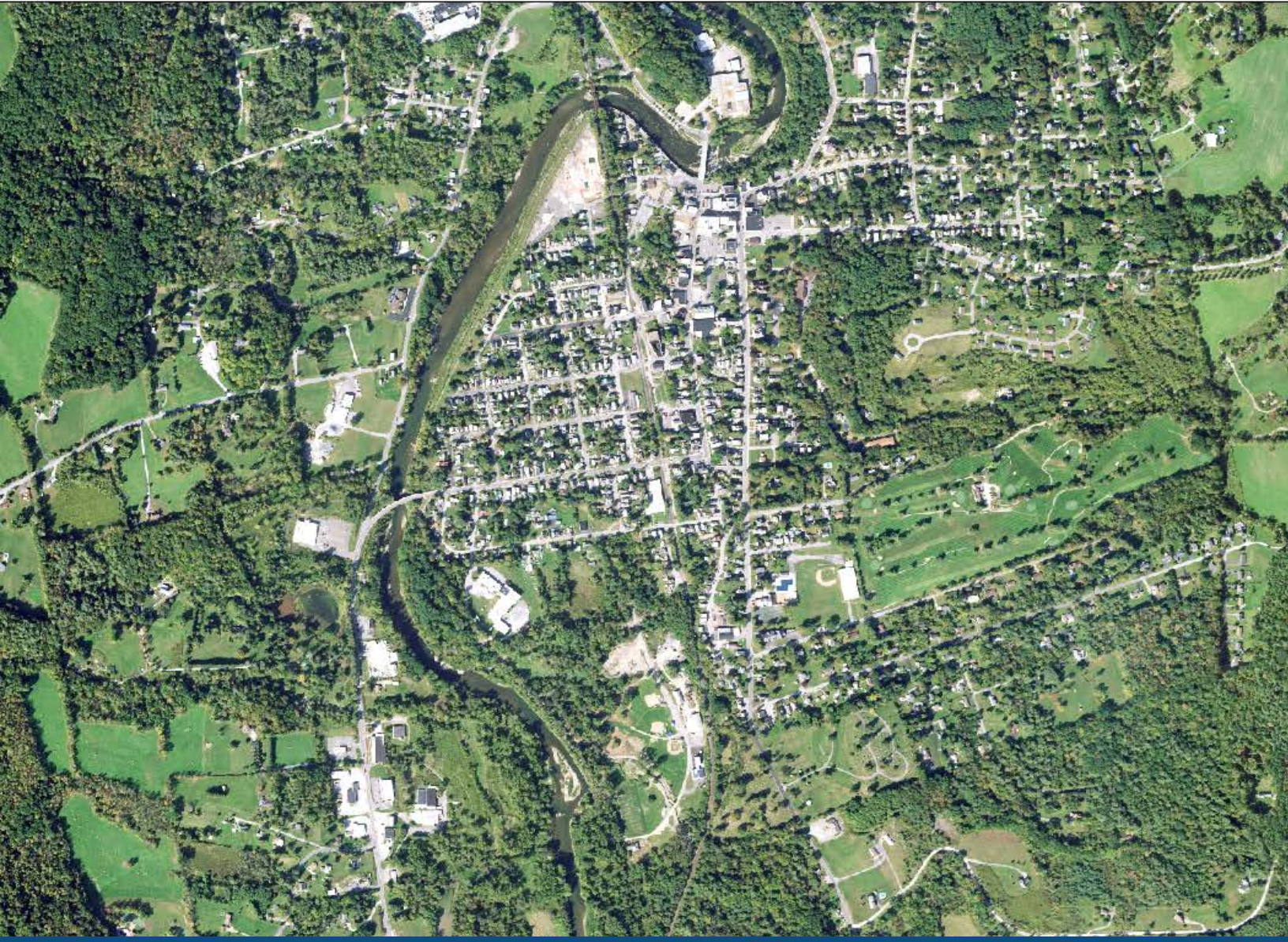

Levee Analysis and Mapping Plan
Hoosick Falls Flood Damage Reduction Project

Village of Hoosick Falls, Rensselaer County, New York

July 2019

FEMA

RiskMAP
Increasing Resilience Together

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Tables

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Acronyms

BFE	Base Flood Elevation
CERC	Community Engagement and Risk Communication
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
LLPT	Local Levee Partnership Team
LOMR	Letter of Map Revision
NFIP	National Flood Insurance Program
NYSDEC	New York State Department of Environmental Conservation
SFHA	Special Flood Hazard Area
STARR II	Strategic Alliance for Risk Reduction
USACE	U.S. Army Corps of Engineers

Definitions

The terms below have been used in this document. Additional terms are provided in FEMA's *Guidance for Flood Risk Analysis and Mapping, Levees* (February 2018) in the Glossary. This guidance document is available from the FEMA Library at https://www.fema.gov/media-library/assets/documents/94095.

Base Flood Elevation (BFE) – The elevation of a flood having a 1-percent chance of being equaled or exceeded in any given year.

Levee Reach Analysis and Mapping Procedures – Levee Analysis and Mapping Procedures include Sound Reach, Freeboard Deficient, Overtopping Analysis, Structural-Based Inundation, and Natural Valley. Details on these approaches can be found in FEMA's *Guidance for Flood Risk Analysis and Mapping, Levees* (February 2018).

Leveed Area* – A spatial feature in the NLD defined by the lands from which flood water is excluded by the levee system.

Levee Reach* – Any continuous section of a levee system to which a single analysis and mapping procedure may be applied.

Levee System* – A flood hazard-reduction system that consists of one or more levee segments and other features such as floodwalls and pump stations, which are interconnected and necessary to ensure exclusion of the design flood from the associated hydraulically independent leveed area, and which are constructed and operated in accordance with sound engineering practices.

Local Levee Partnership Team (LLPT)* – A work group that can be facilitated by FEMA when a levee system will be analyzed by levee analysis and mapping procedures for non-accredited levees. The primary function of this group is to share information/data and identify options based on stakeholder roles and knowledge.

National Levee Database (NLD)* – The NLD, developed by the United States Army Corps of Engineers (USACE) in cooperation with FEMA, is a dynamic, searchable inventory of information for all levee systems in the nation. The database contains information to facilitate and link activities, such as flood risk communication, levee system evaluation for the NFIP, levee system inspections, flood plain management, and risk assessments.

Non-Accredited Levee System* – A levee system that does not meet the requirements in the National Flood Insurance Program (NFIP) regulations at Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44CFR§65.10), *Mapping of Areas Protected by Levee Systems*, and is not shown on a FIRM as reducing the base flood hazards.

Zone A – An area inundated by 1-percent-annual-chance flooding, for which no BFEs have been determined.

Zone X (shaded) – area with reduced 1-percent-annual-chance flood hazard due to levee

*Term description from FEMA's *Guidance for Flood Risk Analysis and Mapping, Levees* (February 2018)

Executive Summary

The Federal Emergency Management Agency's (FEMA's) Flood Insurance Study (FIS) report and Flood Insurance Rate Map (FIRM) for the Village of Hoosick Falls, New York shows the Hoosic River Left Bank and Right Bank Levee System, which are part of the Hoosick Falls Flood Damage Reduction Project, as secluded. The temporary seclusion boundary allowed time for the non-accredited levee system to be addressed while mapping updates for Rensselaer County moved forward. As a result, the FIRM is to be revisited to remove the temporary seclusion boundary and depict the flood risk in the levee impacted areas.

FEMA's guidance was revised in 2013 to incorporate the Analysis and Mapping Procedures for non-accredited levees which provides a suite of flexible procedures to perform flood hazard analysis and mapping for Non-Accredited levees (see Section 1 of this report). In the Village of Hoosick Falls, FEMA Region II has initiated a Levee Discovery project where the Levee Analysis and Mapping Procedures (see Section 2) are being applied to the Hoosic River Levee Systems. This study will help identify potential options the levee owner (Village of Hoosick Falls) may consider for the depiction of flood hazard within the levee impacted areas on a future FIRM.

In November of 2018, FEMA Region II partnered with stakeholders in the Village of Hoosick Falls to form a collaborative Local Levee Partnership Team (LLPT) and worked to determine potential Levee Analysis and Mapping Procedures for the Hoosic River Levee Systems (see Sections 3 and 4 respectively). The process involved the collection and evaluation of available data, development of an initial data analysis (see Section 5), and detailed discussions on mapping needs.

The information gained through the coordination and collaboration with the LLPT and through the initial data analysis performed is summarized in this levee plan. Based on this information, the Hoosic River Left Bank Levee System was identified as a floodwall with high ground elevated above the 1-percent-annual-chance flood of the Hoosic River; therefore, the seclusion boundary will be removed and no flood risk depicted for the 1-percent-annual-chance flood. With the concurrence of the Village of Hoosick Falls, the Natural Valley Procedure was identified to analyze the Hoosic River Right Bank Levee System. As a result of the Natural Valley Procedure, the levee impacted area was estimated to be subject to flooding from the 1-percent-annual-chance flood with average depths of less than one foot. Therefore, these areas will be depicted the FIRM as a low-risk shaded Zone X.

1 Introduction

Under FEMA's prior levee approach, a levee system that did not meet the National Flood Insurance Program (NFIP) requirements outlined in 44CFR 65.10 was analyzed and mapped as if the levee system did not exist and, therefore, provided no flood hazard reduction during a base (1-percent-annual-chance) flood. This was known as the "without levee" approach.

Stakeholders expressed concern about the "without levee" approach. Members of both the U.S. House of Representatives and the U.S. Senate echoed this concern and asked FEMA to consider discontinuing the "without levee" approach. Accordingly, FEMA drew on current modeling techniques to redefine the identification of flood hazard reduction that non-accredited levee systems provide. This process recognizes the uncertainty associated with hazard identification of levee-impacted areas by providing additional options to better depict the flood hazard. Known as the Levee Analysis and Mapping Procedures for non-accredited levees, this process offers a more refined approach to mapping flood hazards in leveed areas.

The FEMA Region II levee team (FEMA levee team), its Production and Technical Services provider Strategic Alliance for Risk Reduction II (STARR II), and Community Engagement and Risk Communication provider (CERC), the U.S. Army Corps of Engineers (USACE), and the New York State Department of Environmental Conservation (NYSDEC) initiated the Levee Analysis and Mapping Procedures process for non-accredited levees in the Village of Hoosick Falls. Recent technological advances in data collection methods and hydrologic and hydraulic modeling were leveraged as part of this process, which also:

- Leverages local knowledge and data, with proactive stakeholder engagement in LLPTs;
- Aligns available resources for engineering analyses and mapping commensurate with the level of risk in levee-impacted areas; and
- Considers the unique characteristics of each levee system from an engineering perspective.

The Hoosic River Right Bank Levee System in the Village of Hoosick Falls is non-accredited. FEMA is using the Levee Analysis and Mapping Procedures for non-accredited levees process to develop refined flood hazard mapping in levee-impacted areas.

This levee plan is the result of the collaboration between FEMA, the Village of Hoosick Falls community, Rensselaer County, New York State Department of Environmental Conservation (NYSDEC), U.S. Army Corps of Engineers (USACE), and other stakeholders and summarizes the stakeholder coordination, initial data analysis, and options to remove the temporary seclusion boundary and depict the levee flood hazard on a future FIRM.

2 Levee System Description

2.1 Flood Damage Reduction Project in the Village of Hoosick Falls

The Hoosic River Left and Right Bank Levee Systems were designed and constructed by USACE as part of the Hoosick Falls Flood Damaged Reduction Project within the Village of Hoosick Falls. Upon completion in 1952, the project was turned over to the local sponsor, New York State Department of Environmental Conservation (NYSDEC).

The concrete wall structure identified as the Hoosic Left Bank Levee System was categorized as a retaining wall by NYSDEC Officials at the LLPT 1 Meeting (see Section 4) as the landside area is elevated above the 1-percent-annual-chance flood and the structure was not intended to reduce flood risk. The retaining wall, located west of and adjacent to the Church Street crossing of the Hoosic River, was not further evaluated as part of this analysis. While the retaining wall is no longer in the USACE National Levee Database, legacy NLD survey points were located and are shown in Figure 1 to help show the alignment of the retaining wall.

The Hoosic River Right Bank Levee System consists of a single segment levee system along the right bank. This levee system is comprised of 2,400 feet (0.47 miles) of levee embankment and approximately 1,100 feet (approximately 0.2 miles) of floodwall (see Figure 1). The purpose of the levee system is to reduce flood risk for mixed use properties located near the river. As discussed in LLPT1 meeting, the levee system would be considered non-accredited in a future remapping effort because FEMA does not have certified engineering data to show that the levee system meets the minimum requirements of Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44 CFR 65.10) to be recognized on the FIRM as reducing the flood hazards posed by a 1-percent-annual-chanceflood.

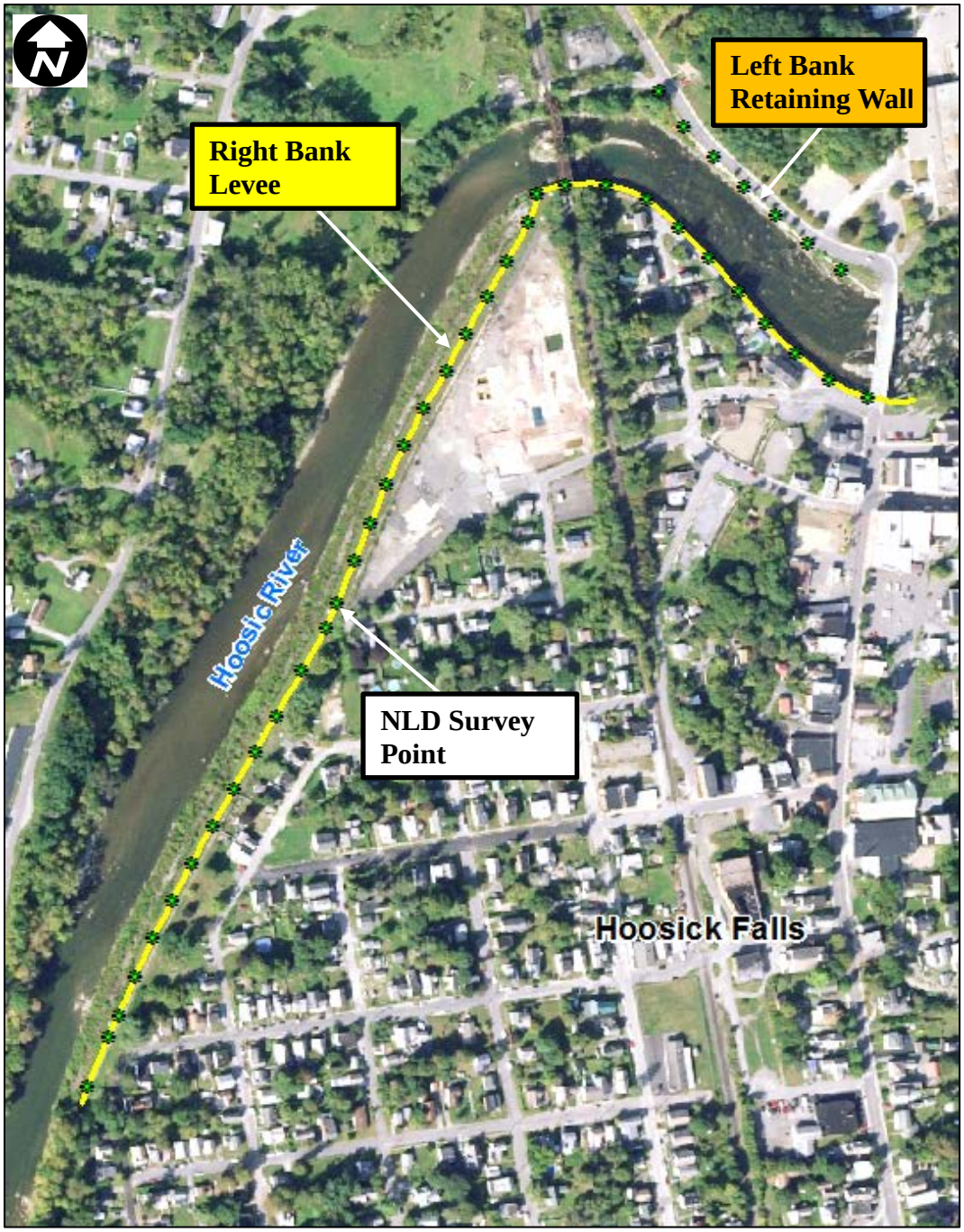

Figure 1: Location of Hoosic Falls Right Bank Levee System and Left Bank Retaining Wall

2.2 Community NFIP and FIRM History

Table 1 and Table 2 summarize the communities' NFIP and FIRM history.

Table 1. Summary of Project Area

County	Community	Participating in the NFIP?	Estimated Number of Potentially Impacted Structures in Levee Impacted Area
Rensselaer County	Village of Hoosick Falls	Yes	0

Table 2. Community Map History

Community Name	Initial Identification	Flood Hazard Boundary Map Revision Date(s)	FIRM Effective Date	FIRM Revision Date(s)
Village of Hoosick Falls	May 10, 1974	May 16, 1980	January 06, 2016	August 1, 1987 February 4, 2005

The Hoosic River Right Bank levee is shown within a temporary seclusion boundary as reducing flood hazard of the 1-percent-annual-chance flood on the effective FIRM for the Village of Hoosick Falls.

3 Local Levee Partnership Team

The LLPT was formed to provide FEMA with data and input, in addition to feedback on the procedures to be used for analyzing and mapping the levee reach based on local levee conditions. The stakeholders who participated in the LLPT for this project are listed in Table 3.

Table 3. LLPT Participants

LLPT Member	Contact Information
Robert Allen	Mayor, Village of Hoosick Falls 518.686.7072; mayor@hfvillage.org
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Niel Stowell	Highway Superintendent, Village of Hoosick Falls 518.686.7072; nielstowellhighway@gmail.com
Kate Better	Director of Intergovernmental Affairs, Rensselaer County 518.270.2900; kbetter@rensco.com
Jay Wilson	Director, Bureau of Public Safety, Rensselaer County 518.266.7676; jwilson@rensco.com
Eric Gaunay	Bureau of Public Safety, Rensselaer County 518.266.7671; egaunay@rensco.com
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Tom Blanchard	NYS Department of Environmental Conservation 518.357.2379; tom.blanchard@dec.ny.gov

LLPT Member	Contact Information
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Alan Springett	FEMA Region II, Regional Engineer 212.680.8557; alan.springett@fema.dhs.gov
Stephanie Nurre	STARR II, FEMA Technical Support Provider, Project Manager 312.262.2284; stephanie.nurre@stantec.com
Melissa Herlitz	CERC - Outreach Provider 646.682.5558; melissa.herlitz@mbakerintl.com
Matt Kroneberger	CERC - Outreach Provider 212.237.6373; matt.kroneberger@ogilvy.com

4 Stakeholder Engagement

4.1 LLPT Meeting 1

A FEMA-led project team engaged the Hoosic River Levee Systems stakeholders including Village of Hoosick Falls and Town of Hoosick officials at the first LLPT Meeting on November 28, 2018, held at Hoosick Falls Village Hall.

The intent of this meeting was to gain local insight on the status and data available for the levee systems, introduce the Levee Analysis and Mapping Procedures concepts for non-accredited levees, and identify stakeholders who would contribute to the LLPT. Additional details regarding the LLPT Meeting 1 is provided in Appendix A.

4.2 LLPT Meeting 2

The next LLPT Meeting was held on March 26, 2019 to review the initial data analysis and discuss outcomes from the data collection process. During the meeting, the FEMA project team discussed the results of the initial data analysis for the Natural Valley and Structural-Based Inundation Procedures. Additional details regarding the LLPT Meeting 2 are provided in Appendix B and information from the data collection are provided in Appendix D.

4.3 LLPT Meeting 3

The LLPT Meeting 3 was held on June 25, 2019 to review the draft levee analysis and mapping plan with the LLPT prior to it being finalized.

4.4 Data Collection

Through the Stakeholder Coordination and Data Collection process, FEMA requested all available data, information, and documentation associated with the levee system from the LLPT.

Table 4 provides a summary of the data, information, and documentation collected during the Stakeholder Coordination and Data Collection process. The data has been included in Appendix D.

Table 4. Data Collection Summary

Data Type	Data Description	Source	Date Obtained
Levee Crest	Levee crest survey (2010)	National Levee Database	2018
Effective Flood Insurance Study	Rensselaer County, New York (All Jurisdictions), FEMA, January 6, 2016	FEMA Map Service Center	2018
Effective Flood Insurance Rate Map	Rensselaer County, New York (All Jurisdictions), FEMA, January 6, 2016	FEMA Map Service Center	2018
Hydraulic Model	Effective HEC-RAS hydraulic model for Hoosic River, FEMA, 2011	FEMA Mapping Information Platform	2018
Topography	2017 LiDAR data, 2-Meter Digital Elevation Model, 2017	New York State GIS Clearinghouse,	2018
Documentation	Hoosic River Basin, Flood Wall and Levee, Hoosick Falls, New York, Analysis of Design, USACE, March 1945	NYSDEC	March 2019
Documentation	Hoosic River Watershed, Hoosick Falls, New York, Local Flood Protection Works, Hoosick River, Operation and Maintenance Manual, USACE, August 1958	NYSDEC	March 2019
As-built Plans	Hoosick Falls Flood Control Project, 1952	NYSDEC	Jan 2019

5 Initial Data Analysis

STARR II developed an initial data analysis to approximate the inundation area of the 1-percent-annual-chance flood for relevant Levee Analysis and Mapping Procedures approaches. This informed the discussions in LLPT Meeting 2. Details of the initial data analysis and application of reach analysis procedures are provided below. Supporting data is provided in Appendix E.

5.1 Reach Analysis

Topographic data (FEMA 2-meter Digital Elevation Model, 2017, available through NYS GIS Clearinghouse) and levee crest survey data from the USACE NLD along with as-built plans and design documents were reviewed to define the levee system and establish reach boundaries for the initial data analysis. A levee reach is any continuous section of a levee system to which a single reach analysis procedure (Section 5.2 through 5.3) may be applied.

Based on the review of the available levee crest data, the Hoosic River Right Bank Levee System appears to meet minimum freeboard requirements of 44CFR§65.10 as shown in levee profile exhibit in Appendix C. For this reason, the Hoosic River Right Bank Levee System was considered a single reach for the initial data analysis. Since the Right Bank Levee System meets minimum freeboard requirement (based on USACE levee crest survey data), the reach analysis procedures that apply are the Natural Valley and Structural-Based Inundation Procedures. FEMA can evaluate and map the flood risk without additional data from the levee stakeholders. A profile exhibit showing the estimated levee crest elevations from the USACE NLD compared to the 1-percent-annual-chance flood elevation is provided in Appendix B.

5.2 Natural Valley Procedure

The Natural Valley Procedure was modeled by keeping the topographic features of the Hoosic River Right Bank Levee system in the terrain data but allowing the stream to flow on both sides of the levee structure. Using a steady-state model (HEC-RAS 5.0.6) with the effective FIS flowrates, the Natural Valley Procedure was simulated to identify the levee impacted area inundated by the 1-percent-annual-chance flood.

5.3 Structural-Based Inundation Procedure

Hypothetical breach analyses were simulated at multiple independent locations along the levee reach to estimate the resulting flood inundation area which would be mapped as Zone AE SFHA. Each breach was analyzed individually using HEC-RAS 5.0.6 (2-Dimensional, unsteady flow). The breach locations were developed for analysis purposes only and are not intended to indicate historic or future breach developments at these locations. All 1-percent-annual-chance inundation breach areas were composited to develop the final visual depiction of the Structural-Based Inundation procedure results.

5.4 Review of Initial Data Analyses[1]

Figure 2 illustrates the approximate inundation area for the 1-percent-annual-chance flood for the Natural Valley Procedure. Figure 3 shows the approximate depth grid for the Natural Valley Procedure. As depicted in Figure 2 and Figure 3, the 1-percent-annual-chance inundation boundary in the levee impacted area includes the channel alongside the levee and few residential parcels. However, since the average depth of flooding was calculated to be less than 1 foot, the flood zone can be designated as Shaded Zone X. Shaded Zone X areas are considered to be at moderate risk of flooding, are not considered Special Flood Hazard Areas, and do not have mandatory flood insurance requirements. Additional information regarding the methodology used in the Initial Data Analyses is provided in Appendix E.

[1] It should be noted that the findings of the Initial Data Analysis are non-regulatory and are intended to inform the path forward for identification of flood risk associated with the levee system for the 1-percent-annual-chance flood. The findings may be used for emergency planning purposes; however, they are subject to change and due process, and should not be used outside of this levee stakeholder group for any regulatory activities. The flood risk due to interior drainage in the levee impacted area is also not depicted and may need to be evaluated in the future prior to updating the FIRM.

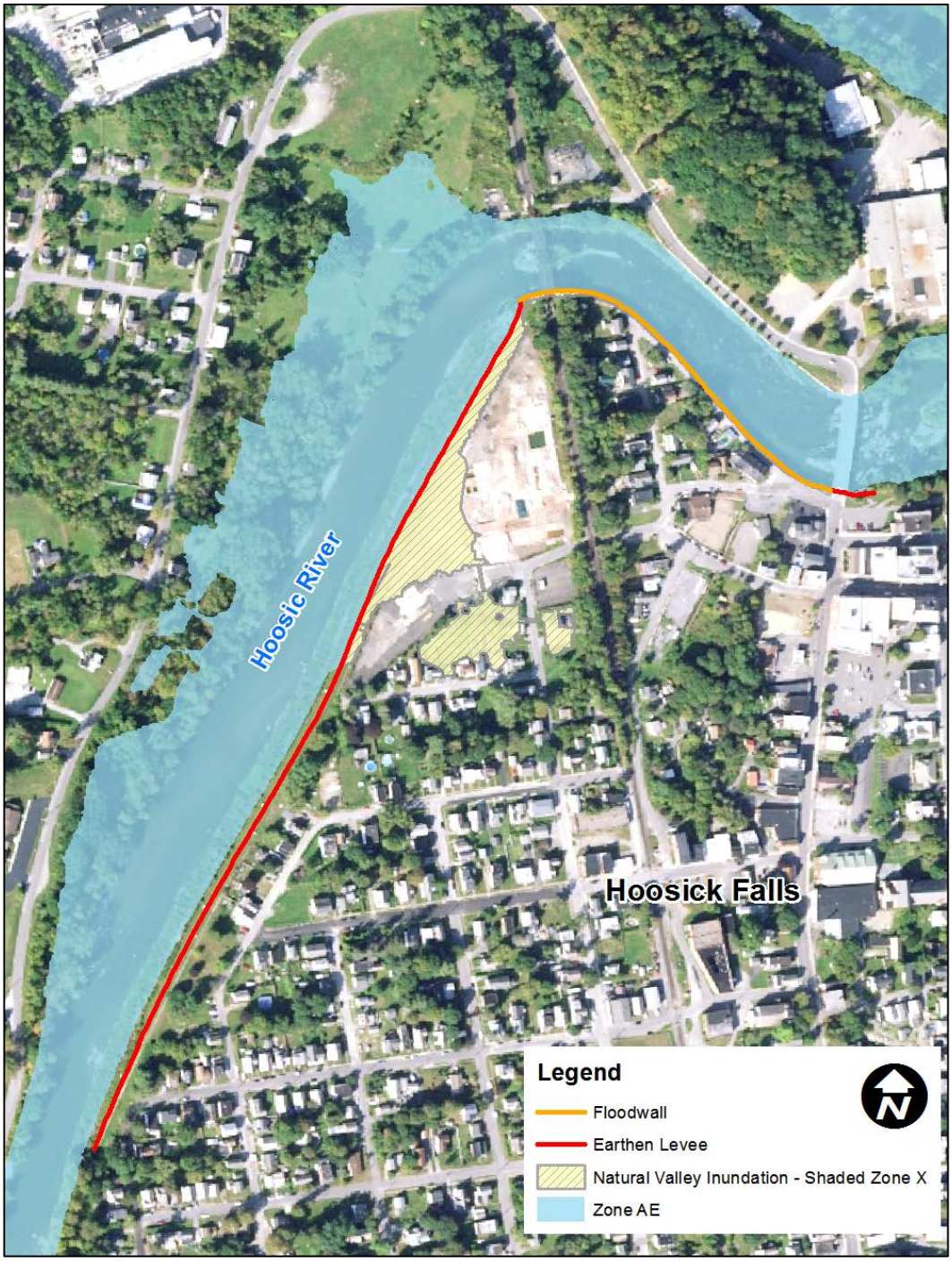

Figure 2: Natural Valley Procedure

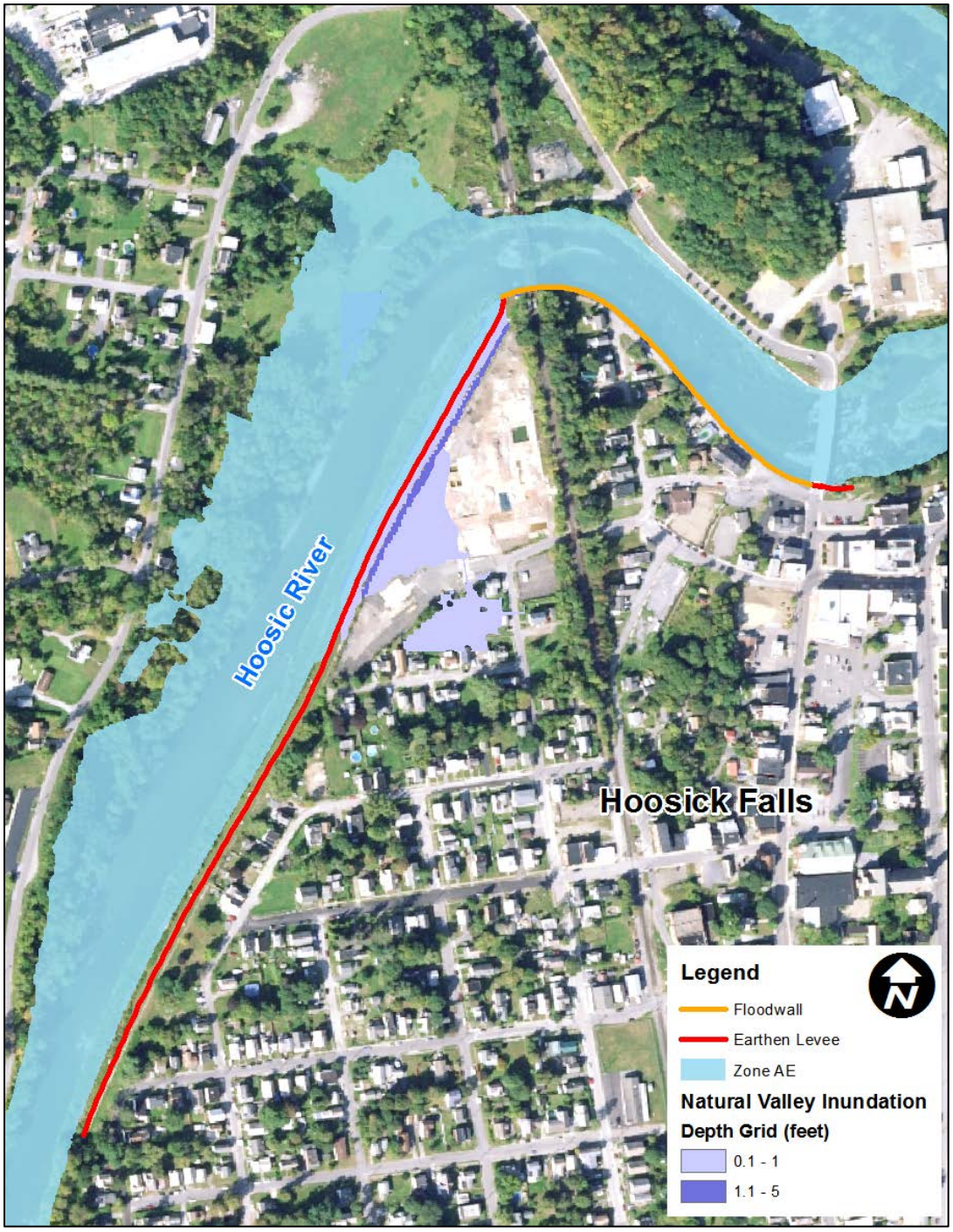

Figure 3: Natural Valley Procedure Flood Depth Grid

The result of the Structural-Based Inundation Procedure, shown in Figure 4, shows a small inundation area including the landside channel alongside the levee embankment. The result of the Structural-Based Inundation Procedure is for information purposes only, as the results of the Natural Valley Procedure depict an average depth of less than 1-foot of flooding in the levee impacted area.

It should be reiterated that the results of this analysis are based on peak flowrate and hydraulic analysis for the 1-percent-annual-chance flood from the effective FIS. Flood risk for storms greater than the 1-percent-annual-chance flood still exists.

Figure 4: Structural-Based Inundation Procedure

6 Path Forward

6.1 Levee Analysis and Mapping Procedures

The Hoosick Falls Flood Damage Reduction Project is depicted within a temporary seclusion boundary as reducing flood hazard on the effective FIRMs. No data in support of the 44 CFR 65.10 requirements has been received by FEMA regarding the levee system; therefore, it is considered non-accredited.

FEMA engaged the Village of Hoosick Falls through the Levee Analysis and Mapping Procedures for non-accredited levees process to help identify potential options to map the flood hazard for the levee impacted area and address the seclusion boundary currently shown on the effective FIRM.

Based on the results of the Natural Valley Procedure and subsequent discussions during the LLPT 2 Meeting between levee stakeholders and FEMA, it was concluded that future map updates would be informed by the results of the Natural Valley Procedure for the Hoosic River Right Bank Levee System, which estimated the average depth of flooding in the levee impacted area as less than 1 foot. The Hoosic River Left Bank Levee System was confirmed by the LLPT as not being designed or necessary to reduce flood risk along the left bank of the Hoosick River as the landside ground is elevated above the 1-percent-annual-chance flood. The temporary seclusion boundaries depicted on the left and right banks of the Hoosic River on the effective FIRM will be removed during the future map update.

The timeline of future map updates to address the seclusion boundary and map the flood hazard is yet to be determined, but standard due process will apply to inform the community of future map updates within the community.

7 References

FEMA, *Analysis and Mapping Procedures for Non-Accredited Levee Systems*, July 2013.

FEMA, F*lood Insurance Study, Rensselaer County, New York, (All Jurisdictions)*, January 16, 2016.

FEMA, *Guidance for Flood Risk Analysis and Mapping, Levees,* February 2019.

New York State GIS Clearinghouse, *FEMA 2-Meter Digital Elevation Model (DEM)*, Available at: https://gis.ny.gov/elevation/.

New York State GIS Clearinghouse, *New York Orthoimagery* (https://orthos.dhses.ny.gov/),2016.

USACE, *National Levee Database* (https://levees.sec.usace.army.mil/#/), 2019.

Appendix A
Stakeholder Engagement - LLPT Meeting 1 Information

Hoosick Falls, NY LLPT 1 Meeting Notes

ATTENDEES

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VILLAGE OF HOOSICK FALLS, NEW YORK

DATE: Wednesday, November 28, 2018 **TIME:** 4:00 PM – 5:30 PM
LOCATION:
Hoosick Falls Office Boardroom – 24 Main St Hoosick Falls, NY

Action Item	Owner
1. Meeting attendees to begin uploading data and relevant information to the project file transfer (FTP) site and email stephanie.nurre@stantec.com upon completion. **Project FTP Site - Login Information** **Browser link:** https://projsftp.stantec.com **Login name:** LAMP1336 **Password:** 4976880	Community Leaders
2. Community leaders to e-mail Matt Kroneberger at matt.kroneberger@ogilvy.com to indicate if they are NOT interested in becoming a member of the Montour Falls Local Levee Patnership Team (LLPT)	Community Leaders
3. All: Work to identify individual owners / easements of levee system	Community Leaders, NYSDEC

AGENDA

- Provide an overview of levee systems
- Discuss levee flood hazard identification
- Identify the LLPT members

Hoosick Falls, NY
LLPT 1 Meeting Notes

ATTENDEES *Continued*

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OVERVIEW

The Federal Emergency Management Agency (FEMA) Region II levee team (FEMA levee team) and the New York State Department of Environmental Conservation (NYSDEC) worked with the Village of Hoosick Falls and Town of Hoosick officials to identify flood hazards for non-accredited levees as they relate to the Hoosic River Levee system.

Detailed discussions covered potential analysis scenarios and the required technical data for each analysis option. Also discussed was the participation of interested community, state, and Federal officials and stakeholders in the Local Levee Partnership Team (LLPT). This group will share data and participate in discussions on the potential analysis and mapping options throughout the duration of the levee project. The LLPT will also be able to review the plan document summarizing the activities and outputs from the project. They will also weigh in on the path forward for identifying and mapping the flood risk associated with the levee.

FEMA reiterated that the levee analysis and mapping approach will give the community a better understanding of how much the levee reduces the flood risk under current conditions.

Hoosick Falls, NY LLPT 1 Meeting Notes

ATTENDEES *Continued*

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NOTES

Matt Kroneberger, FEMA Outreach Support, opened the meeting and facilitated introductions of speakers, Shudipto (Shu) Rahman, FEMA Project Monitor, and Stephanie Nurre, Senior Mitigation Planner, and the attendees presented at the meeting and joined over the phone. Shu then provided an overview of the FEMA focus on levee hazard identification and risk communication. Shudipto shared a quote from the American Society of Civil Engineers, which emphasized that levees never eliminate all flood risk.

Stephanie provided an overview of the Hoosic River levee system comprised of the Right Bank levee system as well as the Left Bank levee system retaining wall. The Right Bank levee system was constructed by United States Army Corps of Engineers (USACE) in 1952. Shu noted that the effective Flood Insurance Rate Map (FIRM) reflects a 2016 flood hazard mapping update that depicts the levee impacted area using seclusion. Seclusion is a temporary designation that shows previously effective hazard information within the seclusion boundary that will be updated in the future to reflect the levee flood hazard.

Officials from the New York State Department of Environmental Protection (NYSDEC) confirmed that the purpose of the Left Bank levee system retaining wall was to protect a building that was behind it. That building no longer exists. The retaining wall does not necessarily reduce flood risk as high-ground exists behind it. It was also verified that the Right Bank levee system has not experienced a recorded breach.

Stephanie then discussed the levee system's current non-accredited status. The levee system is considered non-accredited because FEMA does not have certified engineering data to show that the levee system meets the minimum requirements of Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44 CFR 65.10) to be recognized on the FIRM as reducing the flood hazards posed by a 1-percent-annual-chance or greater flood.

Shu noted that the Village of Nichols was able to have their levee system certified using New York Rising grant funding and submitted to FEMA for accreditation. The levee system is now accredited. FEMA Region II can provide an introduction to the Mayor of the Village of Nichols, and share a recorded webinar on this process, should this be of interest.

Hoosick Falls, NY LLPT 1 Meeting Notes

Stephanie elaborated on FEMA's identification of levees as accredited or non-accredited, and also clarified the meaning of Certified Levee System. Definitions of these terms are provided at the end of the notes.

Stephanie then introduced the Analysis and Mapping Procedures for Non-Accredited Levee Systems, which involves interactive stakeholder engagement and provides a suite of analysis and mapping procedures to review the flood hazard associated with levee systems.

A levee system can also be evaluated as separate reaches, each analyzed based on its unique characteristics, to develop a composite risk for the levee system. Stephanie reviewed each levee reach analysis procedure listed below:

- Natural Valley
- Structural-Based Inundation
- Freeboard Deficient
- Overtopping
- Sound Reach

Stephanie also reviewed the data requirements associated with each reach analysis procedure to map the levee flood risk on a future FIRM. Because the Right Bank levee system meets minimum freeboard requirements (based on USACE levee crest survey data), the reach analysis procedures that could apply are the Natural Valley or Structural-Based Inundation Procedures.

For the Natural Valley and Structural-Based Inundation procedures, FEMA can evaluate and map the flood risk with no additional data from the levee stakeholders; however, to map the other reach analysis procedures, certified 44 CFR 65.10 data would be required. Stephanie then made a request for relevant technical data regarding the levee system, hydrology or hydraulic analyses of impacted or nearby streams, and project data that may be available from the levee stakeholders. This data can be shared on the file transfer site.

Hoosick Falls, NY LLPT 1 Meeting Notes

Stephanie and Shudipto reviewed the main components of this Levee Discovery Project, which include:

- Formation of an LLPT comprised of levee stakeholders and subject matter experts who will work collaboratively to collect data and determine a path forward;
- An initial technical analysis involving review of the Natural Valley and Structural-Based Inundation reach analysis procedures;
- A Levee Analysis and Mapping Plan that will summarize the data collection, characteristics of the levee system and potential reaches, determination of a path forward, and anticipated schedule.

Shu discussed that the results of the initial data analyses and the data collected, including GIS shape files, will be given to the community at the conclusion of the project and can be used in emergency preparedness and hazard mitigation planning. Stephanie also noted that a draft copy of the Levee Analysis and Mapping Plan will be provided to the community for review and will be discussed as a group in a future meeting, prior to being finalized.

Shu and the community discussed next steps in the Levee Discovery process, which includes collecting additional data through a file transfer site. Once the initial data analysis has been conducted, FEMA will then coordinate the LLPT 2 meeting to discuss the results of the initial data analysis with the community. The LLPT 2 meeting is envisioned to occur in winter 2019. There may also be coordination calls scheduled between the LLPT meetings, if needed.

Matt, Shudipto, and Stephanie encouraged all in the discussion to reach out to share questions or comments at any point in this process. Contact information was distributed.

Hoosick Falls, NY LLPT 1 Meeting Notes

DISCUSSION

QUESTION:
Village of Hoosick Falls:
Since both areas identified are called “secluded” how does flood insurance affect those areas?

Response:
STARR II: The levee impacted area within the seclusion boundary currently has no regulatory requirement for flood insurance because there is no Special Flood Hazard Area (SFHA) shown on the effective FIRM. If the levee impacted area is shown as SFHA in the future, property owners who choose to purchase flood insurance in those secluded areas prior to flood maps being effective could have lower flood insurance rates for a period of time.

QUESTION:
Village of Hoosick Falls:
Is the retaining wall (on the Hoosic River left bank) a levee?

Response:
FEMA: To the best of [FEMA’s] knowledge the area behind the structure rises above the top of the retaining wall, whereas a levee is defined as a manmade structure designed and constructed to contain, control, or divert the flow of water to reduce flood hazards posed by flooding. The retaining wall may presently serve the purpose of preventing the erosion of the fill behind it.

QUESTION:
Town of Hoosick:
Is the levee going from accredited to non-accredited as part of this process?
Our levee seems to meet freeboard requirements.
Why invest the time and resources given the levee is meets freeboard?

Response:
FEMA, STARR II:
No data is currently available to show that the levee system meets minimum requirements to map the levee system as accredited. The requirements being discussed at this meeting for continued accreditation of the levee system are from 44 CFR 65.10 enacted by Congress in 1986.

Hoosick Falls, NY LLPT 1 Meeting Notes

Meeting or exceeding minimum freeboard requirements is positive in the levee accreditation process and factors into the overall levee system analysis. The height of the levee system/levee crest elevation should not need to be modified, which can yield lower certification costs.

Gaining further information about the full extent of levee features will aid in assessing flood risk for mapping flood risk. Presently there is not much data available regarding the levee system to support the flood hazard mapping depicted on the effective FIRMs.
[FEMA, STARR II] will work with NYSDEC to obtain as-built plans, operations and maintenance manuals to help compile available data.

Further, a number of properties could lie in the levee impacted area. Going through the levee certification process will assess the risk more accurately, as a number of levee qualities beyond height, such as levee stability, seepage, and settlement, also important in assessing risk, would be evaluated.

QUESTION:
Rensselaer County:
If the levee certification process outlined for levees was adopted in 1986, what incentive does a community have to analyze their levee to those metrics, given that they may change again?

Response:
FEMA:
To make a change in the regulatory requirements for accreditation of levees would most likely require enacting new legislation by Congress, and that would take time to happen; so we don't see any changes in the foreseeable future. With the effective FIRM date of 2016, a restudy of the stream is not anticipated in the near future. Should the flood hazard or status of the levee system change, however, the levee flood hazard would need to be re-evaluated.

Hoosick Falls, NY LLPT 1 Meeting Notes

DEFINITIONS

(Source: *Guidance for Flood Risk Analysis and Mapping, Levees, February 2018*)

Accredited Levee System - A levee system that FEMA has shown on a FIRM that is recognized as reducing the flood hazards posed by a 1-percent-annual-chance flood. This determination is based on the submittal of data and documentation as required by 44 CFR 65.10 of the NFIP regulations. The area landward of an accredited levee system is shown as Zone X (shaded) on the FIRM except for areas of residual flooding, such as ponding areas, which are shown as Special Flood Hazard Area (SFHA).

Certification - As stated in 44 CFR 65.2(b), certification of analyses is a statement that the analyses have been performed correctly and in accordance with sound engineering practices. Certification of structural works is a statement that works are designed in accordance with sound engineering practices to provide risk reduction from the base flood. Certification of "as built" conditions is a statement that the structure(s) has been built according to the plans being certified is in place and is fully functioning. Certification documentation is the responsibility of the local project sponsor.

Non-Accredited Levee System - A levee system that does not meet the requirements in the NFIP regulations at Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44 CFR 65.10), Mapping of Areas Protected by Levee.

Village of Hoosick Falls, Rensselaer County Levee Flood Hazard Identification

Local Levee Partnership Team (LLPT) Meeting 1

November 28, 2018

FEMA

Photo credit NOAA/NASA

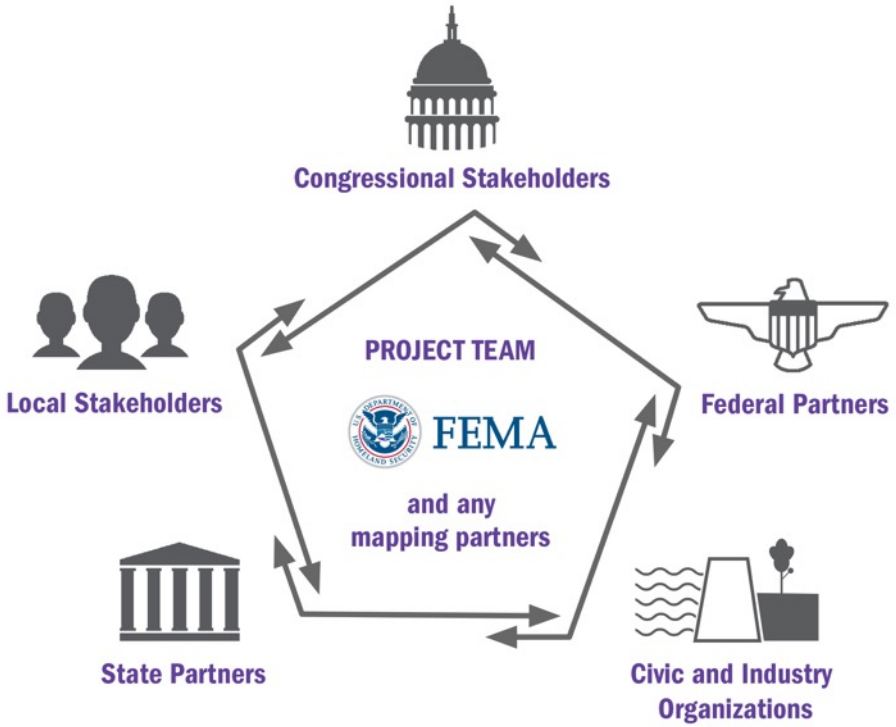
“ Levees reduce the risk of flooding. But no levee system can eliminate all flood risk. There is always the chance that a flood will exceed the capacity of a levee, no matter how well it was built. Levees do not always perform as intended. In fact, levees sometimes fail even when a flood is small.”

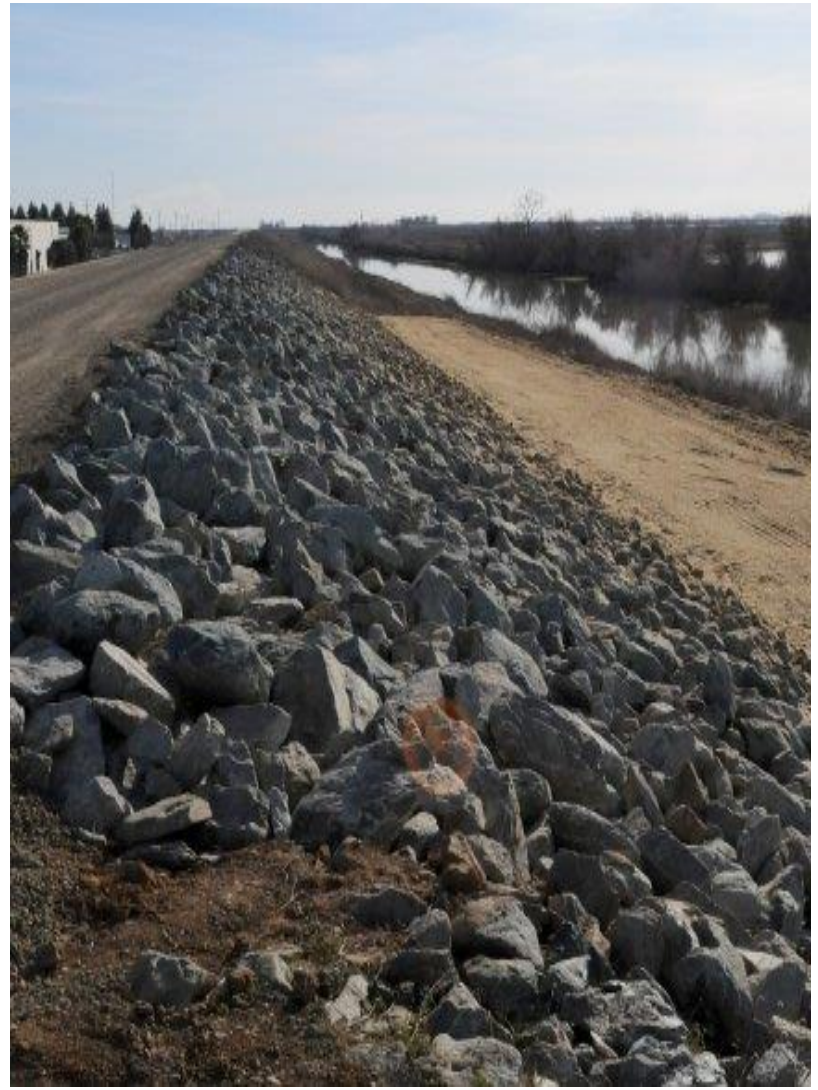
— American Society of Civil Engineers

FEMA

The Focus is on Flood Risk

The Federal Emergency Management Agency (FEMA) works with Federal and State partners, local communities and other stakeholders to assess and communicate flood risks in areas impacted by non-accredited levees.





FEMA

Today's Agenda

1

Levee System Overview

2

Levee Flood Hazard Identification

3

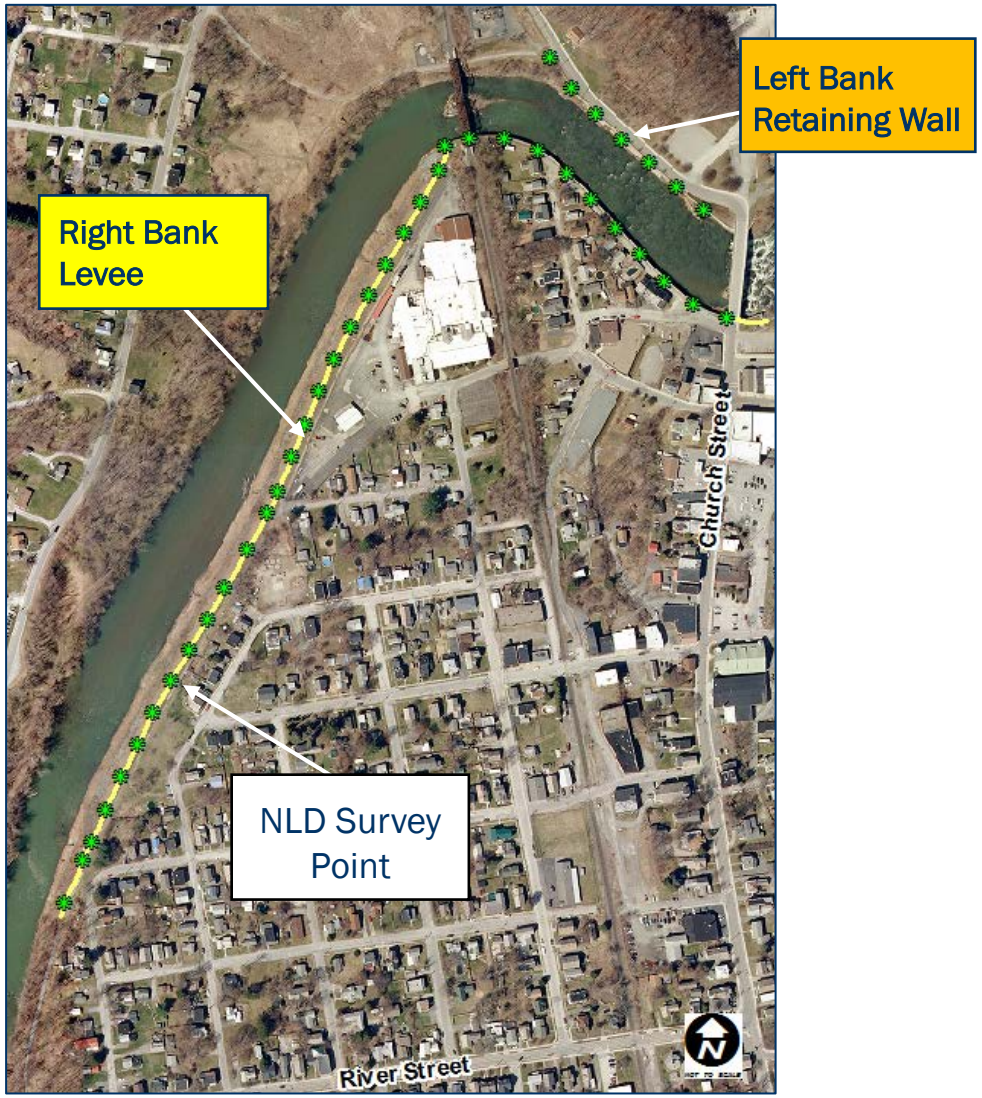
Path Forward & Next Steps

FEMA

Levee System Overview

FEMA

Hoosic River Right Bank Levee System



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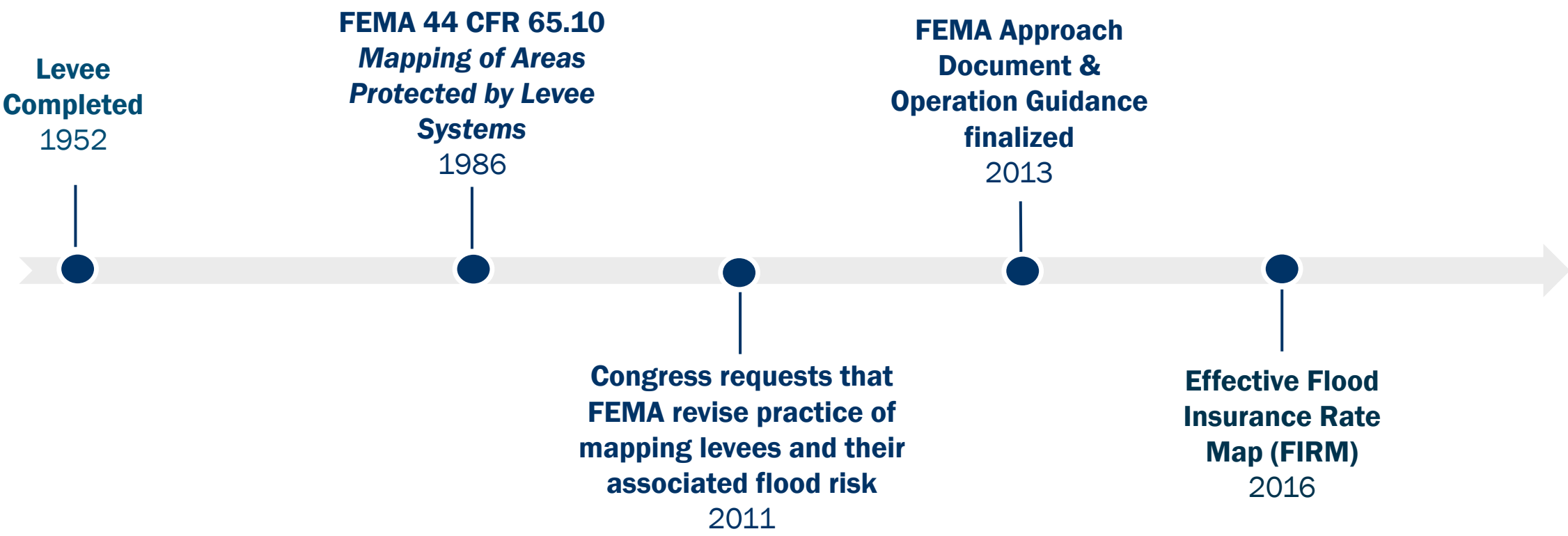
Hoosic River Right Bank Levee System

- Levee Constructed Completed by USACE: June 1952
- Affected Community: Village of Hoosick Falls
- Estimated Length based on National Levee Database alignment:
  - Right Bank - Approximately 2,400 ft embankment, 1,100 ft floodwall
- Left Bank: Approximately 700 ft retaining wall
  - → Non-levee feature
- Initial Data Collection

FEMA

Hoosic River Right Bank Levee System



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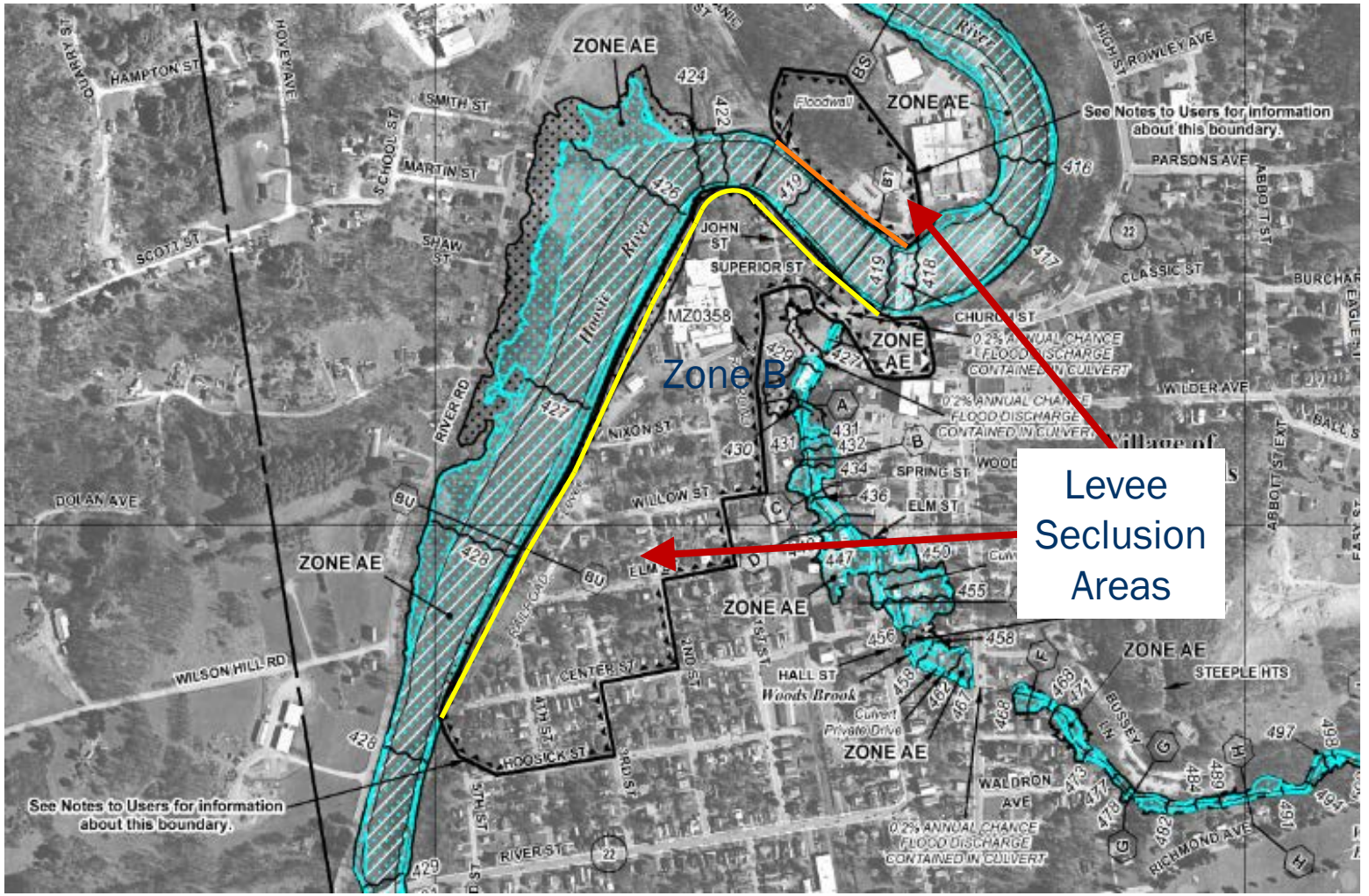
Effective Flood Insurance Rate Map



Effective FIRM: January 6, 2016

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Levee Flood Hazard Identification

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How Levee Systems Are Categorized

Accredited Levee System:

1. Certified Levee documentation* has been provided that demonstrates all requirements of 44 CFR 65.10 have been met.
2. Levee impacted area shown on FIRM(s) as reducing risk from the one-percent-annual-chance flood.

Non-Accredited Levee System:

1. Certified Levee documentation* that demonstrates all requirements of 44 CFR 65.10 have been met has not been provided.
2. Levee impacted areas shown on FIRM(s) as not reducing risk from the one-percent-annual-chance flood.

*Certified levee documentation: As-built plans and additional data must be submitted to support that a given levee system complies with the structural requirements. This data must be certified by a registered professional engineer or a Federal agency with responsibility for levee design.

44 CFR§65.10:
"Mapping of areas protected by levee systems"

- 65.10(a) – General Requirements
- 65.10(b) – Design Requirements
- 65.10(c) – Operations Plans
- 65.10(d) – Maintenance Plans
- 65.10(e) – Certification Requirements

FEMA

65.10(b) Design Requirements

- 65.10(b)(1) – Freeboard
- 65.10(b)(2) – Closures
- 65.10(b)(3) – Embankment Protection
- 65.10(b)(4) – Embankment and foundation stability
- 65.10(b)(5) – Settlement Analysis
- 65.10(b)(6) – Interior Drainage
- 65.10(b)(7) – Other Design Criteria

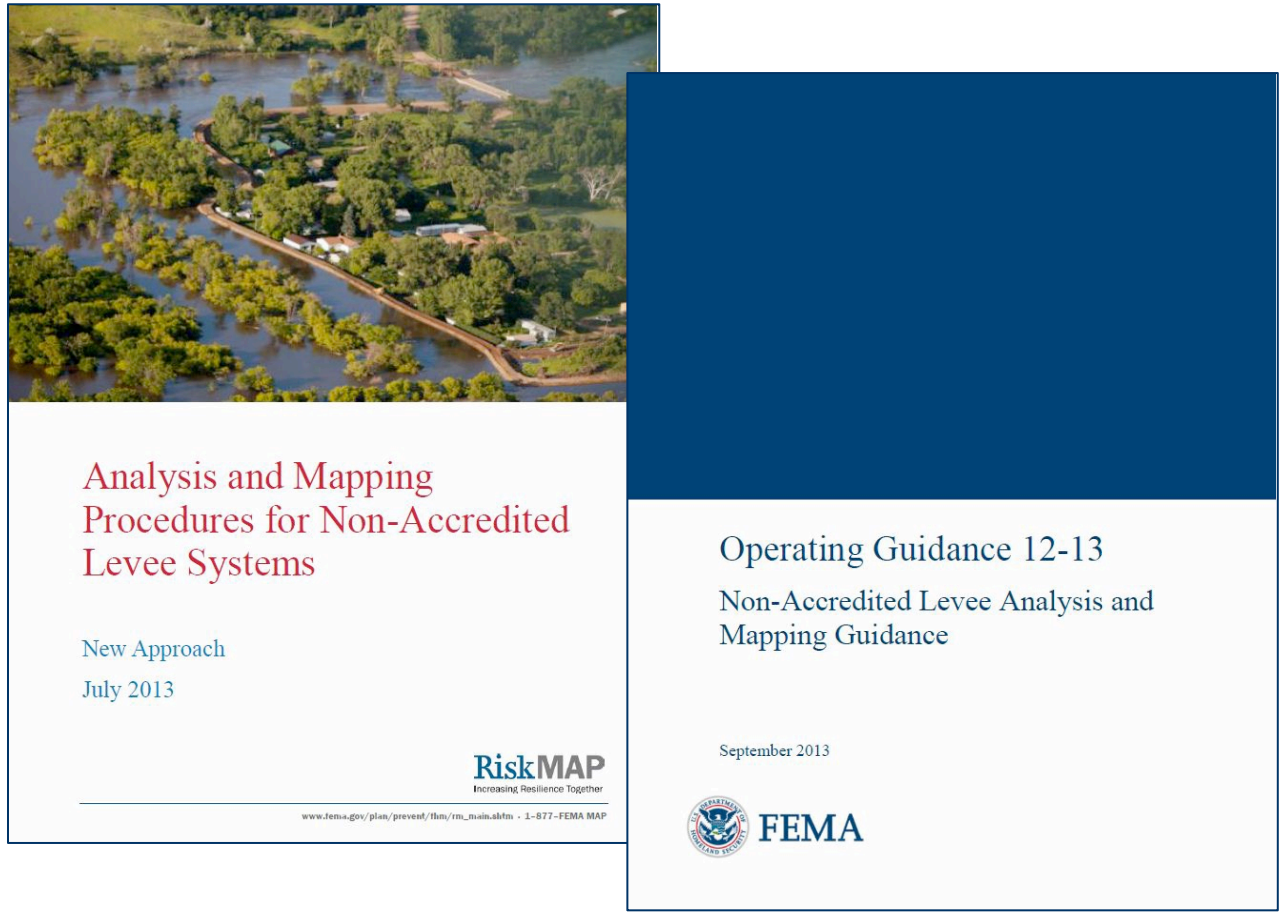
FEMA

FEMA Recognizes Non-accredited Levee Systems Do Impact Flood Risk

Developed Analysis and Mapping Procedures for Non-Accredited Levees

Approach Document
Finalized **July 2013**

Operation Guidance
Finalized **Sept. 2013**



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Analysis and Mapping Procedures for Non-Accredited Levees

Includes:

- Interactive stakeholder engagement
- A suite of analysis and mapping procedures to review the flood hazard associated with levee systems.
- Allows for levee system to be analyzed based on the attributes of specific "**Reaches**" to develop flood hazard.

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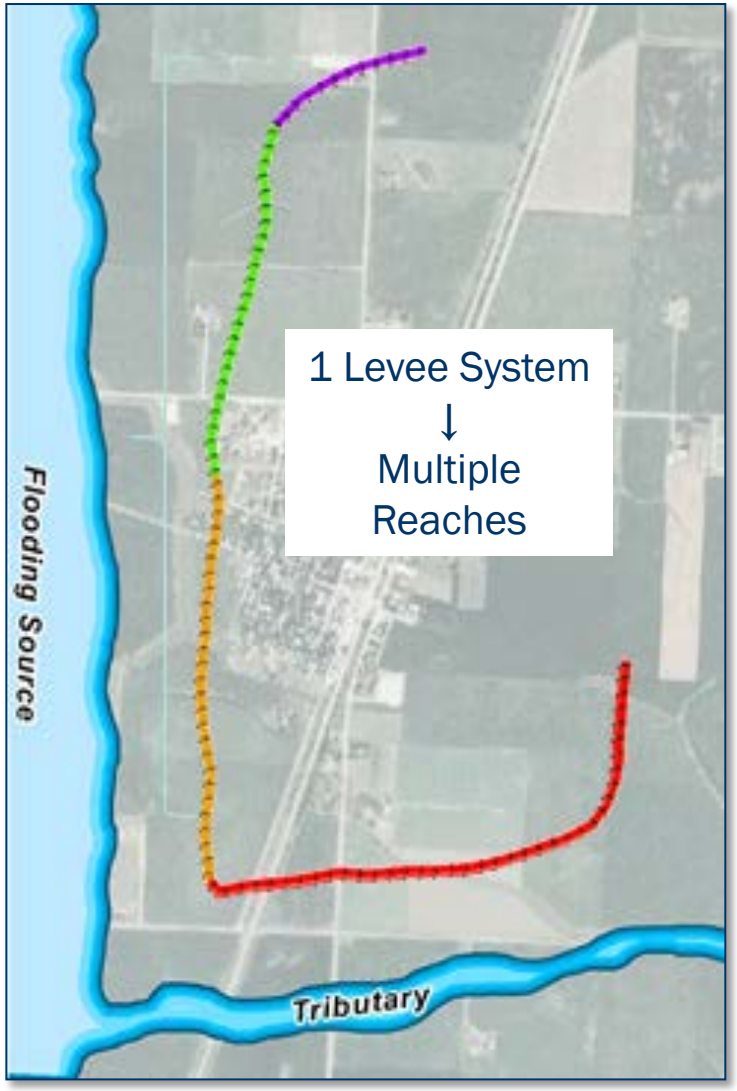
What is a Levee Reach?

- A levee reach is a segment of a levee system, generally with similar characteristics, where a single technical procedure may be applied.
- Used to identify SFHA within the levee impacted area.



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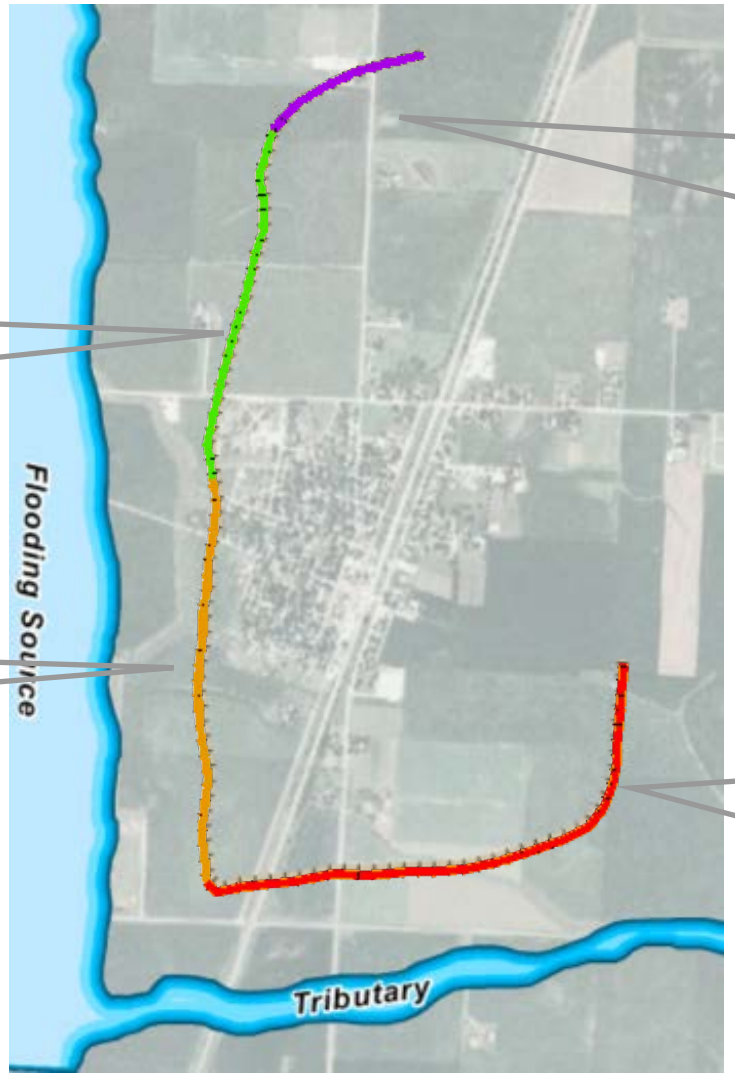
Reach Analysis Procedures

- Natural Valley Procedure
- Structural Based Inundation Procedure
- Overtopping Procedure
- Freeboard Deficient Procedure
- Sound Reach Procedure

Benefits of Applying Procedures to Individual Reaches

Structural-Based Inundation Procedure
Overtops but not armored

Sound Reach Procedure
Has required freeboard



Overtopping Procedure
Barely overtops & is armored: community chooses to do extra evaluation for overtopping

Natural Valley Procedure
Don't know anything about
Not maintained
No owner
No structural analysis

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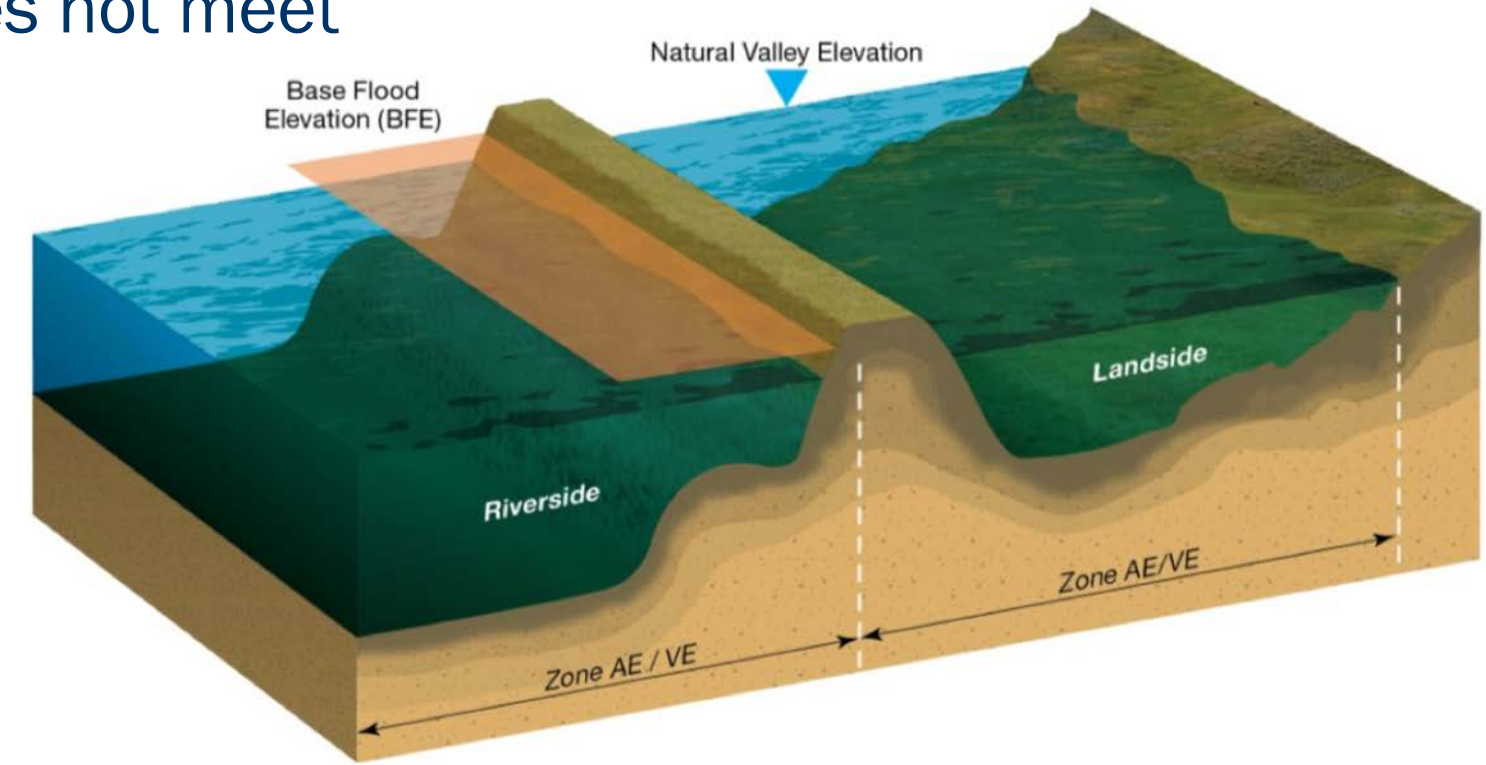
Natural Valley Procedure

This analysis identifies the landside flood risk as though the levee does not impact the flood elevation.

Application: Levee does not meet 44CFR65.10



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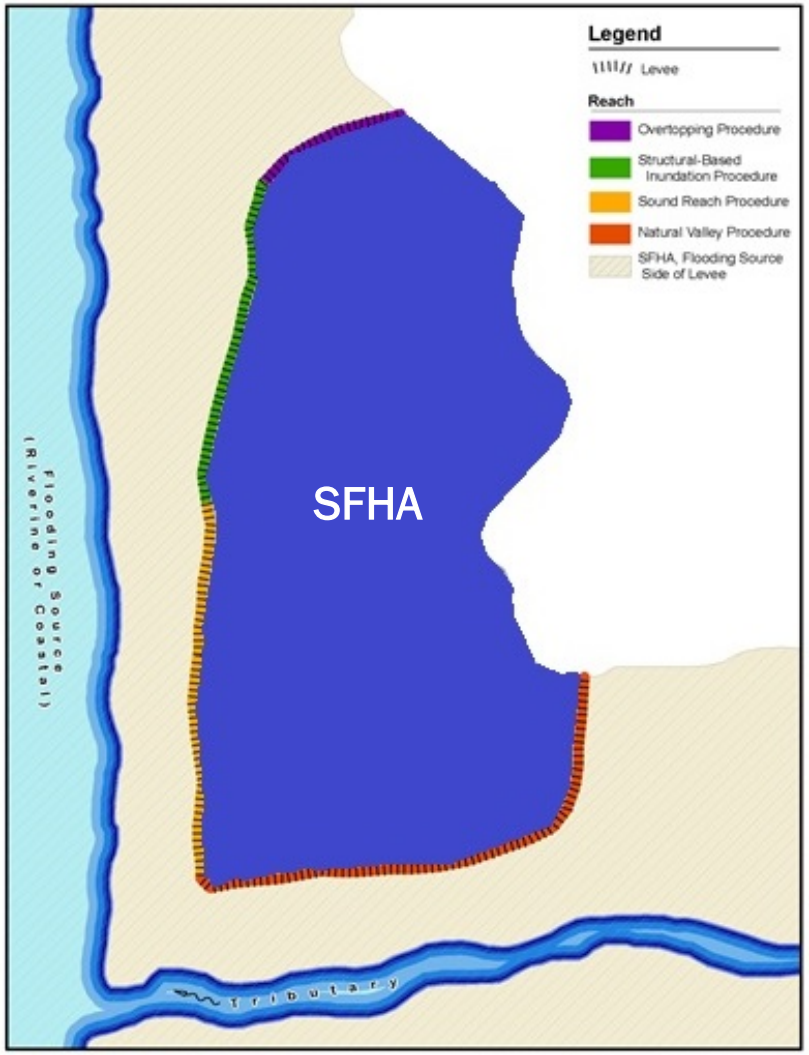
Natural Valley Procedure



This Natural Valley floodplain may be designated as Zone D if other LAMP procedures are applied.

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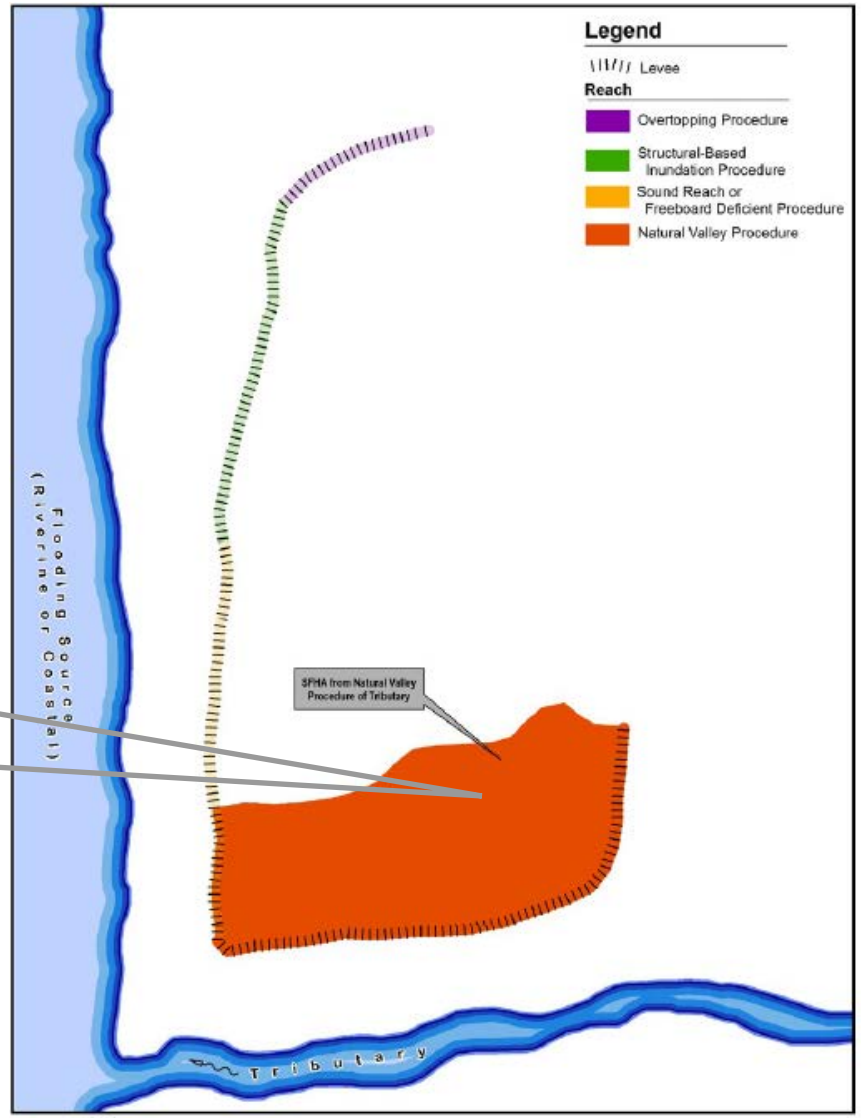
Natural Valley Procedure

SFHA from Natural Valley Procedure of Tributary



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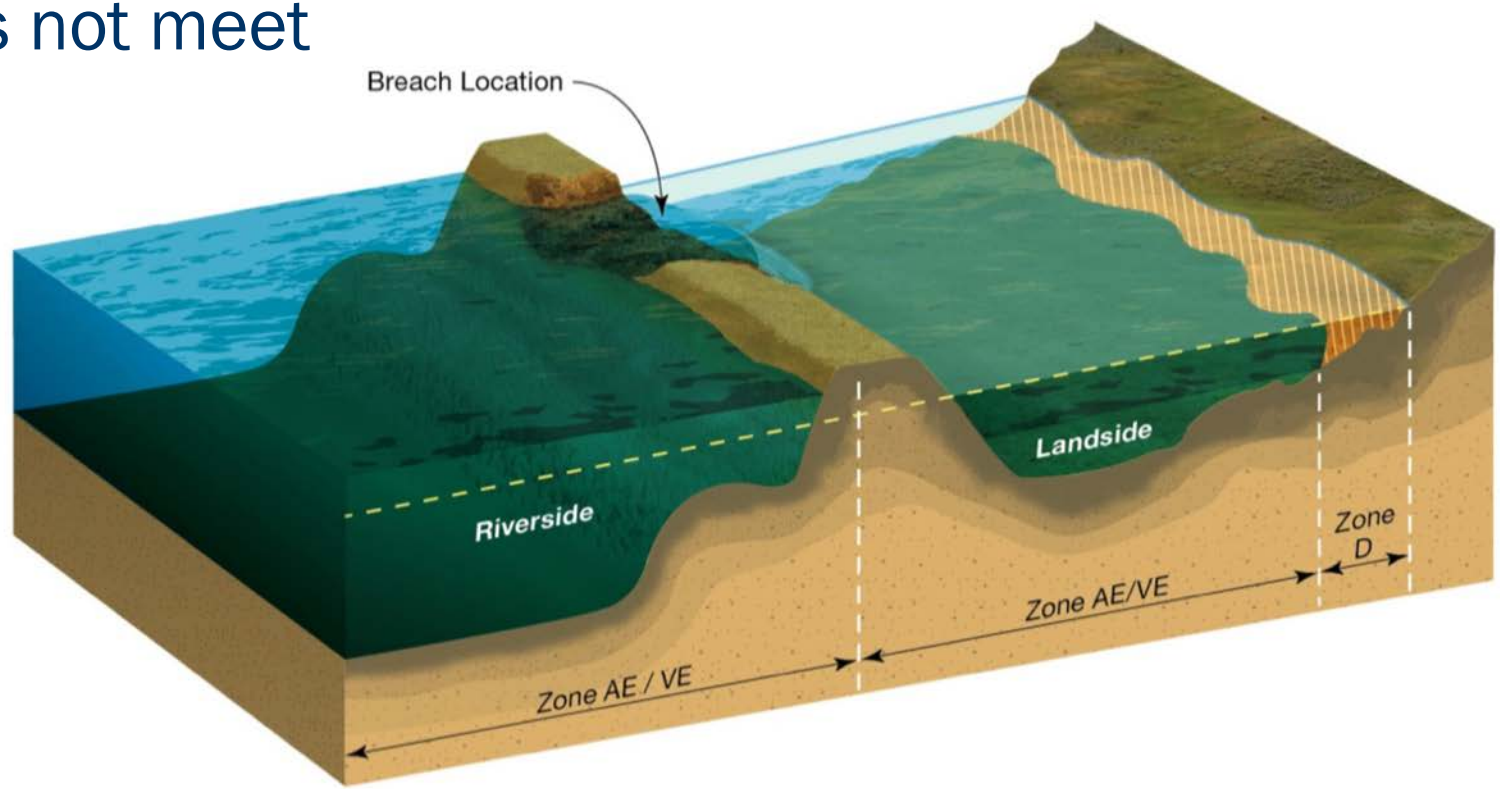
Structural-Based Inundation Procedure

This analysis identifies the landside flood risk by estimate of hypothetical breach analyses.

Application: Levee does not meet 44CFR65.10



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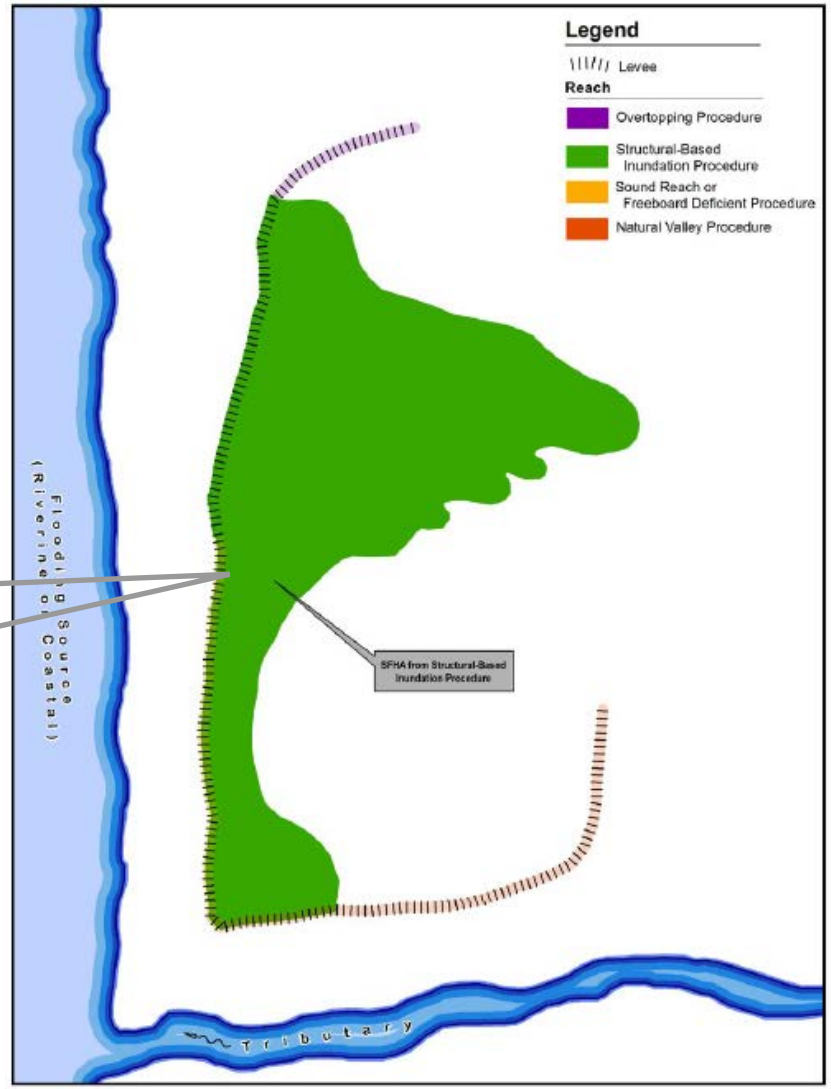
Structural-Based Inundation Procedure

SFHA from Structural-Based Inundation Procedure



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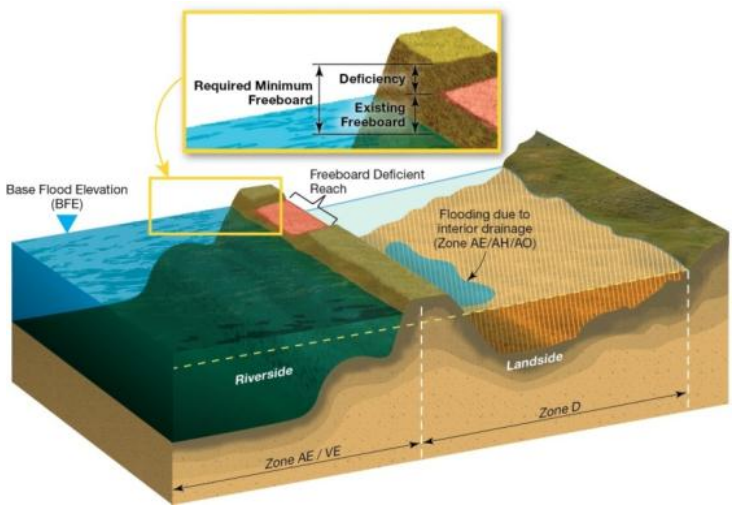
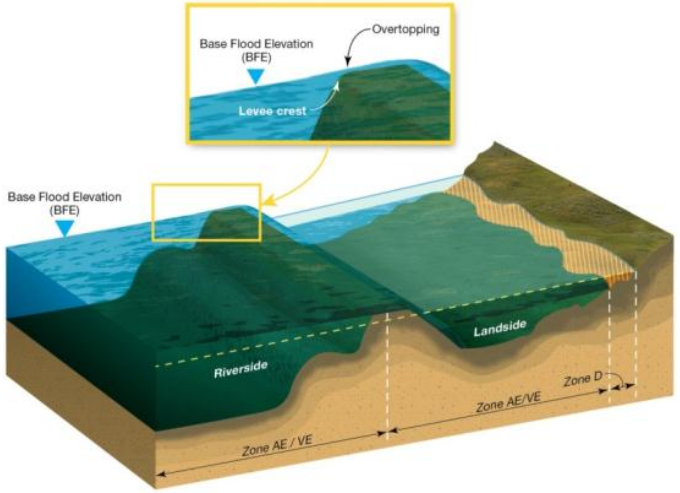
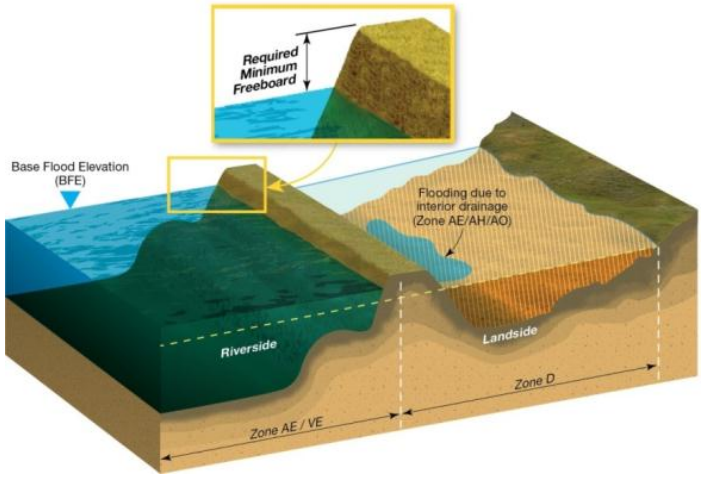
Other Potential Reach Analysis Procedures

- Freeboard Deficient Procedure
- Overtopping Procedure
- Sound Reach Procedure







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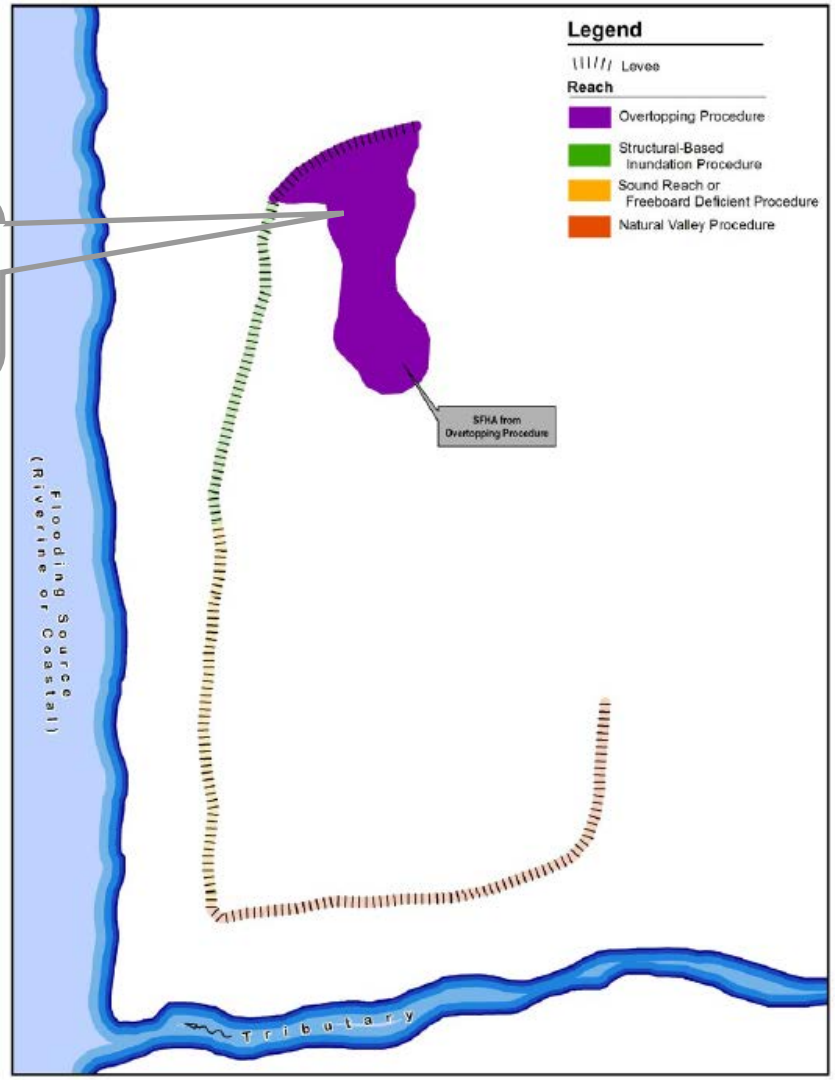
Overtopping Procedure

SFHA from Overtopping Procedure



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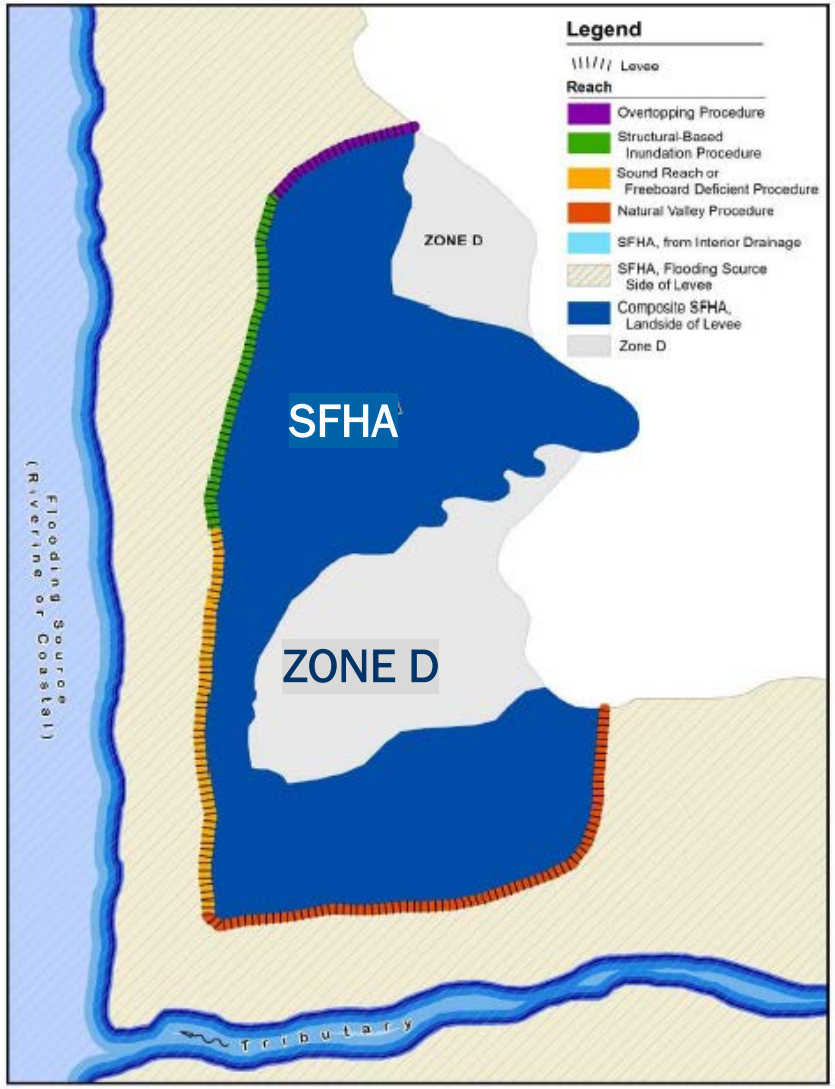
What does the Final Map Look Like?



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Zone D

- Defined as “undetermined, but possible, flood hazards”
- No federal mandatory purchase requirement
- Insurance rates are similar to approximate Zone A
- Minimal NFIP-required floodplain management, but possible to use for floodplain management purposes

Mapping Path Forward Based on Data

	Reach Procedures				
	Sound **	Freeboard Deficient **	Overtopping **	Structural-Based Inundation *	Natural Valley *
Elevation Information for the Levee Crest and Toe	✓	✓	✓	✓	
BFE + Freeboard Less than Levee Crest	✓				
BFE Less than Levee Crest	✓	✓			
Operations and Maintenance Plan	✓	✓	✓	Recommended	
Structural Design Requirements	✓	✓	✓		
Inspection Reports	✓	✓	✓	Recommended	
Evaluation of Overtopping Erosion Potential			✓		

* - No cost to community

** - Potential additional cost to community

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Path Forward & Next Steps

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Village of Hoosick Falls
Local Levee Partnership Team (LLPT)

Group of stakeholders participating in the discussion of levee flood risk and providing feedback and local levee data to FEMA relating to the levee system.

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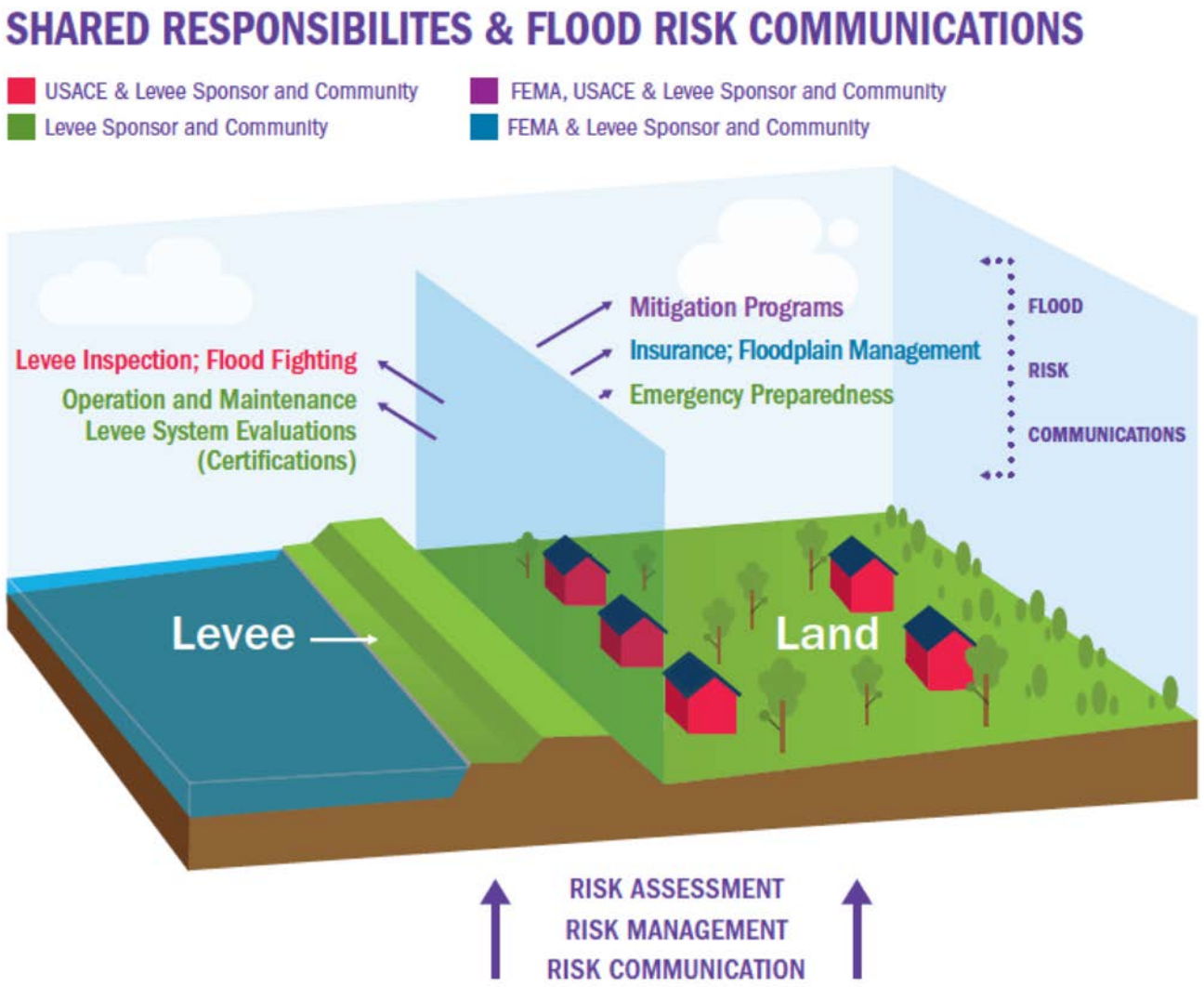
Shared Levee Responsibilities



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Levee Analysis and Mapping Procedure

1 LLPT 1: STAKEHOLDER COORDINATION AND DATA COLLECTION MEETING

Identify Local Levee Partnership Team (LLPT) members with FEMA and begin data collection

2 INITIAL LEVEE DATA ANALYSIS

FEMA performs the initial levee data analysis based on collected information from the LLPT

The reach analysis procedures that will be reviewed include the following:

- Natural Valley
- Freeboard Deficient
- Overtopping
- Structural-Based Inundation
- Sound Reach

3 LLPT 2: MEETING TO REVIEW INITIAL DATA ANALYSIS

Technical review of initial levee data analysis results with LLPT members

4 LLPT 3: REVIEW LEVEE ANALYSIS AND MAPPING PLAN

Discuss the draft levee analysis and mapping plan and ways to convey risk and mitigation information to citizens

FEMA

Levee System Data & Documentation Needed

Identify other community information, resources, developments in the community, and current mitigation projects currently underway

- Elevation Information for the Levee System (Toe & Crest)
- Design Base Flood Elevation (BFE)
- Structural Design Information
- Geotechnical Evaluation
- Interior Drainage Analysis
- Operation and Maintenance Plans
- As-built Plans
- Levee Inspection Reports

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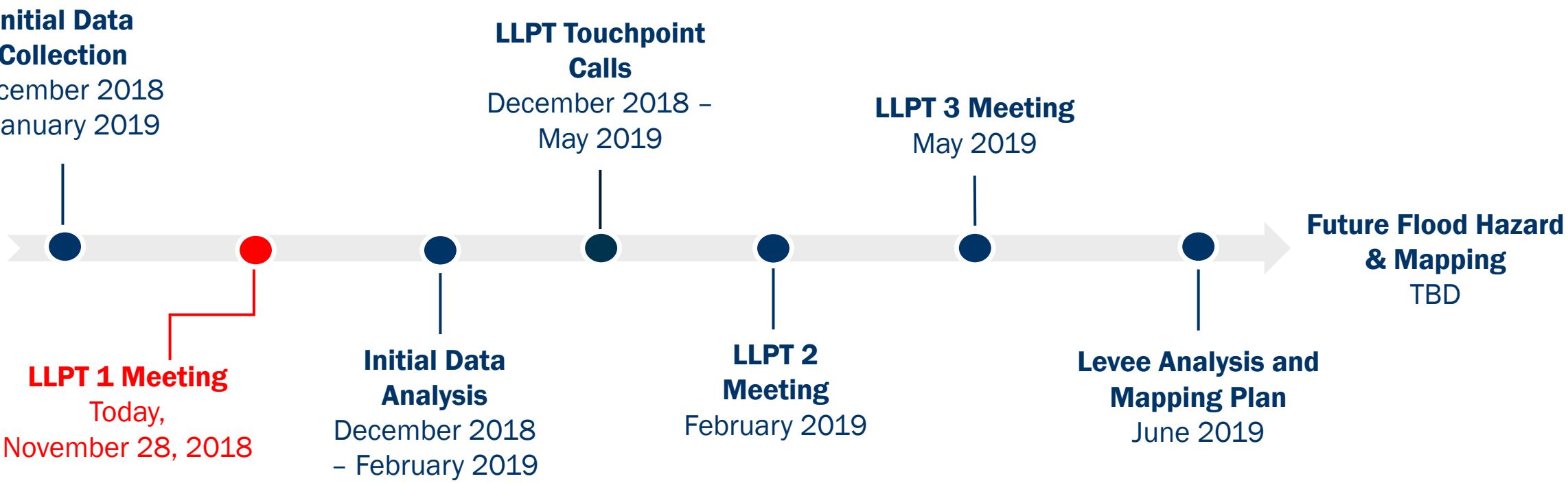
Village of Hoosick Falls LLPT Timeline:



FEMA

QUESTIONS?

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Stephanie Nurre, Senior Mitigation Planner - STARR II
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FEMA

Contacts

	Title	Employee	Phone Number
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		Alan Springett, Alternative Project Monitor alan.springett@fema.dhs.gov	(212) 680-8557
Production and Tech. Services	Project Engineers, Floodplain Analysis and Mapping – STARR II	Stephanie Nurre, STARR II stephanie.nurre@stantec.com	(312) 262-2284
		Curtis Smith, STARR II curtis.smith@stantec.com	(646) 842-8239
Outreach	Community Engagement and Risk Communication (CERC) – Resilience Action Partners	Matt Kroneberger matt.kroneberger@ogilvy.com	(212) 237-6373

FEMA

FEMA

Thank You

Challenges, Innovation, The way forward

Appendix B
Stakeholder Engagement - LLPT Meeting 2 Information

Hoosick Falls, NY LLPT 2 Agenda

ATTENDEES

ROBERT ALLEN
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VILLAGE OF HOOSICK FALLS, NEW YORK

DATE: Tuesday, March 26, 2019 **TIME:** 3:30 PM – 5:00 PM
LOCATION: Village of Hoosick Falls Boardroom – 24 Main St Hoosick Falls, NY

MEETING GOAL(S):

1. Understand the levee analysis and mapping procedures and the impact on your community
2. Finalize the local levee partnership team (LLPT) members
3. Identify relevant data, resources, and feedback to be considered in the project

AGENDA

3:30PM WELCOME AND INTRODUCTIONS

3:40-4:40PM PRESENTATION TO INCLUDE

- Levee system review
- Reach study procedures
- Review results of initial data analysis

4:40-4:50PM QUESTIONS AND REVIEW

4:50-5:00PM NEXT STEPS

- Community actions
- Follow-up meetings

FEMA

RiskMAP
Increasing Resilience Together

Hoosick Falls, NY LLPT 2 Agenda

ATTENDEES *Continued*

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NOTES

Hoosick Falls, NY LLPT 2 Agenda

ATTENDEES *Continued*

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Hoosick Falls, NY LLPT 2 Notes

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VILLAGE OF HOOSICK FALLS, NEW YORK

DATE: Tuesday, March 26, 2019 **TIME:** 3:30 PM – 5:00 PM
LOCATION: Village of Hoosick Falls Boardroom – 24 Main St Hoosick Falls, NY

Action Item	Owner
1. Presentation to be distributed to attendees	Outreach Support
2. Community leaders to e-mail Matt Kroneberger at matt.kroneberger@ogilvy.com to indicate any questions.	Community Leaders
3. All: Work to identify individual owners / easements of levee system	Community Leaders, NYSDEC

AGENDA

- Discuss past meeting materials
- Continue dialogue on levee context
- Plan for LLPT 3 Meeting

FEMA

RiskMAP
Increasing Resilience Together

Hoosick Falls, NY LLPT 2 Notes

ATTENDEES *Continued*

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OVERVIEW

- The floodwall on the left bank of the Hoosic River has been determined not to be part of the Hoosic Right Bank Levee system.
- New York State Department of Environmental Conservation (NYSDEC) staff provided data from the levee design report which were used to support the modeling analyses.
- The effective Flood Insurance Rate Map (FIRM) shows the levee impacted area of the Village of Hoosick Falls with reduced flood risk due to the Hoosic River Right Bank Levee system. The flood risk is currently mapped as a temporary seclusion area.
- The results of the Natural Valley Procedure show that the 1-percent-annual-chance flood would inundate only a small area on the landside of the levee system if the levee system was not reducing flood risk.
- Revised FIRMs for Rensselaer County, including the Village of Hoosick Falls and the Town of Hoosick may be available in 2021-2022. However, these dates are subject to change.
- The building at the northern edge of 1st Street, a former Honeywell manufacturing facility, was torn down in 2018.

DISCUSSION

QUESTION:
Supervisor, Town of Hoosick, Marc Surdam:
If the levee system isn't incorporated into a hazard mitigation plan, would assistance [in case of a disaster] be available?

Response:
FEMA Region II Project Monitor, Shu Rahman:
This levee system should be incorporated into the plan as much as it can be.

QUESTION:
Supervisor, Town of Hoosick, Marc Surdam:
Would secluded areas occur in a future flood map?

Response:
FEMA Region II Project Monitor, Shu Rahman:
In the next flood maps, these areas should be designated as Zone X outside of the Zone AE floodplain resulting from the Natural Valley Procedure.

Village of Hoosick Falls, Rensselaer County Levee Flood Hazard Identification

Local Levee Partnership Team (LLPT) Meeting 2

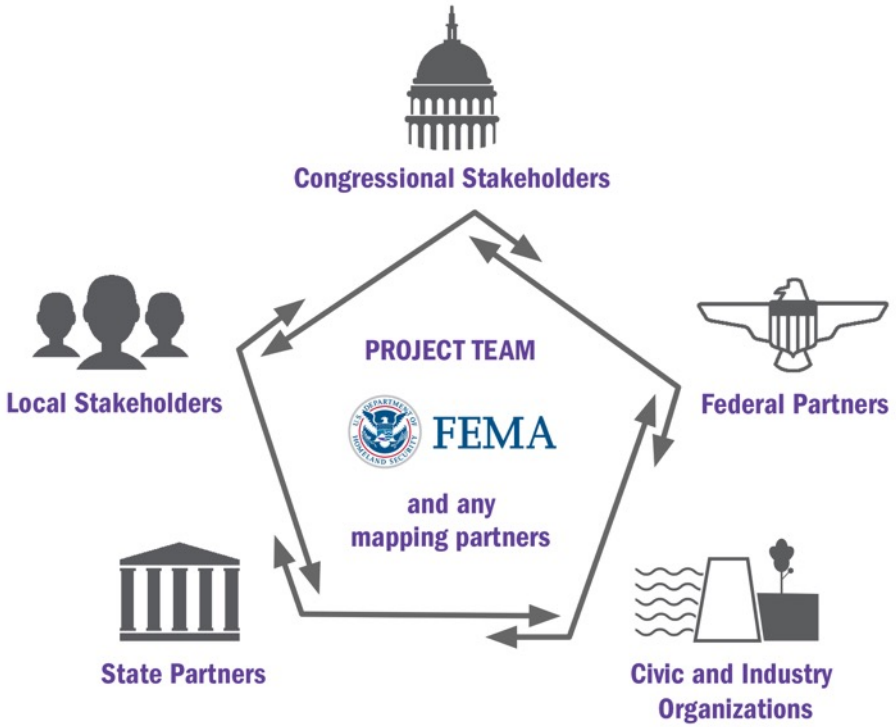
March 26, 2019

FEMA

Photo credit NOAA/NASA

The Focus is on Flood Risk

The Federal Emergency Management Agency (FEMA) works with Federal and State partners, local communities and other stakeholders to assess and communicate flood risks in areas impacted by non-accredited levees.



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Today's Agenda

1. Review Levee Flood Hazard
2. Results of Initial Data Analysis
3. Application of Reach Study Procedures
4. Next Steps

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Review Levee Flood Hazard

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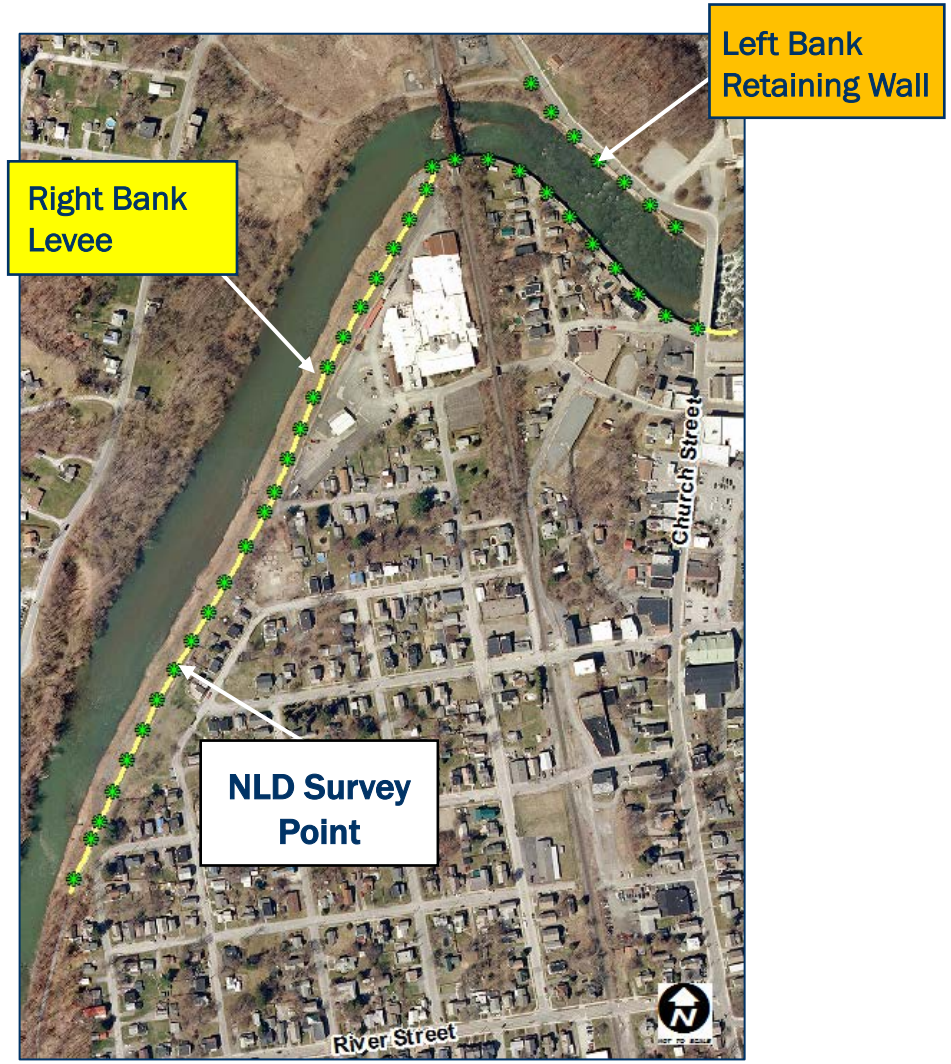
Hoosic River Right Bank Levee System



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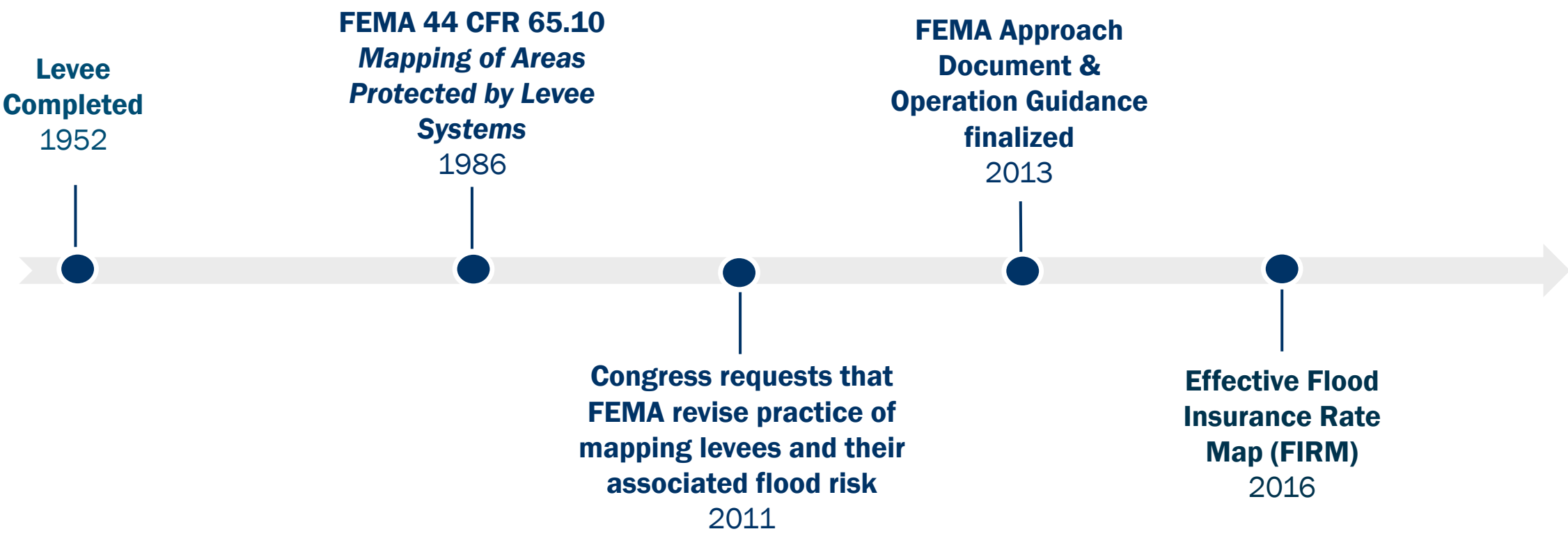
Hoosic River Right Bank Levee System



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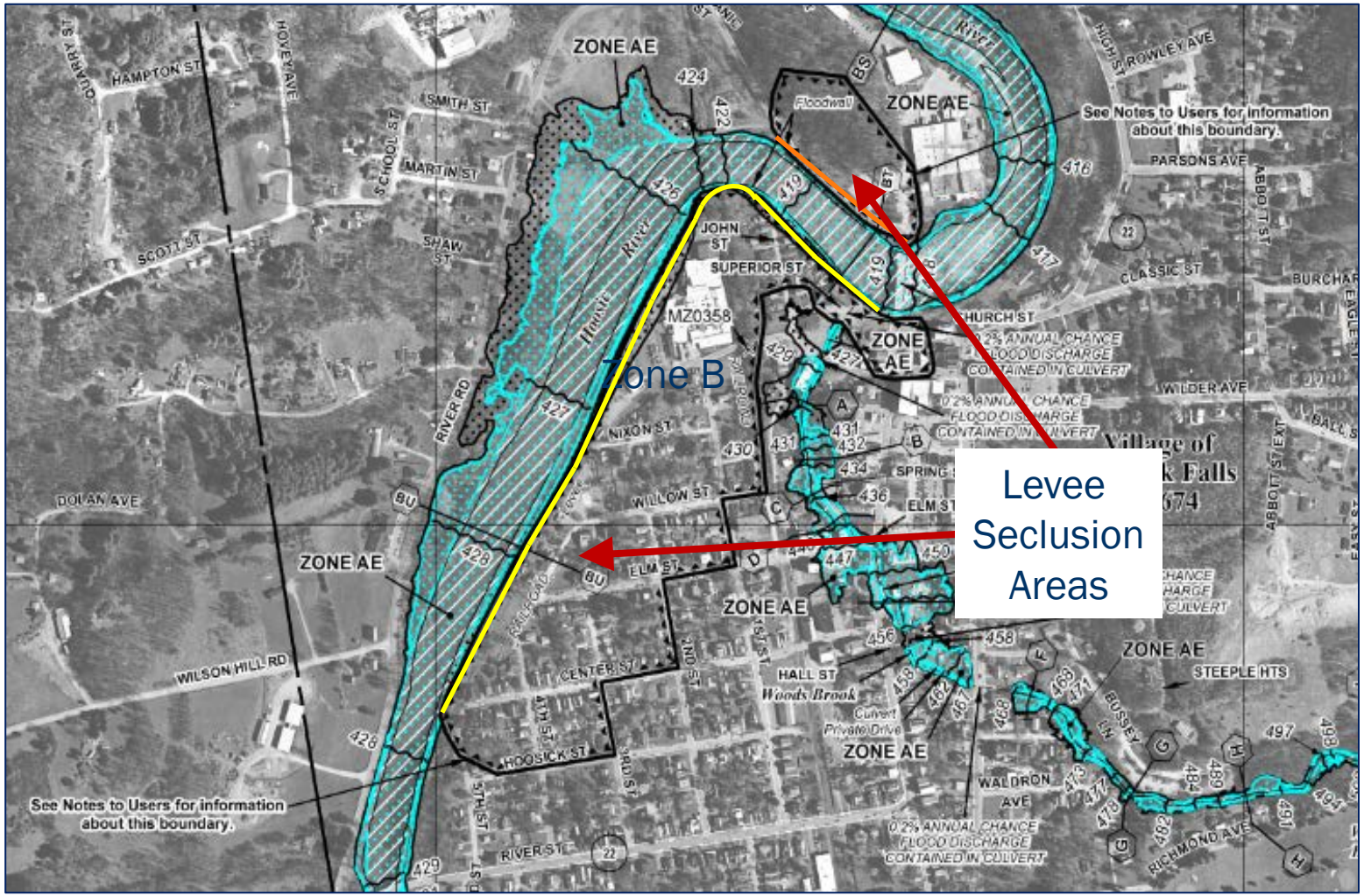
Effective Flood Insurance Rate Map



Effective FIRM: January 6, 2016

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First Meeting Recap

- Initial Stakeholder Engagement Meeting – November 28, 2018
  - Recap of community issues/questions
- Reach Procedures
  - Natural Valley
  - Structural-Based Inundation
  - Freeboard Deficient
  - Overtopping
  - Sound Reach

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Status Update

- Data Collection – Provided by NYSDEC
  - 1945 Analysis of Design Report, USACE
  - 1952 Record Drawings / As-built plans, USACE
  - 1958 Operation and Maintenance Manual, USACE
- Rensselaer County Map Updates
- Any updates from community?

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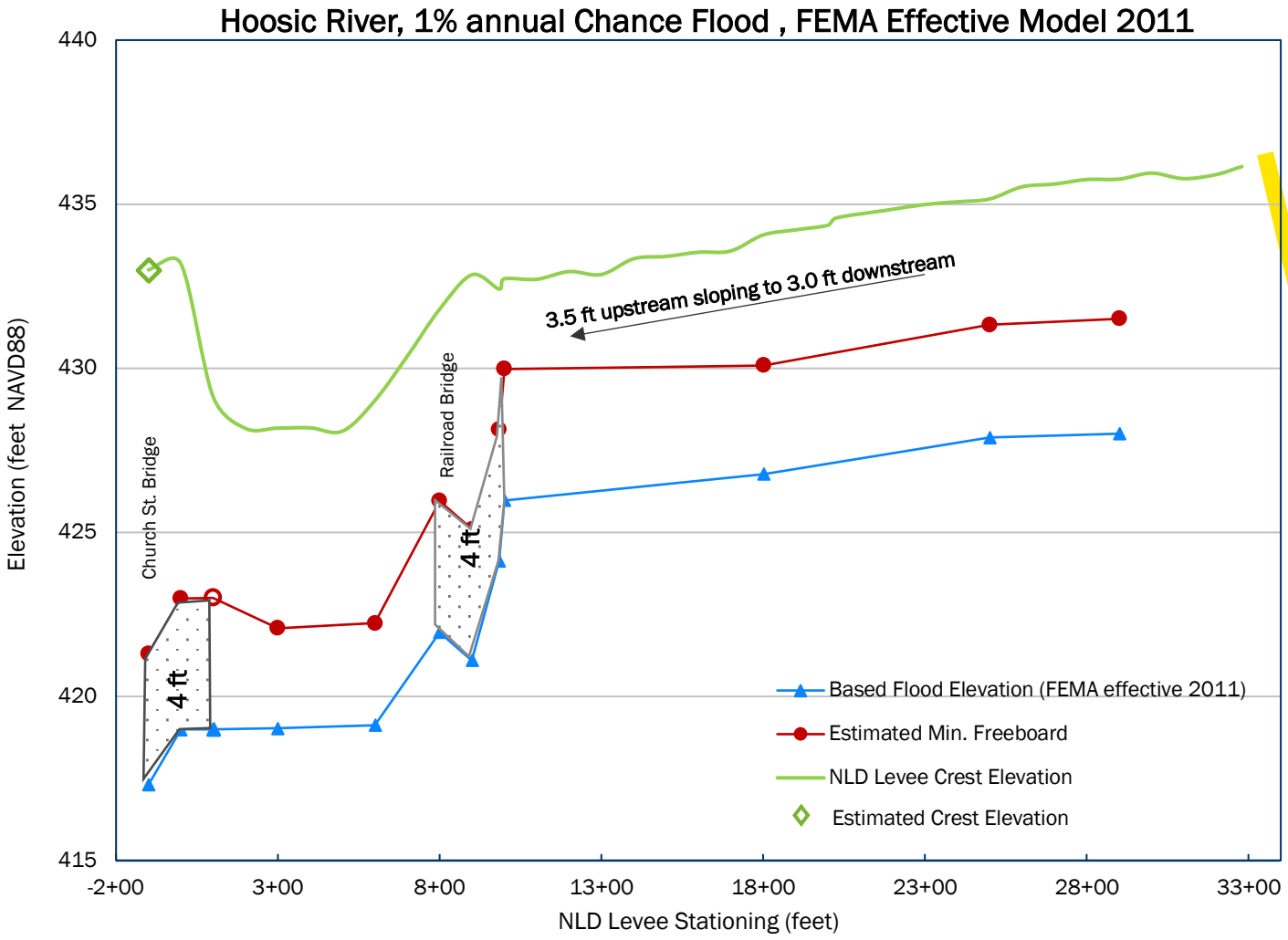
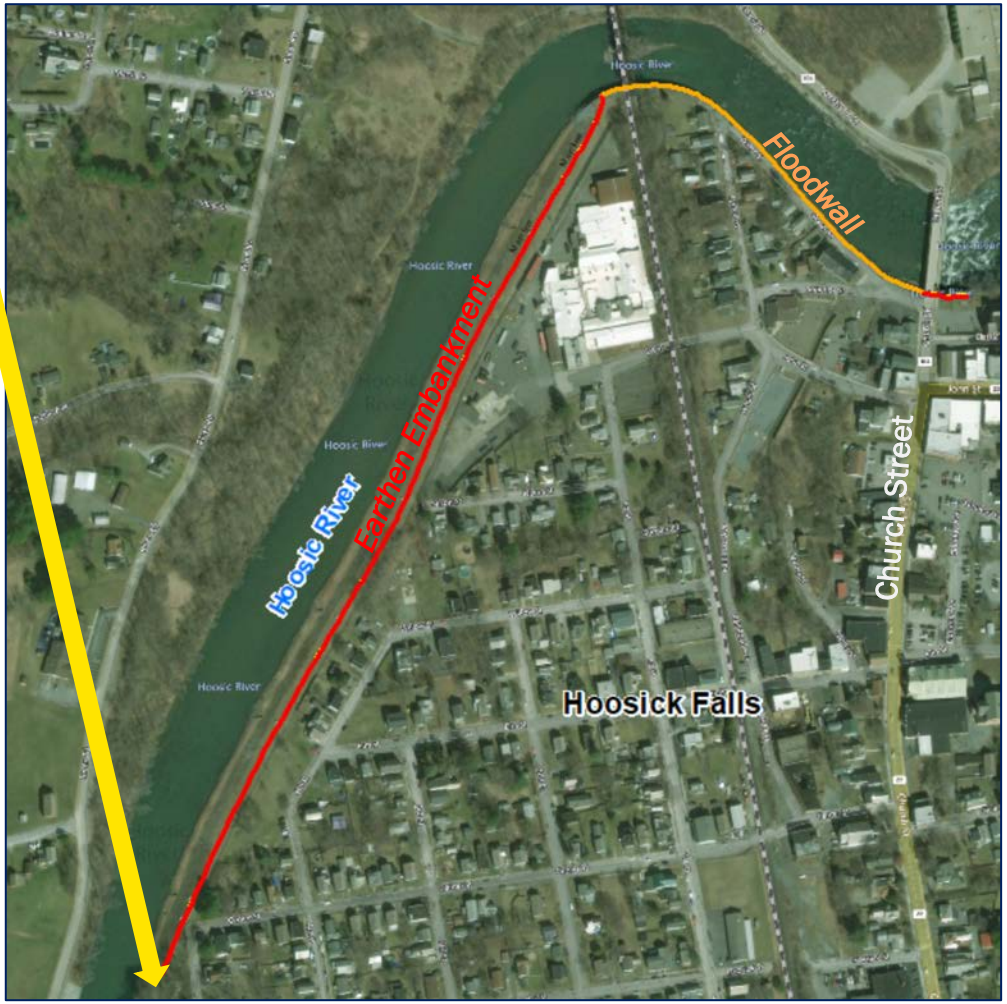
Levee Profile Exhibit – Hoosic River





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Results of Initial Data Analysis

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Natural Valley Procedure

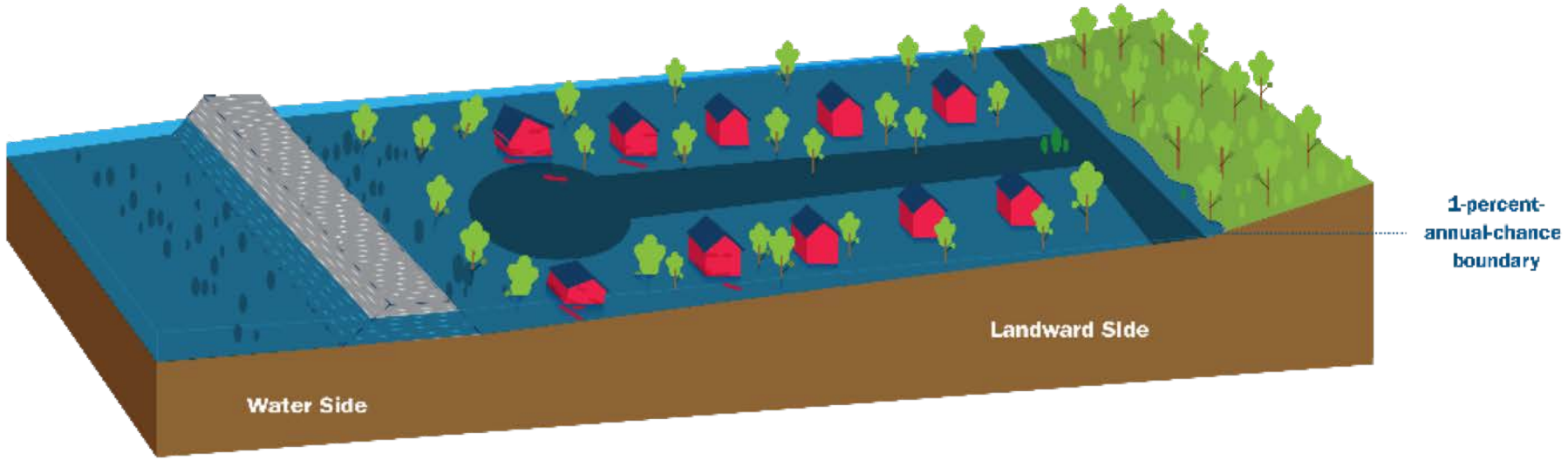
This analysis identifies the landside flood risk as though the levee does not impact the flood elevation.

Applications:

- Levee does not meet 44CFR65.10
  → Zone AE SFHA

Applications:

- Levee meets 44CFR65.10
  →ZONE X – Area with reduced flood risk due to levee



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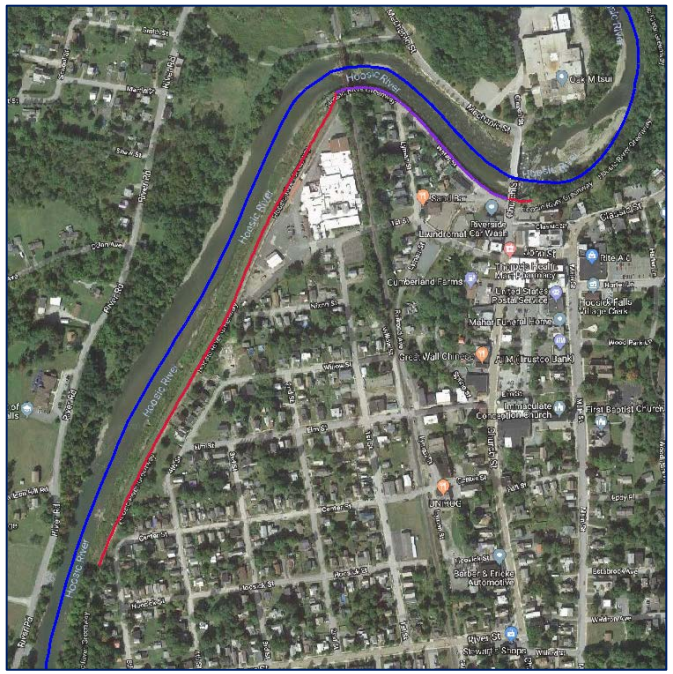
Natural Valley Procedure

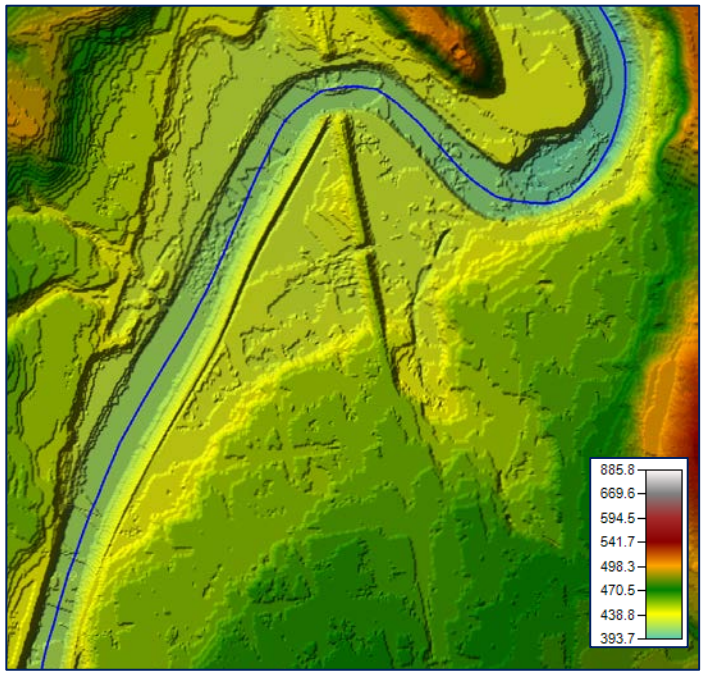
Hydraulics

- Effective Analysis: HEC-2 hydraulic model → HEC-RAS
- 1-Dimensional steady-state model



Hydrology

- Effective Flowrate



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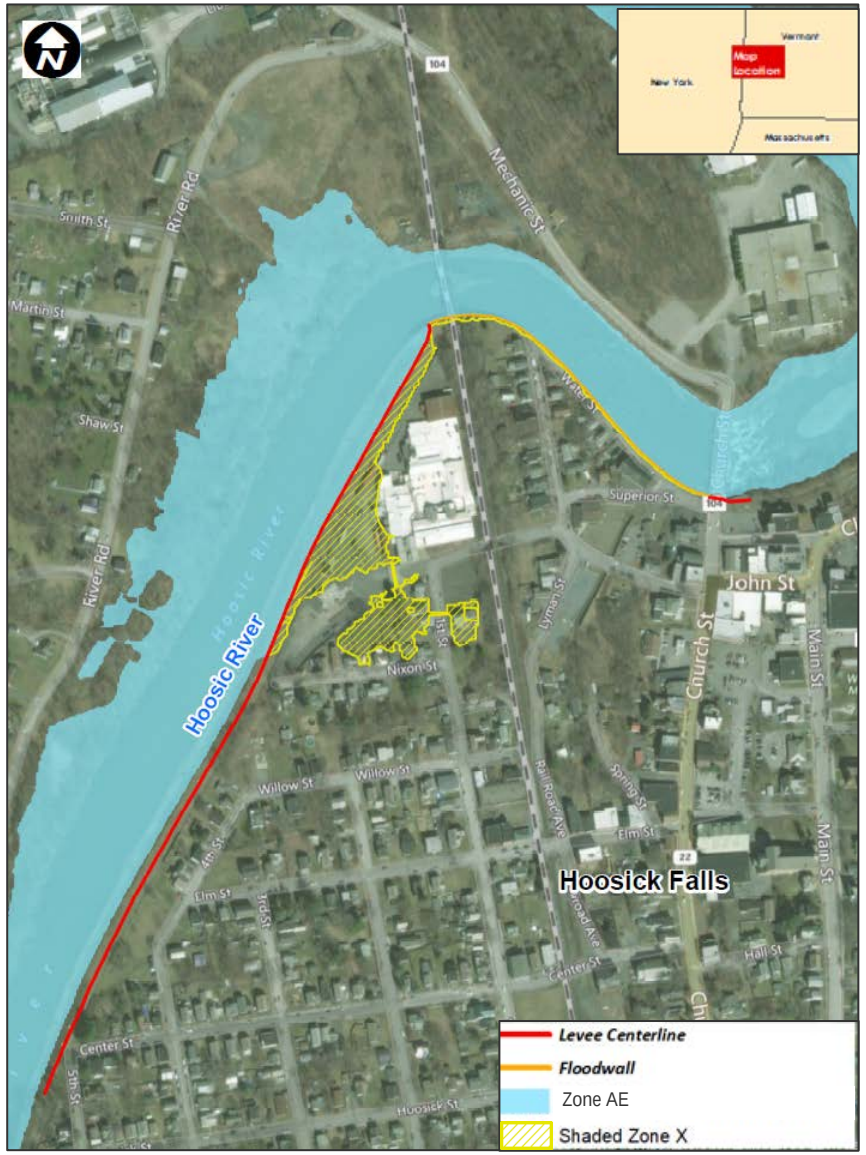
Natural Valley Procedure



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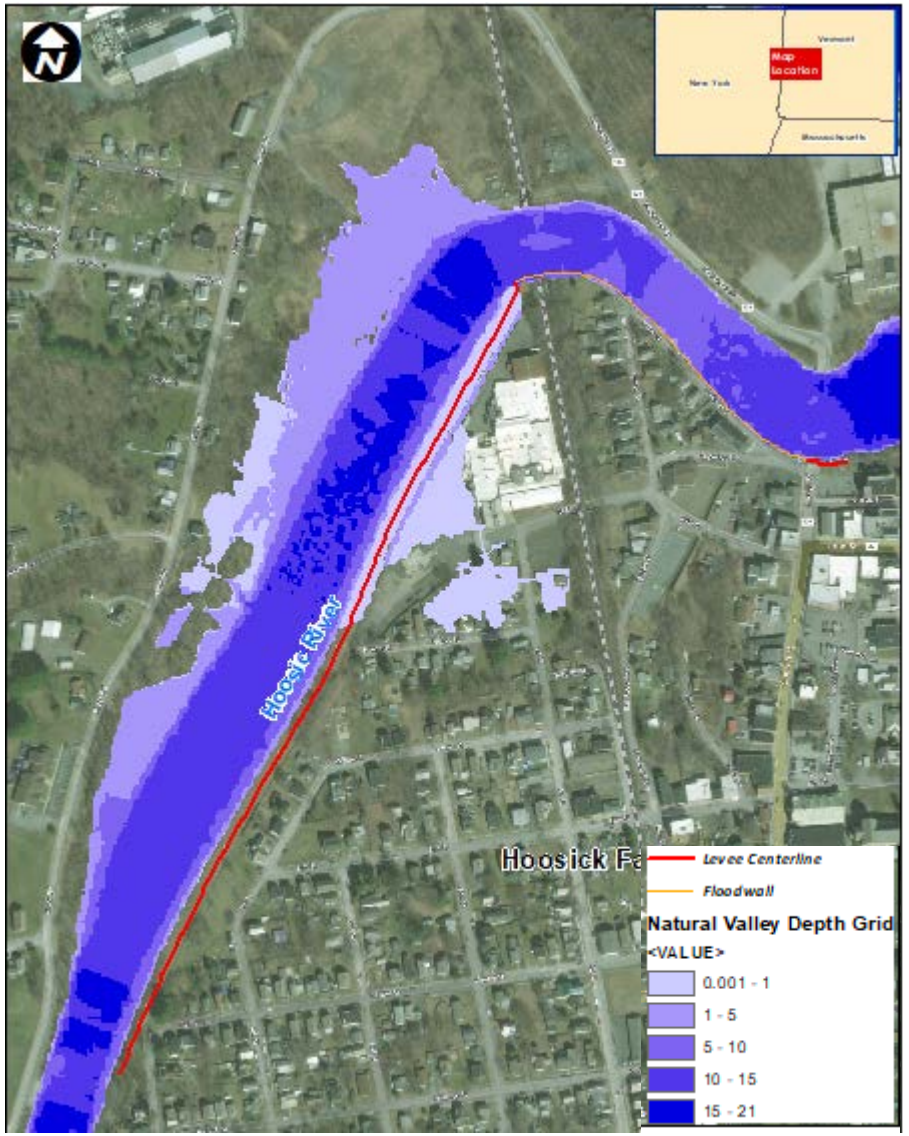
Natural Valley Procedure – Depth Grid



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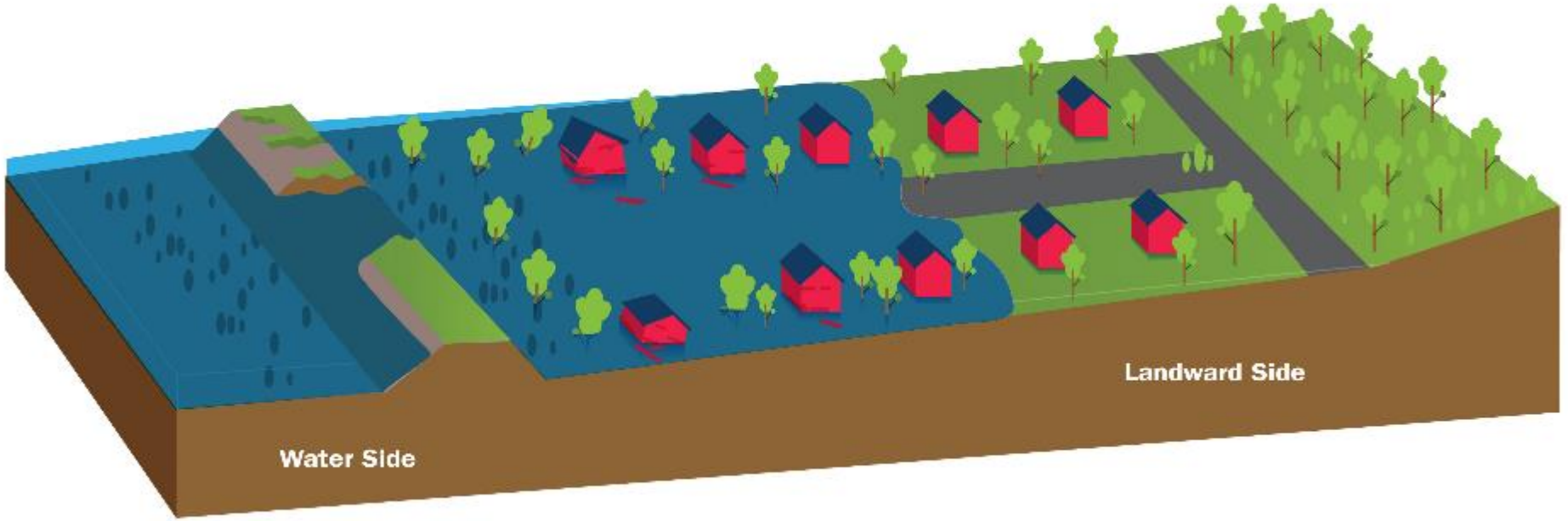
Structural-Based Inundation Procedure

This analysis identifies the landside flood risk by estimate of hypothetical breach analyses.

Application:

- Levee does not meet 44CFR65.10



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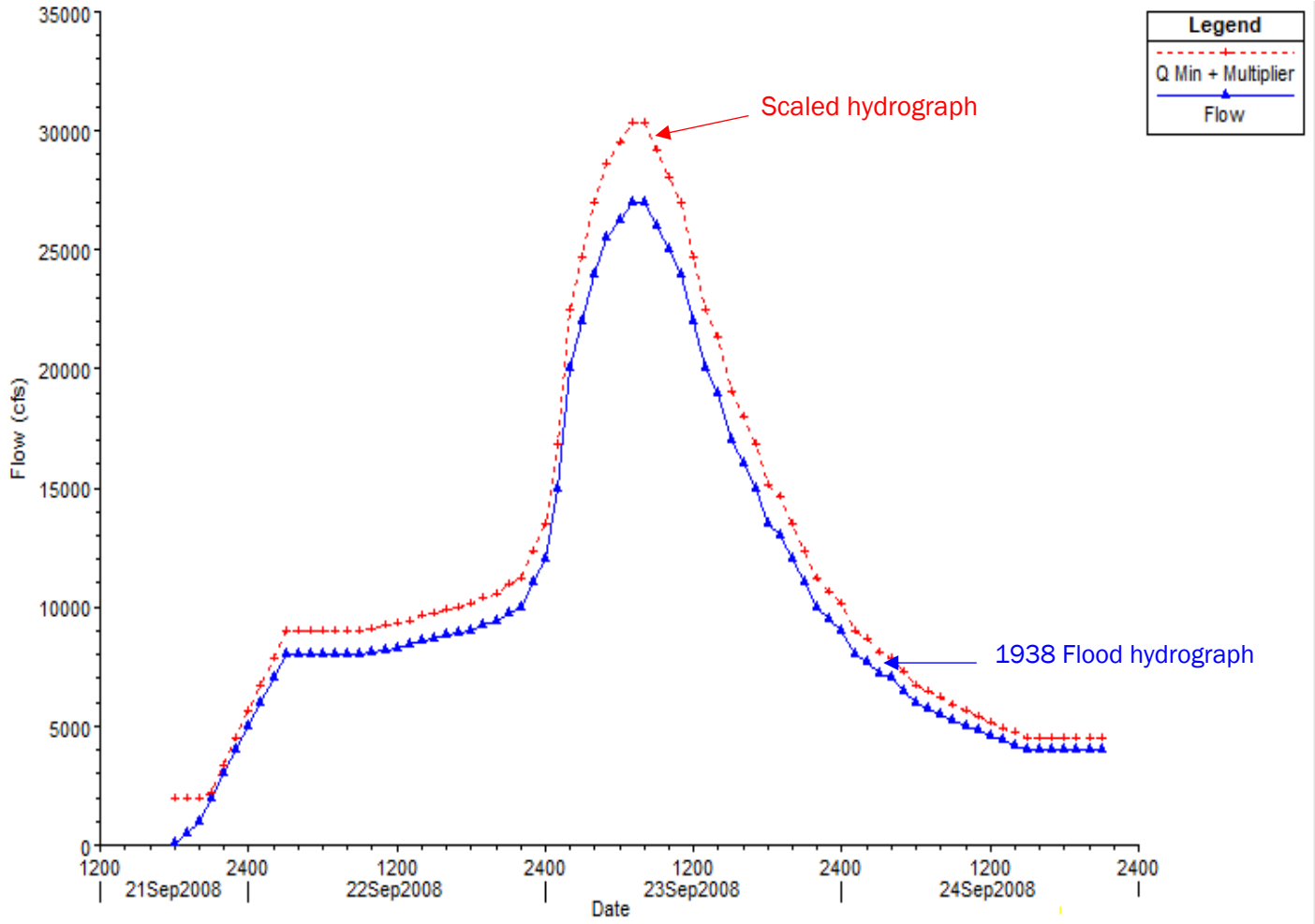
Structural-Based Inundation Procedure

Hydrology

- No stream gage available on local streams to facilitate hydrograph development

- Used historic flood hydrograph at Hoosick Falls, scaled it to 1-percent-annual-chance flowrate



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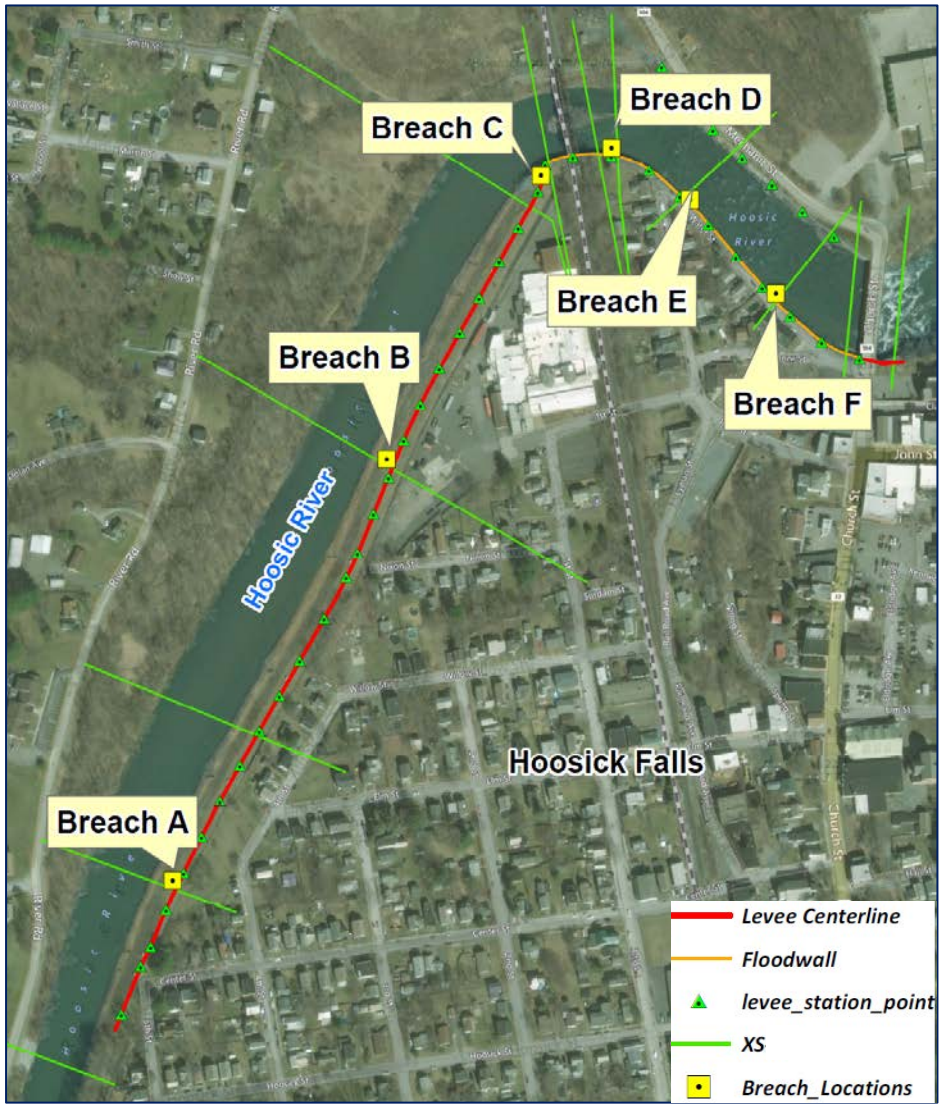
Structural-Based Inundation (SBI) Procedure



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Structural Based Inundation Procedure

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Application of Reach Study Procedures

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Comparison: Reach Study Procedures

Applicable

- Natural Valley Procedure

Not Applicable

- Structural-Based Inundation Procedure**
  - No known vulnerabilities or history of breaching
- Overtopping Procedure
  - Levee crest elevated above minimum freeboard
- Freeboard Deficient Procedure
  - Levee crest elevated above minimum freeboard
- Sound Reach Procedure
  - 44 CFR 65.10 compliant documentation required

**Can be leveraged for emergency planning

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Mapping Path Forward Based on Data

	Reach Procedures				
	Sound **	Freeboard Deficient **	Overtopping **	Structural-Based Inundation *	Natural Valley *
Elevation Information for the Levee Crest and Toe	✓	✓	✓	✓	
BFE + Freeboard Less than Levee Crest	✓				
BFE Less than Levee Crest	✓	✓			
Operations and Maintenance Plan	✓	✓	✓	Recommended	
Structural Design Requirements	✓	✓	✓		
Inspection Reports	✓	✓	✓	Recommended	
Evaluation of Overtopping Erosion Potential			✓		

* - No cost to community

** - Potential additional cost to community

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Next Steps

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FEMA's Role

- FEMA to prepare a Levee Analysis and Mapping plan document that includes:

Summaries of Data Collected and LLPT Discussions

Results from the Initial Data Analysis

Path Forward to Map Flood Hazard in Levee Impacted Area

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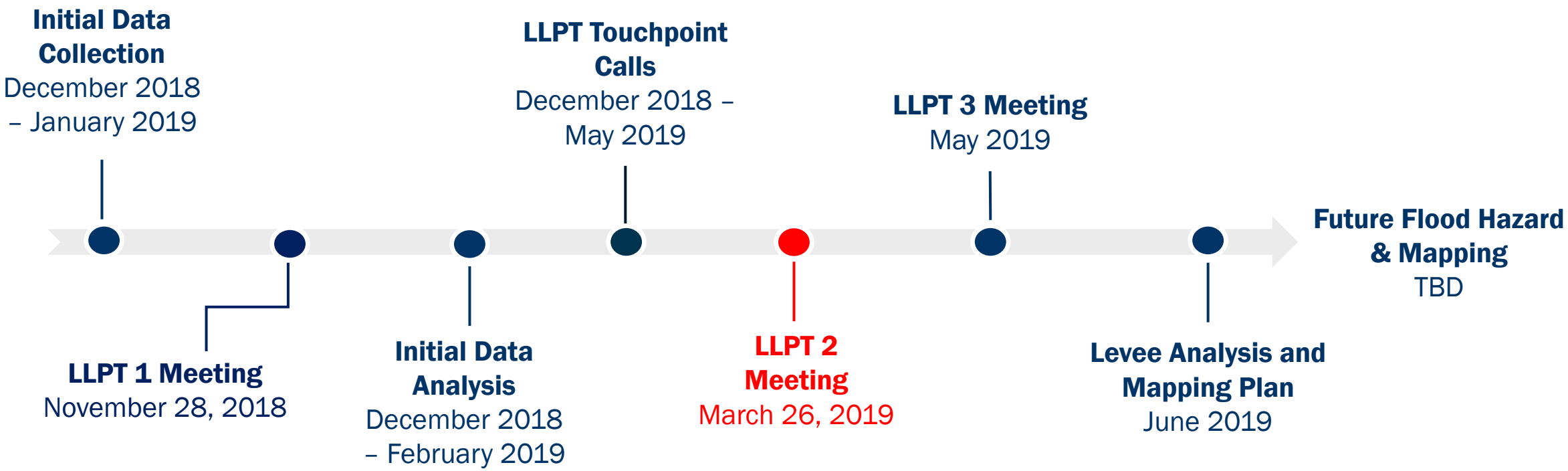
Village of Hoosick Falls LLPT Timeline:



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QUESTIONS?

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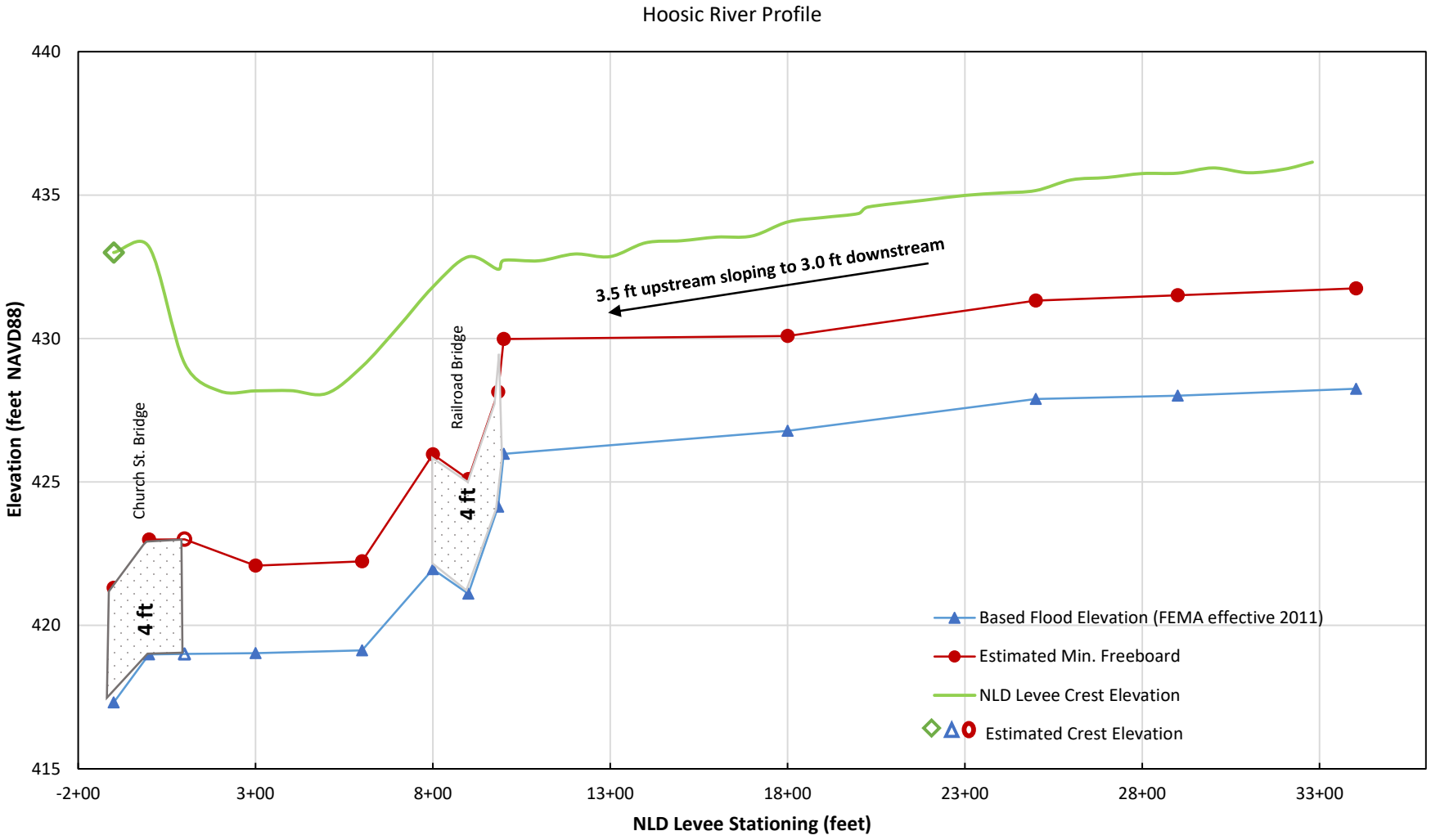
Thank You

Challenges, Innovation, The way forward

Appendix C
Freeboard Profile Comparison


Hoosic River Profile
440
435
430
425
420
415
Elevation (feet NAVD88)
-2+00
3+00
8+00
13+00
18+00
23+00
28+00
33+00
NLD Levee Stationing (feet)
3.5 ft upstream sloping to 3.0 ft downstream
Church St. Bridge
Railroad Bridge
4 ft
4 ft
Based Flood Elevation (FEMA effective 2011)
Estimated Min. Freeboard
NLD Levee Crest Elevation
Estimated Crest Elevation

Appendix D
Collected Data

(Full Appendix Provided Separately)

Appendix E
Initial Data Analysis

(Full Appendix Provided Separately)