Levee Analysis and Mapping Plan
Wellsville Local Flood Protection Project
Dyke Creek Watershed Project

Village of Wellsville, Town of Wellsville
Allegany County, New York

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FEMA

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Acronyms

BFE	Base Flood Elevation
BLE	Base Level Engineering
CERC	Community Engagement and Risk Communication
CFR	Code of Federal Regulations
DEM	Digital Elevation Model
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
NLD	National Levee Database
NRCS	Natural Resources Conservation Service
NYSDEC	New York State Department of Environmental Conservation
O&M	Operations and Maintenance
PTS	Production and Technical Services
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* (November 2019) in the Glossary. This guidance document is available from the FEMA Library at https://www.fema.gov/media-collection/guidance-femas-risk-mapping-assessment-and-planning.

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 mapping procedures for non-accredited levees, which 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*.

Leveed Area* – A spatial feature in the National Levee Database 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 FEMA can facilitate 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)* – A database developed by the U.S. Army Corps of Engineers (USACE) in cooperation with FEMA, which is a dynamic, searchable inventory of information for all levee systems in the Nation. The NLD 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 at Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44 CFR 65.10), *Mapping of Areas Protected by Levee Systems*, and is not shown on a FIRM as reducing 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*

Executive Summary

The Village of Wellsville, New York, has three levee systems that were constructed by the Buffalo District of the United States Army Corps of Engineers (USACE). They are part of the Wellsville Local Flood Protection Project (Wellsville LFPP). These levee systems are along the Genesee River and Dyke Creek. They are not shown as reducing the hazard of the 1-percent-annual-chance flood (base flood) on the effective Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) from 1978.

There are two levee systems constructed by the Natural Resources Conservation Service (NRCS). One is the Dyke Creek NRCS Right Bank Levee System and the other is the Dyke Creek NRCS Left Bank Levee System. They are part of the Dyke Creek Watershed Project (DCWP). These Dyke Creek levee systems are accredited and shown as reducing the base flood hazard. This was accomplished using the Letter of Map Revision (LOMR) process in 1996. The Dyke Creek NRCS Left Bank Levee system is located within the Village and Town of Wellsville. The Dyke Creek NRCS Right Bank Levee system is in the Town of Wellsville.

FEMA Region II plans to develop a modernized county-wide digital Flood Insurance Study (FIS) and FIRMs for Allegany County, New York. These updates will replace community based FISs and FIRMs. As part of the update process, FEMA Region II is engaging the Village and Town of Wellsville early to identify flood risk related to the levee systems.

FEMA guidance was revised in 2013 by the *Analysis and Mapping Procedures for Non-Accredited Levee Systems*. These procedures feature more interactive stakeholder engagement. They also provide additional options to analyze and map flood hazards for non-accredited levee systems. FEMA Region II funded a Levee Discovery project utilizing those procedures in the Village and Town of Wellsville.

In June 2019, FEMA Region II partnered with local, regional, and Federal levee stakeholders to form a Local Levee Partnership Team (LLPT) in the Village and Town of Wellsville. The LLPT coordinated to develop potential analysis and mapping procedures to be applied to local levee systems. This involved collecting and evaluating available data, completing an initial data analysis, and discussing mapping needs.

This levee plan summarizes that information. The plan outlines potential options to identify the levee flood hazard on future FIRMs. It also identifies additional data collection needs.

The Village and Town of Wellsville indicated that they prefer current levee flood risk identification to continue on future FIRMs. For the accredited levee systems of the NRCS DCWP, the levee sponsor would need to supply certified data compliant with Title 44, Code of Federal Regulations, Chapter 1, Part 65, Section 10 (44CFR §65.10) to FEMA. This data submission would need a completeness check to be performed by FEMA. Accreditation would be based on effective flood risk at that time. In this scenario, if the levee sponsor does not submit data or submits incomplete information to FEMA, accreditation will not be provided. Future FIRMs would depict flood risk based on modeling without the levee systems being considered as reducing flood hazards of the base flood.

If levee accreditation data were to later become available, it could be submitted to FEMA using the Letter of Map Revision (LOMR) process.

1 Introduction

Under FEMA's prior levee approach, a levee system that did not meet the National Flood Insurance Program (NFIP) requirements of 44 CFR §65.10 was analyzed and mapped as if the levee system had no effect on flooding on the landward side of the levee system during the base flood. This was known as the "without levee" approach (FEMA, 2019).

Stakeholders expressed concern about the "without levee" approach. Members of both the U.S. House of Representatives and Senate echoed this concern. They requested FEMA consider discontinuing the "without levee" approach. FEMA used current modeling techniques to refine flood hazard reduction provided by non-accredited levee systems. This process, known as the "Analysis and Mapping Procedures for Non-Accredited Levee Systems", enhances interactive stakeholder engagement. This process recognizes the uncertainty associated with hazard identification of levee-impacted areas providing multiple options to show flood hazards.

This approach is being applied to the levee systems along the Genesee River and Dyke Creek within the Village of Wellsville and Town of Wellsville. Analysis and Mapping Procedures for Non-Accredited Levee Systems activities were initiated by FEMA; its Production and Technical Services (PTS) provider, Strategic Alliance for Risk Reduction II (STARR II); and its Community Engagement and Risk Communication (CERC) provider (*Resilience Action Partners*).

Flood hazards change over time. Conditions within a watershed may also change. FEMA funded a Base Level Engineering (BLE) project for the Upper Genesee River Watershed to help inform flood risk mapping projects. This BLE project includes the Genesee River and Dyke Creek in the Village and Town of Wellsville. This BLE project provided flood risk datasets, including flood hazard for Genesee River and Dyke Creek. The results of the BLE project can be used to expand risk awareness discussions with communities.

When a stream with a levee system is restudied, the protective status of the levee system is reevaluated. In this case, if the Genesee River and Dyke Creek are restudied, the levee systems in the Village and Town of Wellsville will be reevaluated. FEMA leveraged the BLE project to develop a first pass estimate of the potential base flood hazard for the levee systems along the Genesee River and Dyke Creek. The initial data analysis is discussed in Sections 4 and 5 of this levee plan.

This levee plan is the result of collaboration between FEMA, the Village and Town of Wellsville, the New York State Department of Environmental Conservation (NYSDEC), Allegany County, the USACE, and other stakeholders. The plan summarizes stakeholder coordination, initial data analysis, and potential options for depicting the flood hazard for the levee systems on a future FIRM.

2 Levee System Descriptions

2.1 Wellsville Local Flood Protection Project (LFPP)

The Genesee River flows through the Village of Wellsville from southeast to northwest for approximately 5 miles. Dyke Creek flows southwest through the Town of Wellsville into the Village of Wellsville to its confluence with the Genesee River near State Street and Genesee Parkway.

USACE originally designed the Wellsville LFPP to reduce flood risk to the Village and Town of Wellsville from the Genesee River and Dyke Creek. The project includes three levee systems: Genesee River Left Bank Levee system, Genesee River Right Bank Levee system, and Dyke Creek Left Bank Levee system. Left and right banks are identified in relation to looking downstream.

The three levee systems of the Wellsville LFPP are earthen levees and include riprap erosion protection and interior drainage features. The Wellsville LFPP also included drop structures, along with channel realignment and widening throughout the stream reaches. Construction of the Wellsville LFPP was completed by USACE in 1958.

In 1972, Tropical Storm Agnes damaged the Wellsville LFPP. The New York State Department of Transportation modified the project based on new frequency curves and a design flow equivalent to a 20-year discharge of the Genesee River and a 35-year discharge of Dyke Creek.

The three levee systems of the Wellsville LFPP have multiple sponsors that have different roles to support the levee system. The levee sponsors include USACE as the Federal sponsor, NYSDEC as the non-federal sponsor, and the Village of Wellsville as the local sponsor. The Village of Wellsville has an agreement with NYSDEC to perform some operations & maintenance (O&M) items in accordance with the O&M Manual.

2.2 Dyke Creek Watershed Project (DCWP)

Dyke Creek passes through the Village and Town of Wellsville for about 1.7 miles until its confluence with the Genesee River. The NRCS constructed the DCWP to reduce flood risk along Dyke Creek downstream of Thomas Road. The project included channel excavation, riprap protection measures, and two earthen levee systems: Dyke Creek NRCS Left Bank Levee system and Dyke Creek NRCS Right Bank Levee system.

The Dyke Creek NRCS Left Bank Levee system begins at the Western New York and Pennsylvania Railroad where it is constructed on top of the Dyke Creek Left Bank Levee system embankment that was constructed by USACE as part of the Wellsville LFPP. The Dyke Creek NRCS Left Bank Levee system then turns northeast along Dyke Creek and continuing to its upstream end near Thomas Road and Baldwin Road. The Dyke Creek NRCS Right Bank Levee is a ring levee that is traversed by Andover Road and includes closure structures.

The two levee systems of the DCWP have multiple sponsors that have different roles to support the levee system. The levee sponsors include the NRCS as the Federal sponsor, NYSDEC as the non-federal sponsor, and the Town of Wellsville as the local sponsor. The Town of Wellsville has an O&M agreement with NRCS for maintenance of the levee systems in accordance with the O&M

Plan. More information about the levee systems is provided in Table 1 and the levee system alignments are shown in Figure 1.

Table 1. Levee Summary

Levee System Name	Levee System ID	County	Impacted Community	Approximate Total Length of Levee System (ft)	Approximate # of Structures Affected
Genesee River Left Bank Levee	2405000024	Allegany	Village of Wellsville	5,000[1]	22[1]
Genesee River Right Bank Levee	2405000025	Allegany	Village of Wellsville	1,980[1]	124[1]
Dyke Creek Left Bank Levee	2405000025	Allegany	Village of Wellsville	950[1]	35[1]
Dyke Creek NRCS Left Bank Levee	460005000001	Allegany	Village of Wellsville, Town of Wellsville	4,645	143[2]
Dyke Creek NRCS Right Bank Levee	460005000002	Allegany	Town of Wellsville	2,745	7[2]

[1] Data from USACE National Levee Database (NLD)
[2] Data estimated from Natural Valley inundation extent and aerial photo

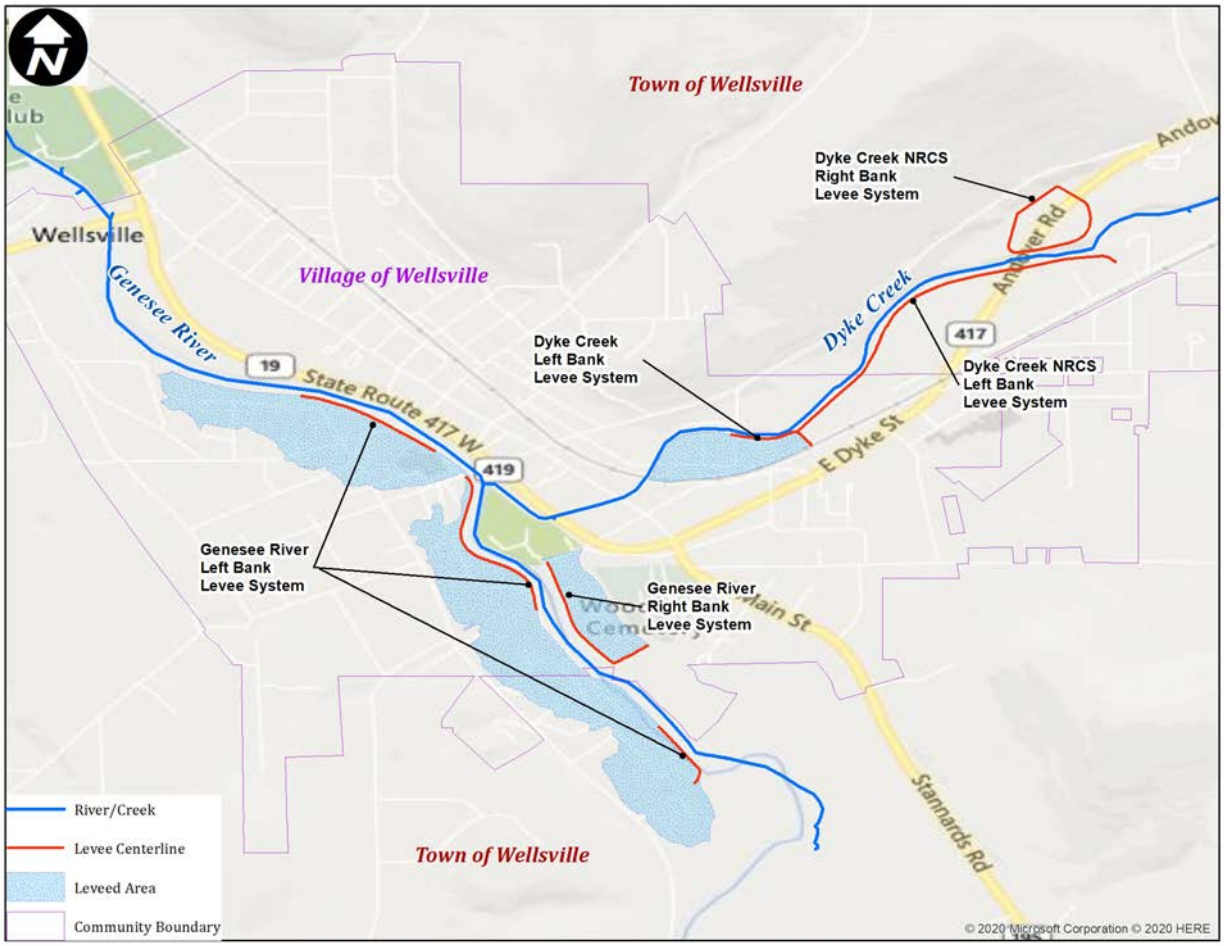

Figure 1: Location Map

2.3 Community NFIP and FIS History

Table 2 summarizes the NFIP participation and FIS history of the Village of Wellsville and Town of Wellsville.

Table 2. Community Map History

Community Name	Participating in the NFIP?	Initial Identification	Flood Hazard Boundary Map Revision Date(s)	FIRM Effective Date	LOMRs Affecting Levee Mapping
Village of Wellsville	Yes	July 17, 1978	N/A	July 17, 1978	LOMR 96-02-007P dated September 6, 1996
Town of Wellsville	Yes	July 17, 1978	N/A	March 18, 1985	LOMR 96-02-007P dated September 6, 1996

The Village of Wellsville FIRM, dated July 17, 1978, does not show the levee system alignments for the Genesee River Left Bank, Genesee River Right Bank, and Dyke Creek Left Bank Levee

systems of the Wellsville LFPP. These three levee systems are mapped as non-accredited and not reducing the hazards of the base flood on the Village of Wellsville FIRM.

The Dyke Creek NRCS Left and Right Bank Levee systems are shown as accredited and reducing the hazards of the base flood (except for interior drainage flooding areas). The levee systems were accredited by a LOMR for the Village and Town of Wellsville, effective September 6, 1996.

2.4 Upper Genesee River Watershed BLE

FEMA funded a large-scale BLE project for the Upper Genesee River Watershed that includes the Genesee River and Dyke Creek in the Village and Town of Wellsville. This watershed-wide BLE project is intended to inform future mapping updates.

The BLE project provides updated information but is limited in detail. The resulting flood risk dataset can be used to initiate flood risk awareness discussions. The final report for the Upper Genesee River Watershed BLE project will be released to the public upon completion.

2.5 Future Detailed Study

In the future, FEMA may fund a detailed study of the Genesee River and Dyke Creek in the Village and Town of Wellsville. A detailed study would supersede the effective FIS report and FIRMs on the effective date of the new study.

A detailed study is an enhanced level of study that may include hydrologic and hydraulic analysis. The detailed hydraulic analysis may include ground survey, additional information about stream crossings such as bridges, and more manipulation of models than the leveraged hydraulic analysis from the BLE project.

3 Stakeholder Engagement and Data Collection

3.1 Local Levee Partnership Team

The LLPT is a group of levee stakeholders who provide FEMA with data and information on local levee conditions. They also share feedback on the procedures for analyzing and mapping the levee reach. The stakeholders who participated in the LLPT for this project are listed in Table 3.

Table 3. LLPT Participants

LLPT Member	Contact Information
Bill Whitfield	Village of Wellsville, Director of Public Works 585-596-1710; bill_whitfield@wellsvilleny.com
Dean Arnold	Town of Wellsville, Highway Superintendent 585-593-5140; twhighway@gmail.com (email, phone number, courtesy of Town Clerk)
Jeff Luckey	Allegany County, Director of Emergency Management 585-268-7658; luckeyj@alleganyco.com
Jo Fenske	Town of Wellsville 585-596-1755; jofenske@wellsvilleny.com
Kier Dirlam	Allegany County, County Planning Director 585-268-7472; dirlamhk@alleganyco.com
Brienna Wirley	NYSDEC 585-226-5465; brienna.wirley@dec.ny.gov
David Walowsky	NRCS 315-477-6531; david.walowsky@usda.gov
Brad Wenskoski	NYSDEC, Environmental Program Specialist 518-402-8280; brad.wenskoski@dec.ny.gov
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Kerrie O'Keeffe	NYSDEC Region 9 kerrie.okeeffe@dec.ny.gov
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Nick Mueller	STARR II, FEMA Technical Support Provider 513-842-8200; nick.mueller@stantec.com
Azadeh Bloorchian	STARR II, FEMA Technical Support Provider 636-764-5852; azadeh.bloorchian@stantec.com
Matt Kroneberger	*Resilience Action Partners*, Outreach Provider 212-237-6373; matt.kroneberger@ogilvy.com

3.2 Data Collection

Through the stakeholder coordination and data collection process, FEMA asked the LLPT for all available data, information, and documentation associated with the levee systems.

Table 4 provides a summary of the data and documentation collected during the stakeholder coordination and data collection process. The data is included in Appendix D.

Table 4. Data Collection Summary

Data Type	Associated Levee System	Data Description	Source	Date Developed or Obtained
Effective Flood Insurance Study	Genesee River and all Dyke Creek	Allegany County, New York, Village of Wellsville, FEMA January 1978	FEMA Map Service Center	1978
Effective Flood Insurance Study	Genesee River and all Dyke Creek	Allegany County, New York, Town of Wellsville, FEMA January 1978	FEMA Map Service Center	1985
LOMC	Dyke Creek NRCS Left and Right Bank	LOMR 96-02-007P Case File	FEMA Library	1996
BLE Analysis, Upper Genesee River Watershed	Genesee River and all Dyke Creek	BLE Upper Genesee Watershed Engineering Analysis (HEC-RAS)	STARR II	2019
Topography	Genesee River and all Dyke Creek	Topographic LiDAR, FEMA 2-Meter Digital Elevation Model (DEM)	New York State GIS Clearinghouse	2019 (Obtained)
Design Report	Dyke Creek NRCS Left and Right Bank	Dyke Creek Watershed, Allegany County, New York, Design Report Dyke Creek Watershed Flood Control Dikes	NRCS	1999
As-built Drawings	Dyke Creek NRCS Left and Right Bank	DCWP	NRCS	1992
Documentation	Genesee River and Dyke Creek	Joint Routine Inspection of Completed Works, Flood Risk Management Project, Genesee River and Dyke Creek	USACE	2013, 2015-2019
Documentation	Genesee River and Dyke Creek	Genesee River Right Bank Levee and Dyke Creek Flood Damage Reduction Project Levee Periodic Inspection	USACE	2010
Documentation	Genesee River and Dyke Creek	Operation and Maintenance Manual for local flood protection on the Genesee River at Wellsville, New York	USACE	January 2000
As-built Drawings	Genesee River and Dyke Creek	Local Flood Protection at Wellsville	USACE	1956
As-built Drawings	Genesee River and Dyke Creek	Local Flood Protection, Wellsville, New York	USACE	1976, 1978
Drawing	Genesee River and Dyke Creek	Genesee River, Wellsville, New York	USACE	September 1994
Hydrologic Data	Genesee River and Dyke Creek	Streamstats Web Application, Magnitude and Frequency of Floods in New York, USGS 2006-5112	USGS	2020

3.3 Levee Inspection Reports

As noted in Table 4, USACE Buffalo District provided the LLPT with Routine Inspection and Periodic Inspection reports for Wellsville LFPP levee systems The Routine Inspection reports dated from 2013 to 2019. A Periodic Inspection report was dated 2010.

A Routine Inspection is currently completed by USACE Districts on an annual basis. A Routine Inspection is a visual inspection to verify proper operation and maintenance of flood control projects, including levee systems. A Periodic Inspection is a more rigorous process currently completed every 5 years. It includes verification of system operation and maintenance.

A levee system must meet certain criteria and standards and keep an acceptable or minimally acceptable rating to stay active in the Public Law (PL) 84-99 Rehabilitation and Inspection Program (note, USACE requirements vary from FEMA's levee data certification requirements under 44 CFR §65.10). Under PL 84-99, USACE has authority to supplement local efforts to repair flood control projects, including levee systems, which are damaged by a flood event.

The 2019 Routine Inspection report rated the Genesee River Right Bank Levee system as minimally acceptable. A minimally acceptable rating indicates that the levee system does not meet all USACE requirements but remains active in the PL 84-99 Rehabilitation and Inspection Program. This means that the levee system is eligible for Federal rehabilitation assistance for flood damage of system features. The primary reasons for minimally acceptable rating for the Genesee River Right Bank Levee system included: areas of heavy unwanted vegetation in the channel or along levee embankments, unauthorized modification of the levee, and observed erosion on side slopes and outfalls. These features will require maintenance to receive an acceptable rating.

The Genesee River Left Bank and Dyke Creek Left Bank Levee systems were both rated as unacceptable. The unacceptable rating was due to significant shoaling and heavy vegetation on channel slopes and no drainage crossing inspections within the last 5 years.

The USACE inspection reports are in Appendix D.

3.4 LLPT Meeting 1

A FEMA project team met with levee stakeholders at the first LLPT meeting on June 27, 2019. The meeting was held at the Village of Wellsville Board Room. The overall intent of the meeting was to gain local insight on the status of the levee systems and confirm the stakeholders who would like to take part in the LLPT. The meeting also discussed the data available for the levee systems and introduced the Analysis and Mapping Procedures for Non-Accredited Levee Systems. More details about the LLPT meeting 1 are in Appendix A.

3.5 LLPT Meeting 2

The LLPT Meeting 2 between FEMA's project team and levee stakeholders occurred February 5, 2020, at the Village of Wellsville Board Room. Representatives from the Village and Town of Wellsville, along with other project stakeholders, participated in the meeting. The meeting built upon discussions held at LLPT Meeting 1. The FEMA project team also updated the LLPT on data

collection and the initial data analysis. The potential flood hazard areas from the Natural Valley Procedure were also discussed. Additionally, the LLPT discussed future map updates and potential options for identifying and mapping the levee flood hazard on future FIRMs.

3.6 LLPT Meeting 3

The FEMA project team held a LLPT Meeting 3 webinar with levee stakeholders on April 29, 2020. Representatives from the Village and Town of Wellsville, along with other project stakeholders, participated in the meeting. The meeting built upon discussions held at LLPT Meeting 2. The FEMA project team provided a preview of this Levee Analysis and Mapping Plan and an overview of the mapping update process. More details about the LLPT meeting are in Appendix A.

After the comment period for this Levee Analysis and Mapping Plan concluded on May 31, 2020, comments were incorporated into the document. The document was finalized and shared with the LLPT in February 2021.

4 Initial Data Analysis

4.1 Understanding Existing Conditions

The effective hydraulic studies for the Genesee River and Dyke Creek were developed using the HEC-2 hydraulic modeling program. These HEC-2 models for the Genesee River and Dyke Creek are no longer available. The HEC-2 hydraulic modeling program is also not used for new studies.

The Upper Genesee River Watershed BLE project used the USACE HEC-RAS hydraulic modeling program for stream analysis. The HEC-RAS hydraulic models for the Genesee River and Dyke Creek were leveraged to conduct the initial data analysis of the levee systems. The initial data analysis was performed to provide a first pass estimate of the potential base flood elevations and inundation areas associated with the levee systems.

The USACE constructed Genesee River Left and Right Bank Levee systems and the Dyke Creek Left Bank Levee system are currently non-accredited.

The Dyke Creek NRCS Left Bank Levee system appears to tie-in to high ground at the Western New York and Pennsylvania Railroad. The Western New York and Pennsylvania Railroad is a non-levee reach as it was not designed or constructed as a levee system. The railroad is also not operated and maintained as a levee system.

Non-levee reaches are not considered as part of a levee system under FEMA regulations and are not considered to reduce flood risk. For the railroad to be considered as part of the Dyke Creek NRCS Left Bank Levee system, the reach of railroad needed for flood control would need to meet the minimum requirements of 44 CFR §65.10. This includes being owned, operated, and maintained as a levee system. A secondary requirement would include that the entity legally responsible for maintenance would be eligible for the criteria identified in 44 CFR§65.10(d). A 44 CFR§65.10 checklist that includes Paragraph 65.10(d) is part of the *Meeting the Criteria for Accrediting Levee systems on Flood Insurance Rate Maps* fact sheet in Appendix C. Additional discussion of potential

options for levee systems that do not tie into natural high ground at the downstream end is provided in Section 4.2 of *FEMA's Guidance for Flood Risk Analysis and Mapping, Levees.*

The Dyke Creek NRCS Left Bank Levee system also has a reach that is constructed on top of the Dyke Creek Left Bank Levee system embankment. While USACE noted that this factor may not prevent levee certification, coordination with USACE is encouraged to verify that any concerns are addressed.

Certified data in support of 44 CFR §65.10 for the Dyke Creek NRCS Left and Right Bank Levee systems was provided as part of the 1996 LOMR. Once results of a detailed restudy of Dyke Creek are available, the levee sponsor would need to provide data and documentation demonstrating that the levee systems continue to meet the requirements of 44 CFR §65.10 to maintain accreditation. This levee certification should be based on the detailed restudy of Dyke Creek.

4.2 Hydrologic and Hydraulic Analyses

The Upper Genesee River Watershed BLE project was leveraged as the baseline conditions for the initial data analysis. The BLE project included the following methodology:

- Topographic data processing of publicly available LiDAR;
- Hydrologic analysis using gridded input parameters, rural regression equations, and gage analysis, if applicable;
- Basin-wide hydraulic analysis (HEC-RAS) and generation of approximate floodplain mapping; and
- Structure data based on the National Bridge Inventory.

As part of the initial data analysis, the BLE project HEC-RAS hydraulic models for the Genesee River and Dyke Creek were modified. The modifications included estimating the channel geometry and adding channel manning's (roughness) values. Additionally, in-line channel structures are included based on available plans. This analysis is referred to as "modified BLE model" in this levee plan.

The modified BLE model was updated to reflect the "with levee" condition. This "with levee" modified BLE model does not allow flow on the land side of the levee system for estimated levee crests elevated above the base flood. The "with levee" condition may produce higher water surface elevations than the traditional Natural Valley Procedure, which allows flow on both sides of the levee. The "with levee" condition is used to estimate the base flood elevations on the river side of the levee system and is used for estimating minimum freeboard requirements. Additional details regarding the modified BLE model can be found in the profile comparison exhibits and technical memorandum provided in Appendix E.

The BLE project provides less local detail than the effective detailed studies of Genesee River and Dyke Creek; therefore, only a future detailed studies would supersede the effective information. The results of the initial data analysis for Genesee River and Dyke Creek are non-regulatory and

will help inform future detailed analyses. These results should not be used for regulatory activities. If a restudy is funded in the future, FEMA will reengage the community throughout the restudy and mapping process.

4.3 Computation of Freeboard

The base flood profile of the Genesee River and Dyke Creek "with levee" modified BLE models were used to estimate minimum freeboard, per the requirements of 44 CFR §65.10 (b)(1), which include:

- "... a minimum freeboard of three feet above the water-surface level of the base flood."
- "An additional one foot above the minimum is required within 100 feet on either side of structures (such as bridges) riverward of the levee or wherever the flow is constricted."
- "An additional one-half foot above the minimum at the upstream end of the levee, tapering to not less than the minimum at the downstream end of the levee, is also required." These are additive and not an either-or situation.

The estimated base flood profile of the Genesee River and Dyke Creek were plotted against the levee crest elevations to see if the levee crest met minimum freeboard requirements.

The levee crest elevations for the Genesee River Left Bank, Genesee River Right Bank, and Dyke Creek Left Bank Levee systems were from the USACE NLD . The levee crest profile of the Dyke Creek Left Bank Levee system includes the embankment associated with the Dyke Creek NRCS Left Bank Levee system. The Dyke Creek NRCS Left Bank and Dyke Creek NRCS Right Bank Levee crest elevations were estimated from as-built plan information.

The approximate freeboard comparison exhibits in Appendix B show that the Genesee River Right Bank and Left Bank Levee systems, and the Dyke Creek Left Bank Levee system crest elevations may be overtopped by the base flood. This finding is consistent with the levee systems being depicted as non-accredited on the effective FIRM. It is also consistent with flood frequency information from the USACE.

The as-built levee crest elevations of the Dyke Creek NRCS Left and Right Bank Levee systems may be Freeboard Deficient and not meet the minimum freeboard requirements of 44 CFR §65.10 (b)(1).

It should be noted that the freeboard comparison was performed using the first pass data from the "with levee" modified BLE model. The results of the first pass analysis do not supersede those of the effective FIS report, FIRM, and applicable LOMRs for Genesee River and Dyke Creek; they are intended for discussion and risk awareness purposes and to inform future detailed studies.

Information from a future detailed study of the Genesee River and Dyke Creek may change the base flood elevation, which would revise minimum freeboard requirements. Additionally, the levee crest elevations for the freeboard comparison are based on available Digital Elevation Model (DEM) and plan data. A future field survey of the levee crest would be the responsibility of the

levee sponsor, if they choose to do so, and may produce results different from this freeboard comparison. A field survey of the levee crest would facilitate the future application of an appropriate levee analysis and mapping procedure.

4.4 Potential Levee Reach[3] Analysis Procedures

Potential reach analysis procedures are in FEMA's *Guidance for Flood Risk Analysis and Mapping, Levees*. The potential reach analysis procedures include: Natural Valley, Structural-Based Inundation, Overtopping, Freeboard Deficient, and Sound Reach Procedures. These procedures may be assigned for separately defined levee reaches of an entire system. Each procedure requires the use of different components of data from 44 CFR §65.10.

Mapping zones within the levee impacted area landward of the levee also vary. The Natural Valley Procedure defines the levee impacted area landward of the levee system. The mapping zone for the Natural Valley procedure landward of the levee system is Zone AE SFHA. Sound Reach, Overtopping, and Structural-Based Inundation procedures may result in a combination of a landward SFHA and Zone D. The Freeboard Deficient procedures may result in mapping flood risk as a Zone D. Interior drainage may also be mapped as SFHA if it is shown to be the dominant source of flooding for an area.

[3] See Levee Reach under Definitions on page iii.

Table 5. Levee Data Summary

Data Type	Levee Reach Analysis Procedure					Levee System Data Collected	
	Sound Reach	Freeboard Deficient	Overtopping	Structural-Based Inundation	Natural Valley	Genesee River Left Bank Levee System, Genesee River Right Bank Levee System, Dyke Creek Left Bank Levee System	Dyke Creek NRCS Left Bank Levee System, Dyke Creek NRCS Right Bank Levee System
Levee Crest Information	Required[4], BFE + Freeboard Less than Levee Crest	Required[4], BFE Less than Levee Crest	Required[4]	Required[4]		NLD levee crest survey	DEM and As-built plan. No levee crest survey
O&M Plan, Emergency Action Plan	Required[4]	Required[4]	Required[4]	Recommended		Yes	Yes
Certified As-Built Plans	Required[4]	Required[4]	Required[4]			Yes	Yes
Structural Design Requirements[5]	Required[4]	Required[4]	Required[4]			No	Unknown
Inspection Plan/ Inspection Reports	Required[4]	Required[4]	Required[4]	Recommended		Yes	Yes
Evaluation of overtopping Erosion Potential			Required[4]			No	No

[4] Data required from levee stakeholder.
[5] Structural design requirements include: freeboard, closures, embankment protection, embankment and foundation stability analyses, settlement analyses, and interior drainage. These requirements are listed in 44 CFR §65.10(b). A checklist of the levee certification data required under 44 CFR §65.10 is provided in Appendix C.

5 Potential Analysis Methods

A brief description of the various methods available to study the Wellsville LFPP and DCWP levee systems based on the FEMA guidance, are presented below. A brief evaluation of the appropriateness of each procedure is presented and focuses primarily on data available.

5.1 Sound Reach

A Sound Reach is a continuous section of a levee system that has been designed, constructed, and maintained to withstand the flood hazards posed by a base flood. A Sound Reach differs from an accredited levee system because it is part of a levee system that overall cannot meet accreditation requirements.

Based on the initial data analysis, each levee system is being considered a hydraulically independent levee system and is not being separated into reaches. The Sound Reach Procedure does not apply.

5.2 Freeboard Deficient

The Freeboard Deficient Procedure can be applied if the levee crest is above the base flood elevation, but the levee crest does not meet minimum freeboard requirements. A Freeboard Deficient Reach must meet structural requirements, O&M, and inspection standards.

As with the Sound Reach Procedure, no reach-specific modeling is required for a Freeboard Deficient Reach. However, SFHAs from the system-wide interior drainage analysis, and/or adjacent levee reaches, may still be delineated landward of Freeboard Deficient Reaches.

Based on the initial data analysis, levee crest elevation for the Genesee River Left Bank, Genesee River Right Bank, and Dyke Creek Left Bank Levee system, are below the base flood elevation; therefore, the Freeboard Deficient Procedure would not apply.

Also based on the initial data analysis, the levee crest elevations for the Dyke Creek NRCS Left Bank and Dyke Creek NRCS Right Bank Levee systems are above the base flood elevation but do not meet minimum freeboard requirements. The Dyke Creek NRCS Right Bank Levee system may be considered Freeboard Deficient. The Dyke Creek NRCS Left Bank Levee system does not tie into natural high ground at the downstream end. The levee system ties into the railroad that is a non-levee reach. Per the FEMA Levee Guidance section 7.1,

- “Non-levee reaches are considered a form of manmade high ground that a levee system ties into and whose existence and performance is necessary for excluding floodwaters from the levee-impacted area.”
- “To demonstrate that non-levee reaches meet the requirements of 44 CFR 65.10, they must be evaluated based on their current condition to determine eligibility for accreditation of the entire levee system of which they are a part.

If this issue is addressed, the levee system may be considered freeboard deficient. It should also be noted that the tie-back levee at the downstream end of the levee system is also constructed on top of the USACE Dyke Creek Left Bank Levee system. Coordination with USACE may be beneficial to

document the status of this levee system and would be needed prior to any modification to the tie-back levee.

Once a detailed analysis of Dyke Creek is available, the freeboard estimate of the levee systems can be reevaluated. If the levee systems are Freeboard Deficient and the Town of Wellsville provides 44 CFR §65.10 data summarized in Table 5, the Freeboard Deficient Analysis may be possible. The mapping zone associated with the Freeboard Deficient Procedure is Zone D. NFIP flood insurance rates in a Zone D are generally equivalent with an Approximate Zone A, and may be higher than in a detailed Zone AE.

5.3 Overtopping

The Overtopping Procedure can be considered when the base flood elevation is above the levee crest for a reach; however, the levee sponsor must provide technical justification that the base flood event will not cause structural failure. In addition to the structural standards established in 44 CFR §65.10, more detailed structural analysis may be required to justify the levee system's ability to sustain the impact of a base flood overtopping the levee. As with the Sound Reach and Freeboard Deficient Reach procedures, an O&M Plan and documentation of inspection are required.

For an Overtopping Reach, technical analyses are performed to determine the volume of water that would overtop the levee during the base flood event. This volume of water is used to establish the inundation area of the SFHA.

Based on initial data analysis, the Dyke Creek NRCS Left and the Dyke Creek NRCS Right Bank Levee systems may not be overtopped by the base flood elevation of Dyke Creek. The Genesee River Left Bank, Genesee River Right Bank, Dyke Creek Left Bank Levee systems would be overtopped by the base flood elevation of the Genesee River and Dyke Creek, respectively. As these levee systems were not designed to be overtopped, the overtopping analysis may not be applicable without redesign and construction.

Once detailed analyses of the Genesee River and Dyke Creek are available, the freeboard estimate of the levee systems will be updated. Based on if the levee systems are overtopped, the level of designed overtopping erosion resistance and if the Town of Wellsville provides additional data listed in Table 5, the Overtopping Analysis may be performed.

5.4 Structural-Based Inundation

In some instances, levee systems have reaches with either known structural deficiencies or unknown structural integrity (a common occurrence for older levee systems). Levee systems with structural integrity issues may provide some flood risk reduction by impeding conveyance to some degree. It is also possible that levee breaches may enhance localized damage due to increased velocity of flow through a breach. For these levee reaches, FEMA will rely on modeling breaches along the levee reach.

It is not possible to predict the exact location of a levee breach. This procedure neither predicts the probability of failure at any breach location, nor provides a specific determination or evaluation of

the overall levee system performance. It also does not require a determination of the potential failure mechanism. The procedure results in the development of a reach specific SFHA that might occur from potential breaches along a specific levee system during the base flood. To determine this SFHA, FEMA will consider possible locations of system breaches, geometry, and failure duration. An updated detailed study is strongly suggested prior to this analysis.

Once detailed analysis of the Genesee River and Dyke Creek are available, the freeboard estimate of the levee systems can be updated. If the levee systems are not significantly overtopped by either the Genesee River or Dyke Creek, FEMA may perform the Structural-Based Inundation Analysis. General practice is to perform such breach scenarios using a two-dimensional model. This may provide information that some areas within a certain radius from any levee breach will be subject to greater forces due to localized flood velocity increases in breach scenarios. Areas near levees are at greater risk due to this velocity increase.

5.5 Natural Valley Procedure

FEMA evaluates the Natural Valley Procedure for all levee systems due to data availability and to estimate the potential levee-impacted area if the levee system does not reduce flood risk.

The base flood inundation associated with the Natural Valley Procedure was estimated by extending the "with levee" base flood elevations landward of the levee into the levee-impacted area. This may produce a more conservative (larger) inundation area than the traditional Natural Valley Procedure; however, for the first pass estimate it is an appropriate level of detail.

The results of the Natural Valley Procedure and the estimated inundation mapping can be seen in Figure 2 and Figure 3 for levee systems along the Genesee River and Dyke Creek, respectively. The figures illustrate the estimated inundation within the levee-impacted area during a base flood, using the Natural Valley Procedure. These results estimate the potential flood risk if the levee systems do not reduce the levee flood hazard.

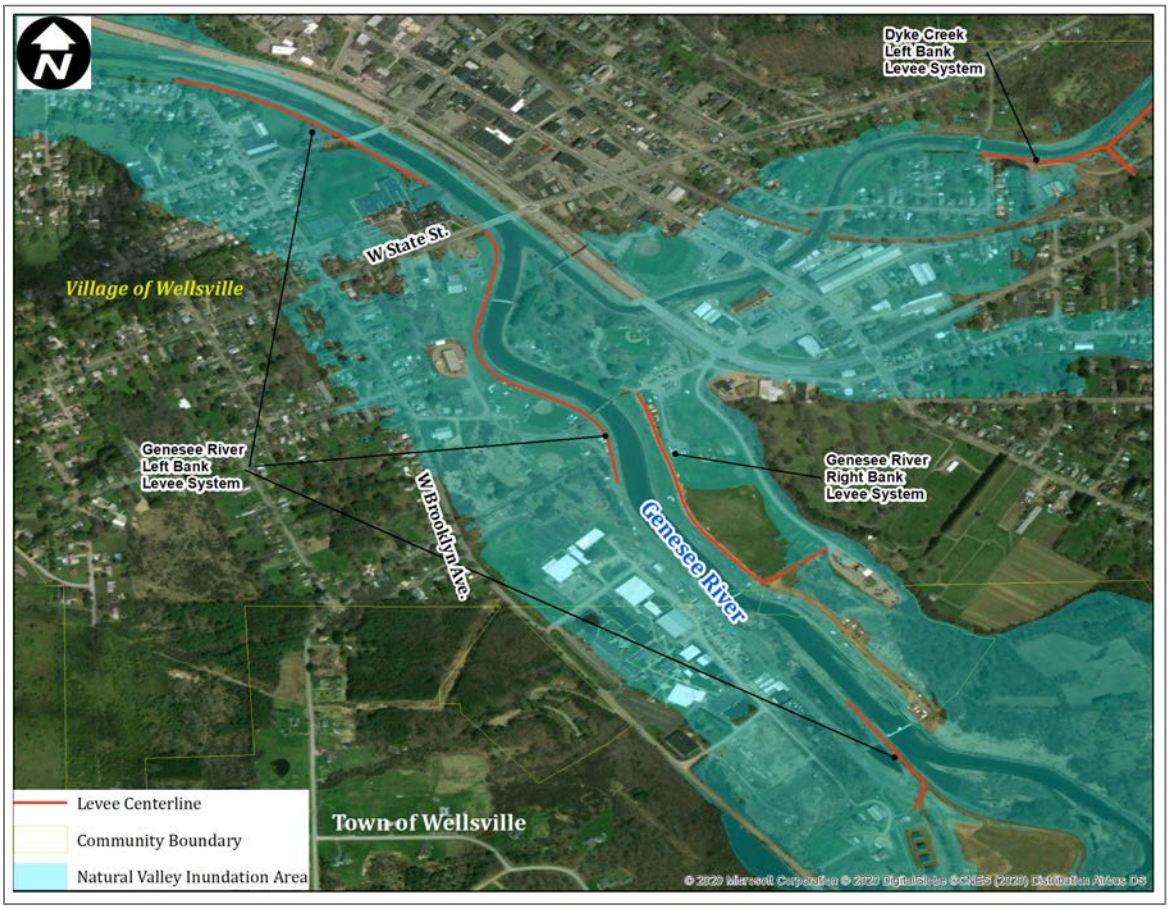

Figure 2: Natural Valley Procedure, Genesee River

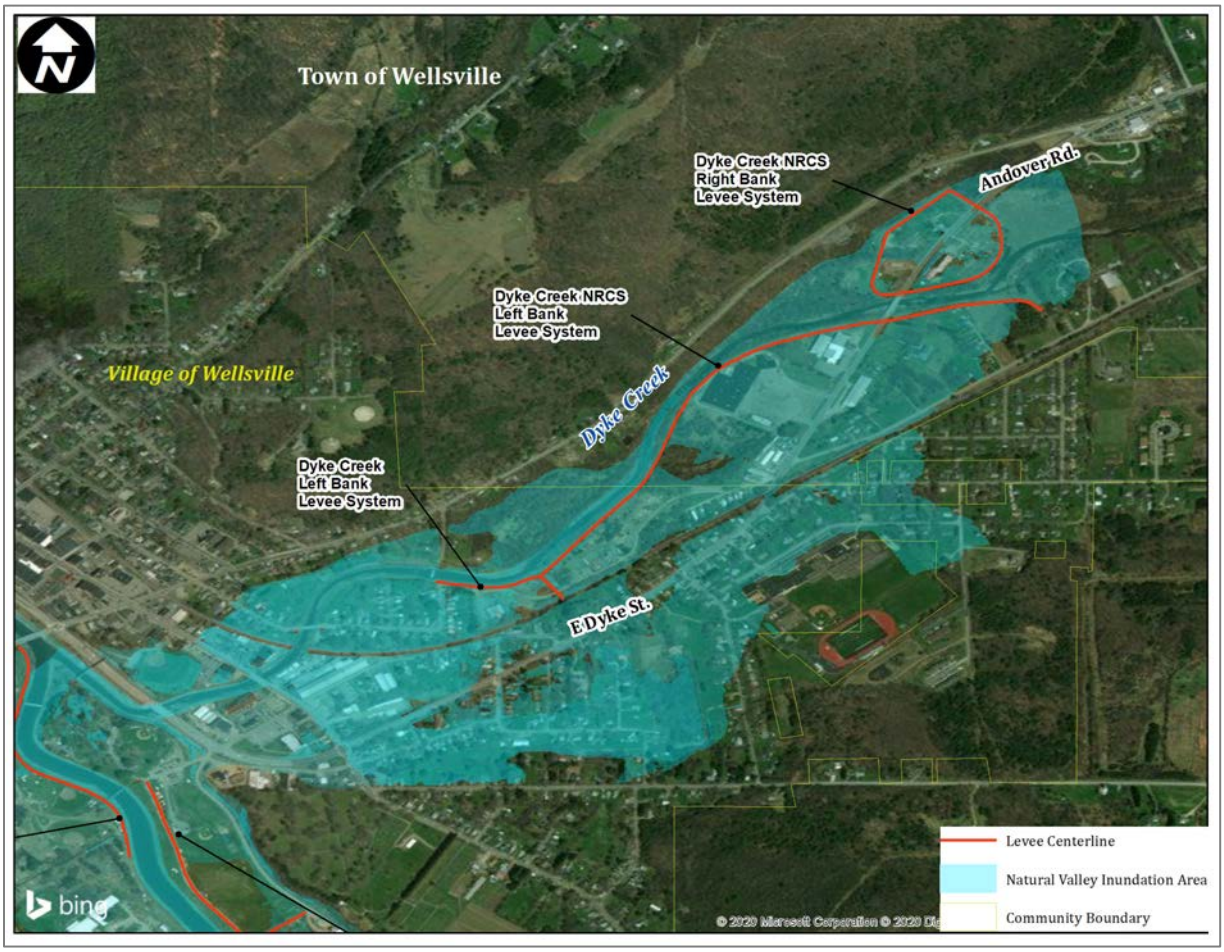

Figure 3: Natural Valley Procedure, Dyke Creek[6]

For a more detailed description of these methodologies, please refer to the FEMA's *Guidance for Flood Risk Analysis and Mapping, Levees*.

6 Path Forward and Next Steps

The information within this levee plan provides the community with a tool that can be used for planning and to increase flood risk awareness. This levee plan will also facilitate scoping of a flood mapping project in accordance with the Analysis and Mapping Procedures for Non-Accredited Levee Systems. FEMA has not funded a mapping project at this time. A mapping project will require additional data collection, information gathering, levee owner coordination, detailed hydraulic analysis, and due process. The timetable for a potential project has not been determined as of the completion of this study; however, initiation of a mapping project is anticipated within the next few years.

[6] Included backwater form Genesee River,

Members of the LLPT will be included in future outreach to determine what, if any, changes have taken place with respect to existing or future conditions that may have an impact on the findings of the Analysis and Mapping Procedures for Non-Accredited Levee Systems summarized in this plan.

For future mapping to show the Dyke Creek NRCS Left Bank or Dyke Creek NRCS Right Bank Levee systems as providing flood hazard reduction during the base flood, the Town of Wellsville will need to provide FEMA with levee data that complies with 44 CFR §65.10. The certified data package may be incorporated into future mapping if FEMA receives it and confirms it is complete prior to the end of the 90-day appeals period after the Preliminary FIRM is released. It is important to note that this data may also be submitted at any time utilizing the LOMR process.

The Town of Wellsville did not anticipate submitting levee data compliant with 44 CFR §65.10 for the Genesee River Left Bank, Genesee River Right Bank, and Dyke Creek Left Bank Levee Systems. These levee systems are currently shown as non-accredited on the effective FIRMs.

7 References

FEMA: *Flood Insurance Study*, Village of Wellsville, Allegany County, New York, January 1978

FEMA: *Flood Insurance Study*, Town of Wellsville, Allegany County, New York, September 18, 1984

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

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

USACE, National Levee Database (https://levees.sec.usace.army.mil/#/), 2020

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

Base Level Engineering Analysis, Region II Upper Genesee Watershed (HUC8-04130002) MIP Case No. 19-02-0041S Deliverable Dated: November 30, 2019

Appendix A

Stakeholder Engagement - LLPT Meeting Information

Appendix B

Freeboard Profile Comparison

Appendix C

Levee Accreditation Checklist

Appendix D

Collected Data

(Digital data provided via FTP)

Appendix E

Initial Data Analysis

(Digital data provided via FTP)