Local Flood Analysis

Town of Conesville
Schoharie County, New York
June 30, 2017

MILONE & MACBROOM®

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MMI #2884-08-06

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ABBREVIATIONS/ACRONYMS

BCA	Benefit-Cost Analysis
BCR	Benefit-Cost Ratio
BFE	Base Flood Elevation
CDBG	Community Development Block Grant
CFS	Cubic Feet per Second
CWC	Catskill Watershed Corporation
DEC	Department of Environmental Conservation
DEMS	Digital Elevation Models
DFIRM	Digital Flood Insurance Rate Map
EPA	Environmental Protection Agency
EWP	Emergency Watershed Protection
FAD	Filtration Avoidance Determination
FEMA	Federal Emergency Management Agency
FGEIS	Final Generic Environmental Impact Statement
FHMIP	Flood Hazard Mitigation Implementation Program
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
FPMS	Floodplain Management Services
GCSWCD	Greene County Soil and Water Conservation District
GIS	Geographic Information System
HEC-RAS	*Hydrologic Engineering Center – River Analysis System*
HEC-SSP	*Hydrologic Engineering Center – Statistical Software Package*
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
LFA	Local Flood Analysis
LiDAR	Light Detection and Ranging
MKMP	Manor Kill Management Plan
MMI	Milone & MacBroom, Inc.
NFIP	National Flood Insurance Program
NFIRA	National Flood Insurance Reform Act
PDM	Pre-Disaster Mitigation
NRCS	Natural Resource Conservation Service
NYCDEP	New York City Department of Environmental Protection
NYCFFBO	New York City Funded Flood Buyout Program
RFC	Repetitive Flood Claims
SALT	Schoharie Area Long Term, Inc.
SCSWCD	Schoharie County Soil and Water Conservation District
SFHA	Special Flood Hazard Area
SMIP-FHM	Stream Management Implementation Program – Flood Hazard Mitigation Grants
SMP	Stream Management Plan
SRL	Severe Repetitive Loss
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey

WOH	West of the Hudson River
WI/PWL	Waterbody Inventory/Priority Waterbodies List

EXECUTIVE SUMMARY

The Conesville Flood Commission has retained Milone & MacBroom, Inc. (MMI) to complete a Local Flood Analysis (LFA) in the town of Conesville, New York. The LFA evaluates flood risks and assesses potential mitigation measures aimed at reducing flood inundation and the associated damages and water quality impairment that may occur due to floods. The LFA is a program within the New York City water supply watersheds initiated following Tropical Storm Irene to help communities identify long-term, cost-effective projects to mitigate flood hazards.

The Manor Kill is the primary source of flooding in Conesville. As part of its scope of services for the Conesville LFA, MMI collected survey data and created hydraulic models for the purposes of evaluating flood risk and developing flood mitigation recommendations in Conesville.

The analysis was divided into three separate study areas based on comments obtained from the Conesville Flood Commission and Conesville residents. The study areas are described as follows:

1. Study Area 1 focuses on the area of the Manor Kill in the hamlet of West Conesville near the Pangman Road bridge.

2. Study Area 2 includes a section of the Manor Kill in the hamlet of Conesville, begins approximately 1,000 feet upstream of the South Mountain Road bridge, and extends to 2,000 feet downstream of the bridge.

3. Study Area 3 is located along the Manor Kill in the hamlet of Manorkill. It extends from approximately 1,800 feet upstream of the Durham Road bridge to approximately 225 feet downstream of the Beaver Hill Road bridge.

A range of flood mitigation measures were investigated within the three project areas. Following is a summary of findings from each study area:

<u>Study Area 1</u>

- The Pangman Road bridge is sufficiently sized to pass the 100-year flood event and does not create a hydraulic constriction that contributes to flooding of buildings.

- Valley confinement results in a high stream power setting that creates powerful erosive forces and unstable channel conditions, which in combination with the two forced channel bends that direct flows at the banks likely contributed to the severe stream bank erosion and the washout of the bridge abutments and portions of the roadway that occurred in this area during Tropical Storm Irene.

<u>Study Area 2</u>

- Two floodplain enhancement scenarios were investigated. Both scenarios would reduce the frequency and depth of flooding on Potter Mountain Road and at one home located north of Potter Mountain Road. Neither scenario would completely eliminate flooding of homes or the roadway during major flood events.

- Floodplain Enhancement Scenario 1 provides modest flood reduction benefit, with only minimal additional flood reduction benefit resulting from Floodplain Enhancement Scenario 2.

- Homes within Study Area 2 do have the potential to be flooded during large flood events. One home in Study Area 2 is currently abandoned and is reportedly going through the flood buyout process. Benefit-cost analysis (BCA) indicates that the remaining homes do not qualify for acquisition. However, other flood protection measures may be available.

Study Area 3

- The replacement bridge at Beaver Hill Road (constructed after Tropical Storm Irene) is adequately sized and does not contribute to flooding of homes.

- The existing bridge at Durham Road creates a hydraulic constriction and contributes to flooding of structures immediately upstream of the bridge during larger floods.

- Homes and businesses located within Study Area 3 have the potential to be flooded during large flood events as indicated by hydraulic modeling results and reports from landowners.

- Some floodprone structures in the vicinity of the Durham Road bridge have been abandoned as a result of damages sustained during previous flood events. Hydraulic modeling indicates that water surface elevations upstream of the Durham Road bridge are sensitive to debris jamming, and as a result, structures located upstream of the bridge become increasingly floodprone as the bridge opening becomes more clogged with debris.

- The flood reduction benefits of a larger bridge at Durham Road are likely not great enough to outweigh the cost of bridge replacement.

- Severe bank erosion occurred along the left bank of the Manor Kill downstream of Durham Road during Tropical Storm Irene. The site was repaired immediately following Irene and has reportedly remained stable since that time.

The following recommendations are provided for each study area:

Study Area 1

- Consider closure of floodprone areas of Pangman Road and Route 990V during major flood events.

- Bank erosion and bank failure sites should be closely monitored and repair measures should be implemented when required, especially in cases where roads, bridges, or other infrastructure is threatened. This may include additional hard bank armoring in the vicinity of the Pangman Road bridge and at the two forced bends along the Manor Kill.

- It is recommended that the home at 111 Pangman Road be considered for acquisition and removal under the New York Department of Environmental Protection (NYCDEP) Flood Buyout Program if the property owner and the Town of Conesville are interested in participating. While the structure itself is not at risk of inundation during the 100-year flood event based on hydraulic modeling, the home was completely surrounded by floodwaters during Tropical Storm Irene. Also, the instability of the channel along this reach of the Manor Kill and the location of the home in close proximity to the channel and the two forced bends leave the home vulnerable to erosion risk.

Study Area 2

- Proceed with further study and apply for funding for Floodplain Enhancement Scenario 1. This scenario would require the demolition and removal of one currently abandoned structure, which is reportedly in the process of being acquired by the NYCDEP, and would involve the excavation and off-site removal of approximately 8,800 cubic yards of material from 500 linear feet of channel.

- Consider closure of floodprone areas of Potter Mountain Road during major flood events.

- Closely monitor bank erosion and implement bank repair and protection measures when required. This is especially true in cases where roads, bridges, or other infrastructure is threatened.

- Implement individual flood protection measures at homes that have been flooded or are at risk of future flooding.

Study Area 3

- If the Durham Road bridge is to be slated for replacement in the future, it is recommended that its replacement be appropriately sized so as not to increase the flood risk at structures located upstream of the bridge.

- Encourage homeowners in the vicinity of the Durham Road bridge who have expressed interest in the flood buyout program to work with the town, NYCDEP, and the Catskill

Watershed Corporation (CWC) to document flood damages, flood damage costs, and high water marks.

- Closely monitor bank erosion along the high bank failure downstream of Durham Road and implement repair and protection measures if required.

In addition to the specific flood mitigation recommendations provided for each of the three study areas, the following general recommendations can be applied:

- It is recommended that the elevations of the 100-year flood event from MMI's existing conditions hydraulic modeling be used as "best available information" for determination of base flood elevations. All new construction and substantial improvements should be required to have their lowest floor elevated at or above 2 feet above the base flood elevation.

- It is recommended that risks associated with the flooding of roadways be reduced by temporarily closing roads during flooding events. This requires effective signage, road closure barriers, and consideration of alternative routes.

- A variety of measures are available to protect existing properties from flood damage. On a case-by-case basis, individual floodproofing should be explored where structures are at risk. Potential measures for property protection are summarized below and provided in greater detail in the body of the report.

  - Elevation of the structure

  - Dry floodproofing of the structure to keep floodwaters from entering

  - Wet floodproofing of the structure to allow floodwaters to pass through the lower area of the structure unimpeded

  - Construction of property improvements such as barriers, floodwalls, and earthen berms

- It is recommended that home and business owners in Conesville minimize flood damages and ensure personal safety by following the flood preparedness guidelines provided by the National Flood Insurance Program (NFIP). These are detailed in this report.

- It is recommended that the United States Geological Survey (USGS) gauge at Pangman Road be used by town officials, emergency responders, and Conesville residents as an alert system to predict flooding. The following link provides access to the gauge information: https://waterdata.usgs.gov/nwis/uv?site_no=01350080. Suggested flood action alert levels corresponding to stream discharge levels are provided in this report.

- Conesville residents can sign up to receive an email or text message when a user-defined water level, stream flow, or other parameter is equaled or exceeded. For more information or to set up alerts visit: http://water.usgs.gov/wateralert/.

- Conesville residents are encouraged to sign up for the Schoharie County Emergency Notifications Registration System at https://www2.schohariecounty-ny.gov/EmergencyNotifications.

Potential sources of funding for project implementation are included in this report. As the recommendations of this LFA are implemented, the Conesville Flood Commission and Town of Conesville will need to work closely with potential funders to ensure that the best combinations of funds are secured for the modeled alternatives and for the property-specific mitigation such as floodproofing and relocations.

1.0 INTRODUCTION

1.1 Project Background

The Conesville Flood Commission, utilizing funding provided by NYCDEP through the Greene County Soil and Water Conservation District (GCSWCD), has retained MMI to complete a LFA in Conesville, New York.

The LFA evaluates flood risks and assesses potential mitigation measures aimed at reducing flood inundation and the associated damages and water quality impairment that may occur due to floods. The Manor Kill, which flows through Conesville and is the primary source of flooding, has been evaluated by Federal Emergency Management Agency (FEMA) using approximate engineering methods only, meaning that identification of areas subject to flooding has been approximated. Therefore, no detailed hydraulic model was available from FEMA for the study area. The FEMA Flood Insurance Rate Maps (FIRMs) available for the Manor Kill extend from the Schoharie Reservoir to a few hundred feet east of the Manorkill hamlet. The tributaries to the Manor Kill have not been mapped by FEMA. The FIRMs depict the Special Flood Hazard Area (SFHA), which is the area inundated by flooding during the 100-year flood event.

As part of its scope of services for the Conesville LFA, MMI collected survey data and created hydraulic models for the purposes of evaluating flood risk and developing flood mitigation recommendations in Conesville.

The LFA is a program within the New York City water supply watersheds, initiated following Tropical Storm Irene to help communities identify long-term, cost-effective projects to mitigate flood hazards. The GCSWCD is implementing the LFA program in the watershed communities within the Schoharie Reservoir basin, which is predominantly located within Greene County. The Manor Kill and its tributaries located within Conesville feed into the Schoharie Reservoir, and while Conesville is located within Schoharie County, the geography of the watershed makes it logical for the GCSWCD to implement the LFA program for Conesville.

1.2 Study Areas

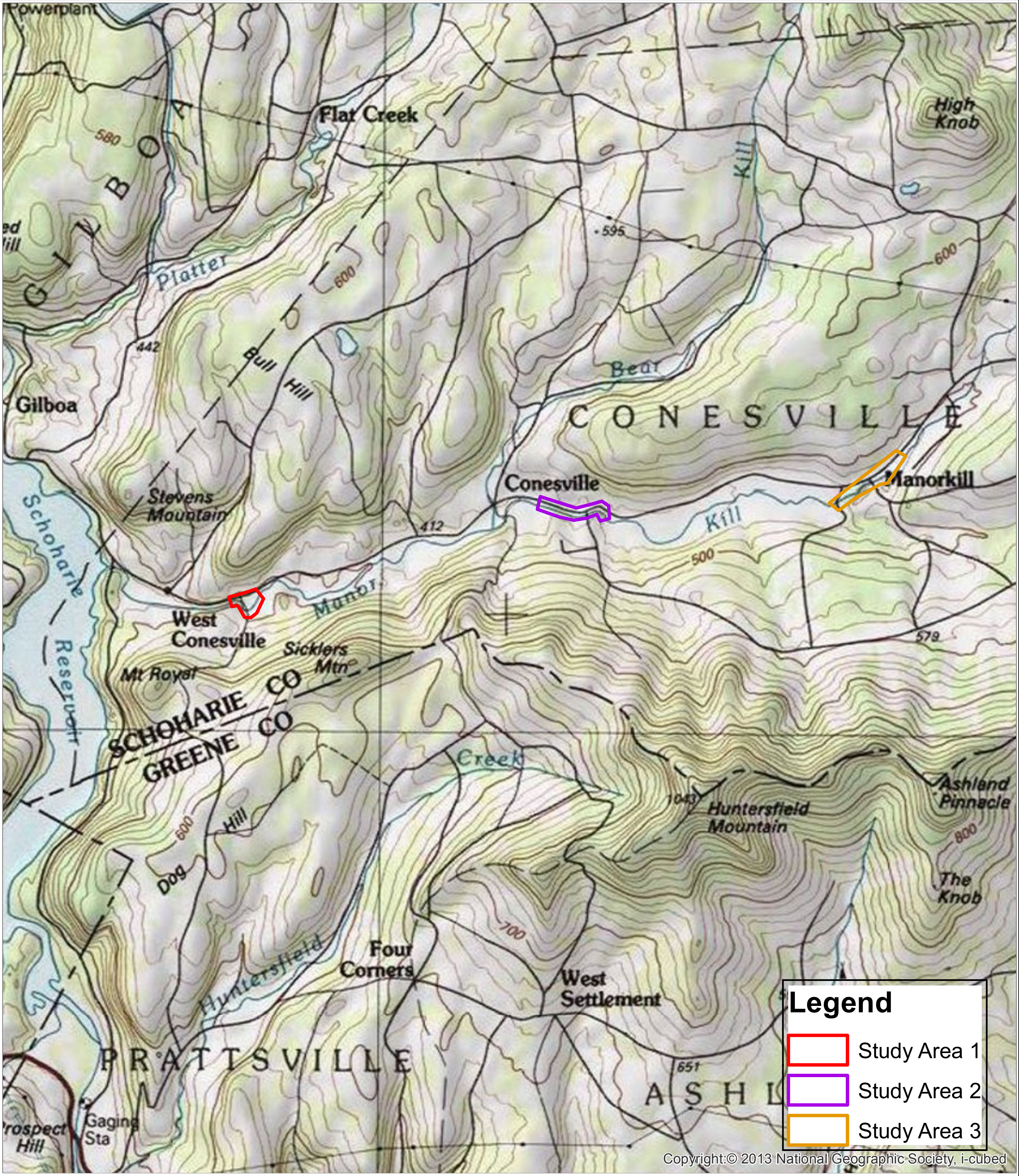
This analysis is divided into three separate study areas. The study areas are focused on areas of Conesville where most of the flood damages occurred during Tropical Storm Irene and previous flood events. The study areas were identified based on comments obtained from the Conesville Flood Commission and Conesville residents. Figure 1-1 is a location plan for the three study areas. The study areas described from downstream to upstream are as follows:

1. Study Area 1 focuses on the area of the Manor Kill in the hamlet of West Conesville in the vicinity of the Pangman Road bridge. It begins 900 feet upstream of the bridge and extends downstream 1,000 feet and includes a detailed hydraulic assessment of the bridge.

2. Study Area 2 includes a section of the Manor Kill in the hamlet of Conesville and begins approximately 1,000 feet upstream of the South Mountain Road bridge and extends to 2,000 feet downstream of the bridge. It includes 3,000 feet of stream channel and a detailed assessment of the South Mountain Road bridge.

3. Study Area 3 is located along the Manor Kill in the hamlet of Manorkill. It extends from approximately 1,800 feet upstream of the Durham Road bridge to approximately 225 feet downstream of the Beaver Hill Road bridge. Evaluation of this area includes a detailed assessment of two bridges—Durham Road bridge and Beaver Hill Road bridge—and approximately 3,700 feet of stream channel.

The Manor Kill and its tributaries all flow into the Schoharie Reservoir, a drinking water supply source to the New York City public drinking water supply system. The Manor Kill Stream Management Plan (SMP) notes that the majority of the 34.4-square-mile Manor Kill watershed is located within the town of Conesville with just a small area located in the town of Gilboa. The Manor Kill is part of the larger Schoharie Creek watershed. The Manor Kill and NYS Route 990V essentially parallel each other through the town. The SMP (2009) describes the Manor Kill as flowing "westerly through the valley [before] emptying into the Schoharie Creek in a spectacular waterfall."



SOURCE(S):

USA_Topo_Maps
Copyright:© 2013 National Geographic Society, i-cubed

Figure 1-1: Study Areas

LOCATION:

Conesville, NY

N

Conesville Local Flood Analysis

MXD: Q:\Projects\2884-08 Conesville LFA\GIS\LFAStudyAreaa8.5x11port.mxd

Map By: EMH
MMI#: 2884-08
Original: 2/27/2017
Revision: 3/31/2017
Scale: 1 inch = 6,700 feet

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Historical Profile from the Comprehensive Plan (2007)

"The Town of Conesville was formed from the Towns of Broome, Schoharie County, and Durham, Greene County, on March 3, 1836. It was named Conesville in honor of Rev. Jonathan Cone, a minister dear to the hearts of the people living in this part of the county.

The story of Conesville, however, actually begins in 1753 when John Dies was appointed to survey the lands between the Van Bergen Patent and Breakabeen on the Schoharie Kill. The land was a heavily wooded wilderness in the foothills of the Catskills with high mountains on the eastern border. The Manorkill stream flowed west through the valley, leading to the Schoharie Creek. John Dies then became connected with Ury Richt-myer in the purchase of the land. Two patents were granted to Ury Richtmyer and others on May 6, 1754. The first tract included land now known as the hamlet of West Conesville and the area around the hamlet of Gilboa. The second tract was long known as Dies' Manor and covered an area of what is now the hamlet of Conesville, including the land running up to the hamlet of Manorkill.

The first settlement in what is now the Town of Conesville was made by Ury Richtmyer and a few other families in 1764 on the land of Dies' Manor, during the period between the close of the French and Indian War and the start of the Revolution. These early settlers lived at peace with the few Native Americans who occasionally passed through the valley. A popular story is that the old Richtmyer homestead was purchased from these Indians for a pound of butter per acre.

During the Revolution the Indians became hostile to the settlers. Peter Richtmyer had cleared quite a farm by the time the war began. While working upon the flat below the cabin one afternoon, he was surprised by a squad of Indians and a Tory and was taken prisoner. He later escaped and returned to his family. They hastily packed up and moved to one of the forts along the Schoharie Creek where the family remained until the war was over. Not long after this, Richtmyer's buildings were all burned as were those of his Patriot neighbors.

Following the war the settlers returned. A number of families from the eastern states and the older settled portions of Schoharie County located in the Town of Conesville, the Yankees climbing upon the hills while the Dutch and Germans settled in the valleys. Peter Richtmyer built the first inn in this part of the county in 1789. The fine old building is still standing.

The Susquehanna Turnpike was commenced in 1800 from Catskill to Unadilla. This turnpike went through the Town of Conesville, closely following the John Dies Road, which originally was an Indian trail over the mountain from Durham to Manorkill. Emigrants bound westward poured over the turnpike by the thousands bringing much activity and prosperity to this area during the next century." (Assembled by Town Historian Beatrice Mattice for the Comprehensive Plan, 2007).

Located in the foothills of the Catskill Mountains, the town of Conesville is bordered by the Schoharie Reservoir to the west, state forest lands to the south and east, and a combination of forested hillsides and open agricultural fields to the north. The Manor Kill and each of the focus areas are located within an east-west-oriented valley that traverses the center of Conesville and is surrounded by steeply sloping hillsides.

Land use within the town of Conesville is dominated by a combination of agricultural land uses, forested areas, and pockets of rural residential development. In addition, the town contains a large sand and gravel quarry operation near the Manorkill hamlet. The land uses found within the town coincide with its very low population density. According to the 2010 U.S. Census, the total population of Conesville was 734 people. The population increased from 726 in 2000 to 734 in 2010 (US Census, 2000 and 2010). The Comprehensive Plan (2007) describes this general increase in population within the town over the years. With a population density of 18.4 people per square mile, Conesville remains a sparsely populated municipality characterized by its rural and forested landscapes.

The Comprehensive Plan (2007) also notes that a large portion of the town's population is made up of second homeowners. According to the U.S. Census (2010), of the 787 housing units in the town, 422 or 54% are occupied by "seasonal, recreational or occasional use persons." After second homeowners, retirees made up the next largest group at 35% (Comprehensive Plan, 2007).

According to a survey taken for the Comprehensive Plan (2007), both seasonal and year round residents expressed interest in some land use controls that would help to preserve the rural character of the town. The Comprehensive Plan continues with a brief historical profile of the town and village; this profile is reprinted in the text box above.

The Agricultural Development and Farmland Protection Plan for Schoharie County (August 2000) notes that over 90% of the total land mass within the county is farmland or forested. The town of Conesville mirrors the land use of the county as a whole.

1.3 Community Involvement

The Conesville Flood Commission guided the LFA process and advised MMI regarding the selection of study focus areas and which mitigation alternatives to evaluate. Table 1-1 lists the members of the Conesville Flood Commission. The commission is comprised of people with technical and nontechnical backgrounds and is meant to represent various interests and stakeholders within the town as well as Greene and Schoharie County Soil & Water Conservation Districts, NYCDEP, the CWC, and the Schoharie County Office of Community Development Services. The Conesville Flood Commission is the primary pathway for community involvement in the planning process.

TABLE 1-1
Conesville Flood Commission Members

Committee Member	Affiliation
Bill Federice, Chair	Conesville Town Supervisor
Ron Barry	Flood Commission
David Porter	Flood Commission
Mike Fleischman	Flood Commission
Paul Tubiolo	Flood Commission
Howard Mattsson	Flood Commission
Kelly Smith	Flood Commission
John Sweatman	Flood Commission
Robert Proudman	Flood Commission
Pete Nichols	Schoharie County Soil & Water Conservation District
Joel DuBois	Greene County Soil & Water Conservation District
Phil Eskeli	New York City Department of Environmental Protection
John Mathiesen	Catskill Watershed Corporation
Shane Nickle	Schoharie County Office of Community Development Services
Zachary Thompson	Schoharie County Office of Community Development Services

Table 1-2 lists Conesville Flood Commission meeting dates that occurred when the Conesville LFA was on the agenda for discussion.

TABLE 1-2
Conesville Flood Commission Meeting Dates

Date	Purpose
June 23, 2016	Introduction, identification of focus areas, gathering of flood history information
January 5, 2017	Presentation of preliminary results, gathered feedback
May 8, 2017	Shared and discussed Draft LFA Report, gathered feedback

The LFA process included two public meetings. These were held near the beginning and end of the LFA project as noted below. In addition to the meetings, a questionnaire was circulated in the community allowing Conesville residents who were not at the public meeting to provide input.

TABLE 1-3
Conesville LFA Public Meeting Dates

Date	Purpose
July 26, 2016	Explanation of the LFA process, identification of focus areas, gathering of flood history information from the public
June 12, 2017	Presentation of final LFA results, recommendations, and plan

Appendix A contains copies of the *PowerPoint* presentations used at the meetings listed in Table 1-2 and Table 1-3 along with meeting minutes.

1.4 Nomenclature

All references to right bank and left bank in this report refer to "river right" and "river left," meaning the orientation assumes that the reader is standing in the river looking downstream. The datum used throughout this report is NAVD88.

In order to provide a common standard, FEMA's NFIP has adopted a baseline probability called the base flood. The base flood has a one percent (one in 100) chance of occurring in any given year and the base flood elevation (BFE) is the elevation of this level. For the purpose of this report, the one percent annual chance flood is referred to as the ***100-year flood event***. Other reoccurrence 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). The SFHA is the area inundated by flooding during the 100-year flood event.

The Manor Kill has been evaluated by FEMA using approximate engineering methods only, meaning that identification of areas subject to flooding has been approximated, and no specific base flood elevation has been identified by FEMA. MMI collected field survey data and conducted hydraulic modeling within the three project areas for the purposes of evaluating flood risk and developing flood mitigation recommendations.

2.0 WATERSHED FACTS AND CHARACTERISTICS

2.1 Initial Data Collection

Initial data collected for this study and analysis included publicly available data as well as input from the Conesville Flood Commission members and the public. A brief summary of key documents follows.

Flood Insurance Study (FIS)

The current FIS for Schoharie County became effective on February 16, 2012. The FIS covers all jurisdictions in the county, inclusive of the town of Conesville. The previous FIS covering Conesville resulted in FIRM panels that were effective on April 2, 2004. As noted earlier, the Manor Kill has been evaluated by FEMA using approximate engineering methods only, meaning that identification of areas subject to flooding were approximated.

Stream Management Plan

Central to maintaining NYCDEP's Filtration Avoidance Determination (FAD) is a series of partnership programs between New York City and the upstate communities along with the set of rules and regulations administered by the NYCDEP. As required in the FAD, Stream Corridor Management Plans are developed and implemented under the Stream Management Program. The Manor Kill Management Plan (MKMP) (January 2009) was developed by the Schoharie County Planning Department, the Schoharie County Soil and Water Conservation District (SCSWCD), and GCSWCD under contract with NYCDEP. One component of the MKMP is the preservation of water quality through effective management of the streams and associated floodplains that feed water supply reservoirs.

The MKMP provides a framework for general stream management decision-making in the watershed. The plan provides documentation of current stream conditions along the Manor Kill and a broad assessment of the condition of existing infrastructure. The MKMP states that "the Manor Kill is highly prone to flooding activities and historically has resulted in significant damages and the expenditure of significant resources to repair these damages… The impact of floods on private property, public infrastructure and the quality of the life is one of the primary concerns of the many watershed stakeholders."

General recommendations for the entire watershed include but are not limited to: updating local regulations to reflect the flood zone mapped on the FIRM map; disseminating flooding information more effectively to local residents, town officials, and community planners; documenting flood damage to ensure funding for recovery; and participating in All Hazard Mitigation Planning and other programs.

At specific locations, the MKMP recommendations include but are not limited to the following:

- When bridges are replaced, construct with the appropriate height and width to allow conveyance of flood flows.
- Plan for potential buyout program.
- Treat, remove, and prevent the spread of Japanese knotweed where feasible.
- Participate in the CWC septic program.
- Establish bank erosion monitoring at mass bank failures.

Multijurisdictional Hazard Mitigation Plan

The Schoharie County Hazard Mitigation Plan (HMP) Update was developed by Cannon Design to update the original 2006 plan and became effective October 25, 2013. The following discussions are taken from the HMP.

Flooding was ranked as the highest hazard risk within the county and categorized as a "Moderately High Hazard," which indicates that "death and injuries are likely and that damages and impacts could have severe impacts for the community." All Schoharie County municipalities participate in the NFIP, which "aims to reduce the impact of flooding… by providing affordable insurance to property owners and by encouraging communities to adopt and enforce floodplain management regulations" (http://www.fema.gov/national-flood-insurance-program, 2016). According to the HMP, there are no properties in Conesville that the NFIP categorizes as Repetitive Loss Properties, or "properties that have been repeatedly flooded and where multiple claims for flood losses have been made through the NFIP fund" (HMP, 2013). In the town of Conesville, there are seven NFIP policies for a total of $959,000 in coverage. One of the seven properties is located in Zone A, or the 1% annual chance of flood zone. Between 1987 and 2012, there were four claims paid for a total of $55,014 in damages.

Without performing the more intricate analysis of determining the exact number of properties that are located within Zone A for each municipality, the HMP for Schoharie County performed a more general analysis of potential flood damage by calculating damage to 1% and 15% of the total property value within each municipality. For Conesville, the total value of the 855 properties within the town is $80,053,000, thus damage to 1% of the property value would equal $0.8 million and damage to 15% would equal $12 million.

The HMP identifies strategies for the communities to mitigate the hazards identified. Strategies identified within the HMP that are consistent with the focus of this LFA include the following:

- Prioritizing stormwater management projects that will provide significant protection for residences as well as for local roadways and infrastructure
- Emphasizing stream stabilization projects to manage erosion and prevent flooding
- Municipal adoption of comprehensive floodplain management ordinances
- Acceptance of hazard mitigation funded buyouts and compliance with hazard mitigation provisions and requirements

Geographic Information System Analysis

Schoharie County provided MMI with Town of Conesville tax parcel data. A review of the tax parcel data revealed that, in total, the Town of Conesville has 1,306 parcels totaling 25,331 acres (39.5 square miles) in land. There are 80 parcels totaling 3,021 acres (5 square miles) within the town that are located within the SFHA along the Manor Kill. The majority of the 80 parcels are partially and not wholly located within the SFHA. These parcels are primarily clustered within the three hamlets within the town: Manorkill, Conesville, and West Conesville.

The 80 parcels partially exposed to the 100-year flood along the Manor Kill have a total assessed property (structure and land) value of $11,584,043. This value does not include parcels outside of the area mapped by FEMA that may be exposed to the 100-year flood. A portion of the Manorkill study area has not been mapped by FEMA.

Water Quality Reports

In order to fulfill requirements of the Federal Clean Water Act the NYSDEC must provide periodic assessments of the quality of the water resources in the state and their ability to support specific uses. These assessments reflect monitoring and water quality information drawn from a number of programs and sources both within and outside the department. This information has been compiled by the NYSDEC Division of Water and merged into an inventory database of all water bodies in New York State. The database is used to record current water quality information, characterize known and/or suspected water quality problems and issues, and track progress toward their resolution.
This inventory of water quality information is the division's Waterbody Inventory/Priority Waterbodies List (WI/PWL). While portions of the Upper Schoharie Creek basin and the Mohawk River are listed within the WI/PWL, the Manor Kill is not listed in the WI/PWL report.

The New York State Section 303(d) List of Impaired Waters (2012, revised 2013) identifies those waters that do not support appropriate uses and that may require development of a Total Maximum Daily Load (TMDL). The Manor Kill is not listed in this document.

The NYSDEC Water Quality Standards and Classifications program is responsible for setting New York State ambient water quality standards and guidance values for surface water and groundwater. The program is also responsible for the classification of surface waters for their best usage. The water quality standards program is a state program with Environmental Protection Agency (EPA) oversight. New York's longstanding water quality standards program predates the federal Clean Water Act and protects both surface water and groundwater. All waters in New York State are assigned a letter classification that denotes their best uses. Letter classes such as A, B, C, and D are assigned to fresh surface waters. The Manor Kill, as it passes through the hamlets of Manorkill and Conesville, is a Class C(TS) stream. To the east of Conesville and through the hamlet of West Conesville, the Manor Kill is classified as a Class C(T) stream. The unnamed tributary to the Manor Kill located in the hamlet of West Conesville is a Class A stream (see inset text box for classification definitions).

NYSDEC Stream Classifications

C(TS) *– The classification (C) indicates that the waters shall be suitable for fish, shellfish, and wildlife propagation and survival. The water quality shall be suitable for primary and secondary contact recreation although other factors may limit the use for these purposes. The standard of (TS) indicates that the waters may support trout spawning (TS) and special requirements apply to sustain these waters that support these valuable and sensitive fisheries resources. While C classified waters are not regulated, those with a T or TS standard are protected by NYS.*

C(T) *– The classification (C) indicates that the waters shall be suitable for fish, shellfish, and wildlife propagation and survival. The water quality shall be suitable for primary and secondary contact recreation although other factors may limit the use for these purposes. The standard of (T) indicates that the waters may support a trout population and special requirements apply to sustain these waters that support these valuable and sensitive fisheries resources. While C classified waters are not regulated, those with a T or TS standard are protected by NYS.*

A *– Class A indicates waters that are suitable as a source of water supply for drinking, culinary, or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival. Class A waters are regulated by NYS.*

Flood Damage Prevention Codes

Subdivision Regulations

The Town of Conesville Subdivision Regulations (May 2006) contain clauses that provide additional protection against development within the floodplain. For example, the regulations require additional review if a project site is located within a SFHA. In addition, the regulations note that "the land to be subdivided shall be of such character that it can be used safely for building purposes without danger from… flood…, that proper provision shall be made for drainage…," and that there are requirements for a preliminary plat to include "the location of the 50- and 100-year flood lines shall be clearly marked on the subdivision preliminary plats."

Finally, in the Drainage Improvements section, the regulations state, "Land subject to flooding or land within designated flood plains as referenced in current NYCDEP, NYSDEC, FEMA FIRM Flood maps, and/or deemed by the Planning Board to be uninhabitable shall not be platted for residential occupancy nor for such other uses as may increase damage to health, life or property or aggravate the flood hazard, but such land within the plat should be set aside for such uses as shall not be endangered by periodic or occasional inundation or improved in a manner satisfactory to the Planning Board to remedy such hazardous conditions. Floodplain areas shall be those defined on the official maps published by the Federal Emergency Management Agency (FEMA) and applicable NYCDEP Watershed Maps."

This clause clearly encourages future development be located outside of the floodplain and protects both the floodplain surrounding waterways and property. The combination of each of the clauses shows a clear intent to protect property and exclude it from the floodplain area.

Final Generic Environmental Impact Statement on the Manor Kill Watershed

The *Final Generic Environmental Impact Statement (FGEIS) on the Manor Kill Watershed in the Towns of Conesville and Gilboa, Schoharie County, NY* dated October 2009 analyzes the entire Manor Kill watershed including the town of Conesville and a part of the town of Gilboa. The FGEIS contains information regarding development within areas prone to flooding and documents the concerns of citizens, which include but are not limited to the following:

- Increases in flooding and flooding severity
- Changes in stream channels and associated scouring/deposits

The FGEIS also noted that construction in the floodways and floodplain is regulated by the New York State Department of Environmental Conservation and the NFIP. Under the NFIP, all development within the SFHA is subject to floodplain development regulations.

New York State Building Code Requirements

The New York State Building Code requires the elevation of residential and nonresidential structures in areas of special flood hazard. In zones where the base flood elevations are known, new residential construction and substantial improvements must have their lowest floor elevated at or above 2 feet above the base flood elevation. In cases where base flood elevation data is not known for Zone A, new residential construction and substantial improvements must have their lowest floor elevated at or above 3 feet above the highest adjacent grade.

For nonresidential structures, developers have the option of either elevating the structure or improvements by a minimum of 2 feet above the base flood elevation or floodproofing the structure so that it is watertight below 2 feet above the base flood elevation. In cases where base flood elevation data is not known for Zone A, new construction and substantial improvements must have their lowest floor elevated at or above 3 feet above the highest adjacent grade.

2.2 Watershed and Stream Characteristics

The watershed of the Manor Kill is 34.5 square miles in size and drains land along the east side of the Schoharie Reservoir. The watershed is bound by high points including Leonard Hill, Hubbard Hill, and High Knob to the north; Steenburg Mountain, Richtmyer Peak, and Richmond Mountain to the east; and Ashland Pinnacle and Huntersfield Mountain to the south where the watershed divide follows the Schoharie County-Greene County line. The watershed is approximately 85% forested with a patchwork of agriculture and rural residential uses scattered throughout. The Manor Kill flows generally west, discharging into Schoharie Reservoir along its eastern shore. Tributaries to the Manor Kill include the Bear Kill, which roughly parallels Bear Kill Road and flows into the Manor Kill from the north, as well as several smaller, unnamed tributaries.

According to geologic and surficial material maps available for the State of New York, the Manor Kill watershed is underlain by unsorted glacial till with some areas of lacustrine clays. When exposed by the erosive action of the river, these lacustrine clays are mobilized, resulting in high turbidity and contributing to water quality issues. The bedrock consists of Moscow formation sandstone and shale from the Middle Devonian period (385.3 to 391.8 million years ago).

2.3 Project Study Areas

Within this report there is a focus on three separate study areas that were selected based on input from the Conesville Flood Commission and the public regarding past flooding impacts.

2.3.1 Study Area 1

Study Area 1 focuses on the Manor Kill in the hamlet of West Conesville near the Pangman Road bridge (Figure 2-1). Study Area 1 begins 900 feet upstream of the bridge and extends 1,000 feet downstream of the bridge. In this area, the Manor Kill flows from a relatively unconfined valley setting to one where the channel is confined on both sides by steep valley walls. After passing under the Pangman Road bridge, the channel makes a forced bend to the right where it encounters a steep valley wall and then makes a hard bend to the left where it encounters the opposite valley wall as well as Route 990V.

During Tropical Storm Irene, stream flow in the Manor Kill through Study Area 1 peaked at 6,590 cubic feet per second (cfs) as measured at the Pangman Road stream gauge. This flow slightly exceeded the predicted 50-year flood event of 6,245 cfs.

Following is a summary of information collected on flooding and flood damages in Study Area 1:

- During Tropical Storm Irene, severe channel erosion took place just upstream of the Pangman Road bridge and the bridge abutments washed out. The bridge abutments were subsequently replaced using the original bridge superstructure. The replacement abutments provide a wider hydraulic opening than the old bridge.

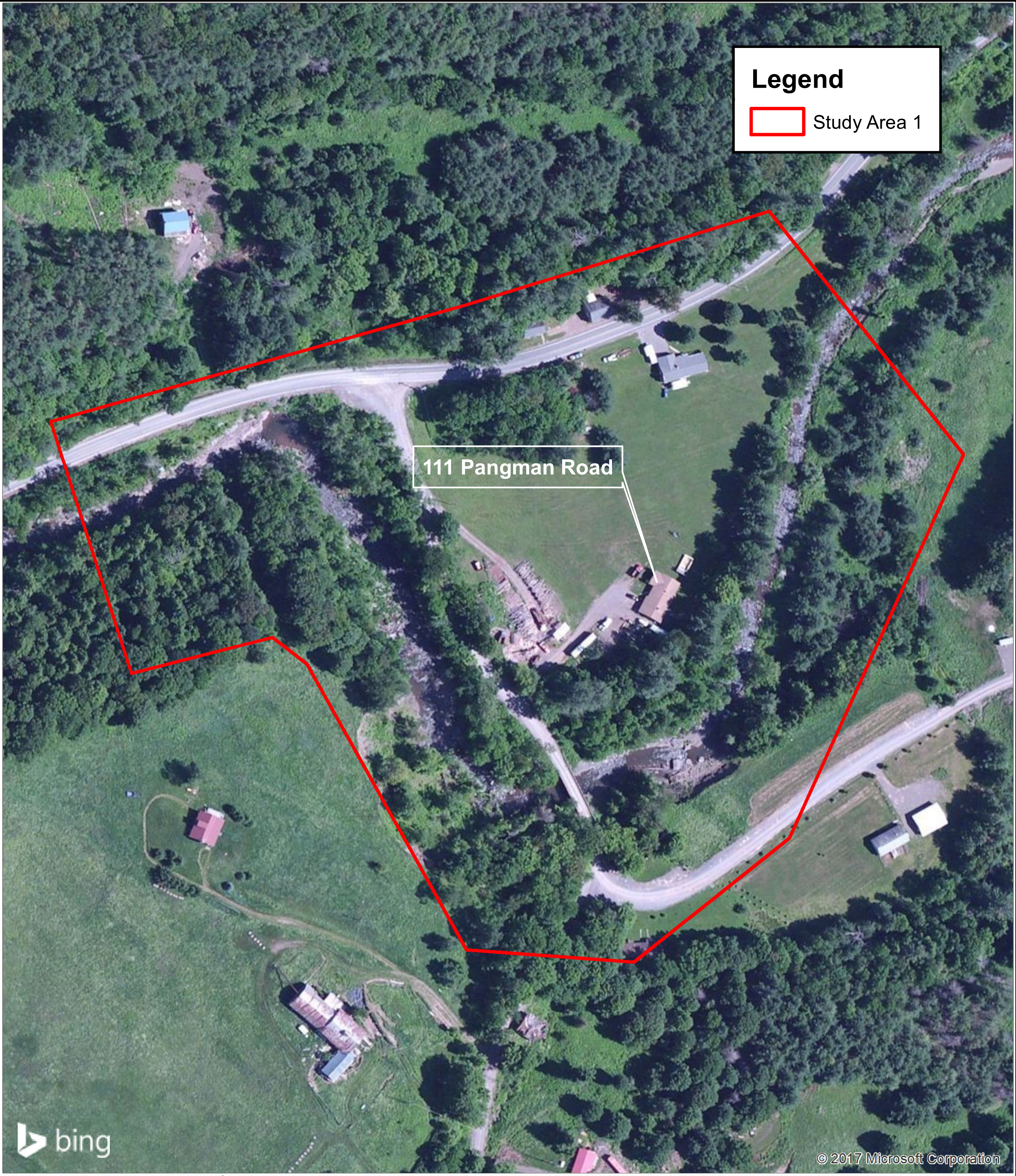
- Bank erosion continues to occur at the forced bend downstream of the Pangman Road bridge.

- During Irene, floodwaters reportedly exited the Manor Kill channel upstream of the Pangman Road bridge and cut across the inside of the bend in the creek, flowing through the yard of the Hughes property (111 Pangman Road) at a depth of approximately 2 feet before returning to the creek (see Figure 2-5). The house at 111 Pangman Road was surrounded by water but remained dry, including the basement. The surrounding property including the firewood operation and equipment were flooded and sustained damages. The area along the bank where flows exited the Manor Kill channel has subsequently been bermed and armored with heavy stone.

- The section of Pangman Road between NYS 990V and the bridge was washed out. The area in the vicinity of the stop sign was flooded by approximately 8 feet of water (see Figure 2-6). The road was subsequently repaired and armoring was placed on the bank.

- A section of NYS 990V near Pangman Road at the forced bend in the creek also washed out. This area and the banks upstream of the Pangman Road bridge have subsequently been repaired and heavily armored.

A land area of 32.6 square miles drains to the study area at its downstream end. Figure 2-2 shows the extent of the watershed that contributes flow to Study Area 1.



SOURCE(S):		LOCATION:
(c) 2010 Microsoft Corporation and its data suppliers	**Figure 2-1: Study Area 1**	**Conesville, NY**

N

Conesville Local Flood Analysis

MXD: Q:\Projects\2884-08 Conesville LFA\GIS\Fig2-1lStudyArea1LABELS.mxd

Map By: EMH
MMI#: 2884-08
Original: 8/20/2016
Revision: 6/26/2017
Scale: 1 inch = 190 feet

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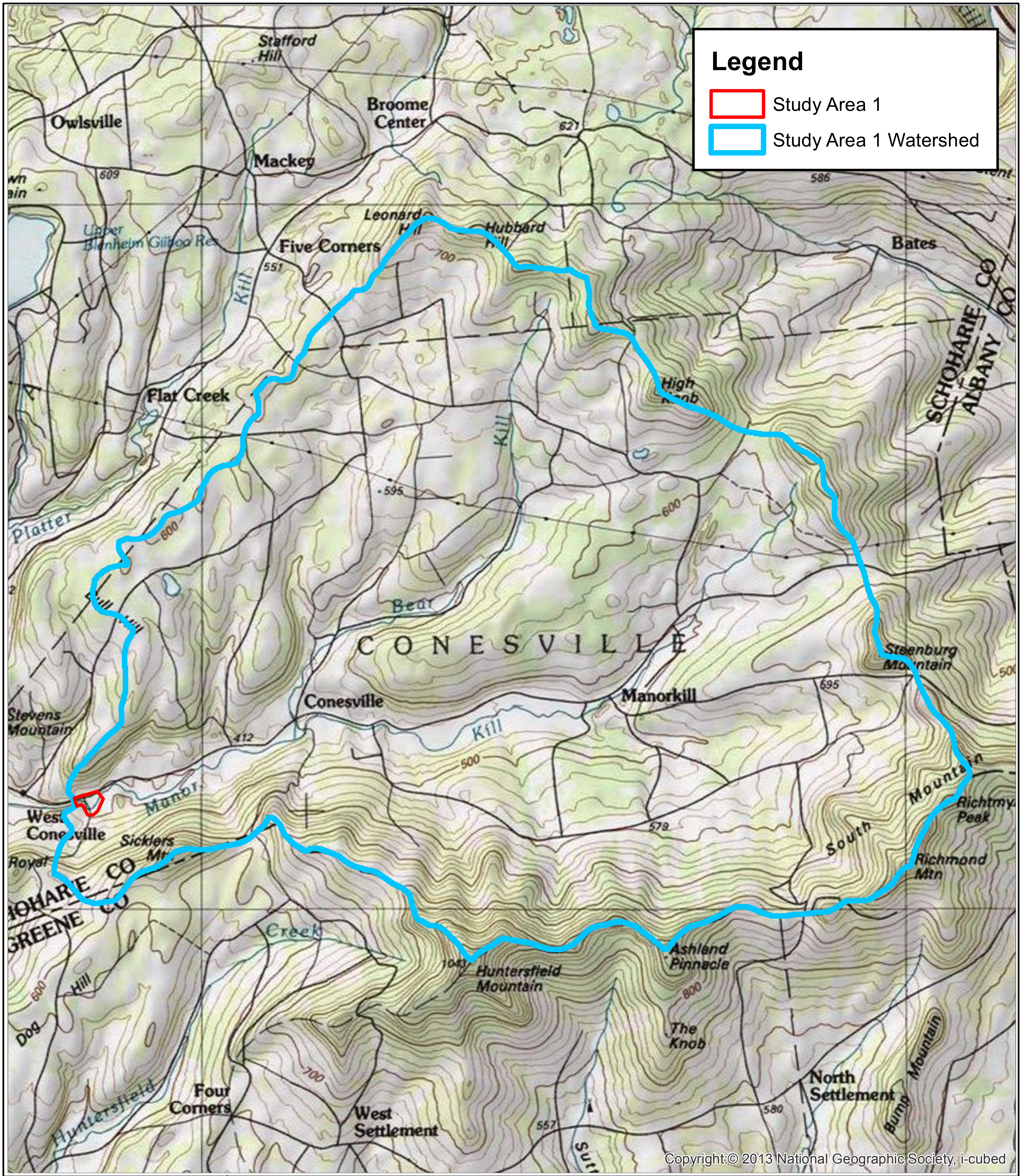

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Figure 2-2: Watershed of Study Area 1

LOCATION:

Conesville, NY

N

Conesville Local Flood Analysis

MXD: Q:\Projects\2884-08 Conesville LFA\GIS\WatershedsAerialStudyArea1.mxd

Map By: EMH
MMI#: 2884-08
Original: 8/20/2016
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Figure 2-3
Project Area 1: View looking upstream on Manor Kill near Pangman Road

Figure 2-4
Project Area 1: Pangman Road Bridge

Figure 2-5
Project Area 1: Floodwater from the Manor Kill flowing through yard at 111 Pangman Road during Tropical Storm Irene, August 2011.

Figure 2-6
Project Area 1: Floodwater from the Manor Kill flooding intersection of Pangman Road and Route 990V during Tropical Storm Irene, August 2011.

2.3.2 Study Area 2

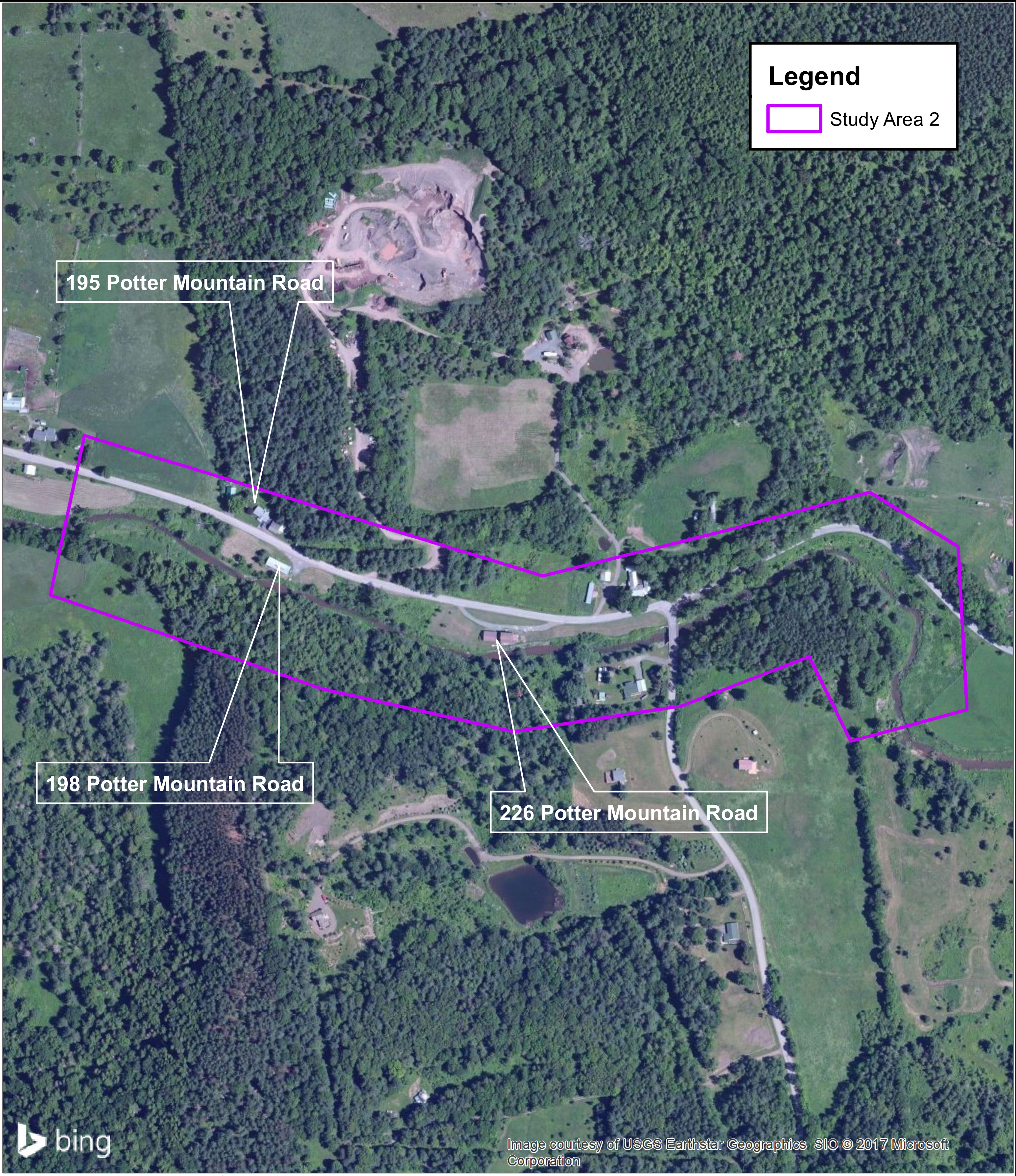
Study Area 2 includes a section of the Manor Kill in the hamlet of Conesville and begins approximately 1,000 feet upstream of the South Mountain Road bridge and extends to 2,000 feet downstream of the bridge (Figure 2-7). The project area includes 3,000 feet of stream channel and includes a detailed hydraulic assessment of the South Mountain Road bridge.

The Manor Kill makes a hard bend to the left before flowing under the South Mountain Road bridge and then flows relatively straight through Project Area 2. The channel is confined by a steep, forested valley wall along its left bank. The right bank is less steep and is lined by several homes and by Potter Mountain Road.

The following information on flooding and flood damages was collected for Study Area 2:

- During Tropical Storm Irene, Potter Mountain Road overtopped at several locations within Study Area 2.
- Potter Mountain Road was washed out by flooding just to the east of its intersection with South Mountain Road at the outside of the bend on the Manor Kill. The road was subsequently repaired and armoring was placed on the bank.
- Three homes within Study Area 2 were damaged by flooding from the Manor Kill during Tropical Storm Irene (195, 198, and 226 Potter Mountain Road, located as shown on Figure 2-7). Specific flood damage descriptions are included in Appendix B of this report.

A land area of 16.8 square miles drains to the study area at its downstream end. Figure 2-8 shows the extent of the watershed that contributes flow to Study Area 2.



SOURCE(S):		LOCATION:
(c) 2010 Microsoft Corporation and its data suppliers	Figure 2-7: Study Area 2	Conesville, NY

N

Conesville Local Flood Analysis

MXD: Q:\Projects\2884-08 Conesville LFA\GIS\Fig2-5StudyArea2LABELS.mxd

Map By: EMH
MMI#: 2884-08
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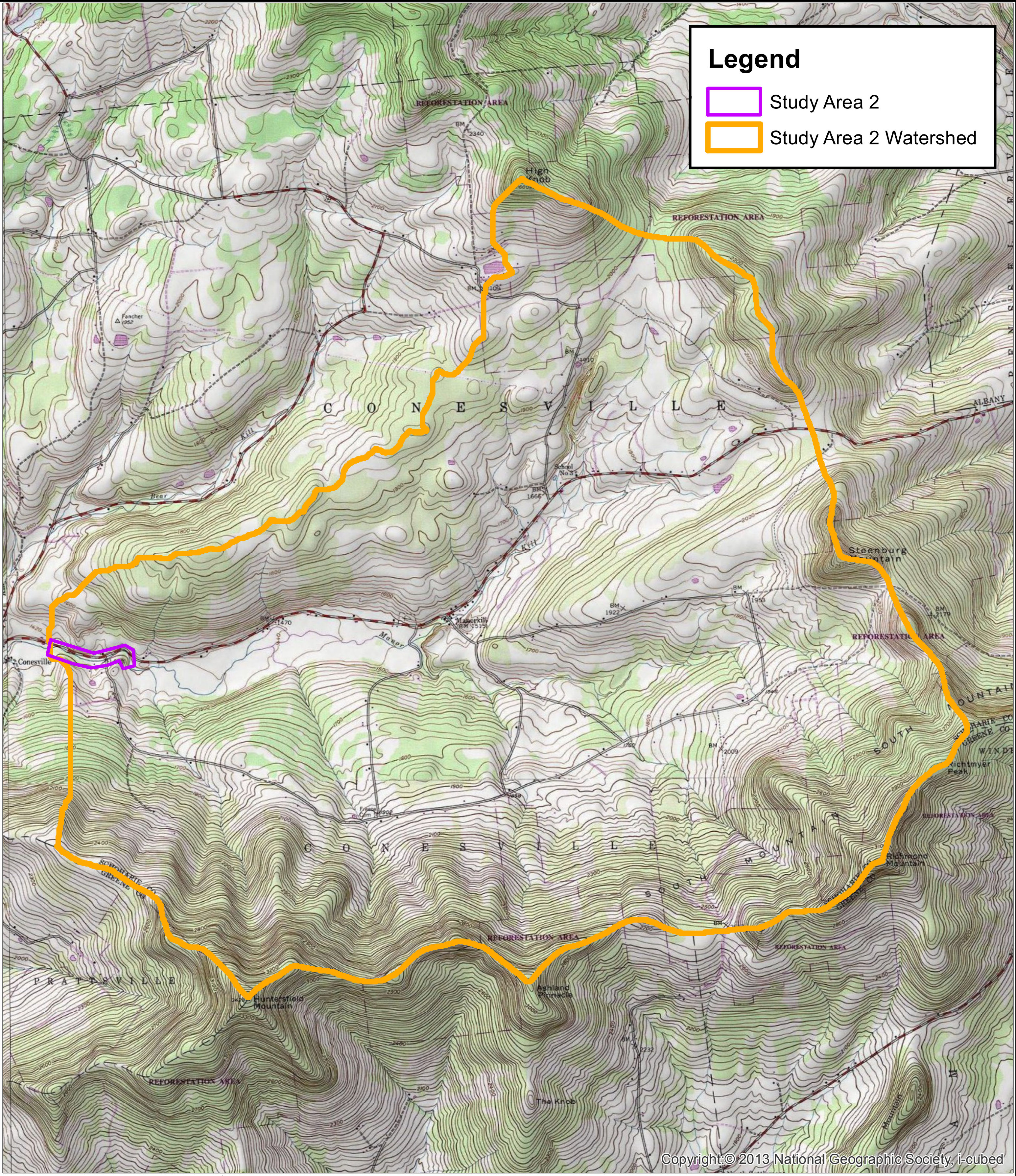

SOURCE(S):

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Figure 2-8: Watershed of Study Area 2

LOCATION:

Conesville, NY

N

Conesville Local Flood Analysis

MXD: Q:\Projects\2884-08 Conesville LFA\GIS\WatershedsAerialStudyArea1.mxd

Map By: EMH
MMI#: 2884-08
Original: 8/20/2016
Revision: 4/5/2017
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Figure 2-9
Study Area 2: View looking downstream from South Mountain Road Bridge

Figure 2-10
Study Area 2: View of South Mountain Road Bridge from downstream

2.3.3 Study Area 3

Study Area 3 is located along the Manor Kill in the hamlet of Manorkill. It extends from approximately 1,800 feet upstream of the Durham Road bridge to approximately 225 feet downstream of the Beaver Hill Road bridge (Figure 2-11). Evaluation of this area includes a detailed assessment of two bridges—Durham Road bridge and Beaver Hill Road bridge—and approximately 3,700 feet of stream channel. The Manor Kill is joined by an unnamed tributary just upstream of the Beaver Hill Road bridge.

The following information on flooding and flood damages was collected for Study Area 3:

- During Tropical Storm Irene, the Manor Kill flooded several homes within Study Area 3.
- A number of the flood-damaged homes were subsequently abandoned.
- A garage was washed away just upstream of the Durham Road bridge.
- Floodwaters inundated the equipment storage yard upstream of the Durham Road bridge but the main building was not flooded and stayed dry.
- During Tropical Storm Irene, extensive bank erosion occurred along the left bank downstream of the Durham Road bridge, which was subsequently repaired.
- The Durham Road bridge did not wash out during the 1996 flood or during Tropical Storm Irene.
- The Durham Road bridge is reportedly prone to debris jamming.
- The Beaver Hill Road bridge and roadway were washed out during Tropical Storm Irene and have subsequently been replaced with a larger structure with an improved alignment.
- Flows entering the Manor Kill from the unnamed tributary just upstream of the Beaver Hill Road bridge were reportedly greater than flows in the Manor Kill.

A land area of 11.3 square miles drains to the study area at its downstream end. Figure 2-12 shows to extent of the watershed that contributes flow to Study Area 3.

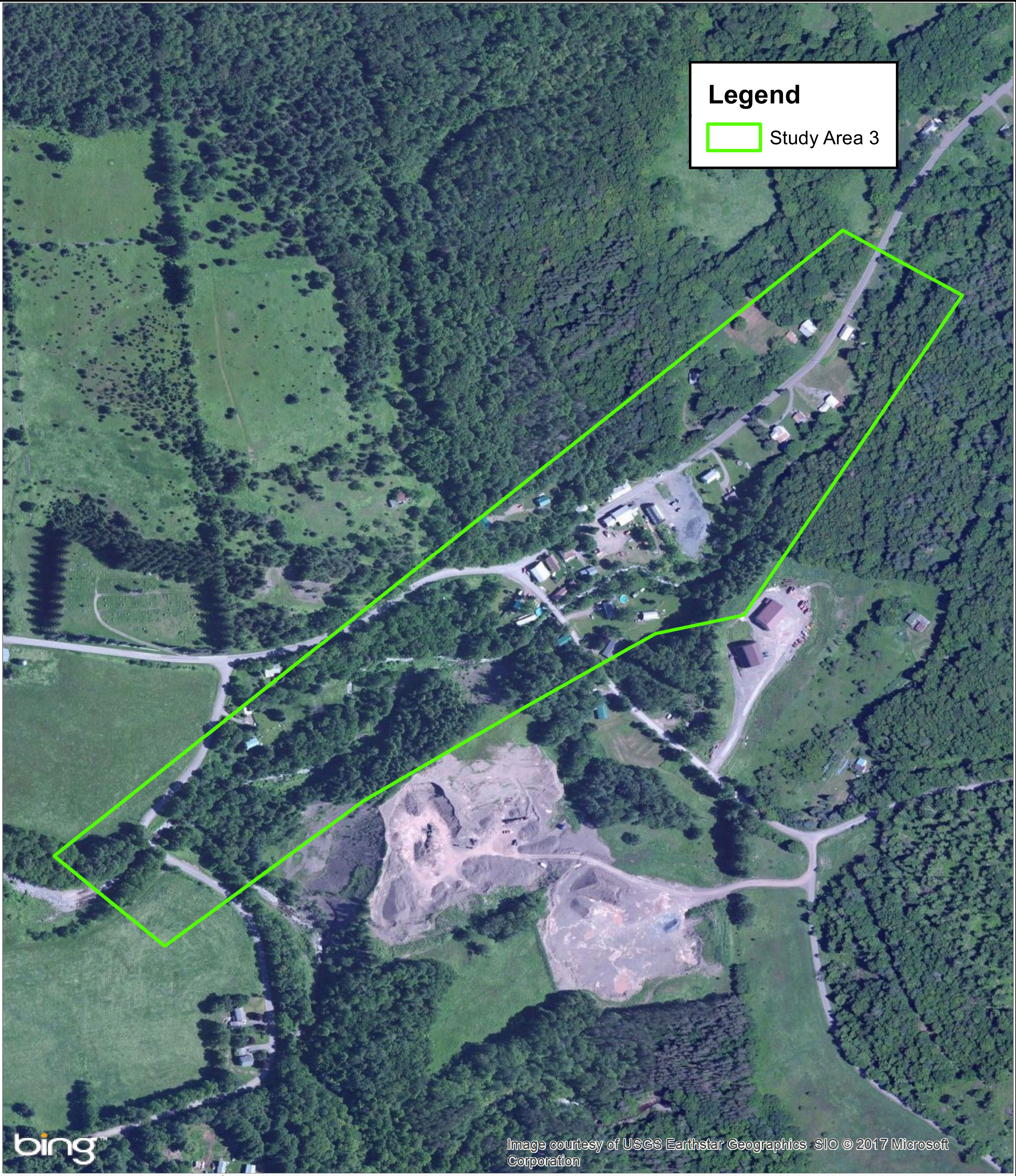

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Figure 2-11: Study Area 3

LOCATION:

Conesville, NY

N

Conesville Local Flood Analysis

MXD: Q:\Projects\2884-08 Conesville LFA\GIS\WatershedsAerialStudyArea1.mxd

Map By: EMH
MMI#: 2884-08
Original: 8/20/2016
Revision: 4/5/2017
Scale: 1 inch = 410 feet

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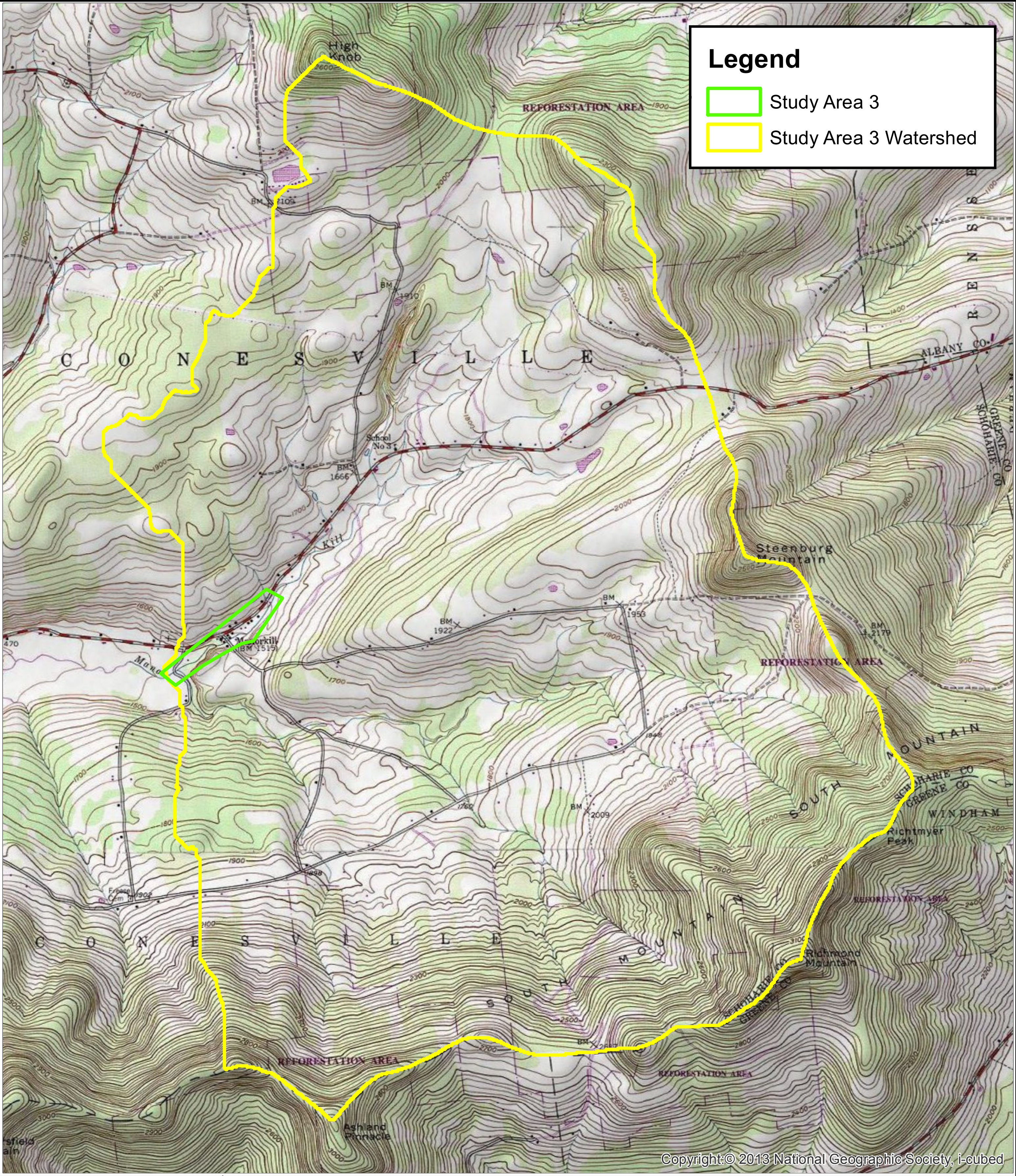

SOURCE(S):

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Figure 2-12: Watershed of Study Area 3

LOCATION:

Conesville, NY

N

Conesville Local Flood Analysis

MXD: Q:\Projects\2884-08 Conesville LFA\GIS\WatershedsAerialStudyArea1.mxd

Map By: EMH
MMI#: 2884-08
Original: 8/20/2016
Revision: 4/5/2017
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Figure 2-13
Study Area 3: Durham Road Bridge and Abandoned Structure

Figure 2-14
Study Area 3: Beaver Hill Road Bridge

2.4 Field Assessment

MMI staff conducted visual inspections of the Manor Kill channel and its floodplain. In general, the inspections focused on (1) the river channel and its banks (bank and channel conditions, sediment bars, vegetation along the stream corridor); (2) development in the floodplains; and (3) bridges and other structures.

Structures located close to the Manor Kill were observed on foot or by driving by the property. Channel reaches along the Manor Kill were photodocumented. Field observation is critical for setup and calibration of the hydraulic models. When observing the stream channel and adjacent floodplains, the following were noted:

- Does the stream profile match the profile in MMI's model?
- Do stream cross sections match the cross sections in MMI's model?
- Do the Manning n values in MMI's model represent current riverbank and floodplain conditions?
- Do hydraulic variances in the model make sense relative to the field conditions such as channel restrictions and bridges?

When observing structures, the following were noted:

- Do the property and building(s) match the parcel data provided by the Schoharie County Planning Department?
- What is the current land use and building use?
- Does the building have a basement?
- Is the building vacant or occupied?
- What is the elevation of the first floor in relation to the adjacent grade?
- For single-family homes, how many feet (vertical) above the adjacent grade is the first floor?
- Are any unique features present in the building or property that would increase or decrease vulnerability to flooding?
- Is there any direct evidence of past flooding such as mud in a window sill?

Information gathered from field inspections was invaluable for aiding the modeling of alternatives and the BCA.

2.5 Infrastructure

Table 2-1 lists the bridges over the Manor Kill that fall within the three study areas. The bridges are listed from downstream to upstream. Each bridge is discussed in more detail in the Flood Analysis section of this report.

TABLE 2-1
Bridges Crossing in Conesville LFA Study Areas

Bridge Crossing	Study Area	Notes
Pangman Road	1	Abutments damaged and replaced after the Irene flood
South Mountain Road	2	Not damaged in the Irene flood
Beaver Hill Road	3	Bridge and roadway were washed out during Irene; replaced with larger structure with improved alignment
Durham Road	3	Did not wash out in 1996 or Irene floods; reportedly prone to debris jams

2.6 Hydrology

Peak flow rates along the Manor Kill were determined through analysis of USGS stream flow gauges in combination with peak flows derived using the USGS *StreamStats* program. The FEMA FIS of Schoharie County was published in 2012 but does not include detailed flow data for the Manor Kill.

The USGS operates and maintains a nationwide system of stream flow gauges that record daily stream flow. There is one active gauge located on the Manor Kill referred to as the Manor Kill at West Conesville near Gilboa, NY gauge (USGS Gauge #01350080). It is located at Pangman Road. The drainage area at the gauge is 32.6 square miles and the period of record extends from July 1986 to the present.

A flood frequency analysis was conducted with the available stream gauge data from the Pangman Road gauge using the U.S. Army Corps of Engineers (USACE) computer model *Hydrologic Engineering Center – Statistical Software Package (HEC-SSP)*, which employs the national standard Bulletin 17B procedure (USGS, 1982). Peak discharges using this method were determined using the available period of record between July 1986 and the present.

Regional regression equations developed by the USGS (Lumia, Freehafer, Smith, 2006) and applied through the USGS web-based *StreamStats* program (Version 4.0) were used to estimate peak discharges along the Manor Kill within each study area. The regression equations used are specific to New York State Hydrologic Region 3 and include the parameters of drainage area, basin lag, and the mean annual runoff to estimate peak flows.

At gauged sites, Lumia, Freehafer, and Smith (2006) recommend a method for improving estimations of peak stream flows by using a weighted average of the peak flows derived from a combination of gauge analysis and regional regression equations. Weighted averages are generally more reliable than either of these methods used alone. This method was used to determine peak flows for Study Area 1.

For ungauged sites located on a gauged stream, Lumia, Freehafer, and Smith (2006) recommend computing a weighted estimate for each ungauged site. The ungauged site's drainage area must be between 50% and 150% of the drainage area of the stream at the gauged site. Weighted averages were used to determine peak flows for Study Area 2.

Regression equations were used to determine peak flows at two locations along the Manor Kill within Study Area 3.

Tropical Storm Irene flows were determined for Area 1 by using the peak flow recorded at the Pangman Road gauge, which slightly exceeded the 50-year flood event. Irene flows were determined at Area 2, Area 3A, and Area 3B by iteratively modeling flows until flood depths and extents in the hydraulic model matched those reported in the community.

The final flows used for hydraulic modeling of the Manor Kill are presented in Table 2-2. Predicted return intervals at the Pangman Road USGS gauge are depicted in Figure 2-15. The graph in Figure 2-13 shows peak stream flow recorded at the West Conesville USGS gauge at Pangman Road between 1987 and the present. Four flood events described in the flood history section of this report are visible on the graph.

TABLE 2-2
Peak Flows for the Manor Kill

Study Area	Drainage Area (square miles)	2-Year	10-Year	25-Year	50-Year	100-Year	500-Year	Irene
1	32.6	1,519	3,765	5,136	6,245	7,428	10,626	6,590
2	16.8	1,003	2,028	2,694	3,262	3,894	5,576	5,000
3A	11.3	718	1,446	1,923	2,331	2,786	4,004	3,500
3B	5.0	358	724	967	1,175	1,409	2,040	1,200

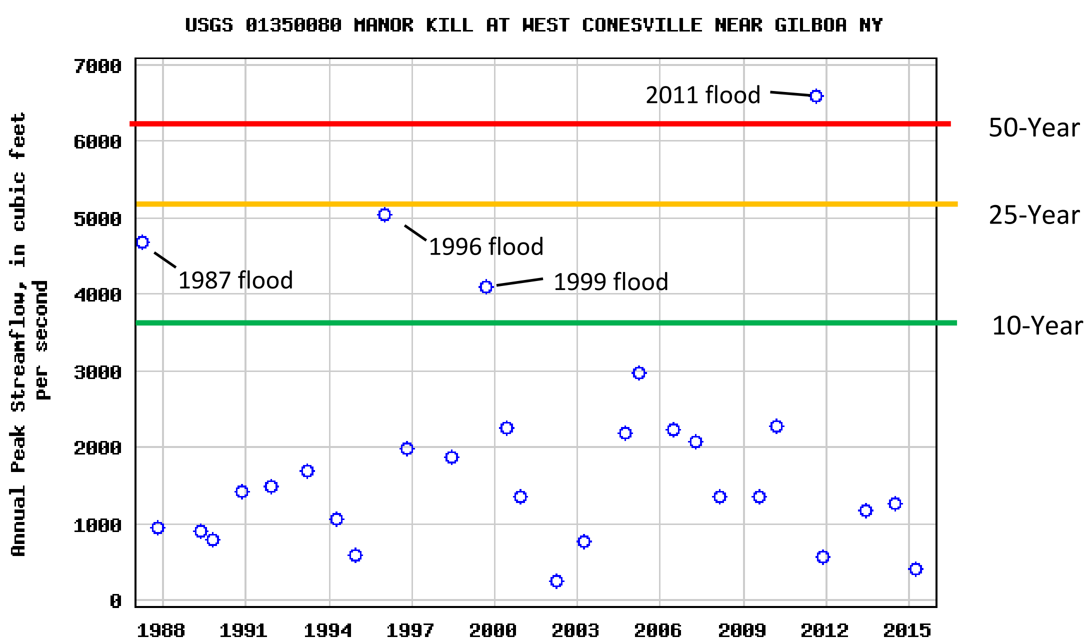


Figure 2-15
Peak Flows for the Manor Kill at Study Area 1

3.0 DESCRIPTION OF FLOOD HAZARDS

3.1 Flood History

The Town of Conesville typically experiences mild summers and cold winters with precipitation occurring year-round. The long-term mean annual precipitation in the Schoharie Creek watershed is reported to be 40 inches per year (FEMA, 2012). However, precipitation is not always distributed uniformly throughout the year and the steep topography of the Catskills Mountains can influence rainfall patterns, with uneven amounts of participation falling from one valley to the next during the same storm event. Several significant and devastating floods have occurred. Beginning with the flood of 1950, these are described below.

Flood of April 1950 – One lifelong resident of Conesville described a flood that occurred in 1950 that was similar in magnitude to the Irene flood of 2011, with extensive flooding and bank erosion along the Manor Kill. There were no stream gauges in place along the Manor Kill at that time, so no known records of stream flow exist indicating the magnitude of the flood.

Flood of April 1987 – With saturated soil conditions and high stream discharges due to previous rainfall and snowmelt, the rainfall event that occurred between April 3 and April 6 resulted in up to 9 inches of rain in locations and led to extensive flooding within Schoharie County. In Conesville, the Manor Kill stream gauge (at Pangman Road) reached a discharge of 4,680 cfs, which exceeds the 10-year flood but not the 25-year flood.

Flood of January 1996 – In January 1996, the combination of a snowpack of over 40 inches and solidly frozen ground with air temperatures that rose to 60 degrees and a 2-day rain storm resulted in 2.0 to 4.5 inches of rain. With a peak discharge of 5,050 cfs on the Manor Kill at the time, this was the event of record for the location. Residents of the town recall extensive flooding along the Manor Kill and damage to buildings, farm fields, bridges, and roadways. The flood was close to a 25-year flood event.

Flood of September 1999 – According to the USGS National Water Information website (2016), the peak flows of September 16, 1999, were due to a combination of snowmelt, a hurricane, and an ice jam or debris dam breakup and resulted in a peak discharge of 4,100 cfs on the Manor Kill, which exceeds the 10-year flood but not the 25-year flood.

Floods of 2011 – In August and September 2011, Tropical Storm Irene and the remnants of Tropical Storm Lee resulted in record flooding in much of the Catskills. The Manor Kill reportedly flooded areas within each of the three hamlets in town resulting in damage to numerous building structures, flooded and washed out roadways, and both the Beaver Hill and Pangman Road bridges being washed away. With a peak discharge of 6,590 cfs on the Manor Kill during the Irene flood, this exceeded the 50-year flood event at the Pangman Road gauge and is the event of record for this location.

3.2 FEMA Floodplain Mapping

The Manor Kill has been evaluated by FEMA using approximate engineering methods only, meaning that identification of areas subject to flooding were approximated. The current FIS for Schoharie County became effective on February 16, 2012.

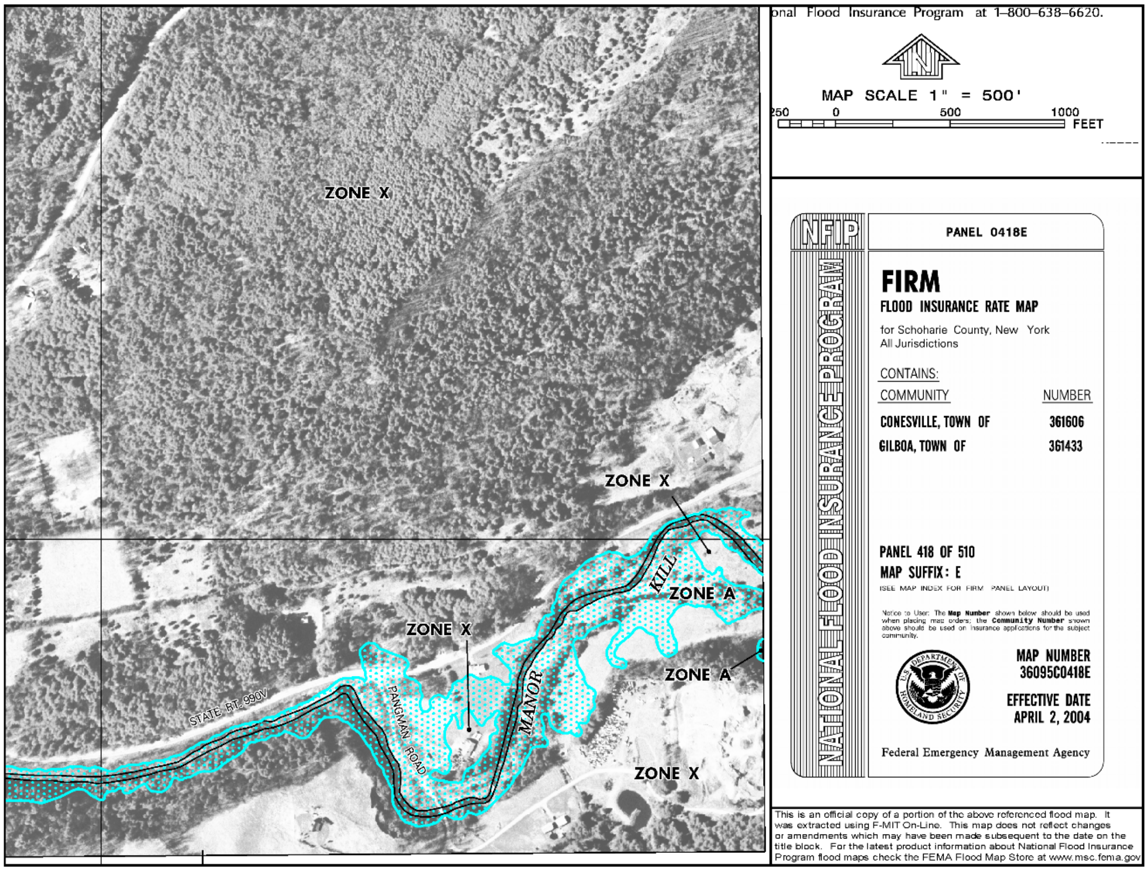


Figure 3-1
FEMA Digital Flood Insurance Rate Map (DFIRM) for Project Area 1

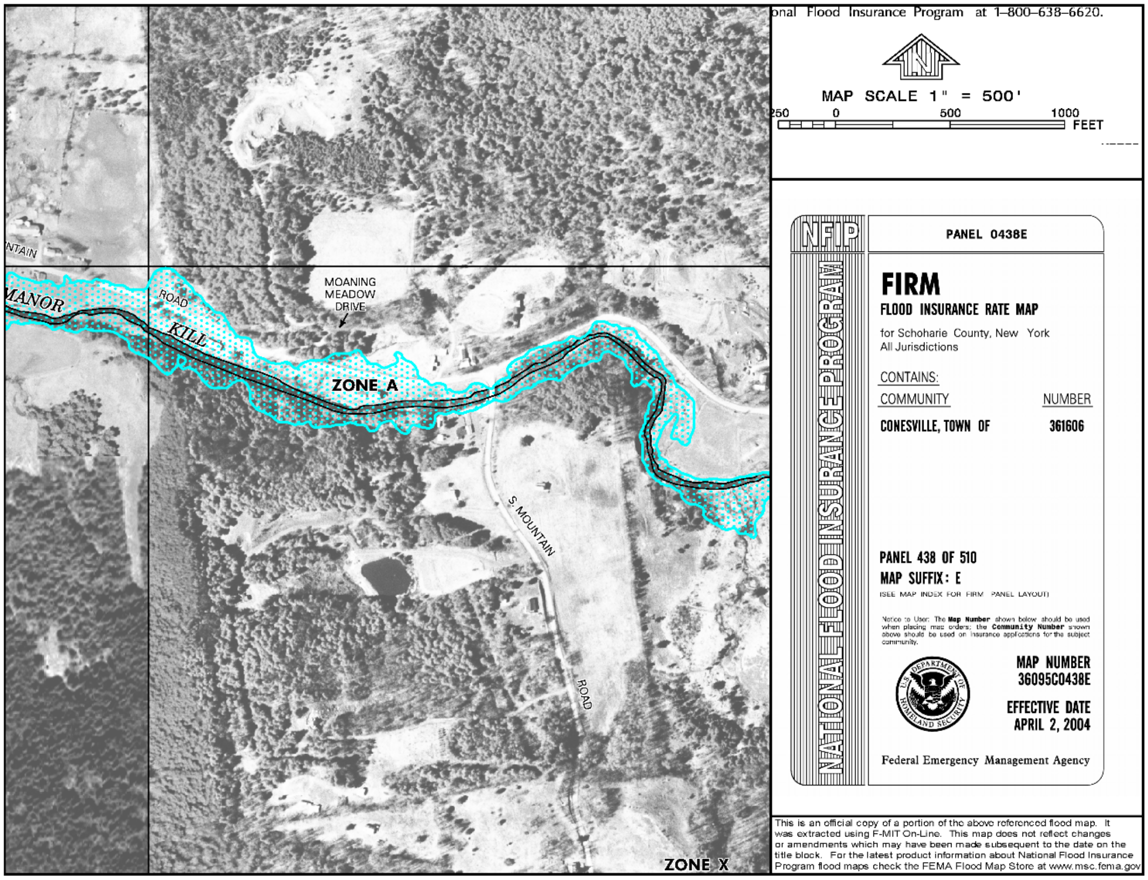


Figure 3-2
FEMA DFIRM for Project Area 2

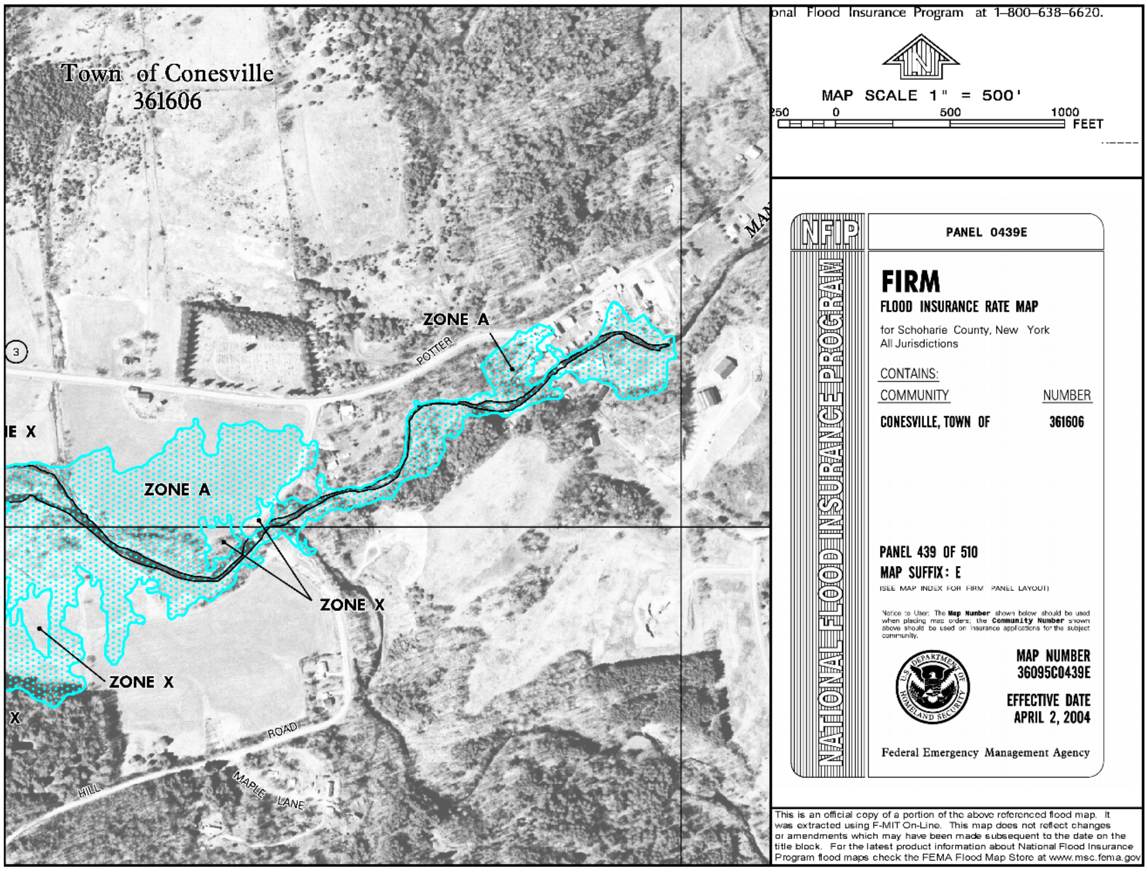


Figure 3-3
FEMA DFIRM for Project Area 3

4.0 FLOOD MITIGATION ANALYSIS AND ALTERNATIVES

The purposes of a hydraulic assessment are to evaluate historic and predicted water surface elevations, identify floodprone areas, and help develop mitigation strategies to minimize future flood damages and protect water quality. Hydraulic analysis techniques can also help predict flow velocities, sediment transport, scour, and deposition if these outcomes are desired.

Specific areas along the Manor Kill have been identified as being prone to flooding during severe rain events. Alternatives were developed and assessed at each area where flooding is known to have caused extensive damage to homes and businesses. Alternatives were assessed with hydraulic modeling to determine their effectiveness. The sections below describe these alternatives and their results.

4.1 Analysis Approach

Hydraulic analysis of the Manor Kill through the three study areas was conducted using the *Hydrologic Engineering Center – River Analysis System (HEC-RAS)* program. The *HEC-RAS* software was written by the USACE Hydrologic Engineering Center and is considered to be the industry standard for riverine flood analysis. The model is used to compute water surface profiles for one-dimensional, steady-state, or time-varied flow. The system can accommodate a full network of channels, a dendritic system, or a single river reach. *HEC-RAS* is capable of modeling water surface profiles under subcritical, supercritical, and mixed-flow conditions.

In order to develop hydraulic modeling, field survey was collected by MMI. Survey consisted of wet channel cross sections and hydraulic openings of bridges. Elevations of dry overbank areas were determined using Digital Elevation Models (DEMs) derived from Light Detection and Ranging (LiDAR) mapping for Schoharie County.

Water surface profiles are computed by *HEC-RAS* from one cross section to the next by solving the one-dimensional energy equation with an iterative procedure called the standard step method. Energy losses are evaluated by friction (Manning's Equation) and the contraction/expansion of flow through the channel. The momentum equation is used in situations where the water surface profile is rapidly varied such as hydraulic jumps, mixed-flow regime calculations, hydraulics of dams and bridges, and for evaluating profiles at a river confluence.

For purposes of water surface elevation computations, the model was run in subcritical flow regime, which tends to use slower velocities but higher water surface elevations and also provides the worst case scenario for flood surface elevations.

4.2 Evaluation of Flood Mitigation Alternatives – Study Area 1

4.2.1 Existing Conditions

Study Area 1 focuses on the Manor Kill in the hamlet of West Conesville near the Pangman Road bridge. The figures below depict hydraulic modeling results under existing conditions for the 10-year flood event (Figure 4-1), the Irene flood (Figure 4-2), and the 100-year flood event (Figure 4-3).

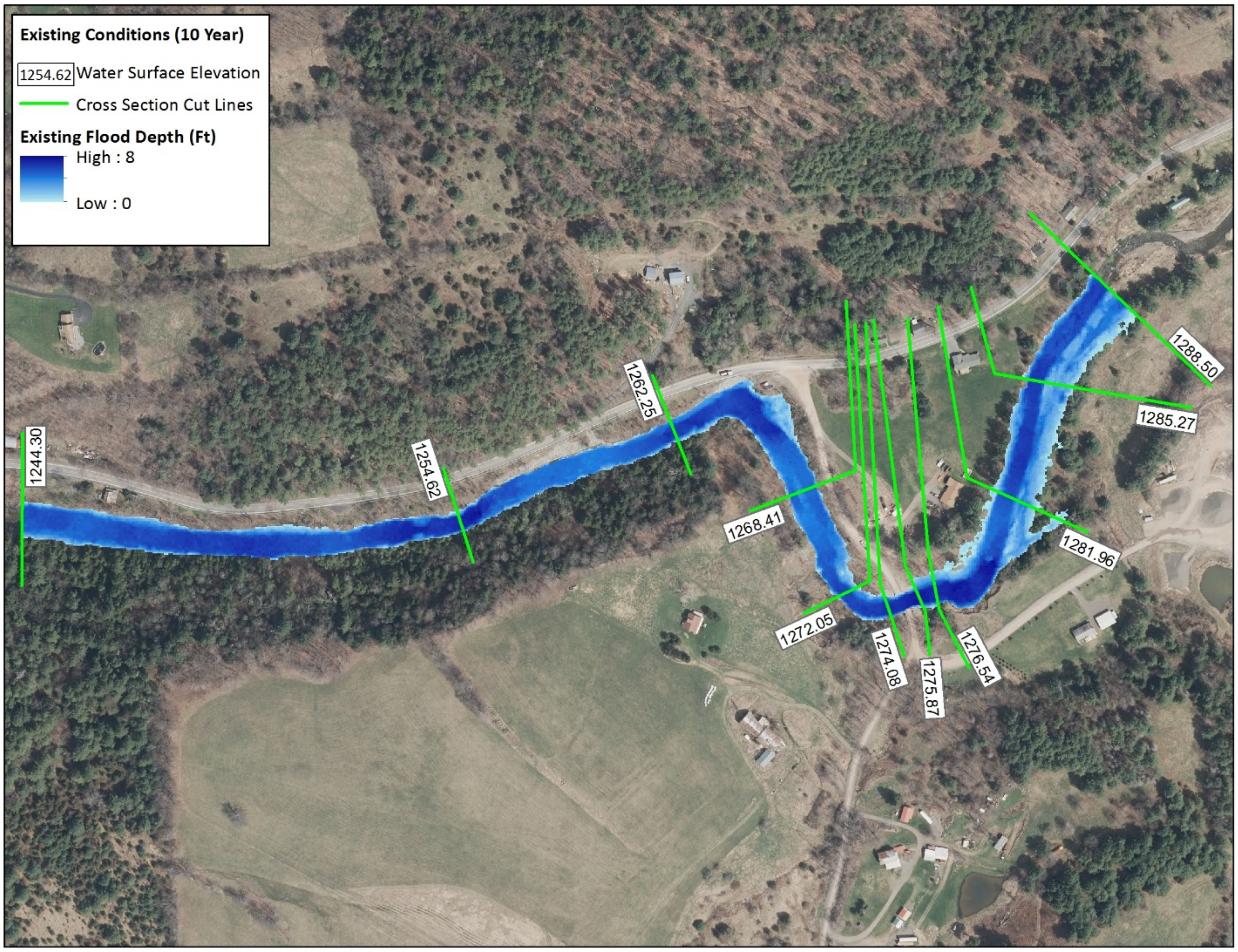


Figure 4-1
Study Area 1 Hydraulic Modeling Results – Existing Conditions, 10-Year Flow

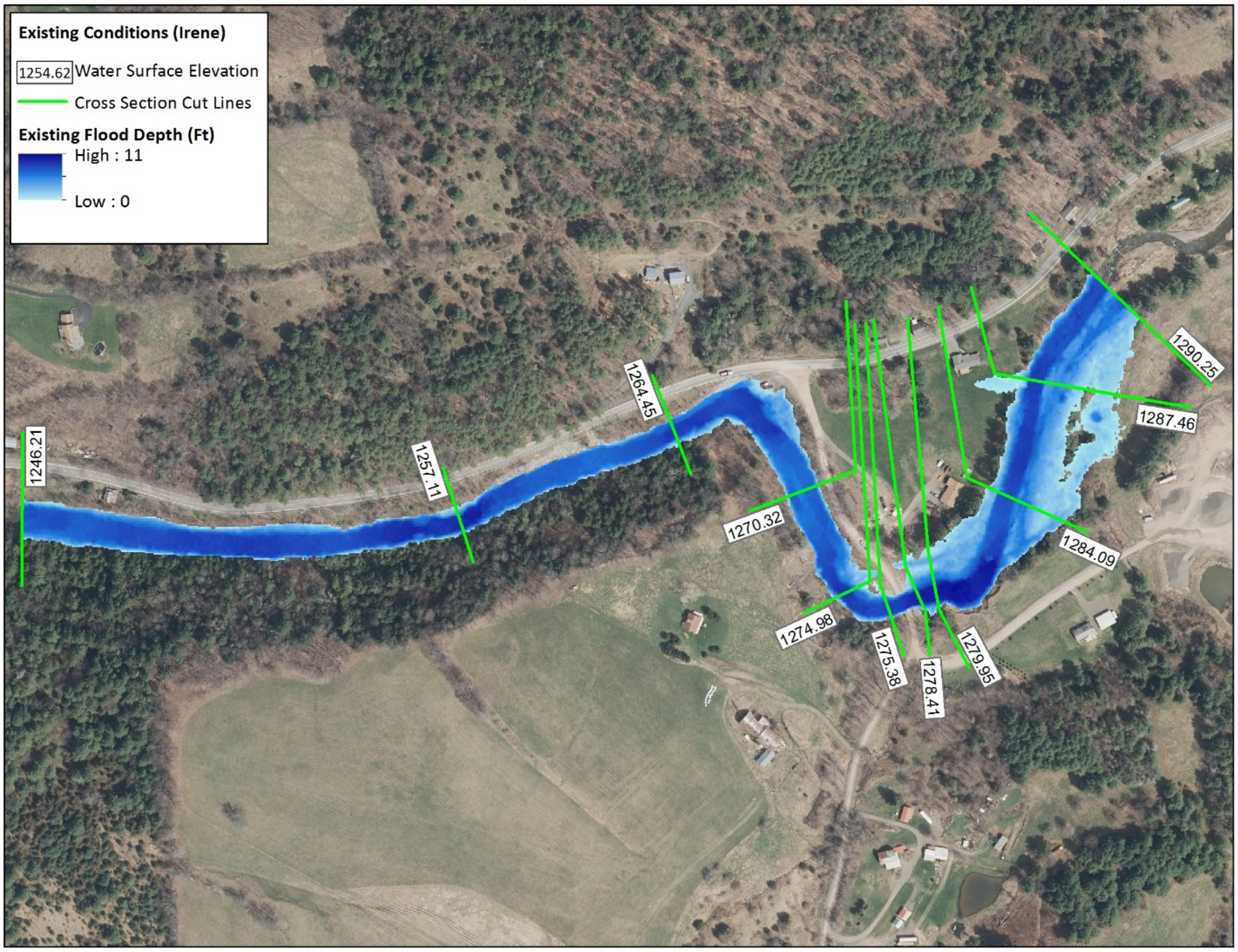


Figure 4-2
Study Area 1 Hydraulic Modeling Results – Existing Conditions, Irene Flow

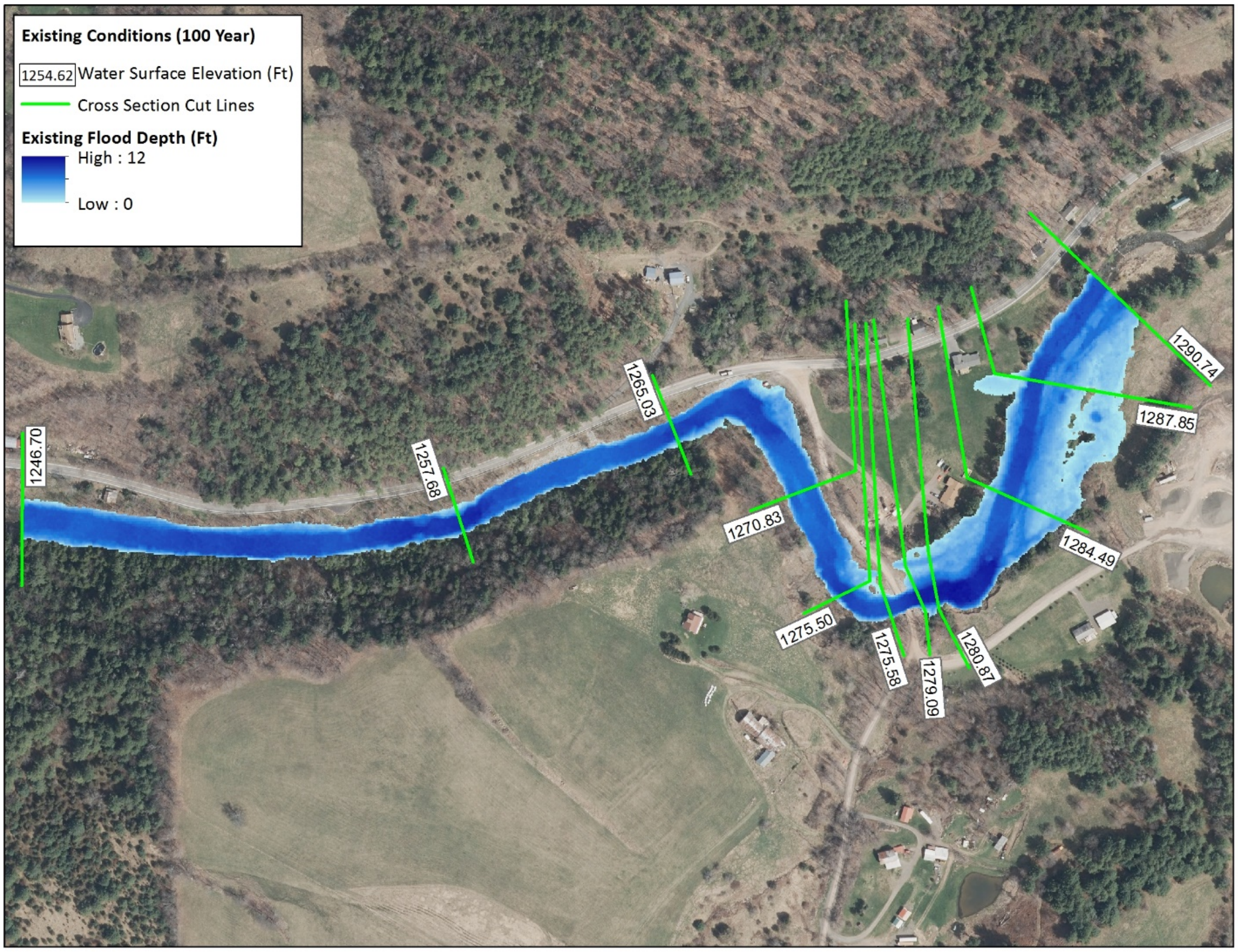


Figure 4-3
Study Area 1 Hydraulic Modeling Results – Existing Conditions, 100-Year Flow

The existing conditions hydraulic modeling results illustrate how flows spread out on the floodplain of the Manor Kill as they approach the Pangman Road bridge and then become more concentrated as they enter the confined valley setting downstream of the bridge. This condition of valley confinement results in a high stream power setting that creates powerful erosive forces which, in combination with the two forced channel bends that direct flows at the banks, likely resulted in the severe stream bank erosion and the washout of the bridge abutments that occurred at the site.

Stream power is a measure of the ability of flowing water to do work. Specific stream power (stream power per unit area of channel bed) is a function of the water surface profile slope, discharge, and width. Narrow, confined river channels will have higher specific stream power than wider channels of the same slope and discharge. Stream power can be an effective predictive tool for coarse-screen identification of erosion, channel migration, and aggradation risk. Figure 4-4 is a graph of specific stream power along the Manor Kill in Project Area 1 under a range of flow conditions and illustrates how stream power increases abruptly in the vicinity of the Pangman Road bridge as the stream channel becomes confined within the valley walls. The increase is most dramatic immediately downstream of the bridge. This rapid increase in stream power indicates channel instability and a high risk of bed and bank erosion.

It was noted that existing conditions hydraulic modeling results for the Irene flood event do not match reports of observations during the actual flood. During Tropical Storm Irene, floodwaters exited the Manor Kill channel upstream of the Pangman Road bridge and cut across the inside of the bend in the creek, flowing through the yard of the Hughes property (111 Pangman Road) at a depth of approximately 2 feet before returning to the creek. The house was surrounded by water but did not flood. The end of Pangman Road in the vicinity of the stop sign was reportedly flooded by approximately 8 feet of water. The existing conditions hydraulic modeling results for the Irene flood and the 100-year flood event indicate that water begins to exit the channel near cross section 1287.85 but does not flow across the yard and Pangman Road and reenter the Manor Kill. This discrepancy between the hydraulic model and observations during Irene is likely due to the following factors:

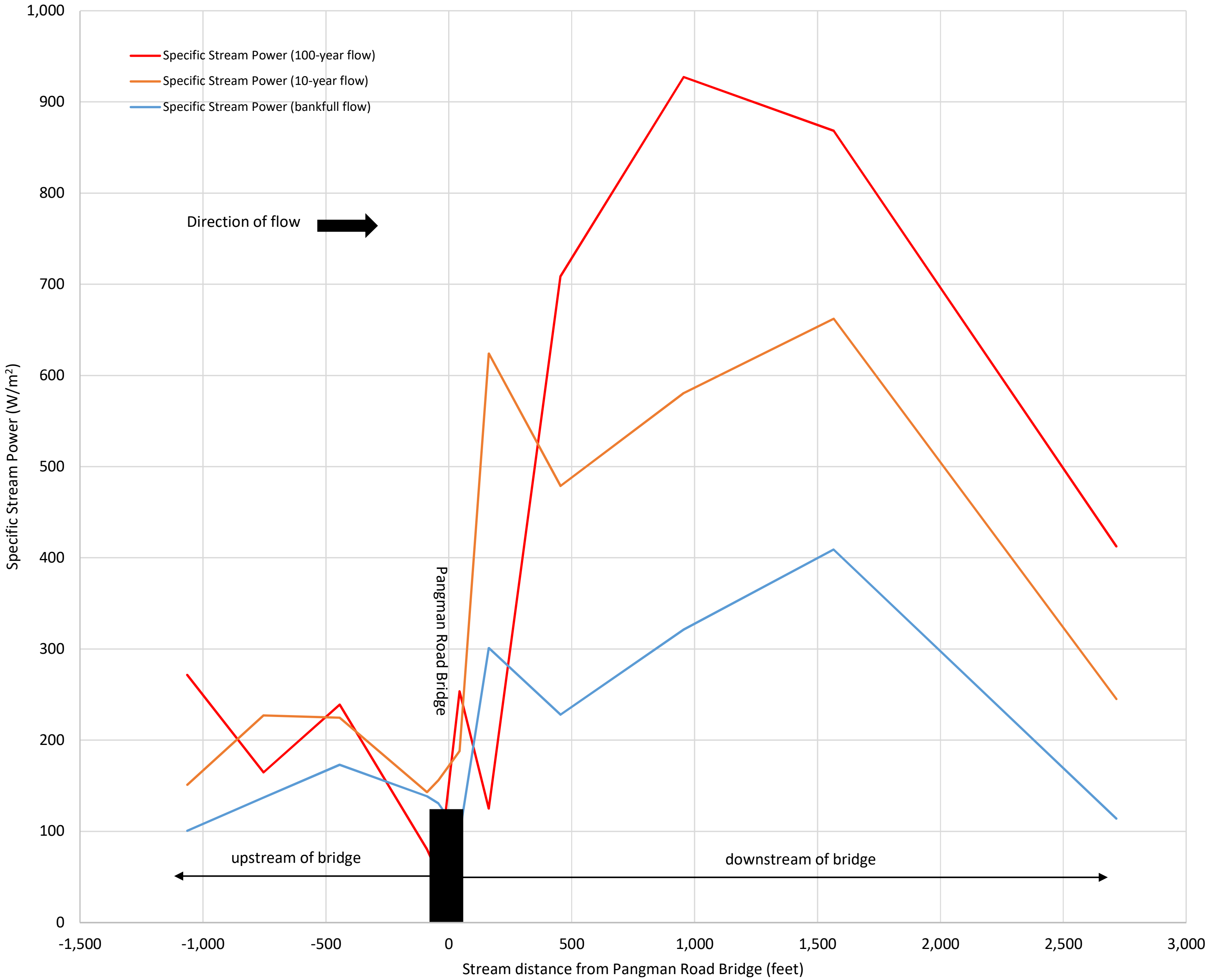
- Following Tropical Storm Irene, the bank along the Manor Kill where overtopping occurred was built up with an earthen berm.

- The hydraulic model does not account for woody debris and other material that may have been clogging the channel during the Irene flood, forcing water out of the channel and across the yard.

- The hydraulic model includes the Pangman Road bridge geometry in its current configuration, which reportedly has a larger hydraulic opening than the bridge did prior to Tropical Storm Irene.

Figure 4-5 depicts the approximate flow path of floodwaters through the property at 111 Pangman Road during Tropical Storm Irene as documented by photographs and accounts from Conesville residents. Although the house was not flooded, floodwaters cut across the inside of the bend in the creek, flowing through the yard at a depth of approximately 2 feet before returning to the creek. The house was surrounded by water but remained dry, including the basement. Once floodwaters cut across the yard, the home at 111 Pangman Road and the surrounding small area of land essentially became an island, surrounded on all sides by flowing water, with no safe way to exit or enter the property. The surrounding area of property including a firewood splitting operation and associated equipment was flooded and sustained damages.

Figure 4-4 - Specific Stream Power in Study Area 1



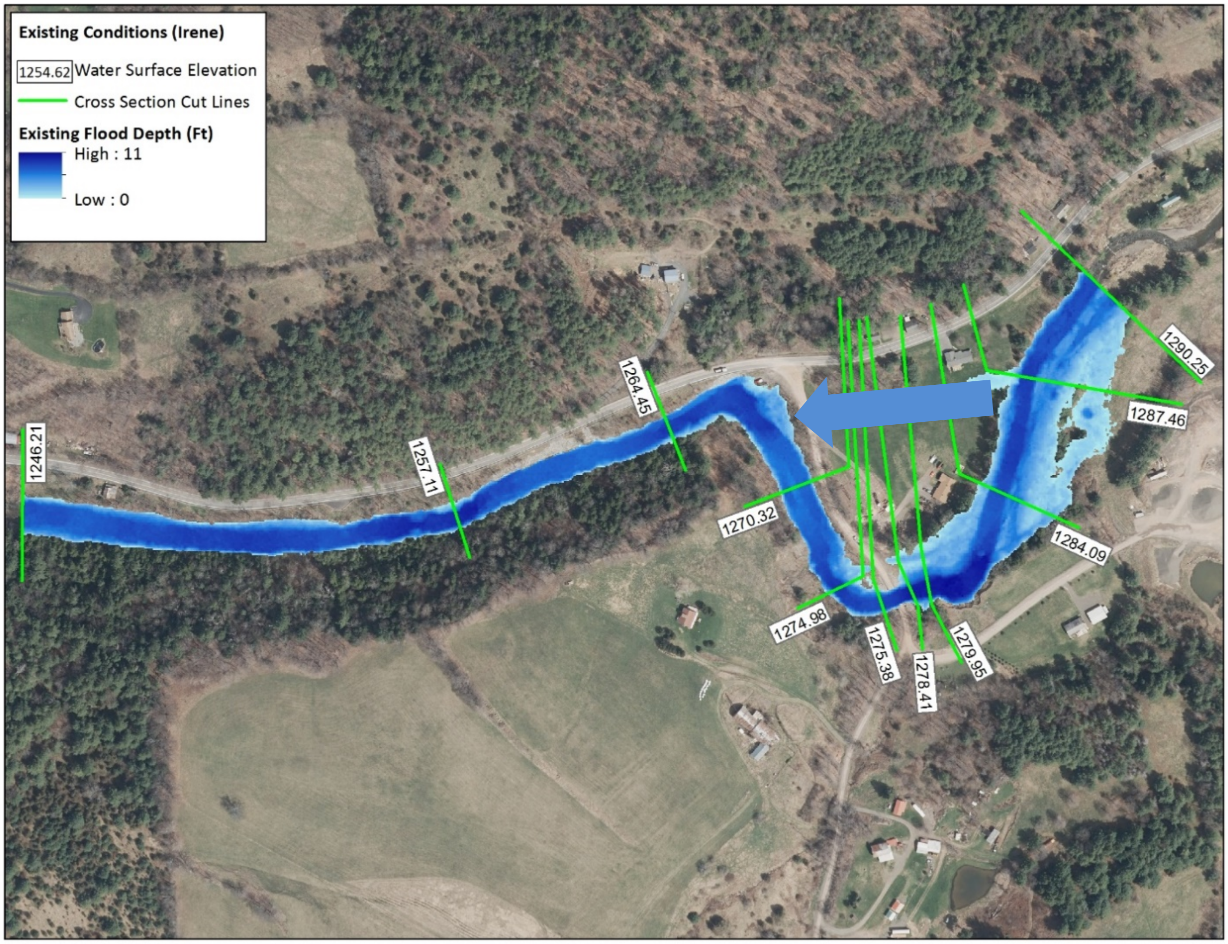


Figure 4-5
Study Area 1 Depicting Flow Path (blue arrow) during Tropical Storm Irene

4.2.2 Proposed Conditions

In some cases, bridges cause lateral or vertical restrictions that increase flood velocities and/or water surface elevations. The replacement of a bridge with a new structure that has a longer span often removes the lateral constrictions while a higher structure removes vertical restrictions and often reduces water surface elevations on the upstream side. Bridge replacement must be carefully evaluated in combination with other alternatives because other flood mitigation projects could change the velocity or height of flows approaching and passing under bridges.

In order to evaluate whether the Pangman Road bridge is acting as a hydraulic constriction, it was removed from the hydraulic model. The figures below show hydraulic modeling results with the Pangman Road bridge removed from the model for the 10-year flood event (Figure 4-6), the Irene flood (Figure 4-7), and the 100-year flood event (Figure 4-8). The numbers in red indicate a change in water surface elevation and the numbers in parentheses indicate the amount of change in feet.

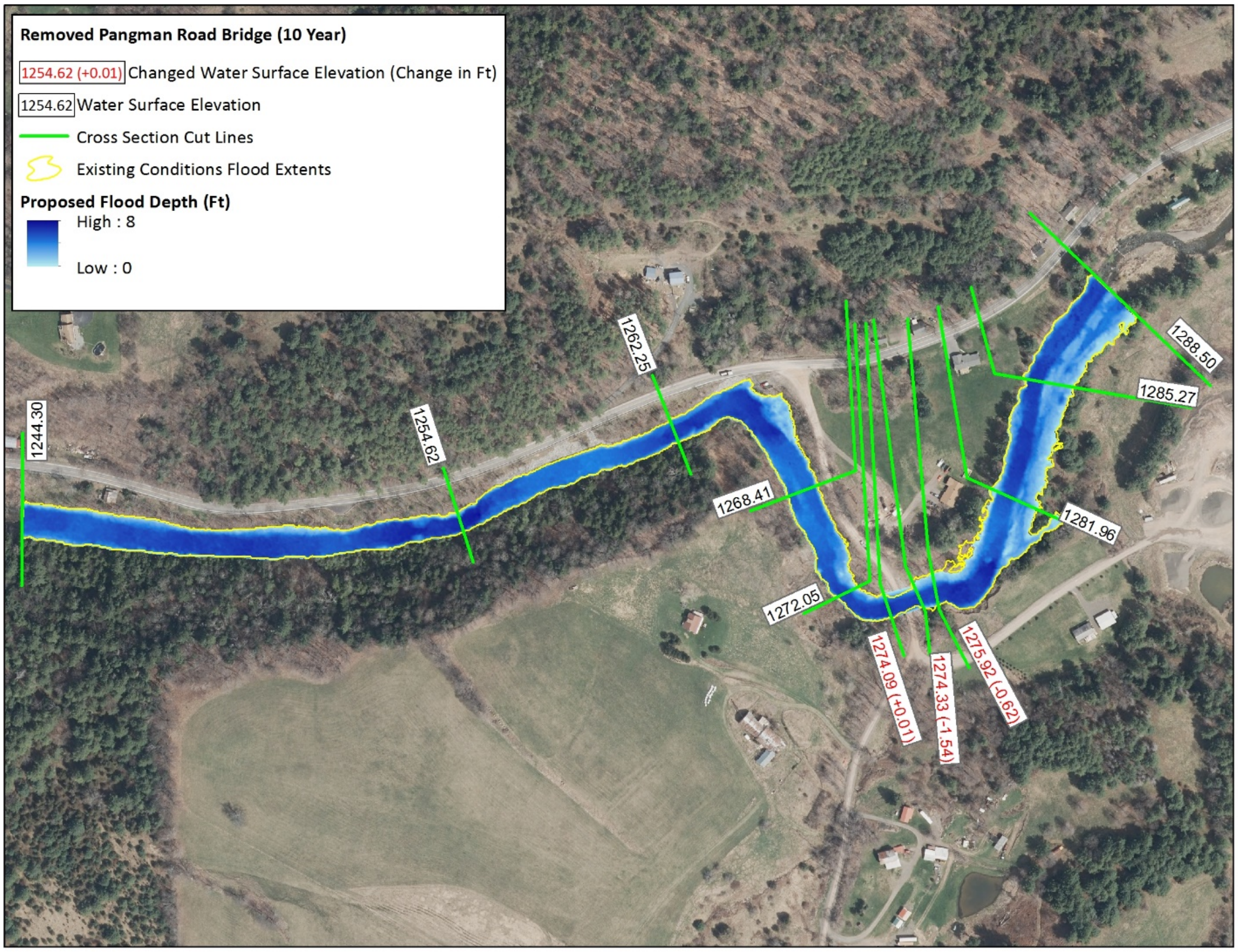


Figure 4-6
Study Area 1 Modeling Results – Pangman Road Bridge Removed, 10-Year Flow

Modeling for the 10-year flood event with the Pangman Road bridge removed from the model indicates a water surface elevation reduction of 1.54 feet at the upstream face of the bridge and a reduction of 0.62 feet a short distance upstream of the bridge when compared to water surface elevations with the bridge in place.

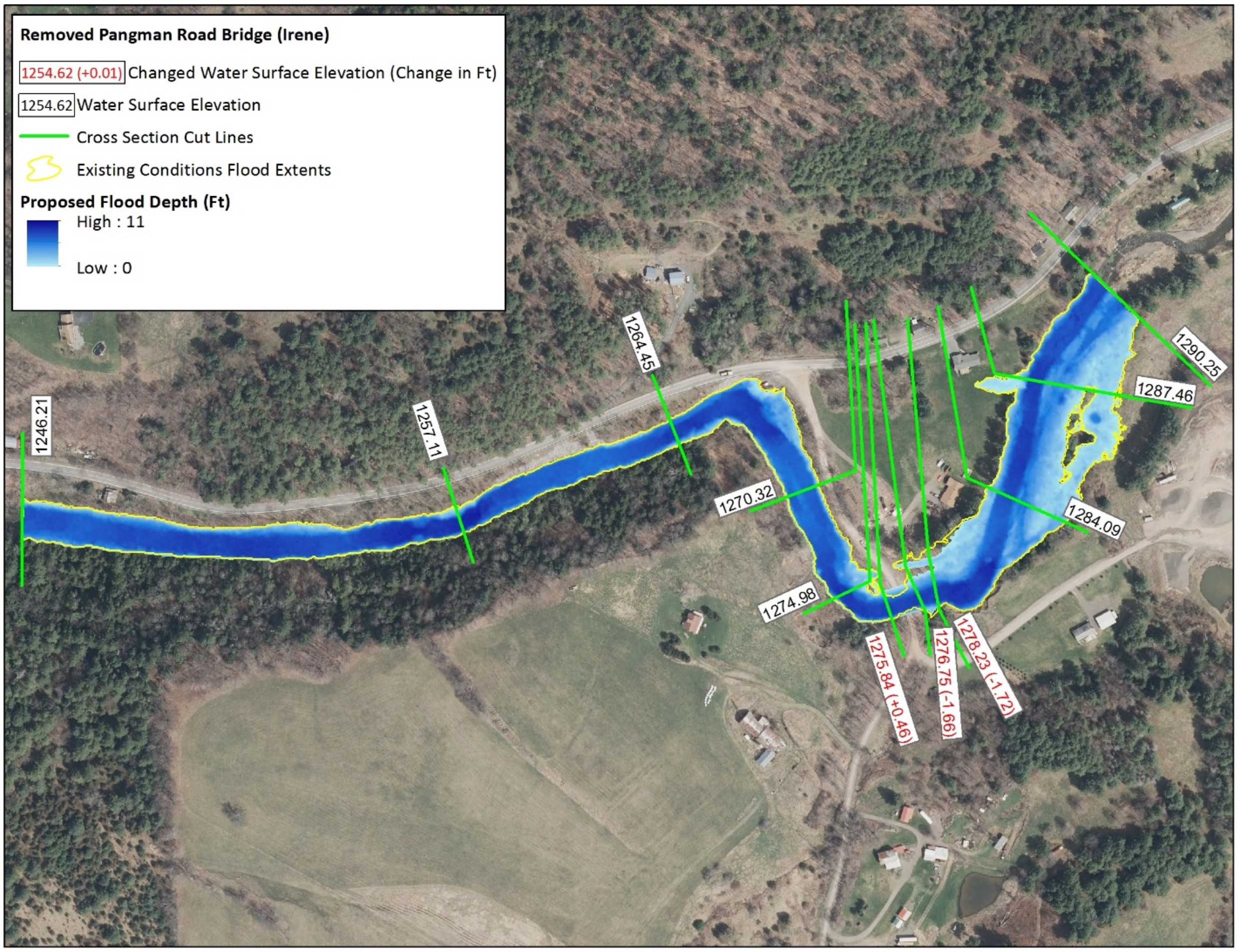


Figure 4-7
Study Area 1 Modeling Results – Pangman Road Bridge Removed, Irene Flow

Modeling of the Irene flood with the Pangman Road bridge removed from the model indicates a water surface elevation increase of 0.46 feet at the downstream face of the bridge, a water surface elevation reduction of 1.66 feet at the upstream face of the bridge, and a reduction of 1.72 feet just upstream of the bridge when compared to water surface elevations with the bridge in place.

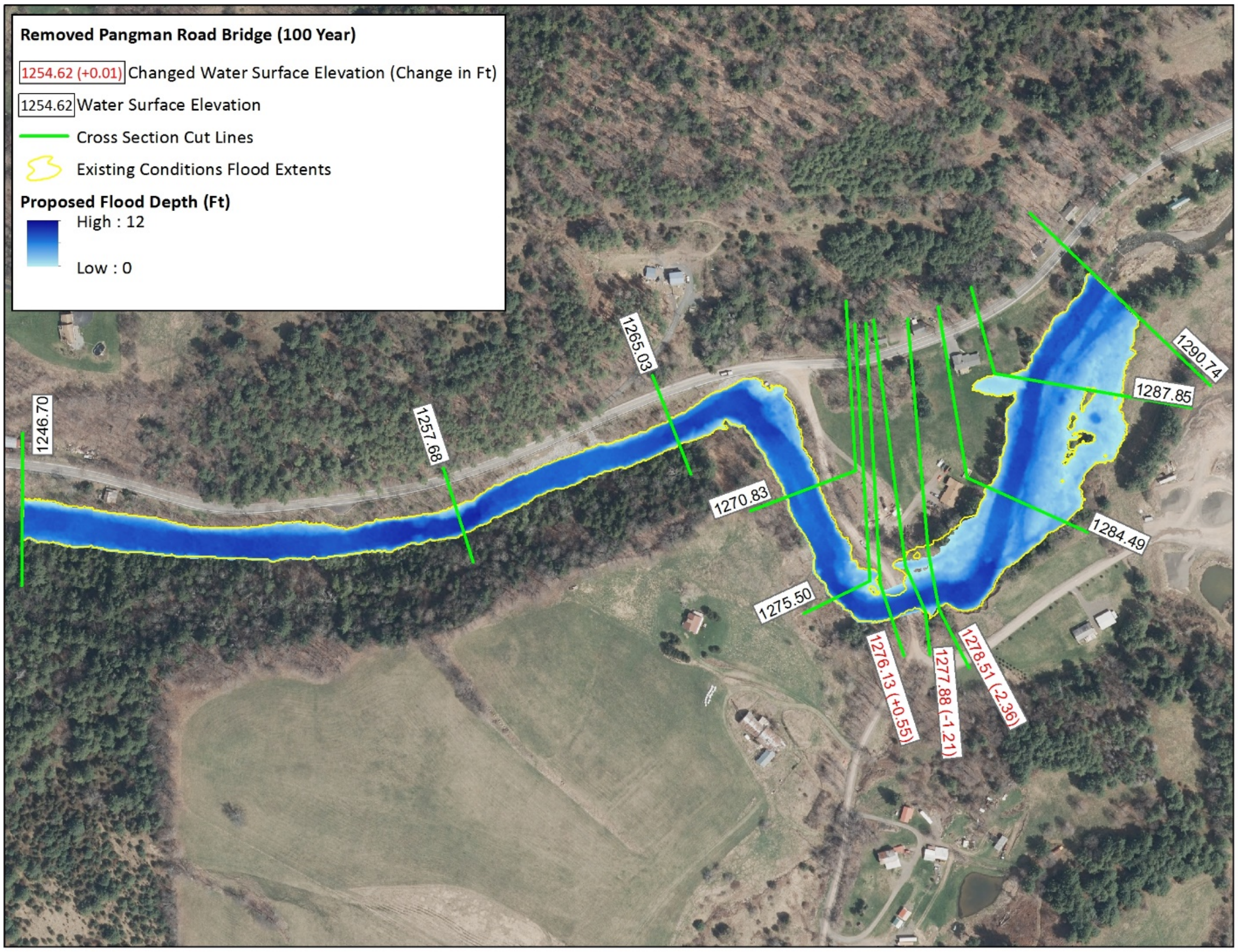


Figure 4-8
Study Area 1 Modeling Results – Pangman Road Bridge Removed, 100-Year Flow

Modeling of the 100-year flood event with the Pangman Road bridge removed indicates a water surface elevation increase of 0.55 feet at the downstream face of the bridge, a water surface elevation reduction of 1.21 feet at the upstream face of the bridge, and a reduction of 2.36 feet just upstream of the bridge when compared to water surface elevations with the bridge in place.

Figure 4-9 is a longitudinal profile of the Manor Kill in Study Area 1, showing water surface elevation profiles for the 10-year and 100-year flood events under existing conditions (in blue) and with the Pangman Road bridge removed (in red).

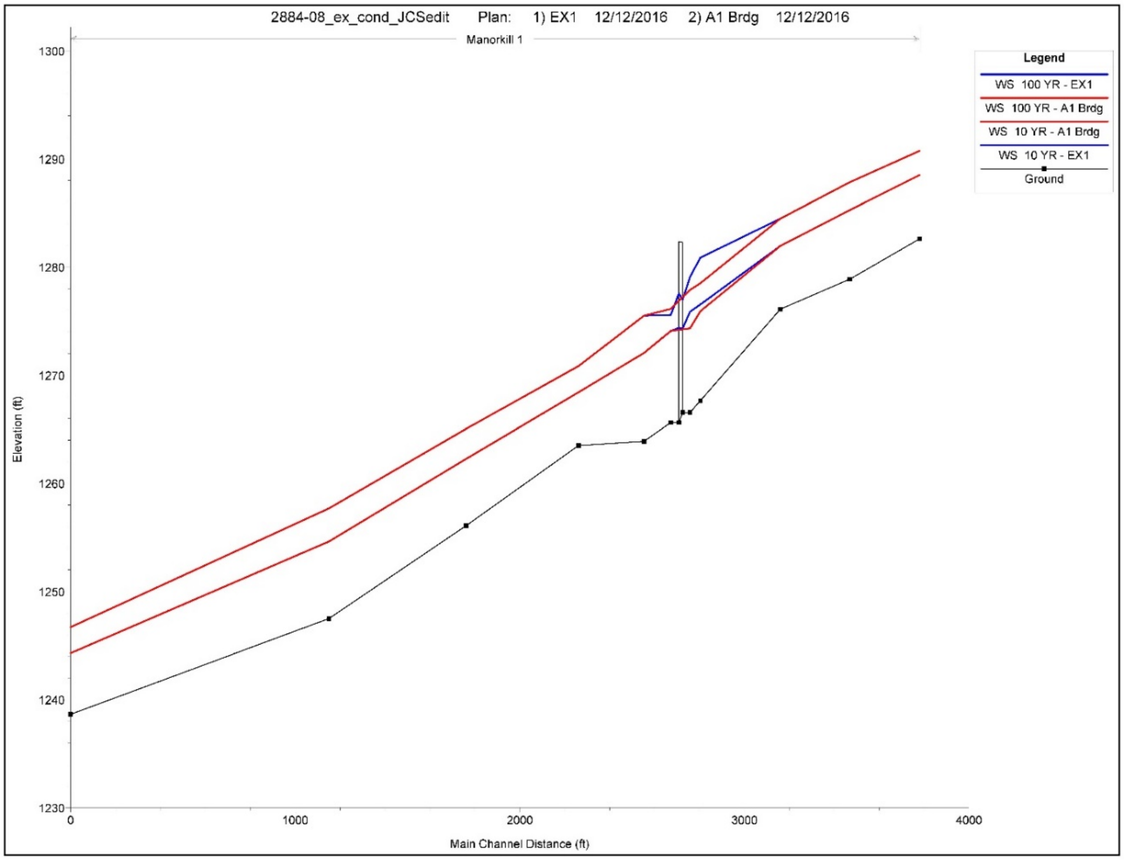


Figure 4-9
Study Area 1 Modeling Results – Longitudinal Profile Showing Pangman Road Bridge

The hydraulic modeling indicates that while the Pangman Road bridge does cause increases in water surface elevations, these increases are relatively small and do not extend very far upstream of the bridge. There are no floodprone homes or other structures located immediately upstream of the bridge. The modeling also indicates that the bridge does not overtop, even in the 100-year flood event.

4.2.3 Results

Hydraulic modeling in Study Area 1 revealed the following:

- The Pangman Road bridge is sufficiently sized to pass the 100-year flood event and does not create a hydraulic constriction that contributes to flooding of buildings.

- Valley confinement beginning at the Pangman Road bridge and extending downstream results in a high stream power setting that creates powerful erosive forces which, in combination with the two forced channel bends that direct flows at the banks, likely resulted in the severe stream bank erosion and the washout of the bridge abutments that occurred in this area during Tropical Storm Irene.

4.3 Evaluation of Flood Mitigation Alternatives – Study Area 2

4.3.1 Existing Conditions

Study Area 2 includes the Manor Kill as it approaches the hamlet of Conesville. The study area begins approximately 1,000 feet upstream of the South Mountain Road bridge and extends 2,000 feet downstream of the bridge. The Manor Kill makes a hard bend to the left before flowing under the South Mountain Road bridge and then flows relatively straight through the project area. The channel is confined by a steep, forested valley wall along its left bank. Potter Mountain Road runs parallel to the right bank.

The figures below show hydraulic modeling results within Study Area 2 under existing conditions for the 50-year flood event (Figure 4-10), the 100-year flood event (Figure 4-11), and the Irene flood (Figure 4-12).

Figure 4-10
Study Area 2 Hydraulic Modeling Results – Existing Conditions, 50-Year Flow

Figure 4-11
Study Area 2 Hydraulic Modeling Results – Existing Conditions, 100-Year Flow

Figure 4-12
Study Area 2 Hydraulic Modeling Results – Existing Conditions, Irene Flow

Hydraulic modeling of existing conditions indicates that flood flows from the Manor Kill begin to flow onto Potter Mountain Road during the 50-year flood event. During the 100-year flood event, water extensively overtops Potter Mountain Road and floods the home on the opposite side of the road (195 Potter Mountain Road). During the Irene flood, which exceeded the 100-year flood in Study Area 2, Potter Mountain Road was flooded at a second location and two homes along the right bank of the Manor Kill were flooded (198 and 226 Potter Mountain Road).

4.3.2 Proposed Conditions

The channel of the Manor Kill through the floodprone section of Study Area 2 is confined on both banks, with evidence of floodplain filling evident along the right bank. Floodplain enhancement was investigated as a flood mitigation scenario with the goals of reducing flooding of homes along Potter Mountain Road as well as the flooding of the roadway itself.

Figure 4-13 shows a typical cross section of a compound channel with enhanced floodplains. The graphic shows enhanced floodplains on both banks; however, floodplains can be enhanced on either or both banks of a river. Due to the steepness of the left bank, floodplain enhancement along this area of the Manor Kill was investigated at two locations along the right bank only. The locations of proposed floodplain enhancements are shown in Figure 4-14.

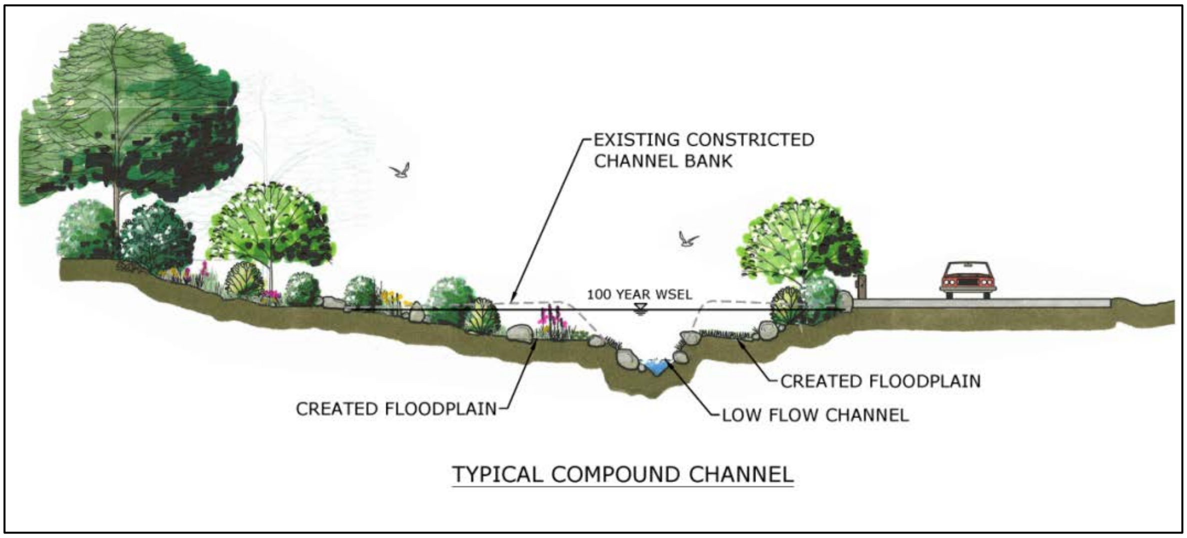


Figure 4-13
Typical Cross Section of Compound Channel with Enhanced Floodplain

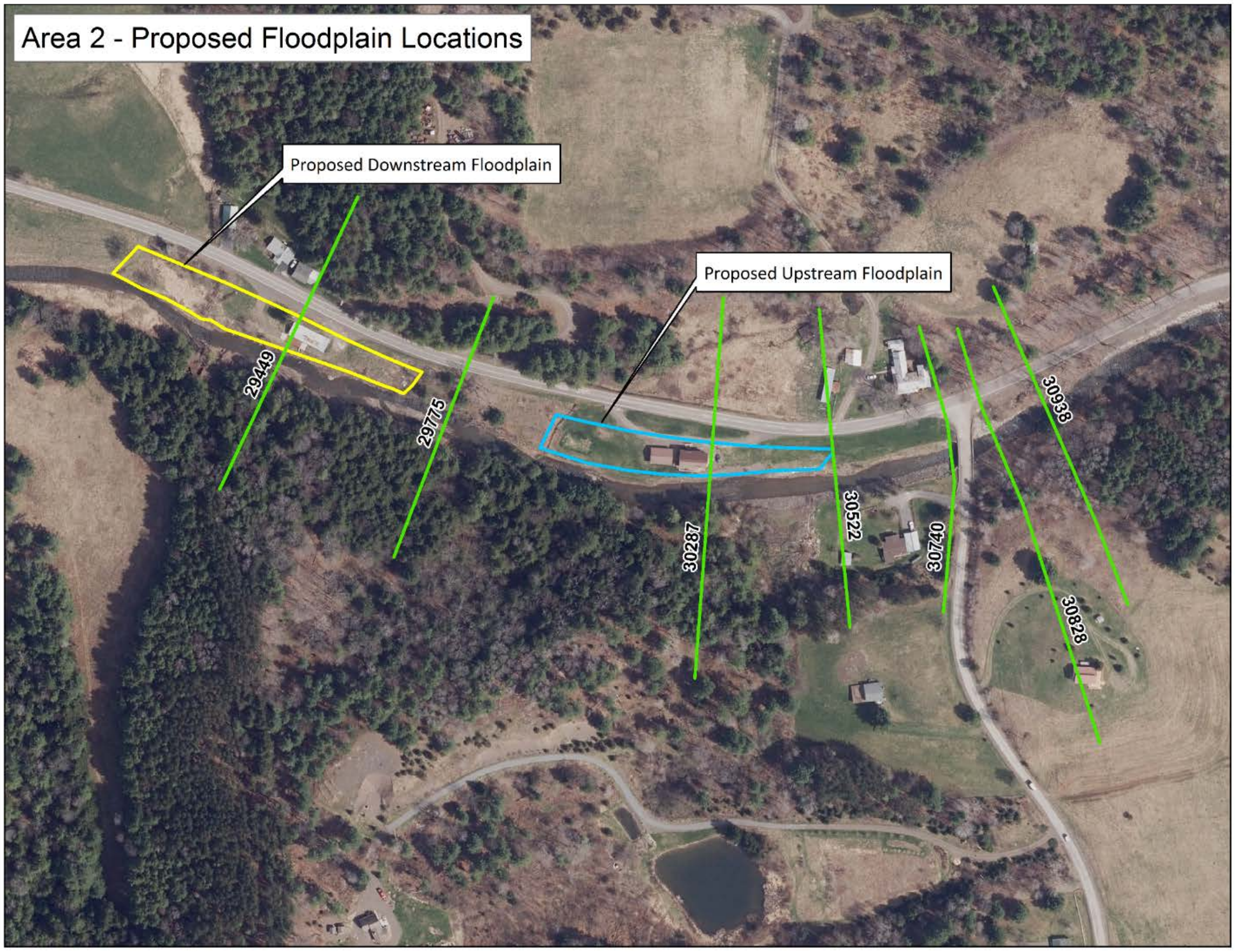


Figure 4-14
Locations of Proposed Floodplain Enhancement in Study Area 2

Hydraulic modeling was used to evaluate the flood reduction benefits under two floodplain enhancement scenarios. Appendix B contains volume calculations and cost estimates for each floodplain enhancement scenario.

1. Floodplain Enhancement Scenario 1: This scenario would involve floodplain enhancement at the downstream location only, in the area depicted in yellow in Figure 4-14 above. Floodplain enhancement under this scenario would require the demolition and removal of one currently abandoned structure at 198 Potter Mountain Road, which is reportedly in the process of being acquired by the NYCDEP. Floodplain enhancement would require the excavation and off-site removal of approximately 8,800 cubic yards of material from 500 linear feet of channel along the right bank. The resulting enhanced floodplain would be approximately 46,000 square feet, or just over 1 acre, in size.

2. Floodplain Enhancement Scenario 2: This scenario would entail floodplain enhancement at the downstream location as described under Scenario 1 as well as the upstream location, depicted in blue in Figure 4-14. Floodplain enhancement under this scenario would require the demolition and removal of the currently abandoned structure at 198 Potter Mountain Road, as described in

Scenario 1, as well as the voluntary buyout, demolition, and removal of one currently occupied home located in the upstream area (226 Potter Mountain Road). Floodplain enhancement under Scenario 2 would require the excavation and off-site removal of approximately 11,500 cubic yards of material from 980 linear feet of channel along the right bank. The resulting enhanced floodplain would be approximately 74,000 square feet, or 1.7 acres, in size.

Hydraulic modeling was used to evaluate the flood reduction benefits under both floodplain enhancement scenarios. The figures below show the resulting reduction in flooding under Scenario 1 (downstream floodplain only) during the 50-year (Figure 4-15), 100-year (Figure 4-16), and Irene (Figure 4-17) flood events. The numbers in red indicate a change in water surface elevation and the numbers in parentheses indicate the amount of change in feet.

Figure 4-15
Study Area 2 – Floodplain Enhancement Scenario 1 – Proposed Conditions, 50-Year Flow

During the 50-year flood event, Floodplain Enhancement Scenario 1 would result in water surface elevation reductions ranging from 0.35 feet to 0.78 feet at the site of the floodplain enhancement with smaller reductions extending upstream of the site. The flooding of Potter Mountain Road would be reduced during the 50-year flood event as would flooding of the home to the north of the roadway at 195 Potter Mountain Road.

Figure 4-16
Study Area 2 – Floodplain Enhancement Scenario 1 – Proposed Conditions, 100-Year Flow

During the 100-year flood event, Floodplain Enhancement Scenario 1 would result in water surface elevation reductions ranging from 0.35 feet to 0.78 feet at the site of the floodplain enhancement with smaller reductions extending upstream of the site to just upstream of the South Mountain Road bridge. The flooding of Potter Mountain Road would still occur during the 100-year flood, but its depth and frequency of flooding would be reduced as would flooding of the home to the north of the roadway at 195 Potter Mountain Road.

Figure 4-17
Study Area 2 – Floodplain Enhancement Scenario 1 – Proposed Conditions, Irene Flow

During the Irene flood event, Floodplain Enhancement Scenario 1 would result in water surface elevation reductions ranging from 0.56 feet to 0.80 feet at the site of the floodplain enhancement with smaller reductions extending upstream of the site to the South Mountain Road bridge. The flooding of Potter Mountain Road would still occur at two locations during an Irene magnitude flood, but its depth and frequency of flooding at both locations would be reduced as would flooding of the home to the north of the roadway at 195 Potter Mountain Road.

Figure 4-18 is a longitudinal profile from the hydraulic model showing water surface elevation reductions under Floodplain Enhancement Scenario 1. The brackets indicate the location of floodplain enhancement.

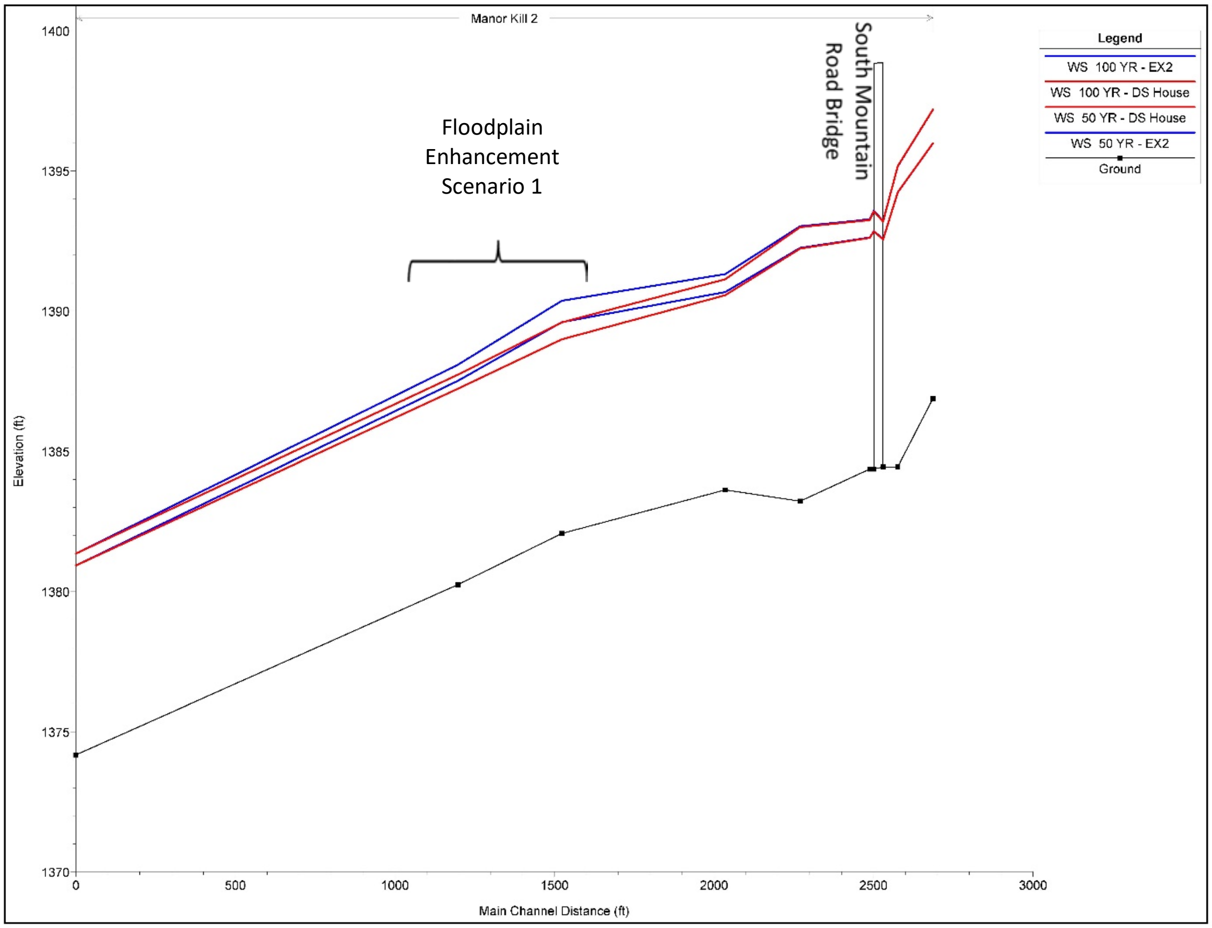


Figure 4-18
Study Area 2 – Longitudinal Profile – Floodplain Enhancement Scenario 1

The figures below show the resulting reduction in flooding under Scenario 2 (downstream and upstream floodplain enhancements) during the 50-year (Figure 4-19), 100-year (Figure 4-20), and Irene (Figure 4-21) flood events. The numbers in red indicate a change in water surface elevation and the numbers in parentheses indicate the amount of change in feet.

Figure 4-19
Study Area 2 – Floodplain Enhancement Scenario 2 – Proposed Conditions, 50-Year Flow

During the 50-year flood event, Floodplain Enhancement Scenario 2 would result in water surface elevation reductions ranging from 0.35 feet to 0.61 feet through the two sites of the floodplain enhancement with smaller reductions extending upstream to the South Mountain Road bridge. Similar to Floodplain Enhancement Scenario 1, the flooding of Potter Mountain Road would be reduced as would flooding of the home to the north of the roadway at 195 Potter Mountain Road. The overall flood reduction benefits are very similar to Floodplain Enhancement Scenario 1, with only minimal additional benefit resulting from the addition of the upstream floodplain enhancement area.

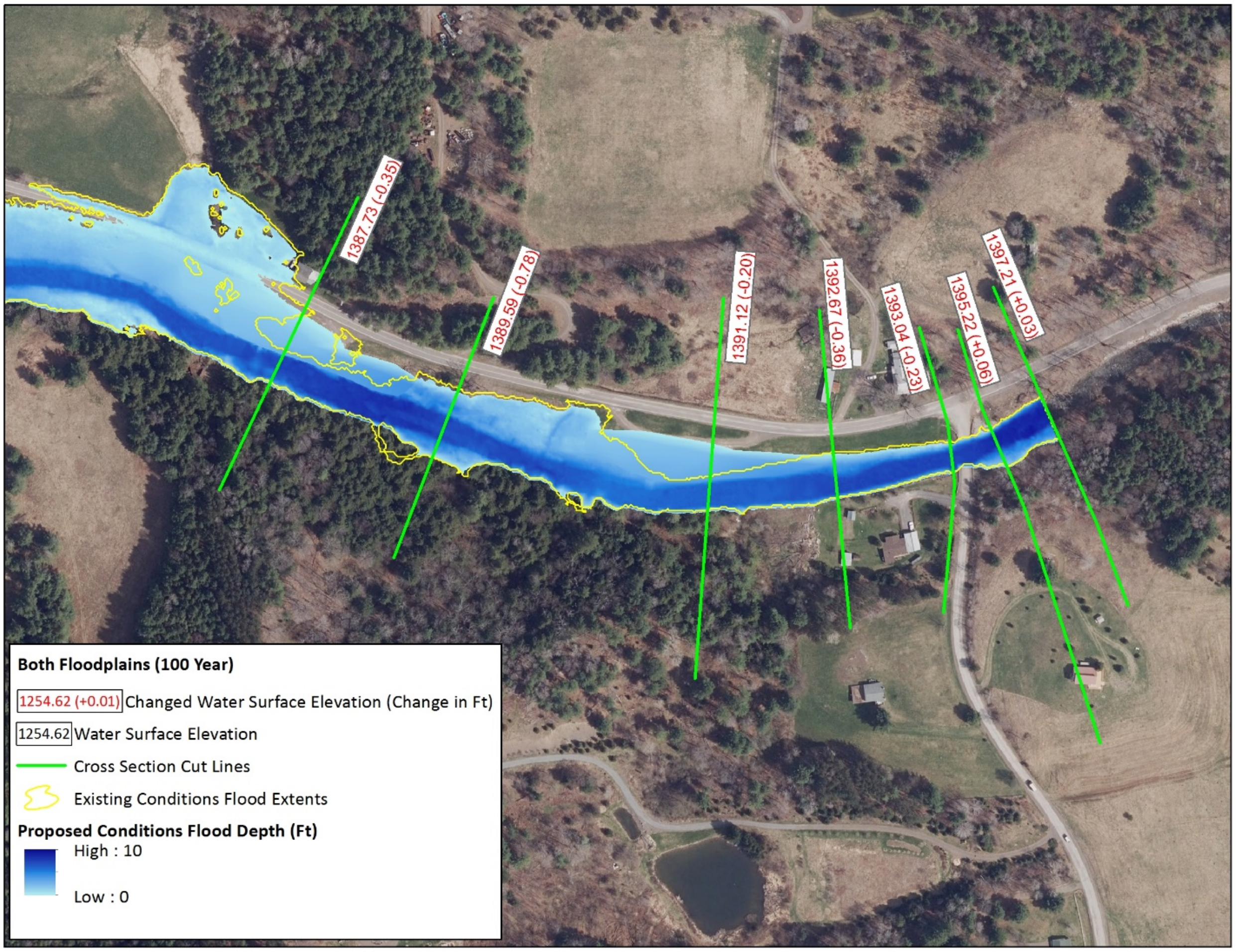


Figure 4-20
Study Area 2 – Floodplain Enhancement Scenario 2 – Proposed Conditions, 100-Year Flow

During the 100-year flood event, Floodplain Enhancement Scenario 2 would result in water surface elevation reductions ranging from 0.20 feet to 0.78 feet through the sites of the floodplain enhancement with smaller reductions extending upstream to the South Mountain Road bridge. The flooding of Potter Mountain Road would still occur during the 100-year flood, but its depth and frequency of flooding would be reduced as would flooding of the home at 195 Potter Mountain Road. As with the 50-year flood event, overall flood reduction benefits are very similar to the benefits seen under Floodplain Enhancement Scenario 1, with only minimal added benefit resulting from the addition of the upstream floodplain enhancement area.

Figure 4-21
Study Area 2 – Floodplain Enhancement Scenario 2 – Proposed Conditions, Irene Flow

During the Irene flood event, Floodplain Enhancement Scenario 2 would result in water surface elevation reductions ranging from 0.19 feet to 0.80 feet through the sites of the floodplain enhancement with smaller reductions extending upstream to the South Mountain Road bridge. The flooding of Potter Mountain Road would still occur at two locations during the Irene flood, but its depth and frequency of flooding at both locations would be reduced as would flooding at 195 Potter Mountain Road. Overall flood reduction benefits are similar to the benefits seen under Floodplain Enhancement Scenario 1, with only minimal added benefit resulting from the addition of the upstream floodplain enhancement area.

Figure 4-22 is a longitudinal profile from the hydraulic model showing water surface elevation reductions in Project Area 2 under Floodplain Enhancement Scenario 2. The brackets indicate the locations of floodplain enhancement.

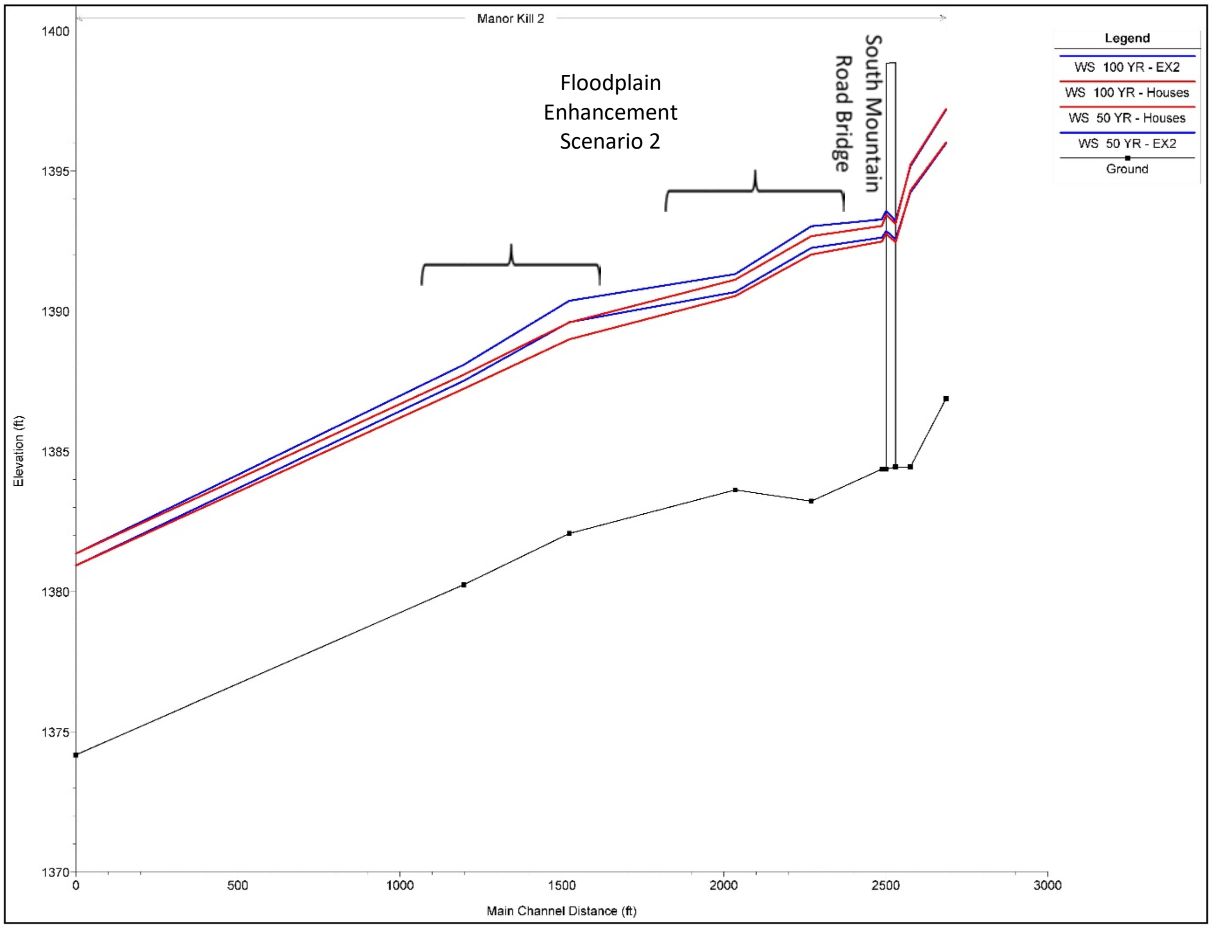


Figure 4-22
Study Area 2 – Longitudinal Profile - Floodplain Enhancement Scenario 2

4.3.3 <u>Results</u>

Hydraulic modeling and analysis in Study Area 2 revealed the following:

- Floodplain Enhancement Scenario 1 would require the demolition and removal of the currently abandoned structure at 198 Potter Mountain Road, which is reportedly in the process of being acquired and demolished by the NYCDEP. This scenario would involve the excavation and off-site removal of approximately 8,800 cubic yards of material from 500 linear feet of channel.

- Floodplain Enhancement Scenario 2 would require the demolition and removal of the currently abandoned structure described in Scenario 1 as well as the voluntary buyout, demolition, and removal of one currently occupied home located in the upstream area (226 Potter Mountain Road). It would require the excavation and off-site removal of approximately 11,500 cubic yards of material from 980 linear feet of channel along the right bank.

- While neither of the proposed floodplain enhancement scenarios would completely eliminate flooding, both would reduce the frequency and depth of flooding of the Potter Mountain Road roadway and at the home located north of the roadway at 195 Potter Mountain Road.

- Floodplain Enhancement Scenario 1 provides the most flood reduction benefit, with only minimal additional flood reduction benefit resulting from Floodplain Enhancement Scenario 2.

- In addition to flood reduction benefits, the floodplain enhancement scenarios would provide riparian and water quality benefits and a reduction in bank erosion.

4.4 Evaluation of Flood Mitigation Alternatives – Study Area 3

4.4.1 Existing Conditions

Study Area 3 is located along the Manor Kill in the hamlet of Manorkill. It extends from approximately 1,800 feet upstream of the Durham Road bridge to approximately 225 feet downstream of the Beaver Hill Road bridge.

The figures below show hydraulic modeling results within Study Area 3 under existing conditions for the 10-year flood event (Figure 4-23), the Irene flood event (Figure 4-24), and the 100-year flood event (Figure 4-25).

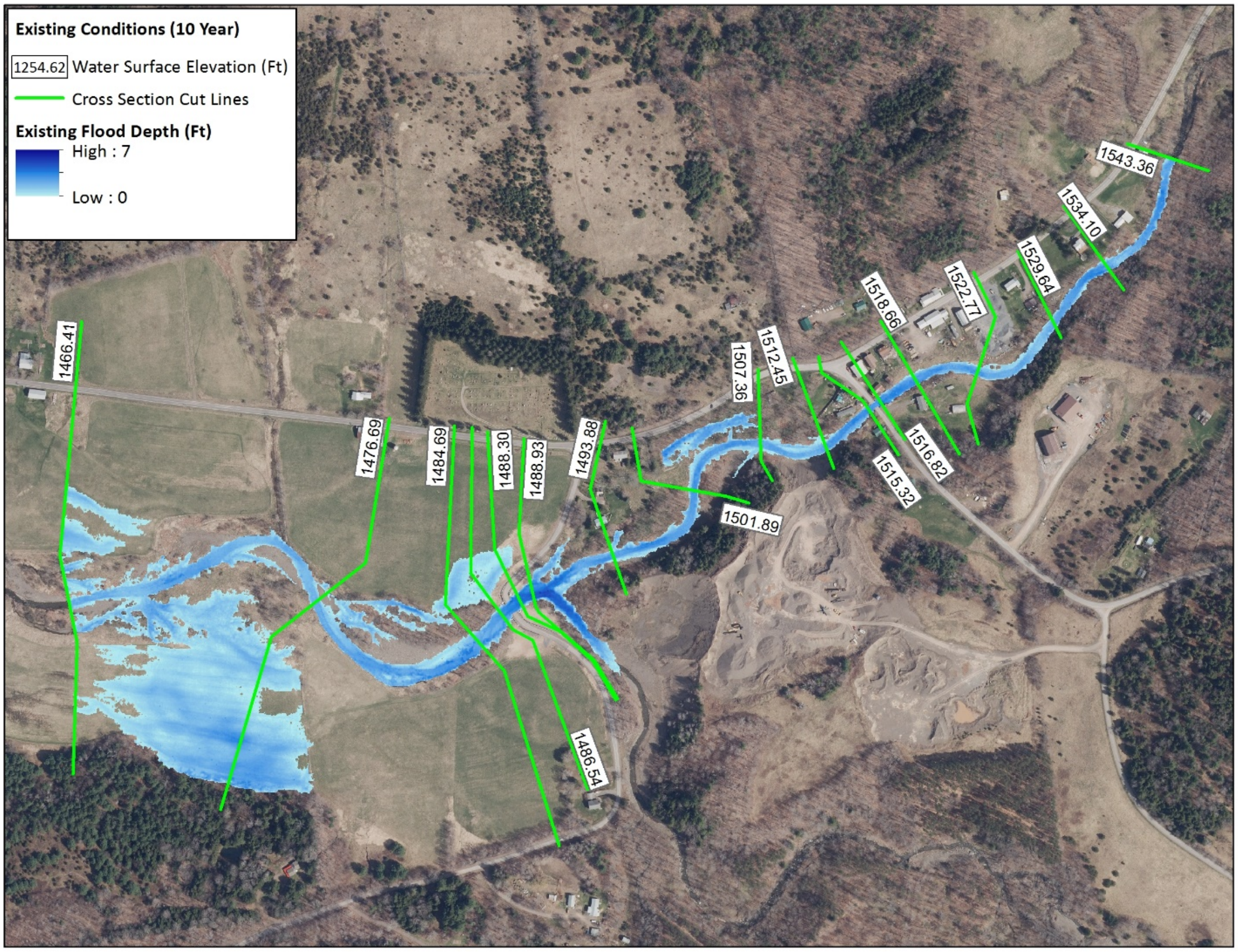


Figure 4-23
Study Area 3 Hydraulic Modeling Results – Existing Conditions, 10-Year Flow

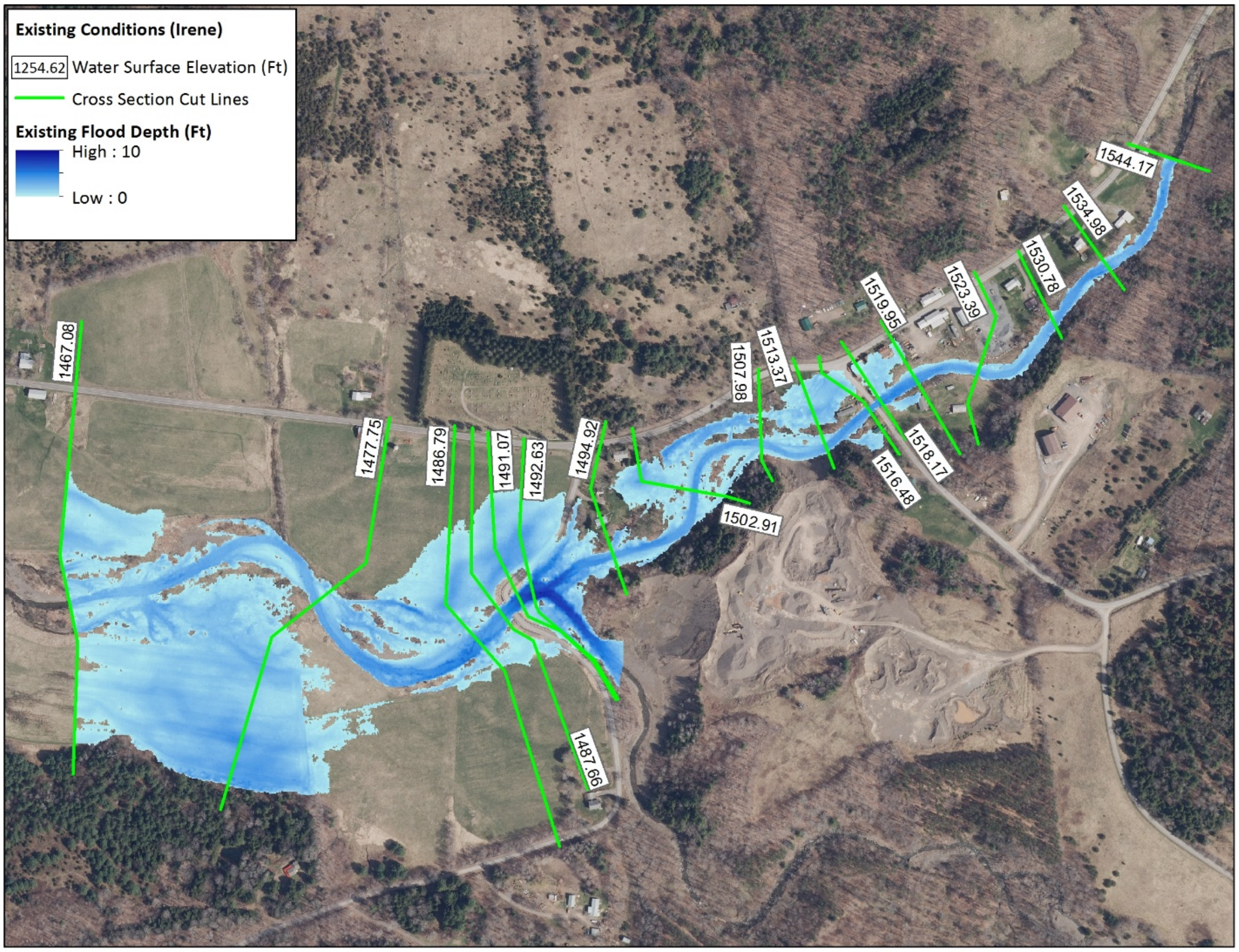


Figure 4-24
Study Area 3 Hydraulic Modeling Results – Existing Conditions, Irene Flow

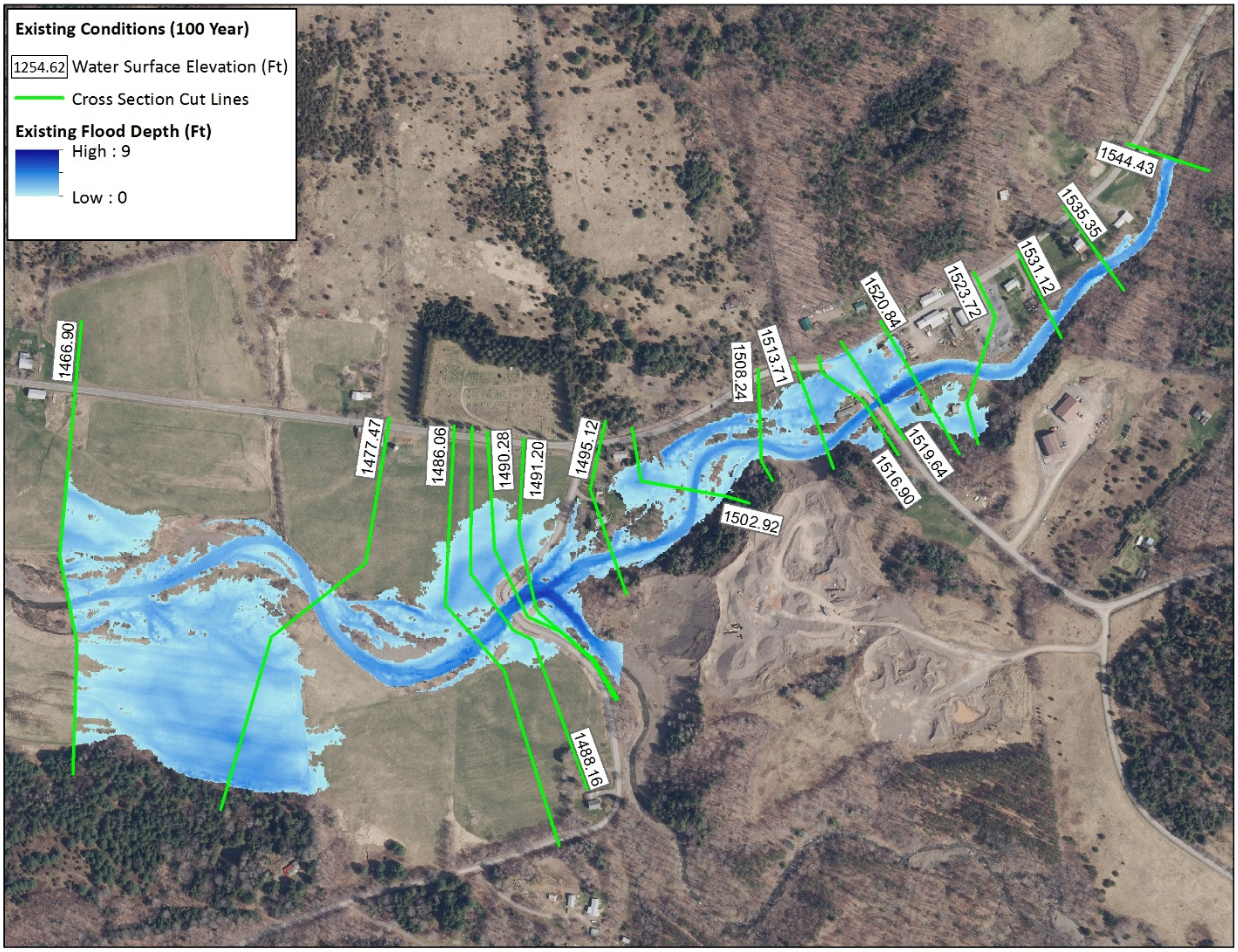


Figure 4-25
Study Area 3 Hydraulic Modeling Results – Existing Conditions, 100-Year Flow

Hydraulic modeling of Irene flows under existing conditions in Study Area 3 indicates that flood flows from the Manor Kill remain in the channel approaching the Durham Road bridge, but flood the area on both sides of the creek just upstream of the bridge. This is consistent with reports of structures upstream of the bridge being damaged by flooding during Tropical Storm Irene. During the 100-year flood event, which in this area exceeds the Irene flood, both sides of the creek are flooded just upstream of the Durham Road bridge and Durham Road is overtopped between the bridge and Potter Mountain Road.

Immediately downstream of Durham Road, modeling of the Irene and 100-year flood events indicates flooding of the structures on both banks of the creek. Between Durham Road and Beaver Hill Road, flooding occurs primarily along the right (north) side of the channel. One home in this area was reportedly flooded during Tropical Storm Irene; however, hydraulic modeling does not indicate that any structures are flooded under existing conditions. This is likely due to the fact that the bridge at Beaver Hill Road, which washed out during Irene, has been replaced with a larger structure with an improved alignment.

It should be noted that under existing conditions during the Irene flow, water overtops the Beaver Hill Road to the north of the bridge between the bridge and the intersection with Potter Mountain Road. This does not occur during the 100-year flood event.

Downstream of Beaver Hill Road, existing conditions modeling indicates that the open fields on both sides of the channel are extensively flooded during the Irene and 100-year flood events, but no structures are flooded.

4.4.2 Proposed Conditions

In order to evaluate whether the Durham Road bridge or the Beaver Hill Road bridge are acting as a hydraulic constriction, both bridges were removed from the hydraulic model. The figures below show hydraulic modeling results with both bridges removed from the model for the Irene flood (Figure 4-26) and the 100-year flood event (Figure 4-27). The numbers in red indicate a change in water surface elevation and the numbers in parentheses indicate the amount of change in feet.

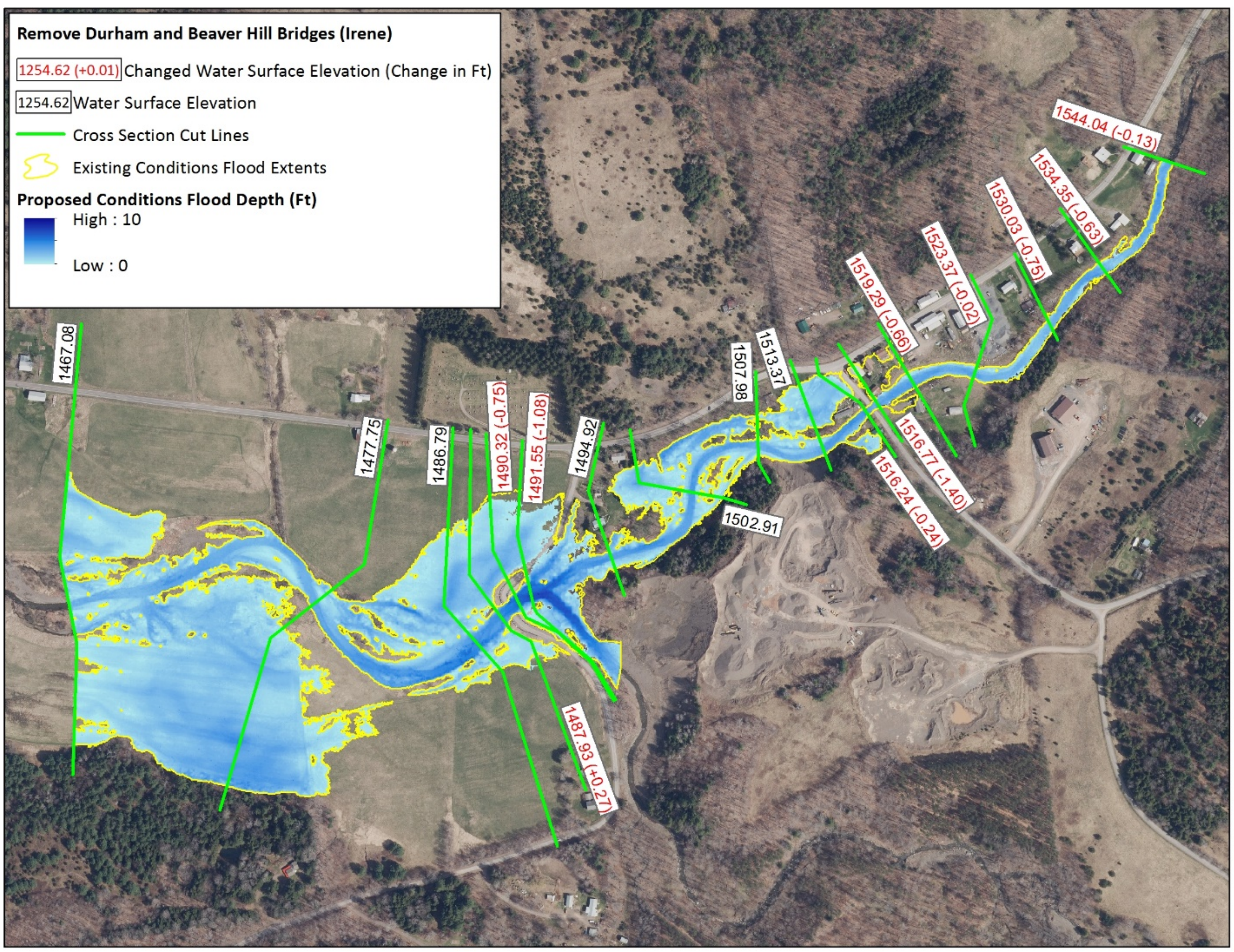


Figure 4-26
Study Area 3 Hydraulic Modeling Results – Bridges Removed, Irene Flow

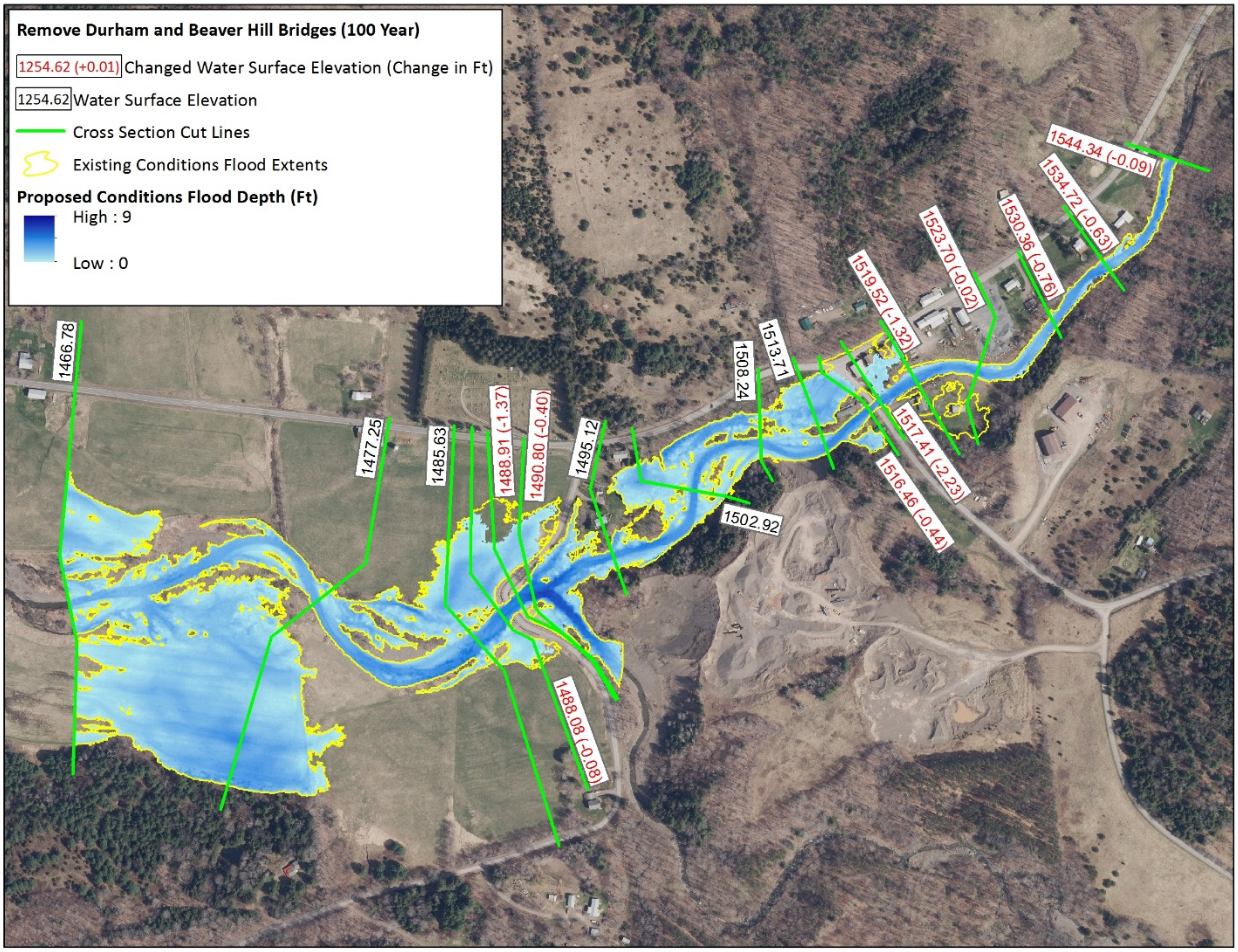


Figure 4-27
Study Area 3 Hydraulic Modeling Results – Bridges Removed, 100-Year Flow

Modeling results at the Beaver Hill Road bridge indicate that the bridge does not act as a significant hydraulic constriction during the 100-year or Irene flood event. Water surface elevation reductions of approximately 1 foot were observed at the bridge location when the bridge was removed from the hydraulic model and the reduction did not extend very far upstream of the bridge. As noted earlier, it was reported that the Beaver Hill Road bridge was washed out during Tropical Storm Irene and was subsequently replaced by a larger structure with an improved alignment with the channel. It is likely that the previous bridge was hydraulically undersized, which would have contributed to its washout.

Modeling results at the Durham Road bridge indicate that the bridge acts as a hydraulic constriction during the 100-year and Irene flood events. Removal of this bridge from the model results in reductions in water surface elevation of 1.40 feet at the upstream face of the bridge during the Irene flow and 2.23 feet during the 100-year event. These reductions in water surface elevation extend approximately 1,500 feet upstream of the bridge. However, the actual reduction in flooding of structures is limited to the area immediately upstream of the Durham Road bridge. Some of these structures are abandoned.

Comments received during the public and FAC meetings indicated that the Durham Road bridge is prone to debris blockages during flood events, which may reduce the hydraulic capacity of the bridge opening and exacerbate flooding of structures upstream of the bridge. No known photographs or other documentation is available to indicate the type and extent of debris blockage that has occurred. The hydraulic model was used to simulate debris blockage at the Durham Road bridge. The amount of blockage at the bridge was gradually increased in the model in order to gain an understanding of how water surface elevations upstream of the bridge responded to debris blockage at the bridge. For example, if the bridge opening was modeled as 25% blocked, water surface elevations upstream of the bridge increased by 0.8 feet in the 50-year event and 0.9 feet in the 100-year event. There is no substantial change in water surface elevations during the 10-year or 500-year events.

Figure 4-28 is a longitudinal profile of the Manor Kill in Study Area 3 showing water surface elevation profiles for the 10-year and 100-year flood events under existing conditions modeled with no debris blockage (in blue) and with the Durham Road and Beaver Hill Road bridges removed from the hydraulic model (in red).

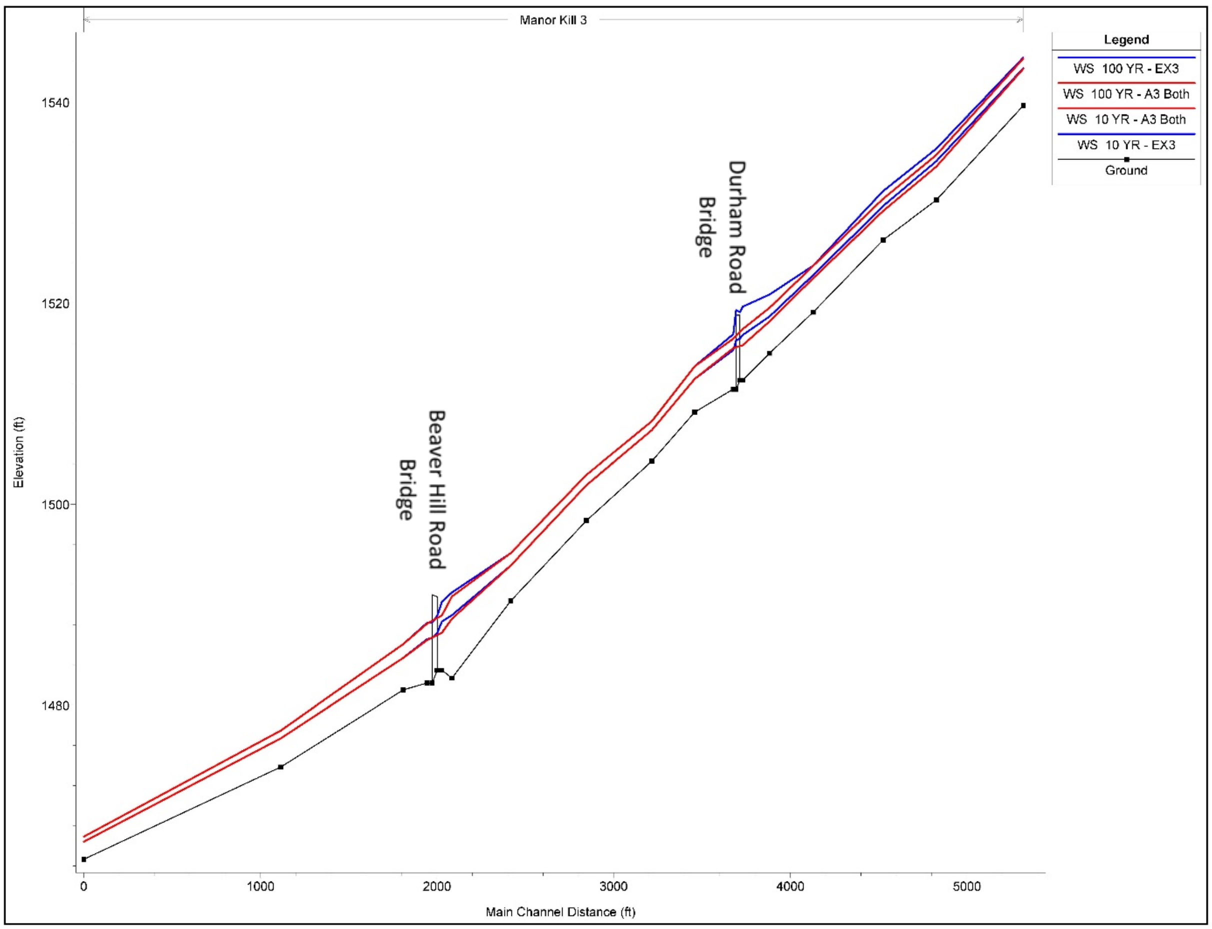


Figure 4-28
Study Area 3 Hydraulic Modeling Results – Longitudinal Profile with Bridges Removed

4.4.3 Results

Hydraulic modeling and analysis in Study Area 3 revealed the following:

- The replacement bridge at Beaver Hill Road is adequately sized and does not contribute to flooding of homes.

- Structures in the vicinity of the Durham Road bridge are prone to flooding during the 100-year flood event.

- The existing bridge at Durham Road does contribute to flooding of structures immediately upstream of the bridge during larger floods.

- Debris jamming at the Durham Road bridge potentially further contributes to the flooding of structures located immediately upstream of the bridge although the amount of debris blockage that has occurred in previous flood events is unknown.

5.0 BENEFIT-COST ANALYSIS

5.1 Overview

A BCA is used to validate the cost effectiveness of a proposed hazard mitigation project. A BCA is a method by which the future benefits of a project are estimated and compared to their costs. The end result is a benefit-cost ratio (BCR), which is derived from a project's total net benefits divided by its total project cost. The BCR is a numerical expression of the cost effectiveness of a project. A project is considered to be cost effective by FEMA when the BCR is 1.0 or greater, indicating the benefits of the project are sufficient to justify the costs. A BCA was conducted for proposed alternatives that would result in reduced flooding, based on evaluation of the *HEC-RAS* modeling.

Factors and assumption for the BCA include the following:

- Benefits for acquired/relocated properties were determined as acquisitions.
- Benefits for all other properties were generated as local flood reduction projects.
- Default depth-damage curves were used in the program unless specific property damage information was made available by homeowners.
- Existing and future water surface elevations were determined from the *HEC-RAS* output at cross sections. For any given building, the nearest cross section was used.
- First-floor elevations were estimated using LiDAR topographic mapping.
- Adjustments to the LiDAR topography were made for buildings based on direct observations of first floors relative to adjacent grades.
- Building replacement values were based on the assessed values and square footages provided by the Schoharie County Planning Department's Geographic Information System (GIS) database.

The BCA does not include benefits that could have been generated for avoided future street cleanup, avoided detours, avoided emergency response, etc.

5.2 Benefit-Cost Analysis for Floodplain Enhancement Projects

The flood reduction benefits for two floodplain enhancement scenarios were evaluated in Study Area 2. Scenario 1 would involve floodplain enhancement in the area depicted in yellow in Figure 5-1. Floodplain enhancement under this scenario would require the demolition and removal of one currently abandoned structure, located at 198 Potter Mountain Road, which is reportedly in the process of being acquired by the NYCDEP.

Scenario 2 would entail floodplain enhancement as described under Scenario 1 as well as in the area depicted in blue in Figure 5-1. Floodplain enhancement under this scenario would require the demolition and removal of the currently abandoned structure at 198 Potter Mountain Road, as described in Scenario 1, as well as the voluntary buyout, demolition, and removal of the currently occupied home located in the upstream area at 226 Potter Mountain Road.

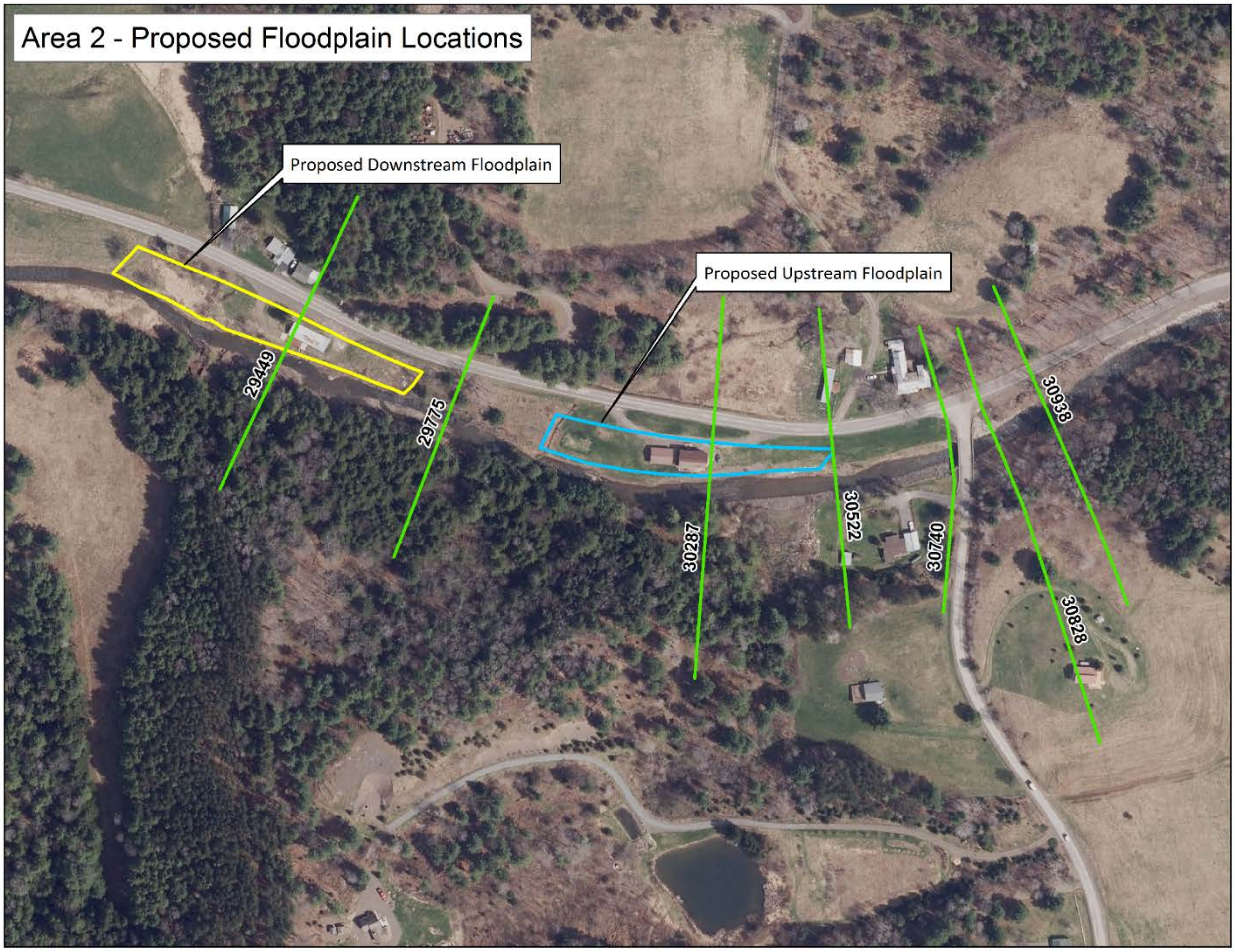


Figure 5-1
Locations of Proposed Floodplain Enhancement in Study Area 2

5.2.1 Floodplain Enhancement Scenario 1

Costs associated with Floodplain Enhancement Scenario 1 include the construction of the floodplain enhancement project. For this scenario it is assumed that the acquisition, demolition, and removal of the abandoned house at 198 Potter Mountain Road has already taken place. The benefits were derived from the reduction of flooding at the properties that remain. The results are summarized in Table 5-1.

TABLE 5-1
Benefit-Cost Ratio – Floodplain Enhancement Scenario 1

Benefits: Property Acquisition/Relocation*	$0
Benefits: Water Surface Reductions at Buildings that Remain	$6,665
Total Benefits	$6,665
Total Cost of Floodplain Construction	$266,659
Benefit-Cost Ratio	**0.03**

*Assumes acquisition, demolition, and removal of one abandoned house has already taken place

5.2.2 Floodplain Enhancement Scenario 2

Costs associated with Floodplain Enhancement Scenario 2 include the construction of the floodplain enhancement project as well as the voluntary buyout, demolition, and removal of the currently occupied home located in the upstream area at 226 Potter Mountain Road. For this scenario, it is assumed that the acquisition, demolition, and removal of the abandoned house at 198 Potter Mountain Road, in the downstream area, has already taken place. Benefits were derived from the acquisition and removal of one home from the floodprone area and from the reduction of flooding at the properties that remain. The results are summarized in Table 5-2.

TABLE 5-2
Benefit-Cost Ratio – Floodplain Enhancement Scenario 2

Benefits: Property Acquisition/Relocation*	$24,235
Benefits: Water Surface Reductions at Buildings that Remain	$4,939
Total Benefits	$29,174
Cost: Home Acquisition	$159,500
Cost: Demolition	$50,000
Cost: Floodplain Construction	$365,381
Total Costs	$574,881
Benefit-Cost Ratio	**0.05**

*Assumes acquisition, demolition, and removal of one abandoned house has already taken place

The BCA does not include consideration of water quality benefits that would be provided by flood mitigation projects. Although reduced flood damage in Conesville would lead to improved water quality during floods, inclusion of water quality benefits was not considered necessary for this LFA.

Appendix B contains volume calculations and cost estimates for each floodplain enhancement scenario.

6.0 FINDINGS, RECOMMENDATIONS, AND IMPLEMENTATION

A summary of findings and flood mitigation recommendations is provided in this section. Recommendations are provided that apply to each of the three study areas as well as those that can be applied globally across all study areas and all of Conesville.

6.1 Project Area 1

Study Area 1 focuses on the area of the Manor Kill in the hamlet of West Conesville near the Pangman Road bridge. The following findings and recommendations are provided for Study Area 1.

6.1.1 Summary of Findings

- The Pangman Road bridge is sufficiently sized to pass the 100-year flood event and does not create a hydraulic constriction that contributes to flooding of buildings.

- Valley confinement beginning at the Pangman Road bridge and extending downstream results in a high stream power setting that creates powerful erosive forces which, in combination with the two forced channel bends that direct flows at the banks, likely contributed to the channel instability that led to the severe stream bank erosion and washout of the bridge abutments and portions of the roadway during Tropical Storm Irene.

- During Tropical Storm Irene, floodwaters exited the channel and flowed across the yard at 111 Pangman Road (this was not projected in the hydraulic model). Although the house was not flooded, floodwaters cut across the inside of the bend in the creek, flowing through the yard at a depth of approximately 2 feet before returning to the creek. The house was surrounded by water, with no safe way to exit or enter the property. The surrounding area of property, including a firewood splitting operation and associated equipment, were flooded and sustained damages.

- Based on the results of the hydraulic modeling, no homes or businesses within Study Area 1 have the potential to be inundated by flooding during a 100-year flood event.

6.1.2 Recommendations

The following recommendations are provided for Study Area 1:

- Consider closure of floodprone areas of Pangman Road and Route 990V during major flood events. More information on road closures is included in the general recommendations section of this report.

- Bank erosion and bank failure issues through this reach of the Manor Kill should be closely monitored and bank repair and protection measures should be implemented when required, especially in cases where roads, bridges, or other infrastructure is threatened.

This may include additional hard bank armoring in the vicinity of the Pangman Road bridge and at the two forced bends along the Manor Kill.

- It is recommended that the home at 111 Pangman Road be considered for acquisition and removal under the NYCDEP Flood Buyout Program, if the property owner and the town of Conesville are interested in participating. Although the structure itself is not at risk of inundation up to and including the 100-year flood event based on hydraulic modeling, the home was completely surrounded by floodwaters during Tropical Storm Irene. Also, the instability of the channel along this reach of the Manor Kill and the location of the home in close proximity to the channel and the two forced bends leave the home vulnerable to erosion risk.

6.2 Project Area 2

Study Area 2 includes a section of the Manor Kill in the hamlet of Conesville and begins approximately 1,000 feet upstream of the South Mountain Road bridge and extends to 2,000 feet downstream of the bridge.

6.2.1 Summary of Findings

- Floodplain Enhancement Scenario 1 would require the demolition and removal of one currently abandoned structure at 198 Potter Mountain Road, which is reportedly in the process of being acquired by the NYCDEP, and would involve the excavation and off-site removal of approximately 8,800 cubic yards of material from 500 linear feet of channel.

- Floodplain Enhancement Scenario 2 would require the demolition and removal of the currently abandoned structure described in Scenario 1 as well as the voluntary buyout, demolition, and removal of one currently occupied home located in the upstream area at 226 Potter Mountain Road. This scenario would require the excavation and off-site removal of approximately 11,500 cubic yards of material from 980 linear feet of channel along the right bank.

- Both floodplain enhancement scenarios would reduce the frequency and depth of flooding on Potter Mountain Road and at one home located north of the roadway (195 Potter Mountain Road). Neither scenario would completely eliminate flooding of homes or the roadway during major flood events.

- Floodplain Enhancement Scenario 1 provides modest flood reduction benefit with only minimal additional flood reduction benefit resulting from Floodplain Enhancement Scenario 2.

- In addition to flood reduction benefits, the floodplain enhancement scenarios would provide riparian and water quality benefits and would potentially reduce erosion along the opposite bank. These additional benefits are not fully captured in the BCA.

- Based on reports and the results of the hydraulic modeling, homes within Study Area 2 do have the potential to be flooded during large flood events. One home in Study Area 2 is currently abandoned and is reportedly going through the flood buyout process. BCA indicates that the remaining homes do not qualify for acquisition. However, other flood protection measures are available as discussed in the general recommendations section of this report.

6.2.2 Recommendations

The following recommendations are provided for Study Area 2:

- Proceed with further study and apply for funding for Floodplain Enhancement Scenario 1. While assessment of this scenario does not result in a BCR of greater than 1.0, there are a number of reasons to recommend it:
    - The frequency and depth of flooding of Potter Mountain Road and of remaining homes (195 and 226 Potter Mountain Road) would be reduced.
    - The flood-damaged structure on the site is abandoned, in very poor condition, and in the process of being acquired and demolished.
    - Enhancement of the floodplain would provide ecological benefits, improve water quality, and potentially reduce erosion along the opposite bank.
    - Implementation would not require the acquisition and removal of the currently-occupied home at 226 Potter Mountain Road as it would be under Floodplain Enhancement Scenario 2.
- Consider closure of floodprone areas of Potter Mountain Road during major flood events. More information on road closures is included in the general recommendations section of this report.
- Closely monitor bank erosion through this reach of the Manor Kill and implement bank repair and protection measures when required. This is especially true in cases where roads, bridges, or other infrastructure is threatened.
- Implement individual flood protection measures at homes that have been flooded or are at risk of future flooding. Flood protection options are discussed in the general recommendations section of this report.

6.3 Project Area 3

Study Area 3 is located along the Manor Kill in the hamlet of Manorkill. It extends from approximately 1,800 feet upstream of the Durham Road bridge to approximately 225 feet downstream of the Beaver Hill Road bridge.

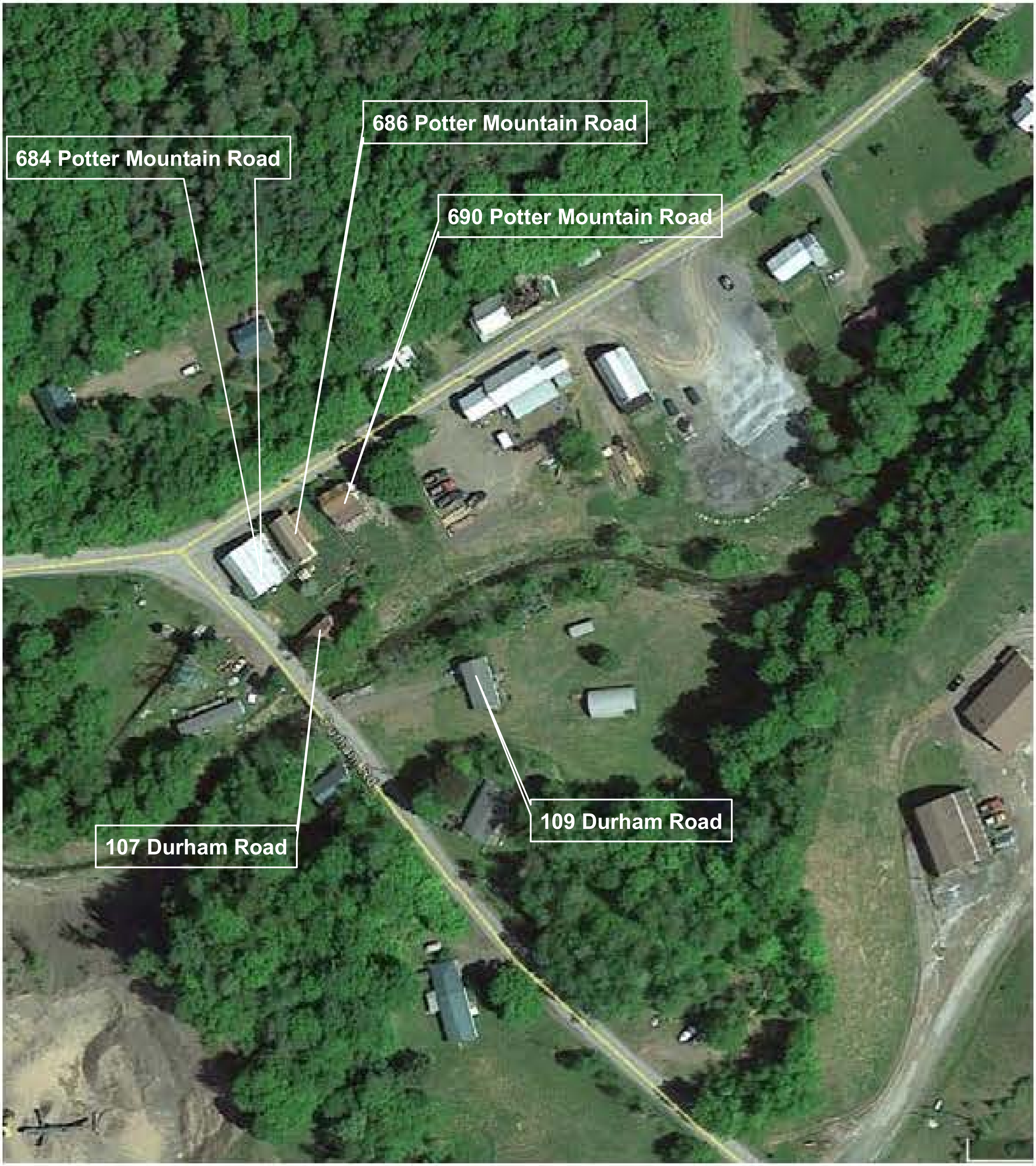
6.3.1 Summary of Findings

- The replacement bridge at Beaver Hill Road is adequately sized and does not contribute to flooding of homes.
- The existing bridge at Durham Road does create a hydraulic constriction and contributes to flooding of structures immediately upstream of the bridge during larger floods.
- Homes and businesses located within Study Area 3 have the potential to be flooded during large flood events as indicated by hydraulic modeling results and reports from landowners. Some floodprone structures in the vicinity of the Durham Road bridge have been abandoned as a result of damages sustained during previous flood events. Hydraulic modeling indicates that water surface elevations upstream of the Durham Road are sensitive to debris jamming and as a result, structures located upstream of the bridge become increasingly floodprone as the bridge opening becomes more clogged with debris.
- The flood reduction benefits of a larger bridge at Durham Road are not great enough to outweigh the cost of bridge replacement.
- Severe bank erosion occurred along the left bank of the Manor Kill downstream of Durham Road during Tropical Storm Irene. The site was repaired immediately following Irene and has reportedly remained stable since that time.

6.3.2 Recommendations

The following recommendations are provided for Study Area 3:

- If the Durham Road bridge were to be slated for replacement in the future, it is recommended that its replacement be appropriately sized so as not to increase the flood risk at structures located upstream of the bridge. Specific properties are identified in Figure 6-1.
- To the extent possible, the Durham Road bridge should be kept free of debris.
- Encourage homeowners in the vicinity of the Durham Road bridge who have expressed interest in the flood buyout program to work with the town, NYCDEP, and the CWC to document flood damages, flood damage costs, and high water marks.
- Closely monitor bank erosion along the high bank failure downstream of Durham Road and implement repair and protection measures if required.



SOURCE(S):

(c) 2017 Google Earth

Figure 6-1: Study Area 3

LOCATION:

Conesville, NY

N

Conesville Local Flood Analysis

MXD: Q:\Projects\2884-08 Conesville LFA\GIS\Fig6-1StudyArea3LABELS.mxd

Map By: EMH
MMI#: 2884-08
Original: 8/20/2016
Revision: 6/22/2017
Scale: 1 inch = 830 feet

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6.4 General Recommendations

In addition to the specific flood mitigation recommendations provided for each of the three study areas, the following general recommendations can be applied.

6.4.1 Establish Base Flood Elevations

The Manor Kill has been evaluated by FEMA using approximate methods only, which means that the SFHA has been designated as Zone A with no base flood elevations provided. It is recommended that the elevations of the 100-year flood event from MMI's existing conditions hydraulic modeling be used as "best available information" for determination of base flood elevations. All new construction and substantial improvements should be required to have their lowest floor elevated at or above 2 feet above the base flood elevation. An example of how the maps should be used is presented in Figure 6-2.

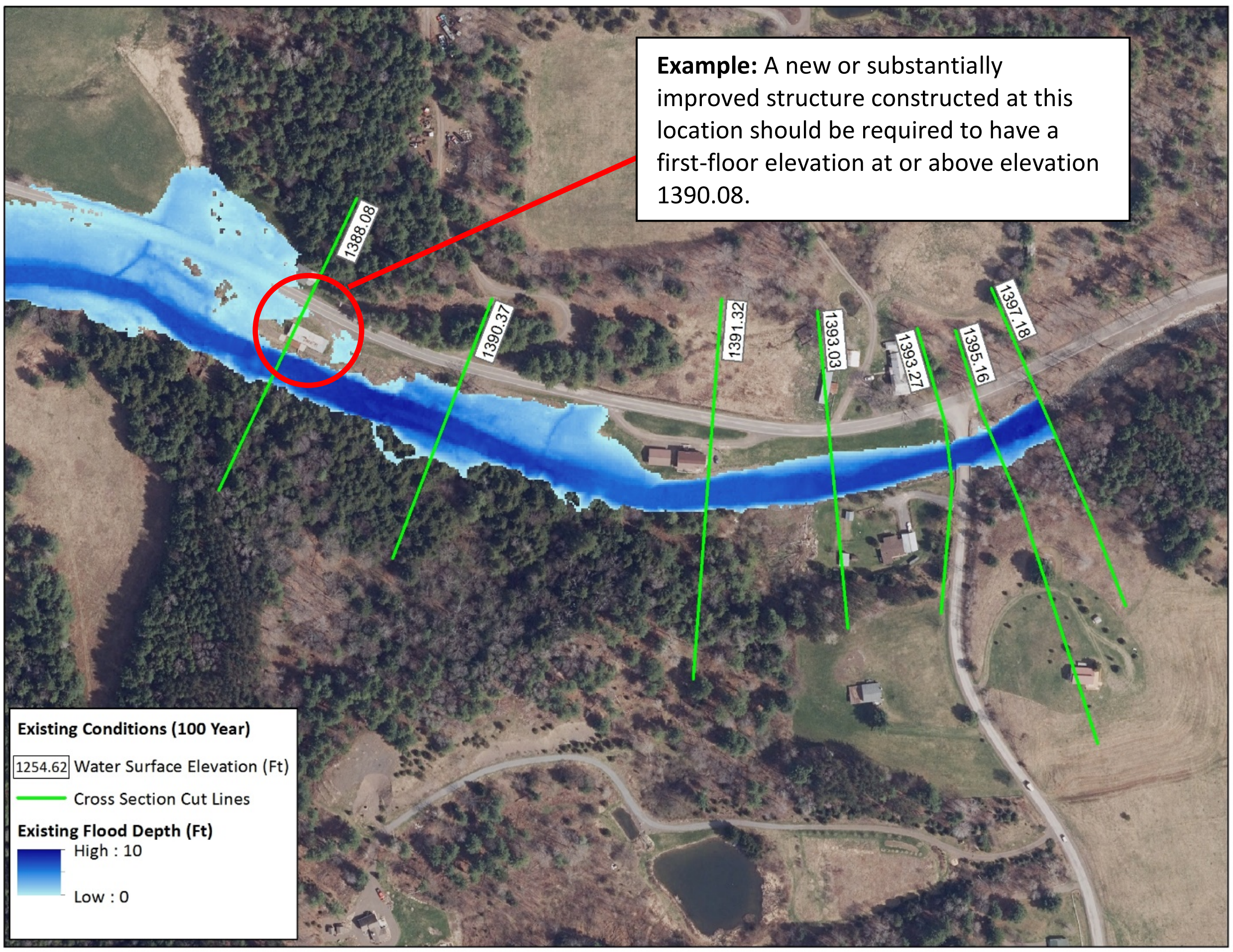

Figure 6-2
Example: Deriving Base Flood Elevation from Existing Conditions Mapping

6.4.2 *Plan for Road Closures*

Flooding of roadways during previous flood events has been reported at several locations in Conesville, including inundation or washouts along Pangman Road and Route 990V in Study Area 1, Potter Mountain Road in Study Area 2, and Potter Mountain Road and Beaver Hill Road in Study Area 3. Approximately 75% of all flood fatalities occur in vehicles. Shallow water flowing across a flooded roadway can be deceptively swift and wash a vehicle off the road. Water over a roadway can conceal a washed out section of roadway or bridge. When a roadway is flooded, travelers should not take the chance of attempting to cross the flooded area. It is not possible to tell if a flooded road is safe to cross just by looking at it. It is recommended that risks associated with the flooding of roadways be reduced by temporarily closing roads during flooding events. This requires effective signage, road closure barriers, and consideration of alternative routes.

6.4.3 Implement Individual Flood Protection Measures

A variety of measures are available to protect existing properties from flood damage. On a case-by-case basis, individual floodproofing should be explored where structures are at risk. Potential measures for property protection include the following:

Elevation of the Structure

Home elevation involves the removal of the building structure from the basement and elevating it on piers to a height such that the first floor is located above the level of the 100-year flood event. The basement area is abandoned and filled to be no higher than the existing grade. All utilities and appliances located within the basement must be relocated to the new elevated first-floor level.

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. Dry floodproofing is not appropriate for residential structures but is permissible for nonresidential structures. An Operations and Maintenance Plan is beneficial to ensure that floodproofing is successful.

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. Wet floodproofing should only be used as a last resort. If considered, furniture and electrical appliances should be moved away or elevated above the 100-year flood elevation. Wet floodproofing is not appropriate for residential structures unless accomplished by elevating the structure as described above, but is permissible for nonresidential structures.

Construction of property improvements such as barriers, floodwalls, and earthen berms.

Such structural projects can sometimes be used to prevent flooding. There may be properties within Conesville where implementation of such measures will serve to protect structures.

6.4.4 Flood Preparedness

Home and business owners in Conesville can minimize flood damages and ensure personal safety by following the flood preparedness guidelines provided by the NFIP. There are a number of ways in which home and business owners can minimize flood damages and ensure personal safety. The NFIP provides useful guidance on flood preparedness at www.FloodSmart.gov or at 1 (888) 379-9531. The following steps are recommended by the NFIP before, during, and after a flood:

Before a Flood:

1. Safeguard Possessions – Create a personal flood file containing information about all your possessions and keep it in a secure place such as a safe deposit box or waterproof container. This file should have the following items:

    - A copy of your insurance policies with your agent's contact information
    - **A household inventory:** For insurance purposes, be sure to keep a written and visual (i.e., videotaped or photographed) record of all major household items and valuables, even those stored in basements, attics, or garages. Create files that include serial numbers and store receipts for major appliances and electronics. Have jewelry and artwork appraised.
    - Copies of all other critical documents including finance records or receipts of major purchases

2. Prepare

    - Make sure your sump pump is working and then install a battery-operated backup in case of a power failure. Install a water alarm, which alerts you if water is accumulating in your basement.
    - Clear debris from gutters and downspouts.
    - Anchor any fuel tanks.
    - Raise your electrical components (switches, sockets, circuit breakers, and wiring) at least 12 inches above your home's projected flood elevation.
    - Place the furnace, water heater, washer, and dryer on cement blocks at least 12 inches above the projected flood elevation.
    - Move furniture, valuables, and important documents to a safe place.

3. Develop a Family Emergency Plan

    - Create a safety kit with drinking water, canned food, first aid, blankets, a radio, and a flashlight.
    - Post emergency telephone numbers by the phone, and teach your children how to dial 911.
    - Plan and practice a flood evacuation route with your family. Know safe routes from home, work, and school that are on higher ground.
    - Ask an out-of-state relative or friend to be your emergency family contact.
    - Have a plan to protect your pets.

During a Flood:

- If flooding occurs, go to higher ground and avoid areas subject to flooding.
- Do not attempt to walk across flowing streams or drive through flooded roadways.
- If water rises in your home before you evacuate, go to the top floor, attic, or roof.
- Listen to a battery-operated radio for the latest storm information.
- Turn off all utilities at the main power switch and close the main gas valve if advised to do so.
- If you come in contact with floodwaters, wash your hands with soap and disinfected water.

After a Flood:

- If your home has suffered damage, call your insurance agent to file a claim.
- Check for structural damage before reentering your home to avoid being trapped in a building collapse.
- Take photos of any floodwater in your home and save any damaged personal property.
- Make a list of damaged or lost items and include their purchase date and value with receipts; place this list with the inventory you took prior to the flood. Some damaged items may require disposal, so keep photographs of these items.
- Keep power off until an electrician has inspected your system for safety.
- Boil water for drinking and food preparation until authorities tell you that your water supply is safe.
- Prevent mold by removing wet contents immediately.
- Wear gloves and boots to clean and disinfect. Wet items should be cleaned with a pine-oil cleanser and bleach, dried completely, and then monitored for several days for any fungal growth or odors.

6.4.5 Flood Warning Alerts

The USGS gauge at Pangman Road should be used by town officials, emergency responders, and Conesville residents as an alert system to predict flooding. Real time gauge information can be accessed at https://waterdata.usgs.gov/nwis/uv?site_no=01350080. Table 6-1 provides suggested flood alert levels corresponding to stream discharge levels along the Manor Kill.

TABLE 6-1
Flood Danger Levels along the Manor Kill

Discharge at Pangman Road USGS Gauge (cfs)	Corresponding Danger Level along Manor Kill
5,000	**Condition Yellow**: Flood levels approaching 10-year flood event
6,000	**Condition Orange**: Flood levels approaching 50-year flood event
7,400	**Condition Red**: Flood levels approaching 100-year flood event

Conesville residents can sign up to receive an email or text message when a user-defined water level, stream flow, or other parameter is equaled or exceeded. For more information or to set up alerts, visit: http://water.usgs.gov/wateralert/.

Conesville residents are also encouraged to sign up for the emergency notification system, which provides notifications to affected residents in the event of an emergency such as a flood. Schoharie County maintains the Schoharie County Emergency Notifications Registration System. This application allows citizens to receive emergency notifications to their cell phone or internet phone numbers. Residents can register at https://www2.schohariecounty-ny.gov/EmergencyNotifications/. Schoharie County has also developed a Flood Education video that airs on a cable network periodically and is available at local libraries for borrowing.

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 water heaters, heating systems, washers, and dryers to a higher floor or to at least 12 inches above the base flood elevation (if the ceiling permits). A wooden platform of pressure-treated wood can serve as the base.
- Anchor the fuel tank to the wall or floor with noncorrosive metal strapping and lag bolts.
- Install a backflow valve to prevent sewer 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.

6.5 Descriptions of Funding Sources and Resources

Several funding sources may be available to the Conesville Flood Commission, the Town of Conesville, and Schoharie County and its departments for the implementation of recommendations of this plan.

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

FHM is a funding category in the SMIP for LFA communities and those participating in the New York Rising Community Reconstruction Program. Municipalities may apply to implement one or more recommendations that are contained in their LFA and approved by the municipal board. All projects must have modeled off-site flood reduction benefits. Eligible projects include:

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

Ineligible projects include: Construction of flood walls, berms or levees; stream dredging; routine annual maintenance; and replacement of privately owned bridges, culverts or roads. Municipalities must apply to the Stream Management Program in their respective county. Contacts are as follows:

Schoharie Basin (Greene County) – Joel DuBois Joel@gcswcd.com

NYC Funded Flood Buyout (NYCFFBO) Program

This voluntary program is 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:

1. Properties identified in community LFAs

2. Anchor businesses, Critical Community facilities and LFA-identified properties applying to the CWC for relocation assistance
3. Properties needed for a stream project
4. Erosion hazard properties
5. Inundation properties

Risk assessments and cost-benefit analysis are required 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 NYS Department of Environmental Conservation and there are limits to what may be placed on these parcels. Allowed structures are public restrooms served by public sewers or by septic systems whose leach field is located outside the 100-year floodplain; or open sided structures.

The NYCFFBO is governed by the Water Supply Permit and the Property Evaluation and Selection 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 Selection Process document.

Local Flood Hazard Mitigation Implementation Program (FHMIP)

The CWC funds LFA recommended projects to prevent and mitigate flood damage in the WOH 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 NY Rising planning process.

Eligible LFA-derived projects could include:

- Alterations to public infrastructure that is expected to reduce/minimize flood damage
- Private property protection measures, such as elevation or floodproofing of a structure
- Elimination of sources of manmade pollution, such as the relocation or securing of fuel oil/propane tank
- Stream related construction. (Ineligible projects include construction of flood walls, 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

Property owners may apply for the following assistance:

- Funds for relocation assistance of an anchor business or critical community facility; Anchor businesses must be located in a Floodplain in a Watershed hamlet where an LFA has been conducted, though their relocation does NOT have to be recommended in the LFA. These include gas stations, grocery stores, lumberyard/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/distribution facility, 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 within an LFA community;
- Funds for assistance to relocate homes and/or businesses within the same town where the NYCFFBO program covers purchase of 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).

Sustainable Community Planning Program

This CWC program is for municipalities that have prepared LFAs. It is intended to fund revisions to local zoning codes or zoning maps or to upgrade comprehensive plans in order to identify areas within those municipalities that can serve as new locations for residences and/or businesses to be moved after purchase under the voluntary NYCFFBO Program. Grants of up to $20,000 are available through this program, part of the CWC's Local Technical Assistance Program.

Emergency Watershed Protection (EWP) Program

Through the EWP program, the U.S. Department of Agriculture's Natural Resource Conservation Service (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% 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.

FEMA Pre-Disaster Mitigation (PDM) Program

The Pre-Disaster Mitigation 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 pre-disaster mitigation 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

PDM
PRE-DISASTER MITIGATION

subject to the availability of appropriation funding as well as any program-specific directive or restriction made with respect to such funds.

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 purposes of the HMGP are 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 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.

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 severe repetitive loss properties have been modified.
- Cost-share requirements have changed to allow more federal funds for properties with repetitive flood claims and severe repetitive loss 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.

USACE

The USACE provides 100% funding for floodplain management planning and technical assistance to states and local governments under several flood control acts and the Floodplain Management Services (FPMS) Program. 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% federally funded up to $100,000, with additional costs shared equally. Costs for preparation of plans and construction are funded 65% with a 35% nonfederal match. In certain cases, the nonfederal share for construction could be as high as 50%. The maximum federal expenditure for any project is $7 million.

- Section 14 – Emergency Streambank 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, described 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, described 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 floodprone structures. When funding is available, this work is 100% 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 postflood 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.

Other Potential Sources of Funding

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.

New York State Grants

All New York State grants are now announced on the NYS Grants Gateway (a direct link is in the "Links Leaving DEC's Website" section of the right-hand column of this page). 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.

Community Development Block Grant (CDBG)

The Office of Community Renewal administers the CDBG program for the State of New York. The NYS CDBG program provides financial assistance to eligible cities, towns, and villages to develop viable communities by providing affordable housing and suitable living environments as well as expanding economic opportunities, principally for persons of low and moderate income. It is possible that the CDBG funding program could be applicable for floodproofing and elevating residential and nonresidential buildings, depending on eligibility of those buildings relative to the program requirements.

Empire State Development

The state's Empire State Development program offers loans, grants, and tax credits as well as other financing and technical assistance to support businesses and encourage growth. It is possible that the program could be applicable for floodproofing, elevating, or relocating nonresidential buildings, depending on eligibility of those businesses relative to the program requirements.

Private Foundations

Private entities such as foundations are potential funding sources in many communities. The Conesville Flood Commission 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.

Schoharie Area Long Term, Inc. (SALT)

SALT has a mission of rebuilding resilient and sustainable communities and a vision that the Schoharie Creek Basin and surrounding communities will be vibrant, thriving, resilient, and sustainable. While not a source of direct funding, SALT is dedicated to flood recovery in the Schoharie Creek watershed and is a potential partner in flood mitigation implementation and long-term recovery. Areas of interest include the following: rebuild infrastructure to meet future community needs; implement mitigation strategies; control of flow and height of the water carried by the river, floodplain, and watershed; land use practices to protect structures against flooding; and floodproofing.

Land Trust and Conservation Groups

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

NYSDEC "Trees for Tribs" Program

Department of Environmental Conservation's (DEC's) Trees for Tribs offers low-cost to no-cost native trees and shrubs for streamside restoration. The program also offers free technical assistance that includes plant selection and designing a site planting plan. Native bare root trees and shrubs are provided by the Saratoga State Tree Nursery. The goal of the program is to plant young trees and shrubs along stream corridors to prevent erosion, increase floodwater retention, improve wildlife and stream habitat, and protect water quality. The program emphasizes comprehensive watershed restoration designed to protect "green infrastructure" and serves as the first line of defense against storm and flooding events, protecting property, water quality, and fish and wildlife habitat. The program also promotes best management practices and encourages tributary protection.

As the recommendations of this LFA are implemented, the Conesville Flood Commission and Town of Conesville will need to work closely with potential funders to ensure that the best combinations of funds are secured for the modeled alternatives and for property-specific mitigation strategies such as floodproofing, elevations, and relocations.

7.0 REFERENCES

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APPENDICES

APPENDIX A

MEETING PRESENTATIONS AND MINUTES

MILONE & MACBROOM

Local Flood Analysis
Conesville, New York

<u>Public Meeting</u>

Mark Carabetta, Project Manager
Jillian Cole, Water Resource Engineer
Ellen Hart, Environmental Scientist

Town of Conesville | July 26, 2016

Purpose of Meeting

1. Introduction to the Local Flood Analysis (LFA)

2. Collect information about flooding and flood damages

MILONE & MACBROOM

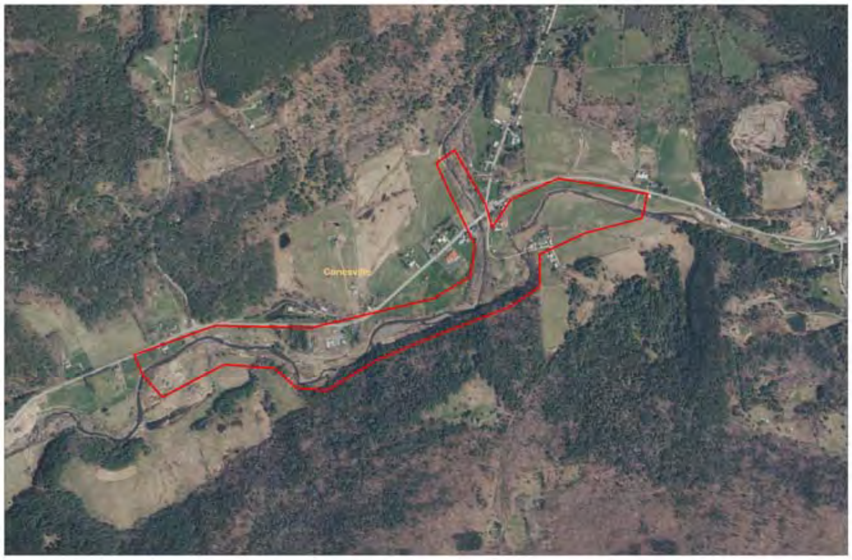
Project Area

MILONE & MACBROOM

Project Area

MILONE & MACBROOM

Project Area



MILONE & MACBROOM

Project Area

MILONE & MACBROOM

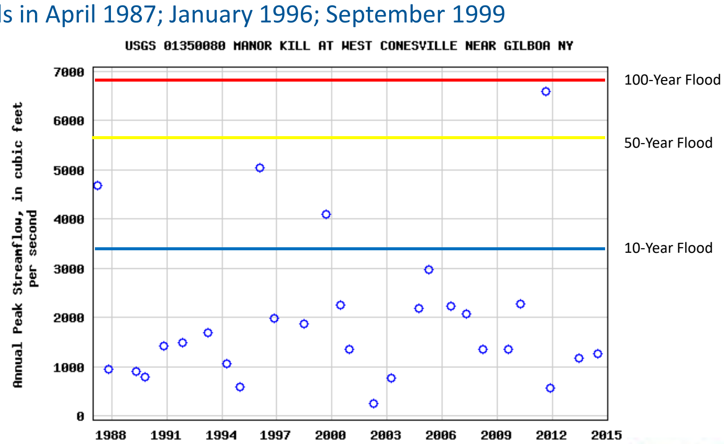
LFA Process

- Local Flood Analysis (LFA)
  - Identify properties and structures inundated during flood events
  - Employ hydraulic modeling to estimate expected depth of flooding
  - Develop mitigation alternatives to reduce flooding
  - Hydraulic modeling of alternatives to determine expected benefit

MILONE & MACBROOM

Flood History

- Conesville has experienced flooding and flood-related damages
- Usually resulting from winter and spring rain/snowmelt or fall hurricanes
- USGS Gauge Data at Pangman Road, 1987 - today
- Irene flood in August 2011 close to 100-year event
- Floods in April 1987; January 1996; September 1999



MILONE & MACBROOM

Examples of Flood Mitigation Strategies

Bridges
- Removal
- Replacement
- Retrofit

Channel Alteration
- Widening
- Realignment

Floodplain
- Reclamation
- Creation
- Enhancement

Sediment
- Dredging
- Sediment Management

Individual Structure Treatment
- Floodproofing
- Elevation of Structures
- Relocation
- Voluntary Buy-Out

MILONE & MACBROOM

Final Outcomes of Conesville's LFA

- Engineering Analysis – Scientifically Based & Defendable
- Benefit Cost Analysis – To Understand Viability
- Concept Sketches of Mitigation Options – Visioning
- Preliminary Cost Estimates
- Identification of Potential Funding Sources
- A Blueprint for Near-Term and Long-Term Flood Mitigation
- A Better Understanding of What is Feasible, What is Cost Effective, and What is Desired by the Citizens of Conesville

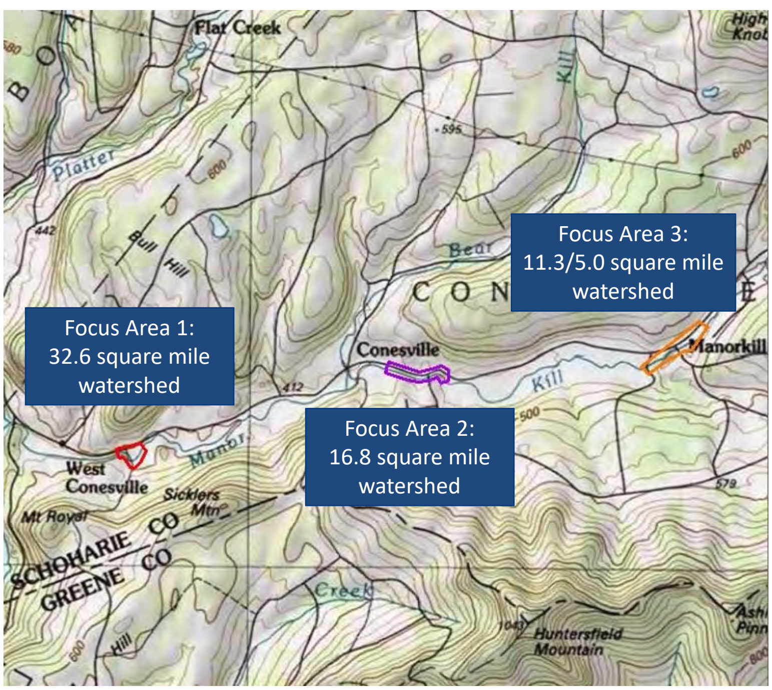
MILONE & MACBROOM

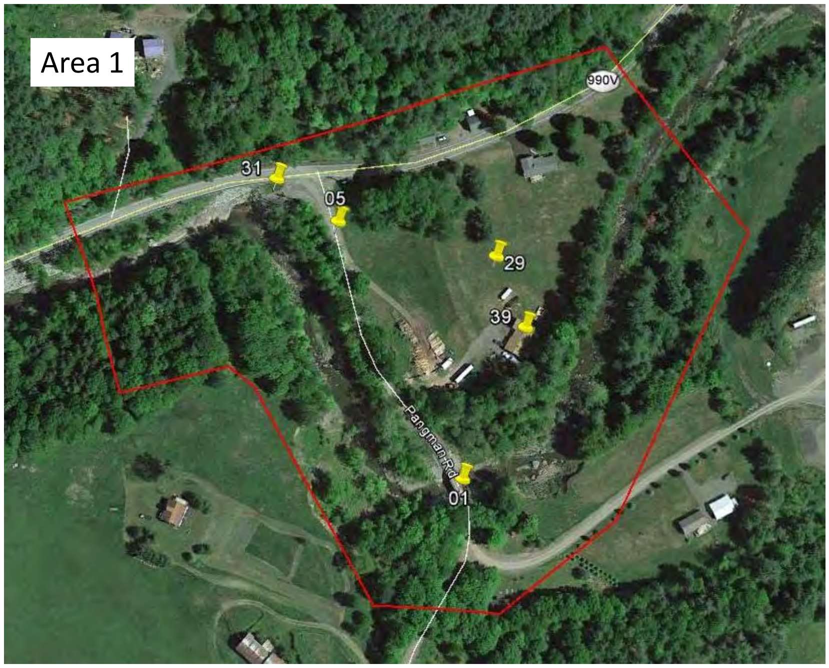
MILONE & MACBROOM

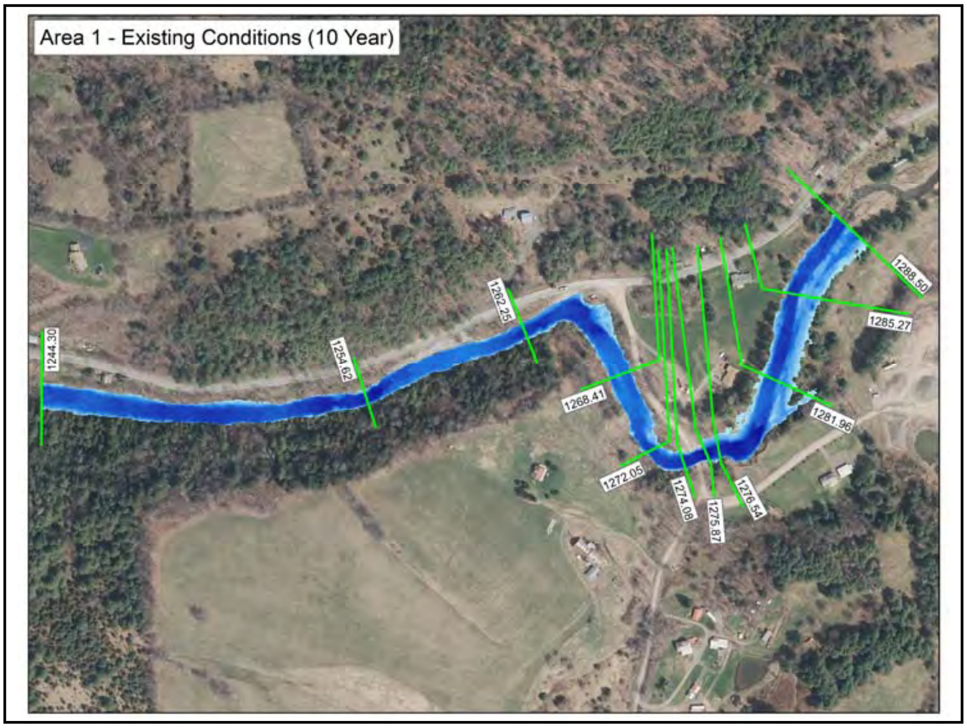
Local Flood Analysis
Conesville, New York

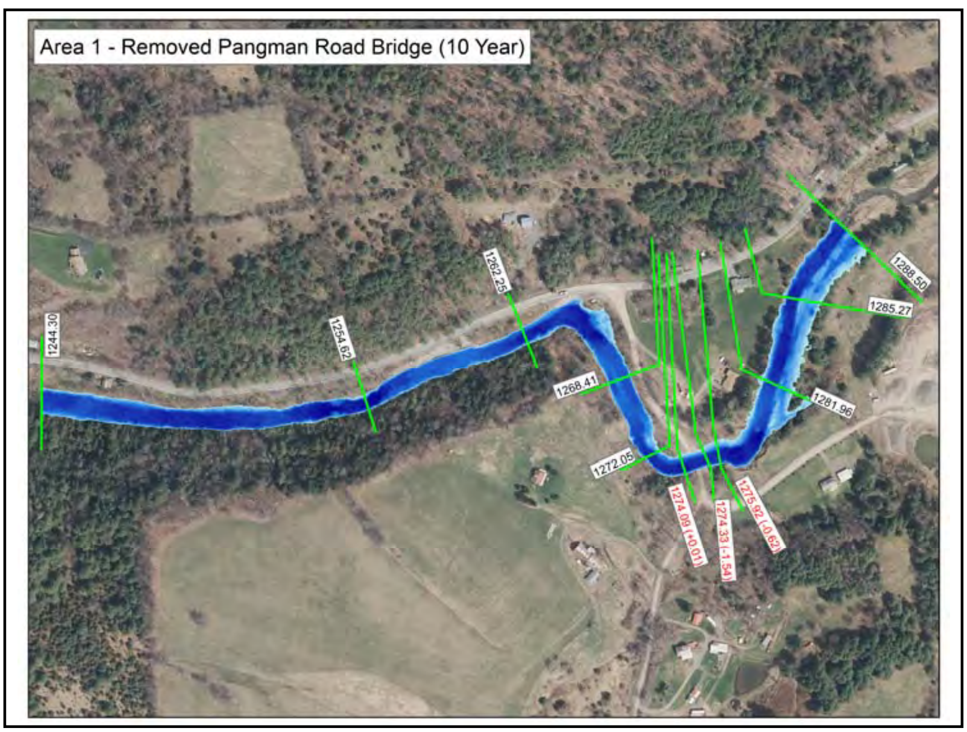
FAC Meeting

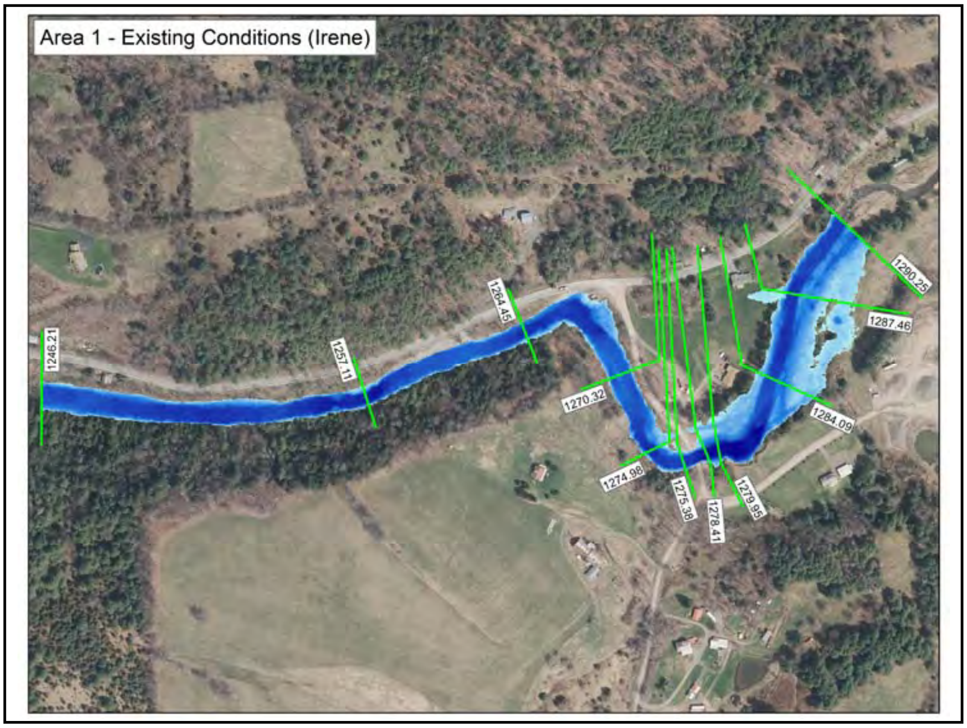
Town of Conesville | January 5, 2017

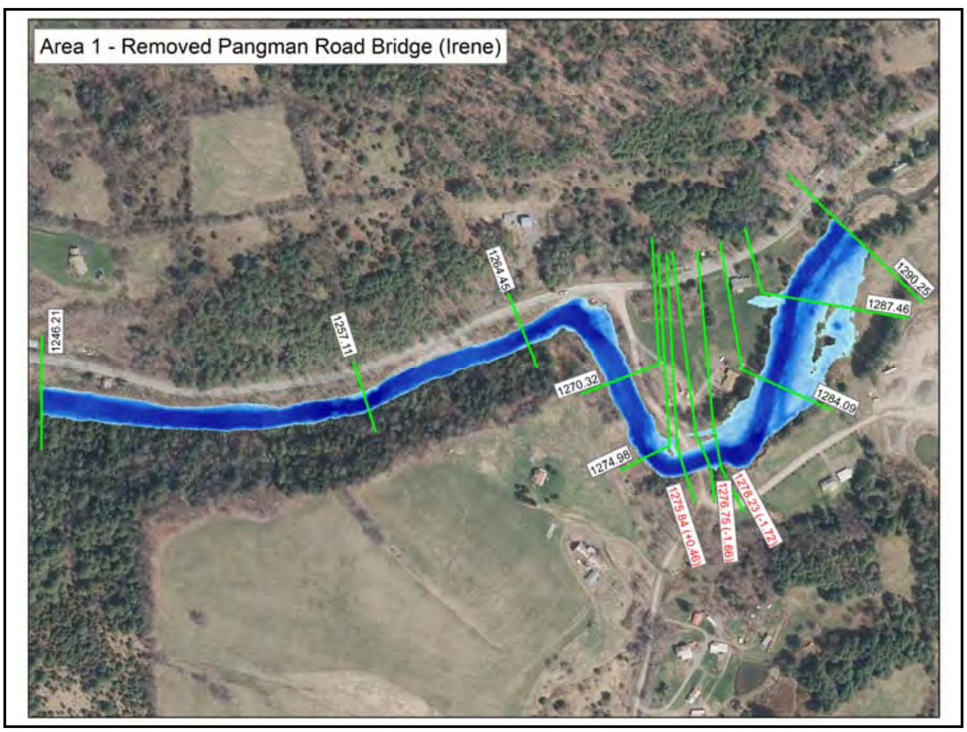


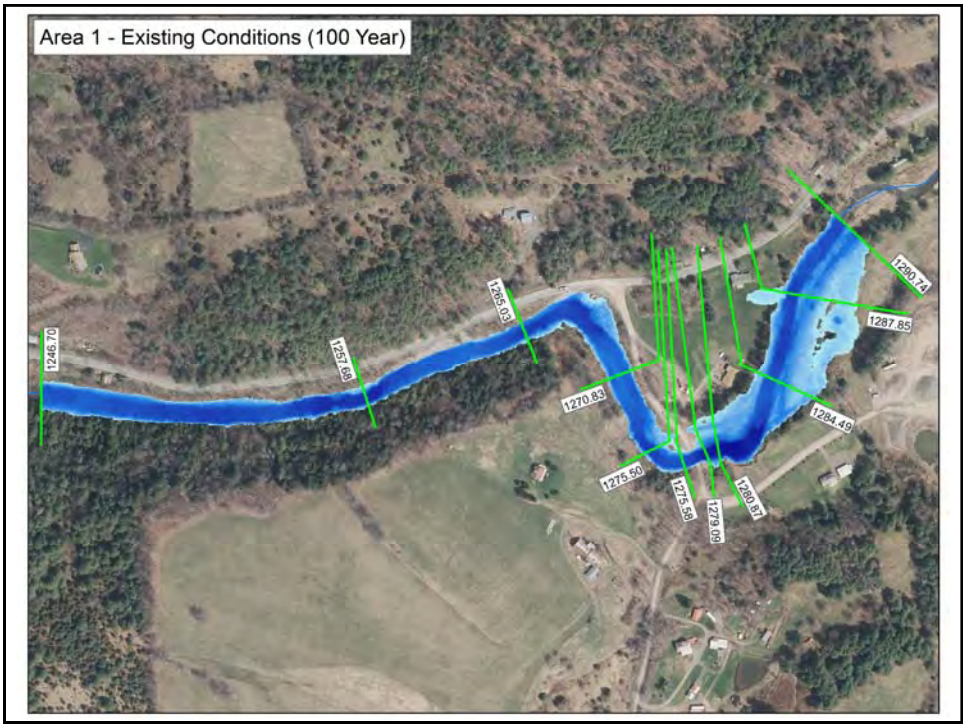

Area 1
990V
31
05
29
39
Pangman Rd
01

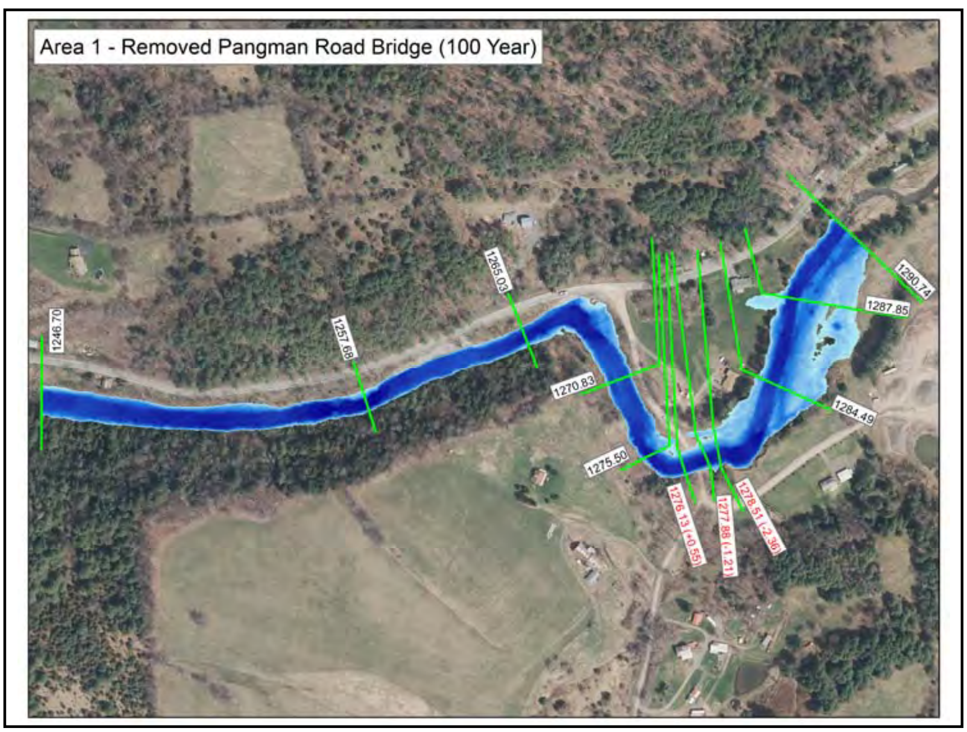

Area 1 - Existing Conditions (10 Year)
1244.30
1254.62
1262.25
1268.41
1272.05
1274.08
1275.87
1276.54
1281.96
1285.27
1288.50

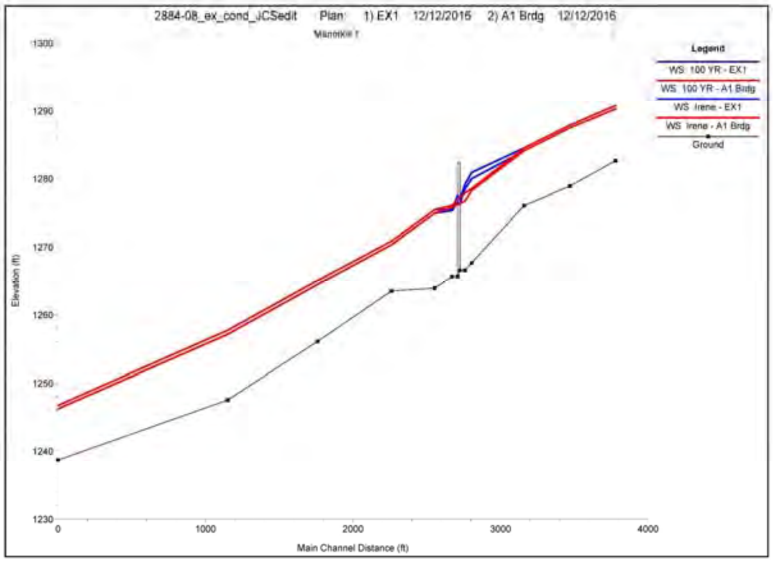

Area 1 - Removed Pangman Road Bridge (10 Year)
1244.30
1254.62
1262.25
1268.41
1272.05
1274.09 (+0.01)
1274.33 (-1.54)
1275.92 (-0.62)
1281.96
1285.27
1288.50


Area 1 - Existing Conditions (Irene)
1246.21
1257.11
1264.45
1270.32
1274.98
1275.38
1278.41
1279.95
1284.09
1287.46
1290.25


Area 1 - Removed Pangman Road Bridge (Irene)
1246.21
1257.11
1264.45
1270.32
1274.98
1275.84 (+0.46)
1276.75 (-1.66)
1278.23 (-1.72)
1284.09
1287.46
1290.25


Area 1 - Existing Conditions (100 Year)
1246.70
1257.68
1265.03
1270.83
1275.50
1275.58
1279.09
1280.87
1284.49
1287.85
1290.74

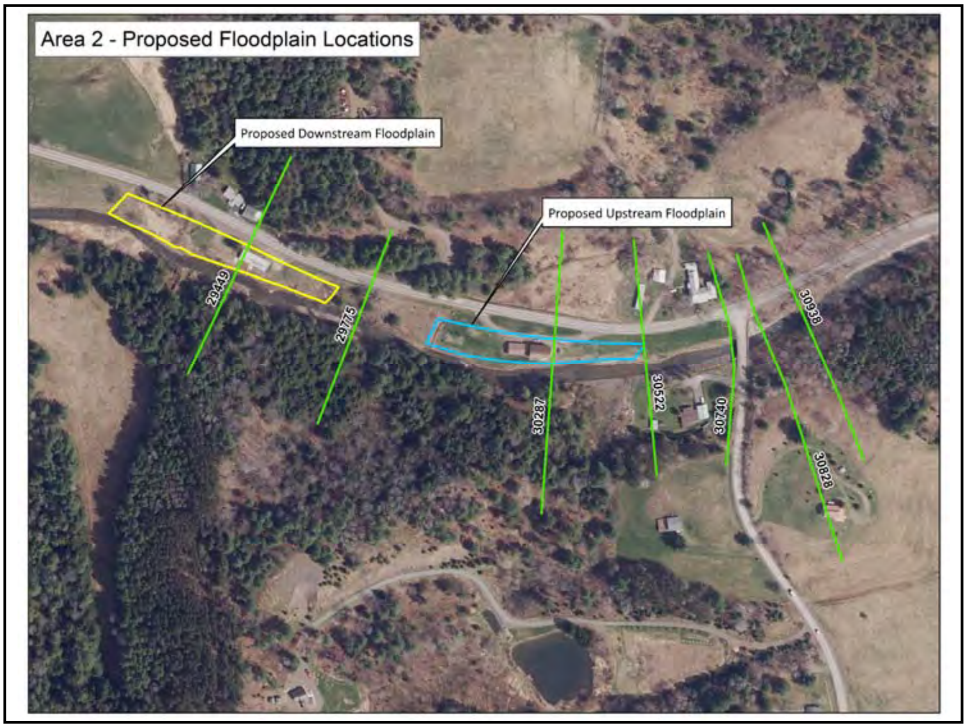

Area 1 - Removed Pangman Road Bridge (100 Year)
1246.70
1257.68
1265.03
1270.83
1275.50
1276.13 (+0.55)
1277.88 (-1.21)
1278.51 (-2.36)
1284.49
1287.85
1290.74

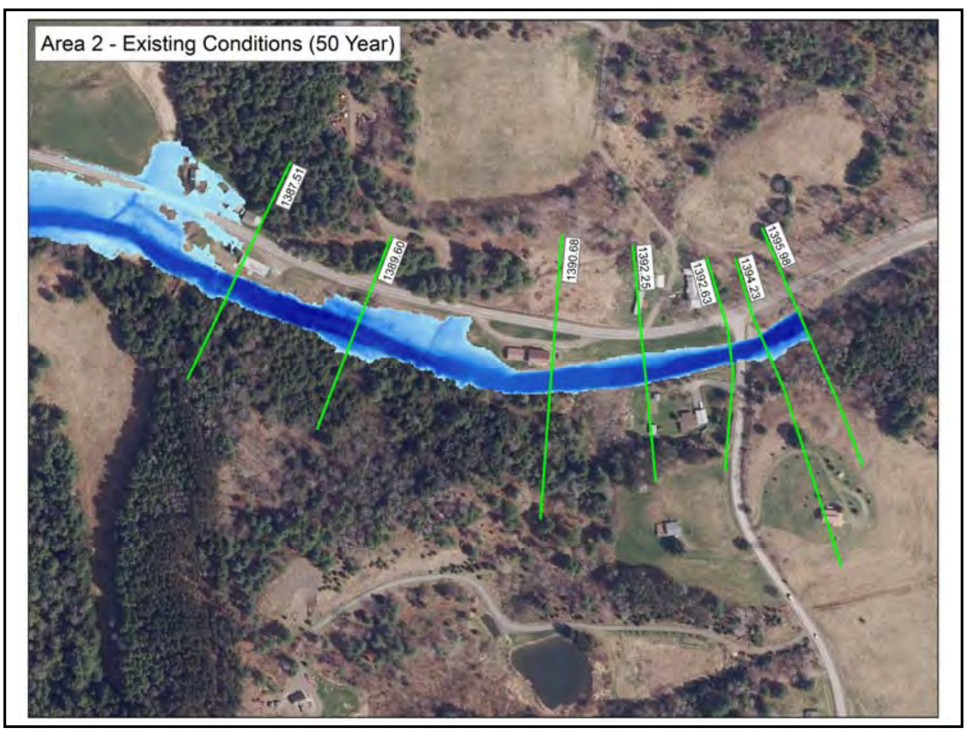


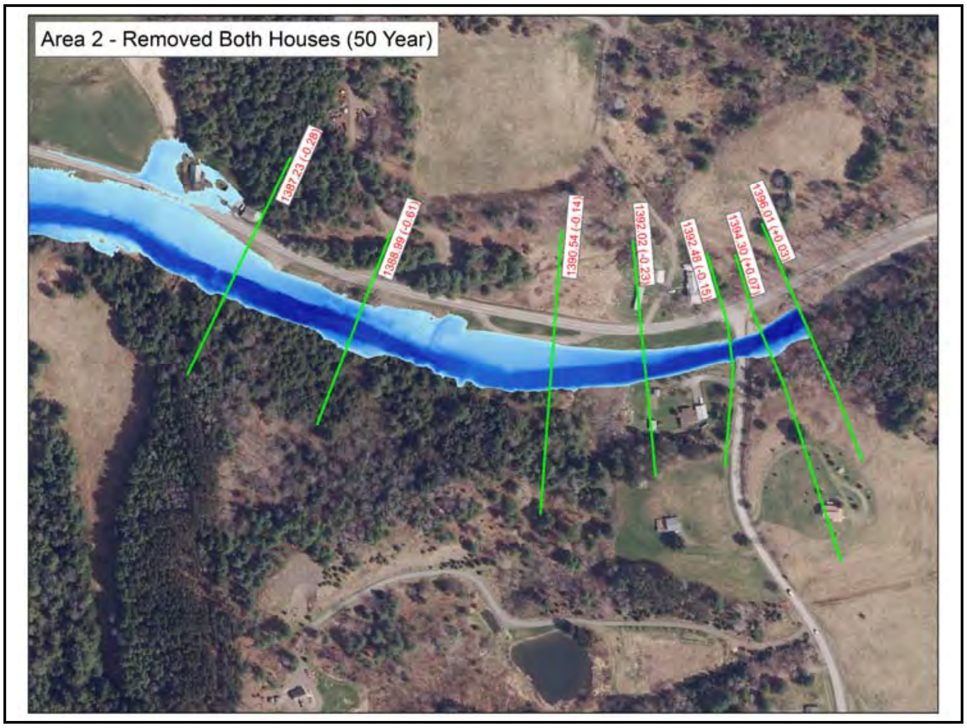
<u>Results in Focus Area 1</u>:

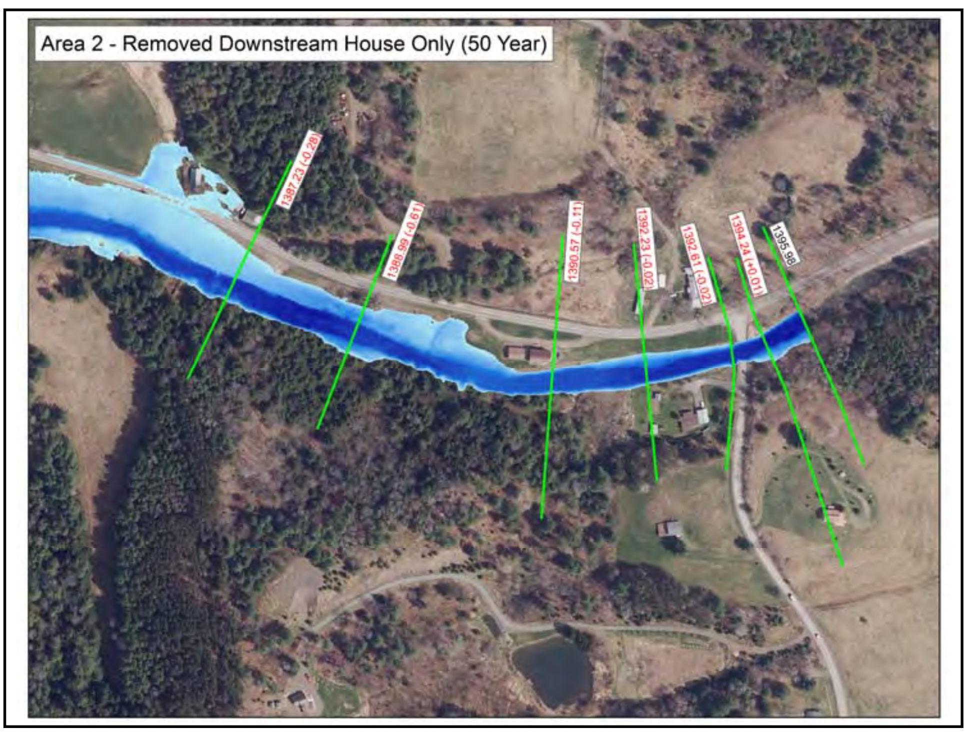
- Pangman Road Bridge is sufficiently sized for 100-year flood event
- Washout in Irene may have resulted from channel geometry (creek enters a confined valley with hard bends)
- Issue may have been resolved with bank armoring after Irene
- For BCA, need damage numbers for at least two flood events (more is better)


Area 2
Potter Mountain Rd
3
17
19
18
04
03

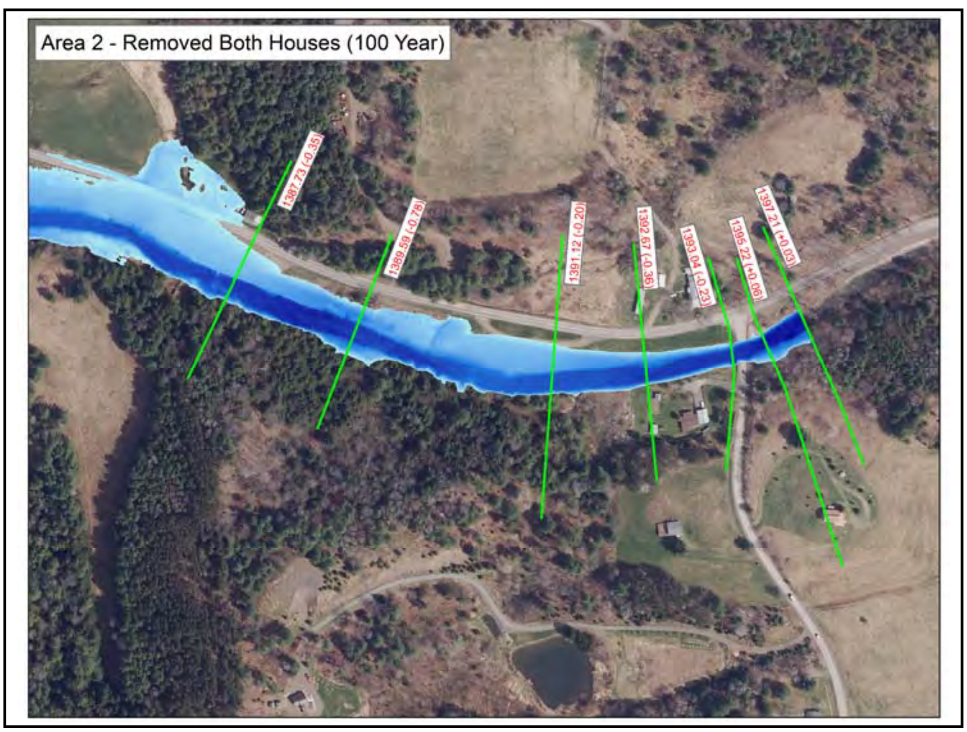

Area 2 - Proposed Floodplain Locations
Proposed Downstream Floodplain
Proposed Upstream Floodplain
29449
29775
30287
30522
30740
30828
30938

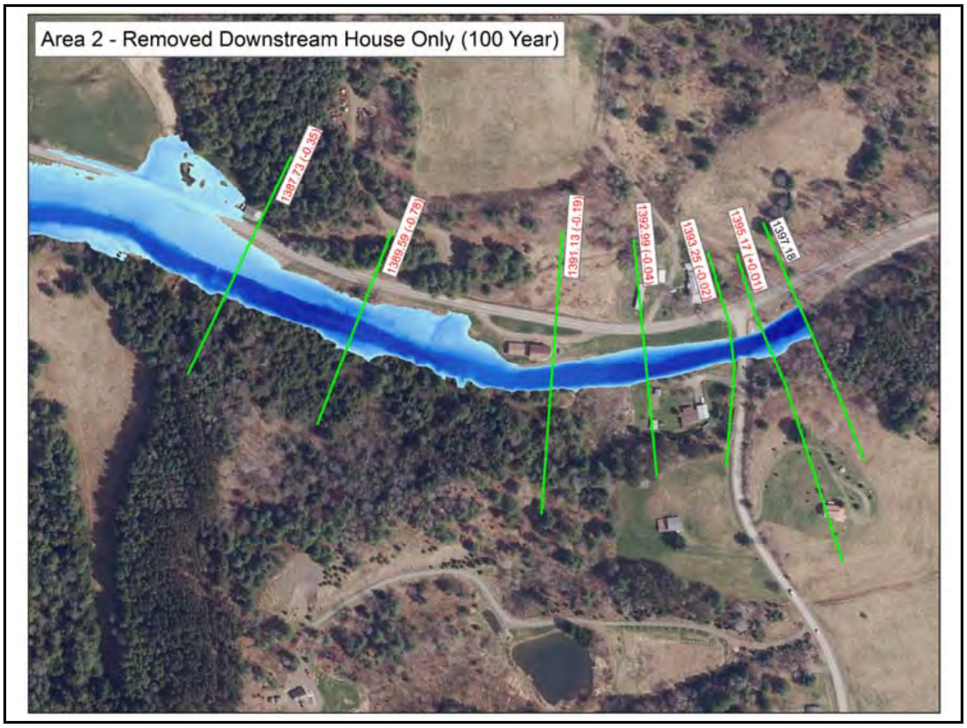

Area 2 - Existing Conditions (50 Year)
1387.51
1389.60
1390.68
1392.25
1392.63
1394.23
1395.98

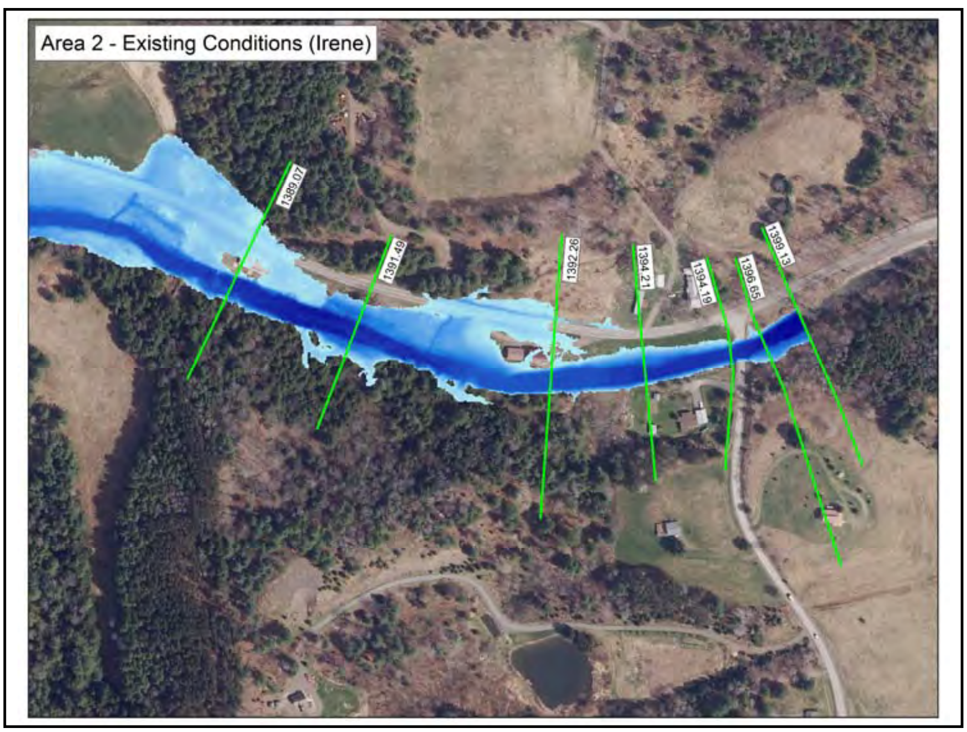

Area 2 - Removed Both Houses (50 Year)
1387.23 (-0.28)
1388.99 (-0.61)
1390.54 (-0.14)
1392.02 (-0.23)
1392.48 (-0.15)
1394.30 (+0.07)
1396.01 (+0.03)


Area 2 - Removed Downstream House Only (50 Year)
1387.23 (-0.28)
1388.99 (-0.61)
1390.57 (-0.11)
1392.23 (-0.02)
1392.61 (-0.02)
1394.24 (+0.01)
1395.98


Area 2 - Existing Conditions (100 Year)
1389.08
1390.37
1391.32
1393.03
1393.27
1395.16
1397.18


Area 2 - Removed Both Houses (100 Year)
1387.73 (-0.35)
1389.59 (-0.78)
1391.12 (-0.20)
1392.67 (-0.36)
1393.04 (-0.23)
1395.22 (+0.06)
1397.21 (+0.03)


Area 2 - Removed Downstream House Only (100 Year)
1387.73 (-0.35)
1389.59 (-0.78)
1391.13 (-0.19)
1392.99 (-0.04)
1393.25 (-0.02)
1395.17 (+0.01)
1397.18


Area 2 - Existing Conditions (Irene)
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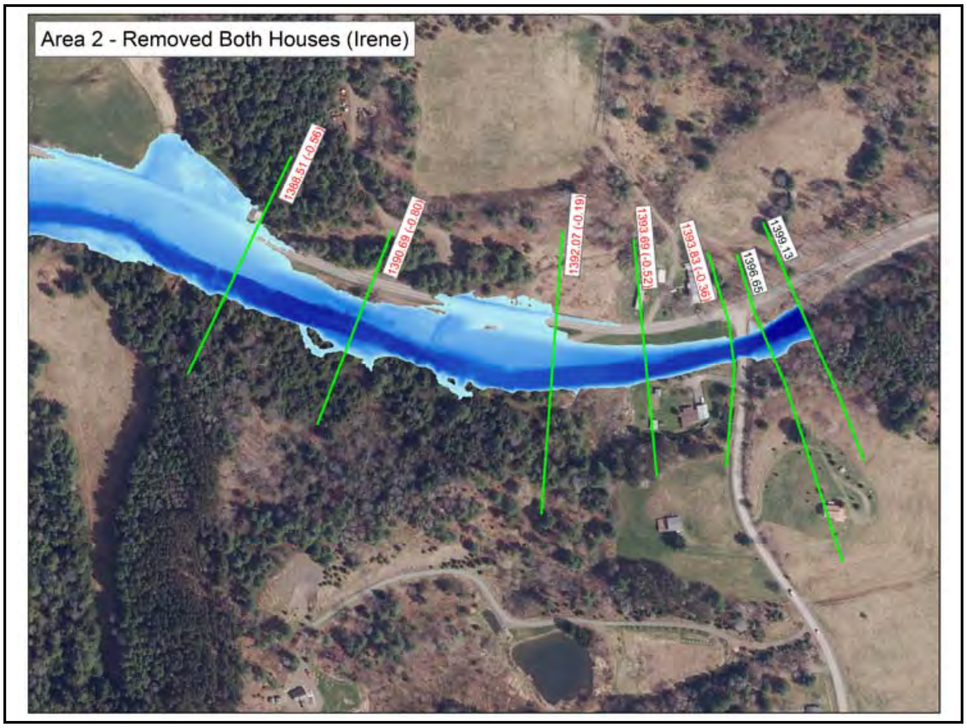
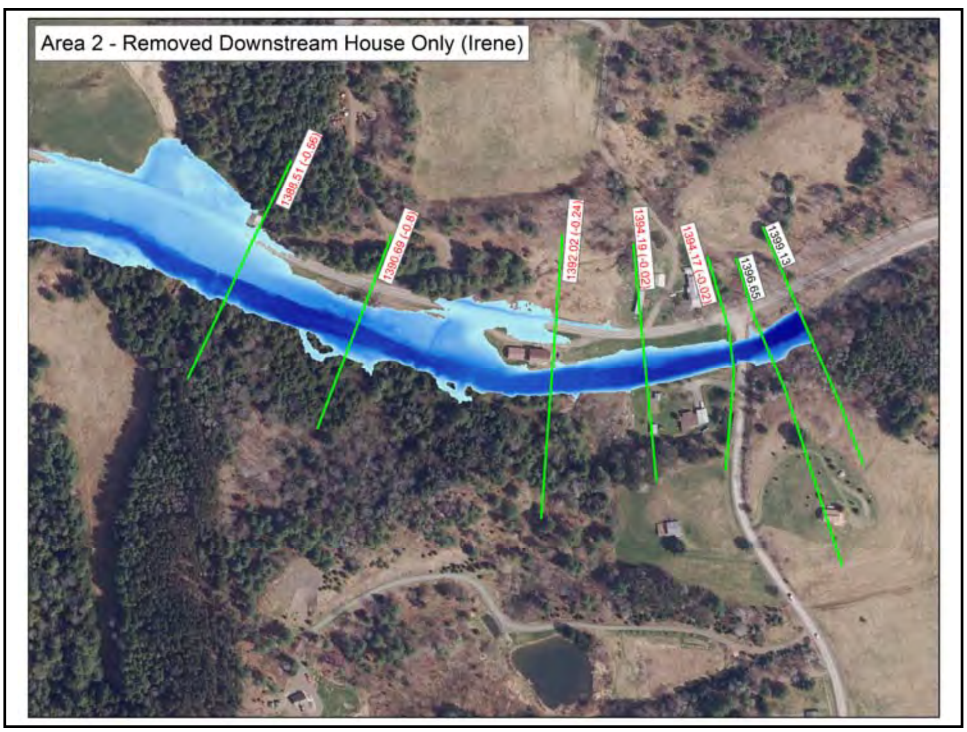
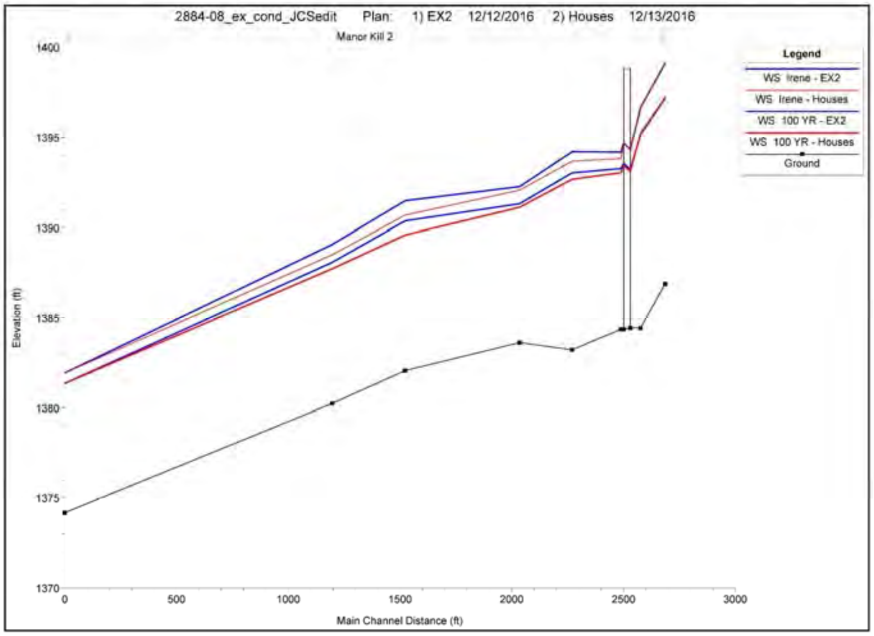
1391.49
1392.26
1394.21
1394.19
1396.65
1399.13


Area 2 - Removed Both Houses (Irene)
1388.51 (-0.56)
1390.69 (-0.80)
1392.07 (-0.19)
1393.69 (-0.52)
1393.83 (-0.36)
1396.65
1399.13


Area 2 - Removed Downstream House Only (Irene)
1388.51 (-0.56)
1390.69 (-0.8)
1392.02 (-0.24)
1394.19 (-0.02)
1394.17 (-0.02)
1396.65
1399.13



Area 2

Benefits: Floodplain removing both houses

Benefit Summary	
Benefits: Property Acquisition/Relocation	$11,066
Benefits: Water Surface Reductions at Buildings that Remain	$4,939
Total Benefits	$16,005

MILONE & MACBROOM

Area 2

Cost/Benefit: Floodplain removing both houses

Benefit Cost Summary	
Total Benefits	$16,005
Total Costs	$536,881
Benefit Cost Ratio	**0.03**

Milone & MacBroom

Area 2

Benefits: Floodplain removing d/s house

Benefit Summary	
Benefits: Property Acquisition/Relocation	$891
Benefits: Water Surface Reductions at Buildings that Remain	$5,509
Total Benefits	$6,400

Milone & MacBroom

Area 2

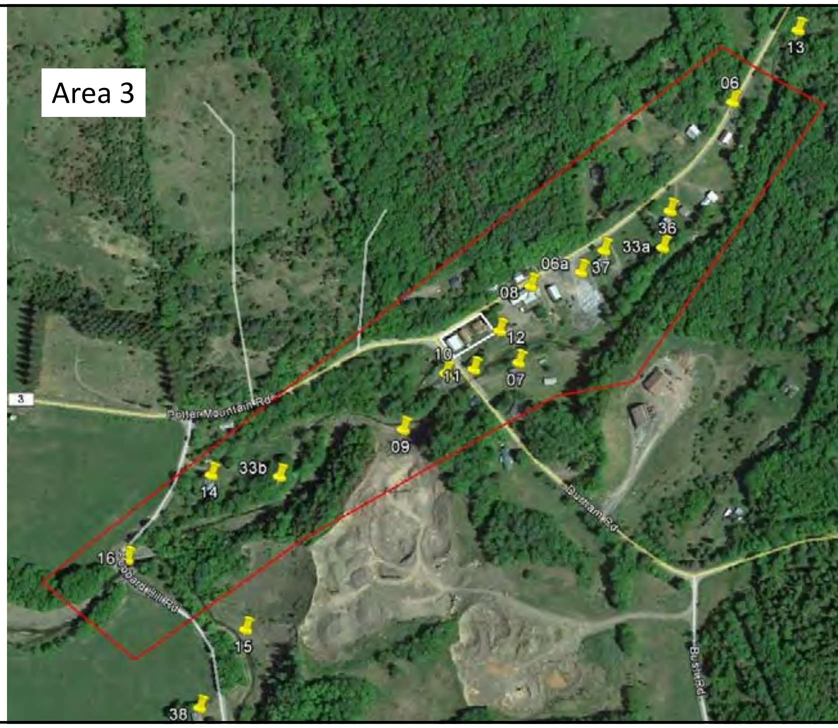
Cost/Benefit: Floodplain removing d/s house

Benefit Cost Summary	
Total Benefits	$6,400
Total Costs	$278,659
Benefit Cost Ratio	**0.02**

Milone & MacBroom

Results in Focus Area 2:

- Floodplain reclamation scenarios along Manor Kill reduce flooding frequency and depth on roadway and at 195 Potter Mountain Road
- Would require removal of one or two houses
- Benefits from floodplain reclamation are not great enough to outweigh costs
- May be able to improve BCRs; would need damage numbers for at least two flood events (more is better)
- Riparian and water quality benefits kick in once BCR reaches 0.75


Area 3
13
06
36
33a
06a
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33b
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38
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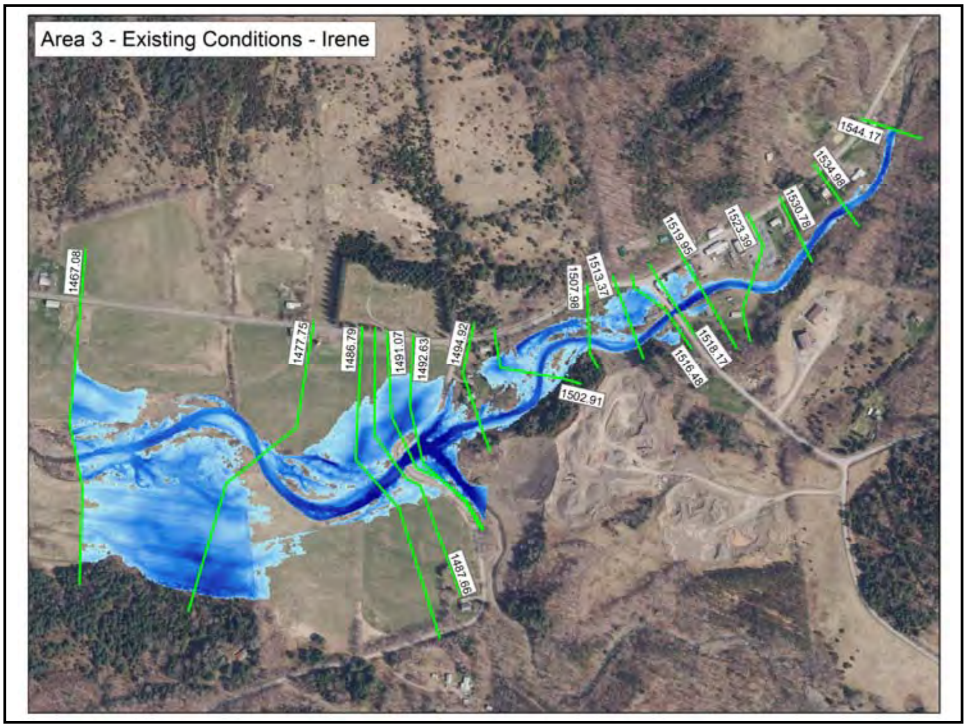
Potter Mountain Rd


Area 3 - Existing Conditions - Irene
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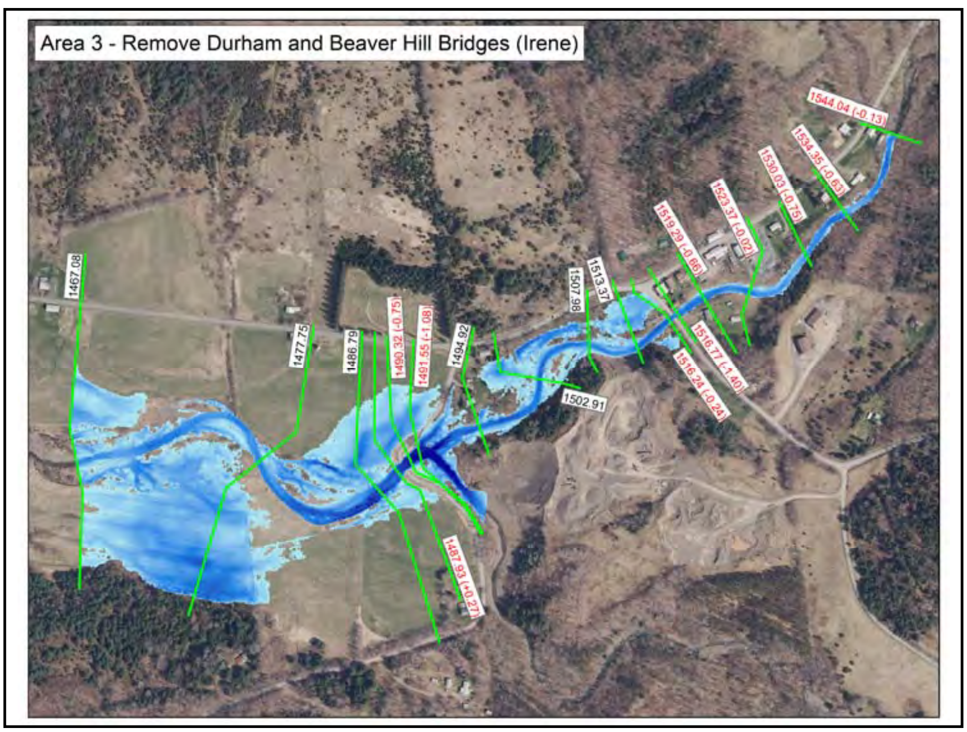
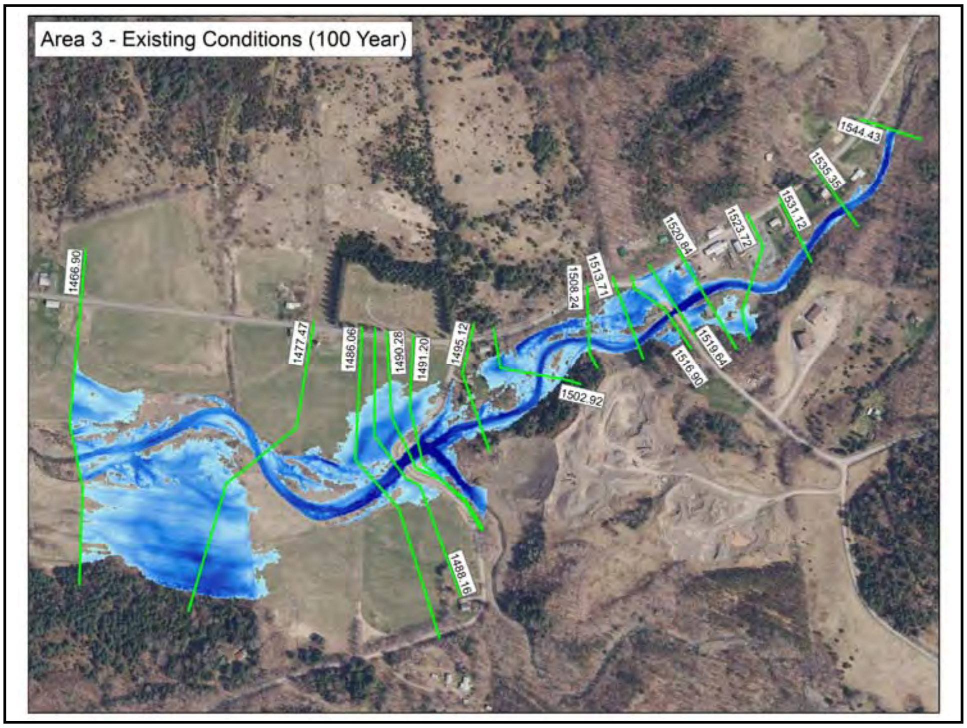
1534.98
1530.78
1523.39
1519.95
1513.37
1507.98
1518.17
1516.48
1502.91
1494.92
1492.63
1491.07
1486.79
1477.75
1467.08
1487.69


Area 3 - Remove Durham and Beaver Hill Bridges (Irene)
1544.04 (-0.13)
1534.35 (-0.63)
1530.03 (-0.75)
1523.37 (-0.02)
1519.29 (-0.66)
1513.37
1507.98
1516.77 (-1.40)
1516.24 (-0.24)
1502.91
1494.92
1491.55 (-1.08)
1490.32 (-0.75)
1486.79
1477.75
1467.08
1487.93 (+0.27)


Area 3 - Existing Conditions (100 Year)
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1535.35
1531.12
1523.72
1520.84
1513.71
1508.24
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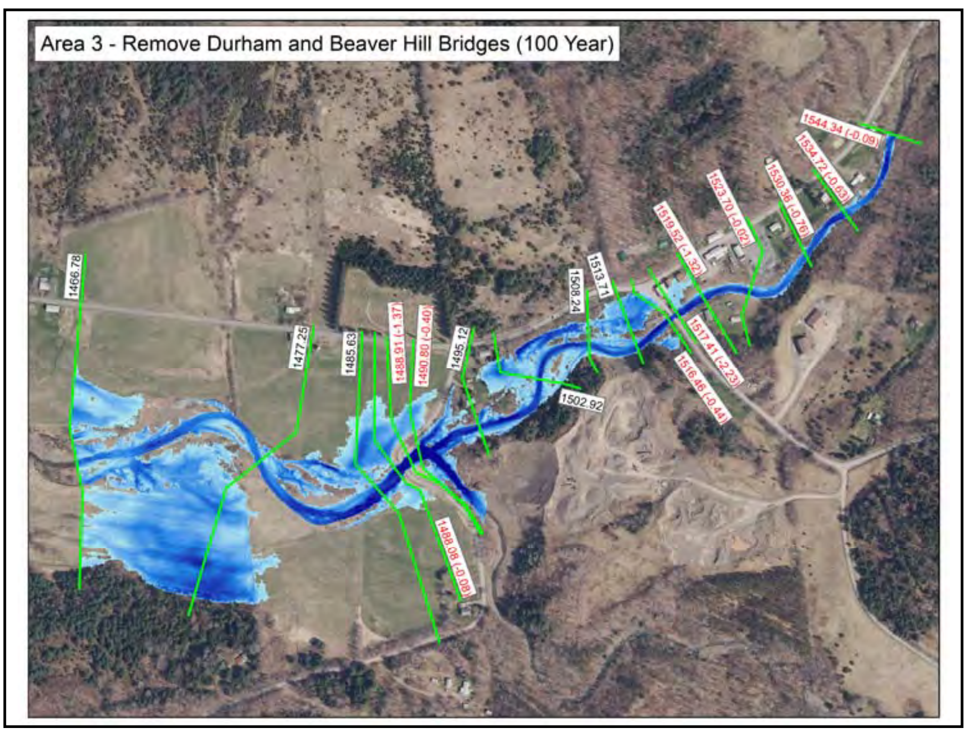
1490.28
1486.06
1477.47
1466.90
1488.16


Area 3 - Remove Durham and Beaver Hill Bridges (100 Year)
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1530.36 (-0.76)
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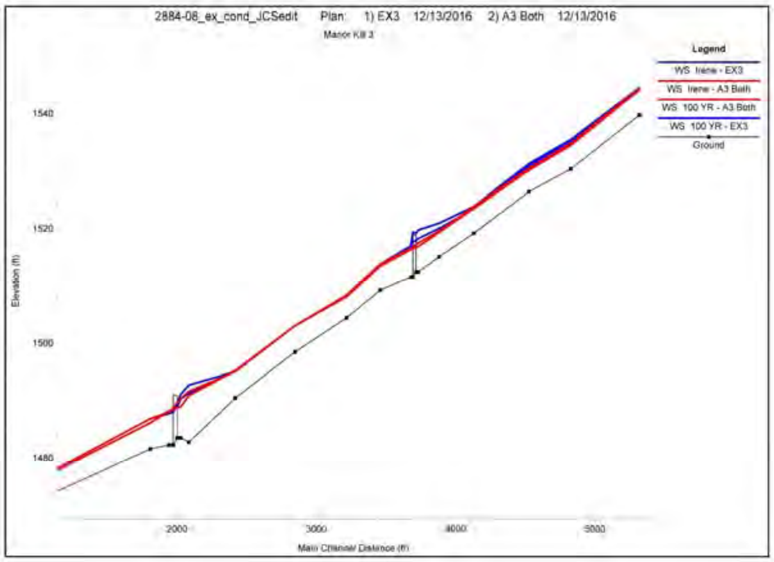
1519.52 (-1.32)
1513.71
1508.24
1517.41 (-2.23)
1516.46 (-0.44)
1502.92
1495.12
1490.80 (-0.40)
1488.91 (-1.37)
1485.63
1477.25
1466.78
1488.08 (-0.08)



Results in Focus Area 3:

- New bridge at Beaver Hill Road is adequately sized and does not contribute to flooding of homes
- Bridge at Durham Road does contribute to flooding of structures during larger floods
- Benefits of a larger bridge are likely not great enough to outweigh cost (some of the structures are abandoned)
- Voluntary buy-outs may be best solution here
- May be able to improve BCRs; would need damage numbers for at least two flood events (more is better)
- Riparian and water quality benefits kick in once BCR reaches 0.75

DATE: June 23, 2016
Time: 7:00 pm
MMI #: 2884-08
PROJECT: Conesville LFA
SUBJECT: Project Kick-off
LOCATION: Conesville Town Hall

Agenda

1. Introductions

2. Identification of focus areas where survey and hydraulic analysis will take place

3. Set plan for public and town board meetings

4. Next steps, other topics

Minutes of Meeting

DATE:	**June 23, 2016**
MMI #:	**2884-08**
PROJECT:	**Conesville LFA**
SUBJECT:	**Project Kick-off Meeting**
LOCATION:	**Town Hall, Conesville, NY**

ATTENDEES:

Bill Federice (Commission Chair), Ron Barry, David Porter, Howard Mattsson, Kelly Smith, John Sweatman, Robert Proudman – Conesville Local Flood Commission; Phil Eskeli – NYCDEP; Mark Carabetta, Jillian Cole – MMI

Minutes:

Prior to the start of the meeting, MMI staff toured project area with Bill Federice.

MMI provided aerial maps of the Manor Kill, Bear Kill and smaller tributaries through Manorkill, Conesville and West Conesville. Maps were laid out during meeting and flood commissioners noted which areas and structures were impacted during Irene and the 2006 flood. MMI documented areas on maps for future reference.

A public meeting is scheduled for July 26th at 7 PM at Conesville Fire Department. The goals of the public meeting will be to introduce the public to the LFA process, and to gather additional information on flooding and flood-related damages. MMI will bring 3 sets of maps with post flood aerial photos along with questionnaires.

Minutes of Meeting

DATE:	**July 26, 2016**
MMI #:	**2884-08**
PROJECT:	**Conesville LFA**
SUBJECT:	**LFA Public Meeting**
LOCATION:	**Fire Department, Conesville, NY**

ATTENDEES:

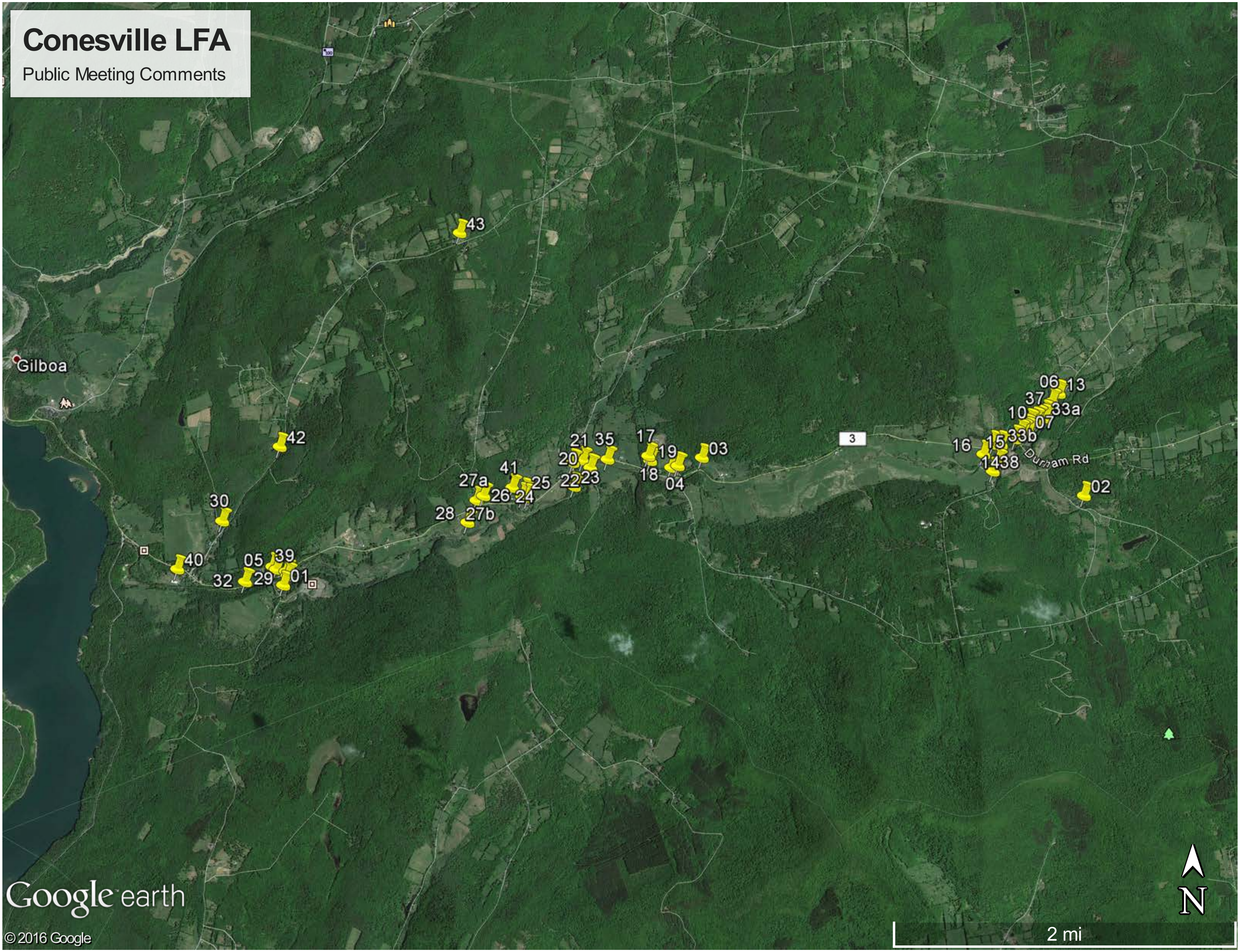
Bill Federice (Commission Chair), David Porter, John Sweatman – Conesville Local Flood Commissioners; Phil Eskeli – NYCDEP; Joel Dubois – Greene County Soil and Water Conservation District; Mark Carabetta, Jillian Cole, Ellen Hart – MMI; Joann Federice, Muriel Kilmer, Ted Kilmer, Mike Brandow, Nancy Sweatman, Jim Noone, Joanne Noone, James Rion, Jerry Hughes, Michael Fleischman – Conesville Residents

Minutes:

Bill Frederice (Commission Chair) began with a quick introduction followed by introductions of MMI staff. Mark Carabetta (MMI) gave a presentation providing an overview of the local flood analysis (LFA) process and goals.

MMI provided aerial maps of the Manor Kill, Bear Kill and smaller tributaries through Manorkill, Conesville and West Conesville. Maps were laid out after the presentation and attendees noted which areas and structures were impacted during Irene and the 2006 flood. MMI documented areas on maps for future reference (see attached reference map showing locations where comments on flooding were collected). MMI also provided questionnaires to be distributed for additional comments.

MMI will review comments and determine where survey information should be collected. Survey areas will be sent to the flood commission via email for review.


Conesville LFA
Public Meeting Comments
Gilboa
43
42
30
40
05
39
32
29
01
41
27a
26
24
25
28
27b
21
35
20
22
23
17
19
18
04
03
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14
38
33b
Durham Rd
06
13
37
33a
10
07
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© 2016 Google

Memorandum

TO: **Conesville Flood Commission**

FROM: **Mark Carabetta and Jillian Cole, MMI**

DATE: **July 29, 2016**

RE: **Local Flood Analysis Study Areas**

Milone & MacBroom, Inc. (MMI) staff obtained comments from the Conesville Flood Commission and Conesville residents regarding areas of flooding along the Manor Kill and its tributaries. Comments were collected during two meetings held in Conesville on June 23, 2016 and July 26, 2016. Upon compilation and review of the comments, MMI recommends the following areas for further investigation:

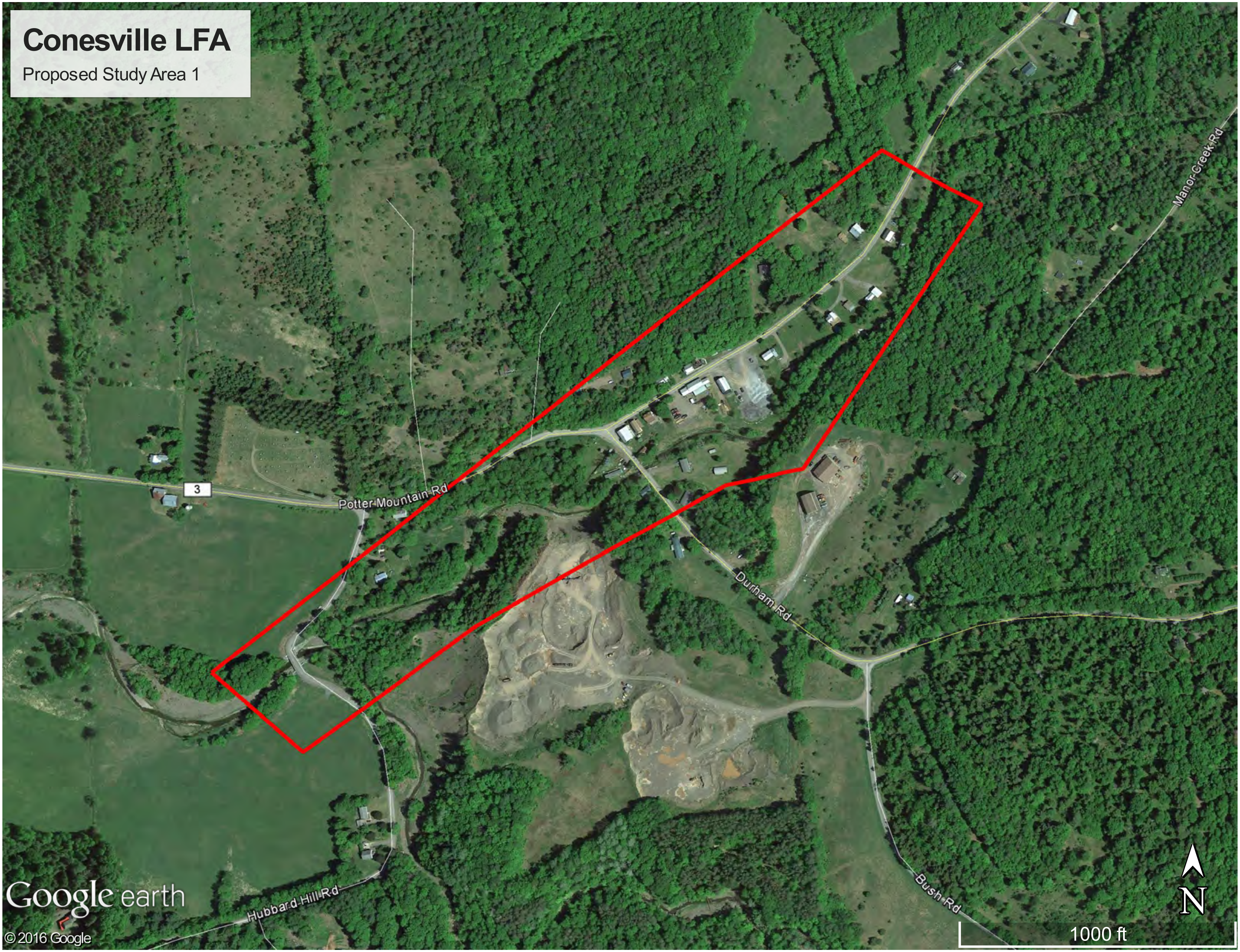
1. Study Area 1 begins upstream of Michael Fleishman's house in the hamlet of Manorkill and ends downstream of Beaver Hill Road. It will include a detailed study of two bridges – Durham Road Bridge and Beaver Hill Road Bridge – and approximately 3,700 feet of stream channel.

2. Study Area 2 will begin approximately 1,000 feet upstream of South Mountain Road Bridge and end downstream of Ted and Muriel Kilmer's property. It will include 3,100 feet of stream channel and detailed study of South Mountain Road Bridge.

3. Study Area 3 will focus on the area near Pangman Road Bridge. It will begin 500 feet upstream of the bridge and extend downstream 1,000 feet and include a detailed study of the bridge.

Refer to the attached maps for study area locations.

Additional areas were considered, however, due to a limited survey scope it was necessary to prioritize the areas that have been the most impacted by flooding. The study areas identified above contain the highest density of structures and infrastructure that have experienced damage from flooding.


Conesville LFA
Proposed Study Area 1
Potter Mountain Rd
3
Durham Rd
Manor Creek Rd
Bush Rd
Hubbard Hill Rd
Google earth
© 2016 Google
1000 ft
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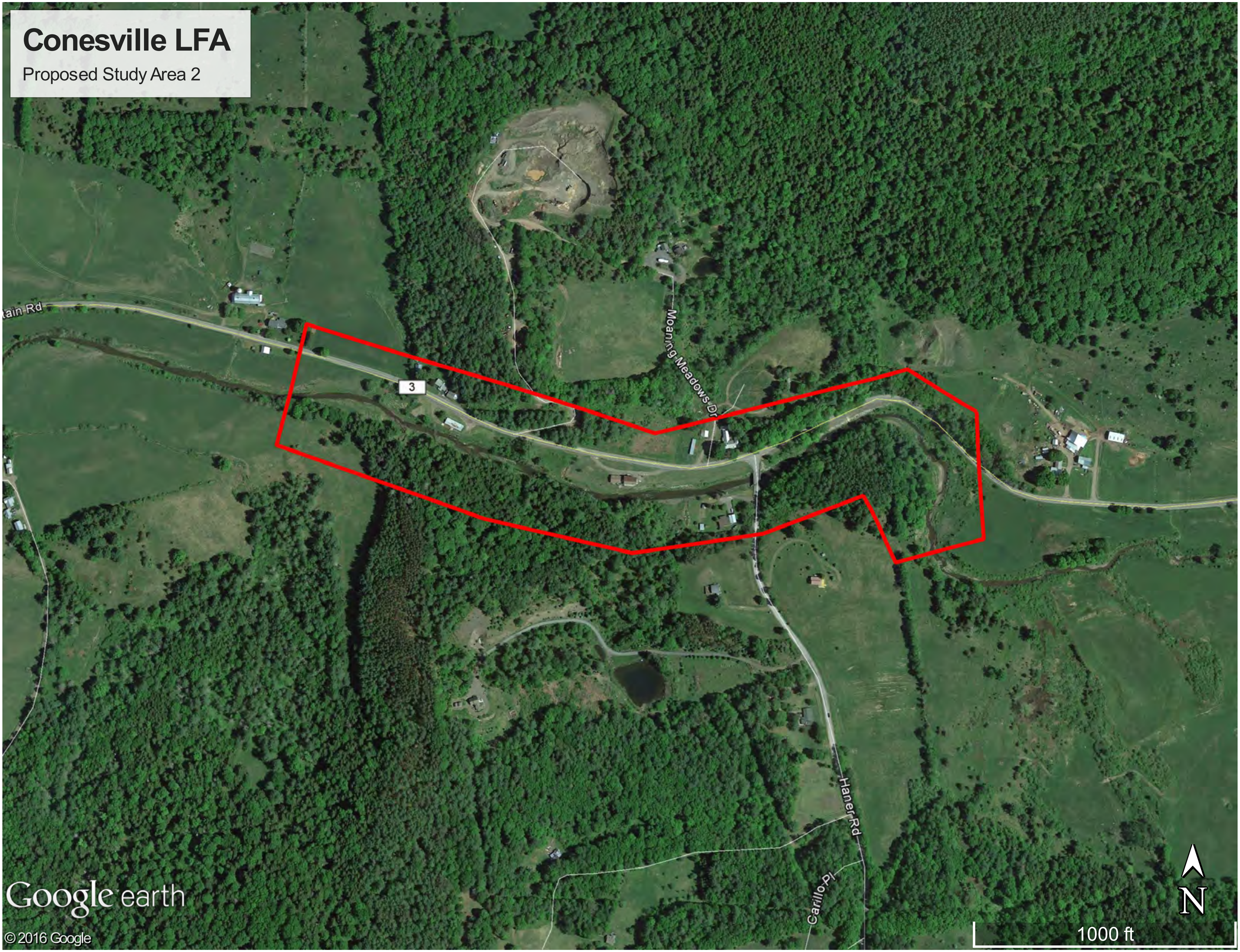

Conesville LFA
Proposed Study Area 2
tain Rd
3
Moaning Meadows Dr
Haner Rd
Carillo Pl
Google earth
© 2016 Google
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1000 ft


Conesville LFA
Proposed Study Area 3
990V
Pangman Rd
Google earth
© 2016 Google
2000 ft
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DATE: Thursday, January 5, 2017
Time: 7:00 pm
MMI #: 2884-08
PROJECT: Conesville LFA
SUBJECT: Project Updates and Feedback
LOCATION: Conesville Fire House

Agenda

1. Review of Conesville focus areas and primary flooding problems

2. Hydraulic modeling results

3. Preliminary results of Benefit-Cost Analysis (BCA)

4. Information requests

5. Next steps

Conesville LFA Landowner Questionnaire

Landowner Name and Address (optional):

1. **Where is your property?**

2. **What are the impacts of the flooding at your property or in your community? What are the recurring problems, and what has changed in recent years?**

3. **Has any work been done on the banks or in the stream near you?**

4. **What values does the stream hold to you...recreation, fishing, wildlife, aesthetics?**

APPENDIX B

CALCULATIONS AND COST ESTIMATES

Area 2 Scenario 2 Floodplain Removing Both Houses

Street Address	Benefits due to Reduction in WSEL	Acquisition Benefits	Costs	BCR
195 Potter Mountain Rd	$4,939			
198 Potter Mountain Rd		$891	$62,000	0.01
226 Potter Mountain Rd		$24,235	$209,500	0.12

Area 2 Scenario 1 Floodplain Removing Downstream House Only

Street Address	Benefits due to Reduction in WSEL	Acquisition Benefits	Costs	BCR
195 Potter Mountain Rd	$4,939			
198 Potter Mountain Rd		$891	$62,000	0.01
226 Potter Mountain Rd	$1,726			

Area 2 Alternative Summary

Alternative	Benefits due to Reduction in WSEL	Acquisition Benefits	Total Benefits	Total Cost	BCR
Scenario 2: Floodplain Removing Both Houses	$4,939	$24,235	$29,174	$574,881	0.05
Scenario 1: Floodplain Removing Downstream House Only	$6,665	$0	$6,665	$266,659	0.02

Area 3 Acquisition Benefits

Street Address	Benefits	Costs	BCR	
104 Durham Rd	$2,834	$78,700	0.04	
107 Durham Rd*	$1,298	$53,000	0.02	< building value of only $2,000
109 Durham Rd*	$1,228	$132,200	0.01	
110 Durham Rd	$10	$98,000	0.00	
684 Potter Mountain Rd*	$25,385	$120,000	0.21	
686 Potter Mountain Rd*	$147,784	$78,100	1.89	< includes riparian benefits
690 Potter Mountain Rd*	$279,933	$100,000	2.80	< includes riparian benefits

*structures are very sensitive to flooding when Beaver Road Bridge becomes clogged with debris

Area 3 Damage Frequency Analysis - Acquisition

Street Address	Benefits	Costs	BCR
109 Durham Road	$3,039	$132,200	0.02

Floodplain Enhancement Scenario 1

Restoration (Floodplains)

Area to restore (SF)	45731
Topsoil cost ($25/CY), assume 0.5 ft topsoil	$21,172
Seedmix cost ($0.75/SF)	$34,298

Volume Calculations
Lower FP

XS	XS Area Removed (SF)	DS Dist to next XS (FT)	Volume (CF)
29775	0	326	50856
29449	312	1197	186732
28252	0		
		Total CF:	237588.00
		Total CY:	8799.56

Excavation costs ($4/CY)	$35,198
Export costs ($20/CY)	$175,991
Total Costs:	$266,659

Floodplain Enhancment Scenario 2

Restoration (Floodplains)

Area to restore (SF)	74294
Topsoil cost ($25/CY), assume 0.5 ft topsoil	$34,395
Seedmix cost ($0.75/SF)	$55,721

Volume Calculations
Lower FP

XS	XS Area Removed (SF)	DS Dist to next XS (FT)	Volume (CF)
30522	0	235	22677.5
30287	193	512	49408
29775	0	326	50856
29449	312	1197	186732
28252	0		
		Total CF:	309,673.50
		Total CY:	11469.39

Excavation costs ($4/CY)	$45,878
Export costs ($20/CY)	$229,388
Total Costs:	$365,381

Flood Damage Descriptions

- 195 Potter Mountain Road was damaged during Tropical Storm Irene when floodwaters crossed Potter Mountain Road, resulting in approximately 3 feet of water on the first floor (the house is built on slab, with no basement). All appliances and furniture in the house (except beds and gas range) were ruined. The home has been repaired and furniture and appliances replaced. Floodwaters reportedly crossed road in the late 1980s and flooded the property near the garage with no damages.

- 198 Potter Mountain Road was used as a storage building at the time of Tropical Storm Irene. Water reportedly came 2 feet above the floorboards (the building is on slab, with no basement). The structure is now abandoned and is reportedly in the process of being acquired by the NYCDEP. Homeowner reports that the section of channel adjacent to the structure is unstable with eroding banks and fallen trees.

- 226 Potter Mountain Road was damaged during Tropical Storm Irene. Floodwaters came up to the first floor but did not flood the living space, only the basement (the home has a partial full basement and partial crawl space). Homeowner reports water in the basement nearly every spring. Homeowner reports that channel is unstable with eroding banks and fallen trees, subject to erosion and migration. Homeowner has paid for bank stabilization.

- 109 Durham Road was damaged during Tropical Storm Irene when floodwaters entered the garage and basement. Landowner shared damage information that was factored in to BCA. The home is now abandoned.