Levee Analysis and Mapping Plan
Montour Falls Flood Damage Reduction Project

Village of Montour Falls, New York

June 2019

FEMA

RiskMAP
Increasing Resilience Together

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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 D – Area of possible, but undetermined flood hazard.

*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 Montour Falls, New York shows the Catharine Creek Left Bank and Catharine Creek Right Bank Levee Systems, which are part of the Montour Falls Flood Damage Reduction Project, as providing reduced flood hazard from the 1-percent-annual-chance flood. To maintain this depiction of flood risk on the future FIRM, certified data must be provided to FEMA, and deemed complete, to show that the levee systems meet the minimum requirements of Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44CFR§65.10). As of the date of this levee plan, no data has been received by FEMA in support of 44CFR§65.10 therefore, the levee systems would be considered non-accredited in a future remapping effort.

FEMA's guidance was revised in 2013 to incorporate new 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 levee systems (see Section 1 of this report). In the Village of Montour 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 Catharine Creek Left Bank and Catharine Creek Right Bank Levee Systems.

In September of 2018, FEMA Region II partnered with stakeholders in the Village of Montour Falls to form a collaborative Local Levee Partnership Team (LLPT) and worked to determine potential Levee Analysis and Mapping Procedures that would be applicable to the Catharine Creek Left Bank and Catharine Creek Right Bank Levee Systems (see Sections 3 and 4 respectively). The process involved the collection and group evaluation of available data, creation and evaluation of an initial data analysis (see Section 5), and detailed discussions on mapping needs.

The information gained through the extensive coordination and collaboration with the LLPT and through the initial data analysis performed is summarized in this levee plan. This plan also outlines potential reach analysis procedures and paths forward for future mapping of the flood hazard within the levee impacted areas of the Catharine Creek Left Bank and Catharine Creek Right Bank Levee Systems within the Village of Montour Falls (see Section 6).

The Village of Montour Falls expressed interest in pursuing accreditation of the Catharine Creek Left Bank and Catharine Creek Right Bank Levee Systems to show the levee systems as reducing flood risk on future FIRM. This identification of flood risk within the levee impacted areas would be similar to that shown on the effective FIRMs for the Village of Montour Falls dated September 15, 1983. If the levee systems would be considered non-accredited, future FIRMs would depict much of the leveed area as Zone AE Special Flood Hazard Area (SFHA).

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.

FEMA, its Production and Technical Services provider Strategic Alliance for Risk Reduction II (STARR II), and Community Engagement and Risk Communication provider (CERC) initiated the Levee Analysis and Mapping Procedures process for non-accredited levees in the Village of Montour 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 leveed areas; and
- Considers the unique characteristics of each levee system from an engineering perspective.

The Catharine Creek Left Bank and Catharine Creek Right Bank Levee System in the Village of Montour Falls would be considered non-accredited in a future remapping effort. 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 Montour Falls, Schuyler 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 depict the flood hazard for with the levee system on a future FIRM.

2 Levee System Description

2.1 Flood Damage Reduction Project in the Village of Montour Falls

The Catharine Creek Left Bank and Catharine Creek Right Bank Levee Systems were designed and constructed by USACE as part of the Montour Falls Flood Damaged Reduction Project to reduce flood risk within the Village of Montour Falls. Upon completion in the 1950's, the project was turned over to the local sponsor, NYSDEC. The Catharine Creek Left Bank Levee System extends from south of the Village of Montour Falls (near Havana Glen Creek) to north of the Village of

Montour Falls at Shequaga Falls. The Catharine Creek Right Bank (Ring) Levee System wraps around East Broadway and extends up to L'Hommedieu Street as shown in Figure 1.

The Catharine Creek Left Bank Levee System is approximately 1.6 miles long along the left bank of Catharine Creek. The Catharine Creek Right Bank (Ring) Levee System includes approximately 0.4 miles of earthen embankment. The Catharine Creek Left Bank and Catharine Creek Right Bank (Ring) Levee Systems are currently "active" in the USACE Rehabilitation Program.

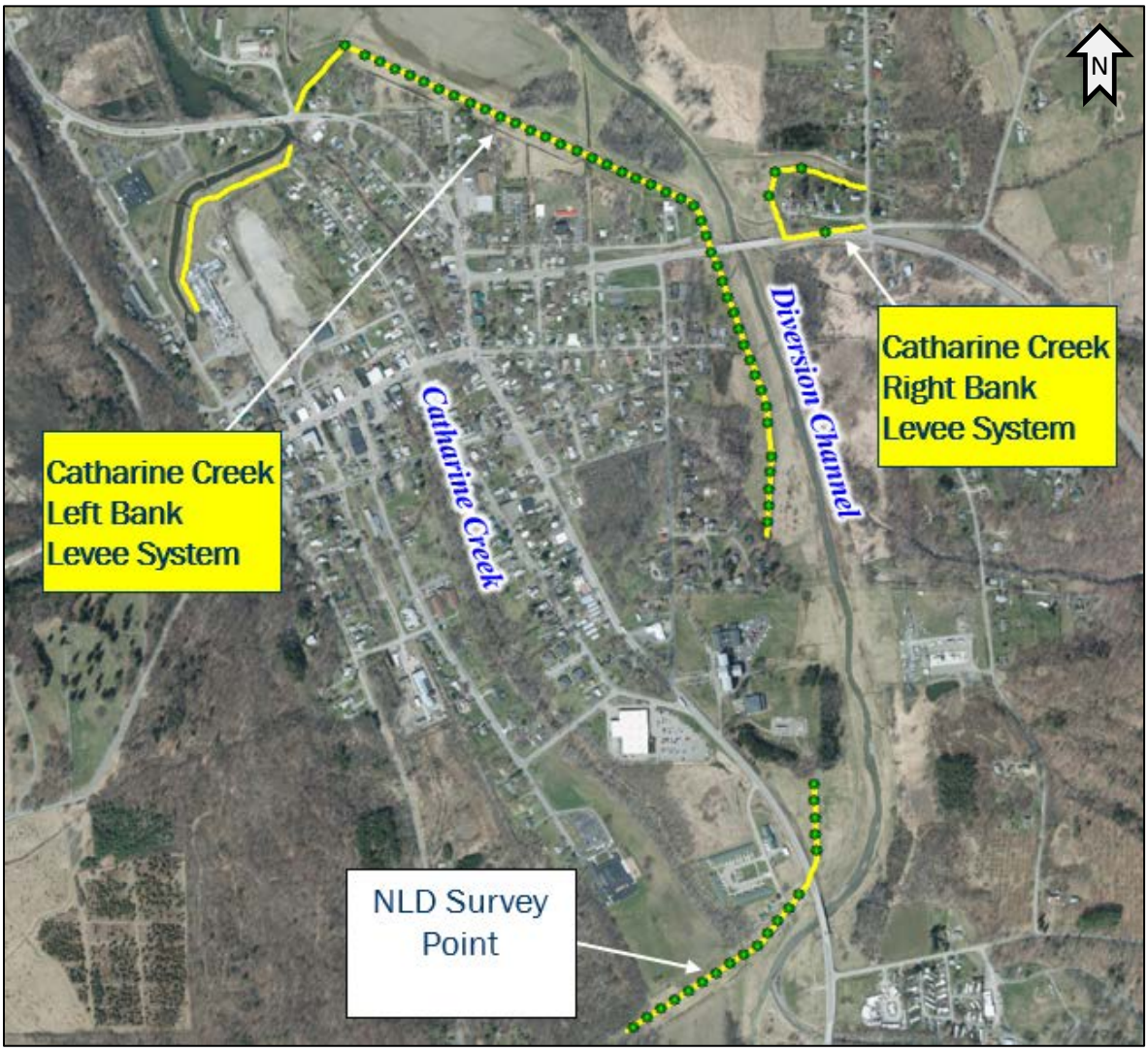

Figure 1: Location Map

2.2 Community NFIP and FIRM History

Tables 1 and 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[1]
Schuyler County	Village of Montour Falls	Yes	Over 450

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 Montour Falls	April 1, 1981	April 1, 1981	September 15, 1983	N/A

The Catharine Creek Left Bank Levee System and the Catharine Creek Right Bank (Ring) Levee System are shown as reducing flood hazard of the 1-percent-annual-chance flood on the effective FIRM for the Village of Montour 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
John King	Village of Montour Falls, Mayor 607.535.7367; mayor@villageofmontourfalls.com
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Jim Scott	Town of Montour, Town Supervisor msupervisor@stny.rr.com
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Katherine Herleman	Cornell Cooperative Extension 607.535.7161; kch227@cornell.edu
Janet Thigpen	Southern Tier Central & Regional Planning & Development Board, Flood Mitigation Specialist 607.737.5271; jthigpen@chemungcountyny.gov
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[1] See Table 4 for additional information regarding potentially impacted structures.

LLPT Member	Contact Information
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4 Stakeholder Engagement

4.1 LLPT Meeting 1

A FEMA-led project team engaged the Catharine Creek Left Bank Levee System and Catharine Creek Right Bank (Ring) Levee System stakeholders at the first LLPT Meeting on September 19, 2017, held at Montour Falls Village Hall. The Village expressed concerns with engaging in the Levee Discovery process at this time, due to the attentions demanded by an ongoing wastewater treatment plant upgrade project, so the Levee Discovery effort was paused. The community was re-engaged on September 19, 2018 at a second LLPT Kickoff Meeting. The overall intent of both meetings was to gain local insight on the status and available data for the levee systems, introduce the Levee Analysis and Mapping Procedures concepts for non-accredited levees, and identify stakeholders who would like to participate in the LLPT.

An overview of the methods available to depict flood risks of leveed areas under the Levee Analysis and Mapping Procedures for non-accredited levees guidance was also discussed during the meeting along with a timeline for the levee project. Additional details regarding the LLPT meetings are provided in Appendix A.

4.2 LLPT Meeting 2

The next LLPT Meeting was held on December 11, 2018 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. An additional coordination call was held on February 26, 2019 to revisit the results of the initial data analysis, review the results of the potential Natural Valley / Accredited option discussed in Section 5, and see if the LLPT had any items to discuss.

Additional details regarding the LLPT Meeting 2 and touchpoint call are provided in Appendix B and information from the data collection are provided in Appendices C through F.

4.3 LLPT Meeting 3

An LLPT Meeting 3 was held on April 24, 2019 to review the draft levee analysis and mapping plan with the LLPT prior to it being finalized.

5 Initial Data Analysis

STARR II developed an initial data analysis to approximate the inundation area of the 1-percent-annual-chance flood for each relevant Levee Analysis and Mapping Procedures approach. This informed the discussions in LLPT Meeting 2 and the touchpoint call prior to LLPT Meeting 3. Details of the initial data analysis and application of reach analysis procedures are provided below. Supporting data is provided in Appendix G.

5.1 Reach Analysis

Topographic data (FEMA 2-meter Digital Elevation Model, 2014, available through NYS GIS Clearinghouse) and levee crest survey data from the USACE National Levee Database (NLD) along with as-built plans were reviewed to define the levee systems 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 5.5) may be applied.

Based on the review of the available levee crest data, the Catharine Creek Left Bank Levee System and the Catharine Creek Right Bank (Ring) Levee System appear to meet minimum freeboard requirements of 44CFR§65.10 as shown in levee profile exhibit in Appendix C.

For the initial data analysis, the Catharine Creek Right Bank (Ring) Levee System was considered a single reach; however, the Catharine Creek Left Bank Levee System was divided into three reaches to facilitate analysis as described below and shown in Figure 2:

- Catharine Creek North reach (from North Catharine Street to tie-in with high ground near Turner Park)

- Catharine Creek South reach (from high ground east of South Catharine Street to tie-in with high ground at upstream end)
- Shequaga Creek reach (from Henry Street to downstream of North Genesee Street as floodwall and ties-in to high ground; then upstream of culvert continuing upstream as floodwall)
- Catharine Creek Ring reach (wraps around East Broadway and extends up to L'Hommedieu Street).

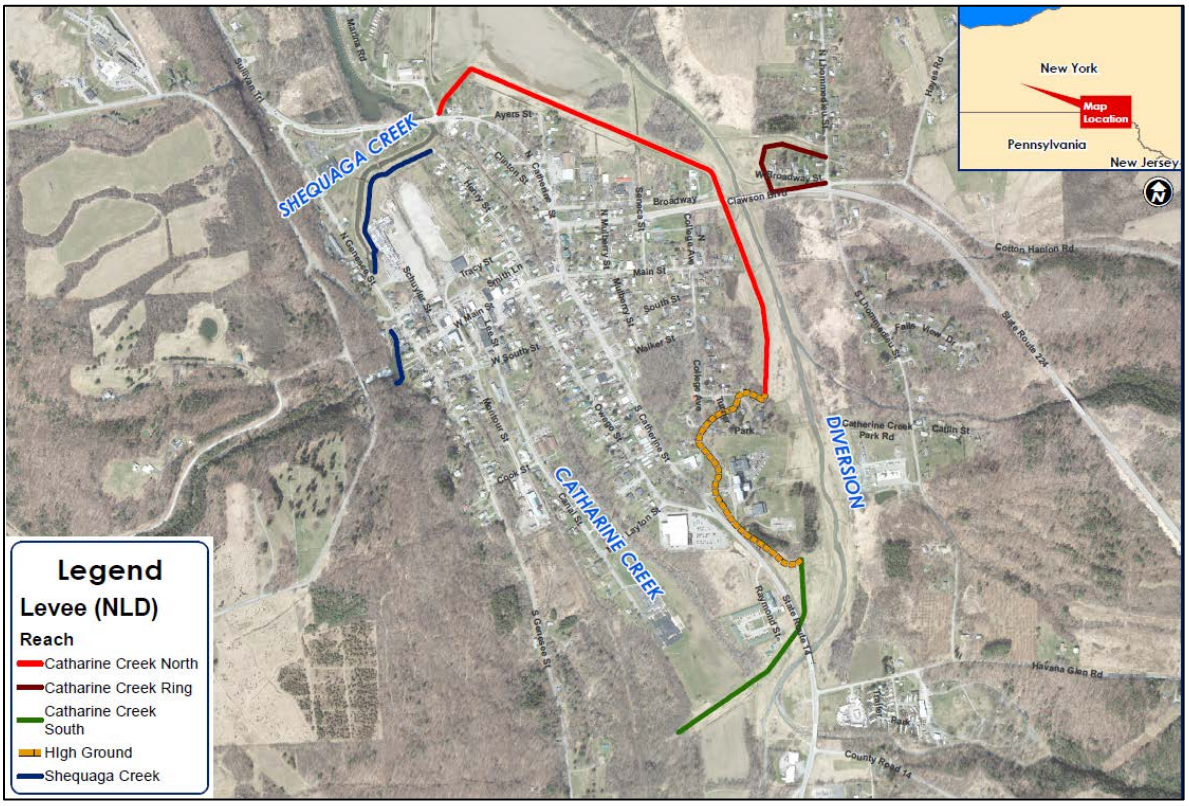

Figure 2: Reaches of Catharine Creek Left Bank and Right Bank Levee Systems

5.2 Natural Valley Procedure

The Natural Valley Procedure was modeled by keeping the topographic features of the levee reaches in the underlying terrain but allowing the discharge to flow on either side of the levee structure. The inundation extents of the Natural Valley Procedure were analyzed for each levee reach independently, assuming the other reaches remain in place. An unsteady 2-Dimensional simulation was performed using HEC-RAS 5.0.6 to better capture the overbank flow through the stream and the levee impacted area, which provides floodplain storage volume, to facilitate mapping of the 1-percent-annual-chance flood inundation.

5.3 Structural-Based Inundation Procedure

For the Structural-Based Inundation Procedure, hypothetical breach analyses were completed at five independent locations along the levee reaches. Each breach was analyzed individually using HEC-RAS 5.0.6 (2-Dimensional, unsteady flow). The breach analyses were performed at two

locations along the Catharine Creek North reach (upstream, and downstream), one location to each of the Catharine Creek South, Shequaga Creek, and Catharine Creek Ring reaches. The breach locations were developed for analysis purposes only and are not intended to indicate historic or future breach development at these locations. All 1-percent-annual-chance inundation breach areas were composited to develop the final visual depiction of Structural-Based Inundation Procedure results.

5.4 Freeboard Deficient and Overtopping Procedures

For the purposes of the initial data analysis of the Freeboard Deficient Procedure and Overtopping Procedure, the Catharine Creek South, Catharine Creek North, Shequaga Creek and Catharine Creek Ring Levee crest elevations were estimated to be elevated at or above the BFE as noted in Section 5.1, therefore, the Freeboard Deficient and Overtopping Procedures do not apply. The levee profile exhibit is included in Appendix C.

5.5 Sound Reach Procedure

A Sound Reach is described as a reach that has been designed, constructed, and maintained to withstand the flood hazards posed by a 1-percent-annual-chance flood, in accordance with the standards in 44 CFR 65.10 of the NFIP regulations, but is part of a levee system that has not been accredited. In the case of the Catharine Creek Left Bank and Catharine Creek Right Bank Levee Systems, current available data does not show that the Sound Reach Procedure applies.

5.6 Review of Initial Data Analyses[2]

The effective FIRMs currently show Zone B on the landside of the levee. The Zone B flood zone is an older designation described as a moderate to low risk, including areas with reduced 1-percent-annual-chance flood risk due to levees. The Natural Valley procedure results identify the potential flood risk if the levee systems were not reducing the levee flood hazard. As described in Section 5.2 of this report, the inundation map represents the composite result of independent Natural Valley Procedures. Figure 3 illustrates the approximate inundation area for the 1-percent-annual-chance flood for the Natural Valley Procedure within the levee impacted area. Figure 4 shows the approximate depth grid for the Natural Valley Procedure within the levee impacted area.

It should be noted that the effective HEC-2 hydraulic model for the Catharine Creek Diversion Channel was converted to an unsteady 2-Dimensional HEC-RAS hydraulic model to evaluate the reach analysis procedures. Additional information regarding the methodology used in the Initial Data Analyses is provided in Appendix G.

[2] 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 would need to be evaluated in the future prior to updating the FIRM.

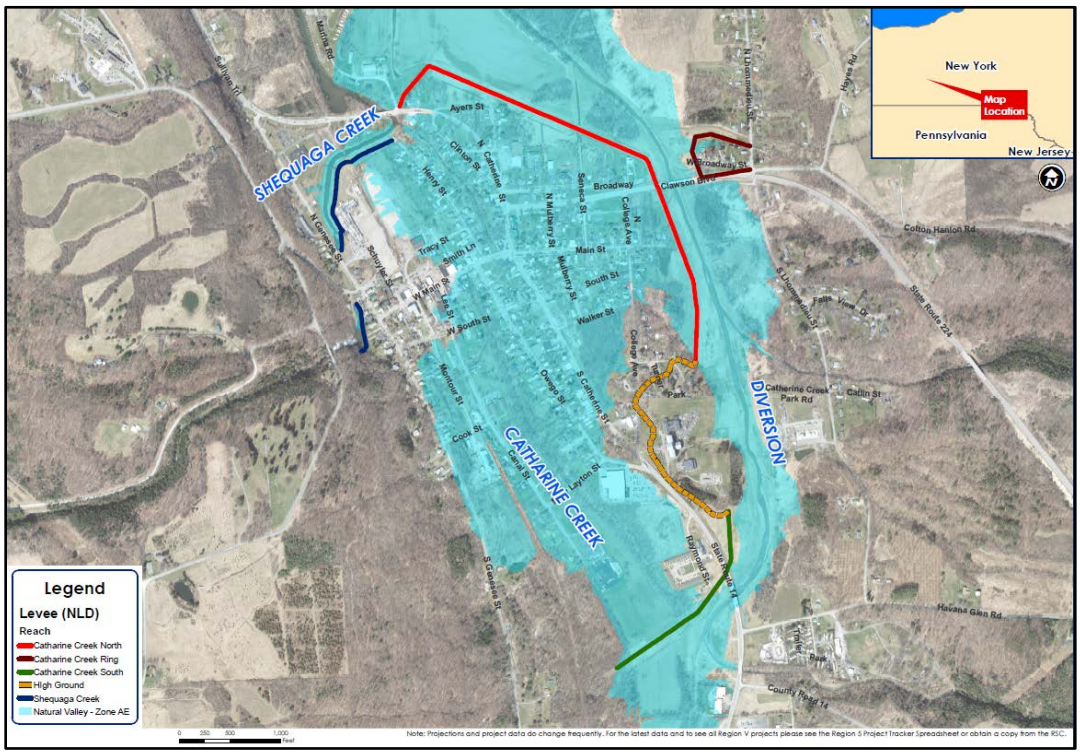

Figure 3: Natural Valley Procedure

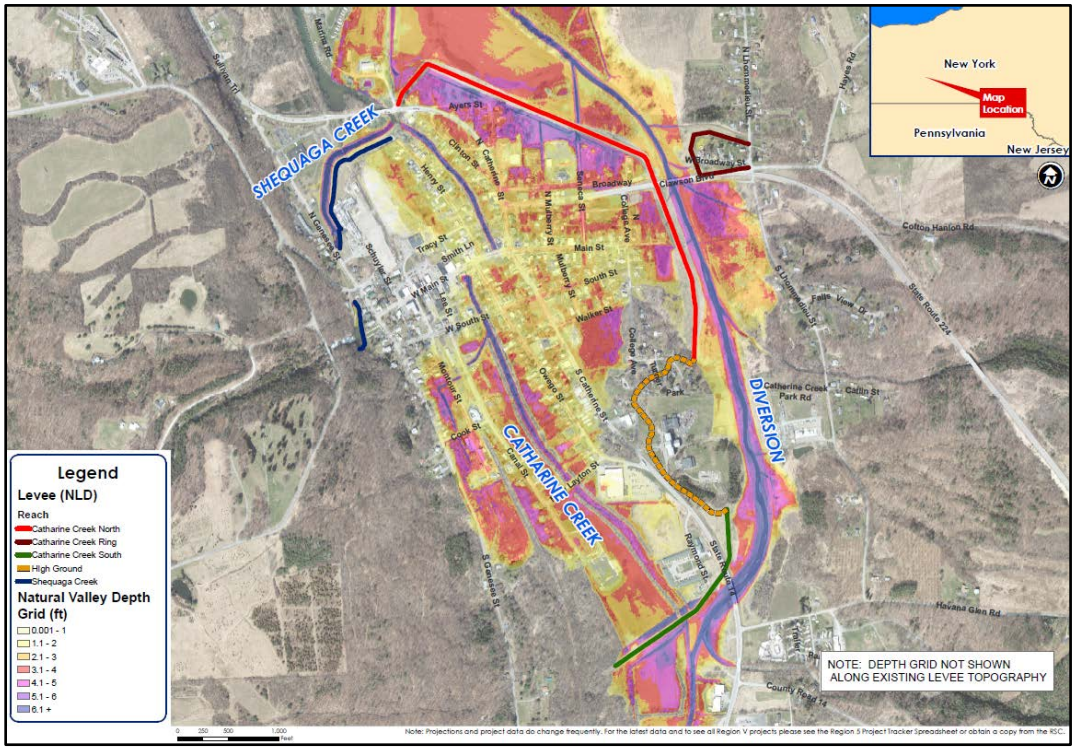

Figure 4: Natural Valley Procedure Flood Depth Grid

The composite results of the Structural-Based Inundation Procedure, shown in Figures 5 and 6, yield a similar inundation area compared to the Natural Valley Procedure within the levee impacted areas. Since the Structural-Based Inundation Procedure yielded a slightly increased inundation area, the Natural Valley Procedure would be used to map the levee flood hazard if incomplete or no additional data is provided for the levee systems.

The results of the Structural-Based Inundation Procedure can be used by community officials and emergency managers to inform emergency action planning and outreach to residents living and working within the levee impacted area. The Structural-Based Inundation Procedure is an important reminder that, should a breach of a levee system occur, areas along or near a breach, are potentially at increased risk to higher velocity flow and inundation which could happen with little or no warning.

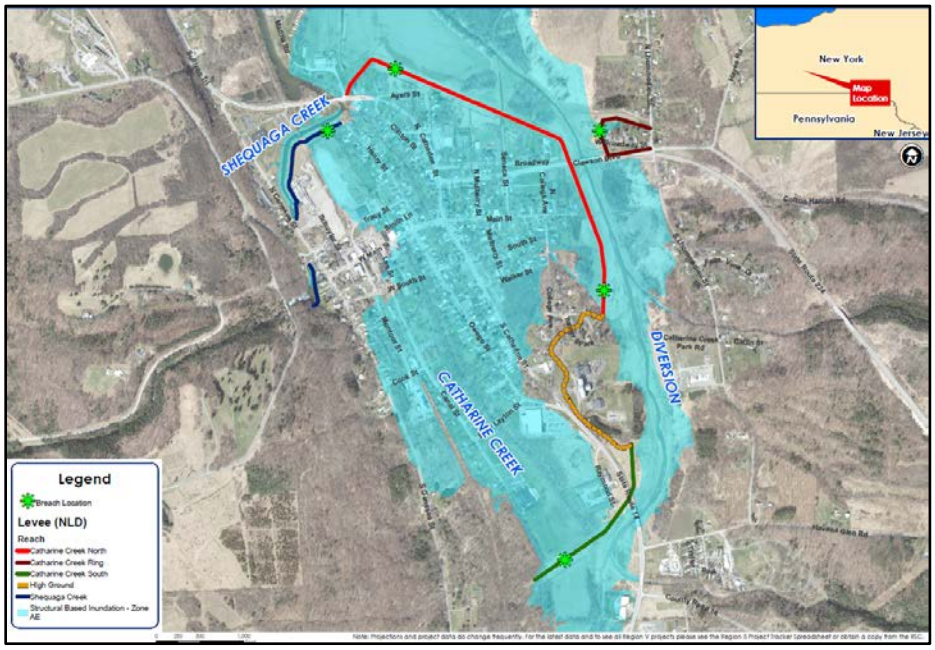

Figure 5: Structural-Based Inundation Procedure

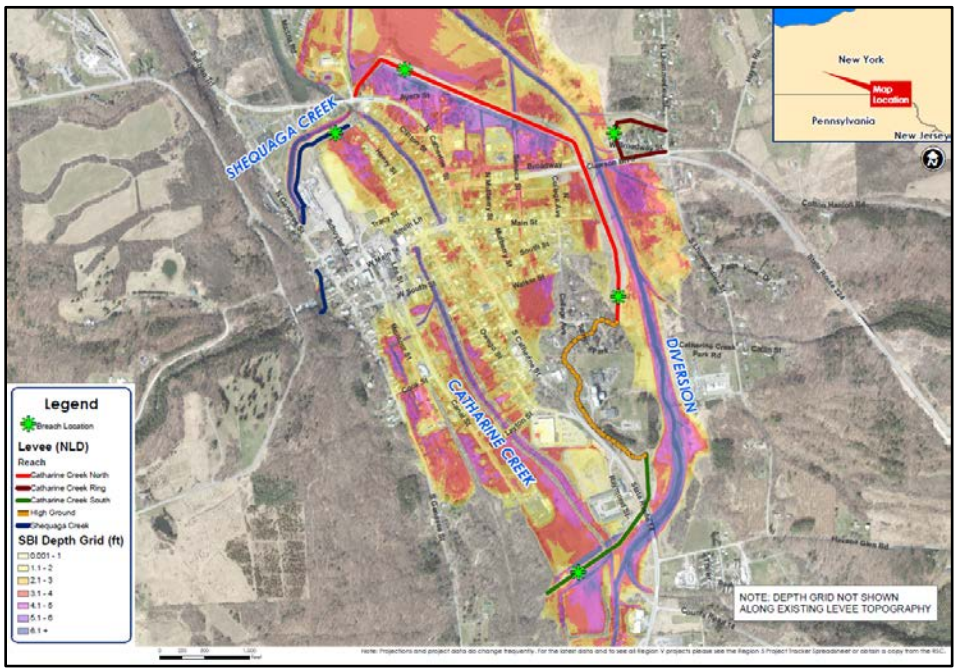

Figure 6: Structural-Based Inundation Procedure Flood Depth Grid

In addition to the Natural Valley and Structural-Based Inundation Procedures considered for each reach, an option was considered for accreditation of the Catharine Creek South reach with the remaining reaches evaluated using the Natural Valley Procedure. This option recognizes the potential flood risk reduction of the Catharine Creek South reach if 44CFR§65.10-compliant data would be provided for the levee reach in support of accreditation. The Catharine Creek Ring Reach was not included as part of this analysis. It should be noted that any or all levee reaches could be accredited in the future; however, this example was selected as it recognizes that much of the inundation shown under the Natural Valley analysis is due to flooding from this reach.

The results of this analysis, shown in Figure 7, depict the Natural Valley Zone AE SFHA within the levee impacted area for inundation resulting from all reaches except the Catharine Creek South reach. The Catharine Creek South reach is shown as Shaded Zone X, with reduced flood hazard from the Catharine Creek Diversion Channel due to accreditation of the reach. Accreditation of the Catharine Creek South reach would require that the minimum requirements of 44CFR§65.10 have been certified by a professional engineer and deemed complete by FEMA. The potential for interior drainage SFHA would need to be evaluated in the future prior to updating the FIRM

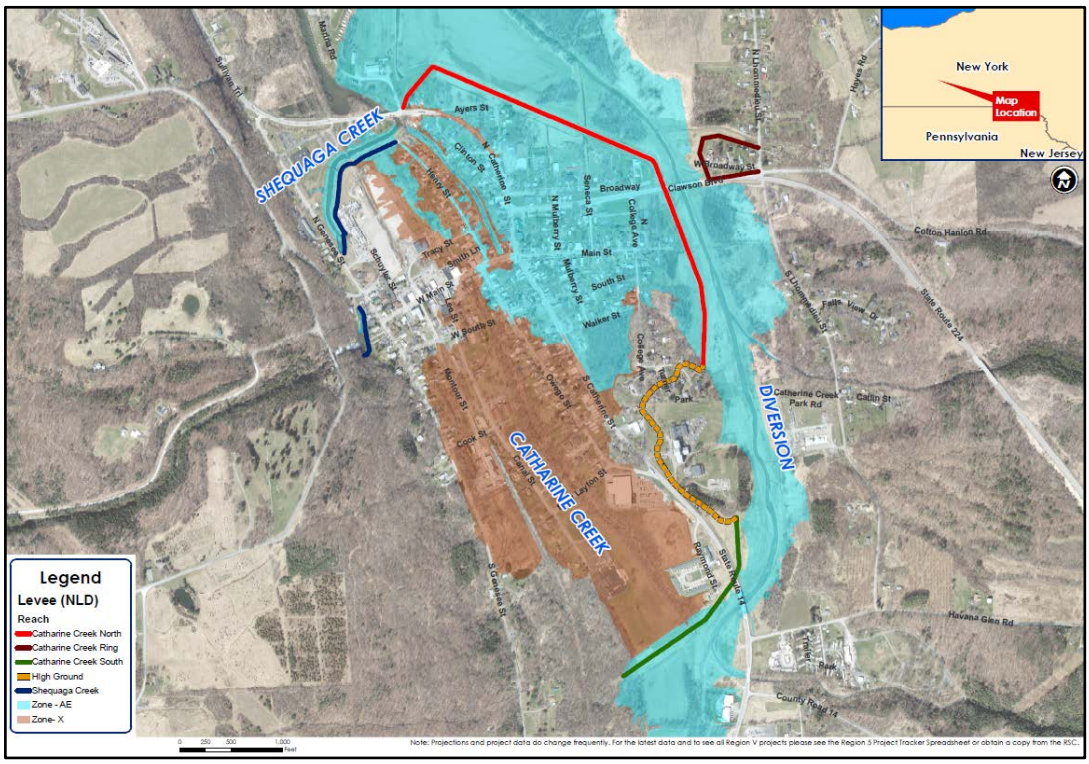

Figure 7: Natural Valley Procedure and Accreditation

Summary results from the Initial Data Analysis are included in Table 4.

Table 4. Results from the Initial Data Analysis

Reach	Approximate Length of Levee Segment (ft)	Comments: Natural Valley Procedure[3] (Figure 3)	Comments: Structural-Based Inundation Procedure[5] (Figure 5)	Comments: Natural Valley Procedure[2] / Accreditation[5, 6] (Figure 7)
		Approximate # Structures[7] Impacted by Zone AE: Over 450	*Approximate # Structures Impacted by Zone AE: Over 450*	*Approximate # Structures Impacted by Zone AE: Over 250*
Catharine Creek North	4,920	Results from updated hydraulic model (2D). Estimates potential inundation/levee impacted area if not mapped as reducing flood hazard.	Inundation extents similar to the Natural Valley Procedure for the 1-percent-annual chance flood. May be utilized for emergency planning.	Natural Valley
Catharine Creek South	2,070	Results from updated hydraulic model (2D). Estimates potential inundation/levee impacted area if not mapped as reducing flood hazard.	Inundation extents similar to the Natural Valley Procedure for the 1-percent-annual chance flood. May be utilized for emergency planning.	Accredited. 44CFR§65.10-compliant data required to map this scenario on the future FIRM.
Shequaga Creek	1,970	Results from updated hydraulic model (2D). Estimates potential inundation/levee impacted area if not mapped as reducing flood hazard.	Inundation extents slightly larger than the Natural Valley Procedure for the 1-percent-annual chance flood. May be utilized for emergency planning.	Natural Valley
Catharine Creek Ring	1,470	Results from updated hydraulic model (2D). Estimates potential inundation/levee impacted area if not mapped as reducing flood hazard.	Inundation extents similar to the Natural Valley Procedure for the 1-percent-annual chance flood. May be utilized for emergency planning.	Natural Valley

[3] Depicts levee reach as not reducing flood hazard. No additional data required to support future analysis or mapping.

[4] Hypothetical levee breach analysis. No additional data required to support future analysis or mapping.

[5] All minimum requirements of 44 CFR§65.10 are met. Certified data compliant with 44 CFR§65.10 required to support future analysis or mapping.

[6] 44 CFR§65.10 data can be submitted at any time for any hydraulically independent levee system.

[7] Approximate number of structures impacted estimated from aerial imagery.

6 Path Forward

6.1 Levee Analysis and Mapping Procedures

The Montour Falls Flood Damage Reduction Project includes the Catharine Creek Left Bank Levee System and the Catharine Creek Right (Ring) Levee System. Both levee systems are shown as reducing flood hazard on the effective FIRM. As no data in support of the 44CFR§65.10 requirements has been received by FEMA in support of the levee project, the levee systems would be considered non-accredited in a future remapping effort.

FEMA engaged the Village of Montour Falls through the Levee Analysis and Mapping Procedures for non-accredited levees process to help identify potential options to evaluate the flood hazard for the levee impacted areas. The community is considering moving forward with levee certification and the accreditation process to continue to map the reduced flood hazard due to the levee systems on the future FIRM.

Should the community be able to provide 44CFR§65.10 compliant data for the Catharine Creek Left Bank Levee System and/or the Catharine Creek Ring Bank (Ring) Levee System, the flood hazard of the associated levee impacted areas could be shown as shaded Zone X plus interior drainage SFHA. If 44CFR§65.10 compliant data can be provided for a hydraulically independent levee reach, such as the Catharine Creek South reach that ties into high ground at the upstream and downstream ends, the levee flood hazard can be shown as a composite of Zone AE and shaded Zone X plus interior drainage SFHA. If the community does not provide 44 CFR§65.10 compliant data, the effective FIRMs dated September 15, 1983 would be revised to show updated flood risk using the Natural Valley Procedure once the FEMA Regional Office incorporates updates into future mapping studies.

FEMA anticipates updating the flood hazard maps in the future, and would inform the community prior to the initiation of any update project Should 44CFR§65.10 compliant levee data be provided prior to the Letter of Final Determination for the countywide mapping project, it should be incorporated into the final countywide mapping. However, data in support of 44CFR§65.10 may be submitted at any time through the Letter of Map Revision (LOMR) process to update the FIRM. It is recommended that the community coordinate with FEMA Region II in advance of any submittal to keep the Region apprised of the levee status. FEMA's Levee Accreditation Checklist has been included in Appendix D for reference.

7 References

FEMA: Non-Accredited Levee Analysis and Mapping Guidance, September 2013

FEMA: Guidance for Flood Risk Analysis and Mapping, Levees, February 2018

FEMA, Flood Insurance Study, Village of Montour Falls, New York, Schuyler County, October 1980.

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

USACE, National Levee Database (https://levees.sec.usace.army.mil/#/), 2018.

Appendix A
Stakeholder Engagement - LLPT Meeting 1 Information

Montour Falls, NY LLPT 1 Meeting Notes

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VILLAGE OF MONTOUR FALLS, NEW YORK

DATE: Wednesday, September 19, 2018 **TIME:** 11:00 AM – 12:00 PM
LOCATION:
Montour Falls Village Hall Boardroom – 408 W Main St Montour 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:** MFNYL1408 **Password:** 3601117	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

FEMA

RiskMAP
Increasing Resilience Together

Montour 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), the U.S. Army Corps of Engineers (USACE), and the New York State Department of Environmental Conservation (NYSDEC) worked with Village of Montour Falls and Town of Montour officials to identify flood hazards for non-accredited levees as they relate to the Catharine Creek 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.

Currently, the levee is shown on the 1983 Flood Insurance Rate Map (FIRM) as reducing flood risk (providing protection) on the land side of the levee system. However, FEMA does not have any data to show that the levee meets the minimum FEMA requirements to provide such protection.

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.

Montour 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.

Shudipto also provided an overview of the levee system alignment and reviewed a timeline from the early 1950's construction of the levee system to 2013 when the Operation Guidance for the Analysis and Mapping Procedures for Non-Accredited Levees was finalized.

Stephanie then provided an overview of the Catharine Creek Levee system with respect to the levee system's status on the September 15, 1983 Flood Insurance Rate Map (FIRM), which depicts the levee system as reducing flood risk. She noted that, based on the available levee crest elevations from USACE National Levee Database (NLD) and shown on slide 6, the Left Bank Levee along the Catharine Creek Diversion Channel appears to meet minimum freeboard requirements of 3 feet minimum freeboard above the Base (1-percent-annual-chance) Flood Elevation (BFE). She further noted that levee crest elevations are currently not available for the levee reach along Shequaga Creek.

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.

Shudipto noted that the Village of Nichols was able to have their levee system certified using New York Rising grant funding. 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 it be of interest.

Montour Falls, NY LLPT 1 Meeting Notes

ATTENDEES *Continued*

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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. 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.

As previously noted, the FIRM for the Village of Montour Falls is from 1983. While no mapping project is currently funded to update the FIRM for the Village of Montour Falls, this Levee Discovery project will help identify potential options for mapping the flood risk associated with the levee system.

Montour 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.

Shudipto discussed that the data collected, including GIS shape files, will be given to the community 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.

Shudipto 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 review the results with the community. The LLPT 2 meeting is envisioned to occur in December. There may also be coordination calls scheduled between the LLPT meetings, if needed.

Shudipto also noted that FEMA Region II availability may be reduced in the event of major disaster declarations during hurricane season; however, the project is anticipated to continue as scheduled.

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.

Montour Falls, NY LLPT 1 Meeting Notes

DISCUSSION

QUESTION:

FEMA: Have there been any changes to the levee system in light of recent flooding events?

ANSWER:
Mayor King: No.
The Army Corps [USACE] completes inspections every year.
The State ensures compliance with operation and maintenance and has done a good job.

USACE: If a levee is damaged by a storm event and it is in good standing in USACE's PL 84-99 Rehabilitation Program, the levee owner would be eligible for Federal assistance to make repairs. The Catharine Creek Left and Right Bank Levee System is active in the PL 84-99 and currently is rated as minimally acceptable.

QUESTION:
FEMA: What was the response by USACE and NYSDEC to recent significant flood events?

ANSWER:
NYSDEC: Staff checked, and checks, all the levee gates prior to flood events, and post-high-water events. NYSDEC also cleans and inspects the gates.

QUESTION:
Mayor King: Where does a levee reach begin and end? Who decides this?

ANSWER:
Stephanie explained that the available levee data is reviewed with respect to the five reach analysis processes and discussed with the levee stakeholders so that all are in agreement with the path forward.

FEMA: Commonly, reaches are defined at points where materials may change – for example, a levee portion made of earthen materials – or where there are levee segments that have different heights.

Montour Falls, NY LLPT 1 Meeting Notes

QUESTION:
Mayor King: What exactly is the Village's responsibility for the levee system? Who owns the system?
He noted that the Village is not allowed to perform basic maintenance, like mowing grass on top of them, as portions of the levee system are on private property.

ANSWER:
An action item for future discussion is for the LLPT to work to clarify the ownership of/easements for the levee.

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 Montour Falls, Schuyler County Levee Flood Hazard Identification

Local Levee Partnership Team (LLPT) Meeting 1

September 19, 2018

FEMA

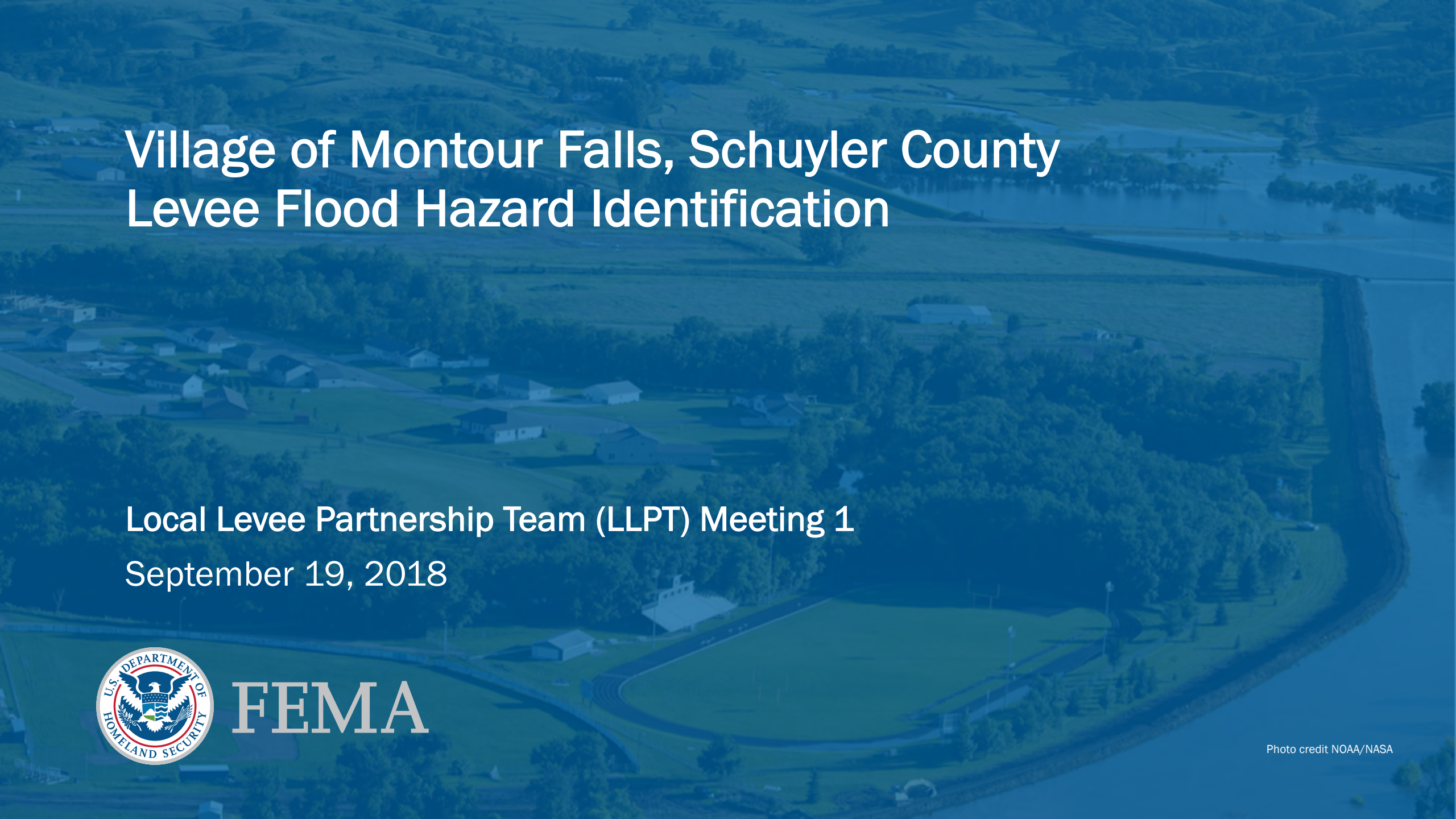


Photo credit NOAA/NASA

“ 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

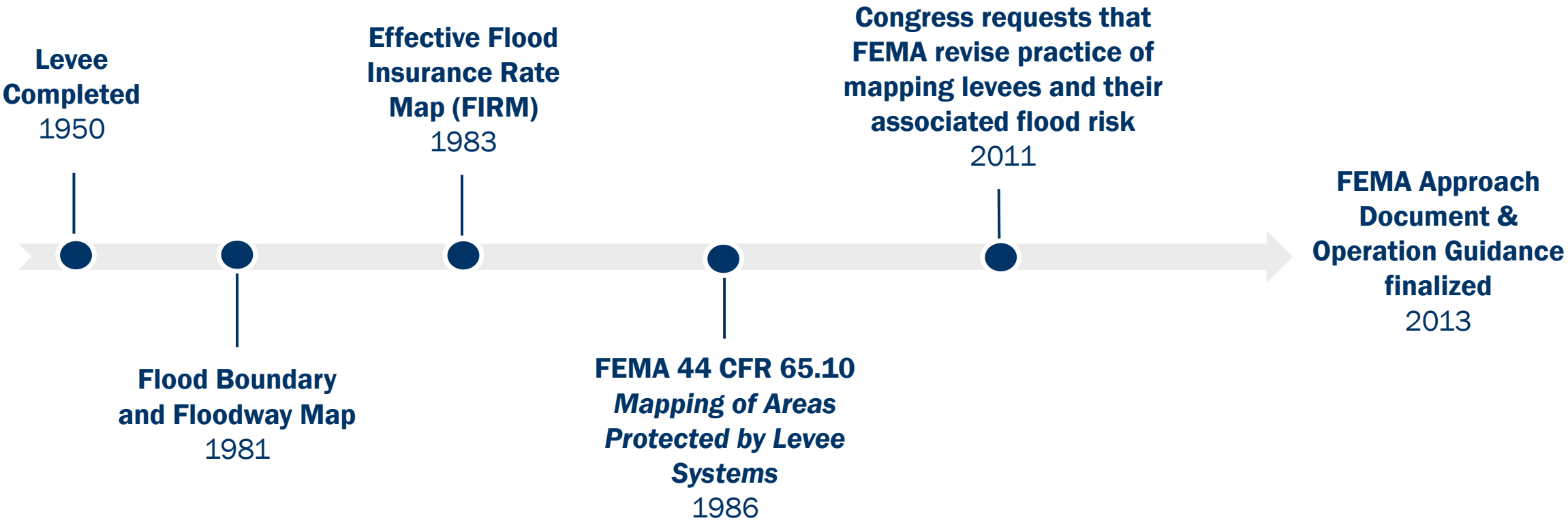
Levee System Overview

FEMA

Catharine Creek Left and Right Bank Levee System

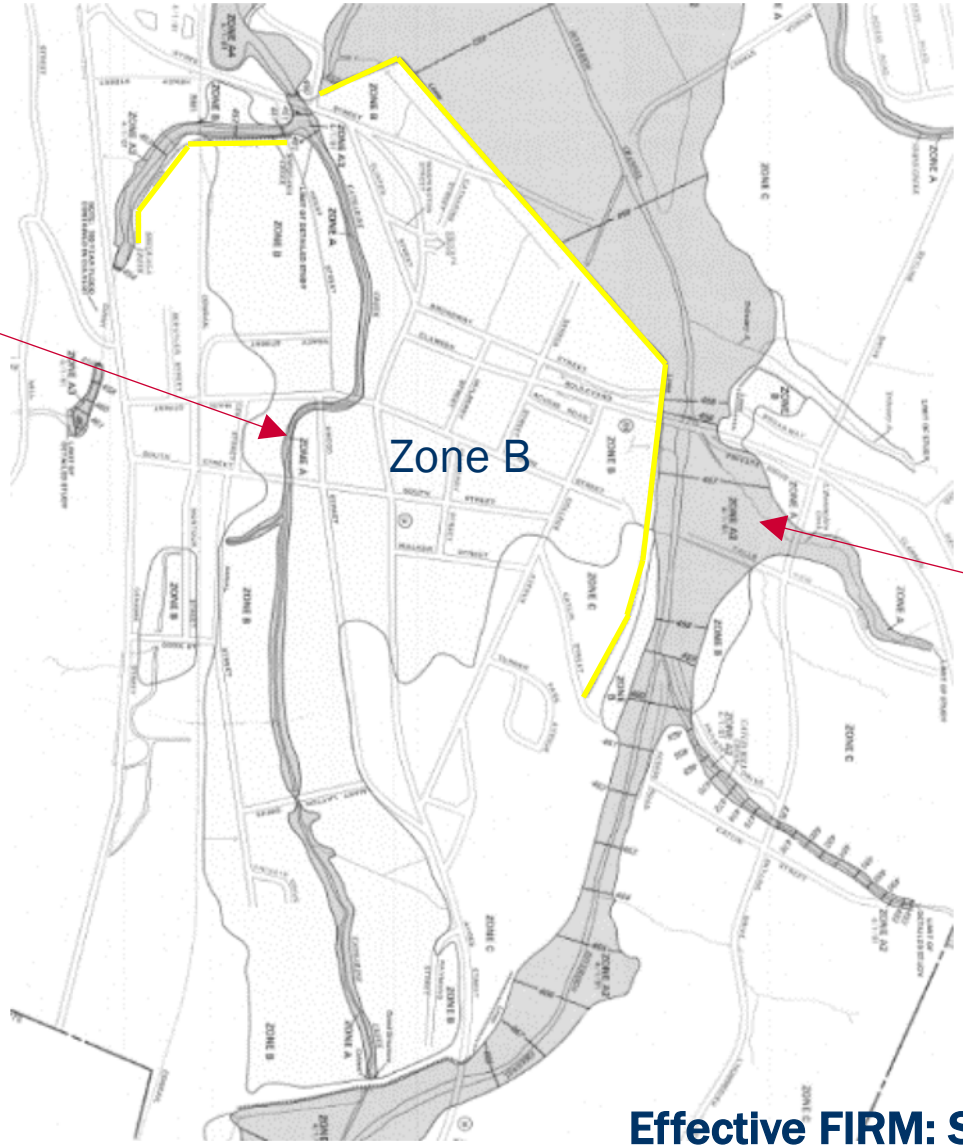
FEMA

Catharine Creek Left and Right Bank Levee System



FEMA

Effective Flood Insurance Rate Map



Effective FIRM: September 15, 1983

FEMA

Levee Flood Hazard Identification

FEMA

How Levee Systems Are Categorized

- Non-Accredited Levee System
- Accredited Levee System
- Certified Levee System

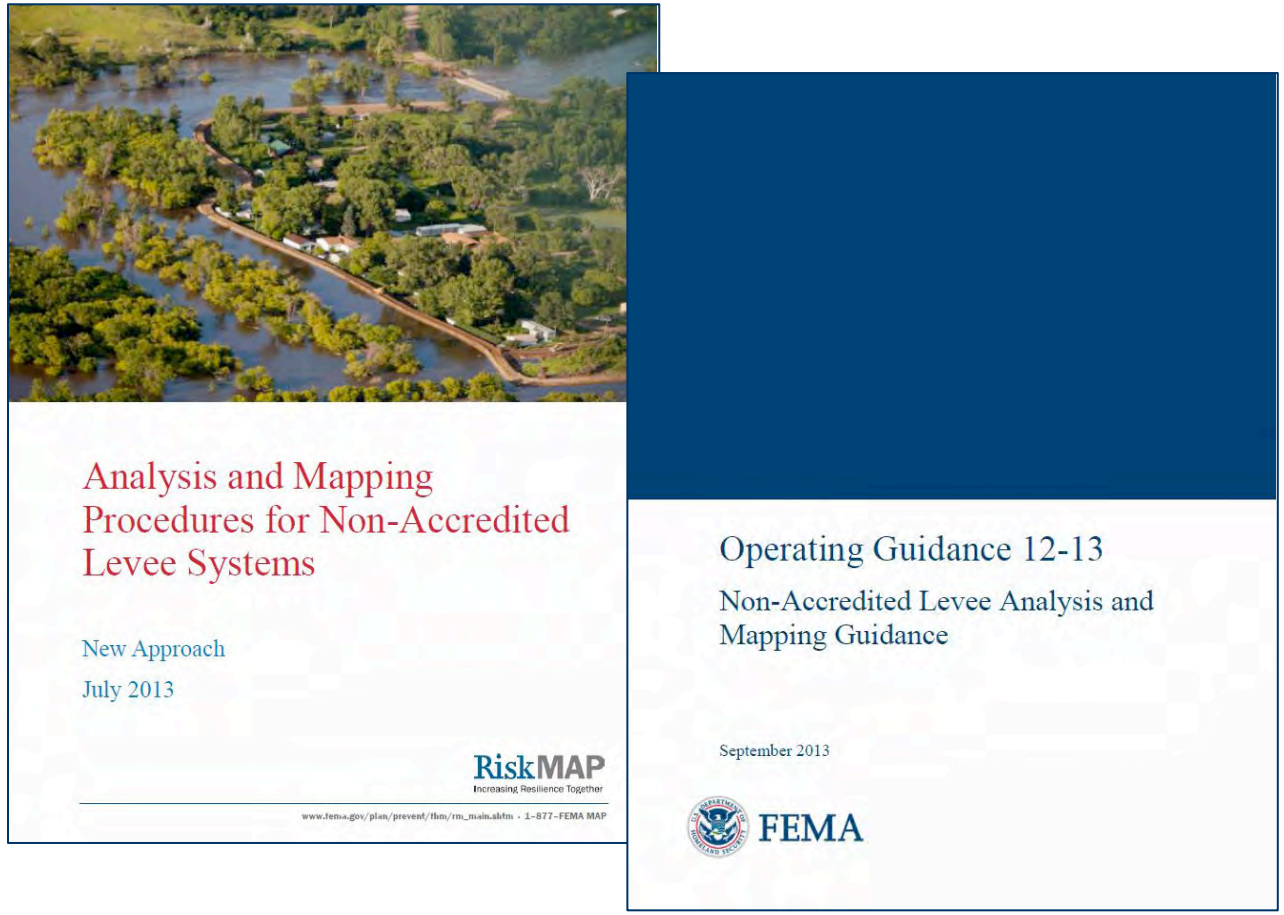
FEMA

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**



FEMA

Analysis and Mapping Procedures for Non-Accredited Levees

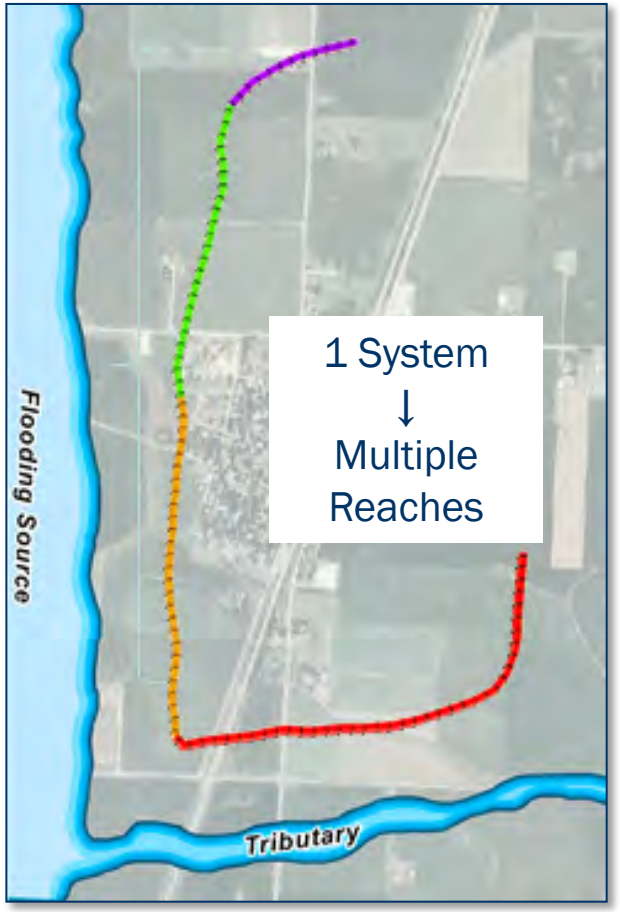
Includes:

- 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 as “**Reaches**” based on the attributes of the specific reach.

FEMA

Breaking a Levee System into Reaches

- The first step is to **analyze risk** for the levee system **by dividing it into segments.**
  - These segments, known as **reaches**, allow FEMA to more precisely evaluate the flood hazard for that area.
- A system can be broken up into multiple reaches in order to analyze the flood risk in its vicinity.



FEMA

Reach Analysis Procedures

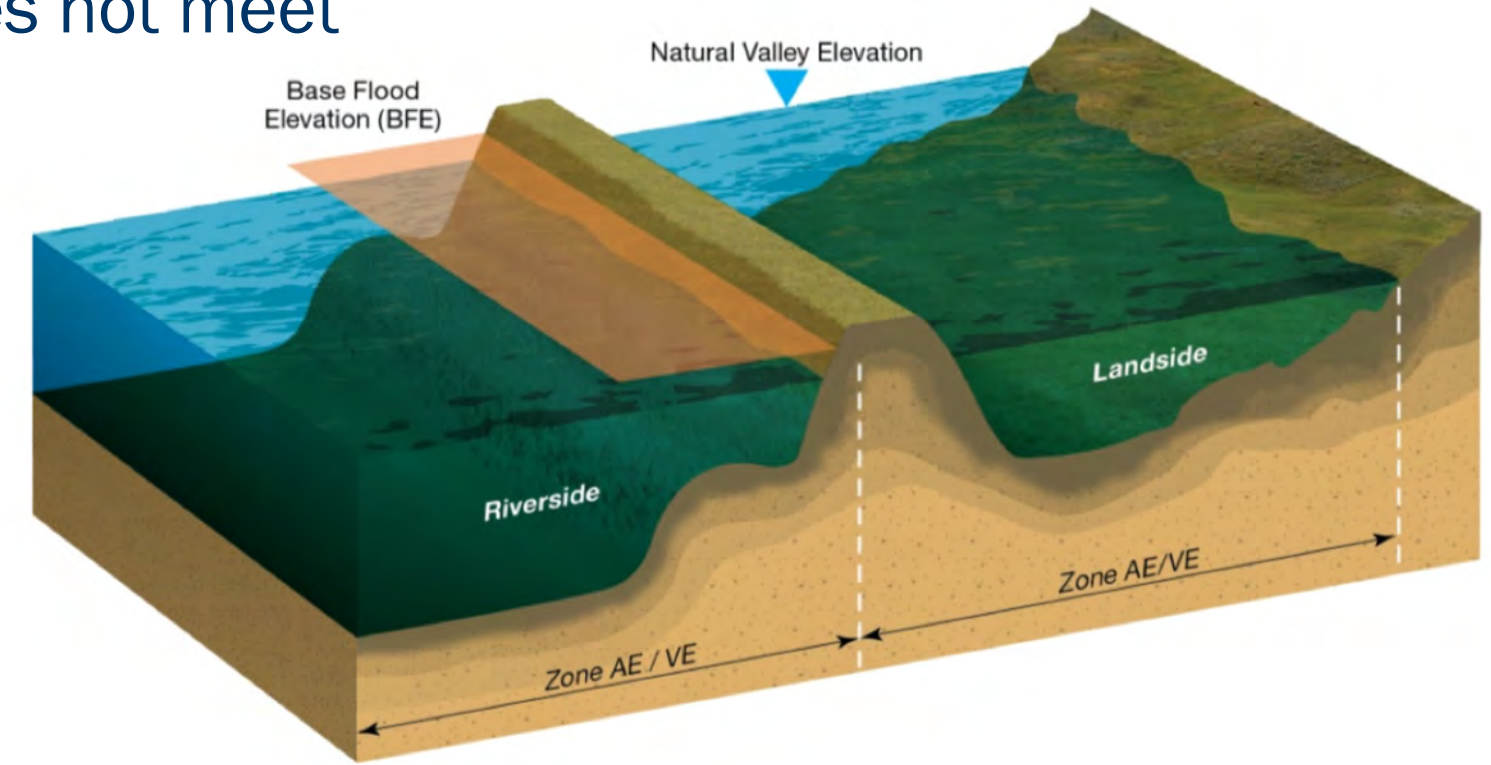
- Natural Valley Procedure
- Structural Based Inundation Procedure
- Overtopping Procedure
- Freeboard Deficient Procedure
- Sound Reach Procedure

FEMA

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

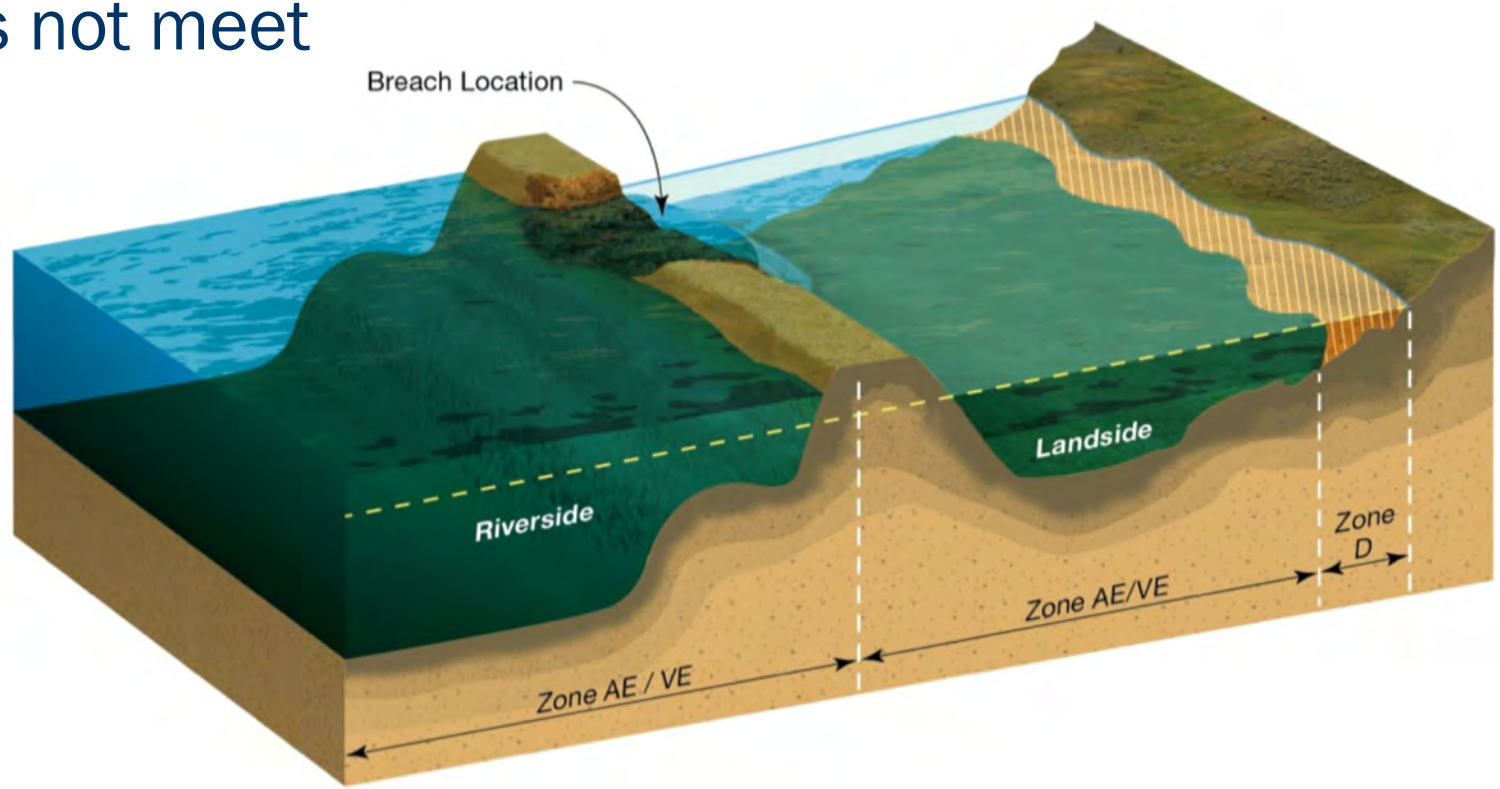


FEMA

Structural-Based Inundation Procedure

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

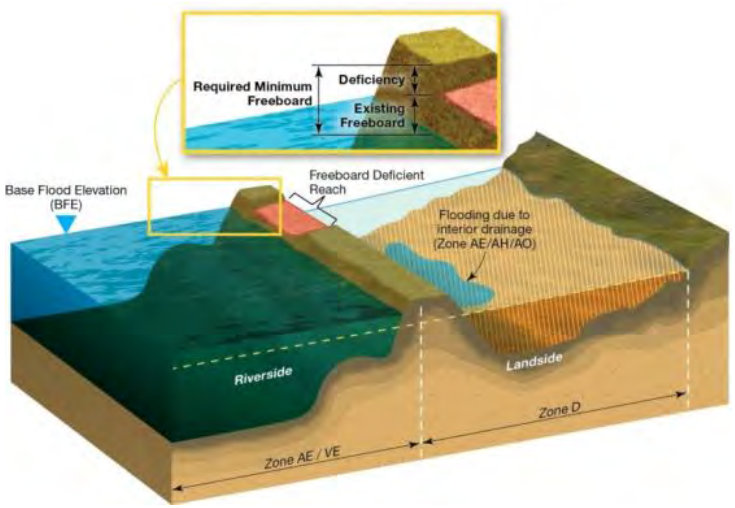
Application: Levee does not meet 44CFR65.10

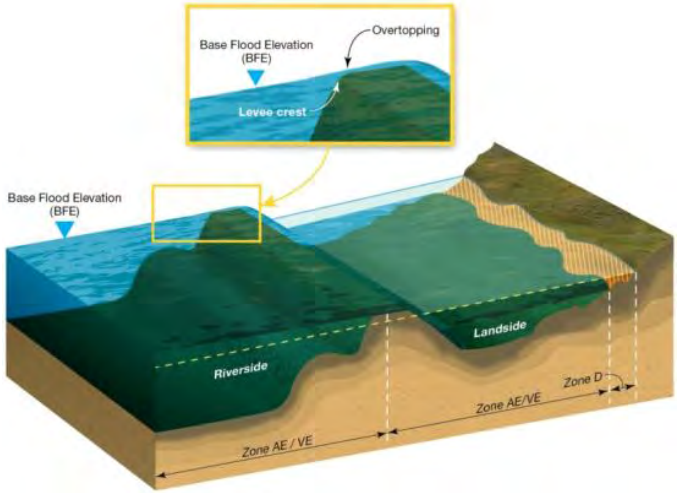


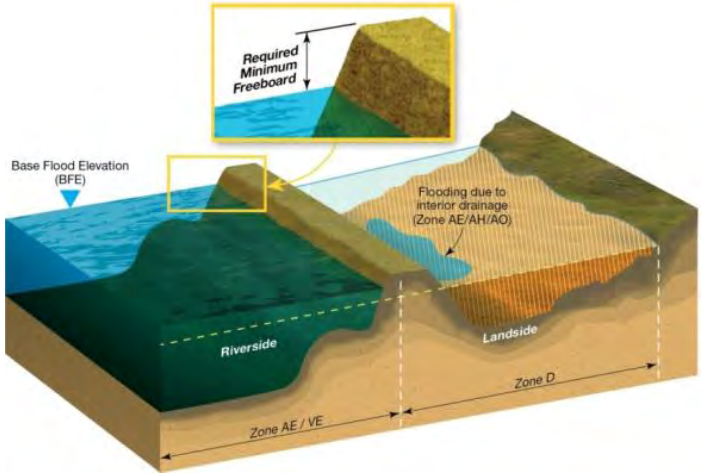
FEMA

Other Potential Reach Analysis Procedures

- Freeboard Deficient Procedure
- Overtopping Procedure
- Sound Reach Procedure







FEMA

Mapping Path Forward Based on Data

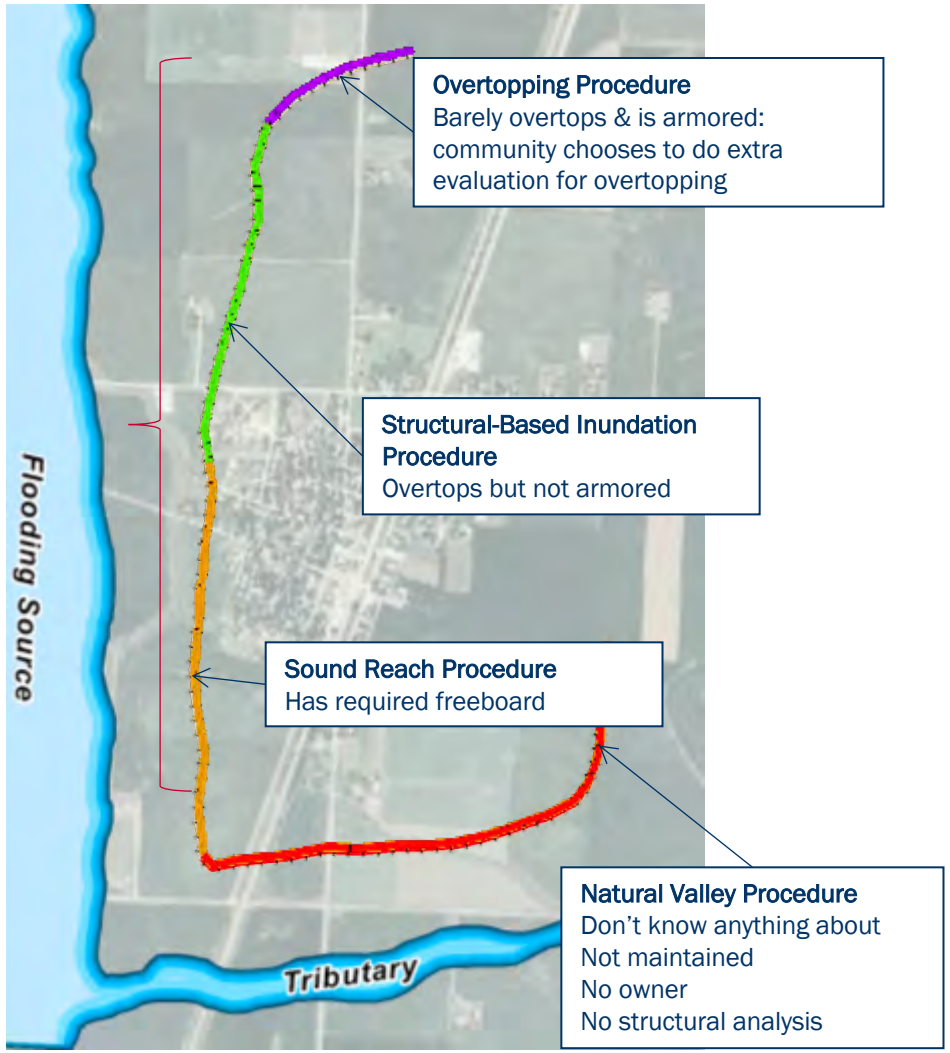
	Reach Procedures				
	Sound **	Freeboard Deficient **	Overtopping **	Structural-Based Inundation *	Natural Valley *
Elevation Information for the Levee Crest and Toe	✓	✓	✓	✓	
BFE + Freeboard Less than Levee Crest	✓				
BFE Less than Levee Crest	✓	✓			
Operations and Maintenance Plan	✓	✓	✓	✓	
Structural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

* - No cost to community

** - Potential additional cost to community

FEMA

Benefits of Applying Procedures to Individual Reaches



FEMA

Path Forward & Next Steps

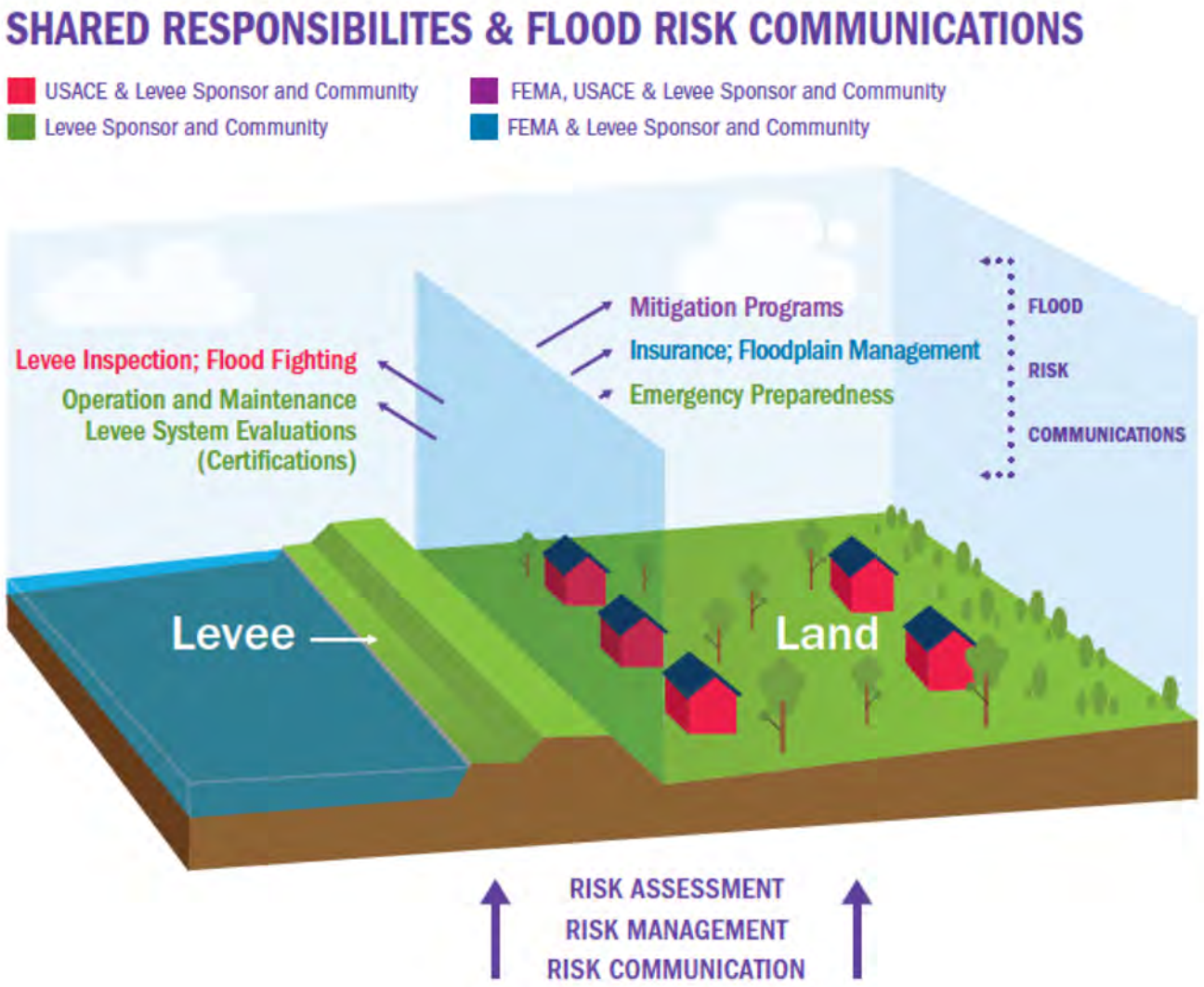
FEMA

Village of Montour 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.

FEMA

Shared Levee Responsibilities



FEMA

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

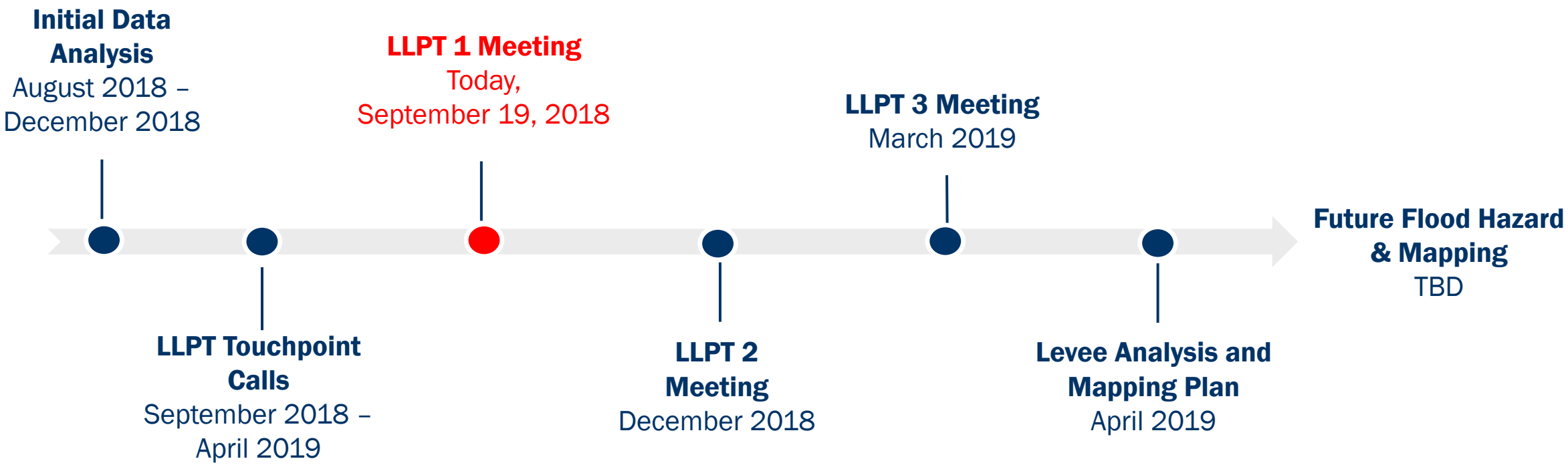
Levee System Data & Documentation Needed

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

FEMA

Village of Montour Falls LLPT Timeline:



FEMA

QUESTIONS?

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		Curtis Smith, STARR II curtis.smith@stantec.com	(646) 842-8239
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FEMA

FEMA

Thank You

Challenges, Innovation, The way forward

Appendix B
Stakeholder Engagement - LLPT Meeting 2 Information

Montour Falls, NY LLPT 2 Meeting Notes

ATTENDEES

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VILLAGE OF MONTOUR FALLS, NEW YORK

DATE: Wednesday, December 11, 2018 **TIME:** 11:00 AM – 12:30 PM
LOCATION:
Montour Falls Village Hall Boardroom – 408 W Main St Montour Falls, NY

Action Item	Owner
1. Meeting attendees to continue 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:** MFNYL1408 **Password:** 3601117	Community Leaders
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

- Present initial analysis of levee systems modelling
- Continue dialogue on levee context
- Continue to review materials on FTP site

Montour Falls, NY LLPT 2 Meeting Notes

ATTENDEES *Continued*

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OVERVIEW

Matt Kroneberger opened the meeting and facilitated introductions of speakers, Shudipto (Shu) Rahman, Stephanie Nurre, and Sagar Neupane, and the attendees present at the meeting and joining over the phone.

Shu then reiterated FEMA's focus on levee flood hazard identification and risk communication and thanked attendees for continuing their engagement within the local levee partnership (LLPT) process for this second meeting in Montour Falls.

Stephanie refreshed the group on the alignment of the Catharine Creek Left and Right Bank levee systems based on National Levee Database (NLD). Stephanie also highlighted the flood risk shown on the effective 1983 Flood Insurance Rate Map (FIRM) including that of Shequaga Creek, Catharine Creek, Catlin Mill Creek and the Diversion Channel east of downtown Montour Falls. It was noted that the Schuyler County effective FIRMs are paper maps as they have not yet been modernized to digital format.

Further information on the levee systems were provided by United States Army Corps of Engineers (USACE) after the first LLPT meeting in September 2018 which aided initial analysis. This included:

- FY17, FY18 Levee Inspection Reports
- Catharine Creek Levee As-Built Plans
- Shequaga Creek Levee As-Built Plans
- Catharine and Shequaga Creek Operation and Maintenance Manual
- 1948 USACE Design Analysis Report

Stephanie shared exhibits with levee profile data from the NLD for the reaches of the levee systems along the Catharine Creek Diversion Channel. The levee crest profile for the Left Bank Levee system west of Catharine Creek was based on the as-built plan as no NLD levee crest survey data is available. Based on the available levee crest and water surface profile data, each levee system appears to meet minimum freeboard requirements.

Sagar and Stephanie then shared the results of the initial analysis for both the Structural-Based Inundation and Natural Valley mapping procedures for each levee system.

Montour Falls, NY LLPT 2 Meeting Notes

ATTENDEES *Continued*

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Phone: 212.237.6373
Email: matt.kroneberger@ogilvy.com

Sagar and Stephanie shared analysis results from mapping using the Natural Valley Procedure which identifies the landside flood risk as though the levee does not impact flood elevation and does not reduce flood risk. For the Natural Valley Analysis, the effective 1-Dimensional HEC-RAS analysis was refined to a 2-Dimensional hydraulic model to better reflect the potential flood risk in the leveed area

Sufficient stream gage data was not available to develop the peak flow hydrograph necessary for the 2-Dimensional analysis; therefore, regional methodologies were vetted to develop the hydrograph corresponding to the peak flowrate for the 1-percent-annual-chance flood.

The Southern Tier Planning Board representative, Janet Thigpen, noted 30 years of gage data was available for the area, however, the data was not granular enough to leverage for this analysis

For the Structural-Based Inundation Procedure, multiple hypothetical breach locations were chosen along each levee system based on FEMA's guidelines for the analysis. It should be noted that this analysis is not intended to predict potential breaches of the levee systems as they could breach at any time, point or at multiple points along the levee system(s). The composite inundation area resulting from the breach analyses is not significantly different from the results of the Natural Valley analysis and a similar number of structures could be inundated by the 1-percentannual-chance flood.

Based on the data currently available, the results of the Natural Valley analysis would likely be used to map the levee flood hazard in the future, should the minimum requirements of Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44 CFR 65.10) not be met. The results of the Structural-Based Inundation Procedure could be leveraged for emergency planning.

Stephanie then discussed the levee systems' current accreditation status. The levee systems are considered non-accredited as FEMA does not have certified engineering data to show that they meet the minimum requirements of 44 CFR 65.10 to be recognized on the FIRM as reducing the flood hazards posed by a 1-percent-annual-chance flood.

Shu noted that the Village of Nichols was able to have their levee system certified using New York Rising grant funding. 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.

Montour Falls, NY LLPT 2 Meeting Notes

Shu then discussed next steps in the levee accreditation process.
FEMA will prepare a Levee Analysis and Mapping plan that will include:

- Summaries of Data Collected and LLPT Discussions
- Results from the Initial Data Analysis
- Path Forward to Map Flood Hazard in the Levee Impacted Area

A touchpoint call between the LLPT 2 meeting and the LLPT 3 meeting was considered and will likely be scheduled early next year. The LLPT 3 meeting was discussed for March 2019.

Community members actively discussed cost considerations for the various reach analysis procedures outlined. Those questions and answers are summarized in the discussion below.

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

DISCUSSION

QUESTION:
Southern Tier Planning Board:
There are 30 years-worth of annual peaks (stream gage) data. Was that data not applicable to the hydrologic analysis?

Response:
STARR II:
Hydrology data for this analysis needs to be more granular data (flowrate over time) than only the peak flowrates.

QUESTION:
Village of Montour Falls:
If we do not get the levee[s] accredited, will the Natural Valley Procedure apply to our flood insurance rates?

Response:
STARR II:
For a levee system to be accredited, all the 65.10 data, would need to be certified by a professional engineer and submitted to FEMA for a completeness check. Without that data, the Natural Valley Procedure in this case would be applied to reflect the levee flood hazard.

Montour Falls, NY
LLPT 2 Meeting Notes

QUESTION:
Village of Montour Falls:
How many buildings would be mapped into the flood plain as part of the Natural Valley Procedure?

Response:
STARR II:
Approximately 400 buildings could be inundated by the 1-percent-annual-chance flood.

QUESTION:
Village of Montour Falls:
Even with all of this information, it sounds like you are going to require us to get our levee system accredited? How much is this going to cost? Why go through this process?

Response:
STARR II, FEMA:
FEMA does not require that communities accredit their levee systems, but provides information so that communities are able to make decisions that are best for their residents.

Every levee system is different and has unique features that affect analysis requirements and cost of analysis. For the levee systems in Montour Falls, the analysis could also provide useful management and risk information regarding the levee system, such as if a pipe is not accounted for, or an embankment cannot be certified, there may be the risk of levee failures during a flood event. Levee analysis works to identify these types of concerns.

The cost burden of levee analysis becomes lower when information is already available. Again, there is a significant amount of lead time before flood risk mapping would become effective.

An example of a community that has gone through the certification process is the Village of Nichols in Tioga County. They worked with a consultant to look at the cost-benefit analysis. In this case, they were able to hire an engineer to certify their flood wall. That made the most financial sense to them. FEMA can provide contact to the Village of Nichols and share outreach materials used as part of the accreditation process.

Montour Falls, NY LLPT 2 Meeting Notes

To offset analysis costs, the Community may take advantage of state and local government grants. FEMA can help facilitate that dialogue. As an example, other hazard planning products, like a Hazard Awareness Map, can be used to gather information for the levee analysis.

QUESTION:
Southern Tier Planning Board:
As part of the levee accreditation process, geotechnical analysis and modeling would be required, needing updated hydrology and hydraulics, correct.

Response:
STARR II:
Currently, the effective model is what stands.
As part of the countywide model, that would become the baseline for freeboard. Currently, the model is shown as acceptable. We can look into if the stream needs to be restudied.
There would also need to be an analysis of interior flood risk.

QUESTION:
Village, Town of Montour Falls, Southern Tier Planning Board:
What are some anticipated costs to the community for levee certification for Montour Falls?

Response:
FEMA:
Costs vary for different levee systems.

Southern Tier Planning Board:
In my experience, it can be between $100,000-$200,000. The closest funding match I've seen is from the Appalachian Regional Commission, which caps their match at 50% of certification costs.

FEMA:
The Village of Nichols levee certification, for approximately 1-mile of levee, was around $250,000. That system was also complicated by interaction with New York State Route 17, which required further coordination for data analysis.

Village of Montour Falls:
We can't do anything [pay for certification] in Montour Falls. We do not have the income.

Montour Falls, NY
LLPT 2 Meeting Notes

QUESTION:
Village, Town of Montour Falls:

If the levees aren't accredited, what are next steps? What would occur then?

Response:
FEMA:
If the flood risk for the levee system is depicted as Natural Valley on future FIRM, once the FIRM is effective, structures with federally backed mortgages that are located in the Special Flood Hazard Area would have mandatory flood insurance purchase requirements.

STARR II/FEMA:
Those expenses could be mitigated several ways for homeowners.
One example is a Preferred Risk Policy.
The insurance rate could be lower for a period of time, for example, if a property currently mapped in a Zone B purchased flood insurance prior to the FIRM becoming effective.

Southern Tier Regional Planning Board:
New buildings and building improvements constructed in the floodplain would be subject to floodplain building regulations including having the lowest floor of the building 2 feet above the base flood elevation (BFE).

STARR II/FEMA: Agreed.

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).

Montour Falls, NY
LLPT 2 Meeting Notes

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 Montour Falls, Schuyler County Levee Flood Hazard Identification

Local Levee Partnership Team (LLPT) Meeting 2

December 11, 2018

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.

FEMA

Today's Agenda

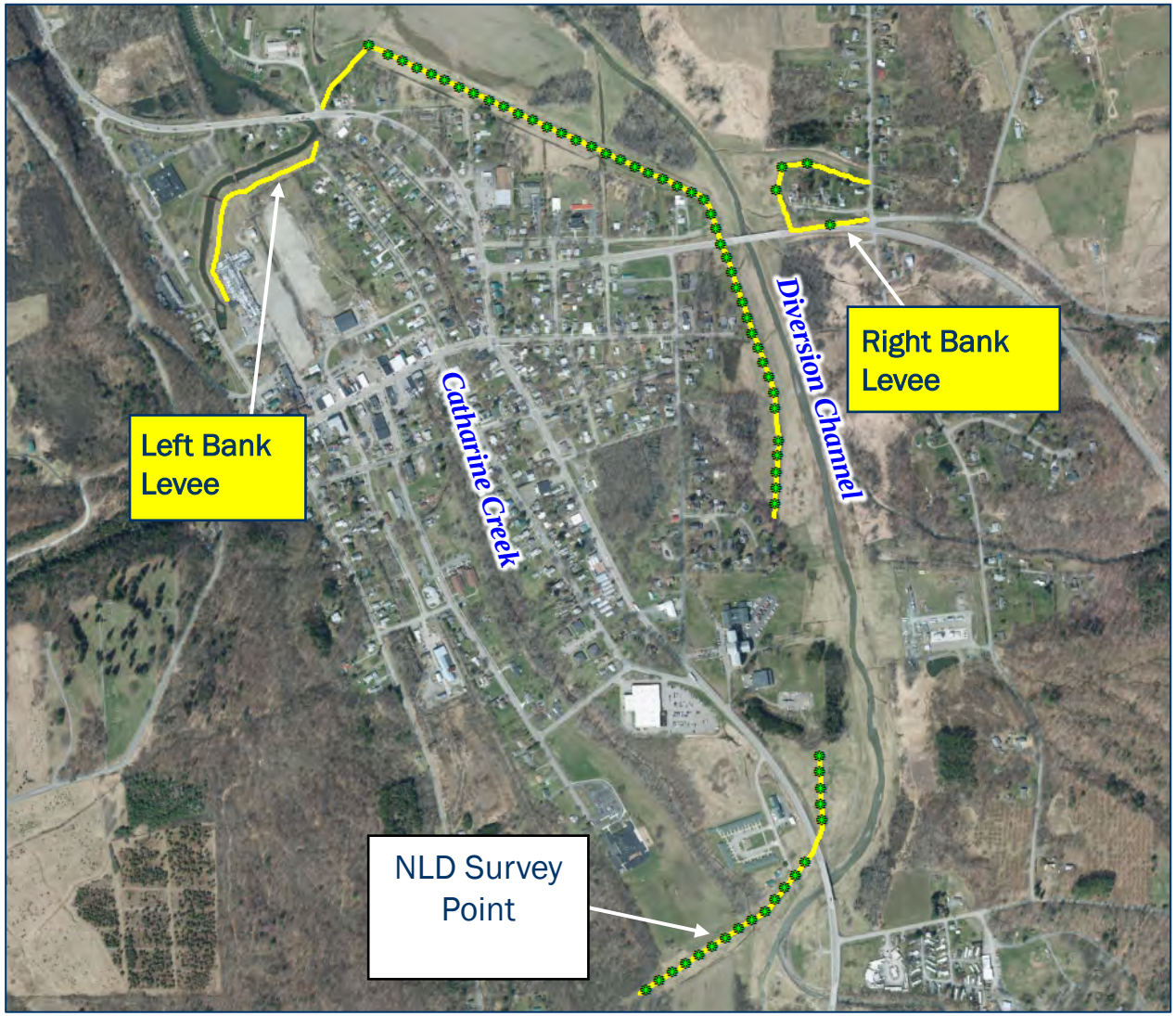
1	2	3	4
Review Levee Flood Hazard	Results of Initial Data Analysis	Application of Reach Study Procedures	Next Steps

FEMA

Review Levee Flood Hazard

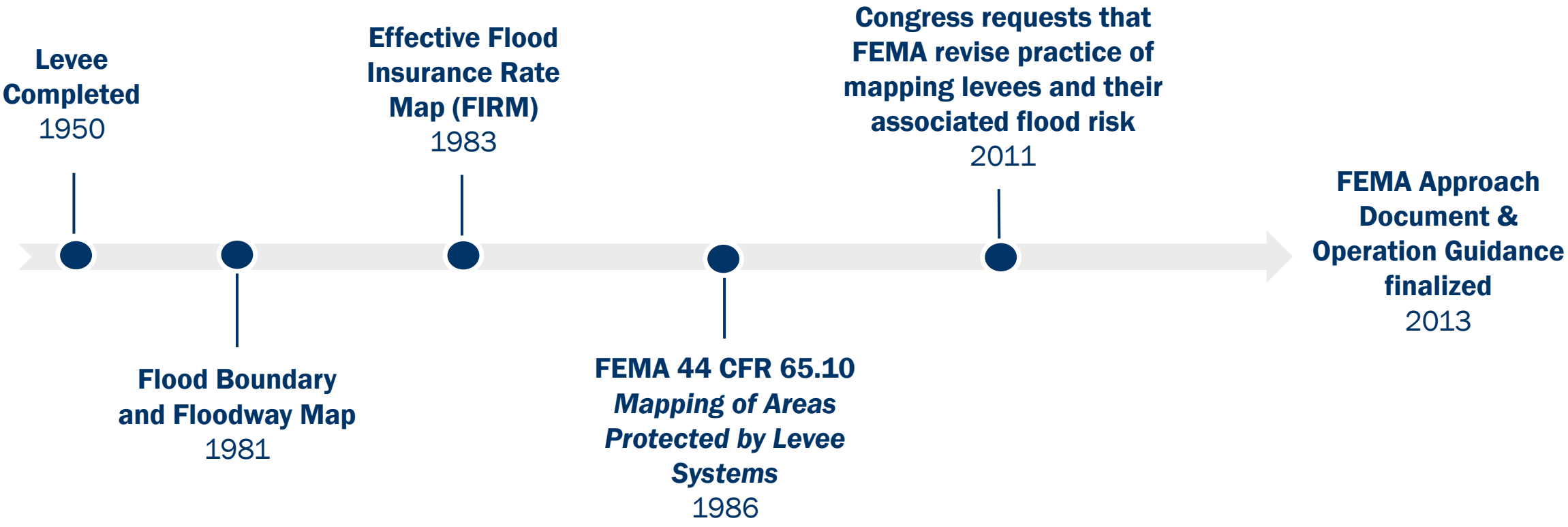
FEMA

Catharine Creek Left and Right Bank Levee System



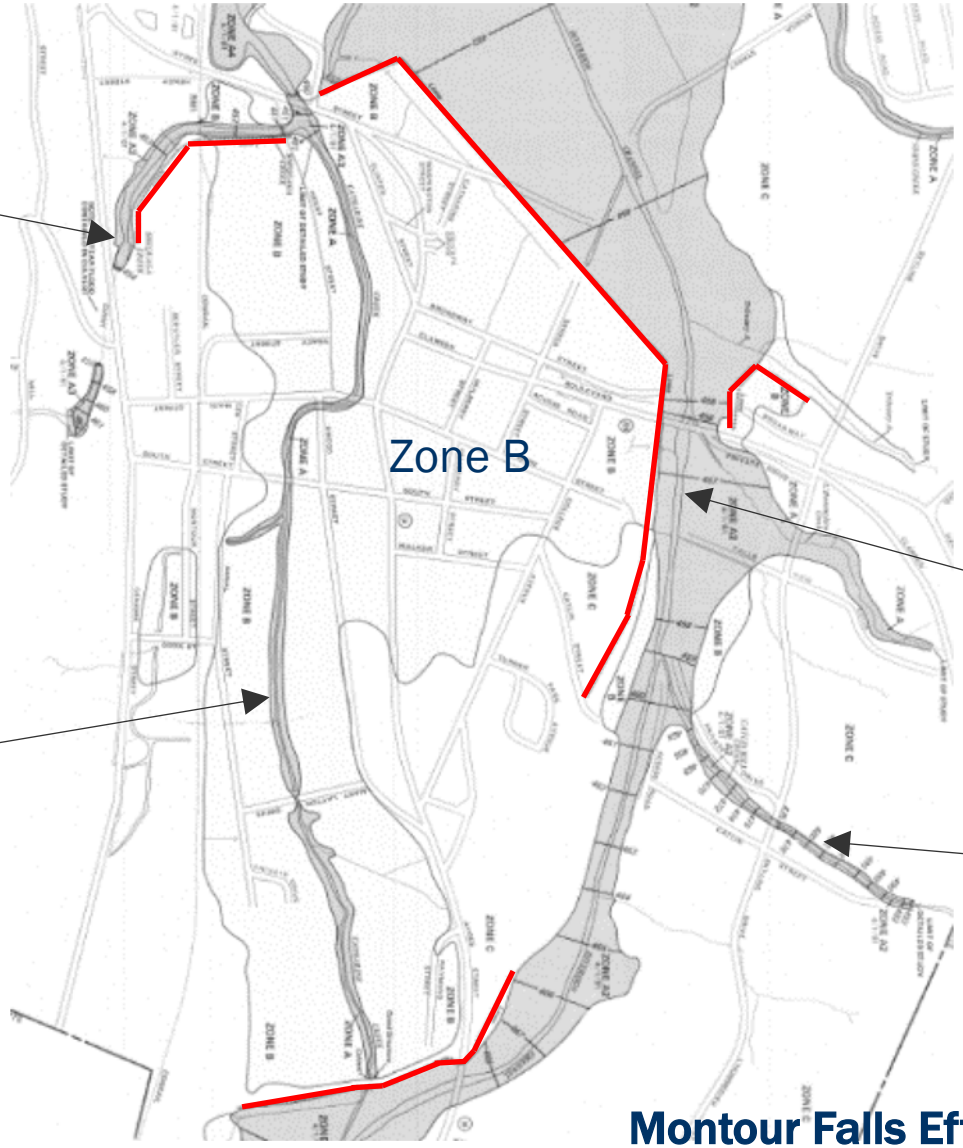
FEMA

Catharine Creek Left and Right Bank Levee System



FEMA

Effective Flood Insurance Rate Map



Montour Falls Effective FIRM: September 15, 1983

FEMA

First Meeting Recap

- Initial Stakeholder Engagement Meeting – September 19, 2018
  - Recap of community issues/questions
- Schuyler County Map Updates
- Reach Procedures
  - Natural Valley
  - Structural-Based Inundation
  - Freeboard Deficient
  - Overtopping
  - Sound Reach

FEMA

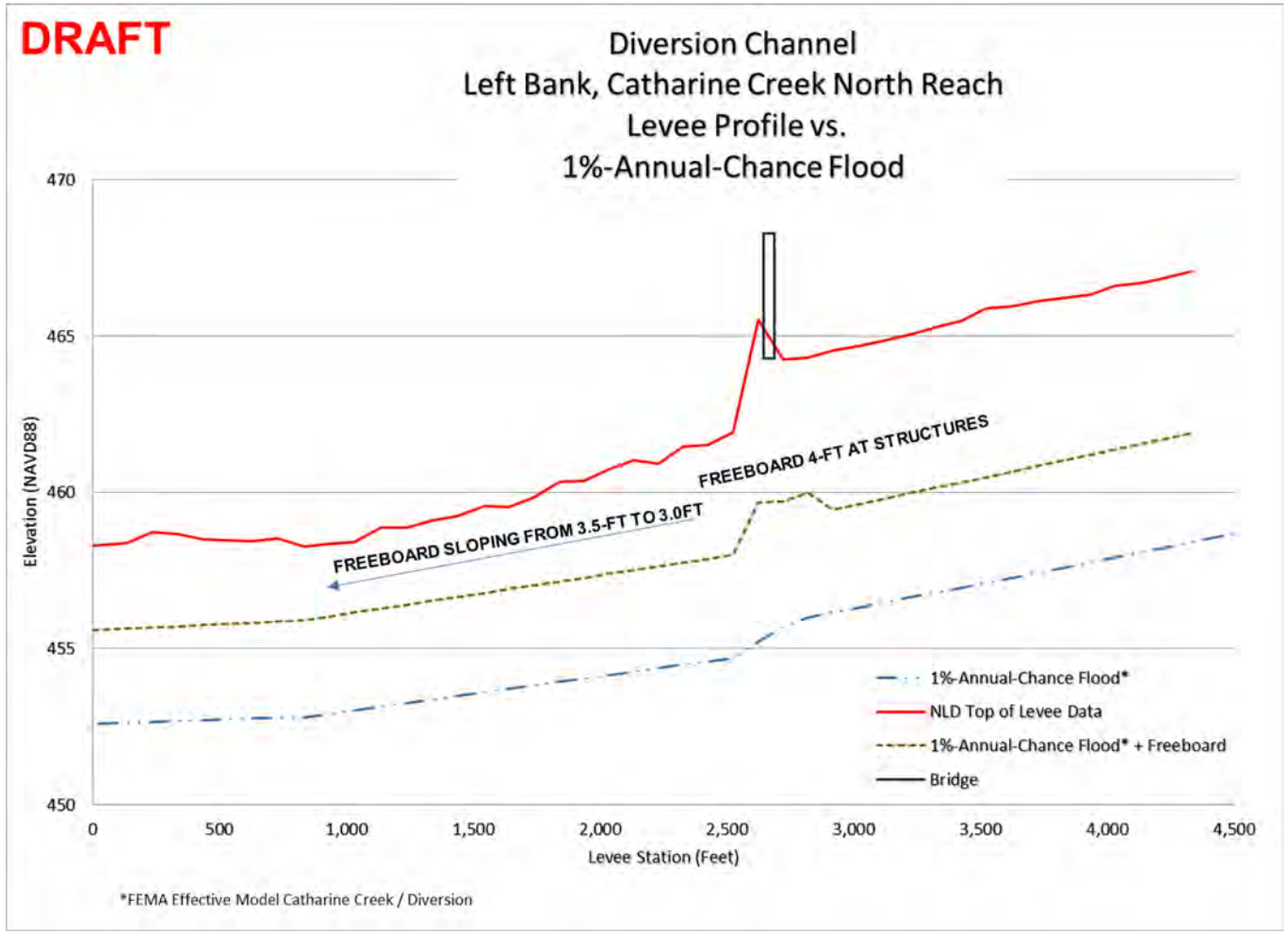
Status Update

- Data Collection - USACE
  - FY17, FY18 Inspection Reports
  - Catharine Creek As-Built Plans
  - Shequaga Creek As-Built Plans
  - Catharine and Shequaga Creek Operation and Maintenance Manual
  - 1948 USACE Design Analysis Report

- Any updates from community?

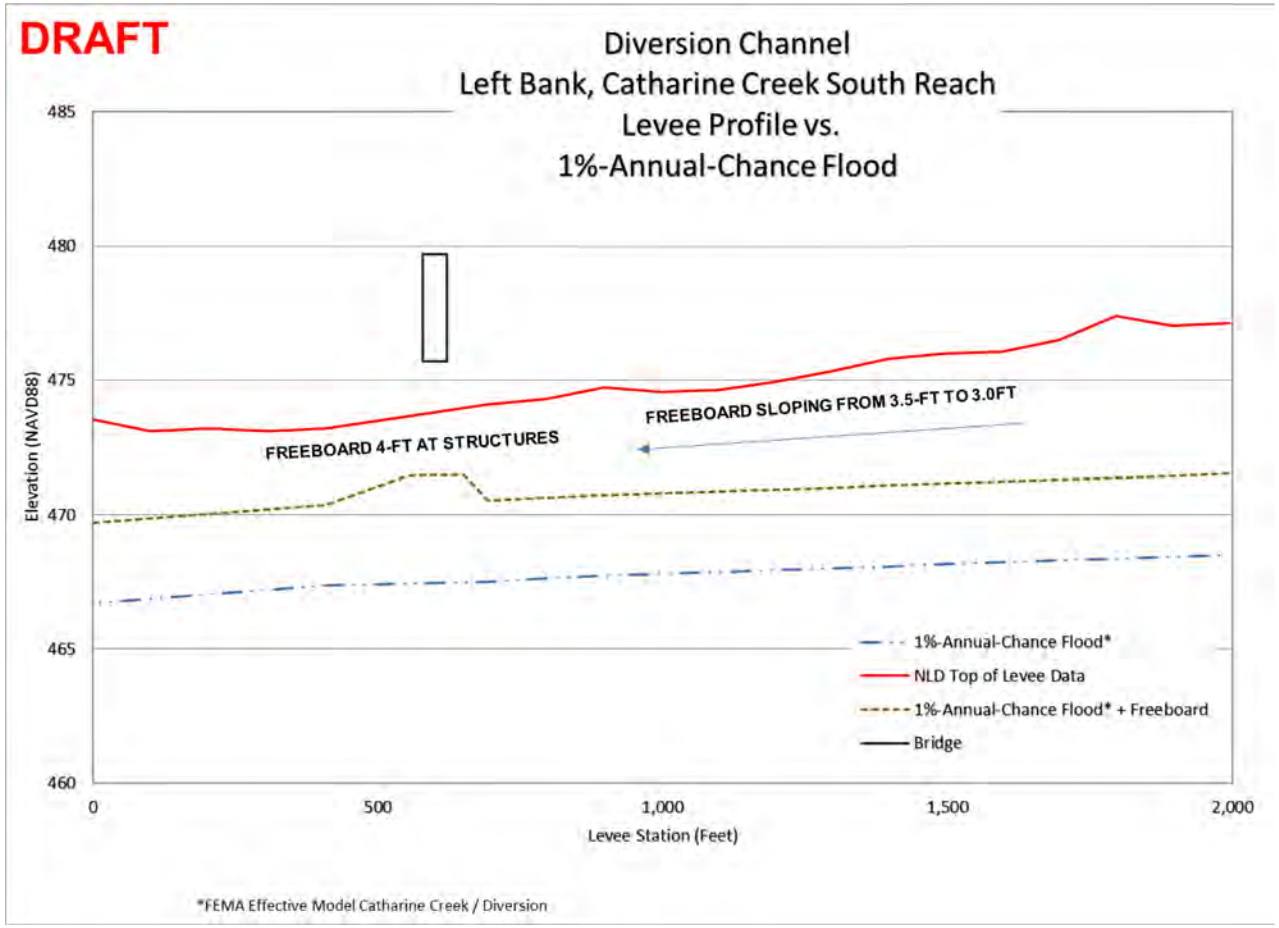
FEMA

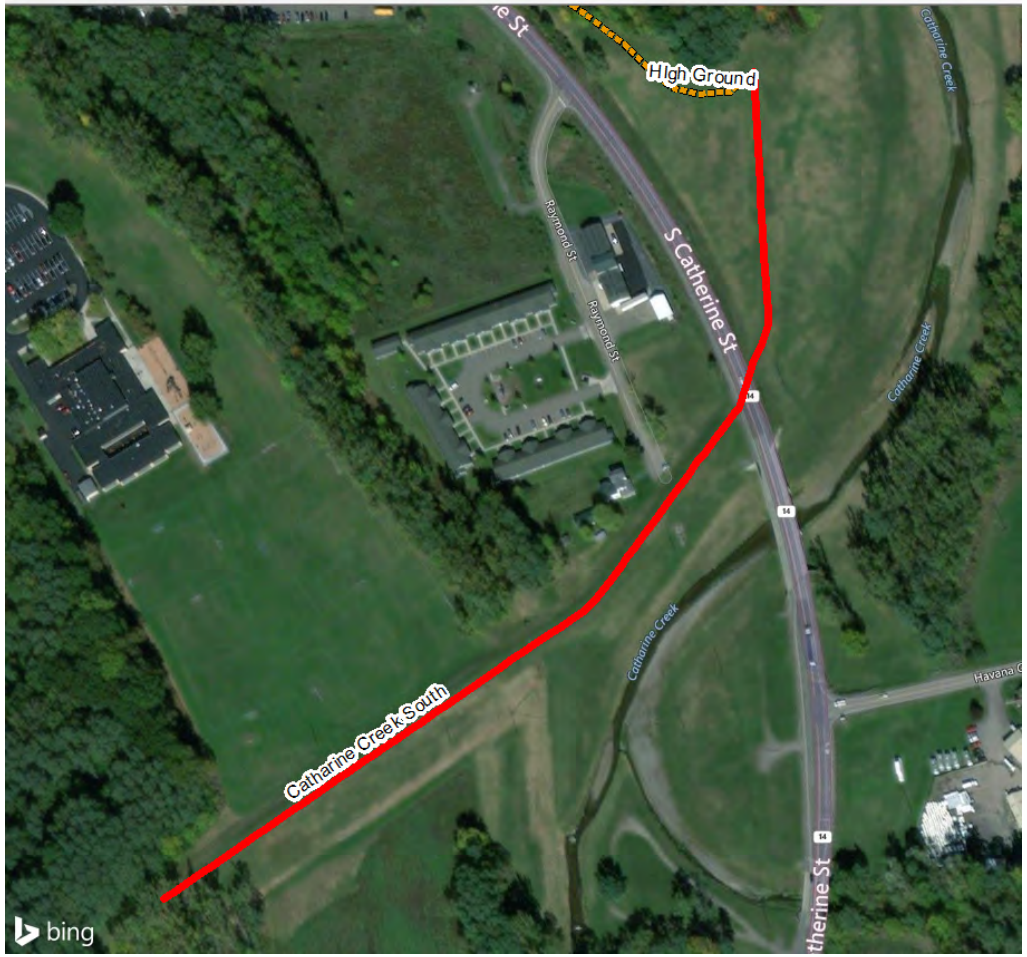
Levee Profile Exhibit – Catharine Creek North



FEMA

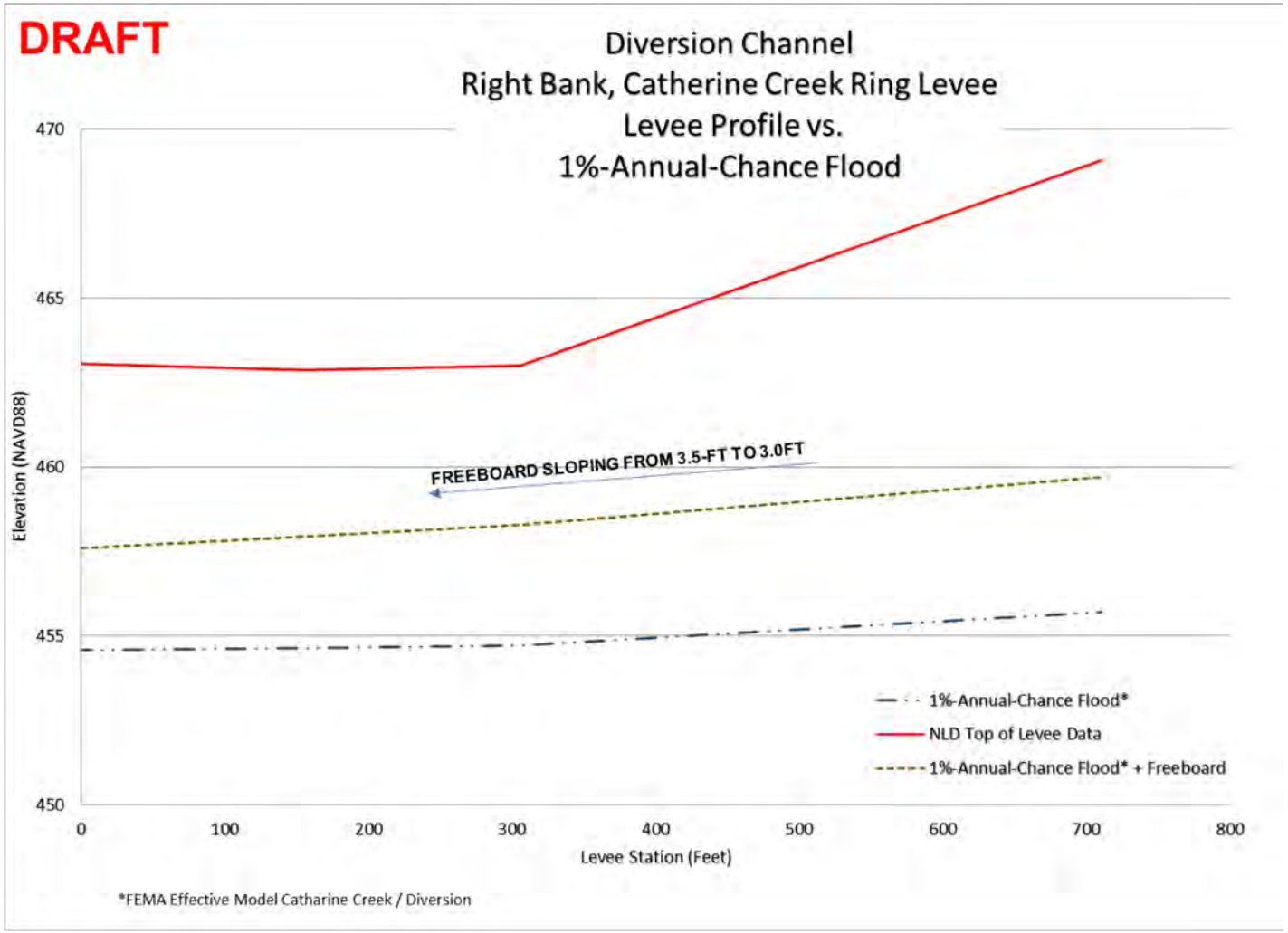
Levee Profile Exhibit – Catharine Creek South





FEMA

Levee Profile Exhibit – Catharine Creek Ring



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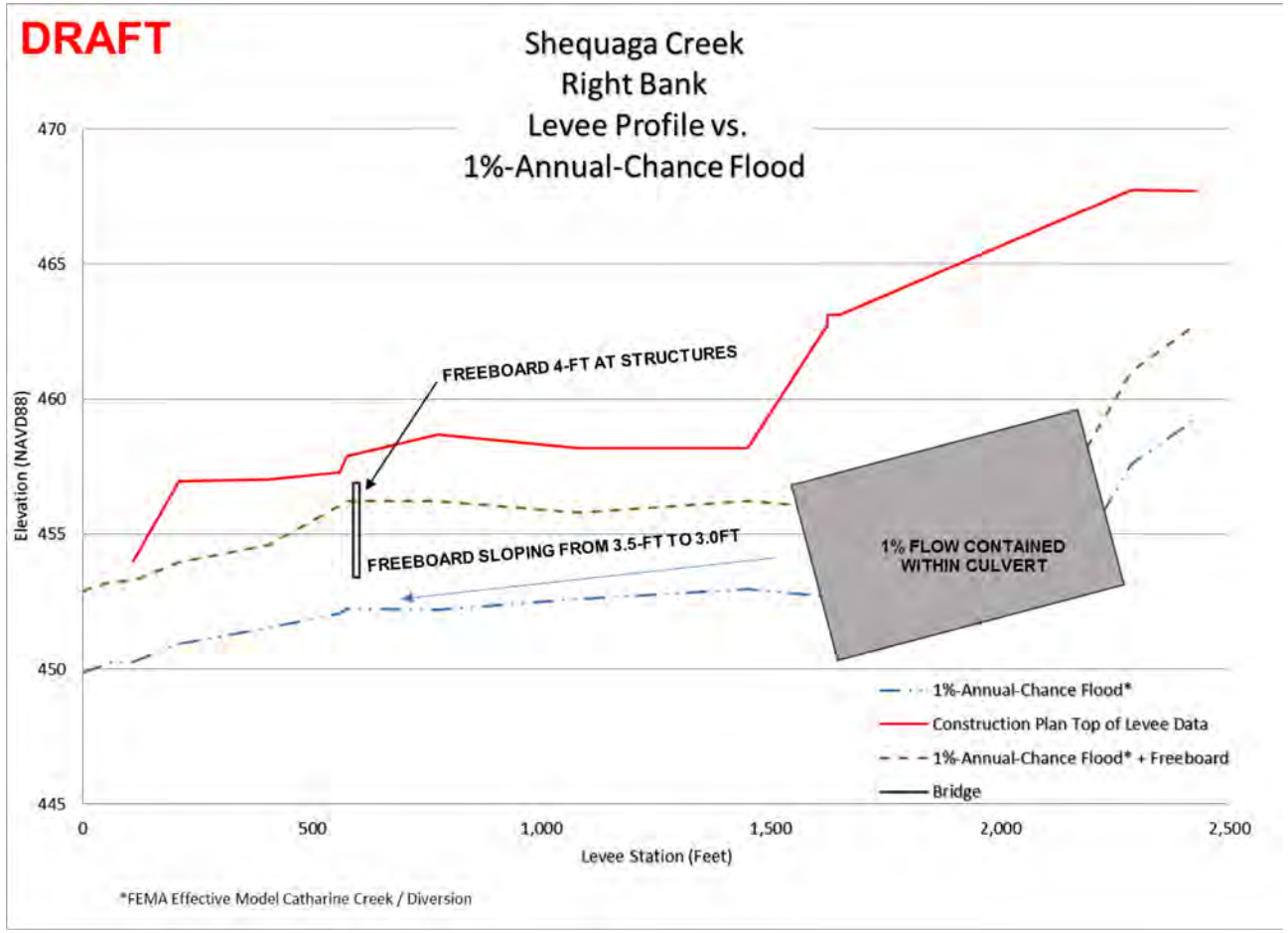
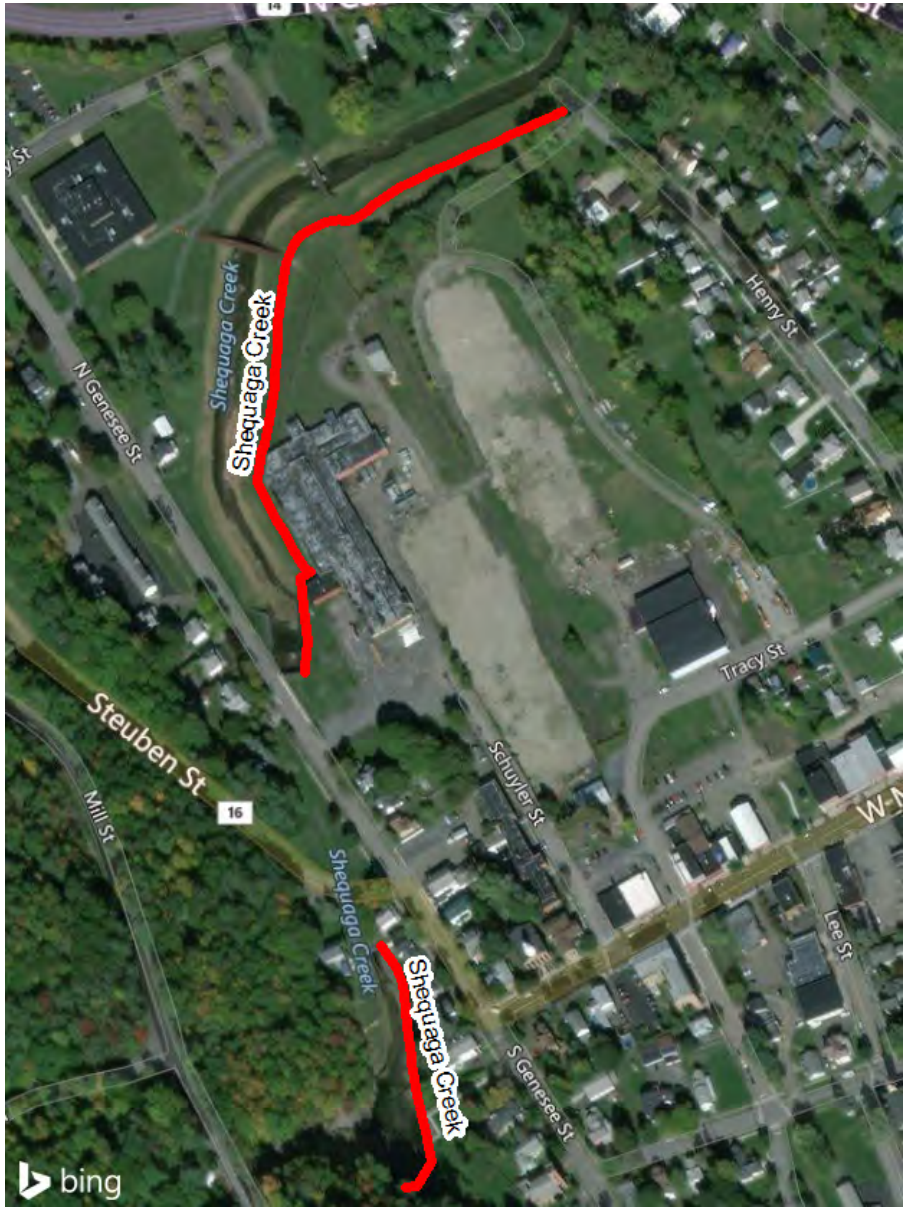
Levee Profile Exhibit – Shequaga Creek





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Results of Initial Data Analysis

FEMA

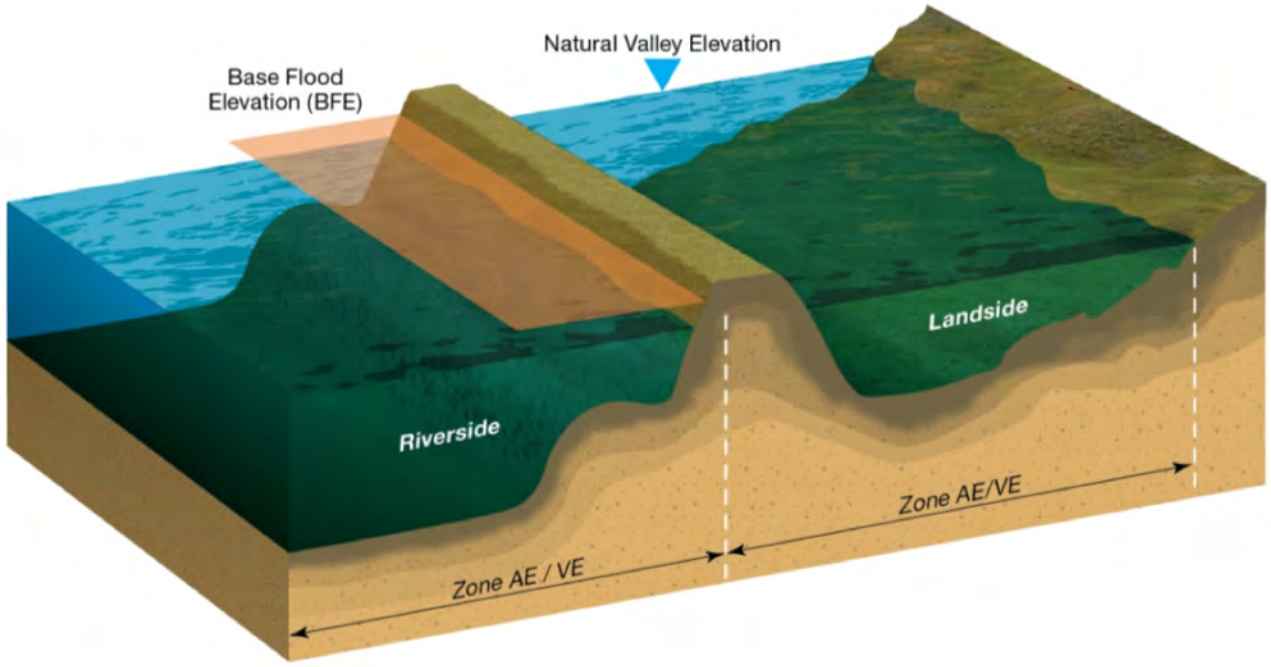
Natural Valley Procedure

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
  → Zone D if used in coordination with another reach analysis procedure

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

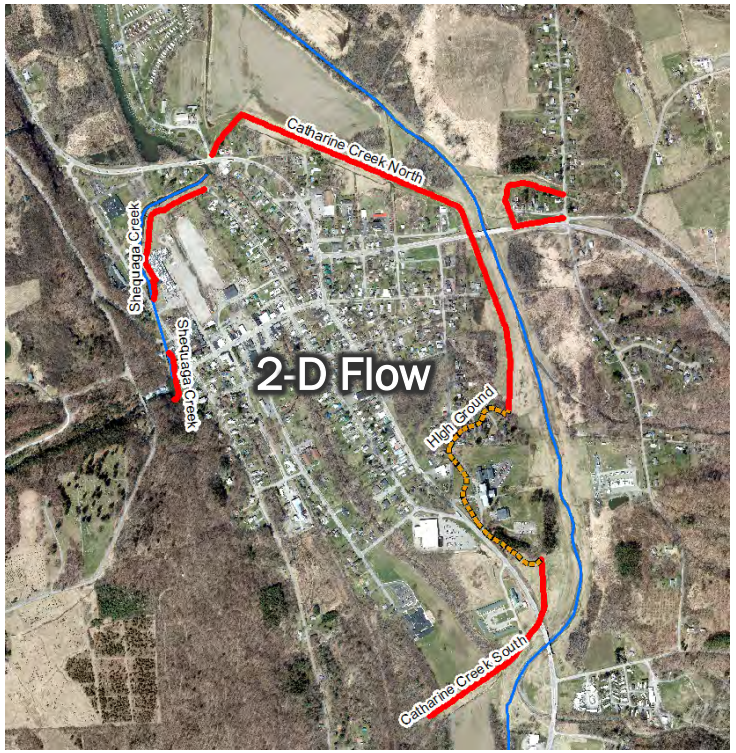


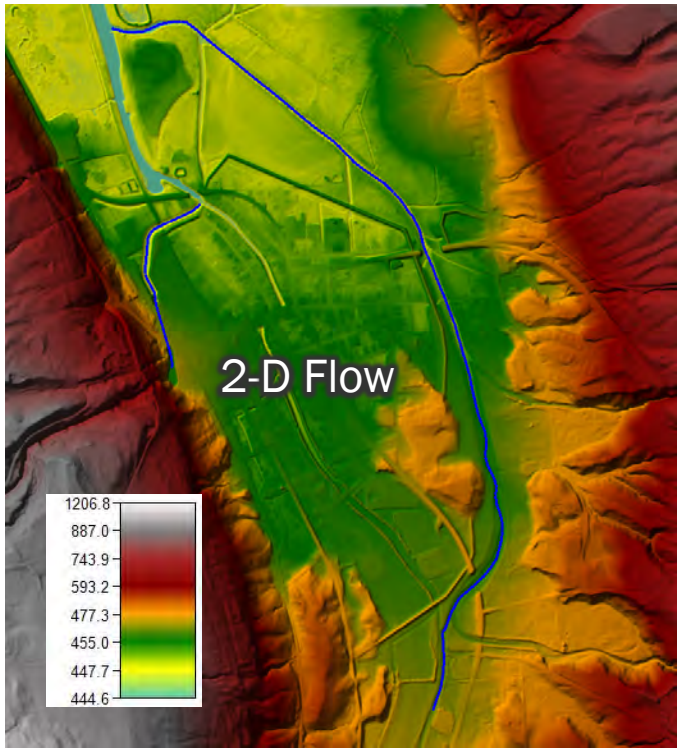
FEMA

Natural Valley Procedure

Hydraulics

- Effective Analysis: HEC-2 hydraulic model
- Duplicated Effective Analysis
- Converted to HEC-RAS 2-D Un-steady state model
- Control structure refined based on as-built drawings





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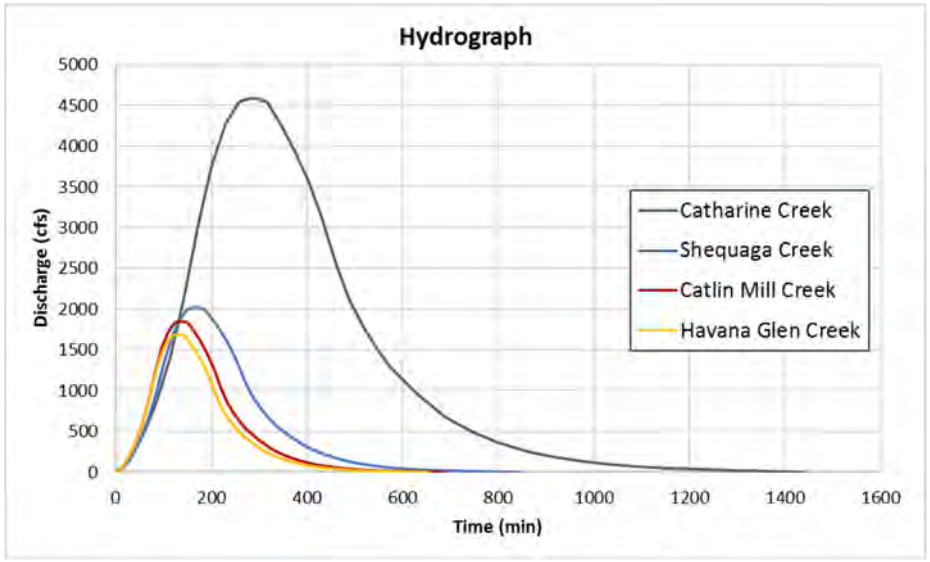
Natural Valley Procedure

Hydrology

- Effective peak 1% annual chance flowrate used
- No stream gage available on local streams to facilitate hydrograph development
- Used combination of methods to determine flow
  - NRCS Unit hydrograph – time of concentration, scaled to peak 1% FIS flow
  - NRCS method for time of concentration- weighted average
    - Kirpich, Simas, Folmar & Miller and velocity method



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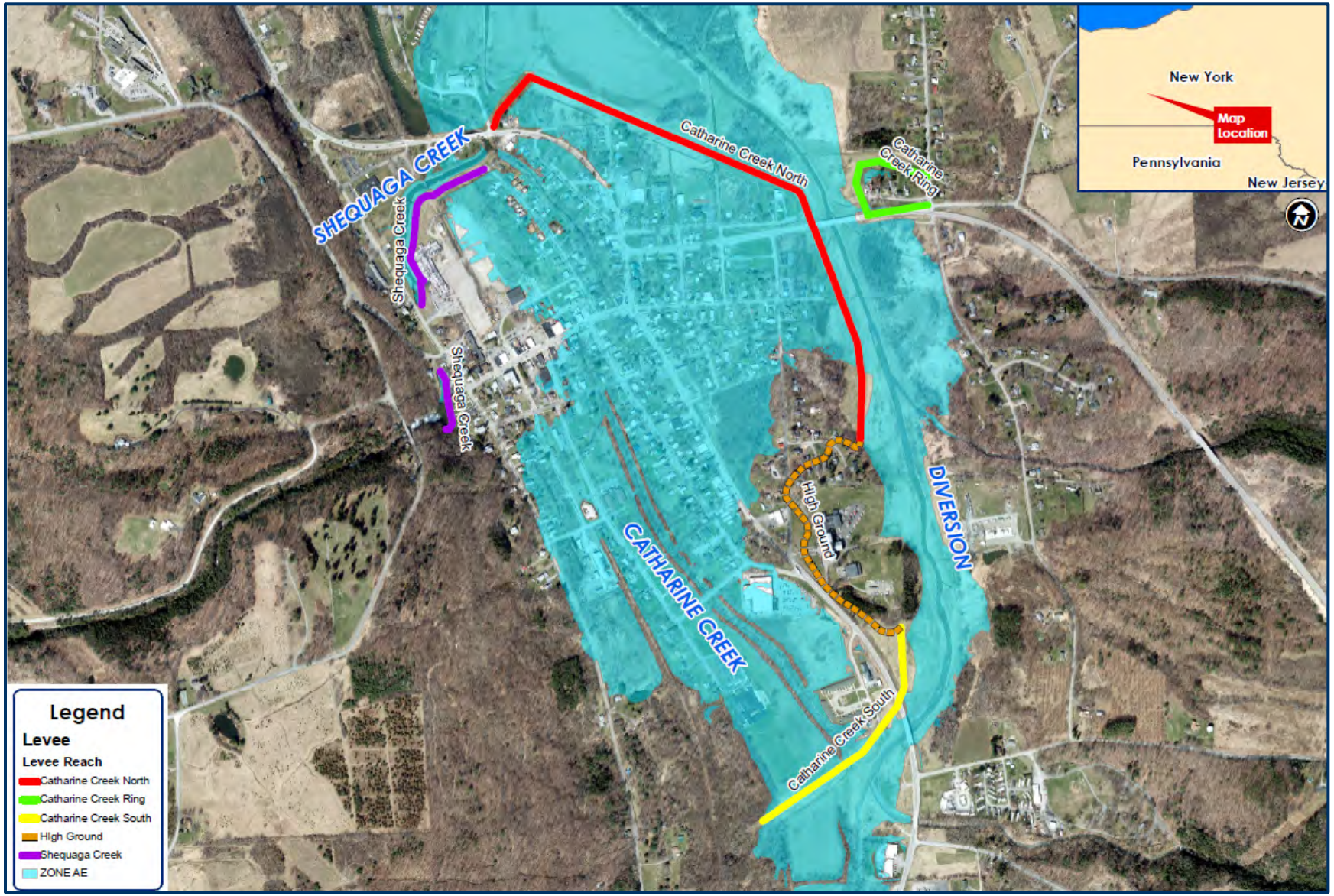
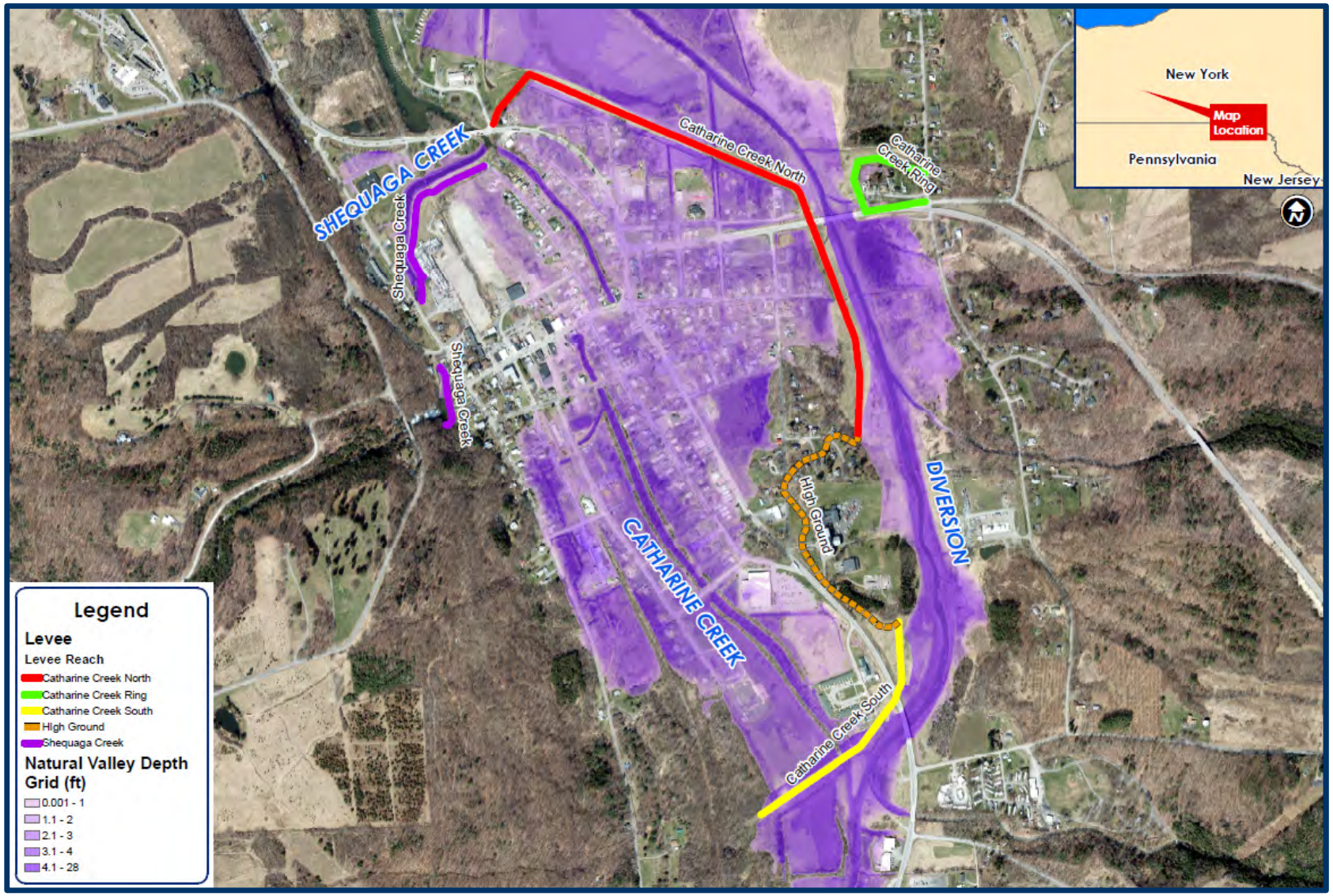
Natural Valley Procedure - Results



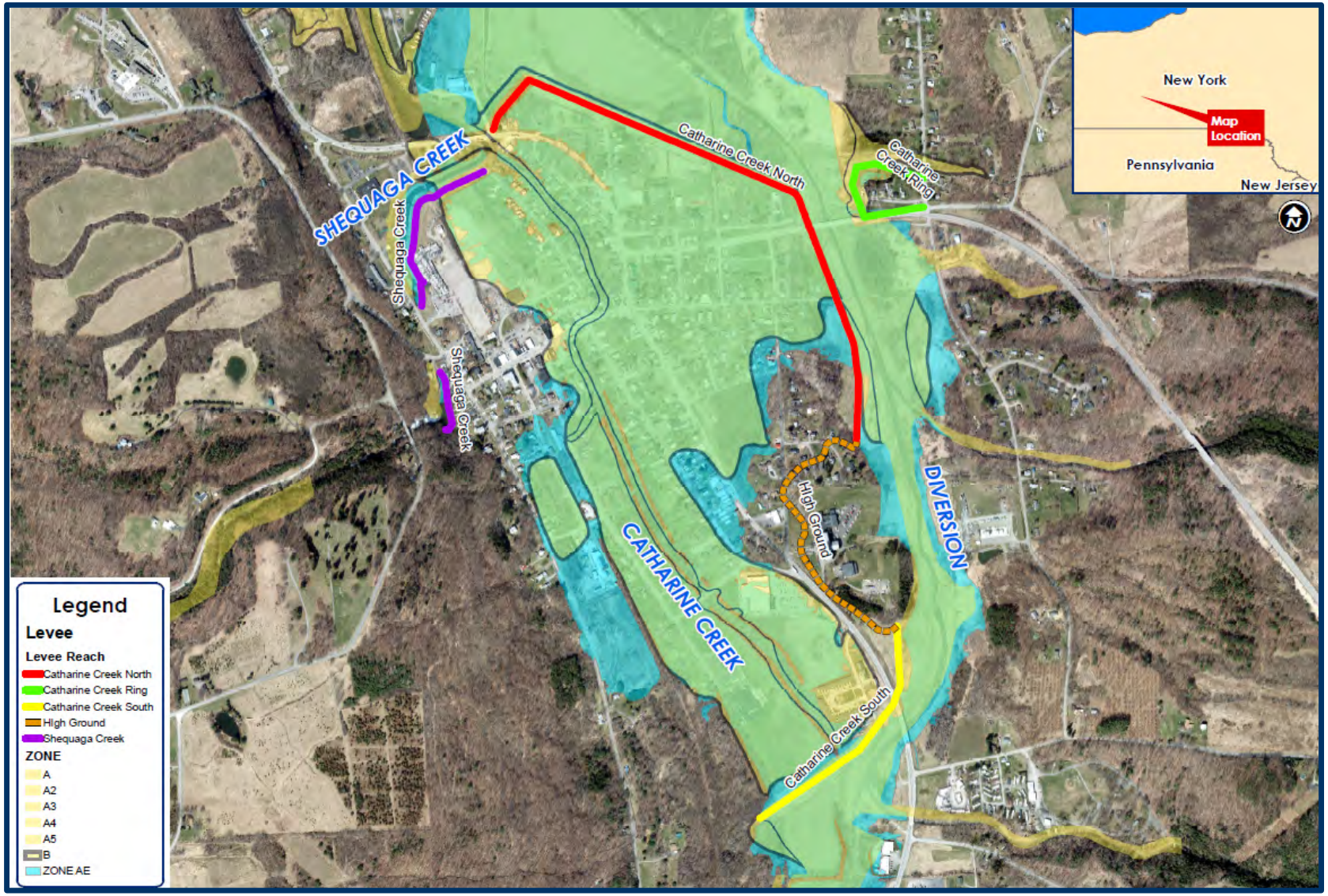
FEMA

Natural Valley Procedure – Depth Grid



FEMA

Natural Valley Procedure Compared to FIRM



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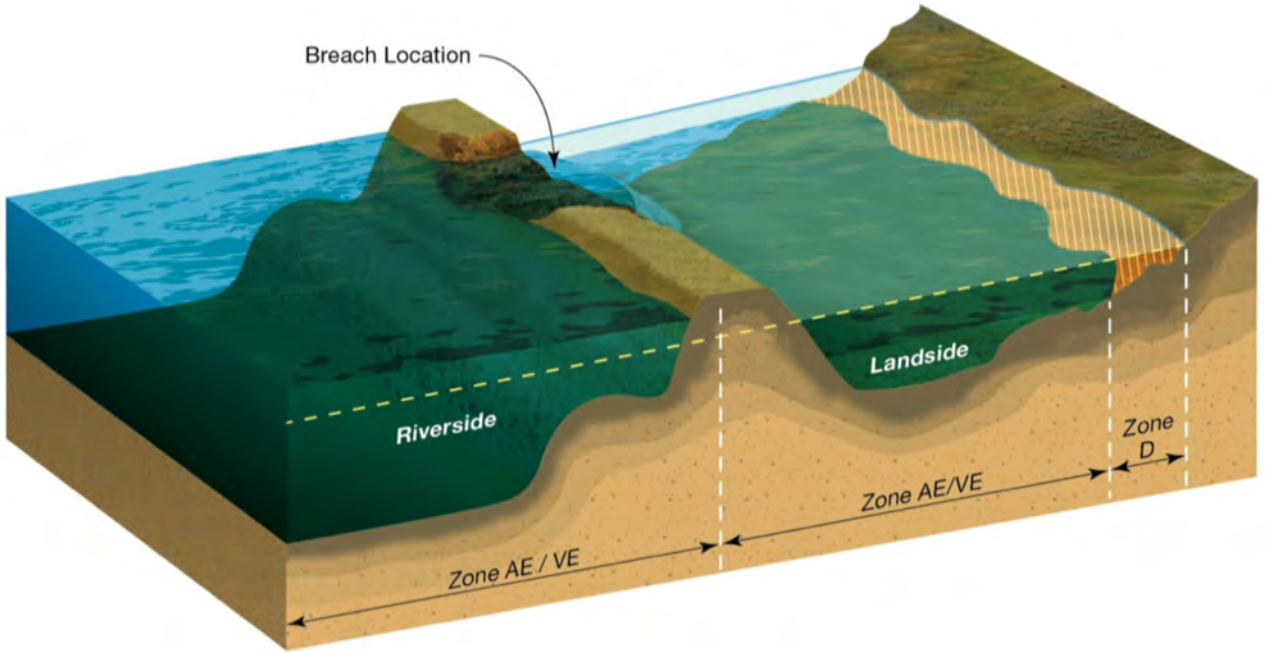
Structural-Based Inundation Procedure

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

Application:

- Levee does not meet 44CFR65.10



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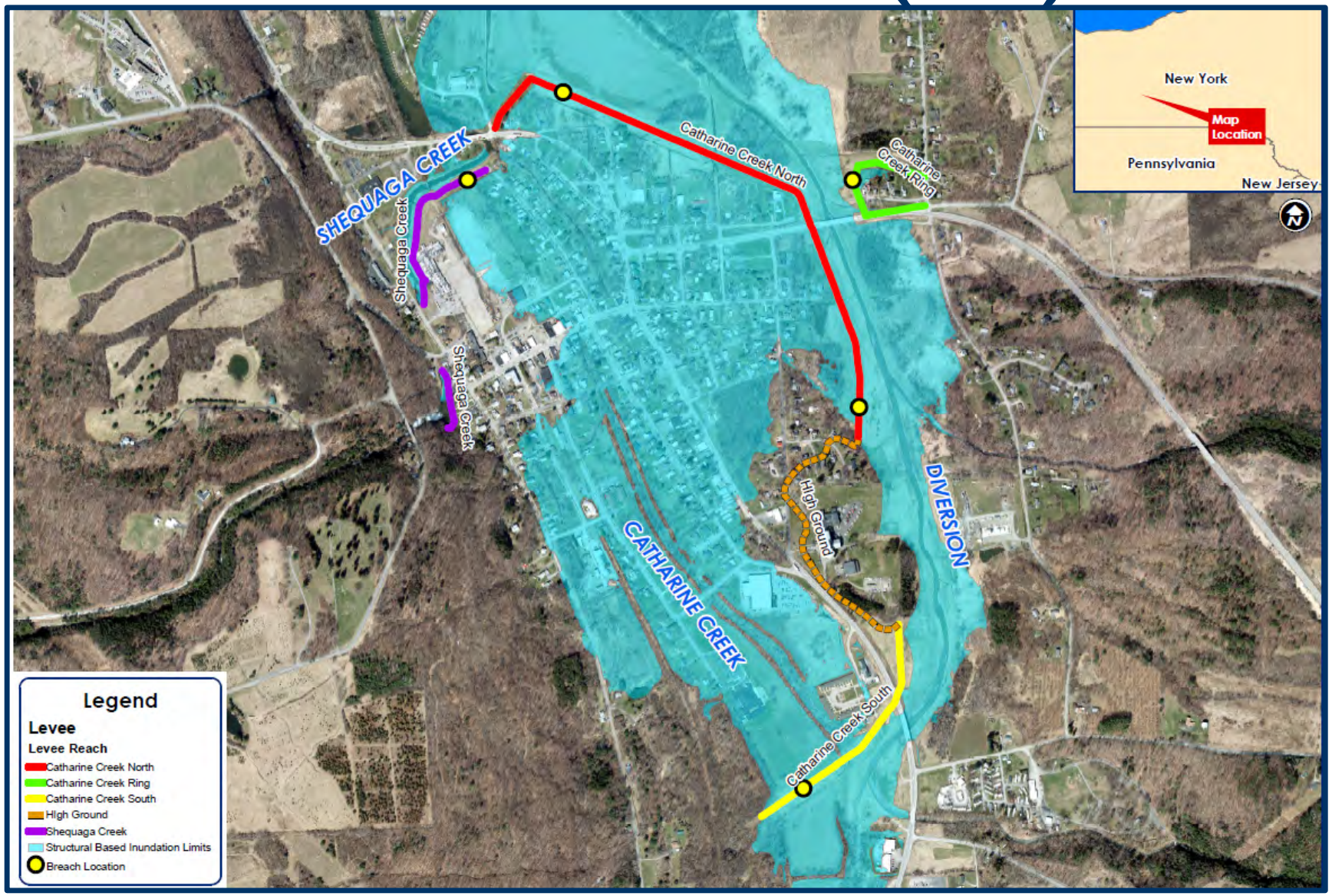
Structural-Based Inundation (SBI) Procedure



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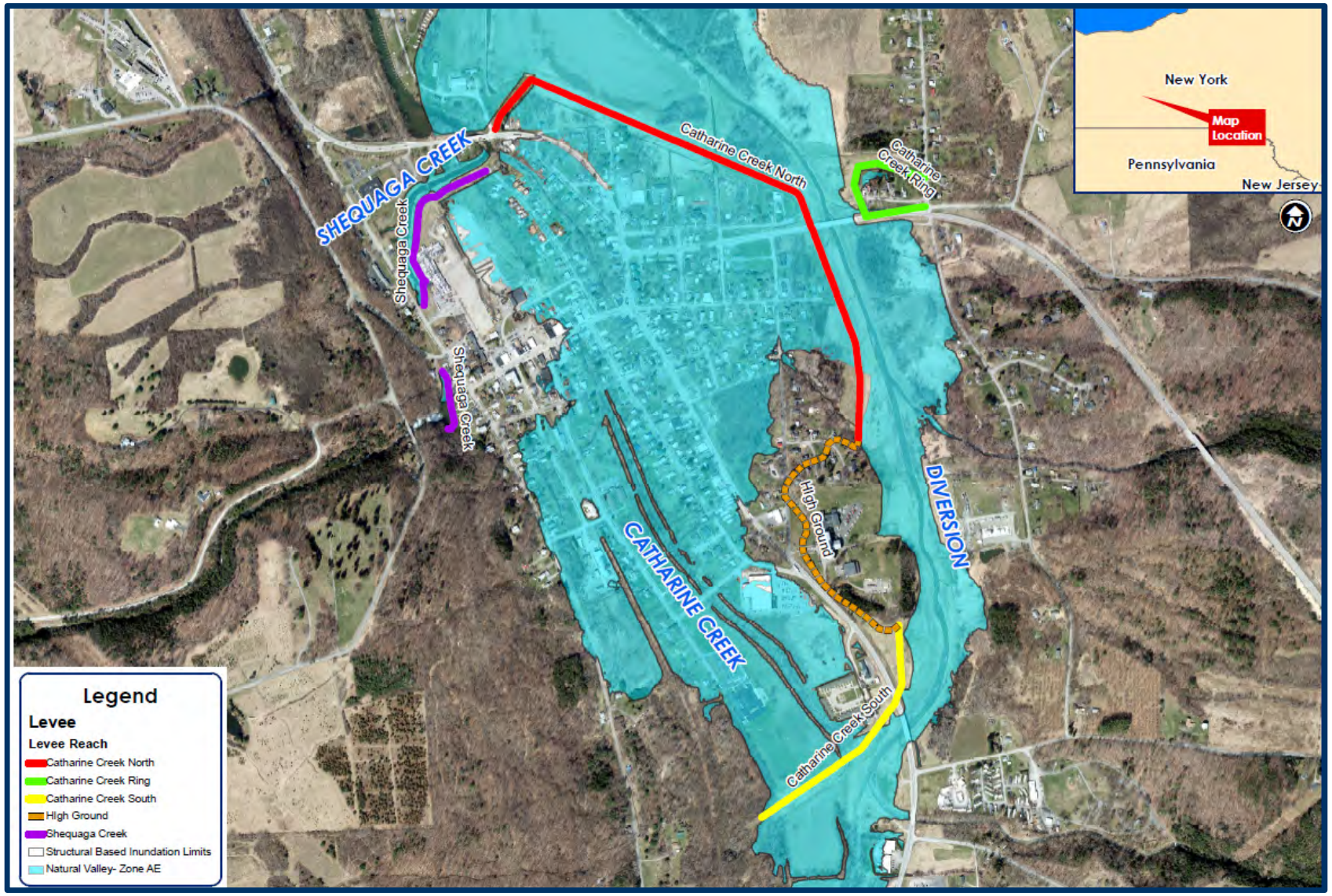
SBI Compared to Natural Valley Procedure



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Application of Reach Study Procedures

FEMA

Comparison: Reach Study Procedures

Applicable

- **Natural Valley Procedure**
- **Sound Reach Procedure**
  - 44 CFR 65.10 compliant documentation required

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

**Can be leveraged for emergency planning

FEMA

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			✓		

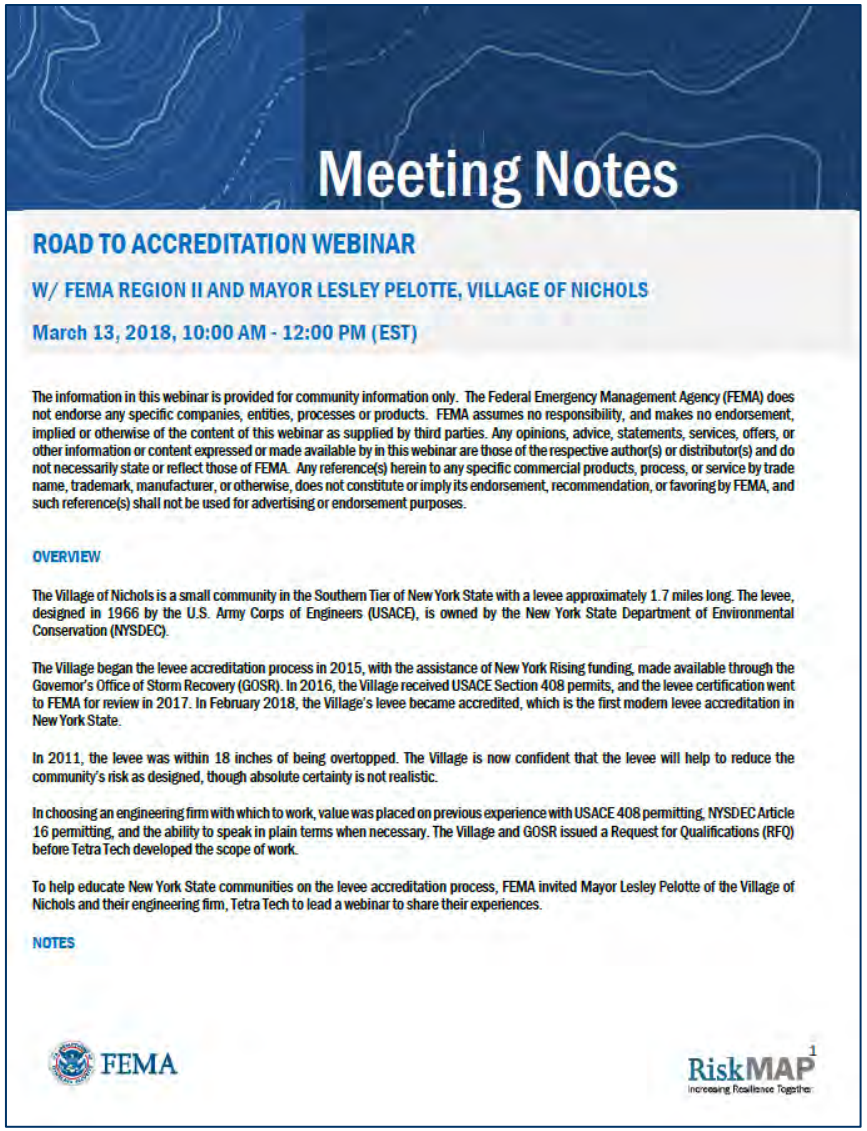
* - No cost to community

** - Potential additional cost to community

FEMA

Village of Nichols, NY Webinar

- 1.7 mile long levee designed by USACE in 1966
- Began levee accreditation process in 2015
- Levee system accredited in 2018
- 1st modern levee accreditation in NY state
- Leveraged New York Rising funding available through GOSR for levee analysis and certification



Meeting Notes

ROAD TO ACCREDITATION WEBINAR

W/ FEMA REGION II AND MAYOR LESLEY PELOTTE, VILLAGE OF NICHOLS

March 13, 2018, 10:00 AM - 12:00 PM (EST)

The information in this webinar is provided for community information only. The Federal Emergency Management Agency (FEMA) does not endorse any specific companies, entities, processes or products. FEMA assumes no responsibility, and makes no endorsement, implied or otherwise of the content of this webinar as supplied by third parties. Any opinions, advice, statements, services, offers, or other information or content expressed or made available by in this webinar are those of the respective author(s) or distributor(s) and do not necessarily state or reflect those of FEMA. Any reference(s) herein to any specific commercial products, process, or service by trade name, trademark, manufacturer, or otherwise, does not constitute or imply its endorsement, recommendation, or favoring by FEMA, and such reference(s) shall not be used for advertising or endorsement purposes.

OVERVIEW

The Village of Nichols is a small community in the Southern Tier of New York State with a levee approximately 1.7 miles long. The levee, designed in 1966 by the U.S. Army Corps of Engineers (USACE), is owned by the New York State Department of Environmental Conservation (NYSDEC).

The Village began the levee accreditation process in 2015, with the assistance of New York Rising funding, made available through the Governor's Office of Storm Recovery (GOSR). In 2016, the Village received USACE Section 408 permits, and the levee certification went to FEMA for review in 2017. In February 2018, the Village's levee became accredited, which is the first modern levee accreditation in New York State.

In 2011, the levee was within 18 inches of being overtopped. The Village is now confident that the levee will help to reduce the community's risk as designed, though absolute certainty is not realistic.

In choosing an engineering firm with which to work, value was placed on previous experience with USACE 408 permitting, NYSDEC Article 16 permitting, and the ability to speak in plain terms when necessary. The Village and GOSR issued a Request for Qualifications (RFQ) before Tetra Tech developed the scope of work.

To help educate New York State communities on the levee accreditation process, FEMA invited Mayor Lesley Pelotte of the Village of Nichols and their engineering firm, Tetra Tech to lead a webinar to share their experiences.

NOTES

FEMA

RiskMAP

Increasing Resilience Together

FEMA

Next Steps

FEMA

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

FEMA

Village of Montour Falls LLPT Timeline:

FEMA

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

QUESTIONS?

Contact:

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Stephanie Nurre, Senior Mitigation Planner - STARR II
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FEMA

Contacts

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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

Montour Falls, NY LLPT Check-in Notes

ATTENDEES

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DEAN HILLYARD
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JANET THIGPEN
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Southern Tier Central & Regional
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VILLAGE OF MONTOUR FALLS, NEW YORK

DATE: Tuesday, February 26, 2019 **TIME:** 11:00 AM – 12:30 PM
LOCATION:
Webinar and Conference Call

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

Montour Falls, NY LLPT Check-in Notes

ATTENDEES *Continued*

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OVERVIEW

- Certified levee data can be submitted to FEMA at any time in support of accreditation.
- The structural-based inundation (SBI) reach analysis procedure yielded similar inundation results to those of the Natural Valley Procedure for the 1-percent-annual-chance flood;, the results of the Natural Valley procedure could be used to identify flood risk on future FIRM should no or incomplete data be provided.
- The results of the SBI can be used for flood risk planning.
- Natural Valley inundation shows approximately half of the Village of Montour Falls in Zone AE Special Flood Hazard Area (SFHA). Zone AE SFHA is considered high risk and has regulatory requirements for flood insurance and floodplain management.
- If the south reach of the Catherine Creek levee system is accredited in the future but the other reaches remain non-accredited, there could be areas of shaded Zone X mapped in the community, which is not considered SFHA.
- The Levee Plan summarizing the LLPT process and engagement will include documentation of meetings, technical information collected, feedback received, and analysis completed to date in multiple formats, including GIS.
- Mapping updates for Schuyler County are forecast for 3-and-a-half years at the earliest

DISCUSSION

QUESTION:
Village of Montour Falls Mayor, John King:
Will this presentation be emailed?

Response:
CERC Outreach Support, Melissa Herlitz:
Yes.

DISCUSSION Continued on following page

Montour Falls, NY LLPT Check-in Notes

SHUDIPTO (SHU) RAHMAN
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sagar.neupane@stantec.com

MELISSA HERLITZ
Outreach support – CERC
Phone: 646.682.5558
Email:
melissa.herlitz@mbakerintl.com

QUESTION:
Village of Montour Falls Mayor, John King:
At what point will we have an estimate of what this will cost?

Response:
FEMA Region II Project Monitor, Shu Rahman:
Typically we don't go through estimating the cost of certification. If that's information you're interested in, we can reach out to other communities that have gone through this process to provide references. If the question is "How much will it cost to accredit the full system or part of the system?" we can find examples and share.

QUESTION:
Southern Tier Planning Board Flood Mitigation Specialist, Janet Thigpen:
After the last meeting, we discussed the gauge in Catharine Creek, and that the peak flow gauge was not sufficiently detailed for the hydrograph. We discussed whether you'd do analysis to learn if discharge was the same or similar to the 1983 flood map study? This is important because if total discharge is higher or lower as what was used in 1983, it would help determine if sufficient freeboard on levee exists.

Response:
STARR II Senior Mitigation Planner, Stephanie Nurre:
We have not yet run that analysis, but we can provide that information and could do so quickly. We did not change effective hydrology and hydraulics from the study, but it is possible things could have changed.

QUESTION:
NYSDEC Engineer, Arvind Goswami:
What kind of topography data did you use for this analysis?
You mentioned using existing flow. Will this be spelled out in the LAMP Plan?

Response:
STARR II Senior Mitigation Planner, Stephanie Nurre;
FEMA Region II Project Monitor, Shu Rahman:
The topography that we used was 2-meter DEM from NY GIS Clearinghouse for the Seneca Watershed. LAMP Plan appendices can include a technical component and write-up of the analysis. It will share levee profiles, information from the USACE, documentation from meetings, and presentation material.

Village of Montour Falls, Schuyler County Levee Flood Hazard Identification

Local Levee Partnership Team (LLPT) Touchpoint Call

February 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.

FEMA

Today's Agenda

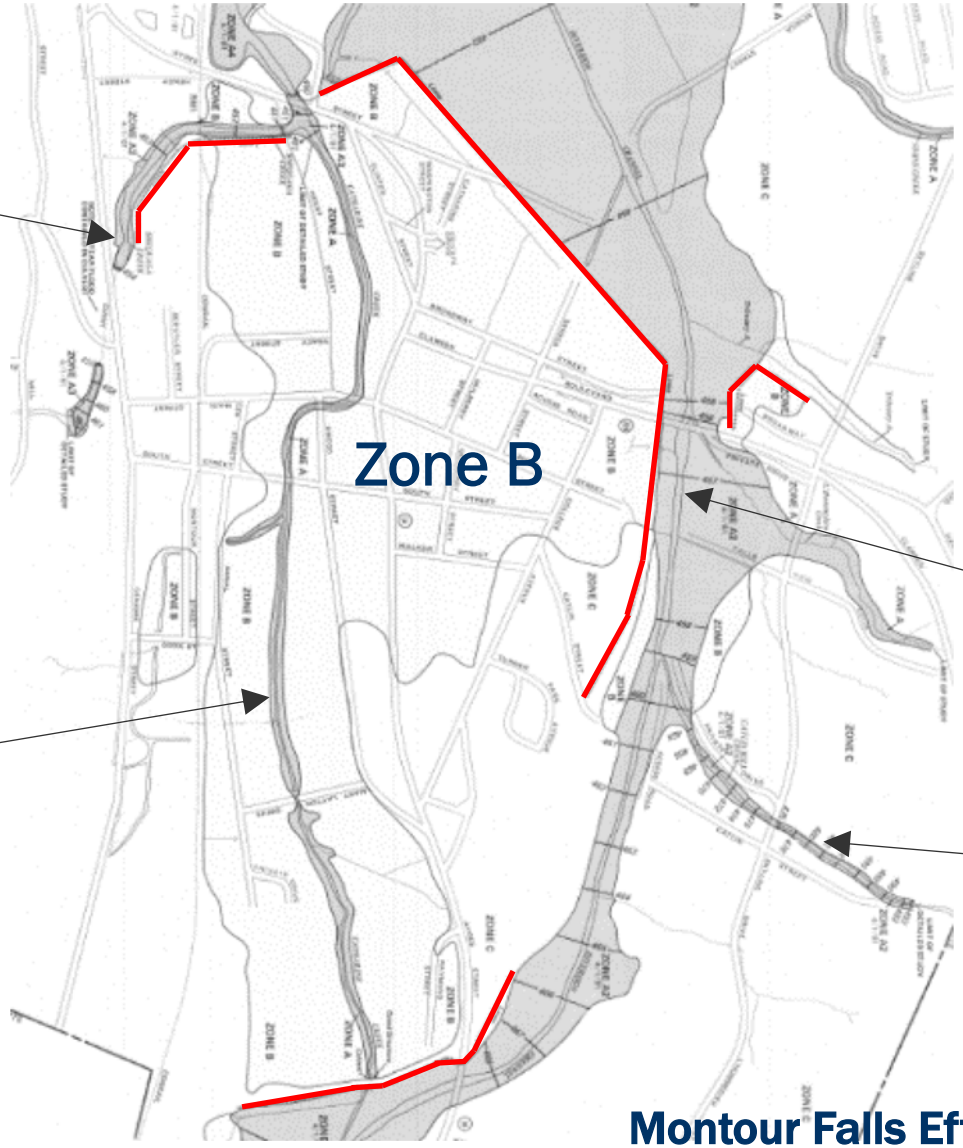
1. Review Levee Flood Hazard
2. Review of Initial Data Analysis Results
3. Next Steps

FEMA

Review Levee Flood Hazard

FEMA

Effective Flood Insurance Rate Map (FIRM)



Montour Falls Effective FIRM: September 15, 1983

FEMA

Review of Initial Data Analysis Results

FEMA

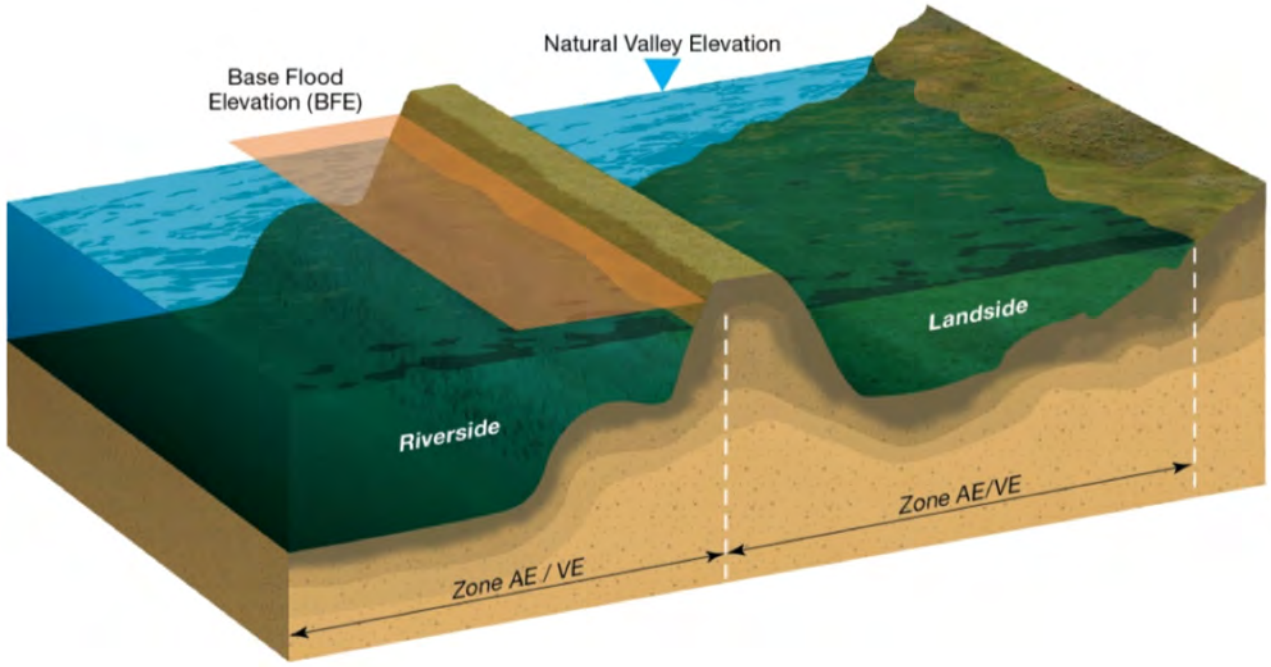
Natural Valley Procedure

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

Applications:

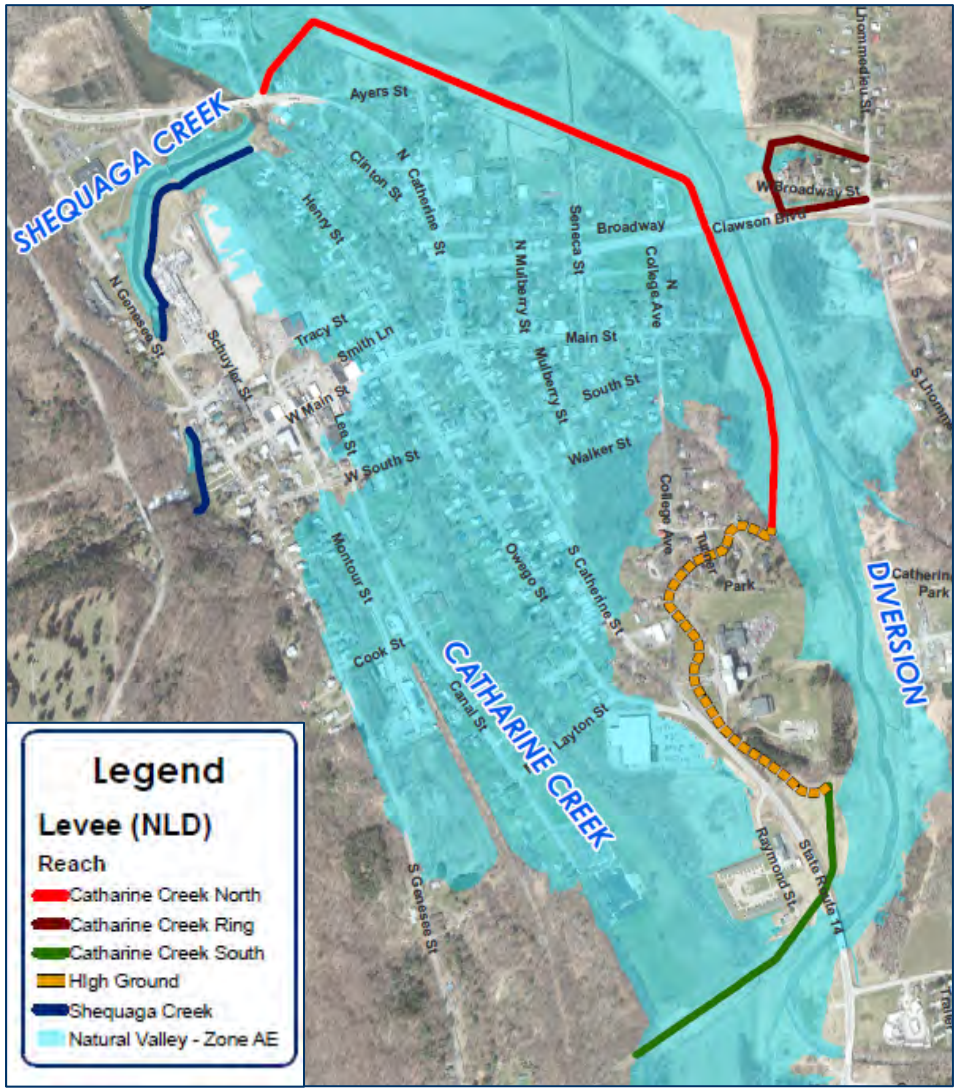
- Levee does not meet 44CFR65.10
  → Zone AE SFHA
  → Zone D if used in coordination with another reach analysis procedure

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



FEMA

Natural Valley Procedure



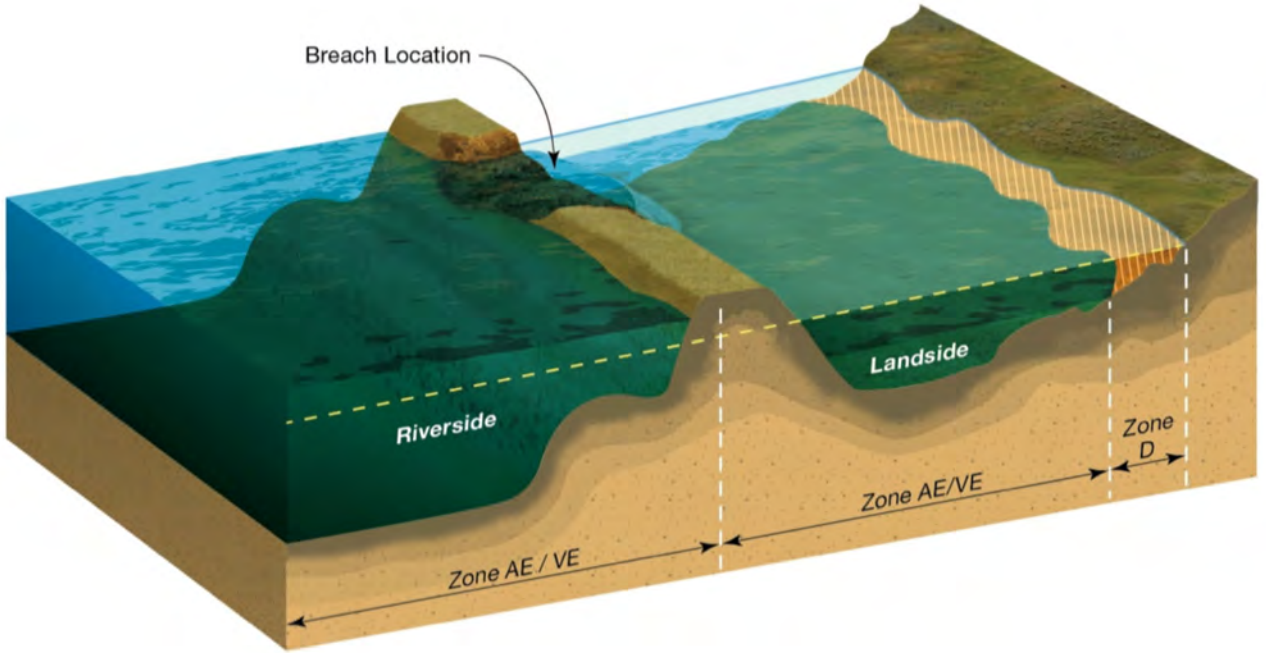
FEMA

Structural-Based Inundation Procedure

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

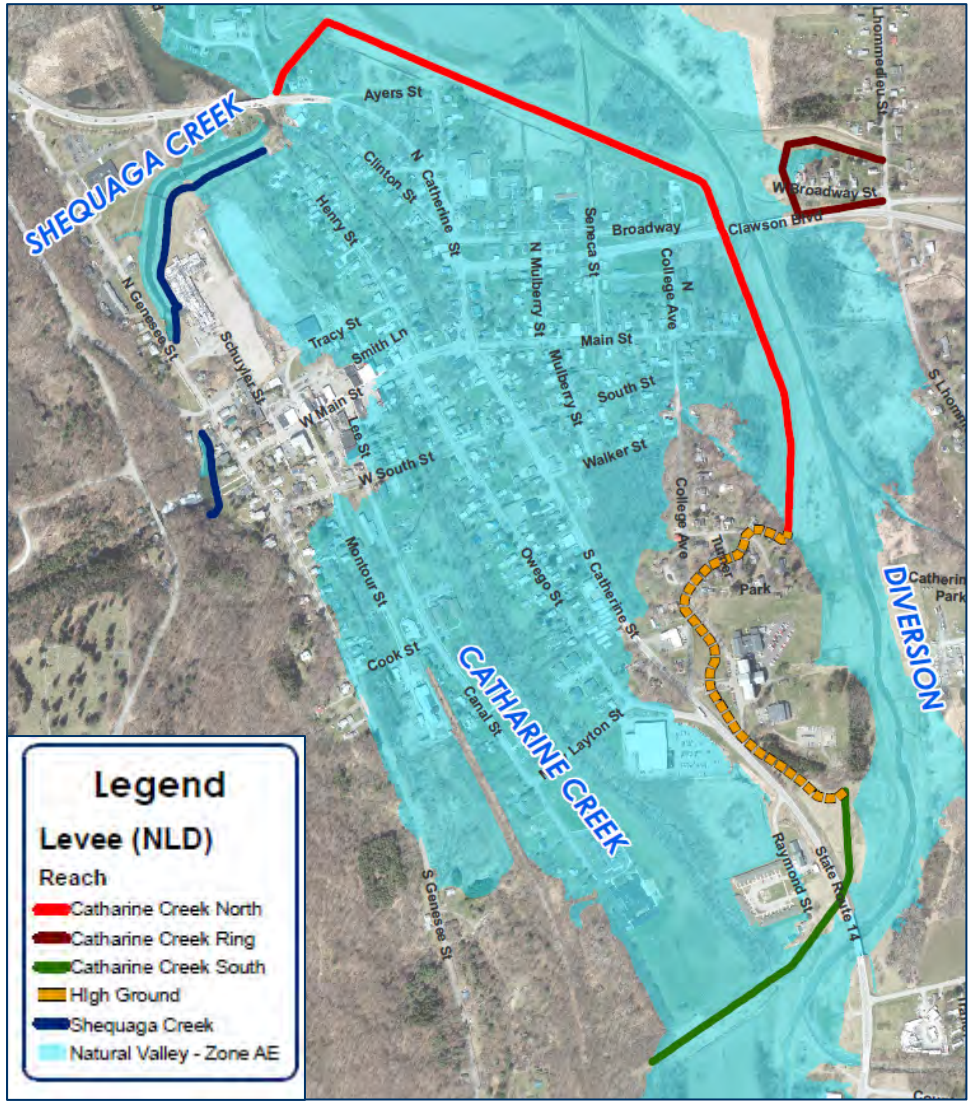
Application:

- Levee does not meet 44CFR65.10



FEMA

Structural-Based Inundation Procedure



FEMA

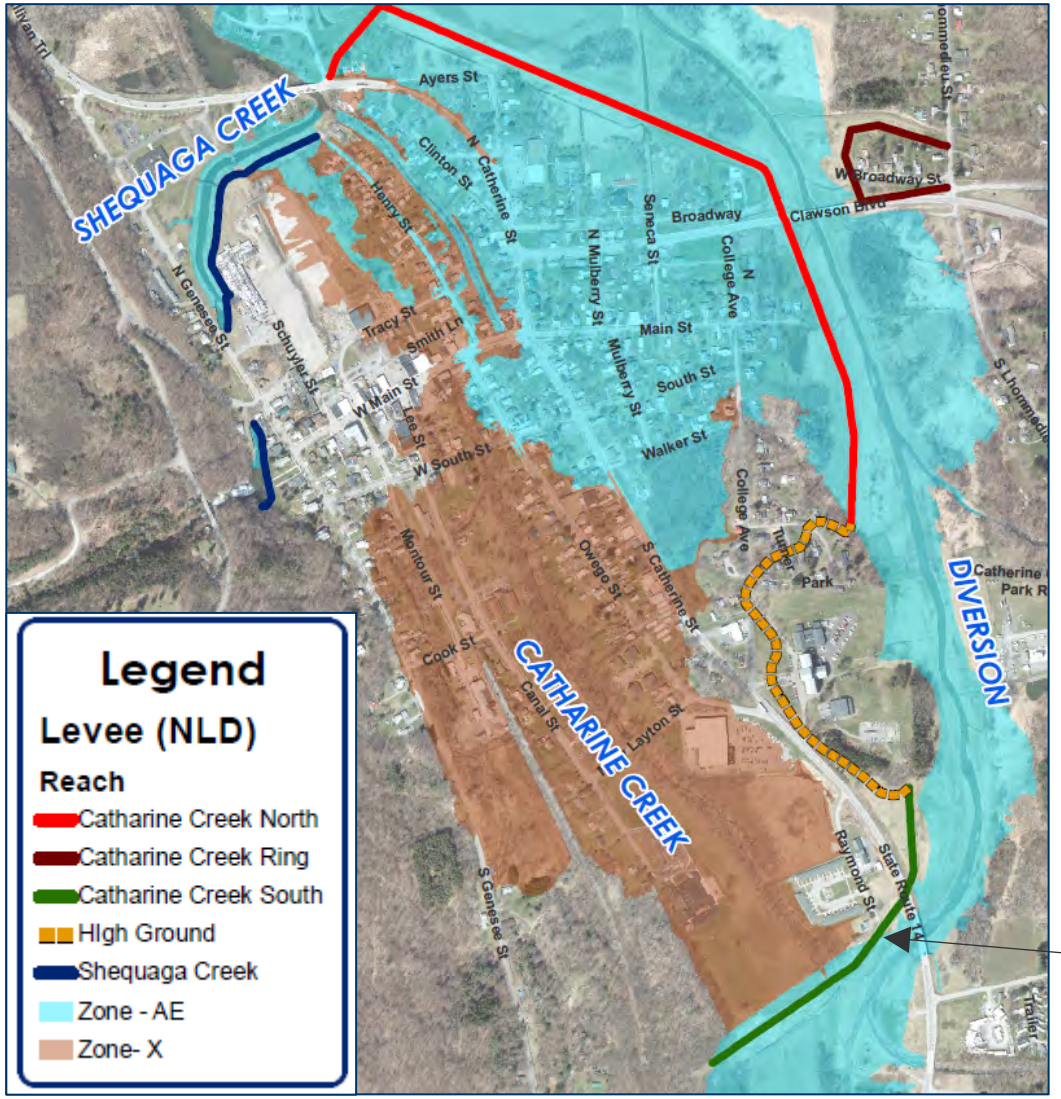
Accreditation and Natural Valley Procedure

This analysis identifies the landside flood risk by estimate of the following:

- Catharine Creek South Reach – Accredited
- Catharine Creek North Reach – Non-accredited / Natural Valley
- Shequaga Creek Reach – Non-accredited / Natural Valley

FEMA

Accreditation and Natural Valley Procedure



Natural Valley
Catharine Creek North, Shequaga Reaches

Accredited
Catharine Creek South Reach

FEMA

Mapping Path Forward is 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	✓	✓	✓	Requested	
Structural Design Requirements	✓	✓	✓		
Inspection Reports	✓	✓	✓	Requested	
Evaluation of Overtopping Erosion Potential			✓		

* - No cost to community

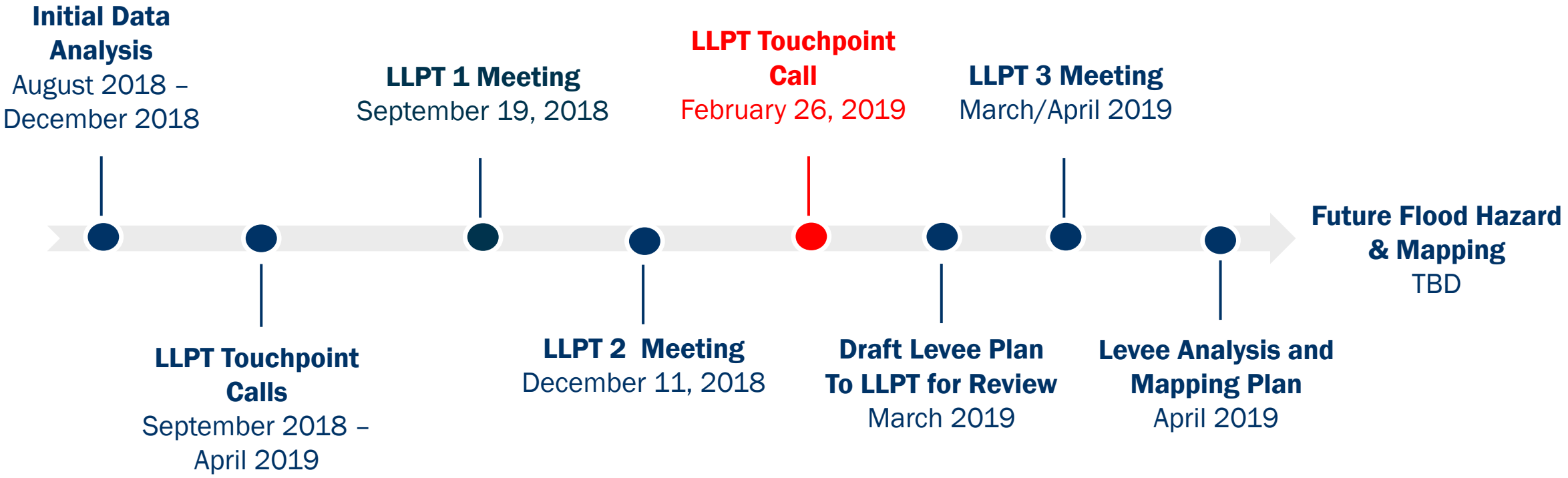
** - Potential additional cost to community

FEMA

Next Steps

FEMA

Village of Montour Falls LLPT Timeline:



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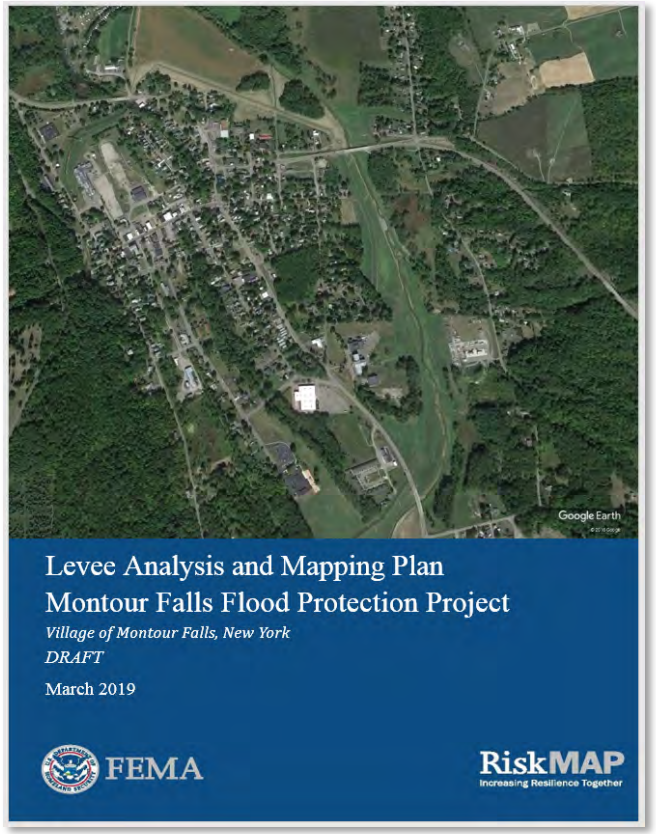
Next Steps

- FEMA to share 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



FEMA

QUESTIONS?

Contact:

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Stephanie Nurre, Senior Mitigation Planner - STARR II
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FEMA

Contacts

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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

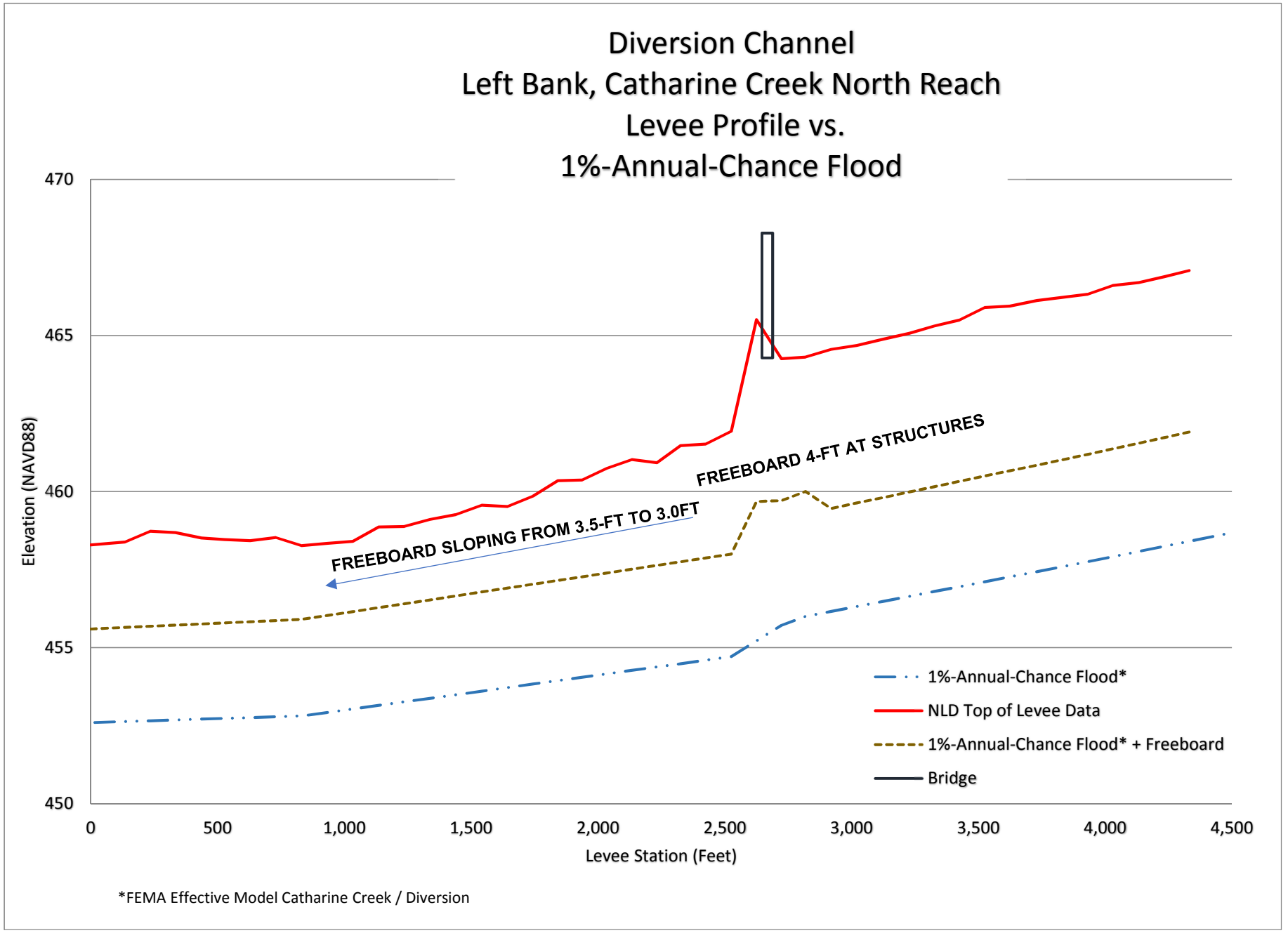
FEMA

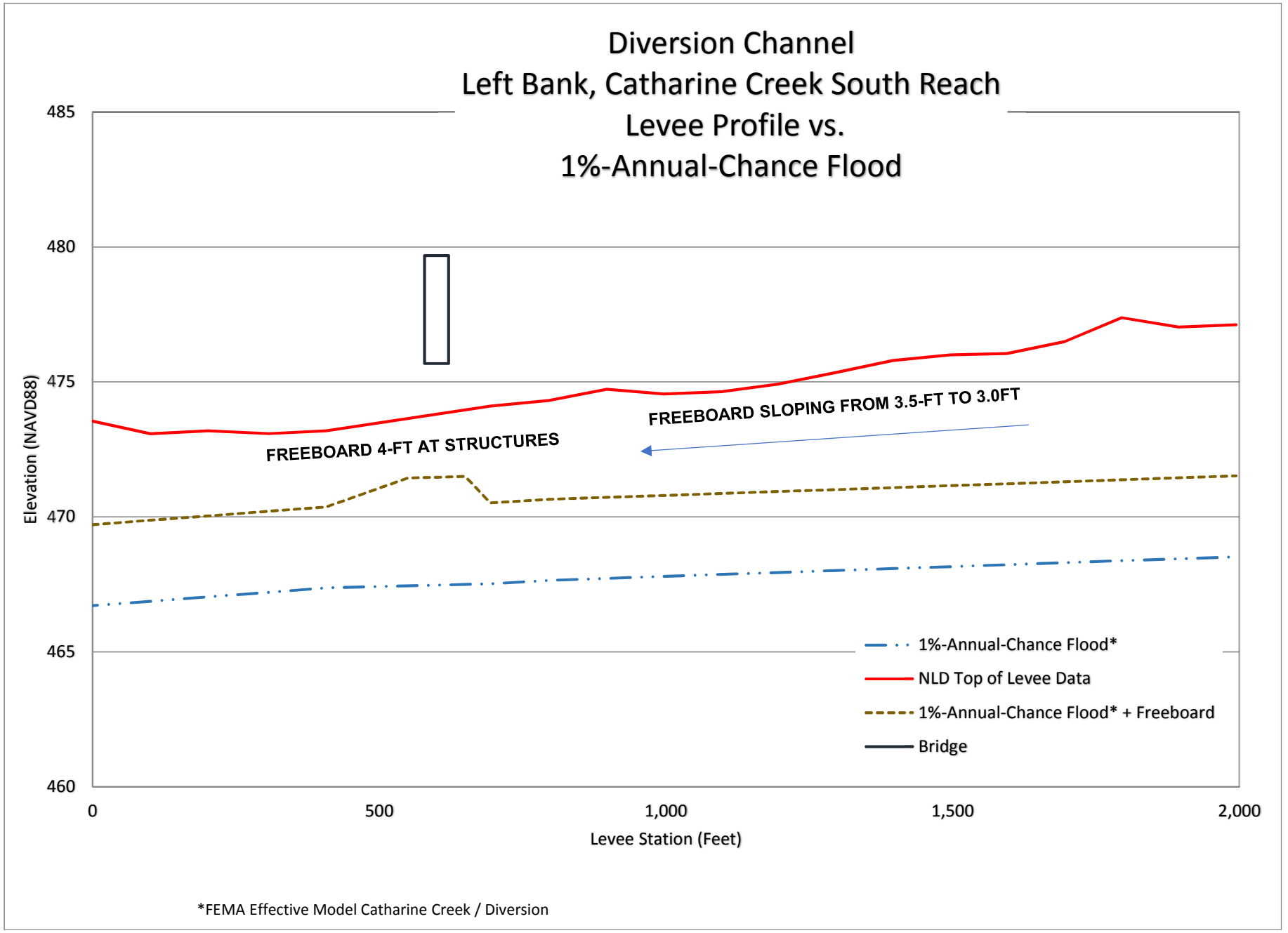
FEMA

Thank You

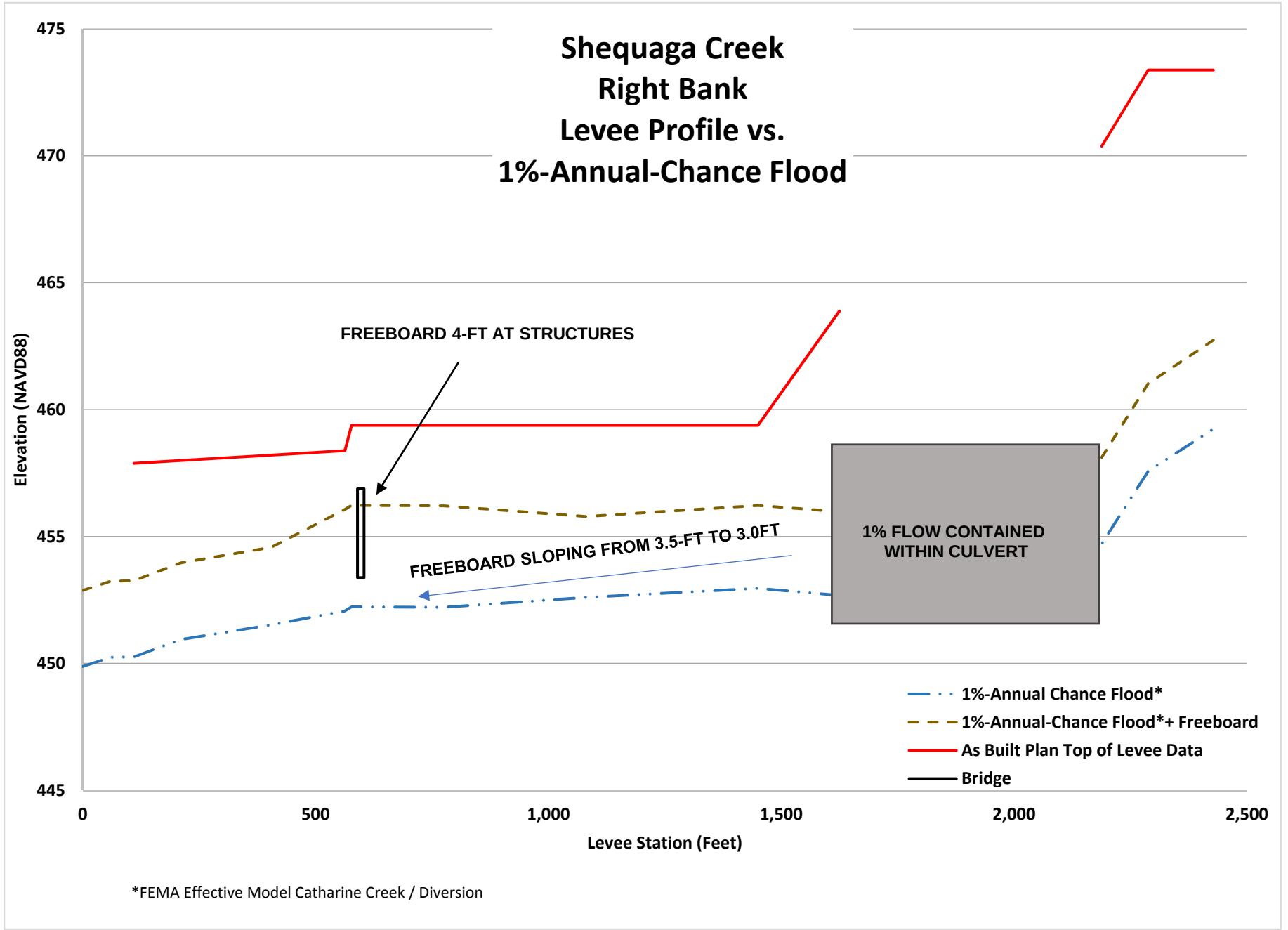
Challenges, Innovation, The way forward

Appendix C
Freeboard Profile Comparison

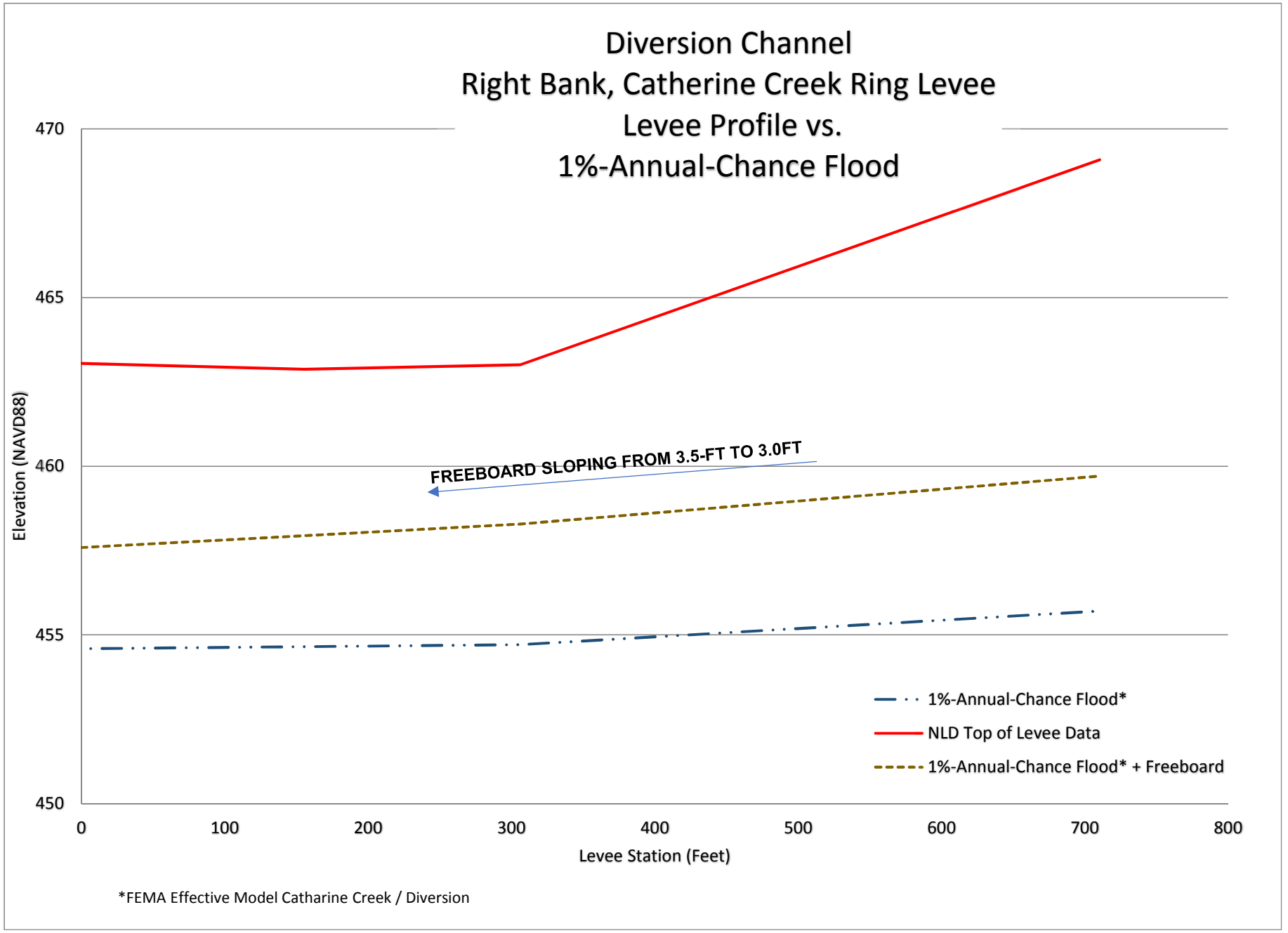

Diversion Channel
Left Bank, Catharine Creek North Reach
Levee Profile vs.
1%-Annual-Chance Flood
Elevation (NAVD88)
470
465
460
455
450
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
Levee Station (Feet)
FREEBOARD 4-FT AT STRUCTURES
FREEBOARD SLOPING FROM 3.5-FT TO 3.0FT
1%-Annual-Chance Flood*
NLD Top of Levee Data
1%-Annual-Chance Flood* + Freeboard
Bridge
*FEMA Effective Model Catharine Creek / Diversion



*FEMA Effective Model Catharine Creek / Diversion



*FEMA Effective Model Catharine Creek / Diversion


Diversion Channel
Right Bank, Catherine Creek Ring Levee
Levee Profile vs.
1%-Annual-Chance Flood
470
465
460
455
450
Elevation (NAVD88)
FREEBOARD SLOPING FROM 3.5-FT TO 3.0FT
1%-Annual-Chance Flood*
NLD Top of Levee Data
1%-Annual-Chance Flood* + Freeboard
0
100
200
300
400
500
600
700
800
Levee Station (Feet)
*FEMA Effective Model Catharine Creek / Diversion

Appendix D
Levee Accreditation Checklist

FACT SHEET

LEVEES
IDENTIFYING THE RISK

Meeting the Criteria for Accrediting Levee Systems on NFIP Flood Maps

How-to-Guide for Floodplain Managers and Engineers

A levee system is a flood protection system that consists of a levee, or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices. A levee is a manmade structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding.

As part of the flood mapping process, the Department of Homeland Security, Federal Emergency Management Agency (FEMA) and its State and local mapping partners review levee system data and documentation.

It is the levee owner's or community's responsibility to provide data and documentation to demonstrate that a levee system meets National Flood Insurance Program (NFIP) requirements as described in Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44 CFR Section 65.10), which you may view on the FEMA Web site at www.fema.gov/plan/prevent/fhm/lv_fpm.shtm.

To be recognized as providing a 1-percent-annual-chance level of flood protection on the modernized NFIP maps, called Digital Flood Insurance Rate Maps (DFIRMs), levee systems must meet *and continue to meet* the minimum design, operation, and maintenance standards (44 CFR Section 65.10)..

To help clarify the responsibilities of community officials, levee owners, or other parties seeking recognition of a levee system identified during a study/mapping project, FEMA issued Procedure Memorandum No. 34 (PM 34), *Interim Guidance for Studies Including Levees*, on August 22, 2005. PM 34 provided clarification of the procedures provided in Appendix H of FEMA's *Guidelines and Specifications for Flood Hazard Mapping Partners*.

FEMA issued Revised Procedure Memorandum No. 43, *Guidelines for Identifying Provisionally Accredited Levees*, on March 16, 2007, which allows issuance of preliminary and, in some cases, effective DFIRMs while communities/levee owners compile and submit required data and documentation. FEMA issued Procedure Memorandum No. 45, *Revisions to Accredited Levee and Provisionally Accredited Levee Notations*, in April 2008 to clarify map notes for accredited and provisionally accredited levee systems.

This document provides information regarding the types of data and documentation that must be submitted for levee systems to be accredited on DFIRMs, including a checklist and an index of further resources you may wish to consult.

COMMUNITIES WITH LEVEE SYSTEMS SHOULD KNOW:

- The community and/or other party seeking recognition or continued recognition of a levee system must provide data and documentation showing that the levee system provides base (1-percent-annual-chance) flood protection for FEMA to credit the levee system with flood protection on a FIRM or DFIRM.
- Communities *must* actively participate in the levee system documentation process.
- Levee systems without sufficient data and documentation will not be credited with providing base flood protection.
- Some levee systems may qualify for the Provisionally Accredited Levee (PAL) designation.
- Guidance regarding the PAL designation and other levee issues is available at:

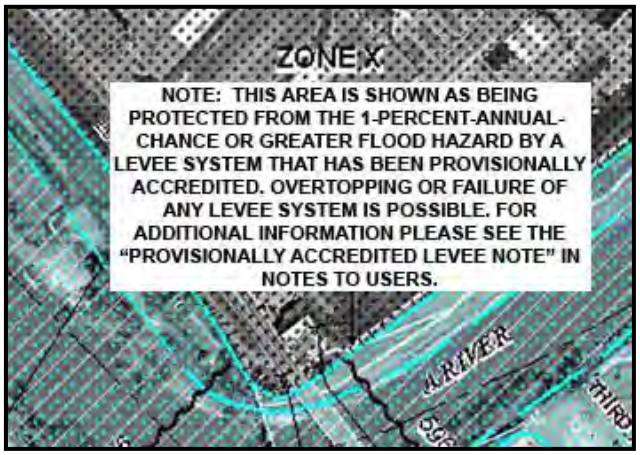
www.fema.gov/plan/prevent/fhm/lv_fpm.shtm

HOW FEMA WILL MAP LEVEE SYSTEMS

FEMA mapping requirements are designed to provide the people living and working behind levee systems with accurate, up-to-date flood hazard and risk information so that they may make wise decisions to minimize damage and loss of life. FEMA does not evaluate the performance of a levee system—this is the responsibility of the levee owner. FEMA is responsible for establishing levee system evaluation and mapping standards, determining flood insurance risk zones, and reflecting these determinations on DFIRMs.

Accredited Levee System

An accredited levee system is a system that FEMA has determined can be shown on a DFIRM as providing a 1-percent-annual-chance or greater level of flood protection. This determination is based on the submittal of data and documentation required by 44 CFR Section 65.10. The area landward of an accredited levee system is shown as a moderate-risk area, labeled Zone X (shaded), on the DFIRM except for areas of residual flooding, such as ponding areas, which will be shown as high-risk areas, called Special Flood Hazard Areas (SFHAs). Flood insurance is not mandatory in Zone X (shaded) areas, but is mandatory in SFHAs. FEMA strongly encourages flood insurance for all structures in levee-impacted areas.



Provisionally Accredited Levee (PAL) System

The PAL designation may be used for a levee system that FEMA has previously accredited with providing 1-percent-annual-chance flood protection on an effective FIRM/DFIRM, and for which FEMA is awaiting data and/or documentation that will show the levee system is compliant with 44 CFR Section 65.10. Before FEMA will apply the PAL designation to a levee system, the community or levee owner will need to sign and return an agreement indicating the data and documentation required for compliance with 44 CFR Section 65.10 will be provided within a specified timeframe. The impacted area landward of a PAL system also is shown as a moderate-risk area, labeled Zone X (shaded). Therefore, flood insurance is not mandatory for insurable structures in the levee-impacted area; however, it is strongly encouraged by FEMA as are other protective measures.

Levee System Not Accredited or De-accredited

If the levee system is not shown as providing 1-percent-annual-chance flood protection on an effective FIRM, the system is considered "not accredited" and the levee-impacted area is mapped as Zone AE or Zone A on a DFIRM, depending on the type of study performed for the area. If the levee system was previously shown as providing 1-percent-annual-chance flood protection on an effective FIRM or DFIRM, but does not meet the PAL requirements or is no longer eligible for the PAL designation, FEMA will de-accredit the levee system and re-map the levee-impacted area as an SFHA, labeled Zone AE or Zone A depending on the type of study performed . Flood insurance will be required for insurable structures with federally backed mortgages in SFHAs.

Design Criteria*	Section of the NFIP Regulations: 65.10(b)
Description: For levee systems to be recognized (i.e., accredited) by FEMA, evidence that adequate design and operation and maintenance systems are in place to provide reasonable assurance that protection from the base flood exists must be provided. The following requirements must be met:	
Checklist for Design Criteria:	
☐	**Freeboard.** Minimum freeboard required 3 feet above the Base Flood Elevation (BFE) all along length, and an additional 1 foot within 100 feet of structures (such as bridges) or wherever the flow is restricted. Additional 0.5 foot at the upstream end of a levee. Coastal levees have special freeboard requirements (see Paragraphs 65.10(b)(1)(iii) and (iv)).
☐	**Closures.** All openings must be provided with closure devices that are structural parts of the system during operation and designed according to sound engineering practice.
☐	**Embankment Protection**. Engineering analyses must be submitted that demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood, as a result of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through reduction of the seepage path and subsequent instability.
☐	**Embankment and Foundation Stability Analyses.** Engineering analyses that evaluate levee embankment stability must be submitted. The analyses provided must evaluate expected seepage during loading conditions associated with the base flood and must demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment or foundation stability. An alternative analysis demonstrating that the levee is designed and constructed for stability against loading conditions for Case IV as defined in the U.S. Army Corps of Engineers (USACE) Engineer Manual 1110–2–1913, *Design and Construction of Levees*, (Chapter 6, Section II), may be used.
☐	**Settlement Analyses.** Engineering analyses must be submitted that assess the potential and magnitude of future losses of freeboard as a result of levee settlement and demonstrate that freeboard will be maintained. This analysis must address embankment loads, compressibility of embankment soils, compressibility of foundation soils, age of the levee system, and construction compaction methods. In addition, detailed settlement analysis using procedures such as those described in USACE Engineer Manual 1110–1–1904, *Soil Mechanics Design— Settlement Analysis*, must be submitted.
☐	**Interior Drainage.** An analysis must be submitted that identifies the source(s) of such flooding, the extent of the flooded area, and, if the average depth is greater than 1 foot, the water-surface elevation(s) of the base flood. This analysis must be based on the joint probability of interior and exterior flooding and the capacity of facilities (such as drainage lines and pumps) for evacuating interior floodwaters.

Operation Plan*	Paragraph 65.10(c)(1) of the NFIP Regulations
Description: For a levee system to be recognized (i.e., accredited), the operational criteria must be as described below. All closure devices or mechanical systems for internal drainage, whether manual or automatic, must be operated in accordance with an officially adopted operation manual, a copy of which must be provided to FEMA by the operator when levee or drainage system recognition is being sought or when the manual for a previously recognized system is revised in any manner. All operations must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP.	
Checklist for Operation Plan:	
	Flood Warning System. Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials that will be used to trigger emergency operation activities; and demonstration that sufficient flood warning time exists for the completed operation of all closure structures, including necessary sealing, before floodwaters reach the base of the closure.
	Plan of Operation. A formal plan of operation including specific actions and assignments of responsibility by individual name or title.
	Periodic Operation of Closures. Provisions for periodic operation, at not less than one-year intervals, of the closure structure for testing and training purposes.
	Interior Drainage Plan. See below.
Interior Drainage Plan	**Paragraph 65.10(c)(2) of the NFIP Regulations**
Description: Interior drainage systems associated with levee systems usually include storage areas, gravity outlets, pumping stations, or a combination thereof. These drainage systems will be recognized by FEMA on NFIP maps for flood protection purposes only if the following minimum criteria are included in the operation plan.	
Checklist for Interior Drainage Plan:	
	Flood Warning System. Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials that will be used to trigger emergency operation activities; and demonstration that sufficient flood warning time exists to permit activation of mechanized portions of the drainage system.
	Plan of Operation. A formal plan of operation including specific actions and assignments of responsibility by individual name or title.

	Manual Backup. Provision for manual backup for the activation of automatic systems.
	Periodic Inspection. Provisions for periodic inspection of interior drainage systems and periodic operation of any mechanized portions for testing and training purposes. No more than 1 year shall elapse between either the inspections or the operations.
Maintenance Plan	**Paragraph 65.10(d) of the NFIP Regulations**
Description: For levee systems to be recognized as providing protection from the base flood (i.e., accredited by FEMA), the maintenance criteria must be as described herein.	
Checklist for Maintenance Plan:	
	Levee systems must be maintained in accordance with an officially adopted maintenance plan, and a copy of this plan must be provided to FEMA by the owner of the levee system when recognition is being sought or when the plan for a previously recognized system is revised in any manner.
	All maintenance activities must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP that must assume ultimate responsibility for maintenance.
	This plan must document the formal procedure that ensures that the stability, height, and overall integrity of the levee and its associated structures and systems are maintained. At a minimum, the plan shall specify the maintenance activities to be performed, the frequency of their performance, and the person by name or title responsible for their performance.
Certification	**Paragraph 65.10(e) of the NFIP Regulations**
Description: Data submitted to support that a given levee system complies with the structural requirements set forth in "Design Criteria" (Paragraphs 65.10(b)(1) through (7) of the regulations) must be certified by a Registered Professional Engineer. Also, certified "as-built" plans of the levee must be submitted. Certifications are subject to the definition given in Section 65.2 of the NFIP regulations. In lieu of these structural requirements, a Federal agency with responsibility for levee design may certify that the levee has been adequately designed and constructed to provide protection from the base flood.	
Checklist for Certification Requirement:	
	All data submitted is certified by Professional Engineer or certified by a Federal agency.
	Certified as-built levee plans are included in the submittal.

A NOTE ABOUT FLOOD RISK AND FLOOD INSURANCE

Levee systems are designed to provide a *specific level of protection*. They can be overtopped or fail during larger flood events.

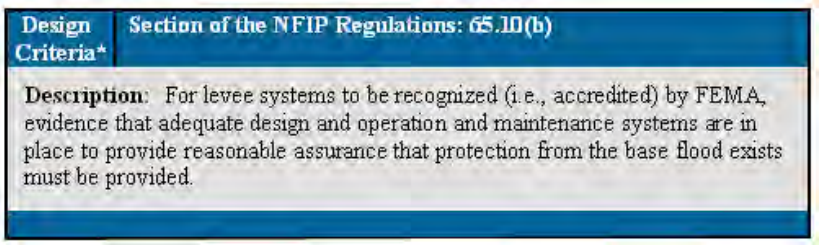
Levee systems also decay over time. They require regular maintenance and periodic upgrades to retain their level of protection. When levees do fail, they often fail catastrophically. The resulting damage, including loss of life, may be much greater than if the levee system had not been built.

For all these reasons, FEMA strongly encourages people in levee-impacted areas to understand their flood risk, know and follow evacuation procedures, and protect their property by purchasing flood insurance protection, by floodproofing, or by taking other protective measures.

CHECKLIST INFORMATION

The checklist provided in this fact sheet is meant to assist local community officials and levee owners in gathering the data and documentation that will be required for FEMA to show a levee system as providing 1-percent-annual-chance flood protection on the community's DFIRM. Where possible, text from the actual NFIP regulations (44 CFR Section 65.10) was used.

The checklist is set up according to the appropriate paragraph of 44 CFR Section 65.10. For example, Design Criteria can be found in Paragraph 65.10(b):



Design Criteria*	Section of the NFIP Regulations: 65.10(b)
Description: For levee systems to be recognized (i.e., accredited) by FEMA, evidence that adequate design and operation and maintenance systems are in place to provide reasonable assurance that protection from the base flood exists must be provided.	

For a comprehensive description of each item in this checklist, please see Appendix H of the *Guidelines and Specifications for Flood Hazard Mapping Partners*. Locations of this resource, and other useful resources, are provided below.

INDEX OF RESOURCES

This fact sheet is accessible, along with an assortment of other levee-related resources, through a dedicated portion of the FEMA Web site. The gateway to the FEMA-provided levee information, which is organized by stakeholder group to assist levee owners, community officials, and other stakeholders, is www.fema.gov/plan/prevent/fhm/lv_intro.shtm. The FEMA resources referenced in this fact sheet, listed below, are directly accessible through www.fema.gov/plan/prevent/fhm/lv_fpm.shtm.

- Procedure Memorandum No. 34, *Interim Guidance for Studies Including Levees*
- Revised Procedure Memorandum No. 43, *Guidelines for Identifying Provisionally Accredited Levees*.
- Procedure Memorandum No. 45, *Revisions to Accredited Levee and Provisionally Accredited Levee Notations*
- Appendix H, "Mapping of Areas Protected by Levee Systems," of *Guidelines and Specifications for Flood Hazard Mapping Partners*.
- Section 65.10. *Mapping of Areas Protected by Levee Systems* of the NFIP regulations.

Flood insurance information can be found at www.fema.gov/business/nfip or on the NFIP's consumer Web site, www.FloodSmart.gov.

Links to the USACE Web site also are provided on the levee-dedicated pages; the resources discussed in this fact sheet are accessible through the USACE Web page at www.usace.army.mil/publications/eng-manuals.

Appendix E
Collected Data

(Full Appendix Provided on DVD)

Montour Falls, Schuyler County, NY
Levee Analysis and Mapping Procedures Discovery Project
Data Inventory

Date: August 22, 2018, revised December 3, 2018, May 2019

**** Please note that data in bold red text is outstanding and has not been obtained ****
**** Data in** black text **is available unless otherwise noted ****

FLOODPLAIN MAPPING & MODELING

FLOODPLAIN MAPPING

- Effective FIRM: September 15, 1983 (Village of Montour Falls, Schuyler County, NY)
  - FBFM: April 1, 1981
- Effective FIS: October 1, 1980

DIVERSION CHANNEL

- Hydrology: exceedance interval/discharge curve
- Hydraulics: detailed / HEC-2 (received scan of HEC-2 model from FEMA library)
  - *Per 1980 FIS, floodway designated but not modeled*
  - *Per 1980 FIS, surveyed channel cross-sections, overbank cross-section points obtained photogrammetrically*
  - *Per 1980 FIS, floodplain mapping based on 5-foot contour interval on 1:2,400 scale maps*

SHEQUAGA CREEK

- Hydrology: exceedance interval/discharge curve
- Hydraulics: detailed / HEC-2 (received scan of HEC-2 model from FEMA library)
  - *Per 1980 FIS, floodway designated but not modeled*
  - *Per 1980 FIS, surveyed channel cross-sections, overbank cross-section points obtained photogrammetrically*
  - *Per 1980 FIS, floodplain mapping based on 5-foot contour interval on 1:2,400 scale maps*

BASE DATA

- National Flood Hazard Layer: None available
- DEM: FEMA 2-meter
- Orthoimagery: http://gis.ny.gov/

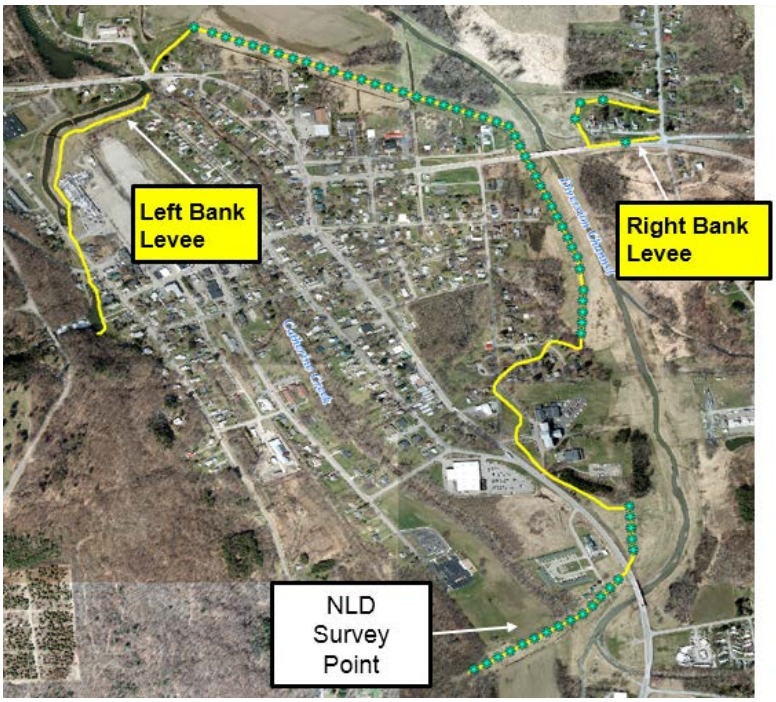
STREAM GAGE DATA:

- Peak yearly flow data available from USGS Station – 04232200, CATHARINE CR AT MONTOUR FALLS NY

LEVEE SYSTEM / 44CFR65.10 DATA:

- NYSDEC Montour Falls Flood Damage Reduction Project Summary
- Levee crest survey: National Levee Database (NLD) – along Diversion Channel, see below
- **Structural requirements:**
  - **Freeboard analysis:**
  - **Closure analysis:**
  - **Embankment protection analysis:**
  - **Geotechnical analyses:**
  - **Interior drainage analysis:**
- As-built Plans:
  - Catharine Creek As-Built Plans
  - Shequaga Creek As-Built Plans
  - Penn Railroad Bridge As-Built Plans
- Operation and Maintenance Plans:
  - Catharine and Shequaga Creek Operation and Maintenance Manual
- Levee Inspection Reports:
  - 2009 Periodic Inspection Report
  - FY17 Periodic Inspection Reports
  - FY18 Periodic Inspection Reports
- Other
  - Montour Falls Auger Borings (1947)
  - USACE Design Analysis (1948)
  - Certification
- **USACE Levee Screening and Levee Safety Action Classification (LSAC): Low 06/20/2017**

USACE National Levee Database Levee Crest Survey Point Overview



Appendix F
Initial Data Analysis

(Full Appendix Provided on DVD)