Levee Analysis and Mapping Plan
Village of Lisle Levees

Village of Lisle

June 2018

FEMA

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Acronyms

BFE	Base Flood Elevation
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
LLPT	Local Levee Partnership Team
LOMA	Letter of Map Amendment
LOMC	Letter of Map Change
LOMR	Letter of Map Revision
NAVD 88	North American Vertical Datum of 1988
NGVD 29	National Geodetic Vertical Datum of 1929
NYSDEC	New York State Department of Environmental Conservation
USACE	U.S. Army Corps of Engineers

Definitions

The terms below have been used in this document. Additional terms are provided in FEMA's *Analysis and Mapping Procedures for Non-Accredited Levee Systems* (July 2013) in the Glossary of Levee Terms. This document is available from the FEMA Library at https://www.fema.gov/media-library-data/20130726-1922-25045-4455/20130703_approachdocument_508.pdf.

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

Levee Analysis and Mapping Procedure Approach* – Levee Analysis and Mapping Procedures include Sound Reach, Freeboard Deficient Procedure, Overtopping Analysis, Structural-Based Inundation, and Natural Valley. Details on these approaches can be found in FEMA's *Analysis and Mapping Procedures for Non-Accredited Levee Systems* (July 2013).

Leveed Area – All land areas that would be subject to inundation by the one percent annual chance flood if the levee system was not present.

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

Levee Segment - A discrete portion of a levee system that is operated and maintained by a single entity.

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 leveed area, and which are constructed and operated in accordance with sound engineering practices.

Local Levee Partnership Team (LLPT) – A work group that is facilitated by FEMA when a non-accredited levee system in a community or project area will be analyzed and the areas landward of the levee system will be mapped. The primary function of this group is to share information/data and identify options based on stakeholder roles and knowledge.

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) and is not shown on a FIRM as reducing the base flood hazards.

Zone D – Area of undetermined but possible flood hazard.

*All definitions on this page except for this one are from FEMA's Analysis and Mapping Procedures for Non-Accredited Levee Systems (July 2013)

0.0 Executive Summary

The Federal Emergency Management Agency's (FEMA's) Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM) for the Village of Lisle, Broome County, New York must be revised to reasonably account for the hazard reduction impacts of non-accredited levees. FEMA's guidance was revised in 2013 to incorporate a new Levee Analysis and Mapping Procedure which provides a suite of flexible procedures to perform flood hazard analysis and mapping (see Section 1). The Village of Lisle has a flood management project where the levee system is being studied using the Levee Analysis and Mapping Procedures (see Section 2).

In September of 2017, FEMA Region II partnered with stakeholders in the Village of Lisle to form a collaborative Local Levee Partnership Team (LLPT) and worked to determine potential Levee Analysis and Mapping Procedures for the Village of Lisle levee system (see Sections 3 and 4 respectively). The process involved the collection and group evaluation of available data, creation and evaluation of analysis and mapping, and detailed discussions on mapping needs.

The information gained through the extensive coordination of the LLPT is now supplemented by a recently completed "first pass" Levee Analysis and Mapping Procedure analysis (see Section 5). The information collected and the analysis performed allows for the development of this document—a plan outlining potential reach procedures. This document informs the path forward (see Section 6). A meeting of the LLPT in December of 2017 allowed FEMA to present the first pass Levee Analysis and Mapping Procedure analyses and discuss the options for moving forward. Based on the limited information at this time, the Village of Lisle has elected the Natural Valley procedure with the understanding that first pass analysis will be augmented with updated H&H prior to revised mapping. The village has expressed interest, and retains the option to move forward with accreditation or other applicable LAMP procedures at any time, should funding become available and sufficient information be provided to meet the applicable data requirements.

This Levee Analysis and Mapping Plan summarizes the discussions and decisions by FEMA and project stakeholders on how best to map the flood hazards landward of the Village of Lisle levee system.

1.0 Introduction

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

Some 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 refine the identification of flood hazard reduction that non-accredited levee system provide. This process recognizes that such modeling is never precise.

FEMA, its Production and Technical Services contractor (STARR II) and Community Engagement and Risk Communication contractor (CERC) initiated the Levee Analysis and Mapping Procedures process for the levees in the Village of Lisle. Recent technological advances in data collection

methods and hydrologic and hydraulic modeling were leveraged as part of this process. Levee Analysis and Mapping Procedures is a more refined approach to mapping flood hazards in areas landward of levee system than the former approach.

The Levee Analysis and Mapping Procedures process 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 the areas impacted by the levee; and
- Considers the unique characteristics of each levee system from an engineering perspective.

The levee system in the Village of Lisle is not currently accredited. FEMA is using the Levee Analysis and Mapping Procedures process to develop refined flood hazard mapping in areas landward of the levees. This will provide a more realistic representation of levee-related flood hazards in the Village of Lisle.

The Levee Analysis and Mapping Procedures process is conducted in four phases:

- **Phase 0: Flood Structure Identification and Review:** Levee systems are identified and verified as being constructed, operated, and maintained as flood risk reduction structures. An LLPT is established during this phase.
- **Phase 1: Analysis and Mapping Plan Preparation:** LLPT meetings are held periodically to review available data and documentation. Discussions assist in the preparation of an Analysis and Mapping Plan based on the available information.
- **Phase 2: Analysis Preparation and Results Review (if applicable):** Analysis is performed by FEMA and shared with the LLPT to validate results against available data and documentation. Results are compared to effective FISs to update the LAMP Plan, if necessary. Draft maps prepared at this stage may be used as best available data for floodplain management.
- **Phase 3: FIRM Update, Due Process and Effective FIRM Issuance:** FIRM panels are updated with Phase 2 results. Communities and FEMA follow all NFIP regulatory due process procedures, and updated FIRM panels are adopted as the regulatory basis for local floodplain management.

This report describes the Levee Analysis and Mapping Plan for the Village of Lisle levee system, a result of the collaboration between FEMA, the Village of Lisle, and Broome County, New York State Department of Environmental Conservation (NYSDEC), U.S. Army Corps of Engineers (USACE), and other local stakeholders. This report documents the progress through Phase 1, including the first pass analysis results and data evaluation, as well as the community's selection of the preferred Levee Analysis and Mapping Procedures scenario.

2.0 Levee System Description

2.1 Flood Protection Measures in the Village of Lisle

The Village of Lisle levee system (see Figure 1) is comprised of a series of riverine flood control structures designed to reduce the flood risk from the Tioughnioga River and Dudley Creek (see Figure 1) in the Village of Lisle, Broome County, New York. According to NYSDEC documentation, the system was designed for flood discharges 20 percent greater on the Tioughnioga River and about 100 percent greater on Dudley Creek than the maximum flood of record, which occurred in July 1935.

Table 1. Village of Lisle Levee Data.

Owner	U.S. Army Corps of Engineers (USACE)
Maintained by	New York State Department of Environmental Conservation (NYSDEC)
Built	U.S. Army Corps of Engineers (USACE) -
Flooding Source	Dudley Creek/ Tioughnioga River
Length	Approximately 5100 feet
Pump Stations	0
Closure Structures	1. Closure Structure - Railroad (Susquehanna & Western) 2. Sandbag – Road (Main St)
Drainage Structures	4 Structures (assessment based on imagery)

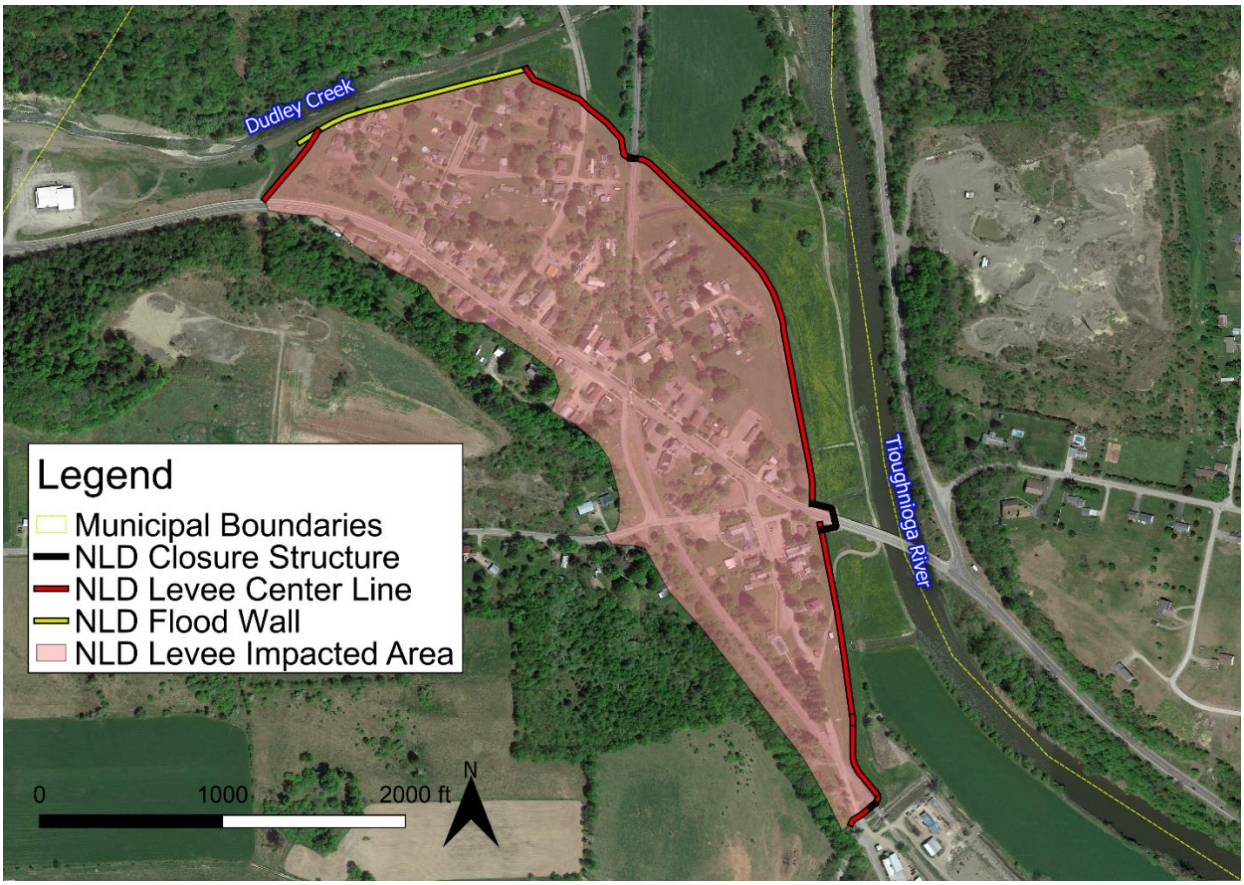

Figure 1. General Location Map.

2.2 Pump Stations

No pump stations were identified in the National Levee Database or the latest USACE Inspection Report for the Village of Lisle.

2.3 Levee Analysis and Mapping Procedures Flood Risk Project

Table 2 and Table **3** summarize the communities' NFIP and FIRM history.

Table 2. Summary of Communities in Project Area.

County	Community	Participating in the NFIP?	Approximate Number of Structures Impacted by Levee System
Broome County	Village of Lisle	Yes	64

Table 3. Community Map History.

Community Name	Initial Identification	Flood Hazard Boundary Map Revision Date(s)	Initial FIRM Effective Date	FIRM Revision Date(s)	Preliminary FIRM*
Village of Lisle	August 9, 1974	April 9, 1976	January 6, 1984	-	February 5, 2010

*Preliminary FIRM has not been published.

The effective FIS for the Village of Lisle states that existing local flood protection measures reduce the hazard from Dudley Creek and the Tioughnioga River. The effective maps show the levee system provides full protection to the leveed area. According to NYSDEC Documentation, the levee project in the village provides protection against a design storm of 52,000 cfs on the Tioughnioga River and 18,000 cfs on Dudley Creek. In comparison, based on the updated gage analysis, the 1-percent annual exceedance discharges are 23,130 cfs for Tioughnioga River and 2,810 cfs for Dudley Creek.

A countywide FIS was issued in preliminary form for Broome County, New York on February 5, 2010. According to the FIS report, the Village of Lisle was studied through approximate methods, therefore, levee information was not incorporated. The preliminary maps never went to Letter of Final Determination in Broome County.

2.4 Levee Analysis And Mapping Procedures Process Tasks

The Levee Analysis and Mapping Procedures process is divided into six distinct tasks: LLPT Compilation, Field Reconnaissance, Perform Initial Levee Analysis, Flood Risk Outreach, Complete Levee Analysis and Mapping Plan, and Produce Preliminary Products/Issue Preliminary (see Table 4).

Table 4. Project Tasks.

Task	Details	Tentative Start/End Dates*
LLPT Compilation (Phase 0)	Identification and outreach to individuals to serve on the LLPT.	July- September 2017
Field Reconnaissance (Phase 1)	LLPT to determine levee reaches to study and potential analysis of those reaches. Perform field reconnaissance of these reaches.	09/14/2017-09/15/2017
Perform Initial Levee Analysis and develop Levee Analysis and Mapping Plan (Phase 1)	FEMA to collaborate with the LLPT to develop analysis based on Field Reconnaissance findings and Levee Analysis and Mapping Plan.	September – December 2017
Flood Risk Outreach (Phase 2)	LLPT to assess results of the Field Reconnaissance and Perform Levee Analysis tasks. LLPT to work at the local level to disseminate findings that could impact local communities.	12/11/2017
Complete Levee Analysis and Mapping Plan; Finalize Levee Analysis and Mapping Procedures mapping (Phase 2)	FEMA to complete detailed analysis based on chosen approach, develop mapping, and finalize Levee Analysis and Mapping Plan; develop final analysis and mapping.	TBD
Produce Preliminary Products / Issue Preliminary (Phase 3)	FEMA to develop Preliminary Products (including FIRM database) from revised analysis above if that is the direction from FEMA and LLPT.	TBD

*All schedules are tentative and will be adjusted at the pace of the LLPT.

3.0 Local Levee Partnership Team

Based on the community meeting associated with the 2010 preliminary FIRM issuance, several stakeholders were identified as members of the LLPT (See Table 5). The LLPT was formed to provide FEMA with data and input, including 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 5.

Table 5. Local Levee Partnership Team Participants.

LLPT Member	Contact Information
Phil French	Village of Lisle
Terry Lynch	Village of Lisle
Jerry Mackey	Village of Lisle
Fran Peterson	Village of Lisle
Stephanie Brewer	Broome County Planning Department
Michael Ponticiello	Broome County Office of Emergency Services
Dan Fuller	New York State Department of Environmental Conservation daniel.fuller@dec.ny.gov
Alex Baldowski	U.S. Army Corps of Engineers
Kevin Fischer	U.S. Army Corps of Engineers
Luis Santiago	U.S. Army Corps of Engineers
Leon Skinner	U.S. Army Corps of Engineers
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Thomas Song	Community Engagement and Risk Communication(CERC) thomas.song@mbakerintl.com

4.0 Stakeholder Engagement

4.1 Stakeholder Engagement Meeting #1.1 (Community Meeting, LLPT 1.1)

A FEMA-led project team engaged with Village of Lisle, levee owners/operators, and other stakeholders during the LLPT meeting # 1.1 on September 14, 2017. During this meeting, a brief review of Levee Analysis and Mapping Procedures was conducted by the FEMA project team, and a discussion pertinent to those sections of levee impacting the Village of Lisle followed. During this discussion, the LLPT reviewed particulars for the components of the levee system, history of performance, and provided an overview of the levee analysis and mapping procedures and potential analysis scenarios. (See Appendix A for minutes for the LLPT 1.1) Srikanth Koka and Seth Lawler of FEMA's contractor team, carried out limited field reconnaissance on September 14-15, 2017 to examine levee features (See Appendix D for site photographs).

4.2 Stakeholder Engagement Meeting # 1.2 (Community Meeting, LLPT 1.2)

On December 11, 2017 the LLPT 1.2 meeting was held to review the first pass analysis and discuss outcomes from the data collection process. During the meeting, the FEMA project team discussed the results of the First Pass Analysis for the Natural Valley Procedure, the Freeboard Deficient Procedure and Structural-based Inundation (SBI) Procedure. Overtopping procedure was not used because the levee crest exceeds the BFE at all locations, and there is no armoring present. During the discussion, FEMA stated that Structural-based Inundation Procedure was not preferred due to apparent overestimation of flood risk, in comparison to the Natural Valley Procedure. Freeboard Deficient Procedure may not be applicable as it appears that the system has adequate freeboard. Natural Valley and Sound Reach Procedure were potentially applicable. FEMA will coordinate further with the community to finalize which procedure to move forward with. (See Appendix B for minutes for the LLPT 1.2)

4.3 Stakeholder Engagement Meeting # 1.3 (Community Meeting, LLPT 1.3)

On May 16, 2018 the LLPT 1.3 meeting was held to review the first phase of the Levee Analysis and Mapping Procedure. During the meeting, the FEMA project team discussed the results of the first phase and the approximate timeline moving forward. (See Appendix C for minutes for the LLPT 1.3)

5.0 First Pass Analysis

FEMA developed a First Pass Analysis, which is an approximate analysis using a relatively low level of detail, to approximate the floodplain boundary for each relevant Levee Analysis and Mapping Procedures approach. This informed the discussions in LLPT Meeting 1.2.

5.1 Natural Valley Procedure

The Natural Valley Procedure allows flow to be conveyed on both sides of a non-accredited levee. Figure 2 illustrates the results of the Natural Valley First Pass Analysis using HEC-RAS 5.0 (1-dimensional, steady-state flow).

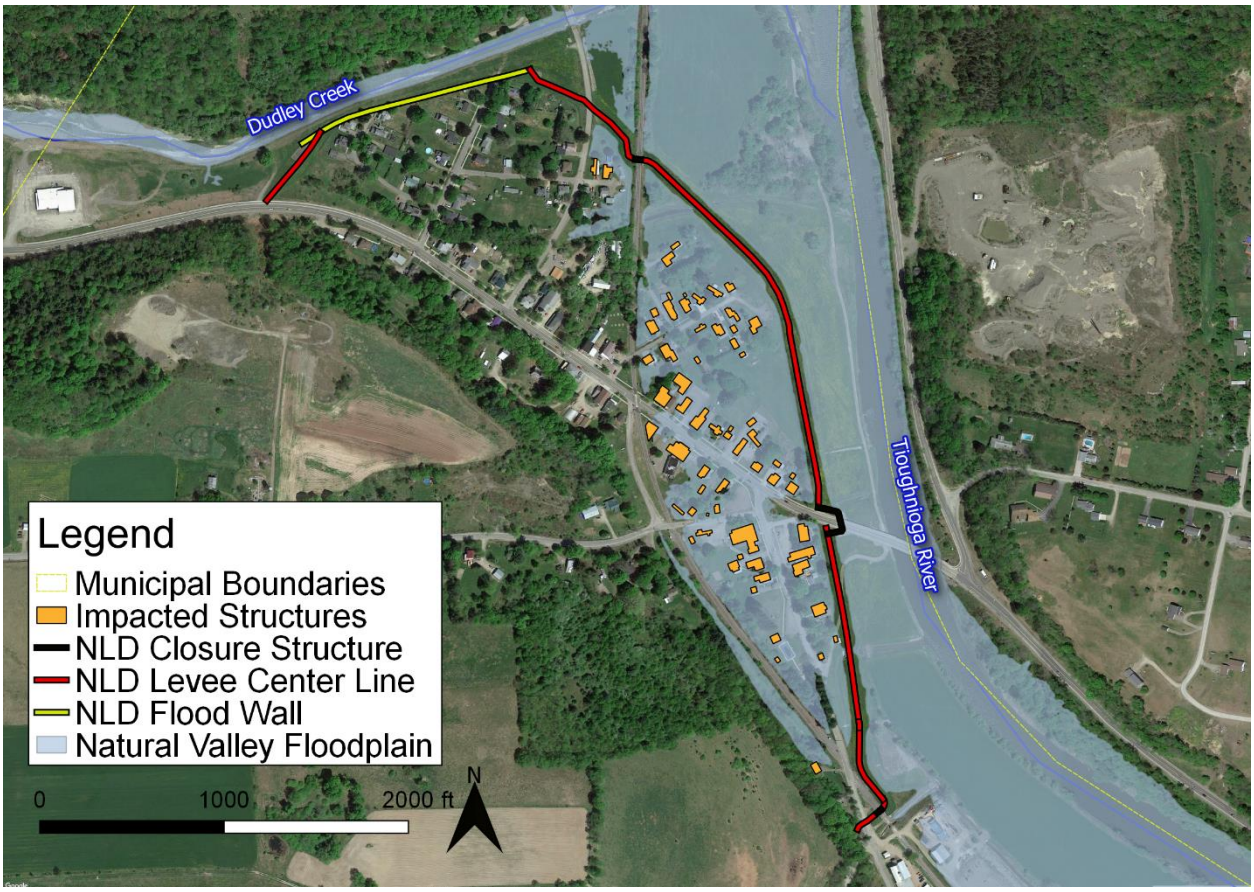

Figure 2. Natural Valley Procedure Mapping.

5.2 Structural-based Inundation Procedure

First Pass Analyses (2-dimensional flow) were developed for two levee breaching scenarios using HEC- RAS 5.0. The results of these analyses are mapped in Figure 3. The procedural guidance outlined in the Levee Analysis and Mapping requires multiple breaches be applied to each levee system. When applied to the Village of Lisle, this procedure results in flood depths 2-8 feet above the Natural Valley Procedure depths.

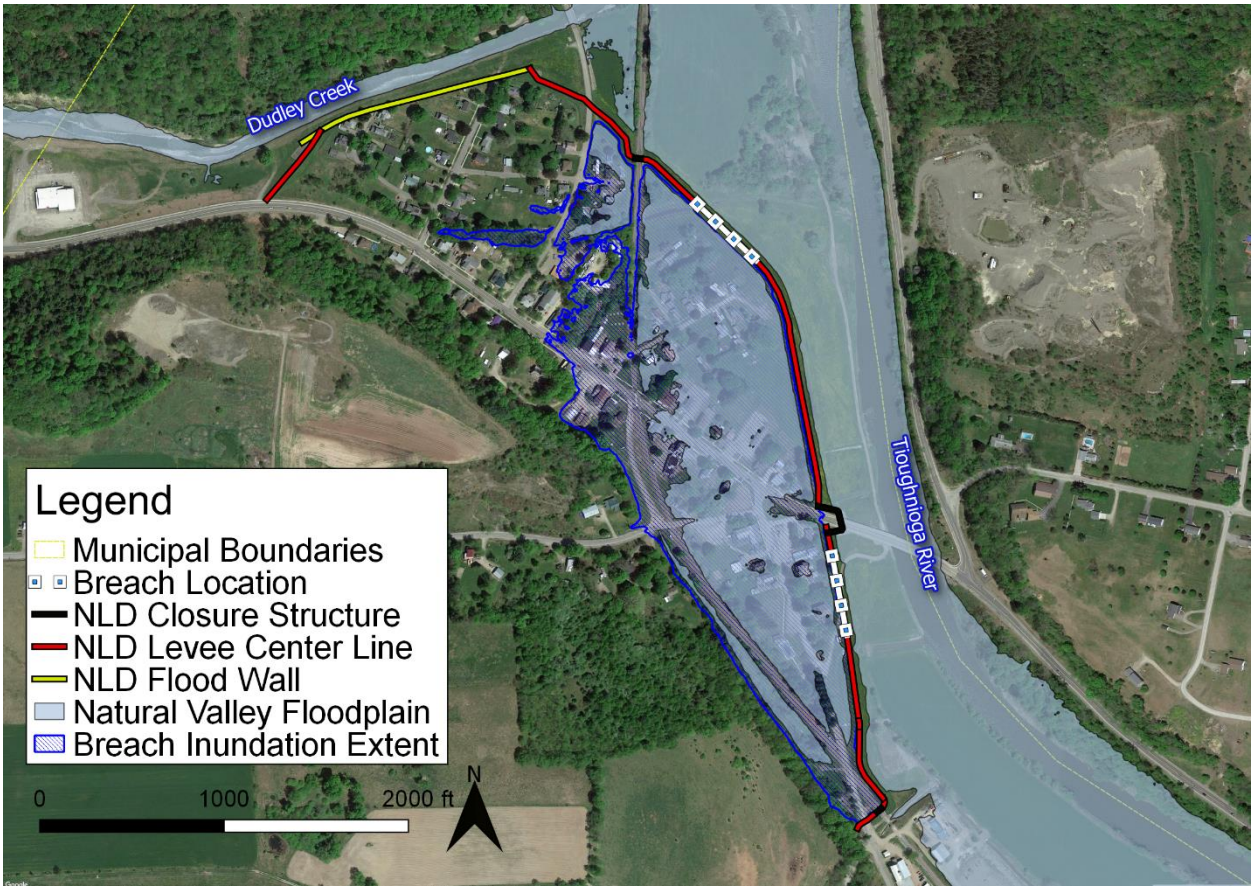

Figure 3. Structural-based Inundation Procedure Mapping.

5.3 Freeboard Analysis

For the freeboard analysis, points were taken along the levee crests for all sections included in this study. Where possible, elevations were taken directly from the USACE National Levee Database. The top of levee profile was compared to the 44 CFR§65.10 required freeboard profile for each segment of the levee system covering areas within the Village of Lisle. The freeboard analyses for the levee system on Tioughnioga River/Dudley Creek is presented in Figure 4. Based on this analysis, there is adequate freeboard for the entire reach, therefore freeboard deficient mapping procedures are not applicable to this system.

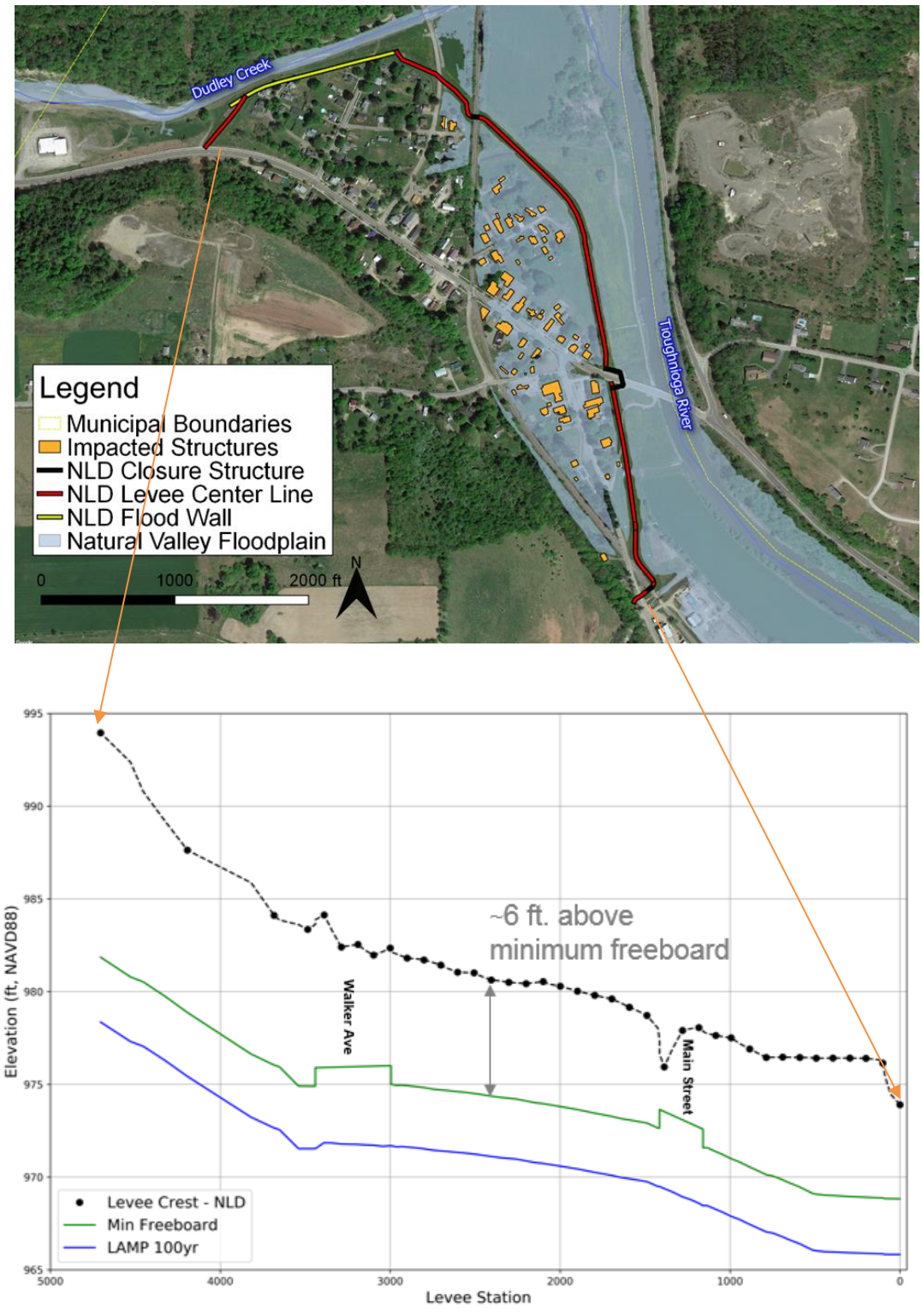

Figure 4. Freeboard results for Tioughnioga River/Dudley Creek.

5.4 Review of First Pass Analyses

Summary results from the first pass analysis, Natural Valley Procedure, Freeboard Analysis and Structural Based Analysis, are included in Table 6. (See Appendix B for LLPT 1.2 Meeting Notes):

Table 6. Results from the First Pass Analysis.

Type	Approximate Length of Levee Segment (ft)	Flooding Source(s)	Approximate # Structures Impacted	Comments: Natural Valley Procedure	Comments: Freeboard Analysis	Comments: Structural-Based Inundation (SBI)	Comments: General
Levee	4150	Tioughnioga River /Dudley Creek	~64	• Similar flood hazards to the preliminary.	• Levee has approximately 6 feet of additional freeboard above the minimum requirement. • Procedure not applicable.	• SBI procedure shows a larger area in the floodplain compared to Natural Valley. • The SBI procedure shows flood depth as being 2-8 feet above the Natural Valley depths.	• Effective maps were prepared before the implementation of 44 CFR 65.10. • Levee system has no known history of overtopping. • Sound Reach procedure would result in a single reach for this system; the data requirements for sound reach in a system with only 1 reach, if fulfilled and acceptable, would result in accreditation.
Flood Wall	970	Dudley Creek	0				

6.0 Path Forward

6.1 Levee Analysis and Mapping Procedures Phase 2 Analysis

The effective maps were prepared before the implementation of 44 CFR 65.10, therefore FEMA will undertake a Levee Analysis and Mapping Procedures Phase 2 and Levee Analysis and Mapping Procedures Phase 3 study to take into account the hazard reduction impacts of the non-accredited levees.

Where feasible, the Levee Analysis and Mapping Procedures Phase 2 analysis will focus on refining community identified procedures. The models and source data will be reviewed and refined with any updated information (e.g. updated discharges, recent surveyed cross sections, updated land cover data, and topographic data).

A subsequent Levee Analysis and Mapping Procedures Phase 3 study will incorporate the Phase 2 results into the regulatory NFIP products, namely the FIS and FIRM. This will likely become part of the data utilized during a restudy of the county-wide Flood Insurance Study at an as-yet unidentified future time.

6.2 Levee Accreditation

The Village of Lisle has indicated an interest in pursuing accreditation if funding can be obtained to perform the physical improvements and engineering review required. If the system can be brought into compliance with 44 CFR§65.10, the levees can be shown as accredited in the Broome County FIS and on the FIRM. Should this occur, FEMA will cease work on the Levee Analysis and Mapping Phase 2 and 3 efforts. If the FIRM and FIS have already been updated by the time of accreditation, FEMA will revise the maps via a Letter of Map Revision or Physical Map Revision.

FEMA's Levee Accreditation Checklist has been included in Appendix E for reference.

7.0 References

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

NYSDEC, Lisle Flood Damage Reduction Project Description, undated.

USACE, National Levee Database (GeoDatabase Version 3.0 dated 07-28-2015), 2015.

USACE Levee Inspection Report, 2008.

New York State Department of Environmental Conservation. (2008). Lisle Flood Control Project, Region 7 Headquarters.

Appendix A
Stakeholder Engagement - LLPT Meeting #1.1 Information

Appendix B
Stakeholder Engagement - LLPT Meeting #1.2 Information

Appendix C
Stakeholder Engagement - LLPT Meeting #3 Information

Appendix D
Site Photographs

(These site photographs correspond to all the communities)

Appendix E
Levee Accreditation Checklist

Appendix F
Modeling and Mapping files