Hamlet of Lanesville

Local Flood Analysis

Town of Hunter, New York

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Tannersville, NY 12485

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Acronyms and Abbreviations

AEP	Annual Exceedance Probability
AWSMP	Ashokan Watershed Stream Management Program
BCA	Benefit-Cost Analysis
BCR	Benefit-Cost Ratio
BFE	Base Flood Elevation
BRIC	Building Resilient Infrastructure and Communities
CFS	Cubic Feet per Second
CRRA	Community Risk and Resiliency Act
CRS	Community Rating System
CSBI	Catskill Streams Buffer Initiative
CSC	Climate Smart Communities
CWC	Catskill Watershed Corporation
DHSES	Division of Homeland Security and Emergency Services
ECL	Environmental Conservation Law
EFC	Environmental Facilities Corporation
EWP	Emergency Watershed Protection
FEMA	Federal Emergency Management Agency
FFA	Flood Frequency Analysis
FFE	Finished Floor Elevations
FHM	Flood Hazard Mitigation
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
FPMS	Floodplain Management Services Program
GCM	Global Climate Model
GIGP	Green Innovation Grant Program
GIS	Geographic Information System
GCSWCD	Greene County Soil & Water Conservation District
HEC-HMS	Hydrologic Engineering Center – *Hydrologic Modeling Software*
HEC-RAS	Hydrologic Engineering Center – *River Analysis System*
HLFRC	Hunter Lanesville Flood Remediation Committee
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan

HMRP	Hazard Mitigation and Resilience Plan
LFA	Local Flood Analysis
LFHMIP	Local Flood Hazard Mitigation Implementation Program
LiDAR	Light Detection and Ranging
LOMA	Letter of Map Amendment
LOMR-F	Letter of Map Revision
NBI BIN	National Bridge Inventory Bridge Identification Number
NFIP	National Flood Insurance Program
NFIRA	National Flood Insurance Reform Act
NOAA	National Oceanic and Atmospheric Administration
NRCC	Northeast Regional Climate Center
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
NYCDEP	New York City Department of Environmental Protection
NYCFFBO	New York City Funded Flood Buy-Out Program
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
PDM	Pre-Disaster Mitigation
RCP	Representative Concentration Pathways
RFC	Repetitive Flood Claims
RL	Repetitive Loss
SD	Substantially Damaged
SFHA	Special Flood Hazard Area
SHELDUS	Spatial Hazard Events and Losses Database for the United States
SLR	SLR Engineering, Landscape Architecture, and Land Surveying, P.C.
SMIP-FHM	Stream Management Implementation Program Flood Hazard Mitigation Grants
SMP	Stream Management Program
SRL	Severe Repetitive Loss
STA	Station
USACE	United States Army Corps of Engineers
US EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VFD	Volunteer Fire Department
WSEL	Water Surface Elevation

Executive Summary

SLR Engineering, Landscape Architecture, and Land Surveying, P.C. was retained to conduct a Local Flood Analysis in the hamlet of Lanesville in the town of Hunter, New York. This analysis was undertaken for the Town of Hunter, with funding provided by the New York City Department of Environmental Protection through the Ashokan Watershed Stream Management Program, with support from the Greene County Soil and Water Conservation District. The Local Flood Analysis Program is specific to the New York City water supply West of Hudson watersheds and was initiated following Tropical Storm Irene in August 2011 to help communities identify long-term, cost-effective projects to mitigate flood hazards. Flood mitigation recommendations provided in this analysis may be eligible for project implementation funding from a range of funding sources.

Past flood events in Lanesville have caused damage to property and infrastructure, with recent significant flooding in 1996, 2005, 2006, 2010, 2011, and 2020. Homes and other buildings have been lost to flooding and erosion; bridges, culverts, and roads have washed out; and inundation of developed areas has been deleterious to water quality and the local economy.

The flood analysis was guided by the Hunter Lanesville Flood Remediation Committee, which is comprised of individuals with technical and nontechnical backgrounds and represents various interests and stakeholders. The Committee met regularly over the course of the flood analysis process to review results and provide input on flood mitigation alternatives. The process included three public meetings.

This Local Flood Analysis provides an analysis of riverine flooding and erosion hazard and provides recommendations for mitigation and infrastructure improvements within the study boundaries. Analysis was conducted along portions of Stony Clove Creek, Hollow Tree Brook, and Myrtle Brook. Multiple flood mitigation approaches to reduce water surface elevations, including bridge and culvert replacements and floodplain bench alternatives, were evaluated in the project areas. Recommendations are provided and are intended to serve as a blueprint for short- and long-term flood mitigation in Lanesville.

The study area lies in the south-central portion of Greene County and is wholly situated in the Catskill Park. The area is part of a 16.3-square-mile drainage sub-area of the Ashokan Reservoir Watershed, just north of the Ulster-Greene county border, and runs generally along New York State Route 214 and the Stony Clove Creek and its tributaries. The study area includes Hollow Tree Brook and Myrtle Brook and is home to residential neighborhoods, a fire house, post office, and a handful of small businesses. Many of the structures are sited in the Federal Emergency Management Agency's Special Flood Hazard Area. In the higher elevations, the valley walls are steep, and the stream channels narrow. However, in the lower elevations, the channels and the valley flatten out considerably as waters meander downstream towards the county line.

The analysis of riverine flooding and input from the public and the Hunter Lanesville Flood Remediation Committee identified four focus areas with multiple properties in relatively close proximity that are affected by flooding:

- Focus Area 1 (Section 3.1.2) is located in central Lanesville, near the intersection of Jansen Road with NY-214 and the confluence area of Hollow Tree Brook and Stony Clove Creek, both of which contribute to flooding in this area.
- Focus Area 2 (Section 3.1.3) is located in the Stony Road neighborhood and surrounding areas that are prone to flooding from Stony Clove Creek.

- Focus Area 3 (Section 3.1.4) is located along NY-214 across from Beecher Road where flood-prone properties lie between the state highway and Stony Clove Creek.
- Focus Area 4 (Section 3.1.5) is located between Benjamin Road and Wright Road along Stony Clove Creek.

Relocation, elevation, or floodproofing of flood-prone homes in the entire LFA area is recommended, with emphasis on improving flood resiliency in the focus areas where there is relatively high-density development in the floodplain. Some buildings may be near floodplain boundaries or in areas of shallow flooding and may benefit from an Elevation Certificate. Residents of flood-prone properties are encouraged to purchase flood insurance and file claims when damages occur.

Erosion hazard areas were identified through field reconnaissance, desktop analysis, input from the HLFRC, and stream management plans. Areas of stream sediment accumulation and channel downcutting are prone to lateral instability and bank erosion. The steep tributaries of Hollow Tree Brook and Myrtle Brook are sediment source areas that deliver material to the lower gradient Stony Clove Creek. While currently no homes or businesses within the study area appear to be in imminent danger from bank erosion, portions of NY-214 are prone to bank failure and washout. A section of NY-214 located near the Greene and Ulster County border most recently washed out during the December 25, 2020, flood. This reach of Stony Clove Creek is prone to lateral migration and floods the adjacent roadway beginning in the 10-year flood. Recommendations included exploring options for road realignment and/or elevation and stream realignment and dimensioning. This should be done in coordination with the New York State Department of Transportation.

Six public stream crossings were assessed in this study, with an additional seven private stream crossings within the study area. Each public crossing was assessed for its capacity to pass flood flows without overtopping the road and the impact of backwater flooding caused by insufficient capacity. All six crossings are impacted and would be rendered impassable by the modeled floods, either due to overtopping of the bridge or flanking along the overbanks and flooding the approach roadway(s). Despite the poor hydraulic performance, flooding of roads and adjacent homes and businesses is generally more a function of natural floodplain dynamics than it is directly related to these public stream crossings. Estimated span lengths and low chord elevations for recommended replacement bridges are provided, and in all cases, completion of a more detailed analysis to optimize flows and reduce flood surface elevations is recommended to accompany replacement. Summary tables of findings and recommendations for public stream crossings can be found in Section 3.3.7.

In coordination with the HLFRC, recommendations for flood hazard mitigation in the Lanesville LFA area were prioritized based on criticality to the community. Prioritized recommendations are listed in Table ES-1 below. These include public infrastructure improvement projects and individual property protection measures for homeowners. Note that priorities may change over time, and it is recommended that HLFRC continue to meet regularly and following any significant flood events to assess any changed conditions and re-prioritize flood hazard mitigation projects as appropriate.

A range of federal, state, and local funding may be available for the implementation of recommendations made in this report. These potential funding sources are discussed in further detail in Section 6.0 of this report.

As the flood mitigation recommendations provided in this Local Flood Analysis are implemented, the Town of Hunter will need to work closely with potential funders to ensure that the best combinations of funds are secured. It will be advantageous for the town to identify combinations of funding sources to reduce its own requirement to provide matching funds.

Table ES-1 Recommendations in the Lanesville LFA area

Priority	Recommendation	Key Stakeholders	Section in Report
High	Resiliency upgrades to NY-214, including: • Relocation and/or elevation of flood- and erosion-prone sections of roadway, • Replacement of undersized bridges and culverts.	NYSDOT, NYSDEC, NYCDEP, GCSWCD, UCSWCD, AWSMP, HLFRC	3.2 New York State Route 214
High	Replacement of the Jansen Road bridge over Stony Clove Creek; berm removal and floodplain bench	GCHD, NYSDEC, NYCDEP, GCSWCD, UCSWCD, AWSMP, HLFRC	3.3.1 Jansen Road Bridge over Stony Clove Creek
High	Individual property protection measures, including: • Relocation, elevation, dry/wet floodproofing, buyout; • Participation in the National Flood Insurance Program & obtaining Elevation Certificates; • Riparian buffer establishment and/or enhancement; • Replacement of undersized private stream crossings where applicable.	CWC, NYCDEP, GCSWCD, AWSMP, UCSWCD, HLFRC, Lanesville Residents	3.1 Flood-Prone Homes and Buildings 3.4.3 Riparian Buffers 3.3.8 Private Bridge Crossings
High	Replacement of the Diamond Notch Road bridge over Hollow Tree Brook.	GCHD, NYSDEC, NYCDEP, GCSWCD, UCSWCD, AWSMP, HLFRC	3.3.5 Diamond Notch Road Bridge over Hollow Tree Brook
Medium	Replacement of NY-214 bridge over Hollow Tree Brook	NYSDOT, NYSDEC, NYCDEP, GCSWCD, UCSWCD, AWSMP, HLFRC	3.3.4 NY-214 Bridge over Hollow Tree Brook
Medium	Replacement of NY-214 culvert over Myrtle Brook	NYSDOT, NYSDEC, NYCDEP, GCSWCD, UCSWCD, AWSMP, HLFRC	3.3.6 NY-214 Culvert over Myrtle Brook
Low	Replacement of Benjamin Road bridge over Stony Clove Creek	GCHD, NYSDEC, NYCDEP, GCSWCD, UCSWCD, AWSMP, HLFRC	3.3.3 Benjamin Road Bridge over Stony Clove Creek

Priority	Recommendation	Key Stakeholders	Section in Report
Low	Replacement of Wright Road bridge over Stony Clove Creek	GCHD, NYSDEC, NYCDEP, GCSWCD, UCSWCD, AWSMP, HLFRC	3.3.2 Wright Road Bridge over Stony Clove Creek
Low	Notch Lake Dam inspection & downstream hazard assessment. Conduct feasibility study for repair, replacement, or removal of dam & implement preferred alternative.	NYSDEC	3.3.9 Notch Lake Dam
Case-by-Case	Large wood & debris management	NYSDEC, NYCDEP, GCSWCD, AWSMP, UCSWCD, HLFRC	3.4.4 Large Wood and Debris Management
Case-by-Case	General Recommendations: • Preparation of road closure & detour plans, signage, & barriers; • Detailed record-keeping of inundation extents, high-water marks, damages, etc. • Continue HLFRC meetings, revise and/or revisit LFA recommendations over time; • Updates to stream management & hazard mitigation plans; • Adherence to local flood damage prevention code; • Participation in the Community Rating System; • Letters of Map Revision for implemented flood hazard mitigation projects	NYSDEC, NYCDEP, GCSWCD, GCHD, GCDES, UCSWCD, NYSDOT, AWSMP, HLFRC, CWC, Town of Hunter, Lanesville Residents	4.0 General Recommendations
AWSMP: Ashokan Watershed Stream Management Program CWC: Catskill Watershed Corporation GCDES: Greene County Department of Emergency Services GCHD: Greene County Highway Department GCSWCD: Greene County Soil & Water Conservation District HLFRC: Hunter Lanesville Flood Remediation Committee NYCDEP: New York City Department of Environmental Protection NYSDEC: New York State Department of Environmental Conservation NYSDOT: New York State Department of Transportation UCSWCD: Ulster County Soil & Water Conservation District			

1.0 Introduction

1.1 Project Background and Overview

SLR Engineering, Landscape Architecture, and Land Surveying, PC (SLR) was retained by the Town of Hunter to conduct a Local Flood Analysis (LFA) in the hamlet of Lanesville, Town of Hunter, New York. The LFA is a program specific to the New York City water supply watershed, which was initiated following Tropical Storm Irene (August 2011) to help communities identify long-term, cost-effective projects to mitigate flood hazards.

Project recommendations generated through an approved LFA may be eligible for Flood Hazard Mitigation (FHM) funding available through the Stream Management Implementation Program (SMIP) administered by the Ashokan Watershed Stream Management Program (AWSMP) and Greene County Soil & Water Conservation District (GCSWCD), the Catskill Watershed Corporation's (CWC) Local Flood Hazard Mitigation Implementation Program (LFHMIP), or NYCDEP's voluntary New York City Funded Flood Buy-Out Program (NYCFFBO). Given the high cost of several projects recommended in this LFA, state and federal funding will likely be required for design and implementation. A more detailed list of potential funding sources is included in Section 6.2 of this LFA report.

1.2 Terminology

In this report, all references to ***right bank*** and ***left bank*** refer to "river right" and "river left," respectively, meaning the orientation assumes that the reader is standing in the river, looking downstream.

Stream stationing is used in the narrative and on maps to identify specific locations along the watercourse. Stream stationing on each watercourse is measured in feet, beginning at an initial downstream point and continuing in the upstream direction. For this study, stationing on Stony Clove Creek begins at station (STA) 0+00 at the downstream end of the LFA study area boundary, located at the Greene-Ulster County line. Stationing on Hollow Tree Brook begins at STA 0+00 at the confluence with Stony Clove Creek. Stationing on Myrtle Brook begins at STA 0+00 at the confluence with Stony Clove Creek. Reference stream stationing for locations within the Lanesville LFA area can be found in Table 1-1 in Section 1.3.

The Federal Emergency Management Agency (FEMA) is an agency of the United States Department of Homeland Security. To provide a common standard, FEMA's ***National Flood Insurance Program (NFIP)*** has adopted a baseline probability called the base flood. The ***base flood*** has a 1 percent (one in 100) chance of occurring or being exceeded in any given year, and the ***base flood elevation (BFE)*** represents the level floodwaters are expected to reach in this event. In this report, the ***1 percent annual chance flood*** is also referred to by its more familiar term, the ***100-year flood***. Other recurrence probabilities used in this report include the 2-year flood event (50 percent annual chance flood), the 10-year flood event (10 percent annual chance flood), the 25-year flood event (4 percent annual chance flood), the 50-year flood event (2 percent annual chance flood), and the 500-year flood event (0.2 percent annual chance flood).

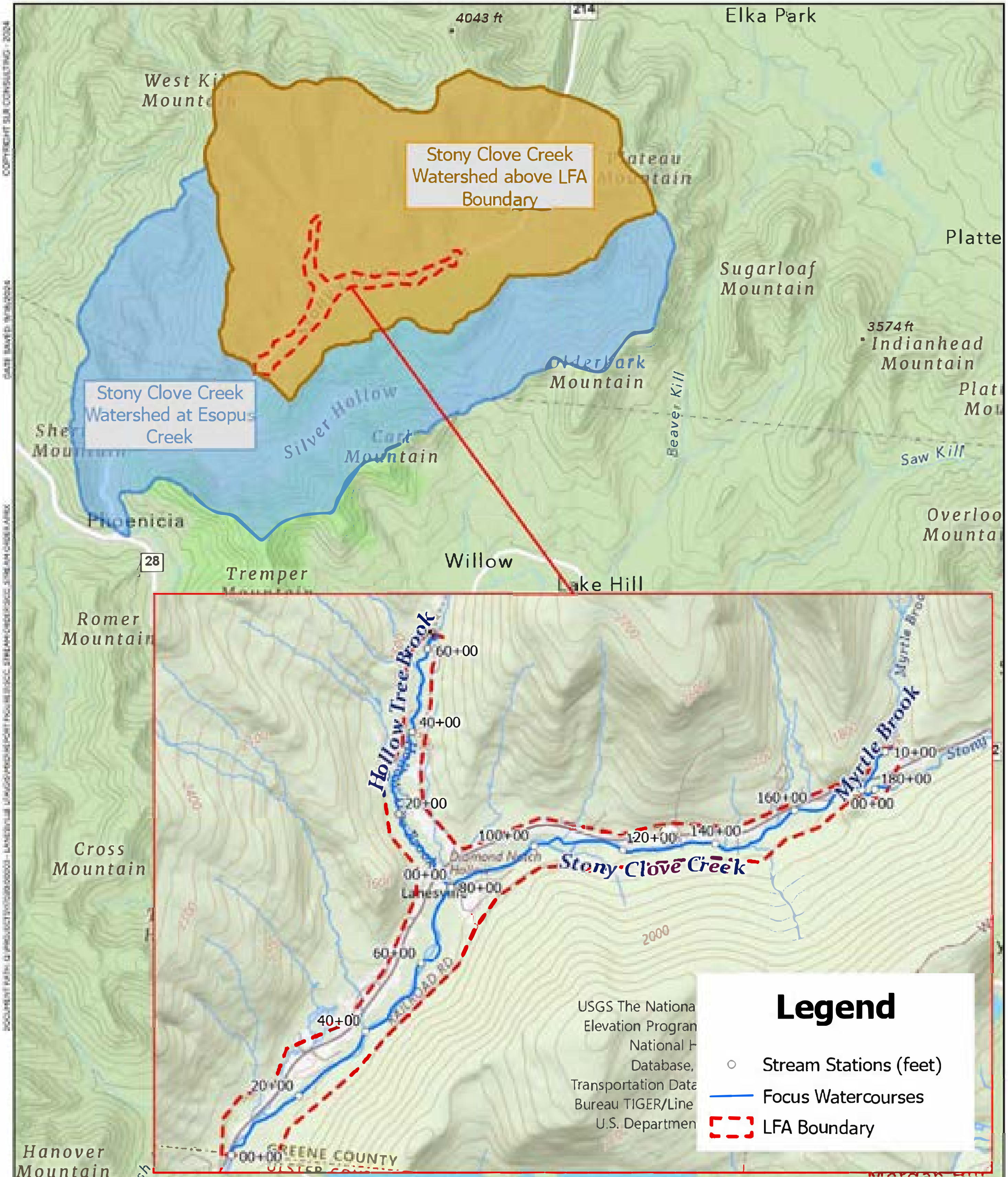
1.3 Study Area

The hamlet of Lanesville is located in southwestern Greene County within the southern portion of the town of Hunter. The Lanesville LFA study area is located within the Stony Clove Creek watershed and is mapped in Figure 1-1. The LFA area extends from the Ulster-Greene county line at STA 0+00 on Stony Clove Creek to the confluence of Myrtle Brook at STA 176+40 and on Hollow Tree Brook from its confluence with Stony Clove Creek at STA 0+00 to the Diamond Notch Road bridge crossing at STA 62+75. Myrtle Brook is studied where it is crossed by NY-214 at STA 2+50.

Several reference locations along the studied streams are listed in Table 1-1. For example, the Jansen Road bridge over Stony Clove Creek is located at STA 81+40, meaning that the bridge crosses Stony Clove Creek 8,140 feet upstream of the county line. The NY-214 bridge over Hollow Tree Brook at STA 3+75 is 375 feet upstream of the confluence with Stony Clove Creek. Key stationing references are mapped in Figure 1-2 along with identified Focus Areas with a relatively high density of flood-prone development; these Focus Areas are discussed in Section 3.1.

Table 1-1 Stream Stationing Reference Locations

Stream	Reference Location	Station (ft)
Stony Clove Creek	Greene-Ulster County Line	0+00
	Stony Clove Rod & Gun Club	15+00
	Stony Road / NY-214 Intersection	28+00
	Beecher Road / NY-214 Intersection Southwest (Lanesville Fire Station)	40+00
	Beecher Road / NY-214 Intersection Northeast	70+00
	Hollow Tree Brook Confluence	80+00
	Jansen Road Bridge	81+40
	Wright Road Bridge	132+75
	Benjamin Road Bridge	168+40
	Myrtle Brook Confluence	176+40
Hollow Tree Brook	Confluence with Stony Clove Creek	0+00
	NY-214 Bridge	3+75
	Diamond Notch Road Bridge	62+75
Myrtle Brook	Confluence with Stony Clove Creek	0+00
	NY-214 Box Culvert	2+50



SLR

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LANESVILLE LFA WATERSHED

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

N

0 4,000
Feet

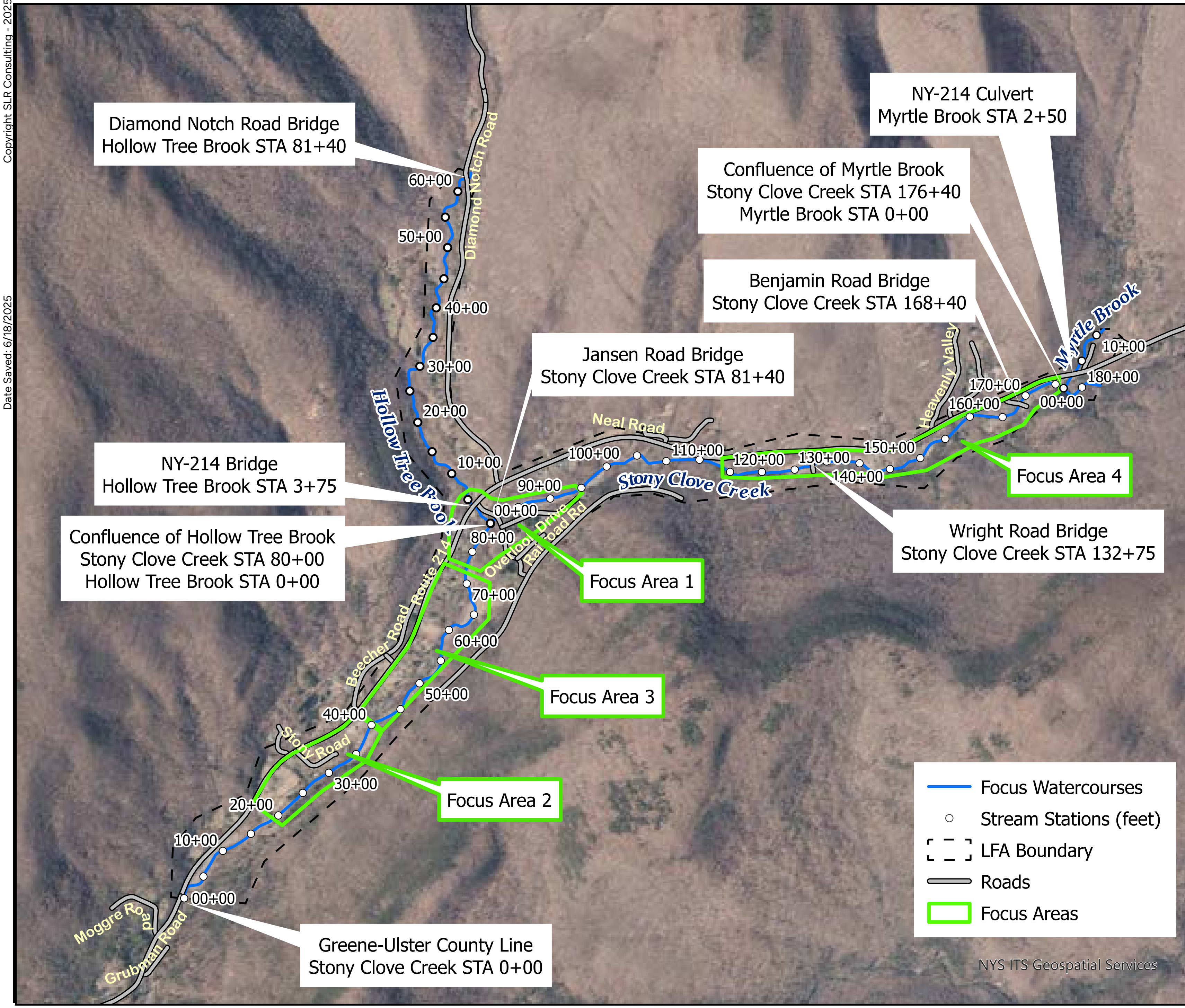
SCALE 1:110,000

DATE 9/18/2024

PROJ. NO. 17020.00003

FIG. 1 - 1

Date Saved: 6/18/2025



N

0 1,000
Feet

SLR
231 MAIN STREET
SUITE 102
NEW PALTZ, NY 12561
845.633.8153

Stream Stationing Reference Map
HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1 in = 2,000 ft
DATE 6/18/2025
PROJ. NO. 17020.00003

FIG. 1-2

1.4 Community Involvement

The Lanesville LFA was undertaken in close consultation with the ***Hunter Lanesville Flood Remediation Committee (HLFRC)***, which was established by the Town of Hunter to assist in the LFA process. HLFRC is comprised of individuals with technical and nontechnical backgrounds and is meant to represent various interests and stakeholders at town and county levels. HLFRC met regularly over the course of the LFA process to review results and provide input on flood mitigation alternatives. HLFRC members include representatives from the following organizations and backgrounds:

- Town of Hunter members:
  - Elected and appointed officials
  - Residents
  - Lanesville Volunteer Fire Department
- Ashokan Watershed Stream Management Program:
  - Ulster County Soil and Water Conservation District
  - Cornell Cooperative Extension of Ulster County
  - New York City Department of Environmental Protection
- Greene County Soil & Water Conservation District
- Ulster County Department of Environment
- Catskill Watershed Corporation
- SLR Engineering, Landscape Architecture, and Land Surveying, P.C.

The LFA process included three public meetings, all held at the Stony Clove Rod & Gun Club on NY-214 in Lanesville. The first public meeting took place near the start of the study and served to inform the public about the LFA process, gather input about past flood events, and record reported flood damages within the project areas. A second public meeting was held at the midpoint of the LFA process to share key findings, field questions, and provide education on topics requested by the public at the first public meeting. A third public meeting was held at the end of the LFA process to summarize final recommendations and make the community aware of the LFA technical report.

Table 1-2 summarizes HLFRC and public meetings that took place during the Lanesville LFA.

Table 1-2 LFA Meeting Schedule

Date	Type of Meeting	Topic
November 1, 2023	HLFRC Meeting #1	Project kickoff meeting with HLFRC, funding agencies, and technical advisory members. Data gathering.
January 25, 2024	Public Meeting #1	Introduction to and overview of the LFA process to Lanesville residents; gathering additional flood information and areas of concern.

Date	Type of Meeting	Topic
March 4, 2024	HLFRC Meeting #2	Committee reviewed and discussed public meeting no. 1 comments and public feedback. SLR presented on initial study findings.
April 11, 2024	Internal HLFRC Meeting	Planning meeting for outreach strategy for public meeting no. 2. AWSMP presented educational information on large wood in response to comments from public meeting 1.
May 21, 2024	HLFRC Meeting #3	Discuss analysis approach, preliminary findings, and presentation to public.
August 5, 2024	Public Meeting #2	Present preliminary findings.
September 18, 2024	Internal HLFRC Meeting	Planning meeting for LFA Draft Report review and comment period, and development of tentative public review and meeting schedule.
October 2, 2024	Internal HLFRC Meeting	Complete initial notes on LFA Draft report.
January 28, 2025	HLFRC Meeting #4	LFA technical report review.
May 8, 2025	Public Meeting #3	LFA technical report presentation and review of recommendations.

Photo 1-1 Lanesville LFA kickoff meeting

2.0 Data Collection

Data were gathered from various sources related to the hydrology and hydraulics of Stony Clove Creek and its tributaries, Stony Clove Creek watershed characteristics, recent and historical flooding in the affected communities, existing reports and adopted plans in the watershed, and factors that may contribute to flood hazards.

Technical details regarding the hydrologic and hydraulic analyses performed for this study are described in Section 7.0.

2.1 Field Assessments

SLR conducted field visits to assess and document watercourse characteristics in the LFA area. Field measurements were collected at hydraulic structures, including bridges, culverts, and dams. Geomorphic conditions were assessed at road-stream crossings and along roadway alignments. Areas of bank erosion or apparent stream instability and potential sources of water quality impairment were identified.

2.2 Critical Facilities and Anchor Businesses

An important component of the LFA information-gathering stage is the identification of critical facilities and anchor businesses. ***Critical facilities*** include public facilities such as firehouses, hospitals, schools, town halls, drinking water supply treatment or distribution facilities, and wastewater treatment plants or collection facilities. Destruction or damage to critical facilities would impair the health and/or safety of the community.

Current critical facilities in the Lanesville LFA area are listed in Table 2-1.

Table 2-1 Critical Municipal Facilities in LFA Area

Facility	River station (feet)	Address	Flood Zone
Lanesville Post Office	74+25	1546 Route 214	SFHA Zone AE, Zone X
Lanesville Volunteer Fire Department	42+25	26 Beecher Road	Not in Regulatory Flood Zone

Anchor businesses are defined as those that are vital to the health and safety of a community as well as the ability to recover from damaging floods. Examples of anchor businesses include gas stations, grocery stores, lumber yards, hardware stores, and medical doctors’ offices or pharmacies. There are currently no anchor businesses in the Lanesville LFA area.

The Stony Clove Rod & Gun Club and the Lanesville United Methodist Church are neither anchor businesses nor critical facilities. However, both of these locations were identified as critical assets that are important to the community and may serve as ad hoc shelters or gathering centers in the event of a flood or other emergency. The main building at the rod and gun club is within the area inundated during the 100-year flood event, and the church is not located within a regulatory flood zone. Elevating, floodproofing, or relocating the Stony Clove Rod & Gun Club building is recommended. There are upland areas on the existing parcel that are outside the flood-prone area that may be appropriate for building relocation. Impacts to the rod and gun club parcel associated with the recommended realignment of NY-214 in this area may make relocation of the building more attractive than elevation or floodproofing in its current location. See Section 3.2 for more details.

2.3 Infrastructure

The Lanesville LFA focuses on riverine flood mitigation and infrastructure improvements within the LFA study boundaries. Six public bridge and culvert crossings of Stony Clove Creek, Hollow Tree Brook, and Myrtle Brook were assessed for hydraulic performance and potential replacement alternatives that would improve infrastructure resilience and/or mitigate nearby flood hazards. Current and projected future flood scenarios were considered (Section 7.1). A brief analysis of seven private bridge crossings was conducted as well. Basic bridge information is presented in Table 2-2; analyses and recommendations are detailed in Section 3.3.

Table 2-2 Public Bridges and Culverts Assessed in Lanesville LFA Area

Stream	Road Crossing	Year Built	NBI BIN	Owner	Bridge Span (ft)
Stony Clove Creek	Jansen Road	1968	3201060	Greene County	38
	Wright Road	1997	3201070	Greene County	60
	Benjamin Road	2012	3201040	Greene County	44
Hollow Tree Brook	NY-214	1957	1041270	NYSDOT	40
	Diamond Notch Road	1915 (1994)	3201050	Greene County	25
Myrtle Brook	NY-214	1957	1041260	NYSDOT	20 (two 10'-span by 8'-rise box culvert)

2.4 Potential Impacts to Water Quality Due to Flooding

In addition to helping communities identify and mitigate flood hazards, the LFA program mandate includes protecting water quality in the New York City water supply watershed. ***Flooding is known to impair water quality***. Flood mitigation can improve water quality by reducing the area of land and buildings exposed to floodwaters and by lowering the depths and velocities of floodwaters that mobilize pollutants.

When developed areas in Lanesville are inundated by floodwaters, oils, gasoline, and other pollutants are mobilized. When flooding is severe, vehicles can become inundated; yards, buildings, and storage areas can be flooded; and tanks and fuel drums can be washed into Stony Clove Creek and its tributaries, severely impacting water quality. Septic systems are also vulnerable to flooding, and potentially to scour, especially when located within the floodway.

Specific private properties with potential sources of water quality impairment are not identified in this report. Because any flood-prone development can be a source of pollutants, ***all residents are encouraged to take measures to properly store and secure potential contaminants***. Fuel tank anchoring is fully funded by CWC.

Glacial legacy sediments deposited during the ice ages of the Pleistocene epoch are ubiquitous in the Stony Clove Creek watershed and are known to be a significant source of suspended sediments to receiving waters (McHale & Siemion, 2014). Bank and bed erosion can result in entrainment of turbidity-producing clays and silts that have a detrimental impact to downstream water quality. As part of the LFA, bank erosion is assessed as a hazard to property and infrastructure as well as potentially deleterious to water quality. Monitoring and restoration of suspended sediment point sources along streams in the Upper Esopus Creek watershed is conducted by NYCDEP in coordination with local and federal partners (NYCDEP, 2022).

Photo 2-1 Turbid flows on Stony Clove Creek at the Jansen Road bridge in December 2020. Photo provided by Kachadourian family.

2.5 Flooding History

The Catskill Mountains are subject to large storm events that are often unevenly distributed across watersheds. As a result, local flash floods can occur in one basin while an adjacent basin receives little rainfall. In addition to local flash floods, larger storm events can cause widespread flooding.

Residents, HLFRC, and watershed stakeholders shared their concerns and past experiences related to flooding in Lanesville. Historical records and reports were also consulted to evaluate how floods have impacted the community in the past.

Flood hazards in Lanesville are commonly associated with inundation and/or damage to roads, bridges, and culverts; logjams and debris accumulations (which may also be associated with bridges or culverts); stream bank erosion; and inundation of developed areas. Prolonged loss of access for residents and emergency services can result from damage to transportation infrastructure. There are also a number of privately owned stream crossings in the LFA area that may be vulnerable to damage in flood events. Residents also reported frustration or dissatisfaction with some previous flood recovery efforts.

As noted in the Stony Clove Creek Management Plan, weather in the Catskills can produce very localized, historically significant flood events. A storm event that produces a large recurrence interval on one stream may produce a smaller recurrence interval on another stream. According to the Flood Insurance Study (FIS) report for Greene County (36039CV001B), flooding in Greene County usually occurs during late winter to early spring months when precipitation events combine with snow. Late summer flooding is also a possibility due to thunderstorms and tropical storms/hurricanes. According to the Hazard Mitigation and Resilience Plan for Greene County, there have been 103 flooding events in Greene County between 1953 and 2022. A summary of selected recent flood events that have affected the Lanesville area is presented in Table 2-3.

Table 2-3 Greene County Flood History

Date	Flood Event	Notes
August 1955	Hurricane and Flooding	Back-to-back Hurricanes Connie and Diane. Severe damages throughout New York and New England.
October 1955	Flooding	
April 1987	Severe Storm and Flooding	Combination of intense precipitation and snowmelt.
January 18 – 20, 1996	Severe Storm and Flooding	Precipitation from a strong storm combined with warm temperatures caused rapid snowmelt and created flooding across New York State. According to estimates by the National Oceanic and Atmospheric Administration (NOAA) and SHELDUS (Spatial Hazard Events and Losses Database for the United States), Greene County experienced approximately $10 million in total property damages due to this event. In response to the flooding, county and state officials initiated flood hazard mitigation and stream restoration projects throughout Greene County, focusing on Stony Clove Creek. There are no gauges on Stony Clove Creek with record of the 1996 flood.
July 4, 1999	Severe Storm and Flooding	A sustained storm cell precipitated heavy rainfall above Stony Clove Creek and other streams in the area, which created flash flooding.
September 16, 1999	Remnants of Tropical Storm Floyd	In Greene County, rainfalls ranged between 6.9 inches and 12.1 inches. NOAA and SHELDUS indicated that Greene County experienced approximately $3 million in flood damages. This event created unstable conditions throughout many rivers and streams of the county and exacerbated the degradation and stream bank erosion that was initially created during the January 1996 flood. **Recurrence Interval:** Approximately a 10-year flood event.
August 2003	Severe Storms and Flooding	
April 2005	Severe Storms and Flooding	A slow-moving storm brought heavy rainfall to the northeast U.S., leading to significant flooding in New York, New Jersey, and Pennsylvania. Prior to this storm, the rivers and streams already had high flow rates due to a rainstorm on March 28 and snowmelt. These conditions worsened the flooding and caused additional damage in addition to the impacts of the current storm. According to NOAA and SHELDUS, Greene County suffered around $1.3 million in flood damages from this event. The United States Geological Survey (USGS) gauge 01362370 on Stony Clove Creek below Ox Clove Creek at Chichester recorded 13,000 cubic feet per second (cfs). **Recurrence Interval:** Approximately a 25-year flood event.
July 2006	Severe Storms and Flooding	
April 2007	Nor’easter	
October 1, 2010	Remnants of Tropical Storm Nicole	The remnants of Tropical Storm Nicole produced heavy rains across central to east New York. In Phoenicia, Stony Clove Creek overflowed its banks and flooded State Route 214, Main Street, High Street, Station Road, and Plank Road. These roads had to close.

Date	Flood Event	Notes
		Flooding was reported at fifteen to twenty homes. A state of Emergency was declared in the town of Shandaken.
December 1 , 2010	Severe Storm and Flooding	A strong cold front swept across east central New York and precipitated heavy rain and sleet across the eastern Catskills. In Chichester, Route 214 and Silver Hollow Road were closed due to flooding.
August 28 -29, 2011	Tropical Storm Irene	Irene produced heavy damage over much of New York, totaling $296 million. The storm is ranked as one of the costliest in the history of New York, after Hurricane Agnes in 1972. Much of the damage occurred due to flooding, both from heavy rainfall in inland areas and storm surge in New York City and on Long Island. Ten fatalities are directly attributed to the hurricane. One death occurred in Lanesville. Between 4 and 11 inches of rain fell on the Catskill Region. High-water marks were collected as part of FEMA's rapid response riverine high-water mark collection for Tropical Storm Irene and were used in calibration of streams studied by detailed and limited detailed models. USGS gauge 01362370 on Stony Clove Creek below Ox Clove Creek measured 14,300 cfs. Route 214 was reported closed due to flooding from Moggre Road to Route 23A. **Recurrence Interval:** Approximately an 80-year flood event.
December 25, 2020	Flood Event	On December 16-17, a winter storm dropped several feet of snow onto the Catskills. The snow compacted over time. On December 24 into 25, an unseasonably warm air mass moved into the region, bringing heavy rain showers. The eastern Catskills received 4 to 6 inches of rain. The combination of warm air, rainfall, and melting snowpack led to riverine flooding across Greene County. Numerous roads were closed, and a few communities were evacuated. Some roads were washed out, including Route 214 in Lanesville, and had to be rebuilt. USGS gauge 01362370 on Stony Clove Creek below Ox Clove Creek measured 11,500 cfs. **Recurrence Interval:** Approximately a 10-year flood event.
August 23, 2021	Remnants of Tropical Cyclone Henri	Remnants of Tropical Cyclone Henri produced heavy rainfall in Greene County. Rainfall totals ranged between 4.00 to 7.50 inches across Greene County between August 22 and 23. Greene County was declared a state of emergency before Henri's arrival. Flash flooding occurred across the county.
October 26, 2021	Severe Storm	A coastal storm brought moderate rainfall across portions of eastern New York. Rainfall amounts of 2 to 5 inches were produced across the region. Most of the significant flooding occurred on the evening of October 26. A state of emergency was declared for Greene County.
April 7-8, 2022	Severe Storm	A slow-moving frontal system produced widespread heavy rainfall and flooding across eastern New York. Rainfall amounts between 1.50 and 4.50 inches were recorded across Greene County. Numerous rivers exceeded minor flood stages, with a few reaching moderate flood stage.

2.6 FEMA Mapping

As part of the NFIP, FEMA produces ***Flood Insurance Rate Map (FIRM)*** panels that demarcate the regulatory floodplain boundaries. As part of a ***Flood Insurance Study (FIS)***, the extents of the 100-year and 500- year floods are computed or estimated as well as the regulatory floodway if one is established. ***The area inundated during the 100-year flood event is also known as the Special Flood Hazard Area (SFHA)*** and shown on the FIRM as Zone A, AE, A1-30, or AH; A and AE Zones have been established in Lanesville. In addition to establishing flood insurance rates for the NFIP, the SFHA and other regulatory flood zones are used to enforce local flood damage prevention codes related to development in floodplains.

The FIS for Greene County has been effective since May 2008 and revised as of June 2015. The flood hazard areas delineated by FEMA are mapped for each focus watercourse, aside from Myrtle Brook, as it is unmapped by FEMA. Figure 2-1 through Figure 2-3 depict flood hazard mapping along Stony Clove Creek. Figure 2-4 depicts mapping along Hollow Tree Brook. Each map displays the Special Flood Hazard layers delineated by FEMA for each focus watercourse in this report, including the 1.0 percent annual chance flood hazard layer (100-year flood), 0.2 percent annual chance flood hazard layer (500-year flood), and the floodway hazard layer. ***The floodway is the area of deepest and swiftest flooding in the channel of a river and the adjacent land areas that must be reserved in order to discharge the base flood.*** Structures located within the floodway may be particularly vulnerable to damage during flood events.

The following figures provide an overview of what FEMA data is currently available on each focus watercourse. Residents are encouraged to consult the most recent products available from the FEMA Flood Map Service Center (https://msc.fema.gov/portal/home) to review potential flood hazards at their properties. FEMA may update or revise flood hazard mapping in the future, and regulatory flood zones may be adjusted to reflect bridge or culvert replacements, natural or constructed modifications to channel alignment or geometry, floodplain development, or advances in hydrologic and/or hydraulic analysis methodologies. Updates to FIRM panels may occur on a regular schedule or, for example, in response to Letter of Map Revision (LOMR) applications following implementation of flood hazard mitigation projects.

FEMA compiles repetitive loss data. A "repetitive loss structure" is defined by FEMA as, "*an NFIP-insured structure that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978*."

At the time this study was conducted:

- ***Sixty structures in the Lanesville LFA area were found to be within the effective 1 percent annual chance (100-year) flood zone (SFHA).***
- ***Eleven of these buildings are situated within the Regulatory Floodway.***
- ***There were two properties with repetitive loss structures in the Lanesville LFA area, both located in Focus Area 3.***

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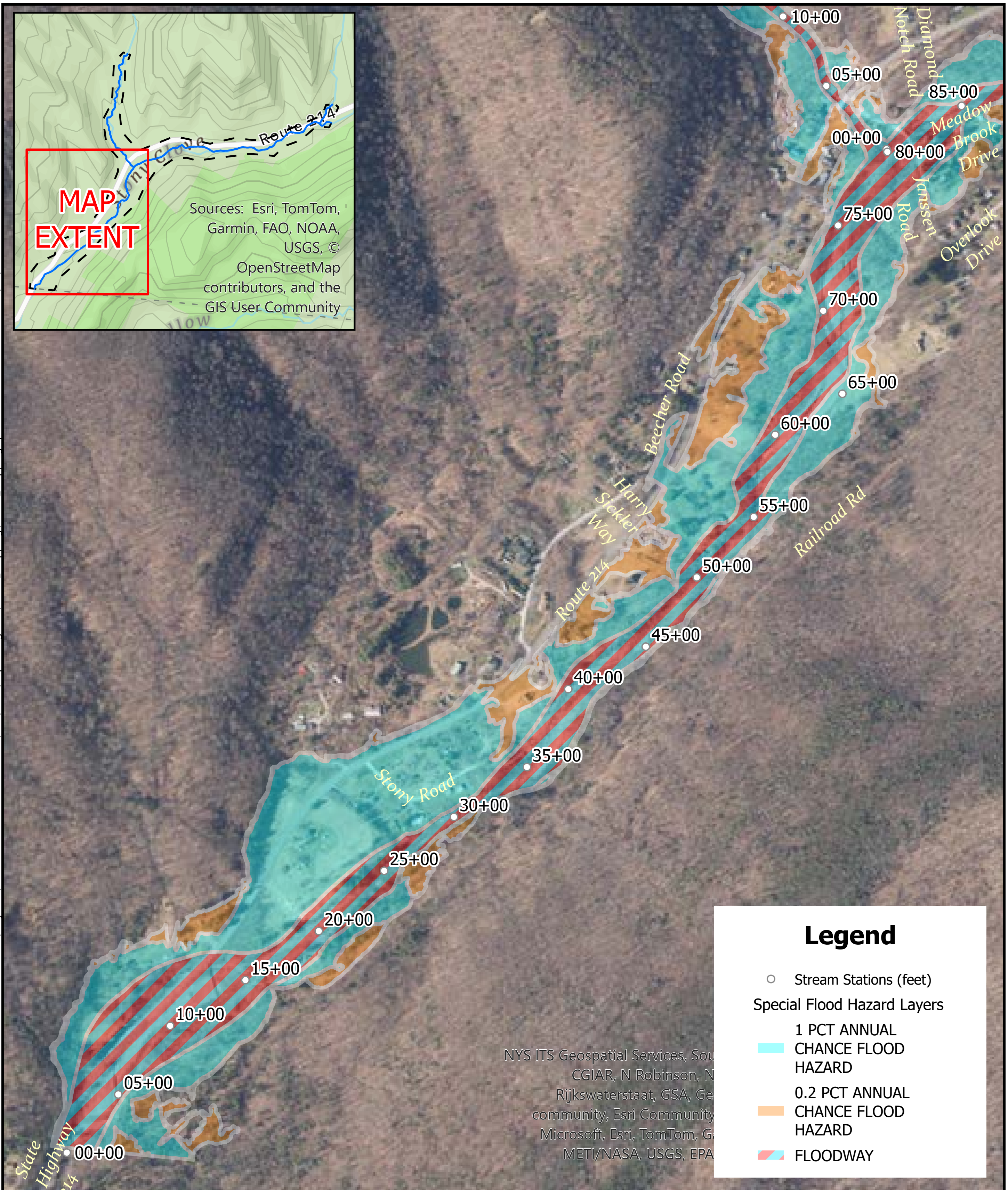

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NEW PALTZ, NY 12561
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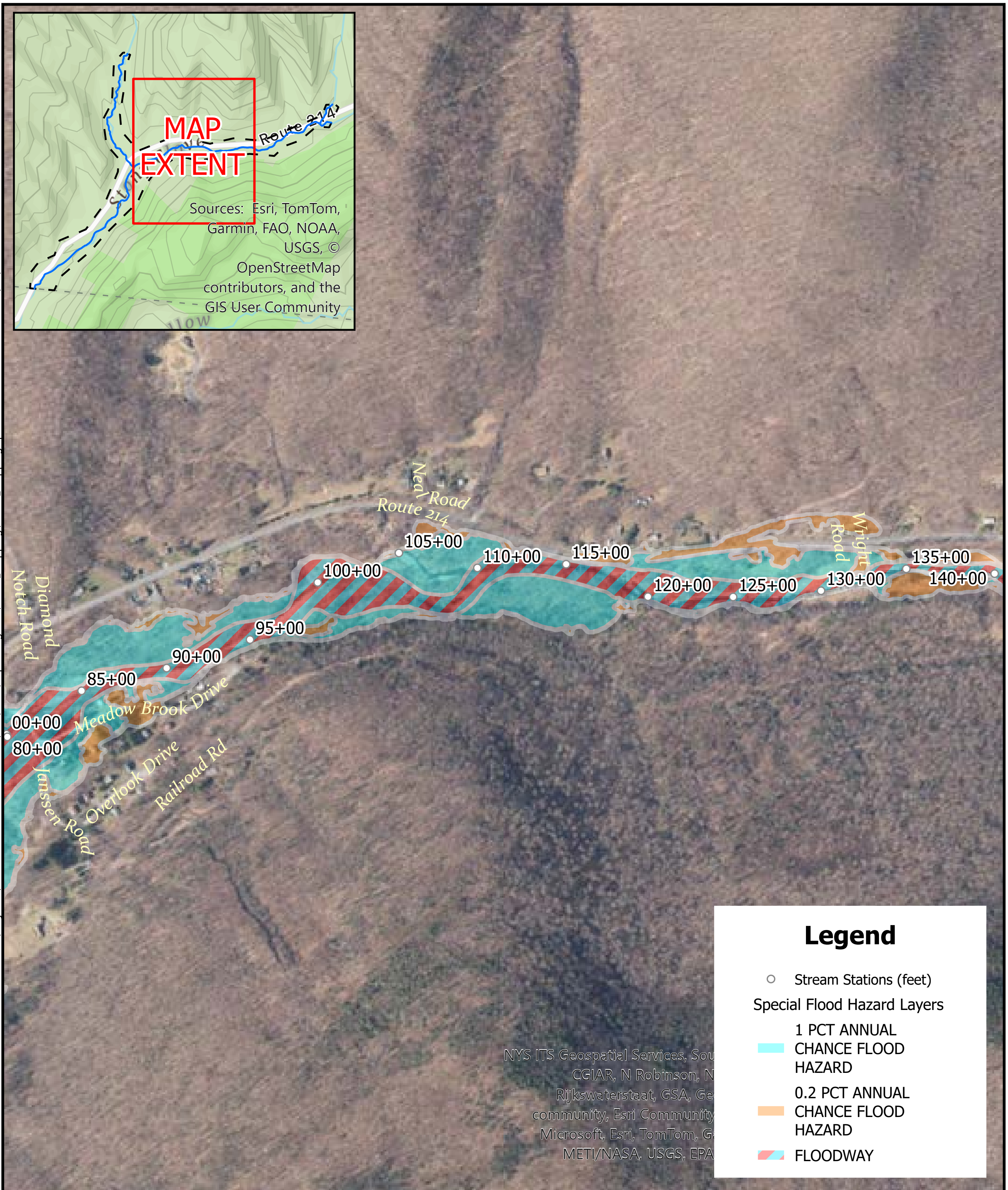
FEMA MAPPING: STONY CLOVE CREEK
HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1:9,000
DATE 11/25/2024
PROJ. NO. 17020.00003

FIG. 2-1



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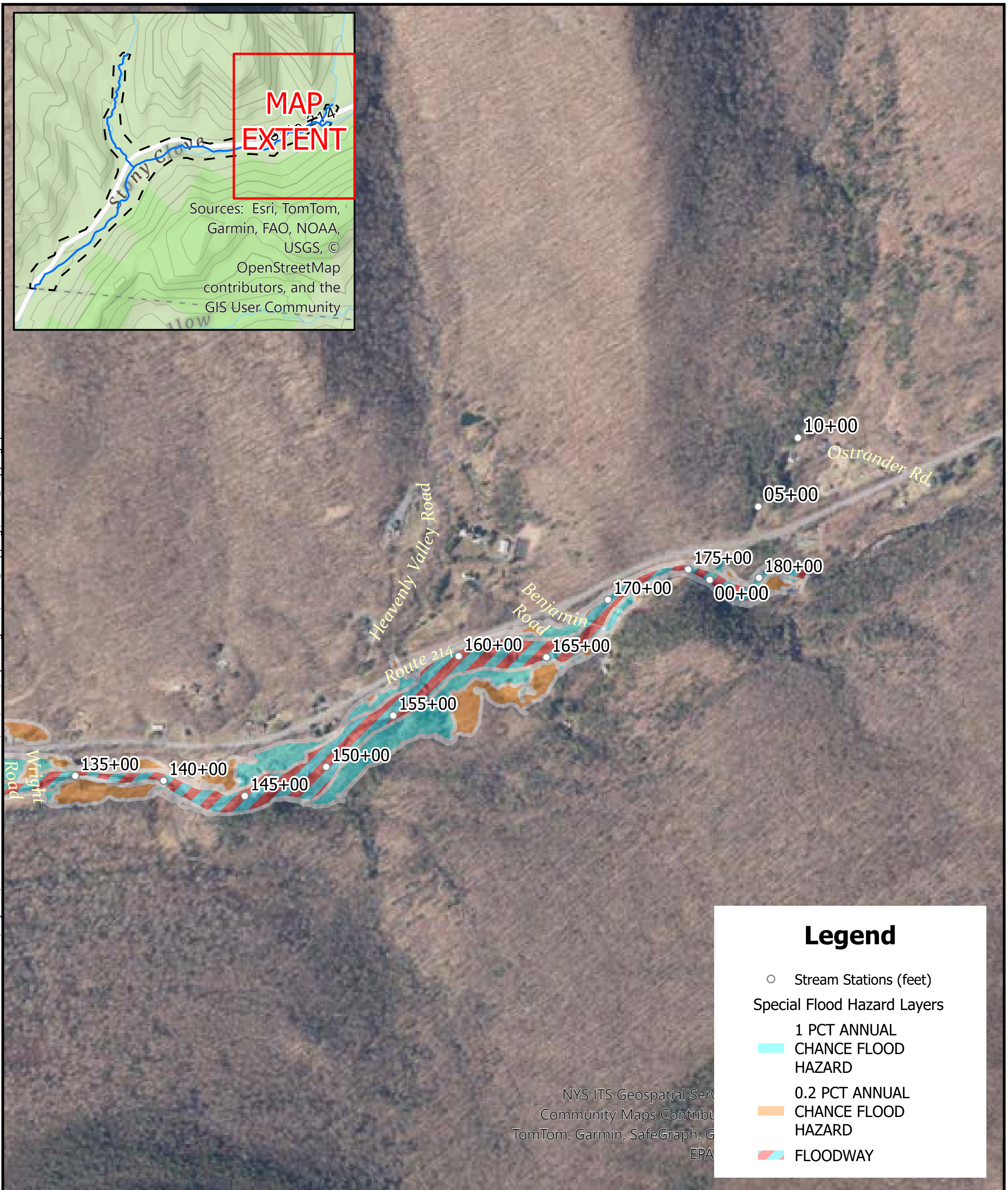
FEMA MAPPING: STONY CLOVE CREEK

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE	1:9,000
DATE	11/25/2024
PROJ. NO.	17020.00003

FIG. 2-2



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231 MAIN STREET
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845.633.8153

FEMA MAPPING: STONY CLOVE CREEK

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

N

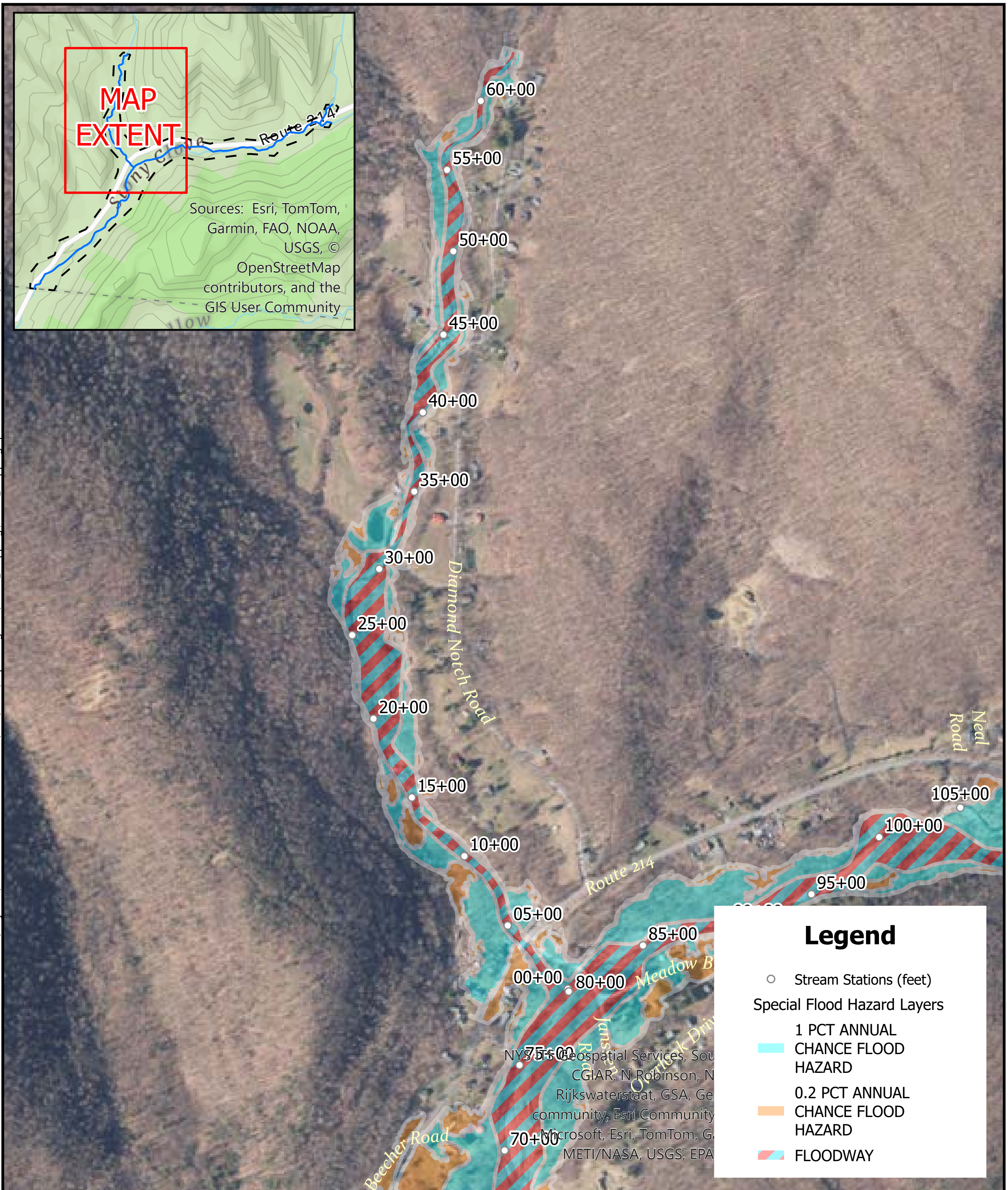
0 240 480 720
Feet

SCALE 1:9,000

DATE 11/25/2024

PROJ. NO. 17020.00003

FIG. 2-3



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FEMA MAPPING: HOLLOW TREE BROOK

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

N

0 240 480 720
Feet

SCALE 1:9,000

DATE 11/25/2024

PROJ. NO. 17020.00003

FIG. 2-4

3.0 Flood Analysis and Recommendations

Multiple flood mitigation approaches to reduce water surface elevations were evaluated in the project areas, including bridge and culvert replacements and floodplain bench alternatives. These are listed below and described in more detail in the sections that follow.

In the Lanesville LFA area, many of the projected flood levels are the result of the valley characteristics. Flood risk is a result of historic development within what is now the SFHA. Stream, valley, and watershed characteristics can result in greater or lesser inundation risks in some areas and along some streams than others. The steep, confined valleys of Myrtle Brook, Hollow Tree Brook, and the upper reaches of Stony Clove Creek have limited floodplain access and do not cause widespread inundation in flood conditions. As the valleys widen and slopes shallow, floodplain width and accessibility increases, resulting in substantial overbank inundation at several priority areas along the lower reaches of Stony Clove Creek in Lanesville. These areas are also prone to dynamic geomorphic adjustment that can result in erosion hazards. The flatter, broader valley bottoms are also more attractive for development than the steep tributary hollows, so flooding would be expected to result in more substantial property damages as well.

Flood-prone development in the LFA area and potential mitigation alternatives are discussed in Section 3.1.

New York State Route 214 (NY-214) is prone to flooding and erosion within the LFA area. At-risk portions of this critical roadway and recommendations for improvements are discussed in Section 3.2.

Bridges and culverts in the Lanesville LFA area are discussed in Section 3.3.

Stream instability, erosion hazards, and large wood management are discussed in Section 3.4 along with contextual information regarding hydrologic and geomorphologic conditions in the Stony Clove Creek watershed.

3.1 Flood-Prone Homes and Buildings

In addition to flood mitigation approaches that seek to reduce or eliminate flood damages by reducing water surface elevations, ***flood protection measures for individual properties*** were explored. These scenarios were evaluated case by case and seek to reduce flood-related damages by either relocating, floodproofing, or elevating homes and businesses located in flood-prone areas. Alternative mitigation actions were assessed with hydraulic modeling wherever possible to evaluate efficacy. The narrative below describes findings and recommendations at these selected sites where replacement of a bridge or culvert alone could not remove homes and buildings from potential flood zones.

At the second public meeting for the LFA, residents were offered the opportunity to have the estimated ***first finished floor elevation (FFE)*** surveyed for a more quantitative assessment of flood risk at their individual properties. FFEs were estimated from the exterior of structures, and these are not equivalent to a FEMA Elevation Certificate (Section 3.1.8). Floodwater surface elevations determined by hydraulic modeling were compared to estimated FFEs to evaluate flooding depths above the first floor of these structures. Participating landowners were provided with specific details for their respective properties. Generalized results are presented in Section 3.1.1.

In consultation with HLFRC, ***four general areas were identified as having relatively high concentrations of developed properties within flood-prone areas***. These areas are discussed in Sections 3.1.2 through 3.1.5.

General flood mitigation recommendations for individual properties and decision-making guidance are presented in Sections 3.1.6 through 3.1.10.

A comprehensive description of ***potential sources of funding for flood mitigation and damage reduction projects*** is found in Section 6.2. Residents may consult the current effective FEMA FIRM to determine the location of their home relative to the SFHA, which is the area inundated by flooding during the 100-year flood event and the 500-year floodplain.

3.1.1 First Floor Elevations

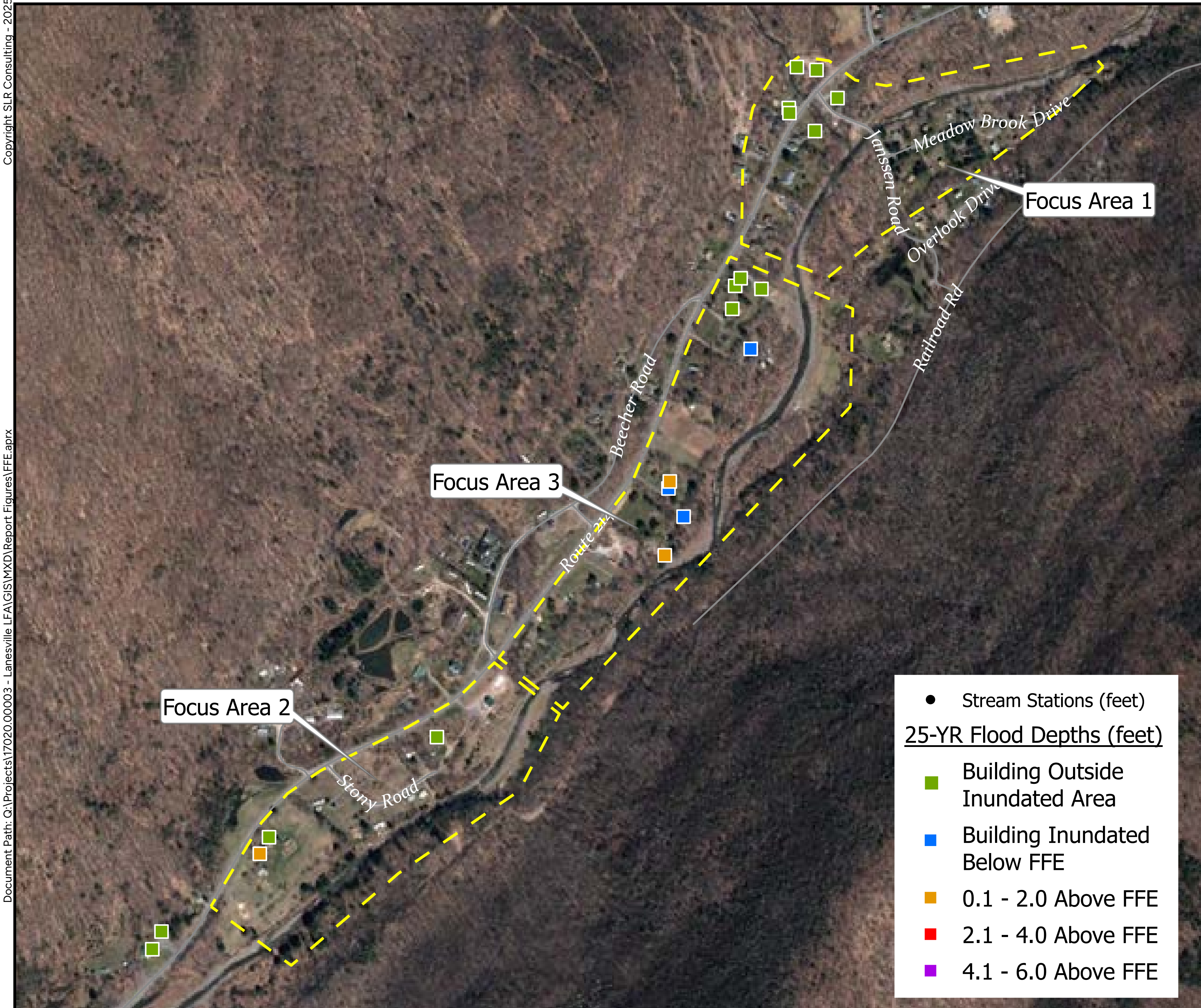
As part of the LFA process, residents in flood-prone areas were given the option to have the first FFE surveyed for structures on their properties. The first finished floor is commonly above ground but may be below ground in cases of finished basements. Fourteen residents opted to participate, and SLR surveyors collected estimated FFE for 21 structures on these properties (homes, garages, barns, etc.). Finished floor elevations were estimated from the exteriors of buildings using indicators such as the tops of foundations, door sills, or rim joists. Because FFE were estimated from the outside, all measurements assume the first finished floor is the first aboveground floor (i.e., these FFE assume that none of the surveyed structures have finished basements).

Surveyed FFE estimates were plotted spatially and compared to water surface elevations modeled in various flood events at these locations. This allows a depth of water above the FFE to be calculated and can assist homeowners with decision-making when considering elevating, floodproofing, or seeking a buyout. Note that because FFE were estimated from the exterior, these FFE measurements are not substitutes for FEMA Elevation Certificates.

In addition to current flood discharges estimated by FEMA, flooding at FFE-surveyed properties was evaluated for two future scenarios, termed "Representative Concentration Pathways" (RCP), that represent potential climate change scenarios in terms of greenhouse gas emissions. RCP 4.5 is considered a midrange-emissions scenario that will produce moderate increases in flood discharges, and RCP 8.5 is a higher-emissions scenario that will generate more severe increases in flood flows.

Hydraulic modeling indicates that flood depths begin to exceed FFE at some of the surveyed structures in the 25-year flood. Depths above FFE are plotted for the current 25-, 50-, and 100-year floods in Figure 3-1, Figure 3-2, and Figure 3-3. Depths above FFE in the projected future 50- and 100-year flood events for the mean of the RCP 4.5 scenario are plotted in Figure 3-4 and Figure 3-5; results for the RCP 8.5 scenario are plotted in Figure 3-6 and Figure 3-7. Future flood hydrology is discussed in Section 7.1.2.

HLFRC has provided each participating landowner with tabular flood depth results for their property.



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INUNDATED FIRST FLOOR ELEVATIONS - 25 YR

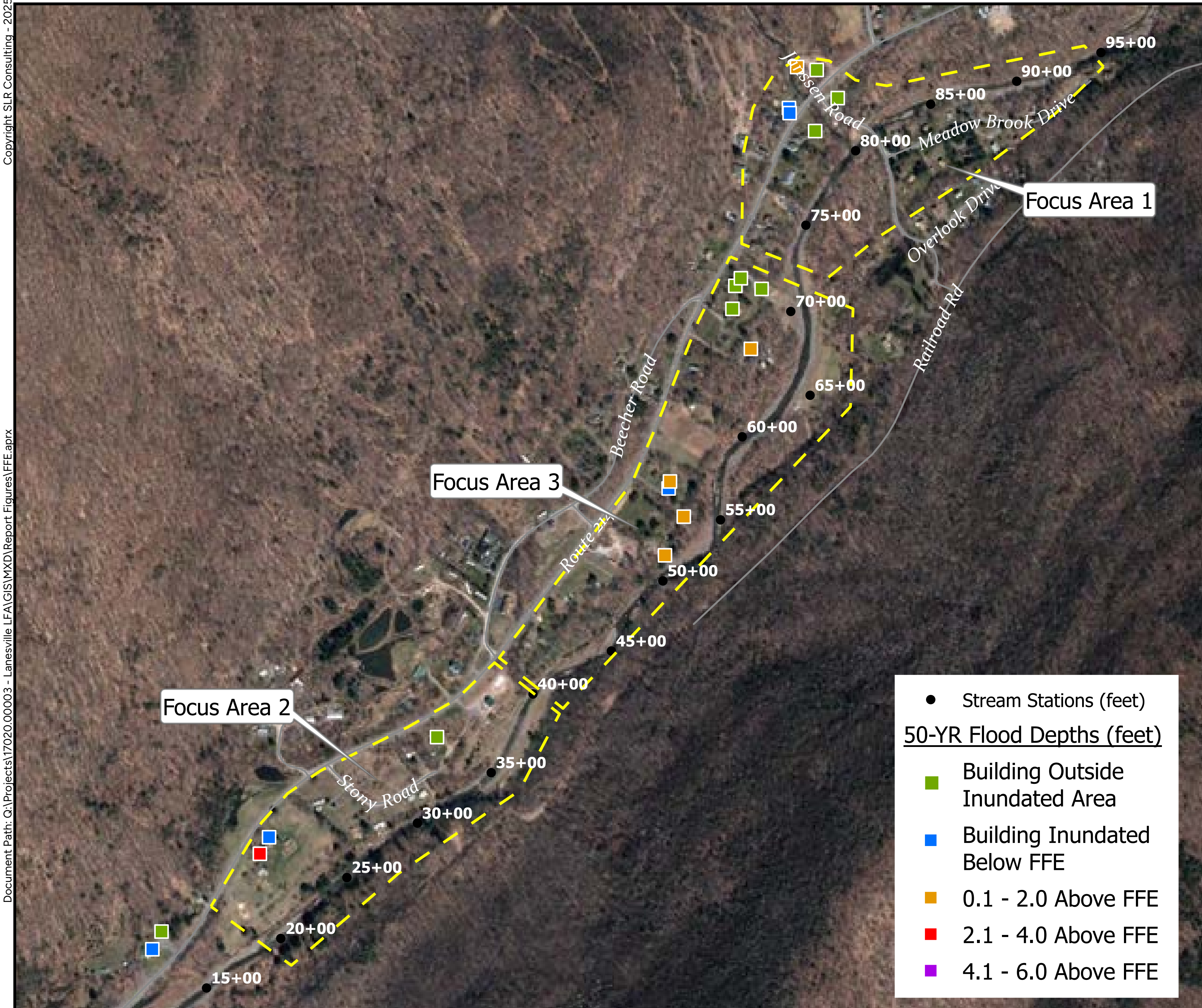
HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1 in = 750 ft

DATE 6/13/2025

PROJ. NO. 17020.00003

FIG. 3-1



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INUNDATED FIRST FLOOR ELEVATIONS - 50 YR

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

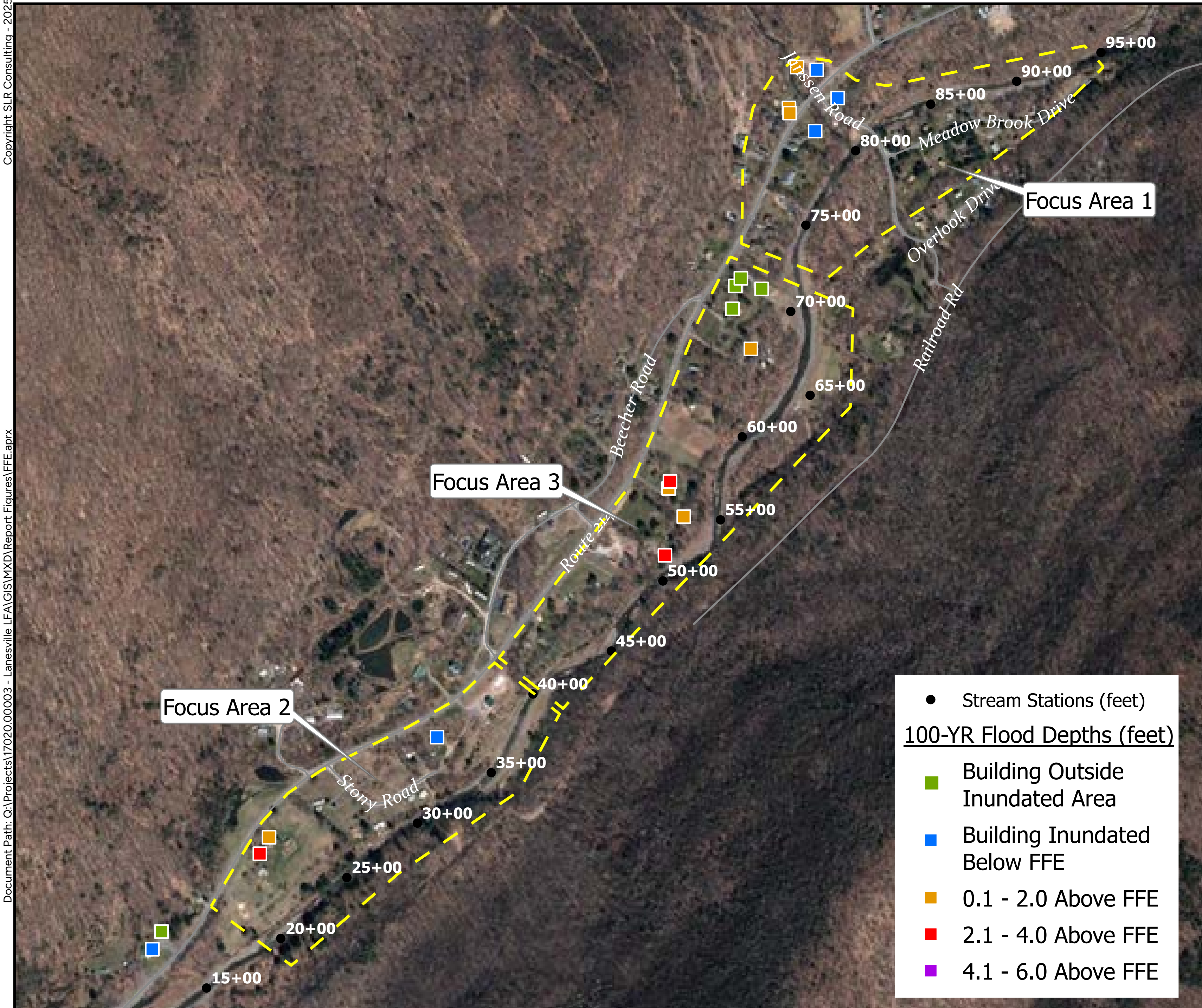
SCALE 1 in = 750 ft

DATE 6/13/2025

PROJ. NO. 17020.00003

FIG. 3-2

Document Path: Q:\Projects\17020.00003 - Lanesville LFA\GIS\MXD\Report Figures\FFE.aprx



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Feet

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231 MAIN STREET
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INUNDATED FIRST FLOOR ELEVATIONS - 100 YR

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS

TOWN OF HUNTER

GREENE COUNTY, NEW YORK

SCALE 1 in = 750 ft

DATE 6/13/2025

PROJ. NO. 17020.00003

FIG. 3-3

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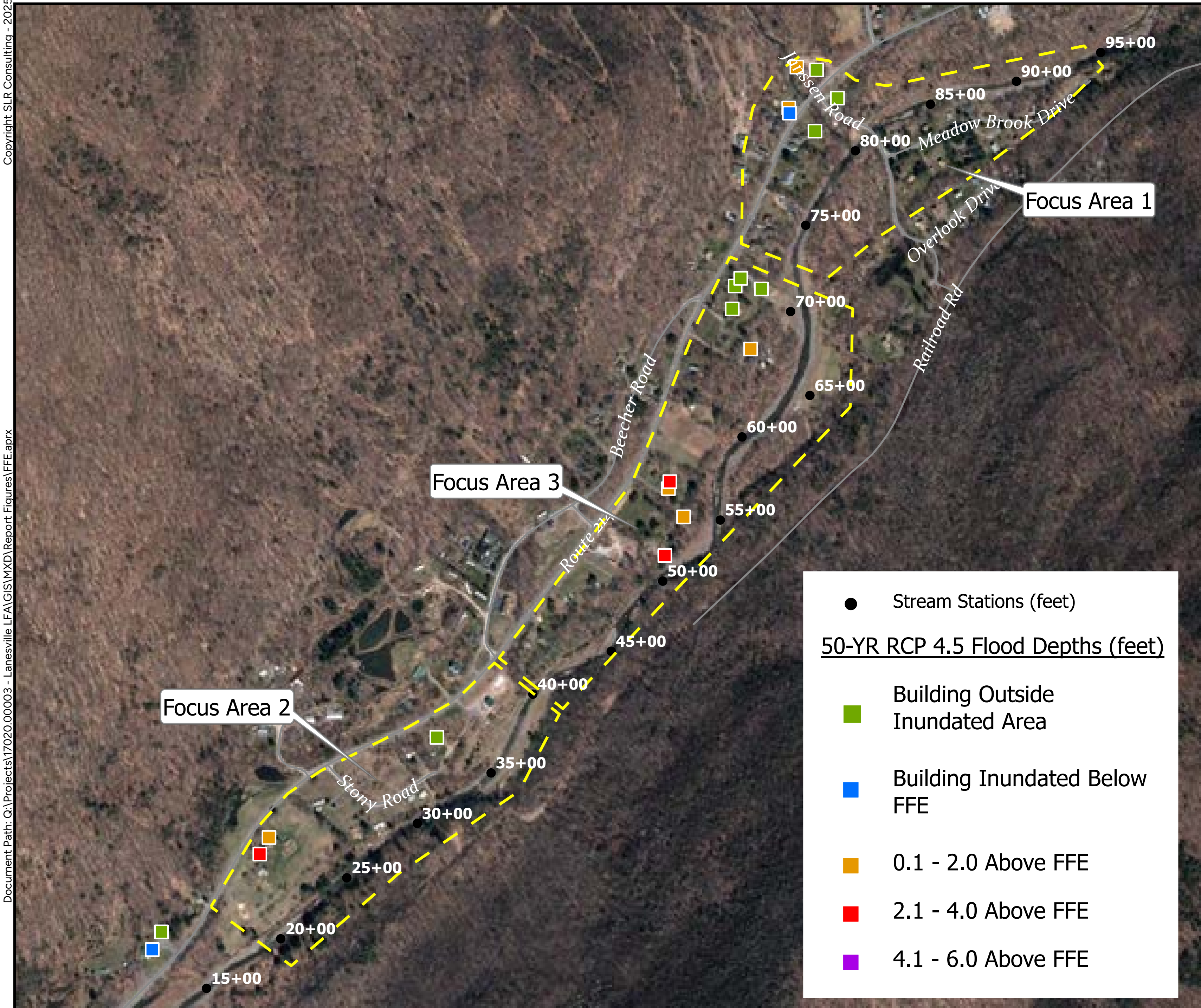

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INUNDATED FIRST FLOOR ELEVATIONS - 50-YR RCP 4.5
HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

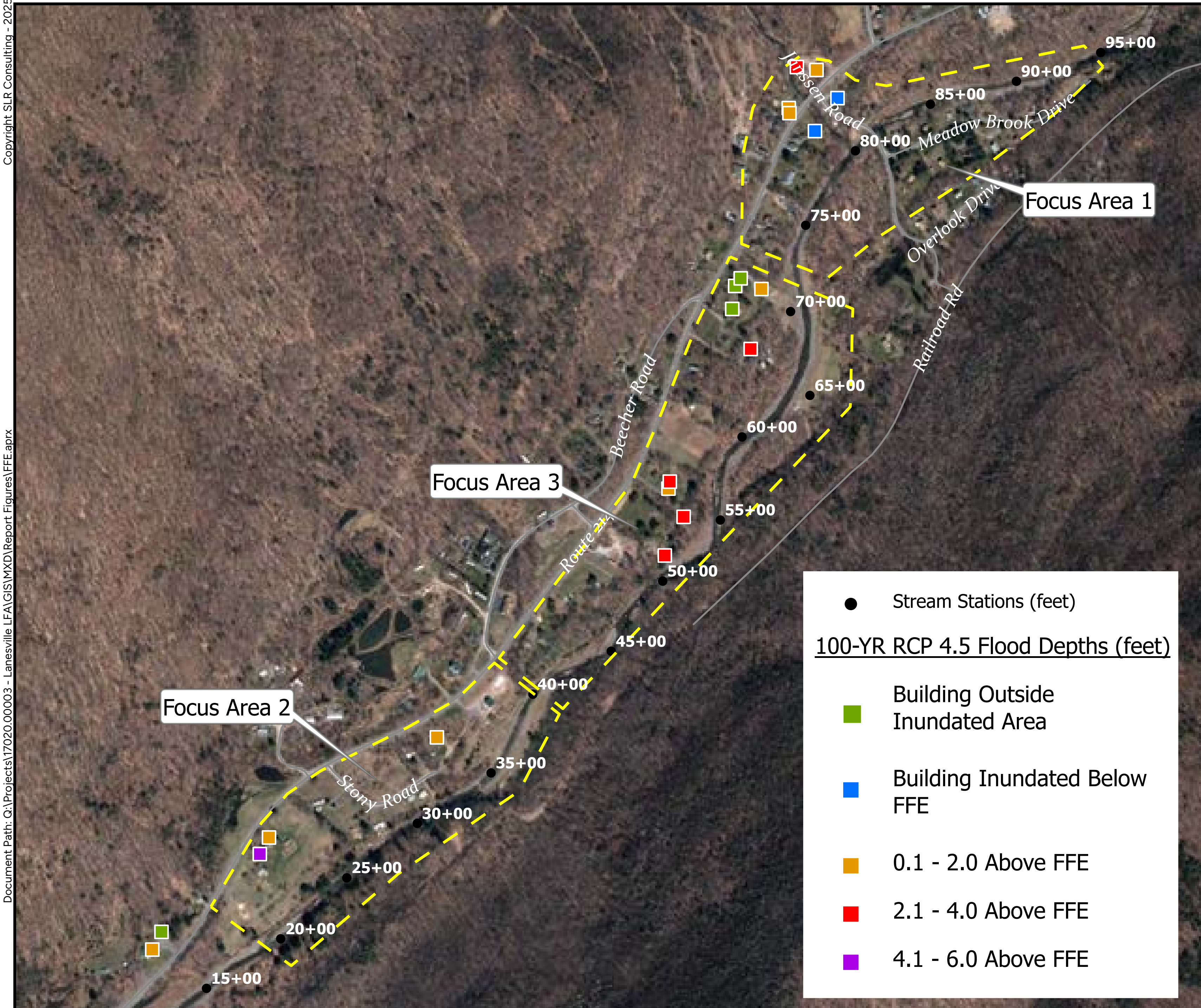
SCALE 1 in = 750 ft

DATE 6/13/2025

PROJ. NO. 17020.00003

FIG. 3-4

Document Path: Q:\Projects\17020.00003 - Lanesville LFA\GIS\MXD\Report Figures\FFE.aprx



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Feet

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231 MAIN STREET
SUITE 102
NEW PALTZ, NY 12561
845.633.8153

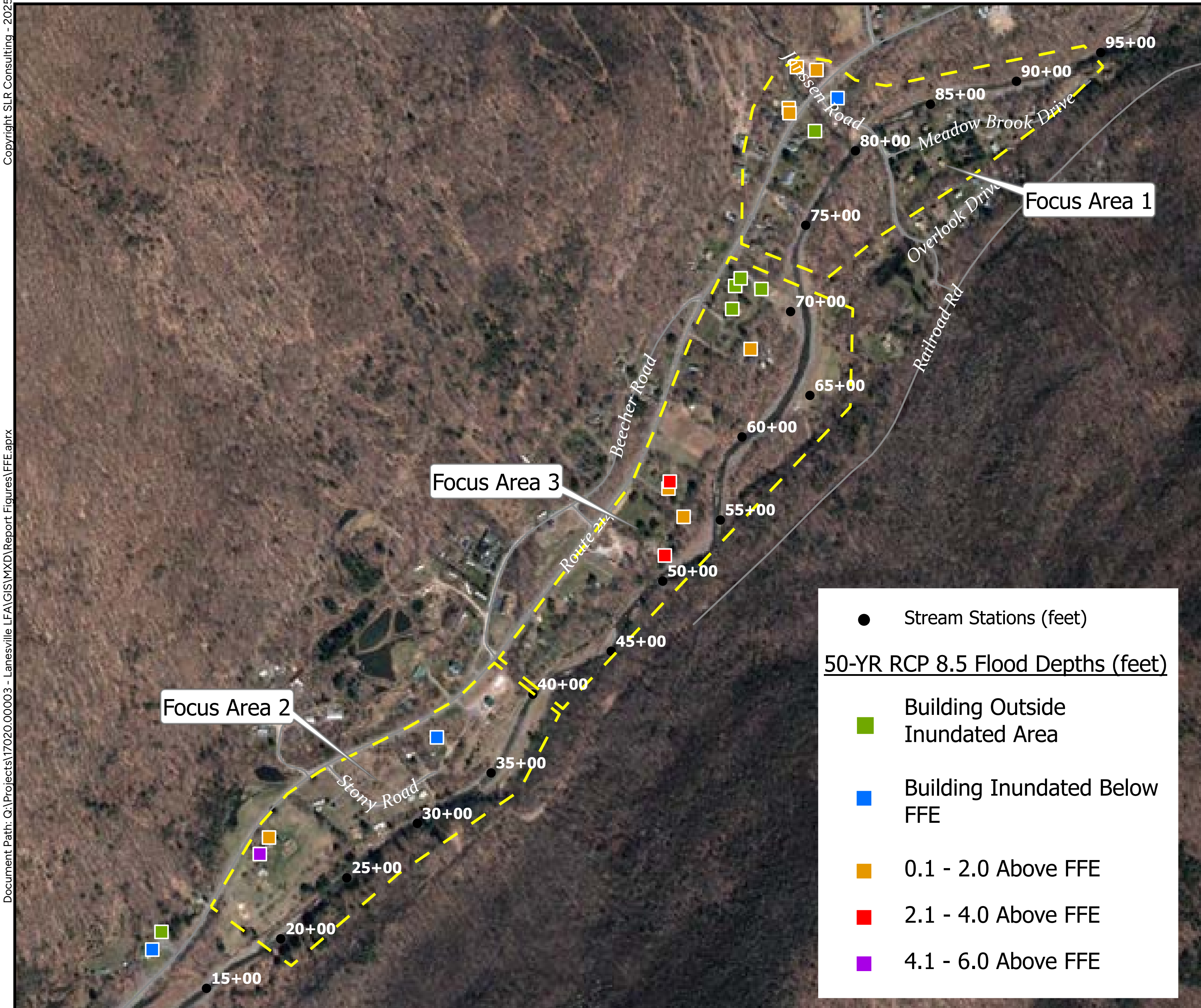
INUNDATED FIRST FLOOR ELEVATIONS - 100-YR RCP 4.5
HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1 in = 750 ft

DATE 6/13/2025

PROJ. NO. 17020.00003

FIG. 3-5



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INUNDATED FIRST FLOOR ELEVATIONS - 50-YR RCP 8.5

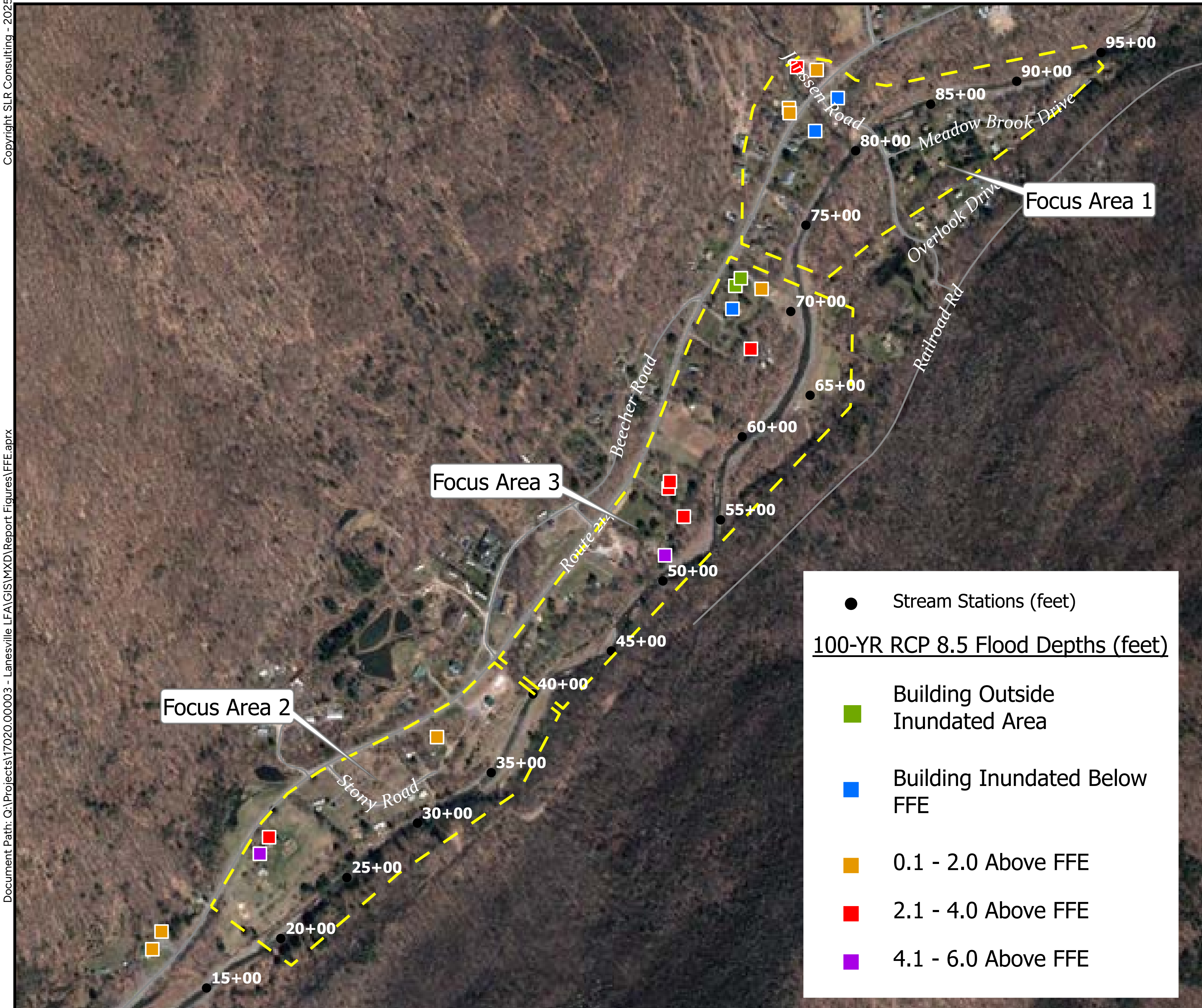
HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1 in = 750 ft

DATE 6/13/2025

PROJ. NO. 17020.00003

FIG. 3-6



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NEW PALTZ, NY 12561
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INUNDATED FIRST FLOOR ELEVATIONS - 100-YR RCP 8.5

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS

TOWN OF HUNTER

GREENE COUNTY, NEW YORK

SCALE 1 in = 750 ft

DATE 6/13/2025

PROJ. NO. 17020.00003

FIG. 3-7

3.1.2 Focus Area 1 – SFHA Structures at NY-214 and Jansen Road

A number of flood-prone properties are located in the central part of Lanesville, in the area of the confluence of Hollow Tree Brook and Stony Clove Creek and the intersection of Jansen Road with NY-214. Flooding in this area is associated with both Stony Clove Creek and Hollow Tree Brook, with some properties affected by flooding on both watercourses.

The Jansen Road bridge over Stony Clove Creek is located in this area; the bridge crossing itself is discussed in Section 3.3.1. ***More than 20 properties rely on the Jansen Road bridge for access, with no available detours***, making this one of the most important stream crossings in the LFA area in terms of criticality.

Ten developed properties have structures located within the SFHA in this area, two of which are in the floodway. Another four buildings are outside the SFHA but within the 500-year floodplain. At least 10 developed parcels are within either the 100- or 500-year floodplains, but the associated structures are located outside the mapped floodplain boundaries. Several undeveloped parcels are also located in regulatory flood zones in this neighborhood. Current effective FEMA flood zone mapping for Focus Area 1 is shown in Figure 3-8.

Many of the flood-prone properties in this area are only accessible via the Jansen Road bridge. The bridge is susceptible to overtopping or being flanked by floodplain flows in flood events that would also affect these properties. The consequence is that access to the eastern bank of Stony Clove Creek may be limited for evacuation or emergency response. A number of other residences in this area are not modeled as flood prone but are only accessed by the Jansen Road bridge.

Depth grid mapping for current estimated flood discharges and projected future inundation boundaries for the 50- and 100-year floods in Focus Area 1 are shown in Figure 3-9 and Figure 3-10, respectively.

Property owners with homes that are mapped near the regulatory flood zone boundaries or in areas of shallow flooding may benefit from a FEMA Elevation Certificate. It is recommended that homeowners in these areas seek elevation certificates.

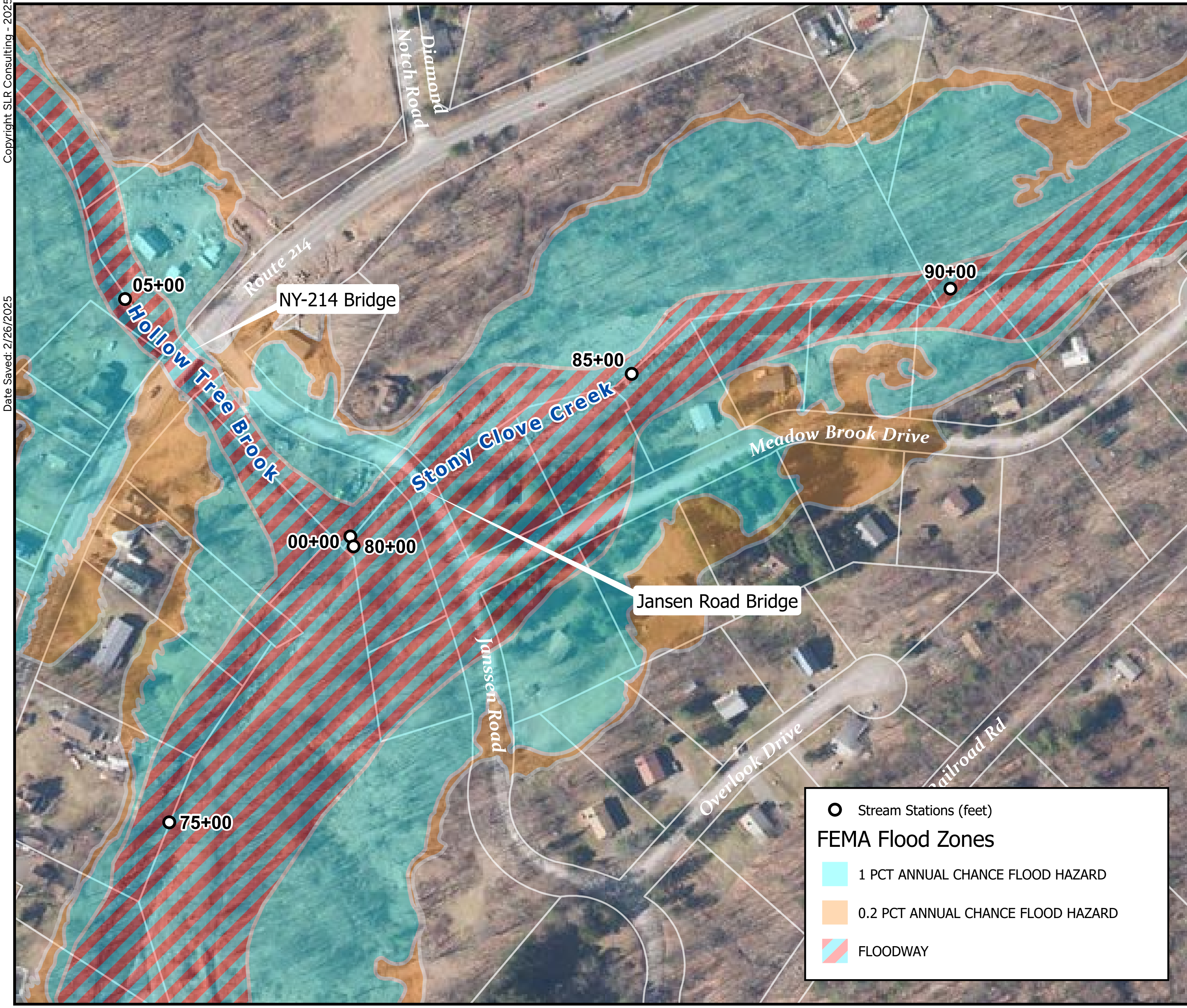
It is recommended that residents with homes in the SFHA or shaded Zone X consider elevating and/or floodproofing structures or seeking buyout or relocation assistance.

It is recommended that owners of homes within the floodway seek buyout or relocation assistance.

It is recommended that all owners of flood-prone properties purchase flood insurance and file claims when damage occurs.

Table 3-1 Summary Information for Focus Area 1

Modeled 100-year flood depths at properties in Focus Area 1	Up to 5 feet
Properties with repetitive loss structures	0
Properties with structures in floodway	2
Properties with structures in 100-year floodplain (SFHA), including floodway	10
Properties with structures in 500-year floodplain, outside SFHA (shaded Zone X)	10
Parcels in flood zones with structures outside mapped floodplains	16
Properties accessed only by Jansen Road bridge	>30



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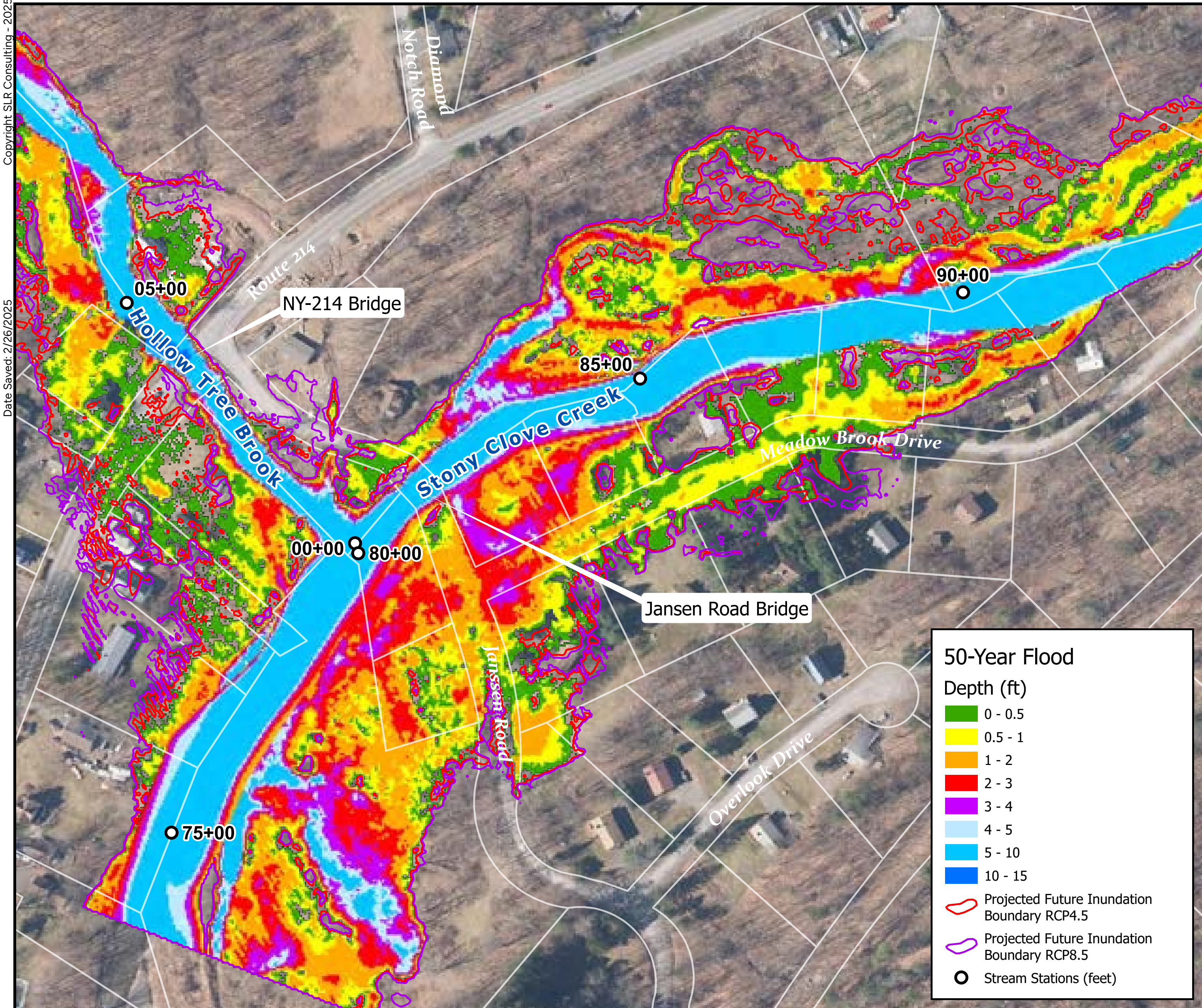
FOCUS AREA 1: FEMA MAPPING
HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1 in = 200 ft

DATE 2/26/2025

PROJ. NO. 17020.00003

FIG. 3-8



N

0 50 100 150 200
Feet

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FOCUS AREA 1: 50-YEAR FLOOD DEPTHS

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1 in = 200 ft

DATE 2/26/2025

PROJ. NO. 17020.00003

FIG. 3-9

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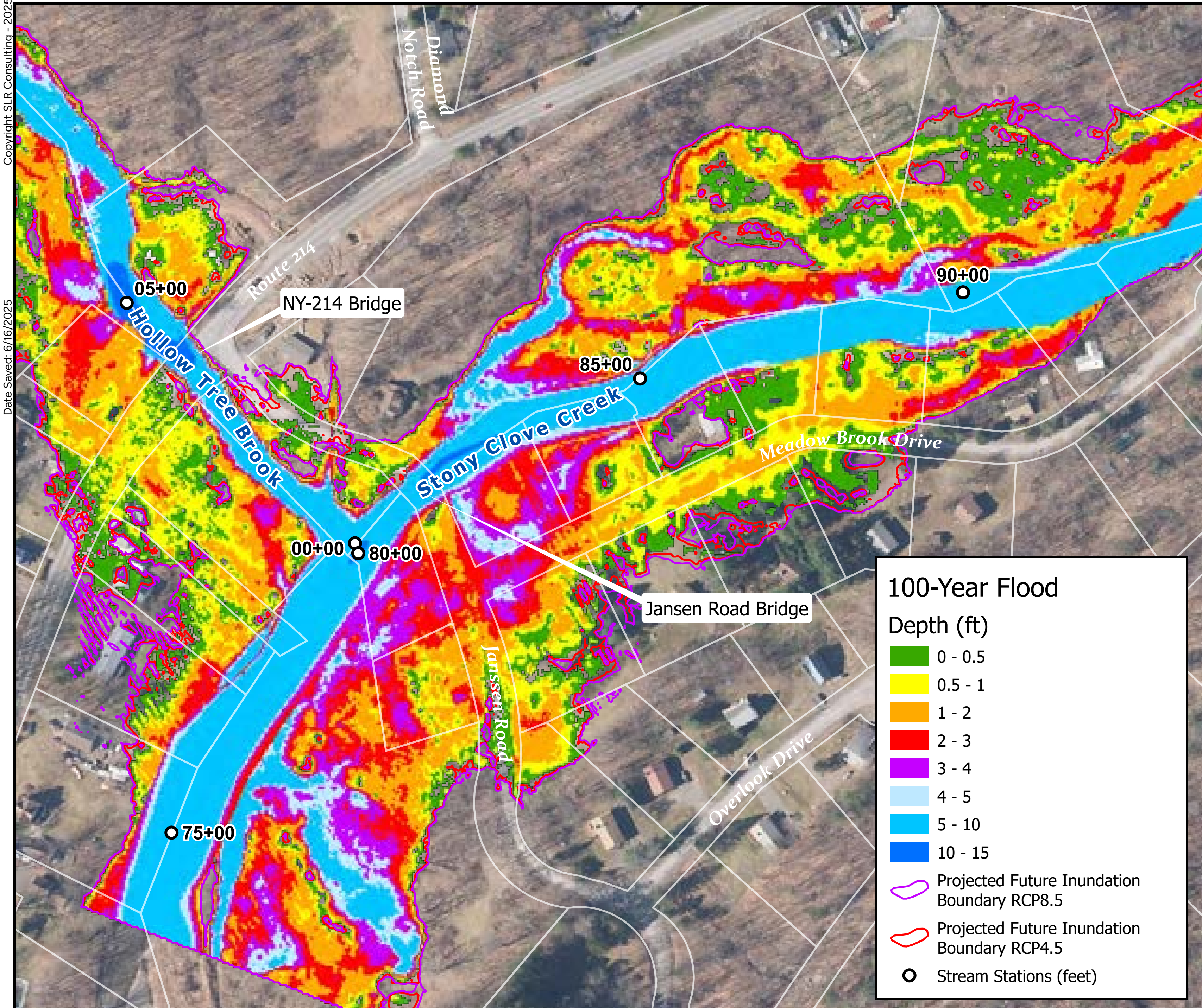

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FOCUS AREA 1: 100-YEAR FLOOD DEPTHS
HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1 in = 200 ft
DATE 6/16/2025
PROJ. NO. 17020.00003

FIG. 3-10

3.1.3 Focus Area 2 – Structures at NY-214 and Stony Road

Ten developed properties are in the Stony Road neighborhood (STA 20+00 to STA 40+00 on Stony Clove Creek), nine of which have buildings within the SFHA; the other has a structure in the 500-year floodplain. Current effective FEMA flood zone mapping for Focus Area 2 is shown in Figure 3-11.

The area between NY-214 and Stony Clove Creek is particularly flood prone along this reach, with 100-year flood depths between about 2 feet and 7 feet in the developed neighborhood, with depths up to 6 feet on Stony Road.

Depth grid mapping for current estimated flood discharges and projected future inundation boundaries for the 50- and 100-year floods in Focus Area 2 are shown in Figure 3-12 and Figure 3-13, respectively.

Property owners with homes that are mapped near the regulatory flood zone boundaries or in areas of shallow flooding may benefit from a FEMA Elevation Certificate. It is recommended that homeowners in these areas seek elevation certificates.

It is recommended that residents with homes in the SFHA or shaded Zone X consider elevating and/or floodproofing structures or seeking buyout or relocation assistance.

It is recommended that all owners of flood-prone properties purchase flood insurance and file claims when damage occurs.

Table 3-2 Summary Information for Focus Area 2

Modeled 100-year flood depths at properties in Focus Area 2	Up to 6 feet
Properties with repetitive loss structures	0
Properties with structures in floodway	0
Properties with structures in 100-year floodplain (SFHA)	9
Properties with structures in 500-year floodplain, outside SFHA (shaded Zone X)	1
Parcels in flood zones with structures outside mapped floodplains	1

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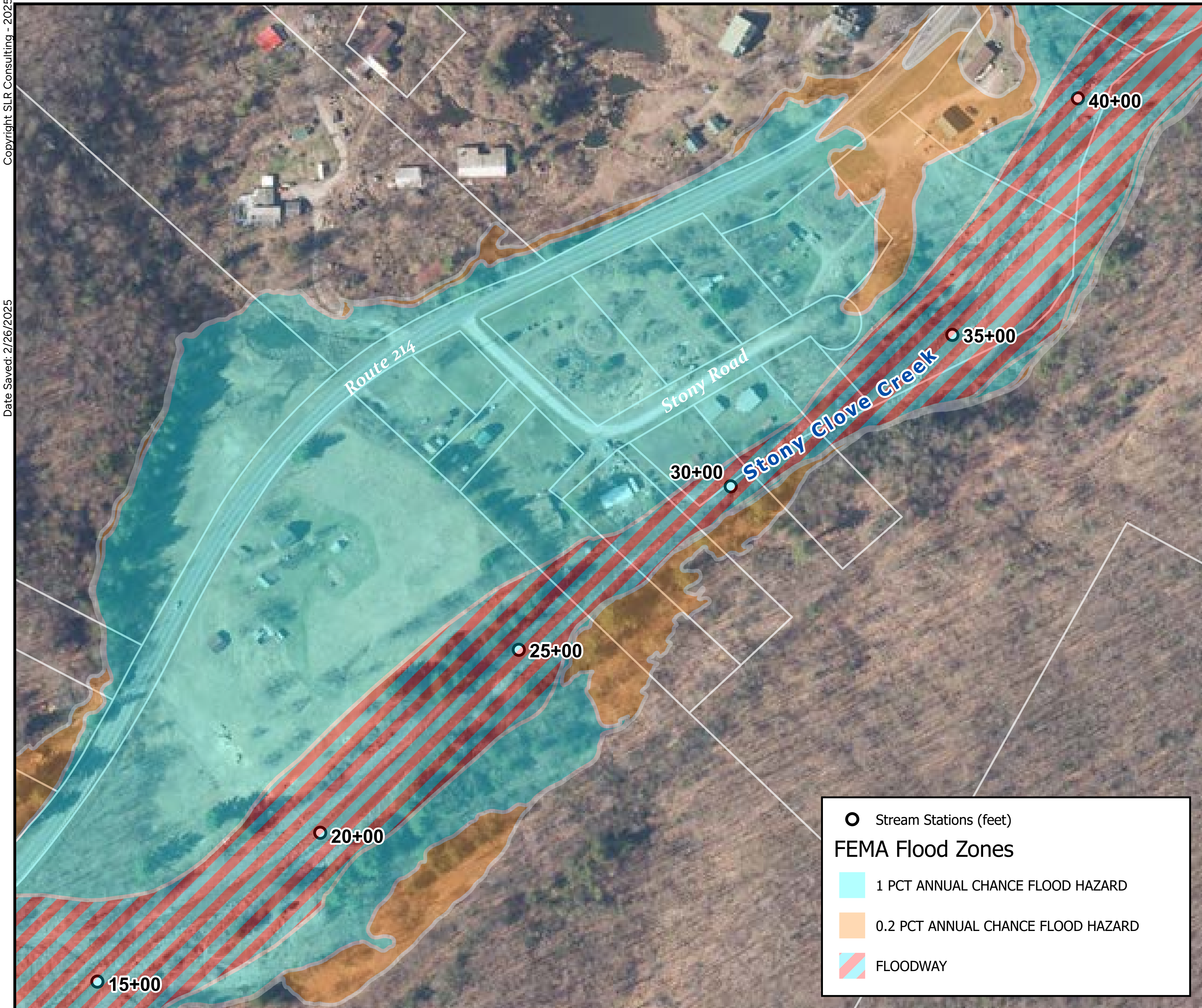

N

0 50 100 150 200 250
Feet

SLR
231 MAIN STREET
SUITE 102
NEW PALTZ, NY 12561
845.633.8153

FOCUS AREA 2: FEMA MAPPING

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS

TOWN OF HUNTER

GREENE COUNTY, NEW YORK

SCALE 1 in = 250 ft

DATE 2/26/2025

PROJ. NO. 17020.00003

FIG. 3-11

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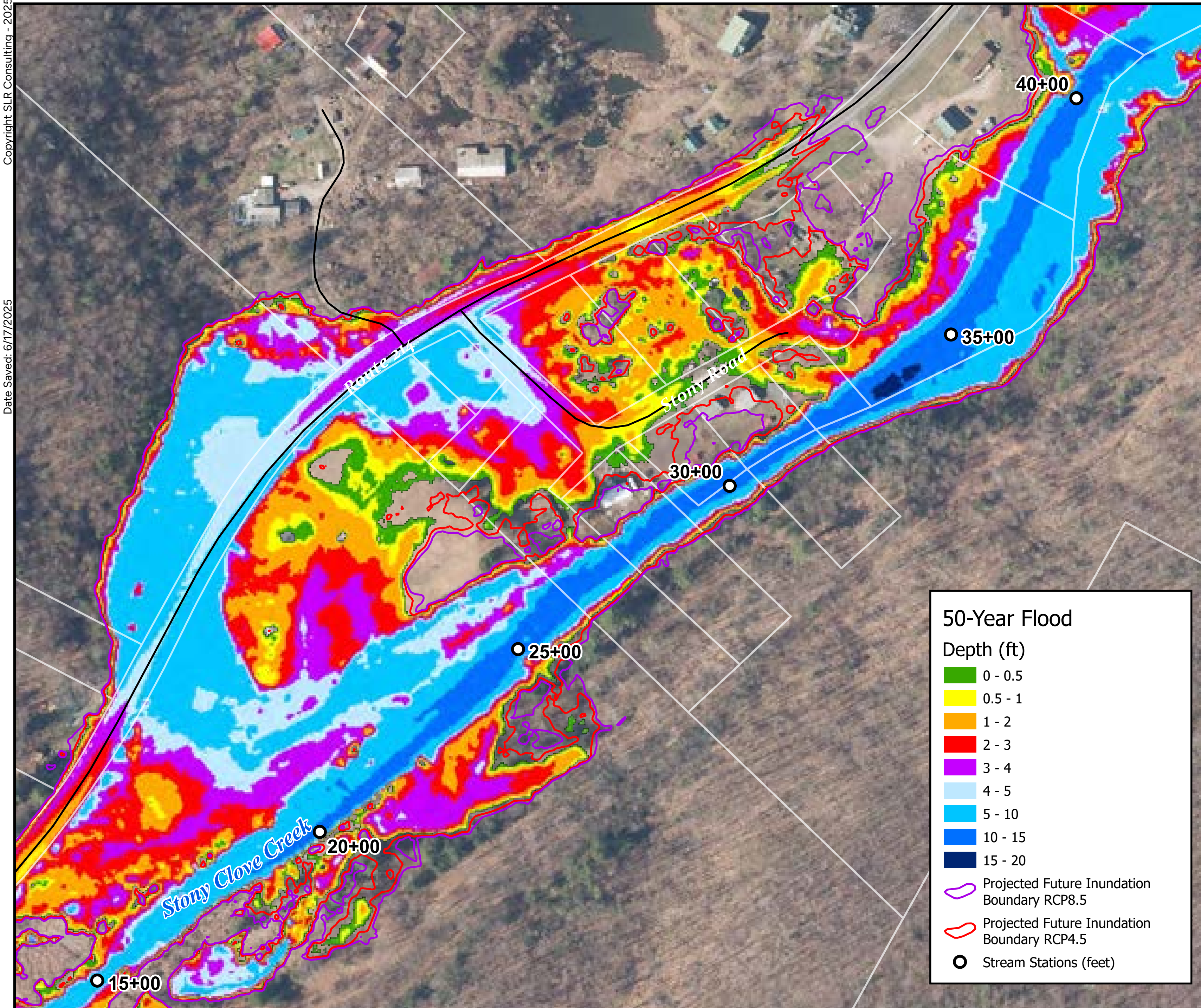

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Feet

SLR
231 MAIN STREET
SUITE 102
NEW PALTZ, NY 12561
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FOCUS AREA 2: 50-YEAR FLOOD DEPTHS

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1 in = 250 ft

DATE 6/17/2025

PROJ. NO. 17020.00003

FIG. 3-12

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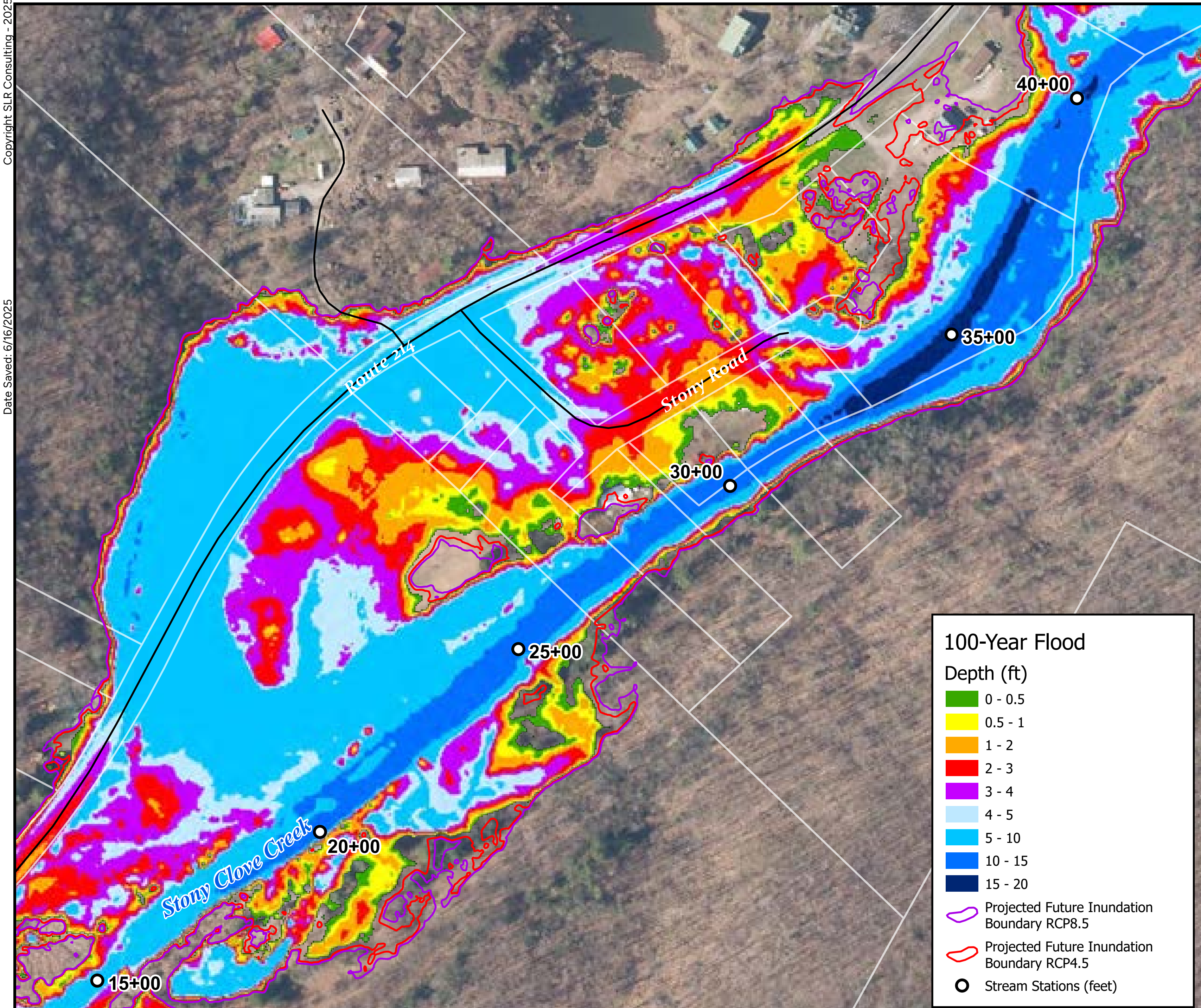

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FOCUS AREA 2: 100-YEAR FLOOD DEPTHS
HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1 in = 250 ft
DATE 6/16/2025
PROJ. NO. 17020.00003

FIG. 3-13

3.1.4 Focus Area 3 - Structures across from Beecher Road

Many of the properties between NY-214 and Stony Clove Creek are prone to flooding. Between STA 40+00 and STA 70+00, 14 developed parcels are within the mapped floodplain plus two that are undeveloped. Of these, two buildings are within the floodway, six buildings are within the SFHA, and two are outside the SFHA but within the 500-year floodplain. Structures on the remaining four flood-prone developed properties are outside the mapped floodplain, although one appears to have an outbuilding in the SFHA. Current effective FEMA flood zone mapping for Focus Area 3 is shown in Figure 3-14.

Two of properties located in this area have incurred repetitive losses. The repetitive loss structures in Focus Area 3 were damaged in at least two of the following flood events: January 1996, April 2005, September 2010, August 2011, and December 2020. It is recommended that owners of repetitive loss properties seek elevation, floodproofing, buyout, or relocation assistance.

Depth grid mapping for current estimated flood discharges and projected future inundation boundaries for the 50- and 100-year floods in Focus Area 3 are shown in Figure 3-15 and Figure 3-16, respectively.

Property owners with homes that are mapped near the regulatory flood zone boundaries or in areas of shallow flooding may benefit from a FEMA Elevation Certificate. It is recommended that homeowners in these areas seek elevation certificates.

It is recommended that residents with homes in the SFHA or shaded Zone X consider elevating and/or floodproofing structures or seeking buyout or relocation assistance.

It is recommended that owners of homes within the floodway seek buyout or relocation assistance.

It is recommended that all owners of flood-prone properties purchase flood insurance and file claims when damage occurs.

Table 3-3 Summary Information for Focus Area 3

Modeled 100-year flood depths at properties in Focus Area 3	Up to 4 feet
Properties with repetitive loss structures	2
Properties with structures in floodway	2
Properties with structures in 100-year floodplain (SFHA), including floodway	9
Properties with structures in 500-year floodplain, outside SFHA (shaded Zone X)	2
Parcels in flood zones with structures outside mapped floodplains	2

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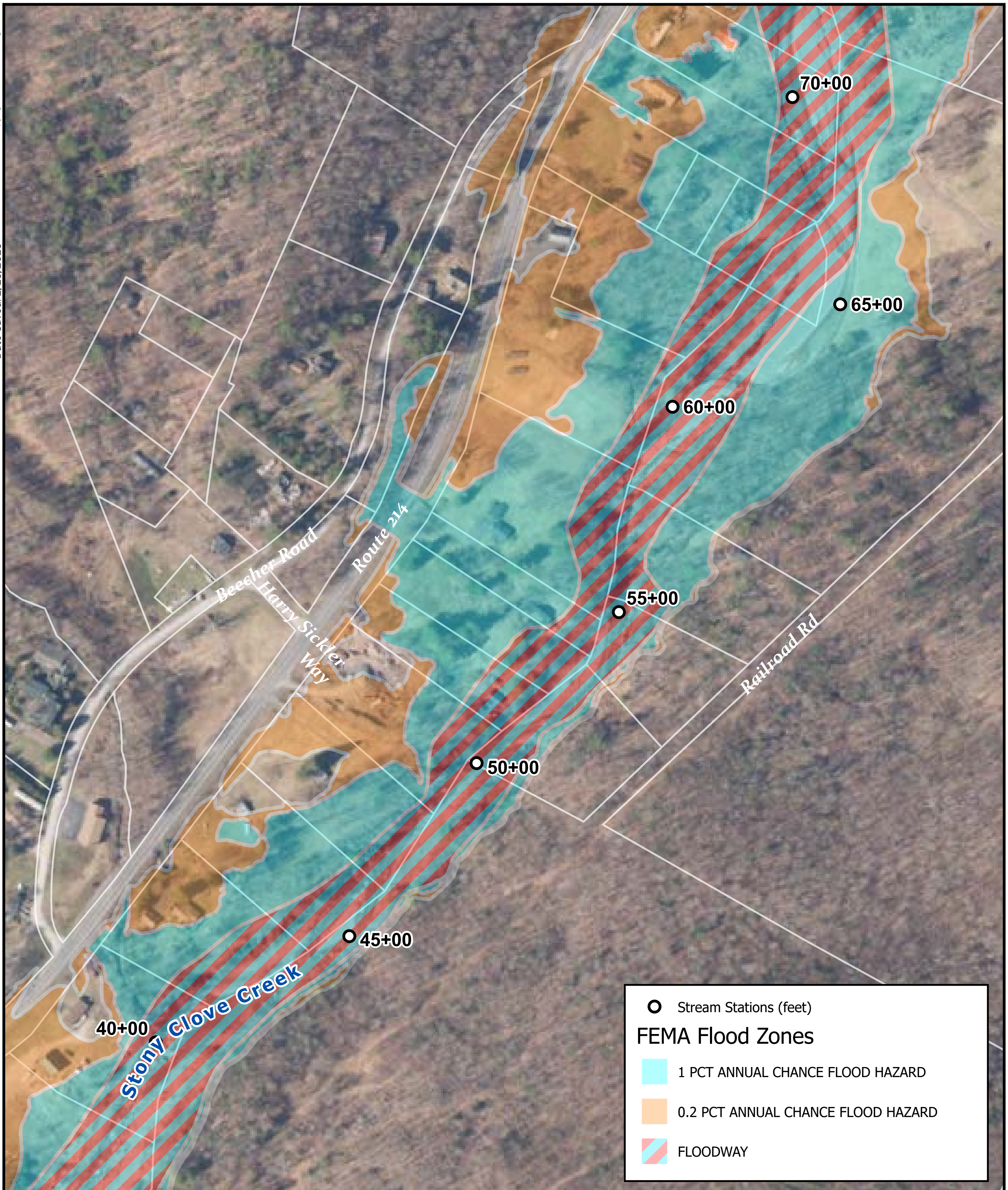

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FOCUS AREA 3: FEMA MAPPING

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

N

0 100 200 300
Feet

SCALE 1 in = 300 ft

DATE 2/26/2025

PROJ. NO. 17020.00003

FIG. 3-14

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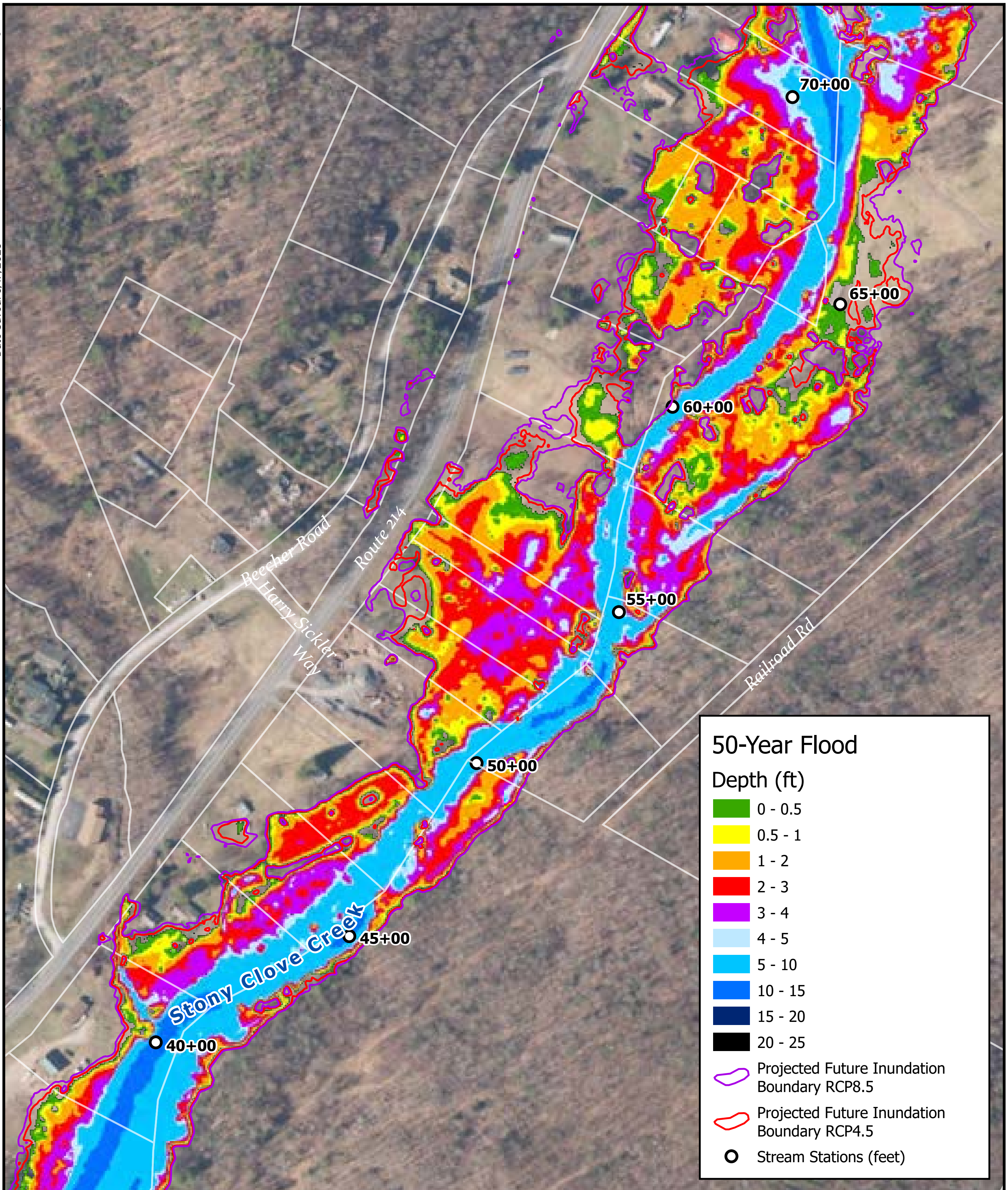

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FOCUS AREA 3: 50-YEAR FLOOD DEPTHS

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

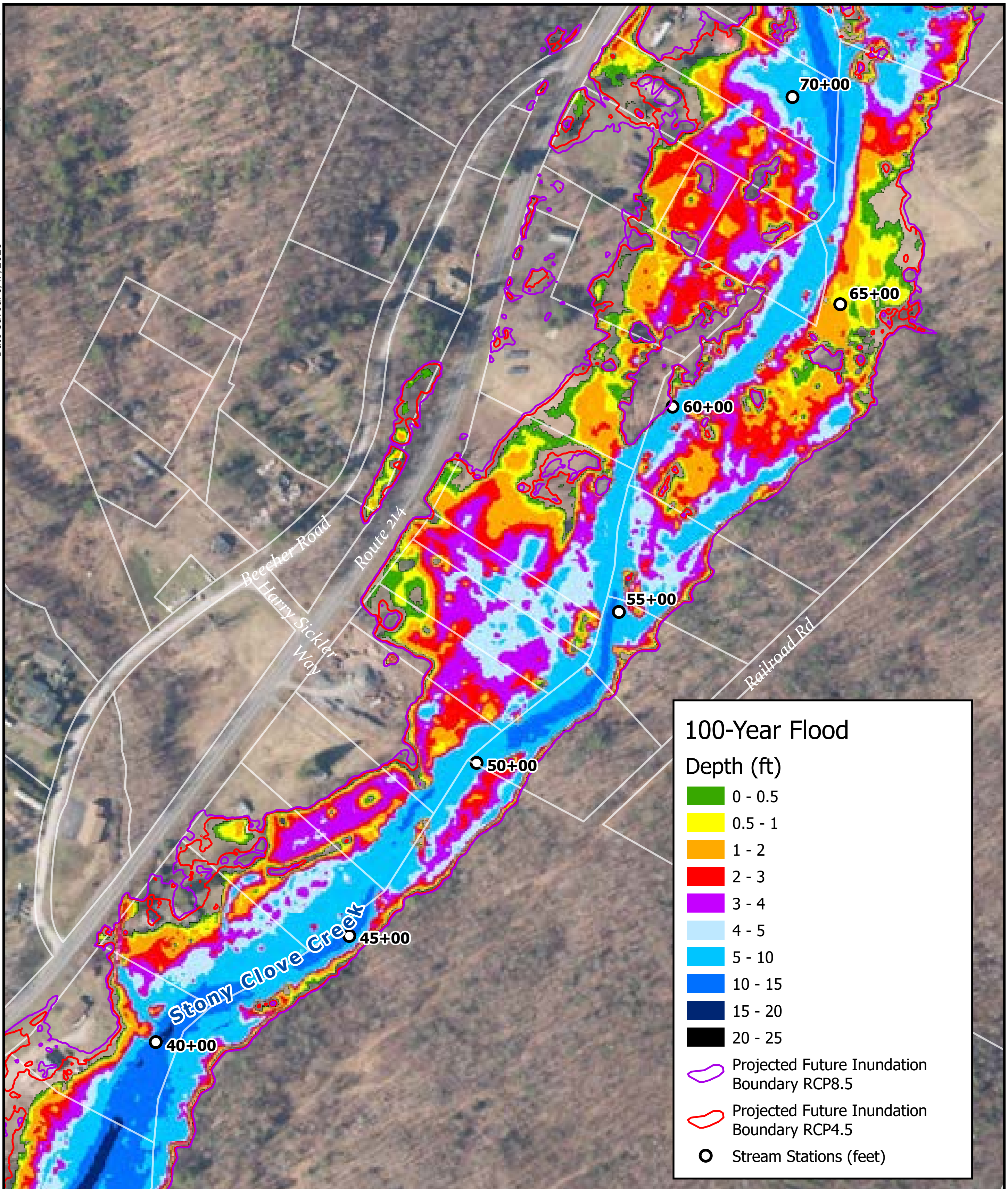
N

0 100 200 300
Feet

SCALE	1 in = 300 ft
DATE	6/17/2025
PROJ. NO.	17020.00003

FIG. 3-15

Date Saved: 6/17/2025



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FOCUS AREA 3: 100-YEAR FLOOD DEPTHS
HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

N
0 100 200 300
Feet

SCALE 1 in = 300 ft
DATE 6/17/2025
PROJ. NO. 17020.00003

FIG. 3-16

3.1.5 Focus Area 4 - Benjamin Road and Wright Road

This focus area extends from STA 120+00 to STA 175+00 and includes one property in the floodway, nine properties in the SFHA, and three outside the SFHA but within the 500-year floodplain. Three parcels are mapped within flood zones, but the buildings are outside the floodplain boundaries, and nine properties are reliant on either a public or private bridge for access. Current effective FEMA flood zone mapping for Focus Area 4 is shown in Figure 3-17.

The Wright Road and Benjamin Road bridges are discussed in Sections 3.3.2 and 3.3.3, respectively.

Upstream of the Benjamin Road bridge, there is one flood-prone property. Buildings on the property are within the SFHA; however, only roughly half of the parcel is mapped in the floodplain; relocating the structure to higher ground on the same parcel may be a viable mitigation strategy. It is recommended that this be considered.

Between the Benjamin Road bridge and the Wright Road bridge, eight properties have structures within the mapped flood zones. Five are in the SFHA, and three are outside the SFHA but within the 500-year floodplain.

Along this reach, four properties are accessed only by private bridges (see Section 3.3.8), two of which have buildings in the SFHA, and two of which have buildings outside the mapped floodplain. Hydraulic modeling of these four private bridges indicates that all are significantly undersized and are either flanked, overtopped, or both, beginning in either the 10- or 25-year floods. Note that damage can also occur in lesser-magnitude floods. An additional three properties are accessed only by the Benjamin Road bridge, which is modeled as being overtopped in the 10-year flood, and two are accessed only by the Wright Road bridge, which is overtopped by the 50-year flood.

Residents at these nine properties along the left (southeast) bank of Stony Clove Creek in this area should anticipate temporary if not prolonged loss of access in these conditions and should be prepared to evacuate in case of flooding. Five of these properties have buildings within either the SFHA or shaded Zone X and are exposed to flooding hazards as well as potential loss of access.

Downstream of Wright Road, three properties on the right (north) bank of Stony Clove Creek are mapped in the SFHA, one of which has a structure in the floodway.

Table 3-4 Summary Information for Focus Area 4

Modeled 100-year flood depths at properties in Focus Area 4	Up to 5 feet
Properties with repetitive loss structures	0
Properties with structures in floodway	1
Properties with structures in 100-year floodplain (SFHA), including floodway	9
Properties with structures in 500-year floodplain, outside SFHA (shaded Zone X)	3
Parcels in flood zones with structures outside mapped floodplains	3
Properties accessed only by Wright Road bridge	2
Properties accessed only by Benjamin Road bridge	3
Properties accessed only by private bridges	4

Depth grid mapping for current estimated flood discharges and projected future inundation boundaries for the 50- and 100-year floods in Focus Area 4 are shown in Figure 3-18 and Figure 3-19, respectively.

Property owners with homes that are mapped near the regulatory flood zone boundaries or in areas of shallow flooding may benefit from a FEMA Elevation Certificate. It is recommended that homeowners in these areas seek elevation certificates.

It is recommended that residents with homes in the SFHA or shaded Zone X consider elevating and/or floodproofing structures or seeking buyout or relocation assistance.

It is recommended that owners of homes within the floodway seek buyout or relocation assistance.

It is recommended that all owners of flood-prone properties purchase flood insurance and file claims when damage occurs.

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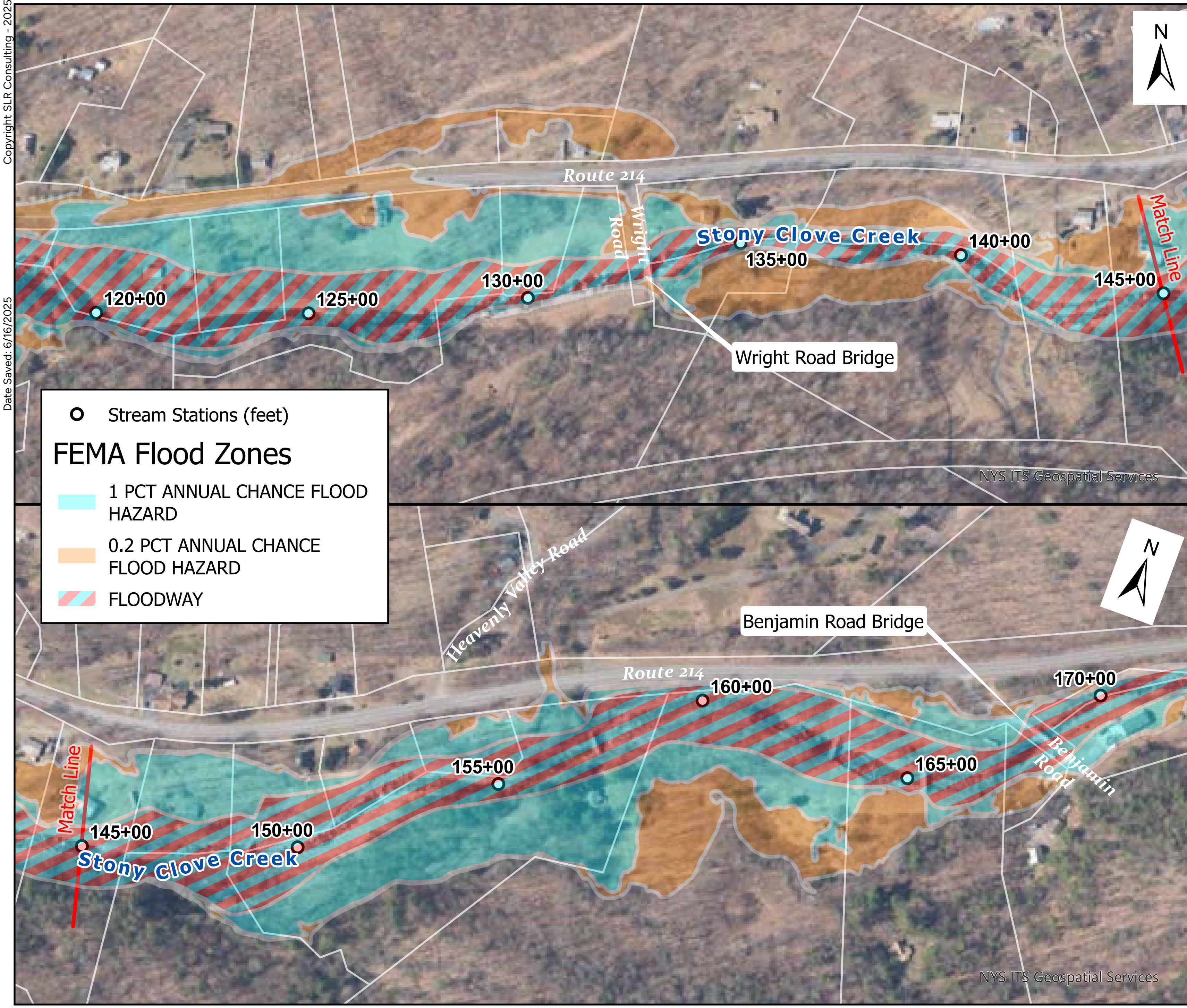

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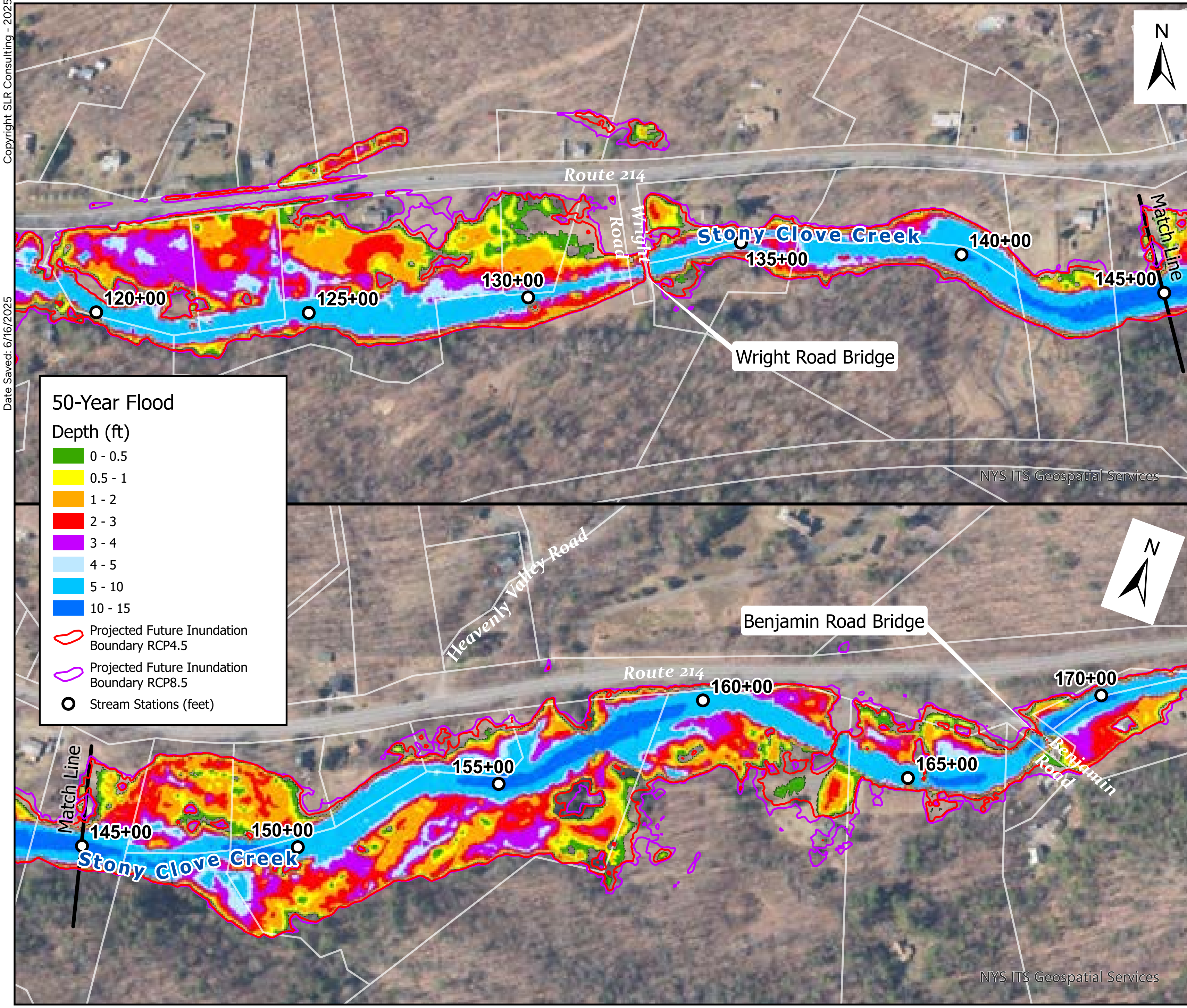
FOCUS AREA 4: FEMA MAPPING

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1 in = 300 ft
DATE 6/16/2025
PROJ. NO. 17020.00003

FIG. 3-17

Date Saved: 6/16/2025



0 100 200 300
Feet

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FOCUS AREA 4: 50-YR FLOOD DEPTHS

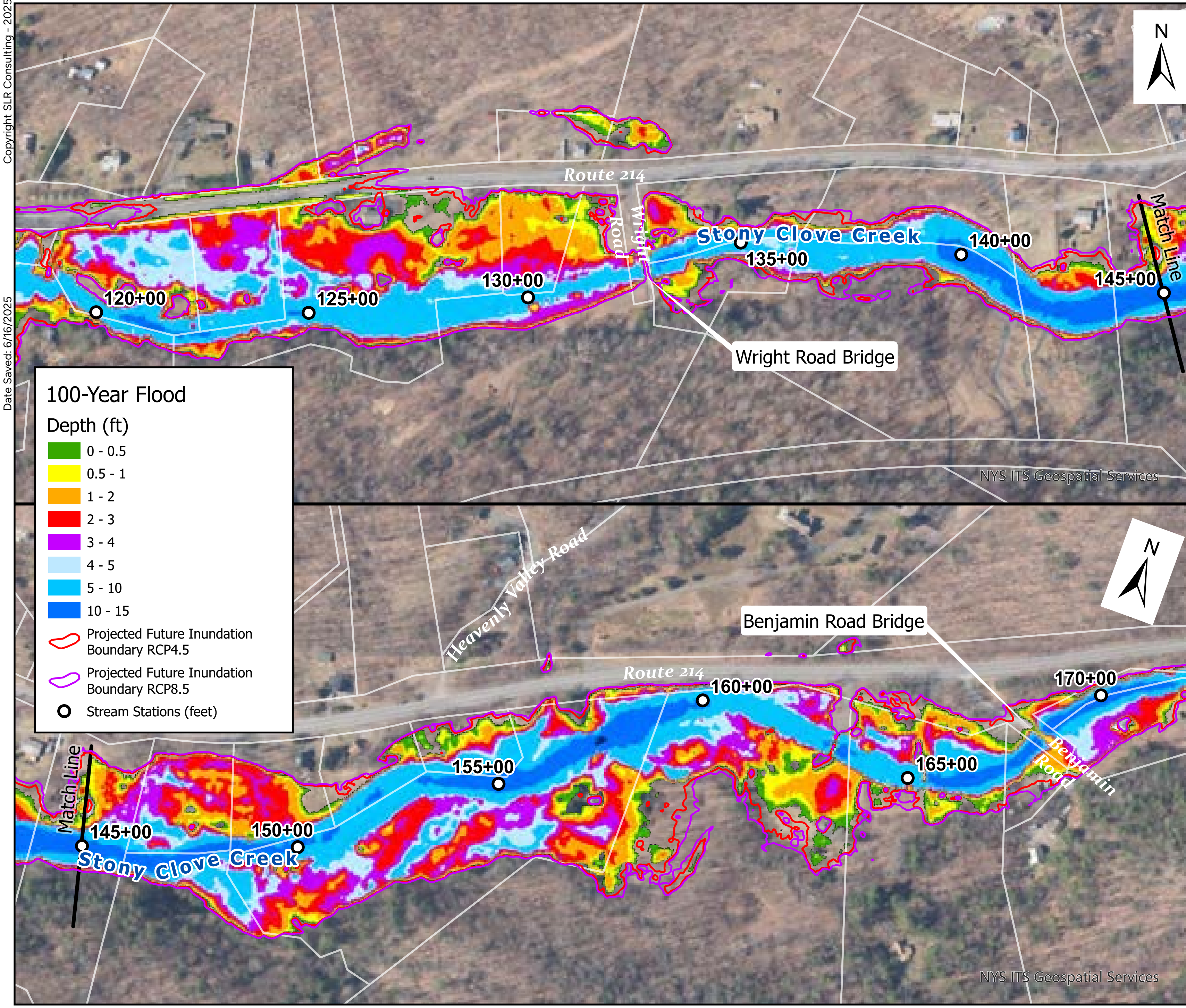
HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1 in = 300 ft

DATE 6/16/2025

PROJ. NO. 17020.00003

FIG. 3-18



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FOCUS AREA 4: 100-YEAR FLOOD DEPTHS

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1 in = 300 ft

DATE 6/16/2025

PROJ. NO. 17020.00003

FIG. 3-19

3.1.6 Flood Mitigation for Individual Properties

Within the project areas, many homes are mapped within or near the 100- or 500-year floodplains. It is recommended that property owners who are in mapped flood zones or who have experienced flooding damage in the past seek appropriate flood mitigation strategies whether through buyouts, relocation, or individual floodproofing measures.

The effective FIRM products for the hamlet of Lanesville are available online. Residents may search for their home address directly by visiting https://msc.fema.gov/portal/home.

- It is recommended that the town works to ***floodproof or relocate the most flood-vulnerable properties where there is owner interest and programmatic funding available*** through flood buyout and relocation programs and flood hazard mitigation implementation programs. The two flow charts below provide decision-making guidance for nonresidential (Figure 3-20) and residential (Figure 3-21) properties.
- It is recommended that the town identify ***priority areas and structures that are prone to most frequent and deepest flooding***. These areas should be considered the highest priority for individual flood protection measures.

Some of the homes in the SFHA are rarely flooded. Residents and businesses may benefit from minor individual property improvements. Providing landowners with information regarding individual property protection is recommended.

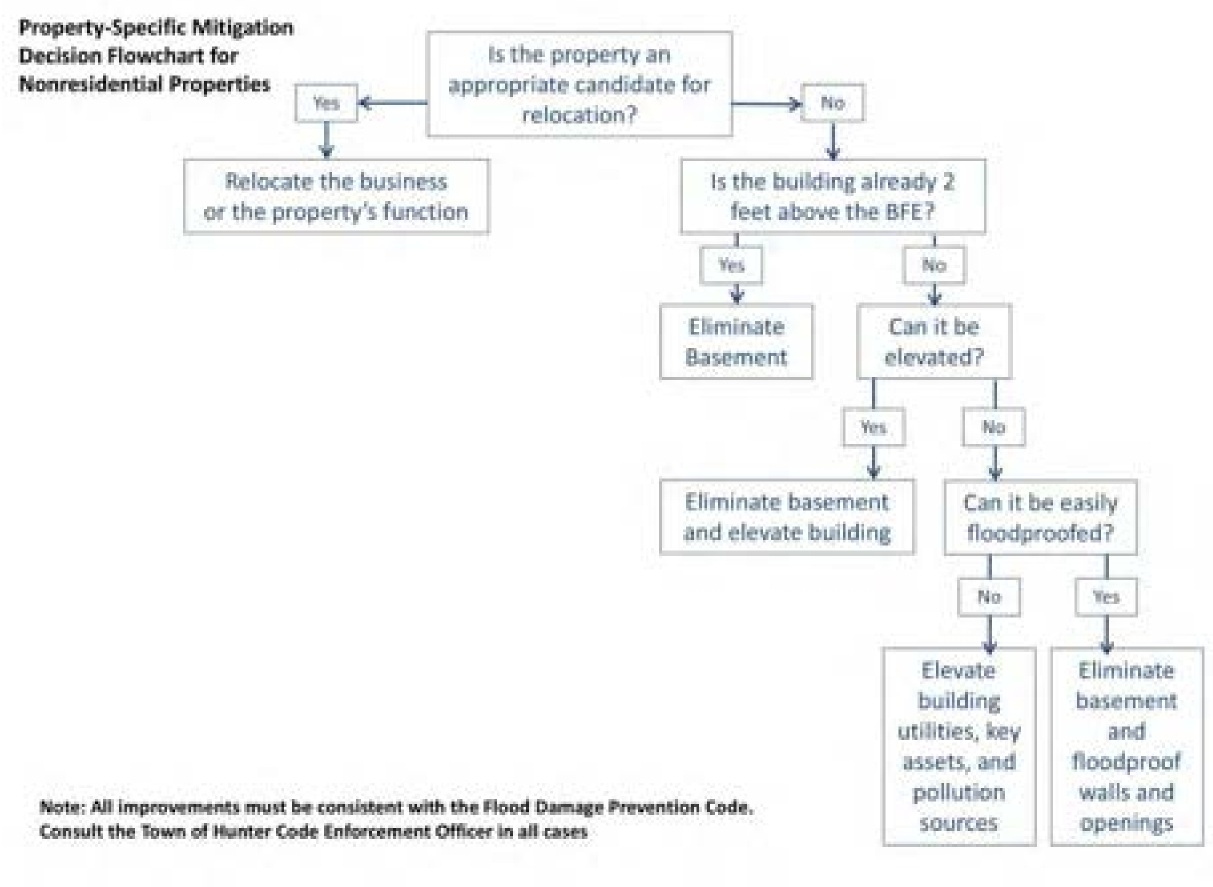


Figure 3-20 Property-specific mitigation for nonresidential properties

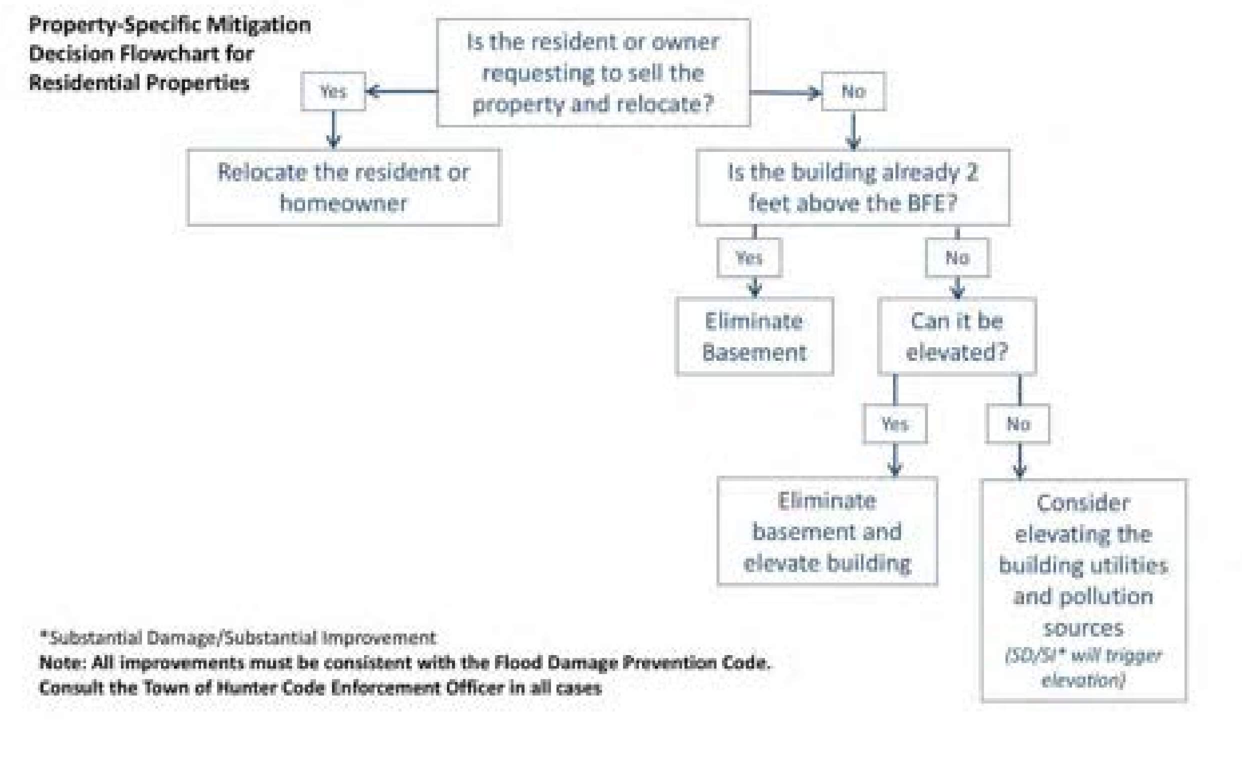


Figure 3-21 Property-specific mitigation for residential properties

In areas that are vulnerable to flooding, improvements of individual properties and structures may be appropriate. ***All practices to protect property within a floodplain must comply with local flood damage prevention code and may require the approval of the town floodplain administrator or code enforcement officer***. Potential measures for property protection include the following:

- ***Elevation of the structure*** – Home elevation entails the removal of the building structure from the basement and elevating it on piers to a height such that the first floor is located 2 feet or more above the level of the 100-year flood event. The basement area is abandoned and filled to be no lower than the existing grade. All utilities and appliances located within the basement must be relocated to the first-floor level or suspended from basement joists or similar mechanism at an elevation no less than 2 feet above the BFE. The remaining enclosure must only be used for parking, access, and/or storage.
- ***Dry floodproofing*** of the structure to keep floodwaters from entering – Dry floodproofing refers to the act of making areas below the flood level watertight. Walls may be coated with compound or plastic sheathing. Openings such as windows and vents would be either permanently closed or covered with removable shields. Flood protection should extend only 2 to 3 feet above the top of the concrete foundation because building walls and floors cannot withstand the pressure of deeper water.
- ***Wet floodproofing*** of the structure to allow floodwaters to pass through the lower area of the structure unimpeded – Wet floodproofing refers to intentionally letting floodwater into a building to equalize interior and exterior water pressures. Furniture and electrical appliances should be moved away or elevated above the 100-year flood elevation.

- Performing other home improvements to mitigate damage from flooding – The following measures can be undertaken to protect home utilities and belongings:
    - ***Relocate valuable belongings*** above the 100-year flood elevation to reduce the amount of damage caused during a flood event.
    - ***Relocate or elevate appliances*** like water heaters, heating systems, washers, and dryers to a higher floor or to at least 12 inches above the BFE.
    - ***Anchor fuel tanks*** to the wall or floor with noncorrosive metal strapping and lag bolts.
    - ***Install a backflow valve*** to prevent sewer or septic backup into the home.
    - ***Install a floating floor drain plug*** at the lowest point of the lowest finished floor.
    - ***Elevate the electrical box*** or relocate it to a higher floor and elevate electric outlets to at least 12 inches above the high-water mark or BFE.
- Encouraging property owners to ***purchase flood insurance under the NFIP*** and to ***make claims when damage occurs*** – While having flood insurance will not prevent flood damage, it will help a family or business put things back in order following a flood event. Property owners should be encouraged to submit claims under the NFIP whenever flooding damage occurs, which will increase the eligibility of the property for projects under the various mitigation grant programs. Average claim payouts are far greater than the average FEMA individual household assistance payments.
- Construction of property improvements such as barriers, floodwalls, and earthen berms – such structural projects can be used to prevent shallow flooding. There may be properties within the town where implementation of such measures will serve to protect structures. Such barriers must not be permitted unless designed by a qualified engineer and shown to comply with NFIP and local floodplain laws. These improvements are not eligible for funding under CWC or Stream Management Program – Flood Hazard Mitigation (SMP-FHM) grant programs.
- ***Anchoring of Fuel Tanks*** – It is recommended that sources of man-made pollution be reduced or eliminated through the relocation or securing of fuel oil and tanks. This can also reduce damage to homes from tip-overs and spills, reduce flood recovery costs, and can help prevent water from entering fuel supplies and damaging appliances. Indoor and outdoor fuel tanks can be anchored. Tank anchoring is fully funded through CWC.
- ***Water Quality*** – In addition to helping communities identify and mitigate flood hazards, the LFA program mandate included water quality in the NYC water supply watershed. In order to protect water quality during flood events, the following are recommended:
    - Effort should be made to identify additional parcels that could benefit from securing or relocating fuel tanks to eliminate a potential source of man-made pollution and apply for funding through CWC. (https://cwconline.org/fhmi-program-flood-analysis-relocation-assistance-fuel-tank-anchoring/)
- Equipment that has the potential to be washed away in a flood (e.g., generators, snowmobiles, ATVs, construction equipment, etc.) should be securely anchored, housed in a shed/garage, or stored outside the 100-year flood boundary.

3.1.7 National Flood Insurance Program

Owners of flood-prone properties are encouraged to purchase flood insurance and file claims in the event of flood damages.

Discounted insurance premiums may be available to residents if the Town of Hunter opts to participate in the Community Rating System (CRS), which is described in Section 4.5.4.

3.1.8 Elevation Certificates

FEMA Elevation Certificates are an important administrative tool of the NFIP and are necessary to provide elevation information to ensure compliance with community floodplain management ordinances. ***Elevation certificates are useful to landowners to determine proper flood insurance premium rates*** and support the request of a Letter of Map Amendment or Revision (LOMA or LOMR-F). As part of the agreement for making flood insurance available to a community, the NFIP requires the Town of Hunter to obtain the elevation of the lowest floor (including basement) of all new and substantially improved buildings. Clear records should be maintained of any such information and filed within the floodplain administrative offices so that they are readily accessible. FEMA encourages communities to use the Elevation Certificate document developed by FEMA since it can also be used by property owners to obtain flood insurance. This document can be accessed at the website below:

https://www.fema.gov/sites/default/files/documents/fema_form-ff-206-fy22-152.pdf

CWC provides flood risk assessment for individual property owners and may be able to assist with the preparation of an Elevation Certificate for those interested.

It is recommended that interested landowners contact CWC for further guidance:

https://cwconline.org/programs/flood-hazard-mitigation/

3.1.9 New York City Funded Flood Buy-Out Program

The New York City Funded Flood Buy-Out Program (NYCFFBO) is a voluntary program intended to assist property owners who are not eligible for, or choose not to participate in, the FEMA flood buyout program. It is intended to operate between flood events, not as an immediate response to one. Categories of eligible properties include the following:

<u>Hydraulic Study Properties</u>

1. Properties identified in community LFAs
2. Anchor businesses, critical community facilities, and LFA-identified properties applying to the CWC for relocation assistance

<u>Special Case Properties</u>

1. Properties needed for a stream project
2. Erosion hazard properties
3. Inundation hazard properties

Risk assessments and authorization or supporting resolutions are required by the Town of Hunter for these purchases. Municipalities may choose to own and manage the properties after they are purchased and cleared of structures. Conservation easements must be given to the New York State Department of Environmental Conservation (NYSDEC), and there are limits to what may be placed on these parcels. Allowed structures may include public restrooms served by public sewers or by septic systems whose leach field is located outside the 100-year floodplain or open-sided structures such as gazebos and pavilions.

The NYCFFBO is governed by the Water Supply Permit and the Property Evaluation and Selection Process document (Process document). Communities work through outreach and assessment leads appointed by the municipality to inform potential applicants about the program and evaluate the eligibility of properties based on the program criteria established in the Process document.

It is recommended that interested landowners contact CWC for further guidance:

https://cwconline.org/programs/flood-hazard-mitigation/

3.1.10 Local Flood Hazard Mitigation Implementation Program

The CWC funds LFA-recommended projects to prevent and mitigate flood damage in the West of Hudson watershed, specifically ***to remedy situations where an imminent and substantial danger to persons or properties exists or to improve community-scale flood resilience*** while providing a water quality benefit.

Municipalities and individual property owners may apply directly to the CWC.

Municipalities may apply for grants for projects identified in an LFA or New York Rising planning process.

Eligible LFA-derived projects could include the following:

- ***Alterations of public infrastructure*** that are expected to reduce/minimize flood damage
- ***Private property protection*** measures such as elevation or floodproofing of a structure
- ***Elimination of sources of man-made pollution*** such as the relocation or securing of fuel oil/propane tanks
- ***Stream-related construction*** (Ineligible projects include construction of floodwalls, berms, or levees; stream dredging; or annual maintenance.)
- ***Relocation assistance*** for a residence or business recommended by an LFA to a location within the same town or village

Property owners may apply for the following assistance:

- ***Funds for relocation assistance of an anchor business***. Anchor businesses must be located in a floodplain in a watershed hamlet where an LFA has been conducted, although their relocation does NOT have to be recommended in the LFA. These include gas stations, grocery stores, lumber yards and hardware stores, medical offices, or pharmacies, which if damaged or destroyed would immediately impair the health and/or safety of a community.
- ***Funds for relocation of critical community facilities***, such as a firehouse, school, town hall, public drinking water treatment or distribution facility, or wastewater treatment plant or collection system, which if destroyed or damaged would impair the health and/or safety of a community. Facilities must have been substantially damaged by flooding. They do NOT have to be recommended by an LFA but MUST be located in an LFA community.

- ***Funds for assistance to relocate homes and/or businesses*** within the same town where the NYCFFBO covers the purchase of a former property (does NOT have to be in an LFA community)
- ***Stream debris removal*** after a serious flood event (does NOT have to be recommended in an LFA)

It is recommended that interested landowners contact CWC for further guidance:

https://cwconline.org/programs/flood-hazard-mitigation/

3.2 New York State Route 214

New York State Route 214 (NY-214) is the main thoroughfare through Lanesville, connecting the hamlet to the rest of the town of Hunter and NY Route 23A to the north and the town of Shandaken, Ulster County, and NY Route 28 to the south. ***NY-214 is the only road providing access to Lanesville, and no detours or alternative routes are available, making this road a critical link in life safety, emergency services, and flood evacuation and recovery networks.*** Flooding-related damage to NY-214 has restricted access to Lanesville in the past. Because the road is often adjacent to the stream as it follows the Stony Clove valley, it is vulnerable to both inundation and erosion damage in flood events.

3.2.1 County Line Washout

The roadway has reportedly been damaged between STA 5+00 and STA 15+00 (just upstream of the Greene-Ulster county line) several times since the state highway was constructed in the 1950s, most recently on December 25, 2020, which is pictured in Photo 3-1 and Photo 3-3. Channel adjustment that occurred during Tropical Storm Irene in 2011 can be seen in Photo 3-2. This section of roadway appears to be incompatible with the morphology of Stony Clove Creek and is vulnerable to inundation and erosion along this reach.

This repeatedly damaged section of road is of particular concern to residents of Lanesville as well as the towns of Hunter and Shandaken, who rely on this thoroughfare. The Town of Hunter, NYCDEP, and NYSDEC have raised concerns with NYSDOT regarding this section of roadway and the adequacy of efforts to repair it. Communications from NYSDOT indicate that re-opening two lanes of traffic on the highway is generally the highest priority when making emergency repairs and that there are additional site constraints that may have restricted the ability to make more holistic improvements to the road at the time of the most recent repairs.

Photo 3-1 December 2020 flood damage to NY-214. Photo provided by AWSMP.

This is a naturally dynamic reach of Stony Clove Creek, primarily characterized by lateral planform adjustment (Figure 3-37) that appears to be related to sediment transport dynamics in this broad, shallow section of valley. The roadway roughly bisects the active alluvial valley along this reach, restricting the belt width available for natural lateral channel migration. Because the roadway must resist the natural tendencies of the stream, it is particularly vulnerable to erosion here.

Repairs in 2021 can be seen in Photo 3-4 and included roadway embankment armoring and relocation of the stream away from the road by between about 50 to 100 feet. ***Critically, the embankment armoring was installed without any overexcavation or keying of the rock below existing grade*** (Appendix A). This leaves the armoring vulnerable to scour, undermining, and eventual collapse into the stream channel; therefore, ***it is not considered to be an effective erosion countermeasure, and the likelihood of damage to this section of road in future severe flood events is high.***

A broad cobble terrace was also constructed between the stream bank and roadway. This section of roadway is still subject to inundation, and the channel remains unstable, with recent adjustment observed in response to relatively moderate hydrologic conditions as well as woody debris accumulations. Planform migration is expected to continue, which can erode the existing right overbank cobble terrace and bring the stream adjacent to the roadway once again.

Potential mitigation alternatives include relocation of the NY-214 alignment away from Stony Clove Creek, out of the floodway and elevation above BFE. Shifting the roadway to the northwest, closer to the valley wall, would allow for more natural geomorphic processes along Stony Clove Creek and reduce the potential for future erosion damage to the highway. Relocating the road will require acquisition of private property.

Elevation of the roadway in its existing alignment to alleviate overtopping is another potential alternative that can improve infrastructure resilience but would not improve geomorphologic conditions and may further degrade the stability of this reach, requiring robust armoring along the elevated embankment. Elevating the road in its current alignment would restrict floodplain access that could increase the flood hazard at adjacent properties.

Realignment of this section of NY-214 adjacent to Stony Clove Creek between approximately STA 1+50 and STA 16+00 by up to about 220 feet to the northwest and elevation of the roadway above BFE between STA 0+00 and STA 40+00 is recommended. A conceptual layout of a hypothetical highway realignment out of the floodway is shown in Figure 3-22. Relocating the road even farther up the valley wall to the west may facilitate improved flood resilience but would be considerably more challenging to implement.

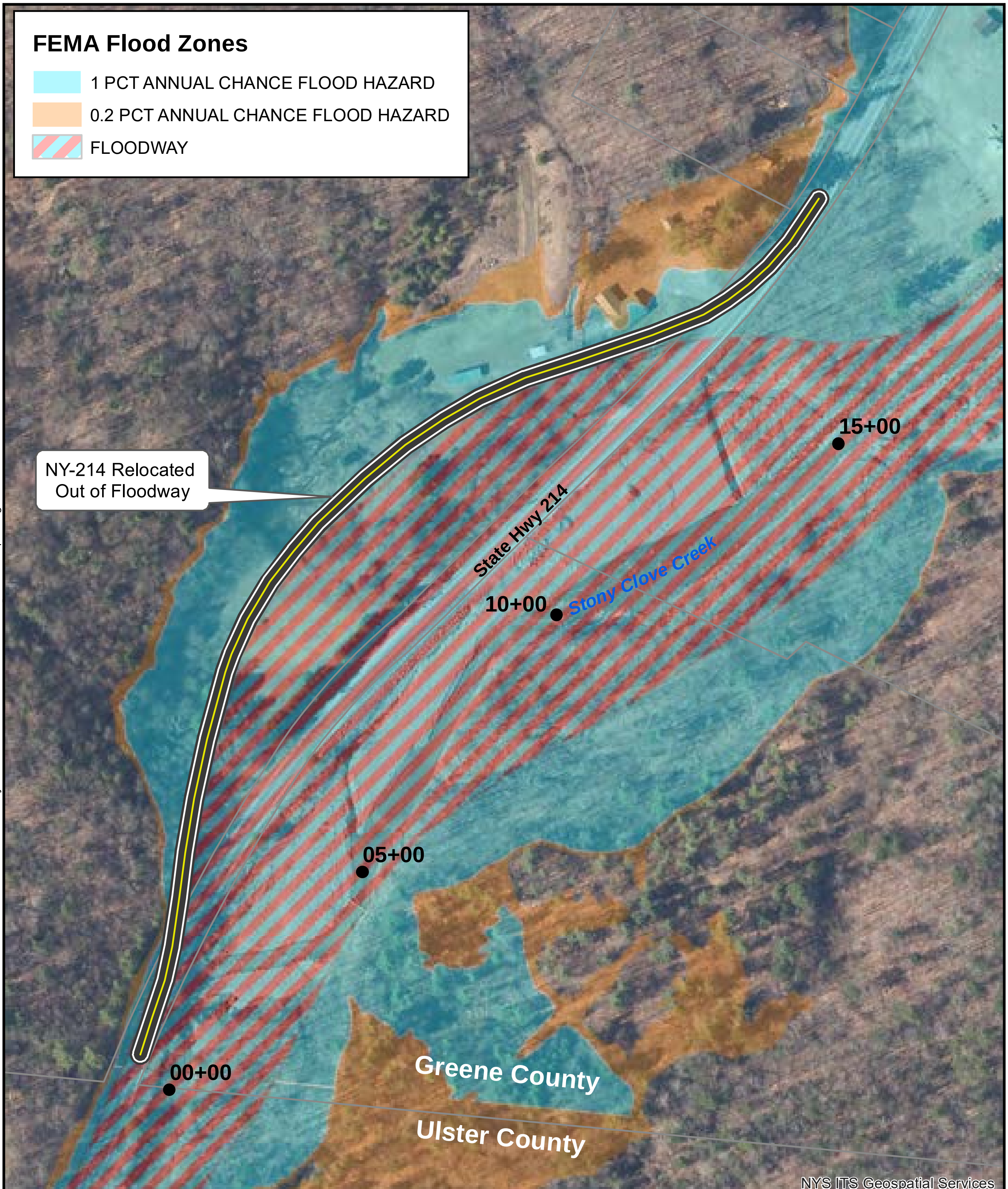
It is recommended that NYSDOT coordinate with stakeholders, including HLFRC, Ashokan and Schoharie stream management programs, soil and water conservation districts for Greene and Ulster counties, NYCDEP, and NYSDEC to implement a practical, holistic, and effective solution for this chronically damaged section of NY-214. Emphasis should be placed on flood resilience and geomorphologic compatibility. This is a high priority.

This proposed realignment would impact the Stony Clove Rod & Gun Club property, and there is only a relatively narrow corridor between the floodway boundary and the three nearby structures at the rod and gun club. The additional footprint required to build up the road embankment above BFE would likely necessitate relocation of these structures. The main building at the rod and gun club is recommended for elevation, floodproofing, or relocation (Section 2.2); if the recommended realignment of NY-214 is pursued, relocation of the building may be more pragmatic than alternatives where it remains in its existing location.

Photo 3-2 Large wood accumulation and lateral channel adjustment along flood-prone section of NY-214 after Tropical Storm Irene in 2011. Photo provided by NYCDEP SMP.

Photo 3-3 Damage to NY Route 214 in December 2020

Photo 3-4 Repairs to NY-214 following damage in December 2020. Stony Clove Creek was relocated farther from the road. Photo provided by NYCDEP SMP.



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Conceptual Realignment of NY-214

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

N

0 200 Feet

SCALE 1" = 200 '

DATE 2/13/2025

17020.00003
PROJ. NO.

FIG. 3-22

1

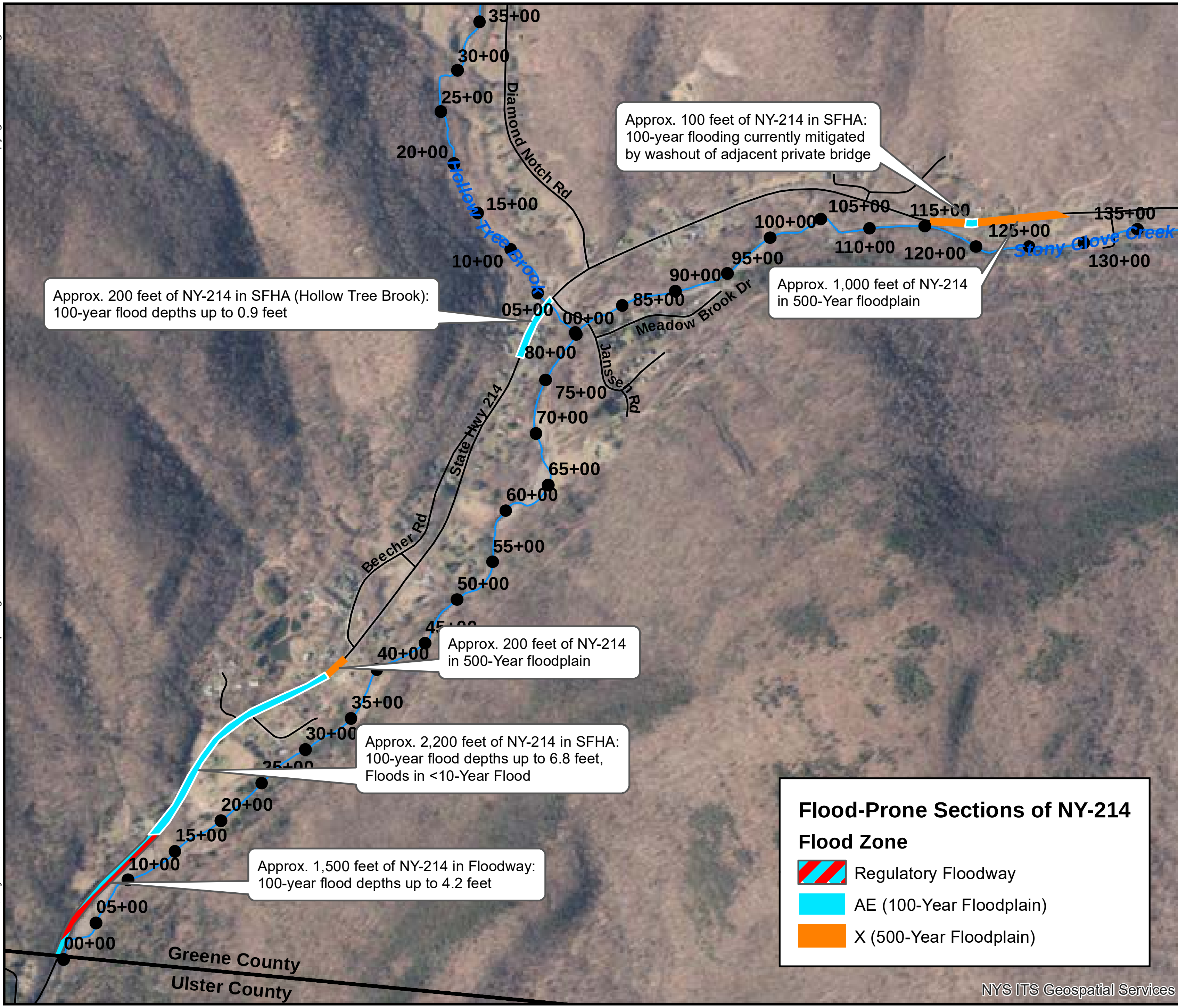
3.2.2 Flood-Prone Sections of NY-214

Flooded roadways can cause interruption of service and loss of access and can be a hazard to motorists (Section 4.2). Several sections of NY-214 in the LFA area are subject to inundation, which are mapped in Figure 3-23 and listed below:

- STA 0+00 and STA 15+00, which is the chronically damaged section near the Greene-Ulster county line discussed above that is within the floodway and is recommended for relocation and elevation above BFE. Note that continuing south into Ulster County, the majority of the next 1,500 feet of roadway is also within either the floodway or SFHA.
- STA 15+00 to STA 40+00, from near the Stony Clove Rod & Gun Club to near the southern intersection with Beecher Road. The section of road between STA 15+00 and STA 40+00 is modeled as being inundated by 100-year floodwaters up to 6.8 feet deep, and depths of more than 2 feet are modeled in the 10-year flood. It is recommended that this flood-prone section of road be elevated above BFE. Considerations should be given to avoiding deleterious influence on nearby flood hazards or stream morphology.
- STA 75+00 to STA 80+00, on the south side of the bridge crossing of Hollow Tree Brook, which is the source of flooding here. Inundation of this section of road can be reduced but not eliminated by a replacement bridge with improved hydraulics. Fully alleviating overtopping of NY-214 at this location would likely require property acquisitions that facilitate floodplain enhancements and a more significant increase in bridge span. Discussion and recommendations related to the NY-214 bridge over Hollow Tree Brook can be found in Section 3.3.4. Note that 100-year flooding of this section of roadway does not occur when modeling flood hydrology determined by analysis of the USGS gauging station record on Hollow Tree Brook; see Sections 3.3.4 and 7.1.
- STA 115+00 to STA 127+00, between Neal Road and Wright Road. This section of road is subject to relatively shallow flooding in the 500-year flood and several of the projected future flood scenarios. About 100 feet of road is within the effective SFHA, however this was due to modeled backwaters caused by the adjacent undersized private bridge crossing that was destroyed in 2011 flooding. Updated modeling indicates that 100-year flooding of this short section of roadway has been mitigated in the current configuration. See Section 3.3.8.1 for additional information and recommendations regarding any potential replacement of this private bridge.

NY-214 sits atop a high glacial outwash terrace between STA 80+00 and STA 105+00 on Stony Clove Creek. This terrace is characterized by progressive geotechnical rotational failures along the escarpment some 40 feet above the streambed. These failures are most active where the hillslope is coupled with the active stream bank. Continued hillslope erosion or failure, particularly between STA 85+00 and STA 90+00, may damage the roadway. Several properties along this terrace may also be at risk of erosion in case of continued slope failure. Affected landowners are encouraged to contact local stream management programs for guidance. It is recommended that NYSDOT address any potential hillslope instabilities along the NY-214 corridor along with comprehensive improvements to the highway that are recommended below.

Additional sections of NY-214 outside the Lanesville LFA area are subject to inundation and erosion hazard from Stony Clove Creek, including farther upstream in Hunter and downstream in Ulster County. Loss of access to Lanesville would therefore remain possible even if all recommended improvements within the LFA area were implemented. ***It is recommended that NYSDOT make comprehensive improvements along the length of NY-214 as needed to ensure reliable and flood-resilient access to Lanesville from NY-28 and NY-23A.***



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Flood-Prone Sections of NY-214 in Lanesville LFA Area

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1" = 1,200'
DATE 2/13/2025
PROJ. NO. 17020.00003

FIG. 3-23

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3.3 Bridge and Culvert Assessment

Flood resilient crossings and improved hydraulics are the key tools used in the mitigation recommendations below. The six crossings identified in Figure 3-23 are discussed in detail below, with recommendations of crossing spans, channel widths, and floodplain or channel changes. In addition, the seven private crossings within the study area are included with crossing-specific general recommendations.

Bridge and culvert crossings were analyzed for both current and projected future peak flows. In many cases, the crossings do not contribute to significant excess flooding of adjacent properties but may be hydraulically inadequate and are overtopped and/or flanked by flood flows.

The following sections are organized by the location of bridges along the studied streams, from downstream to upstream, and by watercourse in the following order: Stony Clove Creek, Hollow Tree Brook, Myrtle Brook.

Additional hydraulically undersized stream crossings or stormwater infrastructure may be present in Lanesville. Many of the culverts along NY-214 in Lanesville have not been upgraded since installation in the 1950s and are likely nearing the end of their structural lifetime. It is recommended that replacement crossings adhere to relevant NYSDOT standards and NYSDEC guidance.

3.3.1 Jansen Road Bridge over Stony Clove Creek

The Jansen (Janssen) Road bridge crosses Stony Clove Creek at STA 81+40, just upstream of the confluence of Hollow Tree Brook. The 40-foot-span bridge is owned by Greene County (National Bridge Inventory Bridge Identification Number [NBI BIN]: 3201060) and was constructed in 1968 and rehabilitated in 2000. A USGS gauging station (01362336) is located just downstream of the bridge.

Hydraulic modeling indicates that the crossing has freeboard in the 10-year flood but is flanked on the left overbank in this event. The bridge low chord is impacted beginning in the 25-year flood. In the 100-year flood, the deck is nearly overtopped and Jansen Road is flooded under more than 4 feet of water on its eastern approach to the bridge. A hydraulic cross section depicting water surface elevations in assessed flood events is shown in Figure 3-24. Backwaters caused by the bridge likely contribute to sediment aggradation upstream as was observed during Tropical Storm Irene in 2011 (Photo 3-5).

In a 2022 inspection for the national bridge inventory, the Jansen Road bridge was identified as “scour critical” with unstable foundations. Other aspects of the crossing are substandard, including the deck geometry, which is rated as “intolerable.” Replacement of this bridge with a hydraulically adequate span that meets relevant NYSDOT standards and NYSDEC guidance is recommended as a high priority.

Twenty-four developed properties (plus several undeveloped parcels) on Jansen Road, Meadow Brook Drive, Overlook Drive, and Railroad Road are accessed by the Jansen Road bridge, and no detours are available in the event of bridge or road closure. This is one of the most densely populated neighborhoods in Lanesville and is also one of the most susceptible to loss of access during flood events.

The Jansen Road bridge is a high priority for replacement due to poor hydraulics, criticality, and age.

Photo 3-5 Post-Irene damage near the Jansen Road bridge, 2011. Photo provided by NYCDEP SMP.

The eastern approach to the Jansen Road bridge is nominally at grade with the adjacent floodplain, which allows for substantial overbank flow conveyance that provides critical relief to the existing undersized bridge (Figure 3-24). Replacement alternatives for the Jansen Road bridge can be configured to meet NYSDOT hydraulic performance standards as well as NYSDEC stream crossing guidelines. Modeling indicates that a bridge low chord elevation of approximately 1,289.5 feet (NAVD88) will meet NYSDOT freeboard standards in the future mean RCP 4.5 scenario. The estimated channel width at the Jansen Road bridge is approximately 60 feet. A bridge span of at least 75 feet is recommended to meet NYSDEC stream crossing guidance and alleviate the constriction of the Stony Clove Creek channel caused by the existing bridge.

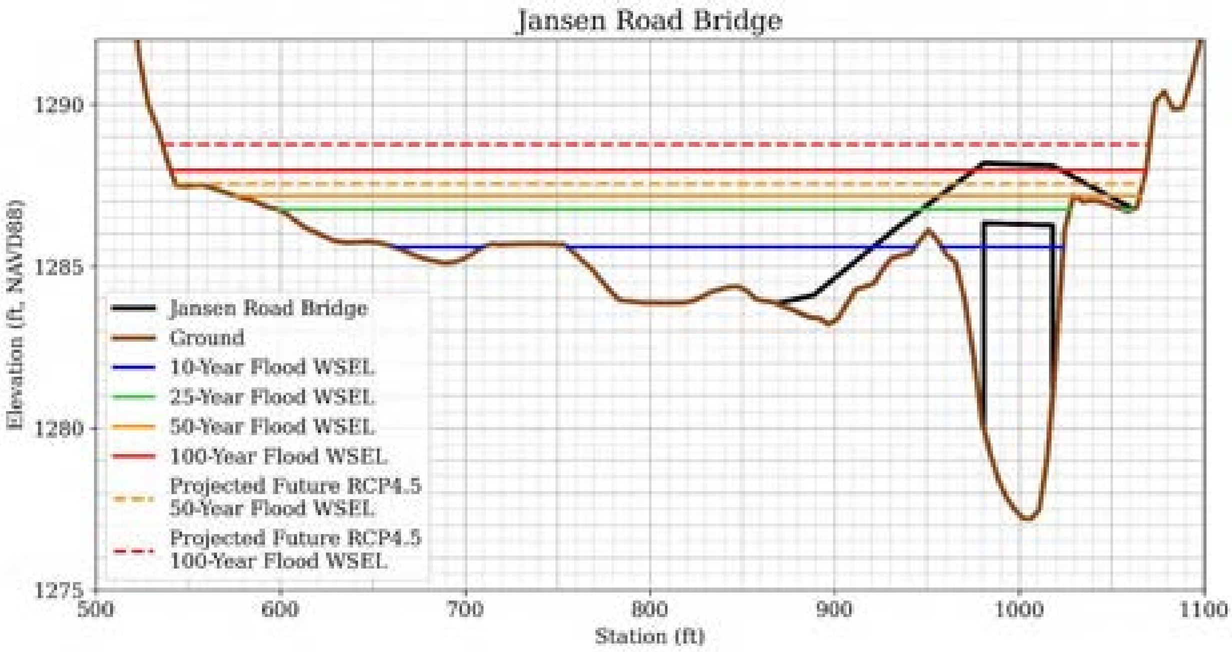


Figure 3-24 Modeled water surface elevations at the Jansen Road bridge

While the bridge low chord and span length can be designed to maximize the structure's resilience to severe floods, practical alternatives will not be able to alleviate flooding of Jansen Road as it approaches the bridge. Therefore, adequate preparation of road closure signage and evacuation planning is critical for protection of life safety as the road would be impassable during severe floods and emergency services may not be able to access residences on the left (southeast) bank.

The Jansen Road bridge is centrally located in Lanesville and is therefore a desirable location for a fire department dry hydrant. It is recommended that a dry hydrant is installed on the right (northwest) bank of Stony Clove Creek along with replacement of the Jansen Road bridge; naturalistic channel features can be constructed in Stony Clove Creek, which will help maintain a pool for a reliable supply of water. If the anticipated bridge replacement timeline is not expedient enough for the Lanesville Volunteer Fire Department's (VFD) needs, it is recommended that a dry hydrant be installed at the existing crossing in the interim.

Modeling indicates that replacement of the Jansen Road bridge would not have meaningful flood mitigation benefits for existing flood-prone properties on Meadow Brook Drive and Jansen Road. Because of the limited potential for practical infrastructure improvements to reduce the flood hazard in this area, it is recommended that owners of affected flood-prone structures consider dry or wet floodproofing measures, building elevation, buyout, or relocation.

Table 3-5 Jansen Road Bridge Summary Information

Jansen Road Bridge	
Area Serviced	24 Developed Properties
Available Detours	None
Road/Bridge Impassable in Flood	10-Year
Replacement Priority	High

3.3.1.1 Floodplain Enhancement at Jansen Road Bridge

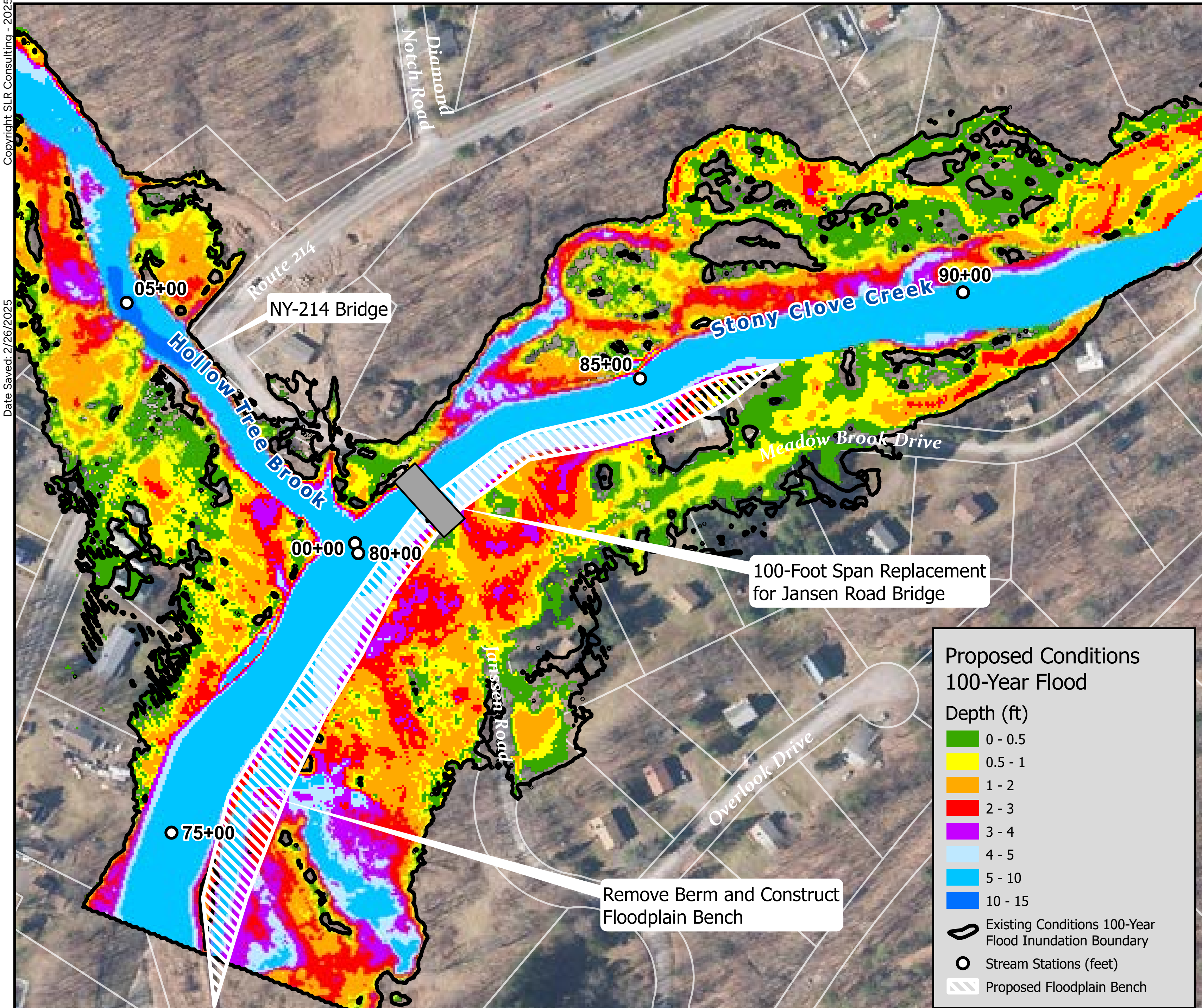
An approximately 600-foot-long, roughly 40-foot-wide floodplain bench was modeled on the left (east) bank of Stony Clove Creek, extending about 300 feet both upstream and downstream of the Jansen Road bridge. Between about 3 feet and 5 feet of cut was modeled along this reach. A berm that runs along the left bank of Stony Clove Creek for about 850 feet downstream of Jansen Road was also removed for this scenario.

The modeled floodplain results in up to about 1 foot of 100-year flood depth reductions along this reach and in the flood-prone neighborhood along Meadow Brook Drive. Note that an approximately 100-foot-span bridge would be required to cross Stony Clove Creek and this floodplain bench.

Flood depth reductions are not sufficient to alleviate overtopping of Jansen Road on its approaches to the bridge but could facilitate a reduced low chord elevation for the replacement bridge. Similar WSEL reductions of about 1 foot are modeled in the 50-year flood and in the 25-year flood. Depth mapping for the 100-year flood with this floodplain bench and a 100-foot span replacement for the Jansen Road bridge is shown in Figure 3-25.

Construction of the floodplain bench as modeled would require acquisition and removal of one home that is located within the floodway and disturbance to three additional developed properties but with no impacts to associated buildings as well as two undeveloped properties. A more substantial floodplain bench would be possible if an additional three flood-prone homes were removed (one each in the floodway, SFHA, and shaded Zone X). This was not modeled but may have additional flood mitigation benefits for the two flood-prone developed properties in this area that would remain.

It is recommended that, if practical, replacement of the Jansen Road bridge should be accompanied by floodplain enhancement along this reach of Stony Clove Creek together with removal of the downstream left bank berm. The recommended floodplain would require a longer bridge span than the roughly 75 feet needed to meet NYSDEC stream crossing guidelines at this location. The viability and efficacy of floodplain benching here will depend on landowner interest in buyout or relocation. A feasibility study is recommended to assess floodplain enhancement and Jansen Road bridge replacement alternatives in more detail.



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FLOODPLAIN ENHANCEMENT AT JANSEN RD BRIDGE

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS

TOWN OF HUNTER

GREENE COUNTY, NEW YORK

SCALE

DATE 6/6/2025

PROJ. NO. 17020.00003

FIG. 3-25

Photo 3-6 Post-Irene recovery work at the Jansen Road bridge, 2011. Photo provided by AWSMP.

Photo 3-7 Post-Irene recovery work at the Jansen Road bridge, 2011. Photo provided by AWSMP.

3.3.2 Wright Road Bridge over Stony Clove Creek

The Wright Road bridge at STA 132+75 on Stony Clove Creek is undersized, with a modeled capacity for the 25-year flood and overtopping beginning in the 50-year flood as shown in Figure 3-26. The bridge is owned by Greene County (NBI BIN: 3201070) and was constructed in 1997. The bridge provides access to two properties, for which there is no available detour.

During Tropical Storm Irene in 2011, the approach roadway embankment on the right bank washed out, leaving the bridge impassable despite no significant structural damage (Photo 3-8, Photo 3-9).

Hydraulic modeling indicates that a replacement bridge low chord elevation of approximately 1,396.0 feet NAVD88 will meet NYSDOT freeboard requirements for the future mean RCP 4.5 scenario. This is approximately 4.5 feet higher than the existing bridge low chord elevation. An approximately 90-foot bridge span would be necessary to achieve this low chord elevation without significantly encroaching on the channel; the existing bridge span is about 60 feet.

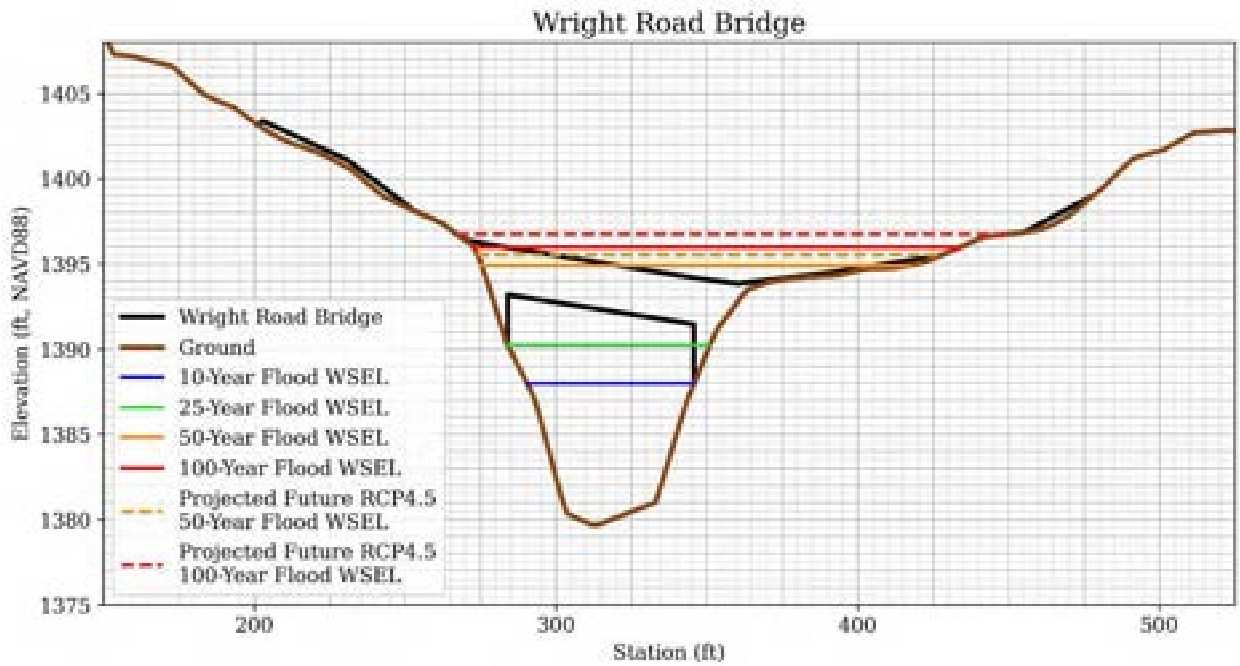

Figure 3-26 Modeled water surface elevations at the Wright Road bridge

Note that channel bed aggradation has been reported at this crossing since it was surveyed for development of the FEMA hydraulic model, which was also used as the basis of this assessment. Significant loss of cross-sectional flow area within the bridge will cause a reduction in hydraulic performance that can increase the flood hazard in adjacent areas. Up-to-date survey and hydraulic modeling should accompany any further analysis of this crossing.

Photo 3-8 Erosion damage at the Wright Road bridge during Tropical Storm Irene in 2011. Repairs to approach roadway embankment are underway. Photo provided by NYCDEP SMP.

Despite its criticality to a small number of properties, the Wright Road bridge was constructed relatively recently, and there do not appear to be significant flood mitigation benefits associated with a hydraulically adequate replacement. The Wright Road bridge is therefore considered to be a relatively low priority for replacement.

When this bridge is structurally due for replacement, rehabilitation, or substantial repairs, it is recommended that the necessity of a public stream crossing at this location be re-evaluated by Greene County as a hydraulically adequate bridge would represent a substantial investment relative to the number of properties served. If this assessment indicates that the crossing should be retained, it is recommended that the Wright Road bridge be replaced with a structure that meets all applicable NYSDOT hydraulic performance standards and NYSDEC stream crossing guidelines. Otherwise, the county should consider strategic disinvestment of this asset.

Recommendations to protect public safety include preparation of adequate road closure signage and evacuation plans and effective outreach and communication with affected landowners.

Table 3-6 Wright Road Bridge Summary Information

Wright Road Bridge	
Area Serviced	Two Properties
Available Detours	None
Road/Bridge Impassable in Flood	50-Year
Replacement Priority	Low

Photo 3-9 Damage to Wright Road bridge in 2011 flooding. Photo provided by HLFRC.

3.3.3 Benjamin Road Bridge over Stony Clove Creek

The Benjamin Road bridge at STA 168+40 is undersized, serves three developed properties with no available detour, and was recently reconstructed in 2012 after failure during Tropical Storm Irene in 2011. Modeling indicates the bridge is overtopped beginning in the 10-year flood, as shown in cross section in Figure 3-27. The bridge is owned by Greene County (NBI BIN: 3201040).

It is recommended that the Benjamin Road bridge be replaced with a structure that meets all applicable NYSDOT hydraulic performance standards and NYSDEC stream crossing guidelines. Because this bridge was recently constructed, replacement of this bridge may not be practical until an appropriate opportunity arises such as the need for significant repairs, rehabilitation, or simply at the end of the current structure’s design life.

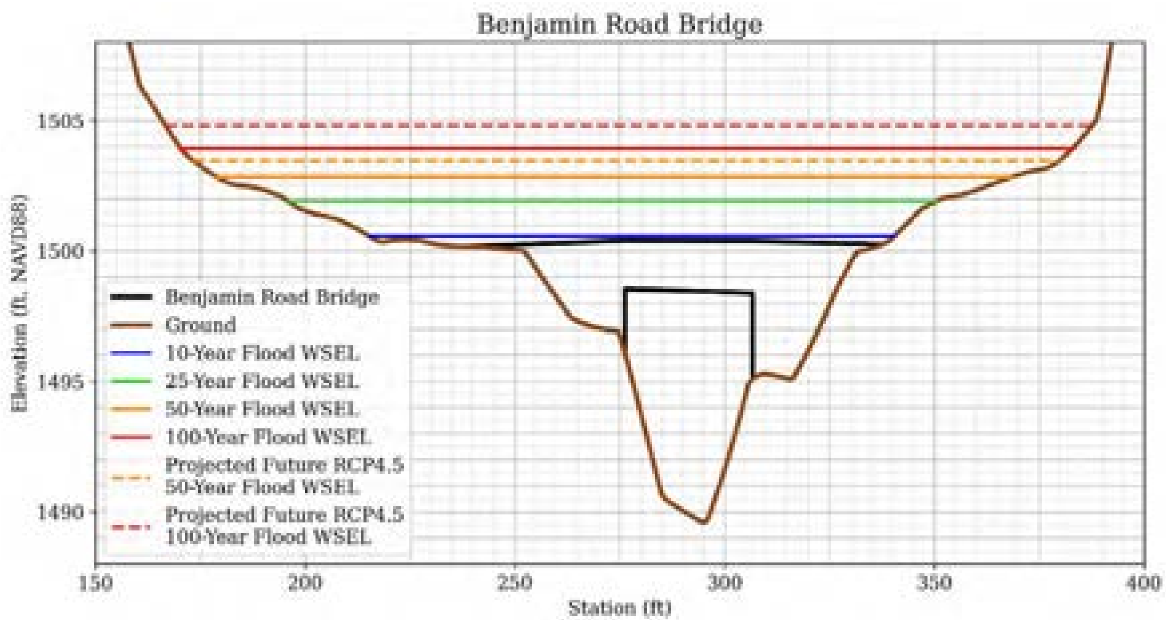

Figure 3-27 Modeled water surface elevations at the Benjamin Road bridge

Regardless, valley topography, roadway and intersection alignments, and the locations of parcel boundaries and buildings may limit the ability of a replacement Benjamin Road bridge to conform to either NYSDOT standards or NYSDEC guidance. Hydraulic modeling indicates that a bridge low chord elevation of about 1,504.5 feet NAVD88 would be required to meet freeboard standards in the projected future mean RCP 4.5 scenario. This is about 6 feet greater than the existing bridge low chord elevation and would likely be incompatible with existing properties, buildings, and access requirements. An approximately 200-foot span would be necessary to cross the floodplain at this low chord elevation, which is similarly impractical at this location. Modeling indicates that even an optimal bridge replacement would not have meaningful flood mitigation benefits for properties on Benjamin Road.

Despite its criticality to a small number of properties, the Benjamin Road bridge was recently constructed, and there do not appear to be significant flood mitigation benefits associated with a hydraulically adequate replacement. The Benjamin Road bridge is therefore considered to be a relatively low priority for replacement.

Because of the limited potential for practical infrastructure improvements to reduce the flood hazard in this area, it is recommended that owners of affected flood-prone structures consider dry or wet floodproofing measures, building elevation, or buyout.

Additional recommendations to protect public safety include preparation of adequate road closure signage and evacuation plans and effective outreach and communication with affected landowners.

Table 3-7 Benjamin Road Bridge Summary Information

Benjamin Road Bridge	
Area Serviced	Three Properties
Available Detours	None
Road/Bridge Impassable in Flood	10-Year
Replacement Priority	Low

3.3.4 NY-214 Bridge over Hollow Tree Brook

The NY-214 bridge over Hollow Tree Brook at STA 3+80 was constructed in 1957 and is nearing the end of its expected structural lifespan. Modeling indicates that the bridge is impacted by the 50-year flood, with minor flanking flows on the right (southwest) overbank, which become more severe in the 100-year flood. This can be seen in cross section in Figure 3-28. The existing bridge has a 40-foot span. An overall condition rating of “poor” was assigned to the structure during a 2023 inspection for the NBI. The bridge is owned by New York State (NBI BIN: 1041270).

Two-dimensional hydraulic modeling indicates that, based on FEMA hydrology, a substantial proportion of the floodwaters that flank the existing bridge on the right (southwest) overbank access the floodplain farther upstream on Hollow Tree Brook, independent of the hydraulic influence of the bridge. The existing bridge does cause backwaters that force additional flows to flank to the right, much of which can be addressed with an increased bridge span. However, naturally occurring floodplain flows would persist. The consequence is that bridge replacement alone can reduce but not entirely alleviate flooding in this area, including at Amy’s Takeaway, the Lanesville Post Office, and overtopping of NY-214.

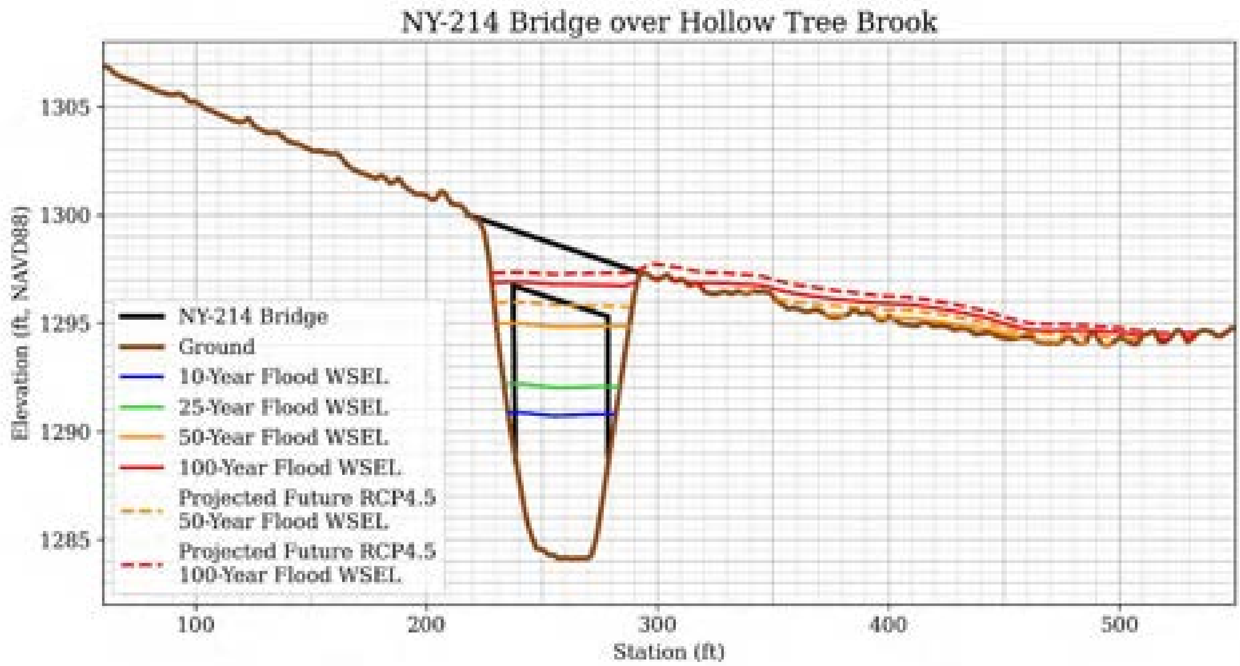

Figure 3-28 Modeled water surface elevations at the NY-214 bridge over Hollow Tree Brook

It is recommended that the NY-214 bridge over Hollow Tree Brook be replaced with a structure that meets all applicable NYSDOT hydraulic performance standards and NYSDEC stream crossing guidelines. This should proceed when the structure is due for replacement or an opportunity arises such as the need for rehabilitation or significant repairs. The estimated channel width at this location is about 45 feet; applying a 125 percent multiplier to this width according to NYSDEC stream crossing guidelines suggests that a minimum span of at least 56 feet is necessary. Hydraulic modeling shows that a 56-foot-span bridge would still constrict flood flows and generate backwaters, which would necessitate elevation of the low chord by about 1.7 feet to approximately elevation 1,297.0 feet NAVD88 to meet NYSDOT standards in the projected future mean RCP 4.5 scenario. Modeling indicates that such a bridge can reduce upstream 100-year flood depths by up to about 0.75 feet. A wider replacement bridge may further improve hydraulics; however, increasing the span beyond about 60 feet would begin to impact adjacent properties.

NY-214 is a critical link in transportation, emergency service, and public safety networks in Lanesville. Damage to or closure of the bridge over Hollow Tree Brook can have significant consequences, and resilience of this crossing is important both for residents of Lanesville and the broader Hunter-Shandaken region. Detours, albeit tortuous, are available, assuming that no other stream crossings along NY-214 are also compromised. This bridge is considered a medium priority for replacement as it is a critical structure with substandard hydraulic performance that has been in service for nearly 70 years. Bridge replacement can reduce but not eliminate flooding in its proximity.

Photo 3-10 Elevated flows on Hollow Tree Brook at the NY-214 bridge in December 2020. Photo provided by Kachadourian family.

It is very important to note that the flood discharges estimated by FEMA for Hollow Tree Brook appear to be conservative, and ***a rigorous re-evaluation of hydrology and resulting hydraulics is recommended to accompany replacement of this bridge***. The peak flood hydrology determined from analysis of the USGS gauging station on Hollow Tree Brook indicates lower peak flood discharges than those determined by FEMA, both at the gauge location and when scaled by drainage area to the NY-214 bridge location. Hydraulic modeling of flood hydrology based on the gauge record suggests that the existing bridge is more hydraulically adequate, and these lesser-magnitude discharges do not impact or flank the structure. Inundation flooding of NY-214 and adjacent properties, including Amy's Takeaway and the Lanesville Post Office that is modeled using FEMA flows, does not occur when modeling the flood hydrology estimated by gauge analysis.

There are significant implications associated with either overestimating or underestimating flood hydrology for a bridge replacement, both for the bridge itself as well as surrounding properties and other infrastructure. ***A feasibility study is recommended to more accurately assess peak flood hydrology at this location and to devise bridge replacement alternatives that meet all applicable NYSDOT standards and NYSDEC guidelines for these conditions***. Potential floodplain enhancements should be assessed as needed to facilitate a hydraulically adequate bridge and feasible flood hazard mitigation in its proximity. A floodplain bench may be more practical on the right bank than the left bank due to the constraints of the Jansen Road intersection with NY-214, although private properties on the right bank would make a floodplain challenging here as well.

Table 3-8 NY-214 Bridge Summary Information

NY-214 Bridge over Hollow Tree Brook	
Area Serviced	Hamlet of Lanesville
Available Detours	40 miles (through Lexington) 50 miles (through Woodstock)
Road/Bridge Impassable in Flood	50-Year
Replacement Priority	Medium

3.3.5 Diamond Notch Road Bridge over Hollow Tree Brook

The Diamond Notch Road bridge over Hollow Tree Brook was constructed in 1915, with superstructure rehabilitation in 1994. The bridge is owned by Greene County (NBI BIN: 3201050). A USGS stream gauging station (01362342) is located just downstream of the bridge.

The bridge is located at STA 62+75 on Hollow Tree Brook and is undersized for flood flows, with very little vertical clearance over the streambed (about 4 feet), and can convey but is impacted by the 10-year flood. The superstructure is impacted, and the roadway to the south is slightly overtopped by the 25-year flood; the bridge deck is substantially overtopped beginning in the 50-year flood as shown in cross section in Figure 3-29. There is no alternative route to access the three developed properties and NYSDEC trailhead located upstream of this bridge.

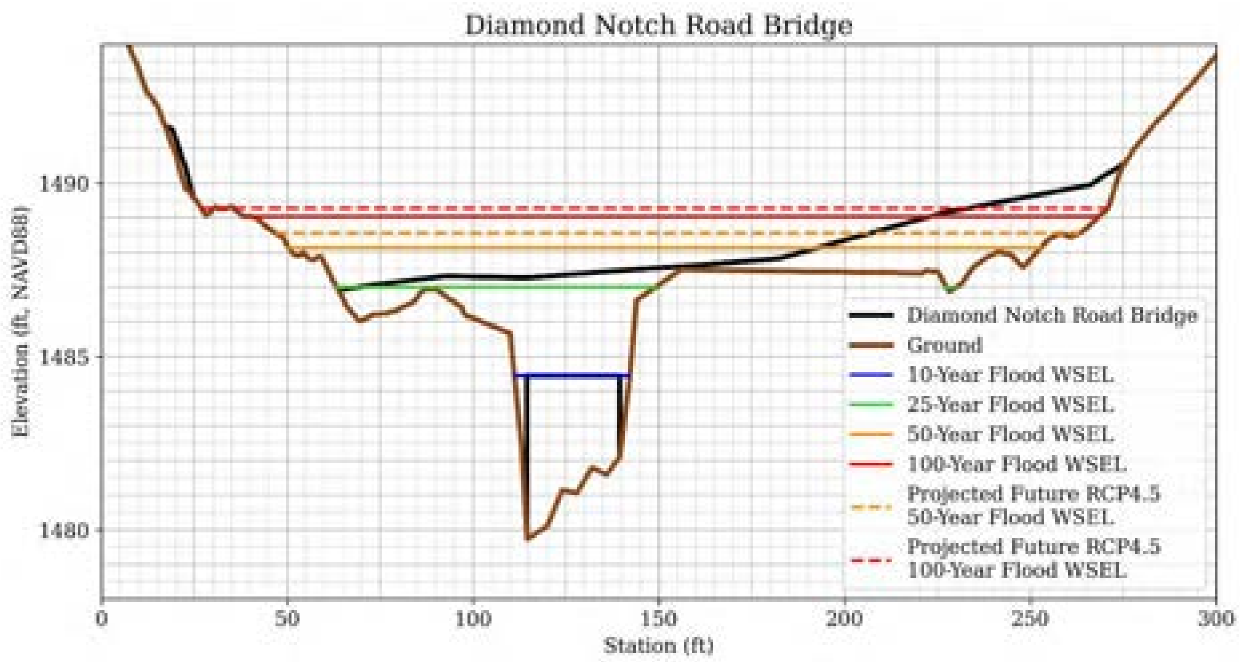

Figure 3-29 Modeled water surface elevations at the Diamond Notch Road bridge

A dry hydrant for the Lanesville VFD is located just downstream of the bridge but has been damaged. An approximately 4.5-foot-high boulder step roughly 50 feet downstream of the bridge holds grade in the channel, which likely provides some stability and scour/headcut protection to the bridge substructure, and also forms a pool for the dry hydrant. It is understood that the process of rehabilitating the dry hydrant in its current configuration is already underway. It is recommended that dry hydrant replacement proceed expeditiously.

Photo 3-11 Diamond Notch Road bridge over Hollow Tree Brook

The existing channel top width of Hollow Tree Brook at the Diamond Notch Road bridge crossing is about 35 feet; the NYSDEC guidance to add 25 percent to this width gives a recommended minimum span of about 44 feet. The existing bridge span is 25 feet.

Bridge replacement should include a substructure that does not require the presence of the downstream boulder step to protect the bridge abutments from scour. Removal of the boulder step will allow regrading of the channel at a steeper slope through the replacement bridge, improving capacity. The proposed bridge replacement and channel regrading would likely be more efficiently constructed together but may be performed separately with adequate coordination. A new pool for a dry hydrant can be constructed in the restored channel downstream.

It is recommended that the Diamond Notch Road bridge be replaced with a minimum 45-foot-span bridge that meets all applicable NYSDOT hydraulic performance standards and NYSDEC stream crossing guidelines. For this recommended span and with the channel grading (boulder step removal) described above, the minimum necessary low chord elevation to meet NYSDOT criteria in the projected future RCP 4.5 scenario is estimated at 1,486.5 feet NAVD88. This is about 3 feet higher than the existing low chord elevation and would require regrading of the approach roadways.

Note that the flood discharges estimated by FEMA for Hollow Tree Brook are conservative compared to those estimated by flood frequency analysis of the USGS gauge at this location. A rigorous re-evaluation of hydrology and resulting hydraulics is recommended to accompany replacement of this bridge.

The Diamond Notch Road bridge is considered a high priority for replacement due to hydraulic inadequacy, lack of available detours, and the age of the substructure.

Until bridge replacement can be implemented, short-term recommendations to protect public safety include preparation of adequate road closure signage and evacuation plans and effective outreach and communication with affected landowners.

Table 3-9 Diamond Notch Road Bridge Summary Information

Diamond Notch Road Bridge	
Area Serviced	Three Properties, NYSDEC Trailhead
Available Detours	None
Road/Bridge Impassable in Flood	25-Year
Replacement Priority	High

Photo 3-12 Diamond Notch Road bridge over Hollow Tree Brook following 2011 flooding. Note damage to roadway from overtopping. Photo provided by HLFRC.

3.3.6 NY-214 Culvert over Myrtle Brook

The NY-214 culvert over Myrtle Brook is a two-barrel, four-sided concrete box culvert located at STA 2+50, a short distance upstream of the confluence with Stony Clove Creek. The twin 10-foot-span, 8-foot-rise, 118-foot-long culvert is owned by New York State (NBI BIN: 1041260). 2023 inspection for the NBI identified moderate to major deterioration of the culvert's condition.

Assuming an unobstructed inlet, this culvert comes very close to meeting modern NYSDOT hydraulic performance standards, with headwater depths slightly greater than the allowable maximum. However, during field investigations, a large wood obstruction was observed at the inlet to the left (eastern) culvert barrel, which has forced some sediment aggradation at the inlet as well. In this partially occluded condition, culvert hydraulics are more definitively substandard. A USGS stream gauging station (01362322) is located at the culvert outlet.

The culvert outlet is characterized by an approximately 4-foot drop, with steel sheet piling apparently providing outlet scour protection for the structure. The culvert barrels have a longitudinal slope of approximately 6 percent, and the concrete floors have no natural channel bed material or roughness features. This leads to high-velocity, shallow flow through the culvert. The existing configuration constitutes a barrier to aquatic organism passage.

This culvert was constructed in 1957 and is nearing the end of its design life. ***It is recommended that the NY-214 crossing of Myrtle Brook be replaced by a single-span bridge or box culvert that meets applicable NYSDOT hydraulic performance standards and NYSDEC stream crossing guidelines***. A single-span structure is recommended, as this would be significantly less prone to wood and debris blockages than a multi-span configuration.

The Myrtle Brook channel is about 35 feet wide at the crossing, suggesting a minimum replacement span of about 44 feet to meet NYSDEC guidance. A more substantial restoration to address apparent degradation of the downstream reach may be necessary to facilitate design of a stable, fish-passable crossing.

Similar to the NY-214 crossing of Hollow Tree Brook, ***replacement of the Myrtle Brook culvert is considered a medium priority***, primarily due to the criticality of NY-214 and the age of the existing structure, although the culvert does very nearly meet modern NYSDOT hydraulic performance standards, assuming the existing debris obstructions are removed. No properties appear to be directly affected by flooding related to this crossing.

Regular inspection, maintenance, and removal of any obstructions at this culvert is recommended to ensure optimal function of the crossing until it can be replaced with a structure that is less prone to debris accumulation.

Table 3-10 NY-214 Culvert over Myrtle Brook Summary Information

NY-214 Culvert over Myrtle Brook	
Area Serviced	Hamlet of Lanesville
Available Detours	40 miles (through Lexington) 50 miles (through Woodstock)
Road/Bridge Impassable in Flood	500-Year
Replacement Priority	Medium

Photo 3-13 NY-214 culvert over Myrtle Brook – inlet, looking downstream. Note partial obstruction by wood and sediment.

Photo 3-14 NY-214 culvert over Myrtle Brook – outlet, looking upstream. USGS gauging station at left. Note sheet piling and aquatic organism barrier.

3.3.7 Bridge and Culvert Assessment Summary

A summary of existing conditions and flood mitigation recommendations based on engineering analysis for public bridges in the LFA area are presented in Table 3-11. Additional details for each road crossing are provided in the preceding sections.

The dependability and flood resiliency of the transportation network in Lanesville can be improved with improved stream crossing infrastructure. Direct flood mitigation benefits to individual homes are relatively limited, although considerable improvements to the reliability of life safety and emergency response networks in Lanesville are possible.

Table 3-11 Bridges and Culverts

Stream	Road Crossing	Year Built	LFA Recommendation
Stony Clove Creek	Jansen Road	1968	• **High priority** – poor hydraulics, aging bridge, no alternative access for >20 developed properties • **Recommend replacement as soon as practical** • Approach roads and adjacent flood-prone areas will still be inundated • Flood resilient bridge will allow more rapid restoration of access • Good central location for new dry hydrant
	Wright Road	1997	• **Low priority** – existing bridge was recently constructed • No alternative access for one developed property and one undeveloped property • Inadequate hydraulic performance • Closure and evacuation plan • Evaluate new structure when due for structural replacement
	Benjamin Road	2012	• **Low priority** – existing bridge was recently constructed • Poor hydraulic performance • No alternative access for three developed properties • Closure and evacuation plan • Evaluate new structure when due for structural replacement
Hollow Tree Brook	NY-214	1957	• **Medium priority** – critical roadway, aging bridge • Inadequate hydraulic performance • Evaluate new structure when due or opportunity arises for replacement • Re-evaluate Hollow Tree Brook hydrology
	Diamond Notch Road	1915 (1994)	• **High priority** – poor hydraulics, aging bridge, no alternative access to three developed properties • **Recommend replacement as soon as practical** • Incorporate restoration of adjacent reach to improve hydraulic performance of replacement bridge • Include improved dry hydrant when replaced
Myrtle Brook	NY-214	1957	• **Medium priority** – critical roadway, aging culvert, prone to wood and debris blockage • Slightly substandard hydraulic performance • Regular inspection and maintenance to remove debris • Evaluate new structure with improved aquatic organism passage when due or opportunity arises for replacement

Alternatives target minimal alterations of roadways and alignments unless necessary. ***Complete hydrologic and hydraulic assessments are recommended prior to any upgrades to ensure that replacement structures meet applicable NYSDOT standards and NYSDEC guidelines for new bridges and culverts,*** including freeboard, hydraulic opening, permissible headwater depths, and aquatic organism passage.

Meeting these criteria frequently requires a substantial capital investment, so upgrades must be prioritized to maintain a robust transportation network and efficiently improve flood resiliency. Unscheduled upgrades such as replacement of a failed culvert following a flood are often ad hoc, intended to quickly reopen roads in the aftermath of a storm. In these cases, the structure may not be meaningfully upgraded and the crossing would be likely to be damaged again in subsequent floods. ***Flood resiliency may be improved if undersized bridges and culverts have been identified and replacement structures adequately sized, even if only approximately, before damage occurs.*** Regular bridge and culvert inspections and an up-to-date asset inventory may help to prioritize culverts for scheduled replacement and prepare for appropriate repairs in case of flooding damage.

3.3.8 Private Bridge Crossings

Several private crossings of Stony Clove Creek and Hollow Tree Brook are located within the LFA area. The construction and maintenance of private bridges are the responsibility of their owners. At present, no LFA-contingent funding sources are available to assist private bridge owners with upgrade or replacement of these structures. In many cases, replacement of existing private crossings with bridges that meet the hydraulic (and structural) design standards for public infrastructure would come at substantial if not prohibitive cost to their owners. General recommendations in this section of the report are intended to provide direction to private bridge owners and to help inform decision-making with respect to any potential investments in these crossings. Ultimately, undersized crossings pose a safety hazard and are more likely to be damaged during floods, with repairs coming at the owner’s expense.

During Tropical Storm Irene flooding in 2011, a fatality occurred at a private bridge crossing in Lanesville. Unlike public bridges, private crossings are not necessarily monitored or assessed for passability and safety during or in the aftermath of severe floods, which can present a significant risk to landowners or others who may attempt to cross these bridges when they are submerged or if they have been damaged or destabilized. Owners of undersized or otherwise hydraulically inadequate private bridges should be prepared for pre-emptive evacuation and/or a potentially prolonged loss of access to property in the event of a significant flood.

Owners of private bridges are encouraged to contact the AWSMP or GCSWCD offices to schedule a free technical assistance site visit to evaluate stream management needs at crossing sites.

It is understood that private bridge crossings are not likely to be constructed to the same structural or hydraulic standards as public infrastructure. To assist landowners with decision-making, bankfull width estimates and natural conditions water surface elevations at the crossing locations are reported for the current 50- and 100-year flood events where modeling is available.

Photo 3-15 Private bridge washout (center of image) on Stony Clove Creek during Tropical Storm Irene in 2011. Benjamin Road bridge at right. Photo provided by NYCDEP SMP.

3.3.8.1 1882 NY-214 (Stony Clove Creek)

The bridge accessing the property at 1882 NY-214 is located near STA 118+50 on Stony Clove Creek.

This crossing had consisted of a series of culverts and a ford, most of which was washed out during Tropical Storm Irene in 2011 and has not been replaced. A pedestrian bridge had been constructed to access the property, but this was carried away by floodwaters in December 2020.

The estimated bankfull width at this location is 45 feet, indicating a minimum 56-foot bridge span is necessary to meet NYSDEC stream crossing guidance.

At this crossing location on Stony Clove Creek, the modeled natural conditions 100-year floodwater surface elevation is 1,361.2 feet NAVD88 and 1,360.0 feet NAVD88 in the 50-year flood.

Hydraulic modeling indicates that the backwaters caused by the old undersized bridge crossing resulted in flooding of the adjacent section of NY-214 up to about 1 foot deep in the 100-year flood. Updating the model to reflect the existing conditions with no bridge shows that current 100-year flooding of the adjacent section of highway has been alleviated. It is recommended that any potential replacement bridge at this location be sized such that it does not contribute to excess flooding of the adjacent roadway.

3.3.8.2 2086 NY-214 (Stony Clove Creek)

Access to 2086 NY-214 is provided by a bridge crossing of Stony Clove Creek near STA 148+75. Modeling shows that this bridge is overtopped and flanked beginning in the 10-year flood.

The estimated bankfull width at this location is 43 feet, indicating a minimum 54-foot bridge span per NYSDEC guidance.

At this crossing location on Stony Clove Creek, the modeled natural conditions 100-year floodwater surface elevation is approximately 1,448.0 feet NAVD88 and approximately 1,447.0 feet NAVD88 in the 50-year flood.

By comparison, the existing bridge has an approximately 30-foot span and low chord elevation of about 1,445.8 feet NAVD88.

3.3.8.3 2150 NY-214 (Stony Clove Creek)

The bridge for 2150 NY-214 crosses Stony Clove Creek at STA 157+40. Modeling shows that this bridge has marginal capacity for the 10-year flood and is both overtopped and flanked beginning in the 25-year flood.

The estimated bankfull width at this location is 40 feet, indicating a 50-foot bridge span per NYSDEC guidance.

At this crossing location on Stony Clove Creek, the modeled natural conditions 100-year floodwater surface elevation is approximately 1,473.5 feet NAVD88 and approximately 1,472.2 feet NAVD88 in the 50-year flood. By comparison, the existing primary bridge has a 38-foot span and low chord elevation of about 1,468.2 feet NAVD88.

Modeling indicates that this undersized bridge contributes to flooding of the home at this address, increasing 100-year flood depths at the building by over a foot compared to natural conditions. Bridge hydraulics also contribute to flooding of this home in the 25- and 50-year floods. While the home would remain naturally flood prone in the most severe floods, hydraulically adequate bridge replacement may be able to help alleviate flooding of the building in up to the 50-year flood. If feasible, the homeowners are encouraged to upgrade this bridge for improved resilience and safety of access as well as direct flood hazard mitigation benefits for the home.

3.3.8.4 2176 NY-214 (Stony Clove Creek)

The property at 2176 NY-214 is accessed by a bridge over Stony Clove Creek at STA 163+15.

Modeling shows that this bridge is overtopped beginning in the 10-year flood.

The estimated bankfull width at this location is 40 feet, indicating a 50-foot bridge span per NYSDEC guidance.

At this crossing location on Stony Clove Creek, the modeled natural conditions 100-year floodwater surface elevation is approximately 1,486.2 feet NAVD88 and approximately 1,485.2 feet NAVD88 in the 50-year flood. By comparison, the existing bridge has a 30-foot span and low chord elevation of 1,483.0 feet NAVD88.

This bridge increases upstream 100-year flood depths by more than 1 foot, which appears to cause flooding of the associated home in this event. Under natural conditions modeling, with the undersized bridge removed, the building is not impacted by this event. If feasible, the homeowners are encouraged to upgrade this bridge for improved resilience and safety of access as well as direct flood hazard mitigation benefits for the home.

3.3.8.5 2202 NY-214 (Stony Clove Creek)

A bridge over Stony Clove Creek at STA 165+35 provides access to 2202 NY-214. Modeling shows that this bridge is adequate for the 10-year flood and is overtopped and flanked beginning in the 25-year flood. This bridge failed during Tropical Storm Irene flooding in 2011 and has been reconstructed. Bridge geometry in the hydraulic model reflects survey collected prior to failure and may not accurately reflect the current layout.

The estimated bankfull width at this location is 40 feet, indicating that a 50-foot bridge span is necessary to meet NYSDEC stream crossing guidelines.

At this crossing location on Stony Clove Creek, the modeled natural conditions 100-year floodwater surface elevation is approximately 1,492.6 feet NAVD88 and approximately 1,491.5 feet NAVD88 in the 50-year flood. By comparison, the existing bridge has a 44-foot span and low chord elevation of about 1,491.6 feet NAVD88.

Available modeling indicates that this bridge generates more than 2 feet of excess backwater flood depths in the 100-year discharge, although this does not appear to directly impact buildings on this property or others nearby.

3.3.8.6 255 Diamond Notch Road – 206.03-2-5 (Hollow Tree Brook)

One of two bridges accessing 255 Diamond Notch Road crosses Hollow Tree Brook at STA 30+50.

This bridge crossing was not modeled for existing conditions. Review of flood profiles in the Greene County FIS report shows that this bridge is adequate for the 10-year flood, is impacted in the 25-year flood, and overtopped by the 100-year flood.

The estimated bankfull width at this location is 32 feet, indicating a 40-foot bridge span would meet NYSDEC guidance.

3.3.8.7 255 Diamond Notch Road – 206.03-2-3 (Hollow Tree Brook)

The second bridge accessing 255 Diamond Notch Road is located at STA 45+10 on Hollow Tree Brook.

This bridge crossing was not modeled for existing conditions. Review of flood profiles in the Greene County FIS report shows that this bridge is impacted in the 10-year flood and overtopped beginning in the 25-year flood.

The estimated bankfull width at this location is 32 feet, indicating a 40-foot bridge span would meet NYSDEC guidance.

3.3.9 Notch Lake Dam

Stony Clove Creek is dammed near its headwaters at Notch Lake, which is within the boundary of the NYSDEC Devil's Tombstone Campground area. The dam is not included in the NYSDEC dam inventory, although the dam is presumed to be owned by the state along with the host parcel (Greene County SBL: 195.00-1-9). A visual inspection of the structure was conducted at the request of the HLFRC due to its reportedly poor apparent condition and its potential influence on flood hydrology in the Lanesville LFA area.

The stone masonry structure is approximately 8 feet high measured from the downstream channel bed to the top of the dam training walls. Maintenance of the dam appears to have been neglected for some time, and it is in a deteriorated condition. Nearly every exposed element of masonry in the primary spillway section was observed to be loose, dislodged, or missing, and very little mortar is visible. The training walls are in better condition and are generally intact, although some loss of mortar, a few dislodged stones, and vegetation growth on and adjacent to the structure were noted.

The low-level outlet valve sits within a drop inlet service spillway. The valve does not appear to be operable, and only one corroded iron bar remains of what appears to have been a trash rack that had prevented debris from obstructing the service spillway or low-level outlet valve.

Stability of the dam, hydraulic capacity of the spillways under design conditions, or dam break scenarios were not evaluated as part of this assessment.

To determine the potential influence the Notch Lake Dam may have on downstream flood risk, including in the Lanesville LFA area, and to minimize any possible adverse impacts of the dam, the following actions are recommended:

It is recommended that NYSDEC inventory and inspect this dam, assign a hazard classification, and evaluate conformance with modern dam safety standards. A feasibility study is recommended to assess options to modify, repair, replace, or remove the dam. As the apparent owner, it is recommended that NYSDEC maintain this dam in safe condition per 6 NYCRR Part 673 and Environmental Conservation Law (ECL) Section 15-0507.

Photo 3-16 Notch Lake Dam spillway

3.4 Bank Erosion, Wood in Streams, and Riparian Buffers

This section begins with a description and brief discussion of valley and stream characteristics related to how land cover and soil characteristics, geography, and topography can affect watershed response to storms and flooding and how current and historical morphological processes influence stream behavior such as bank erosion. This information is provided as background for the recommendations related to ***riparian buffers*** **(Section 3.4.3)** and ***large***

wood and debris management **(Section 3.4.4)**. Individual landowners seeking specific recommendations for their property are encouraged to contact watershed partners for a free technical assistance visit:

https://ashokanstreams.org/our-areas-of-focus/assistance-to-streamside-landowners/

3.4.1 Stony Clove Creek Watershed

Stony Clove Creek originates at Stony Clove Notch between Plateau Mountain and Hunter Mountain. It flows generally southwestward through the southwest portion of the town of Hunter in Greene County and then through the northeast portion of the town of Shandaken in Ulster County before emptying into Esopus Creek in the hamlet of Phoenicia. The study area includes a section of Stony Clove Creek that is approximately 3.5 miles in length. In Lanesville, Stony Clove Creek drains an approximately 16.3-square-mile watershed.

The main stem of Stony Clove Creek can be characterized as a fourth-order stream at the southern boundary of the hamlet of Lanesville and where it joins Esopus Creek. Significant tributaries to Stony Clove Creek in the study area include Myrtle Brook and Hollow Tree Brook.

The Stony Clove Creek watershed falls within the Catskill Mountain physiographic region of New York State, shown in Figure 3-30. The entirety of the hamlet of Lanesville, a small southwest portion of the town of Hunter, and a small southeast portion of the town of Lexington drain into the LFA study area. A topographic relief map of the Stony Clove Creek watershed is shown in Figure 3-31. Note how the valley bottom widens as the creek flows downstream from its steeper headwaters.

The bedrock geology of the Catskill Mountains consists of Devonian-age sedimentary rocks (Ver Straeten, 2013). Within the Stony Clove Creek watershed, three formations from the Upper Devonian Period make up the bedrock: the Upper Walton Formation, Lower Walton Formation, and the Oneonta Formation. Both the Upper and Lower Walton Formations consist of a mixture of sandstone, shale, and minor conglomerates. They are found from 700 and 1,200 feet in elevation. Similar in composition, the Oneonta Formation consists of minor conglomerates, sandstone, and shale.

The surficial geology of the Stony Clove Creek watershed is dominated by a mixture of exposed bedrock and glacial legacy sediments, with some recent alluvium along the valley bottoms. In the Pleistocene Epoch, New York State was undergoing a period of glaciation, during which the Catskill Mountains were covered by mountain glaciers. The retreat and advance of these glaciers eroded the landscape and then redeposited the eroded sediment onto the land. Bedrock is mapped at or within a few feet of the ground surface for the majority of the watershed, mostly above the valley margin and contained within higher elevations. Glacial outwash sand and gravel underly the majority of Stony Clove Creek, and kame deposits are mapped adjacent to the glacial outwash in several areas throughout the watershed. Kame deposits consist mainly of sand and gravel deposited by sediment-laden streams that flowed off the ice front. Additionally, glacial till and lacustrine silts and clays are found throughout the watershed.

For additional information about the Stony Clove Watershed, please visit the Stony Clove Stream Management Plan (2005):

http://www.catskillstreams.org/stonyclovesmp.html

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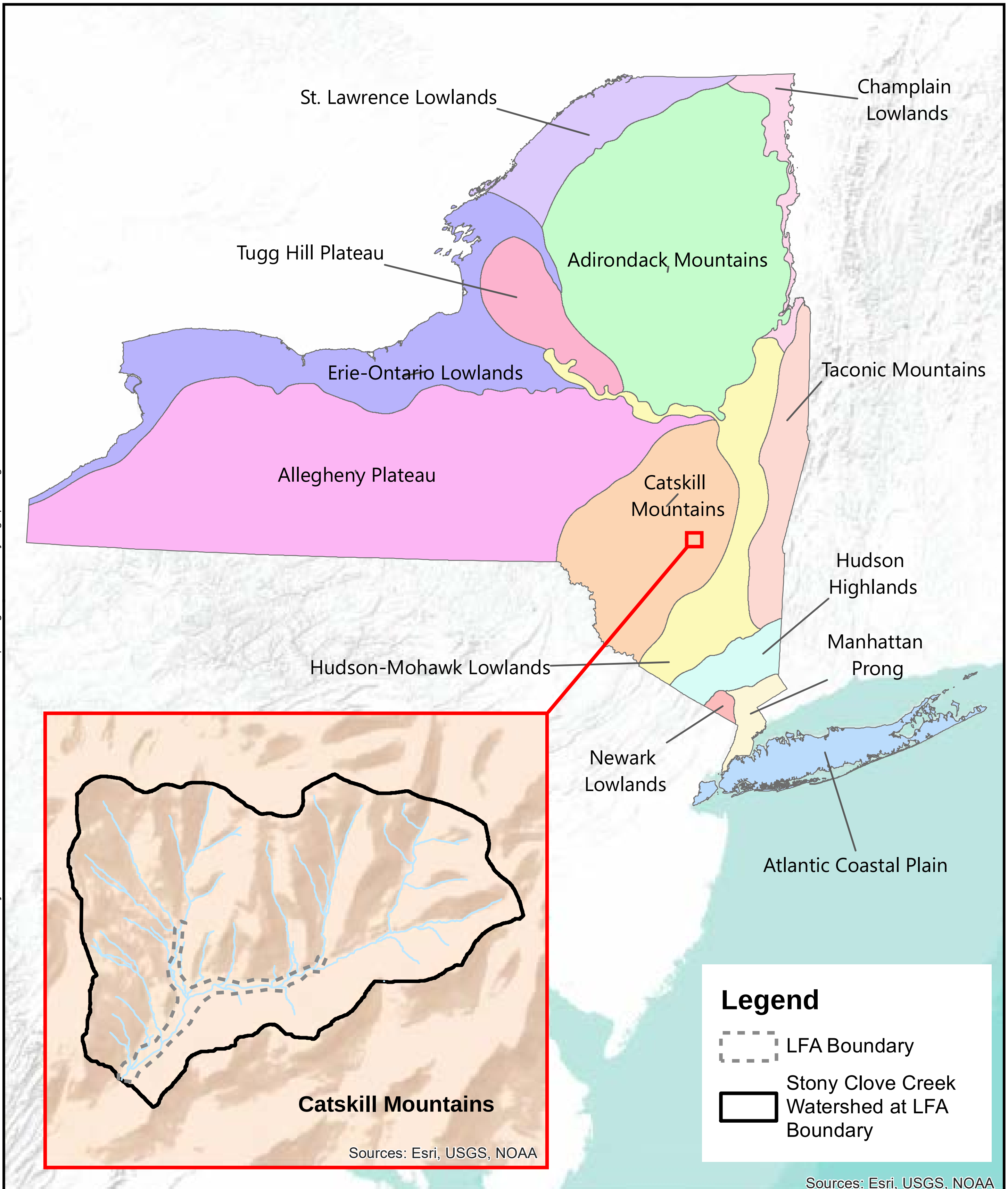

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TOWN OF HUNTER
GREENE COUNTY, NEW YORK

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FIG. 3-30

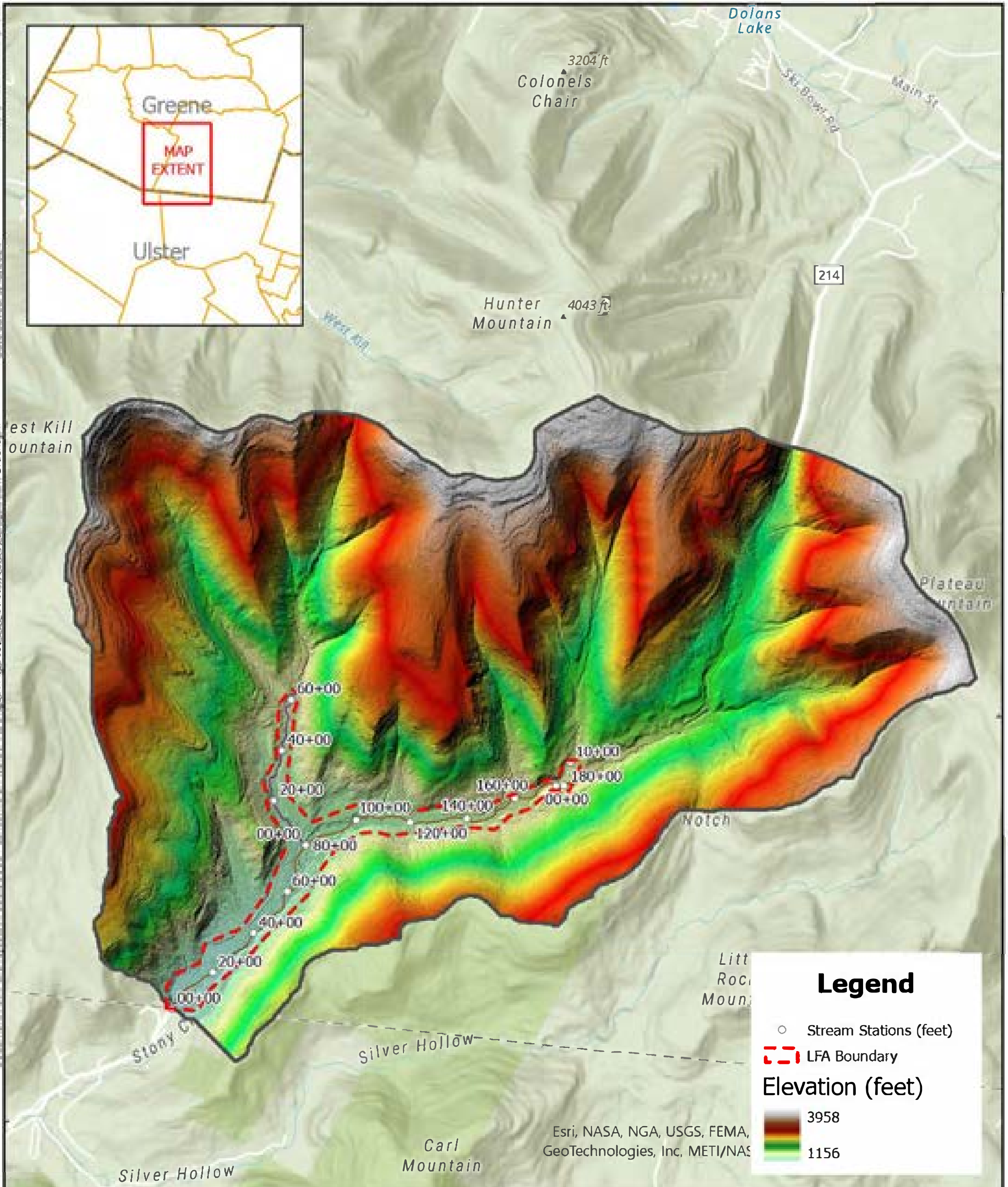

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FIG. 3-31

Around 55 percent of the soils in the Stony Clove Creek watershed are classified as hydrologic soil groups C or C/D, and around 44 percent are classified as hydrologic soil groups A or B. The soils in groups C or C/D are moderately or highly prone to runoff. Soils in groups A or B have a lower tendency for runoff.

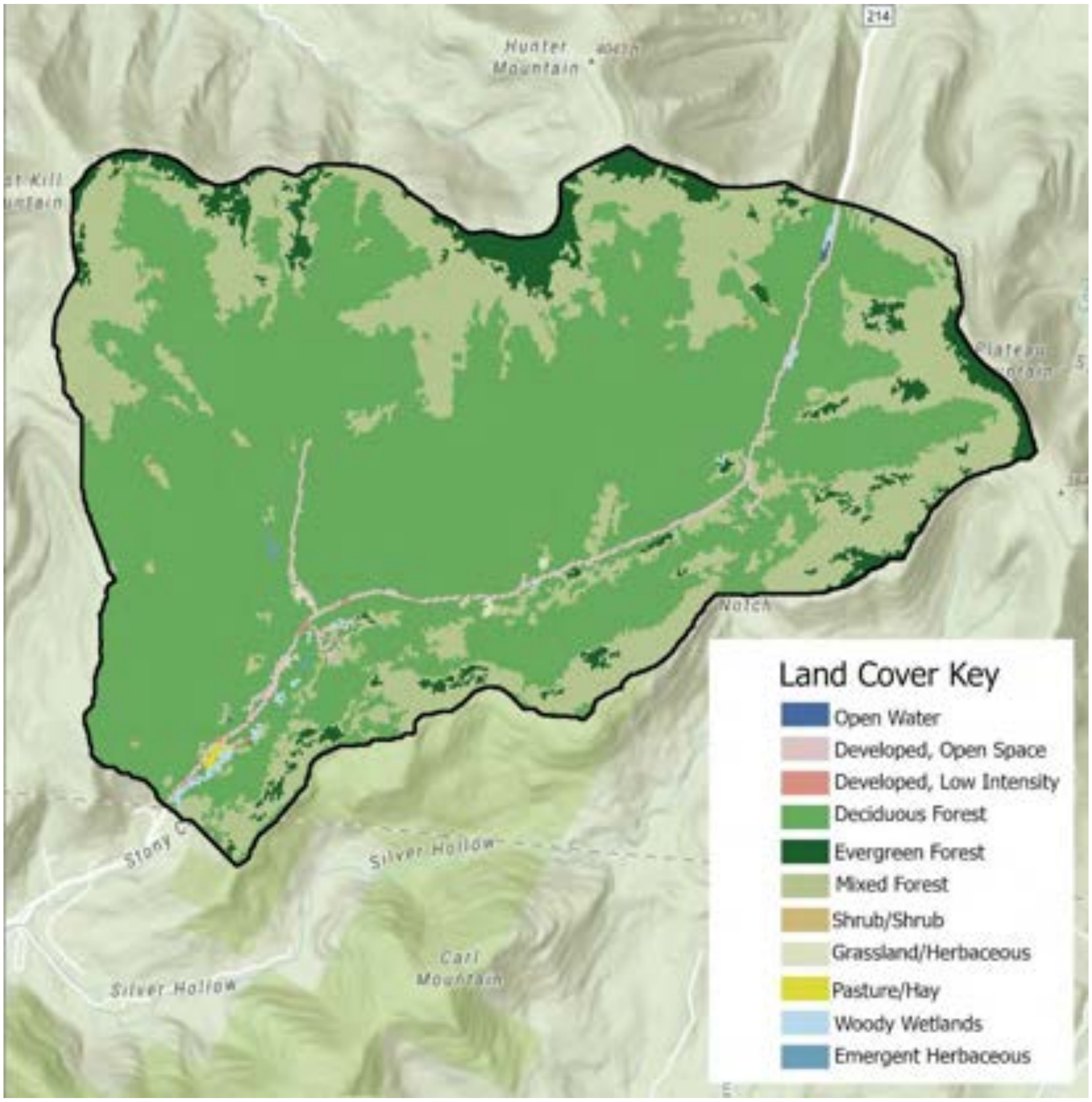

Figure 3-32 Land cover within LFA Stony Clove Creek Watershed

Forested land makes up 98 percent of the Stony Clove Creek watershed. Forest types consist of deciduous, evergreen, and mixed forest. Developed land makes up 1 percent. The remaining 1 percent of land cover consists of open water and barren land.

While the study area watersheds are currently predominantly forested, historical logging activities had substantially if not entirely denuded these valleys. Recovery and regrowth of these forests has been occurring since the early- to mid-twentieth century. Today, much of the land within Catskill Forest Preserve is protected from logging and other kinds of local human disturbance. In the LFA study area, there is a mix of protected and unprotected land. According to the *Hudson Valley Natural Resource Mapper* (created by Hudson River Estuary Program and Cornell University), the forests within the Stony Clove Creek watershed are in the highest condition allowed in the Hudson Valley Forest Condition Index. The Hudson Valley Forest Condition Index rates forest patches based on metrics relating to size, fragmentation, connectivity, stressors, habitat value, and carbon sequestration within the Hudson River watershed.

Wetland cover was also examined using information available from the U.S. Fish & Wildlife Service's National Wetlands Inventory (NWI). The NWI indicates that there are 150 acres of wetlands in the Stony Clove Creek watershed, or approximately 1.4 percent of the watershed. The wetland type found in the Stony Clove Creek watershed includes freshwater emergent wetland, freshwater forested/shrub wetland, freshwater pond, and riverine. Wetlands play an important role in flood mitigation by storing water and attenuating peak flows. It is estimated that since colonial times approximately 50 to 60 percent of the wetlands in the state of New York have been lost through draining, filling, and other types of alteration.

3.4.2 Geomorphology and Bank Erosion

One of the community's primary concerns related to flooding is stream instability, specifically bank erosion. Catskill mountain streams are dynamic and powerful, and erosion, deposition, and channel adjustment are natural processes, but these can threaten streamside property and infrastructure (Photo 3-17). Attempts to counteract these processes are costly and complex to implement successfully and often cause accelerated degradation of adjacent reaches of stream. For this reason, hard bank armoring, channel dredging or straightening, berm construction, or other geomorphologically incompatible treatments are rarely pragmatic and are generally only reserved for protection of critical infrastructure where there may be no other viable option.

There are various stream and valley characteristics that can influence stream stability (or lack thereof) in the Stony Clove watershed. Some of these are related to the history of glaciation in the region dating to the Pleistocene ice ages; today's streams are flowing within valleys that were shaped in part by glaciers, and the valley bottoms are largely composed of glacial legacy sediments that are generally quite different in composition than what would be encountered in a purely alluvial valley. This can make some reaches of stream vulnerable to instability as the non-alluvial soils can respond relatively unpredictably to hydrologic and hydraulic conditions. Low-permeability, glacially dammed lakebed clays are encountered throughout the Lanesville LFA area; these layers can influence groundwater flow dynamics and contribute to hillslope instabilities.

Photo 3-17 Damage to home along Stony Clove Creek from bank erosion in 2011 flooding. Photo provided by HLFRC.

Photo 3-18 Stream bank-coupled hillslope failure along a dynamic reach of Stony Clove Creek (see Figure 3-35) threatening adjacent structure. January 1, 2021, photo. This property was purchased through the NYCFFBO due to erosion hazard risk.

Between Notch Lake and the Greene-Ulster county line, Stony Clove Creek has an average longitudinal slope of 2.4 percent, meaning that the channel bed drops 2.4 feet vertically over every 100 feet traveled downstream. This is depicted graphically in a longitudinal profile in Figure 3-33. There is a relatively well-defined inflection in the profile in the vicinity of the Wright Road bridge where the average channel slope decreases from about 3.5 percent between Notch Lake and Wright Road to about 1.7 percent from Wright Road down to the county line. This change in slope is also associated with a general broadening in the overall valley width, which can be seen in Figure 3-31.

The headwater reaches of Stony Clove Creek are generally able to transport large volumes of relatively large sediment due to the confinement of the stream's energy within a fairly narrow and steep valley. As the longitudinal slope decreases, shear stresses and flow velocities are reduced along with the downstream component of gravitational force acting on sediment particles. Meanwhile, as the valley widens, flows spread onto the floodplain, dispersing the stream's energy across a broader area. As a result, the ability of the stream to transport sediment, both volumetric (capacity) and size (competence), is reduced, and deposition or aggradation occurs. As sediments build up in the channel, flows become confined between its banks, and the stream will generally erode into one or the other bank or potentially avulse in response, leading to a constantly evolving channel that migrates back and forth across the valley floor. This is a natural process that contributes to overall stability of the alluvial system and cannot be modified by interventions like dredging, straightening, or channelizing without degrading adjacent reaches. However, the system-scale stability supported by this process is often associated with significant local instability in the form of dynamic, continuously adjusting reaches of stream. The consequence for streamside properties and infrastructure is often an elevated risk of bank erosion (Photo 3-3, Photo 3-17, Photo 3-18, Photo 3-19).

From their headwaters to their confluences with Stony Clove Creek, Hollow Tree Brook and Myrtle Brook have average slopes of 8.2 percent and 13 percent, respectively, although both shallow considerably as they approach the valley bottom. Similar to the headwater reaches of Stony Clove Creek, these two tributaries can effectively transport sediments down to the valley floor where transport capacity and competence are diminished and deposition forces adjustment.

Sediment inputs can also be unpredictable due to bank or hillslope failures, which can contribute large quantities of material to the stream in short periods of time. Response can be further complicated by the potential non-alluvial origin of the sediment load.

Figure 3-34 through Figure 3-39 depict various alignments of Stony Clove Creek and Hollow Tree Brook in the LFA area as identified from aerial orthophotography captured between 1960 and 2021. Note that the more confined, steeper upstream reaches of these two streams have been relatively stable in planform over these 60 years (Figure 3-34, Figure 3-39), while the reaches in the broader, shallower-sloping valleys of the lower reaches in the LFA area have been considerably more dynamic (Figure 3-35, Figure 3-36, Figure 3-37, Figure 3-38).

Riparian buffers are discussed in the following section (3.4.3). These are streamside plantings that can be an effective, natural, and ecologically beneficial way to mitigate bank erosion. Several areas were identified as potential priority locations for riparian buffer establishment, shown in Figure 3-40. This does not include all locations where riparian plantings may be appropriate or beneficial. Interested landowners are encouraged to reach out to Catskill Streams Buffer Initiative (CSBI) for a technical consultation. This is not limited to the LFA area and is applicable to streamside landowners throughout the watershed.

https://catskillstreams.org/catskill-streams-buffer-initiative/

https://www.gcswcd.com/schoharie-reservoir-watershed/swsmp/csbi

Photo 3-19 Home alongside Stony Clove Creek in Meadow Brook Drive neighborhood (Section 3.1.2) destroyed by stream bank erosion in 2011. This home went through the FEMA buyout process and the parcel is now owned by the NYCDEP. Photo provided by HLFRC.

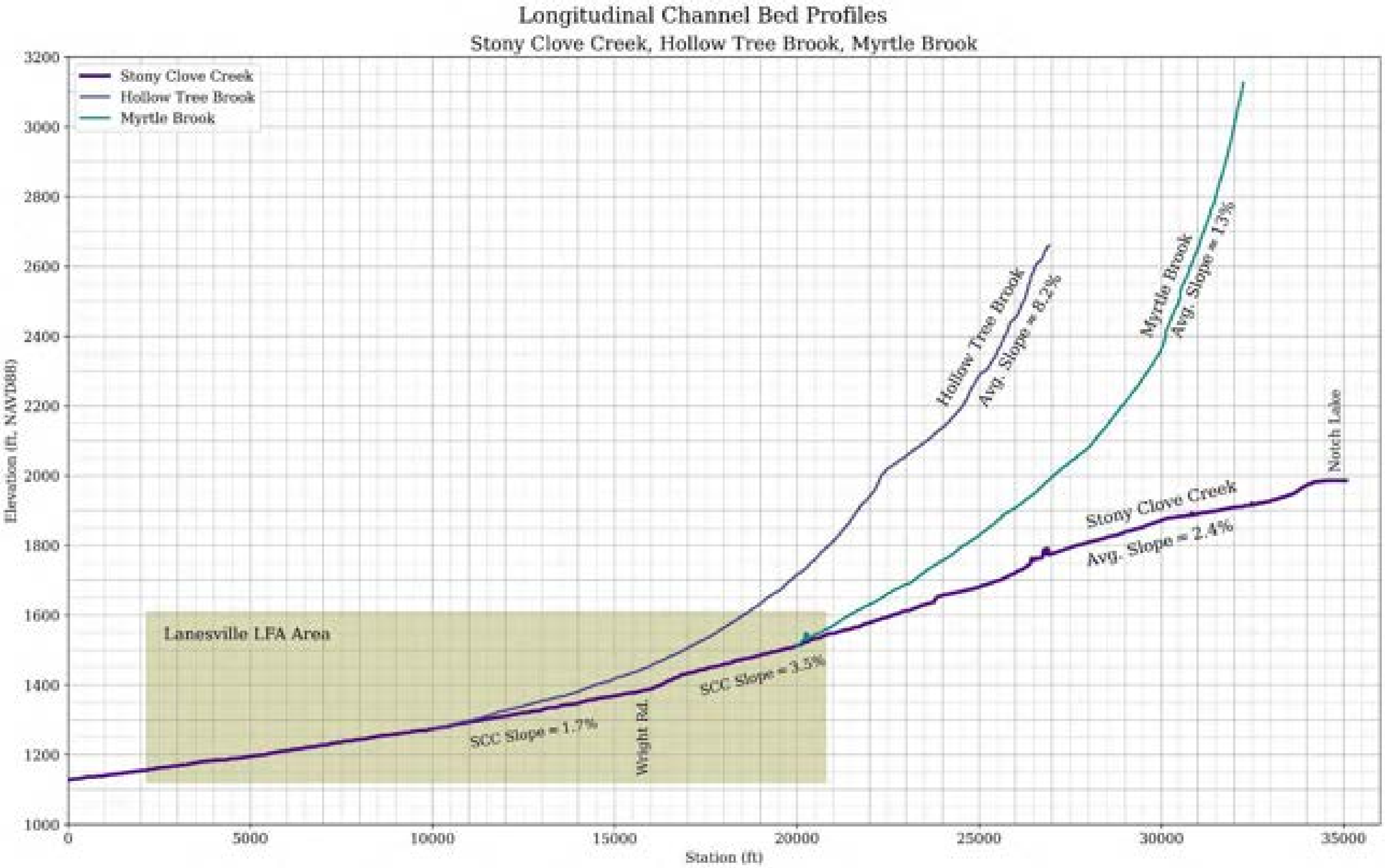

Figure 3-33 Longitudinal profiles for Stony Clove Creek and tributaries in the LFA area

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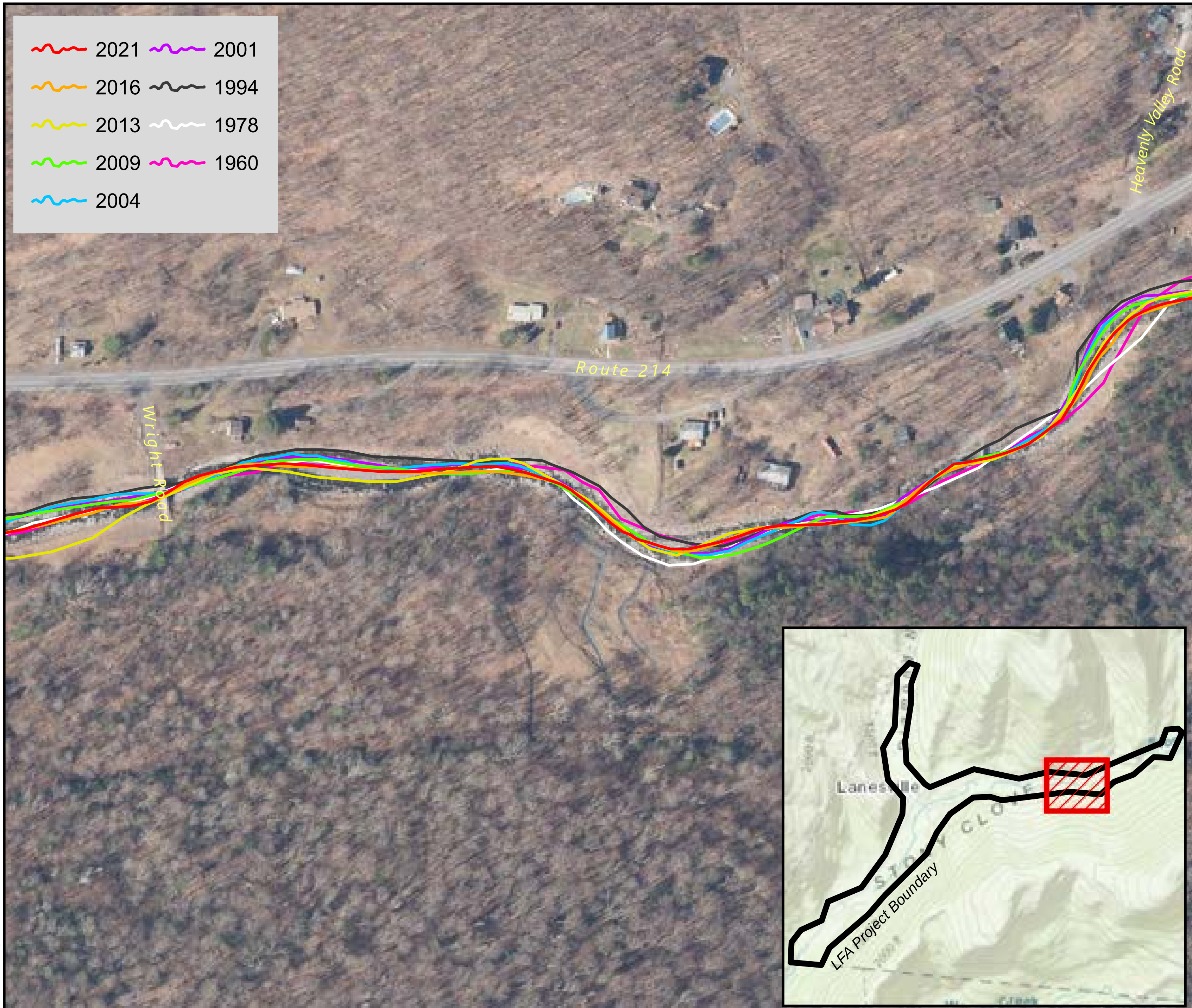

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Historical Alignments - Stony Clove Creek near Wright Road Bridge

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GREENE COUNTY S&WCD
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

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FIG. 3-34

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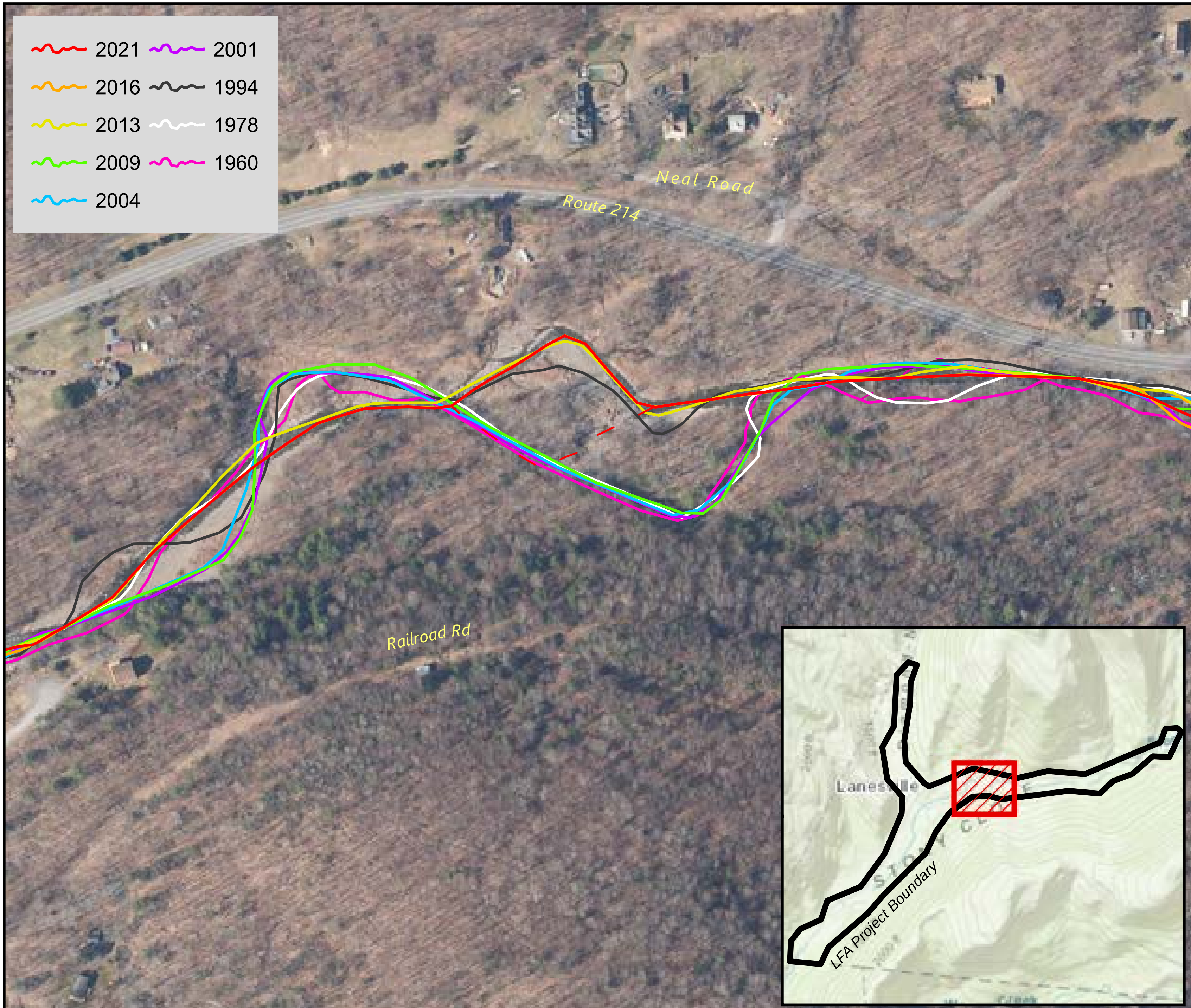

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Historical Alignments - Stony Clove Creek Upstream of Jansen Road

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GREENE COUNTY S&WCD
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

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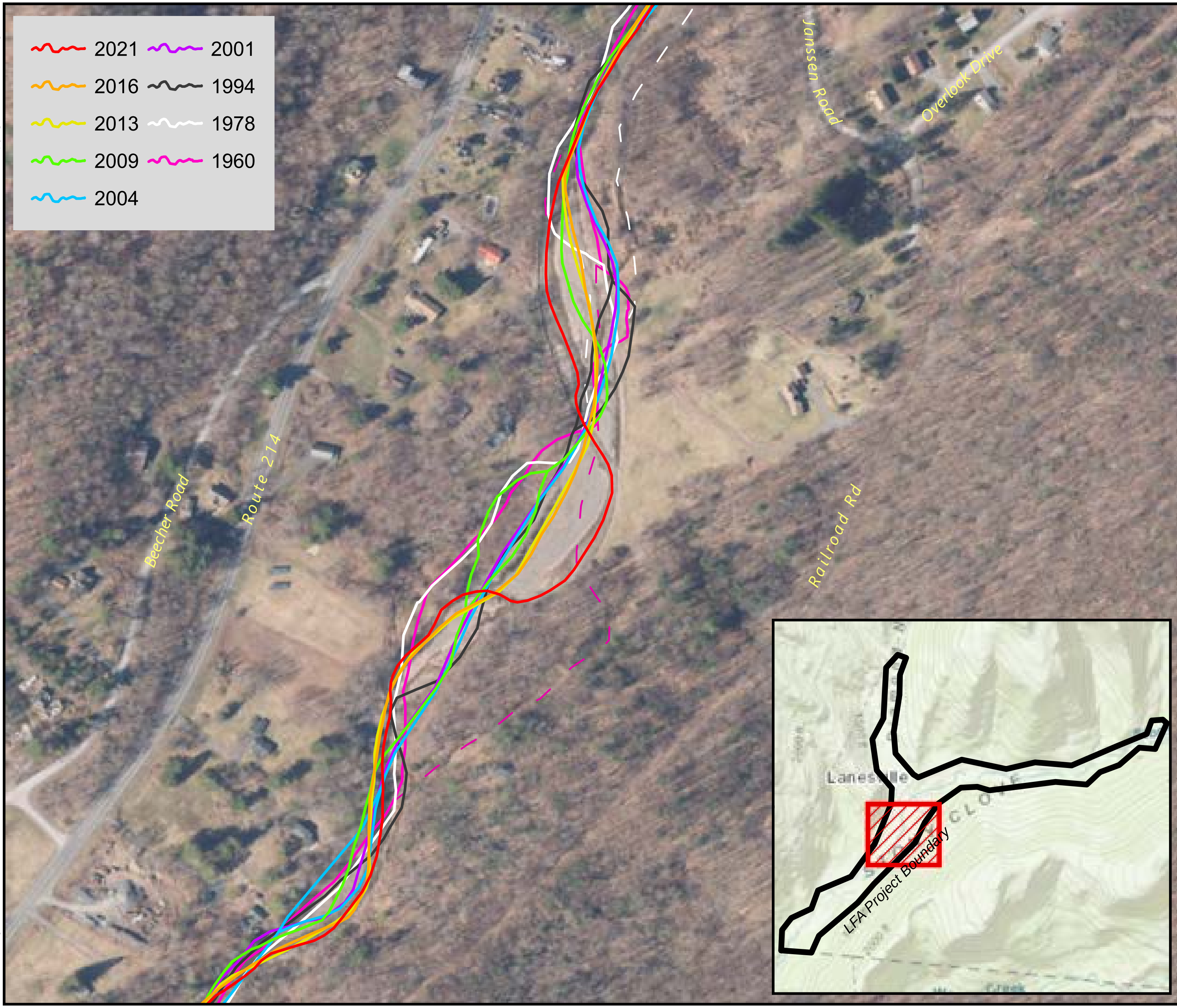
FIG. 3-35



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Historical Alignments - Stony Clove Creek Downstream of Jansen Rd

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS

GREENE COUNTY S&WCD

TOWN OF HUNTER

GREENE COUNTY, NEW YORK

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FIG. 3-36

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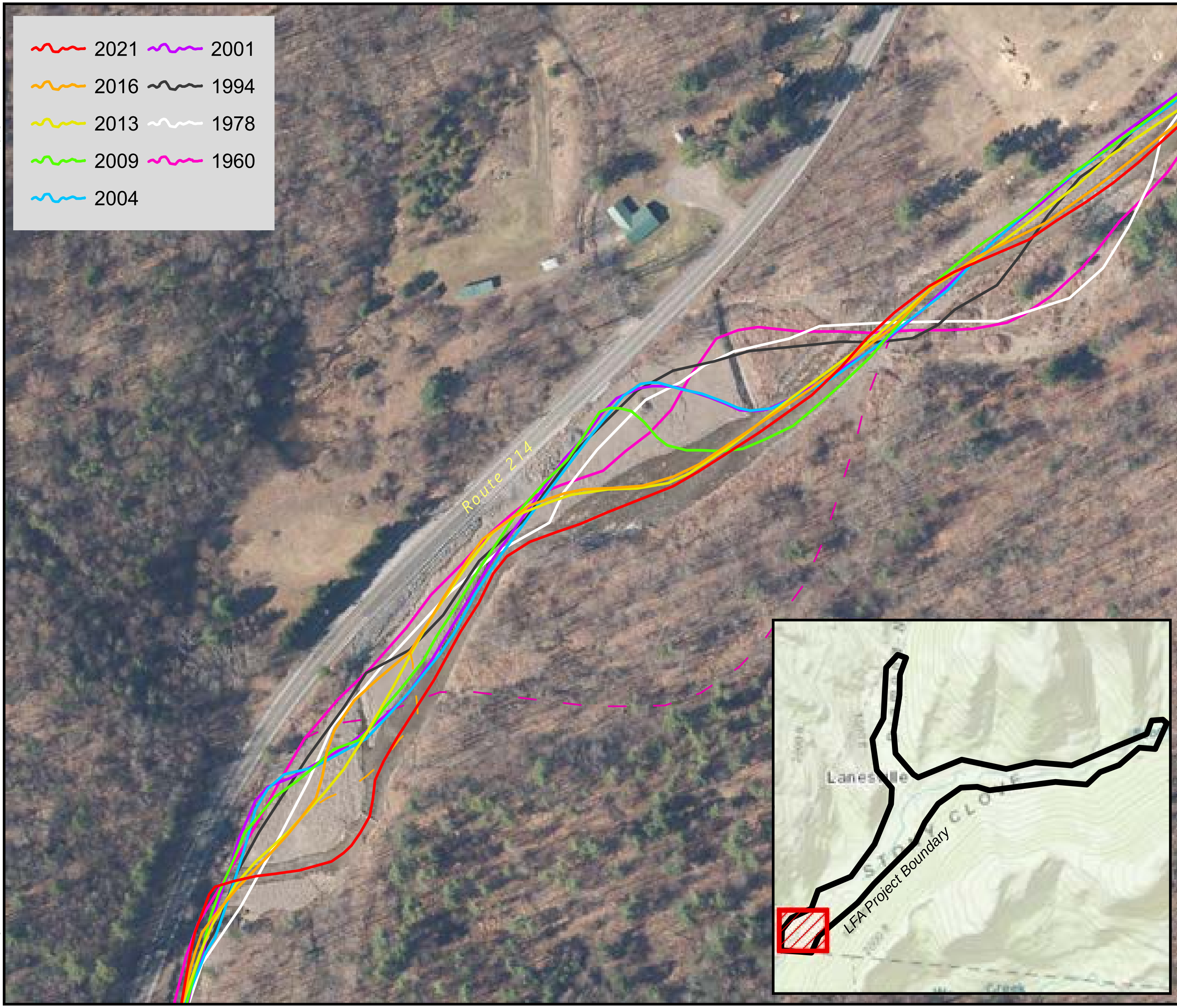

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Historical Alignments - Stony Clove Creek Upstream of County Line

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS

GREENE COUNTY S&WCD

TOWN OF HUNTER
GREENE COUNTY, NEW YORK

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FIG. 3-37

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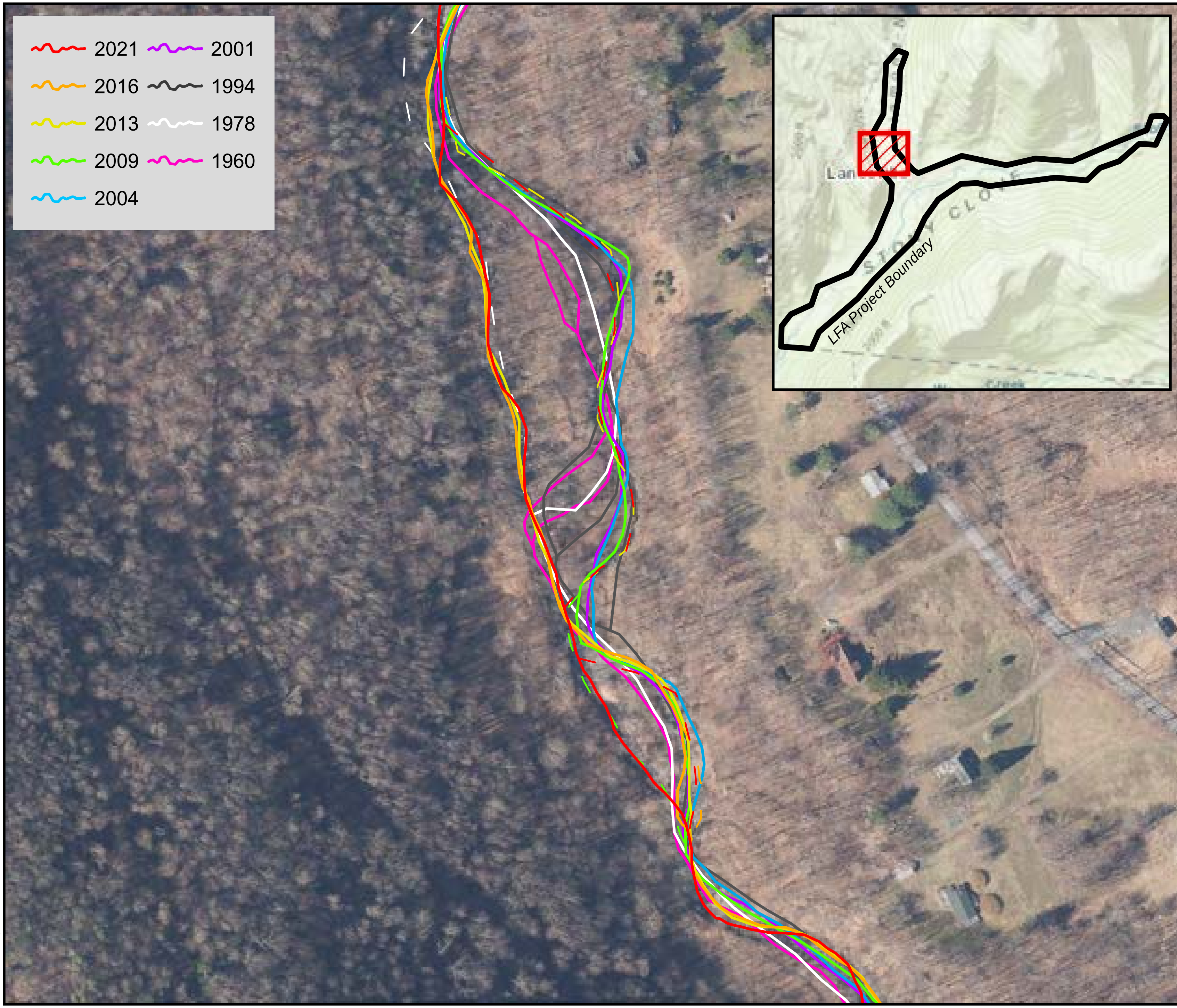

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Historical Alignments - Hollow Tree Brook above Stony Clove Creek

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GREENE COUNTY S&WCD
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1" = 200'

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FIG. 3-38

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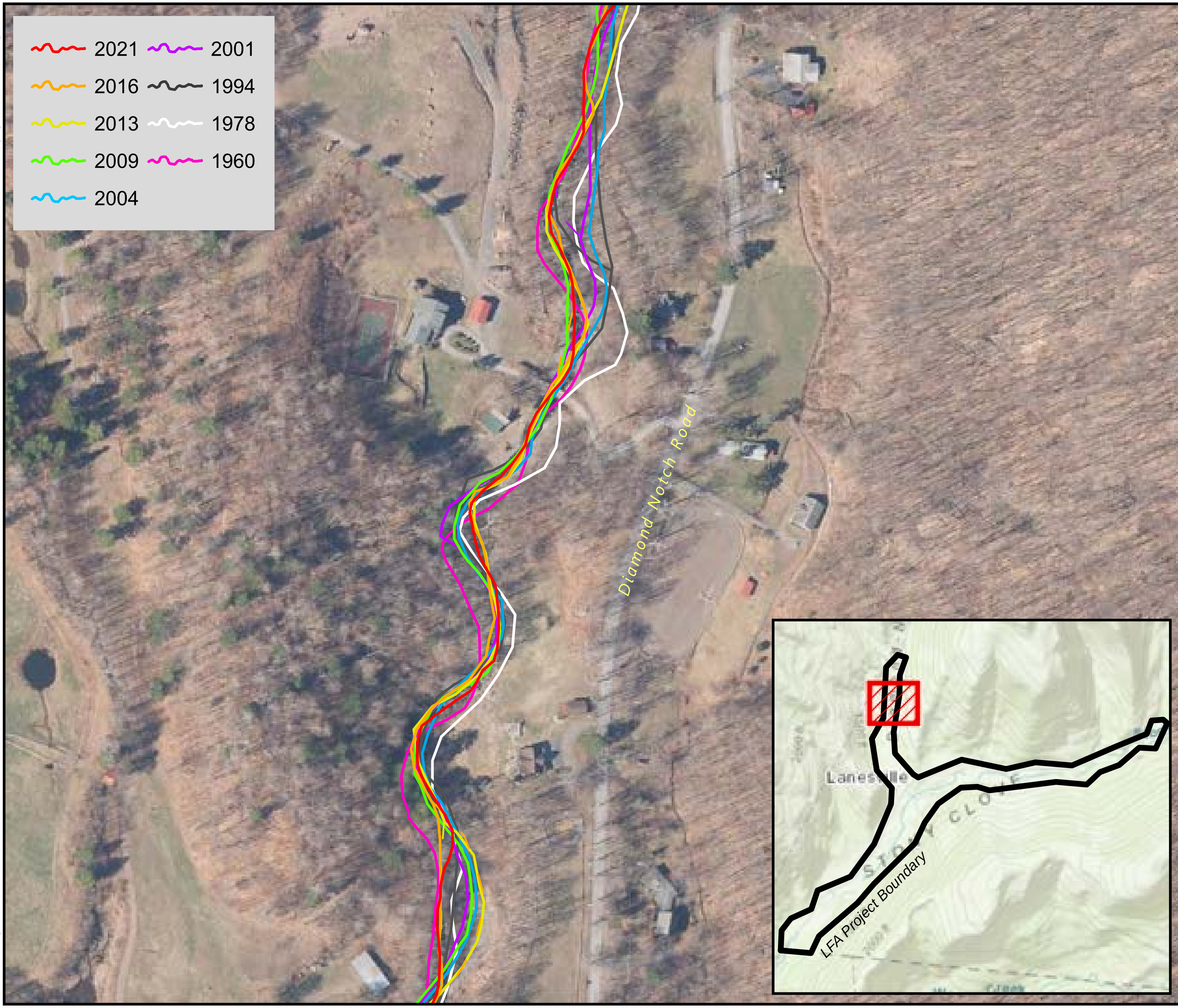

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Historical Alignments - Hollow Tree Brook below Diamond Notch Rd

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SCALE 1" = 200'

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FIG. 3-39

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3.4.3 Riparian Buffers

The Natural Resources Conservation Service (NRCS) (2016) defines a riparian buffer as, "***a corridor of trees and/or shrubs planted adjacent to a river, stream, wetland or water body***;" note that riparian buffers can also be naturally occurring. The definition continues to state that the width of the buffer and the distance of the buffer from the water body are essential characteristics determining the functionality of the buffer.

The benefits provided by riparian buffers to their adjacent water bodies have been well documented. Riparian buffer benefits can include those to the physical stability of the stream as well as habitat and water quality.

The physical benefit of a riparian buffer to a stream has been shown to include ***increased stability, reduced stream bank erosion, and reduced channel migration***. An example along Stony Clove Creek is shown in Photo 3-20. Scientific studies have found that intertwining roots within a stream bank can increase stream bank strength, increase resistance to erosion caused by high flows, and provide greater channel stability (Sweeney and Newbold, 2014). One study found that following major floods bank erosion was 30 times more prevalent along stream bends without forests than those with forests (Beeson and Doyle, 1996). Other studies have also shown that forested stream reaches exhibit slower channel migration and thus provide more stability than deforested channels (Hession et al., 2003; Allmendinger et al., 2005). The NRCS (2016) notes that stabilized stream banks also help maintain the geometry of the stream, including characteristics such as the meander length and profile.

Photo 3-20 Roots from mature riparian vegetation mitigating bank erosion along Stony Clove Creek during December 25, 2020, flooding. January 11, 2021, photo.

The dimensions of the riparian buffer have been shown to play an important role in the functioning of the buffer. Widths of approximately 33 feet provide some protection from channel migration. Similarly, bank erosion was lowered significantly by the presence of a streamside forest approximately 33 feet wide along reaches within an agricultural landscape. According to the NRCS Practice Standard for Riparian Forest Buffers, the minimum width should be at least 35 feet from the top of the bank. Wider widths provide additional protection against erosion and benefit wildlife.

The NRCS recommends utilizing native species in buffer plantings. If available, use native plants that are as follows:

- Adapted to the soil and climate of the planting site
- Water-loving or species tolerant of extended periods of flooding (depending on the width of the planting and distance from the stream banks)
- Moderate to aggressive root and crown spread to occupy the site quickly and provide adequate litter fall
- Resistant to pests and herbicides (if adjacent to farmland)

The benefits of riparian buffers to habitat include providing food and cover for wildlife and shade that helps to lower water temperatures. Buffers can also increase habitat diversity in several ways. The addition of large wood to a stream creates habitat structure. A reduction in sedimentation helps prevent silt from covering large rocks or stones and from filling pools in the streambed, both of which serve as habitat. Buffers have been shown to protect water resources from pollutants in surface runoff such as sediment and nutrients. Vegetated riparian buffers serve to slow water velocity, thus allowing sediment to settle out of the runoff water. The nitrogen and phosphorus attached to the sediment settle out of the surface runoff as well. To a lesser extent, dissolved nitrogen and phosphorus and other pollutants can be sequestered, degraded, and processed within the riparian buffer.

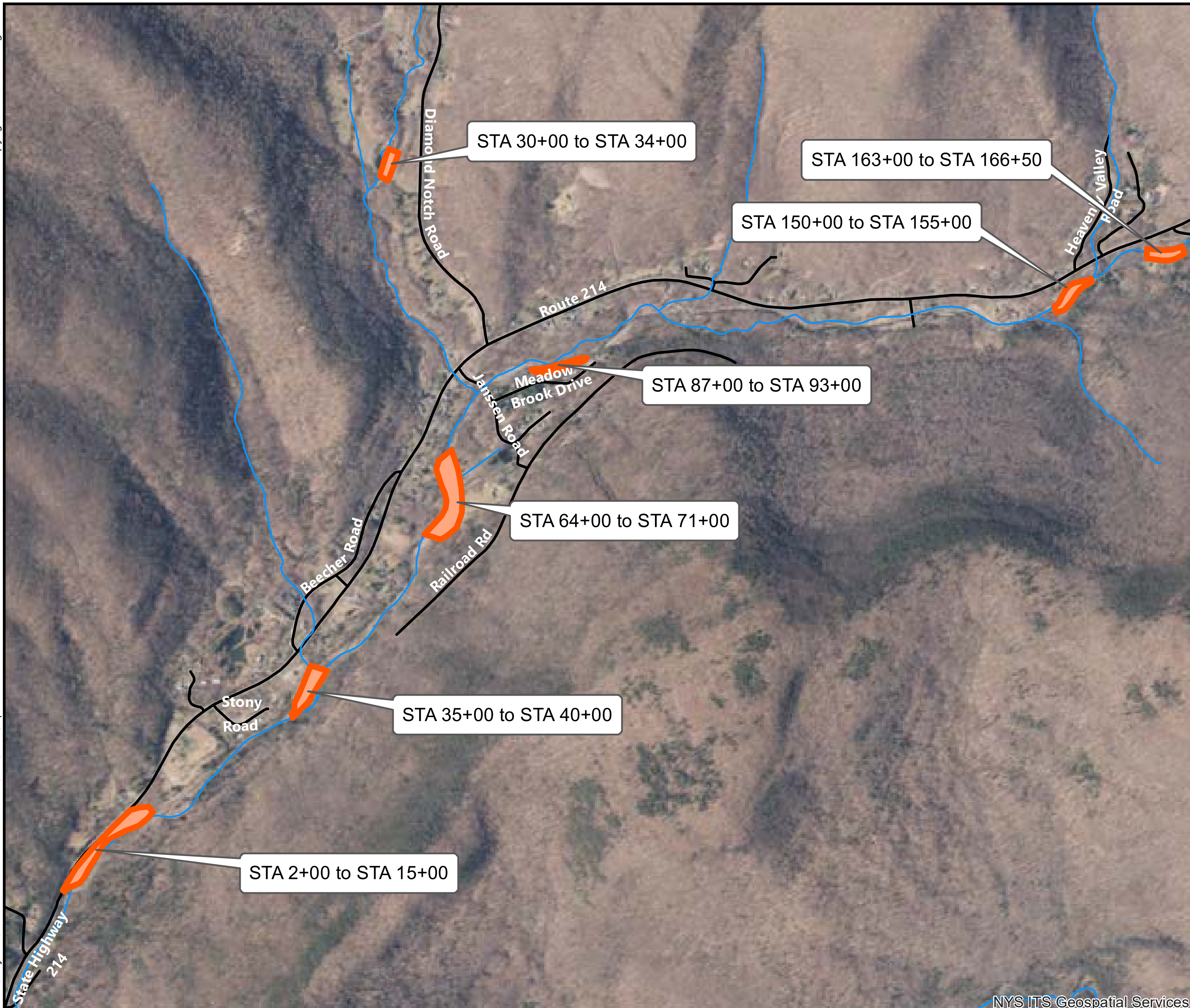
Areas Recommended for Buffer Evaluation and Referral to the Catskill Streams Buffer Initiative

Several stream reaches in Lanesville were identified as being particularly dynamic or having exhibited significant planform adjustment in the past. There is an elevated risk of stream bank erosion and/or channel avulsion in these areas, especially where no riparian vegetation is present to provide supplemental cohesion to soils along the stream banks and overbank areas. Establishment of riparian plantings along these reaches can help provide critical stability that reduces the potential for future erosion damage. Figure 3-40 depicts potential areas for riparian buffer establishment in the LFA study area.

These areas are not exclusive, and all interested streamside landowners in the watershed are encouraged to contact CSBI for a technical consultation:

https://catskillstreams.org/catskill-streams-buffer-initiative/

https://www.gcswcd.com/schoharie-reservoir-watershed/swsmp/csbi



N
0 500
Feet

SLR
231 MAIN STREET
SUITE 102
NEW PALTZ, NY 12561
845.633.8153

Potential Areas for Riparian Buffer Establishment

HAMLET OF LANESVILLE LOCAL FLOOD ANALYSIS
TOWN OF HUNTER
GREENE COUNTY, NEW YORK

SCALE 1 " = 1,500 '

DATE 12/4/2024

142.17020.00003
PROJ. NO.

FIG. 3-40

3.4.4 Large Wood and Debris Management

A common concern raised during public outreach and information-gathering sessions was the occurrence of logjams and wood accumulations that can threaten property and infrastructure. Wood in streams can have ecological and geomorphological benefits but can also contribute to stream instabilities or damage to property and infrastructure. Submerged logjam “strainers” can also pose a drowning risk to recreational users of streams.

Photo 3-21 Large wood accumulation on Stony Clove Creek in Lanesville after Tropical Storm Irene in 2011. Photo provided by NYCDEP SMP.

Wood and debris jams that threaten public infrastructure (Photo 3-23) are often removed by local, county, state highway, and public works departments. Federal involvement (e.g., National Guard deployment) may also occur in particularly damaging events. However, no agency is responsible for addressing logjams that only affect private property, whether or not there is an associated hazard.

Potential benefits of wood in streams:	Potential hazards of wood in streams:
• **Streambed stability** • **Stream bank and hillslope stability** • **Sediment storage** • **Aquatic habitat and ecology**	• **Blockage of bridges and culverts** • **Erosion, lateral adjustment, avulsion** • **Danger to recreational users**

Private landowners may remove wood and debris from streams on their property, at their own risk and generally at their own expense; little to no public funding is available for such actions. ***Wood and debris removal may require a permit from NYSDEC*** depending on site conditions, access requirements, and the proposed means of removal. Streamside landowners should be aware of the potential benefits and hazards associated with either leaving or removing wood from streams. No matter what the situation, removing wood can have unanticipated consequences, which may be negative. In many situations, wood in streams does not pose a risk to streamside property and may have benefits, including bed and bank stabilization (Photo 3-22).

Photo 3-22 Wood accumulations along Hollow Tree Brook

Streamside landowners affected by wood or debris accumulations are encouraged to reach out to AWSMP or GCSWCD to arrange a technical consultation visit at no charge. Each situation is unique, and SMP staff can assess the potential risks or benefits on a case-by-base basis and assist landowners in decision-making.

Some important considerations include:

- If ***heavy equipment is needed*** for wood and debris removal in the stream channel, or if ***any disturbance to the streambed or banks*** will occur, then ***a NYSDEC stream disturbance permit is required***.
- Wood can be ***cut into small pieces*** (about 4 feet or less) and left in the stream channel. This will provide some ecosystem benefits, but if the wood is mobilized, there is little risk it will contribute to issues downstream (e.g., culvert blockage).
- If wood is removed from streams, it should be dispersed across the floodplain or in upland areas. ***Wood should not be piled up along the banks*** where it can easily re-enter the stream and cause issues in the same location or elsewhere downstream.
- Any bare or eroding banks should be ***revegetated with native riparian plantings***. Guidance and funding assistance is available from local stream management programs and county soil and water conservation districts (Section 3.4.3).
- ***Root balls should be left in place*** on the bank as the roots will continue to provide stability to the soils while new plantings establish.

Removing, cutting, or handling wood in or near streams is extremely dangerous. Powerful and unpredictable forces can act on wood and debris that is in or has been deposited by flowing water. Cutting, pulling, or otherwise moving or disturbing jammed materials can result in unexpected and/or abrupt movement that can cause injury or death.

Photo 3-23 Large wood accumulation at Bridge Street bridge over Esopus Creek in Phoenicia during Tropical Storm Irene in 2011. Photo provided by Amy's Takeaway.

4.0 General Recommendations

General flood mitigation and resiliency recommendations are provided in the following sections.

4.1 Stream Management Plan

The Greene County Soil & Water Conservation District (GCSWCD) and New York City Department of Environmental Protection worked with the Towns of Hunter and Shandaken, the NYS Department of Environmental Conservation, Ulster County Soil & Water Conservation District, and other partners to develop a long-term, multiple objective management plan for Stony Clove Creek that was published in 2005. This plan documents historical conditions in the stream and offers recommendations for improving the Stony Clove's stability, fisheries, and water quality as well as reducing flood damage.

Since publication of the Stony Clove Creek Stream Management Plan (SMP), multiple stream feature inventories have been completed along the mainstem Stony Clove Creek and its primary tributaries, including Hollow Tree Brook and Myrtle Brook, to document geomorphic conditions.

The Stony Clove Creek SMP is available online here:

https://catskillstreams.org/stony-clove-stream-management-plan/

The 2005 SMP pre-dates several significant floods in the Stony Clove watershed. It is recommended that watershed partners seek to update the plan as appropriate to reflect updated information and current watershed conditions.

4.2 Road Closures

Flooding of and damage to bridges, culverts, and roadways during flood events has been reported at numerous locations in the Lanesville LFA study area. ***Most flood-related fatalities occur in vehicles***, often when drivers attempt to cross flooded roadways. ***It is impossible to tell if a flooded roadway is safe just by looking at it***. It is recommended that risks associated with the flooding of bridges and roadways be reduced by temporarily closing flood-prone roads during high-flow events. This requires effective signage, road closure barriers, and consideration of alternative routes. Because it is impossible to prepare for every contingency and closing roads and establishing detours in a flash flood event is not always possible, it is critical that residents be advised of the ***extreme danger of attempting to cross flooded roadways*** and reminded not to do so when flooding occurs or is forecasted. Informed and prepared residents are the foundation of life safety preservation in floods.

Photo 4-1 Closure of NY-214 near the Greene-Ulster county line after flooding in 2020. Photo provided by AWSMP.

4.3 Community Involvement

4.3.1 Hunter-Lanesville Flood Remediation Committee

A diverse and active flood committee is essential to successful implementation of recommendations within this LFA and can aid the community in obtaining funding and coordination with the public. This is especially true for more complicated projects that may require additional time to implement. For this reason, it is recommended that the HLFRC or similar entity continue to meet regularly.

4.3.2 Record-Keeping

In the event of future flooding, it is highly recommended that the Town of Hunter collect and maintain clear, detailed records of all damages and associated repair costs, including materials and labor. These should be distinguished by site so that problem areas can be identified and addressed and not lost amongst the overall total. Where possible, once waters recede and it is safe to do so, high-water marks and other evidence of flooding extents should be photographed and carefully documented and their elevations measured from a permanent reference. These data may be extremely valuable when seeking funding for flood mitigation assistance.

4.4 Greene County Hazard Mitigation and Resilience Plan

The 2023 Greene County Hazard Mitigation and Resilience Plan (HMRP) is an update to the previous plan, which was approved and adopted in 2017. This plan will help the county to implement mitigation projects aimed at breaking the cycle of merely responding to and recovering from hazard events but rather working to prevent their effects in the first place. With this plan update, the county aims to maintain eligibility for federal mitigation project funding such as the Hazard Mitigation Grant Program (HMGP), Building Resilient Infrastructure and Communities (BRIC) Program, Flood Mitigation Assistance (FMA) Program, and Repetitive Flood Claims (RFC) Program, in addition to other diverse funding sources that are available.

The Greene County HMRP is available here:

https://www.greenegovernment.com/departments/emergency-services/hazard-mitigation-plan

It is recommended that LFA-recommended projects be included in future updates to the Greene County Hazard Mitigation and Resilience Plan. This will help facilitate eligibility for disaster relief and other funding sources.

4.5 FEMA and National Flood Insurance Program

4.5.1 Hollow Tree Brook Hydrology and Hydraulics

It is recommended that the Hydrologic Engineering Center – *River Analysis System* (HEC-RAS) hydraulic modeling for Hollow Tree Brook developed for the effective Greene County FIS be recovered. The absence of these modeling files will complicate any future map revision applications along this stream.

Analysis of the peak flood hydrology for Hollow Tree Brook based on the USGS stream gauging station near the Diamond Notch Road bridge (01362342), shown in Table 7-1, suggests that the peak flood hydrology for Hollow Tree Brook estimated by hydrologic modeling for the effective Greene County FIS (Table 7-2) may be overly conservative. This LFA study did not seek to determine which of these methods are more accurate; however, the discrepancy is significant enough that it merits further consideration. Re-evaluation of the flood hydrology for Hollow Tree Brook is recommended, and if appropriate, selected peak flood discharges should be revised, and updated flood zone mapping should be produced.

4.5.2 Flood Hazard Mapping Updates

Any project that may impact the flood hazard in its proximity should follow the appropriate C/LOMR/A process.

It is recommended that any flood hazard mitigation project in Lanesville be accompanied by a LOMR application to ensure that FEMA flood hazard mapping accurately reflects the impacts of constructed projects.

4.5.3 Floodplain Administration

Public welfare depends on awareness and proper enforcement of the town's local Flood Prevention Law. It is recommended that town government staff seek training regarding the content and implementation of this law, especially the Town Code Enforcement Officer. As the Local Administrator, this individual is responsible for administering, implementing, and enforcing the local Flood Damage Prevention Code. This will allow town officials to successfully disseminate important information regarding the law to the public and to implement the law accurately to meet its stated purposes.

4.5.3.1 Local Flood Damage Prevention Codes

The Town of Hunter has adopted a local "Flood Damage Prevention Law." The code is authorized by the New York State Constitution and is consistent with the federal guidelines, which are requirements for participation in the NFIP. The law can be found online here:

http://townofhuntergov.com/wp-content/uploads/2015/01/52.Flood_Plan.pdf

The stated purposes of this local law are as follows:

- Regulate uses that are dangerous to health, safety, and property due to water or erosion hazards or that result in damaging increases in erosion or in flood heights or velocities.
- Require that uses vulnerable to floods, including facilities that serve such uses, be protected against flood damage at the time of initial construction.
- Control the alteration of natural floodplains, stream channels, and natural protective barriers that are involved in the accommodation of floodwaters.
- Control filling, grading, dredging, and other development that may increase erosion or flood damages.
- Regulate the construction of flood barriers that will unnaturally divert floodwaters or that may increase flood hazards to other lands.
- Qualify for and maintain participation in the NFIP.

The stated objectives of the local law are as follows:

- To protect human life and health.
- To minimize the expenditure of public money for costly flood-control projects.
- To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public.
- To minimize prolonged business interruptions.
- To minimize damage to public facilities and utilities such as water and gas mains; electric, telephone, and sewer lines; and streets and bridges located in areas of special flood hazard.
- To help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas.
- To provide that developers are notified that property is in an area of special flood hazard.
- To ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

The Town Code Enforcement Officer is empowered as the local administrator and is responsible for administering and implementing the local Flood Damage Prevention Code. The Town of Hunter requires a $100 application fee to apply for a Floodplain Development Permit, and it is the duty of the local administrator to grant or deny floodplain development permits in accordance with the code. The local administrator must conduct a permit application review prior to approval and must review the subdivision or other proposed new development to determine if the proposed site is reasonably safe from flooding. It is also their responsibility to determine if proposed development in an area of special flood hazard may result in physical damage to other property.

The local law identifies a series of Construction Standards for development in the floodplain, broken down into General Standards, Standards for All Structures, Residential Structures, Non-Residential Structures, and Manufactured Homes and Recreational Vehicles. The mapped FEMA flood zones are utilized to guide many of the regulations. For reference, the SFHA indicates all areas within the 1 percent annual chance flood zone, Zone A indicates the approximated 1 percent annual chance flood zone, Zones AE and A1-30 indicate the calculated 1 percent annual chance flood zone, Zone AH is a 1 percent annual chance flood zone where shallow ponding occurs, and Zones X and C are outside of the SFHA.

The floodway is defined as the stream channel and those parts of the floodplain adjoining the channel that are required to carry and discharge the floodwaters or flood flow of the stream. Development within the floodway can be particularly vulnerable to damage.

The General Standards section is broken down into standards for subdivision proposals and encroachments. These standards apply to both new development and substantially improved structures. All new subdivision proposals and other development proposed in a SFHA must be consistent with the need to minimize flood damage. Public utilities and facilities should be located or constructed in order to minimize flood damage, and adequate drainage should be provided. When encroaching within Zones A1-A30 and AE, along streams without a regulatory floodway, development must not increase the BFE by more than 1 foot. Along streams with a regulatory floodway, development must not create any increase in the BFE.

Standards for all structures include provisions for anchoring, construction materials and methods, and utilities. New structures must be anchored so as to prevent flotation, collapse, or lateral movement during the base flood. Construction materials must be resistant to flood damage, and construction methods must minimize flood damage. Enclosed areas below the lowest floor in Zones A1-A30, AE, AH, and in some cases Zone A must be designed to allow for the entry and exit of floodwaters. Utility equipment such as electrical, HVAC, and plumbing connections must be elevated to or above the base flood height. Water supply and sanitary sewage systems must be designed to minimize or eliminate the infiltration of floodwaters.

The elevation of residential and nonresidential structures is required in areas of special flood hazard. In Zones A1-A30, AE, AH, and in some cases Zone A, new residential construction and substantial improvements must have their lowest floor (including basement) elevated to an elevation that is 2 feet above the BFE. In cases where BFE data is not known for Zone A, new residential construction and substantial improvements must have their lowest floor elevated to 3 feet above the highest adjacent grade.

For nonresidential structures in Zones A1-A30, AE, AH, and in some cases Zone A, developers have the option of either elevating the structures or making improvements to the structure such as floodproofing the structure to 2 feet above the BFE. In cases where BFE data is not known within Zone A, new construction and substantial improvements must have their lowest floor elevated to 3 feet above the highest adjacent grade.

Recreational vehicles are only allowed in Zones A1-A30, AE, and AH if they are on site fewer than 180 consecutive days and are licensed and ready for highway use or meet the construction standards for manufactured homes. Manufactured homes in the A1-A30, AE, and AH zones must be placed on a permanent foundation with the lowest floor elevated 2 feet above the BFE. In Zone A, such structures must be placed on reinforced piers or similar elements that are at least 3 feet above the lowest adjacent grade.

4.5.4 Community Rating System

The Community Rating System (CRS) is part of the NFIP that can facilitate discounted flood insurance premiums for residents. FEMA describes the program as:

“a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the National Flood Insurance Program (NFIP).

In CRS communities, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community’s efforts that address the three goals of the program:

1. *Reduce and avoid flood damage to insurable property*

2. *Strengthen and support the insurance aspects of the National Flood Insurance Program*
3. *Foster comprehensive floodplain management"*

Residents of CRS-rated communities can be eligible for discounts of 5 percent to as much as 45 percent on flood insurance premiums, depending on various metrics related to a community's efforts to proactively mitigate flood hazards.

The Town of Hunter is currently not a CRS-rated municipality. If the town chooses to participate, recommendations that can improve the town's scoring in the CRS program include the following:

- Completion of C/LOMR/A applications as appropriate
- Elevation certificates for flood-prone structures
- Local outreach and technical assistance, hazard disclosure, and provision/publication of flood hazard information and mapping
- Conformance with local flood damage prevention code; stricter floodplain development standards than the regulatory minimum for the NFIP can improve CRS rating
- Effective and actionable flood warning and flood response plans and detailed pre-, during, and post-flood record-keeping
- Flood hazard mitigation planning and implementation
- Acquisition or relocation of flood-prone structures out of the floodplain
- Considering the potential impacts of climate change with respect to proposed floodplain development

It is recommended that HLFRC coordinate with local municipal and watershed partners to consider the Town of Hunter's participation in the CRS. Many of the requirements for modest insurance discounts may already be fulfilled by the town or at the county or state level. More significant discounts can be targeted over time. More information is available at the links below:

https://www.fema.gov/floodplain-management/community-rating-system

https://www.fema.gov/sites/default/files/documents/fema_crs-brochure_032023.pdf

5.0 Benefit-Cost Analysis

FEMA has developed specific methodologies for conducting a Benefit-Cost Analysis (BCA), which is used to validate the cost effectiveness of a proposed hazard mitigation project. A BCA is a method by which the projected benefits of a project are compared to its estimated cost to determine a benefit-cost ratio (BCR), which is calculated by a project's total net benefits divided by the total project cost. The BCR is a numerical expression of the cost effectiveness of a project. FEMA considers a project to be cost-effective when the BCR is greater than or equal to 1.0, indicating that the benefits of the project are sufficient to justify its cost.

The BCA does not include benefits that could have been generated for avoiding future street cleanup, avoided detours, avoided emergency response, etc., although these costs are often considerable. Similarly, water quality benefits may be significant but are difficult to quantify and are not directly accounted for in a FEMA BCA.

5.1 Project Areas

None of the flood hazard mitigation projects recommended in this LFA are expected to attain a BCR of 1.0 or greater, and it may therefore be difficult to obtain FEMA-linked funding for the recommended bridge, culvert, and roadway improvements.

This is largely related to the way that project benefits are quantified into cost savings. The recommended significant public infrastructure upgrades, like bridge and culvert replacements or highway improvements, are projected to be far more costly than the direct flood mitigation benefits that may be possible for a limited number of nearby properties.

Lanesville has little to no redundancy in its road network, leaving many areas susceptible to being cut off from assistance in damaging floods. The consequences of loss of access due to flooded roadways or damaged stream crossings can be represented by the BCA methods, but the true impacts to residents and emergency response capabilities can be difficult to quantify.

The applicability of the FEMA BCA is limited in these instances because it does not adequately consider the costs of certain severe but potentially indirect hazards that are faced by a small number of properties. It is also challenging to perform an accurate BCA without detailed information regarding the actual costs of historical damages.

5.2 Individual Properties

FEMA has developed precalculated benefits for acquisition and elevation of buildings located in the SFHA. The following is excerpted from a FEMA memorandum regarding Hazard Mitigation Assistance (HMA) precalculated benefits (FEMA, 2013):

"FEMA's Risk Reduction Division analyzed over 11,000 structures acquired or elevated and found that the average benefits for each project type are $276,000 and $175,000, respectively. Therefore, FEMA has determined that the acquisition or elevation of a structure located in the 100-year floodplain as delineated on the FIRM or based on best available data that costs less than or equal to the amount of benefits listed above is considered cost effective. For projects that contain multiple structures, the average cost of all structures in the project must meet the stated criterion. This methodology is available for all HMA grant programs."

Precalculated benefits have most recently been updated in July 2024, as listed below:

- Acquisitions in the SFHA: $775,411 per structure
- Elevations in the SFHA: $355,552 per structure
- Mitigation Reconstruction in the SFHA: $335,552 per structure

This dramatically simplifies the BCA process for homeowners in the SFHA if acquisition, elevation, or mitigation costs are projected to be less than these average benefit values. Homeowners would require support for any acquisitions in the form of a resolution by the Town of Hunter that identifies the property as an inundation or erosion hazard.

6.0 Project Costs and Funding Sources

6.1 Rough Order of Magnitude Cost Estimates

To assist with prioritization of the above recommendations, Table 6-1 provides an estimated range of probable construction costs for projects. Due to the conceptual nature of recommended actions and the significant amount of data required to produce a reasonable rough order of magnitude cost, it is not feasible to further quantify the cost of all actions. Costs of land acquisition and easements are not included in the costs.

Table 6-1 Estimated Cost Range of Projects

Project	$2M-$5M	$5M-$10M	>$10M
Jansen Road Bridge Replacement		X	
Wright Road Bridge Replacement		X	
Benjamin Road Bridge Replacement		X	
NY-214 Bridge over Hollow Tree Brook Replacement		X	
NY-214 Culvert over Myrtle Brook Replacement	X		
Diamond Notch Road Bridge Replacement	X		
NY-214 Resiliency Improvements			X

6.2 Funding Sources

Funding for culvert replacements and other infrastructure upgrades is often scarce in a small community. In a 2017 survey of county, city, town, and village officials in New York State conducted by Aldag et al. of Cornell University, 80 percent of responders reported that infrastructure needs contribute to local fiscal stress, and 86 percent said that fiscal stress affects local infrastructure budgeting. The consequence is that local governments that are fiscally stressed are likely to have substantial needs for infrastructure investment but must defer addressing them (Aldag, 2017). Because of this, external funding is often necessary, and a concerted effort is required to secure these grants, although small local governments may not have staff available to dedicate to these endeavors.

Several funding sources may be available for the implementation of recommendations made in this report (listed in Table 6-2). These and other potential funding sources are discussed in further detail below. Note that these may evolve over time as grants expire or are introduced.

Table 6-2 Potential Funding Source for Flood Mitigation Alternatives

Recommendation	Potential Eligibility		
	Federal	State	Local
Replacement of assessed bridges and culverts with an appropriately sized structure	FEMA	NYSDOT	Greene County, CWC, AWSMP, GCSWCD
Debris removal following floods	USACE, EWP		CWC, AWSMP, GCSWCD
Floodplain enhancements	FEMA	NYSDEC, EFC	AWSMP, GCSWCD
Install floodproofing at critical facilities	FEMA		CWC
Floodproof or relocate the most flood-vulnerable properties where there is owner interest	FEMA		CWC
Anchor fuel tanks			CWC
Feasibility study to assess individual flood mitigation alternatives for individual properties			CWC
Riparian buffer restoration projects		NYSDEC, EFC	AWSMP, GCSWCD
Emergency Restoration Technical Assistance and Engineering			AWSMP, GCSWCD
Flood-prone property buyout	FEMA		NYCDEP
Technical assistance for outreach and planning of relocation/mitigation for the community		NYS	AWSMP, GCSWCD

AWSMP = Ashokan Watershed Stream Management Program
CWC = Catskill Watershed Corporation
EFC = Environmental Facilities Corporation
EWP = Emergency Watershed Protection Program
FEMA = Federal Emergency Management Agency
GCSWCD = Greene County Soil & Water Conservation District
NYSDEC = New York State Department of Environmental Conservation
NYCDEP = New York City Department of Environmental Protection
NYSDOT = New York State Department of Transportation
USACE = United States Army Corps of Engineers

Stream Management Implementation Program Flood Hazard Mitigation Grants (SMIP-FHM)

FHM is a funding category in the SMIP for LFA communities. Municipalities may apply to implement one or more recommendations contained in their LFA and approved by the municipal board. All projects must have modeled offsite flood reduction benefits. Eligible projects include the following:

- Design/construction of floodplain restoration and reconnection
- Design/construction of naturally stable stream channel dimensions and sediment transport processes
- Design/construction of public infrastructure to reduce water velocity, flow path, and/or elevation
- Correction of hydraulic constrictions

Ineligible projects include construction of floodwalls, berms, or levees; stream dredging; routine annual maintenance; or replacement of privately owned bridges, culverts, or roads. Municipalities must apply to the SMP in their respective counties. In the Ashokan watershed, the program is implemented by AWSMP. For the Schoharie watershed, the program is implemented by GCSWCD.

Contact information is as follows:

Cornell Cooperative Extension of Ulster County
Ashokan Watershed Stream Management Program
P.O. Box 667, 3130 Route 28
Shokan, New York 12481
(845) 688-3047
Info@ashokanstreams.org

Use this link for more information: https://ashokanstreams.org/projects-and-funding/

New York City Funded Flood Buy-Out Program

The New York City Funded Flood Buy-Out Program (NYCFFBO) is a voluntary program intended to assist property owners who were not eligible for, or chose not to participate in, the FEMA flood buyout program. It is intended to operate between flood events, not as an immediate response to one. Categories of eligible properties include the following:

Hydraulic Study Properties

1. Properties identified in community LFAs
2. Anchor businesses, critical community facilities, and LFA-identified properties applying to the CWC for relocation assistance

Special Case Properties

1. Properties needed for a stream project
2. Erosion hazard properties
3. Inundation hazard properties

Risk assessments and authorization or supporting resolutions are required by the Town of Hunter for these purchases. Municipalities may choose to own and manage the properties after they are purchased and cleared of structures. Conservation easements must be given to NYSDEC, and there are limits to what may be placed on these parcels. Allowed structures may include public restrooms served by public sewers or by septic systems whose leach field is located outside the 100-year floodplain or open-sided structures such as gazebos and pavilions.

The NYCFFBO is governed by the Water Supply Permit and the Property Evaluation and Selection Process document (Process document). Communities work through outreach and assessment leads appointed by the municipality to inform potential applicants about the program and evaluate the eligibility of properties based on the program criteria established in the Process document.

Local Flood Hazard Mitigation Implementation Program

The CWC funds LFA-recommended projects to prevent and mitigate flood damage in the West of Hudson watershed, specifically to remedy situations where an imminent and substantial danger to persons or properties exists or to improve community-scale flood resilience while providing a water quality benefit.

Municipalities and individual property owners may apply directly to the CWC. Municipalities may apply for grants for projects identified in an LFA or New York Rising planning process.

Eligible LFA-derived projects could include the following:

- Alterations of public infrastructure that are expected to reduce/minimize flood damage
- Private property protection measures such as elevation or floodproofing of a structure
- Elimination of sources of man-made pollution such as the relocation or securing of fuel oil/propane tanks
- Stream-related construction (Ineligible projects include construction of floodwalls, berms, or levees; stream dredging; or annual maintenance.)
- Relocation assistance for a residence or business recommended by an LFA to a location within the same town or village

Property owners may apply for the following assistance:

- Funds for relocation of critical community facilities, such as a firehouse, school, town hall, public drinking water treatment or distribution facility, or wastewater treatment plant or collection system, which if destroyed or damaged would impair the health and/or safety of a community. Facilities must have been substantially damaged by flooding. They do NOT have to be recommended by an LFA but MUST be located in an LFA community.
- Funds for assistance to relocate homes and/or businesses within the same town where the NYCFFBO covers the purchase of a former property (does NOT have to be in an LFA community).
- Stream debris removal after a serious flood event (does NOT have to be recommended in an LFA).

Emergency Watershed Protection Program (EWP)

Through the EWP program, the U.S. Department of Agriculture's NRCS can help communities address watershed impairments that pose imminent threats to lives and property. Most EWP work is for the protection of threatened infrastructure from continued stream erosion. NRCS may pay up to 75 percent of the construction costs of emergency measures. The remaining costs must come from local sources and can be made in cash or in-kind services. EWP projects must reduce threats to lives and property; be economically, environmentally, and socially defensible; be designed and implemented according to sound technical standards; and conserve natural resources. More information about the EWP program can be found here:

https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp/

FEMA Building Resilient Infrastructure and Communities (BRIC) Program

Building Resilient Infrastructure and Communities (BRIC) will support states, local communities, tribes, and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. The BRIC program guiding principles are supporting communities through capability- and capacity-building, encouraging and enabling innovation, promoting partnerships, enabling large projects, maintaining flexibility, and providing consistency.

The BRIC program aims to categorically shift the federal focus away from reactive disaster spending and toward research-supported, proactive investment in community resilience. Examples of BRIC projects are ones that demonstrate innovative approaches to partnerships, such as shared funding mechanisms, and/or project design. Through BRIC, FEMA continues to invest in a variety of mitigation activities with an added focus on infrastructure projects benefitting disadvantaged communities, nature-based solutions, climate resilience and adaption and adopting hazard resistant building codes.

The BRIC program also offers communities, territories and tribes non-financial direct technical assistance (DTA). This support helps with hazard planning and projects. BRIC DTA does not require a previous grant subapplication or award. Communities also do not need an approved Hazard Mitigation Plan (HMP) to apply.

https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities

FEMA Pre-Disaster Mitigation (PDM) Program

The PDM program was authorized by Part 203 of the Robert T. Stafford Disaster Assistance and Emergency Relief Act (Stafford Act), 42 U.S.C. 5133. The PDM program provides funds to states, territories, tribal governments, communities, and universities for hazard mitigation planning and implementation of mitigation projects prior to disasters, providing an opportunity to reduce the nation's disaster losses through PDM planning and the implementation of feasible, effective, and cost-efficient mitigation measures. Funding of pre-disaster plans and projects is meant to reduce overall risks to populations and facilities. The PDM program is subject to the availability of appropriation funding as well as any program-specific directive or restriction made with respect to such funds.

https://www.fema.gov/pre-disaster-mitigation-grant-program

FEMA Hazard Mitigation Grant Program (HMGP)

The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The HMGP provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. A key purpose of the HMGP is to ensure that any opportunities to take critical mitigation measures to protect life and property from future disasters are not "lost" during the recovery and reconstruction process following a disaster.

The HMGP is one of the FEMA programs with the greatest potential fit to potential projects in this LFA. However, it is available only in the months subsequent to a federal disaster declaration in the State of New York. Because the state administers the HMGP directly, application cycles will need to be closely monitored after disasters are declared in New York.

https://www.fema.gov/hazard-mitigation-grant-program

FEMA Flood Mitigation Assistance (FMA) Program

The FMA program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the NFIP. FEMA provides FMA funds to assist states and communities with implementing measures that reduce or eliminate the long-term risk of flood damage to buildings, homes, and other structures insurable under the NFIP. The long-term goal of FMA is to reduce or eliminate claims under the NFIP through mitigation activities.

The Biggert-Waters Flood Insurance Reform Act of 2012 eliminated the Repetitive Flood Claims (RFC) and Severe Repetitive Loss (SRL) programs and made the following significant changes to the FMA program:

- The definitions of repetitive loss and SRL properties have been modified.
- Cost-share requirements have changed to allow more federal funds for properties with RFC and SRL properties.
- There is no longer a limit on in-kind contributions for the nonfederal cost share.

One limitation of the FMA program is that it is used to provide mitigation for *structures* that are insured or located in SFHAs. Therefore, the individual property mitigation options described in this LFA are best suited for FMA funds. Like PDM, FMA programs are subject to the availability of appropriation funding as well as any program-specific directive or restriction made with respect to such funds.

http://www.fema.gov/flood-mitigation-assistance-grant-program

It is important to note that for repetitive loss homes where the town supports buyouts, FEMA has developed precalculated benefits for acquisition and elevation of buildings. The following is excerpted from a FEMA memorandum regarding HMA precalculated benefits (FEMA, 2013).

FEMA's Risk Reduction Division analyzed over 11,000 structures acquired or elevated and found that the average benefits for each project type are $276,000 and $175,000, respectively. Therefore, FEMA has determined that the acquisition or elevation of a structure located in the 100-year floodplain as delineated on the FIRM or based on best available data that costs less than or equal to the amount of benefits listed above is considered cost effective. For projects that contain multiple structures, the average cost of all structures in the project must meet the stated criterion. This methodology is available for all HMA grant programs.

Precalculated benefits have most recently been updated in July 2024, as listed below:

- Acquisitions in the SFHA: $775,411 per structure
- Elevations in the SFHA: $355,552 per structure
- Mitigation Reconstruction in the SFHA: $335,552 per structure

Homeowners in the SFHA floodplain may qualify if relocation or elevation costs are projected to be less than these average benefit values.

The FMA Swift Current program is funded by FEMA and administered by the New York State Division of Homeland Security and Emergency Services (DHSES). Properties must have an NFIP policy and be defined as Repetitive Loss (RL), Severe Repetitive Loss (SRL), or Substantially Damaged (SD).

Swift Current funds Individual Flood Mitigation Projects for Flood Mitigation Assistance and/or NFIP-defined Repetitive Loss (RL), Severe Repetitive Loss (SRL), or properties deemed Substantially Damaged after the applicant's disaster declaration incident period start date.

Eligible Individual Flood Mitigation Projects include the following project types, which may be referenced in the Hazard Mitigation Assistance Program and Policy Guide:

- Property acquisition and structure demolition/relocation
- Structure elevations
- Dry floodproofing of historic residential structures or nonresidential structures
- Nonstructural retrofitting of existing structures and facilities
- Mitigation reconstruction
- Structural retrofitting of existing structures

For fiscal year 2024, Swift Current now offers Project Scoping as an eligible activity for applicants. Applicants may submit Project Scoping applications up to 1 percent of the total maximum set-aside, and tribes and territories applying as applicants may submit up to 5 percent. Project Scoping is considered a part of the maximum set-aside amount.

NYS Department of State

The Department of State may be able to fund some of the projects described in this report. In order to be eligible, a project should link water quality improvement to economic benefits.

U.S. Army Corps of Engineers (USACE)

The USACE provides 100 percent funding for floodplain management planning and technical assistance to states and local governments under several flood control acts and the Floodplain Management Services Program (FPMS). Specific programs used by the USACE for mitigation are listed below.

- Section 205 – Small Flood Damage Reduction Projects: This section of the 1948 Flood Control Act authorizes the USACE to study, design, and construct small flood control projects in partnership with nonfederal government agencies. Feasibility studies are 100 percent federally funded up to $100,000, with additional costs shared equally. Costs for preparation of plans and construction are funded 65 percent with a 35 percent nonfederal match. In certain cases, the nonfederal share for construction could be as high as 50 percent. The maximum federal expenditure for any project is $7 million.
- Section 14 – Emergency Stream Bank and Shoreline Protection: This section of the 1946 Flood Control Act authorizes the USACE to construct emergency shoreline and stream bank protection works to protect public facilities such as bridges, roads, public buildings, sewage treatment plants, water wells, and nonprofit public facilities such as churches, hospitals, and schools. Cost sharing is similar to Section 205 projects above. The maximum federal expenditure for any project is $1.5 million.
- Section 208 – Clearing and Snagging Projects: This section of the 1954 Flood Control Act authorizes the USACE to perform channel clearing and excavation with limited embankment construction to reduce nuisance flood damages caused

by debris and minor shoaling of rivers. Cost sharing is similar to Section 205 projects above. The maximum federal expenditure for any project is $500,000.

- Section 206 – Floodplain Management Services: This section of the 1960 Flood Control Act, as amended, authorizes the USACE to provide a full range of technical services and planning guidance necessary to support effective floodplain management. General technical assistance efforts include determining the following: site-specific data on obstructions to flood flows, flood formation, and timing; flood depths, stages, or floodwater velocities; the extent, duration, and frequency of flooding; information on natural and cultural floodplain resources; and flood loss potentials before and after the use of floodplain management measures. Types of studies conducted under FPMS include floodplain delineation, dam failure, hurricane evacuation, flood warning, floodway, flood damage reduction, stormwater management, floodproofing, and inventories of flood-prone structures. When funding is available, this work is 100 percent federally funded.

In addition, the USACE provides emergency flood assistance (under Public Law 84-99) after local and state funding has been used. This assistance can be used for both flood response and post-flood response. USACE assistance is limited to the preservation of life and improved property; direct assistance to individual homeowners or businesses is not permitted. In addition, the USACE can loan or issue supplies and equipment once local sources are exhausted during emergencies.

NYSDEC Resilient Watersheds Grant Program (RWG)

Resilient Watersheds Grant (RWG) program is a competitive, statewide grant program open to local governments, Indian Nations, County Soil and Water Conservation Districts, State agencies, and not-for-profit corporations created by the New York State Environmental Facilities Corporation (EFC) in collaboration with the Department of Environmental Conservation (DEC). The funding is for the construction/implementation of projects that build community resilience to extreme weather events, promote flood risk and ice jam reduction and/or restoration, enhance flood and climate resilience, implement natural and nature-based feature construction, or ecologically sustainable projects while supporting healthy riparian habitats. While RWG primarily focuses on implementing projects specifically identified and recommended through DEC's Resilient NY program, other projects, if evaluated in a similar manner to those undertaken through the Resilient NY program, will be considered. Qualifications include:

- Project must be evaluated hydraulically using HEC-RAS or similar modeling program.
- Where applicable, the project should incorporate future flow conditions as anticipated from climate change, including sea level rise and storm surge. This information should be incorporated into the conceptual/preliminary project design.
- The report should be prepared by a Professional Engineer licensed in New York State.

For more information on RWG, please visit the Resilient NY website page:

https://dec.ny.gov/environmental-protection/water/water-quantity/resilient-ny

Other Potential Sources of Funding

New York State Grants

All New York State grants are now announced on the NYS Grants Gateway. The Grants Gateway is designed to allow grant applicants to browse all NYS agency anticipated and available grant opportunities, providing a one-stop location that streamlines the way grants are administered by the State of New York.

https://grantsmanagement.ny.gov/

Climate Smart Communities (CSC)

Climate Smart Communities (CSC) is a New York State program that helps local governments take action to reduce greenhouse gas emissions and adapt to a changing climate. The program offers free technical assistance, grants, and rebates for electric vehicles. Registered communities have made a commitment to act by passing the CSC pledge. Certified communities are the foremost leaders in the state; they have gone beyond the CSC pledge by completing and documenting a suite of actions that mitigate and adapt to climate change at the local level.

https://climatesmart.ny.gov/

Environmental Facilities Corporation

The Environmental Facilities Corporation (EFC) helps local governments and eligible organizations undertake water infrastructure projects. EFC provides grants and financing to help ensure projects are affordable while safeguarding essential water resources. EFC administers state and federal grants as well as interest-free and low-cost financing to help minimize the tax burden for communities.

https://efc.ny.gov

The EFC's Green Innovation Grant Program (GIGP) supports projects across New York State that utilize unique Environmental Protection Agency (EPA)-designated green stormwater infrastructure design and creates cutting-edge green technologies. Competitive grants are awarded annually to projects that improve water quality and mitigate the effects of climate change through the implementation of one or more of the following green practices: Green Stormwater Infrastructure, Energy Efficiency, and Water Efficiency.

https://efc.ny.gov/gigp

Bridge NY Program

The Bridge NY program, administered by NYSDOT, is open to all municipal owners of bridges and culverts. Projects are awarded through a competitive process and support all phases of project development. Projects selected for funding are evaluated based on the resiliency of the structure, including such factors as hydraulic vulnerability and structural resiliency; the significance and importance of the bridge, including traffic volumes, detour considerations, number and types of businesses served, and impacts on commerce; and the current bridge and culvert structural conditions.

https://www.dot.ny.gov/BRIDGENY.

New York State Department of Environmental Conservation Trees for Tribs Program

NYSDEC's Trees for Tribs is a statewide program that has been working to reforest New York's tributaries. The program's goal is to plant trees and shrubs along streams to create a forested riparian (streamside) buffer that helps decrease erosion, reduce flooding damage, improve wildlife and stream habitat, and protect water quality.

https://www.dec.ny.gov/animals/77710.html

Private Foundations

Private entities such as foundations are potential funding sources in many communities. The Town of Hunter and HLFRC members will need to identify the foundations that are potentially appropriate for some of the actions proposed in this report.

In addition to the funding sources listed above, other resources are available for technical assistance, planning, and information. While the following sources do not provide direct funding, they offer other services that may be useful for proposed flood mitigation projects.

Land Trust and Conservation Groups

These groups play an important role in the protection of watersheds, including forests, open space, aquatic ecosystems, and water resources.

As the recommendations of this LFA are implemented, the Town of Hunter will need to work closely with potential funders to ensure that the best combinations of funds are secured for the proposed alternatives and for the property-specific mitigation such as floodproofing, elevations, and relocations. It will be advantageous for the town to identify combinations of funding sources in order to reduce its own requirement to provide matching funds.

7.0 Hydrologic and Hydraulic Analyses

Critical to flood mitigation analyses are estimation of flood discharges (hydrology) and evaluation of how floodwaters travel within a stream's channel and across its floodplains (hydraulics).

Implementation of any recommended projects should be accompanied by rigorous and up-to-date hydrologic and hydraulic analyses. This is especially critical in a changing climate; estimations of contemporary hydrology and projections for future flood flows should be refined based on the best available data and science at the time.

7.1 Hydrology

Hydrologic studies are conducted to understand historical, current, and potential future river flow rates, which are a critical input for hydraulic modeling software such as HEC-RAS and HY-8. These often include statistical techniques to estimate the probability of a certain flow rate occurring within a certain period of time based on data from the past; these data are collected and maintained by the USGS at thousands of stream gauging stations around the country.

For the streams without gauges, the USGS has developed region-specific regression equations that estimate flows based on watershed characteristics. These estimated flows are based on the same watershed characteristics as gauged streams in that region and are informative although not as accurate or reliable as gauge data. For the purposes of this study, we are primarily concerned with stream flows that cause flooding indicated peak (or largest value) river flow reached during a flood event.

7.1.1 Peak Flood Discharge Estimates

Peak flood discharges on Stony Clove Creek, Hollow Tree Brook, and Myrtle Brook were estimated by several methods, including analysis of USGS stream gauging records, the FEMA FIS for Greene County, and regional hydrologic regression equations for New York State. To be consistent with applicable regulatory standards related to floodplain development, flood insurance premiums, and critical decision-making for residents and municipalities, the discharges estimated for the Greene County FIS were selected for hydraulic analyses.

7.1.1.1 USGS Stream Gauging Stations

For Stony Clove Creek, a USGS Bulletin 17C flood frequency analysis (FFA) was performed for the Stony Clove Creek below Ox Clove Creek USGS gauging station in Chichester (01362370), which has 30 years of annual peak flow data. Similarly, an FFA was also conducted for the Hollow Tree Brook gauging station near the Diamond Notch Road bridge (01362342), which has a 26-year peak flow record. Estimated peak flood discharges at the gauging stations are reported in Table 7-1.

Table 7-1 Peak Flood Hydrology for Stony Clove Creek and Hollow Tree Brook at USGS Flow Gauging Stations Estimated by Flood Frequency Analysis

Flood Event	Discharge (cfs)	
	Stony Clove Creek below Ox Clove Creek 01362370 (30.9-square-mile watershed)	Hollow Tree Brook at Diamond Notch Rd Bridge 01362342 (1.95-square-mile watershed)
500-Year / 0.2% AEP	28,480	1,230
100-Year / 1% AEP	20,160	780
50-Year / 2% AEP	16,890	620
25-Year / 4% AEP	13,800	490
10-Year / 10% AEP	10,000	340
5-Year / 20% AEP	7,300	240
2-Year / 50% AEP	3,880	130

7.1.1.2 FEMA Flood Insurance Study

FEMA has produced peak flood discharges for various locations on Stony Clove Creek and Hollow Tree Brook that were estimated for the 2015 revisions to the 2008 FIS for Greene County (36039CV001B). A rainfall-runoff model of the Upper Esopus basin was created using the USACE Hydrologic Engineering Center *Hydrologic Modeling Software* (HEC-HMS) computer program and calibrated to observed flooding in August 2011 (Tropical Storm Irene), and validated using stream gauge records for floods in September 2011 (Tropical Storm Lee) and October 2005. Peak discharges for the 10-, 25-, 50-, 100-, and 500-year flood events estimated for Stony Clove Creek and Hollow Tree Brook are reported in the *Hydrologic Analysis Technical Support Data Notebook, Task Order HSFE02-10-J-0001 for Ashokan Reservoir Watershed Hydrologic Study, New York* (RAMPP, 2012) as well as the FIS report. Flood hydrology for Myrtle Brook is not reported, although the basin was included in the HEC-HMS model. NYCDEP SMP has provided this model to SLR, and the estimated discharge from the Myrtle Brook watershed was obtained from the simulation results. Peak flood hydrology determined from this hydrologic model for the Lanesville LFA area is presented in Table 7-2.

Table 7-2 Peak Flood Hydrology for Sites on Stony Clove Creek, Hollow Tree Brook, and Myrtle Brook Estimated with Hydrologic Modeling by FEMA

Discharge (cfs)								
Stream		Stony Clove Creek				Hollow Tree Brook		Myrtle Brook
Location		At Greene-Ulster County Line	Above Hollow Tree Brook	Below Myrtle Brook	Above Myrtle Brook*	Above Stony Clove Creek	At Diamond Notch Road	Above Stony Clove Creek*
Watershed Area (square miles)		16.3	9.3	4.4	2.6	4.6	2.0	1.81
Flood Event	500-Year / 0.2% AEP	25,736	14,853	11,187	7,770	8,362	3,579	3,467
	100-Year / 1% AEP	13,863	8,031	6,033	4,185	4,553	1,950	1,883
	50-Year / 2% AEP	10,216	5,913	4,420	3,068	3,360	1,443	1,388
	25-Year / 4% AEP	7,451	4,280	3,180	2,206	2,440	1,051	1,007
	10-Year / 10% AEP	4,634	2,647	1,946	1,350	1,517	658	626

* Flows at these locations are not reported in Greene County FIS and were obtained directly from hydrologic model results.

7.1.1.3 USGS Regionalized Regression Equations for New York State

Regional regression equations developed for New York State by USGS in 2006 were also referenced to estimate flood hydrology for Stony Clove Creek, Hollow Tree Brook, and Myrtle Brook; the watersheds fall within Hydrologic Region 2. These regressions are documented in USGS SIR 2006-5112, *Magnitude and Frequency of Floods in New York* (Lumia et al, 2006). The full regression equations for Hydrologic Region 2 are based on drainage area, basin storage, basin lag factor, and mean annual runoff and were computed using USGS's *StreamStats* web service. These regional regression equations are a valuable tool for assessing hydrology, especially when no other reliable data sources are available.

The SIR 2006-5112 report also includes a method for weighting the results of FFA of gauge records with results of regional regressions based on average equivalent years of record of the gauging stations used to develop the regressions. The purpose of this technique, described in Equation (3) for gauged sites, is to improve the reliability of FFA results for gauging stations with limited periods of record. Area-weighted, region-specific transfer equations were also developed for SIR 2006-5112 that can be used to scale estimated peak flows from one location to another along a stream or within the watershed.

7.1.2 Projected Future Flood Hydrology

While modern hydrology is an important component of this assessment, significant infrastructure improvements, like bridge replacements, are typically designed to be in service for up to a century. Therefore, consideration of projected future flood scenarios that account for climate change and projected increased severity of extreme weather events over the lifetimes of any proposed projects is necessary.

The New York State Community Risk and Resiliency Act (CRRA) requires consideration of the effects of climate risk and extreme weather events for state-funded projects. CRRA guidance states that, to the extent practicable, public infrastructure projects should be sited, designed, and constructed to prevent and minimize damage associated with future flooding.

NYSDOT hydraulic design standards require bridge and culvert performance to be evaluated with respect to projected future flood scenarios. Critical criteria include a minimum of 2.0 feet of freeboard in the projected future 50-year flood and for the proposed bridge to clear the projected future 100-year flood without impacting the low chord (NYSDOT, 2021a). Culvert performance is evaluated by the ratio of headwater depth to culvert diameter (or rise) (NYSDOT, 2021b). For NYSDOT Region 1, where Lanesville is located, NYSDOT Hydraulic Design Criteria for estimating projected future flows dictate that the current peak 50- and 100-year flood flows estimated by the USGS *StreamStats* tool (2006 regional regressions) should be increased by 20 percent (NYSDOT, 2021a,b).

This standard was developed based on an assessment of statewide future flood hydrology projections estimated using the USGS *Future Flows Explorer* tool for New York State. Development of this tool is described in USGS OFR 2015-1235 (Burns et al., 2015). The tool computed projected changes in either mean annual runoff or mean annual precipitation for a watershed under various climate scenarios based on five climate models and applied these values to the respective variables used in the *StreamStats* regressions equations for that region. However, this method does not account for projected changes in individual storm intensity, which may be more relevant to flood hydrology than annualized averages of rainfall or runoff.

SLR has developed an alternative approach to estimate future flood hydrology based on the existing calibrated and validated HEC-HMS hydrologic model of the Upper Esopus Creek watershed (upstream of Ashokan Reservoir), which was originally developed for the 2016 revisions to the 2009 FEMA FIS for Ulster County (36111CV001B). This model was provided to SLR by NYCDEP Stream Management Program (SMP). Future flood hydrology for Esopus Creek and Stony Clove Creek in Phoenicia was estimated by modifying the hydrologic modeling of the Ashokan Reservoir watershed to account for projected future changes in rainfall intensity.

Rainfall depths used to determine current flood discharges in this model were adjusted to reflect a range of potential future scenarios based on projected precipitation intensity-duration-frequency (IDF) curves for New York State developed by the Northeast Regional Climate Center (NRCC) (DeGaetano and Castellano, 2015, 2017). A distinct advantage of these projections is that they are associated with individual storm events rather than annual statistics.

The projected IDF curves from NRCC are based on a suite of four regional climate model (RCM) and 25 downscaled global climate model (GCM) outputs for New York State for two emissions scenarios –, RCP 8.5 (“high emissions scenario”) and RCP 4.5 (“low emissions scenario”). IDF data were retrieved for the Slide Mountain weather station, located approximately 7 miles southwest of the hamlet of Phoenicia, for the projected 50- and 100-year recurrence intervals and 24-hour duration storms in the 2070 to 2099 time period for both emissions scenarios as well as for observed precipitation from 1970 to 1999 at the same station. The 2070 to 2099 time period was selected to reflect conditions that might be experienced over the typical design lifetime of significant infrastructure such as bridges.

The mean historical precipitation intensity data were compared to the mean and the 10^{th} and 90^{th} percentiles of the climate model projections for future conditions under the RCP 4.5 and

RCP 8.5 scenarios. Because there is considerable uncertainty associated with these projections, the mean values were bounded by the 10th and 90th percentile values so that a range of risk levels associated with future flooding can be evaluated.

The computed percent changes from historical to future at the Slide Mountain station were applied to the current precipitation depths used by FEMA in the HEC-HMS model to develop a range of potential future 50- and 100-year flood discharges in Lanesville, shown in Table 7-3 and Table 7-4, respectively.

Table 7-3 Estimated 100-Year Flood Discharges for Future Climate Scenarios in Lanesville

Climate Scenario	Projection	100-Year/1% AEP Flood Discharge (cfs)						
		Stony Clove Creek				Hollow Tree Brook		Myrtle Brook
		At Greene-Ulster County Line	Above Hollow Tree Brook	Below Myrtle Brook	Above Myrtle Brook	Above Stony Clove Creek	At Diamond Notch Road	Above Stony Clove Creek
Current	**FEMA**	13,863	8,031	6,033	4,185	4,553	1,950	1,883
RCP 4.5	10th Percentile	14,910	8,620	6,480	4,490	4,880	2,090	2,020
	Mean	17,040	9,810	7,380	5,120	5,540	2,370	2,300
	90th Percentile	21,830	12,530	9,430	6,550	7,060	3,020	2,930
RCP 8.5	10th Percentile	15,430	8,920	6,700	4,650	5,040	2,160	2,090
	Mean	19,210	11,020	8,290	5,750	6,210	2,660	2,570
	90th Percentile	24,990	14,370	10,830	7,520	8,090	3,460	3,360

Table 7-4 Estimated 50-Year Flood Discharges for Future Climate Scenarios in Lanesville

Climate Scenario	Projection	50-Year/2% AEP Flood Discharge (cfs)						
		Stony Clove Creek				Hollow Tree Brook		Myrtle Brook
		At Greene-Ulster County Line	Above Hollow Tree Brook	Below Myrtle Brook	Above Myrtle Brook	Above Stony Clove Creek	At Diamond Notch Road	Above Stony Clove Creek
Current	**FEMA**	10,216	5,913	4,420	3,068	3,360	1,443	1,388
RCP 4.5	10th Percentile	10,760	6,230	4,670	3,240	3,540	1,520	1,460
	Mean	12,180	7,060	5,310	3,680	4,020	1,720	1,660
	90th Percentile	15,240	8,810	6,620	4,590	4,980	2,130	2,060
RCP 8.5	10th Percentile	11,250	6,510	4,880	3,390	3,700	1,590	1,530
	Mean	14,260	8,220	6,180	4,280	4,660	2,000	1,930
	90th Percentile	18,390	10,590	7,970	5,520	5,970	2,560	2,480

This analysis suggests that for the mean of the RCP 4.5 climate projections, peak 100-year flood discharge on Stony Clove Creek, Hollow Tree Brook, and Myrtle Brook may increase by about 22 percent by 2099, with 50-year peak flood discharges increasing by about 20%. Estimated mean increases for the RCP 8.5 scenario are nearly 40 percent. Significant uncertainty is associated with these projections, and the assessed increase in 100-year peak discharge may range from about 7 percent (RCP 4.5, 10th percentile precipitation intensity increase) to about 80 percent (RCP 8.5, 90th percentile precipitation intensity increase). For this reason, these ranges of projections were modeled to facilitate assessment of probable future flooding risks.

7.2 Hydraulics

To assess flood mitigation alternatives, effective FEMA one-dimensional HEC-RAS hydraulic models were obtained from NYCDEP SMP for areas of the Stony Clove Creek watersheds. Between 2022 and 2024, SLR has also developed two-dimensional hydraulic modeling for reaches of Hollow Tree Brook and Stony Clove Creek that were used as part of this analysis as well.

Effective FEMA modeling for Stony Clove Creek and Hollow Tree Brook was completed as part of the 2015 revisions to the 2008 Greene County, New York, FIS (36039CV001B). The Stony Clove Creek HEC-RAS model extends from approximately 500 feet upstream of NY-214 near Notch Inn Road to the confluence with Esopus Creek. The Hollow Tree Brook model extends from approximately 0.3 miles upstream of the Diamond Notch Road bridge to the confluence with Stony Clove Creek. Note that HEC-RAS hydraulic modeling was not developed by FEMA for Myrtle Brook. A model was created for Hollow Tree Brook; however, neither NYCDEP, NYSDEC, nor the FEMA Engineering Library appear to possess a copy of this model. To address this data gap, SLR has developed new one- and two-dimensional models for Hollow Tree Brook.

Hydraulic analyses for the above-listed watercourses were conducted using the HEC-RAS computer software. This program was developed by the USACE Hydrologic Engineering Center and is the industry standard for riverine flood analysis. The model is used to compute water surface profiles for one- and two-dimensional, steady- and unsteady-state flow conditions.

Model geometry was based on a combination of surveyed channel cross sections included in effective FEMA modeling, field measurements and survey by SLR, and light detection and ranging (LiDAR)-derived topographic mapping from the NYS Geographic Information System (GIS) Clearinghouse. Roughness coefficients were applied to the model domain based on field observations and aerial orthophotography.

The Myrtle Brook culvert on NY-214 is outside of the area covered by HEC-RAS modeling and was modeled with the Federal Highway Administration's (FHWA) HY-8 Culvert Hydraulics Analysis Program (Version 7.80.0.2; FHWA, 2022). This software uses several input parameters to perform hydraulic calculations for structures but with limited contextual data relative to the surrounding stream. For this reason, these models are relatively simple and useful for approximate sizing of culverts but are not substitutes for complete hydraulic analyses of proposed culvert upgrades, especially if projects are expected to impact flow dynamics beyond their immediate vicinity.

For HY-8 models, culvert geometry, including dimensions of the hydraulic opening, barrel material, slope, and inlet configuration as well as roadway embankment characteristics and stream channel profile and cross sections were measured in the field. Culvert capacity and potential roadway overtopping were then assessed.

8.0 References

Aldag, Austin M., Warner, M.E., Kim, Y., 2017. "What causes local fiscal stress? What can be done about it?" Cornell University: Department of City and Regional Planning.

Chow, V.T., 1959. *Open Channel Hydraulics*, Blackburn Press, Caldwell, NJ.

Dahl, T.E. 1990. Wetland Losses in the United States ~ 1780s to 1980s. U.S. Department of the Interior, Fish & Wildlife Service, Washington. D.C. 13pp.

FEMA, 2008. Flood Insurance Study, Greene County, New York (All Jurisdictions). Federal Emergency Management Agency Flood Insurance Study Number 36039CV001A. Effective May 16, 2008, Revised June 2, 2015.

FHWA, 2022. HY-8 v. 7.80.0.2. Federal Highway Administration.

GCSWD and NYCDEP, 2005. The Stony Clove Creek Stream Management Plan. NYCDEP.

Isachsen, Y.W., Landing, E., Lauber, J.M., Rickard, L.V., and Rogers, W.B., 2000. Geology of New York: A Simplified Account. New York State Museum/Geological Survey, Albany, New York.

Lumia, R., D. Freehafer, and M. Smith, 2006. Magnitude and Frequency of Floods in New York. Scientific Investigations Report 2006–5112. U.S. Geological Survey, in Cooperation with the New York State Department of Transportation, Troy, NY.

Miller, S. and D. Davis, 2003. Identifying and Optimizing Regional Relationships for Bankfull Discharge and Hydraulic Geometry at USGS Gauging Stations in the Catskill Mountains, NY. NYCDEP Technical Reports. NYCDEP.

Mulvihill, C., Baldigo, B., Miller, S., and DeKoskie, D., 2009. Bankfull Discharge and Channel Characteristics of Streams in New York State. USGS Scientific Investigations Report 2009-5144, U.S. Geological Survey, Reston, VA.

NYCDEP, 2014. NYC Watershed Stream Management Program Local Flood Analysis (LFA) Program Rules, Final Version.

NYCDEP, 2022. Upper Esopus Creek Watershed Turbidity and Suspended Sediment Monitoring Study: Mid-Term Study Report November 2022, Valhalla, NY.

NYSDOT, 2021a. New York State Department of Transportation Bridge Manual 2021.

NYSDOT, 2021b. New York State Department of Transportation Highway Design Manual – Chapter 8: Highway Drainage Revision 97, June 9, 2021.

USACE, 2024. Hydrologic Engineering Center *River Analysis System* (HEC-RAS) (V. 6.5). U.S. Army Corps of Engineers, Hydrologic Engineering Center, Davis, CA.

United States Department of Agriculture, 2006. Soil Survey of Greene County, NY.

U.S. Fish & Wildlife Service, 2021. National Wetlands Inventory (NWI). U.S. Department of Interior, Fish and Wildlife Service, Washington D.C. https://www.fws.gov/wetlands/data/Mapper.html

U.S. Geological Survey, (n.d.). New York Geologic Map Data. USGS Mineral Resources Program. https://mrdata.usgs.gov/geology/state/state.php?state=NY

U.S. Geological Survey, 2016. National Land Cover Database (NLCD) Land Cover, New York. U.S. Department of Interior, Sioux, SD. https://cugir.library.cornell.edu/catalog/cugir-009031

USGS, 2019. Guidelines for Determining Flood Flow Frequency – Bulletin 17C. U.S. Geological Survey Techniques and Methods 4-B5.

USWRC, 1982. Guidelines for Determining Flood Flow Frequency (Bulletin #17b). Interagency Advisory Committee on Water Data, U.S. Geological Survey, Reston, VA.

Ver Straeten, C.H., 2013. Beneath it all: bedrock geology of the Catskill Mountains and implications of its weathering. Annals of the New York Academy of Sciences. Albany, NY.

142.17020.00003.jn1925.rpt

Appendix A Communications with NYSDOT Regarding Damage to Route 214

Hamlet of Lanesville

Local Flood Analysis

Town of Hunter, New York

SLR Project No.: 142.17020.00003

June 19, 2025

KATHY HOCHUL
Governor

MARIE THERESE DOMINGUEZ
Commissioner

PATRICK S. BARNES, P.E.
Regional Director

January 31, 2022

Evan Hogan
New York State Department of Environmental Conservation
1130 North Westcott Road
Schenectady, NY 12306-2014

RE: Request for Additional Information
DEC #4-1936-00435/00001
USACE NAN-2019-01242-UDE
PIN 1810.17 (D264279)
Route 214 at Stony Clove Creek
Emergency Bank Stabilization
Town of Hunter, Greene County

Dear Mr. Hogan,

The New York State Department of Transportation (NYSDOT) received your Request for Additional Information (RFAI) on January 21, 2022. NYSDOT has reviewed the RFAI and provides the following responses:

1. “NYCDEP has concerns regarding the proposed encroachment of the heavy stone fill 6 feet into the channel. The channel narrows abruptly at this location and this degree of intrusion could cause increased scour to the stream bed and left bank. NYCDEP has gone to great lengths to map clay exposures in the channel of the Stony Clove Creek and initiate large projects to prevent scour of these deposits that cause increased turbidity discharges to the Ashokan Reservoir. NYCDEP is currently checking with the Stream Management group to see if any clay has been found in the vicinity of this project that could be further exposed by increased bed scour. Additional comments may follow.”

> **NYSDOT Response:** Based on a review of annual aerial photography and various site visits, the stream channel at this location has fluctuated and re-aligned multiple times over the past few years. The proposed bank stabilization will temporarily narrow the stream and is expected to cause the stream to widen on the other side of the channel (and upstream right at the bend). Having the stream re-align itself, as it has done in the past, is preferred over NYSDOT excavating and widening the stream ourselves. The streambed at the project location is composed of old rip rap, cobbles, pebbles, and gravel with no obvious clay exposures. However, it is unknown if the bank opposite the proposed project location is an area that NYCDEP has identified as having clay and the potential for clay exposure.

2. “Clearly, increased velocities caused by the narrowing of the channel at this location could cause or exacerbate nick points that lead to channel incisement in the immediate vicinity and downstream. NYCDEP recommends that NYSDOT consider a stacked rock wall that is built into the shoulder of the road and does not encroach on the channel dimensions. NYSDEC Request: Please provide a response indicating if this recommended alternative was considered during design and if it would be feasible. If not, please detail the reasons why and indicate how the current proposal will protect against destabilizing the stream bed or opposite bank.”

NYSDOT Response:

A. The stream channel is narrower and deeper at this location than upstream and downstream due to the stream’s severe angle of impact with the road embankment and the downward-directed scour at the toe of slope. It is possible to widen the channel by approximately 6 feet by excavating along the east bank and immediately upstream of the main impact area, but we are not sure of the necessity of doing this. It will be difficult to accomplish such an excavation from the roadway given the reach of the excavators available to the contractor.

   In the immediate vicinity of the 90-degree bend in the stream, we believe that the placement of the heavy stone fill buttress will cause the stream to widen itself proportionally to the east, recreating a channel of approximately the same width as exists currently. The bank and adjacent point bar material to the east is mainly cobble, pebble and gravel. The stream should adjust itself in that direction with relative ease within a year. The stream widens to approximately 60 feet just downstream of the sharp bend, so the degree of encroachment of the proposed stone fill along the toe represents a smaller proportion of the total stream width in that area.

   We did not identify exposed clay rocks or lenses during field observation of the substrate and channel in the project area (from the double pipe culvert downstream to the County line), which contrasts with the stream reach near and just upstream of the section of Route 214 damaged by the Christmas 2020 flooding. We expect the amount of bed material that will be carried downstream by the adjustment of the channel post-installation of the heavy stone fill along the toe will be minor in comparison to the tremendous volume of bedload transported by Stony Clove Creek through this area during elevated flows each year.

   NYSDOT proposes to allow the channel of Stony Clove Creek to adjust itself naturally after the installation of the stone fill. We do not think that the channel will react to the placement of the stone fill along the west bank by forming head-cuts or nick-points that migrate upstream, or otherwise de-stabilize the channel. There is currently not a nick point or abrupt elevation drop just upstream of the scour pool along Route 214 at the 90-degree bend, and that should continue to be the case once the stream adjusts to the placement of the fill along the toe.

B. NYSDOT evaluated the stacked rock wall option and deemed it unfeasible at this location. NYSDOT Geotechnical engineers avoid the application of such walls underneath our roads as it creates hard spots, which causes uneven settlements and increases the likelihood of road failure. The stacked rock wall option would also allow stream water to directly penetrate the ground under Route 214 which would cause fine material loss and significant damage to the road. The effects of installing the

Stone Fill buttress should be temporary and minor compared to the erosion and bedload moving events encountered on this stream each year.

Cost and traffic concerns were also considered when evaluating the bank stabilization options. NYSDOT estimates that installing a vertical stacked stone wall under the road shoulder would cost approximately 1.5-2 times as much as installing the Heavy Stone Fill buttress and would require a closure of one lane of Route 214 for about a month (with alternating one-way traffic and signal). NYSDOT's preferred alternative is to proceed with the placement of the proposed Heavy Stone Fill buttress.

3. "Turbidity curtains do not function well in flowing channels and the Blue Book specifically does not recommended their use in these situations. NYCDEP recommends that NYSDOT consider other possibilities for turbidity control before the project begins so in the event the curtain fails, the contractor has options. <u>NYSDEC Request</u>: Please provide an explanation of what, if any, other turbidity control measures were considered. Additionally, please provide a contingency plan indicating what will be done in the event the turbidity curtain fails."

NYSDOT Response: After review of the proposed soil and erosion controls, NYSDOT is recommending not placing any control measures for this project. As noted, a turbidity curtain placed in a flowing stream is not recommended. The placement of the heavy stone fill along the eroded streambed is not anticipated to disturb the stream bed or create turbidity as the channel is all cobbles and old rip rap at this location, not loose clay. Any placement of a rock coffer or other type of control would cause a disturbance and turbidity in the stream. NYSDOT is not planning on any excavation or keying of any of the rock. We would simply be placing rock along the eroded streambed from the road embankment with the use of an excavator. NYSDOT would monitor site conditions and not plan for any work during high flows that would create turbidity within the stream channel. Due to the removal of the soil and erosion controls, NYSDOT is no longer proposing the 370 linear feet of temporary impacts below ordinary high water.

4. "There is woody debris in the channel at this location. Please clarify if this material will be removed and if any grading of the channel will be performed as part of this project."

NYSDOT Response: NYSDOT is not proposing to remove the woody debris or excavate in the channel at this time. The subject woody debris is too far from the road to remove with the equipment expected to be available. The debris is also farther into private property. We can consider removal of this debris as part of future work that will be focused upstream near the Christmas 2020 storm damage area.

Other than the removal of the 370 linear feet of temporary impacts below ordinary high water, there are no changes to impact quantities from NYSDOT's PCN application submission.

Thank you for your review. If you have additional questions or comments, please contact Loretta McNamee or myself using the information below:

Loretta McNamee, Environmental Specialist I
Region 1 Design, LAES Unit
50 Wolf Road, POD 2-3
Albany, New York 12232
Phone: (518) 457-7818
E-mail: Loretta.McNamee@dot.ny.gov

John L. Hallock, Jr.
Regional Environmental Unit Supervisor
NYS Department of Transportation Region 1
Region 1 Design -Landscape Architecture/Environmental Services Unit
Phone: (518) 457-4945
E-mail: John.Hallock@dot.ny.gov

cc: Andrea Becker, NYSDOT
Joe Damrath, NYDEP
Christine Delorier, US Army Corps of Engineers, New York District
Adam Doan, Ulster County Soil and Water Conservation District
Joel Dubois, Greene County Soil and Water Conservation District
Timothy Knill, NYSDOT R1
Steve Radzyminski, NYSDOT R1
Steve Shepard, NYSDOT
Jeffrey Strassenburg, NYSDEC R4 BEH
LAES Project File

Attachment: January 21, 2022 RFAI letter from DEC

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Permits, Region 4
1130 North Westcott Road, Schenectady, NY 12306-2014
P: (518) 357-2069 | F: (518) 357-2460
www.dec.ny.gov

Transmitted Electronically

January 21, 2022

New York State Department of Transportation
Attn: Loretta McNamee
Region 1 Design, LAES Unit
50 Wolf Road, POD 2-3
Albany, NY 12232
Loretta.McNamee@dot.ny.gov

RE: Request for Additional Information
DEC #4-1936-00435/00001
Emergency Bank Stabilization
Stony Clove Creek (RM 214-1302-1000)
Ulster/Greene County Line up to C130109
Town of Hunter, Greene County

Dear Loretta McNamee:

On January 14, 2022, we received your application to complete emergency bank stabilization along approximately 350 linear feet of the Stony Clove Creek, a Class B(TS) stream, and an Unnamed Tributary to the Stony Clove Creek, with heavy stone fill to protect Route 214 in the Town of Hunter, Greene County. Upon receipt of the application materials, the Department coordinated with the New York City Department of Environmental Protection (NYCDEP) and received the following comments (below). Please submit additional information as described below to complete your application.

- NYCDEP has concerns regarding the proposed encroachment of the heavy stone fill 6 feet into the channel. The channel narrows abruptly at this location and this degree of intrusion could cause increased scour to the stream bed and left bank. NYCDEP has gone to great lengths to map clay exposures in the channel of the Stony Clove Creek and initiate large projects to prevent scour of these deposits that cause increased turbidity discharges to the Ashokan Reservoir. NYCDEP is currently checking with the Stream Management group to see if any clay has been found in the vicinity of this project that could be further exposed by increased bed scour. Additional comments may follow.

- Clearly, increased velocities caused by the narrowing of the channel at this location could cause or exacerbate nick points that lead to channel incisement in the immediate vicinity and downstream. NYCDEP recommends that NYSDOT consider a stacked rock wall that is built into the shoulder of the road and does not encroach on the channel dimensions.

- o NYSDEC Request: Please provide a response indicating if this recommended alternative was considered during design and if it would be feasible. If not, please detail the reasons why and indicate how the current proposal will protect against destabilizing the stream bed or opposite bank.

- Turbidity curtains do not function well in flowing channels and the Blue Book specifically does not recommended their use in these situations. NYCDEP recommends that NYSDOT consider other possibilities for turbidity control before the project begins so in the event the curtain fails, the contractor has options.
  - o NYSDEC Request: Please provide an explanation of what, if any, other turbidity control measures were considered. Additionally, please provide a contingency plan indicating what will be done in the event the turbidity curtain fails.

- There is woody debris in the channel at this location. Please clarify if this material will be removed and if any grading of the channel will be performed as part of this project.

Once we receive this additional information, we will continue our review of your application.

Please feel free to contact me by telephone at (518) 357-2454 or by e-mail at Evan.Hogan@dec.ny.gov if you have any questions or concerns.

Sincerely,

Evan H. Hogan

Evan H. Hogan
Environmental Analyst

cc: J. Strassenburg, NYSDEC R4 BEH
C. Delorier, USACE
J. Damrath, NYCDEP
J. Hallock, NYSDOT

TOWN OF HUNTER

P.O. BOX 70, 5748 ROUTE 23A, TANNERSVILLE, NY 12485

518-589-6150 PH/FAX

Sean Mahoney
Town of Hunter Supervisor
5748, Route 23A
Tannersville, NY, 12485
April 1st, 2022

Stephen Clinton PE
Regional Director of Operations
New York State Department of Transportation – Region 1
50 Wolf Road
Albany, NY 12232

Dear Mr. Clinton,

As Town Supervisor, I recently spoke with a group of residents in Lanesville relating to their concerns arising from the emergency work being completed along NYS Route 214 in Lanesville near the Ulster County line.

Yesterday on March 31st, I visited the site along with Town of Hunter Highway Superintendent John Farrell, and Town of Hunter Highway employee Michael Siatkowski along with Josh Woolheater, a Lanesville resident and officer of the Stony Clove Rod and Gun Club which is located on the opposite side of SR 214 where this work is being completed.

Upon arrival we spoke with Bob, a NYS DOT employee who appeared to be the work foreman at that location. He was very helpful explaining the emergency work that was done by Reale Construction and overseen by NYS DOT.

The purpose of this letter is to address our concerns that the approach being taken here is one of repeated temporary solutions and not designing or addressing a long-term solution. With repeated emergency fixes taking place, this inconveniences our community on a regular and ongoing basis and disrupts a major artery between our community and Ulster County, negatively impacting our residents and local businesses.

After inspecting the work that was done, The Town of Hunter has the following questions that we hope you can answer.

1. How many emergency contracts do you have on file that have been issued to repair that stretch of state highway along SR 214? Our recollection is that there have been several.
    a. Can you please supply copies of these dated emergency work orders to us?

2. We noticed several downed trees laying across the Stony Clove Creek that would appear to impede the flow of water when water levels will inevitably rise and possibly cause the stream to jump the stream bank again. See supplied photos.
    a. We were told that emergency repair workers were told not to remove those trees, and we are wondering why?
3. The concrete double culvert that runs underneath SR 214 looks very old and it is our opinion this will also impede water flow during times of heavy rain and runoff. Our opinion is that a box culvert or something wider would serve this area much better.
4. We were told that the rip rap stone that is meant to armor against erosion alongside SR 214 was not “keyed” in, and only laid over the top of the finer gravel which seems to us to be less than ideal and less secure during times of heavy flooding.
5. Has NYSDOT, NYS DEC or NYC DEP ever studied the flow of water along that stretch that abuts SR 214 in the time after Hurricane Irene?
    a. If so, has there ever been discussion of V-Bars being placed within the stream corridor to better control the flow of the Stream?

The goal of this letter is to better understand the situation on SR 214 and to protect the health, safety and property of our Lanesville residents, along with the critically important connection that SR 214 provides between the Town of Hunter and the Town of Shandaken in Ulster County.

I would like to thank your team, and Reale Construction for the professional work that they did and accommodating our visit yesterday.


One of several trees appearing to impede water flow across Stony Clove Creek where work swas completed.


More trees in stream bed, and area
where creek runs directly into
SR214 into laid stone which is
meant to armor the road.


Aged concrete double culvert where we feel
a box culvert will likely serve much better
for water flow.

I appreciate your response to these questions and our concerns and would be happy to meet with you and other stakeholders in person to discuss further.

Sincerely,

Sean Mahoney
Town of Hunter Supervisor.

Cc: Demassio, Steve (DOT), Denison, Charles (DOT), Clinton, Steve (DOT), Miles, Dan (DOT) John Farrell – Town of Hunter Highway Superintendent, Larry Gardner – Town Attorney, Shaun Groden – Greene County Administrator, Town of Hunter Town Board, Michelle Yost – GCSWD, Patrick Ryan – Ulster County Executive, Peter DiSclifani – Town of Shandaken Supervisor

KATHY HOCHUL
Governor

MARIE THERESE DOMINGUEZ
Commissioner

PATRICK S. BARNES, P.E.
Regional Director

April 19, 2022

The Honorable Sean Mahoney
Town of Hunter Supervisor
5748, Route 23A
Tannersville, NY, 12485

RE: Route 214 / Stony Clove Creek Emergency Repairs

Dear Supervisor Mahoney:

Thank you for your letter expressing your concerns regarding recent emergency repairs that New York State Department of Transportation (NYSDOT) has made on Route 214 and the desire for a long-term solution for this section of Route 214.

NYSDOT has made emergency repairs to this section of Route 214 on several occasions due to damage caused by the Stony Clove Creek flooding dating back to 2006. After the most recent damage caused by flooding on December 25, 2020, NYSDOT made emergency repairs to the roadway and adjacent roadway embankment to reopen the road to two lanes as soon as possible. Plans at that time were to pursue a more involved stream stabilization project of the Stony Clove Creek in this area.

NYSDOT has received comments on the original design of the stream stabilization project from the required environmental permitting agencies. Based on those comments, modifications were required to the design. The emergency work, that was just completed, was required to stabilize the highway embankment and reduce the risk of further damage to Route 214 while the necessary environmental permits can be obtained, and the final design of the stream stabilization project is completed by NYSDOT.

In addition, this section of the Stony Clove Creek is located on private property. While NYSDOT can enter on private property under Section 45 of the Highway Law to address an immediate threat to the highway, a more involved stream stabilization project requires NYSDOT to follow the proper land acquisition process. This limitation on entering private property was also the reason why the downed trees you observed were not removed.

While NYSDOT is actively pursuing a stream stabilization project to protect Route 214, the proposed work will be limited to the area that will directly have an impact on Route

214. If you have any additional questions, please do not hesitate to contact me at (518) 457-9878 or Stephen DeMassio, Greene County Resident Engineer at (518) 622-9312.

If you should have any detail questions on the stream stabilization project, Michael Cukrovany is the Regional Design Engineer and can be reached at (518) 457-9585.

Sincerely,

Stephen Clinton

Stephen Clinton, P.E.
Regional Director of Operations

Cc: all via email
John Farrell, Town of Hunter Highway Superintendent
Larry Gardner, Town Attorney
Shaun Groden, Greene County Administrator
Michelle Yost, GCSWD
Patrick Ryan, Ulster County Executive
Peter DiSclifani, Town of Shandaken Supervisor
Patrick Barnes, Region Director, Region 1 DOT
Michael Cukrovany, Regional Design Engineer, Region 1 DOT
Stephen DeMassio, Greene County Resident Engineer, Region 1 DOT
John Hallock, Environmental Specialist 2, Region 1 DOT

Making Sustainability Happen