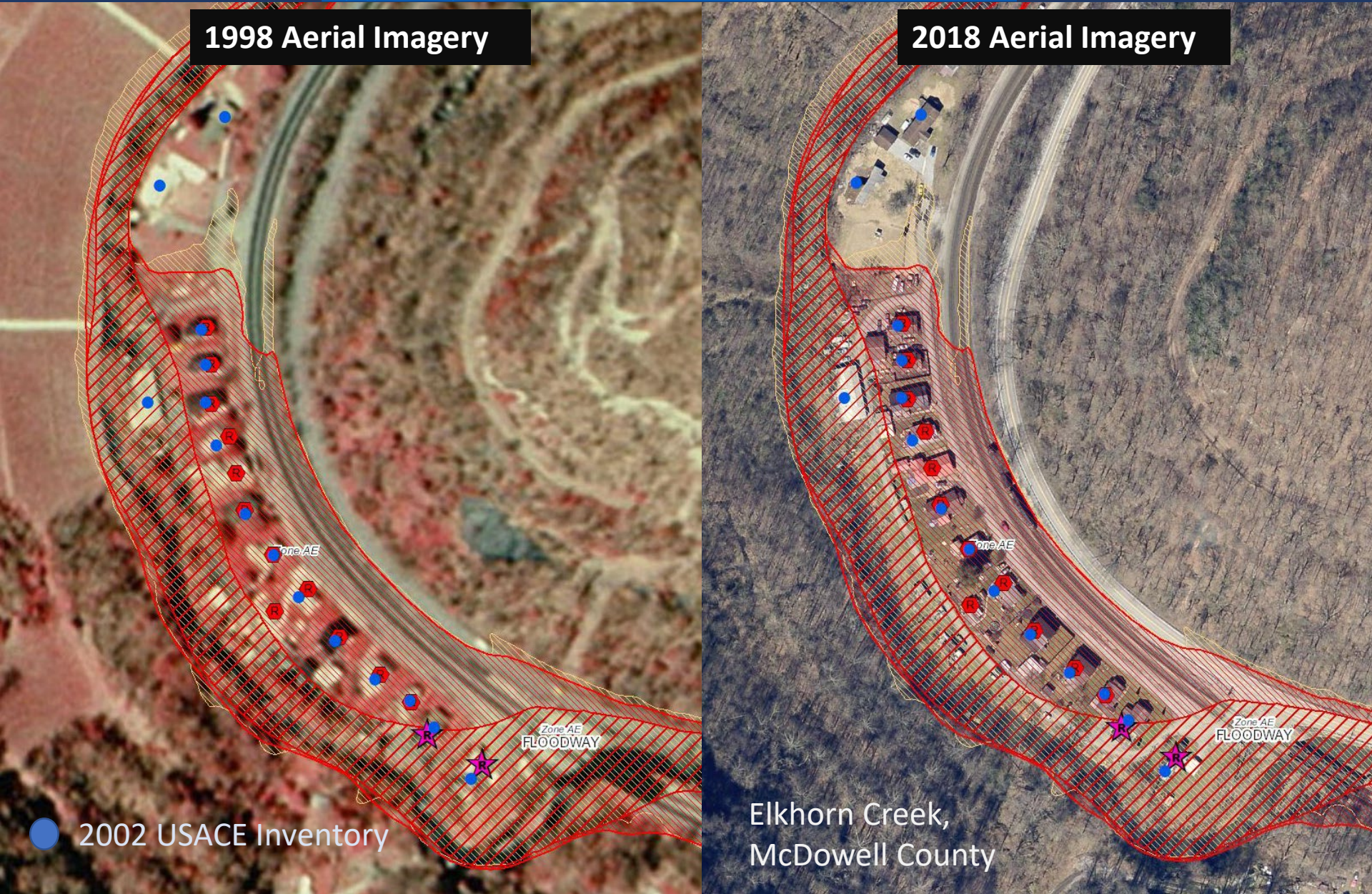
<https://www.mapwv.gov/flood/map/?wkid=102100&x=-9070843&y=4497058&l=11&v=2>

1998 Aerial Imagery

2018 Aerial Imagery

● 2002 USACE Inventory

Elkhorn Creek,
McDowell County



USACE 2002 Building Inventory

<https://www.mapwv.gov/flood/map/?wkid=102100&x=-9069713&y=4496689&l=10&v=2>



Buyout Properties

Zone AE
FLOODWAY

Zone AE

● 2002 USACE Inventory

Elkhorn Creek, McDowell County

Building-Level Flood Risk Assessments

Building-Level Flood Risk Assessments support:

- Hazard Mitigation Plans
- Floodplain Management
- Community Assisted Visits
- Community Rating System

Benefits

- More detailed and accurate assessments
- Automated scripts generate outputs quickly
- Cost savings through efficiencies
- Helps multiple stakeholders
- Comprehensive Building Risk Database

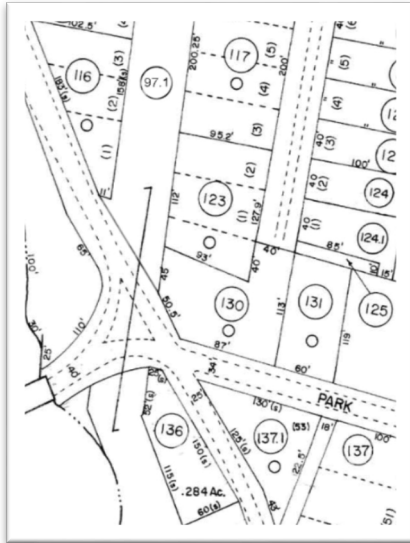
Methodology

- Consistent methodology statewide
- Semi-automated workflows
- Continuous cycle to improve and update assessments



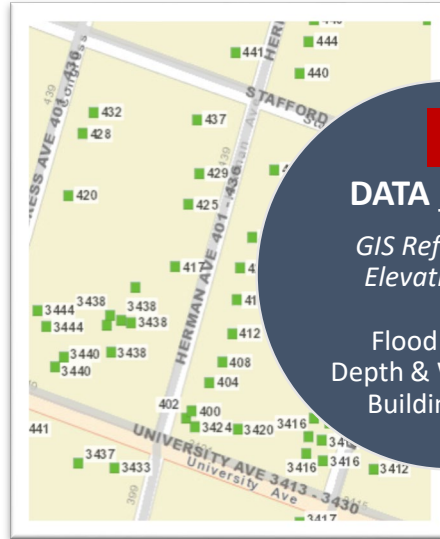
GIS Data Development

Parcels



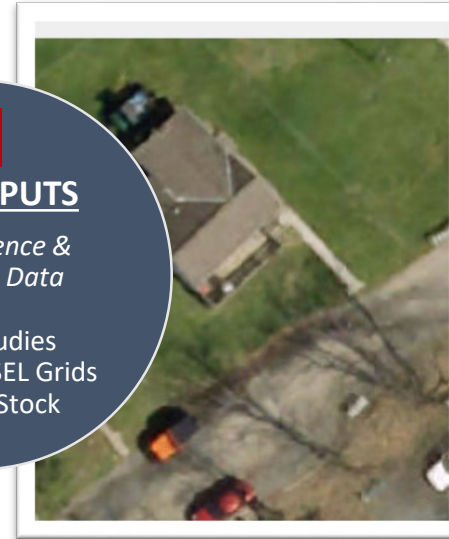
Migrate six counties from paper to digital parcels

Site Addresses



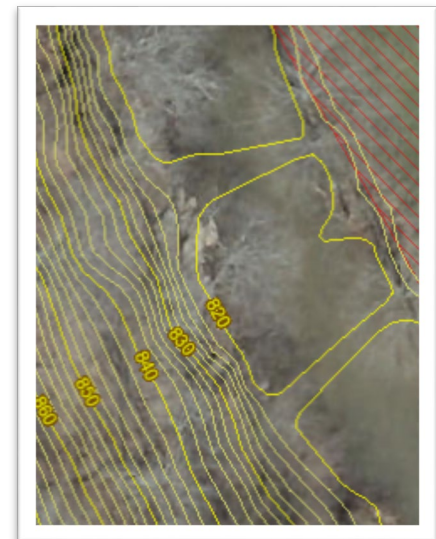
Flood-risk communities with missing or incorrect E-911 addresses

Aerial Imagery



County Leaf-off imagery no older than 5 years

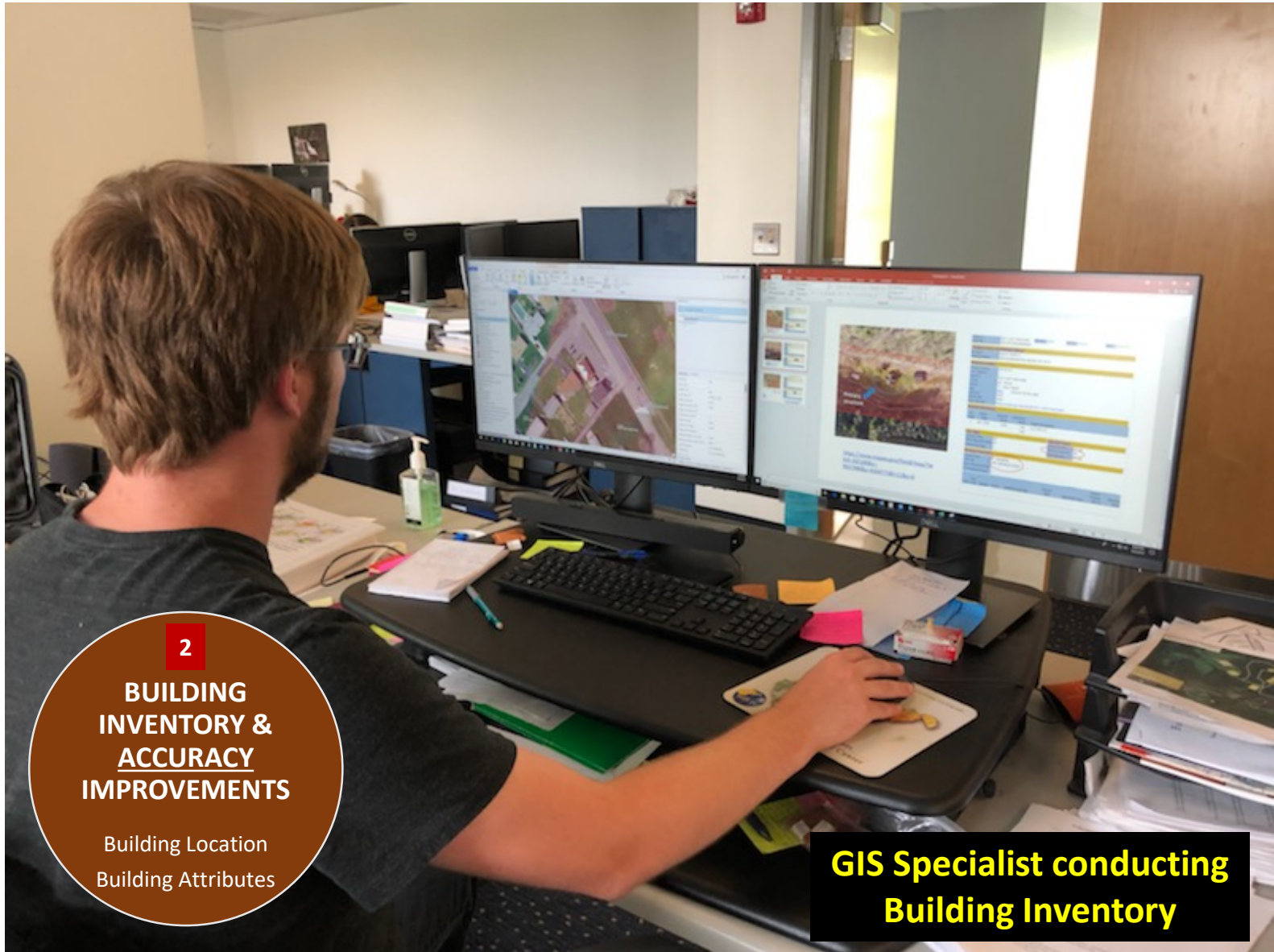
Elevation



Statewide 1-meter DEM and 1-ft. contours. Flood Studies, Depth & WSEL Grids

Parcels, Assessment Records, Aerial Imagery important for pinpointing flood-risk structures

Building Inventory



2

BUILDING INVENTORY & ACCURACY IMPROVEMENTS

Building Location
Building Attributes

**GIS Specialist conducting
Building Inventory**

Building 19-07-022B-0021-0000_7170

WV Flood Tool
Remember: When In Doubt, It's Not Out!

Views: Public | **Expert** | Risk MAP | Flood | Reference | Basemaps

Search: Address e.g., 123 street name, city, state, zip

Tools: [Icons for various map functions]

Building ID: 19-07-022B-0021-0000_7170

10 ft. Water Depth

Click on each tab to view information		
Address	Parcel	Risk
Property Class Type	R - Residential	
Land Use	101 - Residential 1 Family	
Year Built	2011	
Architectural Style	Cape Cod/Cape Ann	
Story Height	2	
Exterior Wall	Aluminum	Built 2011
Construction Area(sq ft)	2,496	
Total Rooms	6	
Building Grade	C+	
Basement Type	Crawl	Crawl Basement
Building (card) Number		
# of main BLDGs (cards)	1	
COST VALUES		
APPRAISED VALUES		

Flood Hazard Area: Location is WITHIN the FEMA 100-year floodplain and floodway.
Flood Zone: AE (Floodway)
Stream: Shenandoah River
Watershed (HUC8): Shenandoah (2070007)

FEMA Issued Flood Map: 54037C0230E NFHL
Map Effective Date: 12/18/2009
Contacts: Jefferson

Flood Height: Refer to FIS report for BFE
Water Depth: About 10.4 ft (Source: HEC-RAS)
HEC-RAS Model: [Redacted]
Flood Profile: 54 [Redacted]
Community: [Redacted]
CID: 5 [Redacted]

Location (long, lat): (-77.831527, 39.219048)
Location (UTM 17N): (773544, 4345869)

External Viewers: [Icons for social media sharing]

Elevation: About 366 ft (Source: FEMA 2012)
Address: 781 AVON BEND RD, CHARLES TOWN, WV, 25414
Parcel ID: 19-06-009H-0019-0000

Flood Risk Information
Flood Risk Assessment: N/A
3D Flood Visualization

Scale: 1:564
Coordinates: -77.831392, 39.219032
©WVGISTC Leaf-Off Mixed-Resolution Imagery

Hazus Flood Loss Estimation Program

A GIS-based natural hazard analysis tool developed and freely distributed by FEMA

What is Hazus?



Flood Depth



Structures



Damage



Loss

Slide courtesy of FEMA

Hazus Flood Loss Estimation Program

Flood Loss Utility



tk

User Defined Fty Id*:

Occupancy Class*:

Building Cost*:

Building Area*:

Number of Stories*:

Foundation Type*:

First Floor Height*:

Content Cost:

Building DDF:

Content DDF:

Inventory DDF:

Inventory Cost:

Specific Occupancy ID:

Latitude*:

Longitude*:

Coastal Flooding attribute (FC)*:

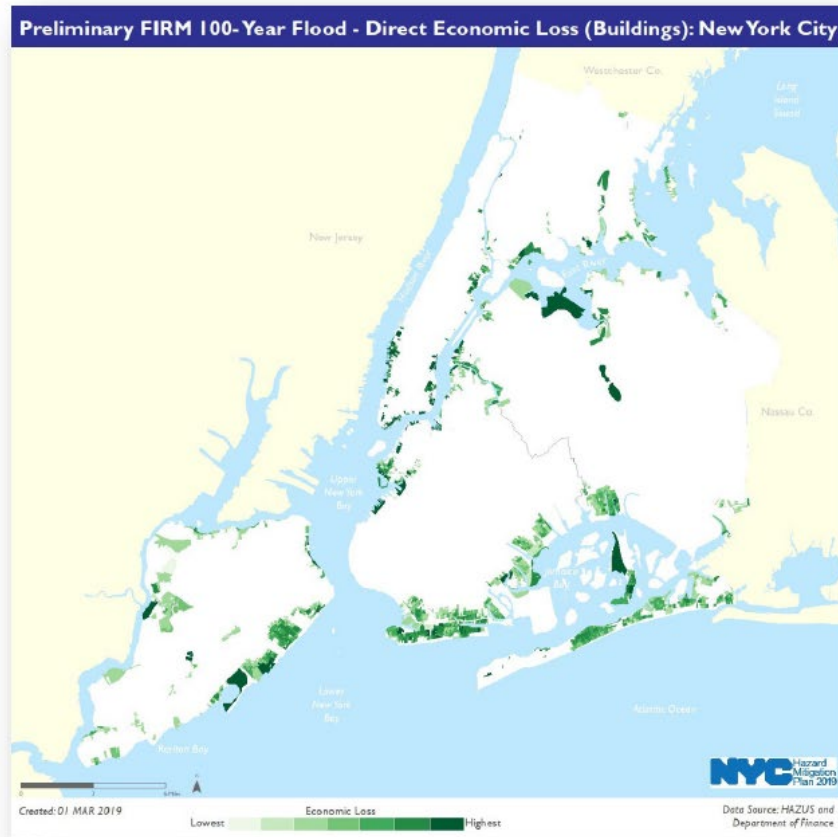
Depth Grid (ft)*:

Riverine
CoastalV
CoastalA

Honolulu_GAT.tif
NYC_100yr.tif

Fields named similar to defaults are searched for.
* indicates required field.
Red fields are required and must be mapped.
Yellow fields have not been mapped, but are not required.
Green fields have been mapped successfully.

Execute Browse to Inventory Input (.csv) Quit



FEMA's new
OpenHazus
Flood Loss
Utility.

It works!

Very
beneficial
for project!

Slide courtesy of FEMA

Depth-Damage Function (DDF) Values

Building_DDF_Riverine_LUT_Hazus4p0_example_point.csv - Excel

File Home Insert Page Layout Formulas Data Review View Power Pivot Tell me what you want to do...

Clipboard Font Alignment Number Styles Cells

A4 R12N

	A	B	C	D	I	J	K	L	M	N	O	P	Q
1	SpecificOccupId	Source	Description	Stories	m1	p0	p1	p2	p3	p4	p5	p6	p7
2	R11N	USACE - IWR	one story, no basement, Structure	1 Story	3	13	23	32	40	47	53	59	63
3	R11B	BCAR - Jan 2011	one story, w/ basement, Structure (B14)	1 Story	19	26	32	39	46	52	59	65	70
4	R12N	FIA	two floors, no basement, Structure, A-Zone	2 Story	0	11	12	14	18	20	22	24	26
5	R12B	FIA (MOD.)	two floors, w/ basement, Structure, A-Zone	2 Story	14	19	21	26	29	34	39	44	50
6	R13N	FIA	three or more floors, no basement, Structure, A-Zone	3 Story	0	5	8	12	17	19	22	24	25
7	R13B	FIA (MOD.)	three or more floors, w/ basement, Structure, A-Zone	3 Story	10	12	14	20	25	31	36	38	41
8	R15N	FIA	split level, no basement, Structure, A-Zone	Split Level	0	3	9	13	25	27	28	33	34
9	R15B	FIA (MOD.)	split level, w/ basement, Structure, A-Zone	Split Level	14	15	24	27	30	35	40	43	44
10	R21N	FIA	Mobile home, structure, A-Zone	1 Story	0	11	44	63	73	78	79	81	82
11	R21B	FIA	Mobile home, structure, A-Zone	1 Story	0	11	44	63	73	78	79	81	82
12	R3A1N	USACE - Chicago	Apartment Unit Grade, Structure	1to2 Stories	0	15	16	25	28	29	31	40	43
13	R3A1B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	1to2 Stories	8	12	15	20	23	28	33	37	43
14	R3A3N	USACE - Chicago	Apartment Unit Grade, Structure	3to4 Stories	0	15	16	25	28	29	31	40	43
15	R3A3B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	3to4 Stories	8	12	15	20	23	28	33	37	43
16	R3A5N	USACE - Chicago	Apartment Unit Grade, Structure	5Plus Stories	0	15	16	25	28	29	31	40	43
17	R3A5B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	5Plus Stories	8	12	15	20	23	28	33	37	43
18	R3B1N	USACE - Chicago	Apartment Unit Grade, Structure	1to2 Stories	0	15	16	25	28	29	31	40	43
19	R3B1B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	1to2 Stories	8	12	15	20	23	28	33	37	43
20	R3B3N	USACE - Chicago	Apartment Unit Grade, Structure	3to4 Stories	0	15	16	25	28	29	31	40	43
21	R3B3B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	3to4 Stories	8	12	15	20	23	28	33	37	43
22	R3B5N	USACE - Chicago	Apartment Unit Grade, Structure	5Plus Stories	0	15	16	25	28	29	31	40	43
23	R3B5B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	5Plus Stories	8	12	15	20	23	28	33	37	43
24	R3C1N	USACE - Chicago	Apartment Unit Grade, Structure	1to2 Stories	0	15	16	25	28	29	31	40	43
25	R3C1B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	1to2 Stories	8	12	15	20	23	28	33	37	43
26	R3C3N	USACE - Chicago	Apartment Unit Grade, Structure	3to4 Stories	0	15	16	25	28	29	31	40	43
27	R3C3B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	3to4 Stories	8	12	15	20	23	28	33	37	43
28	R3C5N	USACE - Chicago	Apartment Unit Grade, Structure	5Plus Stories	0	15	16	25	28	29	31	40	43
29	R3C5B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	5Plus Stories	8	12	15	20	23	28	33	37	43
30	R3D1N	USACE - Chicago	Apartment Unit Grade, Structure	1to2 Stories	0	15	16	25	28	29	31	40	43
31	R3D1B	USACE - Chicago	Apartment Unit Sub-Grade, Structure	1to2 Stories	8	12	15	20	23	28	33	37	43

Post-FIRM Structure in Floodway

Building ID	19-06-009H-0019-0000_781
Full E-911 Address	781 AVON BEND RD, CHARLES TOWN, WV, 25414
Full Owner Address	9299 ALL SAINTS RD, LAUREL, MD 20723
GIS Parcel ID	19-06-009H-0019-0000
Lat	39.218996
Long	-77.83151391
Plus Code	87F46599+H9X
WV Flood Tool Link	https://mapwv.gov/flood/map/?wkid=102100&x=-8664164.49652&y=4753089.59353&l=13&v=0
WV Parcel Assessment Link	https://mapwv.gov/Assessment/Detail/?PID=1906009H0019000000000
CID	540065
Community Name	JEFFERSON COUNTY *
Stream Name	Shenandoah River
Watershed (HUC8)	Shenandoah (2070007)
Flood Zone Designation	Effective 100 yr Zone AE - Floodway
Floodway	Yes
Year Built	2011
FIRM Status	Post-FIRM
Hazard Occupancy Code	RES1
Stories	2
Basement Type	Crawl
First Floor Height	4.0
Building Appraisal	\$170,200
Structure Area	2496
Flood Depth Value	9.8
Flood Depth Source	HEC-RAS
WSEL Value	376.0
WSEL Source	UAE
Ground Elevation	366.2
Ground Elevation Source	2012 FEMA Jefferson, Berkeley & Morgan Lidar
Grade	C+
Tax Class	2
Land Use Description	Residential 1 Family
Exterial Wall Type	Aluminum

**Building
Inputs**

**Water Depth
Input**

Building ID	19-06-009H-0019-0000_781
Full E-911 Address	781 AVON BEND RD, CHARLES TOWN, WV, 25414
GIS Parcel ID	19-06-009H-0019-0000
Plus Code	87F46599+H9X
WV Flood Tool Link	https://mapwv.gov/flood/map/?wkid=102100&x=-8664164.49652&y=4753089.59353&l=13&v=0
WV Parcel Assessment Link	https://mapwv.gov/Assessment/Detail/?PID=1906009H0019000000000
Full Owner Address	9299 ALL SAINTS RD, LAUREL, MD 20723
Occ	RES1
Cost	170200
NumStories	2
FoundationType	5
FirstFloorHt	4
Area	2496
UserDefinedFltyId	453
Latitude	39.218996
Longitude	-77.83151391
Depth_Grid	9.825653
Depth_in_Struc	5.825653076
flExp	1
SOID	R12N
BDDF_ID	107
BldgDmgPct	23.7
BldgLossUSD	\$40,254
ContentCostUSD	\$85,100.00
CDDF_ID	23.00
ContDmgPct	37.95
ContentLossUSD	\$32,299
DebrisID	RES1NBFT4
Debris_Tot	
Restor_Days_Min	270
Restor_Days_Max	450
GridName	AFH_wm.tif

3

DATA OUTPUTS

Building Level
Community Level
3D Visualizations

*Published to
WV Flood Tool*

**OpenHazus
FAST Utility
Building Impact
Output**

Field Verification



Field Verification is important to improve the accuracy of certain properties!

Field Verified from Shenandoah River

Field Verification of the structure located at 781 Avon Bend Road in Charles Town along the Shenandoah River in the **Regulatory Floodway** reveals that this **Post-FIRM** (2011) structure is built on a **piles foundation**. The Foundation Type/First Floor Height will be changed in the Building Inventory and the OpenHazard Flood Assessment Structure Tool (FAST) utility executed again for this structure.

The estimated Base Flood Water Depth for this structure is 10 feet.

781 Avon Bend Road, Charles Town, WV 25414
Building ID 19-06-009H-0019-0000_781

WV Flood Tool Link:

<https://mapwv.gov/flood/map/?wkid=102100&x=-8664165&y=4753090&l=13&v=1>

Field Verification

Modified Foundation Type and First Floor Height – Rerun Hazus Flood Loss Model

WV Flood Tool
Remember: When In Doubt, It's Not Out!

Views: Public Expert **Risk MAP** Risk Reference Basemaps

Layers: Address 781 AVON BEND RD, CHARLES TOWN, WV

Tools: [Icons for search, zoom, etc.]

Click on each tab to view information: Address Parcel Risk

Building #1 in Parcel: 19-06-009H-0019-0000

Flood Exposure for Building: 19-06-009H-0019-0000_781

Building Replacement Cost	\$176,400
Content Cost	\$88,200
Building Info	Area: 2,496 sq ft Stories: 2
Occupancy Class	RES1 (Single Family Dwelling)
Year Built	2011 (Post-FIRM)
Foundation Type	Pile (View Photo)
First Floor Height	10.0 ft above ground
Water Depth-in-Structure	-0.2 ft (Subgrade Basement or Below LF)

Flood Damage Estimates for Building: 19-06-009H-0019-0000_781

Building Damage Pct	9%
Building Loss USD	\$16,021
Content Damage Pct	7%
Content Loss USD	\$5,826

Flood Hazard Area: Location is WITHIN the FEMA 100-year floodplain and floodway.
Flood Zone: AE (Floodway)
Stream: Shenandoah River
Watershed (HUC8): Shenandoah (2070007)

FEMA's Flood Map: 54037C0230E NFHL
Map Effective Date: 12/18/2009
Contacts: Jefferson

Flood Height: 376 ft (BFE - Non-Restudy)
Water Depth: About 9.8 ft (Source: HEC-RAS)
HEC-RAS Model: N/A
Community: Jefferson County
CID: 540065 **CRS Class:** 6

Location (lat, long): (39.218999, -77.831518)
Location (UTM 17N): (4345864, 773545)

External Viewers: [Icons for social media]

Elevation: About 366 ft (Source: FEMA 2012)

Address: 781 AVON BEND RD, CHARLES TOWN, WV, 25414

Parcel: 19-06-009H-0019-0000

Flood Risk: [Icons for flood risk]

scale - 1:1,128
x: -77.831327, y: 39.218239

@WVGISTC Leaf-Off Mixed-Resolution Imagery

4
COMMUNITY ENGAGEMENT & FIELD ACCURACY CHECKS
Floodplain Managers
Local Govt. Officials

781 Avon Bend Road, Charles Town, WV 25414

Parcel ID: 19-06-009H-0019-0000

Building ID: 19-06-009H-0019-0000_781

WV Flood Tool Link:

<https://mapwv.gov/flood/map/?wkid=102100&x=-8664165&y=4753090&l=13&v=1>


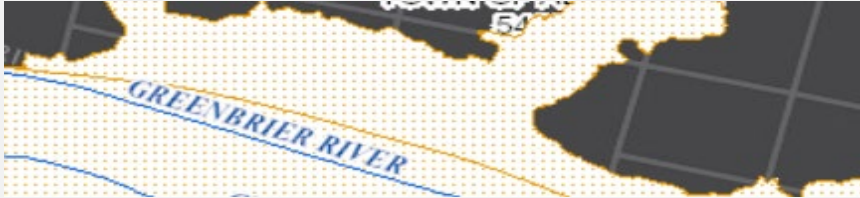

Validate Building Risk Assessments

- Flood Depth Grid
- Water Surface Elevation Grid
- High-Risk Advisory Flood Zones
- **Buildings: Future Map Conditions**
 - Structure Verified LOMAs
- **Buildings: Flood Exposure**
 - Building Replacement Cost
 - Essential Facilities
 - Community Assets
 - Historical Structures
- **Buildings: New Development & Basement**
 - Pre-FIRM / Post-FIRM
 - Basement (First-Floor Height)
- **Buildings: Damage Loss Estimate (Hazus)**
 - Percent Damage
 - Dollars Loss

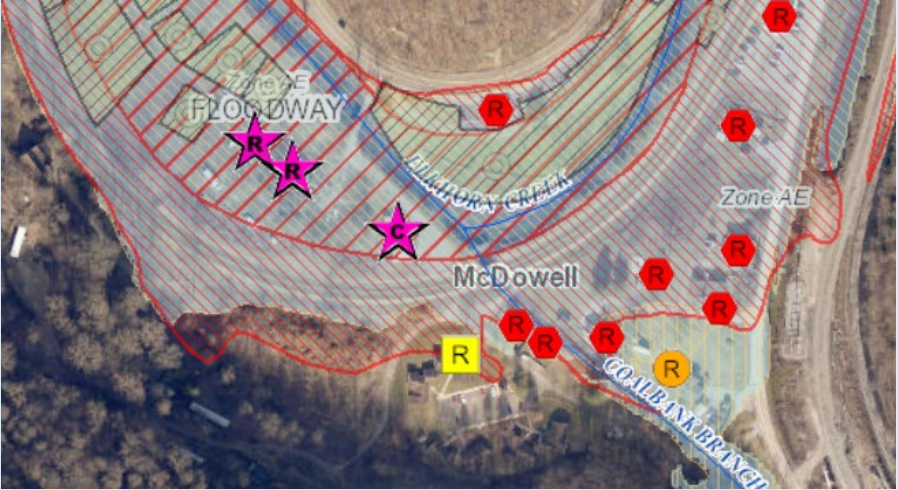



Silver Jackets:
Activity 1



Flood Risk Products

RISK LAYER	CATEGORY	GRAPHICAL OR TABLE FORMATS
1% Chance Flood Event (100-Year)		
<ul style="list-style-type: none"> ● Flood Depth Grid <ul style="list-style-type: none"> ○ Model-Backed ○ Hazus 	Flood Risk Grid	
<ul style="list-style-type: none"> ● Water Surface Elevation Grid <ul style="list-style-type: none"> ○ Base Flood Elevations ○ Advisory BFEs 	Flood Risk Grid	<p>Flood Height ⓘ: 357 ft (BFE - Non-Restudy) More Info</p> <p>Water Depth ⓘ: About 11.9 ft (Source: HEC-RAS)</p> <p>HEC-RAS Model: N/A All Models</p> <p>Community ⓘ: Jefferson County</p> <p>CID: 540065 CRS Class: 6</p>
<ul style="list-style-type: none"> ● Preliminary NFHL <ul style="list-style-type: none"> ○ Changes Since Last FIRM (CSLF) 	Flood Zone Changes	
<ul style="list-style-type: none"> ● High-Risk Advisory Flood Zones (Non-Regulatory) 	Flood Zone Changes	 <p>Flood Hazard Area: Location is WITHIN an updated detailed floodplain boundary but NOT a FEMA 100-year effective floodplain. More Info</p> <p>Flood Zone: Updated AE Floodplain Boundary</p> <p>Stream: Shenandoah River</p> <p>Watershed (HUC8): Shenandoah (2070007)</p>

Flood Risk Products (Cont.)

RISK LAYER	CATEGORY	GRAPHICAL OR TABLE FORMATS
1% Chance Flood Event (100-Year)		
<ul style="list-style-type: none"> ● Buildings: Future Map Conditions <ul style="list-style-type: none"> ○ Map In SFHA (orange) ○ Map Out SFHA (yellow) ○ No Change (red) ○ Floodway (purple) 	Building-Level Risk	
<ul style="list-style-type: none"> ● Buildings: LOMA Verified 	Flood Zone Changes	

Flood Risk Products (Cont.)

RISK LAYER	CATEGORY	GRAPHICAL OR TABLE FORMATS
1% Chance Flood Event (100-Year)		
<ul style="list-style-type: none"> ● Buildings: Exposed to Flooding <ul style="list-style-type: none"> ○ Building Replacement Cost ○ Essential Facilities ○ Community Assets ○ Historical 	Building-Level Risk	
<ul style="list-style-type: none"> ● Buildings: New Development & Basement <ul style="list-style-type: none"> ○ Pre-FIRM (red) ○ Post-FIRM (purple) ○ Basement (black dot) (First Floor Height) 	Building-Level Risk	

Flood Risk Products (Cont.)

Building 19-09-0011-0009-0016_1455



Water Depth

Flood Hazard Area: Location is WITHIN the FEMA 100-year floodplain. Advisory Flood Heights available.
 Flood Zone: A (Advisory Flood Heights available)
 Stream: Potomac River
 Watershed (HUC8): Conococheague-Opequon (2070004)

FEMA's Flood Map: 54037C0075E [Download](#) [Download](#) NFHL
 Map Effective Date: 12/18/2009
 Contacts: Jefferson

Flood Height: About 313 ft (AFH) [More Info](#)
Water Depth: About 3.9 ft (Source: HEC-RAS)
 HEC-RAS Model: PotomacRiver [All Models](#)
 Community: Jefferson County
 CID: 540065 CRS Class: 6

3D Flood Model

Flood Visualization

Depth

- 0 Foot
- 1 Foot
- 2 Foot
- 3 Foot
- 4 Foot**
- 5 Foot
- 6 Foot
- 7 Foot
- 8 Foot
- 9 Foot
- 10 Foot
- 11 Foot
- 12 Foot
- 13 Foot

Parcel ID: 19-09-0011-0009-0016 Water Depth: ~ 3.9 ft (HEC-RAS)

Door and Frames - Most doors in residential structures are hollow and are warped and destroyed between 0.0 and 1.0 foot of floodwater. Some would require replacement at 1.5 feet of floodwater. All doors are totaled at 4.0 feet of floodwater. Hollow metal door frames are never a total loss.

Sheetrock/Wall Insulation/Wall Boards - Walls and insulation are damaged at the rate of 25 percent damages at 0.0 foot to 1.5 feet of floodwater, 50 percent damages at 2.0 feet, and total damages at 4.0 feet. In residential and some commercial structures, the ceiling is made of sheetrock and is a total loss at 0.5 feet of floodwater because of the absorption of water from the sheetrock and insulation in the walls. In commercial structures with a suspended ceiling, tiles are damaged at 4.0 feet of flooding, whereas the framing is not damaged because it is composed of capped aluminum.

Countertops - Water comes over countertops.

Building Information

Property Class: R - Residential
 Land Use: 101 - Residential 1 Family
 Sum of Structure Areas: 2,346
 # of Buildings (Cards): 2

Web Parcel Assessment Report

Card	Year Built	Stories	CG	Architectural Style	Exterior Wall	Basement Type	Square Footage (SFLA)	Building Value
1	1993	1	22	Bi-level/Split Foyer	Aluminum	Full	1,639	\$112,800
2	1955	1	11	Conventional	Frame	Crawl	707	\$28,300
							2,346	\$141,100

Card	Year Built	Attic	Fuel	Heat System	Heat/AC	Bedrooms	Full Baths	Half Baths	Total Rooms
1	1993	None	Gas	Warm Air	Central A/C	3	2	1	8
2	1955	None	None	None	None	1	1	1	2
						4	2	2	10

Other Building and Yard Improvements

Bldg/ Card #	Line	Type	Year Built	CG	Units	Size	Area	Replace Cost	Adjusted Replace Cost
1	1	Frame Utility Shed	2000	11	1	17x27	459	\$2,970	\$2,080
								459	\$2,970

Flood Zone Information [Learn more at WV Flood Tool](#)

Acres (c.)	Risk
1.57	High

This parcel appears to be in a HIGH RISK flood hazard zone.

<https://www.mapwv.gov/flood/map/?wkid=102100&x=-8654355&y=4779871&l=13&v=2>

Flood Risk Products (Cont.)

WV Flood Tool
Remember: When In Doubt, It's Not Out!

Views: Public Expert Risk MAP Layers: Risk Reference Basemaps Parcel Use PARCEL window

Flood Risk Building Info

Address	Parcel	Risk
Building # 1 in Parcel: 19-09-0011-0009-0016		
Flood Exposure for Building: 19-09-0011-0009-0016_1455		
Building Replacement Cost	\$28,900	
Content Cost	\$14,450	
Building Info		
Area:	1,871 sq ft Stories: 1	
Occupancy Class	RES1 (Single Family Dwelling)	
Year Built	1993 (Post-FIRM)	
Foundation Type	Solid Wall (View Photo)	
First Floor Height	8.0 ft above ground	
Water Depth-in-Structure	-4.2 ft (Subgrade Basement or Below LF)	
Flood Damage Estimates for Building: 19-09-0011-0009-0016_1455		
Building Damage Pct	0%	
Building Loss USD	\$0	
Content Damage Pct	0%	
Content Loss USD	\$0	
Inventory Damage Pct	0%	

Flood Risk Assessment Building Link

Flood Risk information
[Flood Risk Assessment](#)

Building Flood Loss Damage
0% of home damaged if First-Floor Height above 4-ft. Base Flood Water Depth and Lower Enclosure properly flood proofed

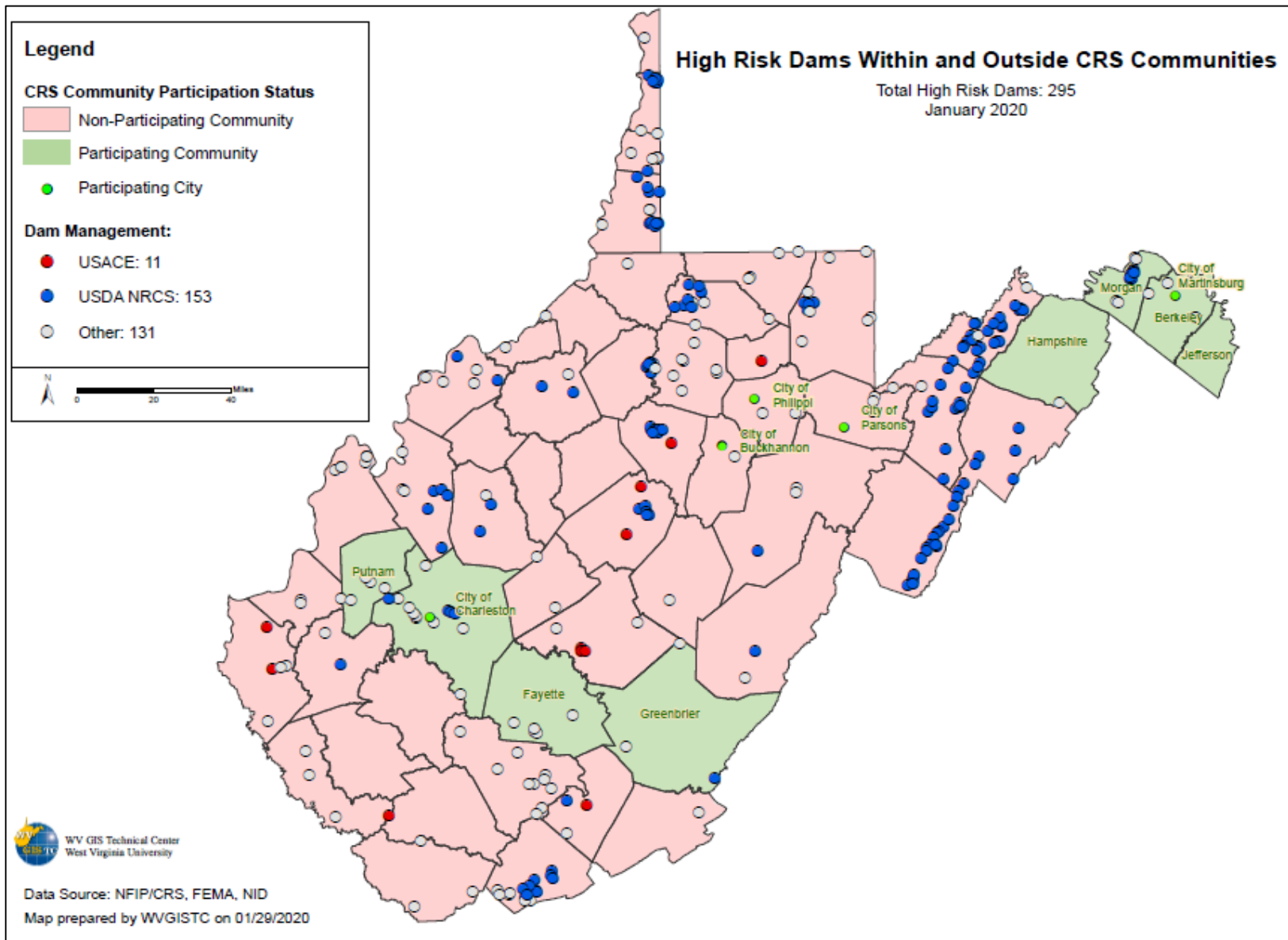
Scale: 1:2,257
x: -77.747139 y: 39.403751
©WVGIS/STC Leaf-Off Mixed-Resolution Imagery

Silver Jackets: Activity 2

Identify Communities Downstream of High-Risk Dams



High Risk Dams

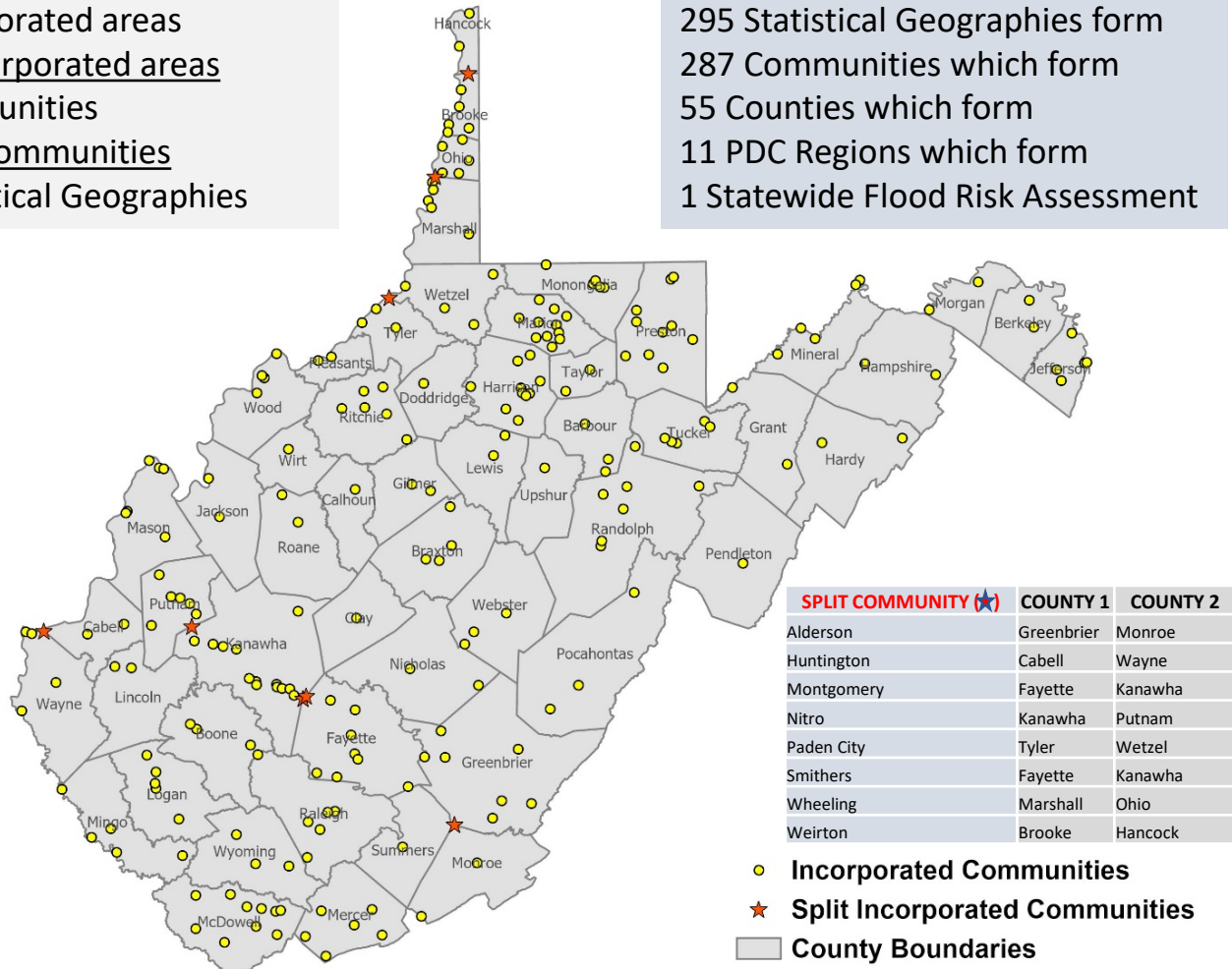


Community Boundaries / Statistical Units

Flood Risk Community Study Map

232 incorporated areas
+55 unincorporated areas
 287 Communities
+ 8 split communities
 295 Statistical Geographies

295 Statistical Geographies form
 287 Communities which form
 55 Counties which form
 11 PDC Regions which form
 1 Statewide Flood Risk Assessment



95% of WV Municipalities have Special Flood Hazard Areas (SFHA)

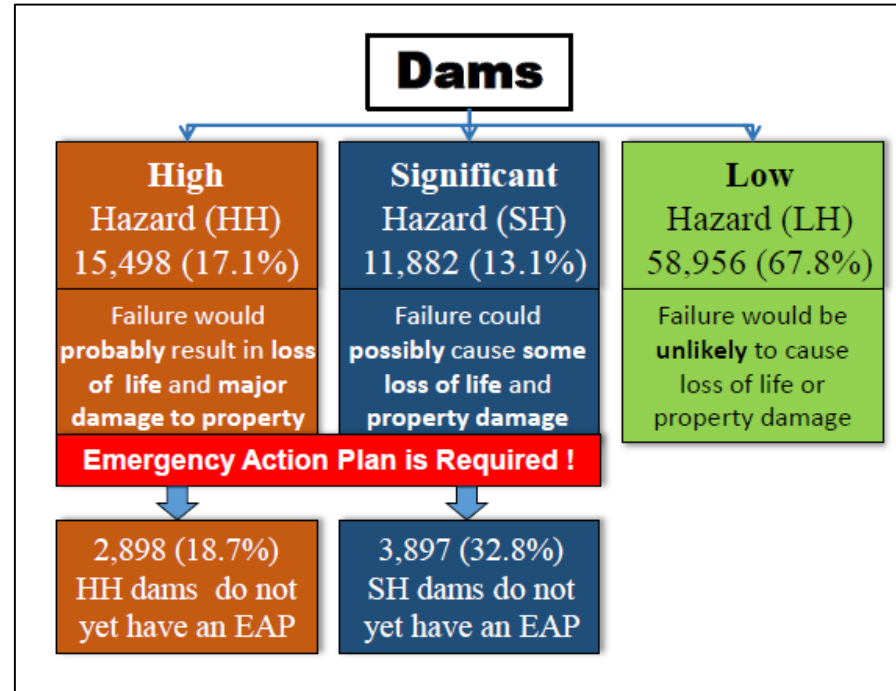
Communities Downstream of HH Dams

#	DAM NAME	RIVER	CITY	OWNER NAME	MAX. STORAGE	Downstream Communities (C1, C2, C3...n)					
						C1	C2	C3	C4	C5	C6
1	BLUESTONE DAM	NEW RIVER	HINTON	CELRH	631000	Hinton	Summers	Raleigh	Fayette	Thurmond	Oak Hill
2	SUMMERSVILLE DAM	GAULEY RIVER	SWISS	CELRH	413400	Nicholas	Fayette	Gauley Bridge	Smithers	Montgomery	Kanawha
3	TYGART DAM	TYGART RIVER	GRAFTON	CELRP	355000	Taylor	Grafton	Marion	Pleasant Valley	White Hall	Fairmont
4	SUMMERSVILLE DAM - DIKE NO. 2	GAULEY RIVER	SUMMERSVILLE	CELRH	283400	Nicholas	Fayette	Gauley Bridge	Smithers	Montgomery	Kanawha
5	SUTTON DAM	ELK RIVER	SUTTON	CELRH	265300	Braxton	Sutton	Gassaway	Clay	Clay	Kanawha
6	SUMMERSVILLE DAM - DIKE NO. 1	GAULEY RIVER	SUMMERSVILLE	CELRH	233400	Nicholas	Fayette	Kanawha	Clay	Gauley Bridge	Smithers
7	R D BAILEY DAM	GUYANDOT RIVER	JUSTICE	CELRH	203700	Wyoming	Mingo	Logan	Man	Logan	West Logan
8	STONEWALL JACKSON DAM	WEST FORK	BROWNSVILLE	CELRP	145000	Lewis	Weston	Harrison	West Milford	Clarksburg	Lumberport
9	EAST LYNN DAM	TWELVEPOLE CREEK	EAST LYNN	CELRH	82500	Wayne	Wayne	Ceredo	Kenova	Huntington	(?)
10	BURNSVILLE LAKE DAM	LITTLE KANAWHA RIVER	BURNSVILLE	CELRH	65900	Braxton	Burnsville	Gilmer	Sand Fork	Glenville	Calhoun
11	BEECH FORK LAKE DAM	BEECH FORK OF TWELVE POLE CK.	LAVALETTE	CELRH	37540	Wayne	Ceredo	Kenova	Cabell	Huntington	(?)

Communities downstream of USACE High Hazard Dams

High Hazard Dams

Community Rating System (CRS)	
** COUNTIES UNINCORPORATED **	
Berkeley	3
Greenbrier	5
Fayette	13
Hampshire	1
Jefferson	0
Kanawha	19
Morgan	15
Putnam	8
** MUNICIPALITIES **	
Buckhannon	0
Charleston	10
Martinsburg	1
Parsons	1
Philippi	1
<i>total Counties Unincorporated</i>	64
<i>total Municipalities</i>	13
<i>total HR DAMs - CRS communities</i>	77
<i>percentage</i>	21%



West Virginia CRS Communities Downstream of High Hazard Dams

Silver Jackets: Activity 3

Community Rating System

As a part of the National Flood Insurance Program (NFIP), the **Community Rating System** is a **voluntary incentive program** that recognizes and encourages community floodplain management activities that **exceed the minimum NFIP requirements**.

As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the Community Rating System



CRS 600 Series: Warning and Response

The 600 series of activities within the National Flood Insurance Program's (NFIP) Community Rating System (CRS) is focused on linkages between a community's emergency management mission/program and its voluntary CRS activities. These credited activities focus on the life safety aspect of a community's floodplain management program, particularly its **emergency management flood warning programs** and can result in additional CRS discounts for your citizens

CRS Activity 630- Dams

Table 110-2. Credit points awarded for CRS activities.*

Activity	Maximum Possible Points	Maximum Points Earned	Average Points Earned	Percentage of Communities Credited
300 Public Information Activities				
310 Elevation Certificates	116	116	38	96%
320 Map Information Service	90	90	73	85%
330 Outreach Projects	350	350	87	93%
340 Hazard Disclosure	80	62	14	84%
350 Flood Protection Information	125	125	38	87%
360 Flood Protection Assistance	110	100	55	41%
370 Flood Insurance Promotion ⁵	110	110	39	4%
400 Mapping and Regulations				
410 Flood Hazard Mapping	802	576	60	55%
420 Open Space Preservation	2,020	1,603	509	89%
430 Higher Regulatory Standards	2,042	1,335	270	100%
440 Flood Data Maintenance	222	249	115	95%
450 Stormwater Management	755	605	132	87%
500 Flood Damage Reduction Activities				
510 Floodplain Mgmt. Planning	622	514	175	64%
520 Acquisition and Relocation	2,250	1,999	195	28%
530 Flood Protection	1,800	541	73	13%
540 Drainage System Maintenance	570	454	218	43%
600 Warning and Response				
610 Flood Warning and Response	395	365	254	20%
620 Levees	235	207	157	0.5%
630 Dams	180	99	35	35%

* Figures are based on communities that have received verified credit under the 2013 *CRS Coordinator's Manual* (about 43% of CRS communities), as of October 2016. The maximum possible points are based on the 2013 *Coordinator's Manual*. Growth adjustments are not included.

REQUIREMENTS

- Advance notification of an impending flood (threat recognition)
- Warnings issued to the threatened population (warning)
- Steps taken to protect life and reduce losses (operations)
- Coordination with critical facilities (critical facilities planning)

PARTICIPATING ORGANIZATIONS

- USACE (Dam Owner)
- FEMA (CRS Program Coordinator)
- ISO / CRS Specialist
- State Dam Safety Office
- State NFIP / SHMO
- WV GIS Technical Center
- Emergency Management Office
- Floodplain Manager / Risk Planner

State-Based CRS Points

BASIC SCENARIO FOR ALL COMMUNITIES

CRS Series	CRS Activity	CRS Element	CRS Credit
Public Information Activities	310	Elevation Certificates	38
Public Information Activities	320	Map Information Services	90
Mapping and Regulations	430	Freeboard 2 Ft. (Higher Regulatory Standards)	225
Mapping and Regulations	440	Additional Map Data (Flood Data Maintenance)	154
Flood Damage Reduction Activities	510	Floodplain Management Planning (Hazard Mitigation Plan)	100
		<i>Basic Scenario Points for West Virginia</i>	<i>607</i>

POTENTIAL ADDITIONAL CRS POINTS

CRS Series	CRS Activity	CRS Element	CRS Credit Points
Public Information Activities	350	Flood Protection Information on Website	77
Mapping and Regulations	410	Advisory BFE (New Study)	130
Mapping and Regulations	420	Open Space Preservation	1,950
Flood Damage Reduction Activities	520	Acquisition & Relocation of Buildings	2,250
Warning and Response	630	High Hazard Dams	160
		<i>Potential Maximum Points</i>	<i>4,567</i>

CRS Program Data and Impact Adjustments	
Program Data and Impact Adjustments	Section
Buildings in the SFHA (bSF)	213a, 222
Acreeage of the SFHA (aSFHA)	213a, 222

Dams – WV Flood Tool

The screenshot displays the WV Flood Tool interface. The top navigation bar includes 'Views' (Public, Expert, Risk MAP), 'Layers' (Risk, Reference, Basemaps), 'Search' (Address: e.g., 123 street name, city, state, zip), and 'Tools'. The 'Risk MAP' view is active, showing a map of Hardy County, West Virginia, with a dam and a landslide highlighted. The map shows the Lost River and the Lost River #4 Dam. A yellow box labeled 'Dam' is placed over the dam, and a grey box labeled 'Landslide' is placed over a landslide area. The interface includes a left sidebar with various layers and a right sidebar with a layer information panel for 'Landslides'.

WV Flood Tool
Remember: When In Doubt, It's Not Out!

Views: Public, Expert, Risk MAP
Layers: Risk, Reference, Basemaps
Search: Address: e.g., 123 street name, city, state, zip
Tools: [Icons for various tools]

BUILDING-LEVEL RISK: 100-YEAR FLOOD

- CRITICAL INFRASTRUCTURE
 - Essential Facilities
 - Community Assets
 - Historic Structures
 - Dams
 - Render By: Hazard Level Owner
 - Levees
- HIGH WATER MARKS & STREAM GAGES
- OTHER NATURAL HAZARDS
 - Landslides
- FLOOD DEPTH
- OPEN SPACE PRESERVED (CRS Credits)
- PRIMARY FLOOD HAZARD LAYERS
- PRELIMINARY FLOOD HAZARD LAYERS
- OTHER FLOOD ZONE SYMBOLOGY
- MISCELLANEOUS LAYERS

* indicates that data is from FEMA
[Show Legend](#)

Layer Name: Landslides

Movement Type	SLD
Creation Date	3/15/2019
Identify Date	3/15/2019
DEM Source	1M - 2016-17 FEMA R3 Lidar WV Northeast
Comments	-
Web Link	West Virginia Landslide Tool
Zoom to	

<https://www.mapwv.gov/flood/map/?wkid=102100&x=-8771562&y=4715438&l=7&v=2>

*Dam are viewable in RiskMAP View
Hardy County, West Virginia*

CRS Activity 630 - Dams

631.a. Activity Description

The maximum credit for Activity 630 is 160 points.

This activity provides credit to communities that would be affected by the failure of an upstream high-hazard-potential dam. State definitions of a high-hazard-potential dam vary, and may include potential damage to buildings or property. However, all state definitions of high-hazard-potential dams include or refer to probably loss of life if there is a failure of the dam.

Credit is provided under five elements:

- The state's dam safety program that sets construction, maintenance, and data provision standards for dams (credited under SDS),
- A system to advise local emergency managers of a potential dam failure (credited under DFR),
- A warning system for the areas downstream of the dam (credited under DFW),
- A plan of action to minimize the threat to life and property during the flood (credited under DFO), and
- Coordination with critical facility operators (credited under DCF).

High-hazard-potential Dams

"Dams assigned the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life."

—*Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams*, 2004, by the Interagency Committee on Dam Safety

CRS Activity 630- Dams

Dams

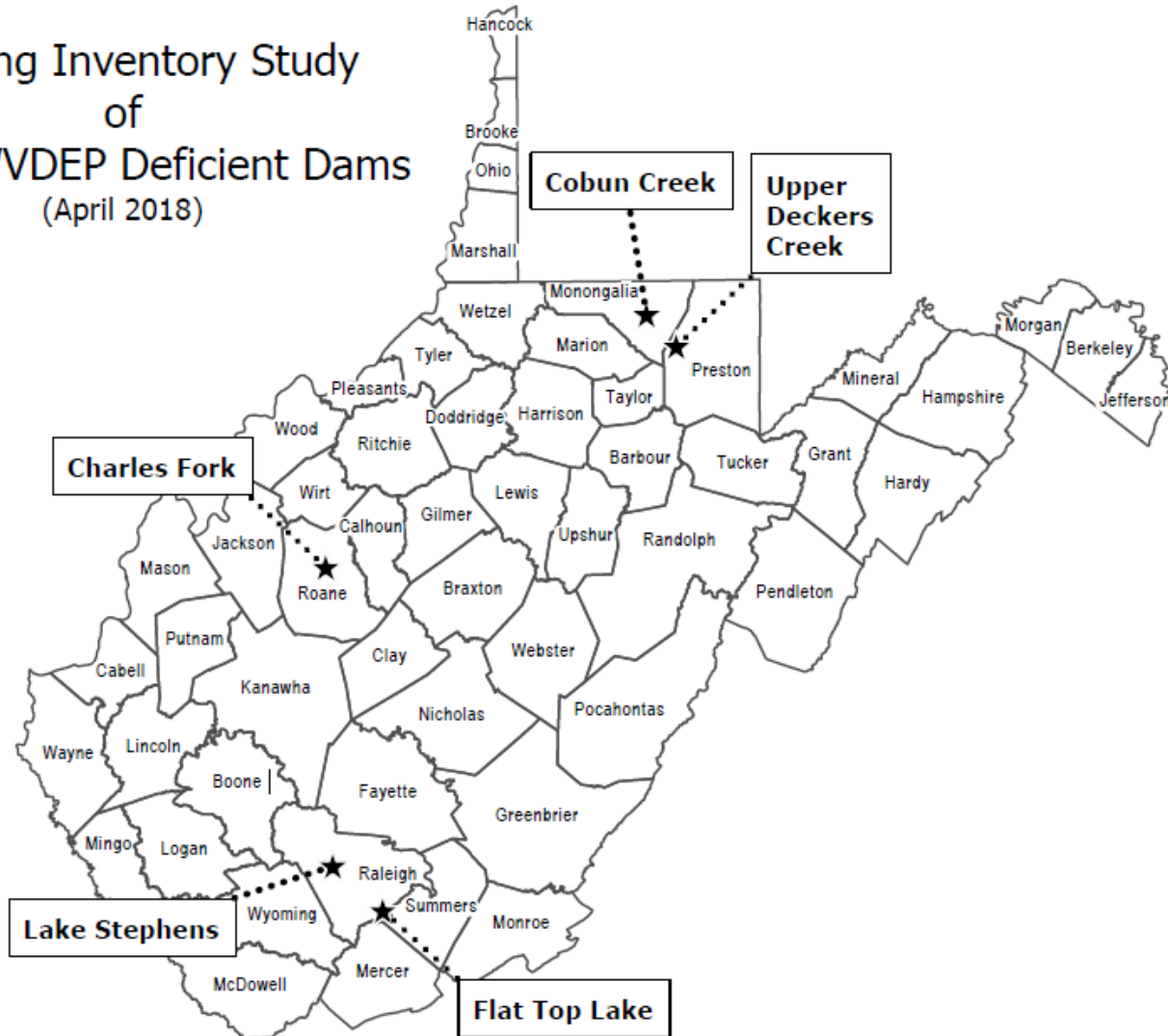
- (2) The community must submit a description of the dam failure threat, including the following for each high-hazard-potential dam that affects the community. The first three items should be available from the state's dam safety office. If they are not available from the state or the owner of the dam, the community may have to develop the information and document it.
- (a) A general description of the dam, including its distance upstream from the community;
 - (b) A dam failure inundation or evacuation map;
 - (c) Dam failure flood hazard data, including the arrival time of flood waters at different locations and peak elevations of the dam failure flood;
 - (d) **An inventory of the types of buildings** (residential, commercial, etc.) exposed to dam failure flooding with an approximate count of the number of buildings and an inventory of the land use (residential, agricultural, open space, etc.) of developed and undeveloped areas within the dam failure inundation or evacuation area for each high-hazard-potential dam;
 - (e) **A list of the critical facilities** that would be flooded or otherwise affected by a failure of the dam; and
 - (f) The expected impacts of dam failure flooding on health and safety; community functions, such as police and utility services; and the potential for secondary hazards.

Local governments may have completed a risk assessment that meets this criterion as part of their floodplain management or hazard mitigation plan credited under Activity 510. If not, the community can complete the CRS Community Self Assessment described in Section 240 of the *CRS Coordinator's Manual*. The products from either of these efforts should provide the basis for the dam failure flood hazard description.

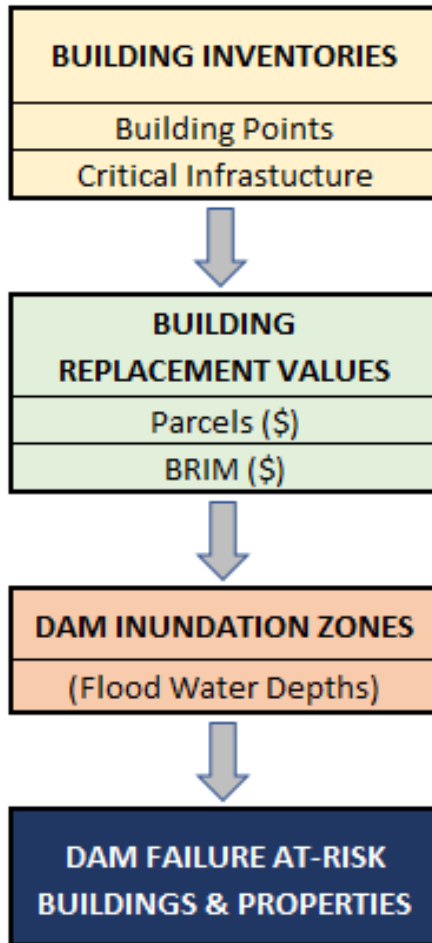
This credit criterion is a prerequisite for Class 4 communities.

Building Inventories – Deficient Dams

Building Inventory Study of Select WVDEP Deficient Dams (April 2018)

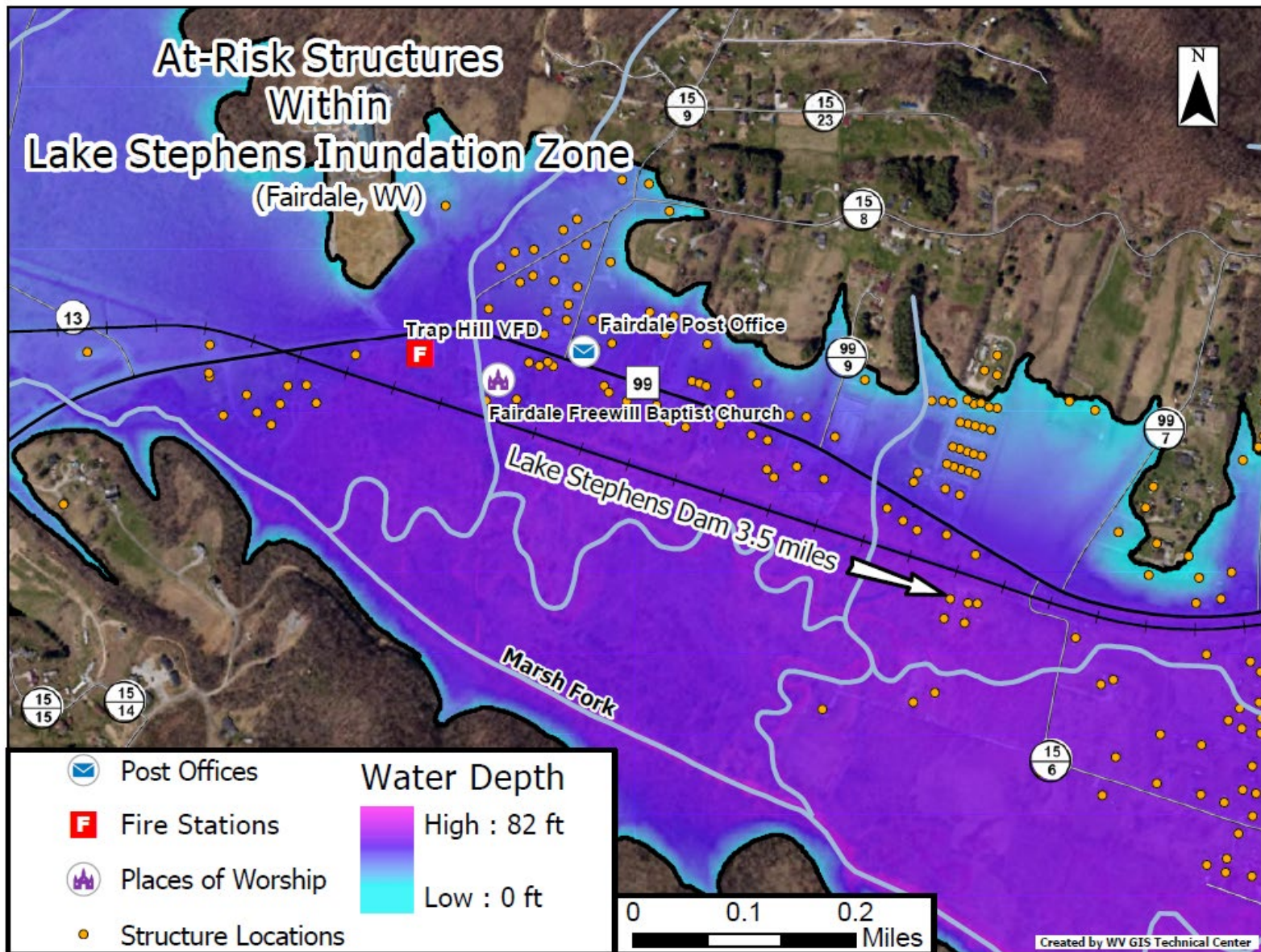


Building Inventories – Deficient Dams



Category	Charles Fork #17 Dam	Cobun Creek Dam	Flat Top Lake Dam	Lake Stephens Dam	Upper Deckers #1 Dam
Hazard Potential Classification	High Risk	Significant Risk	High Risk	High Risk	Significant Risk
WV DEP Deficient Dams / Rank	T1 / 5		T1 / 14	T1 / 7	
Flood Inundation Area (sq. mi.)	3.06	0.04	3.38	4.91	1.55
Flood Inundation Area (acres)	1955	23	2164	3141	995
River or Stream	Charles Fork	Cobun Creek	Beaverpond Branch	Stephens Branch	Decker's Creek
Watershed	Little Kanawha	Upper Monongahela	Lower New	Coal	Upper Monongahela
County	Roane	Monongalia	Raleigh	Raleigh	Preston
Community and distance (mi)	Spencer (2 miles)	Morgantown (1 mile)	Cool Ridge (1 mile)	Surveyor (1 mile)	Arthurdale (1 mile)
Owner	City of Spencer	Morgantown Utility Board	Flat Top Lake Assoc.	Raleigh County Rec. Authority	Monongahela SCD
# Structures	983	7	252	1,071	188
Building Type - % Residential	58%	29%	85%	80%	75%
Building Type - % Farm	16%	0%	9%	5%	12%
Building Type - % Commercial / Industrial	13%	57%	1%	12%	9%
Building Type - % Other	13%	14%	5%	3%	4%
At-Risk Building Exposure Value (\$)	\$33,821,000	\$83,900	\$11,244,500	\$27,286,500	\$7,465,600
# Critical Facilities	7	0	1	5	0
Critical Facilities Exposure Value (\$)	\$2,025,500		\$203,300	\$1,175,800	
# Parcels Intersecting Inundation Zone	1,253	25	478	2,063	277
Land Use Type - % Vacant / Open Space	24%	68%	23%	44%	28%
Land Use Type - % Residential	40%	0%	45%	34%	50%
Land Use Type - % Agriculture	14%	0%	20%	8%	10%
Land Use Type - % Commercial / Industrial	9%	28%	5%	2%	8%
Land Use Type - % Other	13%	4%	7%	11%	5%

Building Inventories – Deficient Dams



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