DRAFT WATERSHED PLAN – ENVIRONMENTAL ASSESSMENT

VOLUNTARY FLOODPLAIN BUYOUT ALONG ELKHORN CREEK/TUG FORK RIVER

McDowell County, West Virginia

Photo Source: West Virginia Department of Environmental Protection, North Fork of Elkhorn Creek Watershed Based Plan

WVU LAW
Land Use and Sustainable Development Law Clinic

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

SPONSORING LOCAL ORGANIZATIONS:
McDowell County Commission
Southern Conservation District of West Virginia

SPONSORED AND PREPARED BY:
Land Use and Sustainable Development Law Clinic, West Virginia University College of Law

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Fly Sheet

Document:	Draft Watershed Plan, Draft Environmental Assessment (Plan-EA)
Title of Proposed Action:	Voluntary Floodplain Buyout
Location:	McDowell County, West Virginia, Third Congressional District
Sponsoring Agencies:	McDowell County Commission Southern Conservation District of West Virginia Land Use and Sustainable Development Law Clinic at West Virginia College of Law
Lead Agency:	U.S.D.A. Natural Resources Conservation Service
Cooperating Agencies:	U.S. Army Corps of Engineers

Authority: This plan is prepared under the authority of the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566), as amended.

Abstract: Residents in the Elkhorn Creek/Tug Fork River Watershed (Elkhorn/Tug Fork Watershed) are subjected to repetitive flooding because of concentrated development in the floodplain. The West Virginia Flood Tool and supplemental information were used to quantify flood damages for 128 homes, structures, and outbuildings to determine a cost-effective solution. The watershed is distressed, with low per capita income and very low housing values. No structural measures were feasible in addressing the flooding problem. The recommended solution is a voluntary floodplain buyout for approximately 30 properties. Total project cost is $2.8 million. The benefit-to-cost ratio is 1.7 to 1.0.

Contact Information for Comments and Inquiries on this Plan-EA: Pamela Yost, Watershed Economist, Natural Resources Conservation Service, United Department of Agriculture; 1550 Earl Core Road, Suite 200 Morgantown, WV 26505, (304) 284-7572, pamela.yost@usda.gov. Comments and inquiries must be received by June 1, 2022.

Contact Information for Landowner Questions on Applications: Staci Thornsbury, Staff Attorney, Land Use and Sustainable Development Law Clinic, West Virginia University College of Law, Office G4, 1 Law School Drive, Morgantown, WV 26505, (304) 293-8840, elkhornwatershed@mail.wvu.edu.

This plan was prepared by the Land Use and Sustainable Development Law Clinic at West Virginia University College of Law in cooperation with Sponsoring Local Organizations the McDowell County Commission and the Southern Conservation District of West Virginia.

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For

Elkhorn Creek/Tug Fork River

Watershed

Voluntary Floodplain Buyout

McDowell County, West Virginia

Congressional District #3

Sponsors

This plan was prepared by the Land Use and Sustainable Development Law Clinic at West Virginia University College of Law in cooperation with Sponsoring Local Organizations the McDowell County Commission and the Southern Conservation District of West Virginia.

Project Authorization

The Elkhorn Creek/Tug Fork River Watershed (Elkhorn/Tug Fork Watershed) project is planned for implementation under the authority of Public Law 83-566, Watershed and Flood Prevention Act (16 U.S.C. § 1001-1008, et. seq.) 1954.

Project Location

Elkhorn Creek/Tug Fork River Watershed, McDowell County, West Virginia.

Preferred Alternative

The *preferred alternative* is a voluntary floodplain buyout.

Purpose and Need for Action

The purpose of this project is flood prevention and flood damage reduction. There is a need to address repetitive flood damage to properties in the Elkhorn/Tug Fork Watershed.

Description of the Preferred Alternative

The *preferred alternative* is a voluntary floodplain buyout to remove houses from the floodplain. An estimated 310 properties will be eligible for buyout consideration, with an anticipted 30 residential properties ultimately being acquired after the application and ranking processes. As each participating property is identified, the impacts and benefits of each property will undergo site-specific review in an Environmental Evaluation, Form CPA-52, tiered to this Plan-EA. Properties in the program would be demolished, and the floodplain would be returned to natural floodplain conditions. In-ground infrastructure, such as septic systems, would be removed or stabilized as appropriate.

Resource Information

- Latitude 37.432892, Longitude -81.584549 (Welch)
- Hydrologic Unit Code: 0507020102[1]
- Humid, continental climate
- Watershed size: 210,347 acres (329 square miles)[2]
- Land uses: 87% forest, 7% developed, 5% other, 1% agriculture, within the watershed[3]
- Land ownership: 100% privately owned properties along Elkhorn Creek proposed for purchase; watershed-wide, 0% federal, 9.4% state/local, 90.6% privately[4]; notably, 62% owned by absentee corporations for timber and coal extraction within the watershed[5]
- Topography: Steep mountains with narrow ridgetops and deep valleys
- Population and demographics: McDowell County population of 18,233, declining 17.5% from 2010 to 2018; per capita income $14,259; poverty rate 38%[6]
- Resource concerns: flood damage, health and safety, water quality, watershed resiliency, riparian and stream habitat, social and economic sustainability, floodplain management, cultural resources, environmental justice
- No environmental mitigation measures are anticipated for this project

Alternative Plans Considered

Alternative 1, No Action: No Action consists of no works of improvement and no reduction in current or future flood damage. Alternative 2, Voluntary Floodplain Buyout: A voluntary buyout of approximately 30 residences that are the most vulnerable will reduce flood damage and improve human health and safety.

Project Costs (by Purpose and Funding)

Table A: Project Costs
Elkhorn Creek/Tug Fork River Watershed Plan-EA

Cost Component	PL83-566 Funds	Other Funds
Construction	$ 800,000	$0
Engineering	$ 70,300	$0
Real Property Rights	$1,209,000	$0
Relocation Payments	$ 675,000	$0
Project Administration	$ 63,300	$7,000
Total	$2,817,600 (99.7%)	$7,000 (.3%)

Project Benefits

The project will yield monetary and other benefits because perpetual flood damage will be reduced for properties acquired through voluntary floodplain buyout. Specifically, such benefits will include improved water quality due to removal of raw sewage discharges from houses, reduced flood debris load, avoided costs to restore damaged houses, avoided costs to obtain temporary housing during flood restoration, and reduced costs to the NFIP program due to discontinued need for policies. Nonmonetary benefits include improved human health and safety, reduced emergency service needs, improved potential for recreational use of Elkhorn Creek and Tug Fork River, improved

environmental justice, better floodplain function, improved habitat, improved watershed resiliency, improved quality of life, and other nonmonetary benefits.

Number of direct beneficiaries: an estimated 72 onsite beneficiaries in the approximately 30 residences to be acquired; 1,700 offsite beneficiaries in Welch and downstream communities that will have reduced flood debris, improved water quality, and reduced emergency service needs

Benefit-to-cost ratio (2.75% discount rate): 1.7 to 1.0

Net Economic Benefits

$60,000

Funding Schedule

(budget year +5)

Year	Federal fiscal year	Activities					Federal funds	Nonfederal funds
1	2021	outreach, application, ranking, design, contracting					$ 500,000.00	$ 7,000.00
2	2022	property acquisition steps					$1,200,000.00	$ -
3	2023	demolition and restoration					$1,200,000.00	$ -
4	2024	demolition and restoration					$ 114,600.00	$ -
5	2025	project completion					$ 10,000.00	$ -
						Subtotal	$2,817,600.00	$ 7,000.00
						Total	$2,824,600.00	

Tiering to the Plan-EA

The Voluntary Floodplain Buyout Along Elkhorn/Tug Fork Watershed is in the planning stage. Through the process described in this Plan-EA, and with considerable support from local and state agencies, NRCS has developed a list of 310 properties that will meet the sponsors' objectives. All of these properties and their respective communities have received a planning-level analysis to ensure that potential buyout of each property appears capable of reducing flood damage.

As the specific property owners who will voluntarily choose to participate in the program have not yet been identified, though approximately 30 participating properties are expected to be acquired, a tiered approach has been taken in this Plan-EA to enable site-specific review of each participating property after those properties have been identified. This document intends to present an analysis in sufficient detail to allow implementation of a proposed action within the *project area* with minimal additional NEPA analysis.

Tiering is a staged approach to NEPA, as described in the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500 to 1508). Broad programs and issues are described in initial analyses, while site-specific proposals and impacts are described in subsequent site-specific studies. The tiered process permits the lead agency to focus on issues that are ripe for decision and exclude from consideration issues already decided or not yet ripe.

This Plan-EA, then, serves as the planning-level analysis of environmental impacts and benefits from the commitment of NRCS technical and financial assistance funds. Discussions focus on the Elkhorn Creek/Tug Fork River-wide environmental setting, preliminary cost estimates, and general areawide impacts. NRCS will complete an Environmental Evaluation (EE), using Form NRCS-CPA-52, tiered to this Plan-EA for site-specific review of each property that is brought forward for participation in the buyout. The EE process determines if a particular individual site and project meets applicable project specifications and whether the site-specific environmental effects are consistent with those as described and developed in this Plan-EA.

In the design phase, the sponsors will develop objective and clearly delineated ranking criteria to inform application materials provided by property owners interested in participating in the buyout. This will enable objectively prioritizing buyout properties to maximize the project's purpose of reducing flood damage. Objective criteria may include, but are not limited to, flood depth, location within the regulatory floodway, location within the Special Flood Hazard Area, the presence and nature of structures located on the property, contiguous properties, and community ingress and egress.

Project Life

Project evaluated at FY 2020 water resources project discount rate of 2.75% for 100 years.

Environmental Impacts

[Section reserved until public comment period ends.]

Major Conclusions

[Section reserved until public comment period ends.]

Areas of Controversy

[Section reserved until public comment period ends.]

Issues to be Resolved

[Section reserved until public comment period ends.]

Evidence of Unusual Congressional or Local Interest

[Section reserved until public comment period ends.]

Is this report in compliance with executive orders, public laws, and other statutes governing the formulation of water resources projects? √ yes ___ no

1.0 PURPOSE AND NEED FOR ACTION

The purpose of this project is to reduce flood damage along Elkhorn Creek and Tug Fork Creek. This project will reduce both physical and economic harm to individuals and communities from flood events and enhance floodplain resiliency in the *project area*. There is a need to address repetitive flood damage to properties in the Elkhorn/Tug Fork Watershed (Hydrologic Unit 0507020102).

2.0 SCOPE OF ENVIRONMENTAL ASSESSMENT

This section documents the range of issues and impacts considered during planning. The concerns identified during project scoping are summarized in Table 2.1. The degree of concern and relevance to the *preferred alternative* were determined by the consensus of the planning team, otherwise referred to as planners. A project scoping meeting was held at Twin Falls State Park on October 16, 2018. The Notice of Intent to begin planning was published in the Beckley Register Herald, Welch News, and the Bluefield Daily Telegraph newspapers and on the NRCS website. Letters were mailed or emailed to resource agencies, local leaders, and stakeholders.

Fifteen individuals attended the scoping meeting, representing federal, state, and local stakeholders. Additional information was requested by the Environmental Protection Agency, the West Virginia Department of Health and Human Resources, and the West Virginia State Historic Preservation Office, as representatives of these agencies were unable to attend the scoping meeting.

Table 2.1: Summary of Concerns and Rationale

ITEM/CONCERN	Relevant to the *preferred alternative*?		RATIONALE
	YES	NO	
Flooding	X		Project purpose; chronic flooding resulting in severe property damage; loss of life.
Public Health and Safety	X		Emergency services required during floods.
Erosion & Sediment		X	Best Management Practices will be used during the demolition phase of the project to minimize short-term erosion and sediment impacts. Long-term reduction in erosion and sediment may be realized as streambanks return to natural vegetation.
Prime or Other Important Farmland		X	This resource does not exist in the *project area*. Refer to Web Soil Survey available at https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm and appended maps.
Water Quality	X		Concentrated housing in floodplains lacks sewage treatment, resulting in high amounts of fecal coliform in streams; Elkhorn Creek and Tug Fork River are on the WVDEP 303(d) list for fecal coliform contamination; project impacts will improve water quality and reduce pollution to jurisdictional waters of the U.S. and Wetlands.
Water Quantity		X	The project involves removing existing homes, revegetating the sites, not clearing new land, and not creating new development; therefore, the proposed action would have negligible impacts to water quantity.
Regional Water Management Plans & Coastal Zone Management Areas		X	West Virginia is a landlocked state with no Coastal Zone Management Area-designated coastal areas. McDowell County is not subject to any regional water management plans.

ITEM/CONCERN	Relevant to the *preferred alternative*?		RATIONALE
	YES	NO	
Floodplain Management	X		Dense development in floodplains due to topography; project involves a voluntary removal of at-risk structures within flood-prone areas, increased floodplain resiliency, and directing residential development outside of floodplain; McDowell County Commission seeks compatible use of floodplains that will economically and socially benefit residents; sponsors request consistent, practical terms for mitigated properties across NRCS, FEMA, USACE.
Wetlands, Waters of the U.S.	X		Not identified as a resource concern but project is anticipated to have positive impacts.
Wild and Scenic Rivers		X	None present in the *project area*.[1]
Air Quality		X	Not included in state non-attainment area.
Invasive Plant Species		X	Kudzu is widespread throughout the watershed, but project will not substantially increase or decrease species; proactive removal of invasive species will take place where practicable in concert with other remediation activities in the *project area*; best management practices will be standard, and site monitoring will occur.
Invasive Animal Species		X	Emerald Ash Borer present in area; project will have no appreciable effects on known or unknown invasive species.
Natural Areas		X	No designated areas.[2]
Riparian Areas	X		Project anticipated to have incidental positive impacts.
Fish & Wildlife Habitat	X		Streambank development degrades fish habitat, denudes vegetation, increases stream temperature, and displaces riparian habitat; project anticipated to have incidental positive impacts.
Coral Reefs		X	Not applicable, as West Virginia is a land-locked state that does not drain directly into waters containing coral reefs.

ITEM/CONCERN	Relevant to the *preferred alternative*?		RATIONALE
	YES	NO	
Threatened & Endangered Plants		X	Potential for Northeastern Bulrush, Virginia Spiraea, and Running Buffalo Clover to exist in watershed, but unlikely in residential settings. The project is removing existing homes and revegetating the sites, not clearing new land and not creating new development; therefore, the proposed action would have negligible impacts to threatened and endangered plants. USFWS consultation and findings will occur during review of Plan-EA.
Threatened & Endangered Animals		X	Potential for Big Sandy Crayfish, Guyandotte Crayfish, Rusty Patch Bumble Bee, Indiana Bat, Gray Bat, Northern Long-eared Bat, and Red Knot Bird to exist in watershed, but unlikely in residential settings. The project is removing existing homes and revegetating the sites, not clearing new land, and not creating new development; therefore, the proposed action would have negligible impacts to threatened and endangered animals. USFWS consultation and findings will occur during review of the Plan-EA.
Forest Resources		X	The project involves removing existing homes and revegetating the sites, not clearing new land and not creating new development; therefore, the proposed action would have negligible impacts to forest resources.
Migratory Birds		X	Migratory bird species might be present, but he project involves removing existing homes and revegetating the sites, not clearing new land and not creating new development; therefore, the proposed action would have negligible impacts to migratory birds.
Cultural Resources	X		Consultation is ongoing with WVSHPO, tribes, and historical societies.

ITEM/CONCERN	Relevant to the *preferred alternative*?		RATIONALE
	YES	NO	
Environmental Justice	X		Watershed demographics indicate high poverty rates, low educational levels, high disability rates, chronic unemployment, high rates of opioid addiction; McDowell County is designated as economically distressed by Appalachian Regional Commission; project will be implemented in disadvantaged areas.
Ecological Critical Areas		X	This resource does not exist in the project area. No federal or state ecologically critical areas are shown on the appended maps.
Regional Water Plan		X	The project is removing existing homes and revegetating the sites, not clearing new land and not creating new development; therefore, the proposed action would have negligible impacts on the WVDEP Water Management Plan.
National Parks, Monuments, Historical Sites		X	This resource does not exist in the project area. No federal or state parks, monuments, or historic sites are shown on the appended maps.
Parklands, Scenic Areas		X	None located in the *project area*.
Significant Scientific Features		X	None located in the *project area*.
Recreation		X	Project would directly affect only residential properties and would not adversely impact recreational facilities.
Social and Economic Conditions	X		Resource concerns identified by McDowell County Commission: lack of affordable, quality housing may cause applicants to move from area; flood-free housing sites not available due to absentee corporate land holdings; community cohesion may diminish; tax base and utility customer base could be negatively impacted if participants move from area. Scope of the project is intentionally small to minimize social and economic disruption and maximize the ability of sponsors to afford project responsibilities.

3.0 AFFECTED ENVIRONMENT

The *project area*, for purposes of this project, is the Elkhorn/Tug Fork Watershed located in McDowell County, West Virginia.

3.1 Floodwater Damage

Floods and flood impacts have been documented in West Virginia since the earliest settlements. Indeed, "[f]lood-producing extreme precipitation over the rugged topography is the costliest and most severe natural hazard for the state."[1] In addition to creating safety and public health hazards, floods result in loss of life. Floods are the leading cause of death from natural disasters in the United States. Between 1960 and 1996, there were 252 deaths from floods or flash floods in West Virginia. This is more than any other state except Texas (619) and California (258). If the 125 deaths caused by the Buffalo Creek disaster in 1972 were excluded, West Virginia would still rank tenth in flood fatalities during this period. Six people perished in southern West Virginia during the July 2001 flood.[2] Twenty-three people were killed in the June 2016 flood in central and southern West Virginia watersheds. It is well established by both data and anecdotal accounts that West Virginia has a long history of deaths, mental trauma, and property damage attributable to flooding.

In just eight years, from 1996 to 2004, West Virginia had 16 federal disaster declarations involving flooding. All 55 counties were included in at least one of those declarations. The costs associated with these events have been substantial, with the Federal Emergency Management Agency (FEMA) disbursing over $500 million in assistance payments for property damage in West Virginia during this time period.[3] Like the varied and severe adverse impacts from flooding experienced across the state of West Virginia, flooding in McDowell County has been frequent, tragic, and costly. In the last four decades, there have been at least 17 federal disaster declarations related to flooding in McDowell County.[4]

For the flood of 1977, associated with disaster declaration #531, "[t]owns along Tug Fork were under 20 to 25 ft of water from Welch [located at the confluence of Elkhorn Creek and the Tug Fork River] to Fort Gay. Some small communities were almost completely inundated." For example, waters in the town of Litwar (within the *project area*) reached a peak stage of 27.37 feet, which is 5.7 feet higher than its previous maximum stage recorded in 1957. Damages for the flood were estimated by the United States Army Corps of Engineers (USACE) at more than $50 million in the Tug Fork basin.[5]

More recently, McDowell County and neighboring counties were subject to two severe flood events in quick succession, in July of 2001 and May of 2002. As reported in the New York Times,

> [o]n Sunday, July 8, 2001 disastrous flash floods struck McDowell and surrounding counties in southern West Virginia. The waters raged down the area's narrow valleys with such force that houses were torn from their foundations and entire communities were devastated. The flooding left more than 1,200 McDowell County residents homeless and damaged an estimated 1,500 structures within the county. Approximately 650 residential and business structures suffered significant damage. The county was declared a federal disaster area. In this region prone to flash floods, this particular episode was called the worst in a century.[6]

On July 8, 2001, the discharge at the United States Geological Survey gage #03212750, Tug Fork downstream of Elkhorn Creek at Welch, West Virginia, was 11,500 cubic feet per second (cfs), while the mean daily discharge for July 8, at the same gage station since 1984 is only 227 (cfs).[7]

Approximately 10 months later, disaster struck McDowell County again. As reported by the New York Times,

> [o]n May 2, 2002, floods resulting from severe storms in the area "killed 6 people in the county while destroying close to 200 homes and flooding more than 2,000 others."[8] Clearly, dangerous and damaging flood events have repeatedly impacted the Elkhorn Creek/Tug Fork River Watershed in McDowell County, West Virginia: the mountainous terrain and narrow ridge tops of the area funnel these watersheds' discharges down steep slopes to narrow valley floors dissected by tributaries and streams, making the floodplains in this area particularly susceptible to flash flooding and high velocity runoff.

On May 2, 2002, the discharge at the United States Geological Survey gage #03212750, Tug Fork downstream of Elkhorn Creek at Welch, West Virginia, was 13,100 cfs, while the mean daily discharge for May 2 at the same gage station, since 1984, is only 483 cfs.[9]

McDowell County experienced $3 million per year in average annual losses due to flooding from 1960 through 2012, according to NOAA's National Climatic Data Center and the United States Geological Survey's (USGS) National Geophysical Data Center.[10]

Homes are continually inundated with floodwaters, perpetuating the cycle of flood, recovery, and repair. Residents are in danger during each flood event, as waters rise unpredictably and often too quickly for evacuation. Opportunities for housing to be improved and modernized are not realized because financial and other resources are continuously in flood-recovery mode.

Frequent flooding occurs in the project area and causes major damage to structures and infrastructure. NRCS used the WV Flood Tool and information from the WVU GIS Tech Center, the McDowell County Tax Assessor's records, and FEMA to estimate damages in the Special Flood Hazard Area, with increased emphasis on residences in the regulatory floodway. Properties were evaluated on flood depth, the age of the residence, type of construction, number of stories, presence or absence of a basement, relative elevation of the first floor to ground elevation, location of the housing relative to the stream, frequency of flooding, ingress and egress to the residence, value of the residence, value of the contents of the residence, outbuildings, significant exterior factors such as swimming pools, and other factors. Examples of the WV Flood Tool outputs are included in Appendix D. The following table focuses on those properties likely residential in nature, based on aerial views of the properties.

Table 3.1: Residential Flooding at Proposed Project Sites

Proposed Project Sites	**Structures Evaluated**	**Structures Flooded at 10-Year Storm**	**Structures Flooded at 50-Year Storm**	**Structures Flooded at 100-Year Storm**
Hunting Shirt Bottom	18	0	10	17
Panther	10	0	8	9
Big Sandy	29	10	18	19
Roderfield	19	1	8	13
Vivian Bottom, Landgraff, Eckman	52	19	27	30
Total	128	30	71	88

3.2 Public Health and Safety

Residents currently live in flood-prone areas. In particular, the elderly, disabled, and young are most at risk, especially with flash flooding. Flash flooding–quickly rising waters with little warning–is of concern in this watershed. The watershed's topography, with steep hillsides and narrow streams, makes the area susceptible to flash floods. Furthermore, during a flood event of any sort, primary escape routes also may flood, thus making vehicle travel or other travel dangerous, and perhaps impossible. The limited ingress and egress points to *proposed project sites* by emergency services or for evacuation of residents is a serious risk to human health and safety. For example, Hunting Shirt Bottom has one point of ingress and egress with roads that have been 19 feet under water. All other *proposed project sites* also have one point of egress/ingress that either crosses a river or is otherwise within the regulatory floodway. Route 52, the highway providing access to all communities is also, at points, within the regulatory floodway.

In addition to existing public health and safety concerns from flooding, there are also public health concerns from the practice of straight-piping by existing homes. Straight-piping is the process of using pipes, most commonly PVC, to discharge wastewater from toilets, sinks, bathing facilities, and washing machines directly into streams. Additional information on the presence of fecal coliform from inadequate wastewater treatment is discussed in the water quality section below.

3.3 Water Quality

Beyond the severe threat to life and property posed by floods and flood impacts in the Elkhorn/Tug Fork Watershed, the lack of wastewater infrastructure also results in a water resource challenge for the area's residents. According to the McDowell County Coalition 2005 Wastewater Treatment Plan, "approximately 7,480 homes in McDowell County have inadequate wastewater treatment, and the vast majority of these are straight-pipes discharging waste directly into rivers and streams."[11] Raw sewage being discharged into waterways by straight-piping has been identified as "the biggest threat in water supplies throughout southern West Virginia . . . by a long shot."[12] Visualized in Figures 3.1 and 3.2, this practice causes high fecal bacteria counts in the county's water bodies, leading to public health threats and generally deterring economic development. Maps illustrating wastewater infrastructure are included in Appendix C.

Figures 3.1 and 3.2: Images of Straight-piping

Straight-pipes and faulty sewage collection systems cause raw sewage discharge into Elkhorn Creek. Due to topography and settlement patterns, traditional sewage collection systems are not cost effective in many areas. Furthermore, existing systems are stressed due to the continual decline in population and the resulting lack of funds for basic maintenance and future upgrades. Individual household septic tanks and drainfields require space that is not available due to mountainous terrain and narrow floodplains. Raw sewage sometimes is visible in Elkhorn Creek, presenting a public health hazard and discouraging direct contact with the stream for recreation.

Elkhorn Creek was included on West Virginia's 303(d) list of impaired waters for 2016 (the most recent list available). Per its inclusion on this list, the bulk of Elkhorn Creek has biological impairment, from the mouth of the creek to River Mile (RM) 19.5. The entire length, 22.7 miles, is impaired for iron. The entirety of North Fork of Elkhorn Creek, a length of eight miles, is impaired for fecal coliform. In 2002, WVDEP developed a TMDL for metals and pH for all of the Elkhorn/Tug Fork Watershed. The TMDL did not address fecal coliform. An unnamed tributary of Elkhorn Creek, at RM 20.15, is impaired by selenium along its entire length of 0.8 miles. Iron, aluminum, manganese, and zinc have all been attributed to mining in the region.

As for the main stem of the Tug Fork itself, it was included on the 2016 303(d) list for fecal coliform for its entire length. It was included on the same list for biological impairment from RM 27.5 to its headwaters. The Tug Fork was included for the same impairments and the same reach description for the 303(d) list in 2014 and 2012.

Many of the areas of focus for this study lie outside of places that are served by public wastewater collection and treatment systems. As such, it is commonly understood that virtually all residences not served by public wastewater systems have failing or inadequate septic systems or lack septic systems altogether. The *project area* homes' contribution to fecal coliform water quality impairment is evident, particularly given their location adjacent to waterways.

3.4 Floodplain Management

Within the watershed, many homes and related community infrastructure are located in the floodplain. Specifically, the Special Flood Hazard Area (SFHA) is the 100-year floodplain (sometimes referred to as base flood or 1% annual chance flood), the area with a 1% chance of flooding within a given year. Similarly, the 500-year floodplain is the area with a 0.2% change of flooding within a given year. To this end, Executive Order (EO) 11988 requires that federal agencies like NRCS examine alternatives to avoid adverse effects and incompatible development in floodplains.

West Virginia has developed a statewide flood plan, and its continued implementation could be key to ameliorate flood problems. This plan has the goals of, *inter alia*, reducing loss of life, reducing property damage, protecting waterway and floodplain environments, and reducing personal and economic losses to flooding. McDowell County, in which most of the Elkhorn/Tug Fork Watershed lies, has a building permit program with bearing on permissible construction in the floodplain. Portions of the *project area* are within the regulatory floodway.

3.5 Wetlands and Waters of the United States

Elkhorn Creek is a tributary of the Tug Fork and is within the Ohio River and Mississippi River water systems. According to local folklore, Elkhorn Creek was named after an incident in which a pioneer displayed an elk's horn near the creek's mouth. Elkhorn Creek is sometimes referred to as Elkhorn Fork or Elkhorn River.

Elkhorn Creek is situated almost entirely in McDowell County, with a small portion of the watershed originating in Mercer County, just south of Coaldale. There are numerous tributaries of Elkhorn Creek, including Mill Creek and Big Branch.

The Tug Fork, a tributary of the Big Sandy River, originates south of Jenkinjones in McDowell County, along the Virginia-West Virginia border. The Tug was named in the mid-1770s when a small number of "Virginians and Cherokees conducted war raids against the Shawnee. At one point [the raiding group] killed and ate two buffaloes and hung their hides on a tree. Later they returned and, being out of provisions, took the hides and cut them into thin strips called 'tugs,' which they roasted and ate."[18]

The confluence of Elkhorn Creek and the Tug Fork is in downtown Welch, the county seat of McDowell County. The Tug Fork continues through McDowell County into Davy, then joins the Dry Fork in Iaeger before continuing into Mingo County, where the Tug Fork serves as the border between Kentucky and West Virginia.

McDowell County is drained largely by the Elkhorn/Tug Fork Watershed. A small area of McDowell County, near the Mercer County line, is located within the Crane Creek Watershed. A project map is located in Appendix B.

While the locations of the main stem of the Tug Fork River in McDowell County and of Elkhorn Creek itself and its tributaries are well established, wetlands are not extensively found or documented in the watershed. To the extent wetlands once existed, they were converted for residential, commercial, industrial, or similar use.

Elkhorn Creek itself rises in eastern McDowell County, West Virginia, with a small portion rising in western Mercer County, West Virginia. It flows in a westerly direction to its confluence with the Tug Fork River at Welch, West Virginia. From Welch, the Tug Fork River flows in a westerly direction, draining much of McDowell County. The Tug Fork River continues to flow in a northwesterly direction once it leaves McDowell County and the *project area*. The Tug Fork and Elkhorn Creek are part of the waters of the United States.

3.6 Riparian Areas

Riparian areas in the subject watershed are a combination of developed lots for commercial and industrial use; residential areas with lawns and gardens; and vacant, abandoned, or unused property. Streambanks in residential communities have light to moderate vegetation. In areas of heavier commercial or industrial use (current and former), vegetation is sparse. Streambanks outside of populated areas are more heavily vegetated given reduced development. The watershed is not experiencing an appreciable influx of new development.

3.7 Fish and Wildlife Habitat

Along the entire length, Elkhorn Creek is plagued with raw sewage discharge and household garbage. Many segments of the Tug Fork are the same. Fish and wildlife habitats suffer as a result. Elkhorn Creek, however, boasts an unusual population of rainbow and brown trout. Owing to consistently cool discharges from old coal mines, these fish populations are able to spawn naturally. The presence of the trout is considered an anomaly, not an indicator of overall favorable stream health. Nevertheless, the presence of trout indicates potential for enhanced fish and wildlife habitat if measures are taken to eliminate sources of pollution.

3.8 Cultural and Historic Resources

This Plan-EA is taking a phased approach to addressing cultural resources. After initial review and consultation with SHPO, it has been determined that no previously known archaeological sites are within the floodplain itself. Additional cultural resource survey will be required upon definition of each individual area of potential effect. For each property enrolled in this program, NRCS West Virginia will follow the process as specified in 36 CFR 800.4. For any properties determined to be eligible for inclusion within the National Register of Historic Places, NRCS West Virginia will resolve adverse effects in accordance with 36 CFR 800.5-6.

Where construction has not yet begun and a cultural resource is discovered after Section 106 review is complete, NRCS West Virginia shall consult to seek avoidance or minimization strategies in consultation with SHPO, interested Indian Tribes, and other consulting parties to resolve adverse effects in accordance with 36 CFR Part 800.6. If a potential historic property is discovered or unanticipated effects to historic properties are found after implementation, installation, or construction has begun, then NRCS West Virginia will halt all work and proceed with the post-review discoveries in accordance with 36 CFR 800.13.

When human remains are discovered, NRCS West Virginia will follow all applicable federal, tribal, and state burial laws and ordinances, including the Native American Graves Protection and Repatriation Act, and implementing regulations, when on tribal or federal lands, and related human rights and health statutes, where appropriate. NRCS West Virginia will also refer to the Advisory Council on Historic Preservation's (AHCP) Policy Statement regarding Treatment of Burial Sites, Human Remains and Funerary Objects and the ACHP's Section 106 Archaeology Guidance. NRCS West Virginia will also follow USDA and NRCS policy on treatment of human remains and consultation.

Additionally, the watershed has numerous communities with a history of coal mining. Much of the housing and the related built environment is associated with coal camps from the early to mid-twentieth century.

3.9 Environmental Justice

McDowell County ranks in the 95th percentile for distressed conditions, indicating the population and geographic area have experienced environmental injustices. Poverty is much higher at 32% than the West Virginia rate of 19% and the national rate of 12%. Median household income at $25,595 in McDowell County is far below the West Virginia rate of $44,061 and less than half the national rate of $57,652. McDowell County is categorized as having “persistent poverty” by the U.S. Census.[25]

McDowell County is one of the most racially diverse counties in West Virginia. The 2015 U.S. Census estimates indicate that 89.1% of the population in McDowell County is White and 9.4% is African-American or Black, which is the second-highest African-American population percentage in the state. There was a high influx of African-Americans migrating to Southern West Virginia in the early 20th century to work in the coal industry. However, the African-American population has declined by nearly two percentage points since 2000. Less than 2% of the population identified as being more than one race.

Until recently, the community of Keystone had an African-American majority population; however, the 2016 U.S. Census estimates that African-Americans comprised 47% of the population, down from 76% in 2010. The Town of Kimball is 63% African-American, which is the highest percentage for an incorporated community in the state.

McDowell County is rated *low* for resiliency according to the Hazards & Vulnerability Research Institute.[13] The baseline resilience indicator (BRIC) score of 2.4 ranks McDowell County 58th lowest out of 3,142 counties nationwide. The BRIC score is a composite score that evaluates resilience to natural disasters based on social, economic, community capital, institutional, infrastructural, and environmental attributes. Specifically, McDowell County ranks 8th lowest in the United States in social resiliency and 34th lowest in economic resiliency.

Spatial Hazard Events and Losses Database for the United States (SHELDUS) data and maps illustrate the magnitude of flooding and other hazards in McDowell County. As shown in Figure 3.3, flooding is by far the costliest hazard in the State of West Virginia and, in turn, McDowell County is the most hazardous county in the state in terms of cost.

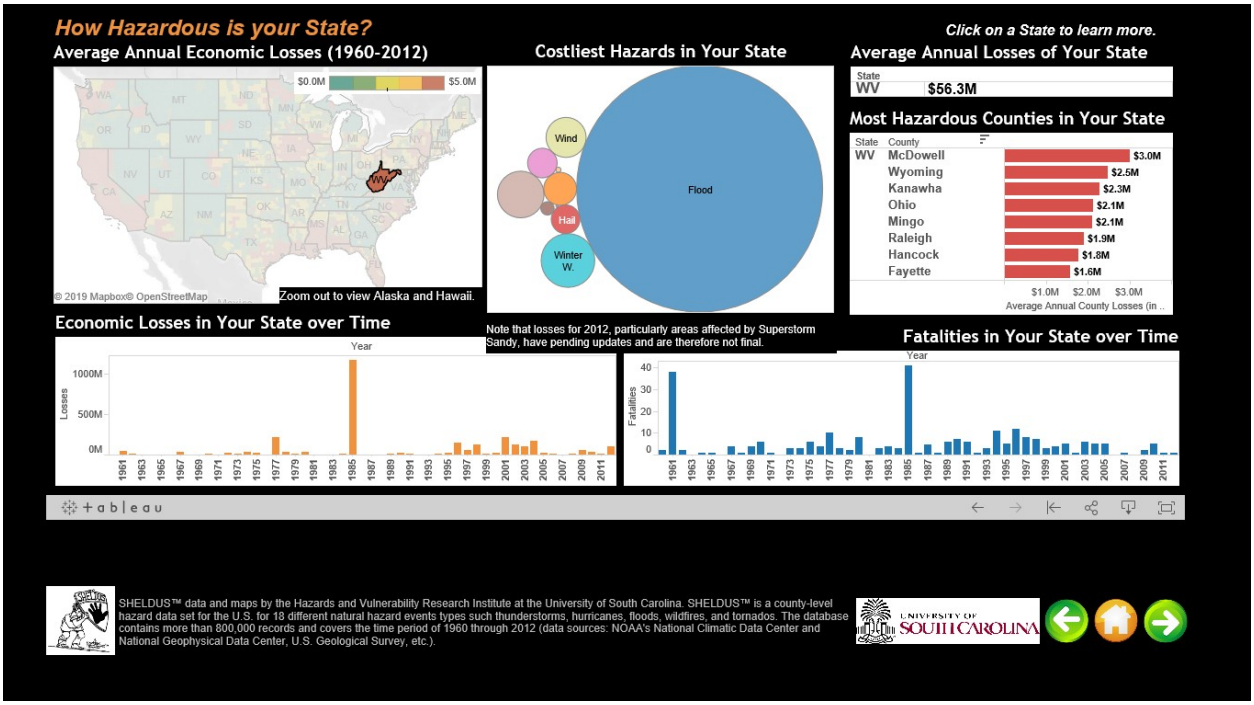


Figure 3.3: SHELDUS Data on West Virginia Hazards

McDowell County is also rated in the top 20% of all counties nationwide for social vulnerability to environmental hazards (SoVI score).[14] Social vulnerability refers to "the characteristics of a person or

group and their situation that influence their capacity to anticipate, cope with, resist, or recover from the impact of a hazard." Social vulnerability is most apparent after a hazard event has occurred, when different patterns of suffering and recovery are observed among certain groups in the population, e.g. the aged, the poor, minorities. Such groups may not only be the least prepared for an emergency but also often live in more hazardous locations or in substandard housing, have the fewest resources, and lack the knowledge or a sense of political efficacy to claim access to resources to assist in recovery.[15]

"Social Vulnerability Analysis (SVA) describes the relationship between social characteristics and vulnerability to hazards (better documenting who is at risk) and the distribution of tangible and intangible hazard effects (primarily focusing on impacts described in the Other Social Effects account)."[16] Refer to Figures 3.4 and 3.5 for nationwide SoVI scores and resilience values for the relevant area.

Economic resilience is also low in McDowell County, as illustrated by a 2019 study commissioned by the Appalachian Regional Commission.[17] The county is among the least resilient due to a host of factors, such as age distribution, workforce participation, high disability rates, lack of local economic diversity, outmigration, low educational levels, and other determinants. Withstanding and recovering from chronic flooding is more difficult in areas that lack economic, social, and environmental resilience.

Figure 3.4: Social Vulnerability to Environmental Hazards

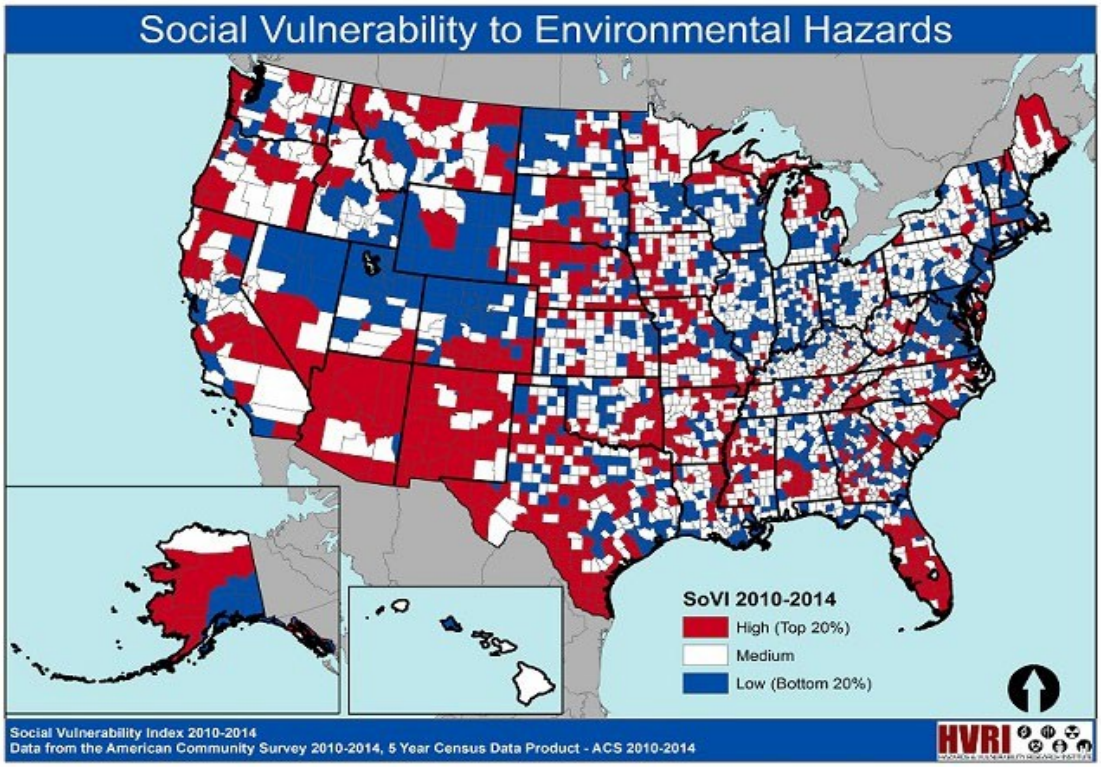
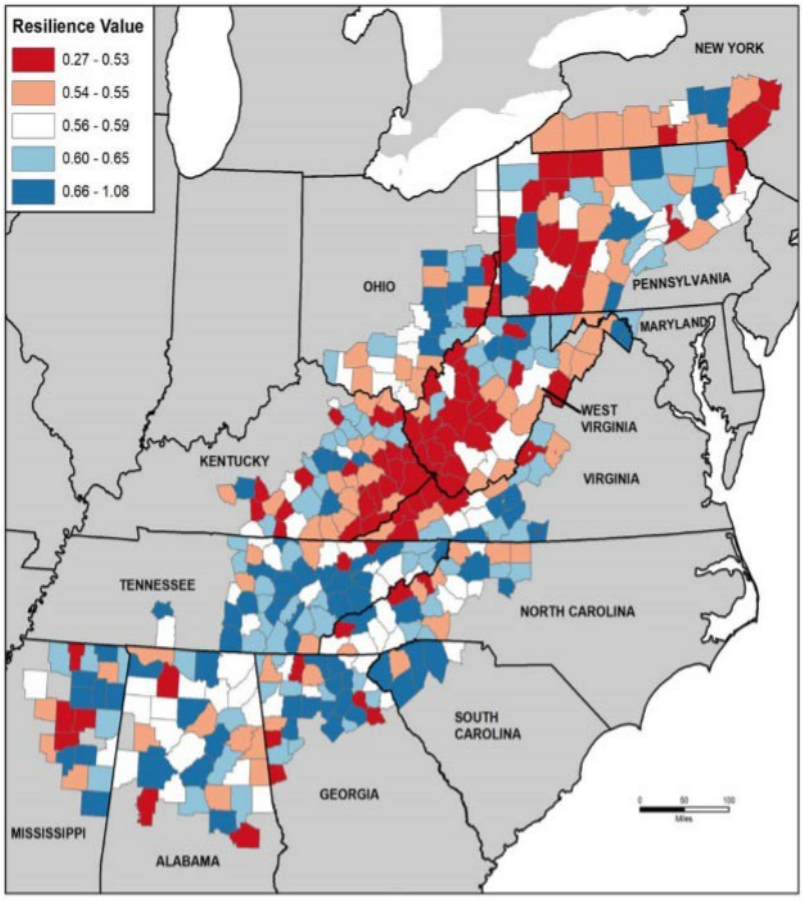


Figure 3.5: Resilience Values in Appalachia



3.10 Social and Economic Conditions

Population

The Elkhorn/Tug Fork Watershed spans across the northern portion of McDowell County. The county was robust and flourishing in the early to mid-1900s, but like many areas rich in natural resources, McDowell County has been subject to the boom-bust cycles of extractive industries. McDowell County started to experience a decline in population in the 1950s and has been steadily losing population ever since. In 2017, the population of McDowell County was estimated at 18,233, down 17.5% from the 2010 U.S. Census count of 22,100. During the same time period, the State of West Virginia experienced only a 2% decrease in population. Regional population centers near the watershed include Charleston, West Virginia (105 miles from Welch); Beckley, West Virginia (49 miles); and Bluefield, West Virginia (33 miles). Welch is the largest municipality in the watershed with an estimated population of 1,700 people.[23] Ethnicity characteristics of McDowell County are representative of the smaller geographic area being considered. Race is 89% white, 10% black, and 1% other. All populations, including minority populations, in the watershed are environmental justice populations.

Income

The Appalachian Regional Commission has designated McDowell County as "distressed."[24] The per capita income of McDowell County is less than half of the per capita income of the United States and less than 40% of the per capita income of West Virginia. The following statistics in Table 3.2 show economic and other conditions in the county.

Table 3.2: Demographic Characteristics McDowell County, West Virginia

Item	United States	West Virginia	McDowell Co.
Per Capita Income	$29,829	$24,002	$14,259
Unemployment Rate	7.40%	7.50%	12.70%
Poverty Rate	15.10%	17.70%	37.60%
Population with Bachelor's Degree or Higher	18.80%	11.90%	3%

Housing

Median housing values in McDowell County are significantly lower than state and national averages. Table 3.3 shows the median value of a home in McDowell County as $34,800, which is 70% less than the median home value for the State of West Virginia. The disparity is even greater when compared to the median home value in the United States at $193,500; the McDowell County median home value is 18% of the national median.

Table 3.3: Housing Values McDowell County, West Virginia

Item	United States	West Virginia	McDowell Co.
Median Home Value	$193,500	$111,600	$34,800

Sixty percent of housing in McDowell County is valued below $50,000. By contrast, less than 20% of housing in West Virginia and less than 10% of housing in the country is valued below $50,000.

McDowell County has the highest housing vacancy rate in West Virginia. According to the 2017 American Community Survey estimates, 31.4%, or roughly 3,500 of the county's 11,228 housing units, were vacant.[25] By contrast, the statewide housing vacancy rate is 17%, while the national average is 12%. The City of Keystone, which is within the Elkhorn/Tug Fork Watershed, has the highest vacancy rate in the county, with 71% of all housing units being categorized as "vacant." Vacant units include both habitable and uninhabitable structures.

Although McDowell County currently lacks a formal code enforcement program or inventory of vacant and uninhabitable structures, many structures appear uninhabitable due to visible evidence of structural decay, prior flooding impacts, and fire damage.

Land in McDowell County is largely owned by corporate entities for the purposes of coal, mineral, and timber extraction. Corporate land is held as a long-term investment, typically irrespective of current market conditions for coal or timber. As a result, land outside the floodplain is generally unavailable to local residents, preventing new home construction elsewhere in the Elkhorn/Tug Fork Watershed. Existing housing is subject to repeated flooding and remains so, with few options to move

to flood-free areas. The lack of access to developable land is a concern for local sponsors and an impediment to comprehensive community planning.

Census reports show a precipitous decline in population in McDowell County. Many social and economic factors are at play in this trend, including the decline of the coal industry; lack of diversification in the local economy; high unemployment; dwindling tax base and, consequently, reduced basic local services; and repeated natural disasters in the form of flooding. All aspects of the community are affected by population loss. Public service districts and schools are experiencing decline as residents move from the area. Property tax revenues and local retail sales continue to decline. Community cohesion continues to erode as churches, civic organizations, volunteer fire departments, and other organizations decrease in membership. Opportunities such as a floodplain buyout are of concern to local sponsors to the extent they may accelerate outmigration.

3.11 Additional Background Information

McDowell County Information

McDowell County is the southernmost county in West Virginia and is 535 square miles in size. Approximately 60% of the land in McDowell County is within the Elkhorn/Tug Fork Watershed.

There are several unincorporated and eight incorporated communities in the Elkhorn/Tug Fork Watershed McDowell County communities in the watershed are concentrated in narrow valley bottoms along Elkhorn Creek and Tug Fork. Incorporated communities in the Elkhorn/Tug Fork Watershed include:

- Anawalt
- Davy
- Gary
- Iaeger
- Keystone
- Kimball
- Northfork
- Welch

At 875 feet above sea level, the lowest point in the Elkhorn/Tug Fork Watershed is at the confluence of the Tug Fork and Fourpole Creek in the western part of McDowell County. Flat Top Mountain, in the eastern part of McDowell County, near Mercer and Wyoming Counties, has the highest elevation in the county at 3,400 feet above sea level.[19]

Climate

Although there is no climate data available for McDowell County, the humid, continental-type climate found in the region is characterized by sharp temperature contrasts, both seasonal and, frequently, day-to-day. In nearby Pineville, West Virginia, the average snowfall is nearly 21 inches per year, while total precipitation averages 46 inches per year, with the highest rainfall totals found in the late spring and early summer. Temperatures range from an average daily high of 83 degrees Fahrenheit in July and August to an average daily low of 23 degrees Fahrenheit in January. The average annual temperature is 53.3 degrees Fahrenheit.

Land Use

The Elkhorn/Tug Fork Watershed is comprised of approximately 210,347 acres (329 square miles) of primarily forestland. Developed land, agricultural land, and other land comprise only 13% of the watershed land use.

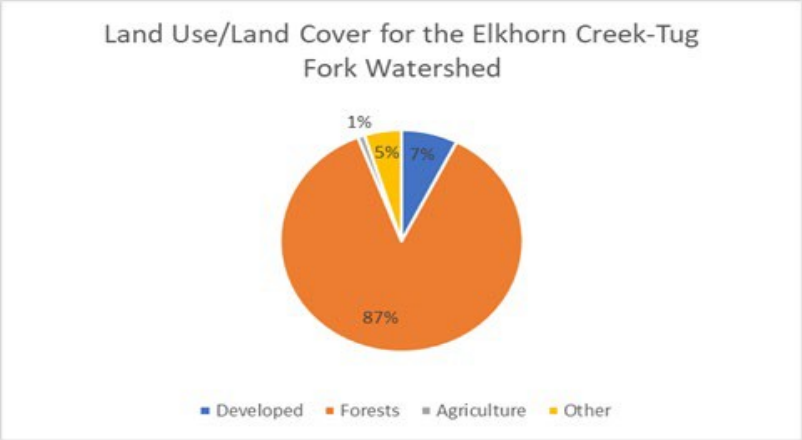


Figure 3.6: Land Use/Land Cover for the Elkhorn/Tug Fork River Watershed

Farming is not prevalent in the watershed due to the topography; however, during the county's comprehensive planning process, participants indicated a desire for more small-scale agriculture in the county.

According to the 2013 report, "Who Owns West Virginia?" published by the West Virginia Center on Budget & Policy and the American Friends Service Committee, the top 10 landowners in McDowell County owned 62.7% of the county's private land. In 2013, the total surface acreage in McDowell County held by the top 10 largest landowners was 182,806 out of a total 341,747 acres.[20]

McDowell County is dominated by steep forested hillsides that are largely undeveloped, with narrow floodplains along streams, where development has historically occurred. Roads, utilities, homes, and commercial activities are concentrated in floodplains and have been subject to chronic flooding. In both 2001 and 2002, there was significant damage in the Elkhorn/Tug Fork Watershed due to severe flood events. These two flood events caused loss of life and millions of dollars in damage.

Land use within the county is primarily forestland. Agricultural production is scarce due to steep slopes. The terrain severely limits development to floodplains and restricts access within and outside the region. The floodplains along narrow streams provide the least challenging building sites, so most of the population is crowded into these valleys. Development patterns were established in the late 1800s and early 1900s, centralized around coal mining operations. For more information on mining, see sections below on geological attributes and soils.

Geological Attributes

The Elkhorn/Tug Fork Watershed is in the Appalachian Plateau physiographic area. The topography is typical of a partially dissected plateau. McDowell County's natural landforms are the result of erosion acting over the millennia dissecting sedimentary rock. The topography of McDowell County

is dominated by very steep mountain side slopes that lie below ridgetops that can be either gently sloping or very steep. Narrow, nearly level, and gently sloping floodplains occur along many of the streams.

Surface rocks in the area are principally confined to the New River Formation of the Pennsylvania Pottsville Formation. The New River Formation is composed of sandstone, shale, coal, and impure fire clay. Sandstone is predominant, making up approximately 63% of the strata. Sandstone is generally massive, hard, siliceous, and forms prominent cliffs that influence the topography. The Pocahontas Formation of the Pottsville Group makes up 19% of McDowell County. The Pocahontas Formation is characterized by sandstone with some shale, siltstone, and coal. The last significant geologic unit is the Kanawha Formation, which is also part of the Pottsville Group. The Kanawha Formation is distinguished by several marine zones that are found in the formation and exhibits a higher frequency of shale.

The principal commercial mineral resource in McDowell County is coal. Mining began on a large scale around 1900 and has continued, with boom and bust cycles, to the present. Within the Elkhorn/Tug Fork Watershed, there are two different coalfields. One coalfield is found along the eastern portion of the watershed and is described as "low volatile bituminous." The western part of the watershed exhibits "medium to high volatile bituminous coal," which is more commonly found in West Virginia.[21]

McDowell County does not contain any karst features. Karst is characterized by soluble rock, such as limestone, and is highly susceptible to land fissures, sinkholes, and caverns.

The county's many mining sites could cause subsidence issues in the form of lateral or vertical movement of land. The McDowell County Public Service District (PSD) has indicated that underground mine subsidence is a concern throughout the county and could have a negative impact on public water quality.

Soils

According to the NRCS Web Soil Survey, the most common soil map units found in McDowell County are the following:

Pineville-Berks association (PBF) found in 80.4% of the county

The Pineville series make up 40% of the map unit and consist of very deep, well-drained soils that formed in acid colluvial material that moved downslope from soils on uplands underlain by sandstone and shale. These soils are typically found on mountain side slopes and foot slopes.

The Berks series make up 35% of the map unit and consist of moderately deep, well-drained soils that formed in material weathered from interbedded siltstone and shale. These soils are on side slopes and ridgetops throughout most of the county. Slopes range from 35% to 80%.

Kaymine-Cedarcreek Matewan (KcF) found in 5% of the county

The Kaymine series make up 35% of the map unit and consist of very deep, well-drained soils that formed in partially weathered siltstone, sandstone, shale, and some coal from surface mining coal. These soils are reclaimed lands on benches and side slopes throughout the county. Slope ranges from 0% to 80%. Kaymine soils are associated on the landscape with the well-drained Cedarcreek soils.

The Cedarcreek series make up 25% of the map unit and consist of very deep, well-drained soils that formed in partially weathered sandstone, siltstone, shale, and some coal from surface mining. These soils are reclaimed lands on ridgetops, benches, and side slopes throughout the county.

The Matewan series make up 20% of the map unit and consists of moderately deep, well-drained soils that formed in sandstone. These soils are on ridgetops in the county. Slope ranges from 35% to 65%.

Berks-Rock outcrop complex (BrF) found in 4.4% of the county

The Berks series make up 50% of the map unit and consist of the moderately deep, well-drained Berks soils and outcrops that formed in shale and siltstone on hillslopes and on mountain sides along the Tug Fork and Dry Fork Rivers. This soil complex is about 50% Berks soil, 30% Rock outcrop, and 20% included soils.

Rock outcrops of shale and siltstone make up 30% of the map unit. Slopes range from 35% to more than 80%. The areas of Berks soil and Rock outcrop are so intermingled on the landscape that it was not practical to map them separately.

Gilpin and Lily soils (GIE) found in 4.0% of the county

The Gilpin series make up 40% of the map unit and consist of moderately deep, well-drained soils that formed in material weathered from interbedded shale, siltstone, and sandstone. These soils are on ridgetops throughout the county. Slope ranges from 15% to 35%.

The Lily series make up 40% of the map unit and consist of moderately deep, well-drained soils that formed in material weathered from sandstone and some interbedded siltstone. These soils are on ridgetops and lower side slopes throughout the county. Slope ranges from 3% to 35%.[22]

Recreation

There are several existing recreational amenities in McDowell County. Expanding existing amenities and creating new recreational opportunities in McDowell County were prioritized by community members during the county's comprehensive planning process.

Recreational amenities in the county include Wildlife Management Areas (WMAs), parks, golf, fishing, ATV trails, and other outdoor activities. McDowell County is home to four WMAs: Berwind Lake (85 acres), Anawalt Lake (1,792 acres), Tug Fork (2,165 acres), and Panther (7,820 acres). All of the WMAs, except for Berwind Lake, are within the Elkhorn/Tug Fork Watershed. WMAs are designed to conserve and manage high quality habitats for a variety of wildlife species and are intended to provide residents with quality recreational options for hunting, fishing, hiking, and other outdoor activities. In particular, fishing can be found in a few areas in McDowell County. The Elkhorn is one of the few streams in the state that has a thriving wild population of rainbow and brown trout.

The Hatfield-McCoy Trail System is a world-class ATV trail system and a foundational component of McDowell's tourism economy. The Hatfield-McCoy Trail (HMT) System is a 700-mile, off-highway vehicle trail system located across six southern West Virginia counties. The trail system was established by the West Virginia Legislature in 2000 and is administered by the Hatfield-McCoy Regional Recreation Authority. The trail system is open daily to all-terrain vehicles (ATVs), dirt bikes, and utility vehicles. The HMT is the second largest off-highway vehicle trail in the world and the most continuous trail system east of the Mississippi River.

4.0 ALTERNATIVES

Alternatives and impacts were evaluated using the procedures outlined in the *National Watershed Program Manual*; Title 390, Part 501; the *National Planning Procedures Handbook, Principles, Requirements, and Guidelines* (PR&G); the National Environmental Policy Act (NEPA); and other watershed planning policies and procedures.

Alternatives were developed based on NRCS planning requirements and the ability of the alternatives to address the purpose and need of the project. Alternatives were considered for completeness, effectiveness, efficiency, and acceptability. Alternatives that advanced to a detailed level of analysis were compared to the Future Without Project Condition (No Action) for environmental, social, and economic impacts. Alternatives analysis was an iterative process where all reasonable alternatives were considered then revisited and refined as additional information became known about the cost, feasibility, and effectiveness of the alternative.

4.1 No-action Alternative, Alternative 1, No Action – Future Without Project Condition (FWOP)

This alternative involves taking no action and allowing the existing conditions to remain. Under this alternative, properties will continue to experience chronic flooding. Financial, social, and environmental impacts of flooding will continue. People living in the floodplain will continue to be exposed to the potential dangers of flooding. There will be no improvements to Elkhorn Creek water quality achieved through remediation of straight-pipes from streamside homes. Natural floodplain functions will not be restored. There will be no improvement to stream access and no enhancement to the recreational potential of Elkhorn Creek. Individual and community resilience will not be improved as areas continue the cycle of flooding and recovery. Federal, state, and local agencies will continue to spend money and resources on recovery, diverting funds from more sustainable opportunities. No adaptation to climate change will occur. Health and mental welfare will not be improved as residents experience continued flooding and fear of flooding. Economic and social stress due to flooding will not be reduced.

4.2 Agency Preferred Alternative, Alternative 2, Voluntary Floodplain Buyout

A voluntary floodplain buyout was studied in detail, based on the successful outcomes of other voluntary buyouts in West Virginia. Preliminary costs and benefits were based on the Dunloup Creek Watershed Project and a limited number of buyouts through the NRCS EWP program. All other alternatives were ruled out based on cost, logistics, existing technology, and environmental reasons. This alternative maximizes public benefits, while appropriately considering cost. This alternative best meets the criteria for efficiency, effectiveness, completeness, and acceptability.

An assessment of the flood damage per structure, the value of the structure, the acquisition cost per structure, and the potential for this alternative to achieve completeness, effectiveness, efficiency, and acceptability indicate this option should be considered in detail. GIS mapping and the West Virginia Flood Tool were used to identify the highest priority areas for buyouts.

Information on the number and characteristics of buildings in the FEMA regulatory floodway and Special Flood Hazard Areas was obtained from the West Virginia Flood Tool.[17] Additional details were considered, such as the concentration of residential housing in priority areas, presence or absence of water and sewer service, municipal impacts, evacuation and fatality history, local leaders input, and other factors. Refer to Appendix D: Investigations and Analysis Report for more information about priority areas.

In order to identify the high priority properties for buyout, the West Virginia Flood Tool's GIS mapping were used to identify areas with homes located in the regulatory floodway and the 100-year floodplain. This tool was also used to analyze flood depths during 100-year flood events. Information on the number and characteristics of buildings in the FEMA regulatory floodway and Special Flood Hazard Areas was also obtained from the West Virginia Flood Tool.[17]

Additional mapping was developed to show water and sewer service areas and identify which properties lacked these services. Supplemental maps that identified economic and industrial centers, recreational assets, development zones, municipal boundaries, and impaired streams were used to further identify the highest priority areas.

In order to identify high priority areas for buyouts, local stakeholders were consulted to determine where efforts to address repetitive flooding could be best focused. From these discussions, priority was given to non-municipal areas as well as those areas not currently serviced by water and sewer infrastructure. Mapping was developed to highlight these water and sewer service areas. Additional mapping was developed to identify economic and industrial centers, recreational assets, development zones, municipal boundaries, and impaired streams.

From there, the West Virginial Flood Tool's GIS mapping was used to identify areas with structures located in the regulatory floodway and the 100-year floodplain. These tools were used to analyze flood depths during 100-year flood events. Information on the number and characteristics of buildings in the Regulatory Floodway and Special Flood Hazard Areas was obtained from the West Virginia Flood Tool. Additional details regarding the analysis involved and the data collected are set forth in Appendix D: Investigations and Analysis Report.

Costs were estimated based on data from the West Virginia Flood Tool, the West Virginia GIS Technical Center, the NRCS Dunloup Creek Voluntary Floodplain Buyout, property tax records, and other sources. Estimated damages avoided with the buyout and acquisition costs indicated a favorable benefit-to-cost ratio could be attained for this alternative.

Detailed study determined this option to be the most effective way to reduce flood damage along Elkhorn Creek. The acquisition of flood-prone properties from the floodplain is a permanent solution that eliminates the flood damage and home repair cycle and reduces risk to human life. Therefore, a voluntary floodplain buyout of flood-prone properties is the *preferred alternative*. Homes and other structures will be removed from each acquired site to eliminate future flood damage and to restore the floodplain to more natural conditions that are more resilient to frequent flooding. Local sponsors will own the land; enforce deed restrictions, restrictive covenants, or similar measures; and perform operation and maintenance. Restoration of the floodplain will include purchase and removal of homes; perpetual deed restrictions on each parcel of land; removal of debris; removal of walks, driveways, and other impervious surfaces; disconnection of utilities; elimination of sewage straight-pipes; minimal regrading of the site to original floodplain contour; capping of private water wells; and

seeding and mulching. Following acquisition of the sites and elimination of the structures on each acquired parcel, the McDowell County Commission, a co-sponsor of the plan, will hold title to the properties. The deeds conveying ownership to the McDowell County Commission will contain restrictions, in perpetuity, that will prevent or restrict any activities that may occur on the acquired parcels. These restrictions would prevent the rebuilding of any residential dwellings on parcels in the regulatory floodway and Special Flood Hazard Areas. The McDowell County Commission will also be responsible for leading the monitoring of said properties such that all deed restrictions, restrictive covenants, or similar measures are followed.

The project was purposely designed as a small project to minimize social impacts and increase the potential for the project to actually be carried out. It is noteworthy that USACE projects in the area received a congressional waiver for economic justification, indicating the extraordinary challenges present in this area.

To minimize the potential adverse social and economic impacts, the project has been scaled to an expected total buyout of approximately 30 residential properties, comprising approximately 25% of the *proposed project sites*. Flood damage was determined for 128 likely residential properties, and damage reduction benefits were based on acquisition of approximately 30 of those properties. Nonresidential properties, such as churches, public buildings, and businesses, were not included to minimize social and economic impacts. These properties, although they sustain flood damage, do not have overnight occupancy and pose less threat to human health and safety. The goal in limiting participating properties to approximately 30 is to give residents ample opportunity to participate in the buyout while limiting the potential adverse effects to the local communities. For example, during scoping and the planning process, one of the concerns voiced by local stakeholders was the potential for McDowell County to lose real property taxes from bought-out properties, particularly where participants do not relocate within McDowell County. An additional concern was the lack of flood-free alternative housing. Efforts are underway to address the housing dilemma, which will be challenging even with only 30 voluntary buyouts. A larger project would exacerbate this problem.

4.3 Other Reasonable Alternatives, Including Those Not Within NRCS Authority

The Big Sandy Watershed Comprehensive Watershed Feasibility Report evaluated options to address flooding across the region, with an emphasis on sustainable solutions. Field reviews were conducted in twenty subwatersheds, including Elkhorn Creek, using existing mapping, building counts, flood records, high water marks, and regional professional expertise.[1] Where possible, multi-purpose projects were considered to expand the project benefit base and bolster economic justification. No viable structural measures, or combination of structural measures, were cost effective in Elkhorn Creek. High construction costs, low property values, unacceptable environmental and social impacts, and distressed local economies that limit local sponsors' financial resources were factors in evaluating dams, channels, dikes, floodwalls, and levees. The following alternatives were considered during planning but were eliminated from detailed study for the reasons stated.

Watershed Dams

Elkhorn/Tug Fork Watershed is extensively mined (active and abandoned), which dramatically increases the cost and reduces the available locations for dams.[1a] Mined areas require extensive geological work, foundation support, and grouting, and pose other construction challenges.

Abandoned mine works have unknown risks. In 1991, NRCS (then SCS) assessed the feasibility of a multi-purpose, roller-compacted concrete dam in the Panther Creek subwatershed of Elkhorn Creek and determined the cost to be more than $35 million for one dam that would control about 50% of the Panther Creek subwatershed drainage area. The 1991 report concluded that watershed dams were not feasible. No other measures were evaluated.[2] In 2019 prices, the cost for this dam would exceed $65 million.

Panther Creek subwatershed is one of eight subwatersheds in Elkhorn Creek. Elkhorn Creek Watershed has a trellis drainage pattern, typically requiring several upstream dams to reduce tributary flows into mainstem Elkhorn Creek. Initial map studies and cost estimates indicate that a network of upstream flood control dams would exceed $520 million. Further, watershed dams would be logistically impractical due to the transportation impacts to active railroads and highways. From an economic perspective, considering the average residential property value in McDowell County is $34,800,[3] this alternative is not efficient or economically viable. As such, watershed dams were eliminated from further consideration.

Channel Modification

The extent to which Elkhorn Creek could be widened, deepened, and straightened is restricted by topography and highly developed floodplains. Map studies and field reviews confirm that the floodplain is so restrictive that increasing the width of the channel would require removal of most properties, thereby eliminating the benefits. The current channel capacity varies greatly due to the number of public and private bridges, railroad crossings, urban encroachment, floodplain filling, utility line crossings, and other factors that diminish channel capacity. Flood profiles from FEMA show the channel capacity at selected stream cross-sections in priority areas. At all locations, the existing stream channel is overtopped by the ten-year frequency storm.

Table 4.1: Flood Profile Information at Priority Area Cross Sections

Priority Area	Range of Ground Elevations in Priority Areas from WV Flood Tool	FEMA Flood Profile Cross Section Identifier	FEMA Flood Profile Streambed Elevation	FEMA Flood Profile Top of Streambank Elevation	FEMA Flood Profile Ten Year Storm Elevation
Vivian Bottom, Landgraff, Eckman	1524.8-1601.0	9.82	1,514	1,521	1,526
Hunting Shirt Bottom	1142.9-1138.4	123.3	1,125	1,133	1,140
Big Sandy	1120.3-1105.6	120.8	1,090	1,098	1,104
Roderfield	1095.2-1086.8	121	1,092	1,100	1,110
Panther	594.0-941.8	105.6	925	933	946

The typical valley in Elkhorn Creek contains a state road, an active railroad, the stream, and at least one row of buildings. Buildings are located adjacent to the stream, usually below the elevation of the railroad tracks. Channelization would necessitate removal of the buildings, thereby eliminating the properties that are intended to benefit from the measures.

Figure 4.1 Elkhorn Creek Floodplain Aerial Image

The estimated cost for channel modification is $47 million per mile based on engineering studies for similar West Virginia watersheds, excluding the impacts to the railroads.[4] Channelizing would be logistically impractical due to the transportation impacts to utilities, highways, bridges, and railroads. From an economic perspective, considering the average residential property value in McDowell County is $34,800, this alternative is not efficient or economically viable. The environmental impacts to channelizing Elkhorn Creek would be detrimental to the threatened Big Sandy crayfish, potentially complicating permit approval. This alternative was ruled out based on costs, logistics, and environmental impacts.

Dikes, Floodwalls, and Levees

Dikes, floodwalls, and levees were considered but dismissed for reasons similar to those cited for the channel modification alternative. The construction of dikes, floodwalls, and levees would be cost-prohibitive and would still expose residents to flooding dangers if a larger-than-expected storm occurs. Although USACE constructed floodwalls at Matewan and Williamson in response to the 1977 flood, these measures were exempt from economic justification based on Congressional authorization.[5] An exemption does not apply to this project.

In addition to the initial high construction cost, these measures are environmentally obtrusive, require extensive land acquisition, affect the wildlife and aquatic habitat, require ongoing maintenance, and may still overtop during extreme weather events. Furthermore, complex pumping systems are necessary behind the floodwalls, dikes, and levees to collect stormwater and pump it over the structures into the stream to maintain the integrity of the structures.

Floodwalls are currently being planned by another federal agency for Marlinton, West Virginia (population 994), and Milton, West Virginia (population 2,612). At current prices, the Marlinton floodwall is estimated to cost $52 million per mile. The estimated cost for the Milton floodwall is $98 million per mile.[6] From an economic perspective, considering the average residential property value in McDowell County is $34,800, this alternative is not efficient or economically viable. The environmental impacts from construction would be detrimental to the threatened Big Sandy crayfish, potentially complicating permitting approval. This alternative was ruled out based on costs, logistics, and environmental impacts.

Dredging, Clearing, and Snagging

Dredging is the practice of removing sediment, debris, and other substrate from the bottom of streams and along the banks. Clearing and snagging removes trees and riparian vegetation from the stream and its banks. This measure does not alter the stream shape or remove buildings from the streambanks. There would be no modification of bridges, culverts, or utilities. The local sponsors would be responsible for annual stream maintenance after the initial clearing and snagging. Although this measure is most often requested by the public, it would have only a minor and temporary effect. Negative environmental impacts from dredging include removal of the riparian vegetation, removal of aquatic habitat in the streambed, increased water temperatures, and destabilization of streambanks.[7] Negative impacts may also occur with the disposal of dredged material if material is contaminated. The West Virginia Statewide Flood Protection Plan cites the negative effects and limited effectiveness of dredging. In response to public interest in this alternative, NRCS produced a white paper discouraging this alternative.[8] For these reasons, this alternative was not developed in detail and was eliminated from further consideration.

Flood-proofing Homes

Flood-proofing homes was considered but dismissed for several reasons. Housing in the area generally lacks the structural integrity to allow for flood-proofing when considering the age of homes and construction characteristics. Census housing information shows that more than 80% of the existing housing is over 40 years old, with 30% of the housing built prior to 1939. Mobile homes make up 15% of the housing stock, with a higher concentration of mobile homes in the floodplains. Approximately 60% of homes are valued at $50,000 or less, as compared to 8% in the US and 19% in West Virginia, respectively.[9]

Flood-proofing may prevent flooding to the elevated floors, but damages still will occur to the ground floor, cars, landscaping, utilities, driveways, and other property improvements and infrastructure. Foundations may be compromised by swift moving flood water, jeopardizing the structural soundness of the building. Although residents are discouraged from using the area under an elevated house, the area often transitions into use over time. It is common to have washers, dryers, freezers, water heaters, furnaces, air conditioners, generators, and other valuable items located in this area, unprotected from flooding. Considerable floating debris is created during high-water events and accumulates against house foundations, further weakening the structures and putting occupants at risk.

Elevated homes are harder to access, especially for elderly and disabled persons. From a safety perspective, flood-proofing encourages residents to stay in place during flooding, increasing the risk of injury and death during flash flooding. Flood-proofed homes are still at risk from floatable debris swept downstream at high velocity, such as trees, logs, campers, mobile homes, and automobiles.

Further, there is risk that the severity of flooding will be underestimated and that flood-proofing will not be sufficient. At the peak of flooding, residents often want to be rescued, placing emergency personnel at risk and increasing evacuation costs. Deaths have occurred in this watershed due to flooding.[10]

The average cost to flood-proof a home is $93,900, based on engineering estimates for a similar West Virginia watershed.[11] This cost does not include extension of sewer lines, which would be necessary to achieve decent, safe, and sanitary conditions. It also does not include displacement costs for residents during construction. For these reasons, this alternative was eliminated from further consideration.

Building Relocation

This alternative was considered, but not developed in detail. Due to the age and condition of many of the homes, it would not be possible to move homes without causing damage; homes would likely require extensive structural reinforcing before being moved. Relocated homes would require renovation work to bring the homes up to decent, safe, and sanitary conditions at their new location. Many structures have sustained prior flood damage, resulting in mold and structural damage that cannot be fully mitigated with the relocation option. Engineering estimates indicate that building relocation costs would amount, on average, to 1.5 times the value of the structure. This alternative is not cost effective and was eliminated from further consideration.

Mandatory Floodplain Relocation

Mandatory floodplain relocation was considered. This alternative would require all residents in a designated area to relocate, eliminating the opportunity for personal choice. Mandatory government relocation would include additional costs for eminent domain actions, legal services, project administration, court challenges, and delays in project implementation. The Uniform Relocation Assistance Act would be invoked, adding additional costs for all participants. These costs primarily would be nonfederal costs, placing a greater burden on local sponsors with limited resources. In 2009, NRCS offered a voluntary buyout in the Dunloup Creek Watershed and there was an overwhelmingly positive response. Over 200 applicants applied, demonstrating the public's willingness to voluntarily relocate.[12] Voluntary participation avoids the costs associated with the use of eminent domain, thereby reducing the acquisition cost per structure. A voluntary approach is more socially acceptable, reducing conflicts between residents, local sponsors, public officials, and the implementing agency. The risk of social upheaval resulting from forced relocation is high, increasing the likelihood that such an alternative would fail to be implemented. Given these considerations, a mandatory floodplain relocation alternative was not developed in detail. This alternative was eliminated from further consideration.

Flood Warning System

The effectiveness of a flood warning system was evaluated as an alternative. In 1978, the National Weather Service created the National Flash Flood Program Development Plan, and the Integrated Flood Observing and Warning System (IFLOWS) was initiated as a pilot project in the twelve-county area along the borders of Virginia, West Virginia, and Kentucky. This area of Appalachia was selected because of its susceptibility to flash flooding and the lack of existing flood warning systems in the region. In 1985, Congress expanded the program to 29 counties in West Virginia and added additional counties in Virginia and Pennsylvania as a result of the deadly November 1985 flood. Since that time,

IFLOWS technology has spread beyond the original pilot project area and evolved into the Automated Flood Warning System network that connects numerous local flood-warning systems and integrates and shares information from 1,700 sensors in 12 states. Although some IFLOWS gauges transmit data over the ALERT communication system, very few do so. Instead, it may take anywhere from four hours to four days to obtain data from gauges that are not part of the ALERT communication system. Delays in receiving information or geographic gaps in the system can delay identification of conditions that contribute to flooding. Currently, 12 IFLOWS gauges are located in McDowell County, and none of them lie within the Elkhorn/Tug Fork Watershed. There is no information as to whether these gauges transmit data to the ALERT system.[13]

Aside from the IFLOWS gauges established by the NWS, the USGS has stream gauges that monitor daily streamflow conditions, water stages, and water quality in West Virginia. The USGS collects this information throughout time, making it possible to view historical water data. Three USGS stream gauges are located in McDowell County, with one of them downstream of Elkhorn Creek but not within the Elkhorn/Tug Fork Watershed. The name of this gauge is "Tug Fork Downstream of Elkhorn Creek at Welch, West Virginia." Data from these gauges are easily accessible on the USGS website, and website users have the option to sign up for a program called "WaterAlert," which sends a text or email alert to warn residents when the water reaches a dangerous threshold.[14] However, in this mountainous watershed, cell phone reception and internet service are sparse and unreliable.

A flood warning system may provide time for some residents to escape rising water, but in mountainous watersheds with rapid runoff, flood warning systems have limitations. Flood warning systems depend on having adequate time for advanced warning and evacuation by the residents. These systems are more reliable in areas where the water levels rise slowly or where residents are located enough distance downstream to allow time for the warning to be issued and citizens to react. According to the West Virginia Statewide Flood Protection Plan, flood warning systems have limited effectiveness in West Virginia: "Flood warnings are transmitted in a manner that is not understandable by many people; the warnings are not considered to be reliable and many times are not timely."[15] Demographics for this watershed show a high percentage of elderly and disabled residents who would require assistance to get out quickly. Additionally, a flood warning system would not protect property from flooding, nor would it restore the floodplain function.

The West Virginia Statewide Flood Protection Plan contains detailed information about existing systems and potential locations for future systems. The statewide plan also identifies shortfalls and needs for completing existing flood warning systems. The existing emergency broadcast system for flooding relies on radio and television alerts that may not reach residents during a flood when power outages are occurring simultaneously with flooding. The Elkhorn/Tug Fork Watershed does not have a siren system or any other type of broadcast system. As such, this alternative was eliminated from further consideration.

Reliance on NRCS Emergency Watershed Protection Program

In the absence of a long-term flood solution, the NRCS Emergency Watershed Protection Program (EWP) has been used to restore streambanks to pre-flood conditions in the Elkhorn/Tug Fork Watershed. From 2005 to 2011, West Virginia NRCS spent an average of $2.5 million dollars per year, every year, in the Big Sandy River Basin for emergency watershed protection of homes.[16] This program has been effective in stabilizing an area and has been used extensively in the Elkhorn/Tug Fork Watershed to install riprap and gabion baskets along Elkhorn Creek and its tributaries. Although

these measures restore the sites to pre-flood conditions, they do not provide relief from future flooding. EWP is reactive and temporary rather than preventative; it does not address chronic flooding. Repeated use of EWP indicates an area is high risk and illustrates the need for a more cost-effective, sustainable solution.

Rain Barrels

In response to a comment during scoping, rain barrels were evaluated as an option to reduce flooding. Rain barrels are typically used to supplement other water sources in times of drought. Rain barrels only capture precipitation from rooftops, which represents a miniscule percentage of the surface area of the watershed. Specifically, a standard 50-gallon rain barrel fills in a matter of minutes during heavy rains and cannot provide storage once full, limiting its ability to store floodwater. A roof that measures 30 foot by 60 foot produces 5,625 gallons of runoff during a 5-inch rain event, the equivalent of 112.5 rain barrels. This alternative is not practical and was eliminated from further consideration.

4.4 NED Alternative or Most Cost-effective Alternative Summary and Comparison of Alternative Plans Table and NED Account

Table 4.2: Summary and Comparison of Alternative Plans

	Item of Concern	Alternative 1 No Action - FWOP	Alternative 2 Voluntary Floodplain Buyout
Measure to Address	Flooding	There will be no action taken to address flooding. The FWOP will not improve. Flood damage will continue. There will be no reduction in risk to human health and safety. The cycle of flood recovery and disaster relief will continue. Point sources of raw sewage will continue to degrade water quality. Streambanks will continue to degrade. Improper floodplain uses will continue to exacerbate flooding.	A voluntary floodplain buyout will remove vulnerable homes from the floodplain. Flood damage will be reduced by $119,000 annually. Savings will be realized in reduced need for flood insurance, saving $10,200 annually. Flood debris will be reduced, saving $1,900 per year. Human health & safety will improve as residents move from flood-prone areas, reducing the need for rescue operations. Water quality will improve.
Installation Cost	NRCS Contribution SLO Contribution Total Cost	$0 $0 $0	$2,817,600 $7,000 $2,824,600
NED Account	Average Annual Benefits	No benefits will be realized.	$144,200
	Average Annual Cost	No costs will be expended.	$84,200
	Annual Net Benefits	None	$60,000
	Benefit-to-cost Ratio	Not applicable	1.7:1
	Annual Operation & Maintenance Cost	None	Monitoring will be required to ensure deed restrictions, restrictive covenants, or similar measures are not violated.

	Item of Concern	Alternative 1 No Action - FWOP	Alternative 2 Voluntary Floodplain Buyout
Environmental Quality (EQ) Account	Water Quality	No improvement in surface water quality will occur, as straight-piped sewage will continue, thereby degrading water quality, harming human health, preventing designated stream uses, and impairing aquatic life.	Streams will likely improve with the removal of residential sewage straight-pipes. Water quality will likely improve to support recreation, aquatic life, and other designated stream uses. Human health will likely be improved as direct contact with raw sewage and fecal coliform is reduced. Incidental benefit of $12,900 annually.
	Floodplain Management	Floodplain management will not be improved, resulting in continued degradation of the watershed.	Floodplains will be restored to natural conditions, supporting floodplain uses and improving watershed resiliency.
	Wetlands, Waters of the United States	There will be no opportunity for wetlands to re-establish in floodplains. Waters of the United States will continue to be degraded by straight-pipes.	Floodplains will be restored to natural conditions, allowing wetlands to reform where possible. Waters of the United States will be positively impacted as sources of fecal coliform (straight-pipes) are removed. Shade will be restored, reducing water temperature and benefiting aquatic life.
	Riparian Areas	Use and occupancy of riparian areas will result in continued flood impacts to homes. Such areas will remain impaired to the extent occupancy results in cleared streambanks.	There will be opportunities to restore streambanks and riparian areas once buildings are removed. Riparian areas will be more naturally resilient. Straight-pipes will be removed, and urban encroachment will be reduced. Natural vegetation will return, providing shade and wildlife habitat. Travel corridors for wildlife will be restored.

	Item of Concern	Alternative 1 No Action - FWOP	Alternative 2 Voluntary Floodplain Buyout
	Fish and Wildlife Habitat	No improvement in habitat will occur; untreated wastewater will continue to impair natural habitat. Occupied properties will continue to pollute and contribute to erosion and impose other impediments to habitat.	Fish and aquatic habitat will improve with removal of streambank development and floodplain restoration; shade will be restored to denuded streambanks; erosion will be reduced; stream crossings and access points will be improved. Water quality should improve with the reduction of fecal coliform.
	Cultural Resources	There will be no opportunities to recognize, document, restore, or preserve historic or cultural resources from continued flooding.	Consultation continues with the WVSHPO office with regard to both tribal consultation and preservation of historic properties. Historic property inventories and photographs are being compiled for properties of potential significance. If there are any impacts to such properties, mitigation will be performed. All nonresidential properties are avoided, thereby reducing potential impacts.
Other Social Effects Account	Public Health & Safety	Health and safety risks will continue as usual, and residents will face compounding issues with repeated flood events.	Residents who participate will be moved from the problematic floodplain and its attendant risk to health and safety.
	Environmental Justice	Environmental injustices will continue. There will be no improvement in social and economic indicators that are linked to environmental injustice. The watershed will continue to be underserved due to physical, economic, and social limitations.	Voluntary relocation will allow residents to move out of vulnerable locations, improving conditions for both those relocated and those remaining. Residents who live in flood-free areas will realize better economic, social, and environmental circumstances. Conditions will improve as a historically underserved area is provided an alternative to reduce the impacts of flooding.

	Item of Concern	Alternative 1 No Action - FWOP	Alternative 2 Voluntary Floodplain Buyout
	Social and Economic Conditions	There will be no opportunity to engage corporate landowners to make flood-free land available for local economic and social benefit. Participants will not have a willing buyer for flooded properties, allowing them to reinvest resources in flood-free housing. No additional funds will flow into the local economy. Owners of flooded homes will continue to experience an erosion of home assets as they decrease in value and habitability with repeat flooding.	Participants will be able to sell their floodplain properties to the government and will be given the opportunity to reinvest in flood-free housing. Financial incentives and land availability, which may complement this project and reduce outmigration, are being pursued at the request of local sponsors. The impacts on utilities, county property tax revenues, and neighborhood configurations have been considered and quantified where possible.
Regional Economic Development (RED) Account	Local Jobs	No local jobs will be created.	There will be a temporary increase in regional employment and wages during project implementation. Real estate services and construction services, including both skilled and unskilled workers, will be needed during the three-year implementation phase. An estimated 15 jobs will be created during the implementation phase, resulting in $1,195,700 in local income.[2]
	Regional Adverse Annual Effect (non-federal cost of project to local sponsors)	None	$10,200
	Local Taxes	There will be no change in local personal property, real estate, or sales tax. Property will continue to degrade due to flooding, further diminishing its value.	There is a potential to offset any regional decline in the tax base due to the buyout if residents relocate to higher quality, flood-free housing within McDowell County.

	Item of Concern	Alternative 1 No Action - FWOP	Alternative 2 Voluntary Floodplain Buyout
	Local Utility Customer Base	There will be no change to the local customer base. Damages will continue to occur to residential utility connections that are susceptible to chronic flooding. Utilities will continue to lose their customer base as population naturally declines in the area.	There is a potential to avoid regional decline in the customer utility base due to the buyout if residents relocate to flood-free areas within McDowell County. There is also a potential for customers to obtain water and sewer services that are not available where they currently live, as well as for residents to move outside of the watershed area.

4.5 Relevant Issues and Concerns Identified through Scoping

NRCS and USACE have built hundreds of dams in West Virginia to reduce flooding and provide downstream benefits to towns and cities. These dams generate millions of dollars each year in benefits by protecting property and improving public safety. Elkhorn/Tug Fork Watershed and the southern coalfields region of West Virginia are highly susceptible to flooding, but the area is also the most limited for cost-effective, feasible engineering solutions. There have been substantial investments in planning, as was noted with disappointment by local leaders, but very little progress has occurred in implementing solutions. Planning studies include the following:

- Tug Fork Valley Flood Damage Reduction Plan, 1982, USACE
- National Coal Heritage Area Management Action Plan, 2002, National Park Service
- West Virginia Statewide Flood Protection Plan, 2002, WV Flood Protection Task Force
- Southern West Virginia Flood Recovery Plan, 2004, Parsons, Brinckerhoff, Quade, Douglas, Inc.
- McDowell County Wastewater Treatment Plan, 2005, Wastewater Treatment Coalition of McDowell County
- North Fork of Elkhorn Creek Watershed Based Plan, 2007, Wastewater Treatment Coalition of McDowell County
- Big Sandy Rapid Watershed Assessment, 2008, NRCS
- Big Sandy Watershed Comprehensive Feasibility Report, 2011, NRCS
- Appalachian Regional Commission Strategic Plan, revolving plans, ARC
- Region One Comprehensive Economic Development Strategy, revolving plans, Region 1 Planning and Development Council

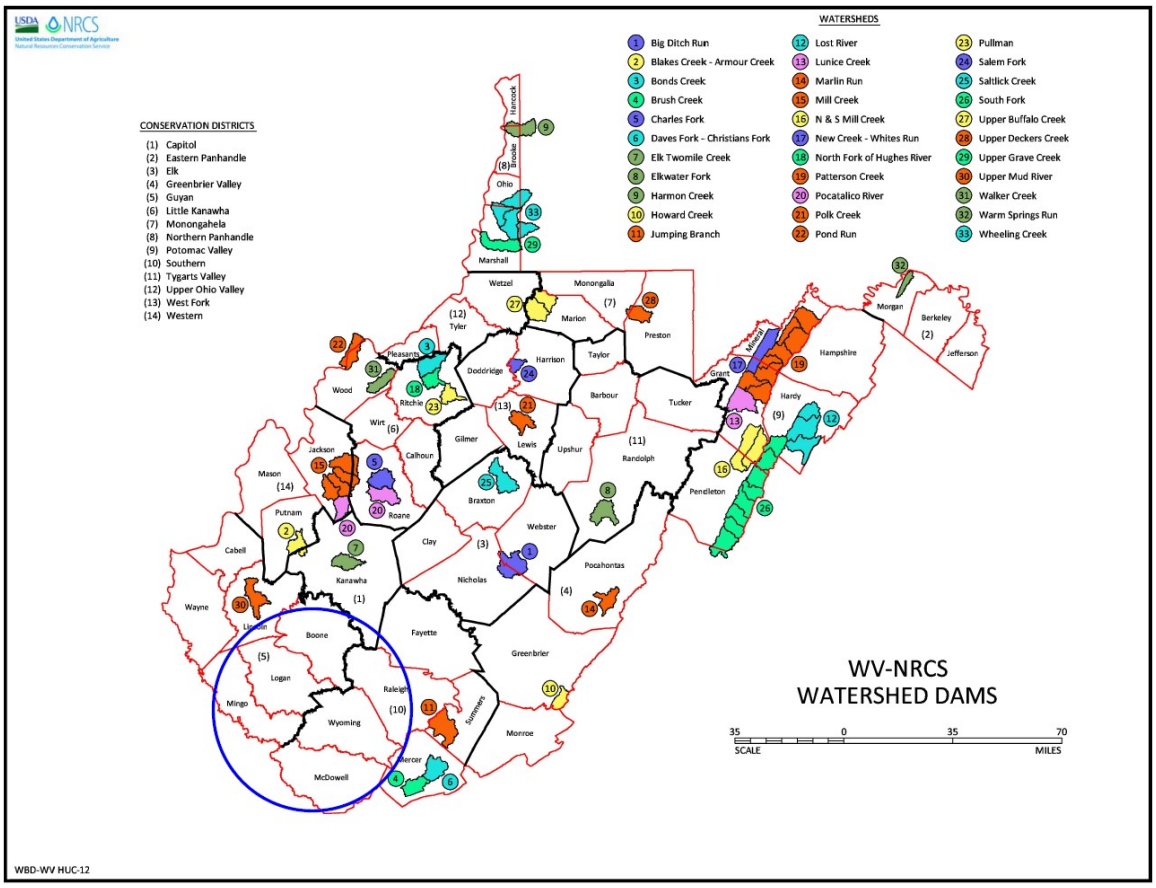


Figure 4.2 NRCS West Virginia Watershed Projects

No PL83-566 watershed projects exist in the southern coalfields region, as indicated in Figure 4.2. It is difficult to overcome the physical, economic, and social challenges of the watershed when evaluating solutions. This is evidenced by Congressional action after the 1977 flood to waive the economic justification for USACE projects in Williamson and Matewan (Mingo County) and Welch (McDowell County).

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Direct, Indirect, and Cumulative Impacts and an Assessment of the Significance of the Impacts

This section describes the anticipated environmental, economic, and social effects for the two remaining alternatives in terms of direct and indirect impact. This section also considers cumulative impacts. Cumulative impacts are effects from incremental or combined activities regardless of what agency (federal or non-federal) or person undertakes such action. Cumulative effects can result from individually minor but collectively significant actions taking place over time. Cumulative impacts may be environmental, economic, or social.

Two alternatives are considered and evaluated in detail in the rest of this document. Alternatives considered include:

1. Alternative 1, No Action – Future Without Project Condition (FWOP)
2. Alternative 2, Voluntary Floodplain Buyout

Flooding

No Action (FWOP)

This alternative would have no effect on reducing flood damage to real and personal property in the area and would have no effect on relocating residents out of harm's way.

Voluntary Floodplain Buyout

There are several direct benefits of a voluntary floodplain buyout. For those residents who participate in a voluntary floodplain buyout and relocate outside of the floodplain, risk to health and property is eliminated. The need for emergency services, flood insurance, public and private funds to address repetitive loss structures, and flood debris removal services is reduced.

Indirect benefits include increased health in riparian areas and reduced regional flooding. In selected areas, structure removal and stream restoration measures may improve overall watershed resiliency and reduce the likelihood that streams will divert into new paths. Floodplains that are more open and natural will absorb and attenuate floods. Healthy riparian areas and stabilized streams will pass floodwaters in a less destructive manner. Minimal stream restoration improvements will be needed where straight-pipes are removed or where homes have encroached on streambanks.

There are no known negative cumulative environmental impacts from this project that would increase flooding. There may be positive cumulative environmental effects if contiguous parcels of the floodplain are returned to natural conditions. It is likely that participants in this buyout may be located near or contiguous to parcels that were acquired through other federal buyout projects, further reducing impacts from flooding.

Public Health and Safety

No Action (FWOP)

This alternative results in continued adverse impacts to public health and safety. Residents would continue to live in hazardous conditions, including within the regulatory floodway. In particular, the elderly, disabled, and young are most at risk, especially with flash flooding. Flash flooding—quickly rising waters with little warning—is of concern in this watershed. The watershed's topography, with steep hillsides and narrow streams, makes the area susceptible to flash floods. Furthermore, during a flood event of any sort, primary escape routes also may flood, thus making vehicle travel or other travel dangerous, and perhaps impossible for both residents and first responders. Additionally, residents in the area may be impacted by unsanitary conditions resulting from and remaining after floods, such as contamination from flooded septic or sewer systems.

Voluntary Floodplain Buyout

Residents participating in a voluntary buyout will move out of harm's way. Relocation will reduce direct risks to residents and first responders. Any project activities undertaken as a result of this alternative will be performed by qualified, properly trained personnel in compliance with applicable health and safety regulations.

An indirect benefit to health and safety is improvement of water quality. Water quality will improve with removal of fecal coliform sources from failing or nonexistent septic systems associated with floodplain properties in an area where the practice of "straight-piping" is common. Improved sanitation and access to water and wastewater treatment will benefit the public health of residents.

There are no known negative cumulative environmental impacts from this project that would impact public health and safety.

Water Quality

No Action (FWOP)

Without a voluntary floodplain buyout, there would be no effect on the existing surface water quality. Degradation of water quality from straight-piping would continue.

Voluntary Floodplain Buyout

A buyout of homes and other impervious structures will reduce runoff and its associated water quality impacts. Other pollutants from households will be reduced with a buyout, as will flood debris. Specifically, there is likely to be a reduction in fecal coliform, as many of the homes in the *project area* are straight-piping. There is a potential for improvement in dissolved oxygen levels from a reduction in biological oxygen demand. Indirect benefits include an opportunity for riparian rehabilitation, including revegetation, to reduce erosion of streambanks, and removal of invasive species. With a buyout of homes lacking adequate sewage treatment, water quality will improve. Acreage of the area to be revegetated will be confirmed after the application and selection phase. Best management practices and standard recommended seed mixes will be used.

There are no known negative cumulative environmental impacts from this project that would impact water quality.

Floodplain Management

No Action (FWOP)

Without a voluntary floodplain buyout, the watershed would continue to experience the deleterious impacts related to existing development in the floodplain. Other floodplain management efforts via the county or other local governments may continue or be further developed.

Voluntary Floodplain Buyout

With a voluntary floodplain buyout, homes and related structures will be removed from land subject to the buyout. Along with local governments' efforts to encourage proper floodplain activity, the properties that are part of a floodplain buyout will be subject to deed restrictions, restrictive covenants, or similar measures as part of the buyout. These provisions will operate to further ensure that the properties are utilized in a manner consistent with the goals of the buyout.

Additionally, it is anticipated that such restrictions or covenants will have indirect benefits in allowing for compatible uses, such as appropriate agricultural or recreational uses, or other endeavors. For example, while ameliorating impacts to residents from floods, the buyout of such properties could result in tracts that would be useful for small urban agriculture and recreation. In general, the properties will be managed in a natural state or for limited, approved uses compatible with location in a floodplain.

There are no known cumulative negative impacts to floodplain management.

Wetlands, Waters of the US

No Action (FWOP)

Without a voluntary floodplain buyout, the watershed would continue to experience negative impacts from existing development in the floodplain that is incompatible with stream and floodplain functions. Streambank erosion, debris accumulation, and sediment removal and deposits would continue unabated. As for wetlands, a "no action" alternative would leave little or no potential to establish or re-establish wetlands on such properties. Properties on which wetlands may have once existed would continue to support non-wetland uses, and the same drainage patterns would continue.

Voluntary Floodplain Buyout

With a buyout of properties susceptible to flood impacts, there will be several indirect benefits for Elkhorn Creek, Tug Fork, and downstream waters of the United States. Harmful forms of streambank clearing and related activities would diminish, lessening the harmful interference to morphological characteristics and features of the stream and stream channel. As for wetlands impacts, with floodplain areas vacated, there is increased potential to establish or re-establish wetlands, starting with vegetation or revegetation of riparian areas and other areas in the floodplain. There also would be increased potential to remove, for example, artificial drainage and unneeded impervious surfaces to encourage wetlands formation or reformation.

There are no known negative cumulative environmental impacts from this project that would impact wetlands or waters of the United States.

Riparian Areas

No Action (FWOP)

The maintenance of riparian areas in their various states of vegetation (or lack thereof) would continue without a voluntary floodplain buyout. Where such riparian areas are near or associated with residences, riparian habitat quality would remain impaired to the extent mowing and removal of helpful vegetation from streambanks continues. With existing patterns of human habitation in the watershed, the riparian corridors would remain fragmented and perhaps nonexistent in some places.

Voluntary Floodplain Buyout

As to the area within the Elkhorn/Tug Fork Watershed where the buyout occurs, the associated riparian areas will be vacated of permanent residents. Mowing and other vegetation control along streambanks will cease (or diminish for properties where limited, permissible uses occur). The riparian area thus will be revegetated via proactive, purposeful revegetation and via passive, natural vegetative succession.

Indirect benefits include improved streambank stability and improved habitat for fish and other wildlife. The quality of stream habitat and riparian areas will improve once structures are removed and the areas are restored to more natural, resilient conditions. Acreage of the area to be revegetated will be confirmed after the application and selection phase. Best management practices and standard recommended seed mixes will be used.

There are no known negative cumulative environmental impacts from this project that would impact riparian areas. The benefits to riparian areas will compound and be enhanced if contiguous properties participate in the voluntary buyout.

Fish and Wildlife Habitat

No Action (FWOP)

Without a voluntary floodplain buyout, existing properties would continue polluting waters. Within a majority of the *project area*, there are no known efforts to otherwise provide wastewater collection and treatment, indicating that the pollution from these residences would continue unabated for the foreseeable future.

Voluntary Floodplain Buyout

With a voluntary buyout, sediment and erosion from residential occupation will decline. Runoff from driveways, lawns, and the like will diminish, and solid waste and trash will diminish. Straight-piping, where present, will be eliminated, improving habitat health. Although there is potential for increased access to the stream for public recreational use once housing is removed, any human use of the properties will be restricted to prohibit such pollution.

Indirect benefits include gradual restoration of natural floodplain functions as properties are taken out of residential use. Streambanks will transition to natural riparian habitat, increasing shade for species that benefit from it and providing streambank stabilization.

There are potential risks to fish and wildlife habitats from accidental fuel spills from demolition equipment, from demolition debris, or from noise generated from demolition equipment and activities.

Best management practices and mitigation measures—such as to prevent erosion into the stream channel—will be employed to minimize or prevent impacts on fish and wildlife.

There are no known negative cumulative environmental impacts from this project that will impact fish or wildlife habitat. There may be positive cumulative environmental effects if contiguous parcels of the floodplain are returned to natural conditions. It is likely that participants in this buyout are located near or contiguous to parcels that were acquired through other federal buyout projects. As more extensive areas of the floodplain are restored to natural functions, wildlife corridors will be created and aquatic habitat will benefit.

Cultural and Historic Resources

No Action (FWOP)

Without action under this plan, any cultural and historic resources in the floodplain will remain subject to repeat flooding with the potential to damage or destroy cultural historic resources.

Voluntary Floodplain Buyout

Little to no impacts to subsurface cultural resources are anticipated, as there will be minimal ground disturbance in the *project area*, as advised by WVSHPO. There are no known negative cumulative environmental impacts from this project that will impact cultural and historic resources.

Because this project is taking a tiered approach to completing NEPA review of site-specific environmental impacts, as those impacts are not ripe for review with buyout properties having not yet been identified, the site-specific review of cultural resources impacts will similarly need to take a phased approach. A phased approach is appropriate when, for example, the location of historic properties and their significance and character cannot be fully determined.

To effectuate the phased approach, a project programmatic agreement will be developed between WVSHPO and NRCS to delay review of site-specific cultural resources until such sites have been identified. Site-specific review will be conducted through Environmental Evaluations, using Form CPA-52, and if mitigation measures are required, agreement as to those mitigation measures will be entered through a Memorandum of Agreement per each site.

During the application phase of the project, there will be an opportunity to recognize and document—and avoid or mitigate if necessary—any notable cultural properties. Consultation with WVSHPO will continue through the design and implementation phases of the project.

Environmental Justice

As discussed in Section 3: Affected Environment, the affected community in the *project area* is considered an environmental justice community due to the severe poverty level.

No Action (FWOP)

Neither adverse nor beneficial impacts to any segment of the population, including low-income and minority populations, will occur under a “no action” alternative. Regardless of residents’ socioeconomic status, flooding will continue to impact all residents in the floodplain. Residents, especially those with less economic or social means, will likely remain unable to move to safer, flood-free housing.

Voluntary Floodplain Buyout

In terms of environmental justice, additional indirect benefits include economic benefits from increased tourism that could improve socioeconomic status and increased public health benefits for local populations. There are no known negative cumulative environmental impacts from this project that would impact environmental justice communities.

Local Economic and Social Conditions

No Action (FWOP)

Under a "no action" plan, there would be no opportunity to engage corporate landowners to make flood-free land available for local economic and social benefit. Willing buyers for flooded properties are unlikely. No additional funds would flow into the local economy as would-be participants remain unable to invest in flood-free housing. Owners of flooded homes would continue to experience an erosion of home assets as they decrease in value and habitability with repeat flooding.

Voluntary Floodplain Buyout

Participants of the buyout will be able to sell flooded properties to the government and will be given the opportunity to reinvest in flood-free housing. Synergies are being created by this project to engage with other professionals that can identify and facilitate acquisition of decent, safe, and sanitary housing in the local area. For example, planners are working with affordable housing agencies and other providers of social services. Fifteen temporary jobs will be created when the properties are acquired and demolished (Appendix D). Impacts to Appalachian Power, which has a customer base of approximately 5 million, will be negligible as participants will re-establish service at alternative housing. Impacts to local water and sewer providers were analyzed through Region 1 mapping (Appendix C) and also factored into the decision to limit the buyouts to approximately 30 residences. It was also a consideration in identifying priority areas that are unserved by one or both utilities. Impacts on utilities, county property tax revenues, and neighborhood configurations have been considered and quantified where possible.

Potential adverse health impacts to construction workers from the emissions and noise generated from the demolition equipment, fugitive dust emissions, and asbestos removal will be minimized through the use of personal protective equipment. Asbestos removal will be done by certified professionals approved by WVDEP. An inspector will be present at all times during the demolition phase to monitor and enforce safety regulations.

Given the distressed economic status of the area, planners considered cumulative social and economic impacts from reduced developable land and from population loss. The Elkhorn/Tug Fork Watershed has limited flat land available for development due to natural topography and land ownership patterns, as previously described. In addition, prior federal floodplain buyout projects have resulted in development restrictions on mitigated properties. Such restrictions have the positive effect of reducing flood damage and risk to human health and safety, but restrictions may also limit availability of affordable housing and other development opportunities. During scoping for this Plan-EA, planners evaluated other community mitigation projects that sought a balance between compatible floodplain uses and property restrictions. The effort to meet both needs, thereby minimizing the cumulative impact of property restrictions, will continue through the implementation phase.

Potential population loss caused by the floodplain buyout program is a concern of stakeholders. Impacts include change to community character, loss of property tax revenue to local governments, and loss of revenue from water and sewer ratepayers to struggling public service districts. The county experienced dramatic population loss from 1950 to 2018. A population of 100,000 people in 1950 is now 18,233, a decline of 81%.[1] The population decline from 2010 to 2018 was 9%, compared to the national average for rural nonmetro counties at 2% for the same time period.[2] Population loss was also mentioned as a concern during the comprehensive planning process, specifically impacts to tax revenue, new business development, grant funding, and education. Stakeholders for this Plan-EA mentioned a concern that property tax revenue could be impacted if owners of mitigated properties decide to relocate outside the county. A purchase of 30 homes could cause a 0.30% decrease in potential property tax revenues.

Likewise, revenue to local public service districts may be impacted if owners of mitigated properties locate outside the county. All *proposed project sites* are currently served by the McDowell County Public Service District (PSD) or may be served by the PSD in the future. The PSD was created to provide adequate and sanitary water services to all unincorporated communities within McDowell County and currently serves approximately 3,600 water accounts and 60 sewer accounts. *Proposed project sites* include homes with and without access to public drinking water. None of the *proposed project sites* currently have access to public wastewater treatment. A buyout of 30 homes with existing drinking water service would equal a 0.83% decrease in revenue accounts to the McDowell County PSD.

There is risk and uncertainty associated with the choice that residents may make regarding replacement housing. Participants will be strongly encouraged to relocate in flood-free areas so that the full intent of this buyout—to reduce flood damage and to improve human health and safety—will be realized. At the same time, every effort will be made to encourage participants to relocate within the watershed to minimize adverse local economic and social impacts described elsewhere in this document. There will be impacts to the social fabric of the community, but the nature of those impacts is unpredictable. Whether the impacts are positive or negative depends primarily on individual perceptions.

5.2 Compliance with Federal, State, and Local Laws

Project planning and development of this EA took full consideration of federal, state, and local law. See Subsection 7.5: Permits and Compliance for a description of compliance with federal, state, and local law.

5.3 Possible Conflicts with Land Use Plans, Regional Water Resource Management Plans, Policies, and Controls for the Area

There are no known conflicts between this Plan-EA and other plans, policies, or controls for the area. This Plan-EA supports other land use plans and policies in existence in McDowell County. Floodplain management will be improved with the removal of homes and buildings from the floodplains.

This Plan-EA is consistent with the goals of the McDowell County comprehensive plan. There are no additional land use regulations or controls. All *proposed project sites* lie outside of municipal boundaries, and McDowell County currently has no zoning ordinances.

5.4 Risk and Uncertainty

Estimating project costs and benefits involves a certain degree of risk and uncertainty. Assumptions made during the planning process are based on the best available technology and information at the time of planning. Extended delays between planning and implementation increase the degree of risk and uncertainty. Estimated project costs are based on actual expenses from the NRCS watershed project in Fayette County, West Virginia: "Dunloup Creek Voluntary Floodplain Buyout" conducted from 2010 through 2016. Costs were indexed to 2020 prices.

Costs can be influenced by several economic factors that cannot be predicted with certainty during the planning process. Fuel shortages, unforeseen labor and materials shortages, natural disasters, and international incidents can adversely affect costs.

Economic benefits are based on material values of floodplain property and infrastructure. Such values may not fully capture sentimental worth or social investment on behalf of residents.

There is some degree of uncertainty associated with using secondary information such as census data, planning documents, tax records, and other information when such data is applied to a very small geographic area. It is probable that some monetary and non-monetary costs and benefits have not been fully captured. Finally, there is inherent uncertainty in forecasting the social and environmental costs and benefits associated with the *preferred alternative*.

5.5 The Relationship Between Short-term Use and Long-term Productivity

In the short term, there will be construction impacts associated with the *preferred alternative*. During demolition and floodplain restoration, there will be short-term increases in noise, dust, sediment, erosion, and traffic. These impacts will be minimized with best management practices, such as installing silt fencing, watering down debris, and providing traffic control. Demolition activities will only occur during normal business hours, avoiding noise and disruption in evenings and weekends. Neighbors will be notified of the demolition schedule in advance. In the floodplain, land use will change from residential development to natural floodplain. The long-term productivity of Elkhorn Creek and the Tug Fork River will be enhanced with the *preferred alternative* as the floodplain is restored to more natural conditions that support the ecosystem services inherent to floodplains. Riparian areas will shade water, lowering water temperatures and improving aquatic habitat. Water infiltration and filtering will be improved, and aesthetic attributes of Elkhorn/Tug Fork Watershed will improve over time.

5.6 Adverse Effects that Cannot be Avoided

There are no anticipated permanent, long-term adverse environmental effects associated with the *preferred alternative*, Alternative 2, Voluntary Floodplain Buyout, as long as best management practices are used. Minimal temporary, short-term adverse impacts could occur during demolition as described in Section 5.1. Consultation with environmental and regulatory agencies during scoping and throughout the planning process have not revealed any known adverse environmental impacts from the implementation of a voluntary floodplain buyout. By contrast, the removal of homes and other structures, related impervious surfaces, and debris from the floodplain should enhance floodplain function and reduce or eliminate the harm of future flooding. Moreover, the implementation of a

voluntary floodplain buyout will result in the removal of some homes that use "straight-pipes" to discharge raw sewage into adjacent waterways, thus improving water quality in the watershed.[3] Positive effects in floodplain function, reduced flooding, reduced hazardous debris from flooding, improved water quality, improved fish and wildlife habitat, improved riparian conditions, and other incidental environmental benefits will also be realized by the implementation of the *preferred alternative*.

Adverse social and economic effects may occur if residents participating in the *preferred alternative* leave the watershed post-buyout. Although population in the area has been declining for several decades, the buyout may hasten the exodus. There may be diminished tax base, reduction in retail customer base, and reduction in public school system enrollment.

Community cohesion, civic organization participation, volunteerism, and church membership may also be adversely impacted if participants in the voluntary floodplain buyout choose to relocate to other jurisdictions.

To minimize the potential adverse social and economic impacts considered in the planning phase, the project has been scaled to an expected total buyout of approximately 30 residential properties, comprising approximately 25% of the *potential project sites*. Nonresidential properties, such as churches, public buildings, and businesses, were not included to minimize social and economic impacts. These properties, although they sustain flood damage, likely do not have overnight occupancy and pose less threat to human health and safety.

The planners' goal in limiting participating properties to this number is to give ample opportunity to participate in the buyout while limiting the potential adverse effects to the local communities. For example, during scoping and the planning process, one of the concerns voiced by local stakeholders was the potential for McDowell County to lose real property taxes from bought-out properties, particularly where participants do not relocate within McDowell County.

In order to evaluate the potential loss of real property tax revenues, the following is a breakdown of the top 30 properties for each *proposed project site* and the top 30 properties across all *proposed project sites* within the entire *project area*. The information provided is derived from 2019 real property tax payments due to McDowell County and indicates the potential impact to the McDowell County budget from the loss of those revenues.

Table 5.1: Proposed Project Sites

	Big Sandy	Eckman	Hunting Shirt Bottom	Landgraff	Roderfield	Vivian Bottom	Sum of 30 Highest Property Taxes Due Across All *Proposed Project Sites* Within the *Project Area*
Proposed Project SiteProposed Project Sites	**Site #1**	**Site #2**	**Site #3**	**Site #4**	**Site #5**	**Site #6**	
Total 2019 tax year payments due for 30 properties with highest real property taxes	$2,320.00	$3,631.92	$781.86	$3,241.40	$2,404.94	$1,342.20	$9,977.86
Percentage of 2019 McDowell County budget realized by payment of property taxes represented by figures above; Percentage of 2019 McDowell County budget realized by payment of property taxes	0.07%	0.11%	0.02%	0.10%	0.07%	0.04%	0.30%

Thus, at worst, in terms of potential loss of real property tax revenue to McDowell County, the successful implementation of the *preferred alternative* should limit the impact to 0.30% of the total budget realized from the payment of property taxes, based on 2019 numbers.

Moreover, to address or mitigate other potential social and economic adverse effects, discussed above, synergies are being created during the planning process with potential partners and other professionals that may be able to help identify and facilitate the acquisition of decent, safe, and sanitary housing in the local area. Synergies include partnerships with non-profits and state agencies. These efforts are intentional and aim to minimize the potential negative impacts of outmigration. Further, the development of certain financial incentives, which may complement this project and reduce outmigration, are being pursued at the request of local sponsors.

5.7 Precedent for Future Actions with Significant Impacts

The proposed action would not set a precedent for future actions with significant effects or represent a decision in principle about a future consideration.

5.8 Areas of Controversy

[Section reserved until public comment period ends.]

5.9 Irreversible or Irretrievable Commitments of Resources

Land that is purchased through the voluntary floodplain buyout will be converted from private land to public land. Presently, this land is privately owned and used for residential purposes.

Funds and labor required to administer the buyout will be irretrievably committed. Funds, labor, and energy expended to demolish the purchased properties and restore the floodplain will also be irretrievably committed.

For each property that is removed through the voluntary floodplain buyout, there will be a permanent elimination of the financial, emotional, and physical resources that would have been required to repair the property after repeat flooding, as the participating properties will be held by a public entity and subject to permanent development restrictions.

5.10 Energy and Natural or Depletable Resource Requirements

The energy requirements for implementing this Plan-EA are equivalent to standard municipal maintenance of buildings due to code enforcement. Resource requirements will include use of heavy machinery during the implementation phase.

5.11 Urban Quality, the Design of the Built Environment

As described in Section 5.1, the *project area* is a rural area. The *project area* currently lacks zoning or subdivision regulation. The plan considers cultural and historic resources, also as described in Section 5.1.

6.0 CONSULTATION, COORDINATION, AND PUBLIC PARTICIPATION

Beginning in August 2018, planners organized or attended numerous meetings aimed at informing or gathering input from local leaders, public and private agencies, and other stakeholders in the *project area*. The following is a summary of those meetings.

First, an introductory meeting was held with McDowell County local leaders on August 27, 2018, at the McDowell County Courthouse. At that meeting, planners explained the desire to plan a project aimed at addressing harm and damage caused by flooding in the *project area*. Planners explained that all alternatives will be considered, as required by NEPA. Planners addressed the obstacles associated with constructing dams, channels, and other structural measures within the *project area*. Planners then worked to gauge local support for a potential voluntary floodplain buyout project. Feedback from the local mayors in attendance and the McDowell County Commission was positive. Attendees expressed interest in prioritizing work in areas outside municipal boundaries and in areas currently not served by public water or sewer where possible.

Thereafter, the public scoping meeting was held on October 16, 2018, at Twin Falls State Park. The scoping meeting invitation and the notice of intent were printed in the Beckley Register Herald, the Bluefield Daily Telegraph, and the Welch Daily News prior to the meeting. Fifteen people attended the scoping meeting, representing local, state, and federal agencies. Individuals and agencies gave input into the development of the Plan-EA. Most comments at the scoping meeting were about sharing data that would benefit the planning process. For example, the FEMA Interagency Recovery Coordination Lead and the West Virginia State Resiliency Office representatives offered to request repetitive loss data and other information to benefit the project, and the WVDEP offered to share TMDL information specific to the *project area*. Beyond the discussion of sharing data, other input included (1) USACE requesting that planners consider mitigation work in the watershed and (2) USEPA, though unable to attend the scoping meeting, offering comments by phone and email, specifically suggesting that rain barrels be considered. WVSHPO was unable to attend but provided a letter of interest requesting additional information when more details become available.

Following these two initial meetings, planners met periodically with certain entities and individuals to provide information regarding the planned project, gather input as plans progressed, and share updates as planners gathered data and worked through the planning phases of the project.

More specifically, on January 23, 2019, planners met with (1) WVSHPO to outline the project's goals and to discuss necessary procedures to verify the historic nature of structures within the *project area* as planning progressed, (2) the State National Floodplain Insurance Program (NFIP) Coordinator, and (3) a representative from USACE to provide a project overview and summarize input received from local leaders and other stakeholders in early meetings.

On April 26, 2019, planners met with Region 1 Planning and Development Council of West Virginia to discuss detailed mapping needed for the planning phase of the project. Planners sought Region 1's assistance in developing maps of the *project area* that would depict the regulatory floodway, Special Flood Hazard Areas, existing water and sewer infrastructure, planned projects related to water and sewer infrastructure, economic development zones, tourism initiatives, and municipal boundaries. Based on the input received during those meetings that occurred during the early stages of the planning process, stakeholders clearly wanted detailed information and mapping related to these topics to

inform decision-making in examining specific potential project sites.

On May 29, 2019, planners met with the McDowell County Floodplain Administrator and Director of the McDowell County Redevelopment Authority. In this meeting, planners (1) discussed what areas in McDowell County present the greatest flood risk and (2) solicited feedback on initial data and floodplain mapping received from Region 1. Following this meeting, planners toured the *project area* and visited potential project sites.

On August 30, 2019, planners met with representatives from FEMA and USHUD. Planners provided these representatives an update on the planning process that included an overview of feedback and information received from local leaders, public agencies, and other stakeholders, as well as an update on the progress made in working toward identifying potential project sites through both the mapping from Region 1 and the West Virginia Flood Tool. Additionally, planners presented information on the topic of incentives in buyout projects. The information focused on incentives used in other buyout projects across the country and how those incentives may be a helpful piece for this project.

Planners returned to the *project area* on September 23, 2019. During that visit, planners met with the McDowell County Acting Floodplain Manager as well as two members of the McDowell County Commission. Planners shared mapping with the Acting Floodplain Manager and discussed any historical knowledge regarding flooding in the areas depicted on the maps, information regarding the most recent flood events in the *project area* and how those areas were impacted, and any knowledge as to how receptive members of those communities may be to a voluntary floodplain buyout. Thereafter, planners met with two members of the McDowell County Commission. The goal of the meeting with those commissioners was to inform them as to the status of the project and to discuss the previous challenges from flooding, identify areas subject to repeated flooding challenges and damage, and determine communities most vulnerable to continued flooding harm. The meeting with the commissioners was wholly educational and informational. Those commissioners were not asked to make any decisions regarding the project or the planning. Following those meetings, planners toured various potential project sites within the *project area*.

On October 9, 2019, NRCS met with USDA Rural Development to provide an update on the project. NRCS shared Region 1's mapping and outputs from the flood tool. At that time, there were no Rural Development housing projects or other infrastructure projects in conflict with this project. Discussion centered on the lack of housing in the area and whether Elkhorn Tower or the Teachers Village would have available apartments. Rural Development may want to collaborate on housing at a future phase of the project.

On October 10, 2019, planners participated in a conference call with WVSHPO. Planners reported to WVSHPO that potential project sites had been identified and requested guidance as to what specific information WVSHPO would need regarding the potential project sites. WVSHPO pointed planners to the Section 106 checklist and indicated that planners would need to provide the information set forth on that checklist for each parcel or structure within the potential project sites.

On October 18, 2019, planners met with the McDowell County Commission and McDowell County Economic Development Authority to discuss project updates and sponsor responsibilities. Planners provided additional detail on potential project sites. Planners and local officials also discussed opportunities for affordable housing and the status of the local building code and floodplain ordinance.

Planners were invited to participate in a December 12, 2019, meeting at the WVU GIS Tech Center. In addition to WVU GIS Tech Center staff, also in attendance were representatives from FEMA and

USACE. At this meeting, planners explained how the West Virginia Flood Tool and the data associated with it were instrumental in informing planners as to potential project sites in the *project area* and how this tool and its accompanying data could be used to inform future projects aimed at responding to harms and damage resulting from flooding.

On December 17, 2019, planners met with two members of the McDowell County Commission, the McDowell County Administrator, McDowell County Floodplain Manager, and Region 1 for another educational and informational session. More specifically, planners (1) presented detailed information about five *proposed project sites*, (2) provided information as to what it would mean to be a project planner during the implementation phase of the project, and (3) discussed what ownership and use may look like after any proposed buyout. Again, this session was wholly educational. The McDowell County Commission was not asked to deliberate or otherwise consider or make any decisions regarding the project.

On February 11, 2020, NRCS met with WVSHPO to continue consultation and seek additional guidance. WVSHPO staff advised NRCS to complete the state checklist for each *proposed project site* and provide a spreadsheet with location and image information for each structure that could potentially be acquired. Additionally, WVSHPO indicated that Historic Properties Inventory Forms and more detailed photography should be completed for any structures over 45 years of age. There was discussion about the extent of ground disturbance with building demolition and whether a Phase 1 archeology investigation would be needed. More consultation will be required as the project moves forward. It is not yet known if mitigation will be needed.

In addition to the in-person meetings listed above, there were several additional teleconferences with state and federal agencies, including the West Virginia Infrastructure Jobs and Development Council, FEMA, USHUD, USACE, WVDEP, and WVDNR. The focus of these phone calls was to request data, inform about the progress of the planning phase of the project, and otherwise seek input. Also, planning updates were provided at each quarterly meeting of the State Technical Committee of the West Virginia State Office of Natural Resources Conservation Service beginning in July 2018.

Comments on the Draft Watershed Plan-EA will be included in the Final Watershed Plan-EA. The Plan-EA will be revised, where appropriate, in response to public suggestions.

In-person public meetings did not occur from March 2020 to September 2021 due to travel restrictions and precautions related to the COVID-19 pandemic. Since March 2020, all formal communication between sponsors occurred by phone or electronic media. Other than informal updates, there was no formal communication with local stakeholders in 2020 as partners worked on the draft Environmental Assessment and responded to comments on the Environmental Assessment from the National Watershed Management Center. On February 24, 2021, partners attended a remote meeting of the McDowell County Commission. The agenda item for the February meeting was "Update and Sponsorship Request Regarding the Elkhorn Creek/Tug Fork Watershed Plan – Environmental Assessment" to present a brief update on the watershed plan. In addition to an update on progress, partners requested that the commission sponsor the plan. Commissioners unanimously approved the sponsorship. On September 8th, 2021, by conference call, planners provided an educational update to the McDowell County Commission on the status of the draft plan and the timing, location, and format of upcoming public meetings.

On June 4, 2021, NRCS sent official correspondence to twenty federally recognized American Indian Tribes seeking to initiate official Tribal Ancestral Lands Consultation (TALC). Listening sessions and

initial watershed program discussions were held on June 28 and 29, 2021. None of the invited Tribes were able to attend the sessions. From these initial communications, NRCS held a meeting with the Osage Nation on July 22, 2021, to initiate consultation. From these communications and further email correspondence, the Osage Nation informed NRCS of their areas of interest and that the Elkhorn Creek Watershed project was located outside of them. No further consultation with the Osage Nation is required for this project. On July 1, 2021, initial conversations with the Seneca Nation occurred. The Seneca Nation informed NRCS West Virginia of their areas of interest on August 27, 2021. The Elkhorn Creek Watershed project lies outside of these areas and no further consultation with the Seneca Nation is required for this project. NRCS is continuing efforts to contact additional tribes to open consultation for the Elkhorn Creek Watershed project.

7.0 THE PREFERRED ALTERNATIVE

7.1 Rationale for Plan Selection

The National Economic Development (NED) Plan is Alternative 2, the Voluntary Floodplain Buyout Alternative. This plan addresses sponsors' needs and provides the best flood damage reduction option for the community. The voluntary floodplain buyout is the *preferred alternative* for all of the following reasons:

1. It best meets the opportunities and needs of local sponsors.
2. It completely removes the floodplain risks to life and property for the participants.
3. It can be accomplished in a short period of time, quickly reducing future exposure to flood-related hazards.
4. It restores the floodplain function and will improve floodplain and riparian habitat.
5. There will be a minor reduction in post-storm runoff since impervious surfaces will be removed and replaced with vegetation.
6. It reduces the economic burden to federal, state, and local governments by providing a solution that does not require perpetual operation and maintenance (O&M).
7. It is an environmentally friendly solution.
8. It maximizes the net benefits to the nation.

7.2 Eligible Areas

The threat of flooding is widespread in the watershed, with nearly all of the developed land located in the floodplain. It is necessary to prioritize within the *project area* in order to remove the most vulnerable properties first. Five areas were identified as the most vulnerable based on the concentration of housing in the floodplain, depth of flooding, population at risk, and accessibility during flooding:

1. Hunting Shirt Bottom
2. Vivian Bottom/Landgraff/Eckman
3. Roderfield
4. Big Sandy
5. Panther

Maps showing the geographic limits of the five areas are included in Appendix C. Within the *proposed project sites*, properties will be prioritized relative to risk and acquired in that order.

7.3 Measures to Be Installed

The *preferred alternative* is a voluntary floodplain buyout. No measures will be installed; rather, homes in the floodplain will be purchased and removed. Before purchase and removal, in the design phase of this project, an objective ranking system will be developed to inform buyout participation applications and prioritize the 310 properties to best reduce flood damage. Applications will be made available to all of the owners of the 310 properties. These applications will be evaluated according to the objective criteria to identify the 30 properties that ultimately will be purchased and removed. Once identified, the approximately 30 properties will each undergo site-specific NEPA review through an Environmental Evaluation, using form CPA-52, tiered to this Plan-EA.

Moving to the implementation phase, construction activities will include asbestos testing of each structure, disconnection and capping of utilities, and demolition and proper disposal of debris at an approved landfill. Straight-pipes that convey raw sewage into Elkhorn Creek will be removed and these discharges will be eliminated with the removal of houses. There will be minimal earth disturbance with minor grading of residential lots. No excavation is expected. Sites will be reseeded with a seed mix that is compatible with floodplain vegetation.

Where feasible, natural stream restoration measures may be installed in conjunction with removal of houses. Elkhorn Creek is a stocked fishing stream that needs improved pool and riffle characteristics to support fish and benthic life. Prior dredging and stream encroachment have diminished the stream's ability to support aquatic life. Natural shade and vegetation have been removed and streambanks have been compromised with sewage discharge pipes and downspouts. In limited areas, there may be opportunities to install natural stream restoration measures to enhance the aquatic habitat in Elkhorn Creek. There also may be opportunities to provide stream access for incidental recreational use. Natural stream restoration measures will be designed and implemented on a site-specific basis. Natural stream restoration will be secondary to property acquisition and demolition. Continued consultation with WVDNR, USFWS, and advocacy groups such as Trout Unlimited will occur during the buyout to capitalize on these secondary opportunities.

7.4 Mitigation

The *preferred alternative* will have minimal adverse impacts. As parcels are acquired and demolished, the need for mitigation will be more strategically evaluated through the tiered NEPA approach. Contingency funding in the amount of $50,000 is included to address the potential need to mitigate.

7.5 Permits and Compliance

All applicable laws will be complied with during the execution of this project. The demolition and site restoration phase of the project will occur in areas with relatively flat topography with minimal problems anticipated due to erosion and sediment. Erosion and sediment control measures will be implemented as needed to meet WVDEP requirements. County and local building permits will be obtained as required for the site demolition and restoration work.

Contractors will be required to properly remove waste and dispose of any hazardous materials that may be encountered during the demolition work, such as asbestos. Water well plugging and septic system removal will be done according to the West Virginia Department of Health requirements. Additional consultation with water resource agencies who may have regulatory or permitting responsibilities will be done during the demolition phase to explore opportunities for stream restoration. If necessary, permits for natural stream restoration practices will be obtained. Additional consultation with the WVSHPO will occur for the duration of the project.

7.6 Costs and Cost-sharing

Project costs include all costs necessary to conduct the buyout and are based on actual costs from approximately 200 West Virginia voluntary acquisitions, indexed to 2020 prices. Costs are narratively described in this section and shown in the six standard tables, Tables 7.2 to 7.7 of this Plan-EA. The construction cost category includes all materials, labor, and equipment necessary to acquire the real property rights (includes all costs necessary to acquire the property; 100% PL 83-566 funds as per

390-NWPM, Part 500, Subpart E, Section 500.42C(3)), and demolish homes and restore the floodplain. The engineering cost category includes engineering services incurred during demolition, inspection, contract management, consultation with sponsors, and other engineering-related services (100% PL 83-566 funds). Project administration costs include project management, outreach, reporting, overhead, and other similar costs.

Sponsors may use cash, in-kind contributions, or a combination thereof, to meet their cost-share requirement as per 390-NPWM, Part 504.11.

7.7 Relocation Payment

Relocation payments will be provided for each eligible property under the Uniform Relocation and Assistance Act. These funds are necessary to close the gap between the appraised value of floodplain property and the ability of applicants to purchase decent, safe, and sanitary housing in safe, flood-free areas. Per-capita income, poverty levels, and other disadvantaged population indicators support the justification for a relocation payment.

7.8 Operation and Maintenance

Alternative 2, Voluntary Floodplain Buyout will effectively restore the floodplain to a natural condition that will require minimal operation and maintenance. Monitoring will be necessary to ensure that no prohibited uses are occurring on parcels after buyouts are complete. Monitoring will be incorporated into existing floodplain management responsibilities, resulting in a negligible cost to sponsors.

7.9 Installation and Financing

This project is administered by NRCS in conjunction with local sponsors, with shared responsibilities for financing and implementing the project. Technical assistance will be provided by NRCS. The *preferred alternative*, Alternative 2, Voluntary Floodplain Buyout will be administered through local contracts managed by sponsors and assisted by NRCS over a five-year period:

Table 7.1: Project Schedule

Year	Activity
1	Establish project office; conduct outreach; take applications; contract for services (title work, surveys, appraisals, etc.)
2, 3	Property acquisition phase
4	Demolition phase (disconnect utilities, asbestos testing, prepare site restoration designs, inspect demolition work)
5	Financial and project closeout

Table 7.2: Estimated Installation Cost

NWPM Standard Table 1

Elkhorn Creek/Tug Fork River Watershed, West Virginia

(Dollars)[1]

Works of Improvement	Number				Estimated Cost (Dollars)[1]						
					Public Law 83-566 Funds			Other Funds			Total
	Unit	Federal Land	Non-Federal Land	Total	Federal Land NRCS	Non-Federal land NRCS	Total	Federal Land	Non-Federal Land	Total	
Voluntary Floodplain Acquisitions	30	0	30	30	$0	$2,817,600	$2,817,600	$0	$7,000	$7,000	$2,824,600
Total Project	30	0	30	30	$0	$2,817,600	$2,817,600	$0	$7,000	$7,000	$2,824,600

Prepared: January 2021

Footnotes:

[1] Price base 2020.

Table 7.3: Estimated Cost Distribution–Nonstructural Measures

NWPM Standard Table 2

Elkhorn Creek/Tug Fork River Watershed, West Virginia

(Dollars)[1]

	Installation Cost – Public Law 83-566						Installation Cost – Other Funds						Total Installation Cost
Works of Improvement	Construction [2]	Engineering [3]	Real Property Rights [4]	Relocation Payments [5]	Project Administration [6]	Total PL83-566 Cost	Construction [2]	Engineering [3]	Real Property Rights [4]	Relocation Payments [5]	Project Administration [6]	Total Other Cost	
Voluntary Floodplain Acquisitions	$800,000	$70,300	$1,209,000	$675,000	$63,300	$2,817,600	$0	$0	$0	$0	$7,000	$7,000	$2,824,600
Total	$800,000	$70,300	$1,209,000	$675,000	$63,300	$2,817,600	$0	$0	$0	$0	$7,000	$7,000	$2,824,600

Prepared: January 2021

Footnotes:

[1] Price Base 2020.

[2] Demolition and site restoration costs.

[3] Includes costs for preparing technical specifications, contract administration, construction inspection, etc.

[4] Includes costs for property acquisition as per NWPM 500.42.C (1-3).

[5] Relocation payment of $22,500 per property.

[6] Project Administration 3.5% of construction.

Table 7.4: Structural Data
NWPM Standard Table 3
Not applicable to this project.

Table 7.5: Estimated Average Annual NED Costs
NWPM Standard Table 4
Elkhorn Creek/Tug Fork River Watershed, West Virginia
(Dollars)[1]

Works of Improvement	Project Outlays Amortization of Installation Cost	Project Outlays Operation, Maintenance, and Replacement Cost [2]	Other Direct Costs	Total
Voluntary Floodplain Acquisitions	$83,200	$1,000	$0	$84,200
Total	$83,200	$1,000	$0	$84,200

Prepared: January 2021

Footnotes:
[1] Price Base 2020, costs amortized for 100 years at 2.75% water resources project discount rate.
[2] Mitigated parcels require monitoring.

Table 7.6: Estimated Average Annual Flood Damage Reduction Benefits
NWPM Standard Table 5
Elkhorn Creek/Tug Fork River Watershed, West Virginia
(Dollars)1

Item	Estimated Average Annual Damage				Damage Reduction Benefit	
Floodwater	Without Project		With Project			
	Agriculture Related[2]	Nonagriculture Related	Agriculture Related[2]	Nonagriculture Related	Agriculture Related[2]	Nonagriculture Related
Crop and Pasture	$0	$0		$0		$0
Residential	$297,200	$0	$214,500	$0	$82,700	$0
Commercial	$0	$0		$0		$0
Transportation	$0	$0		$0		$0
Utilities	$59,400	$0	$42,900	$0	$16,500	$0
Subtotal	$356,600	$0	$257,400	$0	$99,200	$0
Indirect	$71,300	$0	$51,500	$0	$19,800	$0
Total	$427,900	$0	$308,900	$0	$119,000	$0

Prepared: January 2021

Footnotes:
[1] Price Base 2020, costs amortized for 100 years at 2.75% water resources project discount rate.
[2] Agriculture-related damage includes damage to rural communities.

Table 7.7: Comparison of NED Benefits and Costs

NWPM Standard Table 6

Elkhorn Creek/Tug Fork River Watershed, West Virginia (Dollars)[1]

Works of Improvement	Average Annual Benefits					Average Annual Cost	Benefit/Cost Ratio
	Flood Damage Reduction Benefits	Savings in Debris Removal	Flood Insurance Savings	Incidental Water Quality Benefits	Total		
Voluntary Floodplain Acquisitions	$119,000	$1,900	$10,200	$12,900	$144,200	$84,200	1.7
Total	$119,000	$1,900	$10,200	$12,900	$144,200	$84,200	1.7

Prepared: January 2021

[1] Price Base 2020, costs amortized for 100 years at 2.75% water resources project discount rate.

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The watershed plan and environmental assessment were reviewed and concurred in by state staff specialists having responsibility for their respective disciplines. This review was followed by review of the document by the NWMC.		

Acknowledgements

The preparers of this Watershed Plan–Environmental Assessment would like to express sincere appreciation to the many individuals without whose dedicated assistance and hard work this document and the analysis discussed herein would not have been possible. While not all those involved in this effort may be recognized by name here, their contributions are greatly appreciated. The preparers, however, are especially indebted to the following: Mr. Kurt Donaldson, Senior Project Manager, West Virginia GIS Technical Center; Dr. Maneesh Sharma, GIS Project Lead, West Virginia GIS Technical Center; Mr. Jason Roberts, Executive Director, Region 1 Planning and Development Council; Mr. Sheldon LeMay, GIS Specialist, Region 1 Planning and Development Council; Mrs. Mercedes Betler, former Office Manager, West Virginia University College of Law, Land Use and Sustainable Development Law Clinic; Mrs. Erica Bowe, Former Office Manager, West Virginia University College of Law, Land Use and Sustainable Development Law Clinic; and Mrs. Allison Smith, Research Assistant, West Virginia University.

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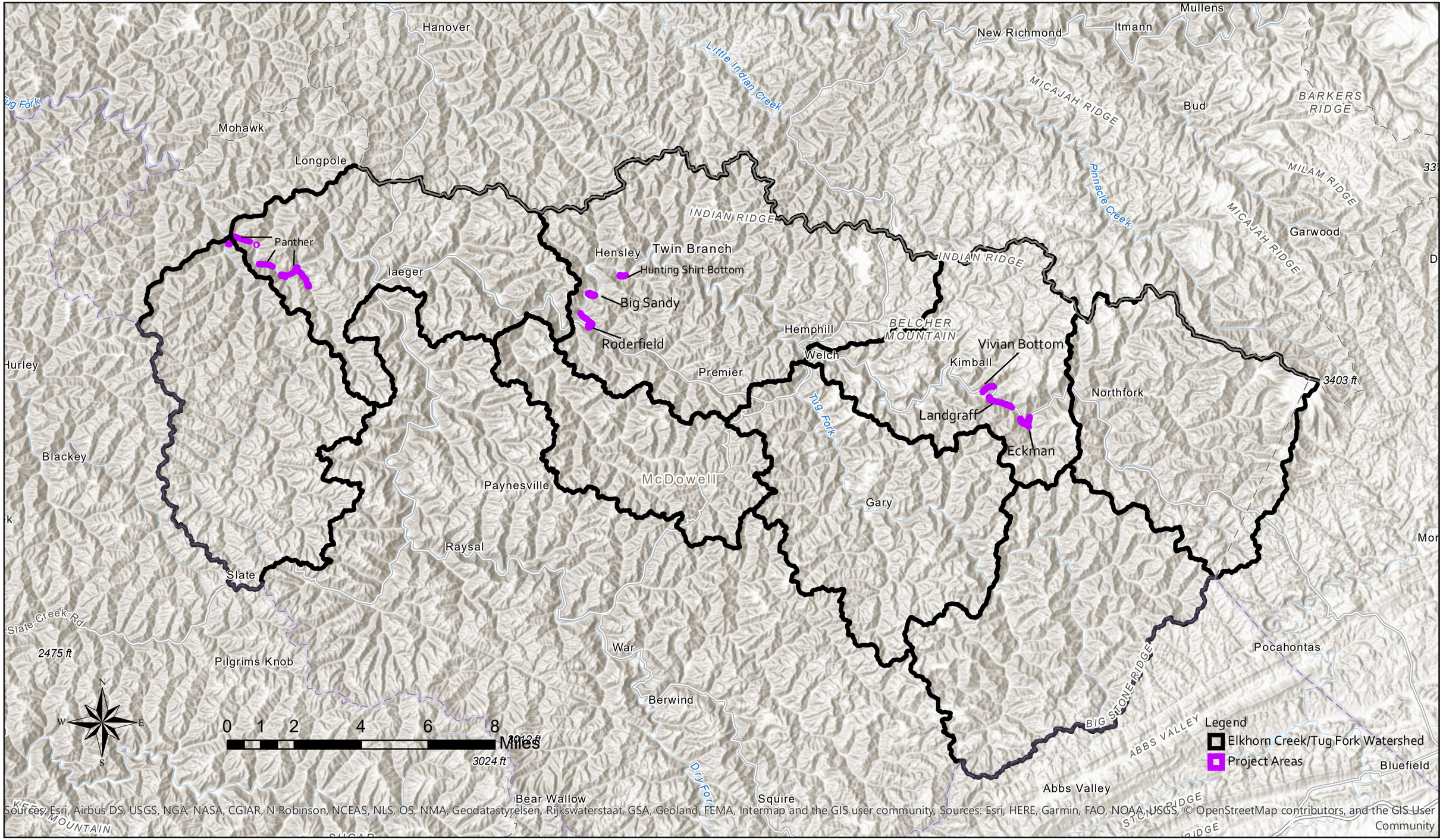
11.0 INDEX

APPENDIX A: PUBLIC COMMENT

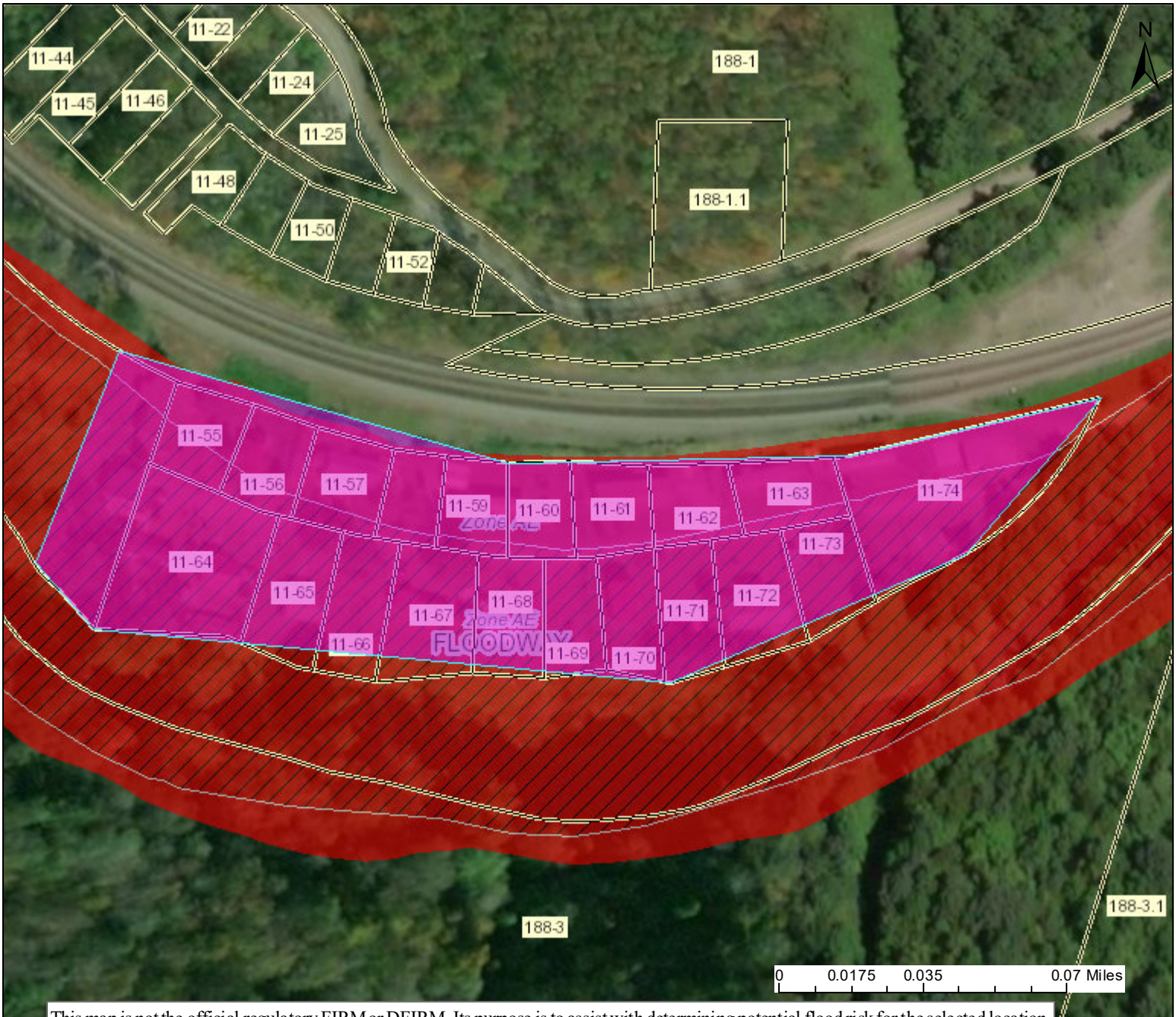
APPENDIX B: PROJECT AREA MAP

Elkhorn Creek/Tug Fork Watershed with Project Boundaries



Hunting Shirt Bottom

Hunting Shirt Bottom



This map is not the official regulatory FIRM or DFIRM. Its purpose is to assist with determining potential flood risk for the selected location.

HIGH RISK

Zone AE	1-Percent-Annual-Chance Flood Hazard Area **With Base Flood Elevation** (BFE)
Floodway	Regulatory **Floodway in AE Zone**
Zone A	1-Percent-Annual-Chance Flood Hazard Area **Without BFE** (may have Advisory Flood Heights)
Advisory	1-Percent-Annual-Chance **High Risk Advisory**

Download the Full Legend for all flood tool symbols
https://www.mapwv.gov/flood/map/docs/wv_flood_tool_legend.pdf

Disclaimer:
The online map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. Refer to the official Flood Insurance Study (FIS) for detailed flood elevation data in flood profiles and data tables. WV Flood Tool (*https://www.mapwv.gov/flood*) is supported by FEMA, WV NFIP Office, and WV GIS Technical Center.

Flood Info Location

Map created on 11/21/2019

User Notes

Flood Hazard Area	Location is **NOT WITHIN** any identified flood hazard area. Unmapped flood hazard areas may be present.
Flood Zone	Out of Flood Zone
Stream	N/A
Watershed (HUC8)	Upper Guyandotte (5070101)
Flood Height	
Water Depth	
Elevation	About 1258 ft (Source: WVDEP 2010-13)
Community & ID	Wyoming County (ID: 540217)
FEMA Map & Date	54109C0257D; Effective Date: 5/16/2006
Location (lat, long)	(37.601690, -81.641188)
Parcel ID	55-01-0106-0005-0000
E-911 Address	multiple addresses

Vivian Bottom

Vivian Bottom

HIGH RISK

Zone AE	1-Percent-Annual-Chance Flood Hazard Area **With Base Flood Elevation** (BFE)
Floodway	Regulatory **Floodway in AE Zone**
Zone A	1-Percent-Annual-Chance Flood Hazard Area **Without BFE** (may have Advisory Flood Heights)
Advisory	1-Percent-Annual-Chance **High Risk Advisory**

Download the Full Legend for all flood tool symbols
https://www.mapwv.gov/flood/map/docs/wv_flood_tool_legend.pdf

Disclaimer:
The online map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. Refer to the official Flood Insurance Study (FIS) for detailed flood elevation data in flood profiles and data tables. WV Flood Tool (*https://www.mapwv.gov/flood*) is supported by FEMA, WV NFIP Office, and WV GIS Technical Center.

Flood Info Location

Map created on 11/21/2019

User Notes

Flood Hazard Area	Location is **NOT WITHIN** any identified flood hazard area. Unmapped flood hazard areas may be present.
Flood Zone	Out of Flood Zone
Stream	N/A
Watershed (HUC8)	Tug (5070201)
Flood Height	
Water Depth	
Elevation	About 1734 ft (Source: WVDEP 2010-13)
Community & ID	Mcdowell County (ID: 540114)
FEMA Map & Date	54047C0211D; Effective Date: 6/16/2005
Location (lat, long)	(37.414894, -81.479086)
Parcel ID	27-04-0234-0012-0000
E-911 Address	multiple addresses

Landgraff

Landgraff

This map is not the official regulatory FIRM or DFIRM. Its purpose is to assist with determining potential flood risk for the selected location.

HIGH RISK

- Zone AE — 1-Percent-Annual-Chance Flood Hazard Area **With Base Flood Elevation** (BFE)
- Floodway — Regulatory **Floodway in AE Zone**
- Zone A — 1-Percent-Annual-Chance Flood Hazard Area **Without BFE** (may have Advisory Flood Heights)
- Advisory — 1-Percent-Annual-Chance **High Risk Advisory**

Download the Full Legend for all flood tool symbols
https://www.mapwv.gov/flood/map/docs/wv_flood_tool_legend.pdf

Disclaimer:
The online map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. Refer to the official Flood Insurance Study (FIS) for detailed flood elevation data in flood profiles and data tables. WV Flood Tool (*https://www.mapwv.gov/flood*) is supported by FEMA, WV NFIP Office, and WV GIS Technical Center.

Flood Info Location

Map created on 11/21/2019

User Notes

Flood Hazard Area	Location is **NOT WITHIN** any identified flood hazard area. Unmapped flood hazard areas may be present.
Flood Zone	Out of Flood Zone
Stream	N/A
Watershed (HUC8)	Tug (5070201)
Flood Height	
Water Depth	
Elevation	About 1734 ft (Source: WVDEP 2010-13)
Community & ID	Mcdowell County (ID: 540114)
FEMA Map & Date	54047C0211D; Effective Date: 5/16/2006
Location (lat, long)	(37.414894, -81.479086)
Parcel ID	27-04-0234-0012-0000
E-911 Address	multiple addresses

Eckman

Eckman

This map is not the official regulatory FIRM or DFIRM. Its purpose is to assist with determining potential flood risk for the selected location.

HIGH RISK

- Zone AE — 1-Percent-Annual-Chance Flood Hazard Area **With Base Flood Elevation** (BFE)
- Floodway — Regulatory **Floodway in AE Zone**
- Zone A — 1-Percent-Annual-Chance Flood Hazard Area **Without BFE** (may have Advisory Flood Heights)
- Advisory — 1-Percent-Annual-Chance **High Risk Advisory**

Download the Full Legend for all flood tool symbols
https://www.mapwv.gov/flood/map/docs/wv_flood_tool_legend.pdf

Disclaimer:
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Flood Info Location

Map created on 11/21/2019

User Notes	
Flood Hazard Area	
Flood Zone	
Stream	
Watershed (HUC8)	
Flood Height	
Water Depth	
Elevation	
Community & ID	
FEMA Map & Date	
Location (lat, long)	
Parcel ID	
E-911 Address	

Roderfield


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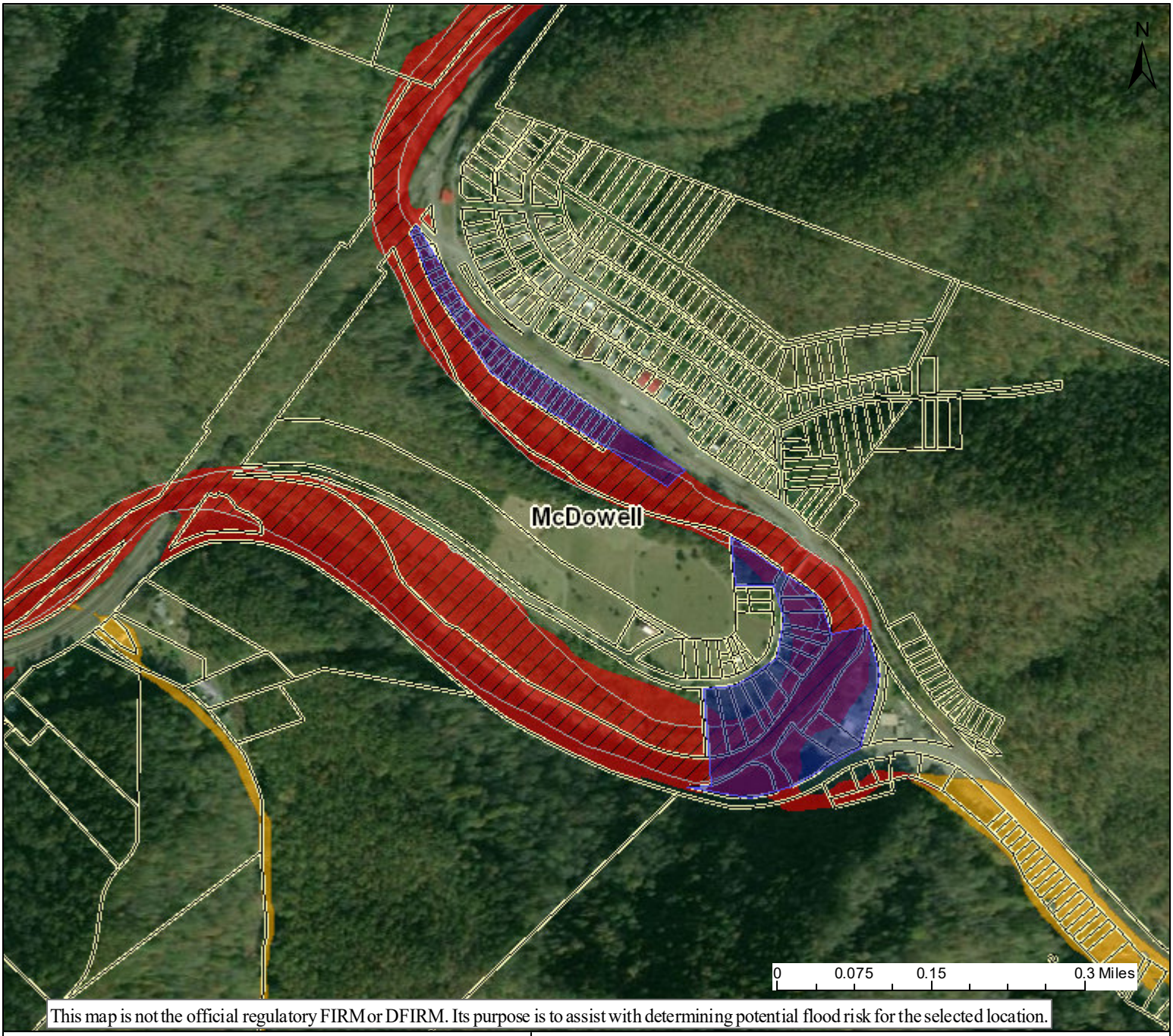
Roderfield



This map is not the official regulatory FIRM or DFIRM. Its purpose is to assist with determining potential flood risk for the selected location.

HIGH RISK

Zone AE	1-Percent-Annual-Chance Flood Hazard Area **With Base Flood Elevation** (BFE)
Floodway	Regulatory **Floodway in AE Zone**
Zone A	1-Percent-Annual-Chance Flood Hazard Area **Without BFE** (may have Advisory Flood Heights)
Advisory	1-Percent-Annual-Chance **High Risk Advisory**

Download the Full Legend for all flood tool symbols
https://www.mapwv.gov/flood/map/docs/wv_flood_tool_legend.pdf

Disclaimer:
The online map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. Refer to the official Flood Insurance Study (FIS) for detailed flood elevation data in flood profiles and data tables. WV Flood Tool (*https://www.mapwv.gov/flood*) is supported by FEMA, WV NFIP Office, and WV GIS Technical Center.

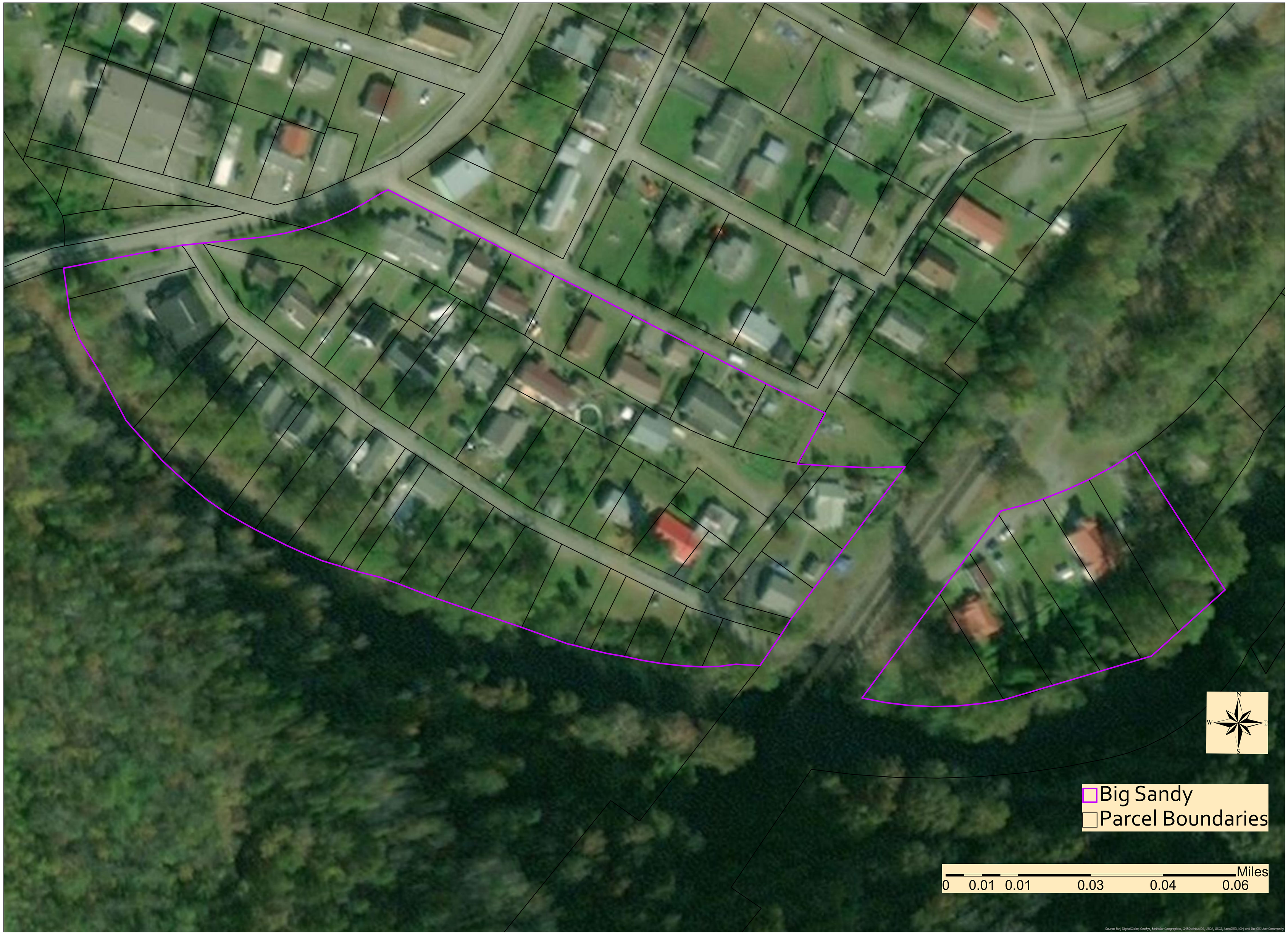
Flood Info Location

Map created on 11/21/2019

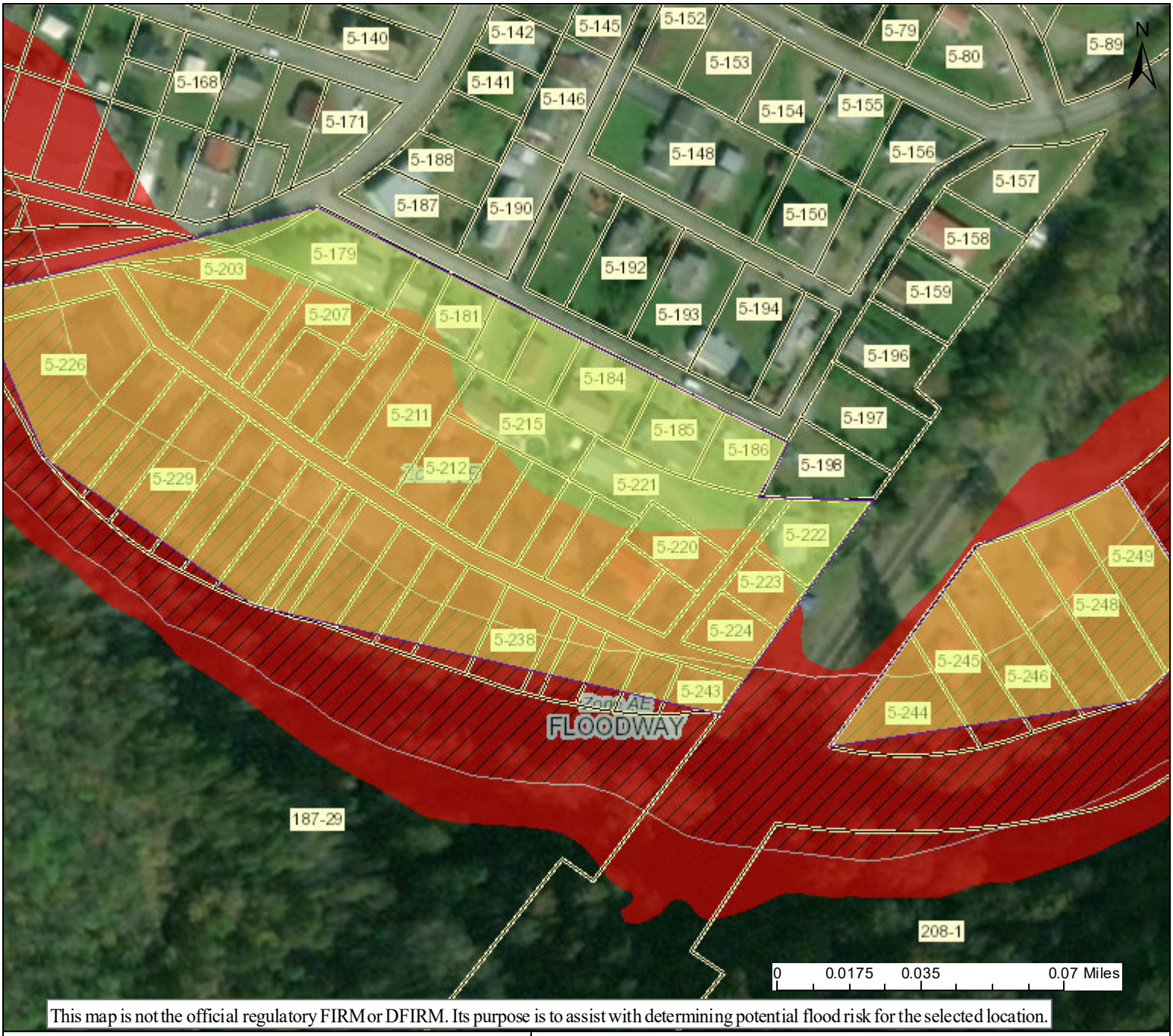
User Notes

Flood Hazard Area	Location is **NOT WITHIN** any identified flood hazard area. Unmapped flood hazard areas may be present.
Flood Zone	Out of Flood Zone
Stream	N/A
Watershed (HUC8)	Tug (5070201)
Flood Height	
Water Depth	
Elevation	About 1734 ft (Source: WVDEP 2010-13)
Community & ID	Mcdowell County (ID: 540114)
FEMA Map & Date	54047C0211D; Effective Date: 6/16/2005
Location (lat, long)	(37.414894, -81.479086)
Parcel ID	27-04-0234-0012-0000
E-911 Address	multiple addresses

Big Sandy


N
W
E
S
Big Sandy
Parcel Boundaries
Miles
0 0.01 0.01 0.03 0.04 0.06
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Big Sandy



This map is not the official regulatory FIRM or DFIRM. Its purpose is to assist with determining potential flood risk for the selected location.

HIGH RISK

Zone AE	1-Percent-Annual-Chance Flood Hazard Area **With Base Flood Elevation** (BFE)
Floodway	Regulatory **Floodway in AE Zone**
Zone A	1-Percent-Annual-Chance Flood Hazard Area **Without BFE** (may have Advisory Flood Heights)
Advisory	1-Percent-Annual-Chance **High Risk Advisory**

Download the Full Legend for all flood tool symbols
https://www.mapwv.gov/flood/map/docs/wv_flood_tool_legend.pdf

Disclaimer:
The online map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. Refer to the official Flood Insurance Study (FIS) for detailed flood elevation data in flood profiles and data tables. WV Flood Tool (*https://www.mapwv.gov/flood*) is supported by FEMA, WV NFIP Office, and WV GIS Technical Center.

Flood Info Location

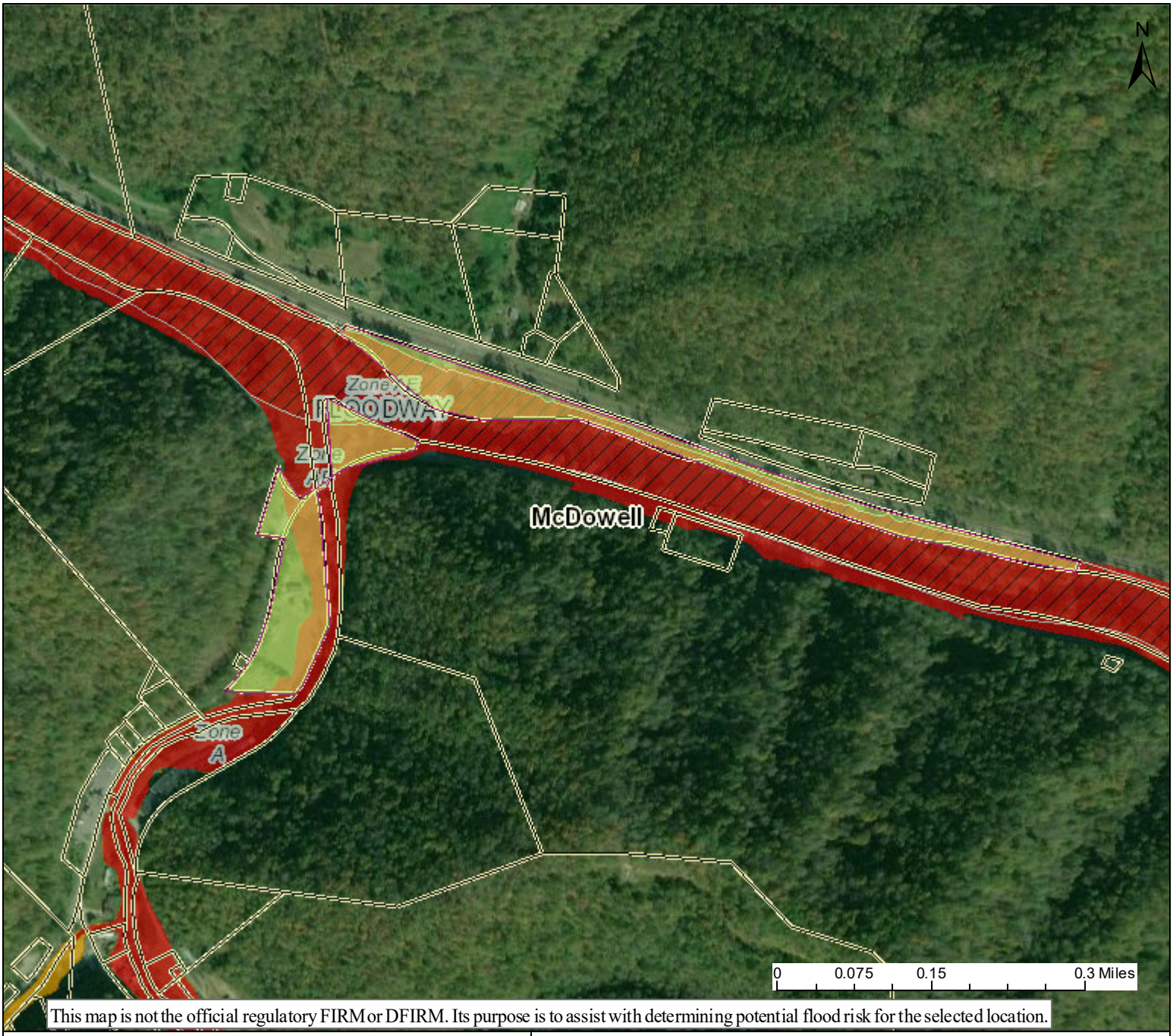
Map created on 11/21/2019

User Notes

Flood Hazard Area	
Flood Zone	
Stream	
Watershed (HUC8)	
Flood Height	
Water Depth	
Elevation	
Community & ID	
FEMA Map & Date	
Location (lat, long)	
Parcel ID	
E-911 Address	

Panther 1

Panther 1



This map is not the official regulatory FIRM or DFIRM. Its purpose is to assist with determining potential flood risk for the selected location.

HIGH RISK

Zone AE	1-Percent-Annual-Chance Flood Hazard Area **With Base Flood Elevation** (BFE)
Floodway	Regulatory **Floodway in AE Zone**
Zone A	1-Percent-Annual-Chance Flood Hazard Area **Without BFE** (may have Advisory Flood Heights)
Advisory	1-Percent-Annual-Chance **High Risk Advisory**

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https://www.mapwv.gov/flood/map/docs/wv_flood_tool_legend.pdf

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Flood Info Location

Map created on 11/21/2019

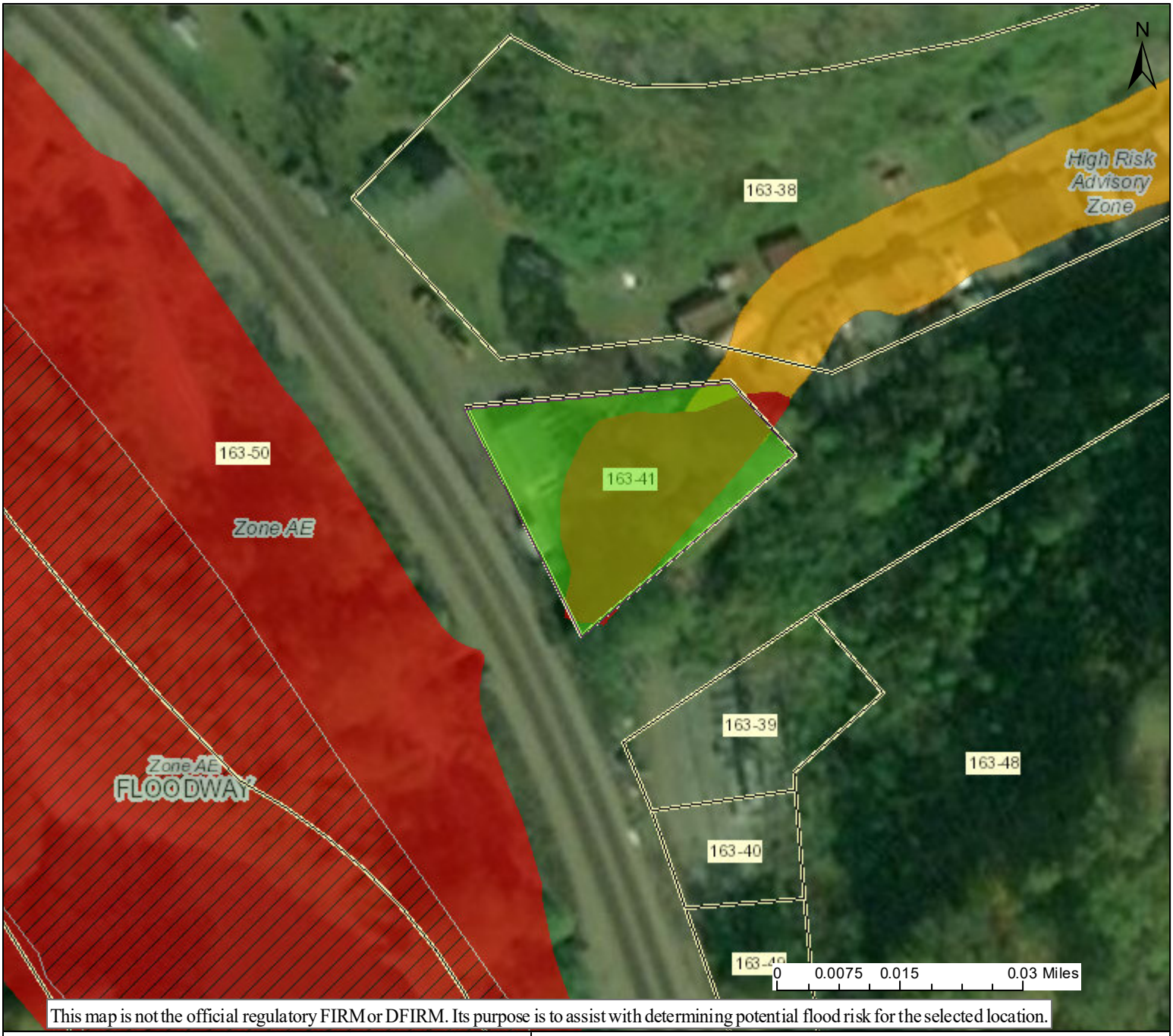
User Notes

Flood Hazard Area	Location is **NOT WITHIN** any identified flood hazard area. Unmapped flood hazard areas may be present.
Flood Zone	Out of Flood Zone
Stream	N/A
Watershed (HUC8)	Tug (5070201)
Flood Height	
Water Depth	
Elevation	About 1734 ft (Source: WVDEP 2010-13)
Community & ID	Mcdowell County (ID: 540114)
FEMA Map & Date	54047C0211D; Effective Date: 6/16/2005
Location (lat, long)	(37.414894, -81.479086)
Parcel ID	27-04-0234-0012-0000
E-911 Address	multiple addresses

Panther 2


N
W
E
S
Panther 2
Parcel Boundaries
Miles
0 0 0 0.01 0.01 0.02
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Panther 2



This map is not the official regulatory FIRM or DFIRM. Its purpose is to assist with determining potential flood risk for the selected location.

HIGH RISK

Zone AE	1-Percent-Annual-Chance Flood Hazard Area **With Base Flood Elevation** (BFE)
Floodway	Regulatory **Floodway in AE Zone**
Zone A	1-Percent-Annual-Chance Flood Hazard Area **Without BFE** (may have Advisory Flood Heights)
Advisory	1-Percent-Annual-Chance **High Risk Advisory**

Download the Full Legend for all flood tool symbols
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Flood Info Location

Map created on 11/21/2019

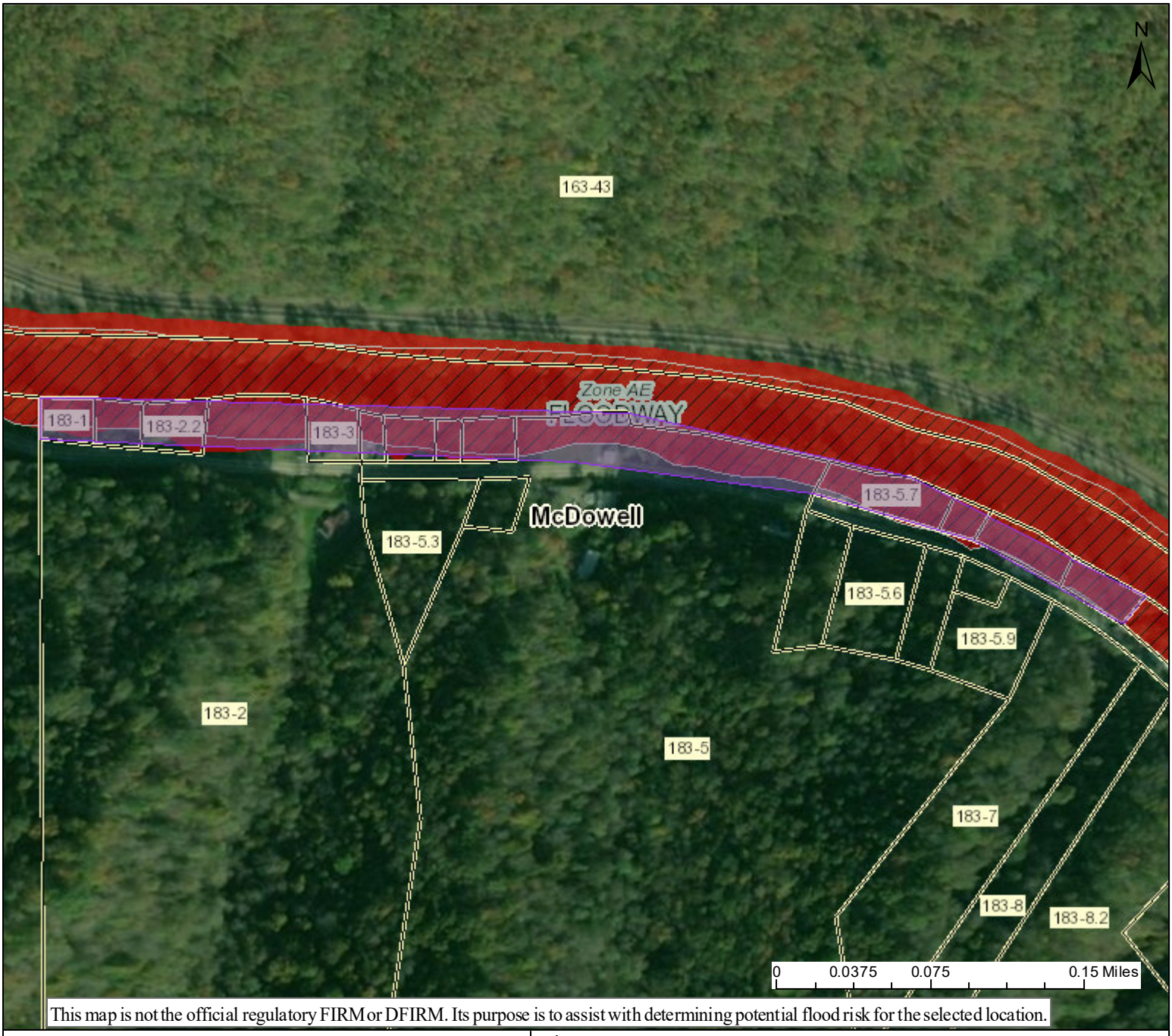
User Notes

Flood Hazard Area	Location is **NOT WITHIN** any identified flood hazard area. Unmapped flood hazard areas may be present.
Flood Zone	Out of Flood Zone
Stream	N/A
Watershed (HUC8)	Tug (5070201)
Flood Height	
Water Depth	
Elevation	About 1734 ft (Source: WVDEP 2010-13)
Community & ID	Mcdowell County (ID: 540114)
FEMA Map & Date	54047C0211D; Effective Date: 6/16/2005
Location (lat, long)	(37.414894, -81.479086)
Parcel ID	27-04-0234-0012-0000
E-911 Address	multiple addresses

Panther 3


N
W
E
S
Panther 3
Parcel Boundaries
Miles
0 0.01 0.03 0.05 0.08 0.1
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Panther 3



HIGH RISK

Zone AE	1-Percent-Annual-Chance Flood Hazard Area **With Base Flood Elevation** (BFE)
Floodway	Regulatory **Floodway in AE Zone**
Zone A	1-Percent-Annual-Chance Flood Hazard Area **Without BFE** (may have Advisory Flood Heights)
Advisory	1-Percent-Annual-Chance **High Risk Advisory**

Download the Full Legend for all flood tool symbols
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Flood Info Location

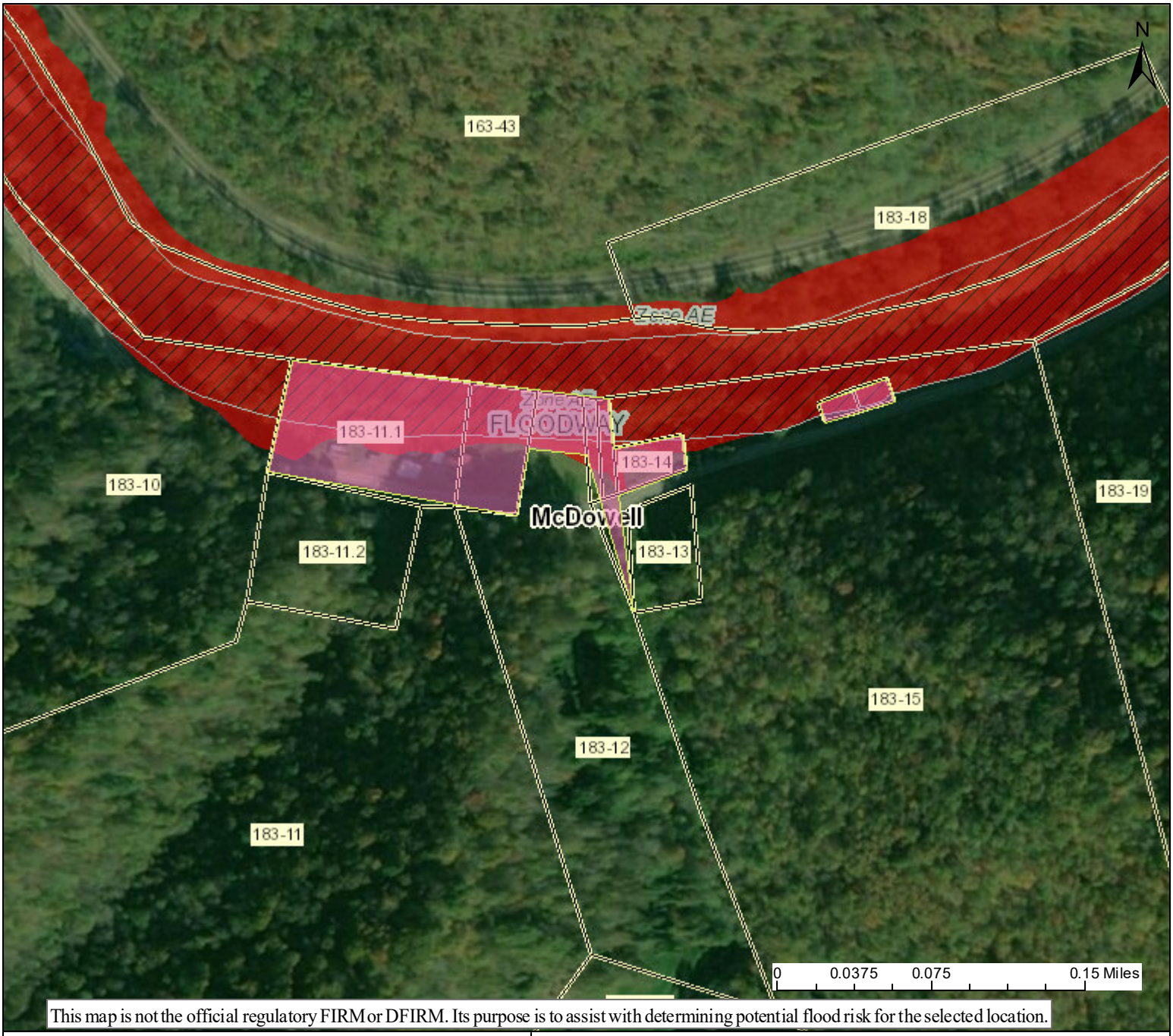
Map created on 11/21/2019

User Notes

Flood Hazard Area	Location is **NOT WITHIN** any identified flood hazard area. Unmapped flood hazard areas may be present.
Flood Zone	Out of Flood Zone
Stream	N/A
Watershed (HUC8)	Tug (5070201)
Flood Height	
Water Depth	
Elevation	About 1734 ft (Source: WVDEP 2010-13)
Community & ID	Mcdowell County (ID: 540114)
FEMA Map & Date	54047C0211D; Effective Date: 6/16/2005
Location (lat, long)	(37.414894, -81.479086)
Parcel ID	27-04-0234-0012-0000
E-911 Address	multiple addresses

Panther 4

Panther 4



This map is not the official regulatory FIRM or DFIRM. Its purpose is to assist with determining potential flood risk for the selected location.

HIGH RISK

Zone AE	1-Percent-Annual-Chance Flood Hazard Area **With Base Flood Elevation** (BFE)
Floodway	Regulatory **Floodway in AE Zone**
Zone A	1-Percent-Annual-Chance Flood Hazard Area **Without BFE** (may have Advisory Flood Heights)
Advisory	1-Percent-Annual-Chance **High Risk Advisory**

Download the Full Legend for all flood tool symbols
https://www.mapwv.gov/flood/map/docs/wv_flood_tool_legend.pdf

Disclaimer:
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Flood Info Location

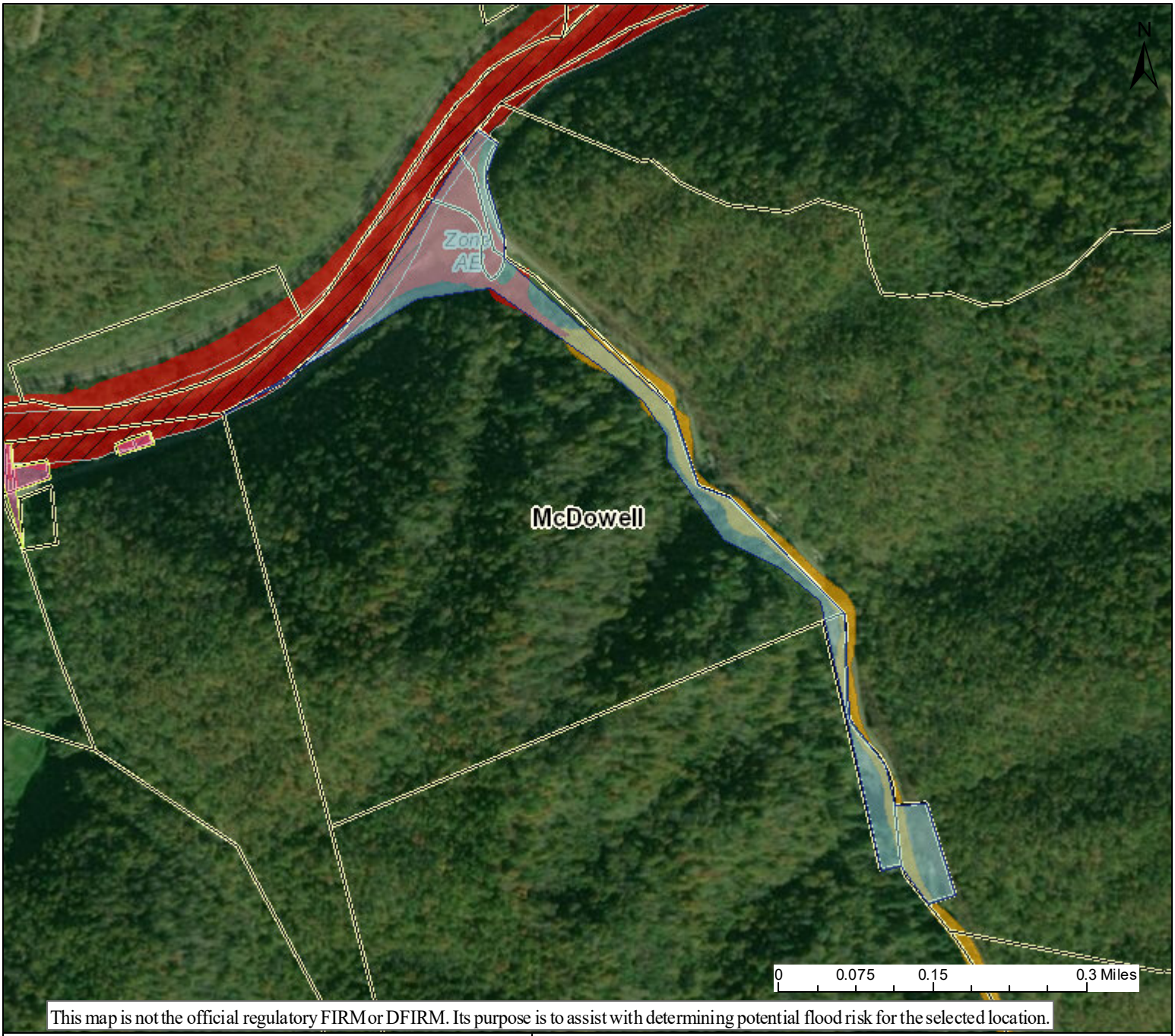
Map created on 11/21/2019

User Notes

Flood Hazard Area	Location is **NOT WITHIN** any identified flood hazard area. Unmapped flood hazard areas may be present.
Flood Zone	Out of Flood Zone
Stream	N/A
Watershed (HUC8)	Tug (5070201)
Flood Height	
Water Depth	
Elevation	About 1734 ft (Source: WVDEP 2010-13)
Community & ID	Mcdowell County (ID: 540114)
FEMA Map & Date	54047C0211D; Effective Date: 6/16/2005
Location (lat, long)	(37.414894, -81.479086)
Parcel ID	27-04-0234-0012-0000
E-911 Address	multiple addresses

Panther 5

Panther 5



This map is not the official regulatory FIRM or DFIRM. Its purpose is to assist with determining potential flood risk for the selected location.

HIGH RISK

Zone AE	1-Percent-Annual-Chance Flood Hazard Area **With Base Flood Elevation** (BFE)
Floodway	Regulatory **Floodway in AE Zone**
Zone A	1-Percent-Annual-Chance Flood Hazard Area **Without BFE** (may have Advisory Flood Heights)
Advisory	1-Percent-Annual-Chance **High Risk Advisory**

Download the Full Legend for all flood tool symbols
https://www.mapwv.gov/flood/map/docs/wv_flood_tool_legend.pdf

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Flood Info Location

Map created on 11/21/2019

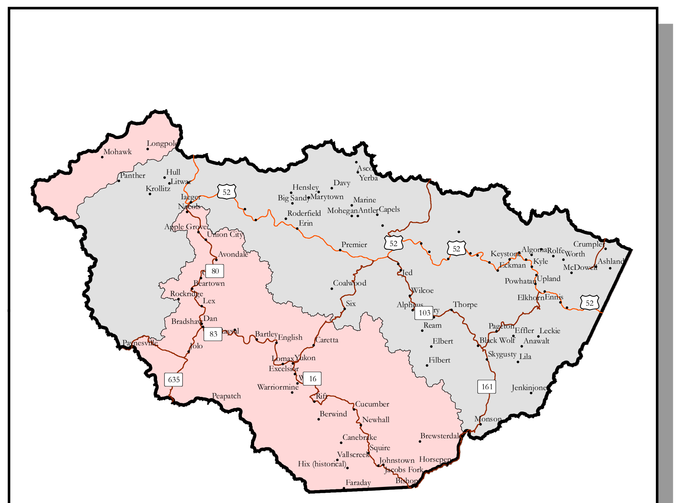
User Notes

Flood Hazard Area	Location is **NOT WITHIN** any identified flood hazard area. Unmapped flood hazard areas may be present.
Flood Zone	Out of Flood Zone
Stream	N/A
Watershed (HUC8)	Tug (5070201)
Flood Height	
Water Depth	
Elevation	About 1734 ft (Source: WVDEP 2010-13)
Community & ID	Mcdowell County (ID: 540114)
FEMA Map & Date	54047C0211D; Effective Date: 6/16/2005
Location (lat, long)	(37.414894, -81.479086)
Parcel ID	27-04-0234-0012-0000
E-911 Address	multiple addresses

APPENDIX C: SUPPORT MAPS

Elkhorn Creek Watershed

Municipal Boundaries



Panther
Hull
Litwar
Johnnycake
Krollitz
Iaeger
Sandy Huff
Wilmore
Clear Fork Junction
Roderfield
Erin
Hensley
Marytown
Twin Branch
Davy
Big Sandy
Asco
Yerba
Marine
Mohegan Antler
Capels
Hemphill
Welch
Maitland
Carswell
Kimball
Bottom Creek
Superior
Big Four
Vivian
Premier
Havaco
Jed
Coalwood
Wilcoe
Six
Alpheus
Gary
Venus
Thorpe
Ream
Elbert
Filbert
Skygusty
Pageton
Effler
Anawalt
Leckie
Lila
Jenkinjones
Monson
Northfork
Algoma
Keystone
Clark
Kyle
Powhatan
Elkhorn
Ennis
Switchback
Maybeury
Eckman
Gilliam
Rolfe
Worth
Crumpler
Ashland
Cherokee
McDowell

Legend

- Populated Places
- Rivers & Streams
- Water Bodies
- Major Roads
- State Roads
- Roads
- Municipal Boundary
- Watershed Boundary

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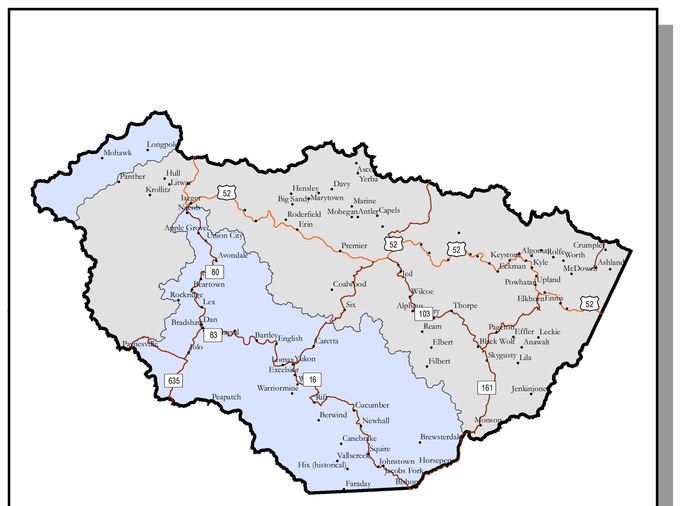
0 2.5 5 10 15 20 Miles

Document Path: \\10.1.0.233\gis\S\projects-one_time\region1_various\Elkhorn Creek & Upper Guyandotte Watershed Project\Elkhorn Creek_Municipal_Boundary.mxd

Elkhorn Creek Watershed

Flood Data



Legend

- Populated Places
- Hazard Mitigation Buyout Properties (265 Structures)
- Rivers & Streams
- Major Roads
- State Roads
- Roads
- Water Bodies
- Watershed Boundary
- Regulatory Floodway
- 1% Annual Chance Flood Hazard

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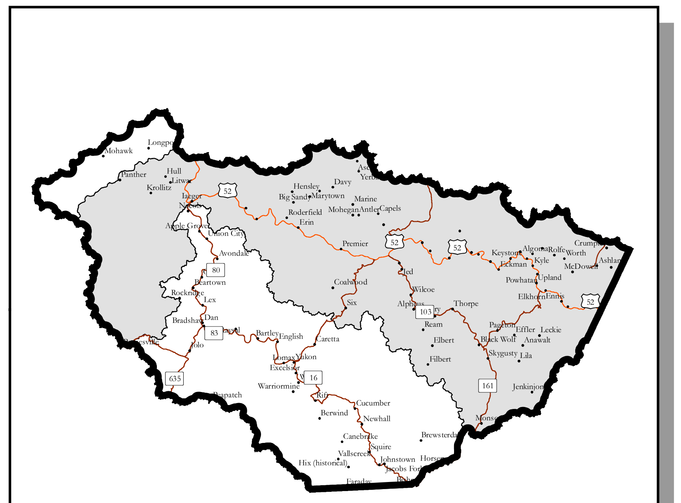
Elkhorn Creek Watershed

Water Service Areas



Elkhorn Creek Watershed-McDowell County

Legend

- Populated Places
- Rivers & Streams
- Major Roads
- State Roads
- Roads
- Water Bodies
- Watershed Boundary
- Municipal Boundary
- Existing Water
- Water Under Construction
- Planned Water

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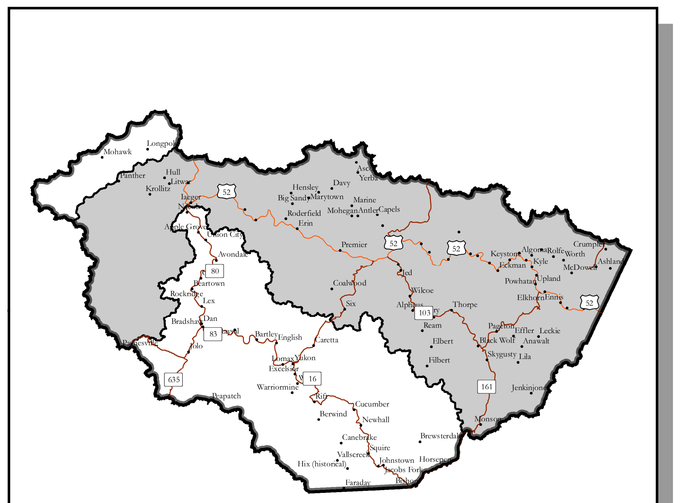
Document Path: \\10.1.0.233\gis\S\projects-one_time\region1_various\Elkhorn Creek & Upper Guyandotte Watershed Project\Elkhorn Creek_Water.mxd

Elkhorn Creek Watershed

Sewer Service Areas



Elkhorn Creek Watershed-McDowell County

Legend

- Populated Places
- Rivers & Streams
- Water Bodies
- Major Roads
- State Roads
- Roads
- Municipal Boundary
- Watershed Boundary
- Existing Sewer
- Funded Sewer Upgrade
- Planned Sewer

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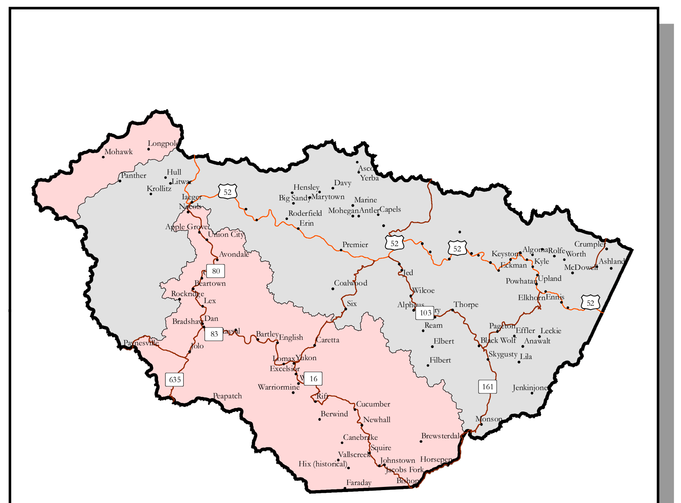
Document Path: \\10.1.0.233\gis\S\projects-one_time\region1_various\Elkhorn Creek & Upper Guyandotte Watershed Project\Elkhorn Creek_Sewer.mxd

Elkhorn Creek Watershed

Water & Sewer Service Areas



Panther
Hull
Litwar
Johnnycake
Krollitz
Iaeger
Sandy Huff
Wilmore
Clear Fork Junction
Hensley
Big Sandy
Roderfield
Erin
Twin Branch
Marytown
Davy
Asco
Yerba
Marine
Mohegan Antler
Capels
Hemphill
Premier
Coalwood
Six
Havaco
Jed
Wilcoe
Alpheus
Gary
Venus
Thorpe
Ream
Elbert
Filbert
Welch
Maitland
Superior
Big Four
Carswell
Kimball
Bottom Creek
Vivian
Eckman
Northfork
Keystone
Clark
Algoma
Gilliam
Rolfe
Worth
Kyle
Powhatan
Elkhorn
Ennis
Switchback
Maybeury
McDowell
Ashland
Crumpler
Cherokee
Pageton
Effler
Leckie
Anawalt
Skygusty
Lila
Jenkinjones
Monson

Legend

- Populated Places
- Rivers & Streams
- Water Bodies
- Watershed Boundary
- Major Roads
- State Roads
- Roads
- Municipal Boundary
- Existing Water Only
- Water & Sewer
- Existing Water & Funded Sewer-No Construction
- Funded Sewer-No Construction (Planned Water)
- Planned Sewer
- Existing Water & Planned Sewer
- Planned Water
- Water Under Construction-No Sewer

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0 2.5 5 10 15 20 Miles

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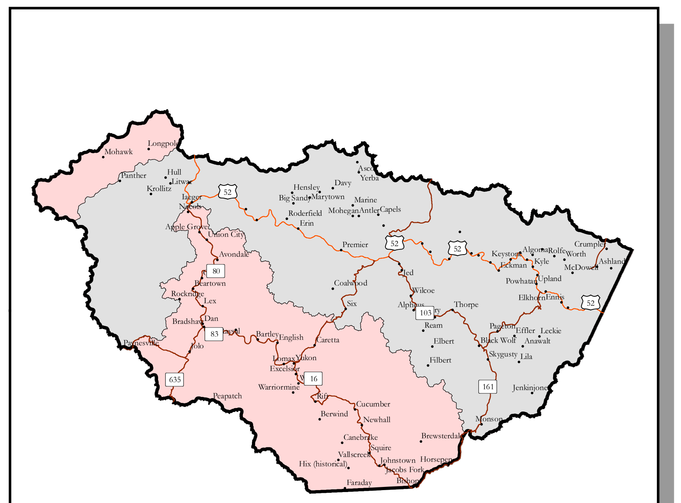
Elkhorn Creek Watershed

-Water & Sewer Service Areas-

-Special Flood Hazard Areas-



Elkhorn Creek Watershed-McDowell County

Legend

- Populated Places
- Rivers & Streams
- Water Bodies
- Watershed Boundary
- Major Roads
- State Roads
- Roads
- Municipal Boundary
- Existing Water Only
- Water & Sewer
- Existing Water & Funded Sewer-No Construction
- Funded Sewer-No Construction (Planned Water)
- Planned Sewer
- Existing Water & Planned Sewer
- Planned Water
- Water Under Construction-No Sewer
- Regulatory Floodway
- 1% Annual Chance Flood Hazard

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0 2.5 5 10 15 20 Miles

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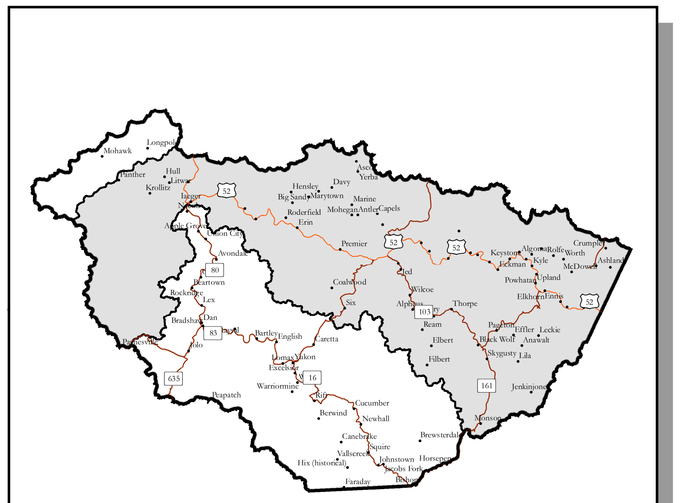
Elkhorn Creek Watershed

Water Quality



Elkhorn Creek Watershed-McDowell County

Legend

- Populated Places
- Water Bodies
- Major Roads
- State Roads
- Roads
- Municipal Boundary
- Watershed Boundary
- Rivers & Streams
- 303(d) Impaired Streams (Cause=Fecal/Bacteria)
- 303(d) Impaired Streams (Cause=Other Sources)
- Wetlands
- Mining Permit Boundary
- Mining Valley Fills

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0 2.5 5 10 15 20 Miles

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Elkhorn Creek Watershed

Land Use

Panther
Hull
Litwar
Johnnycake
Krollitz
Sandy Huff
Iaeger
Wilmore
Clear Fork Junction
Hensley
Twin Branch
Davy
Marytown
Big Sandy
Asco
Yerba
Marine
Mohegan Antler
Capels
Roderfield
Erin
Hemphill
Carswell
Welch
Maitland
Premier
Superior
Kimball
Bottom Creek
Vivian
Northfork
Gilliam
Algoma
Rolfe
Crumpler
Keystone
Clark
Worth
Big Four
Havaco
Jed
Eckman
Kyle
Ashland
Cherokee
Powhatan
McDowell
Upland
Coalwood
Wilcoe
Six
Alpheus
Thorpe
Ennis
Switchback
Maybeury
Gary
Venus
Ream
Pageton
Effler
Leckie
Elbert
Anawalt
Skygusty
Lila
Filbert
Jenkinjones
Monson

Legend

- Populated Places
- Rivers & Streams
- Water Bodies
- Major Roads
- State Roads
- Roads
- Municipal Boundary
- Watershed Boundary
- Shrub/Scrub
- Open Water
- Mixed Forest
- Herbaceuous
- Hay/Pasture
- Evergreen Forest
- Developed, Open Space
- Developed, Medium Intensity
- Developed, Low Intensity
- Developed, High Intensity
- Deciduous Forest
- Barren Land

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0 2.5 5 10 15 20 Miles

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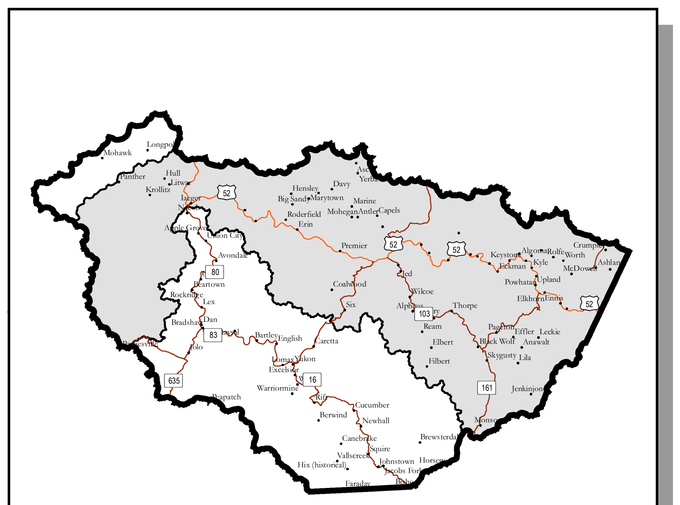
Elkhorn Creek Watershed

Economic Development



Legend

- Populated Places
- Rivers & Streams
- Water Bodies
- Watershed Boundary
- Major Roads
- State Roads
- Roads
- Abandonded Railroad
- Norfolk Southern Railroad
- Indian Ridge Industrial Park
- Hatfield-McCoy Trail System-Dirt Trail (ATV, UTV, & Dirt Bikes)

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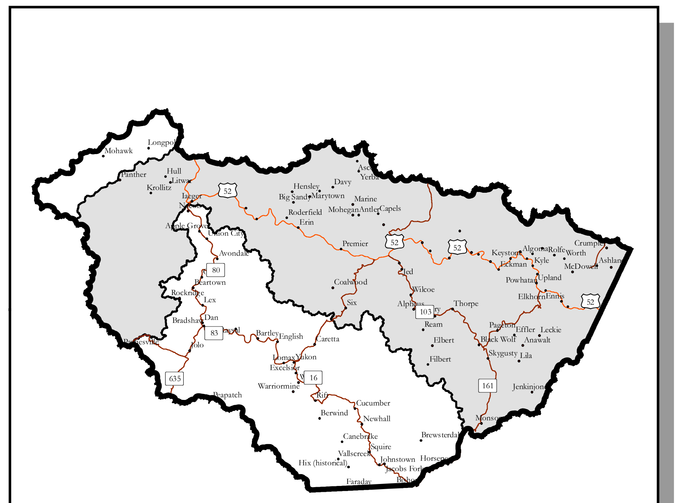
0 2.5 5 10 15 20 Miles

Document Path: \\10.1.0.233\gis\S\projects-one_time\region1_various\Elkhorn Creek & Upper Guyandotte Watershed Project\Elkhorn Creek_Economic_Development.mxd

Elkhorn Creek Watershed

Tourism



Panther State Forest
Panther Wildlife Management Area

Legend

- Populated Places
- Water Bodies
- Watershed Boundary
- Panther State Forest
- Public Fishing Area
- Wildlife Management Area
- State Roads
- Roads
- Major Roads
- Stocked Trout Stream
- Hatfield-McCoy Trail System-Dirt Trail (ATV, UTV, & Dirt Bikes)

Produced By Region I PDC
1439 E. Main Street
Suite 5
Princeton, WV 24740
(304) 431-7225
www.regiononepdc.org
"Serving the people of McDowell, Mercer, Monroe, Raleigh, Summers & Wyoming Counties"

0 2.5 5 10 15 20 Miles

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APPENDIX D: INVESTIGATION AND ANALYSIS REPORT

To determine *proposed project sites* within the *project area*, planners (1) gathered input from local stakeholders; (2) solicited input from the regulatory community; (3) created maps through the Region 1 Planning and Development Council (Region 1) to understand overlays of project data; (4) analyzed project mapping from Region 1 against mapping from the WV Flood Tool; (5) gathered and analyzed flood and real property-related data available through the WV Flood Tool; and (6) calculated potential flood damage reduction benefits for each structure within the *proposed project sites*.

Local Stakeholder Input

The first step taken to determine *proposed project sites* within the *project area* boundary was to gather input from McDowell County local leaders. More specifically, planners invited local leaders, including mayors from all incorporated municipalities in McDowell County; members of the McDowell County Commission; the directors of the McDowell County Economic Development Authority; the director of the McDowell County Redevelopment Authority; the director of Region 1 Planning and Development Council; West Virginia State senators and House of Delegates members representing the area; and county floodplain managers to an introductory meeting.

Planners explained the desire to plan a project aimed at addressing harm and damage caused by flooding in the *project area* and reducing the threat of potential future flooding. Planners explained that all alternatives would be considered and addressed obstacles associated with constructing dams, channels, and other structural measures within the *project area*. At that meeting, planners then worked to gauge local support for a potential voluntary floodplain buyout project and offered the local leaders in attendance an opportunity to discuss local priorities in the context of such a project. In addition to expressing general concerns about flooding, participants identified (1) minimizing impacts to existing and future water and sewer infrastructure; (2) working outside of municipal boundaries; (3) avoiding existing and future economic development areas; and (4) addressing dilapidated buildings as issues to prioritize, if possible, during the planning process.

This group of local leaders also identified additional stakeholders to interview during the planning process, including the West Virginia Bureau for Public Health, the West Virginia Department of Environmental Protection (WVDEP), the West Virginia Department of Highways (WVDOH), the McDowell County Public Service District, the Planning Division of the Federal Emergency Management Administration (FEMA), the West Virginia National Guard, the Elkhorn Creek Watershed Association, Twin Rivers Conservation Club, the Solid Waste Authority, the West Virginia State Development Office, and the Appalachian Regional Commission. Planners had the opportunity to interview these identified stakeholders during the initial scoping meetings, at visits to *potential project sites*, and during individual meetings. Feedback from additional stakeholders was consistent with priorities identified by local leaders.

Regulatory Community Input

Next, planners conducted a public scoping meeting with the regulatory community. All known federal and state agencies working in the *project area* were invited to the scoping meeting. The scoping meeting included participation from the following regulatory agencies: WVDEP, USACE-Planning Division, USACE-Regulatory Division, the West Virginia Development Office, the West Virginia Department of Natural Resources (WVDNR), Region 1 Planning and Development Council, the Coal Heritage Highway Authority, and West Virginia State Parks. In addition to these regulatory agencies, representatives from Trout Unlimited and Downstream Strategies attended the scoping meeting. Most

of the comments at the scoping meeting were about sharing data that would benefit the planning process. Additional information about public feedback is available in Section 6.

Region 1 Maps and Understanding Overlays of Project Data

Following these scoping meetings, the Land Use Clinic contracted with Region 1 to collect and analyze data for mapping purposes to highlight the local priorities identified during conversations with local leaders, regulatory agencies, and other stakeholders. As a result, West Virginia Region 1 Planning and Development Council developed mapping resources displaying the Regulatory Floodway, Special Flood Hazard Areas, existing and planned buyouts (e.g., buyout programs currently or previously implemented through USACE and FEMA), existing and planned water and wastewater infrastructure, municipal boundaries, economic development corridors and development projects, railroads, existing and proposed tourism projects, public fishing areas, stocked trout streams, wildlife management areas, state parks, recreational trails, river stream access and infrastructure, water quality, mining permit boundaries, mining valley fills, TMDLs, and wetlands in the *project area* boundary (hereinafter referred to as "overlay maps"). These overlay maps are detailed in and attached hereto as Appendix C.

Region 1 Maps in Comparison to WV Flood Tool Mapping

The Land Use Clinic then used the overlay maps to identify areas within the watershed that best reflected local priorities and that were at greatest risk of flood impact. The Land Use Clinic also considered whether areas (1) are serviced by water and sewer infrastructure or will be in the future, (2) are situated outside any municipal boundaries, (3) involve any existing or future economic development plans or tourism projects, and (4) are located in the Regulatory Floodway or Special Flood Hazard Areas. Once areas were identified on the overlay maps, the WV Flood Tool was used to gather and analyze additional data to assist with identifying the *proposed project sites*.

As background, the WV Flood Tool is an interactive web application that was designed by the West Virginia GIS Technical Center with funding from the West Virginia Division of Homeland Security and Emergency Management and FEMA to provide, through its online mapping and other data, an effective means by which to make informed decisions about the degree of flood risk for a specific area, property, or parcel. The WV Flood Tool uses interactive data layers to provide detailed mapping and other information about area-specific flood risks, mitigation programs, potential damage assessment, and planning. It also includes parcel-specific data, including tax assessment, appraisal, sales history, and replacement cost figures. More information about the WV Flood Tool is available at www.mapwv.gov/flood and later in this appendix at page 9.

WV Flood Tool Data

The WV Flood Tool has three customized interactive map views: Public MAP View, Expert MAP View, and Risk MAP View. The Public MAP View displays only flood hazard zones, including the Regulatory Floodway and Special Flood Hazard Areas, and is intended for general reference. The Risk MAP View displays information used by communities to reduce flood risk. As data is developed, the Risk MAP View is intended to aggregate local data for the purposes of flood risk assessment and mitigation planning. The Expert MAP View is intended for more advanced users who are familiar with FEMA's official flood maps and flood mitigation programs for risk mapping, assessment, and planning. The Land Use Clinic primarily relied on mapping and data available through the Expert

MAP View to analyze the *project area*.

Utilizing the interactive Expert MAP View allowed the Land Use Clinic to gather data and other information related to (1) overlay of the Regulatory Floodway or Special Flood Hazard Areas on each potential project site; (2) identification of what types of structures (e.g. commercial vs. residential vs. outbuildings), if any, were on the parcels within the *project area*; (3) potential flood impacts in terms of water depth at the 100-year flood frequency and related damage; and (4) real property assessment and appraisal values, potential replacement costs, and sales history of structures within potential project sites.

The Expert MAP View of the WV Flood Tool expands upon the flood hazard mapping and related data with various other categories of data which allowed the Land Use Clinic to gain a parcel-by-parcel perspective for the *project area*. More specifically, the WV Flood Tool has additional data layers that are divided into three major categories: (1) base map or background layers, (2) overlay reference layers, and (3) flood hazard layers. The base map or background layers allow users to customize their view of the interactive mapping so as to highlight roads, imagery, and topography. The imagery layers were especially helpful. These layers allowed for the Land Use Clinic to better understand the lay of the land in the *project area* and to identify where structures and other infrastructure were located at the time of the creation of that imagery.

Next, the Land Use Clinic evaluated the various flood layers to identify those areas with structures that are situated wholly or partially within the Regulatory Floodway or Special Flood Hazard Areas. The Land Use Clinic also utilized water depth information to understand the relative severity of inundation for specific areas at the 100-year flood interval. Also examined as part of the flood layers in the Expert Map View was the existence of parcels that are already mitigated and thus potentially subject to certain land use restrictions.

Building upon what was viewed through the imagery and flood layers, the Land Use Clinic used the overlay reference layers to gather additional data related to the structures located in the Regulatory Floodway or Special Flood Hazard Areas. Analysis of this data allowed the Land Use Clinic to associate structures viewed on the base map or background layers with ownership information, tax classification, specific addresses, and tax map and parcel designations. Using this data to evaluate the potential project sites, the Land Use Clinic worked to (1) identify the number of residential versus commercial structures; (2) analyze whether those structures identified as residential were dwellings as opposed to outbuildings, garages, or other non-occupied structures; and (3) determine if dwellings were likely vacant or likely occupied.

The following is a sample spreadsheet that was developed to compile data regarding individual parcels within each of the *proposed project sites*. Specifically, data was collected from (1) the current tax assessment for each parcel, which includes the tax ticket address, assessment description, and vesting document information; (2) WV Real Estate Assessment Data from the WV Flood Tool, which sets out real estate values, property class, dates of construction, and replacement values; and (3) WV Flood Tool mapping, which includes parcel locations in the regulatory floodway and other floodplains and flood depths at the 100-year floodplain. The spreadsheet summary of the data sets forth threshold criteria to assist in the identification of parcels eligible to make application to participate in the proposed floodplain buyout.

Table D.1: Sample Spreadsheet of Property Attributes

Tax ID		27.11.11.11	27.11.11.12	27.11.11.13	27.11.11.14
Physical Address		123 Main Street, Anytown, WV 99999	124, Main Street, Anytown, WV 99999	Mitigated Property	125, Main Street, Anytown, WV 99999
Tax Ticket Address		John Doe, PO Box 123, Anytown, WV 99999	Jane Doe, PO Box 124, Anytown, WV 99999		Sam Smith, PO Box 125, Anytown, WV 99999
Description		L01 ANYTOWN	L03 ANYTOWN		L05 ANYTOWN
Vesting Document		DB 606/PG 72	DB 590/PG 600		DB 570/PG 642
Structure(s) on Parcel?		Yes, in regulatory floodway	No		Yes, partially in regulatory floodway and partially in 100-yr floodplain
Parcel in Regulatory Floodway or SFHA?		Yes, partially in regulatory floodway and partially in 100-yr floodplain	Yes, partially in regulatory floodway and partially in 100-yr floodplain		Yes, partially in regulatory floodway and partially in 100-yr floodplain
3D Flood Depth		10.0 ft	9.0 ft		9.0 ft
Year Built		2000	1986		1972
Property Class		Residential, single-family	Residential, vacant		Commercial
Cost Value*	**Dwelling Value**	27,600	0		235,000
	Other Bldg Values	0	0		40,000
Total Appraised Value*	**Land Appraisal**	200	200		35,000
	Bldg Appraisal	27,600	0		235,000
	Total Appraisal	27,800	200		270,000
Assessment**	**Land**	120	200		35,000
	Building	16,560	0		195,000
	Total	16,680	200		230,000
Replacement Cost	**Replace-ment Cost**	19,980	N/A		N/A

	Adjusted Replace-ment Cost	18,900	N/A		N/A
Most Recent Sale	**Amount**	28,000	N/A		N/A
	Year	2005	N/A		N/A
Comments		1-story, 1,355 sq ft conventional dwelling with aluminum walls and no basement; 16x20 outbuilding and carport		acquired by Any County, County Commission through FEMA buyout	Smith's Auto Repair
*Cost Value derived from West Virginia Real Estate Assessment Data using West Virginia Flood Tool					
**Assessment derived from current available county tax ticket					

Utilizing this information, the Land Use Clinic was able to identify several pockets of residential structures on relatively small, contiguous parcels lying within the Regulatory Floodway or Special Flood Hazard Areas with a flood history that presented a repetitive risk to human health and safety from future flooding across the *project area*. Secondary considerations when analyzing these areas of interest were as follows: potential impacts to existing water and sewer service from a voluntary floodplain buyout, whether the areas were incorporated, the potential environmental benefits of re-establishing segments of the natural floodplain, likely removal of structures "straight-piping" into waterways, and county land use planning implications. Also considered was the danger posed by flooding events in making routes of vehicular ingress and egress to several areas of interest impassable, creating difficulty for residents and emergency services to access the area in the event of a flood. Weighing this information, five areas were identified as *proposed project sites*: (1) Hunting Shirt Bottom; (2) Vivian Bottom/Landgraff/Eckman; (3) Roderfield; (4) Big Sandy; (5) Panther.

Potential Flood Damage Reduction Benefits and Related Costs

Flood Damage Reduction Benefit Calculated

Flood damage was then determined for residential properties within the *proposed project sites*. The WVGIS Tech Center extracted information from the WV Flood Tool for each priority area and provided detailed risk assessment information for each structure. The median home value ($34,800, 2017 price base) for McDowell County, which is well below the West Virginia and national benchmark, was used as the base for all flood damage calculations. Due to the low median home value relative to the state and national median values, household contents were equated to the value of the house for all occupied housing and 50% of the value for vacant houses. OBERS was not applied as regional growth is not occurring in the area.[1] Properties in the watershed have numerous storage buildings, gardens, garages and other amenities that represent a third category of flood damage not captured in building or content damages. Property improvements were valued at $6,000 per property and assumed a total loss for a 1% storm event for all properties within the Regulatory Floodway and Special Flood Hazard Areas.[2]

Flood damage reduction benefits were based on acquisition of the 30 homes across all *proposed project sites* with the greatest depth of flooding on the first floor. Flood damage was determined using WV coefficient damage tables by building type for the 1% storm event only. These benefits are shown in the Plan-EA Tables 8.2 to 8.7 and comprise the benefit-to-cost ratio for this project.

Additionally, a comparative damage estimate was generated using ratios of 1% storm damages relative to all storms based on NRCS URB1 modeling. Analysis concluded that the 1% storm represents about one-fourth of the damages that floodplain properties endure. Amortized values of total damages are within 97% of the average annual damages from URB1, confirming that amortization of 1% flood damage will yield a similar result as URB1 modeling.

Cost Savings in Flood Debris Avoided

Flood debris will be avoided if homes are proactively removed from the floodplain. The WV Flood Tool estimates the debris load for the top 30 most impacted houses at 555 tons for the 1% flood event. The cost per ton of debris removal, $127.00 per ton, was based on the cost per ton from the demolition phase of the Dunloup Creek project, indexed to current prices. Costs would be similar as the demolition contractor and disposal site are in the same region.

Savings in Flood Insurance Policy Costs

Savings in flood insurance policy administrative costs will be realized when 30 houses are proactively removed from the floodplain. The benefit was calculated per P&G 2.4.12(b), which allows reductions in the administrative costs associated with the NFIP to be claimed as NED benefits in alternatives that effectively remove properties from the 100-year floodplain. The annual cost savings per policy is $339.00.

Incidental Water Quality Benefit for Removal of Straight-piped Sewage

Water quality will improve as sources of raw sewage (straight-pipes from houses) are eliminated. The annual cost for residents' willingness to pay for sewer service is used as a proxy measure of society's environmental benefit for wastewater collection. Although the reduction in fecal coliform will be minimal, positive incremental improvements are noteworthy given the magnitude and complexity of the resource problem.

Regional Job Development

An estimated fifteen jobs will be temporarily created during the implementation phase. Workforce WV wage rates were referenced for five construction laborers, two truck drivers, two inspectors, one heavy equipment operator, one property surveyor, one property appraiser, one lawyer, one real estate agent, and one project manager.

As part of the investigation and analysis for the planning of this project, planners consulted with and utilized data incorporated by the WV GIS Technical Center into the West Virginia Flood Tool. While the development and publication of this data was incredibly helpful to the efforts of the planners, the WV GIS Technical Center developed and published said data as part of a separate ongoing project. Accordingly, to give further context to the data relied on by the planners of this EA, what follows is a discussion of the methodology of the WV GIS Technical Center regarding its separate project involving flood and risk assessment data in WV and its application through the WV Flood Tool. This separate project is specific to the data available through the Risk MAP view of the WV Flood Tool. As such, the discussion from the WV GIS Tech Center included below does not speak to all data and uses of the WV Flood Tool that planners relied upon during investigation and analysis

WV GIS Technical Center

METHODOLOGY

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 standardized 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 Floor 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.

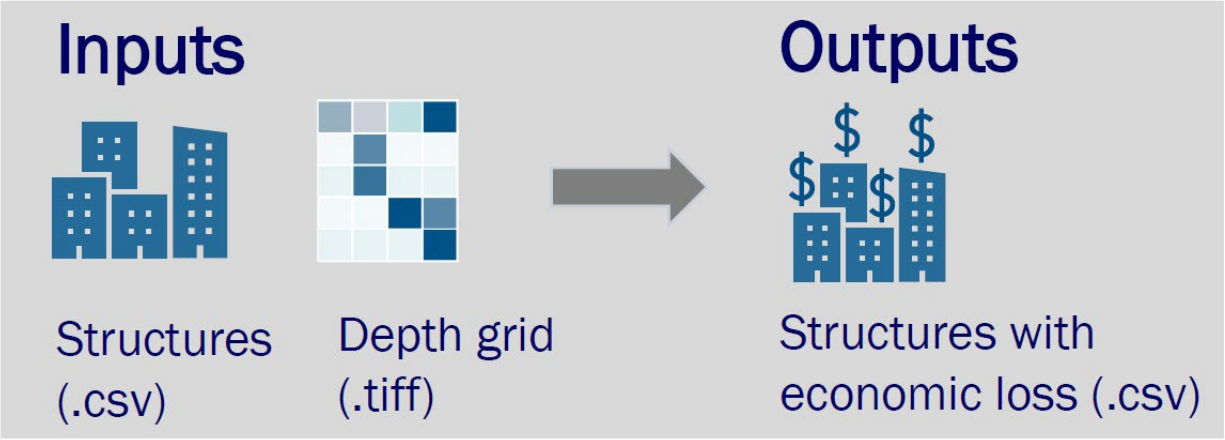

Figure 1. Hazus Building-Level Flood Loss Estimates. Source: FEMA.

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 Special Flood Hazard Area or 100-year floodplain. Historical and community assets (e.g. government buildings, churches) are also inventoried. Essential facilities are inventoried to the 0.2-percent (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 modified where necessary 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 Grid is displayed in the (1) Flood Results Query Panel, (2) Flood Risk Layers Menu, and (3) 3D Flood Visualization.

FLOOD ASSESSMENT PRODUCTS

Flood risk assessment 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, both of which provide inputs for Short-term Shelter Models. Other data layers and products that 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 is viewable in both tabular and graphical formats. Building-level risk assessments are aggregated to the community level and 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
- 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:

<u>Flood Zones</u>

- 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

<u>Water Depth</u>

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

<u>Structures</u>

- 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-FIRM, 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 Open Hazus 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 restrictions, restrictive covenants, or similar measures)
    - 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 AND FIELD OF 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), foundation type, and 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.

APPENDIX E: OTHER SUPPORTING INFORMATION

Elkhorn Creek Proposal and Application for Federal Assistance

Memorandum of Understanding from USACE

APPENDIX F: CULTURAL RESOURCES MATERIALS

Tribal Concurrence Letters

Programmatic Agreement with SHPO

Inventory of Historical Building and Community Assets

APPENDIX G: ACRONYMS

All-terrain vehicle (ATV)

Best management practices (BMP)

Baseline Resilience Indicator (BRIC)

Bureau of Economic Analysis Regional Economic Projections (OBERS)

Codified Federal Rule (CFR)

Environmental Assessment (EA)

Environmental Quality (EQ)

Emergency Watershed Protection (EWP)

Federal Emergency Management Agency (FEMA)

Future Without Project Condition (FWOP)

Geographic Information Systems (GIS)

Hatfield McCoy Trail (HMT)

Housing and Urban Development (HUD)

Hydrologic Unit, Hydrologic Unit Code (HUC)

Integrated Flood Observing and Warning System (IFLOWS)

National Economic Development (NED)

National Environmental Policy Act (NEPA)

National Flood Insurance Program (NFIP)

National Oceanic and Atmospheric Administration (NOAA)

National Watershed Program Manual (NPWM)

National Resource Conservation Service (NRCS)

Operation and Maintenance (O&M)

Principles, Requirements, and Guidelines (PRG)

Public Service District (PSD)

Regional Economic Development (RED)

Social Vulnerability to Environmental Hazards score (SVI score)

Social Vulnerability Analysis (SVA)

Social Vulnerability Index (SoVI)

Soil Conservation Service (SCS)

Spatial Hazard Events and Losses Database for the US (SHELDUS)

Special Flood Hazard Area (SFHA)

Total Maximum Daily Load (TMDL)

Urban Floodwater Damage Economic Evaluation Computer Application Program (URB1)

US Army Corps of Engineers (USACE)

US Department of Agriculture (USDA)

US Environmental Protection Agency (USEPA)

US Fish and Wildlife Service (USFWS)

West Virginia Department of Environmental Protection (WVDEP)

West Virginia Department of Natural Resources (WVDNR)

West Virginia Flood Tool (WV Flood Tool)

West Virginia State Historic Preservation Office (WVSHPO)

Wildlife Management Area (WMA)