Conceptual Stormwater Management Design Report

Section 8

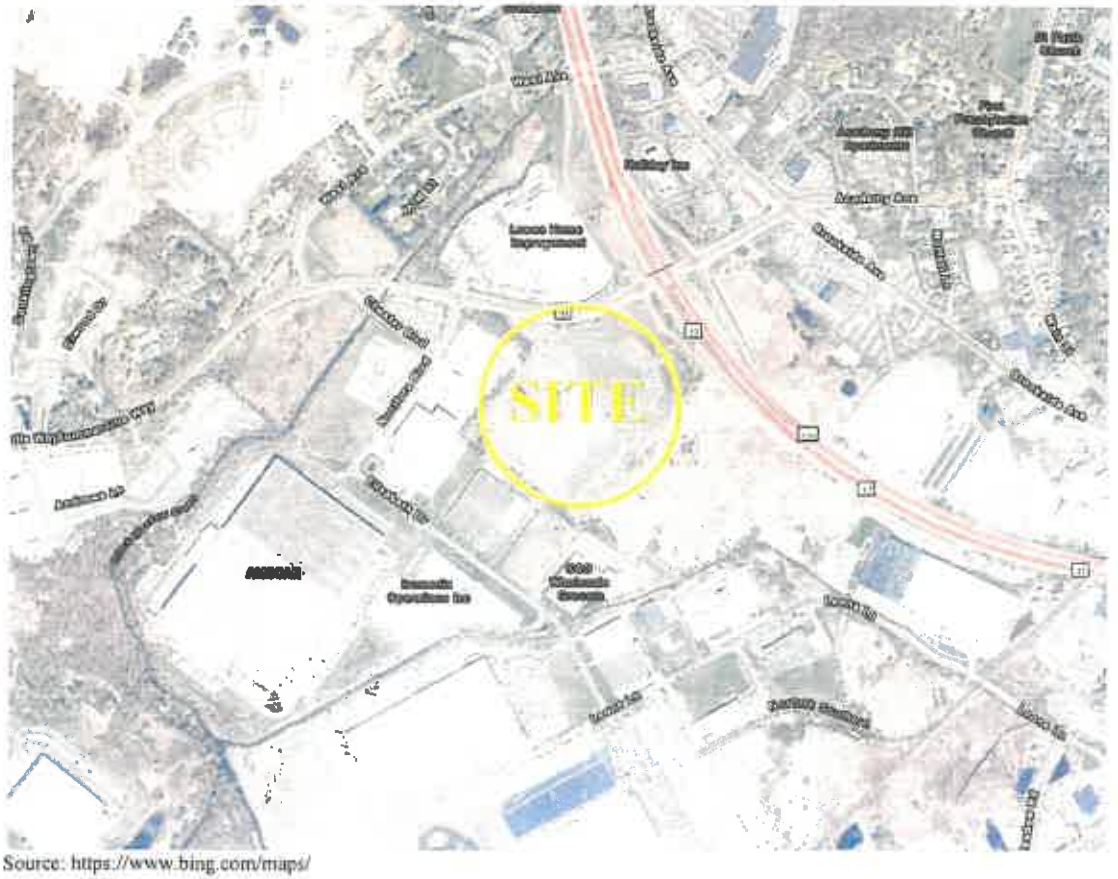
ATZL, NASHER & ZIGLER P.C.
ENGINEERS – SURVEYORS – PLANNERS

CONCEPTUAL STORMWATER MANAGEMENT DESIGN REPORT

Prepared For:

SUMMERVILLE INDUSTRIAL PARK

VILLAGE OF CHESTER
ORANGE COUNTY, NEW YORK



Source: https://www.bing.com/maps/

Date: January 22, 2023
Job No. 3390

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SUMMERVILLE INDUSTRIAL PARK

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NEW YORK

HYDRAULIC
AND
HYDROLOGICAL STUDY

BY

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January 22, 2023

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Att.: Scott Quinn, P.E.
Village Engineer

Ref.: Summerville Industrial Park (Job #3390)
Village of Chester, Orange County, New York

Sub: Conceptual Hydraulic and Hydrological Study

1.1 INTRODUCTION:

The following conceptual drainage study has been prepared for the above-mentioned project in order to provide a zero net increase of peak runoff and water quality mitigation for the proposed development in the Village of Chester, Orange County, New York. The project disturbed area is about 21.122 acres (920,074.3 sq.ft) which is greater than one acre; therefore, a general construction permit is required according to the NYSDEC 2015 version of the design manual. Green infrastructure practices (Porous Asphalt, Dry Swale, and an Underground Infiltration System) have been proposed to treat the required water quality volume. Since the total water quality volume provided is greater than the required the minimum RRv requirements are satisfied. In addition, an underground storage system (Solid Pipes) has been proposed to provide peak flow attenuation.

The existing site consists of grass, dirt, and gravel. The site proposes to construct a building, access road, parking area, and landscaped area.

1.2 SITE LOCATION:

The project site is located southerly of Summerville way, and northly of Elizabeth Drive in the Village of Chester, Orange County, New York.

2.0 HYDROLOGICAL SOIL GROUP:

The soil symbol, name and Hydrological Soil Group is shown below:

Table 1: Hydrological Soil Group

Soil Name	Soil Map Symbol	Hydrological Soil Group
Bath-Nassau channery silt loams, 3 to 8 percent slopes	BnB	C
Bath-Nassau channery silt loams, 8 to 15 percent slopes	BnC	C
Madalin silt loam	Ma	C/D
Mardin gravelly silt loam, 3 to 8 percent slopes	MdB	D
Mardin gravelly silt loam, 8 to 15 percent slopes	MdC	D
Otisville gravelly sandy loam, 8 to 15 percent slopes	OtC	A
Riverhead sandy loam, 3 to 8 percent slopes	RhB	A
Riverhead sandy loam, 8 to 15 percent slopes	RhC	A

* Soil Survey of Orange County, New York, United States Department of Agriculture Soil Conservation Service with Cornell University, October 1990.

3.1 EXISTING CONDITION:

The existing drainage consists of one (1) watershed (WS#1), with a total area of about 21.122 acres. The site consists of grass, dirt, and gravel. The HSG of the study area is type A, C, and D. The 100-yr peak runoff is 143.09 cfs and flows towards the south side of the property. The drainage area delineation is shown on the Existing Condition Drainage Map (E-1).

3.2 DEVELOPED CONDITION:

The proposed development includes the construction of a building, parking area, access driveway, and landscaping areas. The peak runoff from the study area will be increased upon competition of the proposed development due to the increased in impervious area. The drainage area delineation is shown on the Developed Condition Drainage Map (D-1).

4.0 DRAINAGE STUDY:

Due to the proposed improvement, the peak runoff of the designated drainage areas will be increased. The hydrological software, HydroCAD has been used to calculate pre and post peak runoff rates for 1, 10, and 100-year design storm events.

5.0 IMPACT AND MITIGATION MEASURES:

The hydrology and hydraulics study for this project has been undertaken to examine the pre and post construction drainage conditions. The study provides the impact of the proposed impervious area to the drainage system.

In general, the runoff from a basin depends on the precipitation, type of soil, and characteristic of the terrain, type of land cover and geographic location of the property. The hydrology of a site changes during the initial clearing and grading that occurs during construction. Trees and vegetated land covers that have intercepted rainfall are removed, and natural depressions that had absorbed rainfall are scraped off, eroded or severely compacted. The impervious areas such as rooftops, roads, parking lots, driveways, etc. surfaces do not allow rainfall to soak into the ground. Consequently, most of the rainfall is converted into storm water runoff. Therefore, the volume of runoff from a developed site will increase sharply with increment of impervious cover. This is due to the decrease inability of rainfall to percolate into the ground and recharge the aquifer. As a result, the increase in storm water runoff can be too much for the existing drainage system to handle. Post-developed runoff is attenuated to pre-developed runoff and diverted to the existing drainage system with or without improvement. The "Zero Net Increase of Peak Flow" is referring to the above techniques, which is mandated by local and state regulation.

Impervious surfaces accumulate pollutants deposited from the atmosphere, leaked from vehicles, or windblown in from adjacent areas. During storm events, these pollutants quickly wash off, and are rapidly delivered to downstream waters. The source of sediment includes washing off particles that are deposited on impervious surfaces, erosion from stream banks and site construction.

The frequency and magnitude of storms will increase dramatically per increase of impervious areas due to developments. In addition, the discharge associated bank full storm event reaches beyond the "critical erosive velocity" and flow's velocity increases substantially after development occurs. The impacts to the stream channel will be addressed.

Flow events that exceed the capacity of the stream channel spill out into the adjacent floodplain. The "Over bank" flooding will be maintained to pre-development peak discharge rates for the ten-year frequency storm after developments, thus keeping the level of over bank flooding the same over time. This management technique prevents costly damage or maintenance for culverts, drainage structures, and swales.

As with over bank floods, development sharply increases the peak discharge rate associated with the 100-year design storm. As a consequence, the elevation stream's 100-year floodplain becomes higher and the boundaries of its floodplain expand. In some instances, property and structures that had not previously been subject to flooding are now at risk. Additionally, such a shift in a floodplain's hydrology can degrade wetland and forest. To minimize the impact, the 100-year storm will be routed through proposed stormwater management facilities to match the peak developed flow with pre-developed.

The decline in the physical habitat of the stream, coupled with lower base flows and higher storm water pollutant loads, has a severe impact on aquatic community. To meet water quality treatment goals, reduced secondary environmental impacts of facilities and maximum pollutant removal, stormwater management facilities and landscaping are necessary.

To reduce peak flow and provide water quality treatment, a dry swale, porous asphalt, underground infiltration system, and an underground storage system (solid pipes) have been

proposed. The proposed structures have been designed to provide peak flow attenuation as well as to provide water quality treatment.

HydroCAD has been used to calculate peak flows for different storm events at the outlet "Point of Interest", for Existing and Developed Condition. The peak flow of different storm frequencies (1, 10, & 100 year storms) at the point of interest (P.O.I.), are summarized in the following table:

Table 1: Summary flow table at P.O.I. for existing and developed conditions

Storm Frequency (Year)	Existing Condition Peak Flow (cfs) (Per HydroCAD)	Developed Condition Peak Flow (cfs) (Per HydroCAD)
1	18.40	42.78*
10	60.35	91.58*
100	143.09	174.84*

* Note: Peak flow attenuation will be provided by the underground storage system (Solid pipes) and water quality treatment will be provided by the proposed dry swales, porous asphalt, and an underground infiltration system. Full SWPPP, routing and details hydrological model will be provided after acceptance of the conceptual drainage study.

The required and provided water quality volume is summarized below:

Table 2: Water quality volume summary table.

Required Water Quality Volume (cu-ft)	Provided Water Quality Volume (cu-ft)
56,434.0	85,328.0

Table 3: Runoff Reduction Capacity (RRv min.) summary table.

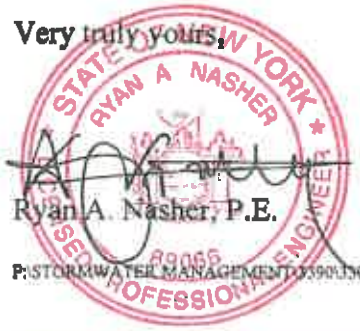
Minimum RRv (cu-ft)	RRv Provided (cu-ft)
19,405.0	85,328.0

Table 3: 100-year storage summary table.

Required 100-yr Storage. (cu-ft)	Provided 100-yr Storage. (cu-ft)
141,079.0	147,088.0

If you have further questions or concerns, feel free to contact me. Thank you.

Very truly yours,



Ryan A. Nasher, P.E.

P:\STORMWATER MANAGEMENT\3390\3390 CONCEPTUAL DRAINAGE REPORT\3390 DRAINAGE NARRATIVE.docx

Drainage Maps

SUMMERVILLE INDUSTRIAL PARK

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DRAINAGE MAPS

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2013
Write a description for your map.
Legend
Feature 1
Limits
Summerville Industrial Park
Summerville Way
94
US Hwy
Summerville Industrial Park
Google Earth
N
400 ft


2009
Write a description for your map.
Legend
Feature 1
Limits
Summerville Industrial Park
Summerville Way
94
US Hwy 6
Summerville Industrial Park
Google Earth
N
400 ft