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STORMWATER MANAGEMENT REPORT

Prepared For

PROPOSED SITE DEVELOPMENT

699 OLD ALBANY POST ROAD, GARRISON, NY

June 2, 2021

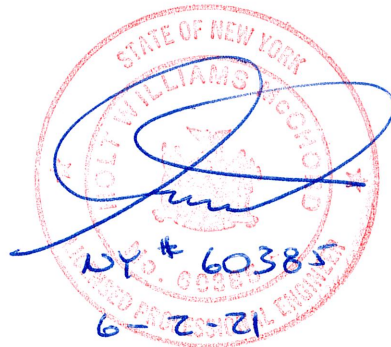


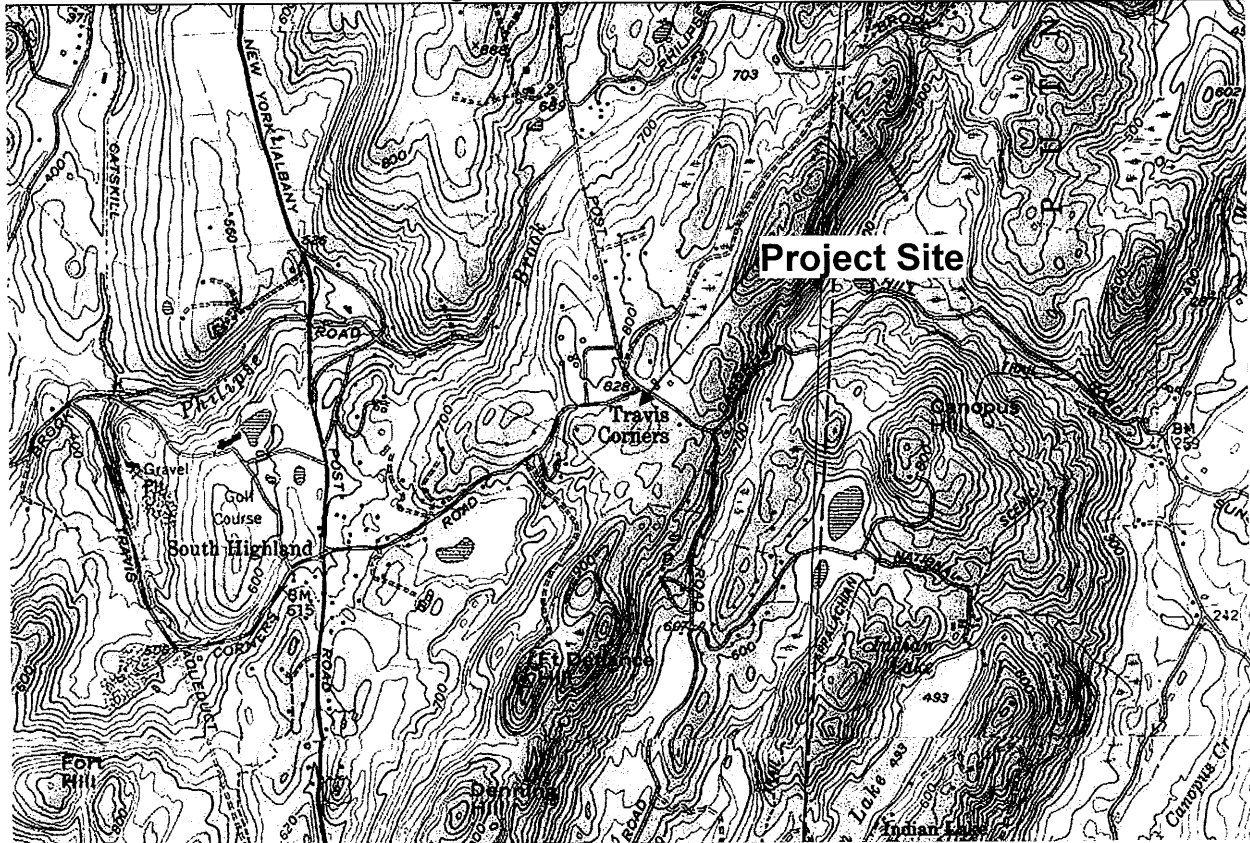
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1. INTRODUCTION

McChord Engineering Associates, Inc. has been commissioned by Christopher Flagg and Heidi Snyder to perform stormwater management computations for the proposed development at 699 Old Albany Post Road in Garrison, New York. The property consists of 4.88-acres and is located on the corner of Travis Corners Road and Old Albany Post Road. The property is outside of the New York City public water supply watershed. Figure 1 shows the location of the property on the United States Geological Survey (USGS) map.

Figure 1: Location Map



The property is currently developed with a single-family residence, gravel driveway, shed, patio and pool. The edges of the property are woodland separating adjacent residences, Travis Corners Road and Old Albany Post Road. Topography on the site consists of gradual slopes that generally drain east. The property is currently served by an on-site septic system and private well.

The proposed development consists of constructing a new addition to the west of the residence. The existing shed and portions of the gravel driveway will be removed to facilitate the addition. The existing patio will also be expanded. A stormwater management system will be installed to control runoff from the proposed development. A second septic system will be installed to serve the proposed addition. Erosion and sedimentation controls will be installed prior to the start of any construction activity. Earthwork is required for the construction of the addition and site improvements. All excavated material will be spread in the northern yard to improve overland drainage conditions on site.

2. SCOPE OF STUDY

This stormwater management report contains studies comparing peak rate of runoff between the existing conditions and the proposed development to ensure that the proposed development will have no adverse impact on adjoining property owners or downstream drainage systems. The site will be developed with its own on-site stormwater management system capable of controlling the increase in peak runoff. The drainage area for this analysis only included the northern portion of the property, as the southern portion will remain unchanged.

3. ANALYSIS METHODOLOGY

Runoff was modeled with HydroCAD 8.50 software produced by HydroCAD Software Solutions LLC. This software uses the NRCS TR-20 method for analyzing stormwater runoff. Soil characteristics, cover conditions, slope, time of concentration, and historical rainfall data are all parameters that are utilized by this method. The analysis considered the 2, 5, 10 and 25-year storm events. Precipitation depth for each storm event was taken from the National Oceanic and Atmospheric Administration's (NOAA) Atlas 14 Point Precipitation Frequency Estimates specific to the subject property.

4. STORMWATER MANAGEMENT STRATEGY

Currently, there are no known stormwater management systems on-site. Rooftop runoff is collected by roof leaders and drains to the ground surface. Driveway runoff is not collected and follows the topography east. There is a low spot north of the driveway that redirects runoff across the driveway. Runoff from the remainder of the property sheet flows east following the topography.

The proposed stormwater management system maintains existing drainage patterns on the site. Rooftop runoff from the proposed addition will be captured by roof leaders and conveyed to an underground detention system. The detention system will consist of eight (8) Cultec Contactor 100HD Stormwater Chambers surrounded by crushed stone with a storage capacity of approximately 289 cubic feet. During typical storm events stormwater will infiltrate into the underlying soils. A high level overflow grate will be installed to provide relief during extreme storm events. The existing low spot north of the driveway will be filled with material excavated for the proposed addition foundation to improve overland drainage conditions on site. Runoff from the remainder of the property will continue to sheet flow east conforming to existing conditions.

Detailed information on the size and configuration of the proposed stormwater management measures is available on the most recent revision of the "Septic System/Site Development Plan" prepared by this office. A Stormwater Facilities Maintenance Plan is also included in Appendix B.

5. ANALYSIS & RESULTS

Runoff from the subject drainage area was analyzed under existing and proposed conditions. Runoff from offsite areas will not be captured by the proposed stormwater management system and was therefore not factored into the analysis. The existing conditions analysis modeled the entire drainage area as a whole. The proposed conditions analysis divided the drainage area into area that is detained through the proposed detention system and undetained areas.

Using the NRCS TR-20 method, the peak rate of runoff for the 2, 5, 10 and 25-year storm event was computed for the site. Soils on the property were determined using the NRCS Web Soil Survey. Cover conditions were derived from site observations and the “Septic System/Site Development Plan” prepared by this office, dated June 2, 2021. Soil testing was conducted on the property in the area of the proposed stormwater management system. Deep test pits and percolation tests were performed and confirmed suitable infiltration rates. The resulting peak flow rates under both the existing and proposed conditions are summarized in Table 1. For detailed computations see Appendix A.

Table 1: Peak Flows

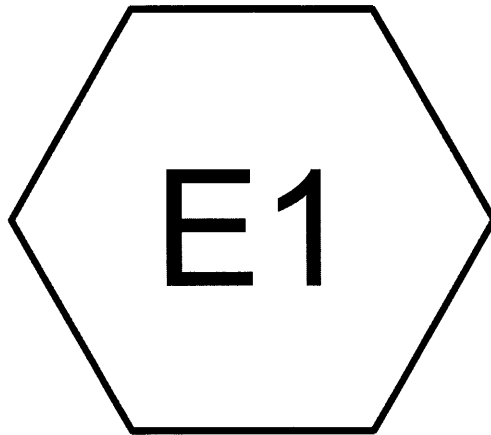
Storm Event	Existing		Proposed	
	Rate (cfs)	Volume (ft ³)	Rate (cfs)	Volume (ft ³)
2-year	0.63	4,467	0.62	4,405
5-year	1.53	9,033	1.51	8,907
10-year	2.44	13,497	2.40	13,309
25-year	3.84	20,457	3.79	20,171

The analysis shows that there is no increase in the peak rate or volume of runoff from the property during any of the analyzed storm events.

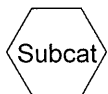
6. CONCLUSIONS

Based on our analysis, McChord Engineering Associates, Inc. has demonstrated that the proposed stormwater management system will adequately control any increase in runoff from the proposed development at 699 Old Albany Post Road in Garrison, New York. It is the opinion of this office and the conclusion of this report that the proposed site development will have no adverse impacts to the adjoining property owners or any downstream drainage systems.

APPENDIX A:
PEAK FLOW COMPUTATIONS



Entire Area of Study



Existing Conditions - 699 Old Albany Post

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
60,000	55	Woods, Good, HSG B (E1)
29,205	61	>75% Grass cover, Good, HSG B (E1)
450	85	Dirt Drive (E1)
4,060	98	Driveway (E1)
570	98	Patio (E1)
2,110	98	Residence (E1)
215	98	Shed (T.B.R.) (E1)
300	98	Sheds (E1)
96,910		TOTAL AREA

Existing Conditions - 699 Old Albany Post

Type III 24-hr 25-yr Rainfall=6.90"

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Summary for Subcatchment E1: Entire Area of Study

Runoff = 3.84 cfs @ 12.39 hrs, Volume= 20,457 cf, Depth= 2.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25-yr Rainfall=6.90"

Area (sf)	CN	Description
* 2,110	98	Residence
* 4,060	98	Driveway
* 215	98	Shed (T.B.R.)
* 570	98	Patio
* 300	98	Sheds
* 450	85	Dirt Drive
60,000	55	Woods, Good, HSG B
29,205	61	>75% Grass cover, Good, HSG B
96,910	60	Weighted Average
89,655		Pervious Area
7,255		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.4	150	0.0330	0.11		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 3.45"
0.9	60	0.0500	1.12		Shallow Concentrated Flow, BC Woodland Kv= 5.0 fps
1.7	250	0.0240	2.49		Shallow Concentrated Flow, CD Unpaved Kv= 16.1 fps
26.0	460	Total			

Existing Conditions - 699 Old Albany Post

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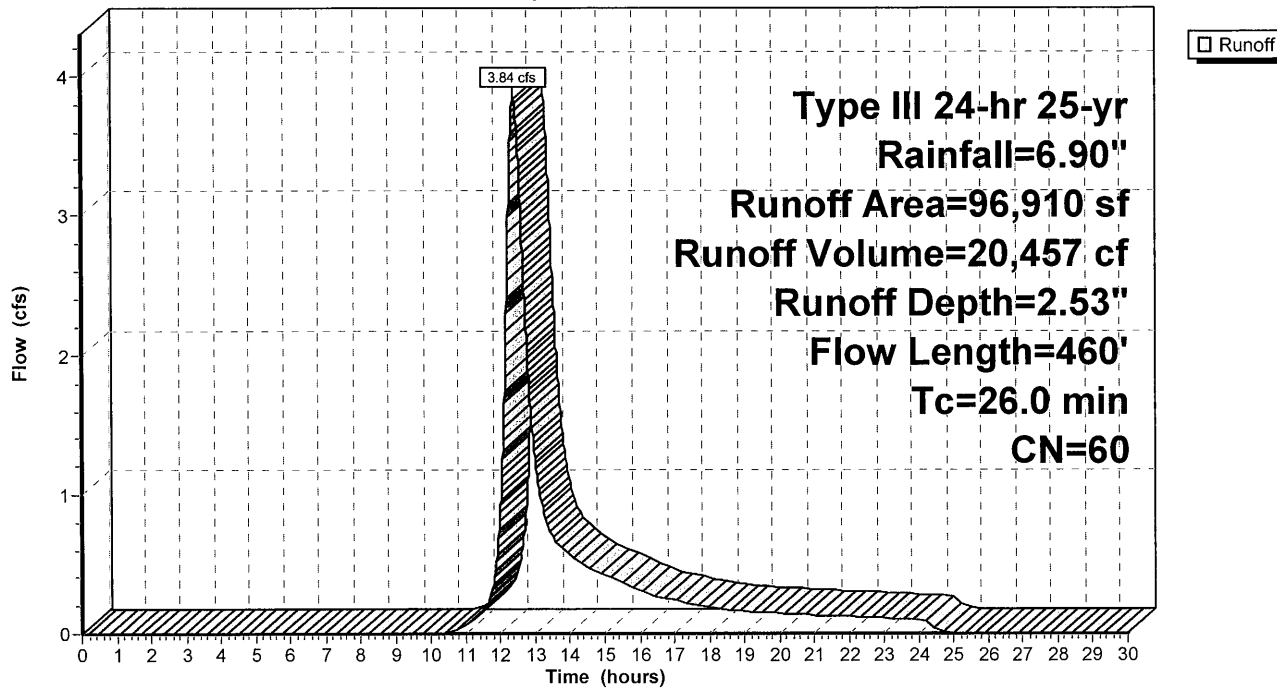
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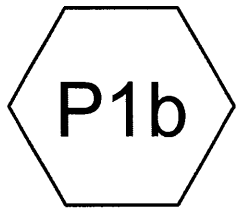
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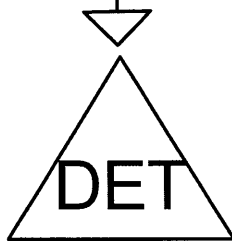
Subcatchment E1: Entire Area of Study

Hydrograph

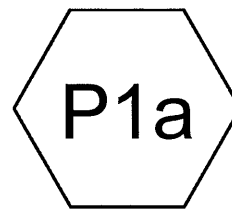




Detained Area



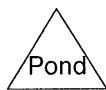
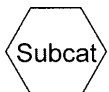
Underground Detention System



Undetained Area



Sum of Hydrographs



Proposed Conditions - 699 Old Albany Post

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
60,000	55	Woods, Good, HSG B (P1a)
28,045	61	>75% Grass cover, Good, HSG B (P1a)
450	85	Dirt Drive (P1a)
3,450	98	Driveway (P1a)
1,200	98	New Patio (P1a)
1,355	98	Proposed Addition (P1b)
2,110	98	Residence (P1a)
300	98	Sheds (P1a)
96,910		TOTAL AREA

Proposed Conditions - 699 Old Albany Post

Type III 24-hr 25-yr Rainfall=6.90"

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Summary for Subcatchment P1a: Undetained Area

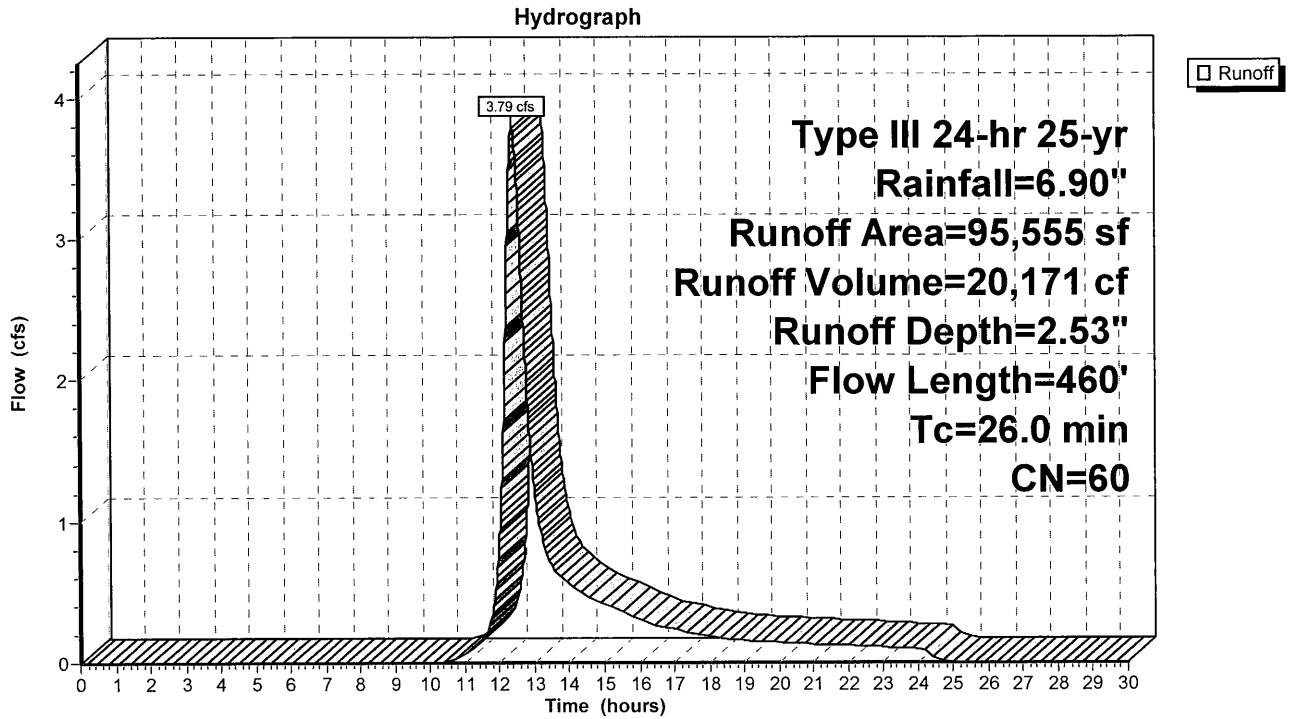
Runoff = 3.79 cfs @ 12.39 hrs, Volume= 20,171 cf, Depth= 2.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=6.90"

Area (sf)	CN	Description
* 2,110	98	Residence
* 3,450	98	Driveway
* 1,200	98	New Patio
* 300	98	Sheds
* 450	85	Dirt Drive
60,000	55	Woods, Good, HSG B
28,045	61	>75% Grass cover, Good, HSG B
95,555	60	Weighted Average
88,495		Pervious Area
7,060		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.4	150	0.0330	0.11		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 3.45"
0.9	60	0.0500	1.12		Shallow Concentrated Flow, BC Woodland Kv= 5.0 fps
1.7	250	0.0240	2.49		Shallow Concentrated Flow, CD Unpaved Kv= 16.1 fps
26.0	460	Total			

Subcatchment P1a: Undetained Area



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Type III 24-hr 25-yr Rainfall=6.90"

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Summary for Subcatchment P1b: Detained Area

Runoff = 0.22 cfs @ 12.07 hrs, Volume= 752 cf, Depth= 6.66"

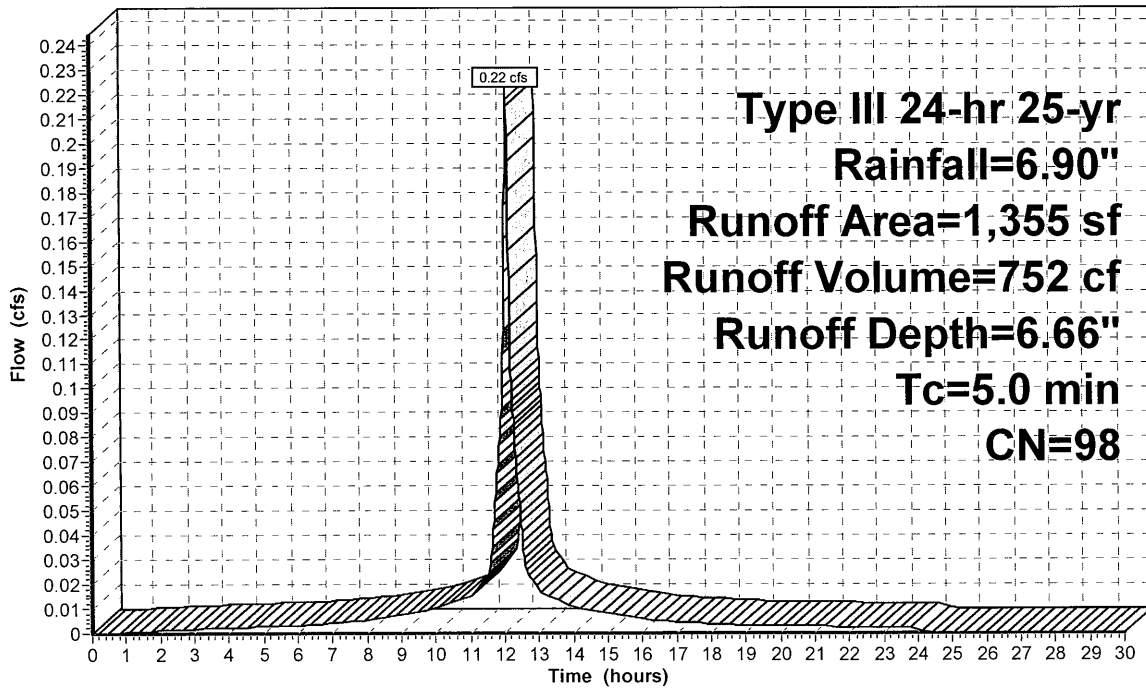
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=6.90"

Area (sf)	CN	Description
* 1,355	98	Proposed Addition
1,355		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Minimum

Subcatchment P1b: Detained Area

Hydrograph



Proposed Conditions - 699 Old Albany Post

Type III 24-hr 25-yr Rainfall=6.90"

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Summary for Pond DET: Underground Detention System

Inflow Area = 1,355 sf, 100.00% Impervious, Inflow Depth = 6.66" for 25-yr event
 Inflow = 0.22 cfs @ 12.07 hrs, Volume= 752 cf
 Outflow = 0.02 cfs @ 11.10 hrs, Volume= 752 cf, Atten= 93%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 11.10 hrs, Volume= 752 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 823.93' @ 13.11 hrs Surf.Area= 271 sf Storage= 277 cf

Plug-Flow detention time= 127.5 min calculated for 752 cf (100% of inflow)
 Center-of-Mass det. time= 127.5 min (869.7 - 742.2)

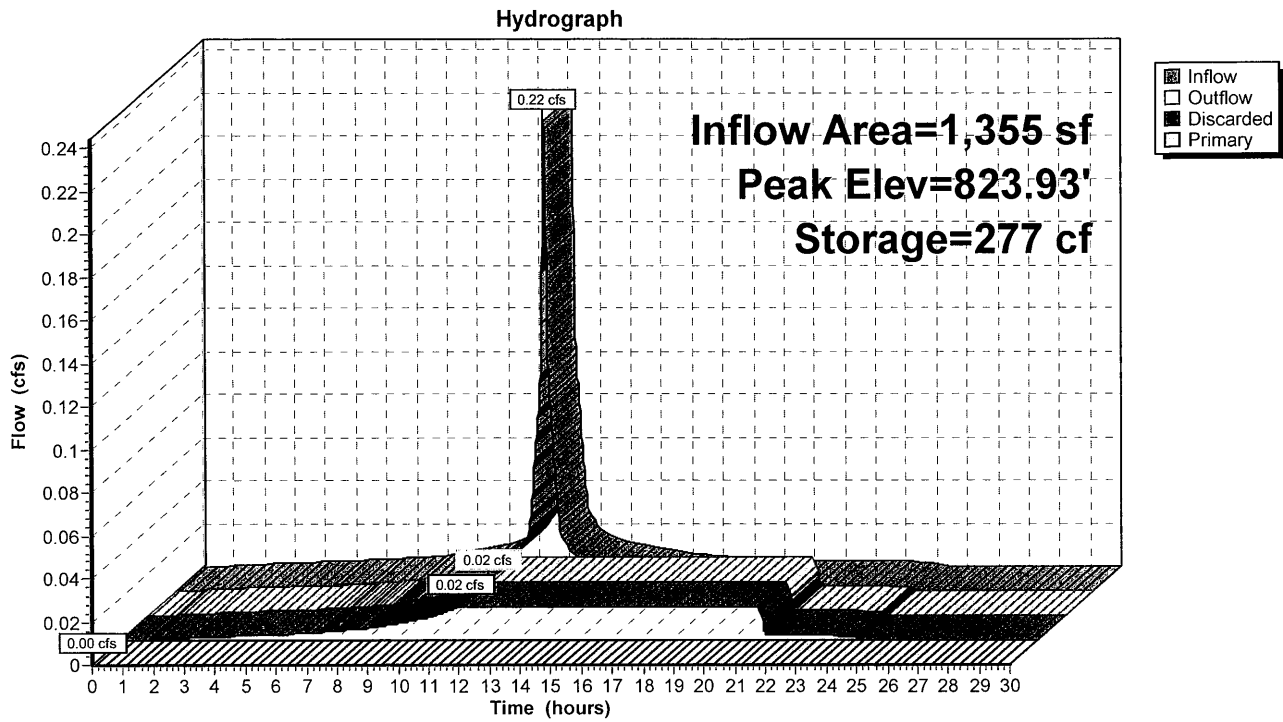
Volume	Invert	Avail.Storage	Storage Description
#1	822.00'	175 cf	8.33'W x 32.50'L x 2.04'H Gravel Bed 552 cf Overall - 114 cf Embedded = 439 cf x 40.0% Voids
#2	822.50'	114 cf	32.1"W x 12.0"H x 30.50'L Cultec C-100 x 2 Inside #1
		289 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	822.00'	2.500 in/hr Exfiltration over Surface area
#2	Primary	824.00'	6.0" Horiz. High Level Overflow Grate Limited to weir flow C= 0.600

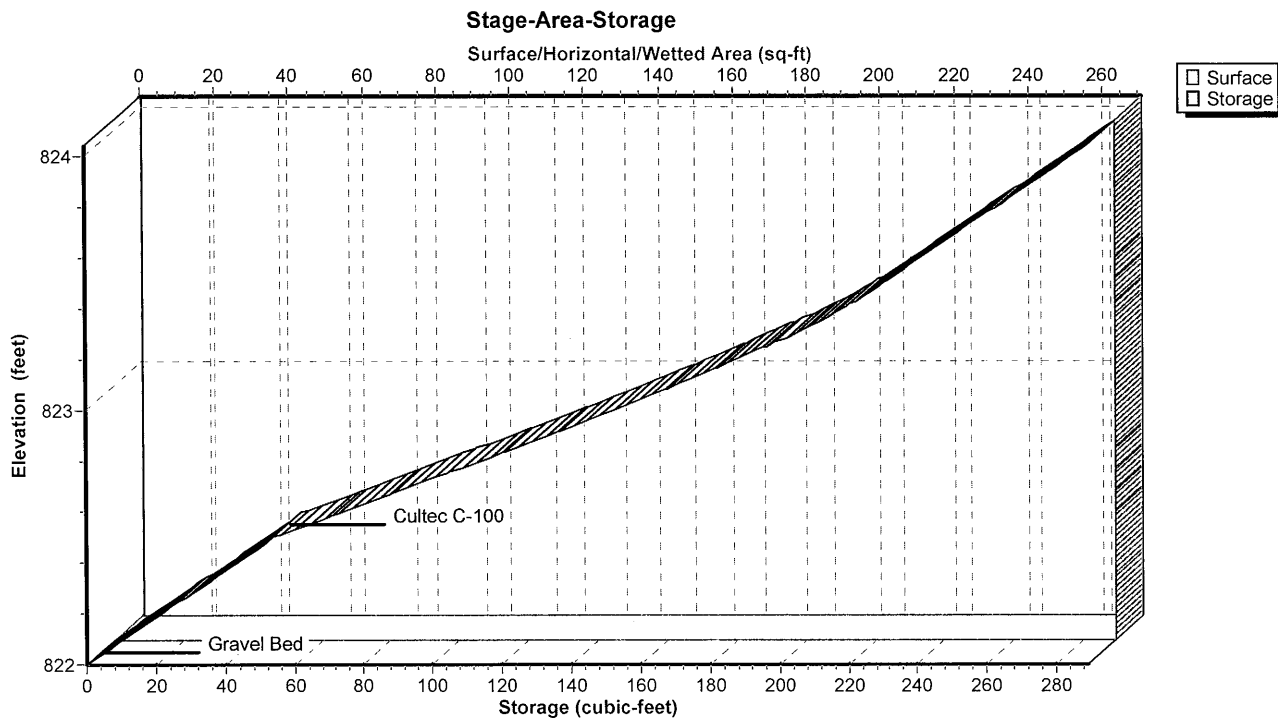
Discarded OutFlow Max=0.02 cfs @ 11.10 hrs HW=822.02' (Free Discharge)
 ↳1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=822.00' (Free Discharge)
 ↳2=High Level Overflow Grate (Controls 0.00 cfs)

Pond DET: Underground Detention System



Pond DET: Underground Detention System



Proposed Conditions - 699 Old Albany Post

Type III 24-hr 25-yr Rainfall=6.90"

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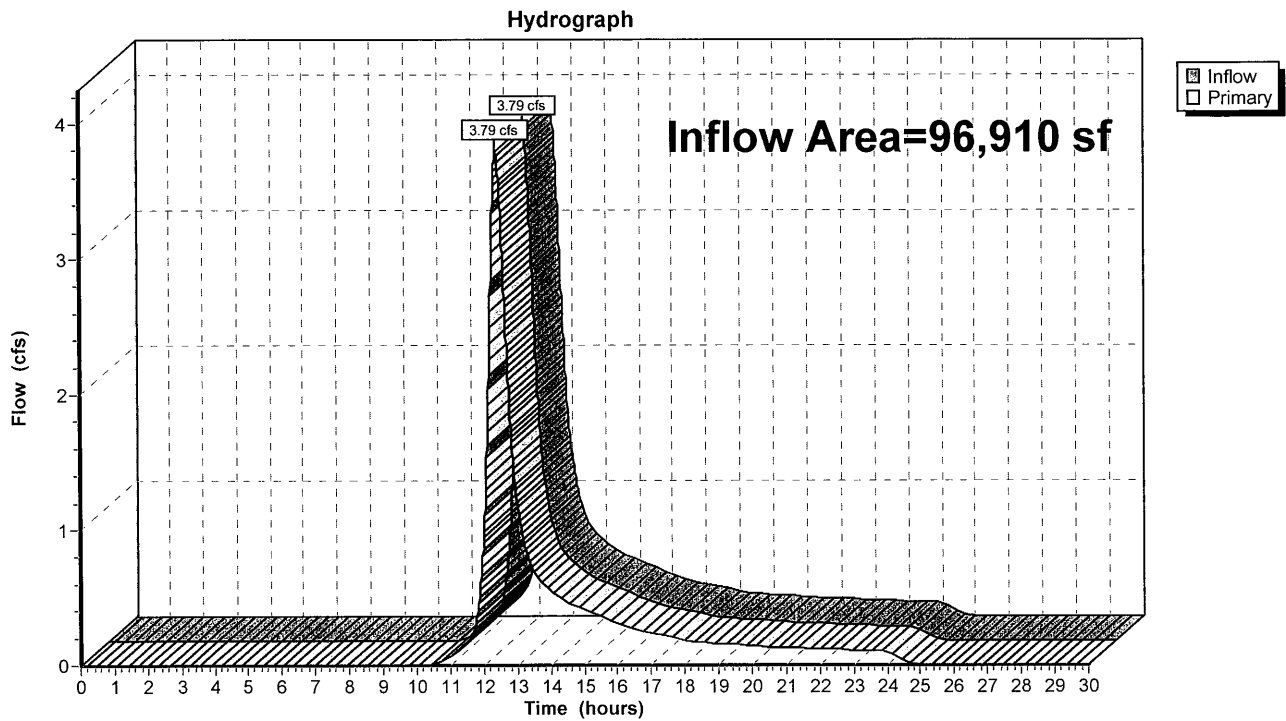
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Summary for Link SUM: Sum of Hydrographs

Inflow Area = 96,910 sf, 8.68% Impervious, Inflow Depth = 2.50" for 25-yr event
Inflow = 3.79 cfs @ 12.39 hrs, Volume= 20,171 cf
Primary = 3.79 cfs @ 12.39 hrs, Volume= 20,171 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link SUM: Sum of Hydrographs



APPENDIX B:

STORMWATER FACILITIES MAINTENANCE PLAN

Stormwater Facilities Maintenance Plan

699 Old Albany Post Road, Garrison, NY

Map 61-3, Lot 6

Scope:

The purpose of the Stormwater Facilities Maintenance Plan is to insure that the proposed stormwater components installed for the site development at 699 Old Albany Post Road are maintained in operational condition throughout the life of the home. The service procedures associated with this plan shall be performed as required by the parties legally responsible for their maintenance.

Description of Stormwater Facilities:

The proposed stormwater facilities are designed to collect, convey, detain and treat the runoff from the site in order to minimize adverse impacts to downstream drainage systems. A description of the stormwater facilities are as follows:

1. **Roof Leaders/Gutters:** Roof leaders (also known as downspouts) from the addition will convey roof runoff collected by the roof gutters on the proposed addition to the underground detention chambers.
2. **Underground Detention Chambers:** The underground detention system consists of a series of plastic chambers which provide storage for the stormwater runoff. Stormwater in the underground detention system is designed to infiltrate into the underlying soils. The detention chambers are designed to overflow to a high level overflow grate during extreme storm events.

Recommended Frequency of Service:

All of the stormwater components installed for this property should be checked periodically and kept in full working order. Ultimately the frequency of inspection and service cleaning depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, trash, etc.); however it is recommended that each facility be inspected and cleaned a minimum of two times a year. The guidelines for the timing of service include early spring after the winter season and late fall after the leaves have fallen from the trees.

Service Procedures:

Service can be performed by the homeowner, landscape contractor or handyman since no specialized equipment is required. Specific service procedures for the stormwater facilities are as follows:

1. **Roof Leaders/Gutters:** Roof gutters shall be inspected twice a year during the spring and fall service inspections to ensure that roof leaders are kept free of leaves and debris that could clog the detention chambers. At a minimum, leaves should be cleaned from the gutters during the fall service inspection.
2. **Underground Detention Chambers:** Functionality of the underground detention chambers ultimately depends on keeping sediment and debris out of the chambers. This is accomplished through proper maintenance of the roof leaders, gutters and driveway drains. These components should be maintained as described above, but more frequent maintenance may be required if excessive accumulation of debris is observed.