SCARSDALE
1701
NEW YORK

January 28, 2026

Re: Village of Scarsdale Village Board of Trustees
Notice of Intent to Act as Lead Agency
Brite Avenue and Fox Meadow Road Drainage Improvements Grant Application and Project

This notice is issued pursuant to 6 NYCRR Part 617 of the regulations implementing Article 8 (State Environmental Quality Review Act – "SEQRA") of the Environmental Conservation Law.

The Village of Scarsdale Village Board of Trustees hereby declares its intent to act as SEQRA Lead Agency for the proposed action identified below. Unless written objections are received from any involved agency by **February 27, 2026** (30 days from the issuance of this Notice), the Village of Scarsdale Village Board of Trustees will be established as Lead Agency for the Coordinated SEQRA Review of the Proposed Action.

Date:	January 28, 2026
Name of the Action:	Brite Avenue and Fox Meadow Road Drainage Improvements Grant Application and Project
SEQR Classification:	Unlisted
Description of the Action:	The Village conducted a road drainage study in 2024 with an engineering consultant, Mott MacDonald, that recommends improvements to the drainage system that includes upsizing existing storm sewer capacity, installing a parallel drainage system and adding lateral connections in order to reduce the frequency, intensity and severity of flooding for residents in this area. The Village is applying for grant funding through Westchester County in order to alleviate stormwater runoff which produces frequent flooding in the Brite Avenue and Fox Meadow Road areas.
Location:	Brite Avenue and Fox Meadow Road Village of Scarsdale
Proposed Lead Agency:	Village of Scarsdale Village Board of Trustees Scarsdale Village Hall 1001 Post Road Scarsdale NY 10583

If any agency has an objection to this designation or any comments on this action, please notify the Project Contact within 30 days from the date of this notice:

Mr. Kellan Cantrell, AICP, Village Planner
Scarsdale Village Hall
1001 Post Road
Scarsdale, NY 10583
914-722-1131
kcantrell@scarsdale.gov

All related materials, including Part 1 of the Short Environmental Assessment Form, are attached to this notice and are available in the Planning Department at Village Hall, 1001 Post Road, Scarsdale, NY 10583.

A copy of this Notice is being sent to the following Involved Agencies:

Westchester County Board of Legislators
Via email

A copy of this Notice is being sent to the following Interested Agencies:

Westchester County Planning Department
Via email

Village of Scarsdale Building Inspector Frank Diodati
Via email

Village of Scarsdale Superintendent of Public Works Jeff Coleman
Via email

Village of Scarsdale Fire Chief Christopher Mytych
Via email

Village of Scarsdale Police Chief Steven DelBene
Via email

Village of Scarsdale Volunteer Ambulance Corps
Via email

Village of Scarsdale Traffic Safety Committee
Via email

Short Environmental Assessment Form
Part 1 - Project Information

Instructions for Completing

Part 1 – Project Information. The applicant or project sponsor is responsible for the completion of Part 1. Responses become part of the application for approval or funding, are subject to public review, and may be subject to further verification. Complete Part 1 based on information currently available. If additional research or investigation would be needed to fully respond to any item, please answer as thoroughly as possible based on current information.

Complete all items in Part 1. You may also provide any additional information which you believe will be needed by or useful to the lead agency; attach additional pages as necessary to supplement any item.

Part 1 – Project and Sponsor Information

Name of Action or Project:

Brite Avenue and Fox Meadow Road Drainage Improvements Grant Application and Project

Project Location (describe, and attach a location map):

Brite Avenue and Fox Meadow Road

Brief Description of Proposed Action:

the Village of Scarsdale is proposing improvements to the drainage system that includes upsizing existing storm sewer capacity, installing a parallel drainage system and adding lateral connections in order to reduce the frequency, intensity and severity of flooding for residents in this area. The Village is applying for grant funding for this project.

Name of Applicant or Sponsor:	Telephone: 914-722-1132
Kellan Cantrell/Village of Scarsdale Village Board	E-Mail: kcantrell@scarsdale.gov

Address:

1001 post Rd.

City/PO:	State:	Zip Code:
Scarsdale	NY	10583

	NO	YES
1. Does the proposed action only involve the legislative adoption of a plan, local law, ordinance, administrative rule, or regulation? If Yes, attach a narrative description of the intent of the proposed action and the environmental resources that may be affected in the municipality and proceed to Part 2. If no, continue to question 2.	☐	☑
2. Does the proposed action require a permit, approval or funding from any other government Agency? If Yes, list agency(s) name and permit or approval: Westchester County - Grant Funding	☐	☑

3. a. Total acreage of the site of the proposed action? _____ acres
   b. Total acreage to be physically disturbed? _____ acres
   c. Total acreage (project site and any contiguous properties) owned or controlled by the applicant or project sponsor? _____ acres

4. Check all land uses that occur on, are adjoining or near the proposed action:

☐ Urban ☐ Rural (non-agriculture) ☐ Industrial ☐ Commercial ☑ Residential (suburban)
☐ Forest ☐ Agriculture ☐ Aquatic ☐ Other(Specify):
☐ Parkland

	NO	YES	N/A
5. Is the proposed action,			
a. A permitted use under the zoning regulations?	☐	☐	☑
b. Consistent with the adopted comprehensive plan?	☐	☑	☐

	NO	YES
6. Is the proposed action consistent with the predominant character of the existing built or natural landscape?	☐	☑

	NO	YES
7. Is the site of the proposed action located in, or does it adjoin, a state listed Critical Environmental Area?		
If Yes, identify: _____	☑	☐

	NO	YES
8. a. Will the proposed action result in a substantial increase in traffic above present levels?	☑	☐
b. Are public transportation services available at or near the site of the proposed action?	☑	☐
c. Are any pedestrian accommodations or bicycle routes available on or near the site of the proposed action?	☐	☑

	NO	YES
9. Does the proposed action meet or exceed the state energy code requirements?		
If the proposed action will exceed requirements, describe design features and technologies: _____ _____	☑	☐

	NO	YES
10. Will the proposed action connect to an existing public/private water supply?		
If No, describe method for providing potable water: _____ N/A. Stormwater drainage Project _____	☑	☐

	NO	YES
11. Will the proposed action connect to existing wastewater utilities?		
If No, describe method for providing wastewater treatment: _____ N/A. Stormwater drainage Project _____	☑	☐

	NO	YES
12. a. Does the project site contain, or is it substantially contiguous to, a building, archaeological site, or district which is listed on the National or State Register of Historic Places, or that has been determined by the Commissioner of the NYS Office of Parks, Recreation and Historic Preservation to be eligible for listing on the State Register of Historic Places?	☑	☐
b. Is the project site, or any portion of it, located in or adjacent to an area designated as sensitive for archaeological sites on the NY State Historic Preservation Office (SHPO) archaeological site inventory?	☑	☐

	NO	YES
13. a. Does any portion of the site of the proposed action, or lands adjoining the proposed action, contain wetlands or other waterbodies regulated by a federal, state or local agency?	☐	☑
b. Would the proposed action physically alter, or encroach into, any existing wetland or waterbody?	☑	☐
If Yes, identify the wetland or waterbody and extent of alterations in square feet or acres: _____ _____ _____		

14. Identify the typical habitat types that occur on, or are likely to be found on the project site. Check all that apply:

☐ Shoreline ☐ Forest ☐ Agricultural/grasslands ☐ Early mid-successional

☐ Wetland ☐ Urban ☑ Suburban

	NO	YES
15. Does the site of the proposed action contain any species of animal, or associated habitats, listed by the State or Federal government as threatened or endangered?	☑	☐
16. Is the project site located in the 100-year flood plan?	☑	☐
17. Will the proposed action create storm water discharge, either from point or non-point sources?	☑	☐
If Yes,		
a. Will storm water discharges flow to adjacent properties?	☐	☐
b. Will storm water discharges be directed to established conveyance systems (runoff and storm drains)?	☐	☐
If Yes, briefly describe:		
18. Does the proposed action include construction or other activities that would result in the impoundment of water or other liquids (e.g., retention pond, waste lagoon, dam)?	☑	☐
If Yes, explain the purpose and size of the impoundment:		
19. Has the site of the proposed action or an adjoining property been the location of an active or closed solid waste management facility?	☑	☐
If Yes, describe:		
20. Has the site of the proposed action or an adjoining property been the subject of remediation (ongoing or completed) for hazardous waste?	☑	☐
If Yes, describe:		

I CERTIFY THAT THE INFORMATION PROVIDED ABOVE IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE

Applicant/sponsor/name: Kellan D. Cantrell, AICP Date: 12.1.2025

Signature: K.D. C Title: Village Planner

PRINT FORM

MOTT MACDONALD

Brite Avenue and Fox Meadow Road Drainage Study

Village of Scarsdale
Westchester County, NY

November 2024

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Village of Scarsdale
Engineering Dept.
1001 Post Road
Scarsdale, NY 10583

Brite Avenue and Fox Meadow Road Drainage Study

Village of Scarsdale
Westchester County, NY

November 2024

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
0	11/11/2024	CJ	KKN	JKR	Original Draft
1	06/12/2025	CJ	SJA	JKR	Complete Draft

Document reference: 505101243-009 | 01 |

Information class: **Standard**

Contents

1 Introduction

The Village of Scarsdale (Village) authorized Mott MacDonald to perform a hydrologic and hydraulic analysis of the drainage system in the vicinity of Fox Meadow Road and Chesterfield Road within the Village of Scarsdale and investigate the flooding concerns within the surrounding areas due to the suspected insufficient capacity of the existing systems. Currently the existing drainage systems along Chesterfield Road and Fox Meadow Road and the low-lying areas around Brite Avenue experience frequent flooding due to insufficient capacity and the Village wishes to analyze the system to determine the approximate capacity of the system, identify the key problem areas, and provide potential solutions or improvements to increase the system's capacity and ultimately reduce the impacts to the area due to flooding. Figures 1.1 and 1.2 show the project location and project limits.

Figure 1.1: Project Location Plan

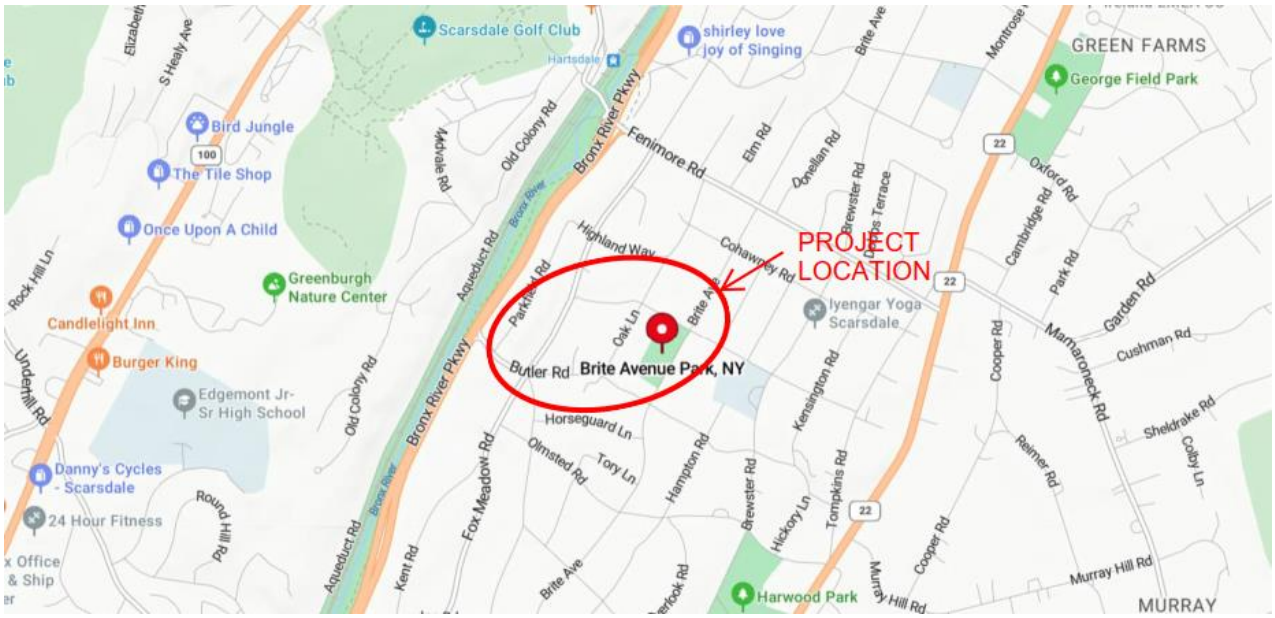


Figure 1.2: Approximate Project Limits (Brite Avenue to Fox Meadow Road)

Hydrologic and hydraulic analyses were conducted for the Chesterfield Road and Fox Meadow Road drainage system and key problem areas were identified as well as potential recommendations for improvements were provided. Based on the results and the analyses, the Village wishes to proceed to the next step and implement a final design for improvements to the area. The purpose of this report is to describe the means and methods used to perform the hydrologic and hydraulic analysis and implement a proposed design for improvements.

2 Hydrologic Analysis

2.1 Hydrologic Analyses

The hydrologic analysis was conducted to determine peak flow rates to the existing Chesterfield Road and Fox Meadow Road project area at key locations and/or at the individual drainage structures contributing flow to the drainage system. The peak flow rates determined for this area were based on the overall drainage area to upstream limits of the system to determine the base flow into the system and to each individual drainage structure contributing flow to the downstream drainage system, and included the 1, 2, 10, 25, and 100-year storm events. The existing drainage infrastructure is grossly undersized to convey storms greater than a 1-year storm event. As such, our report focuses on the impacts associated with smaller storm events. The following sections describe the methodology used to determine the peak flow rates used for the hydraulic analyses discussed in sections 3 and 4.

2.2 Methodology

SewerGEMS modeling software was used to analyze the drainage systems for both existing and proposed conditions, which utilizes the Rational Method to estimate peak runoff rates, typical for analyzing and designing storm sewer systems and local drainage. The Rational Method determines the various flows in cubic feet per second (cfs) and uses the following equation:

Q = CiA
Q = Peak rate of runoff in cubic feet per second (cfs)
C = runoff coefficient
i = Average rainfall intensity (in/hr)
A = Drainage Area (acres)

Each drainage area to key locations were delineated using available GIS topographic data with 2-foot contour intervals. Refer to Figure 2.1 for the delineated areas.

Figure 2.1: Drainage Areas for Chesterfield Road and Fox Meadow Road System

SewerGEMS models were developed for both existing and proposed conditions which included the delineated drainage areas for the drainage systems along Chesterfield Road and Fox Meadow Road. With the drainage areas delineated, the Time of Concentration (Tc) and runoff coefficient were determined. The Time of Concentrations are necessary in determining the appropriate rainfall intensity to be used in the Rational Method equation for determining the various peak flow rates and represents the time required for runoff to travel from the hydraulically most distant point in the drainage area to the downstream limit. The Tcs were estimated for the drainage areas using the NRCS velocity method which uses three methods of calculations, sheet flow, shallow concentrated flow, and channel flow.

The runoff coefficient was estimated for the drainage area using a weighted methodology based on the various percentages of each land use within the drainage areas. The values used for the runoff coefficients were taken from the New York Department of Transportation Highway Design Manual as shown in the Table 2.1 below:

Table 2.1: New York Department of Transportation Highway Design Manual Runoff Coefficients

Type of Surface	Runoff Coefficient (C)[1]
Rural Areas	
Concrete, or Hot Mix Asphalt pavement	0.95 - 0.98
Gravel roadways or shoulders	0.4 - 0.6
Steep grassed areas (1:2, vert.:horiz.)	0.6 - 0.7
Turf meadows	0.1 - 0.4
Forested areas	0.1 - 0.3
Cultivated fields	0.2 - 0.4
Urban/Suburban Areas	
Flat residential, @ 30% of area impervious	0.40
Flat residential, @ 60% of area impervious	0.55
Moderately steep residential, @ 50% of area impervious	0.65
Moderately steep built up area, @ 70% of area impervious	0.80
Flat commercial, @ 90% of area impervious	0.80

NOTE

1. For flat slopes and/or permeable soil, use lower values. For steep slopes and/or impermeable soil, use the higher values.

The precipitation intensities used to estimate the peak rates of runoff were taken from NOAA's National Weather Service web site using a rain gage station near Scarsdale. The following table lists the Point Precipitation Frequency Estimate used:

Table 2.2: NOAA Rainfall Intensities

NOAA Atlas 14, Volume 10, Version 3
Location name: Scarsdale, New York, USA*
Latitude: 41.0042°, Longitude: -73.7938°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.48** (3.53-5.62)	**5.20** (4.09-6.53)	**6.38** (5.00-8.02)	**7.36** (5.74-9.32)	**8.71** (6.54-11.4)	**9.74** (7.15-13.0)	**10.8** (7.64-14.7)	**11.9** (8.04-16.7)	**13.4** (8.69-19.3)	**14.5** (9.19-21.4)
10-min	**3.17** (2.50-3.98)	**3.68** (2.90-4.63)	**4.52** (3.54-5.69)	**5.21** (4.06-6.59)	**6.17** (4.63-8.06)	**6.90** (5.06-9.16)	**7.64** (5.42-10.4)	**8.41** (5.69-11.8)	**9.47** (6.15-13.7)	**10.3** (6.51-15.2)
15-min	**2.49** (1.96-3.12)	**2.89** (2.27-3.63)	**3.54** (2.78-4.46)	**4.09** (3.18-5.17)	**4.84** (3.64-6.32)	**5.41** (3.97-7.19)	**5.99** (4.25-8.19)	**6.60** (4.46-9.27)	**7.42** (4.82-10.7)	**8.06** (5.10-11.9)
30-min	**1.72** (1.35-2.15)	**1.99** (1.57-2.50)	**2.45** (1.92-3.08)	**2.82** (2.20-3.57)	**3.34** (2.51-4.36)	**3.74** (2.74-4.96)	**4.14** (2.93-5.64)	**4.55** (3.08-6.38)	**5.09** (3.31-7.37)	**5.51** (3.49-8.11)
60-min	**1.10** (0.862-1.37)	**1.27** (1.00-1.60)	**1.56** (1.22-1.96)	**1.80** (1.40-2.28)	**2.13** (1.60-2.78)	**2.39** (1.75-3.16)	**2.64** (1.87-3.60)	**2.90** (1.96-4.07)	**3.24** (2.10-4.68)	**3.49** (2.21-5.14)
2-hr	**0.734** (0.582-0.915)	**0.845** (0.669-1.05)	**1.03** (0.810-1.28)	**1.18** (0.923-1.48)	**1.38** (1.05-1.80)	**1.54** (1.14-2.04)	**1.70** (1.21-2.31)	**1.87** (1.27-2.61)	**2.10** (1.37-3.01)	**2.27** (1.44-3.32)

3 Existing Conditions Hydraulic Analysis

3.1 Introduction

Based on detailed survey data, the existing condition storm drainage system in the vicinity of Chesterfield Road and Fox Meadow Road was entered into the SewerGEMS model and analyzed for the 1, 2, 10, 25, and 100-year storm events. The SewerGEMS model was used to perform the hydraulic analysis of the storm drainage system within this area to better understand and identify the components of the drainage system that has insufficient capacity and contributing to the regular flooding.

3.2 Methodology

The hydraulic analysis was conducted for the storm drainage system within the Chesterfield Road and Fox Meadow Road area. The hydraulic analysis was conducted using SewerGEMS modeling to estimate existing pipe and channel capacities and identify the associated stormwater runoff flows contributing to the drainage system for the 1, 2, 10, 25 and 100-year storm events. The results of the modeling helped identify the problem areas of the system and help verify the necessary improvements needed should it be increasing the capacity of the system, installing a bypass pipe system, or other improvements to help alleviate flooding.

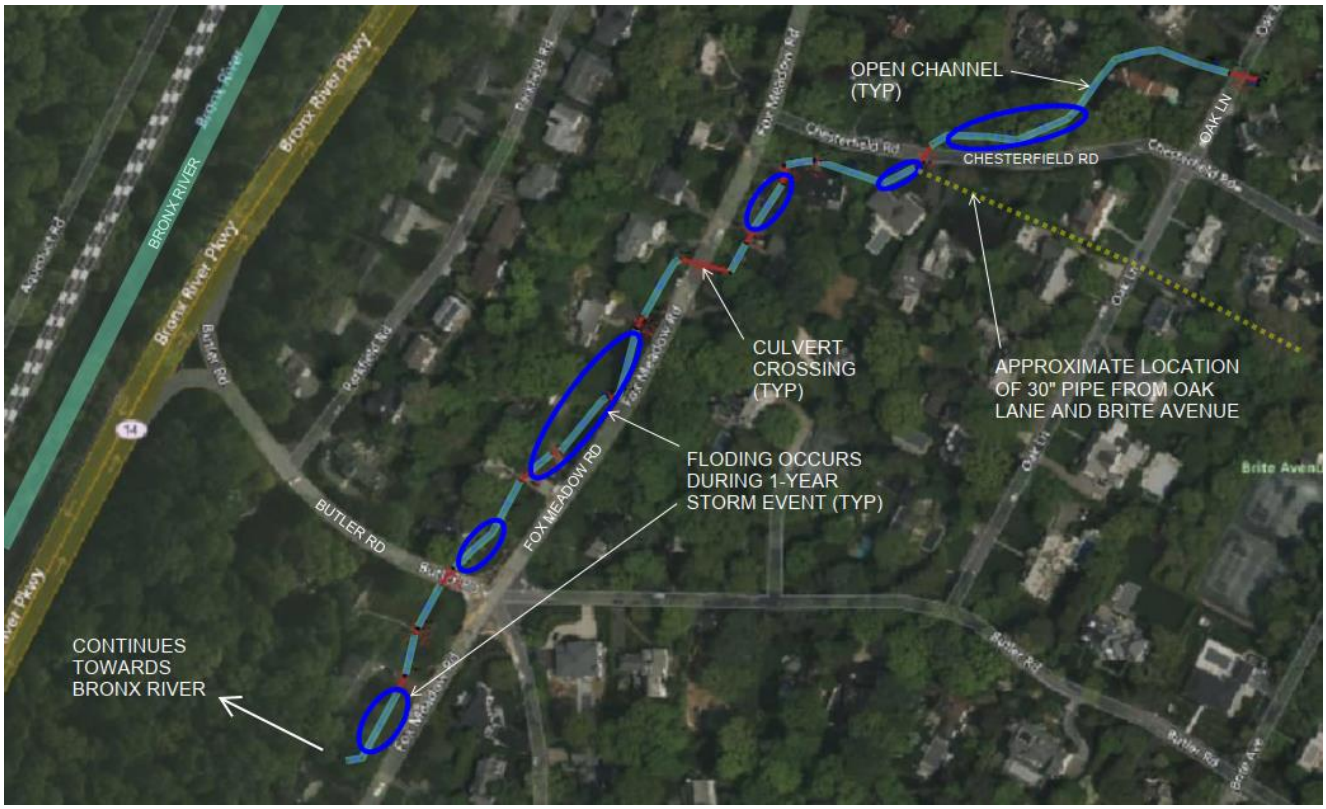
To develop the SewerGEMS modeling for the drainage system, field reconnaissance and detailed surveys were conducted to become familiar with the storm drainage system and to obtain the necessary physical data of the systems, such as pipe sizes, channel geometry, and inverts, to include into the modeling.

The SewerGEMS modeling uses the Rational Method to generate overland flows and used Manning's equation and loss methods to calculate the flows and hydraulic grades in the pipe and open cannel systems. Refer to Section 2.2 for a detailed description of the Rational Method used to calculate the associated flows.

3.3 Hydraulic Calculation Results

The existing storm drainage system in the vicinity of Chesterfield Road and Fox Meadow Road that was analyzed is an open channel system with numerous culvert crossings under local roadways and private driveways. The system starts with a culvert crossing under Oak Lane approximately 150 feet north of the intersection with Chesterfield Road and continues as an open channel in a westerly direction to a culvert crossing under Chesterfield Road approximately 225 feet east of the intersection with Fox Meadow Road. The system then continues westerly towards Fox Meadow Road as an open channel before it turns southwest and continues parallel to Fox Meadow Road for approximately 240 feet with three driveway culvert crossings along the way. The system then crosses under Fox Meadow Road and continues as an open channel in a southwesterly direction parallel to Fox Meadow Road for approximately 900 feet crossing Butler Road and several private driveways. At this point the system turns west and continues as an open channel for approximately 600 feet before discharging into the Bronx River. There are also several local smaller drainage systems in the vicinity of the project area that drain into the main system at multiple locations including. These smaller pipe system were not hydraulically modeled but are represented through the associated drainage areas contributing flow into the main system. Refer to Figure 3.1.

Figure 3.1: Existing Conditions SewerGEMS Model



The drainage system was analyzed for the 1, 2, 10, 25, and 100-year storm events and the results revealed that the drainage system has less than a 1-year storm capacity with several sections of the system exceeding its capacity and surcharging/flooding during the 1-year storm event. Refer to Figure 3.1 for approximate locations that the system exceeds its capacity. During the 1-year storm event, the drainage system surcharges at multiple locations with several of the culvert crossings at capacity which is consistent with the reported frequent flooding that occurs within the project area. The results of the 2-year storm event are similar with the 1-year storm with the system surcharging at multiple locations. The results of the 10-year storm or greater show that almost the entire system surcharges.

The capacity of the main existing drainage system to convey flows from Oak Lane to the Bronx River was estimated to be less than the 1-year storm event before is begins to surcharge at multiple locations. The results of the analysis indicate that the existing system is undersized and has inadequate capacity and flood mitigation measures should be implemented to reduce flooding due to increasing storm events.

4 Drainage Improvements and Analyses

4.1 Introduction

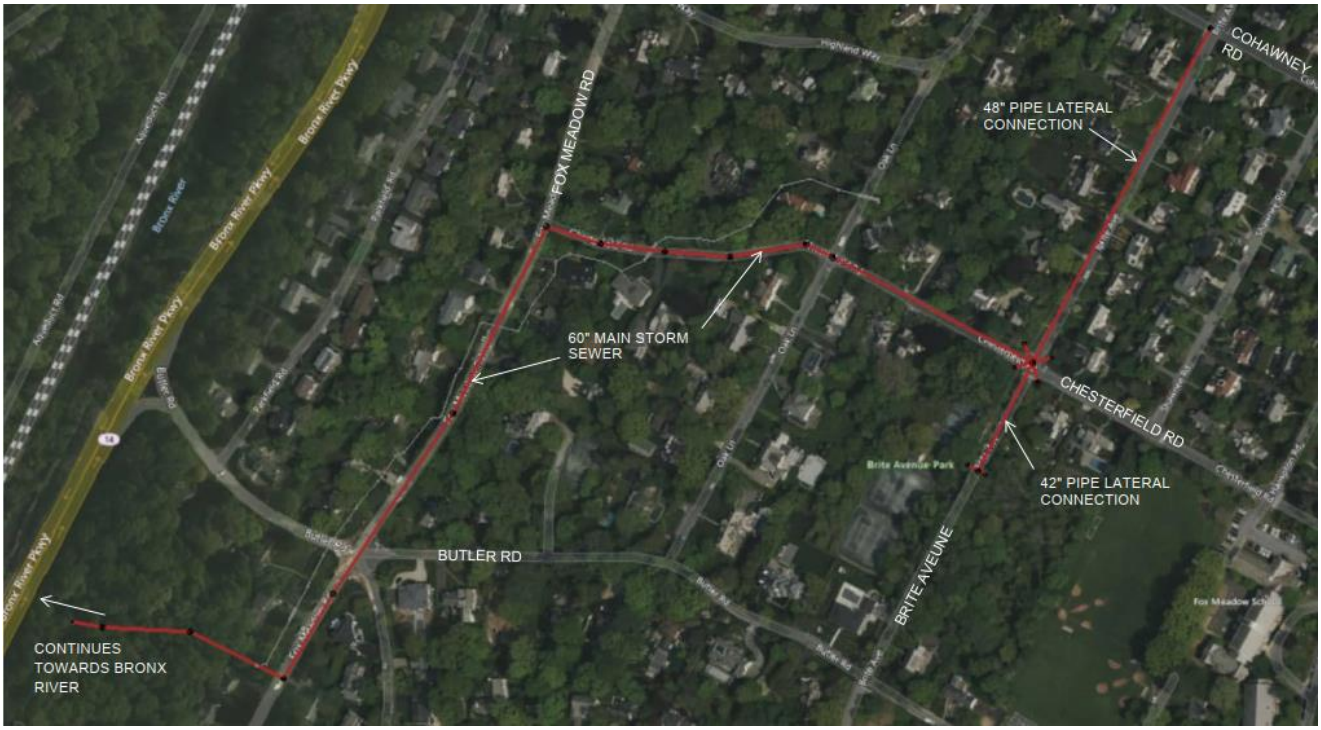
Based on the results of the existing conditions hydrologic and hydraulic analysis of the Chesterfield Road and Fox Meadow Road drainage system and the reported flooding concerns within the project area, a couple proposed solutions for improvements were identified and reviewed or analyzed to help address and alleviate the flooding concerns within this area. As previously noted, it was determined that this area experiences regular flooding along the alignment of the existing open channel drainage system in the vicinity of Chesterfield Road and Fox Meadow Road due to its insufficient capacity. In addition, there are natural low-lying areas along Brite Avenue in the vicinity of Brite Avenue Park and Fox Meadow School that experience regular flooding. These low-lying areas are drained through an existing 30” pipe that is conveyed through private property and discharges into the existing open channel adjacent to Chesterfield Road. Refer to Figure 3.1 for the approximate location of the 30” pipe. It was determined that the capacity of the existing storm drainage system is less than the 1-year storm event.

One alternative improvement was evaluated, and two other possible alternatives were considered and reviewed. The first alternative included a new storm sewer system along Chesterfield Road and Fox Meadow Road that would alleviate the contributing flow into the existing open channel system and bypass the flow downstream of Fox Meadow Road towards the Bronx River. The two other possible alternatives considered included, upgrading the existing 30” pipe that drains the low-lying areas along Brite Avenue adjacent to the Fox Meadow school and installing a parallel system along Butler Road to supplement the new storm sewer system along Chesterfield Road and Fox Meadow Road. The proposed improvements will provide improved storm conveyance capacity up to and including the 100-year storm event and alleviate flooding within the project area.

4.2 Chesterfield Road and Fox Meadow Road Storm Drainage System Option 1

This alternative includes constructing a new storm sewer system along Chesterfield Road and Fox Meadow Road that would intercept the contributing flow into the existing open channel drainage system and bypass the flow to a point downstream of Fox Meadow Road towards the Bronx River. In addition, the new system would include lateral connections that would extend into the low-lying areas of Brite Avenue to alleviate flooding within these areas. The new system would be designed to convey the 100-year storm event and would be designed to maintain a trickle flow into the existing open channel drainage system. The main system starts with a 60” diameter pipe from the intersection of Chesterfield Road and Brite Avenue and extends down Chesterfield Road to the intersection with Fox Meadow Road. The 60” pipe then continues in a southwesterly direction along Fox Meadow Road to a point approximately 300 feet past the intersection with Butler Avenue before turning west and continuing for approximately 500 feet before discharging into the open channel towards the Bronx River. The system also includes a 48” lateral connection that extends approximately 840 feet along Brite Avenue starting from the intersection with Chesterfield Road and extending to the intersection with Cohawney Road. The system also includes a 42” lateral connection along Brite Avenue starting from the intersection with Chesterfield Road and extending 270 feet in a southwesterly direction to the low-lying area along Brite Avenue near the Fox Meadow school. Refer to Figure 4.1.

Figure 4.1: Proposed Chesterfield Road and Fox Meadow Road System Option 1



A SewerGEMS model of the proposed Chesterfield Road and Fox Meadow Road storm sewer system for Option 1 was developed to analyze the benefits to the overall drainage system and to the low-lying area of Brite Avenue and the results of the proposed SewerGEMS model show that the proposed improvements will provide flooding benefits up to and including the 100-year storm event. The results of this analysis show that the proposed improvements will provide a significant benefit to the low area of Brite Avenue and will alleviate the regular flooding that currently occurs along the existing open channel drainage system.

4.2.1 Option 1 Cost Estimate

The approximate construction cost estimate for Option 1 of the proposed Chesterfield Road and Fox Meadow Road system was estimated to be in the range of **$2,600,000**. For a detailed breakdown of the cost estimate, refer to Appendix B.

4.2.2 Option 1 Pros and Cons

The potential pros and cons for the installation of the new Chesterfield Road and Fox Meadow Road system for Option 1 are listed in the table below.

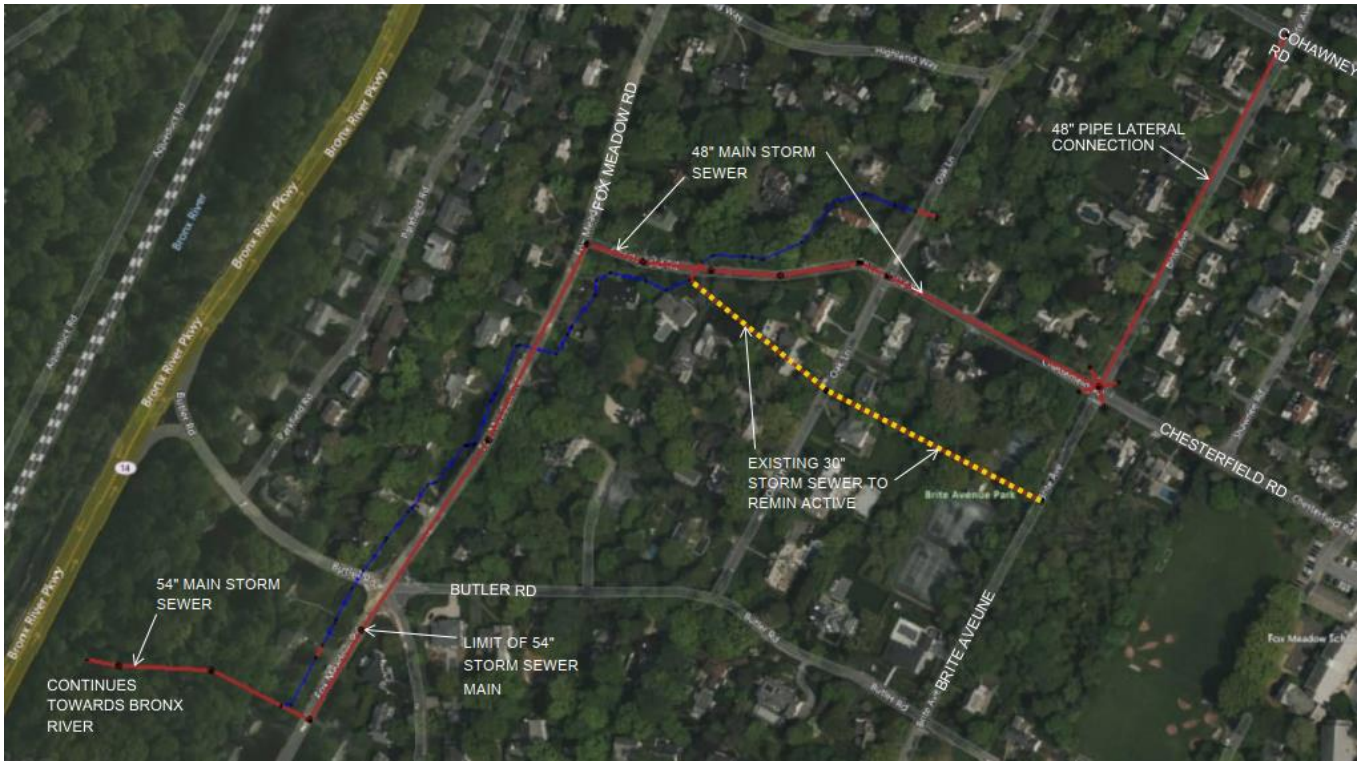
	Positive Impacts	**Negative Impacts**
New Chesterfield Road and Fox Meadow Road System	• Provides flood protection to Brite Avenue and surrounding areas up to and including the 100-year storm. • Reduces the volume of water that discharges to the existing open channel within private properties. • The majority of the proposed improvements are within the right-a-way of Brite Avenue, Chesterfield Road and Fox Meadow Road. Easements may only be required	• Several of the existing stormwater infrastructure within the area does not support flood mitigation greater than a 1-year storm event. • Easements may be required for the last 500 feet of pipe downstream of Fox Meadow Road. • Some sections of the 60” main may require deep excavations for installation.

	for the last 500 feet of pipe downstream of Fox Meadow Road.	• There may be concerns with increased flows downstream and to the Bronx River.

4.3 Chesterfield Road and Fox Meadow Road Storm Drainage System Option 2

This alternative is similar to Option 1 described in Section 4.2 except it eliminates the 42” later connection along the southern end of Brite Avenue adjacent to the Fox Meadow school. By eliminating the 42” lateral extension along Brite Avenue, the proposed main storm sewer line can be installed at a shallower elevation along Chesterfield Road and with smaller capacity pipes due to the elimination of the 42” lateral. The area draining to Brite Avenue in the vicinity of the Fox Meadow school and Brite Avenue Park will continue to be drained through the existing storm sewer system. The existing storm sewer system in this area, which has approximately a 2-year storm capacity, consists of a 30” diameter pipe that starts at Brite Avenue and continues towards Oak Lane and ultimately discharges into the existing open channel drainage system at the crossing with Chesterfield Road. Refer to Figure 4.2. Under this option, a proposed main storm sewer line will be installed along the northern end of Brite Avenue, Chesterfield Road and Fox Meadow Road and would intercept the contributing flow to these areas from entering the existing open channel drainage system and bypass the flow to a point downstream of Fox Meadow Road towards the Bronx River. The new system would be designed to convey the 100-year storm event. The main system starts with a 48” diameter pipe starting from the intersection of Brite Avenue and Cohawney Road and extends approximately 840 feet along Brite Avenue to the intersection with Chesterfield Road. The 48” pipe then continues down Chesterfield Road to the intersection with Fox Meadow Road. The 48” diameter pipe then continues in a southwesterly direction along Fox Meadow Road to the intersection with Butler Road where it then changes to a 54” diameter pipe and continues along Fox Meadow Road to a point approximately 300 feet past the intersection with Butler Avenue before turning west and continuing for approximately 500 feet before discharging into the open channel towards the Bronx River. Refer to Figure 4.2.

Figure 4.2: Proposed Chesterfield Road and Fox Meadow Road System Option 2



A SewerGEMS model of the proposed Chesterfield Road and Fox Meadow Road storm sewer system for Option 2 was developed to analyze the benefits to the overall drainage system and to the low-lying area of Brite Avenue and the results of the proposed SewerGEMS model show that the proposed improvements will provide flooding

benefits up to and including the 100-year storm event. The results of this analysis show that the proposed improvements will provide a significant benefit to the existing open channel drainage system and the Northern portion of Brite Avenue. The low area of Brite Avenue near the Fox meadow school will continue to be drained by the existing drainage system. However, the contributing flow to this low lying area should be reduced since the new drainage systems along Chesterfield Road will intercept a portion of the contributing flows coming from the drainage areas north of Chesterfield Road. Therefore, the low lying areas along Brite Avenue will see some benefits to help alleviate flooding.

4.3.1 Option 2 Cost Estimate

The approximate construction cost estimate for Option 2 of the proposed Chesterfield Road and Fox Meadow Road system was estimated to be in the range of **$2,000,000**. For a detailed breakdown of the cost estimate, refer to Appendix B.

4.3.2 Option 2 Pros and Cons

The potential pros and cons for the installation of the new Chesterfield Road and Fox Meadow Road system under Option 2 are listed in the table below.

	Positive Impacts	**Negative Impacts**
New Chesterfield Road and Fox Meadow Road System	• Provides flood protection up to and including the 100-year storm for Chesterfield Road and Fox Meadow Road and Brite Avenue north of Chesterfield Road. • Contributing flow to the low lying areas of Brite Avenue will be reduced. • Excavations to install storm sewer pipes will not be as deep as Option 1 described in Section 4.2 • Reduces the volume of water that discharges to the existing open channel within private properties. • The majority of the proposed improvements are within the right-a-way of Brite Avenue, Chesterfield Road and Fox Meadow Road. Easements may only be required for the last 500 feet of pipe downstream of Fox Meadow Road.	• Several of the existing stormwater infrastructure within the area does not support flood mitigation greater than a 1-year storm event. • Easements may be required for the last 500 feet of pipe downstream of Fox Meadow Road. • The low lying areas of Brite Avenue near the Fox Meadow school may continue to experience some flooding during larger storm events. • There may be concerns with increased flows downstream and to the Bronx River.

4.4 Other Possible Alternatives to supplement the New Drainage System

The two other possible alternatives to supplement the new Chesterfield Road and Fox Meadow Road drainage system considered included, upgrading the existing 30” pipe that drains the low-lying areas along Brite Avenue adjacent to the Fox Meadow school and/or installing a parallel system along Butler Road to supplement the new storm sewer system along Chesterfield Road and Fox Meadow Road. The proposed improvements will provide improved storm conveyance capacity up to and including the 100-year storm event and alleviate flooding within the project area.

4.4.1 Upgrading the Brite Avenue System

The proposed analysis considered upgrading the existing 30” pipe that extends from the low-lying area of Brite Avenue and extends through Brite Avenue Park and crosses Oak Lane and continues westerly through private property before discharging into the existing open channel drainage system where it crosses Chesterfield Road. Refer to Figure 3.1. However, After further review this concept was abandoned due to the location of the pipe being within close proximity to numerous existing structures. Construction of a new system would require numerous easements and may be challenging or unfeasible to construct.

4.4.2 Installing a Parallel System along Butler Road

The proposed analysis considered installing a parallel storm sewer system along Butler Avenue to supplement the proposed system along Chesterfield Road and Fox Meadow Road and potentially reduce the size of the Chesterfield Road and Fox Meadow Road system. The Butler Road system would pick up incoming runoff from the south and southeast portions of the project areas drainage and convey the flow along Butler Road starting from Brite Avenue and tying into the proposed Chesterfield Road and Fox Meadow Road system at the intersection of Brite Avenue and Fox Meadow Road. However, After further review this concept was abandoned due to the potential deep excavations that would be required to construct the Butler Road system. The existing grade in the vicinity of Oak Lane is significantly higher than Brite Avenue resulting in potential excavations to install the system that would exceed 25 feet in depth. Construction of a new system along Butler Road would be challenging and may not be feasible.

5 Project Benefit-Cost Analysis (BCA)

5.1 Introduction TO BCA

A Benefit-Cost Analysis (BCA) is the method by which the future benefits of a hazard mitigation project are determined and compared to its costs. The result of the BCA is a Benefit-Cost Ratio (BCR). The BCR is calculated by dividing a project's total benefits by its total costs. The BCR is a numerical expression of the "cost-effectiveness" of a project. A project is 'cost effective' when the BCR is 1.0 or greater, indicating the benefits of a prospective hazard mitigation project are sufficient to justify the costs. To be eligible for Federal funding assistance and grants, a project must be cost effective.

FEMA has developed the BCA Toolkit to facilitate the process of preparing a BCA. Using the BCA Toolkit ensures that the calculations are prepared in accordance with OMB Circular A-94 and FEMA's standardized methodologies. The BCA Toolkit is free to download from the FEMA website. The BCA Toolkit 6.0 software (most current version) has been utilized for computing the BCR for this report.

5.2 Benefit Cost Analysis

The estimated benefit cost ratio (BCR) for Option 1 was computed utilizing the FEMA-approved BCA Toolkit, version 6.0. The BCA Toolkit uses Office of Management and Budget cost-effectiveness guidelines and FEMA-approved methodologies and tools to complete a benefit-cost analysis.

For the proposed mitigation measure, Option 1, the BCA has been configured as a drainage improvement mitigation project for riverine flooding that impacts residential properties. The chosen frequency and damage relationship are based on professional expected damages. The BCA was calculated utilizing a FEMA Discount Rate of 7%, which is required to be used on projects seeking mitigation funding.

5.2.1 Damages Before Mitigation - Residential

The inundation area includes twenty-nine (29) homes on Fox Meadow Road, Chesterfield Road, Oak Lake, Paddington Road, and Highland Way Road. These homes are generally two-story single family residential dwellings, and include full or partially below grade basements and garage space. The residences have primarily been developed such that the first floor of living space is elevated above the flood limits for lesser storm events. This creates a unique situation in which flood waters generally stay within the roadway systems and within any low laying areas around the dwellings such as driveways and patios, but do not generally impact the living spaces. An H & H analysis was performed for a range of storms up to and including the 100-year storm event. The basis of the damages before mitigation to residential properties a comparison between the flood depths at existing dwellings during storm events, their first floor elevation, and the cost to repair/reconstruct finished basement spaces below grade.

In a recent survey of the inundation area undertaken by the Village of Scarsdale Engineering Department, many property owners reported that they have had significant drainage issues from Tropical Storm Ida, or for lesser storm events, and sustained material losses. Findings indicated that basement and garage flooding were common for residential properties in the inundation areas as well as sanitary sewer surcharges for some. Basement and garage flooding reported routinely reported damages up to $10,000 per event. Taken in totality, during each storm event, there is a significantly possibility of several hundred thousand dollars in damage to residential properties.

5.2.2 Damages Before Mitigation – "Other Damages"

The basis of the benefit analysis for "other damages" was a combination of costs that the City incurs after storm events. The damages include costs of DPW clean-up, Police Costs, pavement and Drainage Report Costs, Costs for Heavy Cleaning of the drainage system, and costs for CCTV and cleaning of the sanitary sewer system in the project area. Please note that standardized methods for calculating these costs were developed based upon actual historical costs incurred by the Village of Scarsdale by storm events. The assumptions are listed in table B.1, including in Appendix B of the report.

Appendix B includes all the data that was utilized in the BCA Toolkit software, as well as the output from the Toolkit software for this project.

5.3 Benefit Cost Analysis Results

The results of the benefit cost analysis for Option 1 utilizing FEMA's CBA Toolkit results in a positive BCR of 1.1. Because a project is 'cost effective' when the BCR is 1.0 or greater, this result indicates that the benefits of this project justify the costs. As such, the project would be eligible for Federal funding assistance and grants.

Appendix B includes the BCR output from the Toolkit software for this Project.

6 Findings

As previously described, Option 1 includes constructing a new storm sewer system along Chesterfield Road and Fox Meadow Road that would intercept the contributing flow into the existing open channel drainage system and bypass the flow to a point downstream of Fox Meadow Road towards the Bronx River. This option would include lateral connections that would extend into the low-lying areas of Brite Avenue to alleviate flooding within these areas. The new system would be designed to convey the 100-year storm event and would be designed to maintain a trickle flow into the existing open channel drainage system.

The findings of the analysis confirmed that mitigating local flooding on portions of Brite Avenue, Chesterfield Road and Fox Meadow Road can be achieved up to a 100-year storm event through the installation of large diameter drainage stormwater piping. The depressed portion of Brite Avenue near the tennis courts would have protection up to a 25-year storm. Although this portion of Brite Avenue will experience some flooding the duration should be limited. A backflow preventor will need to be installed at this location. It is anticipated that the subject improvements can be accomplished with no expected downstream impacts. Further analysis will be required during final design to confirm same and to provide for adequate downstream channel protection. It is anticipated that a private storm sewer will be required to provide for adequate downstream channel protection. A portion of the proposed piping will be installed at considerable depths due to the profile of the roads. This may result in conflicts with the existing sanitary sewer mains and laterals. All utility impacts would have to be assessed during a detail design phase.

The approximate construction cost estimate for Option 1 is $2,600,000. The positive BCR of 1.1, indicates that the project is cost effective, and that the benefits of this project justify the costs. As such, the project would be eligible for Federal funding assistance and grants, which should be pursued by the Village.

Appendix A - Hydrologic and Hydraulic Data

Existing 1-Year Storm Event - Catchment Table							
Label	Runoff Method	Area (acres)	Catchment Intensity (in/h)	Time of Concentration (min)	Runoff Coefficient	Outflow Element	Flow (cfs)
DA-A	Rational Method	13.938	3.17	10	0.35	CS-22	15.59
DA-B	Rational Method	2.963	3.17	10	0.35	CS-11	3.31
DA-C	Rational Method	61.769	2.336	18	0.35	CS-2	50.91
DA-D	Rational Method	2.582	3.17	10	0.35	CS-3	2.89
DA-E	Rational Method	1.951	3.17	10	0.35	CS-21	2.18
DA-F	Rational Method	9.51	3.17	10	0.35	CS-26	10.64
DA-H	Rational Method	9.77	3.17	10	0.35	CS-36	10.93
DA-I	Rational Method	40.897	2.167	21.3	0.31	CS-13	27.66
DA-J	Rational Method	4.398	3.17	10	0.35	CS-13	4.92
DA-K	Rational Method	7.689	3.17	10	0.35	CS-2	8.6

Existing 2-Year Storm Event - Catchment Table							
Label	Runoff Method	Area (acres)	Catchment Intensity (in/h)	Time of Concentration (min)	Runoff Coefficient	Outflow Element	Flow (cfs)
DA-A	Rational Method	13.938	3.68	10	0.35	CS-22	18.1
DA-B	Rational Method	2.963	3.68	10	0.35	CS-11	3.85
DA-C	Rational Method	61.769	2.71	18	0.35	CS-2	59.06
DA-D	Rational Method	2.582	3.68	10	0.35	CS-3	3.35
DA-E	Rational Method	1.951	3.68	10	0.35	CS-21	2.53
DA-F	Rational Method	9.51	3.68	10	0.35	CS-26	12.35
DA-H	Rational Method	9.77	3.68	10	0.35	CS-36	12.68
DA-I	Rational Method	40.897	2.512	21.3	0.31	CS-13	32.07
DA-J	Rational Method	4.398	3.68	10	0.35	CS-13	5.71
DA-K	Rational Method	7.689	3.68	10	0.35	CS-2	9.98

Existing 10-Year Storm Event - Catchment Table							
Label	**Runoff Method**	**Area (acres)**	**Catchment Intensity (in/h)**	**Time of Concentration (min)**	**Runoff Coefficient**	**Outflow Element**	**Flow (cfs)**
DA-A	Rational Method	13.938	5.21	10	0.35	CS-22	25.62
DA-B	Rational Method	2.963	5.21	10	0.35	CS-11	5.45
DA-C	Rational Method	61.769	3.836	18	0.35	CS-2	83.59
DA-D	Rational Method	2.582	5.21	10	0.35	CS-3	4.75
DA-E	Rational Method	1.951	5.21	10	0.35	CS-21	3.59
DA-F	Rational Method	9.51	5.21	10	0.35	CS-26	17.48
DA-H	Rational Method	9.77	5.21	10	0.35	CS-36	17.96
DA-I	Rational Method	40.897	3.557	21.3	0.31	CS-13	45.4
DA-J	Rational Method	4.398	5.21	10	0.35	CS-13	8.08
DA-K	Rational Method	7.689	5.21	10	0.35	CS-2	14.13

Existing 25-Year Storm Event - Catchment Table							
Label	**Runoff Method**	**Area (acres)**	**Catchment Intensity (in/h)**	**Time of Concentration (min)**	**Runoff Coefficient**	**Outflow Element**	**Flow (cfs)**
DA-A	Rational Method	13.938	6.17	10	0.35	CS-22	30.34
DA-B	Rational Method	2.963	6.17	10	0.35	CS-11	6.45
DA-C	Rational Method	61.769	4.54	18	0.35	CS-2	98.94
DA-D	Rational Method	2.582	6.17	10	0.35	CS-3	5.62
DA-E	Rational Method	1.951	6.17	10	0.35	CS-21	4.25
DA-F	Rational Method	9.51	6.17	10	0.35	CS-26	20.7
DA-H	Rational Method	9.77	6.17	10	0.35	CS-36	21.27
DA-I	Rational Method	40.897	4.21	21.3	0.31	CS-13	53.74
DA-J	Rational Method	4.398	6.17	10	0.35	CS-13	9.57
DA-K	Rational Method	7.689	6.17	10	0.35	CS-2	16.74

Existing 100-Year Storm Event - Catchment Table							
Label	**Runoff Method**	**Area (acres)**	**Catchment Intensity (in/h)**	**Time of Concentration (min)**	**Runoff Coefficient**	**Outflow Element**	**Flow (cfs)**
DA-A	Rational Method	13.938	7.64	10	0.35	CS-22	37.57
DA-B	Rational Method	2.963	7.64	10	0.35	CS-11	7.99
DA-C	Rational Method	61.769	5.62	18	0.35	CS-2	122.47
DA-D	Rational Method	2.582	7.64	10	0.35	CS-3	6.96
DA-E	Rational Method	1.951	7.64	10	0.35	CS-21	5.26
DA-F	Rational Method	9.51	7.64	10	0.35	CS-26	25.63
DA-H	Rational Method	9.77	7.64	10	0.35	CS-36	26.33
DA-I	Rational Method	40.897	5.213	21.3	0.31	CS-13	66.54
DA-J	Rational Method	4.398	7.64	10	0.35	CS-13	11.85
DA-K	Rational Method	7.689	7.64	10	0.35	CS-2	20.73

Existing 1-Year Storm Event - Conduit Table														
Label	Start Node	Stop Node	Length (ft)	Invert up	Invert down	Conduit Desc.	Cover up (ft)	Cover Down (ft)	Slope (%)	Capacity (cfs)	Velocity	Flow (cfs)	HGL In (ft)	HGL Out (ft)
CO-2	CS-2	CS-3	45.8	192.67	192.31	Arch - 3.0 x 2.4 ft	0.45	1.5	0.79	46.06	3.08	57.24	196.77	196.21
CO-4-Driveway	CS-40	CS-41	30.1	171.16	171.09	Arch - 6.3 x 3.7 ft	3.01	3.08	0.23	106.41	1.64	98.01	177.89	177.83
CO-5	CS-12	CS-13	45.4	188.88	185.64	Circle - 30.00 in	0.11	0.02	7.14	109.58	6.92	58.53	191.26	188.16
CO-27	CS-15	CS-16	8.2	184.84	184.84	Box - 8.0 x 2.5 ft	0.75	0.75	0	2.19	1.34	87.18	188.08	188.07
CO-28	CS-17	CS-18	29.1	183.45	183.41	Box - 5.5 x 2.0 ft	1.15	1.19	0.14	37.94	2.4	86.64	186.81	186.6
CO-29	CS-19	CS-20	28.4	181.68	181.68	Circle - 30.00 in	0.92	0.92	0	0.82	2.67	85.91	185.41	185.1
CO-30	CS-21	CS-22	79.9	179.17	178.69	Box - 7.0 x 2.1 ft	2.67	3.15	0.6	112.95	1.79	86.52	183.4	183.12
CO-31	CS-24	CS-25	24.5	177.76	177.76	Box - 7.0 x 3.1 ft	0.99	0.99	0	2.6	1.32	94.14	181.88	181.85
CO-33	CS-30	CS-31	16.1	175.09	175.09	Box - 5.0 x 3.0 ft	1.86	1.86	0	1.64	1.98	97.55	180.01	179.95
CO-34	CS-32	CS-33	24.1	174.87	174.87	Box - 4.0 x 3.4 ft	1.86	1.86	0	1.47	2.17	96.84	180.23	180.13
CO-35 - Butler Rd	CS-36	CS-37	35.9	172.5	172.11	Arch - 5.2 x 2.4 ft	2.35	2.74	1.09	94.57	3.1	100.55	177.7	177.26
CO-36 - Driveway	CS-38	CS-39	11.3	172.95	172.89	Arch - 5.4 x 3.7 ft	0.59	0.65	0.53	137.72	1.94	99.08	177.23	177.2
CO-37	CS-34	CS-35	7.2	174.24	174.24	Box - 7.0 x 3.4 ft	0.77	0.77	0	2.98	1.22	95.47	178.42	178.41

Existing 2-Year Storm Event - Conduit Table														
Label	Start Node	Stop Node	Length (ft)	Invert up	Invert down	Conduit Desc.	Cover up (ft)	Cover Down (ft)	Slope (%)	Capacity (cfs)	Velocity	Flow (cfs)	HGL In (ft)	HGL Out (ft)
CO-2	CS-2	CS-3	45.8	192.67	192.31	Arch - 3.0 x 2.4 ft	0.45	1.5	0.79	46.06	3.57	66.41	196.96	196.21
CO-4-Driveway	CS-40	CS-41	30.1	171.16	171.09	Arch - 6.3 x 3.7 ft	3.01	3.08	0.23	106.41	1.95	116.42	177.91	177.83
CO-5	CS-12	CS-13	45.4	188.88	185.64	Circle - 30.00 in	0.11	0.02	7.14	109.58	7.18	68.42	191.31	188.16
CO-27	CS-15	CS-16	8.2	184.84	184.84	Box - 8.0 x 2.5 ft	0.75	0.75	0	2.19	1.56	101.26	188.09	188.07
CO-28	CS-17	CS-18	29.1	183.45	183.41	Box - 5.5 x 2.0 ft	1.15	1.19	0.14	37.94	2.79	100.71	186.88	186.6
CO-29	CS-19	CS-20	28.4	181.68	181.68	Circle - 30.00 in	0.92	0.92	0	0.82	3.1	99.97	185.52	185.1
CO-30	CS-21	CS-22	79.9	179.17	178.69	Box - 7.0 x 2.1 ft	2.67	3.15	0.6	112.95	2.09	100.82	183.57	183.19
CO-31	CS-24	CS-25	24.5	177.76	177.76	Box - 7.0 x 3.1 ft	0.99	0.99	0	2.6	1.55	110.13	181.89	181.85
CO-33	CS-30	CS-31	16.1	175.09	175.09	Box - 5.0 x 3.0 ft	1.86	1.86	0	1.64	2.33	114.7	180.03	179.95
CO-34	CS-32	CS-33	24.1	174.87	174.87	Box - 4.0 x 3.4 ft	1.86	1.86	0	1.47	2.55	113.99	180.28	180.13
CO-35 - Butler Rd	CS-36	CS-37	35.9	172.5	172.11	Arch - 5.2 x 2.4 ft	2.35	2.74	1.09	94.57	3.67	118.92	177.88	177.26
CO-36 - Driveway	CS-38	CS-39	11.3	172.95	172.89	Arch - 5.4 x 3.7 ft	0.59	0.65	0.53	137.72	2.3	117.47	177.24	177.2
CO-37	CS-34	CS-35	7.2	174.24	174.24	Box - 7.0 x 3.4 ft	0.77	0.77	0	2.98	1.44	112.64	178.42	178.41

Existing 10-Year Storm Event - Conduit Table														
Label	Start Node	Stop Node	Length (ft)	Invert up	Invert down	Conduit Desc.	Cover up (ft)	Cover Down (ft)	Slope (%)	Capacity (cfs)	Velocity	Flow (cfs)	HGL In (ft)	HGL Out (ft)
CO-2	CS-2	CS-3	45.8	192.67	192.31	Arch - 3.0 x 2.4 ft	0.45	1.5	0.79	46.06	5.05	94	197.71	196.21
CO-4-Driveway	CS-40	CS-41	30.1	171.16	171.09	Arch - 6.3 x 3.7 ft	3.01	3.08	0.23	106.41	2.89	172.36	178.01	177.83
CO-5	CS-12	CS-13	45.4	188.88	185.64	Circle - 30.00 in	0.11	0.02	7.14	109.58	7.7	98.24	191.36	188.16
CO-27	CS-15	CS-16	8.2	184.84	184.84	Box - 8.0 x 2.5 ft	0.75	0.75	0	2.19	2.21	143.86	188.11	188.07
CO-28	CS-17	CS-18	29.1	183.45	183.41	Box - 5.5 x 2.0 ft	1.15	1.19	0.14	37.94	3.97	143.31	187.17	186.6
CO-29	CS-19	CS-20	28.4	181.68	181.68	Circle - 30.00 in	0.92	0.92	0	0.82	4.43	142.59	185.96	185.1
CO-30	CS-21	CS-22	79.9	179.17	178.69	Box - 7.0 x 2.1 ft	2.67	3.15	0.6	112.95	2.99	144.16	184.2	183.42
CO-31	CS-24	CS-25	24.5	177.76	177.76	Box - 7.0 x 3.1 ft	0.99	0.99	0	2.6	2.23	158.65	181.94	181.85
CO-33	CS-30	CS-31	16.1	175.09	175.09	Box - 5.0 x 3.0 ft	1.86	1.86	0	1.64	3.39	166.81	180.12	179.95
CO-34	CS-32	CS-33	24.1	174.87	174.87	Box - 4.0 x 3.4 ft	1.86	1.86	0	1.47	3.72	166.12	180.44	180.13
CO-35 - Butler Rd	CS-36	CS-37	35.9	172.5	172.11	Arch - 5.2 x 2.4 ft	2.35	2.74	1.09	94.57	5.39	174.76	178.59	177.26
CO-36 - Driveway	CS-38	CS-39	11.3	172.95	172.89	Arch - 5.4 x 3.7 ft	0.59	0.65	0.53	137.72	3.39	173.36	177.3	177.2
CO-37	CS-34	CS-35	7.2	174.24	174.24	Box - 7.0 x 3.4 ft	0.77	0.77	0	2.98	2.11	164.81	178.43	178.41

Existing 25-Year Storm Event - Conduit Table														
Label	Start Node	Stop Node	Length (ft)	Invert up	Invert down	Conduit Desc.	Cover up (ft)	Cover Down (ft)	Slope (%)	Capacity (cfs)	Velocity	Flow (cfs)	HGL In (ft)	HGL Out (ft)
CO-2	CS-2	CS-3	45.8	192.67	192.31	Arch - 3.0 x 2.4 ft	0.45	1.5	0.79	46.06	5.98	111.25	198.31	196.21
CO-4-Driveway	CS-40	CS-41	30.1	171.16	171.09	Arch - 6.3 x 3.7 ft	3.01	3.08	0.23	106.41	3.48	207.27	178.1	177.83
CO-5	CS-12	CS-13	45.4	188.88	185.64	Circle - 30.00 in	0.11	0.02	7.14	109.58	7.64	116.88	191.13	187.89
CO-27	CS-15	CS-16	8.2	184.84	184.84	Box - 8.0 x 2.5 ft	0.75	0.75	0	2.19	2.62	170.51	188.12	188.07
CO-28	CS-17	CS-18	29.1	183.45	183.41	Box - 5.5 x 2.0 ft	1.15	1.19	0.14	37.94	4.71	169.96	187.4	186.6
CO-29	CS-19	CS-20	28.4	181.68	181.68	Circle - 30.00 in	0.92	0.92	0	0.82	5.25	169.24	186.31	185.1
CO-30	CS-21	CS-22	79.9	179.17	178.69	Box - 7.0 x 2.1 ft	2.67	3.15	0.6	112.95	3.55	171.27	184.71	183.61
CO-31	CS-24	CS-25	24.5	177.76	177.76	Box - 7.0 x 3.1 ft	0.99	0.99	0	2.6	2.65	188.99	181.98	181.85
CO-33	CS-30	CS-31	16.1	175.09	175.09	Box - 5.0 x 3.0 ft	1.86	1.86	0	1.64	4.05	199.37	180.19	179.95
CO-34	CS-32	CS-33	24.1	174.87	174.87	Box - 4.0 x 3.4 ft	1.86	1.86	0	1.47	4.45	198.69	180.57	180.13
CO-35 - Butler Rd	CS-36	CS-37	35.9	172.5	172.11	Arch - 5.2 x 2.4 ft	2.35	2.74	1.09	94.57	6.47	209.63	179.18	177.26
CO-36 - Driveway	CS-38	CS-39	11.3	172.95	172.89	Arch - 5.4 x 3.7 ft	0.59	0.65	0.53	137.72	4.08	208.25	177.34	177.2
CO-37	CS-34	CS-35	7.2	174.24	174.24	Box - 7.0 x 3.4 ft	0.77	0.77	0	2.98	2.53	197.4	178.44	178.41

Existing 100-Year Storm Event - Conduit Table														
Label	Start Node	Stop Node	Length (ft)	Invert up	Invert down	Conduit Desc.	Cover up (ft)	Cover Down (ft)	Slope (%)	Capacity (cfs)	Velocity	Flow (cfs)	HGL In (ft)	HGL Out (ft)
CO-2	CS-2	CS-3	45.8	192.67	192.31	Arch - 3.0 x 2.4 ft	0.45	1.5	0.79	46.06	7.4	137.72	199.43	196.21
CO-4-Driveway	CS-40	CS-41	30.1	171.16	171.09	Arch - 6.3 x 3.7 ft	3.01	3.08	0.23	106.41	4.38	260.8	178.25	177.83
CO-5	CS-12	CS-13	45.4	188.88	185.64	Circle - 30.00 in	0.11	0.02	7.14	109.58	9.03	145.48	193.85	188.14
CO-27	CS-15	CS-16	8.2	184.84	184.84	Box - 8.0 x 2.5 ft	0.75	0.75	0	2.19	3.25	211.41	188.15	188.07
CO-28	CS-17	CS-18	29.1	183.45	183.41	Box - 5.5 x 2.0 ft	1.15	1.19	0.14	37.94	5.84	210.87	187.84	186.6
CO-29	CS-19	CS-20	28.4	181.68	181.68	Circle - 30.00 in	0.92	0.92	0	0.82	6.52	210.15	186.96	185.1
CO-30	CS-21	CS-22	79.9	179.17	178.69	Box - 7.0 x 2.1 ft	2.67	3.15	0.6	112.95	4.41	212.88	185.61	183.9
CO-31	CS-24	CS-25	24.5	177.76	177.76	Box - 7.0 x 3.1 ft	0.99	0.99	0	2.6	3.31	235.55	182.05	181.85
CO-33	CS-30	CS-31	16.1	175.09	175.09	Box - 5.0 x 3.0 ft	1.86	1.86	0	1.64	5.07	249.34	180.32	179.95
CO-34	CS-32	CS-33	24.1	174.87	174.87	Box - 4.0 x 3.4 ft	1.86	1.86	0	1.47	5.57	248.67	180.82	180.13
CO-35 - Butler Rd	CS-36	CS-37	35.9	172.5	172.11	Arch - 5.2 x 2.4 ft	2.35	2.74	1.09	94.57	8.12	263.11	180.28	177.26
CO-36 - Driveway	CS-38	CS-39	11.3	172.95	172.89	Arch - 5.4 x 3.7 ft	0.59	0.65	0.53	137.72	5.12	261.76	177.42	177.2
CO-37	CS-34	CS-35	7.2	174.24	174.24	Box - 7.0 x 3.4 ft	0.77	0.77	0	2.98	3.17	247.4	178.46	178.41

Proposed 2-Year Storm Event for Option 1- Catchment Table							
Label	**Runoff Method**	**Area (acres)**	**Catchment Intensity (in/h)**	**Time of Concentration (min)**	**Runoff Coefficient**	**Outflow Element**	**Flow (cfs)**
DA-A	Rational Method	13.938	3.68	10	0.35	MH-5	18.1
DA-B	Rational Method	2.963	3.68	10	0.35	MH-4	3.85
DA-C	Rational Method	61.769	2.71	18	0.35	MH-1	59.06
DA-D	Rational Method	2.582	3.68	10	0.35	MH-3	3.35
DA-E	Rational Method	1.951	3.68	10	0.35	MH-5	2.53
DA-F	Rational Method	9.51	3.68	10	0.35	MH-6	12.35
DA-H	Rational Method	9.77	3.68	10	0.35	MH-7	12.68
DA-I	Rational Method	40.897	2.512	21.3	0.31	MH-38	32.07
DA-J	Rational Method	4.398	3.68	10	0.35	MH-3	5.71
DA-K	Rational Method	7.689	3.68	10	0.35	MH-3	9.98

Proposed 10-Year Storm Event for Option 1- Catchment Table							
Label	**Runoff Method**	**Area (acres)**	**Catchment Intensity (in/h)**	**Time of Concentration (min)**	**Runoff Coefficient**	**Outflow Element**	**Flow (cfs)**
DA-A	Rational Method	13.938	5.21	10	0.35	MH-5	25.62
DA-B	Rational Method	2.963	5.21	10	0.35	MH-4	5.45
DA-C	Rational Method	61.769	3.836	18	0.35	MH-1	83.59
DA-D	Rational Method	2.582	5.21	10	0.35	MH-3	4.75
DA-E	Rational Method	1.951	5.21	10	0.35	MH-5	3.59
DA-F	Rational Method	9.51	5.21	10	0.35	MH-6	17.48
DA-H	Rational Method	9.77	5.21	10	0.35	MH-7	17.96
DA-I	Rational Method	40.897	3.557	21.3	0.31	MH-38	45.4
DA-J	Rational Method	4.398	5.21	10	0.35	MH-3	8.08
DA-K	Rational Method	7.689	5.21	10	0.35	MH-3	14.13

Proposed 25-Year Storm Event for Option 1- Catchment Table							
Label	**Runoff Method**	**Area (acres)**	**Catchment Intensity (in/h)**	**Time of Concentration (min)**	**Runoff Coefficient**	**Outflow Element**	**Flow (cfs)**
DA-A	Rational Method	13.938	6.17	10	0.35	MH-5	30.34
DA-B	Rational Method	2.963	6.17	10	0.35	MH-4	6.45
DA-C	Rational Method	61.769	4.54	18	0.35	MH-1	98.94
DA-D	Rational Method	2.582	6.17	10	0.35	MH-3	5.62
DA-E	Rational Method	1.951	6.17	10	0.35	MH-5	4.25
DA-F	Rational Method	9.51	6.17	10	0.35	MH-6	20.7
DA-H	Rational Method	9.77	6.17	10	0.35	MH-7	21.27
DA-I	Rational Method	40.897	4.21	21.3	0.31	MH-38	53.74
DA-J	Rational Method	4.398	6.17	10	0.35	MH-3	9.57
DA-K	Rational Method	7.689	6.17	10	0.35	MH-3	16.74

Proposed 100-Year Storm Event for Option 1- Catchment Table							
Label	**Runoff Method**	**Area (acres)**	**Catchment Intensity (in/h)**	**Time of Concentration (min)**	**Runoff Coefficient**	**Outflow Element**	**Flow (cfs)**
DA-A	Rational Method	13.938	7.64	10	0.35	MH-5	37.57
DA-B	Rational Method	2.963	7.64	10	0.35	MH-4	7.99
DA-C	Rational Method	61.769	5.62	18	0.35	MH-1	122.47
DA-D	Rational Method	2.582	7.64	10	0.35	MH-3	6.96
DA-E	Rational Method	1.951	7.64	10	0.35	MH-5	5.26
DA-F	Rational Method	9.51	7.64	10	0.35	MH-6	25.63
DA-H	Rational Method	9.77	7.64	10	0.35	MH-7	26.33
DA-I	Rational Method	40.897	5.213	21.3	0.31	MH-38	66.54
DA-J	Rational Method	4.398	7.64	10	0.35	MH-3	11.85
DA-K	Rational Method	7.689	7.64	10	0.35	MH-3	20.73

Proposed 2-Year Storm Event for Option 1 - Conduit Table														
Label	Start Node	Stop Node	Length (ft)	Invert up	Invert down	Conduit Desc.	Cover up (ft)	Cover Down (ft)	Slope (%)	Capacity (cfs)	Velocity	Flow (cfs)	HGL In (ft)	HGL Out (ft)
P-1	MH-1	MH-2	841.4	199	194	Circle - 48.00 in	2.89	1.91	0.59	110.73	2.73	59.06	201.31	196.08
P-2	MH-2	MH-3	502.8	188	187	Circle - 60.00 in	6.91	12.11	0.2	116.14	1.97	85.36	191.15	189.78
P-6	MH-6	MH-7	219	168	166	Circle - 60.00 in	2.98	6.88	0.91	248.89	3.76	112.31	171.02	169.19
P-7	MH-7	MH-8	232.5	166	162.5	Circle - 60.00 in	6.88	9.07	1.51	319.51	4.6	119.15	169.12	165.63
P-8	MH-8	MH-9	196.1	162.5	158	Circle - 60.00 in	9.07	2.55	2.3	394.55	5.35	118.33	165.61	161.11
P-9	MH-9	O-1	67.5	158	157	Circle - 60.00 in	2.55	0	1.48	316.88	4.56	117.73	161.1	159.39
P-10	MH-2	MH-38	269.6	188	189	Circle - 42.00 in	8.41	0.85	-0.37	61.28	1.96	32.07	191.32	191.16
P-5(1)	MH-5	MH-39	464.2	177	173.04	Circle - 60.00 in	2.77	2.37	0.85	240.5	3.64	108.28	179.97	175.39
P-5(2)	MH-39	MH-6	481.3	173.04	168	Circle - 60.00 in	2.37	2.98	1.05	266.54	3.91	106.47	175.98	171.03
P-4(1)	MH-4	MH-40	144.3	182.5	181	Circle - 60.00 in	5.42	2.82	1.04	265.52	3.79	96.06	185.29	183.16
P-4(2)	MH-40	MH-5	125.5	180	178.5	Circle - 60.00 in	3.82	1.27	1.19	284.66	3.98	95.59	182.78	180.6
P-3(2)	MH-41	MH-4	145.6	184.5	183.5	Circle - 60.00 in	7.87	4.42	0.69	215.83	3.24	94.14	187.26	185.84
P-3(1)(1)	MH-3	MH-42	66.2	187	186.5	Circle - 60.00 in	12.11	10.74	0.76	226.31	3.36	95.06	189.77	189.29
P-3(1)(2)	MH-42	MH-41	170.7	186.5	185.5	Circle - 60.00 in	10.74	6.87	0.59	199.35	3.06	94.82	189.27	187.94

Proposed 10-Year Storm Event for Option 1 - Conduit Table														
Label	Start Node	Stop Node	Length (ft)	Invert up	Invert down	Conduit Desc.	Cover up (ft)	Cover Down (ft)	Slope (%)	Capacity (cfs)	Velocity	Flow (cfs)	HGL In (ft)	HGL Out (ft)
P-1	MH-1	MH-2	841.4	199	194	Circle - 48.00 in	2.89	1.91	0.59	110.73	2.95	83.59	201.77	196.6
P-2	MH-2	MH-3	502.8	188	187	Circle - 60.00 in	6.91	12.11	0.2	116.14	2.05	120.12	191.98	190.33
P-6	MH-6	MH-7	219	168	166	Circle - 60.00 in	2.98	6.88	0.91	248.89	4.1	158.98	171.62	169.83
P-7	MH-7	MH-8	232.5	166	162.5	Circle - 60.00 in	6.88	9.07	1.51	319.51	5.03	168.78	169.72	166.25
P-8	MH-8	MH-9	196.1	162.5	158	Circle - 60.00 in	9.07	2.55	2.3	394.55	5.88	167.72	166.21	161.72
P-9	MH-9	O-1	67.5	158	157	Circle - 60.00 in	2.55	0	1.48	316.88	4.98	166.96	161.7	159.94
P-10	MH-2	MH-38	269.6	188	189	Circle - 42.00 in	8.41	0.85	-0.37	61.28	1.44	45.4	192.54	191.99
P-5(1)	MH-5	MH-39	464.2	177	173.04	Circle - 60.00 in	2.77	2.37	0.85	240.5	3.95	152.85	180.54	175.94
P-5(2)	MH-39	MH-6	481.3	173.04	168	Circle - 60.00 in	2.37	2.98	1.05	266.54	4.26	150.51	176.56	171.63
P-4(1)	MH-4	MH-40	144.3	182.5	181	Circle - 60.00 in	5.42	2.82	1.04	265.52	4.14	135.5	185.83	183.64
P-4(2)	MH-40	MH-5	125.5	180	178.5	Circle - 60.00 in	3.82	1.27	1.19	284.66	4.36	134.89	183.33	181.07
P-3(2)	MH-41	MH-4	145.6	184.5	183.5	Circle - 60.00 in	7.87	4.42	0.69	215.83	3.52	132.73	187.8	186.38
P-3(1)(1)	MH-3	MH-42	66.2	187	186.5	Circle - 60.00 in	12.11	10.74	0.76	226.31	3.66	133.92	190.31	189.84
P-3(1)(2)	MH-42	MH-41	170.7	186.5	185.5	Circle - 60.00 in	10.74	6.87	0.59	199.35	3.32	133.61	189.81	188.5

Proposed 25-Year Storm Event for Option 1 - Conduit Table														
Label	Start Node	Stop Node	Length (ft)	Invert up	Invert down	Conduit Desc.	Cover up (ft)	Cover Down (ft)	Slope (%)	Capacity (cfs)	Velocity	Flow (cfs)	HGL In (ft)	HGL Out (ft)
P-1	MH-1	MH-2	841.4	199	194	Circle - 48.00 in	2.89	1.91	0.59	110.73	3.04	98.94	202.01	196.95
P-2	MH-2	MH-3	502.8	188	187	Circle - 60.00 in	6.91	12.11	0.2	116.14	2.22	142.71	192.56	190.64
P-6	MH-6	MH-7	219	168	166	Circle - 60.00 in	2.98	6.88	0.91	248.89	4.25	189.83	171.94	170.19
P-7	MH-7	MH-8	232.5	166	162.5	Circle - 60.00 in	6.88	9.07	1.51	319.51	5.24	201.59	170.05	166.58
P-8	MH-8	MH-9	196.1	162.5	158	Circle - 60.00 in	9.07	2.55	2.3	394.55	6.15	200.4	166.54	162.05
P-9	MH-9	O-1	67.5	158	157	Circle - 60.00 in	2.55	0	1.48	316.88	5.2	199.53	162.03	160.28
P-10	MH-2	MH-38	269.6	188	189	Circle - 42.00 in	8.41	0.85	-0.37	61.28	1.7	53.74	193.34	192.57
P-5(1)	MH-5	MH-39	464.2	177	173.04	Circle - 60.00 in	2.77	2.37	0.85	240.5	4.11	182.24	180.87	176.3
P-5(2)	MH-39	MH-6	481.3	173.04	168	Circle - 60.00 in	2.37	2.98	1.05	266.54	4.44	179.58	176.88	171.95
P-4(1)	MH-4	MH-40	144.3	182.5	181	Circle - 60.00 in	5.42	2.82	1.04	265.52	4.32	161.48	186.14	183.94
P-4(2)	MH-40	MH-5	125.5	180	178.5	Circle - 60.00 in	3.82	1.27	1.19	284.66	4.55	160.79	183.64	181.36
P-3(2)	MH-41	MH-4	145.6	184.5	183.5	Circle - 60.00 in	7.87	4.42	0.69	215.83	3.66	158.14	188.11	186.72
P-3(1)(1)	MH-3	MH-42	66.2	187	186.5	Circle - 60.00 in	12.11	10.74	0.76	226.31	3.81	159.5	190.62	190.16
P-3(1)(2)	MH-42	MH-41	170.7	186.5	185.5	Circle - 60.00 in	10.74	6.87	0.59	199.35	3.44	159.15	190.12	188.88

Proposed 100-Year Storm Event for Option 1 - Conduit Table														
Label	Start Node	Stop Node	Length (ft)	Invert up	Invert down	Conduit Desc.	Cover up (ft)	Cover Down (ft)	Slope (%)	Capacity (cfs)	Velocity	Flow (cfs)	HGL In (ft)	HGL Out (ft)
P-1	MH-1	MH-2	841.4	199	194	Circle - 48.00 in	2.89	1.91	0.59	110.73	2.97	122.47	203.42	197.33
P-2	MH-2	MH-3	502.8	188	187	Circle - 60.00 in	6.91	12.11	0.2	116.14	2.75	177.38	193.7	191.06
P-6	MH-6	MH-7	219	168	166	Circle - 60.00 in	2.98	6.88	0.91	248.89	4.4	237.94	172.34	170.63
P-7	MH-7	MH-8	232.5	166	162.5	Circle - 60.00 in	6.88	9.07	1.51	319.51	5.5	252.78	170.44	166.99
P-8	MH-8	MH-9	196.1	162.5	158	Circle - 60.00 in	9.07	2.55	2.3	394.55	6.49	251.37	166.93	162.45
P-9	MH-9	O-1	67.5	158	157	Circle - 60.00 in	2.55	0	1.48	316.88	5.45	250.36	162.43	160.77
P-10	MH-2	MH-38	269.6	188	189	Circle - 42.00 in	8.41	0.85	-0.37	61.28	2.11	66.54	194.91	193.73
P-5(1)	MH-5	MH-39	464.2	177	173.04	Circle - 60.00 in	2.77	2.37	0.85	240.5	4.25	228.09	181.27	176.93
P-5(2)	MH-39	MH-6	481.3	173.04	168	Circle - 60.00 in	2.37	2.98	1.05	266.54	4.64	224.91	177.29	172.36
P-4(1)	MH-4	MH-40	144.3	182.5	181	Circle - 60.00 in	5.42	2.82	1.04	265.52	4.54	202	186.56	184.4
P-4(2)	MH-40	MH-5	125.5	180	178.5	Circle - 60.00 in	3.82	1.27	1.19	284.66	4.79	201.19	184.05	181.8
P-3(2)	MH-41	MH-4	145.6	184.5	183.5	Circle - 60.00 in	7.87	4.42	0.69	215.83	3.8	197.78	188.52	187.28
P-3(1)(1)	MH-3	MH-42	66.2	187	186.5	Circle - 60.00 in	12.11	10.74	0.76	226.31	3.96	199.4	191.03	190.65
P-3(1)(2)	MH-42	MH-41	170.7	186.5	185.5	Circle - 60.00 in	10.74	6.87	0.59	199.35	3.53	198.98	190.59	189.53

Proposed 2-Year Storm Event for Option 2- Catchment Table							
Label	**Runoff Method**	**Area (acres)**	**Catchment Intensity (in/h)**	**Time of Concentration (min)**	**Runoff Coefficient**	**Outflow Element**	**Flow (cfs)**
DA-A	Rational Method	13.938	3.68	10	0.35	MH-5	18.1
DA-B	Rational Method	2.963	3.68	10	0.35	MH-4	3.85
DA-C	Rational Method	61.769	2.71	18	0.35	MH-1	59.06
DA-D	Rational Method	2.582	3.68	10	0.35	MH-3	3.35
DA-E	Rational Method	1.951	3.68	10	0.35	MH-5	2.53
DA-F	Rational Method	9.51	3.68	10	0.35	MH-6	12.35
DA-H	Rational Method	9.77	3.68	10	0.35	MH-7	12.68
DA-I	Rational Method	40.897	2.512	21.3	0.31	MH-38	32.07
DA-J	Rational Method	4.398	3.68	10	0.35	MH-43	5.71
DA-K	Rational Method	7.689	3.68	10	0.35	MH-3	9.98

Proposed 10-Year Storm Event for Option 2- Catchment Table							
Label	**Runoff Method**	**Area (acres)**	**Catchment Intensity (in/h)**	**Time of Concentration (min)**	**Runoff Coefficient**	**Outflow Element**	**Flow (cfs)**
DA-A	Rational Method	13.938	5.21	10	0.35	MH-5	25.62
DA-B	Rational Method	2.963	5.21	10	0.35	MH-4	5.45
DA-C	Rational Method	61.769	3.836	18	0.35	MH-1	83.59
DA-D	Rational Method	2.582	5.21	10	0.35	MH-3	4.75
DA-E	Rational Method	1.951	5.21	10	0.35	MH-5	3.59
DA-F	Rational Method	9.51	5.21	10	0.35	MH-6	17.48
DA-H	Rational Method	9.77	5.21	10	0.35	MH-7	17.96
DA-I	Rational Method	40.897	3.557	21.3	0.31	MH-38	45.4
DA-J	Rational Method	4.398	5.21	10	0.35	MH-43	8.08
DA-K	Rational Method	7.689	5.21	10	0.35	MH-3	14.13

Proposed 25-Year Storm Event for Option 2- Catchment Table							
Label	**Runoff Method**	**Area (acres)**	**Catchment Intensity (in/h)**	**Time of Concentration (min)**	**Runoff Coefficient**	**Outflow Element**	**Flow (cfs)**
DA-A	Rational Method	13.938	6.17	10	0.35	MH-5	30.34
DA-B	Rational Method	2.963	6.17	10	0.35	MH-4	6.45
DA-C	Rational Method	61.769	4.54	18	0.35	MH-1	98.94
DA-D	Rational Method	2.582	6.17	10	0.35	MH-3	5.62
DA-E	Rational Method	1.951	6.17	10	0.35	MH-5	4.25
DA-F	Rational Method	9.51	6.17	10	0.35	MH-6	20.7
DA-H	Rational Method	9.77	6.17	10	0.35	MH-7	21.27
DA-I	Rational Method	40.897	4.21	21.3	0.31	MH-38	53.74
DA-J	Rational Method	4.398	6.17	10	0.35	MH-43	9.57
DA-K	Rational Method	7.689	6.17	10	0.35	MH-3	16.74

Proposed 100-Year Storm Event for Option 2- Catchment Table							
Label	**Runoff Method**	**Area (acres)**	**Catchment Intensity (in/h)**	**Time of Concentration (min)**	**Runoff Coefficient**	**Outflow Element**	**Flow (cfs)**
DA-A	Rational Method	13.938	7.64	10	0.35	MH-5	37.57
DA-B	Rational Method	2.963	7.64	10	0.35	MH-4	7.99
DA-C	Rational Method	61.769	5.62	18	0.35	MH-1	122.47
DA-D	Rational Method	2.582	7.64	10	0.35	MH-3	6.96
DA-E	Rational Method	1.951	7.64	10	0.35	MH-5	5.26
DA-F	Rational Method	9.51	7.64	10	0.35	MH-6	25.63
DA-H	Rational Method	9.77	7.64	10	0.35	MH-7	26.33
DA-I	Rational Method	40.897	5.213	21.3	0.31	MH-38	66.54
DA-J	Rational Method	4.398	7.64	10	0.35	MH-43	11.85
DA-K	Rational Method	7.689	7.64	10	0.35	MH-3	20.73

Proposed 2-Year Storm Event for Option 2 - Conduit Table														
Label	Start Node	Stop Node	Length (ft)	Invert up	Invert down	Conduit Desc.	Cover up (ft)	Cover Down (ft)	Slope (%)	Capacity (cfs)	Velocity	Flow (cfs)	HGL In (ft)	HGL Out (ft)
P-1	MH-1	MH-2	841.4	200.5	194.5	Circle - 48.00 in	1.39	1.41	0.71	121.29	2.92	59.06	202.81	196.47
P-2	MH-2	MH-3	502.8	194.5	192	Circle - 48.00 in	1.41	8.11	0.5	101.28	2.53	57.14	196.78	194.45
P-6	MH-6	MH-7	219	168	167	Circle - 54.00 in	3.48	6.38	0.46	132.88	2.71	85.92	170.72	169.63
P-7	MH-7	MH-8	232.5	166	162.5	Circle - 54.00 in	7.38	9.57	1.51	241.25	4.33	93.32	168.84	165.35
P-8	MH-8	MH-9	196.1	162.5	158	Circle - 54.00 in	9.57	3.05	2.3	297.91	5.04	92.69	165.32	160.83
P-9	MH-9	O-1	67.5	158	157	Circle - 54.00 in	3.05	0.5	1.48	239.26	4.29	92.22	160.82	159.16
P-5(1)	MH-5	MH-39	464.2	179	174	Circle - 48.00 in	1.77	2.41	1.08	149.07	3.68	80.23	181.71	176.09
P-5(2)	MH-39	MH-6	481.3	174	168	Circle - 48.00 in	2.41	3.98	1.25	160.38	3.88	79	176.69	170.72
P-4(1)	MH-4	MH-40	144.3	184	182.5	Circle - 48.00 in	4.92	2.32	1.04	146.44	3.47	66.79	186.47	184.44
P-4(2)	MH-40	MH-5	125.5	181	179	Circle - 48.00 in	3.82	1.77	1.59	181.29	4.06	66.45	183.46	181.77
P-3(2)	MH-41	MH-4	145.6	188	187	Circle - 48.00 in	5.37	1.92	0.69	119.04	2.95	64.53	190.42	189.11
P-3(1)(1)	MH-3	MH-42	66.2	192	191.5	Circle - 48.00 in	8.11	6.74	0.76	124.82	3.06	65.11	194.44	193.96
P-3(1)(2)	MH-42	MH-41	170.7	191.5	190	Circle - 48.00 in	6.74	3.37	0.88	134.66	3.24	64.94	193.93	191.98
CO-27	MH-38	MH-43	509.7	189	187.2	Circle - 30.00 in	1.85	19.3	0.35	24.37	1.99	32.07	194.1	190.98
CO-28	MH-43	CS-13	371.9	187.2	185.64	Circle - 30.00 in	19.3	0.02	0.42	26.56	2.16	34.85	190.54	187.65

Proposed 10-Year Storm Event for Option 2 - Conduit Table														
Label	Start Node	Stop Node	Length (ft)	Invert up	Invert down	Conduit Desc.	Cover up (ft)	Cover Down (ft)	Slope (%)	Capacity (cfs)	Velocity	Flow (cfs)	HGL In (ft)	HGL Out (ft)
P-1	MH-1	MH-2	841.4	200.5	194.5	Circle - 48.00 in	1.39	1.41	0.71	121.29	3.17	83.59	203.27	197.28
P-2	MH-2	MH-3	502.8	194.5	192	Circle - 48.00 in	1.41	8.11	0.5	101.28	2.73	81.11	197.23	194.93
P-6	MH-6	MH-7	219	168	167	Circle - 54.00 in	3.48	6.38	0.46	132.88	2.89	122.77	171.41	170.26
P-7	MH-7	MH-8	232.5	166	162.5	Circle - 54.00 in	7.38	9.57	1.51	241.25	4.74	133.45	169.4	165.92
P-8	MH-8	MH-9	196.1	162.5	158	Circle - 54.00 in	9.57	3.05	2.3	297.91	5.54	132.63	165.89	161.4
P-9	MH-9	O-1	67.5	158	157	Circle - 54.00 in	3.05	0.5	1.48	239.26	4.7	132.04	161.38	159.68
P-5(1)	MH-5	MH-39	464.2	179	174	Circle - 48.00 in	1.77	2.41	1.08	149.07	3.99	114.32	182.23	176.63
P-5(2)	MH-39	MH-6	481.3	174	168	Circle - 48.00 in	2.41	3.98	1.25	160.38	4.21	112.71	177.21	171.42
P-4(1)	MH-4	MH-40	144.3	184	182.5	Circle - 48.00 in	4.92	2.32	1.04	146.44	3.78	95.09	186.96	184.91
P-4(2)	MH-40	MH-5	125.5	181	179	Circle - 48.00 in	3.82	1.77	1.59	181.29	4.45	94.66	183.95	182.31
P-3(2)	MH-41	MH-4	145.6	188	187	Circle - 48.00 in	5.37	1.92	0.69	119.04	3.19	91.83	190.91	189.64
P-3(1)(1)	MH-3	MH-42	66.2	192	191.5	Circle - 48.00 in	8.11	6.74	0.76	124.82	3.32	92.58	194.92	194.45
P-3(1)(2)	MH-42	MH-41	170.7	191.5	190	Circle - 48.00 in	6.74	3.37	0.88	134.66	3.52	92.36	194.41	192.46
CO-27	MH-38	MH-43	509.7	189	187.2	Circle - 30.00 in	1.85	19.3	0.35	24.37	2.82	45.4	203.25	197
CO-28	MH-43	CS-13	371.9	187.2	185.64	Circle - 30.00 in	19.3	0.02	0.42	26.56	3.09	49.81	193.54	187.94

Proposed 25-Year Storm Event for Option 2 - Conduit Table														
Label	Start Node	Stop Node	Length (ft)	Invert up	Invert down	Conduit Desc.	Cover up (ft)	Cover Down (ft)	Slope (%)	Capacity (cfs)	Velocity	Flow (cfs)	HGL In (ft)	HGL Out (ft)
P-1	MH-1	MH-2	841.4	200.5	194.5	Circle - 48.00 in	1.39	1.41	0.71	121.29	3.28	98.94	203.51	197.67
P-2	MH-2	MH-3	502.8	194.5	192	Circle - 48.00 in	1.41	8.11	0.5	101.28	2.8	96.1	197.61	195.19
P-6	MH-6	MH-7	219	168	167	Circle - 54.00 in	3.48	6.38	0.46	132.88	2.79	145.79	172.02	170.55
P-7	MH-7	MH-8	232.5	166	162.5	Circle - 54.00 in	7.38	9.57	1.51	241.25	4.93	158.43	169.68	166.22
P-8	MH-8	MH-9	196.1	162.5	158	Circle - 54.00 in	9.57	3.05	2.3	297.91	5.79	157.5	166.17	161.69
P-9	MH-9	O-1	67.5	158	157	Circle - 54.00 in	3.05	0.5	1.48	239.26	4.89	156.83	161.67	159.98
P-5(1)	MH-5	MH-39	464.2	179	174	Circle - 48.00 in	1.77	2.41	1.08	149.07	4.1	135.63	182.47	177.47
P-5(2)	MH-39	MH-6	481.3	174	168	Circle - 48.00 in	2.41	3.98	1.25	160.38	4.35	133.78	177.45	172.03
P-4(1)	MH-4	MH-40	144.3	184	182.5	Circle - 48.00 in	4.92	2.32	1.04	146.44	3.92	112.78	187.21	185.19
P-4(2)	MH-40	MH-5	125.5	181	179	Circle - 48.00 in	3.82	1.77	1.59	181.29	4.63	112.28	184.2	182.57
P-3(2)	MH-41	MH-4	145.6	188	187	Circle - 48.00 in	5.37	1.92	0.69	119.04	3.27	108.9	191.16	190.01
P-3(1)(1)	MH-3	MH-42	66.2	192	191.5	Circle - 48.00 in	8.11	6.74	0.76	124.82	3.42	109.75	195.17	194.71
P-3(1)(2)	MH-42	MH-41	170.7	191.5	190	Circle - 48.00 in	6.74	3.37	0.88	134.66	3.64	109.5	194.66	192.76
CO-27	MH-38	MH-43	509.7	189	187.2	Circle - 30.00 in	1.85	19.3	0.35	24.37	3.34	53.74	211.16	202.41
CO-28	MH-43	CS-13	371.9	187.2	185.64	Circle - 30.00 in	19.3	0.02	0.42	26.56	3.67	59.16	195.84	188.03

Proposed 100-Year Storm Event for Option 2 - Conduit Table														
Label	Start Node	Stop Node	Length (ft)	Invert up	Invert down	Conduit Desc.	Cover up (ft)	Cover Down (ft)	Slope (%)	Capacity (cfs)	Velocity	Flow (cfs)	HGL In (ft)	HGL Out (ft)
P-1	MH-1	MH-2	841.4	200.5	194.5	Circle - 48.00 in	1.39	1.41	0.71	121.29	2.97	122.47	205.31	199.19
P-2	MH-2	MH-3	502.8	194.5	192	Circle - 48.00 in	1.41	8.11	0.5	101.28	2.88	118.6	199.06	195.67
P-6	MH-6	MH-7	219	168	167	Circle - 54.00 in	3.48	6.38	0.46	132.88	3.44	179.63	173.01	170.88
P-7	MH-7	MH-8	232.5	166	162.5	Circle - 54.00 in	7.38	9.57	1.51	241.25	5.15	195.56	170.01	166.56
P-8	MH-8	MH-9	196.1	162.5	158	Circle - 54.00 in	9.57	3.05	2.3	297.91	6.08	194.46	166.5	162.02
P-9	MH-9	O-1	67.5	158	157	Circle - 54.00 in	3.05	0.5	1.48	239.26	5.11	193.67	161.99	160.4
P-5(1)	MH-5	MH-39	464.2	179	174	Circle - 48.00 in	1.77	2.41	1.08	149.07	4.06	167.33	185.78	179.48
P-5(2)	MH-39	MH-6	481.3	174	168	Circle - 48.00 in	2.41	3.98	1.25	160.38	4	165.03	179.39	173.04
P-4(1)	MH-4	MH-40	144.3	184	182.5	Circle - 48.00 in	4.92	2.32	1.04	146.44	4.04	139.29	187.5	185.65
P-4(2)	MH-40	MH-5	125.5	181	179	Circle - 48.00 in	3.82	1.77	1.59	181.29	3.36	138.69	185.94	184.77
P-3(2)	MH-41	MH-4	145.6	188	187	Circle - 48.00 in	5.37	1.92	0.69	119.04	3.26	134.49	191.86	190.46
P-3(1)(1)	MH-3	MH-42	66.2	192	191.5	Circle - 48.00 in	8.11	6.74	0.76	124.82	3.29	135.54	195.65	195.03
P-3(1)(2)	MH-42	MH-41	170.7	191.5	190	Circle - 48.00 in	6.74	3.37	0.88	134.66	3.72	135.22	194.97	193.29
CO-27	MH-38	MH-43	509.7	189	187.2	Circle - 30.00 in	1.85	19.3	0.35	24.37	4.13	66.54	220.45	207.03
CO-28	MH-43	CS-13	371.9	187.2	185.64	Circle - 30.00 in	19.3	0.02	0.42	26.56	4.57	73.53	200.07	188.09

Appendix B – BCA Calculations

FEMA Benefit-Cost Calculator

V.6.0 (Build 20250604.2146 | Release Notes)

Benefit-Cost Analysis

Project Name: Brite Avenue and Fox Meadow Road Drainage Improvements [Professional Expected Damages]

Map Marker ▲	Mitigation Title	Property Type	Hazard	Discount Rate (%)	Benefits (B)	Costs (C)	BCR (B/C)
1	Other @ Brite Ave, Scarsdale, New York, 10583	•••	DFA - Severe Storm	7.0	$ 2,881,789	$ 2,603,574	1.11
TOTAL (SELECTED)					**$ 2,881,789**	**$ 2,603,574**	**1.11**
TOTAL					**$ 2,881,789**	**$ 2,603,574**	**1.11**

Property Configuration

Property Title:	Other @ Brite Ave, Scarsdale, New York, 10583
Property Location:	10583, Westchester, New York
Property Coordinates:	41.00567446252989, -73.79205074095488
Hazard Type:	Severe Storm
Mitigation Action Type:	Other
Property Type:	Other
Analysis Method Type:	Professional Expected Damages

Cost Estimation

Other @ Brite Ave, Scarsdale, New York, 10583

Discount Rate (%):	7.0% Use Default:Yes
Project Useful Life (years):	30
Project Cost:	$2,600,000
Number of Maintenance Years:	30 Use Default:Yes
Annual Maintenance Cost:	$288

Damage Analysis Parameters - Damage Frequency Assessment

Other @ Brite Ave, Scarsdale, New York, 10583

Year of Analysis was Conducted:	2025
Year Property was Built:	0
Analysis Duration:	10 Use Default:Yes

Professional Expected Damages Before Mitigation

Other @ Brite Ave, Scarsdale, New York, 10583

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	Category 1 ($)	Category 2 ($)	Category 3 ($)	Number of Volunteers	Number of Days	Damages ($)
1	36,120	0	0	0	0	0	36,120
2	90,680	0	0	0	0	0	90,680
10	290,320	185,090.63	0	0	0	0	475,411
25	425,480	740,362.5	0	0	0	0	1,165,843
100	554,440	2,961,450	0	0	0	0	3,515,890

Annualized Damages Before Mitigation

Other @ Brite Ave, Scarsdale, New York, 10583

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
1	36,120	28,615
2	90,680	83,052
10	475,411	44,669
25	1,165,842	60,738
100	3,515,890	35,159
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	5,283,943	252,233

Professional Expected Damages After Mitigation

Other @ Brite Ave, Scarsdale, New York, 10583

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	Category 1 ($)	Category 2 ($)	Category 3 ($)	Number of Volunteers	Number of Days	Damages ($)
1	20,000	0	0	0	0	0	20,000
2	20,000	0	0	0	0	0	20,000
10	20,000	0	0	0	0	0	20,000
25	20,000	0	0	0	0	0	20,000
100	20,000	0	0	0	0	0	20,000

Annualized Damages After Mitigation

Other @ Brite Ave, Scarsdale, New York, 10583

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
1	20,000	10,000
2	20,000	8,000
10	20,000	1,200
25	20,000	600
100	20,000	200
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	100,000	20,000

Benefits-Costs Summary

Other @ Brite Ave, Scarsdale, New York, 10583

Discount Rate (%):	7.0% Use Default:Yes
Total Project Benefits:	$2,881,789
Total Project Cost:	$2,603,574
Benefit-Cost Ratio:	1.11

MOTT MACDONALD

APPENDIX B.1

Scarsdale - BCA Data

Project Configuration														Damagaes Before Mitigation												Damages After Mitigation											
																	Other Damages							Category 1 - Residential Property Damage									Other Damages							Category 1 - Residential	
Project Name	Project Location (Address/street)	Type of Concern	Hazard Type	Mitigation Action Type	Damage & Frequency Relationship	Project Useful life	Analysis Duration	Federal Rate ($)	Structures Impacted (Y/N)	# of Basins	Annual Basin Maintenance Cost ($)	Total Annual Maintenance Cost ($)	Storm Event	Length of road impacted	Existing LOP	DPW Cleanup Costs ($)	Police Cost ($) Per Location	Pavement and Drainage Repair Costs ($)	Heavy Cleaning - Drainage ($)	Sanitary Sewer Costs ($)	Total Damages (Other) ($)	Residential Damage Repairs ($)	Total Damages Before Mitigation	Proposed LOP	Length of road Impacted (proposed)	DPW Cleanup Costs ($)	Police Cost ($) Per Location	Pavement and Drainage Repair Costs ($)	Heavy Cleaning - Drainage ($)	Sanitary Sewer Costs ($)	Total Damages (Other) ($)	Residential Damage Repairs ($)	Total Damages After Mitigation
Fox Meadow Road and Chesterfield Road Drainage Study	Fox Meadow Road and Chesterfield Road	Flooding	Riverine Flood	Drainage Improvement	Professional Expected Damages	30	10	0.625	Y	16	$288.00	$288.00	1 year	100	Less than 1-year	$15,000.00	$0.00	$800.00	$20,000.00	$320.00	$36,120.00	$0.00	$36,120.00	100 year	0	$0.00	$0.00	$0.00	$20,000.00	$0.00	$20,000.00	$0.00	$20,000.00
													2 year	400		$60,000.00	$6,200.00	$3,200.00	$20,000.00	$1,280.00	$90,680.00	$0.00	$90,680.00		0	$0.00	$0.00	$0.00	$20,000.00	$0.00	$20,000.00	$0.00	$20,000.00
													10 year	1600		$240,000.00	$12,400.00	$12,800.00	$20,000.00	$5,120.00	$290,320.00	$185,090.63	$475,410.63		0	$0.00	$0.00	$0.00	$20,000.00	$0.00	$20,000.00	$0.00	$20,000.00
													25 year	2400		$360,000.00	$18,600.00	$19,200.00	$20,000.00	$7,680.00	$425,480.00	$740,362.50	$1,165,842.50		0	$0.00	$0.00	$0.00	$20,000.00	$0.00	$20,000.00	$0.00	$20,000.00
													100 year	3200		$480,000.00	$18,600.00	$25,600.00	$20,000.00	$10,240.00	$554,440.00	$2,961,450.00	$3,515,890.00		0	$0.00	$0.00	$0.00	$20,000.00	$0.00	$20,000.00	$0.00	$20,000.00

Unit Prices:
Annual Basin Maintenance: $18/structure per year
DPW Debris Cleanup = $15,000/year per 100 feet of road flooded for each storm recurrence Interval
Pavement and Drainage Repair = $800/year per 100 feet of road flooded for each storm recurrence interval
Police Cost = $3,100/year at each location (typically at intersections)
Heavy Cleaning Drainage = $20,000 per year
SS Costs = $3.20/ LF Cleaning and CCTV