New York City Department of Environmental Protection
Bureau of Water Supply

Evaluation of the Local Flood Hazard Mitigation Program

June 2020

Prepared in accordance with Section 4.6 of the NYSDOH
2017 Filtration Avoidance Determination

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1. Background

Following the widespread flooding impacts of Tropical Storms Irene and Lee in 2011, communities in the New York City West of Hudson (WOH) watershed requested that the New York City Department of Environmental Protection (DEP) commit to funding a comprehensive program to address recurring flood damages and to mitigate flood-related water quality threats. Throughout 2012 and 2013, DEP worked with WOH watershed stakeholders to develop and begin implementing the framework for a Local Flood Hazard Mitigation Program (LFHMP) comprised of four complementary components designed to reduce repetitive flood losses, secure a sustainable future for watershed communities, and protect water quality by reducing areas of inundation and minimizing floodwater contact with residential and commercial pollutants.

The four components of the LFHMP include: (1) a Local Flood Analysis (LFA) process for identifying flood hazards and recommending potential mitigation projects based on a detailed engineering analysis of flooding in population centers; (2) dedicated funding through DEP's Stream Management Program (SMP) to address LFA-recommended stream, floodplain and stream-related infrastructure projects implemented by local SMP partners; (3) funding through the Catskill Watershed Corporation (CWC) Local Flood Hazard Mitigation Implementation Program (LFHMIP) to support the protection of residential and commercial properties, the protection or relocation of critical facilities, the removal of post-flood emergency debris, and other eligible pollution prevention measures; and (4) a New York City-Funded Flood Buyout Program (NYCFFBO), with dedicated funding through DEP's Land Acquisition Program.

As envisioned by DEP based on discussions with watershed stakeholders, the driving principles of the LFHMP are that it be community-led with broad public input, identify the most effective mitigation projects using state-of-the art hydraulic modeling, and include an analysis of benefits and costs for recommended projects. The provision of city funds was not intended to replace existing state or federal programs, but rather to provide communities with the tools and baseline funding needed to leverage outside funding through other available programs.

In May 2014, the New York State Department of Health (NYSDOH) codified the components of the LFHMP in the Revised 2007 Filtration Avoidance Determination (FAD). The Revised 2007 FAD required the City to commit a total of $42.1 million to support the various program components as follows: $10.1 million provided to local SMP partners for LFAs and their recommended projects, $17 million provided to CWC for the LFHMIP, and $15 million for the NYCFFBO. The terms of the NYCFFBO, as agreed to by DEP and WOH watershed stakeholders, are further codified in a June 2016 modification to the 2010 Water Supply Permit (WSP) issued by the New York State Department of Environmental Conservation (NYSDEC).

In December 2017, NYSDOH issued a new 10-year FAD that requires the city to make additional funding commitments to continue the LFHMP through December 2027, and to coordinate LFHMP funding with state and federal flood hazard mitigation agencies to ensure consistency and maximize funding to WOH watershed communities. These 2017 FAD commitments include an additional $15 million to SMP partners to support a minimum of 50 LFA-recommended projects, and annual assessments of DEP's initial commitments made under the Revised 2007 FAD ($10.1 million for the SMP and $17 million for the CWC LFHMIP) to

determine if remaining funding is adequate to meet program needs. For the NYCFFBO, the 2017 FAD requires the city to conduct two evaluations; the first evaluation report was submitted in June 2018 and the second report is due June 15, 2021.

The 2017 FAD also requires the city to conduct two evaluations for the LFHMP to assess its contribution to the protection of water quality and recommend steps for enhancing this protection in the future; the first evaluation is due June 30, 2020 and the second is due June 30, 2023. This report, submitted in fulfillment of the FAD deliverable due June 30, 2020, is intended to be a preliminarily evaluation of each component of the LFHMP with the exception of the NYCFFBO, which has its own FAD evaluation requirement. In the following sections, DEP describes the LFA process and status; summarizes the implementation of LFA-recommended projects through the SMP and CWC LFHMIP, respectively; and describes several challenges faced by the overall LFHMP along with recommendations for the future.

As part of this evaluation, DEP solicited input from LFHMP partners during a program coordination meeting held in March 2020 and via several direct conversations with local partner staff during the past few months. DEP received one comment letter, from the Greene County Schoharie Watershed Program, which is attached in the Appendix.

2. Local Flood Analysis

Prior to the initiation of the LFA process, municipalities in the WOH watershed lacked sufficient resources to accurately estimate the level of mitigation provided by a particular project. Previous "All Hazard Mitigation Plans" prepared by municipalities for the Federal Emergency Management Agency (FEMA) often listed potential projects that were believed to be effective, but lacked engineering or benefit cost analysis to support FEMA grant applications when federal funding was available. Likewise, when watershed municipalities requested funding from DEP's program partners, there was often no basis for determining project viability.

LFAs provide the tools that address this problem, and they are a critical foundation of the LFHMP. LFAs build upon digital hydraulic models developed and completed by FEMA in 2015 for all WOH communities under a prior $7 million DEP contract. The models produce the modern floodplain map updates under the National Flood Insurance Program (NFIP) and they provide a powerful planning tool for modelling areas of inundation, depth and velocities under a series of changing assumptions such as modifying infrastructure (bridges and culverts), reducing floodplain elevation, increasing floodplain areas, or modifying channel dimensions and future watershed hydrology.

The models provide these estimates for several recurrence intervals including the 100-year "base flood" event (the 1% annual chance recurrence flood event) which is the basis for NFIP floodplain delineation and corresponding regulations. Systematic use of software such as the FEMA benefit cost analysis (BCA) toolkit allows communities to quickly estimate the reduction in damages associated with lowering flood depths and velocities. Applied together, the results give communities a planning-level assessment of potential projects, relative viability for community consideration, and a basis for recommending project funding.

2.1 LFA Process

As scoped, the LFA process establishes a Flood Advisory Committee (FAC) within a community or population center comprised of local municipal officials such as town supervisors, village mayors, planning board members, highway superintendents, code enforcement officers, and floodplain administrators, as well as community representatives such as realtors, business owners, farmers, surveyors and environmental advocates. This extensive participation in each municipally-designated FAC has ensured that local concerns are fully represented throughout the LFA process while elevating awareness and understanding within a community about flooding issues, impacts, and the relative value and merits of various mitigation options.

Each FAC works with a consultant to identify the location and magnitude of flooding, consider options for reducing flood-related damages, enable public input into the feasibility and desirability of mitigation options, develop planning-level cost estimates, compare the benefits and costs of each option, and prepare recommendations for projects to be advanced following a community's acceptance of the LFA. After sharing initial results and recommendations with members of the community during public meetings, each municipality can accept or adopt the LFA via formal resolution to enable eligibility of recommended projects for implementation funds available through the SMP, CWC LFHMIP, or NYCFFBO. Importantly, the LFA also provides the required information for grant applications to FEMA, the U.S. Army Corps of Engineers (ACOE), and state flood hazard mitigation programs.

Throughout the LFA process, DEP, CWC and local SMP partners including Delaware, Greene, Ulster and Sullivan County Soil and Water Conservation Districts (SWCDs) and Cornell Cooperative Extension of Ulster County (CCEUC) collectively serve as a resource for the FAC. Once a municipality selects a consultant through a competitive bidding process, the appropriate local SMP partner procures the engineering services on behalf of the municipality and provides an orientation for municipal leaders and FAC members about the LFA process and available funding programs. DEP and its SMP partners developed a template scope of work for LFAs and funding rules for stream-related LFA projects, which can be found at catskillstreams.org/lfa.

To address the dual goals of community resiliency and water quality protection, DEP and watershed stakeholders agreed that all WOH villages, hamlets, and village extension areas as designated in the 1997 NYC Watershed Memorandum of Agreement (MOA) would be eligible for the LFA process. DEP and stakeholders also agreed that LFA boundaries may be extended upstream or downstream of the MOA-designated boundaries for villages and hamlets at the advice of local partners and with approval from DEP to reflect the area of flooding concern.

Many WOH watershed communities are located along headwater rivers in narrow mountain valleys or on alluvial fans of streams where they confluence with a main river. As such, they are prone to flooding during major storms or localized flash flooding from the tributaries. The five WOH watershed counties have collectively experienced 19 declared flood disasters since 1996, with eight of these disasters affecting three or more counties.

The risk of flood hazards in any particular area varies widely and is the result of a combination of hydrology (the statistical frequency and magnitude of flows), hydraulics (defined

by the channel and floodplain morphology), and land development patterns (especially transportation infrastructure). Therefore, each LFA reports findings for the analysis of hydrology and hydraulics, along with a BCA for the most promising projects.

Hydrology/Hydraulics Modeling and Analysis

The most frequent flooding issues revealed by the analysis of existing hydrology and river hydraulic conditions through WOH populations centers include: backwater flooding upstream of undersized bridges and culverts; over bank flooding of undersized channelized or walled streams; displaced flood waters from filled floodplains; and flooding caused by debris jams at bridges. LFA models provide approximate dimensions for the sizing of bridges, culverts, channels and floodplains under various mitigation scenarios. When a modeled floodplain or infrastructure modification does not yield benefits, LFA consultants work with the FAC to identify alternatives such as potential relocation of activities from the floodway (where water flows fastest and deepest during a flood) or elevation of structures located on the flood fringe (areas within the floodplain but further back from the river's edge and floodway). In areas where debris accumulation at bridges or culverts is identified as the source of flooding, LFA consultants investigate options for increasing the size of the bridge/culvert or locating and stabilizing the source of the debris, which is frequently upstream failing hillslopes.

Benefit Cost Analysis (BCA)

When proposing LFA-recommended projects, consultants often complete a BCA to provide a relative indication of a project's monetary benefits compared with cost. This step is important, since a BCA is typically required for federal flood hazard mitigation grant applications, and coordinating the LFHMP with state and federal programs is explicitly referenced in the 2017 FAD to maximize funding to watershed communities. Consultants use FEMA's BCA toolkit software which compares the reduction in flood elevation achieved by a project over a range of flood return intervals to produce a current value of the avoided future damages; this value is then compared with the estimated cost of a project to develop the benefit cost ratio (BCR). The data collection/input effort required for each project – including identifying the first-floor elevation of each building potentially affected by a change in flood elevations, calculating each building's area and value, and evaluating flood elevations for a range of flood magnitudes and frequencies at each building – can require significant time and staff resources. In the village of Walton, for example, LFA consultants collected this information for 17 businesses and created loss estimates for 175 individual structures.

Typically, projects with higher BCRs involve sites with frequent flooding (5 to 25-year recurrence intervals), high property values and development density, and low-to-medium costs for implementation. Given that WOH watershed communities tend to be less dense with modest property values, the avoidable flood losses tend to be low when compared with more densely populated areas. For the LFAs completed thus far, projects with the highest BCRs include those that significantly reduce flood damages for large businesses and multiple residential properties. Bridge replacement projects frequently have lower BCRs due to the high construction costs.

The initial set of LFAs revealed that BCRs for recommended projects were commonly less than 1.0, which is the threshold for federal grants. Within the component programs of the LFHMP, the SMP required a BCR greater than 1.0 while the CWC LFHMIP did not. During negotiations leading up to the 2017 FAD, watershed communities appealed the BCR requirement and argued that a BCA does not consider non-monetized benefits of projects such as community resiliency and water quality protection. DEP agreed and the requirement was dropped from the SMP funding rules. However, the LFA scope continues to require a BCA to support possible grant applications to state and federal flood hazard mitigation programs.

Water Quality Benefits

Floods tend to mobilize unsecured objects stored in floodplains including lawn and garden equipment, fuel tanks, and vehicles, as well as inundate septic leach fields. Flood hazard mitigation projects, therefore, have the potential to protect water quality from pollutants such as oil and petroleum, industrial or household chemicals, and human waste. Each LFA generally describes water quality benefits. For specific recommended projects with notable sources of pollution, such as relocating a highway garage out of a floodway, LFAs list possible sources of pollution. This enables a relative comparison between LFA-recommended projects for water quality benefit. For floodplain restoration and flood buyout projects, the value of converting the land to greenspace is estimated using the FEMA BCA toolkit for riparian buffer extension.

In an early attempt to quantify water quality threats within an LFA area, DEP and local SMP partners proposed and piloted an initial rapid reconnaissance protocol to inventory sources of pollution. This protocol proved unworkable given the extensive inventory (time) requirement and privacy concerns. DEP and local SMP partners agreed instead to enumerate, to the extent possible, the water quality benefits associated with specific projects during their design process. For example, during the implementation of floodplain restoration projects and flood buyouts, DEP and its partners use phase I and II environmental assessments, pre-demolition lead/asbestos test results, and trucking manifests to quantify contaminants removed from the floodplain. DEP and its partners also use feasibility studies and designs for property protection measures to document the elevation of pollution sources above the level of inundation.

2.2 LFA Status

In 2012, DEP assisted Prattsville, the WOH watershed community hardest hit by Tropical Storm Irene, with piloting the LFA process as part of its flood recovery efforts. DEP provided engineering services of its SMP consultant, Milone and MacBroom, Inc., to hydraulically model a series of scenarios which included expansion of the NYS Route 23 bridge over the Schoharie Creek and dredging alternatives to lower flood elevations. The Prattsville LFA became a model for the LFA process across the WOH watershed, which reached its peak between 2015-2017 with an average of 16 communities working on LFAs each year during that period.

To date, 33 of the 59 MOA-designated villages and hamlets (56%) are covered by 21 completed LFAs; several LFAs cover more than one population center. Three population centers (villages of Stamford and Hobart, hamlet of South Kortright) are currently undergoing the LFA process, with one combined LFA planned as a result. Five additional population centers (hamlets of Grahamsville, Curry, Unionville, Jewett and East Jewett) are currently in the preliminary

stages of scoping and consultant procurement, with two separate LFAs planned as a result (one for "Grahamsville" and one for "Jewett"). All municipalities undertaking an LFA have adopted or accepted them, and all completed LFAs are available at catskillstreams.org/lfa. The remaining MOA-designated villages and hamlets either have very small population centers with little or no history of flood damage, or they have not yet indicated their intentions to proceed; this suggests that the LFA process is substantially complete for the majority of WOH watershed communities.

Table 1 summarizes the status of all LFAs completed or underway as of June 1, 2020, arranged in order of adoption date. The total cost of these 21 LFAs was $1.76 million and does not include DEP's cost of the original FEMA flood mapping study ($7 million). DEP funded these LFAs through existing SMP partner contracts, and these funds are counted against the city's $10.1 million commitment as required by the Revised 2007 FAD. The cost of each LFA varied based on the size of the community and planning area. Figure 1 depicts the geographic location of LFAs either completed or underway/preliminary as of June 1, 2020.

Table 1. Summary of LFAs completed or underway in the WOH watershed as of June 1, 2020.

Population Center	Start Date	Adopt/Accept Date	Funding Allocated
Prattsville	January 2012	September 2013	$126,780
Lexington (includes West Kill)	January 2014	February 2015	$49,850
Walton (West Branch Delaware River mainstem)	March 2014	May 2015	$51,860
Windham (includes Windham, Maplecrest, Hensonville)	March 2015	October 2015	$58,460
Phoenicia/Mt. Tremper	September 2014	March 2016	$92,850
Shandaken/Allaben	December 2016	February 2018	$103,448
Claryville	October 2014	July 2016	$81,826
Fleischmanns	March 2014	August 2016	$98,438
Sundown	August 2016	February 2017	$66,964
Olive (includes Boiceville, West Shokan)	April 2015	May 2017	$81,594
Clovesville[1]	March 2014	June 2017	$0
Arkville	June 2015	June 2017	$57,018
Conesville (includes Conesville, West Conesville, Manorkill)	June 2016	July 2017	$80,430
Hamden (includes Hamden, Delancey)	March 2016	December 2017	$69,995

Walton (West Branch Delaware River tributaries)	June 2015	December 2017	$105,577
Delhi (includes Delhi, Fraser)	May 2015	January 2018	$79,607
Tannersville	April 2017	March 2018	$168,388
Andes	February 2016	May 2018	$79,607
Ashland (includes East Ashland)	May 2017	December 2018	$56,751
Hunter (town and village)[2]	January 2018	December 2018	$0
Halcott	April 2019	January 2020	$40,000
Roxbury (includes Roxbury, Grand Gorge)	April 2019	January 2020	$85,000
Stamford (includes Stamford, Hobart, South Kortright)	November 2019	TBD	$130,750
Total Funding Allocation			**$1,765,191**

[1] Funding allocation for Clovesville LFA is included with Fleischmanns.
[2] Funding allocation for Hunter LFA is included with Tannersville.

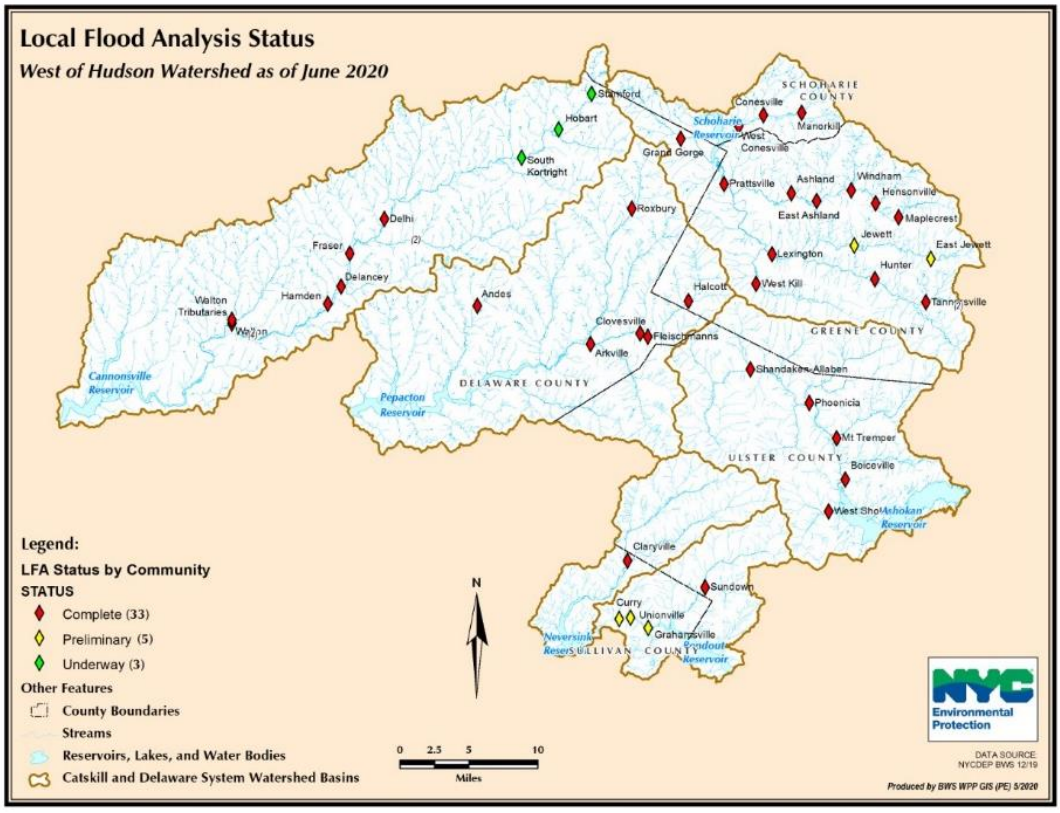

Figure 1. Status and distribution of LFAs in the WOH watershed.

2.3 LFA Recommendations

The LFAs completed for WOH communities thus far provide a diversity of project options and recommendations that are summarized in Table 2 and described in the following section. LFAs provide BCRs for most project recommendations, and they provide planning-level cost estimates for specific projects, such as infrastructure or floodplain restoration projects. The total cost estimate for the 23 floodplain restoration projects was approximately $35 million; 30 of the 34 infrastructure projects included cost estimates totaling over $95 million. A complete list of LFA recommendations and alternatives considered can be found at catskillstreams.org/LFA.

Table 2. Summary of recommendations in LFAs completed to date, by project category.

Project Category	Number of Recommendations
Floodplain Restoration	23
Infrastructure Upgrade/Replacement	34
Property Protection[1]	30
Buyout[1]	15
Emergency Response	10
Pollution Prevention	17
Channel Modification	9
Streambank Stabilization[1]	9
Relocation	8
Flood Control	2

[1] These recommendations frequently involved multiple projects or properties.

Floodplain Restoration

This category of projects allows streams and rivers to have greater access at higher flows to their floodplain, thereby lowering the depth and velocity of floodwaters. As depicted in Figure 2, achieving this objective requires excavating a streambank to establish a lower floodplain (a small floodplain close to the channel is considered a floodplain bench) which will increase water conveyance and storage. Restoration of a floodplain can direct flows away from structures on or adjacent to the floodplain. Additional benefits include enhanced habitat and new greenspace.

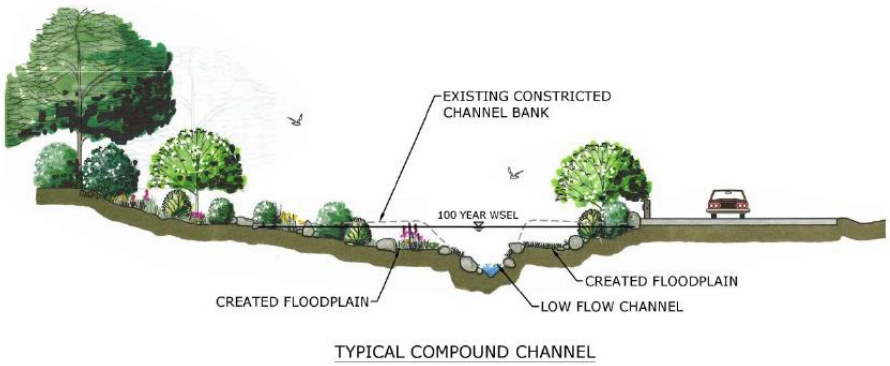

Figure 2. Example of a floodplain restoration project; dashed line shows original bank height (Milone and MacBroom, Windham LFA, August 2015).

When restoring a floodplain, municipal infrastructure such as bridges and roadways frequently needs to be modified to accommodate the change in flood routing. Implications for property owners, municipal tax base, and community character are typically considered before an FAC commits to including the recommendation in its LFA. The ability of a community to implement floodplain restoration recommendations can depend on the willingness of landowners to contribute part of their land or the cost of the infrastructure modifications. Disposal of significant volumes of excavated material can also be a complicating factor.

In valley settings with wide floodplains, such as the West Branch Delaware River, Batavia Kill or Schoharie Creek, the ability to lower flood elevations by creating additional floodplain capacity has proven to be limited except where a bridge or berm restricting flow is also removed, resized or relocated. For example, the Shandaken LFA revealed that replacing an undersized bridge and removing an adjacent levee would dramatically reduce upstream flood elevations along the Esopus Creek in the hamlet of Mt. Tremper. However, the Hamden LFA was unable to demonstrate that floodplain restoration would reduce flood damages given the wide floodplains along the West Branch Delaware River. In both Hamden and Ashland (a community along the Batavia Kill), the LFAs concluded that expansion of county bridges could reduce upstream flooding, but the number of affected properties and the value of damages did not justify a near-term project until the bridge is due for repair or replacement.

In valley settings with moderately-sized floodplains, such as the WOH communities of Delhi and Arkville where filling the floodplain over time has reduced its size, the restoration or creation of floodplains are shown to have potential for lowering flood elevations. Although the LFAs for some of these communities demonstrate a reduction in flood damages, the presence of homes or businesses frequently preclude extensive floodplain restoration unless buyouts are advanced prior to restoration.

In narrow valley settings such as Fleischmanns, Allaben and Andes, the effects of floodplain restoration or creation tends to be localized to the restored reach of stream and does not improve conditions upstream unless similar improvements are made along the entire stream corridor. Because bridges and culverts in these population centers also constrict flow, infrastructure replacements are frequently necessary to ensure the improved flood conveyance extends along the entire reach.

Development at the outlet of tributaries on alluvial fans has historically led to the channelization of many streams flowing through WOH population centers. These walled channels are subject to debris jams during flood events which divert flows through nearby homes and businesses. The communities of Windham, Walton, Delhi, Margaretville and Phoenicia are built on alluvial fans. LFA modeling demonstrates that creation of floodplain benches (depicted in Figure 2) would potentially lower flood elevations and prevent overtopping of the walled channels. Bridges in these settings are frequently shown to need widening to allow for the flow carried on the floodplain bench to pass under the bridge. In many cases, creation of these floodplain benches would require property buyouts or the use of a backyard.

Infrastructure Upgrade/Replacement

One of the first steps in the hydraulic modeling stage of the LFA process is to assess whether bridges and culverts in a community constrict flows and create a backwater condition. As noted in Table 2, replacements to undersized infrastructure are the most frequent recommendation in the 21 LFAs completed thus far. When the estimated cost of a bridge replacement is substantially greater than the mitigation value, the LFA typically recommends replacing the bridge with a longer span when the bridge's structural condition warrants replacement. Although Table 2 depicts 34 infrastructure recommendations, the LFAs actually assessed 70 infrastructure alternatives. An additional 20 bridges and culverts were recommended for replacement with a longer span when structurally necessary, while 16 assessed alternatives were either not recommended or the LFA did not contain a clear recommendation.

Property Protection

As a flood hazard mitigation measure, property protection includes the elevation or floodproofing of structures located in the flood fringe where flood elevations and velocities allow. This measure is possible for properties where flood depths are not excessive (typically less than three feet) and velocities are less than five feet per second. In addition to reducing flood damages, property protection can preserve a community's tax base, lower flood insurance costs for residents, and increase property values; the latter is particularly important in communities where rising flood insurance costs create an obstacle to the sale of flood-prone properties. Property protection is a relatively new mitigation measure in the WOH watershed and largely introduced by the New York Rising Program following Hurricane Sandy in 2012. All LFAs contain general recommendations for property protection measures while others, such as the Olive LFA, identify specific properties for consideration.

Flood Buyouts

Buyouts include the purchase of residential and commercial properties that are converted to greenspace, which is one option where alternatives such as floodplain restoration are either unable to lower flood elevations or velocities, or where property protection measures are not practical due to flood depths and velocities. Buyouts are typically recommended for abandoned structures in or near a floodway. The NYCFFBO requires municipal approval of each buyout and willing participation of the property owner. The buyout process is defined in the modified 2010 WSP and modeled after previous FEMA-funded buyout programs that have been implemented in the WOH watershed since the late 1990s. The NYCFFBO provides municipalities with the option to own each property as greenspace with a conservation easement granted to NYSDEC and a reuse plan developed by the municipality and approved by NYSDEC.

To date, LFA-recommended buyouts have supported floodplain restoration projects in the communities of Shandaken and Conesville. Although the NYCFFBO offers five categories of buyouts for the relocation of critical facilities, anchor businesses, erosion hazards, inundation properties outside of LFA areas, and properties needed for stream projects, 27 of the 33 closed or active NYCFBBO properties (82%) are recommended in an LFA. While some LFAs recommend specific properties, sensitivity to the privacy of property owners has led several communities to

instead recommend designated areas where multiple buyouts could be considered by the municipality and property owners.

Business and Critical Facility Relocation

This category of projects recommends relocating essential activities out of a floodplain and floodway, to a safer upland area, which is a key element of the LFHMP's community resiliency goal. CWC's program rules for the LFHMIP require that applicants purchase a similarly-sized area of land outside of the floodplain but within the same municipality, while the NYCFFBO purchases the flood-prone structure and underlying land. The property owner is responsible for building a new structure on the upland site, for which cost-sharing funds are available. The LFAs completed to date have specifically identified several businesses and critical facilities such as town halls, highway departments and fire houses that have incurred repetitive losses and are recommended for relocation. Commercial structures such as anchor businesses are also eligible for relocation. Of the eight specific property relocation recommendations, most are critical community facilities. Some LFAs recommend relocations in combination with floodplain restoration to protect flood fringe properties.

Streambank Stabilization

LFAs recommend streambank stabilization projects where fallen trees and stream sediment (jointly referred to as debris) have historically clogged channels, bridges and culverts or damaged floodplain buildings. This practice is best suited for treating failing hillslopes caused by channel incision (lowering of the streambed by natural or human activity) or scour along the toe of a slope. LFAs completed for headwater communities such as Claryville and West Shokan, or along tributaries such as Steele Brook in Delhi recommend streambank stabilization as viable flood hazard mitigation projects. For these projects, excess sediment from eroding banks contributes to channel aggradation and reduces conveyance capacity.

Other Recommendations

As part of the LFA process, the FACs and their consultants also considered a range of other mitigation measures. For example, pollution prevention through the anchoring of propane and fuel oil tanks was recommended in nearly every LFA. Several communities discussed the need for improved emergency response and advance warning of flood events, so corresponding recommendations included the establishment or reactivation of stream gauges in head water settings or areas with a greater distance between gauges. Some LFAs modeled and considered flood control and channel modification measures, ranging from the design and construction of levees and berms to the widening or dredging of river channels; although these projects are not eligible for funding within the LFHMP and might not be the best mitigation option, the LFAs reflected public input and therefore included these recommendation for future consideration. Finally, several LFAs recommended administrative measures such as the update of flood studies or municipal application to the NFIP Community Rating System, a program that provides insurance cost reductions for residents in municipalities that are more actively engaged in floodplain protection, code enforcement and flood hazard mitigation.

2.4 Evaluation of the LFA Process and Recommendations

In general, LFAs have required 10-12 meetings over the course of 12-24 months to complete. The time required to complete each LFA varied, with earlier LFAs taking about two years to complete compared to more recent LFAs being finalized in approximately one year. DEP attributes the variable rate of progress for each LFA based on the size of each population center, the complexity of the river system, the number of bridges/culverts modeled, the availability of consultants to work with each FAC, and the number of public meetings held.

Each LFA was reviewed by the local FAC and shared with community members, with advisory agencies such as DEP, CWC and local SMP partners reviewing and providing comments prior to acceptance or adoption; SEQR was also completed prior to LFA adoption. Funding eligibility for implementation of LFA-recommended project through the various components of the LFHMP hinges on municipal adoption or acceptance of its LFA by formal resolution. Community outreach included a series of public meetings supported by presentations by the LFA consultants, direct mail invitation to residents and business owners, press releases, and in some cases, the use of public access television for broadcasting public meetings.

All watershed municipalities successfully used the LFA process to identify potential projects that can reduce future flood damages and protect water quality while increasing community resiliency. LFAs have provided local decision makers with valuable information on the costs and benefits of each recommended option. The availability of implementation funds incentivized communities to engage in the LFA process and to move from analysis to implementation where ready. The LFA process also resulted in a timely transfer of knowledge between the FACs and supporting agencies about local flood concerns and possible solutions.

Consultant Support

The scope of work produced at the start of the LFA process was not substantially modified from community to community and was adequate for the required analyses. Three consulting firms were awarded contracts under the LFA process, but two firms completed only three LFAs each. All firms were capable of effectively using the hydraulic analysis tool HEC-RAS, however one firm did not make use of the FEMA BCA toolkit for calculating BCRs for recommended projects. DEP requested all HEC-RAS files and BCA toolkit files for each LFA to ensure future data access by each community, and DEP shared this data with its SMP partners. During the peak years 2015-2017, consultants were working on up to 16 LFAs and fully engaged with the LFA process; minor delays were experienced due to consultant workloads.

Agency Support

In addition to DEP funding and staff support, SMP partner staff at county SWCDs and CCEUC played a critical outreach role with municipalities to promote the many benefits of developing an LFA. SMP partners also assisted with organizing each FAC, selecting and hiring consultants, and advancing the LFA process on schedule. Agency staff ensured each consultant addressed community concerns and reviewed the consultant's work, commenting on each LFA and ensuring the final report was available to the public. DEP, SMP partners, and CWC staff

assisted with the preparation of resolutions for adoption by municipalities and advised them on the funding options available for project implementation through the LFHMP as well as state and federal programs. At the start of the LFA process, agency staff were provided in-depth training on the use and interpretation of HEC-RAS and the FEMA BCA toolkit. DEP organized quarterly coordination meetings that continue to serve as a forum for all LFHMP partners to discuss the status of the LFAs, coordinate programmatic roles, and strategize solutions to the various challenges faced by each community throughout the LFA process.

Community Engagement

The formation of FACs and their regular interaction with the LFA consultants, agency staff, and municipal boards was an important requirement of the LFA process. Each FAC was key to the exchange of information and their suggestions frequently became the subject of further analysis and, ultimately, many LFA recommendations. FACs were typically led by a town supervisor or mayor whose involvement and support was critical to keeping members engaged to ensure a successful process. Consultant presentations, while technical in nature, were understood by the FAC and often led to a detailed discussions of mitigation options.

Public involvement was invited at the beginning, middle and end of the LFA process. The most effective interactions between the public and each FAC encouraged the exchange of ideas and opinions on flooding issues and mitigation options. Alternative mitigation strategies such as buyouts, dredging, or the use of flood control structures such as levees were controversial but ultimately the technical, economic and practical considerations of each option were deliberated and resolved. Field excursions were also an effective tool for LFA consultants to engage with the FAC and the public while inspecting flood damages and considering mitigation options. This engagement often helped to identify realistic alternatives and helped the consultants to gauge community willingness to consider the impacts of project alternatives on the community.

For some communities, unfortunately, the level of public involvement waned over time due largely to the length of time since the last flood event. The commitment of certain FACs to continue meeting after completion of the LFA process has been key to the extensive implementation of LFA-recommended projects to date.

LFA Recommendations

Projects recommended within LFAs vary greatly in scale and complexity. Some projects are straightforward to construct, and they can likely be completed in one to two years. Other recommendations require more time to develop community consensus, pursue additional funding beyond the capacity of the LFHMP, secure property rights, complete project designs, and obtain necessary permits. For example, most floodplain restoration projects require the acquisition of one or more properties followed by the removal of structures. This requires communities to decide it they are willing to sacrifice tax revenue and to work through the NYCFFBO process to acquire the requisite properties, coordinate clearing of structures, and design the restoration project. Complex municipally-led projects will require longer periods of time to complete.

In the short term, non-controversial projects such as culvert replacements, streambank stabilizations, property protection measures, and fuel tank anchoring have advanced without the need for community consensus. Some LFAs, such as Hamden and Ashland, did not identify many large municipally-led projects, but they did recommend projects that private property owners or non-profit organizations can undertake. Thus far, all communities with completed LFAs have project recommendations that are eligible for LFHMP funding. While completion and acceptance of LFAs is a funding eligibility requirement, it is up to each community to decide if and when to seek funding from the appropriate entity to implement a recommendation.

Water Quality Benefits

To date, none of the completed LFAs contain a detailed enumeration of water quality benefits. As previously noted, during stakeholder negotiations, the SMP partners agreed that a project with significant water quality benefits would not require a BCR of 1.0 to be eligible for funding. It was decided that water quality benefits would be described for projects and quantified where practicable. Quantifying water quality benefits during the LFA process was not workable, as previously described. For this reason, LFAs only identify general descriptions of water quality protections associated with a particular project, such as recommending a highway garage for relocation and correlating that with a reduced risk of hazardous chemicals and petroleum products being released. LFA consultants obtained information on the amount and types of materials which would could be mitigated in only a very limited number of instances.

Summary

The LFA process was used successfully to identify flood hazards and viable mitigation alternatives at the local level, and with community support. All communities with completed LFAs have project recommendations that are eligible for funding through the LFHMP. City funding was used efficiently to create the LFAs and the overall program support from local partners has been effective. Community understanding of the causes of flooding and viable solutions was enhanced, and mitigation plans are now ready for use following a future flood event. The LFA process has become a model of grassroots mitigation strategy development and is being used elsewhere in New York State. As a grassroots process, however, it remains up to the community to decide when and how to implement the LFA recommendations.

Limitations of the LFA process include the time required to advance the LFA from initiation to completion. Rigorous analysis of hydraulics and cost/benefits is time consuming and requires substantial engineering resources, as well as a personal commitment from community members to attend meetings and review documents. Water quality benefits proved difficult to assess during the LFA process in more than a general way and was shifted to the design process. The LFA provides a planning-level set of recommendations for which larger and more complex projects may require additional feasibility studies prior to design and construction.

3. LFA Implementation (SMP)

As previously noted, DEP's SMP funds the stream-related projects recommended within LFAs, by awarding grants through the locally-driven Stream Management Implementation

Program (SMIP). Stream-related projects include floodplain restoration, infrastructure modification and replacement, streambank stabilization, and channel modification; the objectives of these projects include lowering flood elevations, preventing debris jams, and improving stream stability. Per its program rules, the SMIP does not fund routine maintenance activities, dredging, channelization, private bridges or flood control projects such as flood walls, berms and levees even when they are recommended by an LFA.

Because the SMIP is locally-driven, municipalities control the pace of project initiation; while SMP partners encourage applications for funding, it is up to each municipality to apply. Greene County SWCD and CCEUC work with municipalities through their basin-specific SMIP advisory committees to award funds for projects. Delaware and Sullivan County SWCDs coordinate applications directly with interested municipalities or through a local FAC to commit funding to projects. In all cases, the local SMP partner administers the contracts for project design and/or construction on behalf of the municipality. Most projects are designed by consulting engineers selected in coordination with the municipality either through existing SMP engineering service contracts or through project-specific requests for proposals. Project designs are reviewed by both SMP partners and DEP; these designs typically require 12-18 months to complete depending upon the complexity of the project.

Pursuant to the Revised 2007 FAD, in 2014 DEP allocated $10.1 million through its existing contracts with local SMP partners to support the LFHMP, including LFA development and project implementation in all WOH reservoir basins; these commitments are summarized in Table 3a and include the $1.765 million committed to LFA development as summarized in Table 1. The 2017 FAD requires DEP to commit an additional $15 million through new SMP partner contracts to support a minimum of 50 LFA-recommended projects through December 2027. As of June 1, 2020, DEP executed five of six new SMP partner contracts, with the sixth contract expected to register in July 2020; these six contracts allocate $6.65 million in new funding to support LFA-recommended projects in all WOH reservoir basins for roughly the first half of the 2017 FAD period; these newer commitments are also summarized in Table 3a, which documents a total city allocation of $16.764 million to the LFHMP through SMP partner contracts.

Table 3b summarizes the amount of SMP partner funds committed to implementing LFA projects in the WOH reservoir basins; for the Revised 2007 FAD allocations, these figures exclude LFA costs and reflect only funds dedicated to project implementation out of the city's initial $10.1 million allocation. As of June 1, 2020, SMP partners have committed or spent a total of $4.961 million on LFA projects out of a total $16.764 million allocation thus far.

Table 3a. Status of SMP funding allocations for each WOH reservoir basin as of June 1, 2020.

Basin	Revised 2007 FAD[1]	2017 FAD	Total
Ashokan	$2,877,008	$2,500,000	$5,377,008
Schoharie	$2,060,466	$1,200,000	$3,260,466
Rondout/Neversink	$1,365,664	$500,000	$1,865,644
Cannonsville/Pepacton	$3,811,715	$2,450,000	$6,261,715
Total	**$10,114,853**	**$6,650,000**	**$16,764,853**

[1] Funding allocation includes $1,765,191 spent or committed to the completion of LFAs.

Table 3b. Status of SMP partner commitments to implement LFA projects as of June 1, 2020.

Basin	Revised 2007 FAD	2017 FAD	Total
Ashokan	$287,510	$1,567,455	$1,854,965
Schoharie	$624,436	$90,000	$714,436
Rondout/Neversink	$1,073,907	$0	$1,073,907
Cannonsville/Pepacton	$1,318,432	$0	$1,318,432
Total	**$3,304,285**	**$1,657,455**	**$4,961,740**

Given the complexity and scope of certain large-scale LFA projects, which often span multi-year timeframes and require the bidding and awarding of individual contracts for each of the feasibility study, project design, and construction phases, DEP counts individual contract funding awards as distinct projects when assessing progress towards the 2017 FAD goal of 50 LFA projects. When the 2017 FAD was released, DEP and its SMP partners were still working under their existing program contracts, so SMP partners began to initiate implementation of LFA-recommended projects using Revised 2007 FAD allocations until new 2017 FAD funding commitments could be codified in new contracts. As of June 1, 2020, SMP partners have awarded 20 grants to support the design or construction of 13 LFA-recommended projects. Table 4 summarizes the LFA-recommended projects funded to date and their component contracts. Fifteen of these projects are attributed to Revised 2007 FAD funding commitments, while the city's 2017 FAD funds are dedicated to the construction of the town of Olive culverts (DeSilva Road, Upper Boiceville Road, and Burgher Road) and the Maltby Hollow Bridge, and the design of the Saw Kill Streambank Stabilization Project.

Table 4. Summary of LFA project funding awards through the SMP as of June 1, 2020.

Project Name	Contract Type	Amount	Status
Water Street Floodplain Restoration	Design	$224,767	Complete
	Construction	$716,665	Complete
Steele Brook Streambank Stabilization	Construction	$217,000	Ongoing
Steele Brook Debris Removal	Construction	$20,000	Ongoing
Mill Street Floodplain Restoration	Construction	$140,000	Complete
Manor Kill Floodplain Restoration	Design	$97,886	Complete
	Construction	$476,550	Complete
Saw Kill Streambank Stabilization	Design	$140,000	Ongoing
Blue Hill Lodge Streambank Stabilization	Design	$58,744	Complete
	Construction	$506,760	Complete
Town Hall Streambank Stabilization	Design	$58,743	Complete
	Construction	$424,660	Complete
DeSilva Road Culvert Replacement	Design	$69,170	Complete
	Construction	$524,320	Ongoing

Upper Boiceville Road Culvert Replacement	Design Construction	$69,170 $764,320	Complete Ongoing
Maltby Hollow Bridge Replacement	Design Construction	$80,000 $219,495	Complete On Hold
Burgher Road Culvert Replacement	Design	$128,490	Ongoing
Hunter Road Elevation Study	Feasibility	$25,000	Ongoing
Total		**$4,961,740**	

3.1 Floodplain Restoration

Floodplain restoration, with a goal of lowering flood elevations and associated damages, is a frequently recommended mitigation project within LFAs. While the LFA provides a conceptual floodplain elevation to determine relative project benefits, the design process requires re-modeling of the site hydraulics and creation of excavation, grading, stormwater and site protection plans prior to construction. Calculating the volume of material to be excavated requires soil testing to determine the presence, extent and type of contamination. The fate of the excavated material must be determined before construction begins; finding a disposal location is time consuming, and disposal of contaminated material is costly.

To date, three floodplain restoration projects have been designed and constructed by SMP partners; a fourth is under design and not included in Table 4 because it is funded through the CWC LFHMIP. For the three floodplain projects, the design process identified extensive contamination. Two of the four projects required property acquisition through the NYCFFBO and structure removal through the CWC LFHMIP prior to construction. The time required for acquisition is typically 12-24 months, with demolition requiring an additional 8-12 months. Below is a brief summary of the largest floodplain restoration project undertaken to date, and an assessment of its contribution to the protection of water quality.

Water Street Floodplain Restoration Project (Village of Walton)

Following a 2006 flood, the village of Walton had acquired and removed the former Walton Reporter building, a "repetitive loss" property located along Delaware Street in the village. The availability of this new greenspace allowed the design of an improved stormwater drainage system to route flood waters from Delaware Street through a new culvert and under Water Street to a drainage swale and restored floodplain along the West Branch Delaware River.

After more than a year in design and permitting, Delaware County SWCD and its contractor initiated removal of the fill during fall 2018 through spring 2019. Pre-project soil sampling revealed that the soil contained concentrations of polycyclic aromatic hydrocarbons and metals exceeding New York State "unrestricted" fill standards in 18 of 38 test pits. As Delaware County SWCD closely coordinated with NYSDEC, the contractor began removing general fill to its quarry, followed by the removal of both "restricted" and "limited use" fills. The contractor sent 3,792 cubic yards of "limited use" fill to the county landfill while 22,284 cubic yards of "restricted use" fill was used for roadway improvements. In total, the project reclaimed

6.8 acres of floodplain through excavation of approximately 48,784 cubic yards of material (including wood, tires, wire, metal, plastic and concrete) which had been placed in the floodplain over time to facilitate development within the village. While the average floodplain "cut" was four feet, the maximum "cut" was approximately 10 feet.

The Water Street Floodplain Restoration Project was completed in 2019; it is the first phase of a set of LFA-recommended floodplain projects that are supported by the Walton Flood Commission. The village plans to use this site for recreation, with a boat launch and improved access to the river planned for 2020. The cost of construction was $1,184,950, with $716,665 funded by DEP through its SMP contract with Delaware County SWCD and matched with $468,285 from the ACOE through the Water Resources Development Act.

The water quality benefits of this project will be substantial. The project provides improved conveyance of flood flows along the West Branch Delaware River, lowers flood elevations on Delaware Street in downtown Walton, and enables flood waters to return to the river. This initial phase is expected to lower flood elevations in the 1% return interval flood (the 100-year "base" flood) by up to 0.5 feet. Among the numerous homes and local businesses that will experience reduced flooding are a variety store, auto repair garage, several restaurants, and the only grocery store in the village; this will reduce household and commercial chemicals and biological waste from being mobilized in a flood event. The removal of hazardous materials and debris in the floodplain will also benefit nearby water supply wells that serve village residents.

Visioning and implementing the Water Street Floodplain Restoration Project required the leadership of elected officials in the village and town of Walton, Delaware County SWCD, the Delaware County Departments of Public Works (DPW) and Planning, CWC, DEP, and federal funding support from the ACOE. This extensive cooperation demonstrates the potential of the LFHMP to successfully achieve its dual goals of improving community resiliency and protecting water quality. The next phase of LFA-recommended projects in the village of Walton will continues with design of the floodplain restoration at the former Breakey Motors property upstream from the Water Street site.

Figure 3 depicts the modelled restoration of the Water Street floodplain and the Breakey Motors floodplain to provide a reduction in the extent of the 10-year flood (light blue fill retreats to brown line), lower flood heights for the 100-year flood (yellow line), and a route for flood waters to flow off Delaware Street back into the West Branch Delaware (dashed blue line with arrow indicating direction of flow).

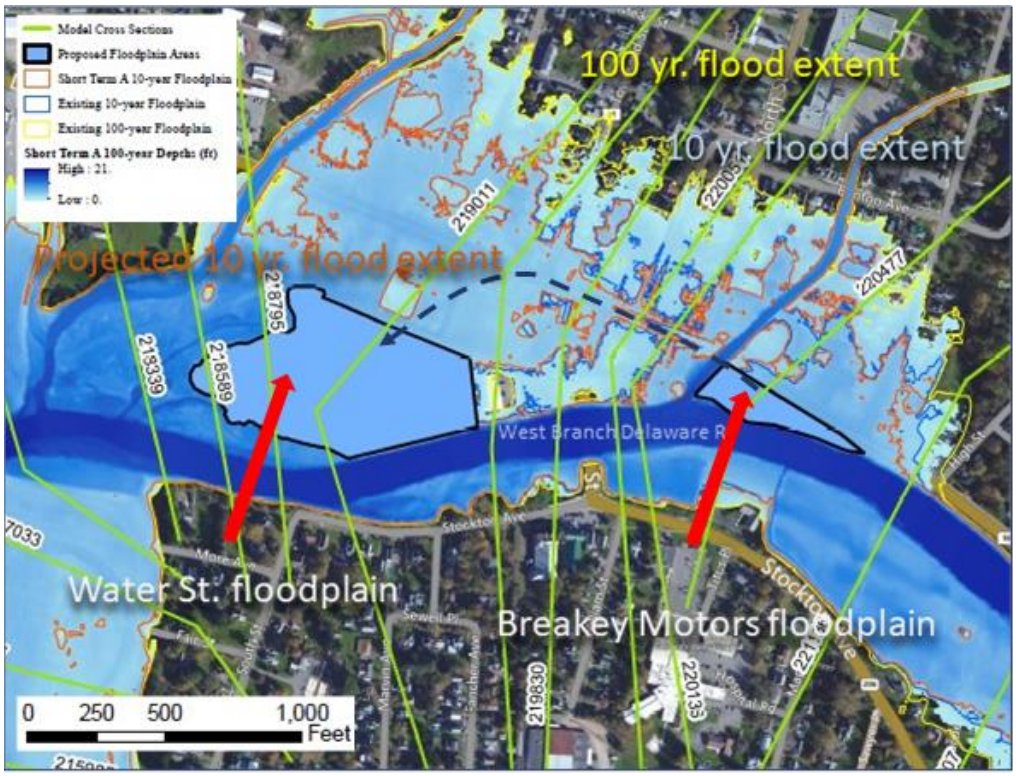

Figure 3. Walton LFA Short Term A Scenario – Water Street and Breakey Motors Floodplain Restoration Projects.

3.2 Infrastructure Upgrades and Replacements

LFAs have identified that undersized bridges and culverts are the most common cause of exacerbated flooding in communities and as a result, infrastructure upgrade and replacement is the most frequent LFA recommendation. The undersized nature of bridges and culverts is partially attributable to the increase in the magnitude of flood flows. State standards for sizing bridges and culverts have increased recently with the recommendations of the New York Community Risk and Resiliency Act (CRRA) and LFAs recommend the replacement of bridges or culverts consistent with CRRA standards. However, the cost of replacement is a potential barrier, which is exacerbated further by floodplain restoration often being associated with bridge and culvert replacement recommendations.

The responsibility for bridge replacement most frequently rests with either NYSDOT or county highway departments. Both state and county transportation agencies have repair and replacement schedules which may not coincide with a municipality's interests. When there is a synchronicity of interest and schedules, there is a higher likelihood that bridges can be replaced with larger structures. The active replacement of the NYS Route 28 bridge that crosses the Esopus Creek at Mt. Tremper is one excellent example of this synchronicity while demonstrating the potential of the LFHMP to enhance community resiliency by helping to keep an essential travel corridor open during major flood events.

NYSDOT's bridge replacement plan coincided with the release of the Phoenicia/Mt. Tremper LFA which recommends the combined bridge replacement/widening and floodplain restoration along this reach. At a cost of over $25 million, this effort by NYSDOT, together with the replacement of the NY Route 23 bridge in Prattsville, are significant contributions to flood mitigation in the region. Coordination between NYSDOT, NYSDEC, FEMA, ACOE, the town of Shandaken, Ulster County Department of the Environment, CCEUC, and DEP helped to advance the Mt. Tremper bridge project.

Bridge replacement costs, especially with an expansion to accommodate deeper floodwaters, are estimated to be greater than $2 million for county and town bridges and can rise to more than $30 million for large state bridges. Timeframes for design, property acquisition, permitting, bidding and construction can minimally be three years. To date, SMP partners have dedicated their LFA implementation funds to bridge design and construction supervision; the costs of construction are beyond the scope of city resources. SMP partners and CWC continue to decide on a case-by-case basis the amount of construction funding to commit for the costs associated with replacing county and state infrastructure assets.

Structures smaller than 20 feet in span are typically classified as culverts and usually owned by town highway departments. Flooding associated with culverts is generally localized and can result in the loss of an emergency access route from culvert overtopping. In larger flood events, culverts can be washed away and require replacement. SMP funds are used to undertake priority culvert replacements that increase conveyance capacity. The costs are typically less than $500,000 and the timeframe for design and construction is 18-24 months.

DEP and its SMP partners are planning to upgrade numerous culverts as LFA-recommended projects. Table 5 provides examples of bridge and culvert replacement projects, including three in the town of Olive that are funded by CCEUC through its current SMP contract. It is worth noting that cost estimates in Table 5 are from the respective LFA reports and can be significantly less than actual costs for design, construction and inspection.

Table 5. Examples of bridge and culvert replacement projects recommended in LFAs.

LFA	Bridge/Culvert Replacement Project	Owner	Estimated Cost
Prattsville	NY23 Bridge at Prattsville	NYSDOT	$11,000,000
Hunter	Bridge Street Bridge and Floodplain Restoration	Greene DPW	$5,695,000
Windham	NY23 Bridge and Floodplain Restoration	NYSDOT	$3,723,000
Phoenicia	Bridge Street Bridge and Floodplain Restoration	Ulster DPW	$7,728,085
Mt. Tremper	NY28 Bridge and Floodplain Restoration	NYSDOT	$15,000,000
Fleischmanns	Main Street Bridge	NYSDOT	$800,000
Fleischmanns	Mill Street Bridge Removal	Delaware DPW	$334,000
Arkville	NY28 Culvert By-pass Channel	NYSDOT	$2,533,047
West Shokan	Maltby Hollow Bridge	Ulster DPW	$1,438,000
Boiceville	Upper Boiceville Road Culvert	Town of Olive	$142,451
Boiceville	DeSilva Road Culvert	Town of Olive	$307,551
West Shokan	Burgher Road Culvert	Town of Olive	$99,720
Walton	Ogden Street and Delaware Street Bridges	NYSDOT	$2,862,000

Walton	Mead Street Bridge and Floodplain Restoration	Delaware DPW	$1,472,000
Walton	Benton Street Bridge	Delaware DPW	$2,476,000
Walton	Griswold St. Bridge and Floodplain Restoration	Delaware DPW	$4,421,000
Delhi	Elm Street Bridge and Steele Brook Channel	Delaware DPW	$1,100,480
Roxbury	Bridge Street Bridge and Floodplain Restoration	Delaware DPW	$3,757,000
Roxbury	Vega Mt. Road and NY30 Culverts	NYSDOT	$1,549,000
Halcott	Townsend Hollow Road Culvert	Roxbury (town)	$300,000
Halcott	Fairburn Drive Culvert at Elk Creek	Roxbury (town)	$380,000
Halcott	CR 1 culvert at Brownell Creek	Greene DPW	$410,000
Halcott	CR 3 culvert at Brownell Creek	Greene DPW	$430,000

Water quality benefits associated with the replacement of a bridge or culvert are correlated to the reduction in flooding of nearby properties; for this reason, replacements near large population centers will provide the greatest water quality benefit. Reduced scour downstream of an undersized structure can benefit water quality through a reduction in fine sediment entrainment, which may be important where turbidity mitigation is a high priority.

3.3 Streambank Stabilization

DEP and its SMP partners have designed and constructed numerous streambank stabilization projects over the past two decades. Delaware County SWCD has successfully employed this strategy for flood hazard mitigation in the Third Brook sub-basin (Cannonsville basin) following the 2006 flood which triggered several landslides and mobilized tremendous volumes of sediment and wood that posed downstream flooding hazards.

The number of streambank stabilization projects recommended in LFAs thus far has been limited, with the majority located in headwater settings such as in the Neversink and Rondout basins where landslides and channel aggradation present localized flooding concerns. In lower gradient reaches such as the West Branch Delaware River at Hamden or the Manor Kill at West Conesville, these LFAs recommend streambank stabilization to protect highway infrastructure.

The Rondout/Neversink SMP has been actively monitoring and rating streambanks for relative stability. DEP and Sullivan County SWCD have used this data to prioritize for stabilization two large hillslope failures in the East Branch Neverink River in Claryville. These hillslopes, at Blue Hill Lodge and the Denning Town Hall, are located upstream from an aggrading reach and LFA consultants have suggested control of sediment from these hillslopes may reduce flooding in the long term. Projects at both sites were constructed in 2018 and stabilized 1,450 feet of eroding streambank, thus protecting a town hall and business. Figure 4 depicts before and after conditions at the Denning Town Hall Streambank Stabilization site.

Figure 4. Denning Town Hall Streambank Stabilization – before (left) and after (right).

4. LFA Implementation (CWC LFHMIP)

In 2015, DEP entered into a $17 million contract with CWC to support the LFHMIP, in part to fund flood hazard mitigation projects that go beyond the scope the SMP and to broaden initiatives that improve community resiliency and provide water quality benefits. In consultation with DEP, CWC established program rules for the following categories of projects:

- relocation of anchor businesses, critical facilities, businesses and residences;
- alteration to public infrastructure;
- property protection measures, (elevation and floodproofing of structures);
- pollution prevention (fuel and propane tank anchoring);
- emergency removal of debris (fallen trees and sediment threatening bridges/culverts)
- design and construction of stream-related projects recommended by an LFA; and
- flood buyout activities (NYCFFBO property demolitions and site restoration).

CWC has amended its program rules periodically to clarify funding requirements and expand eligible mitigation measures. Major amendments have included the expansion of fuel and propane tank anchoring eligibility to all floodplain properties in the WOH watershed (2016), the funding of property protection measures regardless of whether there is an off-site flood reduction benefit (2018), and the ability for CWC to purchase properties that are needed for an LFA-recommended stream project or modification of public infrastructure (2018).

As administrator of the LFHMIP, CWC conducts public outreach, issues press releases, receives and processes project applications, manages subcontracts with consultants and contractors, advises municipalities and FACs on funding opportunities for their LFAs, and coordinates with DEP and the SMP partners. CWC maintains a web page with necessary program information including rules and application materials (cwconline.org/fhmi-program-overview/). CWC accepts and reviews program applications on a rolling basis, usually following a site visit by CWC and DEP; CWC shares applications with DEP for review and comment

before they are recommended for funding approval, which ultimately rests with the CWC Board of Directors. Table 6 provides a summary of all LFHMIP grants awarded through June 2, 2020. Additional information related to individual LFHMIP grant awards, including an interactive map, can be found at catskillstreams.org/LFA.

Table 6. Summary of CWC LFHMIP grants and funding allocations as of June 2, 2020.

Type of Project	Number of Grants Awarded	Number of Grants Completed	Total Funding Allocated
Property Protection	45	26	$642,385
Relocation	9	5	$1,161,984
Pollution Prevention	36	36	$123,100
Infrastructure	1	0	$1,000,000
Stream-Related	5	3	$2,328,063
Demolitions	6	6	$633,608
Buyouts	1	1	$388,550
Totals	**101**	**75**	**$6,277,689**

Additionally, CWC has contracted for engineering services with a total value of $500,000 to provide technical assessments for flood buyout properties, preparation of demolition plans for NYCFFBO and CWC property acquisitions, and property protection feasibility studies.

4.1. Property Protection

Property protection measures eligible for CWC funding include wet and dry floodproofing of commercial structures, and elevation of residential and commercial structures or utilities. These measures are often preferable to buyouts as they preserve community integrity and the local tax base. Property protection includes a suite of options which vary depending upon the type of use (residential versus commercial) and whether the floodplain structure is located on the flood fringe where depths and velocities are lower, or within the floodway where depths and velocities can be extreme. Applications for property protection measures increased significantly after CWC eliminated eligibility requirements for off-site flood reduction in 2018.

It is worth noting that property protection is a relatively new practice in the WOH watershed. To build familiarity with the practices and share some of the lessons from other states, CCEUC provided a two-day workshop in 2019 on elevation and floodproofing for code enforcement officers and local staff involved with the LFHMP, with emphasis on standards, techniques and project management. CWC and the New York State Division of Homeland Security and Emergency Services presented information on their respective grant programs.

To assist with identifying property-specific options, CWC has contracted with Chazen Engineering to conduct feasibility studies of applicant structures. These studies are limited to $5,000 per property and are required to report options and conceptual cost estimates. In a feasibility study, the consulting engineer provides the property owner with information from the FEMA flood study such as the flood zone, base flood elevation (1% chance recurrence flood elevation), first floor elevation, and design elevation for mitigation. The engineer identifies the best options as well as those that might be more affordable or practical to implement. The

standards used to determine eligibility for property protection feasibility studies or their recommended practices are not defined in any guidance document other than CWC program rules. For program consistency and because of safety issues at hand, DEP relies on NFIP and American Society of Civil Engineers 24 (ASCE-24) guidance as applied to the location and flood conditions of a structure to determine whether to recommend an application for approval. ASCE-24 and NFIP standards guide FEMA, NYS Division of Homeland Security and Emergency Services and New York Rising funding determinations for property protection grants.

Upon completion, the property owner is eligible to apply for design funding up to 10% of the estimated construction cost. Per CWC program rules, funding for construction costs is capped at 75% of the design estimate for construction costs. CWC has awarded a total of 45 property protection grants, of which 36 are feasibility study grants (22 studies are complete). CWC has also approved six grants for design (two designs are complete) and three grants for construction of property protection measures (two projects are complete). For construction grants, CWC reviews a contractor's activities to ensure the work is completed according to building code and NFIP requirements prior to approving final payment.

Water quality benefits can be identified through the feasibility study process. Often there are opportunities to anchor fuel tanks, elevate utilities, and move household hazardous materials to a higher location. Under NFIP rules, areas of a structure that are wet floodproofed (allowed to flood during an event) cannot be habitable space but can still be used for storage. For example, a vented basement or attached garage could be used for storage of materials such as paints, oils, cleaning materials or parking vehicles. This can reduce the potential water quality benefit of some property protection measures. Also, elevated or floodproofed structures remain in the floodplain and components of the structure, such as a septic system or vehicles and materials stored outside of the structure in outbuildings also remain in the floodplain.

As shown in Figure 5, elevation of the Main Street Café in the village of Hunter demonstrates a successful property protection project. Following completion of the Hunter LFA in December 2018, CWC began working with the property owner who planned to elevate a two-story wood frame structure and convert it for use as a café and office space. The owner's application for completing the design to elevate the structure by 3.25 feet was approved in April 2019 in the amount of $19,100. In addition to the elevation, designs called for the replacement of the stone foundation with a flood vented concrete basement and foundation that would allow flood flows to enter the basement and equalize hydrostatic pressure on the basement walls. Designs also included a lift for handicap access and floodproofing of the ventilation system. Upon completing the design, CWC awarded the owner $278,115 in construction funds to elevate the structure. CWC also provided $3,700 for anchoring propane tanks on this site.

Figure 5. Main Street Café prior to elevation (left) and during elevation (right).

4.2. Relocation of Businesses and Critical Facilities

When developing the components of the LFHMP, DEP and watershed stakeholders recognized the need to relocate key businesses and critical community facilities out of the floodplain to promote community resiliency. Implementing this effort requires coordination between the CWC LFHMIP, which provides funds for the purchase of land upon which to build a new structure, and the NYCFFBO, which purchases the existing floodplain structure from the owner. The cost of constructing the new structure is the responsibility of the owner, which for a critical community facility means the municipality. To be eligible for relocation assistance, CWC program rules require the new structure to be located within the same municipality.

Of the nine applications that CWC approved for relocation funding, three projects involved the purchase of land; these included a large commercial hardware store, a town hall and highway garage complex, and a municipal firehouse. In each case, the applicant has identified new land and the NYCFFBO has been prepared to purchase the existing property. To date, however, no business or critical facility has successfully completed the relocation process, due primarily to the prohibitive cost of constructing a new building. In no instance has the owner been able to obtain or provide the necessary additional funds; in cases where outside grant funds were pursued, they were deemed insufficient. The remaining six applications were for feasibility studies to consider issues related to the proposed relocation. Only one of these studies – a business relocation study – has been completed and it also did not result in a relocation.

4.3. Pollution Prevention

Following a major flood event, a community's floodplains tend to be littered with oil and propane tanks, and the ubiquitous odor of fuel oil lingers in soils and basements long after the floodwaters recede. This occurred in the WOH watershed when Tropical Storm Irene washed numerous unanchored tanks across floodplains. To prevent this potentially avoidable source of pollution and mitigate associated flood hazard risks, CWC funds the anchoring fuel oil and

propane tanks at no cost to floodplain property owners in the WOH watershed. CWC provides the necessary specifications and helps identify contractors able to complete the work.

CWC allows up to $5,000 for oil tanks up to 330 gallons and propane tanks up to 420 gallons. Since 2015, CWC has provided 36 grants to anchor 21 oil tanks and 63 propane tanks securing 5,825 gallons of oil and 17,422 gallons of propane. CWC has deployed a significant outreach effort to advocate for the program and solicit applications by meeting with property owners, fuel delivery companies, code enforcement officials, and contractors. CWC issues press releases and promotes the program during LFA public meetings and other venues. SMP partners also promote the program through their own effort working with FACs.

4.4. Infrastructure

CWC funds LFA-recommended projects that assist with alterations to public infrastructure. These include bridge and culvert replacements, protection for municipal wells and wastewater treatment facilities, and the alteration of utilities. CWC can also fund protection of municipal facilities through property protection feasibility studies.

As previously described, undersized bridges and culverts are the most frequent category of LFA-recommended infrastructure projects. CWC has received two applications for infrastructure projects, including one by the village of Walton for design of a new bridge to replace a NYSDOT culvert crossing Third Brook on NYS Route 10; this remains in the application stage awaiting documentation of NYSDOT's commitment to the project. CWC recently awarded $1 million to Ulster County Department of Public Works for replacement of the Maltby Hollow Bridge in the Town of Olive; the grant would provide approximately 40% of the engineer's estimate for replacement.

4.5. Stream Projects

CWC provides funding for the design and construction of stream-related projects recommended by an LFA. CWC can fund design costs up to 10% of the estimated construction costs. Municipalities can either be responsible for procuring engineering support of the project, or they can allow CWC to contract on their behalf. CWC and DEP jointly review designs prior to the award of funds for construction. To date, CWC has funded five stream LFA projects totaling $2.328 million as summarized in Table 7.

Table 7. Summary of CWC funding awards for LFA-recommended stream projects.

Project	Status	Grant Amount
USGS Gauge Installation at West Brook	Complete	$16,000
Mt. Pleasant Bridge Removal	Underway	$955,858
Mitchell Hollow Streambank Stabilization (design)	Complete	$23,000
Sundown Stream Restoration (design)	Underway	$153,200
Breakey Motors Floodplain Restoration (construction)	Underway	$1,180,004
Total		**$2,328,062**

With support from a consulting engineer, CWC is in the process of demolishing and removing the closed Mt. Pleasant bridge over the Esopus Creek. This bridge is considered a threat to the downstream NYSDOT bridge at Mt. Tremper in the event the old bridge should wash off its abutments in a flood event. The bridge demolition involves a substantial abatement process to remove lead-based paint from the structure prior to its demolition.

For the design of the Mitchell Hollow and Sundown stream projects, the respective applicant towns of Windham and Denning hired their own engineering firms. The design process for some of these projects has been affected by the limited experience of the consulting engineers with stream project designs and delays associated with landowner permissions and approvals.

The Breakey Motors floodplain restoration project is a good example of CWC partnering with Delaware County SWCD for design work after CWC managed the purchase of the property, demolition of structures, disposal of contaminated material, and site remediation. CWC purchased this former automotive business property in 2019, tasking its engineering contractor to prepare demolition bid documents and monitor demolition, asbestos abatement, and clean-up of a leaking underground storage tank. CWC also hired a contractor to remove the contaminated materials and filter groundwater associated with the fuel leaks.

After preparing the restoration design, Delaware County SWCD will supervise construction of the floodplain restoration as funded by CWC, along with removal of additional contaminated material that may be required during the restoration. Upon completion of the project, the site will be conveyed to the town of Walton and a conservation easement will be granted to NYSDEC. This project is phase 2 of the village of Walton's series of LFA-recommended floodplain restoration projects.

4.6. Property Buyouts

In 2018, CWC changed the LFHMIP rules to enable CWC to purchase property needed for a stream or infrastructure project. This rule change allows for the purchase in fee and also the purchase of an easement, and it was instituted to advance the overall Breakey Motors LFA-recommended project more quickly than the NYCFFBO. To date, the purchase of the Breakey Motors property has been the only CWC-funded buyout. All other acquisitions for LFA-recommended stream and infrastructure projects have advanced through the NYCFFBO. While the CWC LFHMIP has the potential advantage of being able to acquire property in a shorter period of time, the NYCFFBO has more established protocols for landowner contacts, appraisals, purchase offers and contracts, property surveys, environmental site assessments, closings, conveyance of conservation easements, and preparation of reuse plans as required by the WSP.

4.7. Demolition Support

CWC manages the demolition process for properties acquired under the NYCFFBO through a consulting engineer who prepares demolition and safe work plans, bid documents, and provides oversight of hazardous materials abatement, demolition and site remediation. Through its Land Acquisition Program, DEP provides the environmental site assessments, surveys, and

pre-demolition site testing for hazardous materials. DEP has provided this information to CWC for use in preparing its own bid documents.

As the number of properties acquired through the NYCFFBO has increased, so has the number of demolitions. CWC completed one demolition each year during 2017 and 2018, and two in 2019; before the COVID-19 pandemic, CWC was expecting to complete demolitions on up to six structures in 2020. CWC and DEP work closely to share environmental site assessments and surveys, and to review and approve subcontracts for demolitions in a timely manner.

4.8. Debris Management

CWC implemented an effective debris management program following Tropical Storm Irene to remove woody debris and flood trash capable of being remobilized and threatening downstream infrastructure in a subsequent flood event. CWC and DEP jointly assessed sites and prepared task orders for each site to be used by the property owner for obtaining quotes for the cost of the debris removal. CWC LFHMIP program rules allow the CWC Board of Directors to reactivate this program following a flood event.

There have been no flood events and therefore no federal, state or CWC emergency declarations since the LFHMIP was initiated. CWC has funded one application for debris removal through the LFHMIP to enable the town of Walton to remove an abandoned mobile home which was considered a potential debris concern in the Third Brook sub-basin.

5. Challenges and Recommendations

For the past two decades, DEP has collaborated with numerous partners and stakeholders to successfully develop, evaluate and refine a comprehensive portfolio of city-funded watershed protection and partnership programs that achieve the dual goals of water quality protection for nine million water consumers and the preservation of rural character and economic sustainability for local watershed communities. During this period, the WOH watershed has also experienced multiple catastrophic flooding events, with the last major event being Tropical Storms Irene and Lee in 2011, which permanently changed the physical landscape of several rural communities,

In response to the 2011 floods, DEP has worked with WOH watershed stakeholders to develop and implement a new LFHMP that addresses recurring flood damages threatening communities and mitigates flood-related water quality threats. The components of the LFHMP have been codified in the Revised 2007 FAD and the 2017 FAD, as well as modifications to the 2010 WSP, with the city required to commit at least $57 million to the LFHMP through 2027. As DEP, CWC and local SMP partners continue to implement an increasing number of flood hazard mitigation projects as recommended in more nearly two dozen LFAs developed for WOH population centers, DEP has identified a few challenges and potential recommendations.

First, the SMP and CWC LFHMIP both provide funds for the design and construction of stream-related projects, which is unique among the diversity of project types funded through the LFHMP as a whole. Programmatic overlap has the potential to create confusion among project applicants, undermine program efficiency, and inadvertently lead to competition when advancing

important stream-related projects. SMP partners and CWC each have unique strengths and capacities: the SMP has extensive experience and technical training in river assessment and engineering, stream morphology and floodplain restoration processes, while the LFHMIP has the ability to fund larger projects beyond the scope of the SMP.

- **Recommendation**: DEP believes that clarification of partner roles and project eligibility requirements could improve program efficiency while promoting cooperation and coordination among partners. Since the SMP has a FAD requirement to fund 50 LFA projects, DEP recommends that LFHMP partners work towards designating the SMP as the primary recipient of applications for stream-related project funding. SMP partners have valuable engineering experience in hydraulic modeling as well as ongoing service contracts with engineering firms that possess years of stream design and construction experience. When supplemental funds are needed for large or complex stream projects, DEP recommends that SMP partners and CWC work with project applicants to complement respective funding based on project size or phases; for example, the SMP could fund the design of projects and provide engineering supervision, while CWC could fund larger construction costs through the LFHMIP.

A second challenge facing the LFHMP is that numerous communities have reservations about property buyouts needed to advance floodplain restoration projects. This precludes many floodplain restoration projects from getting off the ground despite evidence that these projects can reduce flood elevations and insurance costs while increasing property values for residual property owners.

- **Recommendation:** DEP encourages program partners to continue outreach efforts to FACs and municipal officials, urging them to consider the community resiliency benefits associated with property acquisitions where floodplain restoration projects are shown to provide substantial reductions in flood losses. Securing the protection of floodplains through conservation easements could also be considered as a tool to facilitate the creation of modestly-sized floodplain benches over a series of neighboring backyards without having to purchase each and every property. Property owners would continue to have access to their streamside property while streams would have access to restored or created floodplains needed to meet hazard mitigation and water quality goals.

Related to the above, although CWC is now able to acquire properties for stream and infrastructure LFA projects, CWC does not have the institutional capacity to acquire many of these properties. DEP's Land Acquisition Program already has the procedures and staff needed to manage multiple acquisitions simultaneously through the NYCFFBO, which is consistent with the initial framework established for the LFHMP by DEP and watershed stakeholders.

- **Recommendation**: DEP encourages CWC to focus property acquisition efforts on those instances when a project's implementation schedule requires emergency action or when unforeseen property issues arise during the late planning/design phases of a stream or infrastructure project. For efficiency and consistency, DEP recommends the NYCFFBO remain the primary mechanism for acquiring flood hazard mitigation properties; for projects where a CWC acquisition role is necessary, DEP recommends that all requirements of the NYCFFBO be applied, including the granting of conservation easements to NYSDEC, approval of a Reuse Plan, and routine monitoring.

Many of the water quality benefits of the LFHMP will take years to materialize, but anchoring fuel tanks in floodways and floodplains can have short-term water quality benefits. CWC has identified administrative barriers to anchoring fuel tanks throughout the region, including insufficient number of contractors, matching tank owners to contractors, and a lack of interest to anchor tanks that are not owned by a homeowner.

- **Recommendation:** DEP recommends that CWC consider various approaches to increase the number of tanks anchored each year under the LFHMIP. These may include establishing a full-time staff member to work with homeowners, fuel companies and contractors, and to establish a list of pre-qualified contractors.

Another program challenge involves the extent of contamination found in previously-filled floodplains that have been restored to date; the presence of contaminants, along with the associated remedial costs, were not anticipated in the original scope of work for these projects.

- **Recommendation**: Based on information gained from the initial projects, and prior to affirmatively deciding to construct floodplain restoration projects, DEP recommends that project designers obtain Phase I and II environmental site assessments and factor in clean-up costs and schedules. While removal of contaminated material provides an important water quality benefit, it is an added cost that can delay construction. For the purpose of managing projects and budgets more effectively, DEP suggests that LFHMP partners obtain estimates based on the findings of complete environmental assessments prior to advancing these projects to construction.

Infrastructure projects recommended by LFAs are largely limited to bridge and culvert replacements, which are a frequent cause of localized flooding; these types of projects can be expensive and complicated, often exceeding the availability of program funds and the institutional capacity of program partners. Relatedly, the replacement of undersized bridges and culverts is often required for many floodplain restoration projects that are recommended in LFAs. Consistent with the 2017 FAD and the stakeholder process that designed the LFHMP framework, City funds are intended to leverage additional funds from state and federal sources; this requires coordination with NYSDOT and county highway departments to prioritize projects and secure matching funds where needed.

- **Recommendations**: DEP supports the use of City funds to advance designs for priority infrastructure projects in the short term, to ensure projects are shovel ready and poised to secure state or federal funding following the next flood event. However, DEP also recommends that the provision of matching funds be considered a condition of certain bridge and culvert project applications, especially those exceeding a certain funding threshold (e.g., $1,000,000). Another alternative is for LFHMP partners to prioritize larger and more expensive bridge and culvert replacement projects based on criteria associated with flood damage reduction, access concerns, and water quality benefits, potentially using program funds as a cost-share for the incremental cost of flood hazard mitigation. Lastly, DEP suggests that improved coordination between partners could allow program funds to be applied in a more complementary manner, whereby smaller culvert replacement design and construction could be funded by the SMP while the CWC LFHMIP funds the construction cost of replacing larger culverts or potentially provides a cost-share for certain bridge replacement projects that are currently cost-prohibitive.

DEP believes the LFHMP should focus on implementing the highest priority projects with the greatest potential for community resiliency and maximum water quality benefits. One set of challenge is a lack of specific published standards for eligible property protection measures and expenses, which makes it difficult to determine which applications should be funded for elevation or floodproofing based upon the flood zone and flood conditions. Another challenge has been the ability to procure qualified engineering support for property protection feasibility studies and the design of resulting projects. Applicants initially hired their own engineers, but many could not find one while some engineers did not fully understand the scope of work. To address this, CWC hired a single engineering firm to develop feasibility studies at a fixed price while developing a standardized scope of work and final report template that allowed the firm to work through a substantial backlog of studies. With many feasibility studies now complete, the next step is for property owners to apply for project design funds; this may pose a challenge based on the program's experience with completing feasibility studies.

- **Recommendation**: To ensure qualified applications for property protection feasibility studies, DEP recommends that CWC consider aligning program rules to be more consistent with NFIP requirements and ASCE 24 standards, and to dovetail with the funding and eligibility requirements of the New York State Division of Homeland Security and Emergency Service for non-structural mitigation measures; this will enable applicants to better leverage state and federal matching funds, and it will assist consulting engineers, code officials, community leaders, interested property owners and program partners with efficiently evaluating priority projects for advancement. To ensure adequate engineering support for project designs, DEP recommends that CWC consider soliciting vendors through a request for qualifications process that results in a list of experienced and qualified engineering firms that can be offered to property owners. It is likely that additional public outreach will be needed to encourage property owners with completed feasibility studies to advance viable projects to the design and construction phase.

Finally, relocation of businesses and critical facilities is essential to improving community resiliency and protecting water quality. However, the lack of available funds to construct new buildings outside of floodplains is a major obstacle to advancing this effort, and DEP does not support the expanded use of city funds for this purpose. Further, CWC rules require municipalities to relocate critical facilities within their municipality, limiting creative and cost-effective planning among adjacent municipalities interested in combining forces.

- **Recommendation**: DEP recommends that program partners work more closely with potential property relocation applicants to explore options for securing additional funds for new facility construction, especially state and federal funding opportunities for municipal and quasi-government entities, such as fire districts, for construction of new facilities. DEP also recommends that CWC consider modifying the requirement that relocated critical community facilities remain within the same municipality.

6. Summary

Mitigating flood hazards in the mountainous WOH watershed is a major planning and engineering challenge given the proximity of communities to rivers and the fact that many floodplains stretch from valley wall to valley wall. Success in mitigating flood hazards is a high priority for watershed communities to ensure sustainability, and is important to DEP for

protecting the city's water supply. Since Tropical Storms Irene and Lee, watershed stakeholders have worked together to build the necessary framework and foundation to meet this challenge.

Achieving the stated goals of the LFHMP will take time and continued commitment of all stakeholders during non-flood emergency periods; it may take decades to fully achieve flood resilience. The strategy of identifying the most effective projects using an engineering approach (LFAs) appears to be working as envisioned to provide population centers with prioritized projects that are eligible for city funding under various partner programs. Both straightforward and highly complex projects have been implemented using the combined resources of the LFHMP and outside partners as well. As project implementation continues in the years ahead, DEP and its program partners should continue pursuing state and federal programs to leverage additional resources. The recommendations within this report are intended to streamline project implementation and encourage broader participation. DEP commends the many partners and individuals working together to advance this important partnership effort.

APPENDIX

Comment Letter from Greene County Watershed Assistance Program

Greene County Schoharie Watershed Program
PO Box 996, Tannersville, NY 12485
Phone (518) 589-6871 Fax (518) 589-6874

May 1, 2020

Philip Eskeli
Flood Hazard Mitigation Coordinator
NYCDEP
71 Smith Ave.
Kingston, NY 12401

Ref: Comments on the Local Flood Hazard Mitigation Implementation Program

Dear Phil,

Thank you for the opportunity to comment on the LFHMIP for the June 2020 evaluation. Overall, the program is serving a very important function. Assisting communities with funding for flood mitigation is extremely important given the devastating community and water quality impacts left by Tropical Storm Irene in August 2011. Seeing the breadth of flood mitigation projects across the watershed that would not be possible without the city-funded programs is impressive. Some have greater flood reduction benefits than others, but all contribute in some fashion to reducing flood-related risks and the programs seem to be filling their intended purposes.

With that I offer the following recommendations for enhancing the program.

1. The LFA's started with studying the hamlet designated areas as defined in the 1997 MOA. If communities or SMP technicians identify other areas that pose potential flood risk to public and private property that are beyond the 1997 HDA's, those areas should be studied as well using the same engineering modeling. Local officials should have a say in what areas beyond their HDA's they feel may need additional flood modeling.
2. Amend the FHMIP program rules to allow municipalities to apply on behalf of a block or cluster of property owners interested in having their homes and/or businesses evaluated for property protection measures vs. individual applications. Each property owner would get a report for their home/business, and if they are interested in implementing any recommendation, they could apply on their own for implementation funds. Where there is interest from the local municipality, this economy of scale approach could make more sense from an administrative, financial and long-term planning standpoint. Moreover, where practical, the county or municipality could then apply on behalf of interested landowners for hazard mitigation funds to match with the CWC program and vise versa.
3. Amend the FHMIP program rules to allow a critical community facility to relocate outside the municipality in which it is located if no options exist for it to relocate in the same municipality, or if it makes more sense to co-locate with another public facility that is subject to flood damage. This may be the case with the Greene County Highway garage in Ashland. There is the potential for the county highway garage to co-locate with the Windham-Ashland-Jewett bus garage (located in Windham), both of which are located in the floodplain and subject to flood damages. Amending the program rule to allow this will enable both municipalities, and the county and school district, to work together on finding a suitable parcel that meets their needs and reduces flood risk to their operations, regardless of the municipality in which it is located.

4. Designate a contractor in each county to facilitate tank anchoring on a mass scale with fuel providers and property owners, rather than leaving it up to the home/business owner to find a contractor. This program has one of the highest flood mitigation and water quality benefits and would make sense to funnel it through a pre-qualified contractor. Similarly contracting for flood proofing projects, such as elevations, could streamline projects. If a pre-approved list of contractors does not already exist, the CWC should consider developing one to expedite the process for home and business owners prepared to implement flood-proofing measures identified in their structural evaluations. The contracts with the Chazen Companies for Assessment services, property protection studies, and demolition planning are good examples. They have helped standardize reviews, even though there was a back log initially. Creating a pool of contractors that are pre-qualified and approved could expedite flood proofing projects where funding is lined up, especially as more studies are completed.
5. The property protection reports The Chazen Companies is doing are informative and will lead to mitigation projects that benefit water quality and community sustainability. The report mentions a buyout/acquisition option as one of several. This is distinct from the other options that evaluate structural changes to make the structure more flood resilient. To reference a buyout/acquisition in a property protection study seems contrary to the purpose of a feasibility study, even if it is not recommended.
6. If the Restore Mother Nature Bond Act is approved in November, there should be an agreement between NYS and NYC on matching LFHMIP dollars, thereby spreading out the funds. Coordinating with the state to develop a special application that matches the LFHMIP programs with the Bond Act funding for flood mitigation could go a long way.
7. Land swapping NYCDEP-owned property outside the floodplain for relocation projects in the floodplain has been discussed and conceptually endorsed by stakeholders in the past. This needs to be kept in the "tool box," and supported when projects are identified.
8. The universe of relocating critical community facilities out of floodplains is limited throughout the watershed and some projects may not advance because of the cost to build a new facility. Consideration should be given to assist public entities with a portion of the construction costs of new facilities whether there is state or federal assistance or not.

The LFHMIP is progressing nicely thanks to the support of CWC, DEP, consultants, SWCD's, and other support staff assisting communities with projects. The first few years have shown a solid program from which to build. The funding available for flood mitigation in the city watershed is significant, and identifying projects through the Local Flood Analysis has helped communities understand flood risk and causes and options for mitigation where they exist. Although communities are using their LFA's at a different rate due to a number of factors (local endorsement of particular projects, property owner participation, funding levels, overall complexity), they remain a viable tool to guide communities in reducing impacts from devastating floods.

Thank you for the opportunity to provide these comments.

Sincerely yours,

Michelle Yost

Michelle Yost
WAP Coordinator