FINAL
CLIMATE RESILIENCY ASSESSMENT
ERIE CANAL, TOWN OF FRANKFORT SECTION SITE
SITE NO. 622006

WORK ASSIGNMENT NO. D007619-20

Prepared for:

New York State Department of Environmental Conservation
Albany, New York

Prepared by:

MACTEC Engineering and Geology, PC
Portland, Maine

MACTEC No. 3612122259

AUGUST 2020

FINAL
CLIMATE RESILIENCY ASSESSMENT
ERIE CANAL, TOWN OF FRANKFORT SECTION SITE
SITE NO. 622006

WORK ASSIGNMENT NO. D007619-20

Prepared for:

New York State Department of Environmental Conservation
Albany, New York

Prepared by:

MACTEC Engineering and Geology, PC
Portland, Maine

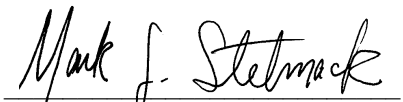
MACTEC No. 3612122259

AUGUST 2020

Submitted by:

Andrew Flynn
Project Engineer

Approved by:



Mark Stelmack, PE
Project Manager

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICIES

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
AP	analysis point
bgs	below ground surface
BMP	Best Management Practices
cm	centimeters
COC	contaminants of concern
FEMA	Federal Emergency Management Agency
FWIA	Fish and Wildlife Impact Analysis
MACTEC	MACTEC Engineering and Geology, P.C.
mg/kg	milligram per kilogram
NYSDEC	New York State Department of Environmental Conservation
NYSERDA	New York State Energy Research and Development Authority
NYS	New York State
PCB	polychlorinated biphenyl

PDI Pre-Design Investigation

GLOSSARY OF ACRONYMS AND ABBREVIATIONS CONT.

PISCES Passive In-Situ Concentration Extraction Sampling

ppb parts per billion

RA Remedial Action

RI Remedial Investigation

ROD Record of Decision

SCO Site Cleanup Objective

Site Erie Canal Town of Frankfort Section site

WSE water surface elevation

1.0 INTRODUCTION

MACTEC Engineering and Geology, P.C. (MACTEC), is submitting this Climate Resiliency Assessment to the New York State (NYS) Department of Environmental Conservation (NYSDEC) for the Erie Canal Town of Frankfort Section site (Site) located in Frankfort, Herkimer County, New York (Figure 1.1). The Assessment was prepared in response to Work Assignment No. D007619-20 and in accordance with April 2011 Superfund Standby Contract No. D007619 between the NYSDEC and MACTEC.

In the New York State Registry of Inactive Hazardous Waste Sites, the Site is currently listed as Class 2, indicating the Site represents a significant threat to public health and/or the environment and action is required.

This Assessment provides an evaluation of the projected impacts of climate change and identifies possible climate-related sensitivities and vulnerabilities posed to the Site and its surrounding environment. The Assessment also provides a list of possible adaptation measures that could be undertaken now or in the future to address the identified sensitivities and/or vulnerabilities.

The Assessment reflects the current climate impact projections for the region. Due to the evolving knowledge of projected climate-associated changes and impacts, the information provided in this Assessment may need to be revisited periodically as projections are updated. The timeframe for conducting updates to the Assessment should be based on the timing of updates to regional climate projections.

2.0 PROJECT SITE CHARACTERIZATION

The Site is located just east of the town line of the City of Utica and within Frankfort, Herkimer County, New York, in an area that is primarily comprised of industrial and commercial properties and undeveloped land (Figure 1.1). The property that includes the canal is currently owned by National Grid; a portion of the canal is located within the right-of-way of NYS Route 5S maintained by the NYS Department of Transportation. The Site includes the area encompassed by the highwater line within the canal section which is approximately 4,200 feet long and ranges in width from seven to 60 feet wide, covering an area of approximately 1.6 acres. The Site is bounded to the north by Route 5S, to the east by S. Ferguson Road, to the south by commercial and undeveloped private properties, and to the west by Turner Street.

The canal section is fed by a 30-inch diameter pipe on its western end which carries water from the upstream stormwater drainage collection system. The canal empties into a 36-inch diameter storm pipe that conveys water under NYS Route 5S and combines with nearby Tributary 204 which eventually flows into the Mohawk River (Figure 2.1). In its existing condition, the canal consists of pond-like and stream-like sections along its length.

2.1 PHYSICAL CHARACTERISTICS

2.1.1 Geology & Hydrology

Surficial soils in the vicinity of the Site are described in the 1975 Soil Survey of Herkimer County as Phelps gravel and fine sandy loam and other unknown materials with an approximate permeability range of 10^{-5} to 10^{-3} centimeters (cm) per second (EA, Inc., 1984). Underlying the sand and gravel deposits is glacial till which directly overlies the bedrock surface. Bedrock in the vicinity of the Site (the Mohawk Valley) is flat lying shale with some interbedded siltstone identified as part of the Utica Shale Formation (Calocerinos and Spina, 1986).

The Mohawk River, located to the north of the Site, appears to be a local discharge point for groundwater from the Site. Depth to groundwater beneath the Site is approximately 3 to 7 feet below ground surface (bgs) based on the groundwater sampling conducted in the Pre-Design Investigation (PDI) (MACTEC,

2020a). There is a steep hydraulic gradient to the south of the Site, which then flattens closer to the former canal. The canal also retains surface water runoff from the surrounding watershed as the Site is located at a topographical low.

2.2 PREVIOUS INVESTIGATIONS

A Record of Decision (ROD) (NYSDEC, 2010) was finalized in March 2010. Data reviewed in preparation for the ROD included a Preliminary Investigation of the Site completed in September 1984, a Phase II investigation completed in August 1986, and a subsequent Phase II investigation conducted in December 2002 and in April 2003. Additional Remedial Investigations (RI) were conducted in 2005 and 2008. The Final RI Report and Feasibility Study were completed in May 2008 and August 2009, respectively (MACTEC, 2008 and 2009). The results of the RI concluded that sediment within the canal contains polychlorinated biphenyl (PCB)s and selected metals, the primary contaminants of concern (COCs) at the Site, at concentrations that pose a risk to human health and the environment. The ROD includes a summary of the investigations, a listing of the Administrative Record documents for the investigations conducted at the Site, proposed cleanup alternatives, and the selected remedy (NYSDEC, 2010). Previous sampling, remedial efforts, and reporting associated with the Site include:

- Preliminary Investigation of the Old Erie Canal Site (Ecological Analysts, Inc., 1984)
- Old Erie Canal Phase II Investigation (Calocerinos and Spina Consulting Engineers, 1986)
- Additional Investigation Results (Blasland, Bouck, and Lee, Inc, 2003)
- Final RI Report (MACTEC, 2008)
- Final Feasibility Study Report (MACTEC, 2009)
- PDI (MACTEC, 2020a)

2.3 CONTAMINANTS OF CONCERN

Previous investigations of the Site identified metals and PCBs in sediment at concentrations above the 1999 NYSDEC sediment screening guidelines. Sediment sampling conducted at the Site between November 2004 and November 2008 in support of the RI (MACTEC, 2009a) identified concentrations of PCBs exceeding the NYS Residential Site Cleanup Objective (SCO) of 1 milligram per kilogram (mg/kg) identified in Table 375-6.8(b): Restricted Use SCO (NYSDEC, 2006). Reported concentrations of several metals (cadmium, chromium, copper, lead, mercury, and silver) also exceeded Residential SCOs.

2.4 HUMAN HEALTH ASSESSMENT

This section summarizes the current or potential human exposures (the way people may come in contact with contamination) that may result from the Site contamination. An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a Site. An exposure pathway has five elements: [1] a contaminant source, [2] contaminant release and transport mechanisms, [3] a point of exposure, [4] a route of exposure, and [5] a receptor population. Contaminant release and transport mechanisms carry contaminants from the source to a point where people may be exposed. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, or direct contact). The receptor population is the people who are, or may be, exposed to contaminants at a point of exposure.

An exposure pathway is complete when all five elements of an exposure pathway exist. An exposure pathway is considered a potential pathway when one or more of the elements currently does not exist but could in the future. There are no current complete human exposure pathways identified. Because the Site is located in an industrialized, remote area and partially fenced, human contact with PCB and metals contaminated sediment is not likely. The area is also served by a public water supply, making exposure to contaminated groundwater unlikely.

Surface water at the Site is not used as a source of drinking water and is not used for recreational purposes. Therefore, the potential for human exposure to contaminated surface water is not considered an exposure pathway of significance.

2.5 ENVIRONMENTAL ASSESSMENT

This section summarizes the assessment of existing and potential future ecological impacts presented by the site. Ecological impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water. The Fish and Wildlife Impact Analysis (FWIA) included in the RI report presents a detailed discussion of the existing and potential impacts the Site poses to fish and wildlife receptors.

The FWIA identified ecological resources at or in the vicinity of the Site that constitute an important component of the environment. The FWIA determined that ecological receptors are, or potentially are,

impacted by contaminants in the soil of the Site, requiring the application of Soil Cleanup Objectives as protection.

The following environmental exposure pathways and ecological impacts have been identified:

Surface water resources at or near the Site include the canal waters, the unnamed tributary to the Mohawk River, and the Mohawk River. NYSDEC conducted PCB Passive In-Situ Concentration Extraction Sampling (PISCES) in 1995 and 1996. This methodology qualitatively evaluates PCB surface water contamination. The PISCES sampling identified the Erie Canal-Frankfort Section as a potential source of PCB contamination to the Mohawk River. Conventional surface water sampling conducted at this Site did not detect PCBs; however, the method detection limit of 1 part per billion (ppb) is above the New York State surface water quality standard for PCBs of 0.00012 ppb. Therefore, even though no PCBs were detected in the Site water samples the PISCES data indicates surface water in the Erie Canal –Town of Frankfort Section Site is a potential threat of PCB contamination to the Mohawk River.

Fish and wildlife resources using the canal are at risk of impact from the sediment-related exposures to PCBs and metals in the canal. The remedial action will address potential impacts from the Site sediments to the receiving surface water resource (i.e., Mohawk River).

3.0 POTENTIAL SITE-RELATED CLIMATE CHANGE IMPACTS

In 2014, the New York State Energy Research and Development Authority (NYSERDA) investigated Climate Change in New York State, publishing a document of the same name (Horton, 2014). The document summarizes the potential future climate change impacts and coping strategies for all regions of the state. It outlines climate change impacts that have already been observed, and projects future climate impacts based on models of past climate change.

The Site is included in the Albany Region (Region 5) of New York in the NYSERDA report. Region 5 is also called the Saratoga Region in the report. Hence, the Albany Region and the Saratoga Region both are names used for Region 5.

Three major climate change related potential impacts to locations in Region 5 are temperature change, precipitation fluctuation, and extreme weather events. The impacts as they relate to the Site are described in Subsections 3.1, 3.2, and 3.3. Descriptions of how the impacts are addressed during and after the proposed site remediation are provided in Sections 4.0 and 5.0, respectively.

3.1 PRECIPITATION

In the region where the Site is located, precipitation has increased more than any other region in the state from 1901-2012, at a rate of 0.90 inches per decade. This rate equals a site-specific precipitation increase between two and seven percent in the 2020's, 4 to 12 percent in the 2050's, and 5 to 15 percent in the 2080's (Horton, 2014). Note that the percent ranges cited are fluid because new climate data will cause a change in percentage. According to the 2014 NYSERDA report, "much of this additional precipitation is projected to occur during the winter months." In addition, the report mentions that "late summer and early fall precipitation is slightly reduced in many climate models." This indicates that winters have the potential to be wetter than in the past, which could present challenges for the Site during winter and spring months in the future. Table 3.1 shows the expected percent change in precipitation in 30-year increments for the next 80 years in Region 5. The precipitation changes are based on current observed precipitation trends in the region.

One important factor to consider is the precipitation depth from storm events. Figure 3.1 depicts the amount of observed precipitation events in the region over one inch. The observed events are compared to the Hadley Centre Coupled Model Version 3 (HADCM3) model projections for the next 80 years.

ADCM3 is a coupled atmospheric-ocean general circulation model developed at the Hadley Center in the United Kingdom. The HADCM3 model is the climate model used in the NYSERDA report to project climate changes in Region 5.

Table 3.1: Future Precipitation Percent Change Estimates for New York Region 5 (Horton, 2014)

Baseline annual rainfall (1971-2000) 38.6 inches	Low Estimate (10th Percentile)	Middle Range (25th to 75th Percentile)	High Estimate (90th Percentile)
2020s	-1 percent	+ 2 to + 7 percent	+ 10 percent
2050s	+ 2 percent	+ 4 to + 12 percent	+ 15 percent
2080s	+ 3 percent	+ 5 to + 15 percent	+ 17 percent
2100	- 1 percent	+ 5 to + 21 percent	+ 26 percent

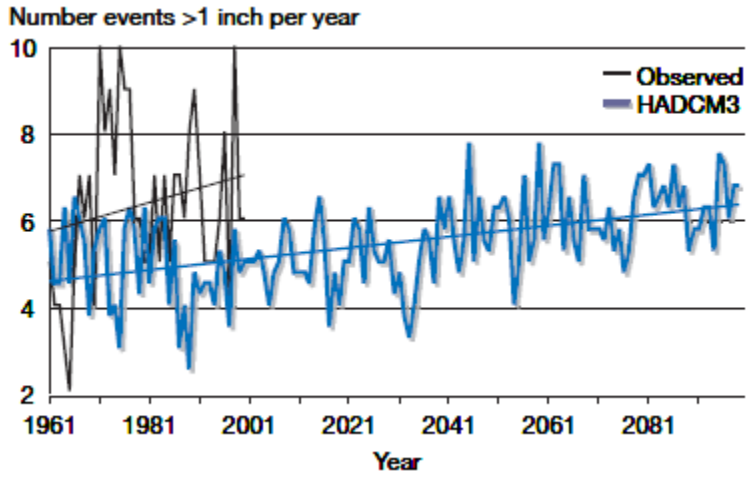


Figure 3.1: The Number of Rainfall Events over One Inch, 1960-2100

Increased future annual precipitation at the Site has the potential to increase water flow into the culvert at the east end of the canal, thus increasing the mean water elevation in the canal. An increase in precipitation can also cause upland stormwater infrastructure to approach maximum flow capacity more

frequently. This could cause more surface water runoff to be introduced to the canal in the future, which would affect both flow rate and flow volume and water quality in the canal. An increase in precipitation may also cause more erosion within the canal, and thus cause transport of canal bottom materials to downstream offsite water bodies.

Groundwater on Site is generally close to the ground surface, approximately 3 to 7 feet bgs. An increase in short term, high intensity precipitation events may lead to saturated overland flow.

3.2 TEMPERATURE

Temperature is expected to continue to rise in Region 5. From 1901-2012, Region 5 saw a 0.22 °F per decade increase in temperature. The temperature increase has resulted in lesser amounts of snowfall in winter months and warmer summers in recent years. Table 3.2 shows estimated temperature changes in 30-year increments for the next 80 years. The three estimates are based on fractions of climate data. For example, the low estimate reflects the lower 10 percent of temperature data. Future climate projections for Region 5 indicate that average annual temperature will increase between 2.3 to 3.2 °F in the 2020s, 4.5 to 6.2 °F in the 2050s, and 5.6 to 9.7 °F in the 2080s (Horton, 2014). These future projections could fluctuate as temperature projections change.

Table 3.2: Future Temperature Change Estimates for New York Region 5 (Horton, 2014)

Baseline (1971-2000) 47.6 °F	Low Estimate (10th Percentile)	Middle Range (25th to 75th Percentile)	High Estimate (90th Percentile)
2020s	+ 1.7 °F	+ 2.3 to 3.2 °F	+ 3.7 °F
2050s	+ 3.5 °F	+ 4.5 to 6.2 °F	+ 7.1 °F
2080s	+ 4.1 °F	+ 5.6 to 9.7 °F	+ 11.4 °F
2100	+ 4.4 °F	+ 6.1 to 11.4 °F	+ 13.6 °F

The increase in temperature for the Site could be challenging, particularly in the winter months. Warmer temperatures will lead to additional snow melt in months that historically retained snow coverage. This could cause more water to be funneled into the canal because of the Site's low topography relative to the nearby watershed. The higher temperatures could also exacerbate the influence that the overall increase in

precipitation has on the Site because it establishes a more favorable environment for more water to enter the canal.

3.3 EXTREME WEATHER EVENTS

Extreme weather events are becoming more prevalent across the United States, including New York State. According to the NYSERDA 2014 report, New York State will experience more heat waves and droughts, fewer cold weather events, and more large-scale precipitation events. Due to an anticipated increase in weather events of short duration with high intensity, the Site will be vulnerable to additional erosion and flooding. Figure 3.2 shows that the total rainfall for a 24-hour, 100-year storm is projected to increase over the next 40 years. In addition, it shows that events that are presently considered 100-year events may become more frequent in the future. More droughts in Region 5 could cause the Site's mean surface water level to drop, thus affecting stormwater infrastructure entering and leaving the Site and surrounding land and, in turn, increase the storage capacity of the canal section. High wind events may damage natural features (trees and shrubs) and manmade features (overhead power lines) at the Site.

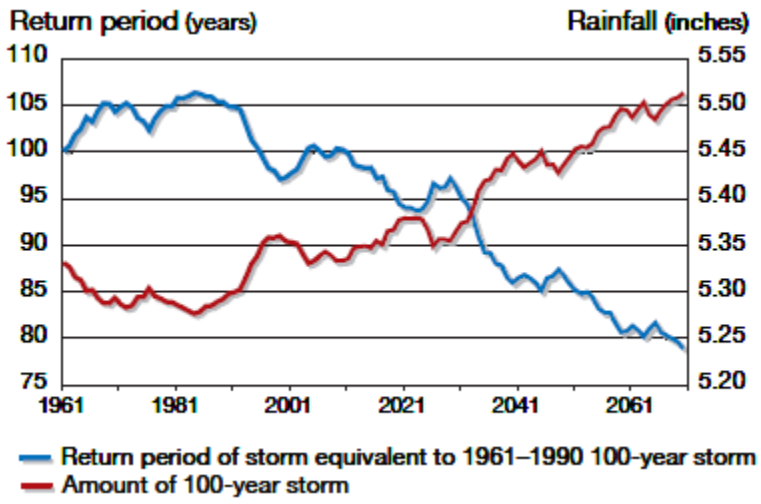


Figure 3.2: Projected Rainfall and Frequency of Extreme Storms (Rosenzweig, 2011)

The presented extreme weather projections are subject to change with future changes in climate trend data. Once new data have been analyzed, it can be incorporated into climate models to revise climate projections.

4.0 REMEDIAL ACTION SITE CONDITIONS

Remedial action (RA) at the Site is scheduled to commence in 2021. This section describes how the expected climate change related potential impacts discussed in Section 3.0 will be addressed during the proposed site remediation.

4.1 DESCRIPTION OF REMEDIAL ACTION

The RA for the Site is shown in the excavation and restoration drawings (Appendix A) and described in the supplementary specifications (MACTEC, 2020b). The planned RA includes:

- Pre-Construction Activities
    - Obtainment of required permitting, location of underground utilities, and required Town of Frankfort and State of New York inspections
- Mobilization and Site Preparation
    - Implementation of necessary contractor utilities (e.g., power, water, and sanitary sewer), site support facilities (e.g., trailer, wastewater storage tank), equipment and material staging and storage areas, personnel decontamination and hygiene facilities as required per Health and Safety Plan, access and site controls (e.g., temporary fencing and barricades) to isolate work area, and decontamination pad for equipment and vehicles.
- Erosion and Sediment Control
    - Implementation of necessary stormwater utilities to minimize erosion in accordance with Erosion and Sediment Control Plan and Supplementary Specifications.
- Excavation
    - Excavation of PCB-impacted materials to the limits (horizontal and vertical) indicated in the Excavation Construction Drawings (C-104-C-107 in Appendix A) in segments beginning at the upstream end of the canal and proceeding downstream.
- Site Restoration
    - Restoration of the excavated canal bed using natural stream bank restoration techniques.
- Demobilization from Site
    - Removal of temporary facilities, Site/access controls, and erosion and sediment control utilities.

4.2 CLIMATE CHANGE SENSITIVITY

During the RA, the Site will become more vulnerable to intense precipitation events due to the altering of flow of water through the canal. During each of the expected remedial construction phasing, water will be rerouted away from the active work area. If an intense rainfall event were to occur during remedial activities, potential impacts to the Site could include water overtopping the canal banks into ditches along NYS Route 5S and failure of Best Management Practices (BMPs) that prevent water from entering the active work area. Examples of short and long term BMPs being used in the remedial action of the Site include vegetation (plantings along the canal banks), silt fence, and level spreaders.

After RA is complete and the canal has been restored, vulnerability to precipitation events will be greatly reduced. The canal restoration includes increasing the flood storage capacity by creating pond habitat and bordering vegetated wetlands (which also reduce flood flow velocities).

4.3 ADAPTATION MEASURES

To account for these potential impacts during construction, the RA contractor will install and operate a temporary bypass system to divert water around the active remediation area. This will prevent the backup of water in and upstream of the active remediation phase. The bypass system is being designed using a chosen storm event for sizing pumping operations. Research was done regarding large recent precipitation events at the Site. Two such events larger than the 10-year, 24-hour storm event for the Site region occurred in the last five years. As a result, the contingency storm event for the design of the temporary bypass system is being increased by 1-inch (from 4.5 inches) to accommodate for the recent large precipitation events. The Contractor will also need to provide contingency for the temporary bypass system for a 5.5 inch 24-hour storm event. This will make the by-pass system more capable of handling abnormally large precipitation events during construction and bolster the Site's climate adaptability to short-term climate change impacts.

5.0 POST REMEDIAL ACTION SITE CONDITIONS

5.1 DESCRIPTION OF SITE CONDITIONS

The Site will be restored in accordance with an approved site restoration plan incorporated into the remedial design. The plan proposes backfill of granular fill into the canal bottom, with restorative plantings and soil similar to wetland environments existing near the Site. The size of the canal cross section will be increased, resulting in an improved flow path and reduction of erosional effects.
To analyze pre-RA versus post-RA impacts, water surface elevations (WSEs), velocities, and Site discharges were evaluated for both pre- and post- remediation site conditions using a stormwater model. The model was created using HydroCAD Version 10® stormwater modeling software. HydroCAD is a commercially available stormwater hydrologic and hydraulic modeling software by Applied Microcomputer Systems, Inc. HydroCAD is based upon the United States Department of Agriculture Technical Release 20 (TR-20) combined with the standard hydraulic equations and is appropriate for evaluating runoff conditions and estimating the flow rates and flow volumes for the canal.

The software uses standard engineering hydrologic and hydraulic equations and techniques with the inputs of surrounding watershed area as well as the canal, including drainage area size, soil and cover types, flow path and Time of Concentration (T_c, the longest flow path of surface water with respect to time), canal cross sections longitudinal slope, and local rainfall depths for various storm events to determine stormwater capacity at a chosen analysis point (AP). This AP is usually chosen at a point where surface water would be discharged from the site either into existing storm drain systems or a water body such as a stream. For this project, the AP is the 36-inch diameter storm pipe that conveys water out of the canal under NYS Route 5S. The model was used to establish a scenario where downstream impacts (WSEs, velocities, and discharges) from the Site in post-RA conditions were less than or equal to pre-RA Site conditions. The model incorporated existing stormwater conveyances at the Site including the culverts located at each end of the canal section.

5.2 CLIMATE CHANGE SENSITIVITY

Based on the review of projected climate trends and proposed remedial activities for the Site, a series of possible climate-related sensitivities and vulnerabilities for the Site have been developed. The series was generated by reviewing Site components including but not limited to surface water, groundwater, canal

bottom material, planned RA and restoration, and evaluating the sensitivity of these components to climate impacts.

The Site has features that may be negatively affected in future climate change events. According to the attached FEMA Flood Insurance Rate Map in Appendix B, the Site is not located within a floodplain. The Site is located in an area where a 500-year flood event would not cause flooding in excess of one foot across the Site. This assessment was confirmed by the HydroCAD stormwater model prepared by MACTEC (MACTEC, 2020c). Extreme precipitation events however may result in scour and erosion of the restored canal. The backfill material and canal restoration presented in the Remedial Design were selected to minimize scour during large magnitude storm events while providing suitable substrate for aquatic invertebrates. Materials were also selected to withstand freeze-thaw periods by using New York State Department of Transportation approved subbase materials for road design.

According to the stormwater model, the mean velocity of water within the canal is less than 1 ft/s for a 100-year event. This mean velocity within the canal was used to choose the backfill material based on scour calculations. Scour calculations were performed using equations in the document "Computing Degradation and Local Scour" (USDOI, 1984). For the scour analysis, the unit weight of the chosen backfill material, the average grain size of the backfill material, the cross sectional area of the canal, and the 100-year storm event velocity within the canal was used to determine scour potential for the backfill material in short and long term scenarios. These scenarios are a straight channel, a channel with bends, incipient motion, and long-term scour potential. The backfill material was selected based on a calculated scour potential of less than 0.1 feet and the backfill material would self-armor (smaller particles removed near the surface leaving larger particles to armor the backfill layer). Using the chosen backfill material, the scour potential of the canal is minimal in the short and long term.

According to the scour calculations, the canal is expected to be minimally impacted during a 100-year storm event. Since a 100-year event is likely to happen more frequently in the future, the chosen material is expected to withstand a 100-year storm with minimal scour. A 500-year event is also considered because it is likely that a 500-year event will also become more frequent in the future (See Figure 3.2). Design of the backfill material did not consider the 500-year event.

The stormwater model was developed for the contributing drainage area and Site using the local 2-year, 5-year, 10-year, 50-year, and 100-year storm events to calculate stormwater discharges within the canal for the post-RA canal capacity. Post-RA conditions were modeled using the restored canal cross sections designed to accommodate a 100-year stormwater discharge. The cross sections and subsequent restoration plan are included in the construction drawings in Appendix A. The model results indicate a lower

discharge volume, lower peak water elevation, and reduced flow velocity in the enhanced canal section compared to pre-RA conditions. This is due to an improved flow path within the canal.

The stormwater model was also used to assess a 500-year storm event; model results indicate that water within the canal would not overtop the proposed canal bank elevation, and that the discharge from the canal and velocities within the canal are reduced from those modeled for pre-RA conditions. Within the Site limits, the proposed remedial activities are expected to reduce the peak WSE throughout the canal during a 500-year storm. Compared to current conditions, stormwater impacts to the Site during a 500-year storm are expected to be the same or reduced during post-RA conditions. Results from the stormwater modeling are included in Appendix C.

5.3 ADAPTATION MEASURES

The site restoration plan (MACTEC, 2020d) has accounted for anticipated climate conditions in Central New York. The objective of the restoration plan is to naturalize the environment within the canal and to promote diverse aquatic habitat. The remedial design incorporates site restoration plan features, as follows:

- a pond and stream habitat within the canal
- a bordering wetland habitat along the newly created pond and stream habitat

The restoration design incorporates features designed to manage elevated stormwater flows by providing an increase in the available water storage capacity in the canal and construction of bordering wetlands which allows for increased water storage capacity and acts to reduce water flow velocities. Level spreaders are incorporated into the design, installed at the beginning and end of the newly created stream habitat to stabilize the transition between the pond and stream habitat created within the remediated canal. In addition, the material selected to restore the canal is resistant to erosion and will provide substrate for aquatic invertebrates and rooted hydrophytic vegetation. The exposed uplands bordering the canal disturbed during the remediation will be revegetated to stabilize the ground surface to protect from future erosion and sedimentation in the canal.

6.0 CONCLUSIONS & RECOMMENDATIONS

In an ever-changing environment, it is important for climate trends to be incorporated into designs of hazardous waste site cleanups.

This Climate Resiliency Assessment has summarized:

- remedial design and restoration plans for the Site
- current climate trends for the Site's region
- the remedial design's capacity to accommodate these trends.

The Site may experience an increase in ambient temperatures, an increase in extreme storm events, and a decrease in snowpack. Although these threats are looming, the proposed remedial action will better equip the site to withstand impacts from current and future climate trends.

The proposed remedial design and site restoration will:

- improve flow storage capacity for the canal
- improve the flow path within the canal
- improve slope stability for the canal banks
- restore the canal to provide suitable aquatic habitat
- improve stormwater capacities up to a 500-year storm event
- improve scour-resistant potential for the canal bed

As more data is collected concerning the region's impacts from climate change, this report can be reassessed to account for additional information.

7.0 REFERENCES

Horton, R., D. Bader, C. Rosenzweig, A. DeGaetano, and W. Solecki. 2014. *Climate Change in New York State; Updating the 2011 ClimAID Climate Risk Information.* New York State Energy Research and Development Authority (NYSERDA), Albany, New York.

Rosenzweig, C., W. Solecki, A. DeGaetano, M. O'Grady, S. Hassol, P. Grabhorn (Eds.). 2011. *Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation.* Technical Report. New York State Energy Research and Development Authority (NYSERDA), Albany, New York.

MACTEC Engineering and Geology, PC (MACTEC), 2008. *Final Remedial Investigation (RI) Report*. Prepared for the New York State Department of Environmental Conservation. May 2008.

MACTEC, 2009. *Final Feasibility Study (FS) Report*. Prepared for the New York State Department of Environmental Conservation. August 2009.

MACTEC, 2020a. *Field Activities Report – Pre-Design Investigation*. Prepared for the New York State Department of Environmental Conservation. January 2020.

MACTEC, 2020b. *Remedial Action Drawings and Specifications – 60% Design, Erie Canal Town of Frankfort Section*. Prepared for the New York State Department of Environmental Conservation. March 31, 2020.

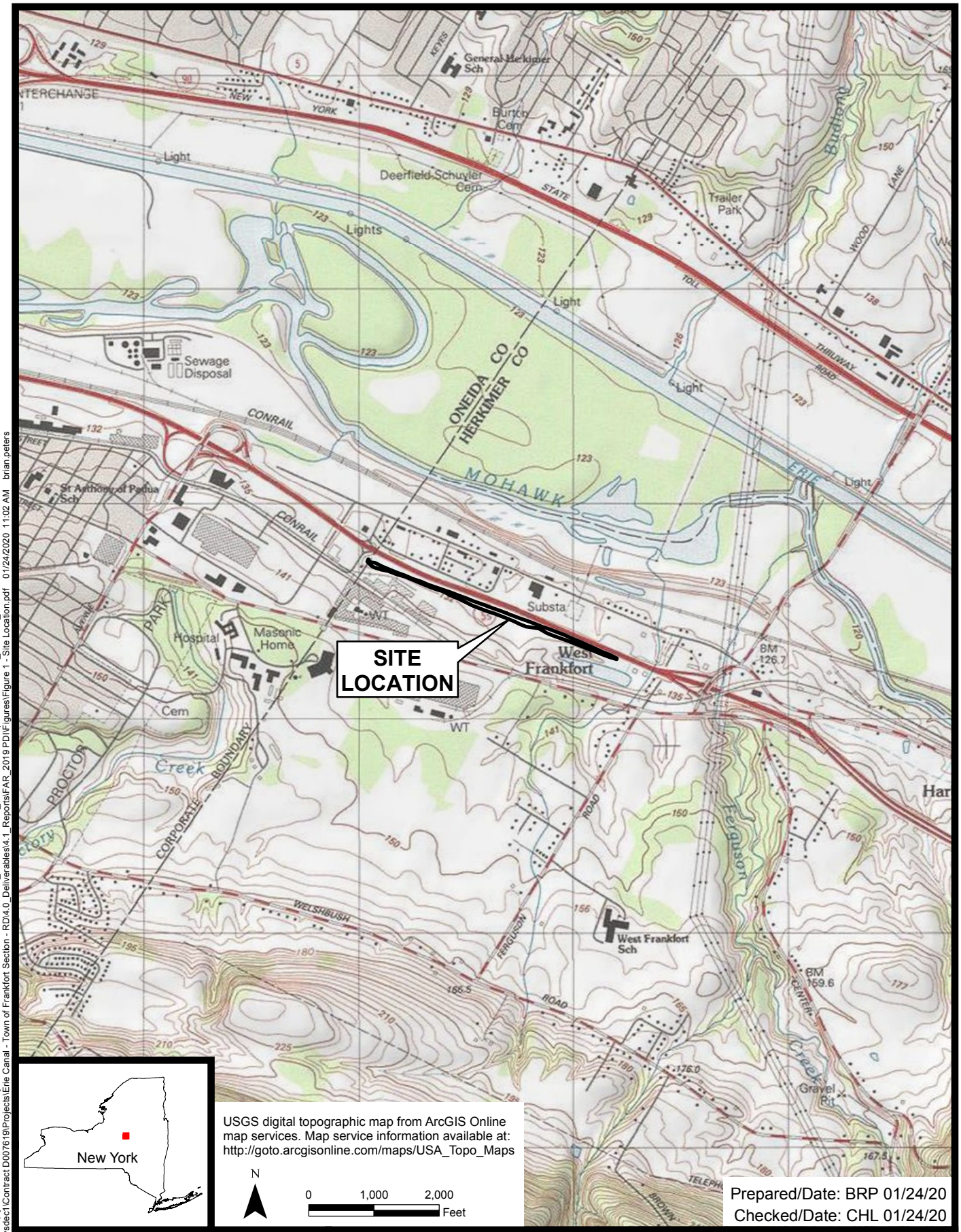
MACTEC, 2020c. *Old Erie Canal – Existing & Proposed Stormwater Models*. HydroCAD Version 10. Prepared for the New York State Department of Environmental Conservation. February 2020.

MACTEC, 2020d. *Restoration Plan – Erie Canal, Town of Frankfort Section*. Prepared for the New York State Department of Environmental Conservation. April 2020.

New York State Brownfield Cleanup Program, 2006. *Development of Soil Cleanup Objectives: Technical Support Document*. September 2006.

New York State Department of Environmental Conservation (NYSDEC). *Record of Decision, Erie Canal, Town of Frankfort Section Site*. March 2010.

FIGURES



Climate Resiliency Assessment
Erie Canal - Town of Frankfort Section
Work Assignment No. D007619-20

MACTEC

Site Location

Project 3612122259 Figure 1.1

Document: P:\Projects\nysdec1\Contract D007619\Projects\Erie Canal - Town of Frankfort Section - RD\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Site_Location_8x11P.mxd
PDF: P:\Projects\nysdec1\Contract D007619\Projects\Erie Canal - Town of Frankfort Section - RD\4.0_Deliverables\4.1_Reports\FAR_2019 PDI\Figures\Figure 1 - Site Location.pdf 01/24/2020 11:02 AM brian.peters

SD-01N,S
SW-1
0.5
1
1.5
SD-13C
SW-3
SD-02N,S
2
2.5
3
SD-03C
3.5
4
4.5
5
SD-04C
5.5
6
6.5
7
7.5
8
SD-05N,C,S
8.5
9
SD-06N,C,S
9.5
10
10.5
11
SD-07N,C,S
11.5
12
SD-08N,C,S
12.5
13
SD-09N,C,S
13.5
14
SD-10C
14.5
15
15.5
16
SD-11N
16.5
SD-12C
SW-2
SD-14C
SW-4
SD-15C
SD-16C
Tributary 204
Remet Corporation
Watertown Business Complex
Route 5S
Bleeker Street
Coolidge Utica, LLC
Industrial Park Road
Ferguson Road

Legend

- Sediment Location
- Sediment/Surface Water Location
- Previous Transect
- Approximate Culvert

N
0 70 140
Feet

Notes:
1) Canal edge and transects surveyed for MACTEC by:
Orn P. Popli, PE LS PC, Consulting Engineers and Surveyors
555 Pembrooke Drive, Penfield, New York 14526

2) Herkimer County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at http://www.nysgis.state.ny.us

Prepared/Date: BRP 01/30/20
Checked/Date: CRS 01/30/20

Pre-Design Investigation
Erie Canal - Town of Frankfort Section
Work Assignment No. D007619-20

MACTEC

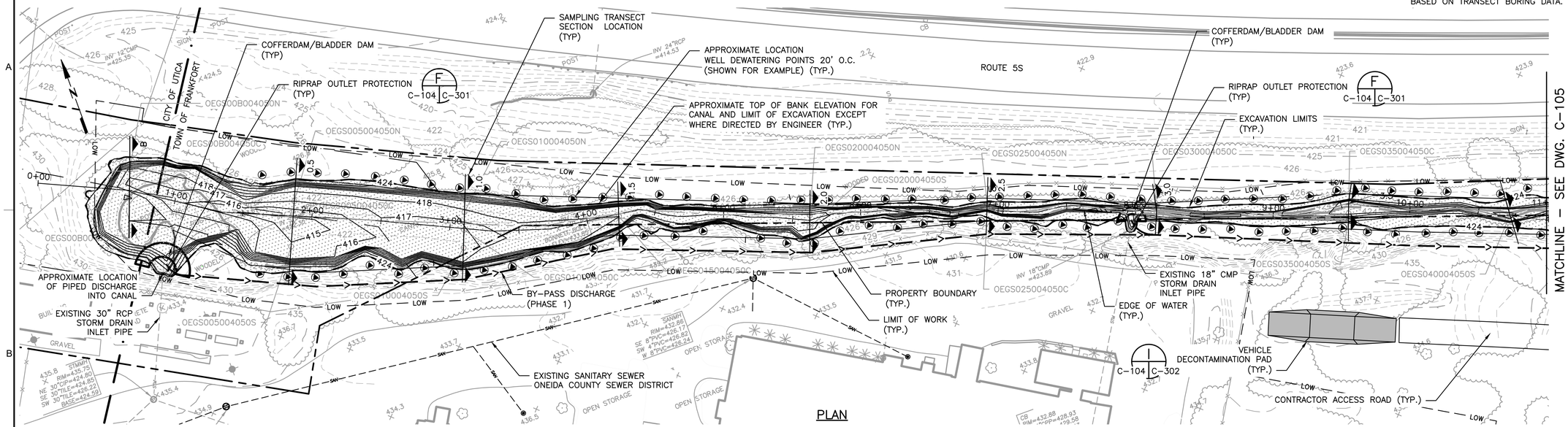
Site Plan
Project 3612122259
Figure 2.1

Document: P:\Projects\nysdec1\Contract D007619\Projects\Erie Canal - Town of Frankfort Section - RD\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\FAR_2019_PDI\FAR_2019_PDI_22x34_LS.mxd PDF: P:\Projects\nysdec1\Contract D007619\Projects\Erie Canal - Town of Frankfort Section - RD\4.0_Deliverables\4.1_Reports\FAR_2019 PDI\Figures\Figure 2 - Sample Locations.pdf 01/30/2020 8:08 AM brian.peters

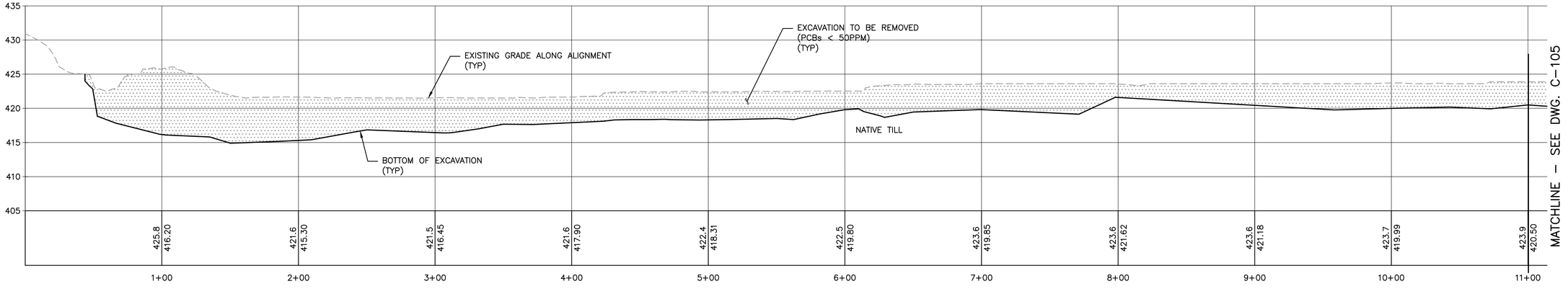
APPENDIX A: REMEDIAL ACTION DRAWINGS

NOTE:

1. SEE DRAWING G–002 FOR NOTES, LEGENDS AND ABBREVIATIONS.
2. HISTORICAL SAMPLE LOCATIONS AND TRANSECTS SHOWN FOR REFERENCE. CROSS SECTION PROFILES BASED ON TRANSECT BORING DATA.



PLAN



PROFILE

SCALE IN FEET
VERT: 1"=5'

SCALE IN FEET
HORIZ: 1"=40'

NO.	DATE	DSGN	DR	CHK
A	3/31/20	MAP	MAP	MAP
		MJS	WJW	APVD
		BY	APVD	MJS

60% DESIGN SUBMITTAL TO NYSDEC

REVISION

THIS DRAWING IS THE PROPERTY OF MACTEC, INCLUDING ALL PATENTED AND PATENTABLE FEATURES, AND/OR CONFIDENTIAL INFORMATION AND ITS USE IS CONDITIONED UPON THE USERS AGREEMENT NOT TO REPRODUCE THE DRAWING, IN WHOLE OR PART, NOR THE USE OF THE DRAWING FOR ANY PURPOSE OTHER THAN SPECIFICALLY PERMITTED IN WRITING BY MACTEC.

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

REMEDIAL ACTION
ERIE CANAL:
TOWN OF FRANKFORT SECTION SITE
FRANKFORT, NEW YORK
NYSDEC SITE NUMBER 622006

MACTEC Engineering and Consulting, P.C.
P.O. Box 1076 | 1 Courthouse Street
Portland, Maine 04112–7050
(207) 775–5401

MACTEC

CIVIL
EXCAVATION
PLAN AND PROFILE
SHEET 1 OF 4

VERIFY SCALE

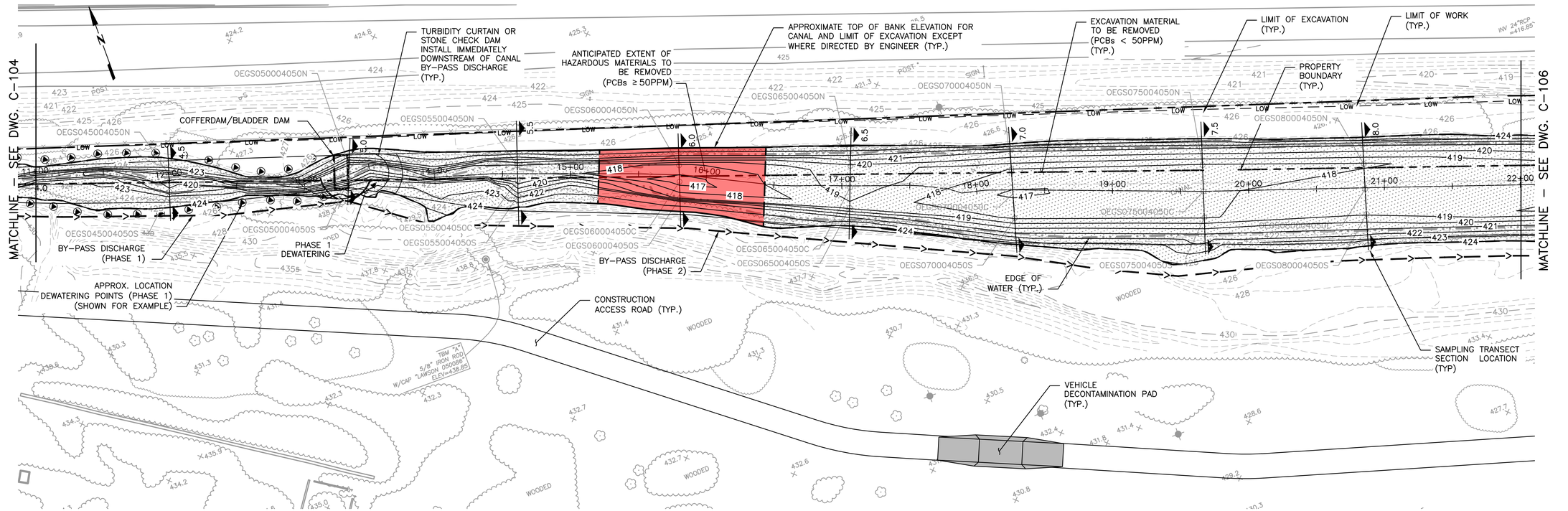
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	MAR 2020
	3612-12-2259
DWG	C-104
SHEET	6 OF 34

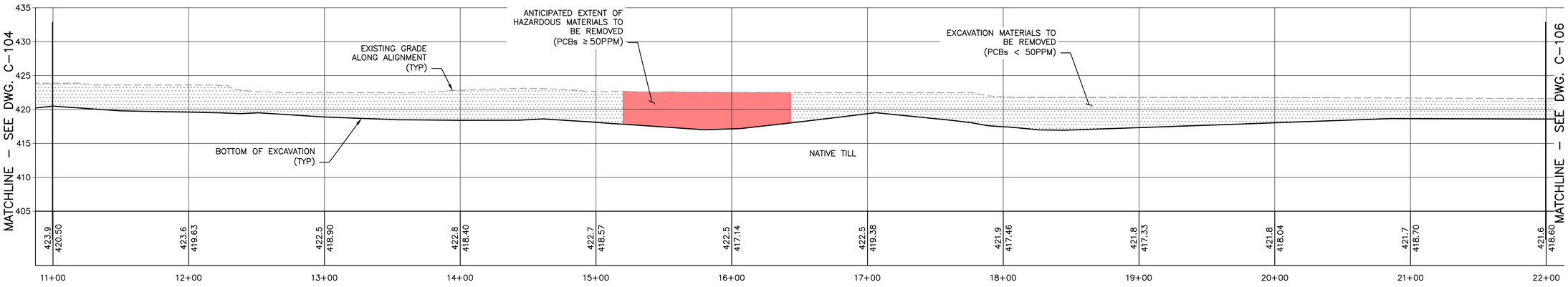
FILE NAME: C:\Users\william.whitten\OneDrive - Wood PLC\Projects\Old Erie Canal\Remedial Design\C-104 Excavation.dwg PLOT DATE: Tue, 24 Mar 2020 PLOT TIME: 8:34 AM

NOTE:

1. SEE DRAWING G–002 FOR NOTES, LEGENDS AND ABBREVIATIONS.
2. HISTORICAL SAMPLE LOCATIONS AND TRANSECTS SHOWN FOR REFERENCE. CROSS SECTION PROFILES BASED ON TRANSECT BORING DATA.



PLAN



PROFILE

SCALE IN FEET
VERT: 1"=5'

SCALE IN FEET
HORIZ: 1"=40'

NO.	DATE	DSGN	DR	CHK	APVD	BY
A	3/31/20	BPN	WJW	MAP	APVD	MJS

REVISION

60% DESIGN SUBMITTAL TO NYSDEC

NEW YORK STATE DEPARTMENT | Department of Environmental Conservation

REMEDIAL ACTION
ERIE CANAL:
TOWN OF FRANKFORT SECTION SITE
FRANKFORT, NEW YORK
NYSDEC SITE NUMBER 622006

MACTEC

MACTEC Engineering and Consulting, P.C.
P.O. Box 7050, 5 Dunstan Street
Portland, Maine 04112–7050
(207) 775–5401

CIVIL
EXCAVATION
PLAN AND PROFILE
SHEET 2 OF 4

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

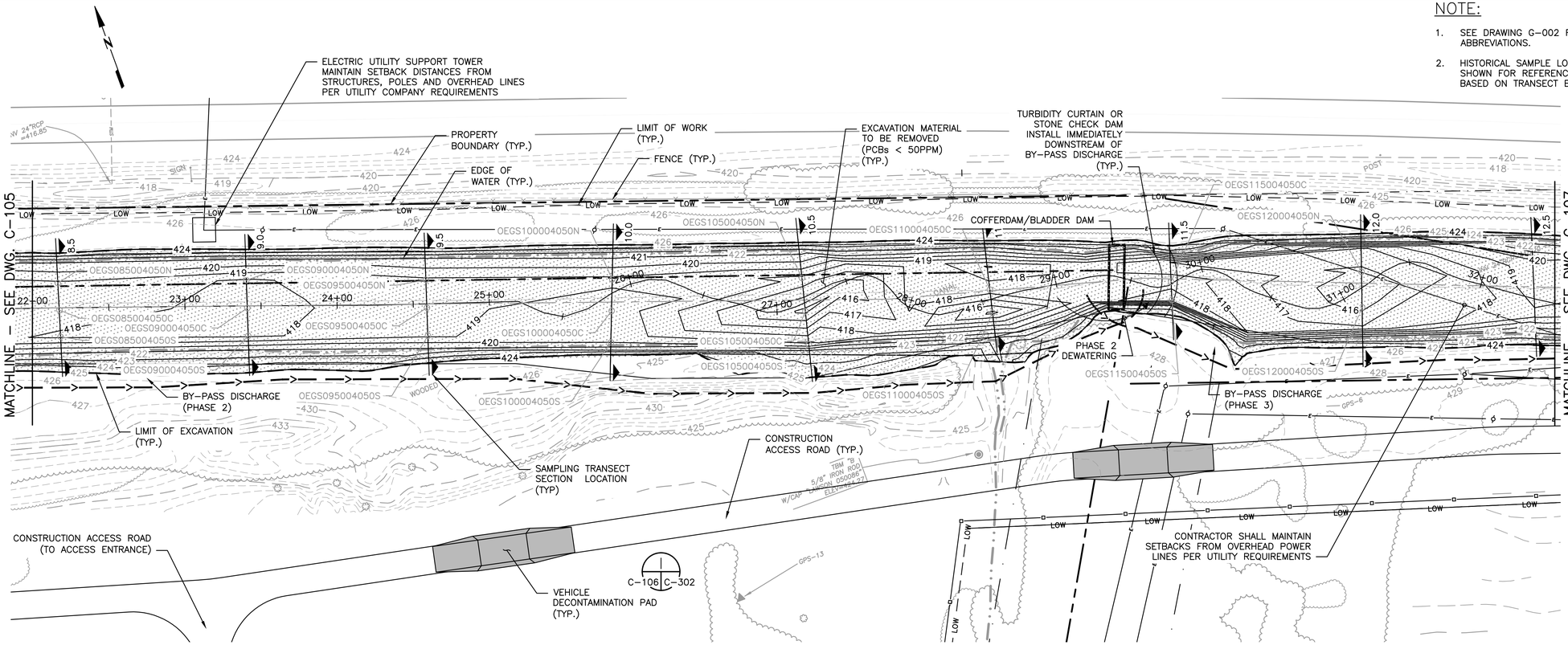
DATE MAR 2020
3612-12-2259
DWG C-105
SHEET 7 OF 34

THIS DRAWING IS THE PROPERTY OF MACTEC, INCLUDING ALL PATENTED AND PATENTABLE FEATURES, AND/OR CONFIDENTIAL INFORMATION AND ITS USE IS CONDITIONED UPON THE USERS AGREEMENT NOT TO REPRODUCE THE DRAWING, IN WHOLE OR PART, NOR THE MATERIAL DESCRIBED THEREON, NOR THE USE OF THE DRAWING FOR ANY PURPOSE OTHER THAN SPECIFICALLY PERMITTED IN WRITING BY MACTEC.

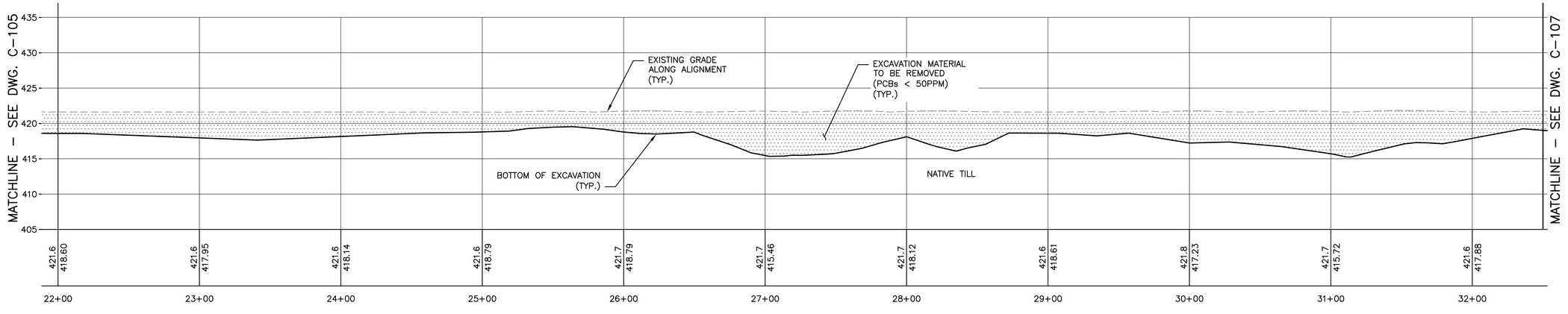
FILE NAME: C:\Users\william.whitten\OneDrive - Wood PLC\Projects\Old Erie Canal\Remedial Design\C-105 Excavation.dwg PLOT DATE: Tue, 24 Mar 2020 PLOT TIME: 8:37 AM

NOTE:

1. SEE DRAWING G–002 FOR NOTES, LEGENDS AND ABBREVIATIONS.
2. HISTORICAL SAMPLE LOCATIONS AND TRANSECTS SHOWN FOR REFERENCE. CROSS SECTION PROFILES BASED ON TRANSECT BORING DATA.



PLAN



PROFILE

0 2.5 5 10
SCALE IN FEET
VERT: 1"=5'

0 20 40 80
SCALE IN FEET
HORIZ: 1"=40'

NO.	DATE	DSGN	DR	CHK	APVD
A	3/31/20	BPN	WJW	MAP	MJS

60% DESIGN SUBMITTAL TO NYSDEC

REVISION BY APVD MJS

THIS DRAWING IS THE PROPERTY OF MACTEC, INCLUDING ALL PATENTED AND PATENTABLE FEATURES, AND/OR CONFIDENTIAL INFORMATION AND ITS USE IS CONDITIONED UPON THE USERS AGREEMENT NOT TO REPRODUCE THE DRAWING, IN WHOLE OR PART, NOR THE MATERIAL DESCRIBED THEREON, NOR THE USE OF THE DRAWING FOR ANY PURPOSE OTHER THAN SPECIFICALLY PERMITTED IN WRITING BY MACTEC.

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

REMEDIAL ACTION
ERIE CANAL:
TOWN OF FRANKFORT SECTION SITE
FRANKFORT, NEW YORK
NYSDEC SITE NUMBER 622006

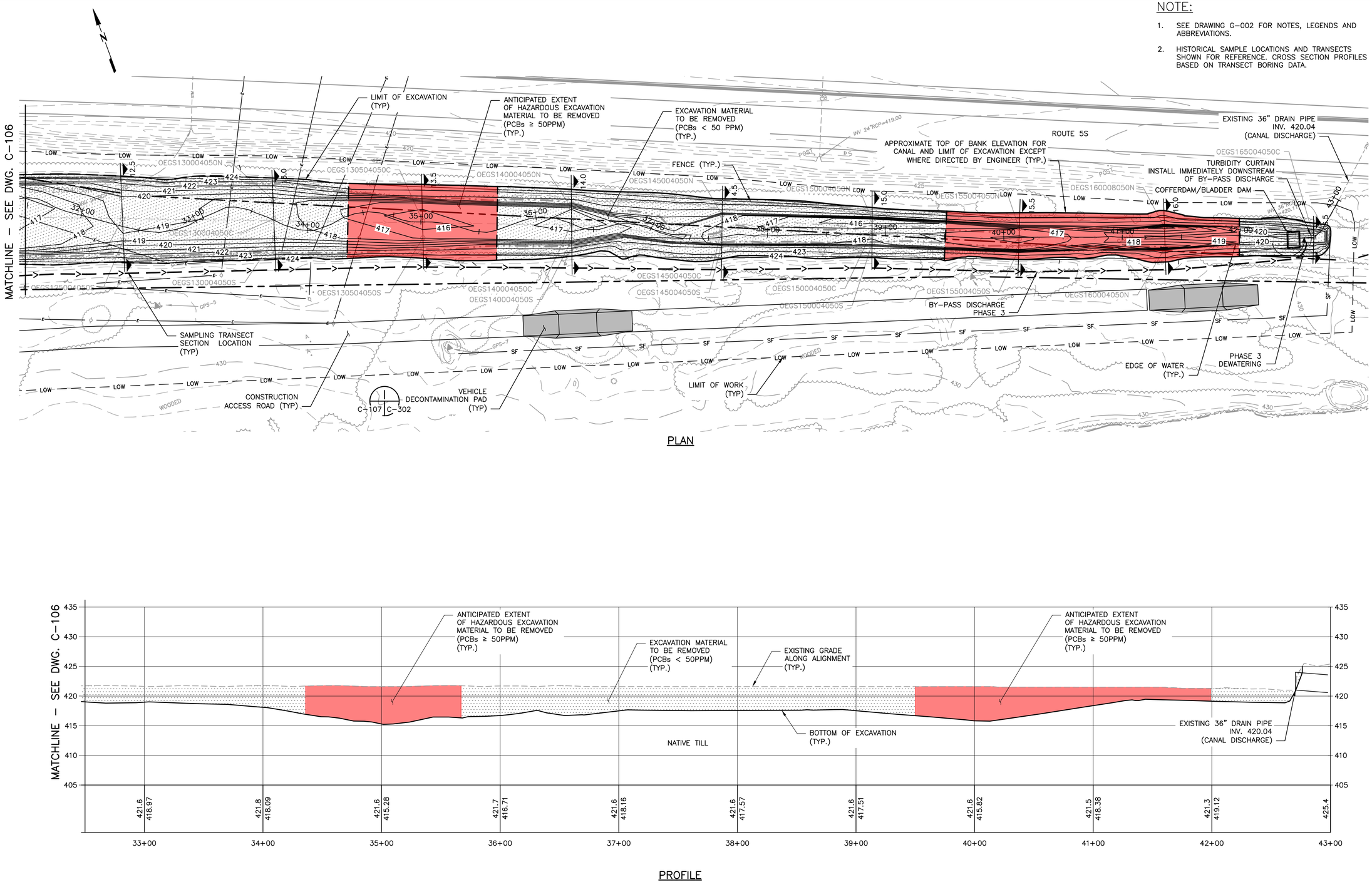
MACTEC Engineering and Consulting, P.C.
P.O. Box 7050, 511 Congress Street
Portland, Maine 04112–7050
(207) 775–5401

MACTEC

CIVIL
EXCAVATION
PLAN AND PROFILE
SHEET 3 OF 4

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	MAR 2020
	3612-12-2259
DWG	C-106
SHEET	8 OF 34



PLAN

PROFILE

NOTE:

1. SEE DRAWING G–002 FOR NOTES, LEGENDS AND ABBREVIATIONS.
2. HISTORICAL SAMPLE LOCATIONS AND TRANSECTS SHOWN FOR REFERENCE. CROSS SECTION PROFILES BASED ON TRANSECT BORING DATA.

SCALE IN FEET
VERT: 1"=5'

SCALE IN FEET
HORIZ: 1"=40'

NO.	DATE	DSGN
A	3/31/20	BPN
		DR
		W.JW
		CHK
		MAP
		APVD
		MJS

60% DESIGN SUBMITTAL TO NYSDEC

REVISION | BY | APVD

MAP | MJS

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

REMEDIAL ACTION
ERIE CANAL:
TOWN OF FRANKFORT SECTION SITE
FRANKFORT, NEW YORK
NYSDEC SITE NUMBER 622006

MACTEC Engineering and Consulting, P.C.
P.O. Box 1076 (Courthouse Street
Portland, Maine 04112–7050
(207) 775–5401

MACTEC

CIVIL
EXCAVATION
PLAN AND PROFILE
SHEET 4 OF 4

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	MAR 2020
	3612-12-2259
DWG	C-107
SHEET	9 OF 34

THIS DRAWING IS THE PROPERTY OF MACTEC, INCLUDING ALL PATENTED AND PATENTABLE FEATURES, AND/OR CONFIDENTIAL INFORMATION AND ITS USE IS CONDITIONED UPON THE USERS AGREEMENT NOT TO REPRODUCE THE DRAWING, IN WHOLE OR PART, NOR THE MATERIAL DESCRIBED THEREON, NOR THE USE OF THE DRAWING FOR ANY PURPOSE OTHER THAN SPECIFICALLY PERMITTED IN WRITING BY MACTEC.

FILE NAME: C:\Users\william.whitten\OneDrive - Wood PLC\Projects\Old Erie Canal\Remedial Design\C-107 Excavation.dwg PLOT DATE: Tue, 24 Mar 2020 PLOT TIME: 8:42 AM

NIAGARA MOHAWK POWER CO.
AND
NATIONAL GRID
"ABANDONED ERIE CANAL LANDS" BEING A PORTION OF PARCEL
1091
(REPUTED OWNERS)
5.736 ACRES

POND SECTION (TYP) L C-108 | C-303

LEVEL SPREADER (TYP) N C-108 | C-303

STREAM SECTION (TYP) M C-108 | C-303

POND SECTION (TYP) L C-108 | C-303

LEVEL SPREADER (TYP) N C-108 | C-303

NEW YORK STATE ROUTE 5 S

TURNER STREET

0+00 1+00 2+00 3+00 4+00 5+00 6+00 7+00 8+00 9+00 10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00

EXISTING SANITARY SEWER
ONEIDA COUNTY SEWER DISTRICT (TYP.)

30 TURNER STREET
(UTICA) LLC
(REPUTED OWNER)
L 1354 P 391
319.20-1-16
104.03-1-19

COMPLETE GRASS RESTORATION IN AREAS DISTURBED BY THE WORK

P C-108 | C-303

104.03-1-18
BUONA FORTUNA OF
UTICA, LLC
(REPUTED OWNER)
L 1479 P 200

EDGE OF WATER (TYP)

MATCHLINE - SEE BELOW

MATCHLINE - SEE ABOVE

LEVEL SPREADER (TYP) N C-108 | C-303

STREAM SECTION (TYP) M C-108 | C-303

36" DRAINAGE PIPE
(CANAL DISCHARGE)

NEW YORK STATE ROUTE 5 S

24+00 25+00 26+00 27+00 28+00 29+00 30+00 31+00 32+00 33+00 34+00 35+00 36+00 37+00 38+00 39+00 40+00 41+00 42+00 43+00

COMPLETE GRASS RESTORATION IN AREAS DISTURBED BY THE WORK

P C-108 | C-303

EXISTING POND

S. FERGUSON ROAD

104.03-1-17
RONALD G. RITZEL
(REPUTED OWNER)
L 710 P 637
AREA = 20.862
ACRES

0 50 100 200
SCALE IN FEET

NOTES:

1. SEE DRAWING G-002 FOR NOTES, LEGENDS AND ABBREVIATIONS.
2. SEE DRAWING C-109 THRU C-112 FOR SITE RESTORATION PLAN AND PROFILE.
3. SEE DRAWING C-303 FOR RESTORATION DETAILS AND PLANTING TABLE.

NO.	DATE	DSGN	DR	CHK	APVD
A	3/31/20	BPN	DAB	MAP	MJS

60% DESIGN SUBMITTAL TO NYSDEC

REVISION	BY	APVD
	MAP	MJS

THIS DRAWING IS THE PROPERTY OF MACTEC, INCLUDING ALL PATENTED AND PATENTABLE FEATURES, AND/OR CONFIDENTIAL INFORMATION AND ITS USE IS CONDITIONED UPON THE USERS AGREEMENT NOT TO REPRODUCE THE DRAWING, IN WHOLE OR PART, NOR THE MATERIAL DESCRIBED THEREON, NOR THE USE OF THE DRAWING FOR ANY PURPOSE OTHER THAN SPECIFICALLY PERMITTED IN WRITING BY MACTEC.

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

REMEDIAL ACTION
ERIE CANAL:
TOWN OF FRANKFORT SECTION SITE
FRANKFORT, NEW YORK
NYSDEC SITE NUMBER 622006

MACTEC Engineering and Consulting, P.C.
P.O. Box 1026, 511 Congress Street
Portland, Maine 04112-7050
(207) 775-5401

MACTEC

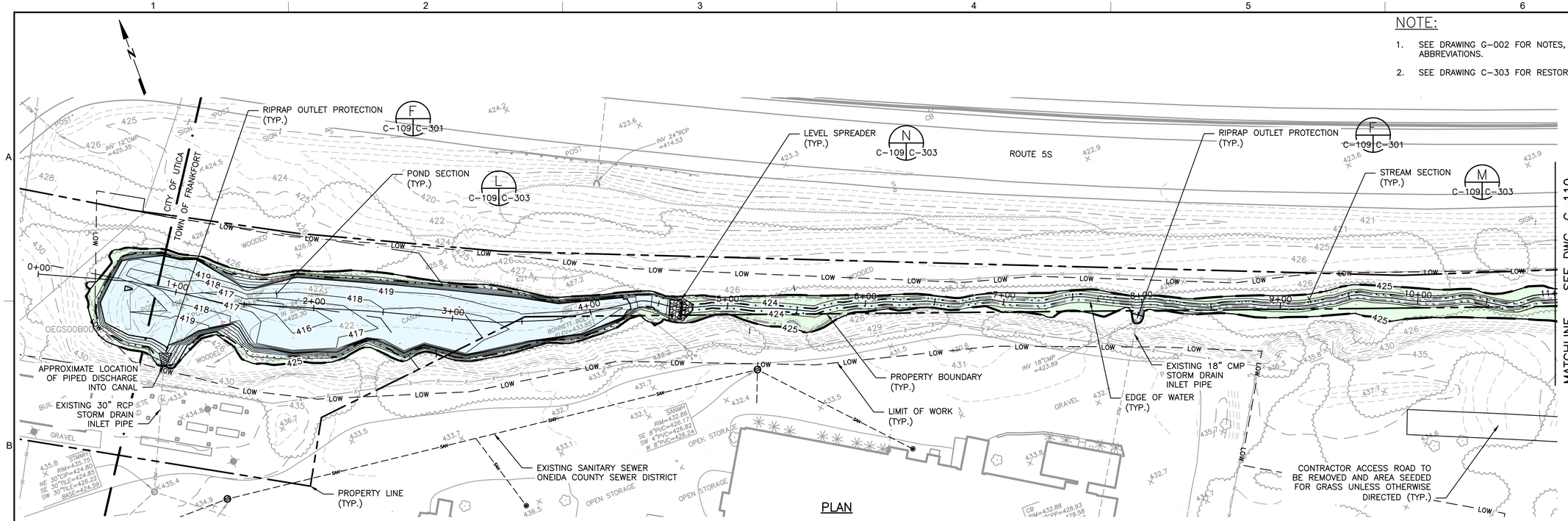
CIVIL
SITE RESTORATION PLAN

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

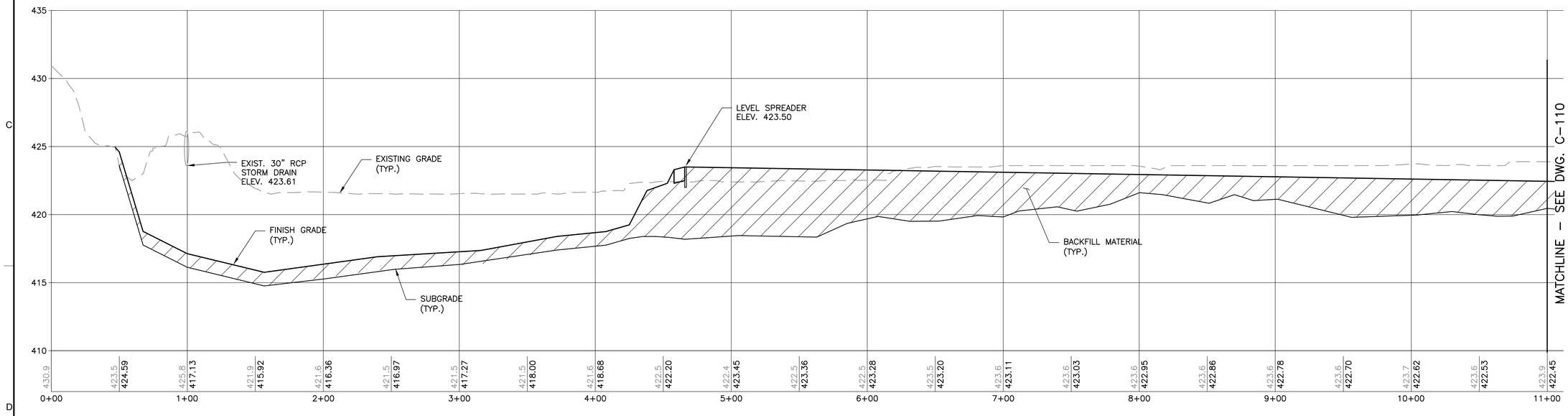
DATE	MAR 2020
	3612-12-2259
DWG	C-108
SHEET	10 OF 34

NOTE:

1. SEE DRAWING G–002 FOR NOTES, LEGENDS AND ABBREVIATIONS.
2. SEE DRAWING C–303 FOR RESTORATION DETAILS.



PLAN



PROFILE

SCALE IN FEET
VERT: 1"=5'

SCALE IN FEET
HORIZ: 1"=40'

DSGN	NO.	DATE	REVISION	BY	APVD
MAP	A	3/31/20	60% DESIGN SUBMITTAL TO NYSDEC	MAP	MJS
DR				CHK	APVD
MAP				WJW	MAP
					MJS

THIS DRAWING IS THE PROPERTY OF MACTEC, INCLUDING ALL PATENTED AND PATENTABLE FEATURES, AND/OR CONFIDENTIAL INFORMATION AND ITS USE IS CONDITIONED UPON THE USERS AGREEMENT NOT TO REPRODUCE THE DRAWING, IN WHOLE OR PART, NOR THE USE OF THE DRAWING FOR ANY PURPOSE OTHER THAN SPECIFICALLY PERMITTED IN WRITING BY MACTEC.

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

REMEDIAL ACTION
ERIE CANAL:
TOWN OF FRANKFORT SECTION SITE
FRANKFORT, NEW YORK
NYSDEC SITE NUMBER 622006

MACTEC Engineering and Consulting, P.C.
P.O. Box 1076, 1 Courthouse Street
Portland, Maine 04112–7050
(207) 775–5401

MACTEC

CIVIL
SITE RESTORATION
PLAN AND PROFILE
SHEET 1 OF 4

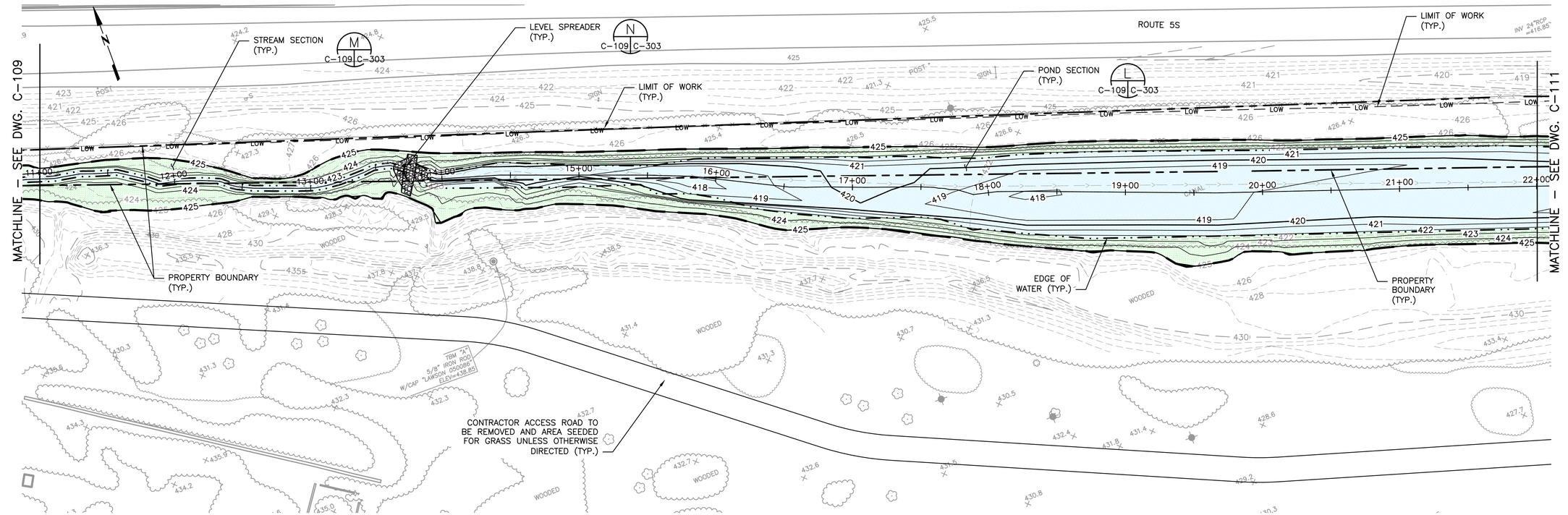
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	MAR 2020
	3612-12-2259
DWG	C-109
SHEET	11 OF 34

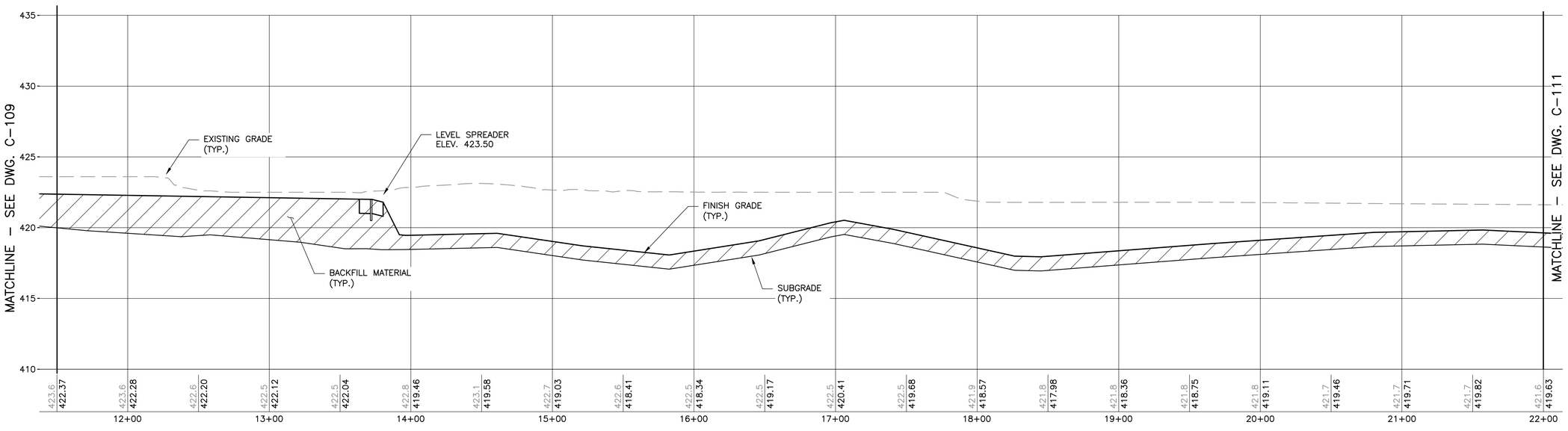
FILE NAME: C:\Users\william.whitten\OneDrive - Wood PLC\Projects\Old Erie Canal\Remedial Design\C-109 Restoration P_P.dwg PLOT DATE: Mon, 23 Mar 2020 PLOT TIME: 7:47 AM

NOTE:

1. SEE DRAWING G-002 FOR NOTES, LEGENDS AND ABBREVIATIONS.
2. SEE DRAWING C-303 FOR RESTORATION DETAILS.



PLAN



PROFILE

SCALE IN FEET
VERT: 1"=5'

SCALE IN FEET
HORIZ: 1"=40'

NO.	DATE	DSGN	DR	CHK	APVD	MJS
A	3/31/20	BPN	WJW	MAP	BY	APVD
		60% DESIGN SUBMITTAL TO NYSDEC				MJS
		REVISION				

THIS DRAWING IS THE PROPERTY OF MACTEC, INCLUDING ALL PATENTED AND PATENTABLE FEATURES, AND/OR CONFIDENTIAL INFORMATION AND ITS USE IS CONDITIONED UPON THE USERS AGREEMENT NOT TO REPRODUCE THE DRAWING, IN WHOLE OR PART, NOR THE MATERIAL DESCRIBED THEREON, NOR THE USE OF THE DRAWING FOR ANY PURPOSE OTHER THAN SPECIFICALLY PERMITTED IN WRITING BY MACTEC.

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

REMEDIAL ACTION
ERIE CANAL:
TOWN OF FRANKFORT SECTION SITE
FRANKFORT, NEW YORK
NYSDEC SITE NUMBER 622006

MACTEC Engineering and Consulting, P.C.
Pan Am Plaza, 1 Monument Street
Portland, Maine 04112-7050
(207) 775-5401

MACTEC

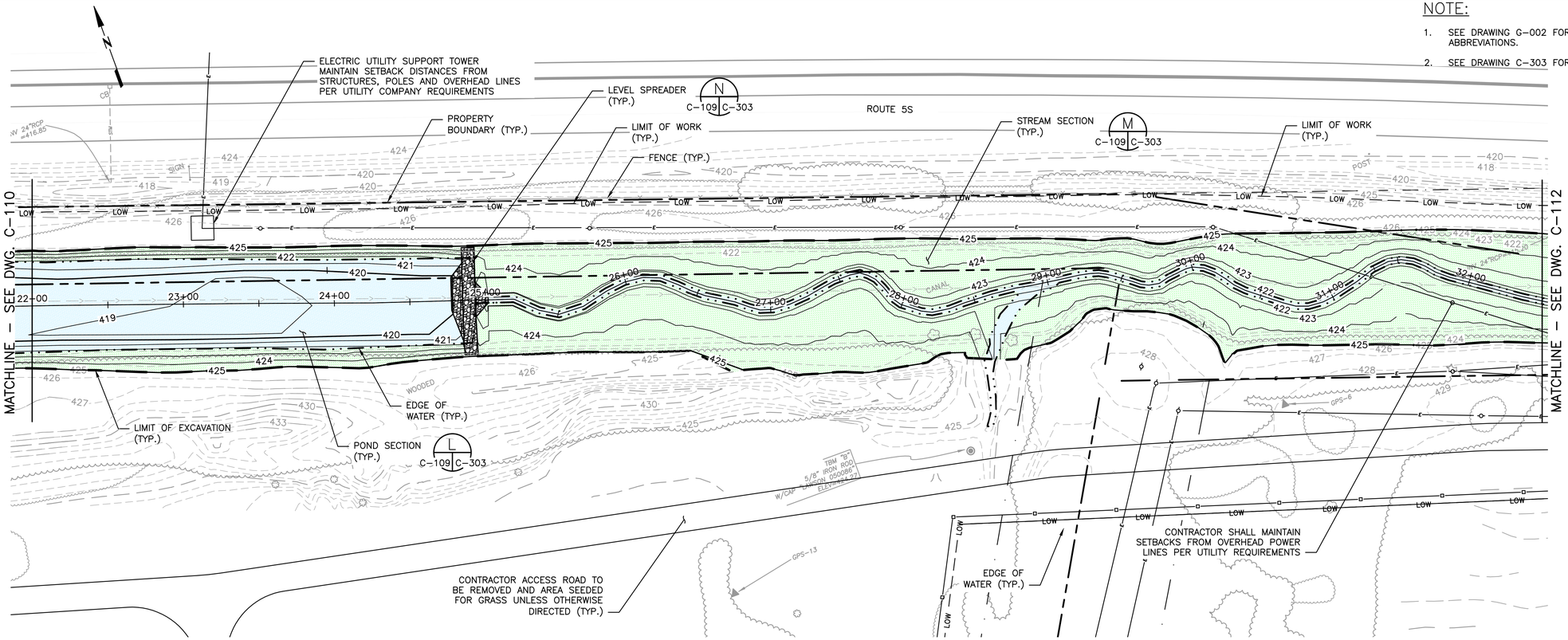
CIVIL
SITE RESTORATION
PLAN AND PROFILE
SHEET 2 OF 4

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

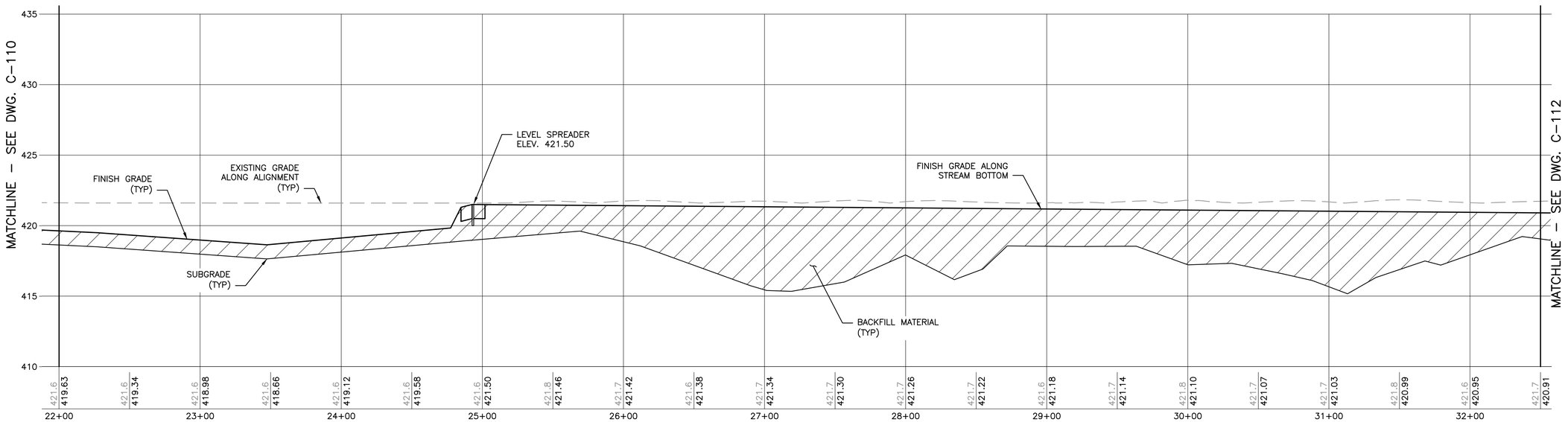
DATE	MAR 2020
	3612-12-2259
DWG	C-110
SHEET	12 OF 34

NOTE:

1. SEE DRAWING G-002 FOR NOTES, LEGENDS AND ABBREVIATIONS.
2. SEE DRAWING C-303 FOR RESTORATION DETAILS.



PLAN



PROFILE

0 2 4 8
SCALE IN FEET
VERT: 1"=5'

0 20 40 80
SCALE IN FEET
HORIZ: 1"=40'

NO.	DATE	DSGN	MAP	BY	APVD
A	3/31/20	BPN	DR	WJW	CHK

60% DESIGN SUBMITTAL TO NYSDEC

REVISION

MAP APVD MJS

THIS DRAWING IS THE PROPERTY OF MACTEC, INCLUDING ALL PATENTED AND PATENTABLE FEATURES, AND/OR CONFIDENTIAL INFORMATION AND ITS USE IS CONDITIONED UPON THE USERS AGREEMENT NOT TO REPRODUCE THE DRAWING, IN WHOLE OR PART, NOR THE USE OF THE DRAWING FOR ANY PURPOSE OTHER THAN SPECIFICALLY PERMITTED IN WRITING BY MACTEC.

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

REMEDIAL ACTION
ERIE CANAL:
TOWN OF FRANKFORT SECTION SITE
FRANKFORT, NEW YORK
NYSDEC SITE NUMBER 622006

MACTEC Engineering and Consulting, P.C.
P.O. Box 1076, 11 Commercial Street
Portland, Maine 04112-7050
(207) 775-5401

MACTEC

CIVIL

SITE RESTORATION
PLAN AND PROFILE
SHEET 3 OF 4

VERIFY SCALE

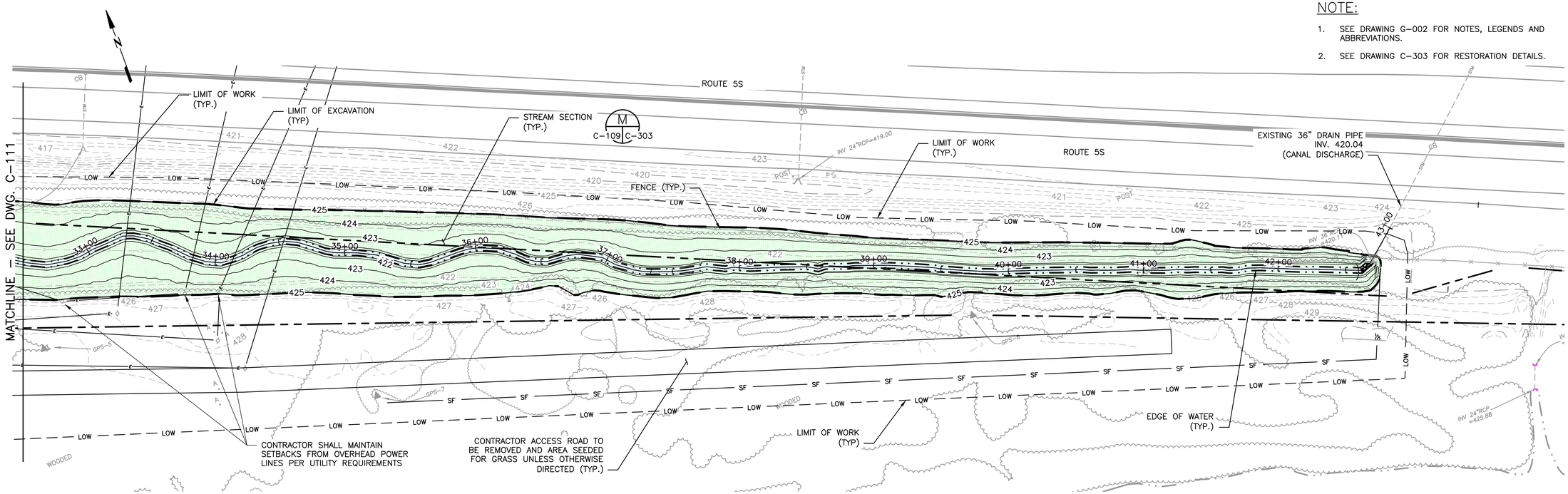
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	MAR 2020
	3612-12-2259
DWG	C-111
SHEET	13 OF 34

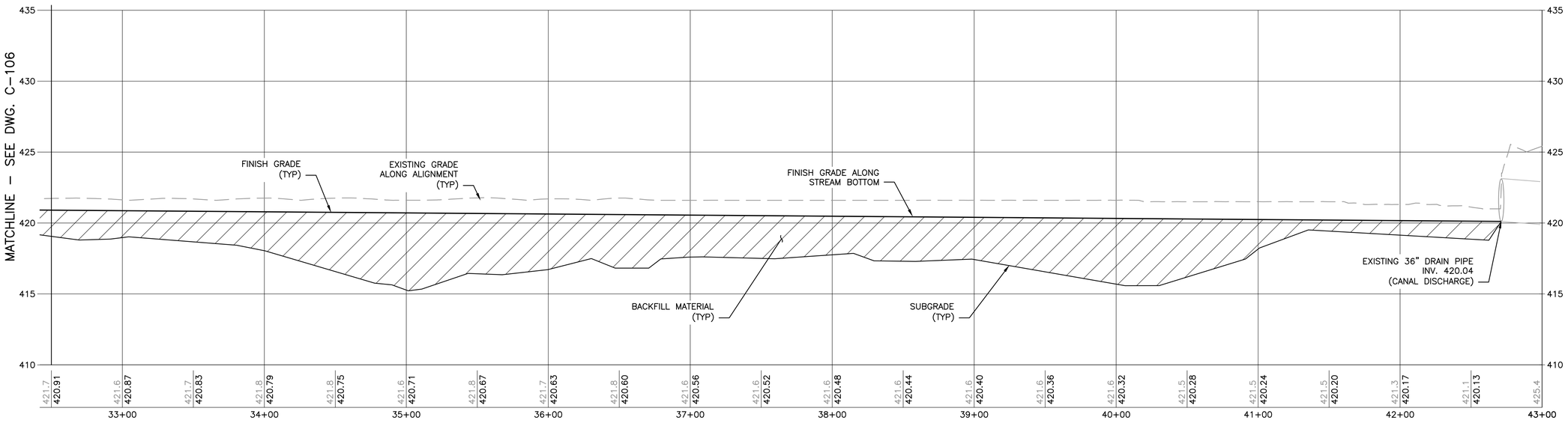
FILE NAME: Z:\Projects\nysdec1\Old Erie Canal\Remedial Design\C-111 Restoration P_P.dwg PLOT DATE: Mon, 16 Mar 2020 PLOT TIME: 1:56 PM

NOTE:

1. SEE DRAWING G-002 FOR NOTES, LEGENDS AND ABBREVIATIONS.
2. SEE DRAWING C-303 FOR RESTORATION DETAILS.



PLAN



PROFILE

SCALE IN FEET
VERT: 1"=5'

SCALE IN FEET
HORIZ: 1"=40'

NO.	DATE	DSGN
A	3/31/20	BPN

60% DESIGN SUBMITTAL TO NYSDEC

REVISION	CHK	DR
MAP	APVD	MJS
BY	APVD	MJS

THIS DRAWING IS THE PROPERTY OF MACTEC, INCLUDING ALL PATENTED AND PATENTABLE FEATURES, AND/OR CONFIDENTIAL INFORMATION AND ITS USE IS CONDITIONED UPON THE USERS AGREEMENT NOT TO REPRODUCE THE DRAWING, IN WHOLE OR PART, NOR THE USE OF THE DRAWING FOR ANY PURPOSE OTHER THAN SPECIFICALLY PERMITTED IN WRITING BY MACTEC.

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

REMEDIAL ACTION
ERIE CANAL:
TOWN OF FRANKFORT SECTION SITE
FRANKFORT, NEW YORK
NYSDEC SITE NUMBER 622006

MACTEC Engineering and Consulting, P.C.
P.O. Box 1026, 1 Courthouse Street
Portland, Maine 04112-7050
(207) 775-5401

MACTEC

CIVIL
SITE RESTORATION
PLAN AND PROFILE
SHEET 4 OF 4

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	MAR 2020
	3612-12-2259
DWG	C-112
SHEET	14 OF 34

APPENDIX B: FLOOD INSURANCE RATE MAP

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION IN FT. (NGVD)[1]	DESCRIPTION OF LOCATION
RM 1	413.12	Masonry nail set in centerline of intersection of Broad Street and Zoar Avenue.
RM 2	414.58	Box cut on top of corner of concrete bridge deck at southwest corner of Dyke Road bridge over the Mohawk River.
RM 3	408.19	X cut on top of bolt of railroad bridge over the Mohawk River.
RM 4	410.6	Box cut on corner of stone approximately 5 feet above road at southwest corner of old railroad bridge approximately 30 feet north of Old Route 5S, approximately 200 feet west of San-Bro Ballite Frozen Meats.
RM 5	405.78	Box cut on top of southwest corner of concrete headwall, approximately 75 feet north of centerline of Old Route 5S approximately 100 feet east of intersection of Old Route 5S and west entrance into Mohawk Valley Power Production Plant.
RM 6	414.3	Box cut on top of southwest corner of concrete headwall on south side of Old Route 5S, approximately 150 feet west of tin building No. 39 owned by Waste Management of New York/Utica.
RM 7	428.32	Masonry nail in centerline of Old Route 5S at intersection with dirt driveway to southeast of house No. 31.
RM 8	419.74	Masonry nail set in centerline of Old Route 5S at intersection with dirt farm lane to south.
RM 9	401.6	Box cut on southeast corner of concrete headwall on east side of Old Route 5S at north edge of power lines.

[1]National Geodetic Vertical Datum of 1929

NOTES TO USERS

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations and therefore may not exactly reflect the flood elevation data presented in the FIS report. For construction and/or floodplain management purposes, users are encouraged to use the flood elevation data presented in the FIS report in conjunction with the data shown on this FIRM.

Elevation Reference Mark (ERM) elevations listed on this map were obtained from the National Geodetic Survey (NGS) data base. For descriptions of flood elevations and floodplain boundaries portrayed on this map, users should be aware that these ERM elevations may have changed since the publication of this map. To obtain up-to-date elevation information on National Geodetic Survey (NGS) ERMs shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at WWW.NGS.NOAA.GOV. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

DIGITAL DATA AVAILABILITY: Digital files containing the thematic floodplain information shown on this map can be made available on CD-ROM by request. The files are currently archived in MicroStation Image (DGN) file format referenced to the Universal Transverse Mercator (UTM) projection and the North American Datum of 1927 (NAD27). To obtain the digital files, send a written request to: Flood Insurance Information Specialist, 2977 Prosperity Avenue, Fairfax, Virginia 22031. Telephone: (703) 876-0160, Fax: (703) 876-0073.

LEGE

SPECIAL FLOOD HA
BY 100-YEAR FLOOD

ZONE A — No base
ZONE AE — Base flo
ZONE AH — Flood d
ponding
ZONE AO — Flood d
flow ve
determ
velocit
ZONE AR/A99 — To be p
Federal
structur
mitigat
ZONE V — Coastal
action;
ZONE VE — Coastal
actions;

FLOODWAY AREAS

OTHER FLOOD AR

ZONE X — Areas of
flood ve
or with
and are
flood

OTHER AREAS

ZONE X — Areas d
floodpla
ZONE D — Areas in
exist, f

UNDEVELOPED CO

Identified (1982)

* Coastal barrier zones are normally located
Hazard Areas.

Floo
Floo
Zone
Boun
CBRS
OPA

Base
Cross
Trans
Base
elevat
Boun
Flood

(EL. 987)

RM7 ×
●M1.5

**Referenced to the National Geodetic Ver

NOTES TO

This map is for use in administering the
does not necessarily identify all areas subj
Drainage sources of small size, or all
Flood Hazard Areas. The community may
possible updated flood hazard information
purchase or construction purposes.

Coastal base flood elevations apply only be
Datum of 1929 (NGVD) and include the e
may also differ significantly from those
Service for hurricane evacuation planning.

Areas of Special Flood Hazard (100-year flo
V, and VE.

Certain areas not in Special Flood Hazard
control structures.

Boundaries of the floodways were compute
between cross sections. The floodways we
with regard to requirements of the Federa

Boundary widths in some areas may be too
widths are provided in the Flood Insurance

For adjoining map panels see separately

NOTE: This coordinate system, exact ho
area Rate Map (FIRM) is Universal Transv
Datum of 1927 (NAD27). Clarke 1866 ellip
spheroid used in the production of FIRMs
in slight positional differences in map fe
These differences do not affect the accura
FIRM.

ATTENTION: Flood elevations on this m
Geodetic Vertical Datum of 1929. These e
to structures and ground elevations refere
mation regarding conversion between th
of 1929 and the North American Vertical
Geodetic Survey at the following address

Vertical Network Branch, N/CG33
National Geodetic Survey, NOAA
Silver Spring Metro Center 3
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

BASE MAP SOURCE: Planimetric base
U.S. Geological Survey 7.5-Minute Series
compiled at a scale of 1:24,000. Additiona
from other sources. Users of this FIRM s
may have been made to specific base m

MAP REPOSI

Frankfort Town Hall, 96 South Litchfield S
available for reference only; not for distribu

INITIAL IDENTIFI
MARCH 1, 197

FLOOD HAZARD BOUNDAR
MAY 26, 1978; JANU

FLOOD INSURANCE RATE
APRIL 17, 19

FLOOD INSURANCE RATE
December 20, 2000 - to add base flood
special flood hazard areas and zone des
to reflect updated topographic informati

To determine if flood insurance is avail
insurance agent or call the National Flood

APPROXIMA

1000 0

NATIONAL FLO

FIRM
FLOOD INS

TOWN OF
FRANKFO
NEW YO
HERKIMER

PANEL 10 OF

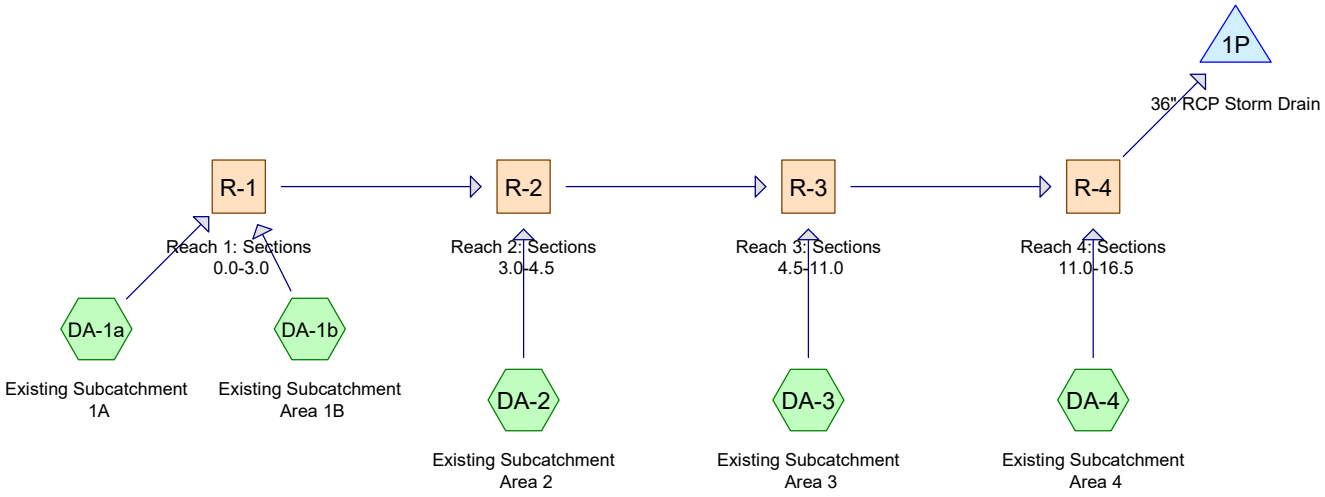
SEE MAP INDE

COMMU

Federal Emerg

APPENDIX C: HYDROCAD MODEL REPORT

APPENDIX C.1 HYDROCAD EXISTING REPORT



Subcat Reach Pond Link

Routing Diagram for Old Erie Canal - Existing
Prepared by Wood, Printed 5/19/2020
HydroCAD® 10.00 s/n 00677 © 2011 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
78.050	40	Brush, Good, HSG A/B (DA-1b)
6.830	43	Woods, Good, HSG A/B (DA-3)
9.880	46	Brush, Fair, HSG A/B (DA-2)
14.320	50	>75% Grass cover, Good, HSG A/B (DA-1a)
91.150	55	Woods, Good, HSG A/B (DA-1b)
104.220	56	2 acre lots, 12% imp, HSG B/A (DA-1b)
47.030	56	Brush, Fair, HSG B (DA-3, DA-4)
43.640	62	1/2 acre lots, 25% imp, HSG A/B (DA-1b)
2.470	77	Brush, Fair, HSG D (DA-1a, DA-1b, DA-2)
3.120	77	Brush, Fair, HSG D - Canal (DA-3, DA-4)
30.090	88	Urban industrial, 72% imp, HSG B (DA-1a, DA-1b)
16.600	92	Urban Ind/Com, 85% imp, HSG B (DA-2)
17.620	92	Urban commercial, 85% imp, HSG B (DA-3)
465.020	**58**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
243.870	HSG A	DA-1a, DA-1b, DA-2, DA-3
215.560	HSG B	DA-1a, DA-1b, DA-2, DA-3, DA-4
0.000	HSG C	
5.590	HSG D	DA-1a, DA-1b, DA-2, DA-3, DA-4
0.000	Other	
465.020		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
43.640	0.000	0.000	0.000	0.000	43.640	1/2 acre lots, 25% imp	DA-1b
0.000	104.220	0.000	0.000	0.000	104.220	2 acre lots, 12% imp	DA-1b
14.320	0.000	0.000	0.000	0.000	14.320	>75% Grass cover, Good	DA-1a
0.000	12.880	0.000	3.120	0.000	16.000	Brush, Fair	DA-3, DA-4
0.000	17.620	0.000	0.000	0.000	17.620	Urban commercial, 85% imp	DA-3
9.880	34.150	0.000	0.800	0.000	44.830	Brush, Fair	DA-2, DA-3
78.050	0.000	0.000	0.000	0.000	78.050	Brush, Good	DA-1b
0.000	16.600	0.000	0.000	0.000	16.600	Urban Ind/Com, 85% imp	DA-2
0.000	30.090	0.000	0.000	0.000	30.090	Urban industrial, 72% imp	DA-1a, DA-1b
0.000	0.000	0.000	1.670	0.000	1.670	Brush, Fair	DA-1a, DA-1b
97.980	0.000	0.000	0.000	0.000	97.980	Woods, Good	DA-1b, DA-3
243.870	**215.560**	**0.000**	**5.590**	**0.000**	**465.020**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	420.11	419.37	155.0	0.0048	0.012	36.0	0.0	0.0

Time span=0.00-45.00 hrs, dt=0.01 hrs, 4501 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment DA-1a: Existing Runoff Area=26.630 ac 31.07% Impervious Runoff Depth=0.21"
Flow Length=1,872' Slope=0.0370 '/' Tc=39.4 min CN=67 Runoff=1.93 cfs 0.457 af

Subcatchment DA-1b: Existing Runoff Area=336.510 ac 10.94% Impervious Runoff Depth>0.02"
Flow Length=8,612' Slope=0.0050 '/' Tc=494.2 min CN=55 Runoff=0.73 cfs 0.696 af

Subcatchment DA-2: Existing Runoff Area=27.280 ac 51.72% Impervious Runoff Depth=0.43"
Flow Length=2,428' Slope=0.0226 '/' Tc=49.9 min CN=75 Runoff=5.63 cfs 0.980 af

Subcatchment DA-3: Existing Runoff Area=60.080 ac 24.93% Impervious Runoff Depth=0.18"
Flow Length=3,650' Slope=0.0160 '/' Tc=105.0 min CN=66 Runoff=2.09 cfs 0.921 af

Subcatchment DA-4: Existing Runoff Area=14.520 ac 0.00% Impervious Runoff Depth=0.05"
Flow Length=830' Slope=0.0470 '/' Tc=23.0 min CN=58 Runoff=0.09 cfs 0.065 af

Reach R-1: Reach 1: Sections 0.0-3.0 Avg. Flow Depth=0.18' Max Vel=0.35 fps Inflow=1.93 cfs 1.153 af
L=850.0' S=0.0006 '/' Capacity=337.25 cfs Outflow=1.17 cfs 1.151 af

Reach R-2: Reach 2: Sections 3.0-4.5 Avg. Flow Depth=0.53' Max Vel=0.67 fps Inflow=6.36 cfs 2.131 af
L=400.0' S=0.0010 '/' Capacity=105.23 cfs Outflow=6.03 cfs 2.129 af

Reach R-3: Reach 3: Sections 4.5-11.0 Avg. Flow Depth=0.24' Max Vel=0.64 fps Inflow=6.94 cfs 3.050 af
L=1,615.0' S=0.0013 '/' Capacity=1,025.60 cfs Outflow=5.23 cfs 3.044 af

Reach R-4: Reach 4: Sections 11.0-16.5 Avg. Flow Depth=0.61' Max Vel=0.69 fps Inflow=5.31 cfs 3.109 af
L=1,256.0' S=0.0007 '/' Capacity=169.95 cfs Outflow=4.85 cfs 3.102 af

Pond 1P: 36" RCP Storm Drain Peak Elev=420.99' Storage=13 cf Inflow=4.85 cfs 3.102 af
Primary=4.85 cfs 3.102 af Secondary=0.00 cfs 0.000 af Outflow=4.85 cfs 3.102 af

Total Runoff Area = 465.020 ac Runoff Volume = 3.119 af Average Runoff Depth = 0.08"
84.05% Pervious = 390.852 ac 15.95% Impervious = 74.168 ac

Summary for Subcatchment DA-1a: Existing Subcatchment 1A

Area sized to give full flow through pipe during 10 yr storm.

Flow source assumed to be residential drainage from neighborhoods to the west.

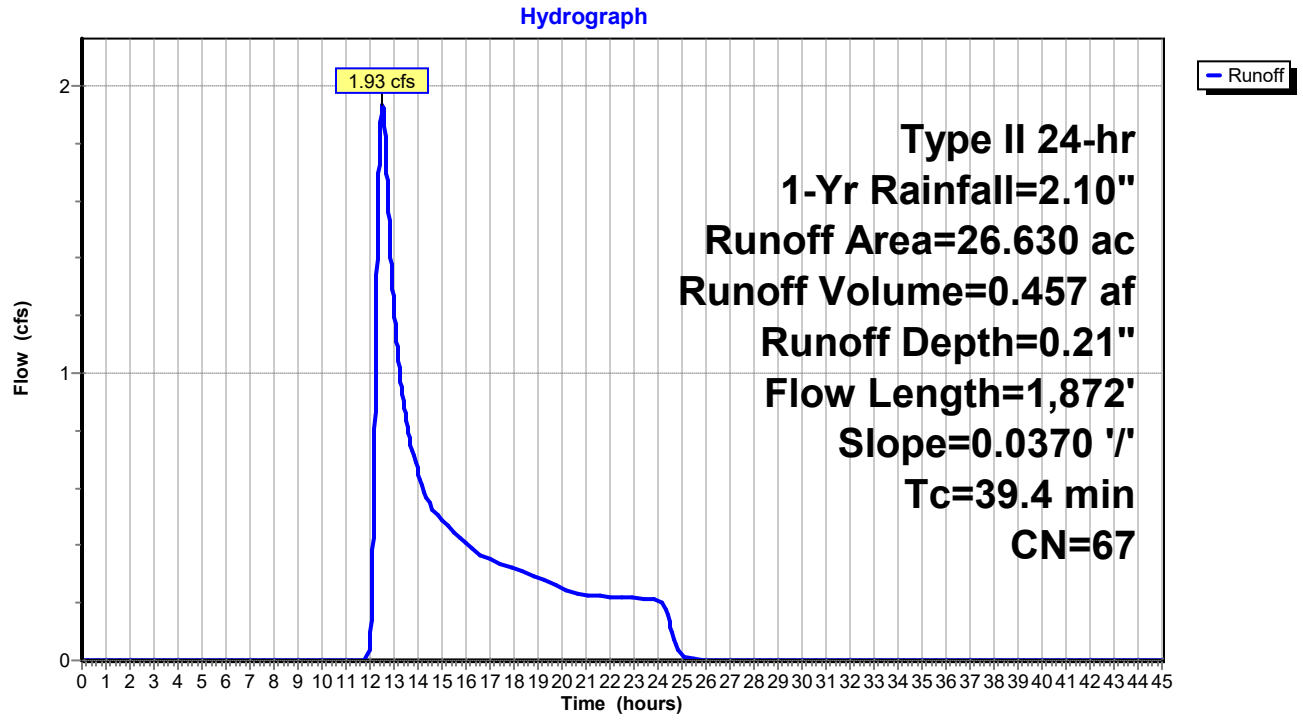
Runoff = 1.93 cfs @ 12.52 hrs, Volume= 0.457 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.10"

	Area (ac)	CN	Description
*	14.320	50	>75% Grass cover, Good, HSG A/B
	11.490	88	Urban industrial, 72% imp, HSG B
	0.820	77	Brush, Fair, HSG D
	26.630	67	Weighted Average
	18.357		68.93% Pervious Area
	8.273		31.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.4	1,872	0.0370	0.79		**Lag/CN Method,**

Subcatchment DA-1a: Existing Subcatchment 1A



Summary for Subcatchment DA-1b: Existing Subcatchment Area 1B

See map A for total area of 188,420 sf.

Estimated 10% roof surface, 70% gravel surfaces, 20% near water as grass and forest.

Slope of flow: 438 to 435 surface elevation over 300 feet for gravel; 435 to 421 over 50 feet

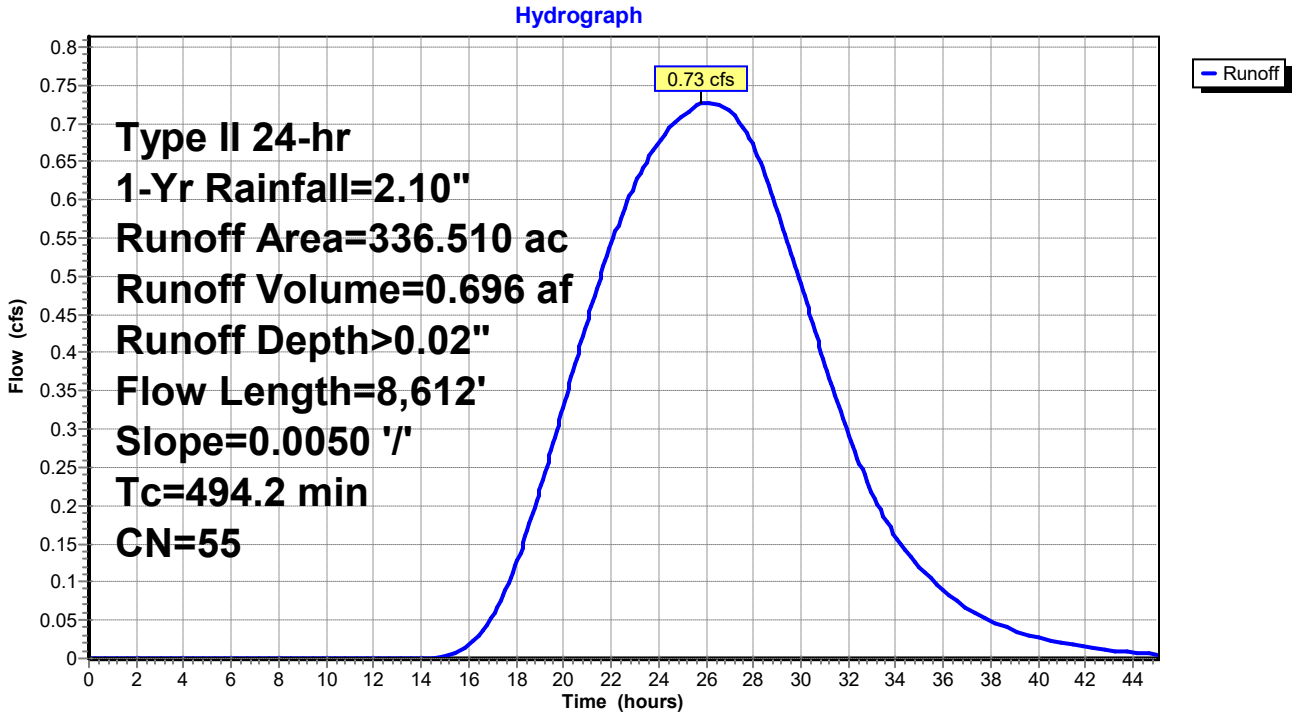
Runoff = 0.73 cfs @ 25.82 hrs, Volume= 0.696 af, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.10"

	Area (ac)	CN	Description
*	43.640	62	1/2 acre lots, 25% imp, HSG A/B
	18.600	88	Urban industrial, 72% imp, HSG B
*	91.150	55	Woods, Good, HSG A/B
*	78.050	40	Brush, Good, HSG A/B
*	104.220	56	2 acre lots, 12% imp, HSG B/A
	0.850	77	Brush, Fair, HSG D
	336.510	55	Weighted Average
	299.702		89.06% Pervious Area
	36.808		10.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
494.2	8,612	0.0050	0.29		**Lag/CN Method, Incude Est Attenuation**

Subcatchment DA-1b: Existing Subcatchment Area 1B



Summary for Subcatchment DA-2: Existing Subcatchment Area 2

Cover type: industrial type A soils based on Maps C, D and F.

Channel Tc:

Slope as 445 inlet to 420 outlet over 460 feet.

Perimiter as length (460)x2 + width (50)x2.

X-sec area estimated as rectangular with 5' depth and 25' wide.

Other Tc area: 16' elev over 430 feet. Unpaved based on aerial photography.

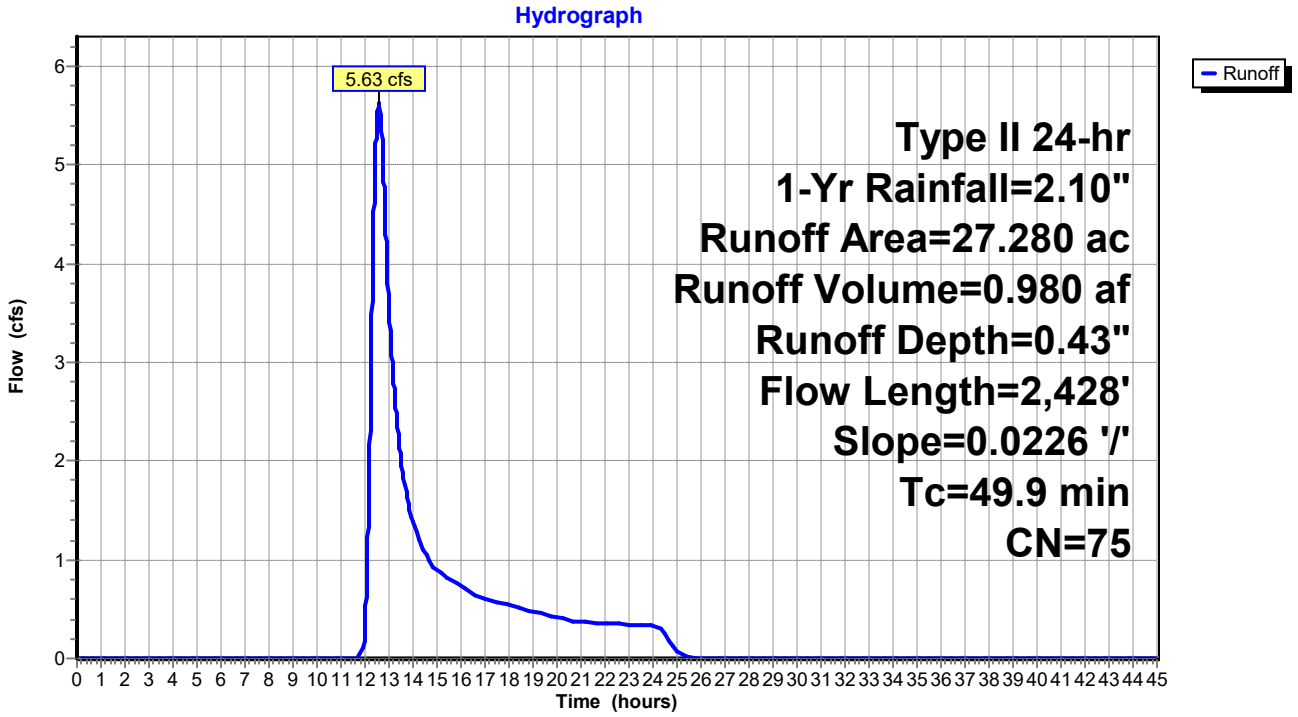
Runoff = 5.63 cfs @ 12.59 hrs, Volume= 0.980 af, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.10"

	Area (ac)	CN	Description
*	16.600	92	Urban Ind/Com, 85% imp, HSG B
*	9.880	46	Brush, Fair, HSG A/B
	0.800	77	Brush, Fair, HSG D
	27.280	75	Weighted Average
	13.170		48.28% Pervious Area
	14.110		51.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.9	2,428	0.0226	0.81		**Lag/CN Method,**

Subcatchment DA-2: Existing Subcatchment Area 2



Summary for Subcatchment DA-3: Existing Subcatchment Area 3

Cover type: 20% industrial class A, 30% wood class B, 30% range class B, 20% grass class B for large area south of Bleecker. 55% grass 45% wood class B for area west of channel and north of Bleecker.

Channel Tc:

Slope as 452 inlet to 419 outlet over 565 feet.

Perimiter as length 565'x2 + width (12')x2.

X-sec area estimated as rectangular with 5' depth and 12' wide.

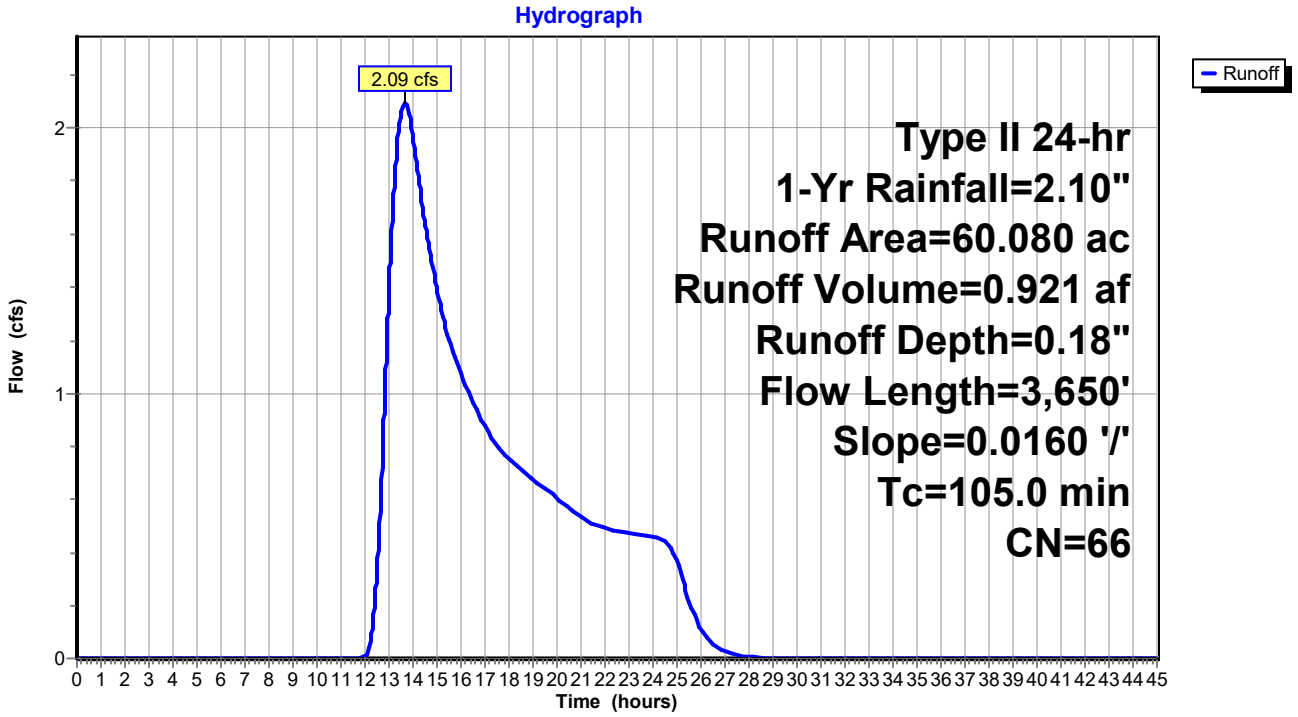
Runoff = 2.09 cfs @ 13.65 hrs, Volume= 0.921 af, Depth= 0.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.10"

	Area (ac)	CN	Description
	17.620	92	Urban commercial, 85% imp, HSG B
*	6.830	43	Woods, Good, HSG A/B
	34.150	56	Brush, Fair, HSG B
*	1.480	77	Brush, Fair, HSG D - Canal
	60.080	66	Weighted Average
	45.103		75.07% Pervious Area
	14.977		24.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
105.0	3,650	0.0160	0.58		**Lag/CN Method,**

Subcatchment DA-3: Existing Subcatchment Area 3



Summary for Subcatchment DA-4: Existing Subcatchment Area 4

See Map A for area of subcatchment and farthest run for Tc. Slope calculated as 725 foot run from 460 to 418 elevation.

CN for area average of A and B soil groups for grass/woodland.

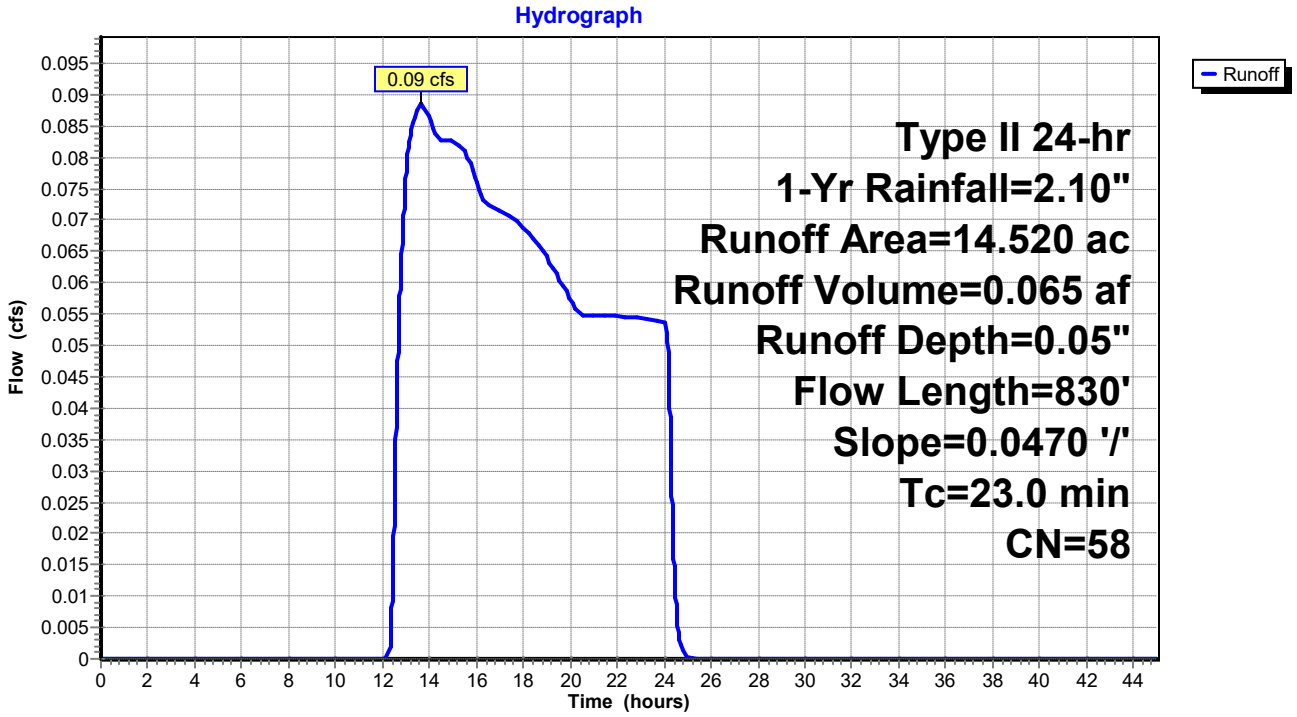
Runoff = 0.09 cfs @ 13.62 hrs, Volume= 0.065 af, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.10"

	Area (ac)	CN	Description
	12.880	56	Brush, Fair, HSG B
*	1.640	77	Brush, Fair, HSG D - Canal
	14.520	58	Weighted Average
	14.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	830	0.0470	0.60		**Lag/CN Method,**

Subcatchment DA-4: Existing Subcatchment Area 4



Summary for Reach R-1: Reach 1: Sections 0.0-3.0

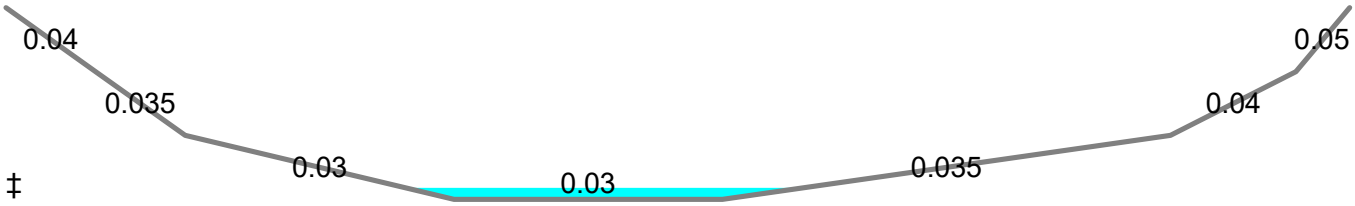
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 363.140 ac, 12.41% Impervious, Inflow Depth > 0.04" for 1-Yr event
Inflow = 1.93 cfs @ 12.52 hrs, Volume= 1.153 af
Outflow = 1.17 cfs @ 13.06 hrs, Volume= 1.151 af, Atten= 40%, Lag= 32.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.35 fps, Min. Travel Time= 40.9 min
Avg. Velocity = 0.22 fps, Avg. Travel Time= 63.0 min

Peak Storage= 2,873 cf @ 13.06 hrs
Average Depth at Peak Storage= 0.18'
Defined Flood Depth= 426.00' Flow Area= 31,841.2 sf, Capacity= 95,948.09 cfs
Bank-Full Depth= 3.00' Flow Area= 167.0 sf, Capacity= 337.25 cfs

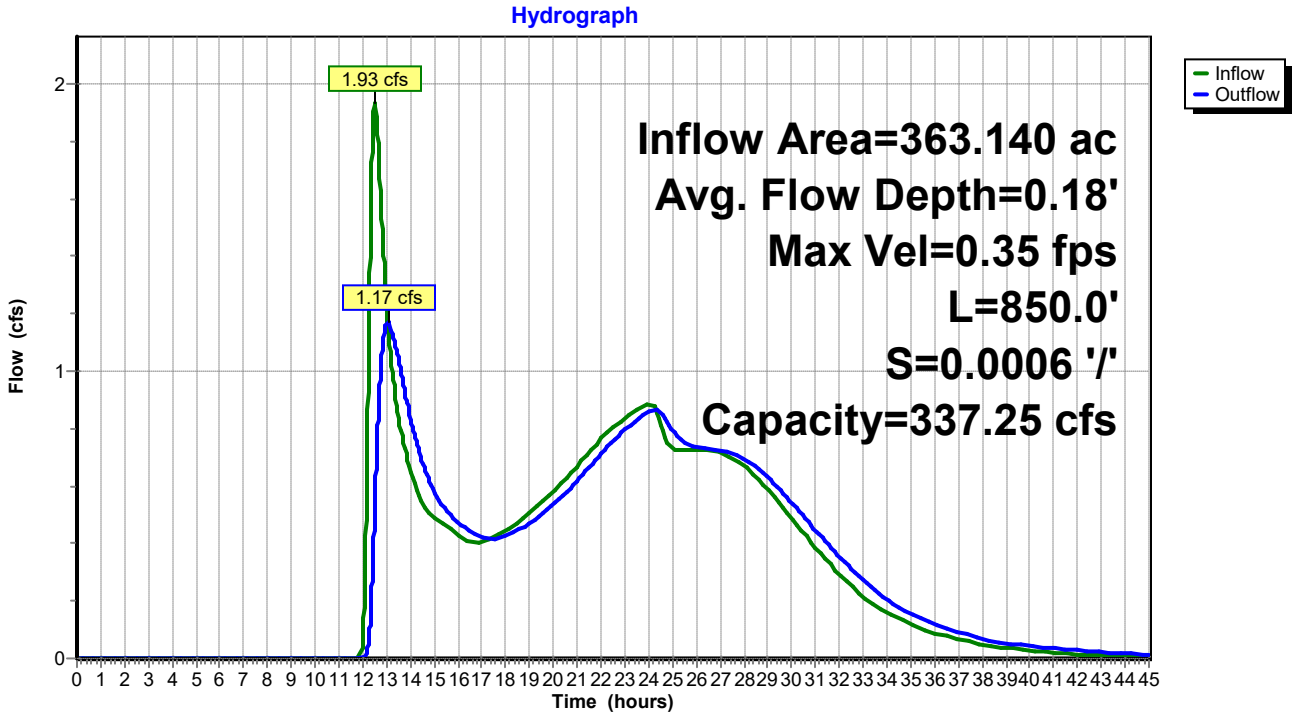
Custom cross-section, Length= 850.0' Slope= 0.0006 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 424.00', Outlet Invert= 423.50'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
25.00	425.00	0.00		
30.00	424.00	1.00	0.040	Earth, dense weeds
35.00	423.00	2.00	0.035	Earth, dense weeds
50.00	422.00	3.00	0.030	Earth, clean & winding
65.00	422.00	3.00	0.030	Earth, clean & winding
90.00	423.00	2.00	0.035	Earth, dense weeds
97.00	424.00	1.00	0.040	Earth, dense weeds
100.00	425.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	15.0	0	0.00
1.00	35.0	55.1	29,750	30.40
2.00	96.0	67.2	81,600	145.67
3.00	167.0	75.5	141,950	337.25

Reach R-1: Reach 1: Sections 0.0-3.0



Summary for Reach R-2: Reach 2: Sections 3.0-4.5

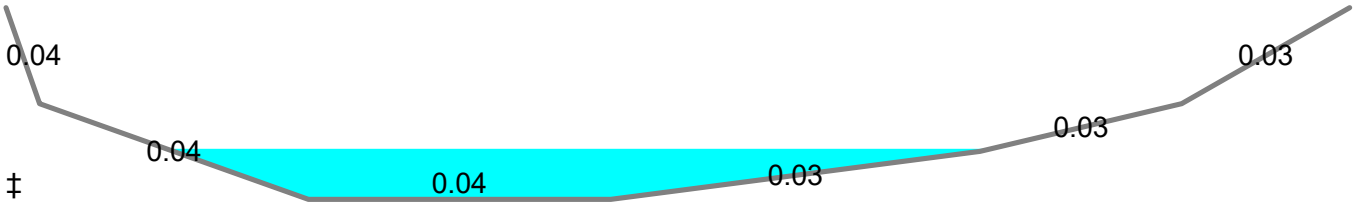
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 390.420 ac, 15.16% Impervious, Inflow Depth > 0.07" for 1-Yr event
Inflow = 6.36 cfs @ 12.63 hrs, Volume= 2.131 af
Outflow = 6.03 cfs @ 12.76 hrs, Volume= 2.129 af, Atten= 5%, Lag= 8.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.67 fps, Min. Travel Time= 9.9 min
Avg. Velocity = 0.30 fps, Avg. Travel Time= 22.2 min

Peak Storage= 3,581 cf @ 12.76 hrs
Average Depth at Peak Storage= 0.53'
Defined Flood Depth= 426.00' Flow Area= 16,994.3 sf, Capacity= 45,417.71 cfs
Bank-Full Depth= 2.00' Flow Area= 59.8 sf, Capacity= 105.23 cfs

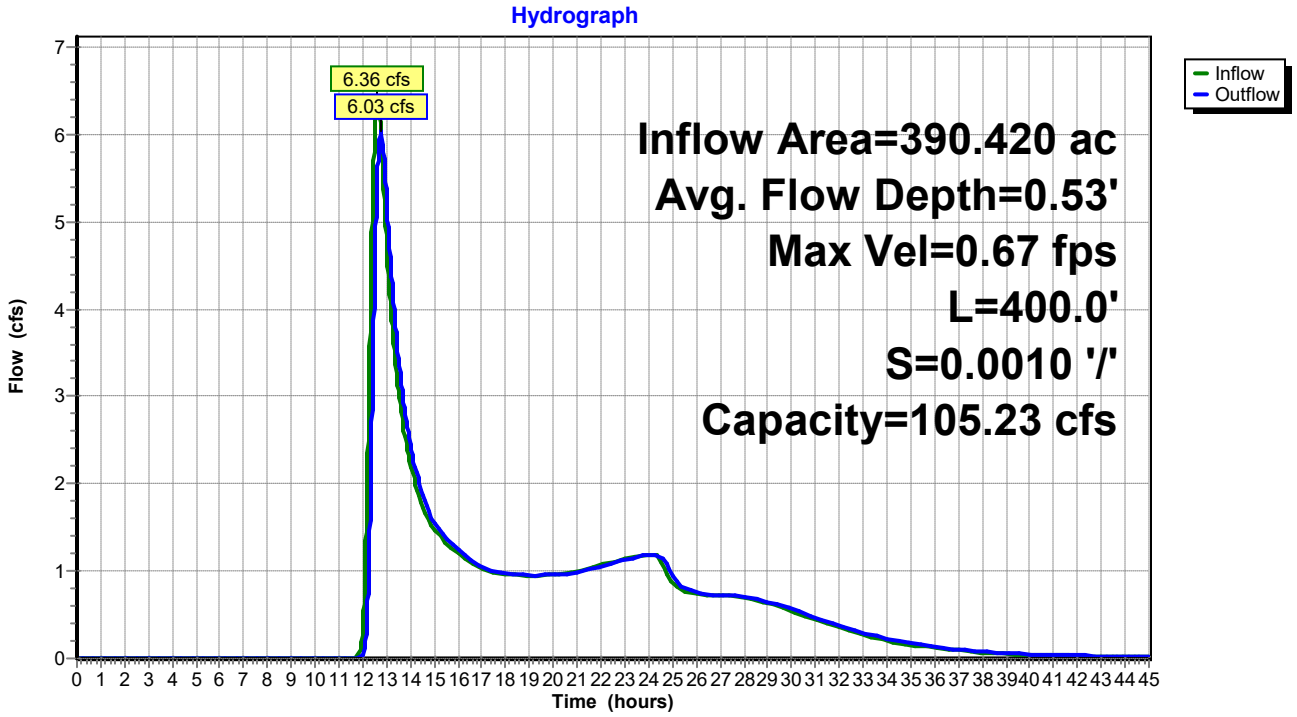
Custom cross-section, Length= 400.0' Slope= 0.0010 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.50', Outlet Invert= 423.10'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
40.00	425.00	0.00		
41.00	424.00	1.00	0.040	Earth, dense weeds
49.00	423.00	2.00	0.040	Earth, dense weeds
58.00	423.00	2.00	0.040	Earth, dense weeds
69.00	423.50	1.50	0.030	Earth, grassed & winding
75.00	424.00	1.00	0.030	
80.00	425.00	0.00	0.030	

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	9.0	0	0.00
0.50	8.3	24.0	3,300	5.34
1.00	22.8	34.1	9,100	23.27
2.00	59.8	40.6	23,900	105.23

Reach R-2: Reach 2: Sections 3.0-4.5



Summary for Reach R-3: Reach 3: Sections 4.5-11.0

Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 450.500 ac, 16.46% Impervious, Inflow Depth > 0.08" for 1-Yr event
Inflow = 6.94 cfs @ 12.83 hrs, Volume= 3.050 af
Outflow = 5.23 cfs @ 13.62 hrs, Volume= 3.044 af, Atten= 25%, Lag= 47.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.64 fps, Min. Travel Time= 41.9 min
Avg. Velocity = 0.33 fps, Avg. Travel Time= 80.7 min

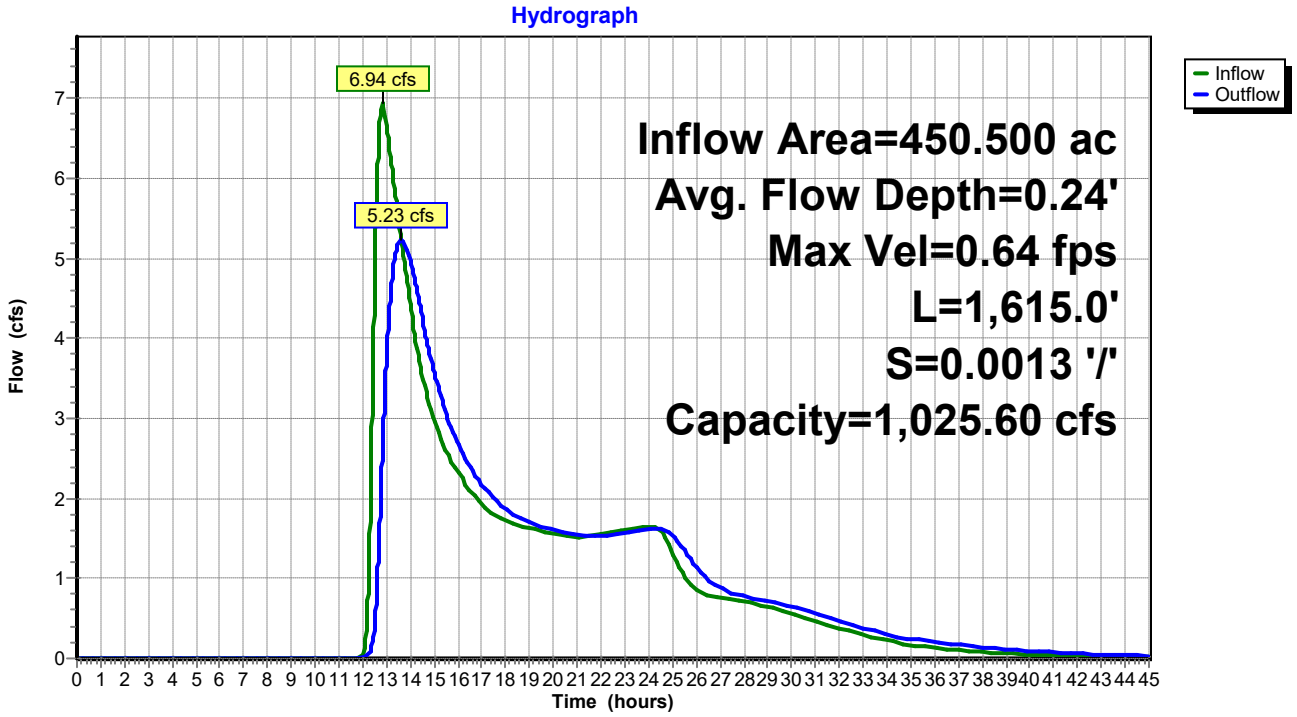
Peak Storage= 13,125 cf @ 13.62 hrs
Average Depth at Peak Storage= 0.24'
Defined Flood Depth= 426.00' Flow Area= 31,858.3 sf, Capacity= 198,961.16 cfs
Bank-Full Depth= 4.00' Flow Area= 250.5 sf, Capacity= 1,025.60 cfs

Custom cross-section, Length= 1,615.0' Slope= 0.0013 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.10', Outlet Invert= 421.00'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
15.00	426.00	0.00		
17.00	425.00	1.00	0.050	Earth, long dense weeds
19.00	424.00	2.00	0.040	Earth, dense weeds
21.00	423.00	3.00	0.035	Earth, dense weeds
50.00	422.00	4.00	0.030	Earth, clean & winding
80.00	422.00	4.00	0.030	Earth, clean & winding
83.00	423.00	3.00	0.035	Earth, dense weeds
85.00	424.00	2.00	0.040	Earth, cobble bottom, clean sides
87.00	425.00	1.00	0.050	Earth, long dense weeds
90.00	426.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	30.0	0	0.00
1.00	46.0	62.2	74,290	67.24
2.00	110.0	66.7	177,650	279.24
3.00	178.0	71.1	287,470	602.50
4.00	250.5	76.5	404,558	1,025.60

Reach R-3: Reach 3: Sections 4.5-11.0



Summary for Reach R-4: Reach 4: Sections 11.0-16.5

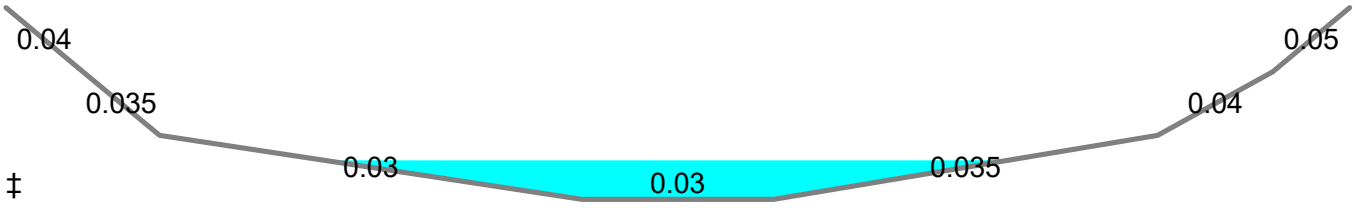
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 0.08" for 1-Yr event
Inflow = 5.31 cfs @ 13.62 hrs, Volume= 3.109 af
Outflow = 4.85 cfs @ 14.15 hrs, Volume= 3.102 af, Atten= 9%, Lag= 31.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.69 fps, Min. Travel Time= 30.2 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 51.2 min

Peak Storage= 8,806 cf @ 14.15 hrs
Average Depth at Peak Storage= 0.61'
Defined Flood Depth= 426.00' Flow Area= 14,856.6 sf, Capacity= 48,804.33 cfs
Bank-Full Depth= 3.00' Flow Area= 77.0 sf, Capacity= 169.95 cfs

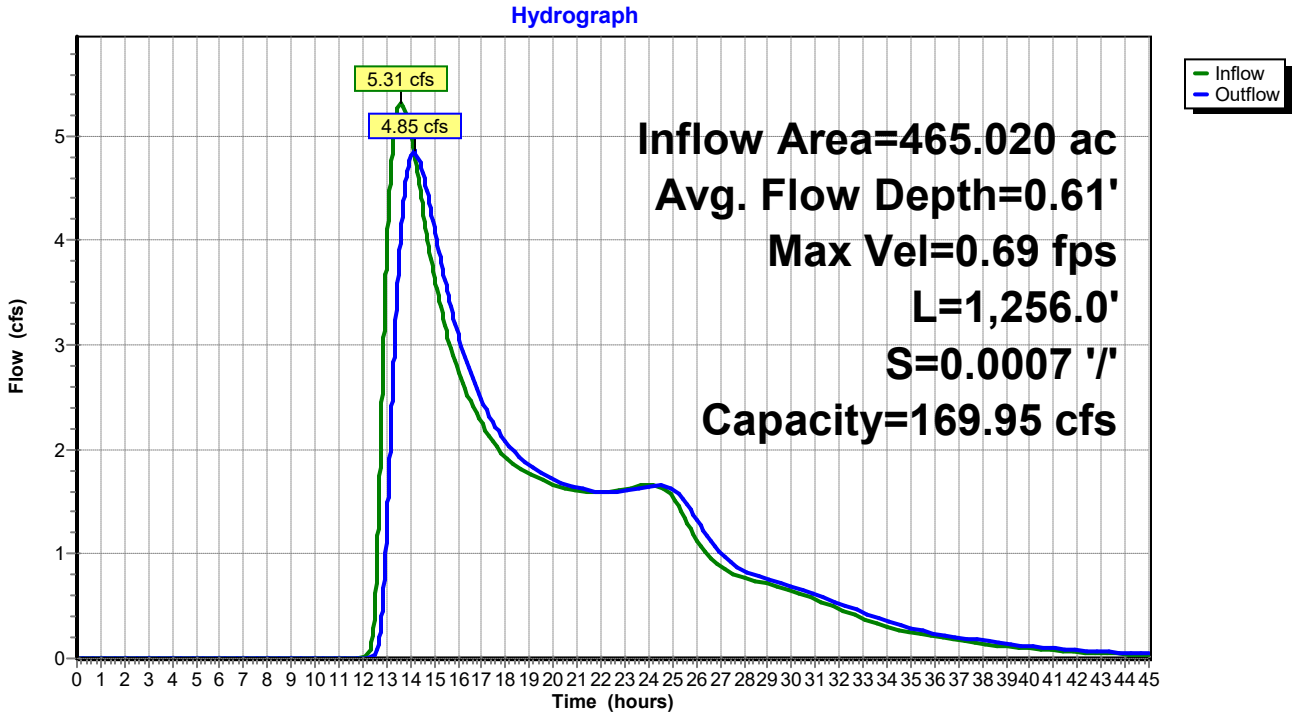
Custom cross-section, Length= 1,256.0' Slope= 0.0007 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 421.00', Outlet Invert= 420.11'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
35.00	425.00	0.00		
37.00	424.00	1.00	0.040	Earth, dense weeds
39.00	423.00	2.00	0.035	Earth, dense weeds
50.00	422.00	3.00	0.030	Earth, clean & winding
55.00	422.00	3.00	0.030	Earth, clean & winding
65.00	423.00	2.00	0.035	Earth, dense weeds
68.00	424.00	1.00	0.040	Earth, dense weeds
70.00	425.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	5.0	0	0.00
1.00	15.5	26.1	19,468	13.98
2.00	44.0	31.5	55,264	72.53
3.00	77.0	36.0	96,712	169.95

Reach R-4: Reach 4: Sections 11.0-16.5



Summary for Pond 1P: 36" RCP Storm Drain

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 0.08" for 1-Yr event
Inflow = 4.85 cfs @ 14.15 hrs, Volume= 3.102 af
Outflow = 4.85 cfs @ 14.15 hrs, Volume= 3.102 af, Atten= 0%, Lag= 0.0 min
Primary = 4.85 cfs @ 14.15 hrs, Volume= 3.102 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 420.99' @ 14.15 hrs Surf.Area= 25 sf Storage= 13 cf
Flood Elev= 425.00' Surf.Area= 217,978 sf Storage= 570,044 cf

Plug-Flow detention time= 0.1 min calculated for 3.102 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (1,241.4 - 1,241.4)

Volume	Invert	Avail.Storage	Storage Description
#1	420.11'	807,325 cf	**Canal (Prismatic)** Listed below (Recalc)

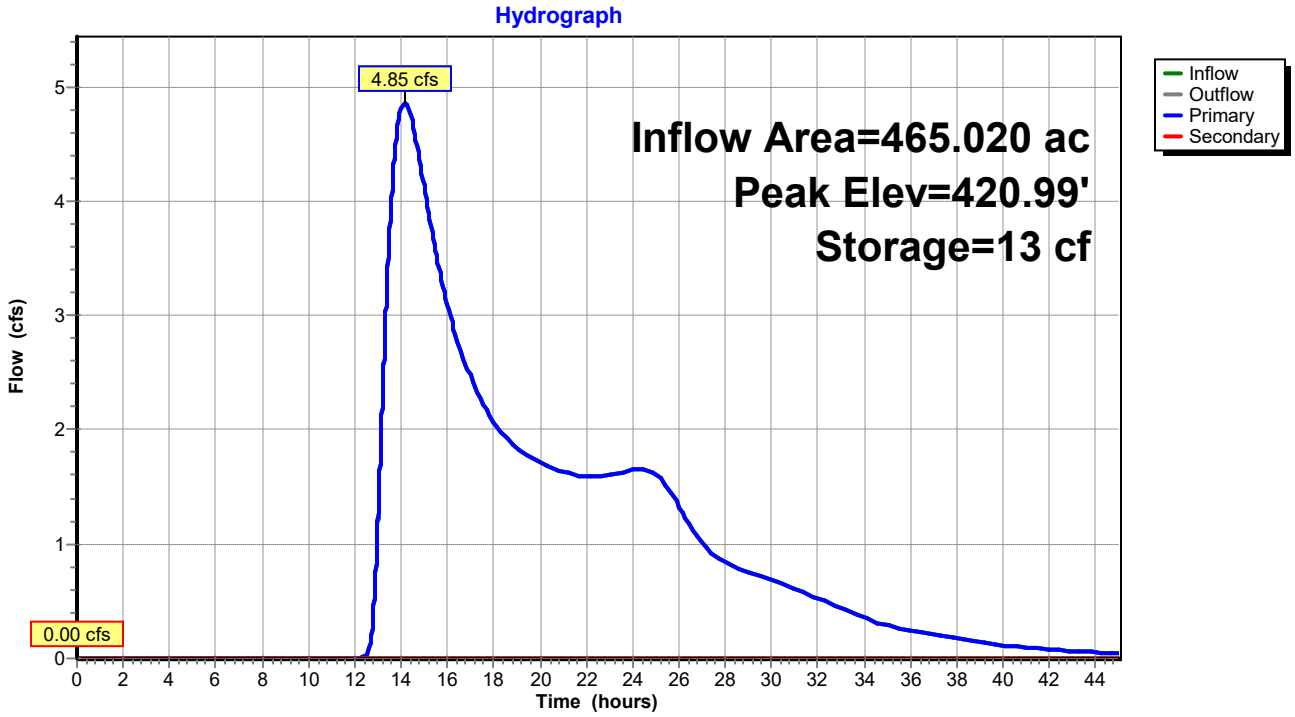
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.11	5	0	0
421.00	25	13	13
422.00	113,500	56,763	56,776
423.00	157,948	135,724	192,500
424.00	189,581	173,765	366,264
425.00	217,978	203,780	570,044
426.00	256,585	237,282	807,325

Device	Routing	Invert	Outlet Devices
#1	Primary	420.11'	**36.0" Round RCP_Round 36"** L= 155.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 420.11' / 419.37' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	425.40'	**260.0' long x 20.0' breadth Canal Overflow to Highway ROW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=4.85 cfs @ 14.15 hrs HW=420.99' (Free Discharge)
↑—**1=RCP_Round 36"** (Barrel Controls 4.85 cfs @ 4.22 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.11' (Free Discharge)
↑—**2=Canal Overflow to Highway ROW** (Controls 0.00 cfs)

Pond 1P: 36" RCP Storm Drain



Time span=0.00-45.00 hrs, dt=0.01 hrs, 4501 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment DA-1a: Existing Runoff Area=26.630 ac 31.07% Impervious Runoff Depth=0.36"
Flow Length=1,872' Slope=0.0370 '/' Tc=39.4 min CN=67 Runoff=4.41 cfs 0.791 af

Subcatchment DA-1b: Existing Runoff Area=336.510 ac 10.94% Impervious Runoff Depth>0.08"
Flow Length=8,612' Slope=0.0050 '/' Tc=494.2 min CN=55 Runoff=2.13 cfs 2.310 af

Subcatchment DA-2: Existing Runoff Area=27.280 ac 51.72% Impervious Runoff Depth=0.65"
Flow Length=2,428' Slope=0.0226 '/' Tc=49.9 min CN=75 Runoff=9.31 cfs 1.479 af

Subcatchment DA-3: Existing Runoff Area=60.080 ac 24.93% Impervious Runoff Depth=0.33"
Flow Length=3,650' Slope=0.0160 '/' Tc=105.0 min CN=66 Runoff=4.50 cfs 1.633 af

Subcatchment DA-4: Existing Runoff Area=14.520 ac 0.00% Impervious Runoff Depth=0.13"
Flow Length=830' Slope=0.0470 '/' Tc=23.0 min CN=58 Runoff=0.43 cfs 0.161 af

Reach R-1: Reach 1: Sections 0.0-3.0 Avg. Flow Depth=0.30' Max Vel=0.46 fps Inflow=4.41 cfs 3.101 af
L=850.0' S=0.0006 '/' Capacity=337.25 cfs Outflow=2.82 cfs 3.097 af

Reach R-2: Reach 2: Sections 3.0-4.5 Avg. Flow Depth=0.71' Max Vel=0.82 fps Inflow=11.63 cfs 4.575 af
L=400.0' S=0.0010 '/' Capacity=105.23 cfs Outflow=11.18 cfs 4.573 af

Reach R-3: Reach 3: Sections 4.5-11.0 Avg. Flow Depth=0.36' Max Vel=0.82 fps Inflow=13.41 cfs 6.206 af
L=1,615.0' S=0.0013 '/' Capacity=1,025.60 cfs Outflow=10.62 cfs 6.196 af

Reach R-4: Reach 4: Sections 11.0-16.5 Avg. Flow Depth=0.86' Max Vel=0.83 fps Inflow=10.90 cfs 6.357 af
L=1,256.0' S=0.0007 '/' Capacity=169.95 cfs Outflow=9.97 cfs 6.346 af

Pond 1P: 36" RCP Storm Drain Peak Elev=421.33' Storage=6,024 cf Inflow=9.97 cfs 6.346 af
Primary=8.94 cfs 6.346 af Secondary=0.00 cfs 0.000 af Outflow=8.94 cfs 6.346 af

Total Runoff Area = 465.020 ac Runoff Volume = 6.375 af Average Runoff Depth = 0.16"
84.05% Pervious = 390.852 ac 15.95% Impervious = 74.168 ac

Summary for Subcatchment DA-1a: Existing Subcatchment 1A

Area sized to give full flow through pipe during 10 yr storm.

Flow source assumed to be residential drainage from neighborhoods to the west.

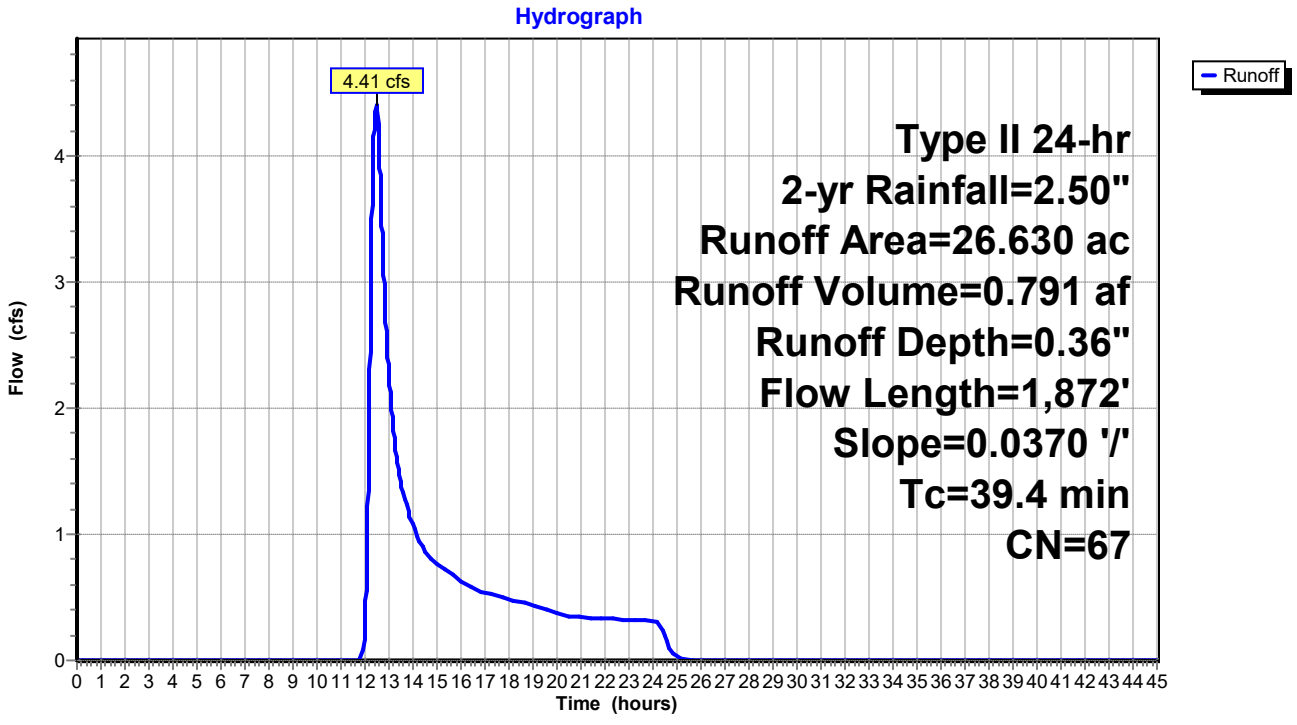
Runoff = 4.41 cfs @ 12.47 hrs, Volume= 0.791 af, Depth= 0.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.50"

	Area (ac)	CN	Description
*	14.320	50	>75% Grass cover, Good, HSG A/B
	11.490	88	Urban industrial, 72% imp, HSG B
	0.820	77	Brush, Fair, HSG D
	26.630	67	Weighted Average
	18.357		68.93% Pervious Area
	8.273		31.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.4	1,872	0.0370	0.79		**Lag/CN Method,**

Subcatchment DA-1a: Existing Subcatchment 1A



Summary for Subcatchment DA-1b: Existing Subcatchment Area 1B

See map A for total area of 188,420 sf.

Estimated 10% roof surface, 70% gravel surfaces, 20% near water as grass and forest.

Slope of flow: 438 to 435 surface elevation over 300 feet for gravel; 435 to 421 over 50 feet

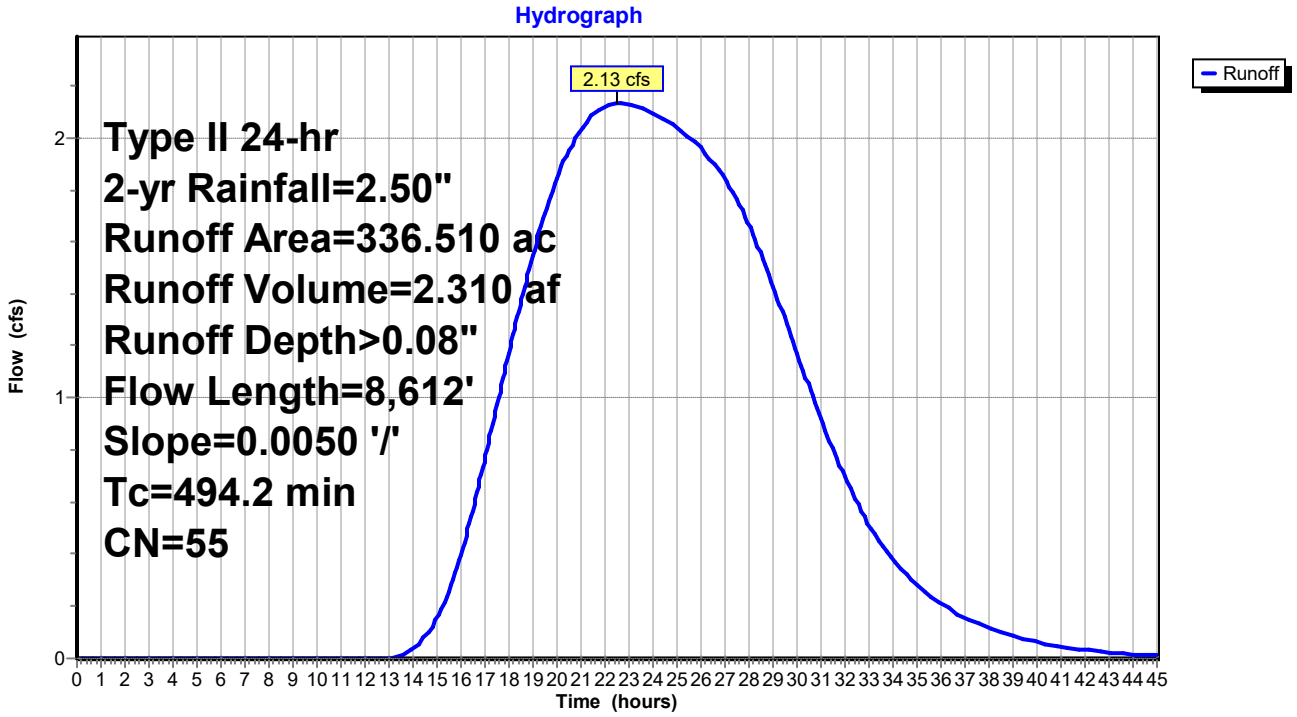
Runoff = 2.13 cfs @ 22.52 hrs, Volume= 2.310 af, Depth> 0.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.50"

	Area (ac)	CN	Description
*	43.640	62	1/2 acre lots, 25% imp, HSG A/B
	18.600	88	Urban industrial, 72% imp, HSG B
*	91.150	55	Woods, Good, HSG A/B
*	78.050	40	Brush, Good, HSG A/B
*	104.220	56	2 acre lots, 12% imp, HSG B/A
	0.850	77	Brush, Fair, HSG D
	336.510	55	Weighted Average
	299.702		89.06% Pervious Area
	36.808		10.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
494.2	8,612	0.0050	0.29		**Lag/CN Method, Incude Est Attenuation**

Subcatchment DA-1b: Existing Subcatchment Area 1B



Summary for Subcatchment DA-2: Existing Subcatchment Area 2

Cover type: industrial type A soils based on Maps C, D and F.

Channel Tc:

Slope as 445 inlet to 420 outlet over 460 feet.

Perimiter as length (460)x2 + width (50)x2.

X-sec area estimated as rectangular with 5' depth and 25' wide.

Other Tc area: 16' elev over 430 feet. Unpaved based on aerial photography.

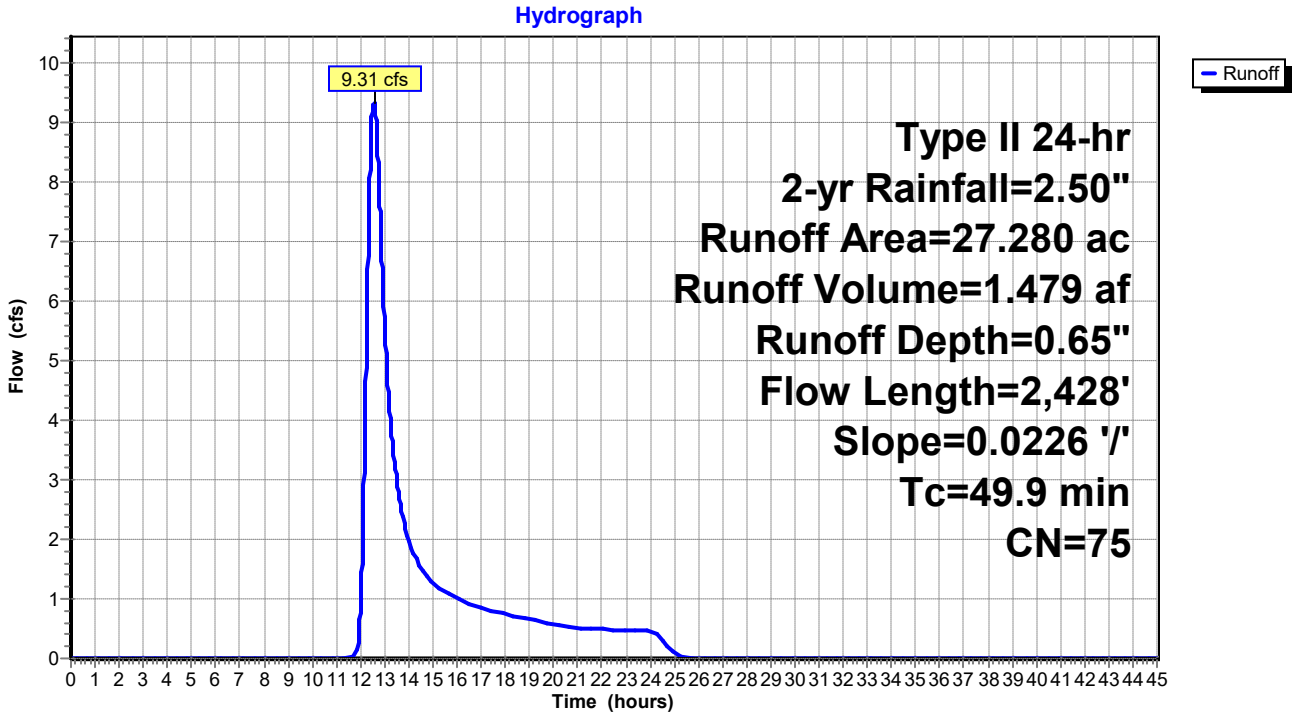
Runoff = 9.31 cfs @ 12.58 hrs, Volume= 1.479 af, Depth= 0.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.50"

	Area (ac)	CN	Description
*	16.600	92	Urban Ind/Com, 85% imp, HSG B
*	9.880	46	Brush, Fair, HSG A/B
	0.800	77	Brush, Fair, HSG D
	27.280	75	Weighted Average
	13.170		48.28% Pervious Area
	14.110		51.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.9	2,428	0.0226	0.81		**Lag/CN Method,**

Subcatchment DA-2: Existing Subcatchment Area 2



Summary for Subcatchment DA-3: Existing Subcatchment Area 3

Cover type: 20% industrial class A, 30% wood class B, 30% range class B, 20% grass class B for large area south of Bleecker. 55% grass 45% wood class B for area west of channel and north of Bleecker.

Channel Tc:

Slope as 452 inlet to 419 outlet over 565 feet.

Perimiter as length 565'x2 + width (12')x2.

X-sec area estimated as rectangular with 5' depth and 12' wide.

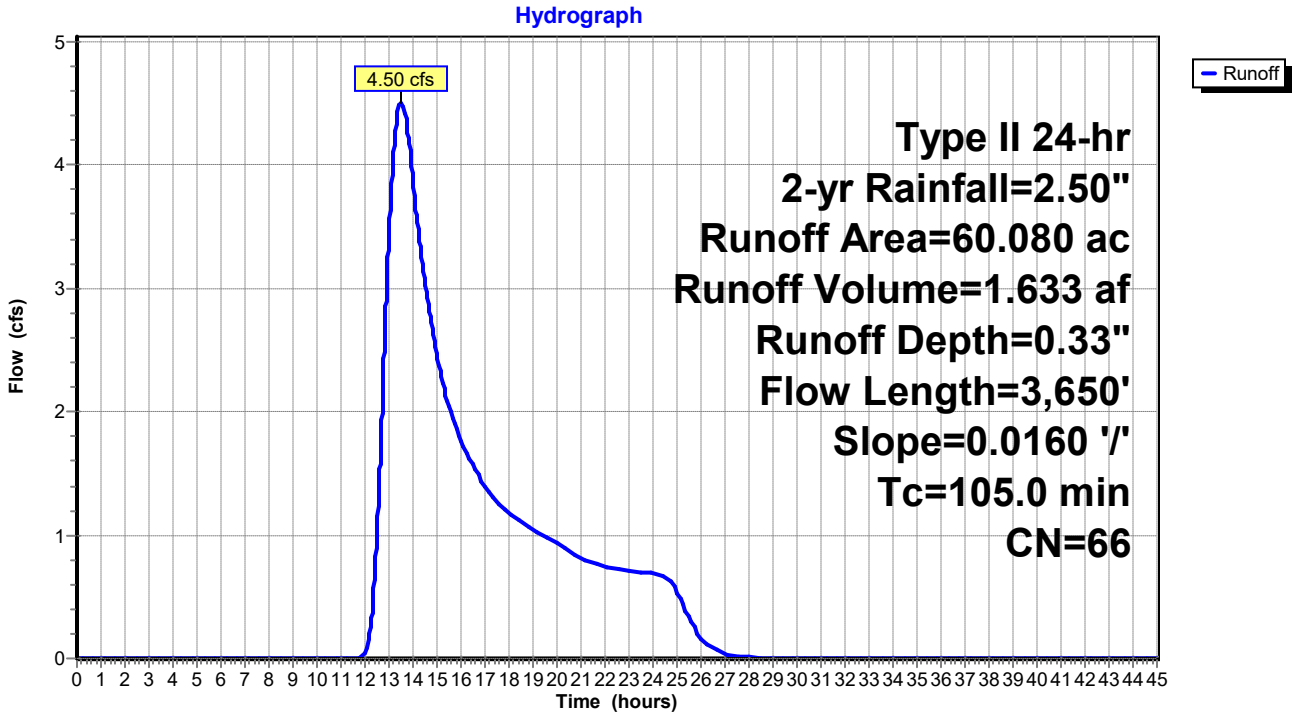
Runoff = 4.50 cfs @ 13.53 hrs, Volume= 1.633 af, Depth= 0.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.50"

	Area (ac)	CN	Description
	17.620	92	Urban commercial, 85% imp, HSG B
*	6.830	43	Woods, Good, HSG A/B
	34.150	56	Brush, Fair, HSG B
*	1.480	77	Brush, Fair, HSG D - Canal
	60.080	66	Weighted Average
	45.103		75.07% Pervious Area
	14.977		24.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
105.0	3,650	0.0160	0.58		**Lag/CN Method,**

Subcatchment DA-3: Existing Subcatchment Area 3



Summary for Subcatchment DA-4: Existing Subcatchment Area 4

See Map A for area of subcatchment and farthest run for Tc. Slope calculated as 725 foot run from 460 to 418 elevation.

CN for area average of A and B soil groups for grass/woodland.

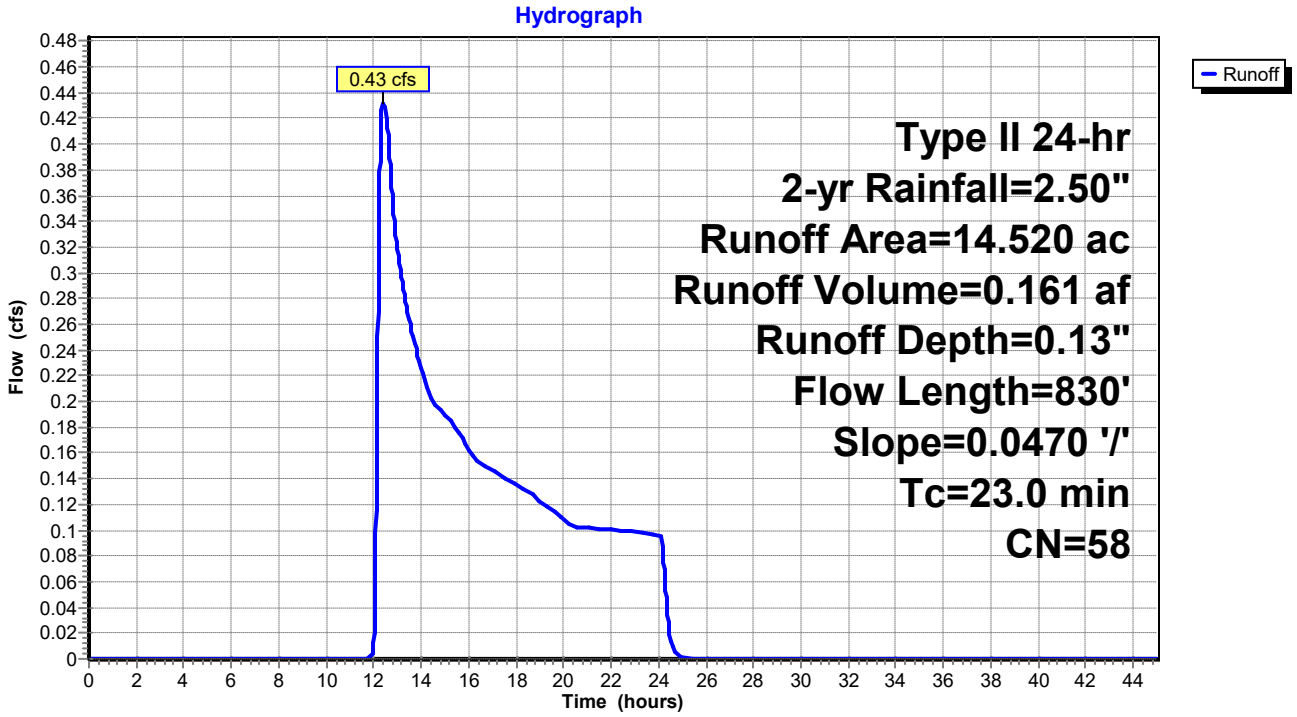
Runoff = 0.43 cfs @ 12.39 hrs, Volume= 0.161 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.50"

	Area (ac)	CN	Description
	12.880	56	Brush, Fair, HSG B
*	1.640	77	Brush, Fair, HSG D - Canal
	14.520	58	Weighted Average
	14.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	830	0.0470	0.60		**Lag/CN Method,**

Subcatchment DA-4: Existing Subcatchment Area 4



Summary for Reach R-1: Reach 1: Sections 0.0-3.0

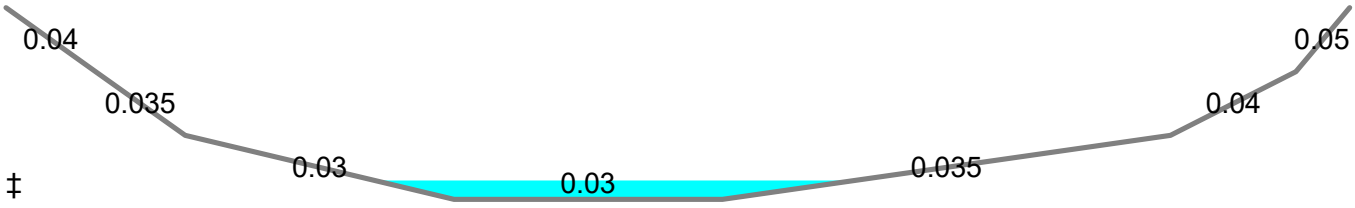
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 363.140 ac, 12.41% Impervious, Inflow Depth > 0.10" for 2-yr event
Inflow = 4.41 cfs @ 12.47 hrs, Volume= 3.101 af
Outflow = 2.82 cfs @ 12.84 hrs, Volume= 3.097 af, Atten= 36%, Lag= 21.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.46 fps, Min. Travel Time= 31.1 min
Avg. Velocity = 0.30 fps, Avg. Travel Time= 46.8 min

Peak Storage= 5,261 cf @ 12.84 hrs
Average Depth at Peak Storage= 0.30'
Defined Flood Depth= 426.00' Flow Area= 31,841.2 sf, Capacity= 95,948.09 cfs
Bank-Full Depth= 3.00' Flow Area= 167.0 sf, Capacity= 337.25 cfs

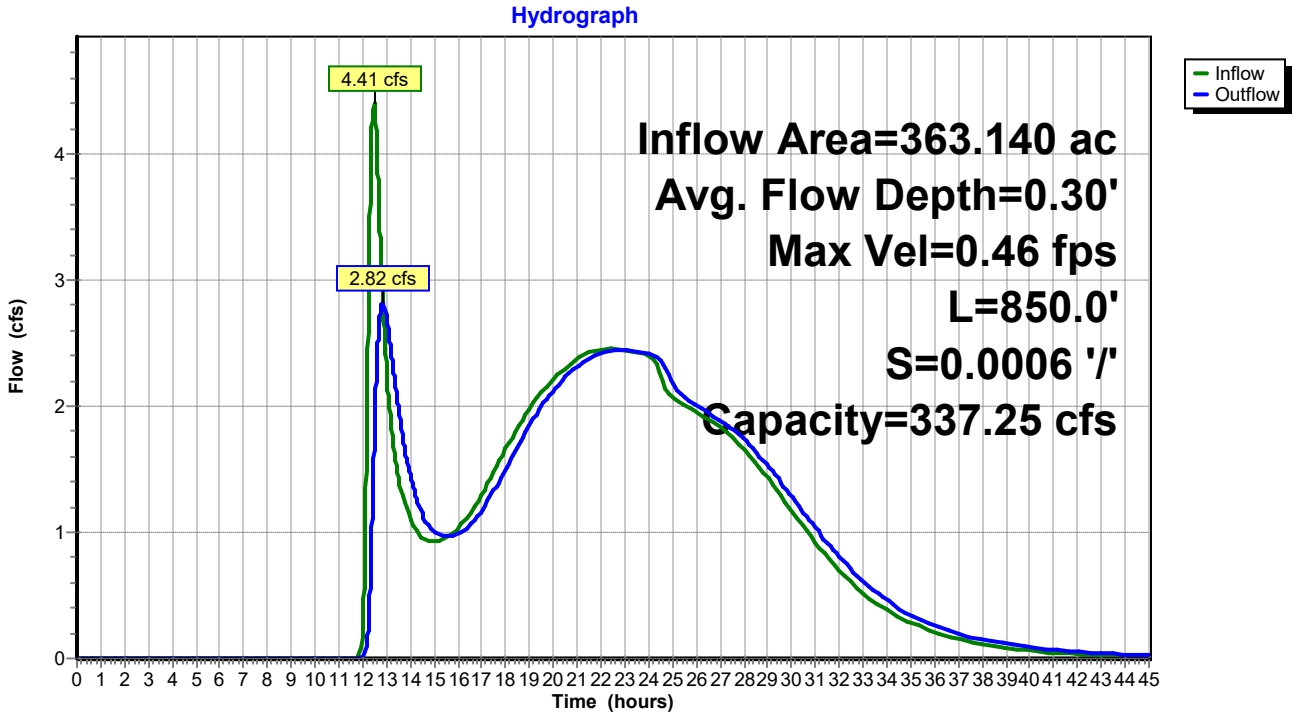
Custom cross-section, Length= 850.0' Slope= 0.0006 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 424.00', Outlet Invert= 423.50'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
25.00	425.00	0.00		
30.00	424.00	1.00	0.040	Earth, dense weeds
35.00	423.00	2.00	0.035	Earth, dense weeds
50.00	422.00	3.00	0.030	Earth, clean & winding
65.00	422.00	3.00	0.030	Earth, clean & winding
90.00	423.00	2.00	0.035	Earth, dense weeds
97.00	424.00	1.00	0.040	Earth, dense weeds
100.00	425.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	15.0	0	0.00
1.00	35.0	55.1	29,750	30.40
2.00	96.0	67.2	81,600	145.67
3.00	167.0	75.5	141,950	337.25

Reach R-1: Reach 1: Sections 0.0-3.0



Summary for Reach R-2: Reach 2: Sections 3.0-4.5

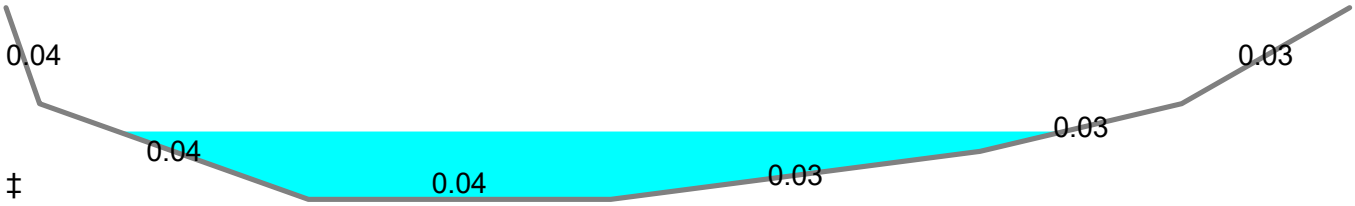
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 390.420 ac, 15.16% Impervious, Inflow Depth > 0.14" for 2-yr event
Inflow = 11.63 cfs @ 12.59 hrs, Volume= 4.575 af
Outflow = 11.18 cfs @ 12.72 hrs, Volume= 4.573 af, Atten= 4%, Lag= 7.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.82 fps, Min. Travel Time= 8.1 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 17.2 min

Peak Storage= 5,461 cf @ 12.72 hrs
Average Depth at Peak Storage= 0.71'
Defined Flood Depth= 426.00' Flow Area= 16,994.3 sf, Capacity= 45,417.71 cfs
Bank-Full Depth= 2.00' Flow Area= 59.8 sf, Capacity= 105.23 cfs

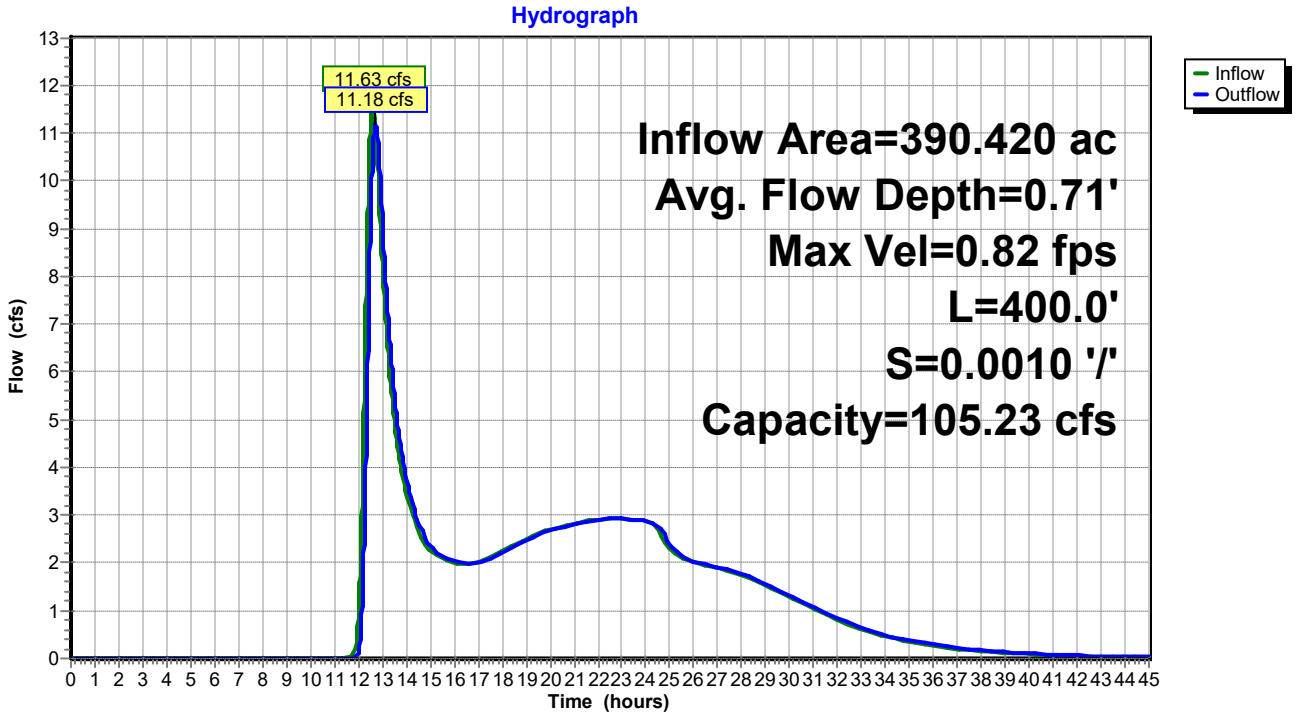
Custom cross-section, Length= 400.0' Slope= 0.0010 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.50', Outlet Invert= 423.10'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
40.00	425.00	0.00		
41.00	424.00	1.00	0.040	Earth, dense weeds
49.00	423.00	2.00	0.040	Earth, dense weeds
58.00	423.00	2.00	0.040	Earth, dense weeds
69.00	423.50	1.50	0.030	Earth, grassed & winding
75.00	424.00	1.00	0.030	
80.00	425.00	0.00	0.030	

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	9.0	0	0.00
0.50	8.3	24.0	3,300	5.34
1.00	22.8	34.1	9,100	23.27
2.00	59.8	40.6	23,900	105.23

Reach R-2: Reach 2: Sections 3.0-4.5



Summary for Reach R-3: Reach 3: Sections 4.5-11.0

Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 450.500 ac, 16.46% Impervious, Inflow Depth > 0.17" for 2-yr event
Inflow = 13.41 cfs @ 12.80 hrs, Volume= 6.206 af
Outflow = 10.62 cfs @ 13.38 hrs, Volume= 6.196 af, Atten= 21%, Lag= 35.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.82 fps, Min. Travel Time= 32.8 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 64.3 min

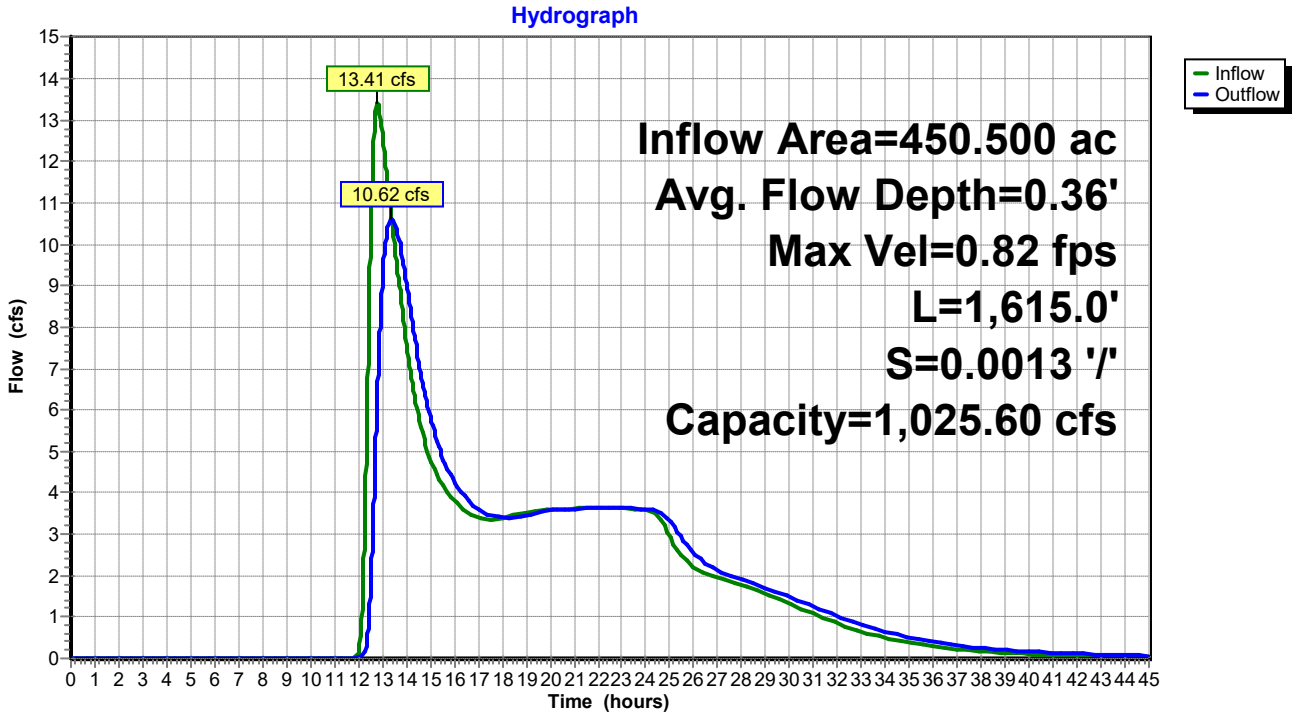
Peak Storage= 20,895 cf @ 13.38 hrs
Average Depth at Peak Storage= 0.36'
Defined Flood Depth= 426.00' Flow Area= 31,858.3 sf, Capacity= 198,961.16 cfs
Bank-Full Depth= 4.00' Flow Area= 250.5 sf, Capacity= 1,025.60 cfs

Custom cross-section, Length= 1,615.0' Slope= 0.0013 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.10', Outlet Invert= 421.00'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
15.00	426.00	0.00		
17.00	425.00	1.00	0.050	Earth, long dense weeds
19.00	424.00	2.00	0.040	Earth, dense weeds
21.00	423.00	3.00	0.035	Earth, dense weeds
50.00	422.00	4.00	0.030	Earth, clean & winding
80.00	422.00	4.00	0.030	Earth, clean & winding
83.00	423.00	3.00	0.035	Earth, dense weeds
85.00	424.00	2.00	0.040	Earth, cobble bottom, clean sides
87.00	425.00	1.00	0.050	Earth, long dense weeds
90.00	426.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	30.0	0	0.00
1.00	46.0	62.2	74,290	67.24
2.00	110.0	66.7	177,650	279.24
3.00	178.0	71.1	287,470	602.50
4.00	250.5	76.5	404,558	1,025.60

Reach R-3: Reach 3: Sections 4.5-11.0



Summary for Reach R-4: Reach 4: Sections 11.0-16.5

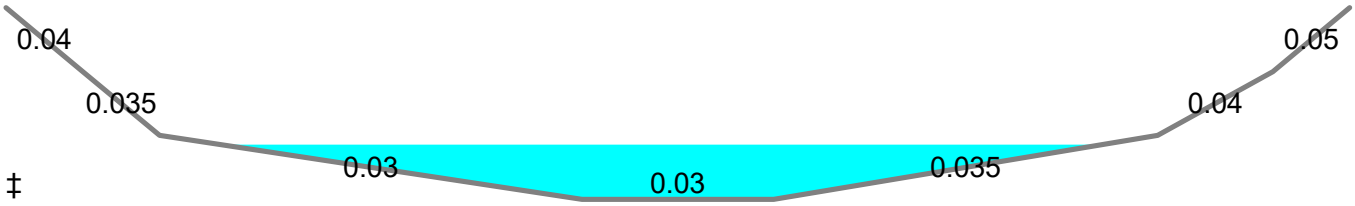
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 0.16" for 2-yr event
Inflow = 10.90 cfs @ 13.38 hrs, Volume= 6.357 af
Outflow = 9.97 cfs @ 13.82 hrs, Volume= 6.346 af, Atten= 9%, Lag= 26.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.83 fps, Min. Travel Time= 25.2 min
Avg. Velocity = 0.50 fps, Avg. Travel Time= 42.0 min

Peak Storage= 15,092 cf @ 13.82 hrs
Average Depth at Peak Storage= 0.86'
Defined Flood Depth= 426.00' Flow Area= 14,856.6 sf, Capacity= 48,804.33 cfs
Bank-Full Depth= 3.00' Flow Area= 77.0 sf, Capacity= 169.95 cfs

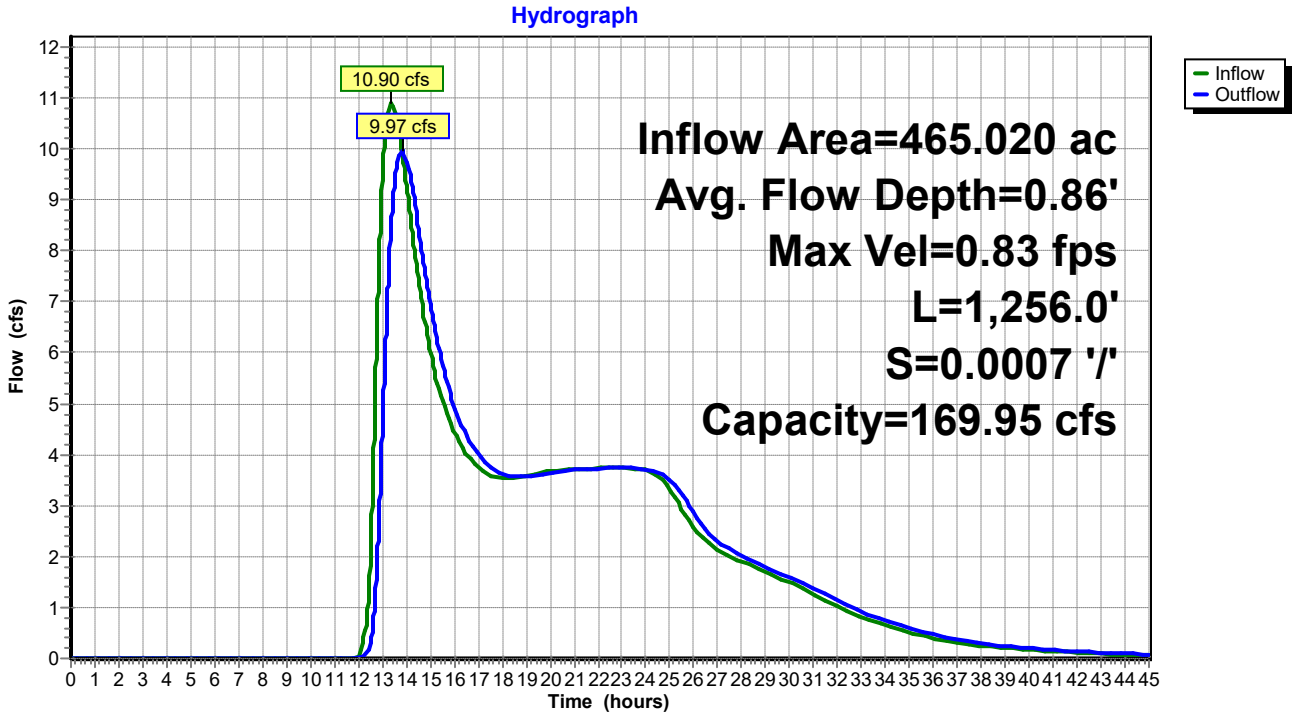
Custom cross-section, Length= 1,256.0' Slope= 0.0007 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 421.00', Outlet Invert= 420.11'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
35.00	425.00	0.00		
37.00	424.00	1.00	0.040	Earth, dense weeds
39.00	423.00	2.00	0.035	Earth, dense weeds
50.00	422.00	3.00	0.030	Earth, clean & winding
55.00	422.00	3.00	0.030	Earth, clean & winding
65.00	423.00	2.00	0.035	Earth, dense weeds
68.00	424.00	1.00	0.040	Earth, dense weeds
70.00	425.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	5.0	0	0.00
1.00	15.5	26.1	19,468	13.98
2.00	44.0	31.5	55,264	72.53
3.00	77.0	36.0	96,712	169.95

Reach R-4: Reach 4: Sections 11.0-16.5



Summary for Pond 1P: 36" RCP Storm Drain

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 0.16" for 2-yr event
Inflow = 9.97 cfs @ 13.82 hrs, Volume= 6.346 af
Outflow = 8.94 cfs @ 14.35 hrs, Volume= 6.346 af, Atten= 10%, Lag= 31.7 min
Primary = 8.94 cfs @ 14.35 hrs, Volume= 6.346 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 421.33' @ 14.35 hrs Surf.Area= 36,935 sf Storage= 6,024 cf
Flood Elev= 425.00' Surf.Area= 217,978 sf Storage= 570,044 cf

Plug-Flow detention time= 2.2 min calculated for 6.345 af (100% of inflow)
Center-of-Mass det. time= 2.2 min (1,256.3 - 1,254.2)

Volume	Invert	Avail.Storage	Storage Description
#1	420.11'	807,325 cf	**Canal (Prismatic)** Listed below (Recalc)

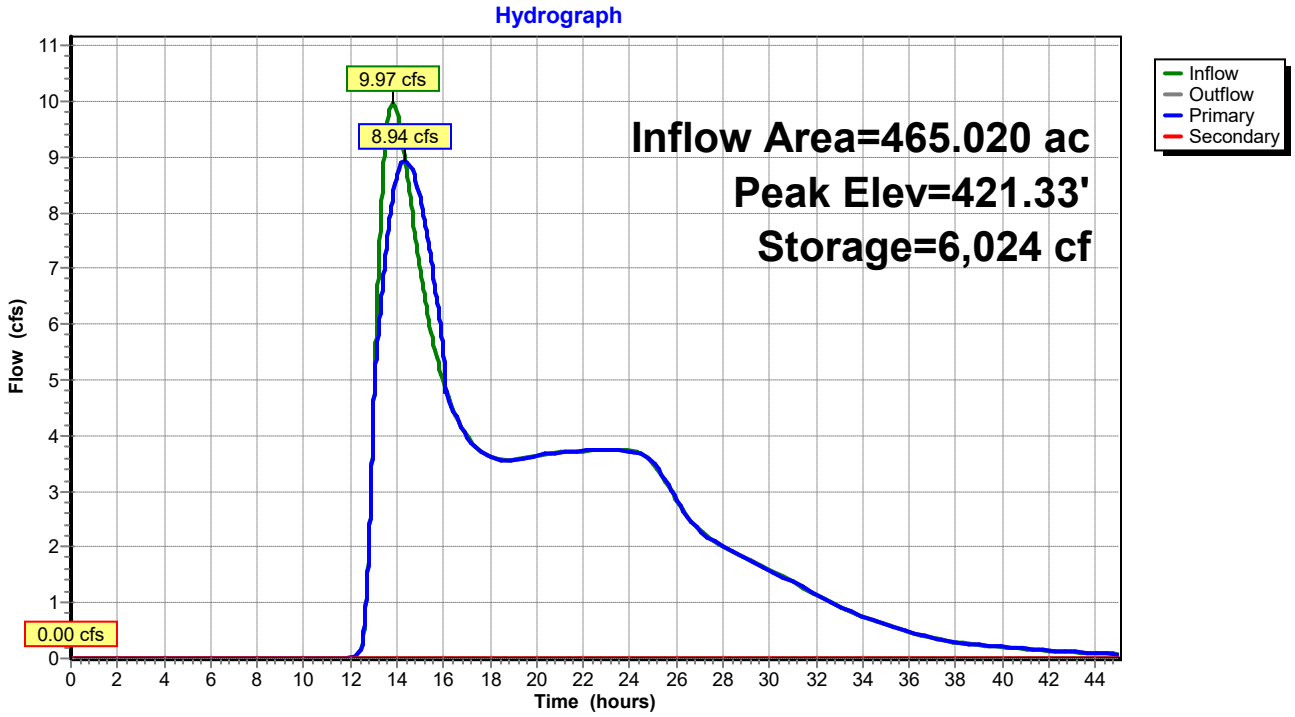
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.11	5	0	0
421.00	25	13	13
422.00	113,500	56,763	56,776
423.00	157,948	135,724	192,500
424.00	189,581	173,765	366,264
425.00	217,978	203,780	570,044
426.00	256,585	237,282	807,325

Device	Routing	Invert	Outlet Devices
#1	Primary	420.11'	**36.0" Round RCP_Round 36"** L= 155.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 420.11' / 419.37' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	425.40'	**260.0' long x 20.0' breadth Canal Overflow to Highway ROW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=8.94 cfs @ 14.35 hrs HW=421.33' (Free Discharge)
↑—**1=RCP_Round 36"** (Barrel Controls 8.94 cfs @ 4.93 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.11' (Free Discharge)
↑—**2=Canal Overflow to Highway ROW** (Controls 0.00 cfs)

Pond 1P: 36" RCP Storm Drain



Time span=0.00-45.00 hrs, dt=0.01 hrs, 4501 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment DA-1a: Existing Runoff Area=26.630 ac 31.07% Impervious Runoff Depth=0.82"
Flow Length=1,872' Slope=0.0370 '/' Tc=39.4 min CN=67 Runoff=13.22 cfs 1.824 af

Subcatchment DA-1b: Existing Runoff Area=336.510 ac 10.94% Impervious Runoff Depth>0.33"
Flow Length=8,612' Slope=0.0050 '/' Tc=494.2 min CN=55 Runoff=9.11 cfs 9.223 af

Subcatchment DA-2: Existing Runoff Area=27.280 ac 51.72% Impervious Runoff Depth=1.27"
Flow Length=2,428' Slope=0.0226 '/' Tc=49.9 min CN=75 Runoff=19.94 cfs 2.879 af

Subcatchment DA-3: Existing Runoff Area=60.080 ac 24.93% Impervious Runoff Depth=0.77"
Flow Length=3,650' Slope=0.0160 '/' Tc=105.0 min CN=66 Runoff=13.26 cfs 3.872 af

Subcatchment DA-4: Existing Runoff Area=14.520 ac 0.00% Impervious Runoff Depth=0.43"
Flow Length=830' Slope=0.0470 '/' Tc=23.0 min CN=58 Runoff=3.89 cfs 0.525 af

Reach R-1: Reach 1: Sections 0.0-3.0 Avg. Flow Depth=0.57' Max Vel=0.65 fps Inflow=13.27 cfs 11.047 af
L=850.0' S=0.0006 '/' Capacity=337.25 cfs Outflow=9.79 cfs 11.039 af

Reach R-2: Reach 2: Sections 3.0-4.5 Avg. Flow Depth=1.09' Max Vel=1.10 fps Inflow=28.96 cfs 13.918 af
L=400.0' S=0.0010 '/' Capacity=105.23 cfs Outflow=28.34 cfs 13.914 af

Reach R-3: Reach 3: Sections 4.5-11.0 Avg. Flow Depth=0.65' Max Vel=1.15 fps Inflow=35.24 cfs 17.786 af
L=1,615.0' S=0.0013 '/' Capacity=1,025.60 cfs Outflow=29.86 cfs 17.765 af

Reach R-4: Reach 4: Sections Avg. Flow Depth=1.34' Max Vel=1.19 fps Inflow=30.83 cfs 18.289 af
L=1,256.0' S=0.0007 '/' Capacity=169.95 cfs Outflow=29.29 cfs 18.273 af

Pond 1P: 36" RCP Storm Drain Peak Elev=422.00' Storage=56,296 cf Inflow=29.29 cfs 18.273 af
Primary=19.48 cfs 18.273 af Secondary=0.00 cfs 0.000 af Outflow=19.48 cfs 18.273 af

Total Runoff Area = 465.020 ac Runoff Volume = 18.323 af Average Runoff Depth = 0.47"
84.05% Pervious = 390.852 ac 15.95% Impervious = 74.168 ac

Summary for Subcatchment DA-1a: Existing Subcatchment 1A

Area sized to give full flow through pipe during 10 yr storm.

Flow source assumed to be residential drainage from neighborhoods to the west.

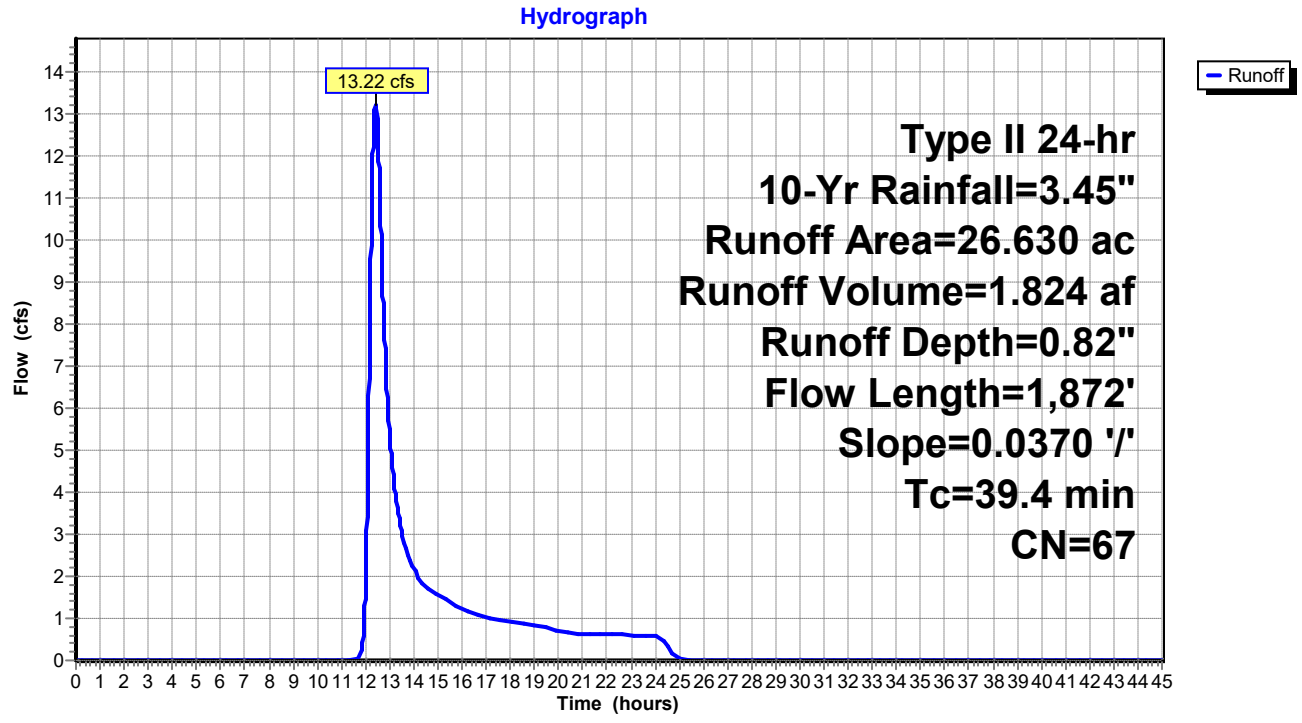
Runoff = 13.22 cfs @ 12.39 hrs, Volume= 1.824 af, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=3.45"

	Area (ac)	CN	Description
*	14.320	50	>75% Grass cover, Good, HSG A/B
	11.490	88	Urban industrial, 72% imp, HSG B
	0.820	77	Brush, Fair, HSG D
	26.630	67	Weighted Average
	18.357		68.93% Pervious Area
	8.273		31.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.4	1,872	0.0370	0.79		**Lag/CN Method,**

Subcatchment DA-1a: Existing Subcatchment 1A



Summary for Subcatchment DA-1b: Existing Subcatchment Area 1B

See map A for total area of 188,420 sf.

Estimated 10% roof surface, 70% gravel surfaces, 20% near water as grass and forest.

Slope of flow: 438 to 435 surface elevation over 300 feet for gravel; 435 to 421 over 50 feet

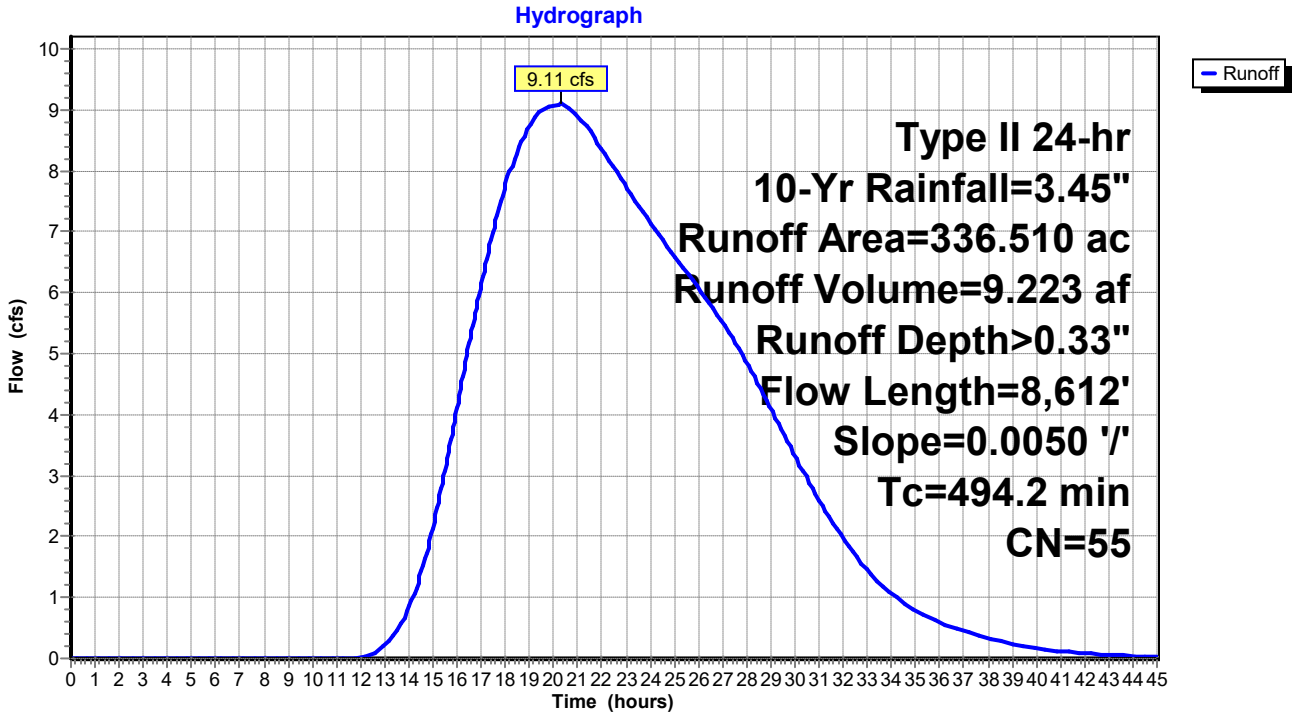
Runoff = 9.11 cfs @ 20.31 hrs, Volume= 9.223 af, Depth> 0.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=3.45"

	Area (ac)	CN	Description
*	43.640	62	1/2 acre lots, 25% imp, HSG A/B
	18.600	88	Urban industrial, 72% imp, HSG B
*	91.150	55	Woods, Good, HSG A/B
*	78.050	40	Brush, Good, HSG A/B
*	104.220	56	2 acre lots, 12% imp, HSG B/A
	0.850	77	Brush, Fair, HSG D
	336.510	55	Weighted Average
	299.702		89.06% Pervious Area
	36.808		10.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
494.2	8,612	0.0050	0.29		**Lag/CN Method, Incude Est Attenuation**

Subcatchment DA-1b: Existing Subcatchment Area 1B



Summary for Subcatchment DA-2: Existing Subcatchment Area 2

Cover type: industrial type A soils based on Maps C, D and F.

Channel Tc:

Slope as 445 inlet to 420 outlet over 460 feet.

Perimiter as length (460)x2 + width (50)x2.

X-sec area estimated as rectangular with 5' depth and 25' wide.

Other Tc area: 16' elev over 430 feet. Unpaved based on aerial photography.

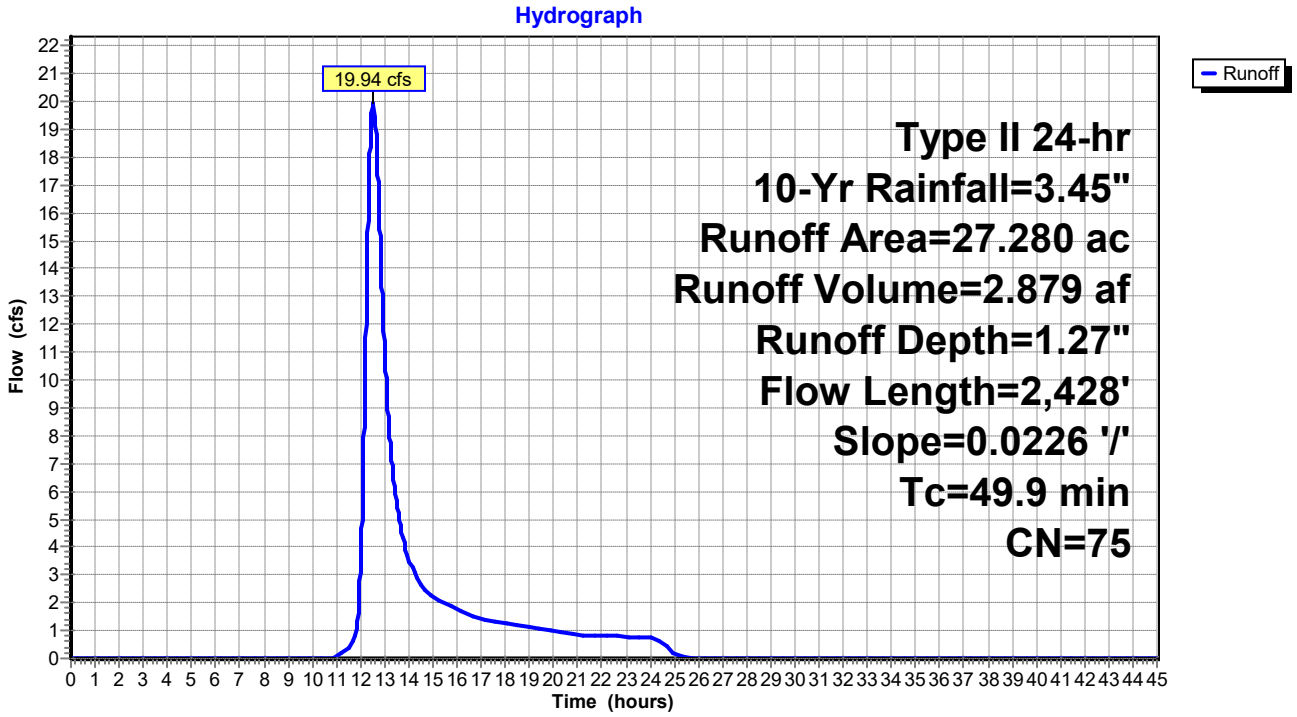
Runoff = 19.94 cfs @ 12.53 hrs, Volume= 2.879 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=3.45"

	Area (ac)	CN	Description
*	16.600	92	Urban Ind/Com, 85% imp, HSG B
*	9.880	46	Brush, Fair, HSG A/B
	0.800	77	Brush, Fair, HSG D
	27.280	75	Weighted Average
	13.170		48.28% Pervious Area
	14.110		51.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.9	2,428	0.0226	0.81		**Lag/CN Method,**

Subcatchment DA-2: Existing Subcatchment Area 2



Summary for Subcatchment DA-3: Existing Subcatchment Area 3

Cover type: 20% industrial class A, 30% wood class B, 30% range class B, 20% grass class B for large area south of Bleecker. 55% grass 45% wood class B for area west of channel and north of Bleecker.

Channel Tc:

Slope as 452 inlet to 419 outlet over 565 feet.

Perimiter as length 565'x2 + width (12')x2.

X-sec area estimated as rectangular with 5' depth and 12' wide.

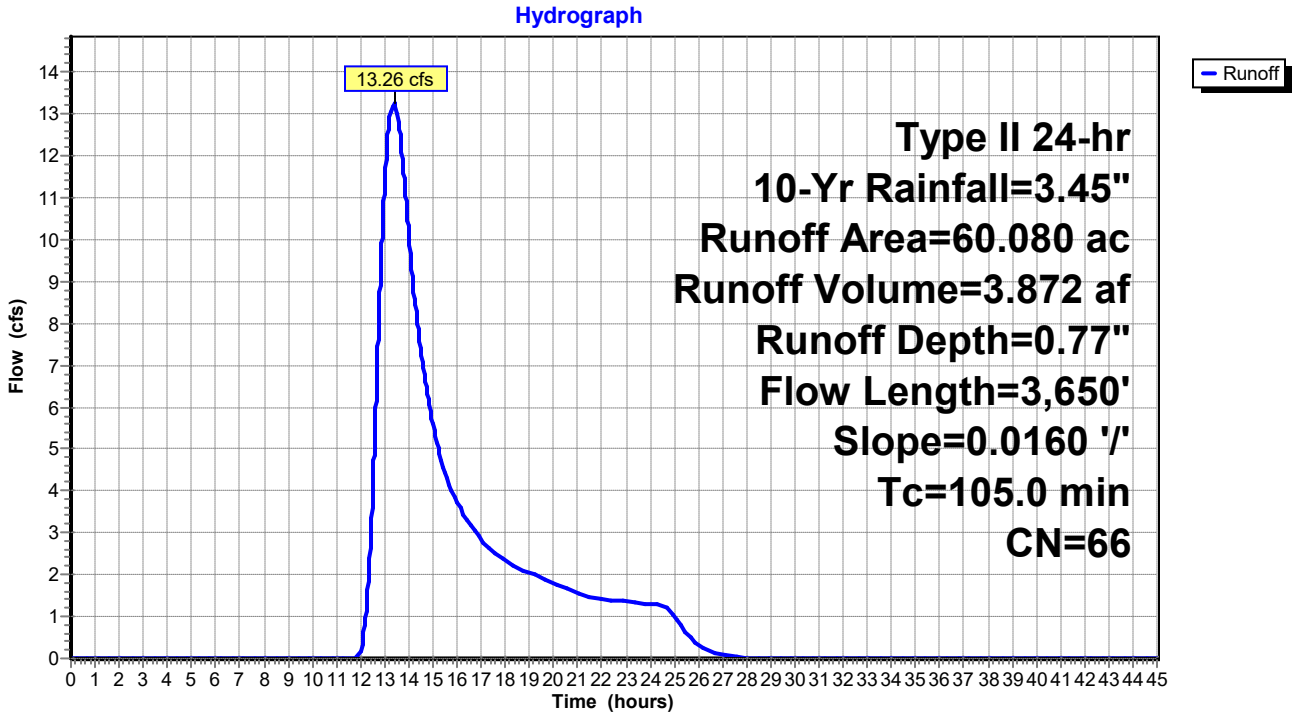
Runoff = 13.26 cfs @ 13.41 hrs, Volume= 3.872 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=3.45"

	Area (ac)	CN	Description
	17.620	92	Urban commercial, 85% imp, HSG B
*	6.830	43	Woods, Good, HSG A/B
	34.150	56	Brush, Fair, HSG B
*	1.480	77	Brush, Fair, HSG D - Canal
	60.080	66	Weighted Average
	45.103		75.07% Pervious Area
	14.977		24.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
105.0	3,650	0.0160	0.58		**Lag/CN Method,**

Subcatchment DA-3: Existing Subcatchment Area 3



Summary for Subcatchment DA-4: Existing Subcatchment Area 4

See Map A for area of subcatchment and farthest run for Tc. Slope calculated as 725 foot run from 460 to 418 elevation.

CN for area average of A and B soil groups for grass/woodland.

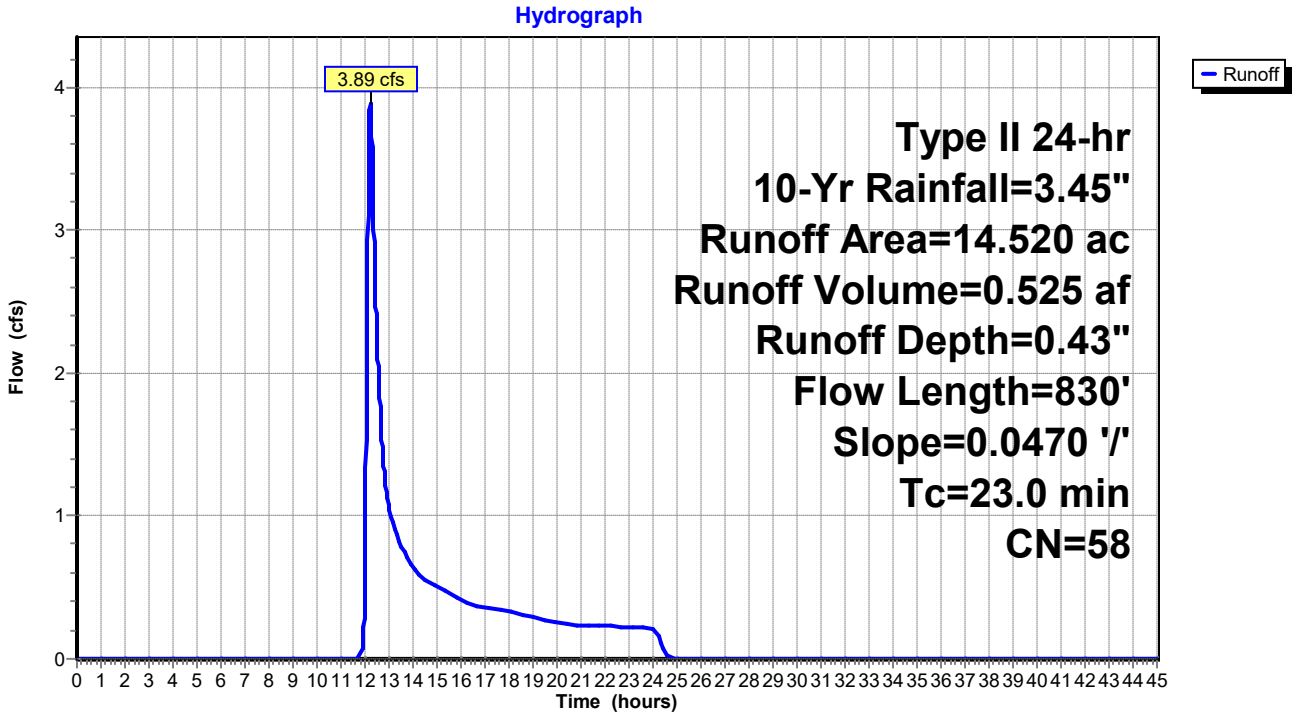
Runoff = 3.89 cfs @ 12.24 hrs, Volume= 0.525 af, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=3.45"

	Area (ac)	CN	Description
	12.880	56	Brush, Fair, HSG B
*	1.640	77	Brush, Fair, HSG D - Canal
	14.520	58	Weighted Average
	14.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	830	0.0470	0.60		**Lag/CN Method,**

Subcatchment DA-4: Existing Subcatchment Area 4



Summary for Reach R-1: Reach 1: Sections 0.0-3.0

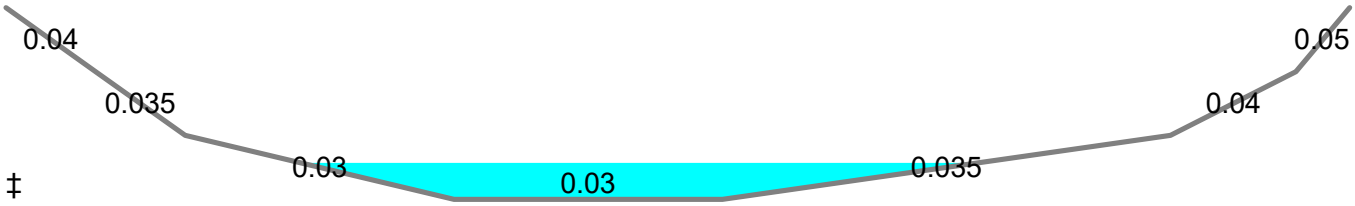
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 363.140 ac, 12.41% Impervious, Inflow Depth > 0.37" for 10-Yr event
Inflow = 13.27 cfs @ 12.39 hrs, Volume= 11.047 af
Outflow = 9.79 cfs @ 20.31 hrs, Volume= 11.039 af, Atten= 26%, Lag= 475.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.65 fps, Min. Travel Time= 21.9 min
Avg. Velocity = 0.43 fps, Avg. Travel Time= 32.7 min

Peak Storage= 12,829 cf @ 20.31 hrs
Average Depth at Peak Storage= 0.57'
Defined Flood Depth= 426.00' Flow Area= 31,841.2 sf, Capacity= 95,948.09 cfs
Bank-Full Depth= 3.00' Flow Area= 167.0 sf, Capacity= 337.25 cfs

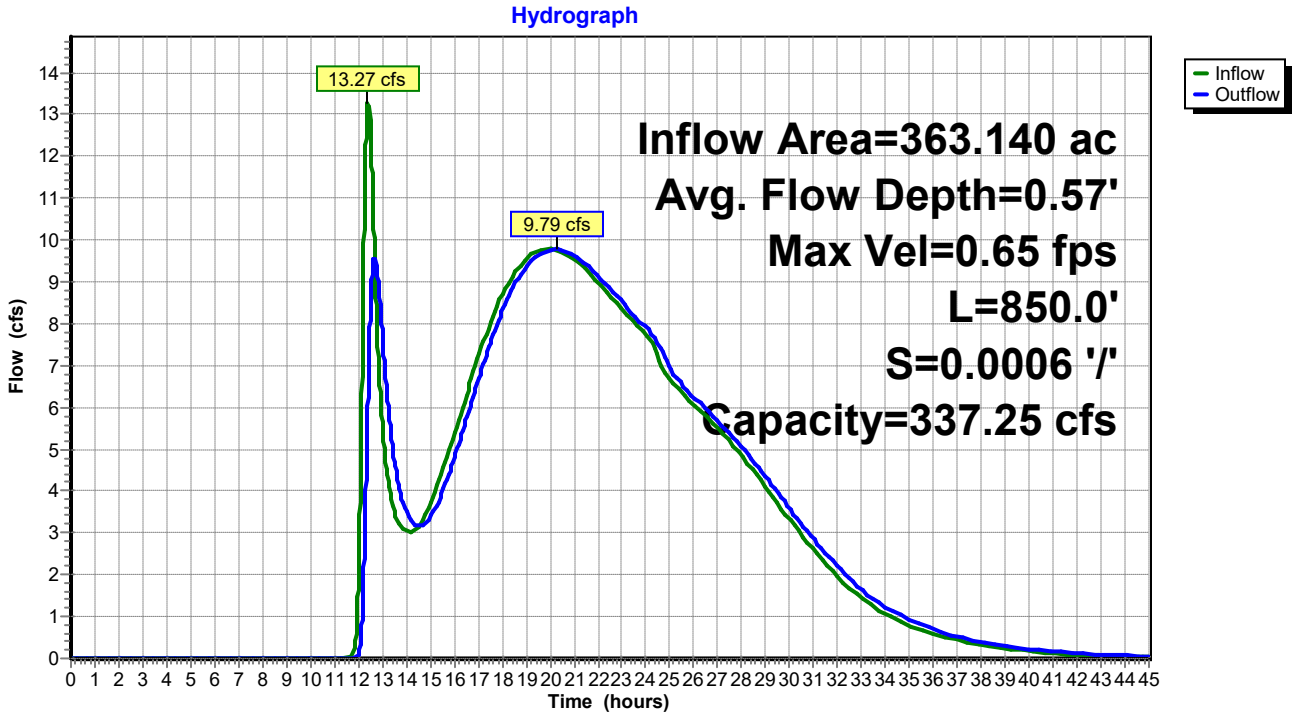
Custom cross-section, Length= 850.0' Slope= 0.0006 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 424.00', Outlet Invert= 423.50'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
25.00	425.00	0.00		
30.00	424.00	1.00	0.040	Earth, dense weeds
35.00	423.00	2.00	0.035	Earth, dense weeds
50.00	422.00	3.00	0.030	Earth, clean & winding
65.00	422.00	3.00	0.030	Earth, clean & winding
90.00	423.00	2.00	0.035	Earth, dense weeds
97.00	424.00	1.00	0.040	Earth, dense weeds
100.00	425.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	15.0	0	0.00
1.00	35.0	55.1	29,750	30.40
2.00	96.0	67.2	81,600	145.67
3.00	167.0	75.5	141,950	337.25

Reach R-1: Reach 1: Sections 0.0-3.0



Summary for Reach R-2: Reach 2: Sections 3.0-4.5

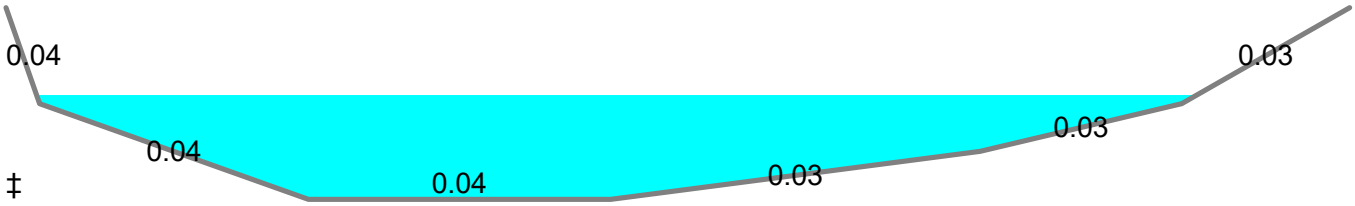
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 390.420 ac, 15.16% Impervious, Inflow Depth > 0.43" for 10-Yr event
Inflow = 28.96 cfs @ 12.58 hrs, Volume= 13.918 af
Outflow = 28.34 cfs @ 12.65 hrs, Volume= 13.914 af, Atten= 2%, Lag= 3.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.10 fps, Min. Travel Time= 6.1 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 12.5 min

Peak Storage= 10,299 cf @ 12.65 hrs
Average Depth at Peak Storage= 1.09'
Defined Flood Depth= 426.00' Flow Area= 16,994.3 sf, Capacity= 45,417.71 cfs
Bank-Full Depth= 2.00' Flow Area= 59.8 sf, Capacity= 105.23 cfs

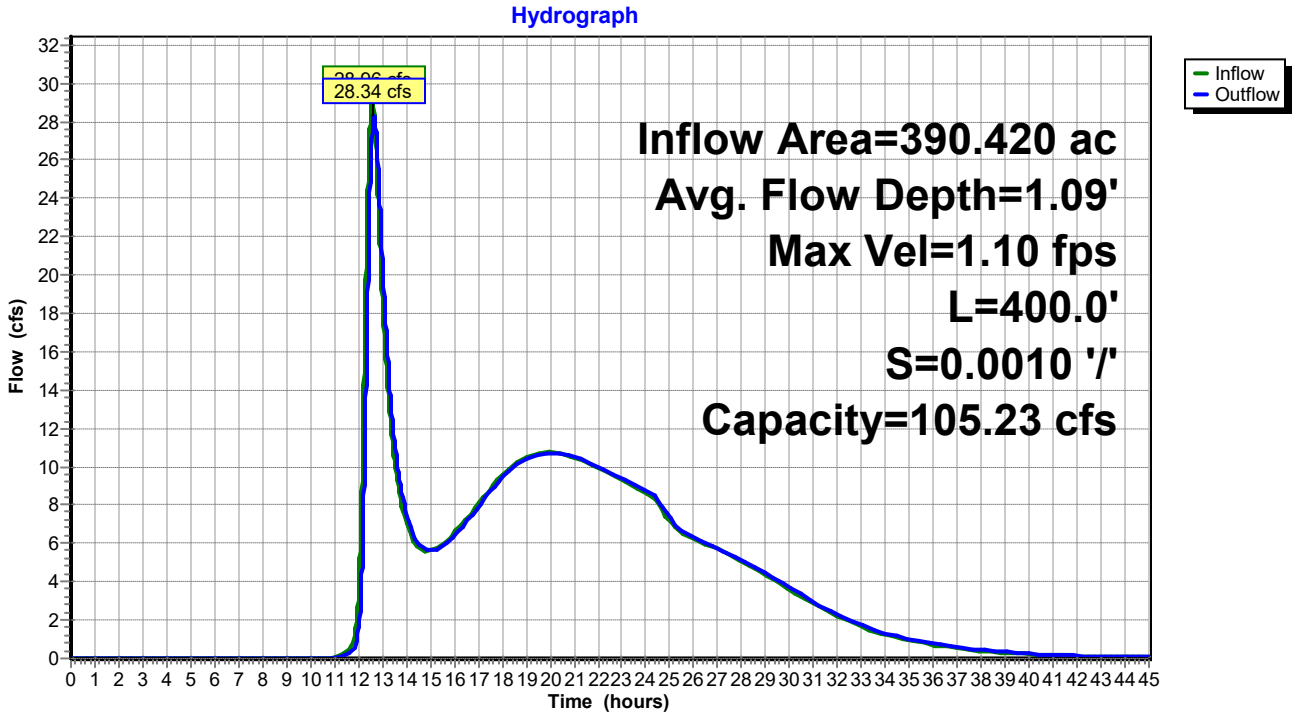
Custom cross-section, Length= 400.0' Slope= 0.0010 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.50', Outlet Invert= 423.10'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
40.00	425.00	0.00		
41.00	424.00	1.00	0.040	Earth, dense weeds
49.00	423.00	2.00	0.040	Earth, dense weeds
58.00	423.00	2.00	0.040	Earth, dense weeds
69.00	423.50	1.50	0.030	Earth, grassed & winding
75.00	424.00	1.00	0.030	
80.00	425.00	0.00	0.030	

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	9.0	0	0.00
0.50	8.3	24.0	3,300	5.34
1.00	22.8	34.1	9,100	23.27
2.00	59.8	40.6	23,900	105.23

Reach R-2: Reach 2: Sections 3.0-4.5



Summary for Reach R-3: Reach 3: Sections 4.5-11.0

Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 450.500 ac, 16.46% Impervious, Inflow Depth > 0.47" for 10-Yr event
Inflow = 35.24 cfs @ 12.73 hrs, Volume= 17.786 af
Outflow = 29.86 cfs @ 13.14 hrs, Volume= 17.765 af, Atten= 15%, Lag= 24.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.15 fps, Min. Travel Time= 23.5 min
Avg. Velocity = 0.58 fps, Avg. Travel Time= 46.6 min

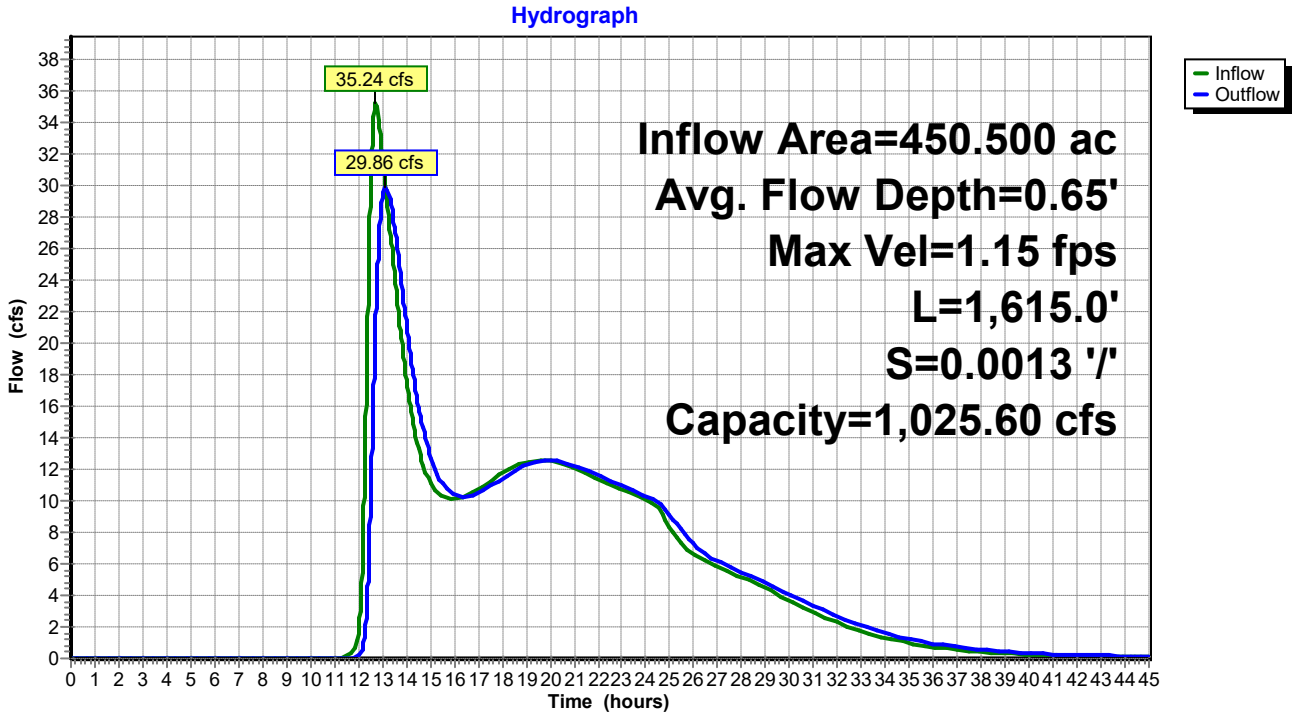
Peak Storage= 42,067 cf @ 13.14 hrs
Average Depth at Peak Storage= 0.65'
Defined Flood Depth= 426.00' Flow Area= 31,858.3 sf, Capacity= 198,961.16 cfs
Bank-Full Depth= 4.00' Flow Area= 250.5 sf, Capacity= 1,025.60 cfs

Custom cross-section, Length= 1,615.0' Slope= 0.0013 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.10', Outlet Invert= 421.00'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
15.00	426.00	0.00		
17.00	425.00	1.00	0.050	Earth, long dense weeds
19.00	424.00	2.00	0.040	Earth, dense weeds
21.00	423.00	3.00	0.035	Earth, dense weeds
50.00	422.00	4.00	0.030	Earth, clean & winding
80.00	422.00	4.00	0.030	Earth, clean & winding
83.00	423.00	3.00	0.035	Earth, dense weeds
85.00	424.00	2.00	0.040	Earth, cobble bottom, clean sides
87.00	425.00	1.00	0.050	Earth, long dense weeds
90.00	426.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	30.0	0	0.00
1.00	46.0	62.2	74,290	67.24
2.00	110.0	66.7	177,650	279.24
3.00	178.0	71.1	287,470	602.50
4.00	250.5	76.5	404,558	1,025.60

Reach R-3: Reach 3: Sections 4.5-11.0



Summary for Reach R-4: Reach 4: Sections 11.0-16.5

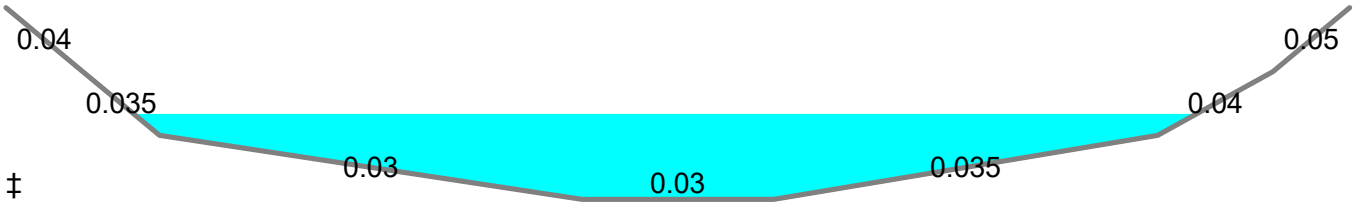
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 0.47" for 10-Yr event
Inflow = 30.83 cfs @ 13.13 hrs, Volume= 18.289 af
Outflow = 29.29 cfs @ 13.40 hrs, Volume= 18.273 af, Atten= 5%, Lag= 16.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.19 fps, Min. Travel Time= 17.5 min
Avg. Velocity = 0.64 fps, Avg. Travel Time= 32.6 min

Peak Storage= 30,833 cf @ 13.40 hrs
Average Depth at Peak Storage= 1.34'
Defined Flood Depth= 426.00' Flow Area= 14,856.6 sf, Capacity= 48,804.33 cfs
Bank-Full Depth= 3.00' Flow Area= 77.0 sf, Capacity= 169.95 cfs

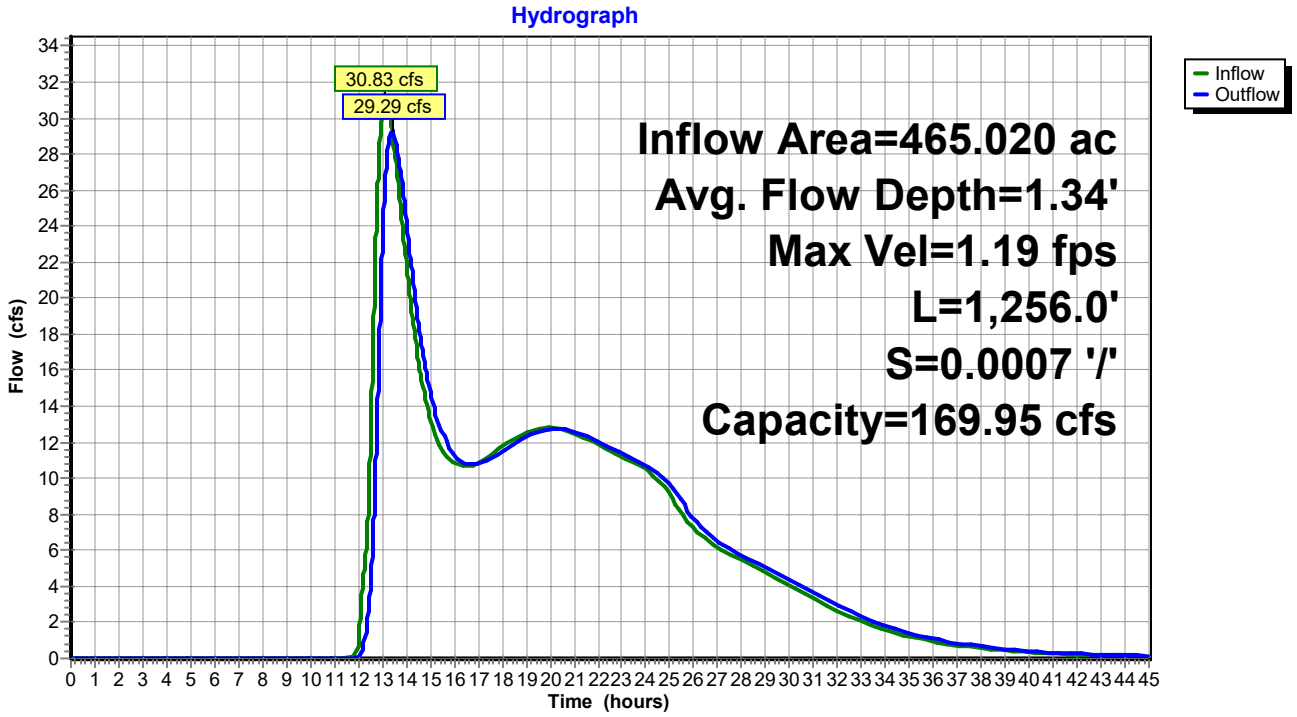
Custom cross-section, Length= 1,256.0' Slope= 0.0007 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 421.00', Outlet Invert= 420.11'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
35.00	425.00	0.00		
37.00	424.00	1.00	0.040	Earth, dense weeds
39.00	423.00	2.00	0.035	Earth, dense weeds
50.00	422.00	3.00	0.030	Earth, clean & winding
55.00	422.00	3.00	0.030	Earth, clean & winding
65.00	423.00	2.00	0.035	Earth, dense weeds
68.00	424.00	1.00	0.040	Earth, dense weeds
70.00	425.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	5.0	0	0.00
1.00	15.5	26.1	19,468	13.98
2.00	44.0	31.5	55,264	72.53
3.00	77.0	36.0	96,712	169.95

Reach R-4: Reach 4: Sections 11.0-16.5



Summary for Pond 1P: 36" RCP Storm Drain

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 0.47" for 10-Yr event
Inflow = 29.29 cfs @ 13.40 hrs, Volume= 18.273 af
Outflow = 19.48 cfs @ 14.42 hrs, Volume= 18.273 af, Atten= 34%, Lag= 61.3 min
Primary = 19.48 cfs @ 14.42 hrs, Volume= 18.273 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 422.00' @ 14.42 hrs Surf.Area= 113,019 sf Storage= 56,296 cf
Flood Elev= 425.00' Surf.Area= 217,978 sf Storage= 570,044 cf

Plug-Flow detention time= 23.4 min calculated for 18.273 af (100% of inflow)
Center-of-Mass det. time= 23.4 min (1,263.0 - 1,239.6)

Volume	Invert	Avail.Storage	Storage Description
#1	420.11'	807,325 cf	**Canal (Prismatic)** Listed below (Recalc)

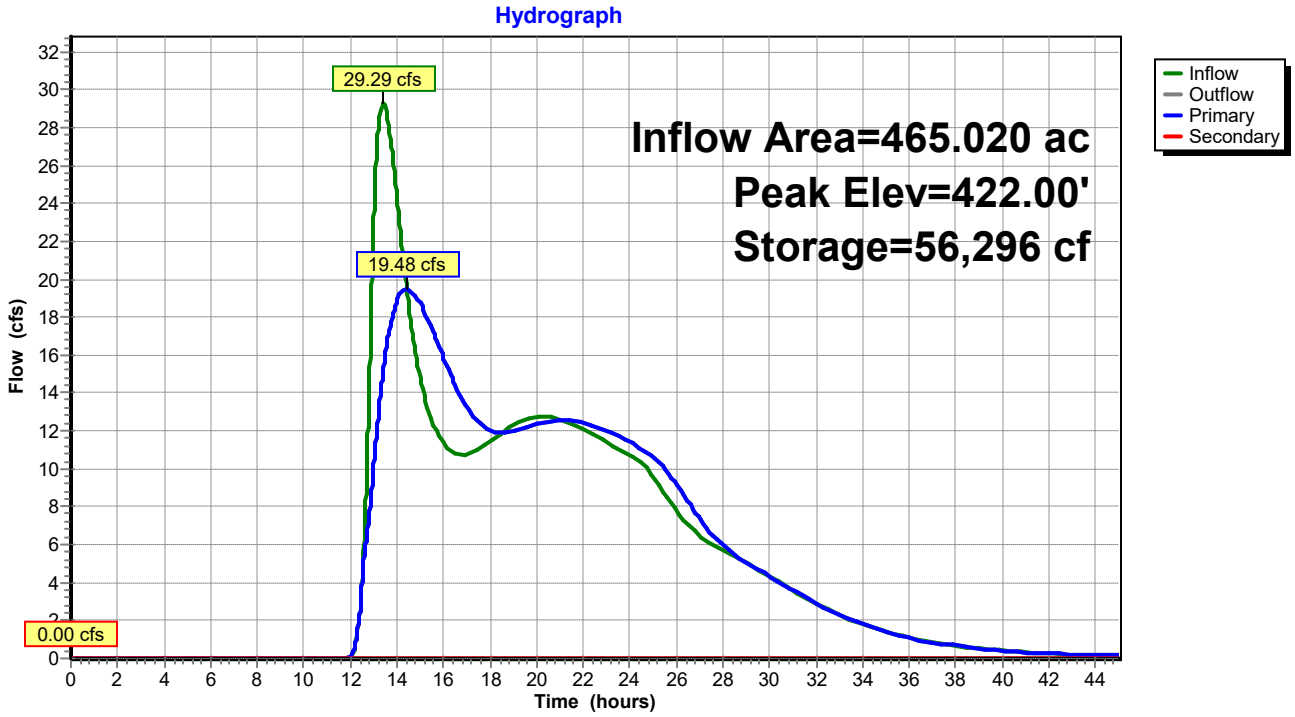
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.11	5	0	0
421.00	25	13	13
422.00	113,500	56,763	56,776
423.00	157,948	135,724	192,500
424.00	189,581	173,765	366,264
425.00	217,978	203,780	570,044
426.00	256,585	237,282	807,325

Device	Routing	Invert	Outlet Devices
#1	Primary	420.11'	**36.0" Round RCP_Round 36"** L= 155.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 420.11' / 419.37' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	425.40'	**260.0' long x 20.0' breadth Canal Overflow to Highway ROW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=19.48 cfs @ 14.42 hrs HW=422.00' (Free Discharge)
↑—**1=RCP_Round 36"** (Barrel Controls 19.48 cfs @ 5.94 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.11' (Free Discharge)
↑—**2=Canal Overflow to Highway ROW** (Controls 0.00 cfs)

Pond 1P: 36" RCP Storm Drain



Time span=0.00-45.00 hrs, dt=0.01 hrs, 4501 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment DA-1a: Existing Runoff Area=26.630 ac 31.07% Impervious Runoff Depth=1.19"
Flow Length=1,872' Slope=0.0370 '/' Tc=39.4 min CN=67 Runoff=20.68 cfs 2.650 af

Subcatchment DA-1b: Existing Runoff Area=336.510 ac 10.94% Impervious Runoff Depth>0.56"
Flow Length=8,612' Slope=0.0050 '/' Tc=494.2 min CN=55 Runoff=16.25 cfs 15.752 af

Subcatchment DA-2: Existing Runoff Area=27.280 ac 51.72% Impervious Runoff Depth=1.73"
Flow Length=2,428' Slope=0.0226 '/' Tc=49.9 min CN=75 Runoff=27.92 cfs 3.926 af

Subcatchment DA-3: Existing Runoff Area=60.080 ac 24.93% Impervious Runoff Depth=1.13"
Flow Length=3,650' Slope=0.0160 '/' Tc=105.0 min CN=66 Runoff=20.78 cfs 5.678 af

Subcatchment DA-4: Existing Runoff Area=14.520 ac 0.00% Impervious Runoff Depth=0.70"
Flow Length=830' Slope=0.0470 '/' Tc=23.0 min CN=58 Runoff=7.75 cfs 0.849 af

Reach R-1: Reach 1: Sections 0.0-3.0 Avg. Flow Depth=0.76' Max Vel=0.75 fps Inflow=20.78 cfs 18.402 af
L=850.0' S=0.0006 '/' Capacity=337.25 cfs Outflow=17.24 cfs 18.391 af

Reach R-2: Reach 2: Sections 3.0-4.5 Avg. Flow Depth=1.30' Max Vel=1.28 fps Inflow=43.05 cfs 22.317 af
L=400.0' S=0.0010 '/' Capacity=105.23 cfs Outflow=42.43 cfs 22.313 af

Reach R-3: Reach 3: Sections 4.5-11.0 Avg. Flow Depth=0.82' Max Vel=1.31 fps Inflow=53.42 cfs 27.991 af
L=1,615.0' S=0.0013 '/' Capacity=1,025.60 cfs Outflow=46.31 cfs 27.963 af

Reach R-4: Reach 4: Sections Avg. Flow Depth=1.62' Max Vel=1.41 fps Inflow=47.92 cfs 28.812 af
L=1,256.0' S=0.0007 '/' Capacity=169.95 cfs Outflow=45.98 cfs 28.792 af

Pond 1P: 36" RCP Storm Drain Peak Elev=422.43' Storage=109,791 cf Inflow=45.98 cfs 28.792 af
Primary=27.37 cfs 28.792 af Secondary=0.00 cfs 0.000 af Outflow=27.37 cfs 28.792 af

Total Runoff Area = 465.020 ac Runoff Volume = 28.854 af Average Runoff Depth = 0.74"
84.05% Pervious = 390.852 ac 15.95% Impervious = 74.168 ac

Summary for Subcatchment DA-1a: Existing Subcatchment 1A

Area sized to give full flow through pipe during 10 yr storm.

Flow source assumed to be residential drainage from neighborhoods to the west.

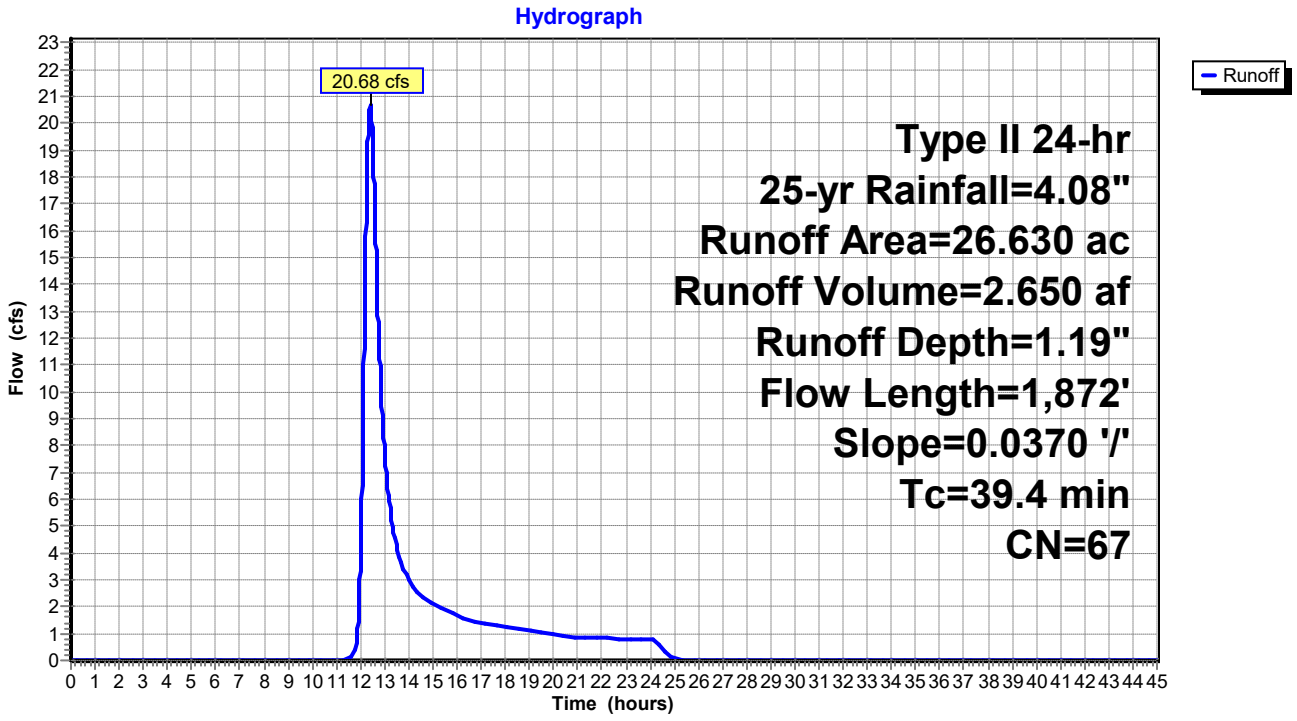
Runoff = 20.68 cfs @ 12.39 hrs, Volume= 2.650 af, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.08"

	Area (ac)	CN	Description
*	14.320	50	>75% Grass cover, Good, HSG A/B
	11.490	88	Urban industrial, 72% imp, HSG B
	0.820	77	Brush, Fair, HSG D
	26.630	67	Weighted Average
	18.357		68.93% Pervious Area
	8.273		31.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.4	1,872	0.0370	0.79		**Lag/CN Method,**

Subcatchment DA-1a: Existing Subcatchment 1A



Summary for Subcatchment DA-1b: Existing Subcatchment Area 1B

See map A for total area of 188,420 sf.

Estimated 10% roof surface, 70% gravel surfaces, 20% near water as grass and forest.

Slope of flow: 438 to 435 surface elevation over 300 feet for gravel; 435 to 421 over 50 feet

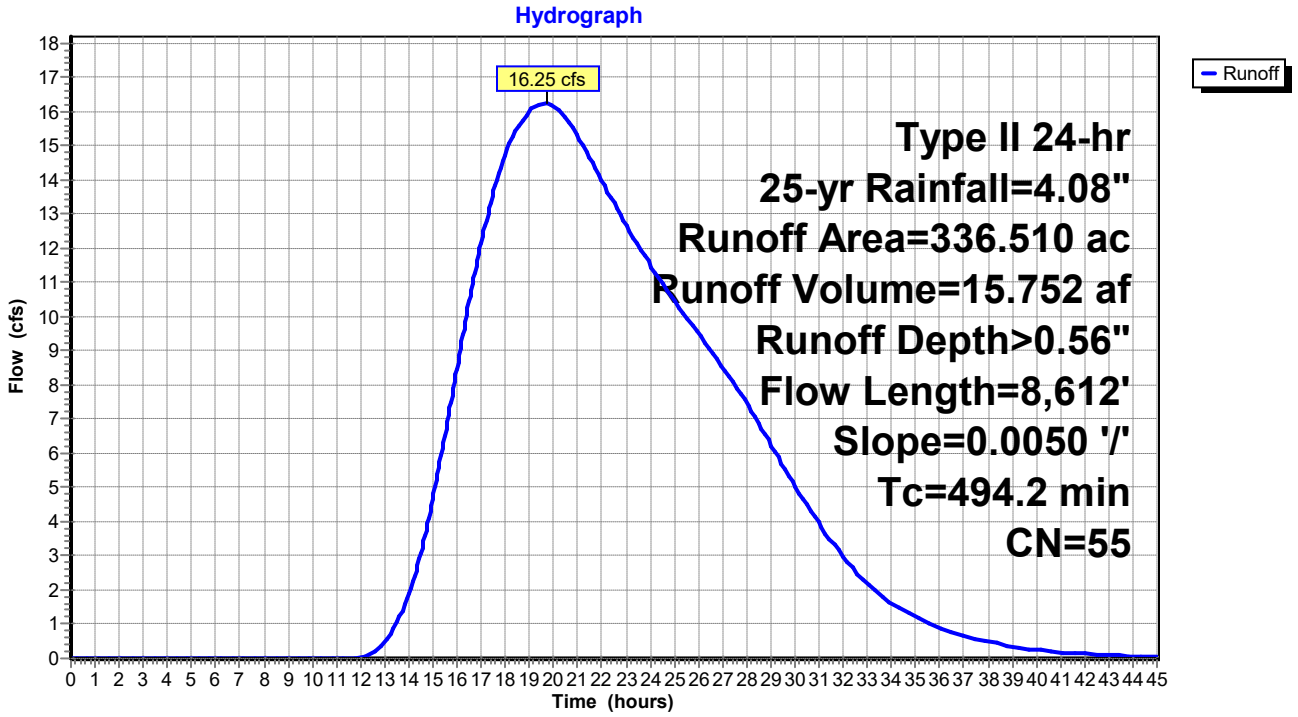
Runoff = 16.25 cfs @ 19.76 hrs, Volume= 15.752 af, Depth> 0.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.08"

	Area (ac)	CN	Description
*	43.640	62	1/2 acre lots, 25% imp, HSG A/B
	18.600	88	Urban industrial, 72% imp, HSG B
*	91.150	55	Woods, Good, HSG A/B
*	78.050	40	Brush, Good, HSG A/B
*	104.220	56	2 acre lots, 12% imp, HSG B/A
	0.850	77	Brush, Fair, HSG D
	336.510	55	Weighted Average
	299.702		89.06% Pervious Area
	36.808		10.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
494.2	8,612	0.0050	0.29		**Lag/CN Method, Incude Est Attenuation**

Subcatchment DA-1b: Existing Subcatchment Area 1B



Summary for Subcatchment DA-2: Existing Subcatchment Area 2

Cover type: industrial type A soils based on Maps C, D and F.

Channel Tc:

Slope as 445 inlet to 420 outlet over 460 feet.

Perimiter as length (460)x2 + width (50)x2.

X-sec area estimated as rectangular with 5' depth and 25' wide.

Other Tc area: 16' elev over 430 feet. Unpaved based on aerial photography.

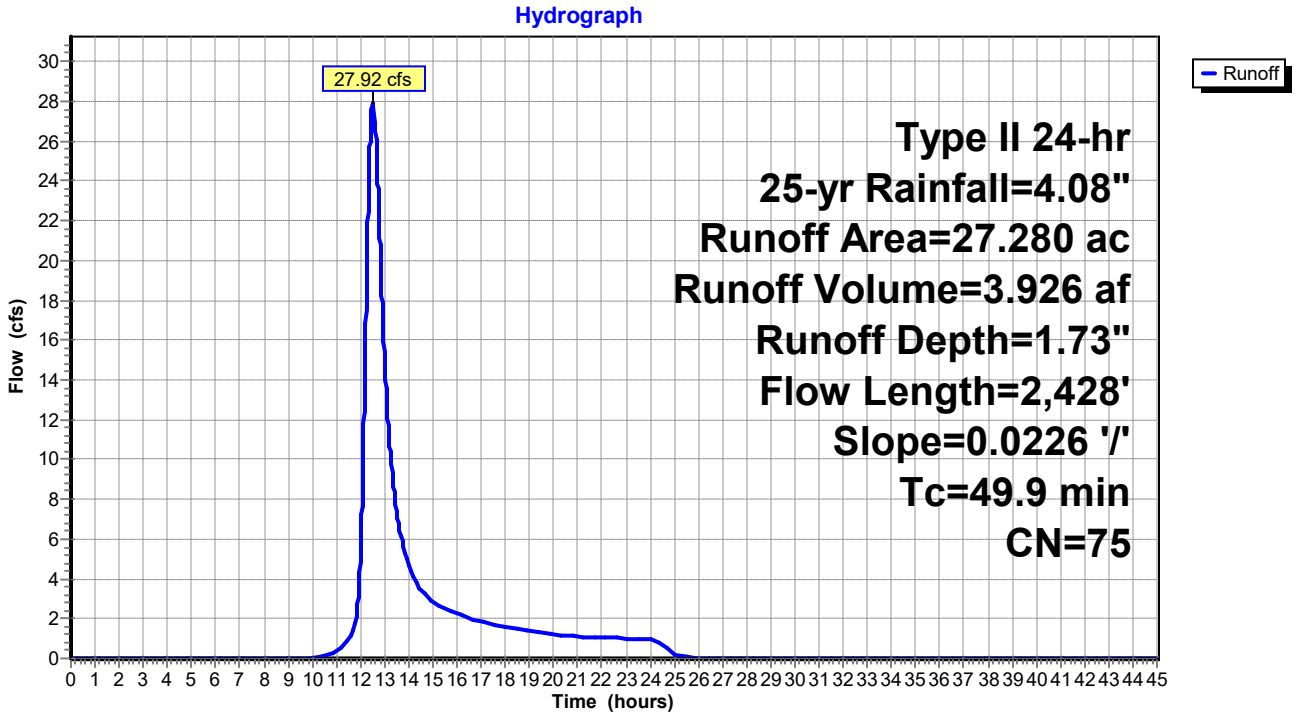
Runoff = 27.92 cfs @ 12.48 hrs, Volume= 3.926 af, Depth= 1.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.08"

	Area (ac)	CN	Description
*	16.600	92	Urban Ind/Com, 85% imp, HSG B
*	9.880	46	Brush, Fair, HSG A/B
	0.800	77	Brush, Fair, HSG D
	27.280	75	Weighted Average
	13.170		48.28% Pervious Area
	14.110		51.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.9	2,428	0.0226	0.81		**Lag/CN Method,**

Subcatchment DA-2: Existing Subcatchment Area 2



Summary for Subcatchment DA-3: Existing Subcatchment Area 3

Cover type: 20% industrial class A, 30% wood class B, 30% range class B, 20% grass class B for large area south of Bleecker. 55% grass 45% wood class B for area west of channel and north of Bleecker.

Channel Tc:

Slope as 452 inlet to 419 outlet over 565 feet.

Perimiter as length 565'x2 + width (12')x2.

X-sec area estimated as rectangular with 5' depth and 12' wide.

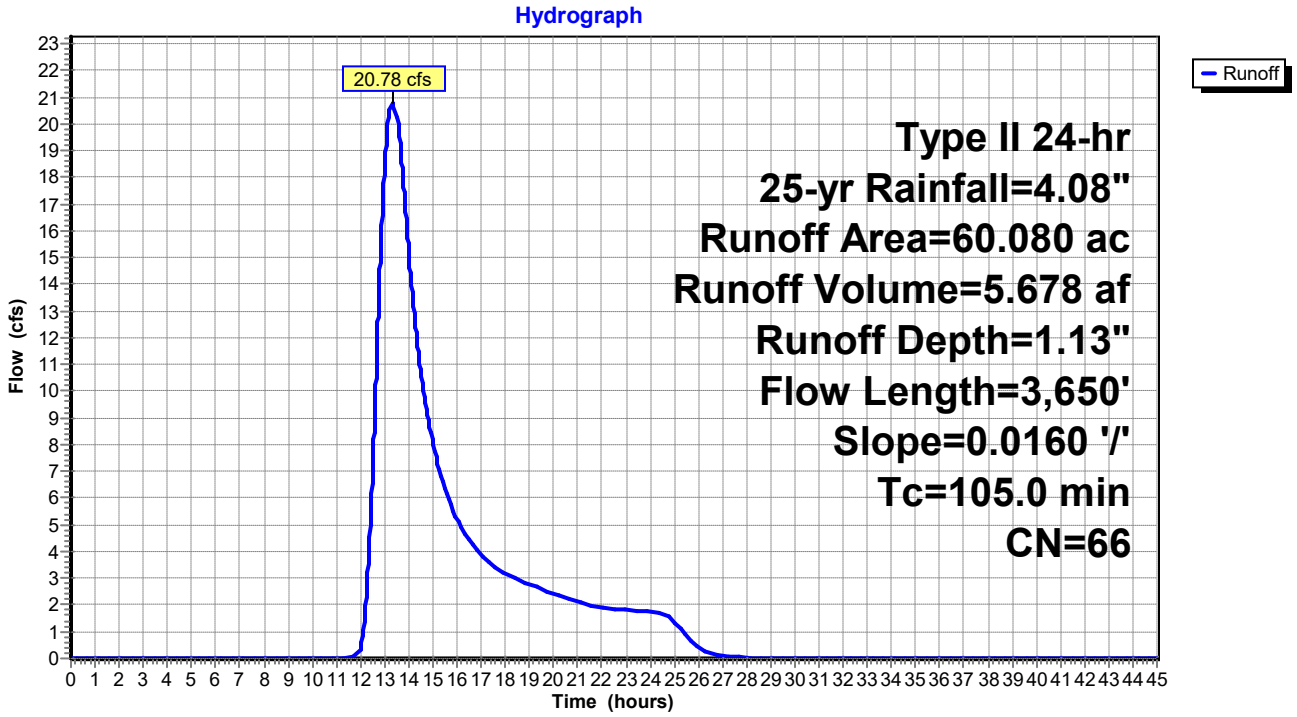
Runoff = 20.78 cfs @ 13.31 hrs, Volume= 5.678 af, Depth= 1.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.08"

	Area (ac)	CN	Description
	17.620	92	Urban commercial, 85% imp, HSG B
*	6.830	43	Woods, Good, HSG A/B
	34.150	56	Brush, Fair, HSG B
*	1.480	77	Brush, Fair, HSG D - Canal
	60.080	66	Weighted Average
	45.103		75.07% Pervious Area
	14.977		24.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
105.0	3,650	0.0160	0.58		**Lag/CN Method,**

Subcatchment DA-3: Existing Subcatchment Area 3



Summary for Subcatchment DA-4: Existing Subcatchment Area 4

See Map A for area of subcatchment and farthest run for Tc. Slope calculated as 725 foot run from 460 to 418 elevation.

CN for area average of A and B soil groups for grass/woodland.

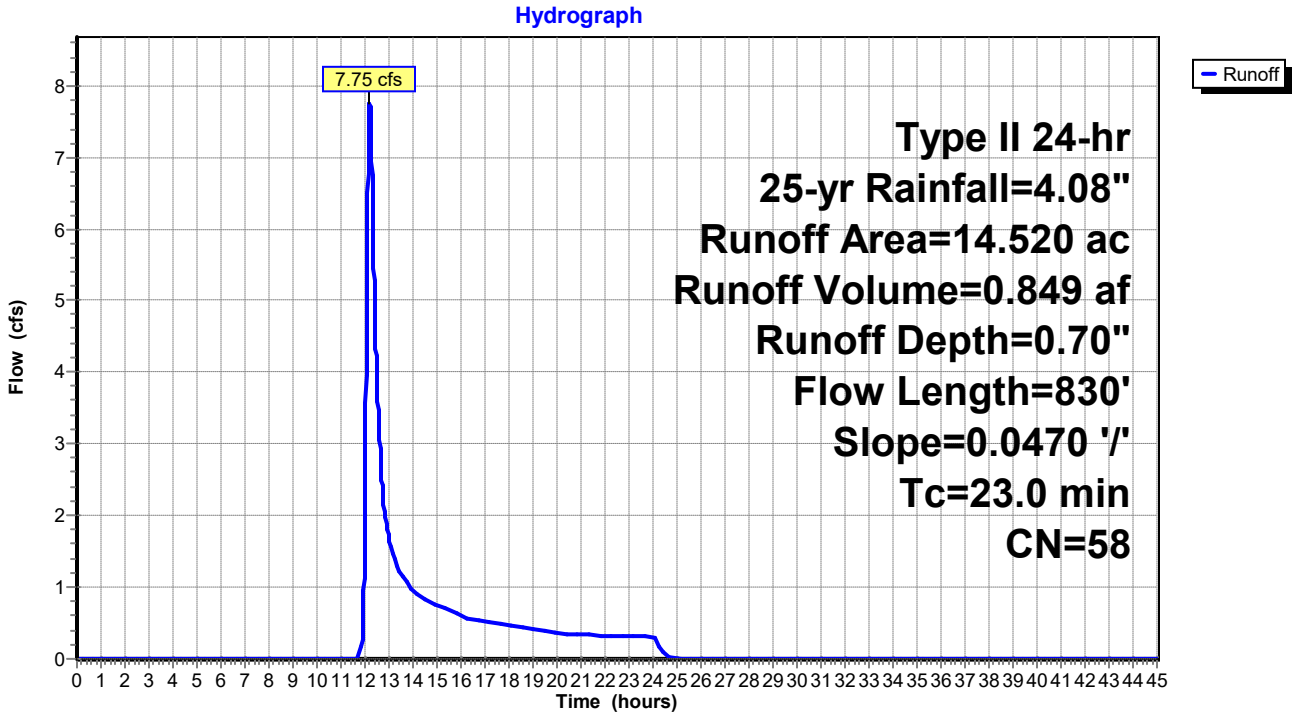
Runoff = 7.75 cfs @ 12.20 hrs, Volume= 0.849 af, Depth= 0.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.08"

	Area (ac)	CN	Description
	12.880	56	Brush, Fair, HSG B
*	1.640	77	Brush, Fair, HSG D - Canal
	14.520	58	Weighted Average
	14.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	830	0.0470	0.60		**Lag/CN Method,**

Subcatchment DA-4: Existing Subcatchment Area 4



Summary for Reach R-1: Reach 1: Sections 0.0-3.0

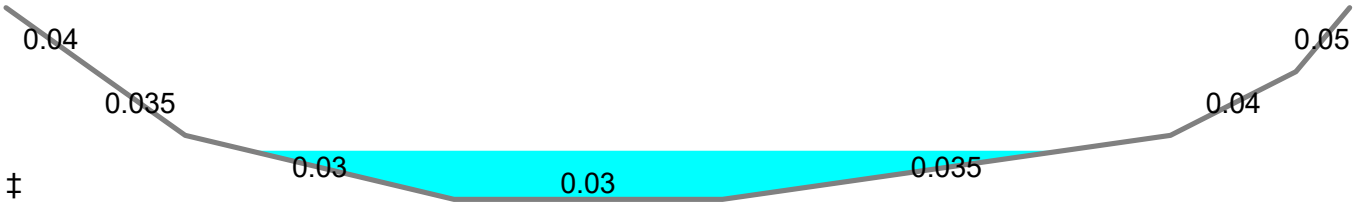
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 363.140 ac, 12.41% Impervious, Inflow Depth > 0.61" for 25-yr event
Inflow = 20.78 cfs @ 12.39 hrs, Volume= 18.402 af
Outflow = 17.24 cfs @ 19.77 hrs, Volume= 18.391 af, Atten= 17%, Lag= 443.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.75 fps, Min. Travel Time= 18.8 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 28.8 min

Peak Storage= 19,478 cf @ 19.77 hrs
Average Depth at Peak Storage= 0.76'
Defined Flood Depth= 426.00' Flow Area= 31,841.2 sf, Capacity= 95,948.09 cfs
Bank-Full Depth= 3.00' Flow Area= 167.0 sf, Capacity= 337.25 cfs

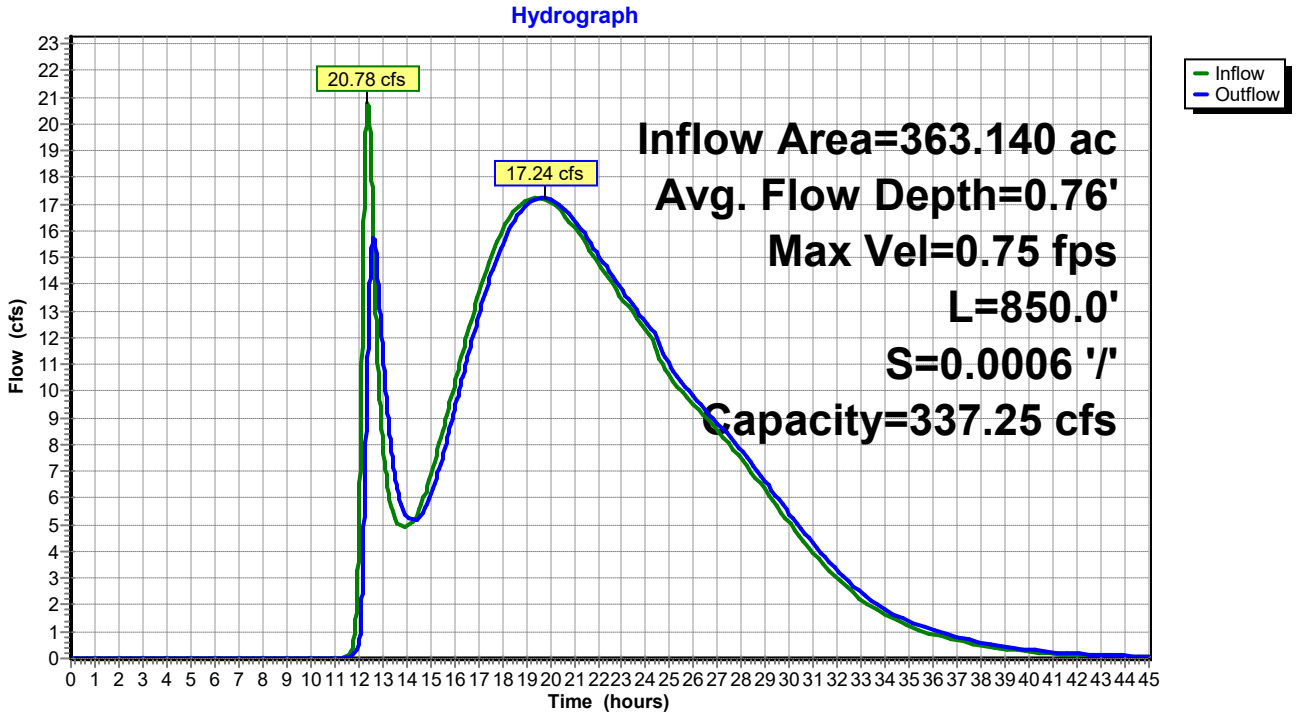
Custom cross-section, Length= 850.0' Slope= 0.0006 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 424.00', Outlet Invert= 423.50'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
25.00	425.00	0.00		
30.00	424.00	1.00	0.040	Earth, dense weeds
35.00	423.00	2.00	0.035	Earth, dense weeds
50.00	422.00	3.00	0.030	Earth, clean & winding
65.00	422.00	3.00	0.030	Earth, clean & winding
90.00	423.00	2.00	0.035	Earth, dense weeds
97.00	424.00	1.00	0.040	Earth, dense weeds
100.00	425.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	15.0	0	0.00
1.00	35.0	55.1	29,750	30.40
2.00	96.0	67.2	81,600	145.67
3.00	167.0	75.5	141,950	337.25

Reach R-1: Reach 1: Sections 0.0-3.0



Summary for Reach R-2: Reach 2: Sections 3.0-4.5

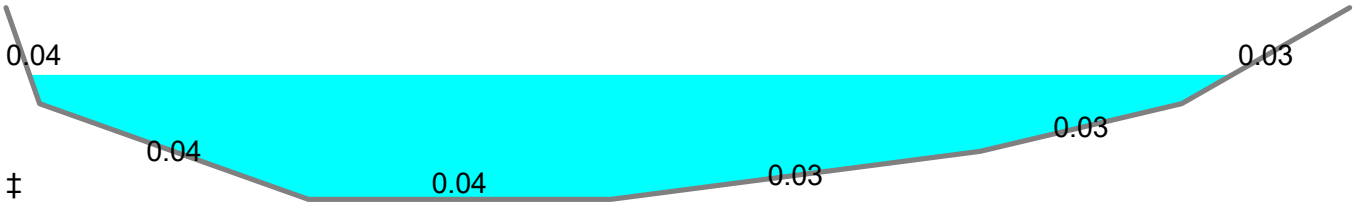
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 390.420 ac, 15.16% Impervious, Inflow Depth > 0.69" for 25-yr event
Inflow = 43.05 cfs @ 12.58 hrs, Volume= 22.317 af
Outflow = 42.43 cfs @ 12.62 hrs, Volume= 22.313 af, Atten= 1%, Lag= 2.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.28 fps, Min. Travel Time= 5.2 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 11.0 min

Peak Storage= 13,294 cf @ 12.62 hrs
Average Depth at Peak Storage= 1.30'
Defined Flood Depth= 426.00' Flow Area= 16,994.3 sf, Capacity= 45,417.71 cfs
Bank-Full Depth= 2.00' Flow Area= 59.8 sf, Capacity= 105.23 cfs

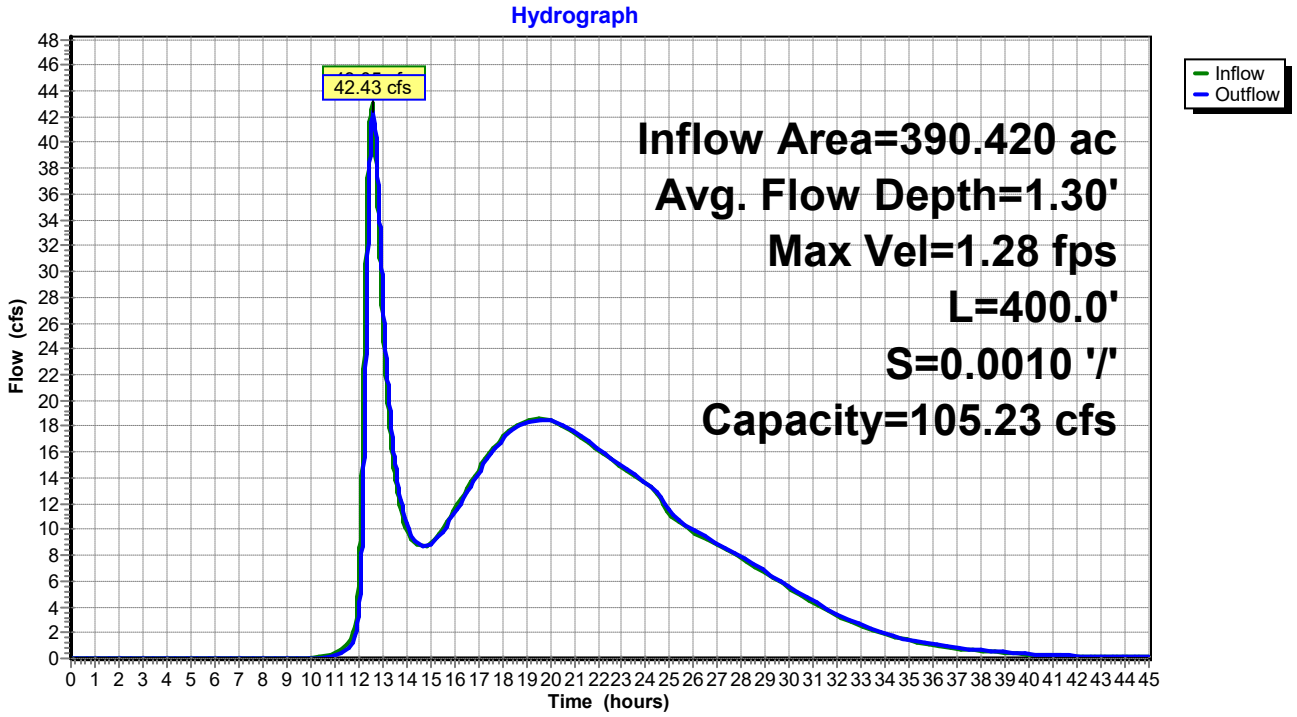
Custom cross-section, Length= 400.0' Slope= 0.0010 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.50', Outlet Invert= 423.10'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
40.00	425.00	0.00		
41.00	424.00	1.00	0.040	Earth, dense weeds
49.00	423.00	2.00	0.040	Earth, dense weeds
58.00	423.00	2.00	0.040	Earth, dense weeds
69.00	423.50	1.50	0.030	Earth, grassed & winding
75.00	424.00	1.00	0.030	
80.00	425.00	0.00	0.030	

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	9.0	0	0.00
0.50	8.3	24.0	3,300	5.34
1.00	22.8	34.1	9,100	23.27
2.00	59.8	40.6	23,900	105.23

Reach R-2: Reach 2: Sections 3.0-4.5



Summary for Reach R-3: Reach 3: Sections 4.5-11.0

Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 450.500 ac, 16.46% Impervious, Inflow Depth > 0.75" for 25-yr event
Inflow = 53.42 cfs @ 12.71 hrs, Volume= 27.991 af
Outflow = 46.31 cfs @ 13.05 hrs, Volume= 27.963 af, Atten= 13%, Lag= 20.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.31 fps, Min. Travel Time= 20.5 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 41.0 min

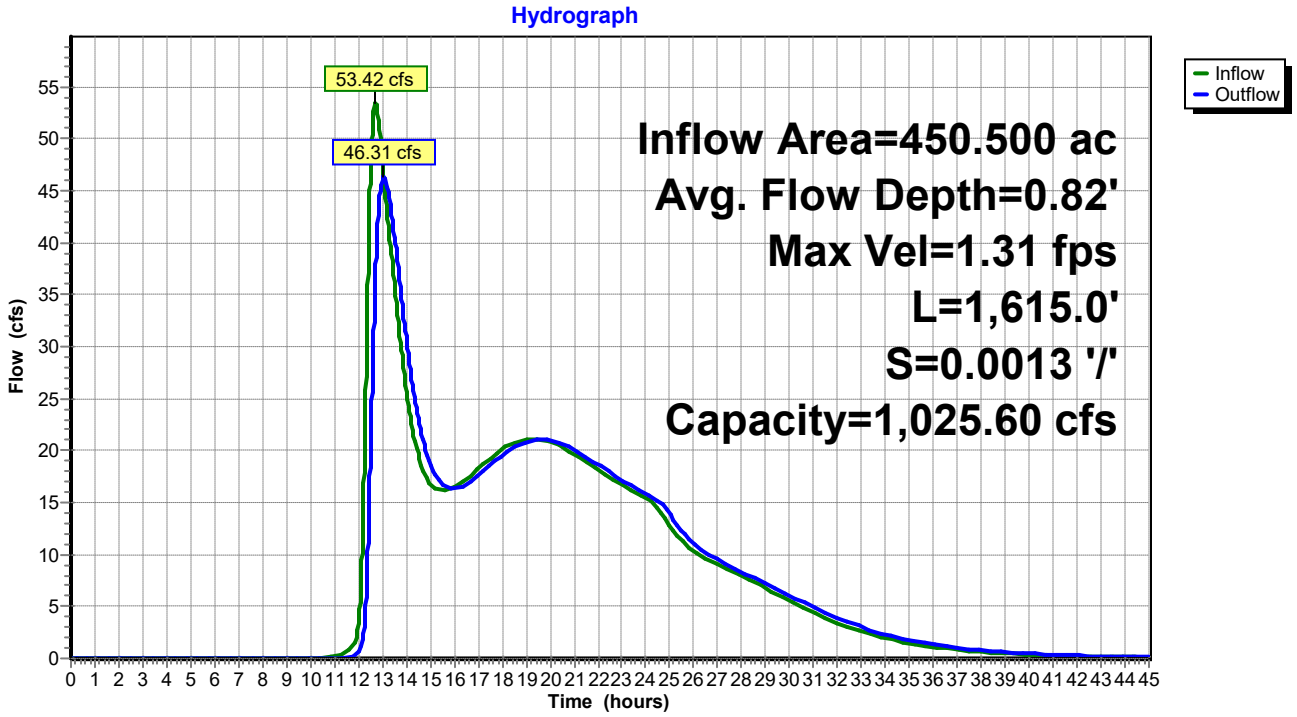
Peak Storage= 57,084 cf @ 13.05 hrs
Average Depth at Peak Storage= 0.82'
Defined Flood Depth= 426.00' Flow Area= 31,858.3 sf, Capacity= 198,961.16 cfs
Bank-Full Depth= 4.00' Flow Area= 250.5 sf, Capacity= 1,025.60 cfs

Custom cross-section, Length= 1,615.0' Slope= 0.0013 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.10', Outlet Invert= 421.00'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
15.00	426.00	0.00		
17.00	425.00	1.00	0.050	Earth, long dense weeds
19.00	424.00	2.00	0.040	Earth, dense weeds
21.00	423.00	3.00	0.035	Earth, dense weeds
50.00	422.00	4.00	0.030	Earth, clean & winding
80.00	422.00	4.00	0.030	Earth, clean & winding
83.00	423.00	3.00	0.035	Earth, dense weeds
85.00	424.00	2.00	0.040	Earth, cobble bottom, clean sides
87.00	425.00	1.00	0.050	Earth, long dense weeds
90.00	426.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	30.0	0	0.00
1.00	46.0	62.2	74,290	67.24
2.00	110.0	66.7	177,650	279.24
3.00	178.0	71.1	287,470	602.50
4.00	250.5	76.5	404,558	1,025.60

Reach R-3: Reach 3: Sections 4.5-11.0



Summary for Reach R-4: Reach 4: Sections 11.0-16.5

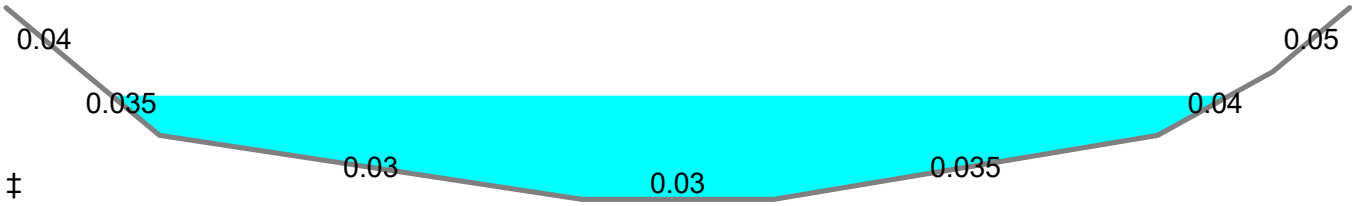
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 0.74" for 25-yr event
Inflow = 47.92 cfs @ 13.04 hrs, Volume= 28.812 af
Outflow = 45.98 cfs @ 13.26 hrs, Volume= 28.792 af, Atten= 4%, Lag= 13.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.41 fps, Min. Travel Time= 14.9 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 29.1 min

Peak Storage= 41,103 cf @ 13.26 hrs
Average Depth at Peak Storage= 1.62'
Defined Flood Depth= 426.00' Flow Area= 14,856.6 sf, Capacity= 48,804.33 cfs
Bank-Full Depth= 3.00' Flow Area= 77.0 sf, Capacity= 169.95 cfs

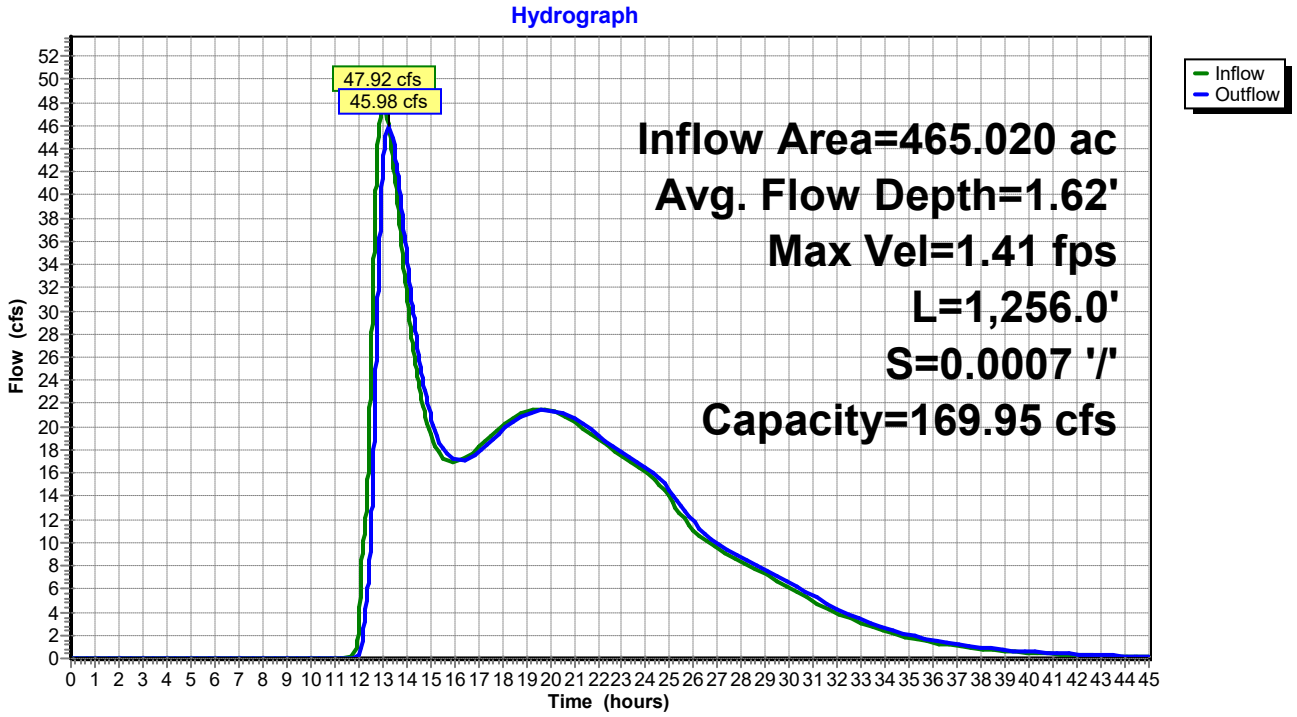
Custom cross-section, Length= 1,256.0' Slope= 0.0007 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 421.00', Outlet Invert= 420.11'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
35.00	425.00	0.00		
37.00	424.00	1.00	0.040	Earth, dense weeds
39.00	423.00	2.00	0.035	Earth, dense weeds
50.00	422.00	3.00	0.030	Earth, clean & winding
55.00	422.00	3.00	0.030	Earth, clean & winding
65.00	423.00	2.00	0.035	Earth, dense weeds
68.00	424.00	1.00	0.040	Earth, dense weeds
70.00	425.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	5.0	0	0.00
1.00	15.5	26.1	19,468	13.98
2.00	44.0	31.5	55,264	72.53
3.00	77.0	36.0	96,712	169.95

Reach R-4: Reach 4: Sections 11.0-16.5



Summary for Pond 1P: 36" RCP Storm Drain

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 0.74" for 25-yr event
Inflow = 45.98 cfs @ 13.26 hrs, Volume= 28.792 af
Outflow = 27.37 cfs @ 14.44 hrs, Volume= 28.792 af, Atten= 40%, Lag= 70.8 min
Primary = 27.37 cfs @ 14.44 hrs, Volume= 28.792 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 422.43' @ 14.44 hrs Surf.Area= 132,646 sf Storage= 109,791 cf
Flood Elev= 425.00' Surf.Area= 217,978 sf Storage= 570,044 cf

Plug-Flow detention time= 43.6 min calculated for 28.792 af (100% of inflow)
Center-of-Mass det. time= 43.6 min (1,272.4 - 1,228.8)

Volume	Invert	Avail.Storage	Storage Description
#1	420.11'	807,325 cf	**Canal (Prismatic)** Listed below (Recalc)

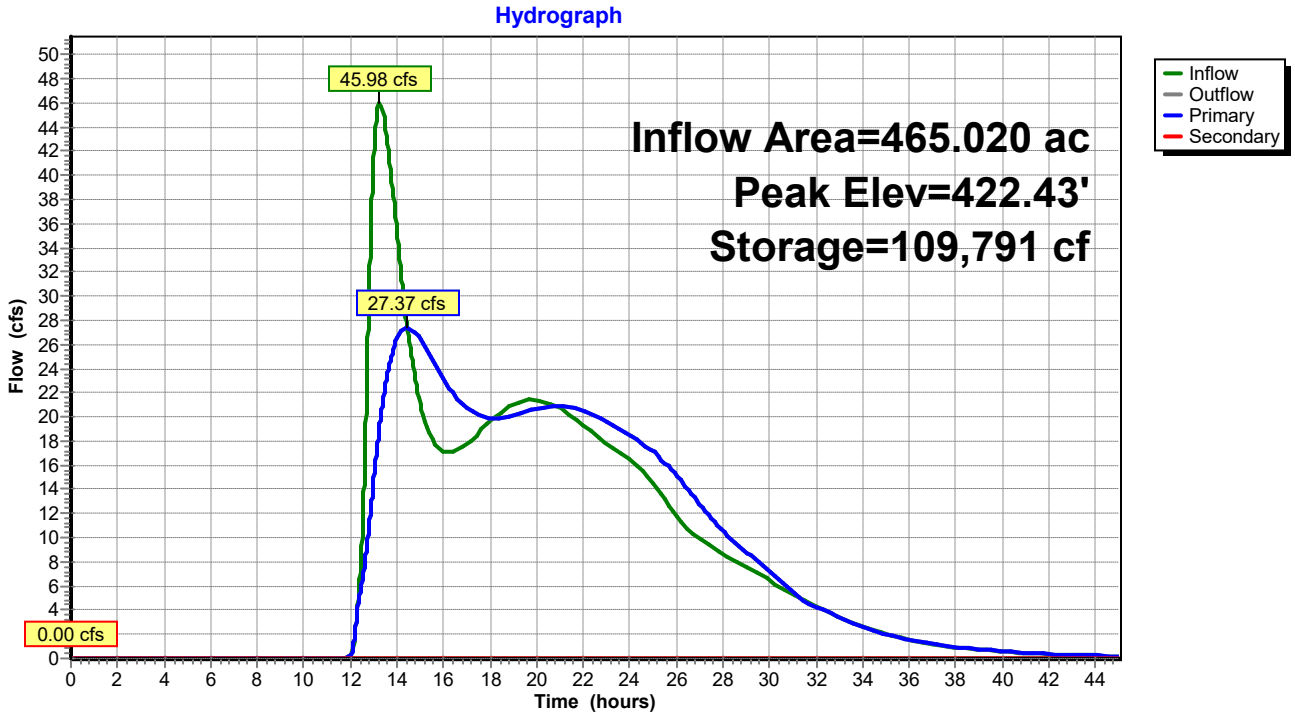
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.11	5	0	0
421.00	25	13	13
422.00	113,500	56,763	56,776
423.00	157,948	135,724	192,500
424.00	189,581	173,765	366,264
425.00	217,978	203,780	570,044
426.00	256,585	237,282	807,325

Device	Routing	Invert	Outlet Devices
#1	Primary	420.11'	**36.0" Round RCP_Round 36"** L= 155.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 420.11' / 419.37' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	425.40'	**260.0' long x 20.0' breadth Canal Overflow to Highway ROW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=27.37 cfs @ 14.44 hrs HW=422.43' (Free Discharge)
↑—**1=RCP_Round 36"** (Barrel Controls 27.37 cfs @ 6.43 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.11' (Free Discharge)
↑—**2=Canal Overflow to Highway ROW** (Controls 0.00 cfs)

Pond 1P: 36" RCP Storm Drain



Time span=0.00-45.00 hrs, dt=0.01 hrs, 4501 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment DA-1a: Existing Runoff Area=26.630 ac 31.07% Impervious Runoff Depth=1.50"
Flow Length=1,872' Slope=0.0370 '/' Tc=39.4 min CN=67 Runoff=26.88 cfs 3.336 af

Subcatchment DA-1b: Existing Runoff Area=336.510 ac 10.94% Impervious Runoff Depth>0.77"
Flow Length=8,612' Slope=0.0050 '/' Tc=494.2 min CN=55 Runoff=22.88 cfs 21.574 af

Subcatchment DA-2: Existing Runoff Area=27.280 ac 51.72% Impervious Runoff Depth=2.10"
Flow Length=2,428' Slope=0.0226 '/' Tc=49.9 min CN=75 Runoff=34.34 cfs 4.768 af

Subcatchment DA-3: Existing Runoff Area=60.080 ac 24.93% Impervious Runoff Depth=1.44"
Flow Length=3,650' Slope=0.0160 '/' Tc=105.0 min CN=66 Runoff=27.25 cfs 7.185 af

Subcatchment DA-4: Existing Runoff Area=14.520 ac 0.00% Impervious Runoff Depth=0.94"
Flow Length=830' Slope=0.0470 '/' Tc=23.0 min CN=58 Runoff=11.32 cfs 1.132 af

Reach R-1: Reach 1: Sections 0.0-3.0 Avg. Flow Depth=0.89' Max Vel=0.82 fps Inflow=27.05 cfs 24.910 af
L=850.0' S=0.0006 '/' Capacity=337.25 cfs Outflow=24.08 cfs 24.898 af

Reach R-2: Reach 2: Sections 3.0-4.5 Avg. Flow Depth=1.45' Max Vel=1.39 fps Inflow=54.75 cfs 29.667 af
L=400.0' S=0.0010 '/' Capacity=105.23 cfs Outflow=54.14 cfs 29.661 af

Reach R-3: Reach 3: Sections 4.5-11.0 Avg. Flow Depth=0.94' Max Vel=1.42 fps Inflow=68.69 cfs 36.847 af
L=1,615.0' S=0.0013 '/' Capacity=1,025.60 cfs Outflow=60.42 cfs 36.815 af

Reach R-4: Reach 4: Sections Avg. Flow Depth=1.84' Max Vel=1.55 fps Inflow=62.61 cfs 37.946 af
L=1,256.0' S=0.0007 '/' Capacity=169.95 cfs Outflow=60.34 cfs 37.925 af

Pond 1P: 36" RCP Storm Drain Peak Elev=422.77' Storage=158,064 cf Inflow=60.34 cfs 37.925 af
Primary=33.80 cfs 37.925 af Secondary=0.00 cfs 0.000 af Outflow=33.80 cfs 37.925 af

Total Runoff Area = 465.020 ac Runoff Volume = 37.996 af Average Runoff Depth = 0.98"
84.05% Pervious = 390.852 ac 15.95% Impervious = 74.168 ac

Summary for Subcatchment DA-1a: Existing Subcatchment 1A

Area sized to give full flow through pipe during 10 yr storm.

Flow source assumed to be residential drainage from neighborhoods to the west.

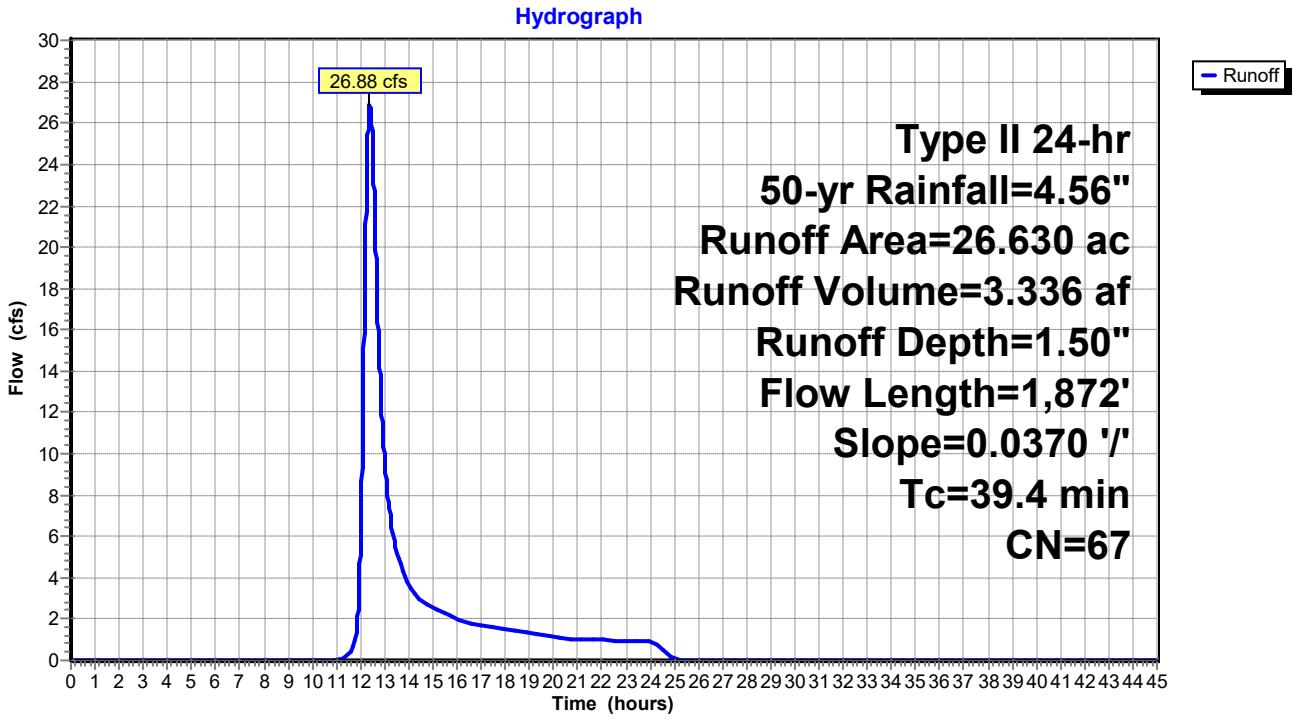
Runoff = 26.88 cfs @ 12.39 hrs, Volume= 3.336 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=4.56"

	Area (ac)	CN	Description
*	14.320	50	>75% Grass cover, Good, HSG A/B
	11.490	88	Urban industrial, 72% imp, HSG B
	0.820	77	Brush, Fair, HSG D
	26.630	67	Weighted Average
	18.357		68.93% Pervious Area
	8.273		31.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.4	1,872	0.0370	0.79		**Lag/CN Method,**

Subcatchment DA-1a: Existing Subcatchment 1A



Summary for Subcatchment DA-1b: Existing Subcatchment Area 1B

See map A for total area of 188,420 sf.

Estimated 10% roof surface, 70% gravel surfaces, 20% near water as grass and forest.

Slope of flow: 438 to 435 surface elevation over 300 feet for gravel; 435 to 421 over 50 feet

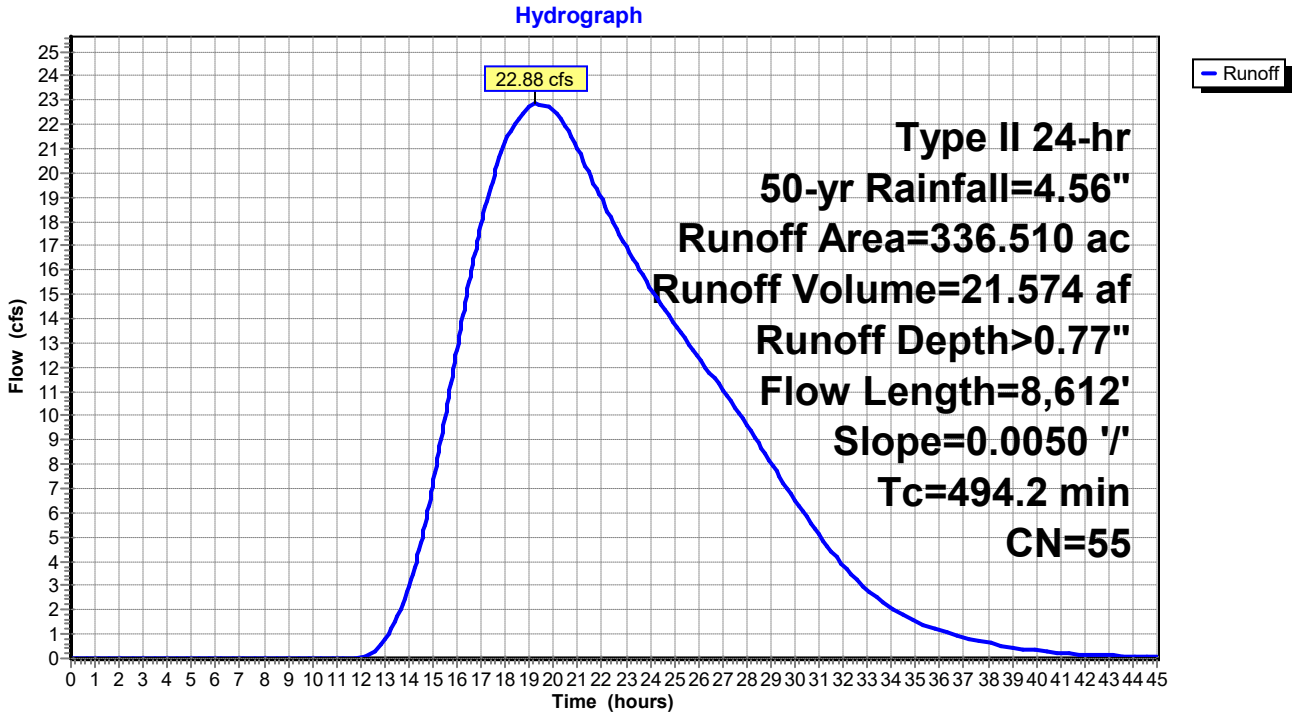
Runoff = 22.88 cfs @ 19.22 hrs, Volume= 21.574 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=4.56"

	Area (ac)	CN	Description
*	43.640	62	1/2 acre lots, 25% imp, HSG A/B
	18.600	88	Urban industrial, 72% imp, HSG B
*	91.150	55	Woods, Good, HSG A/B
*	78.050	40	Brush, Good, HSG A/B
*	104.220	56	2 acre lots, 12% imp, HSG B/A
	0.850	77	Brush, Fair, HSG D
	336.510	55	Weighted Average
	299.702		89.06% Pervious Area
	36.808		10.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
494.2	8,612	0.0050	0.29		**Lag/CN Method, Incude Est Attenuation**

Subcatchment DA-1b: Existing Subcatchment Area 1B



Summary for Subcatchment DA-2: Existing Subcatchment Area 2

Cover type: industrial type A soils based on Maps C, D and F.

Channel Tc:

Slope as 445 inlet to 420 outlet over 460 feet.

Perimiter as length (460)x2 + width (50)x2.

X-sec area estimated as rectangular with 5' depth and 25' wide.

Other Tc area: 16' elev over 430 feet. Unpaved based on aerial photography.

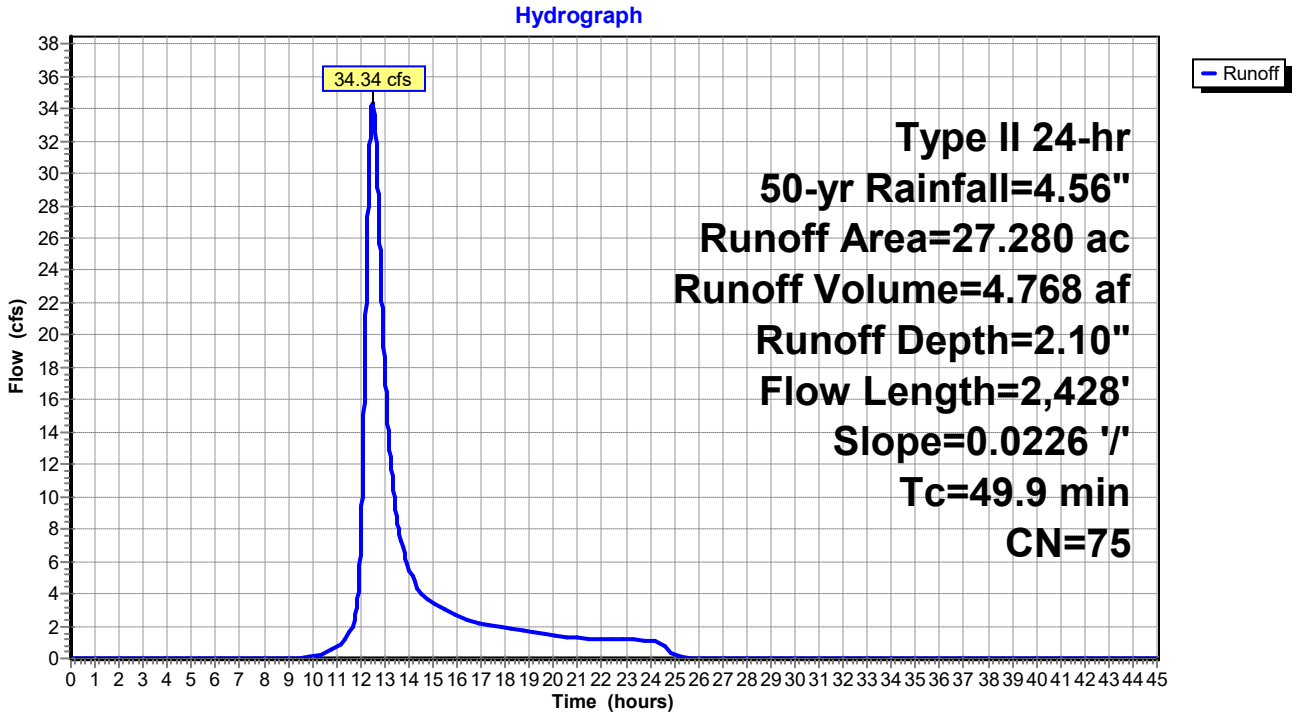
Runoff = 34.34 cfs @ 12.48 hrs, Volume= 4.768 af, Depth= 2.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=4.56"

	Area (ac)	CN	Description
*	16.600	92	Urban Ind/Com, 85% imp, HSG B
*	9.880	46	Brush, Fair, HSG A/B
	0.800	77	Brush, Fair, HSG D
	27.280	75	Weighted Average
	13.170		48.28% Pervious Area
	14.110		51.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.9	2,428	0.0226	0.81		**Lag/CN Method,**

Subcatchment DA-2: Existing Subcatchment Area 2



Summary for Subcatchment DA-3: Existing Subcatchment Area 3

Cover type: 20% industrial class A, 30% wood class B, 30% range class B, 20% grass class B for large area south of Bleecker. 55% grass 45% wood class B for area west of channel and north of Bleecker.

Channel Tc:

Slope as 452 inlet to 419 outlet over 565 feet.

Perimiter as length 565'x2 + width (12')x2.

X-sec area estimated as rectangular with 5' depth and 12' wide.

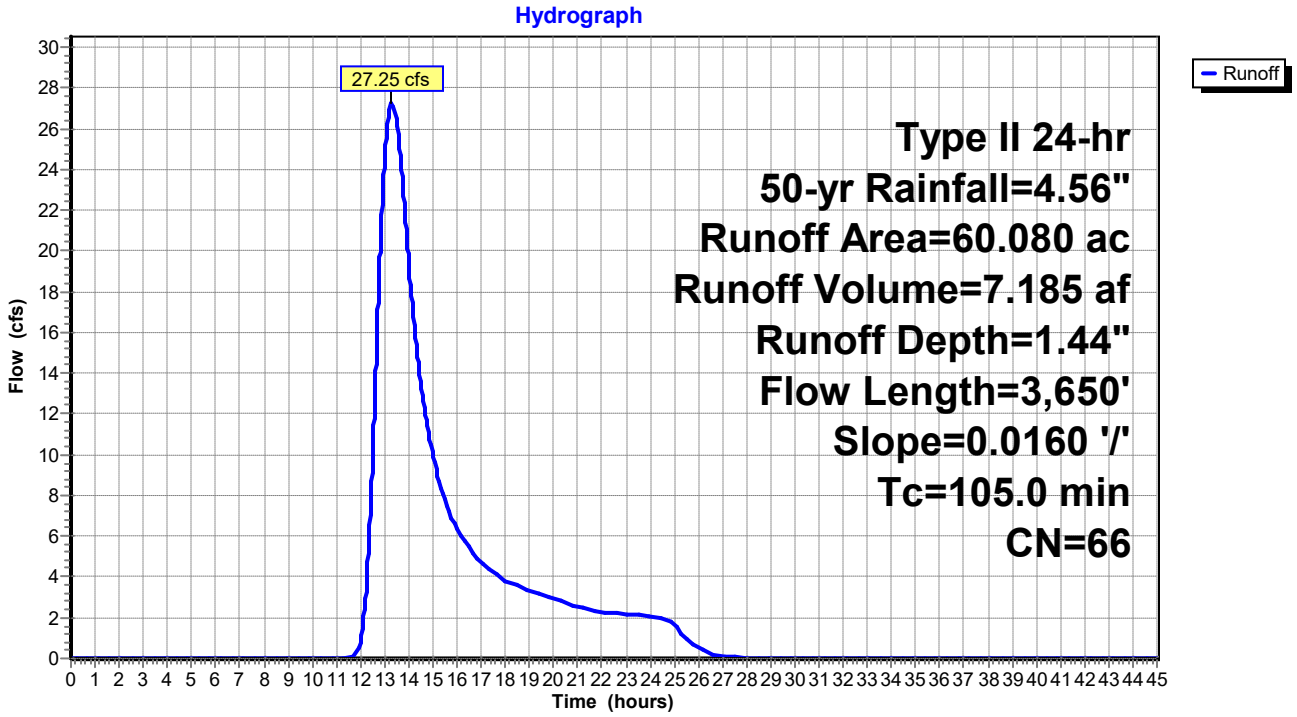
Runoff = 27.25 cfs @ 13.30 hrs, Volume= 7.185 af, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=4.56"

	Area (ac)	CN	Description
	17.620	92	Urban commercial, 85% imp, HSG B
*	6.830	43	Woods, Good, HSG A/B
	34.150	56	Brush, Fair, HSG B
*	1.480	77	Brush, Fair, HSG D - Canal
	60.080	66	Weighted Average
	45.103		75.07% Pervious Area
	14.977		24.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
105.0	3,650	0.0160	0.58		**Lag/CN Method,**

Subcatchment DA-3: Existing Subcatchment Area 3



Summary for Subcatchment DA-4: Existing Subcatchment Area 4

See Map A for area of subcatchment and farthest run for Tc. Slope calculated as 725 foot run from 460 to 418 elevation.

CN for area average of A and B soil groups for grass/woodland.

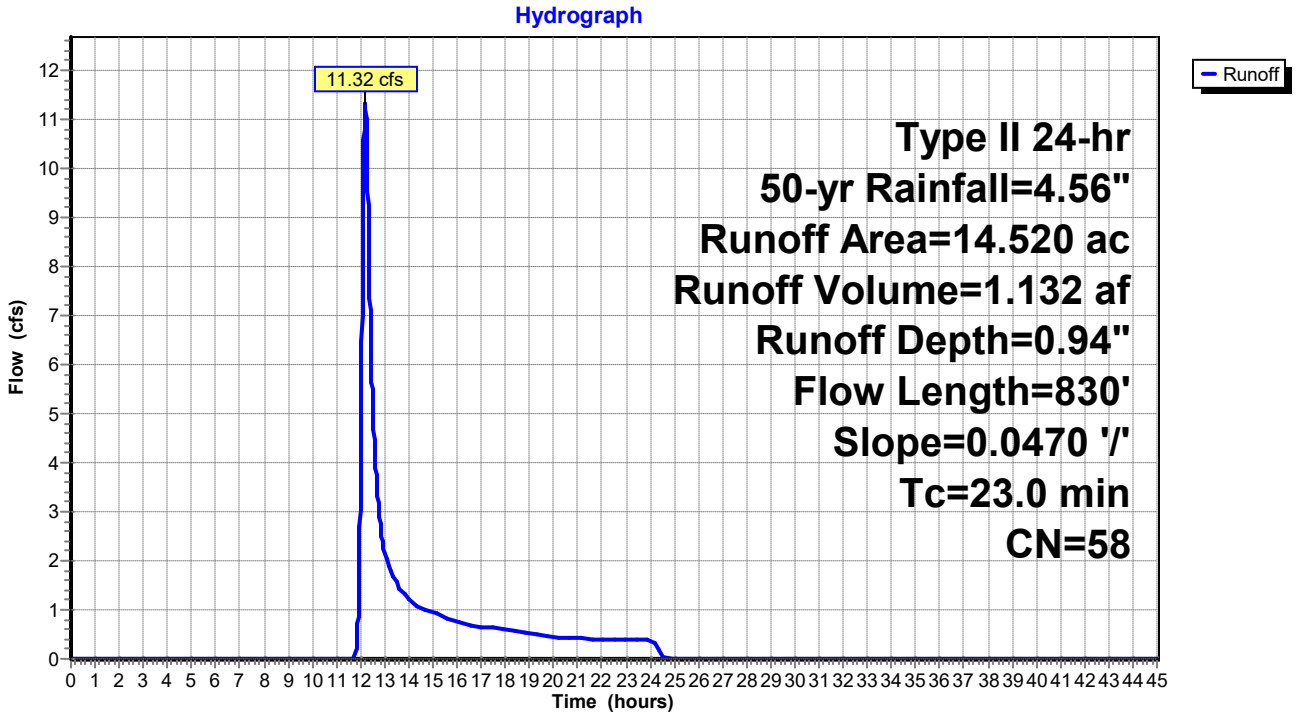
Runoff = 11.32 cfs @ 12.19 hrs, Volume= 1.132 af, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=4.56"

	Area (ac)	CN	Description
	12.880	56	Brush, Fair, HSG B
*	1.640	77	Brush, Fair, HSG D - Canal
	14.520	58	Weighted Average
	14.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	830	0.0470	0.60		**Lag/CN Method,**

Subcatchment DA-4: Existing Subcatchment Area 4



Summary for Reach R-1: Reach 1: Sections 0.0-3.0

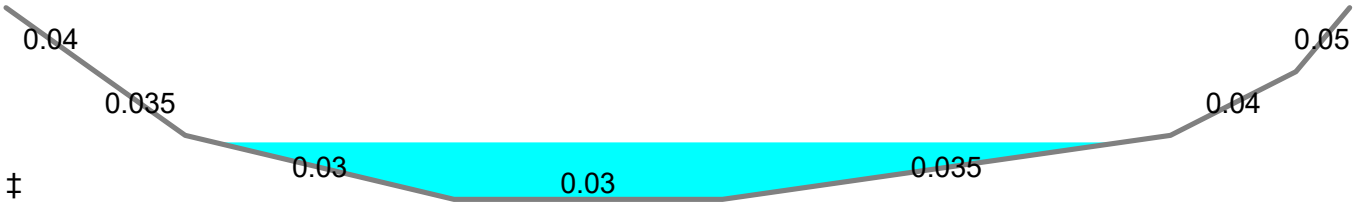
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 363.140 ac, 12.41% Impervious, Inflow Depth > 0.82" for 50-yr event
Inflow = 27.05 cfs @ 12.39 hrs, Volume= 24.910 af
Outflow = 24.08 cfs @ 19.44 hrs, Volume= 24.898 af, Atten= 11%, Lag= 423.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.82 fps, Min. Travel Time= 17.3 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 26.8 min

Peak Storage= 24,984 cf @ 19.44 hrs
Average Depth at Peak Storage= 0.89'
Defined Flood Depth= 426.00' Flow Area= 31,841.2 sf, Capacity= 95,948.09 cfs
Bank-Full Depth= 3.00' Flow Area= 167.0 sf, Capacity= 337.25 cfs

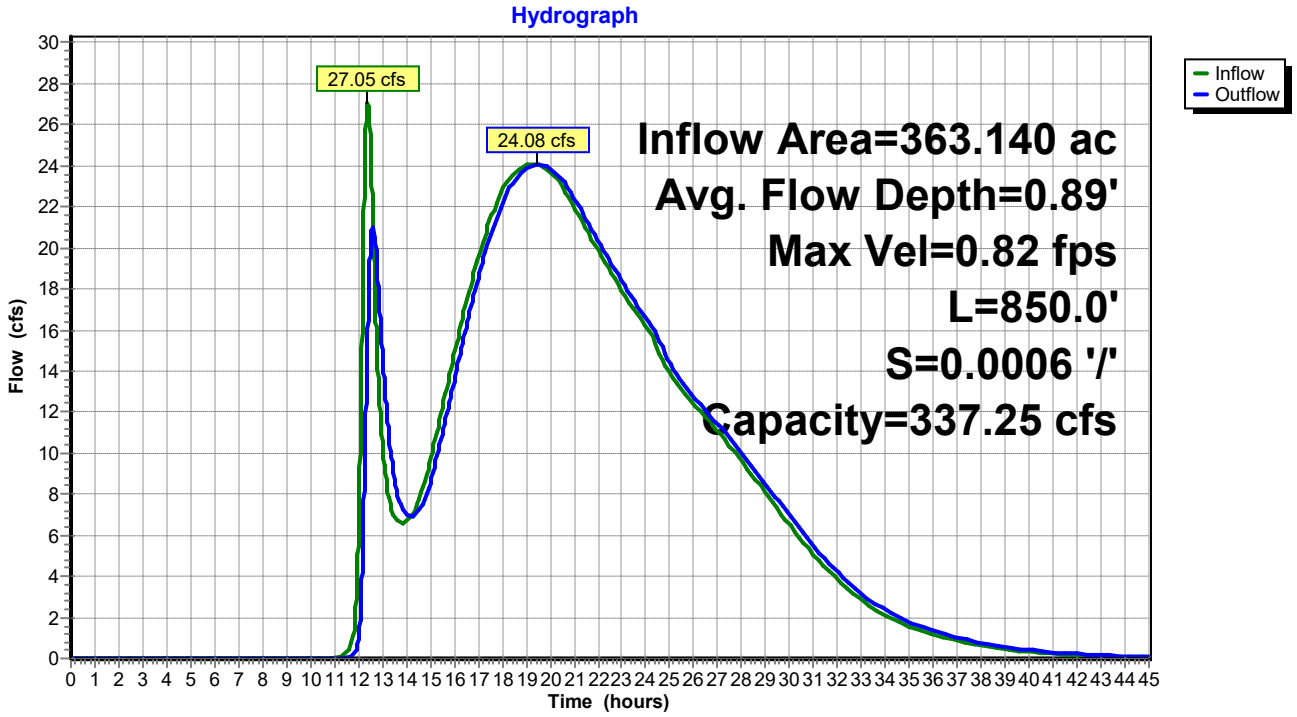
Custom cross-section, Length= 850.0' Slope= 0.0006 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 424.00', Outlet Invert= 423.50'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
25.00	425.00	0.00		
30.00	424.00	1.00	0.040	Earth, dense weeds
35.00	423.00	2.00	0.035	Earth, dense weeds
50.00	422.00	3.00	0.030	Earth, clean & winding
65.00	422.00	3.00	0.030	Earth, clean & winding
90.00	423.00	2.00	0.035	Earth, dense weeds
97.00	424.00	1.00	0.040	Earth, dense weeds
100.00	425.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	15.0	0	0.00
1.00	35.0	55.1	29,750	30.40
2.00	96.0	67.2	81,600	145.67
3.00	167.0	75.5	141,950	337.25

Reach R-1: Reach 1: Sections 0.0-3.0



Summary for Reach R-2: Reach 2: Sections 3.0-4.5

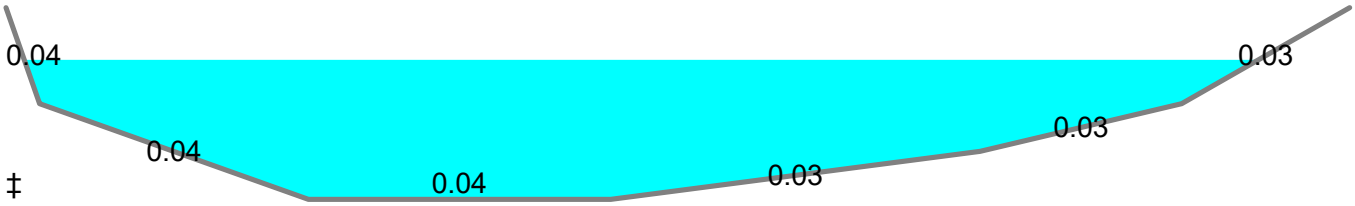
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 390.420 ac, 15.16% Impervious, Inflow Depth > 0.91" for 50-yr event
Inflow = 54.75 cfs @ 12.55 hrs, Volume= 29.667 af
Outflow = 54.14 cfs @ 12.60 hrs, Volume= 29.661 af, Atten= 1%, Lag= 3.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.39 fps, Min. Travel Time= 4.8 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 10.1 min

Peak Storage= 15,532 cf @ 12.60 hrs
Average Depth at Peak Storage= 1.45'
Defined Flood Depth= 426.00' Flow Area= 16,994.3 sf, Capacity= 45,417.71 cfs
Bank-Full Depth= 2.00' Flow Area= 59.8 sf, Capacity= 105.23 cfs

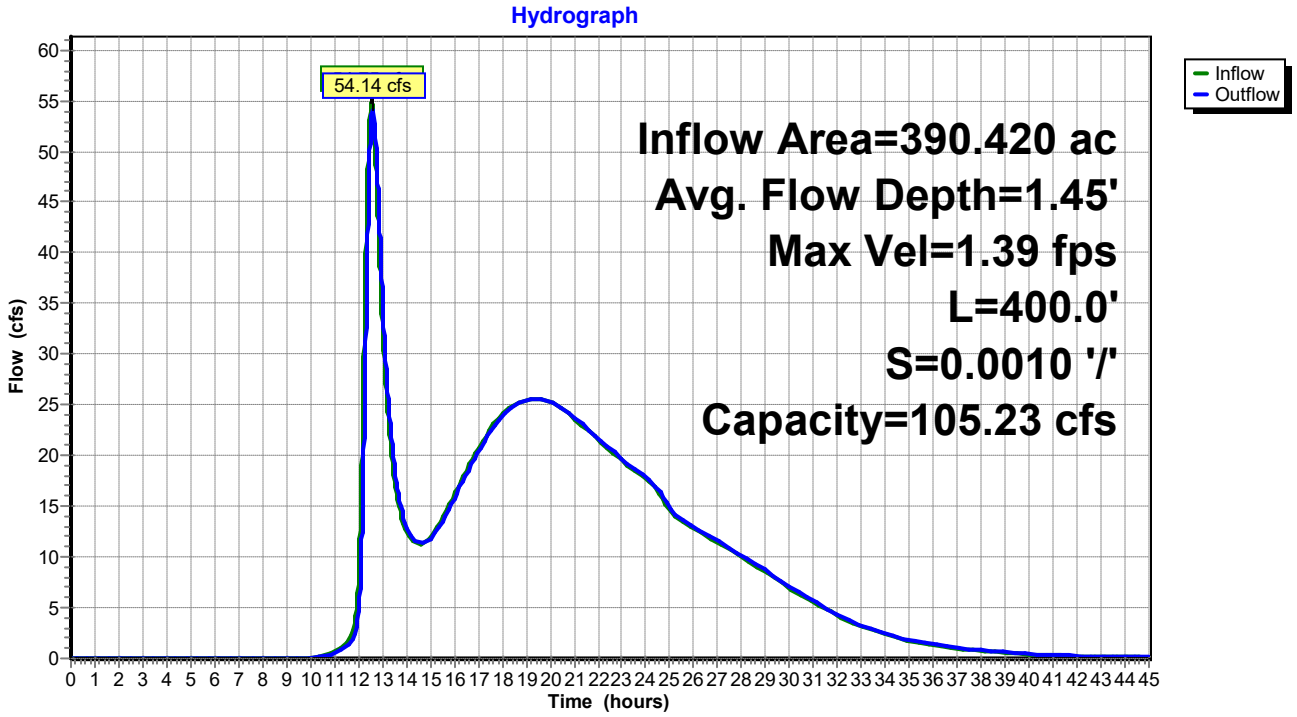
Custom cross-section, Length= 400.0' Slope= 0.0010 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.50', Outlet Invert= 423.10'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
40.00	425.00	0.00		
41.00	424.00	1.00	0.040	Earth, dense weeds
49.00	423.00	2.00	0.040	Earth, dense weeds
58.00	423.00	2.00	0.040	Earth, dense weeds
69.00	423.50	1.50	0.030	Earth, grassed & winding
75.00	424.00	1.00	0.030	
80.00	425.00	0.00	0.030	

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	9.0	0	0.00
0.50	8.3	24.0	3,300	5.34
1.00	22.8	34.1	9,100	23.27
2.00	59.8	40.6	23,900	105.23

Reach R-2: Reach 2: Sections 3.0-4.5



Summary for Reach R-3: Reach 3: Sections 4.5-11.0

Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 450.500 ac, 16.46% Impervious, Inflow Depth > 0.98" for 50-yr event
Inflow = 68.69 cfs @ 12.69 hrs, Volume= 36.847 af
Outflow = 60.42 cfs @ 13.00 hrs, Volume= 36.815 af, Atten= 12%, Lag= 18.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.42 fps, Min. Travel Time= 19.0 min
Avg. Velocity = 0.71 fps, Avg. Travel Time= 38.1 min

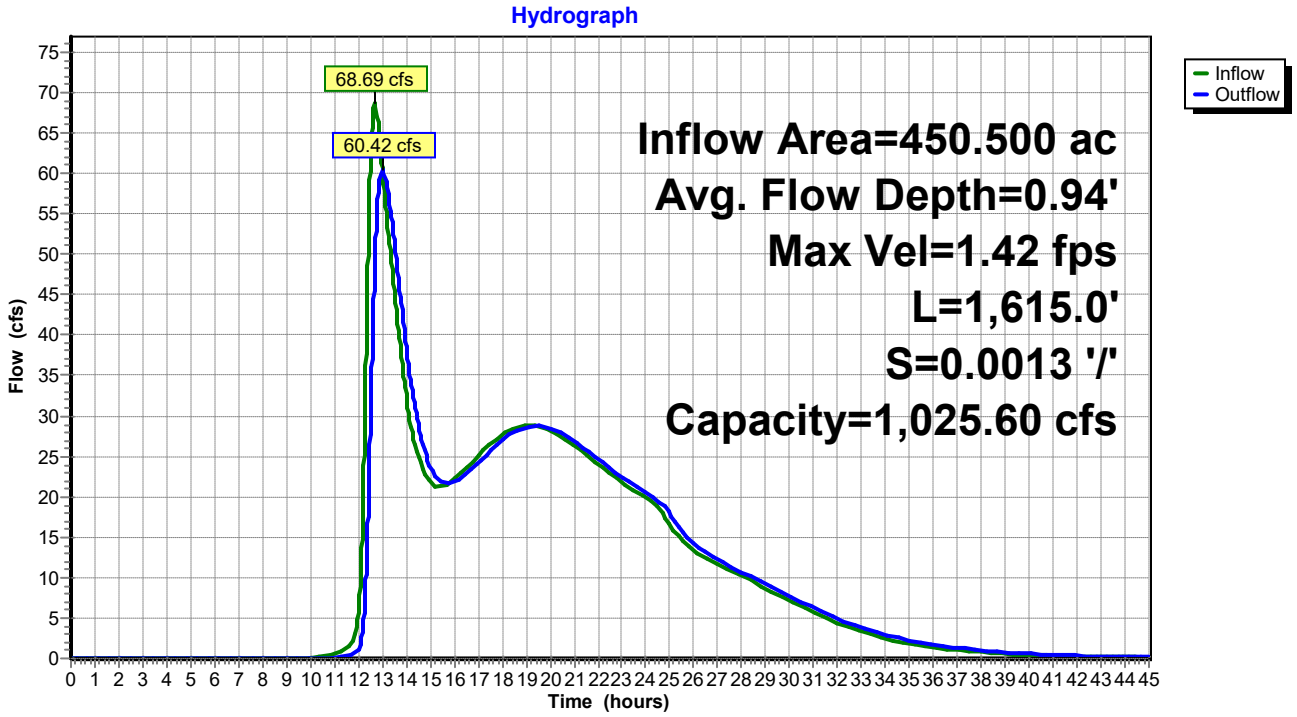
Peak Storage= 68,851 cf @ 13.00 hrs
Average Depth at Peak Storage= 0.94'
Defined Flood Depth= 426.00' Flow Area= 31,858.3 sf, Capacity= 198,961.16 cfs
Bank-Full Depth= 4.00' Flow Area= 250.5 sf, Capacity= 1,025.60 cfs

Custom cross-section, Length= 1,615.0' Slope= 0.0013 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.10', Outlet Invert= 421.00'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
15.00	426.00	0.00		
17.00	425.00	1.00	0.050	Earth, long dense weeds
19.00	424.00	2.00	0.040	Earth, dense weeds
21.00	423.00	3.00	0.035	Earth, dense weeds
50.00	422.00	4.00	0.030	Earth, clean & winding
80.00	422.00	4.00	0.030	Earth, clean & winding
83.00	423.00	3.00	0.035	Earth, dense weeds
85.00	424.00	2.00	0.040	Earth, cobble bottom, clean sides
87.00	425.00	1.00	0.050	Earth, long dense weeds
90.00	426.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	30.0	0	0.00
1.00	46.0	62.2	74,290	67.24
2.00	110.0	66.7	177,650	279.24
3.00	178.0	71.1	287,470	602.50
4.00	250.5	76.5	404,558	1,025.60

Reach R-3: Reach 3: Sections 4.5-11.0



Summary for Reach R-4: Reach 4: Sections 11.0-16.5

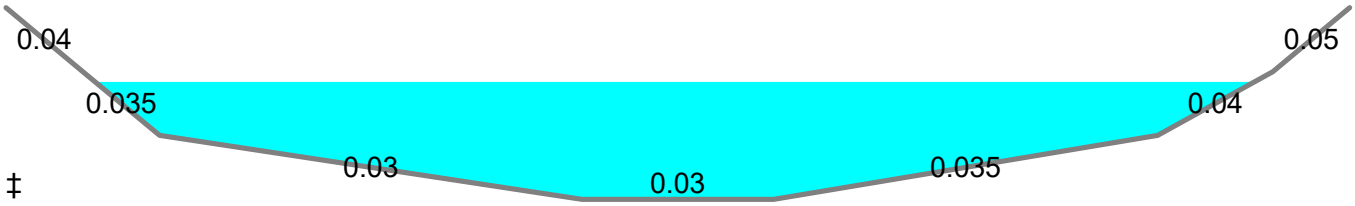
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 0.98" for 50-yr event
Inflow = 62.61 cfs @ 12.99 hrs, Volume= 37.946 af
Outflow = 60.34 cfs @ 13.19 hrs, Volume= 37.925 af, Atten= 4%, Lag= 12.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.55 fps, Min. Travel Time= 13.5 min
Avg. Velocity = 0.78 fps, Avg. Travel Time= 27.0 min

Peak Storage= 49,005 cf @ 13.19 hrs
Average Depth at Peak Storage= 1.84'
Defined Flood Depth= 426.00' Flow Area= 14,856.6 sf, Capacity= 48,804.33 cfs
Bank-Full Depth= 3.00' Flow Area= 77.0 sf, Capacity= 169.95 cfs

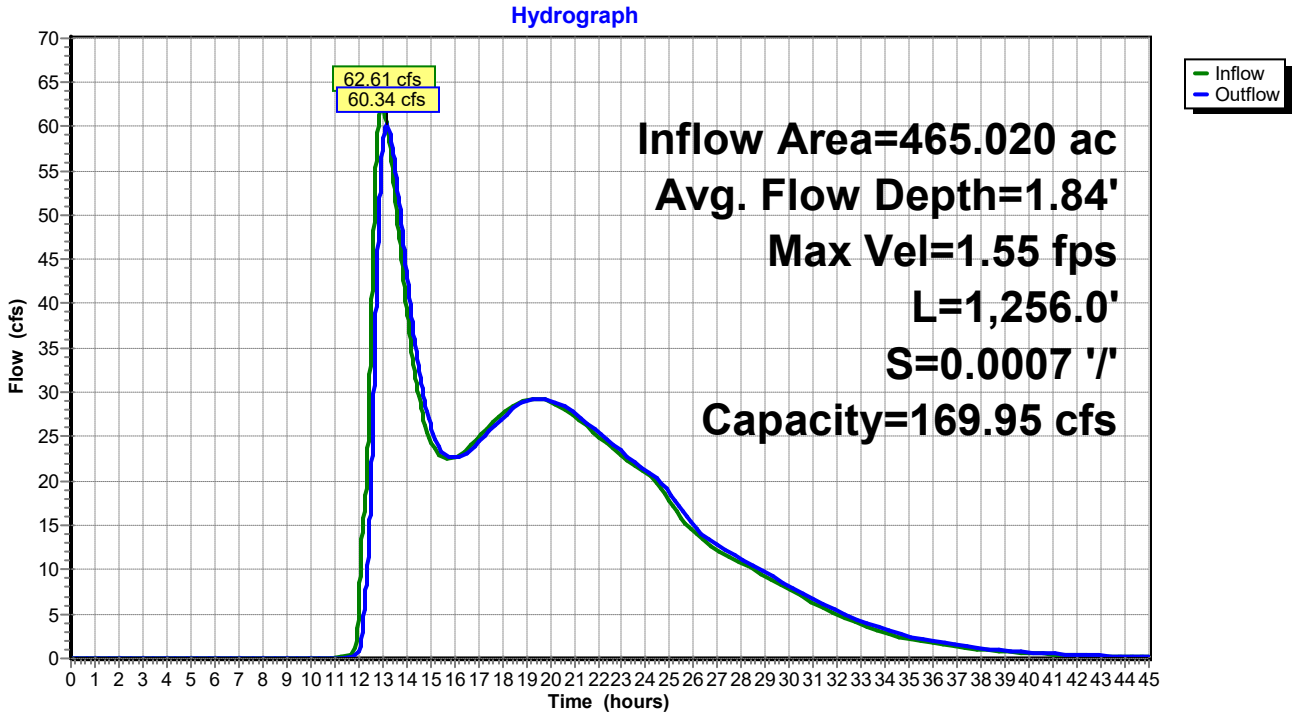
Custom cross-section, Length= 1,256.0' Slope= 0.0007 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 421.00', Outlet Invert= 420.11'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
35.00	425.00	0.00		
37.00	424.00	1.00	0.040	Earth, dense weeds
39.00	423.00	2.00	0.035	Earth, dense weeds
50.00	422.00	3.00	0.030	Earth, clean & winding
55.00	422.00	3.00	0.030	Earth, clean & winding
65.00	423.00	2.00	0.035	Earth, dense weeds
68.00	424.00	1.00	0.040	Earth, dense weeds
70.00	425.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	5.0	0	0.00
1.00	15.5	26.1	19,468	13.98
2.00	44.0	31.5	55,264	72.53
3.00	77.0	36.0	96,712	169.95

Reach R-4: Reach 4: Sections 11.0-16.5



Summary for Pond 1P: 36" RCP Storm Drain

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 0.98" for 50-yr event
Inflow = 60.34 cfs @ 13.19 hrs, Volume= 37.925 af
Outflow = 33.80 cfs @ 14.45 hrs, Volume= 37.925 af, Atten= 44%, Lag= 75.8 min
Primary = 33.80 cfs @ 14.45 hrs, Volume= 37.925 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 422.77' @ 14.45 hrs Surf.Area= 147,940 sf Storage= 158,064 cf
Flood Elev= 425.00' Surf.Area= 217,978 sf Storage= 570,044 cf

Plug-Flow detention time= 56.9 min calculated for 37.917 af (100% of inflow)
Center-of-Mass det. time= 56.9 min (1,278.8 - 1,221.9)

Volume	Invert	Avail.Storage	Storage Description
#1	420.11'	807,325 cf	**Canal (Prismatic)** Listed below (Recalc)

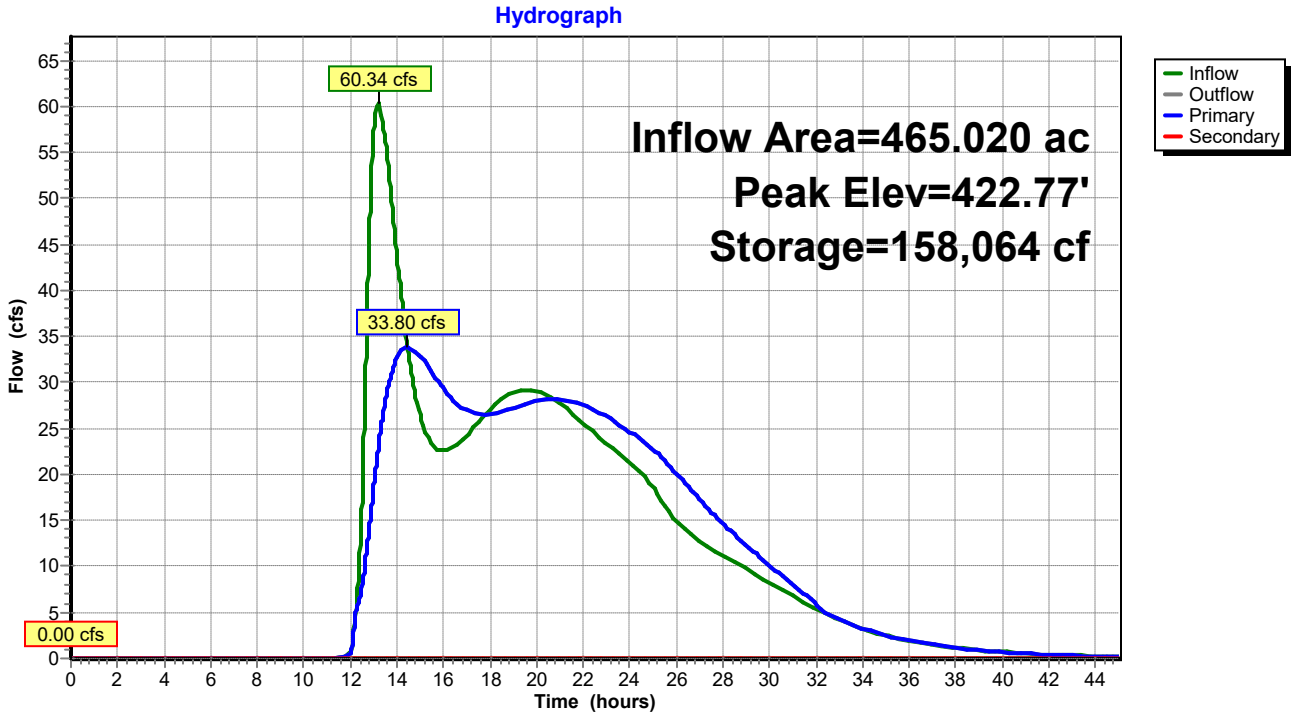
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.11	5	0	0
421.00	25	13	13
422.00	113,500	56,763	56,776
423.00	157,948	135,724	192,500
424.00	189,581	173,765	366,264
425.00	217,978	203,780	570,044
426.00	256,585	237,282	807,325

Device	Routing	Invert	Outlet Devices
#1	Primary	420.11'	**36.0" Round RCP_Round 36"** L= 155.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 420.11' / 419.37' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	425.40'	**260.0' long x 20.0' breadth Canal Overflow to Highway ROW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=33.80 cfs @ 14.45 hrs HW=422.77' (Free Discharge)
↑—**1=RCP_Round 36"** (Barrel Controls 33.80 cfs @ 6.76 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.11' (Free Discharge)
↑—**2=Canal Overflow to Highway ROW** (Controls 0.00 cfs)

Pond 1P: 36" RCP Storm Drain



Time span=0.00-45.00 hrs, dt=0.01 hrs, 4501 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment DA-1a: Existing Runoff Area=26.630 ac 31.07% Impervious Runoff Depth=1.84"
Flow Length=1,872' Slope=0.0370 '/' Tc=39.4 min CN=67 Runoff=33.71 cfs 4.094 af

Subcatchment DA-1b: Existing Runoff Area=336.510 ac 10.94% Impervious Runoff Depth>1.01"
Flow Length=8,612' Slope=0.0050 '/' Tc=494.2 min CN=55 Runoff=30.72 cfs 28.310 af

Subcatchment DA-2: Existing Runoff Area=27.280 ac 51.72% Impervious Runoff Depth=2.50"
Flow Length=2,428' Slope=0.0226 '/' Tc=49.9 min CN=75 Runoff=41.26 cfs 5.679 af

Subcatchment DA-3: Existing Runoff Area=60.080 ac 24.93% Impervious Runoff Depth=1.77"
Flow Length=3,650' Slope=0.0160 '/' Tc=105.0 min CN=66 Runoff=34.45 cfs 8.855 af

Subcatchment DA-4: Existing Runoff Area=14.520 ac 0.00% Impervious Runoff Depth=1.20"
Flow Length=830' Slope=0.0470 '/' Tc=23.0 min CN=58 Runoff=15.45 cfs 1.454 af

Reach R-1: Reach 1: Sections 0.0-3.0 Avg. Flow Depth=1.02' Max Vel=0.89 fps Inflow=33.96 cfs 32.404 af
L=850.0' S=0.0006 '/' Capacity=337.25 cfs Outflow=32.16 cfs 32.391 af

Reach R-2: Reach 2: Sections 3.0-4.5 Avg. Flow Depth=1.61' Max Vel=1.50 fps Inflow=67.66 cfs 38.070 af
L=400.0' S=0.0010 '/' Capacity=105.23 cfs Outflow=66.99 cfs 38.064 af

Reach R-3: Reach 3: Sections 4.5-11.0 Avg. Flow Depth=1.06' Max Vel=1.54 fps Inflow=85.58 cfs 46.919 af
L=1,615.0' S=0.0013 '/' Capacity=1,025.60 cfs Outflow=76.91 cfs 46.883 af

Reach R-4: Reach 4: Sections Avg. Flow Depth=2.05' Max Vel=1.68 fps Inflow=79.81 cfs 48.337 af
L=1,256.0' S=0.0007 '/' Capacity=169.95 cfs Outflow=76.89 cfs 48.314 af

Pond 1P: 36" RCP Storm Drain Peak Elev=423.14' Storage=214,973 cf Inflow=76.89 cfs 48.314 af
Primary=40.46 cfs 48.314 af Secondary=0.00 cfs 0.000 af Outflow=40.46 cfs 48.314 af

Total Runoff Area = 465.020 ac Runoff Volume = 48.393 af Average Runoff Depth = 1.25"
84.05% Pervious = 390.852 ac 15.95% Impervious = 74.168 ac

Summary for Subcatchment DA-1a: Existing Subcatchment 1A

Area sized to give full flow through pipe during 10 yr storm.

Flow source assumed to be residential drainage from neighborhoods to the west.

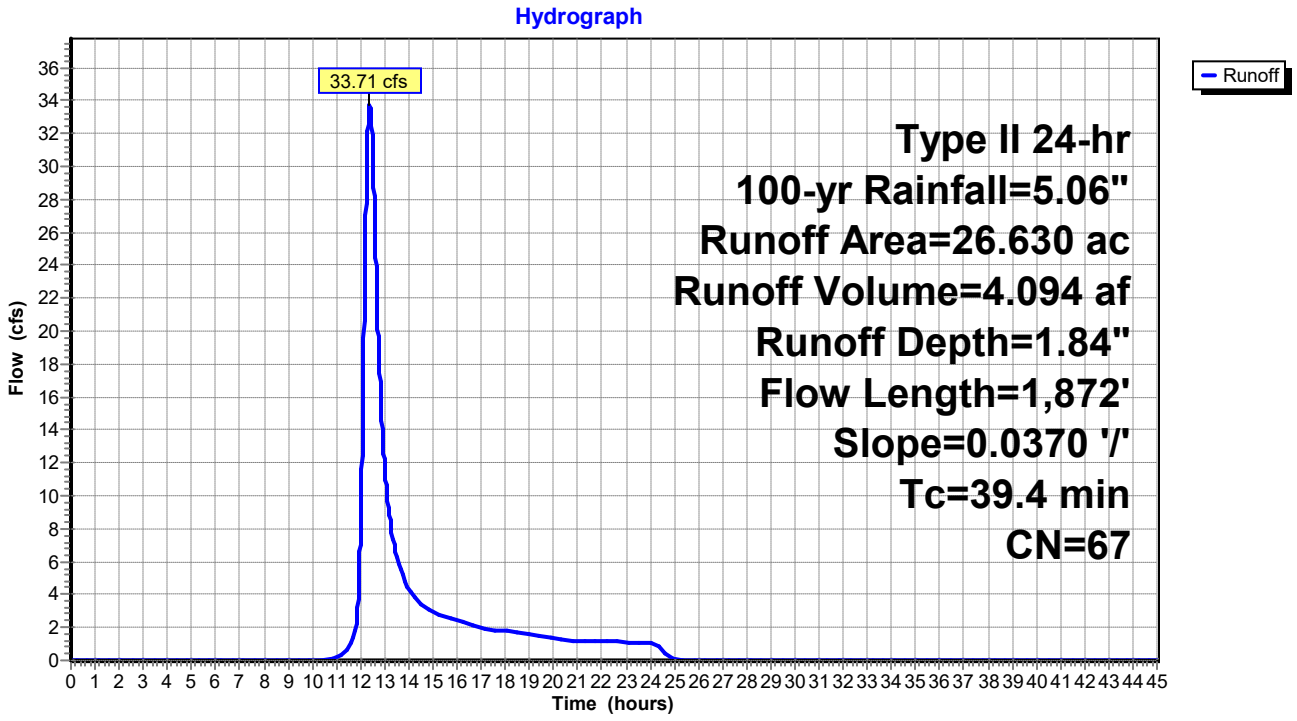
Runoff = 33.71 cfs @ 12.39 hrs, Volume= 4.094 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

	Area (ac)	CN	Description
*	14.320	50	>75% Grass cover, Good, HSG A/B
	11.490	88	Urban industrial, 72% imp, HSG B
	0.820	77	Brush, Fair, HSG D
	26.630	67	Weighted Average
	18.357		68.93% Pervious Area
	8.273		31.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.4	1,872	0.0370	0.79		**Lag/CN Method,**

Subcatchment DA-1a: Existing Subcatchment 1A



Summary for Subcatchment DA-1b: Existing Subcatchment Area 1B

See map A for total area of 188,420 sf.

Estimated 10% roof surface, 70% gravel surfaces, 20% near water as grass and forest.

Slope of flow: 438 to 435 surface elevation over 300 feet for gravel; 435 to 421 over 50 feet

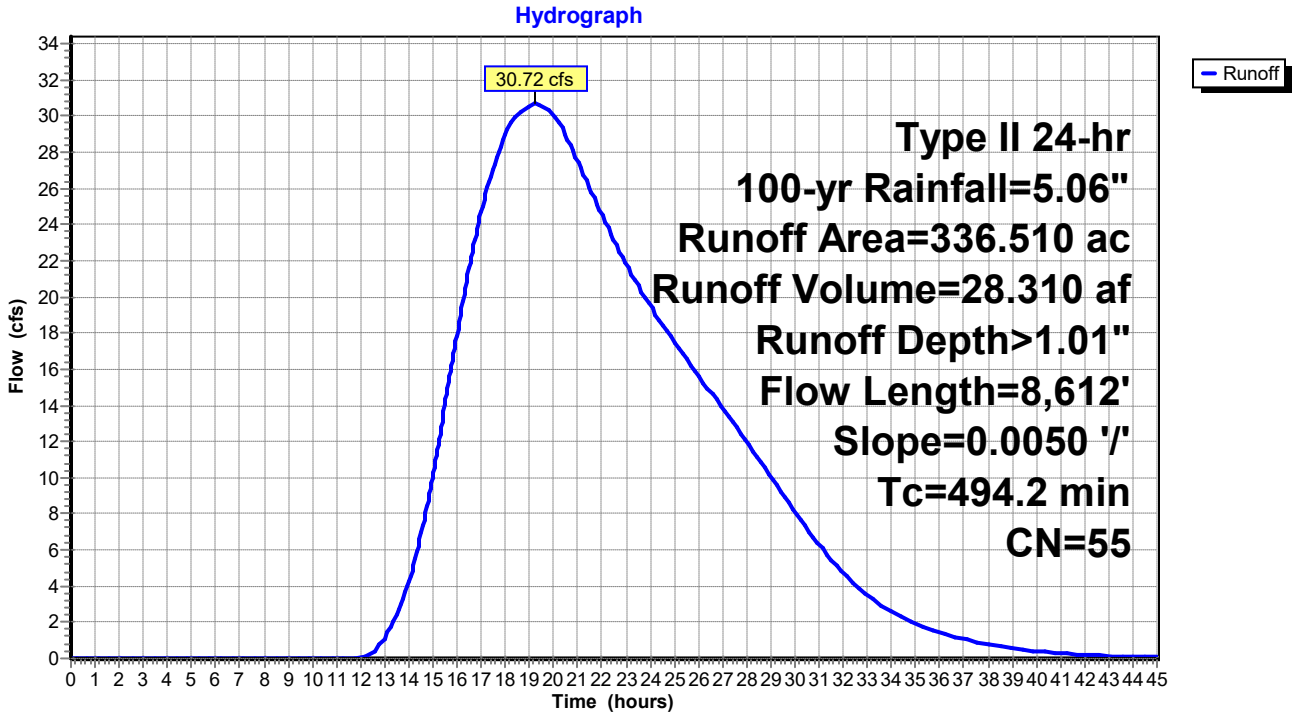
Runoff = 30.72 cfs @ 19.22 hrs, Volume= 28.310 af, Depth> 1.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

	Area (ac)	CN	Description
*	43.640	62	1/2 acre lots, 25% imp, HSG A/B
	18.600	88	Urban industrial, 72% imp, HSG B
*	91.150	55	Woods, Good, HSG A/B
*	78.050	40	Brush, Good, HSG A/B
*	104.220	56	2 acre lots, 12% imp, HSG B/A
	0.850	77	Brush, Fair, HSG D
	336.510	55	Weighted Average
	299.702		89.06% Pervious Area
	36.808		10.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
494.2	8,612	0.0050	0.29		**Lag/CN Method, Incude Est Attenuation**

Subcatchment DA-1b: Existing Subcatchment Area 1B



Summary for Subcatchment DA-2: Existing Subcatchment Area 2

Cover type: industrial type A soils based on Maps C, D and F.

Channel Tc:

Slope as 445 inlet to 420 outlet over 460 feet.

Perimiter as length (460)x2 + width (50)x2.

X-sec area estimated as rectangular with 5' depth and 25' wide.

Other Tc area: 16' elev over 430 feet. Unpaved based on aerial photography.

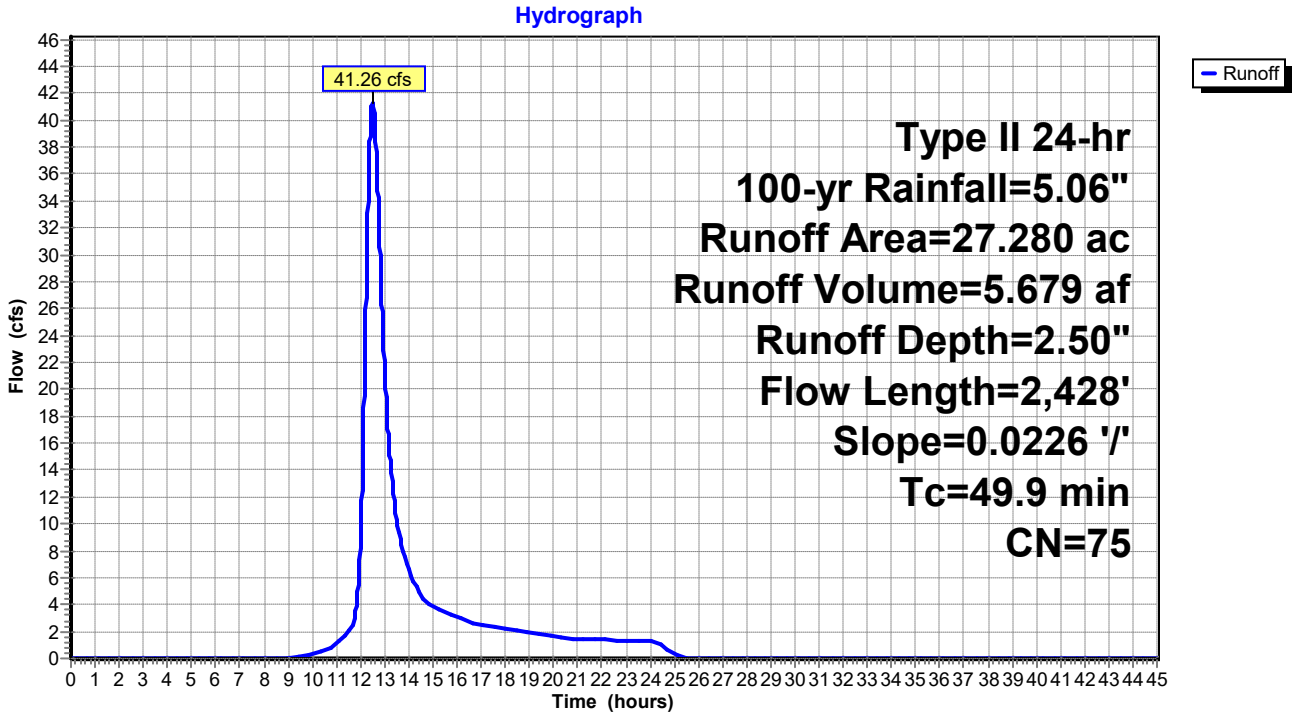
Runoff = 41.26 cfs @ 12.48 hrs, Volume= 5.679 af, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

	Area (ac)	CN	Description
*	16.600	92	Urban Ind/Com, 85% imp, HSG B
*	9.880	46	Brush, Fair, HSG A/B
	0.800	77	Brush, Fair, HSG D
	27.280	75	Weighted Average
	13.170		48.28% Pervious Area
	14.110		51.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.9	2,428	0.0226	0.81		**Lag/CN Method,**

Subcatchment DA-2: Existing Subcatchment Area 2



Summary for Subcatchment DA-3: Existing Subcatchment Area 3

Cover type: 20% industrial class A, 30% wood class B, 30% range class B, 20% grass class B for large area south of Bleecker. 55% grass 45% wood class B for area west of channel and north of Bleecker.

Channel Tc:

Slope as 452 inlet to 419 outlet over 565 feet.

Perimiter as length 565'x2 + width (12')x2.

X-sec area estimated as rectangular with 5' depth and 12' wide.

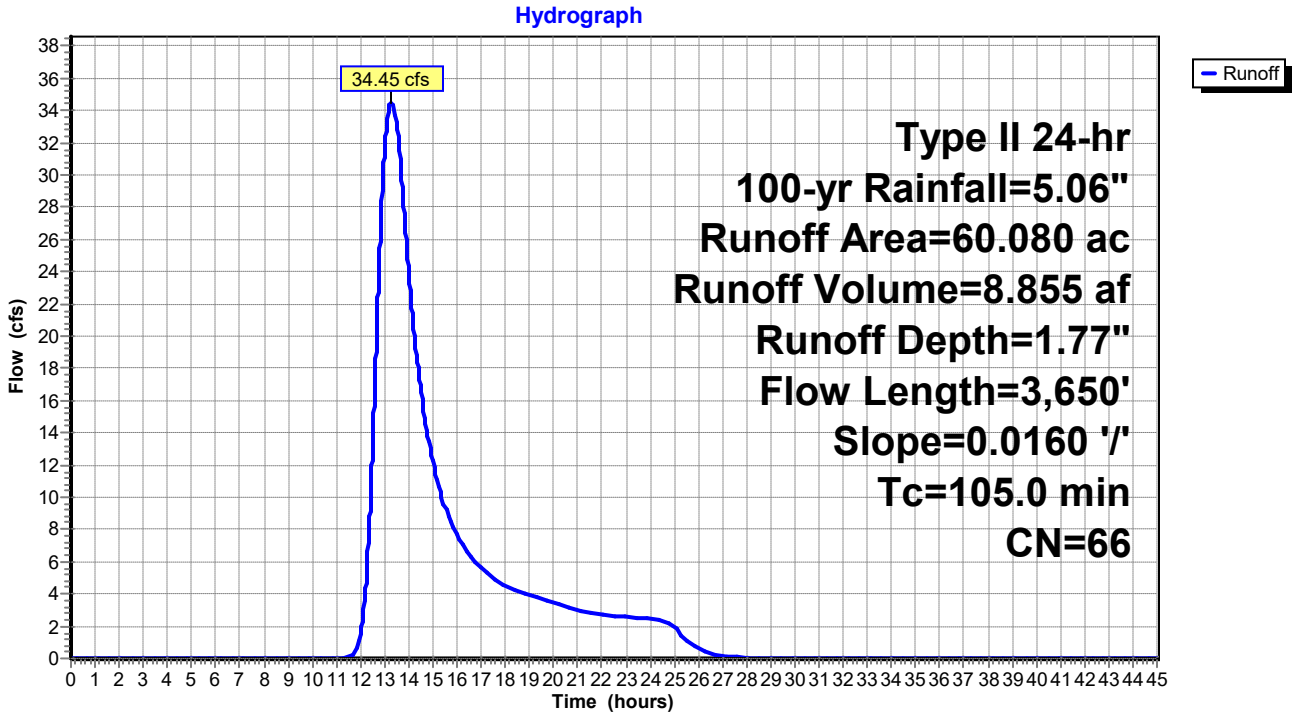
Runoff = 34.45 cfs @ 13.30 hrs, Volume= 8.855 af, Depth= 1.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

	Area (ac)	CN	Description
	17.620	92	Urban commercial, 85% imp, HSG B
*	6.830	43	Woods, Good, HSG A/B
	34.150	56	Brush, Fair, HSG B
*	1.480	77	Brush, Fair, HSG D - Canal
	60.080	66	Weighted Average
	45.103		75.07% Pervious Area
	14.977		24.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
105.0	3,650	0.0160	0.58		**Lag/CN Method,**

Subcatchment DA-3: Existing Subcatchment Area 3



Summary for Subcatchment DA-4: Existing Subcatchment Area 4

See Map A for area of subcatchment and farthest run for Tc. Slope calculated as 725 foot run from 460 to 418 elevation.

CN for area average of A and B soil groups for grass/woodland.

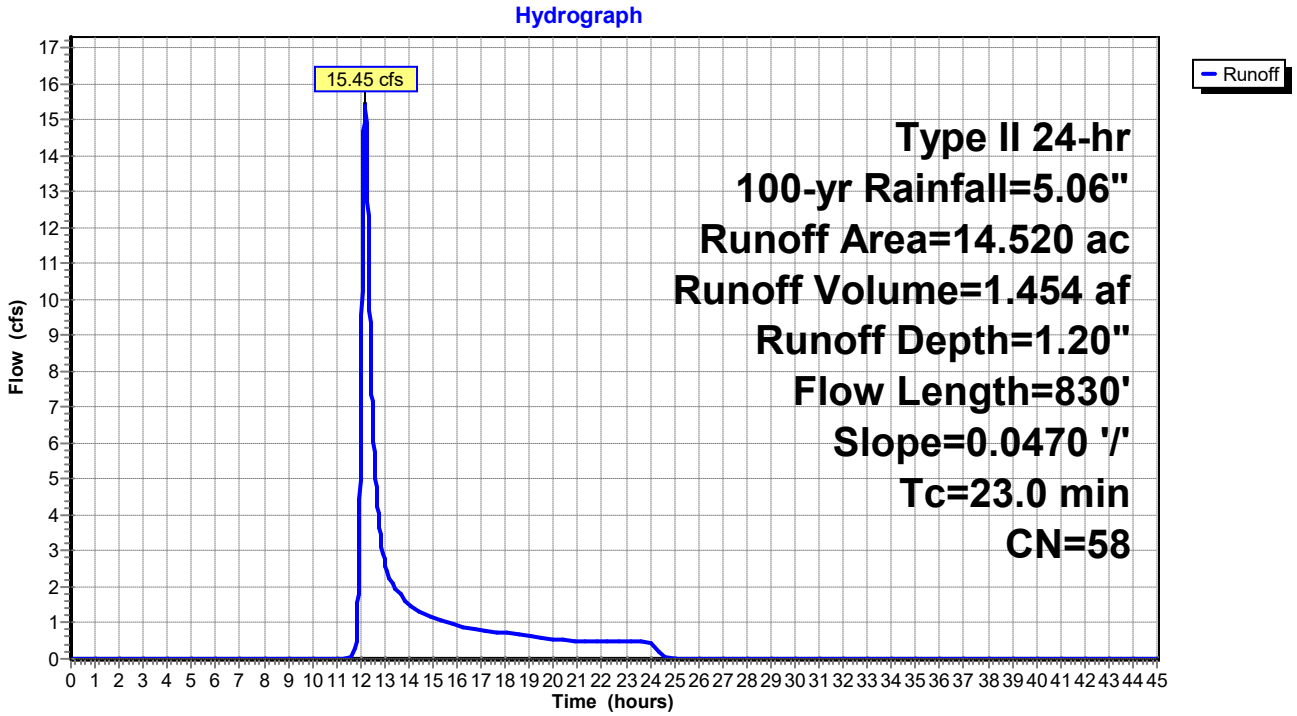
Runoff = 15.45 cfs @ 12.19 hrs, Volume= 1.454 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

	Area (ac)	CN	Description
	12.880	56	Brush, Fair, HSG B
*	1.640	77	Brush, Fair, HSG D - Canal
	14.520	58	Weighted Average
	14.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	830	0.0470	0.60		**Lag/CN Method,**

Subcatchment DA-4: Existing Subcatchment Area 4



Summary for Reach R-1: Reach 1: Sections 0.0-3.0

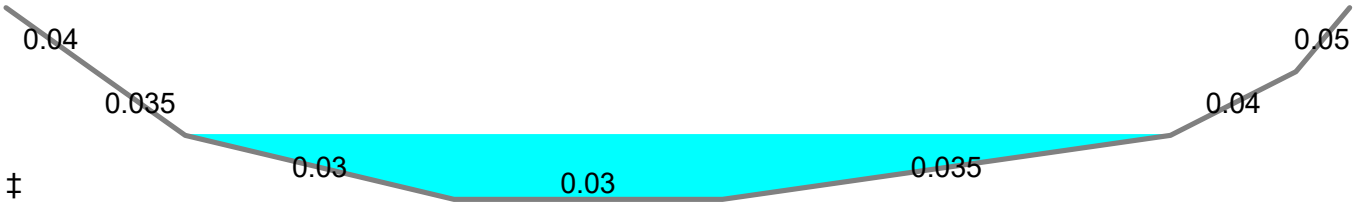
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 363.140 ac, 12.41% Impervious, Inflow Depth > 1.07" for 100-yr event
Inflow = 33.96 cfs @ 12.39 hrs, Volume= 32.404 af
Outflow = 32.16 cfs @ 19.30 hrs, Volume= 32.391 af, Atten= 5%, Lag= 415.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.89 fps, Min. Travel Time= 16.0 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 25.2 min

Peak Storage= 30,812 cf @ 19.30 hrs
Average Depth at Peak Storage= 1.02'
Defined Flood Depth= 426.00' Flow Area= 31,841.2 sf, Capacity= 95,948.09 cfs
Bank-Full Depth= 3.00' Flow Area= 167.0 sf, Capacity= 337.25 cfs

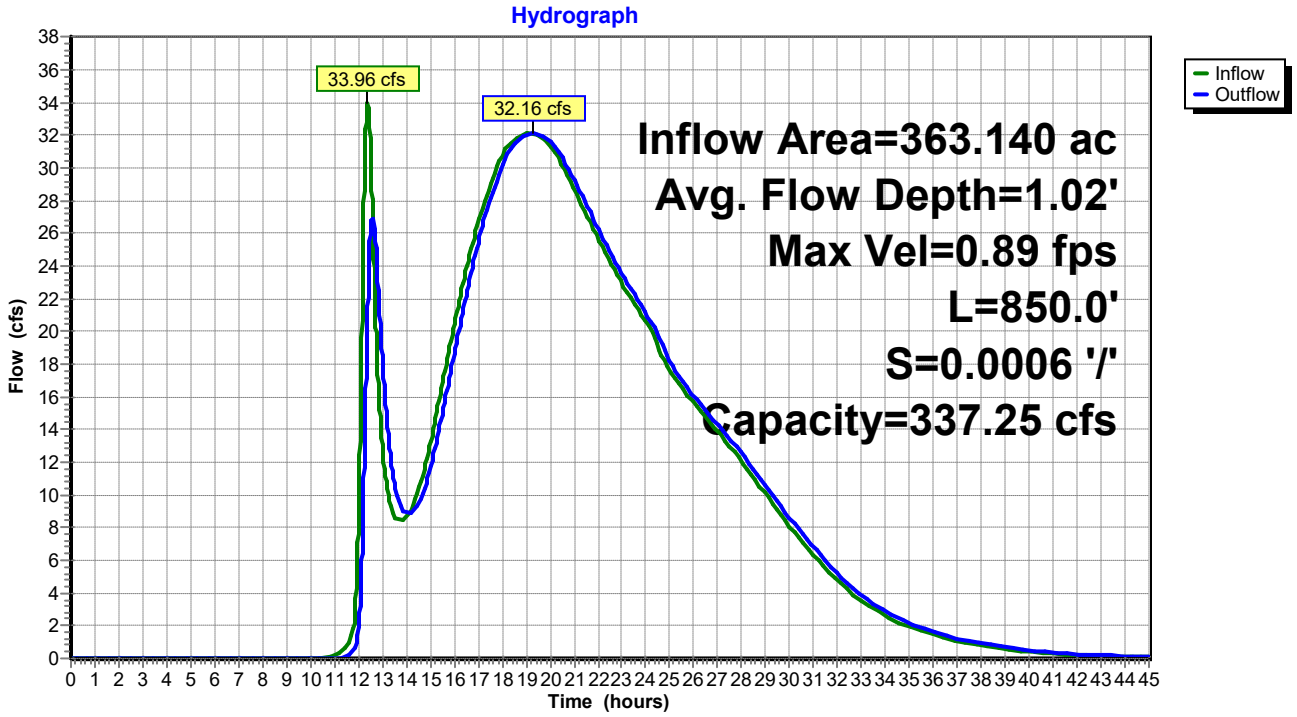
Custom cross-section, Length= 850.0' Slope= 0.0006 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 424.00', Outlet Invert= 423.50'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
25.00	425.00	0.00		
30.00	424.00	1.00	0.040	Earth, dense weeds
35.00	423.00	2.00	0.035	Earth, dense weeds
50.00	422.00	3.00	0.030	Earth, clean & winding
65.00	422.00	3.00	0.030	Earth, clean & winding
90.00	423.00	2.00	0.035	Earth, dense weeds
97.00	424.00	1.00	0.040	Earth, dense weeds
100.00	425.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	15.0	0	0.00
1.00	35.0	55.1	29,750	30.40
2.00	96.0	67.2	81,600	145.67
3.00	167.0	75.5	141,950	337.25

Reach R-1: Reach 1: Sections 0.0-3.0



Summary for Reach R-2: Reach 2: Sections 3.0-4.5

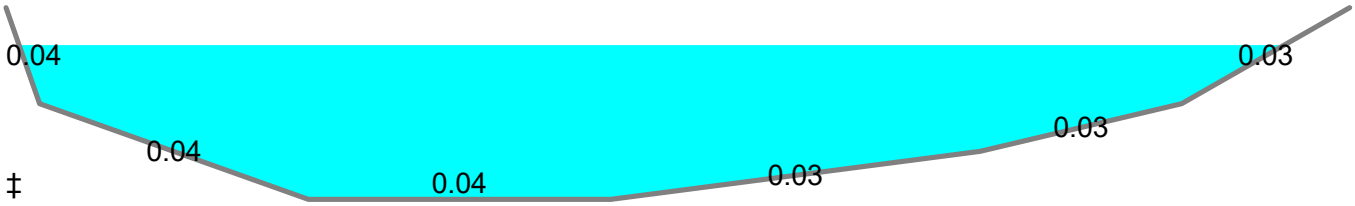
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 390.420 ac, 15.16% Impervious, Inflow Depth > 1.17" for 100-yr event
Inflow = 67.66 cfs @ 12.54 hrs, Volume= 38.070 af
Outflow = 66.99 cfs @ 12.59 hrs, Volume= 38.064 af, Atten= 1%, Lag= 3.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.50 fps, Min. Travel Time= 4.4 min
Avg. Velocity = 0.71 fps, Avg. Travel Time= 9.4 min

Peak Storage= 17,814 cf @ 12.59 hrs
Average Depth at Peak Storage= 1.61'
Defined Flood Depth= 426.00' Flow Area= 16,994.3 sf, Capacity= 45,417.71 cfs
Bank-Full Depth= 2.00' Flow Area= 59.8 sf, Capacity= 105.23 cfs

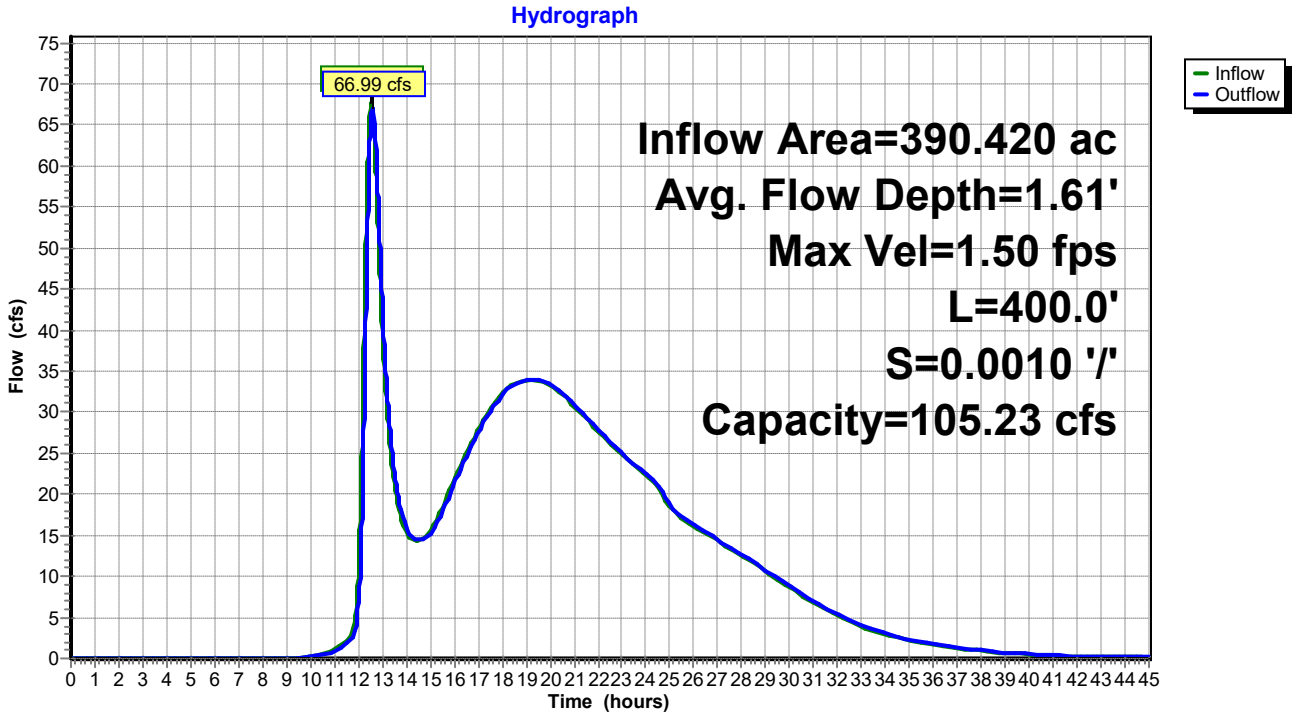
Custom cross-section, Length= 400.0' Slope= 0.0010 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.50', Outlet Invert= 423.10'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
40.00	425.00	0.00		
41.00	424.00	1.00	0.040	Earth, dense weeds
49.00	423.00	2.00	0.040	Earth, dense weeds
58.00	423.00	2.00	0.040	Earth, dense weeds
69.00	423.50	1.50	0.030	Earth, grassed & winding
75.00	424.00	1.00	0.030	
80.00	425.00	0.00	0.030	

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	9.0	0	0.00
0.50	8.3	24.0	3,300	5.34
1.00	22.8	34.1	9,100	23.27
2.00	59.8	40.6	23,900	105.23

Reach R-2: Reach 2: Sections 3.0-4.5



Summary for Reach R-3: Reach 3: Sections 4.5-11.0

Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 450.500 ac, 16.46% Impervious, Inflow Depth > 1.25" for 100-yr event
Inflow = 85.58 cfs @ 12.68 hrs, Volume= 46.919 af
Outflow = 76.91 cfs @ 12.95 hrs, Volume= 46.883 af, Atten= 10%, Lag= 16.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.54 fps, Min. Travel Time= 17.5 min
Avg. Velocity = 0.75 fps, Avg. Travel Time= 35.7 min

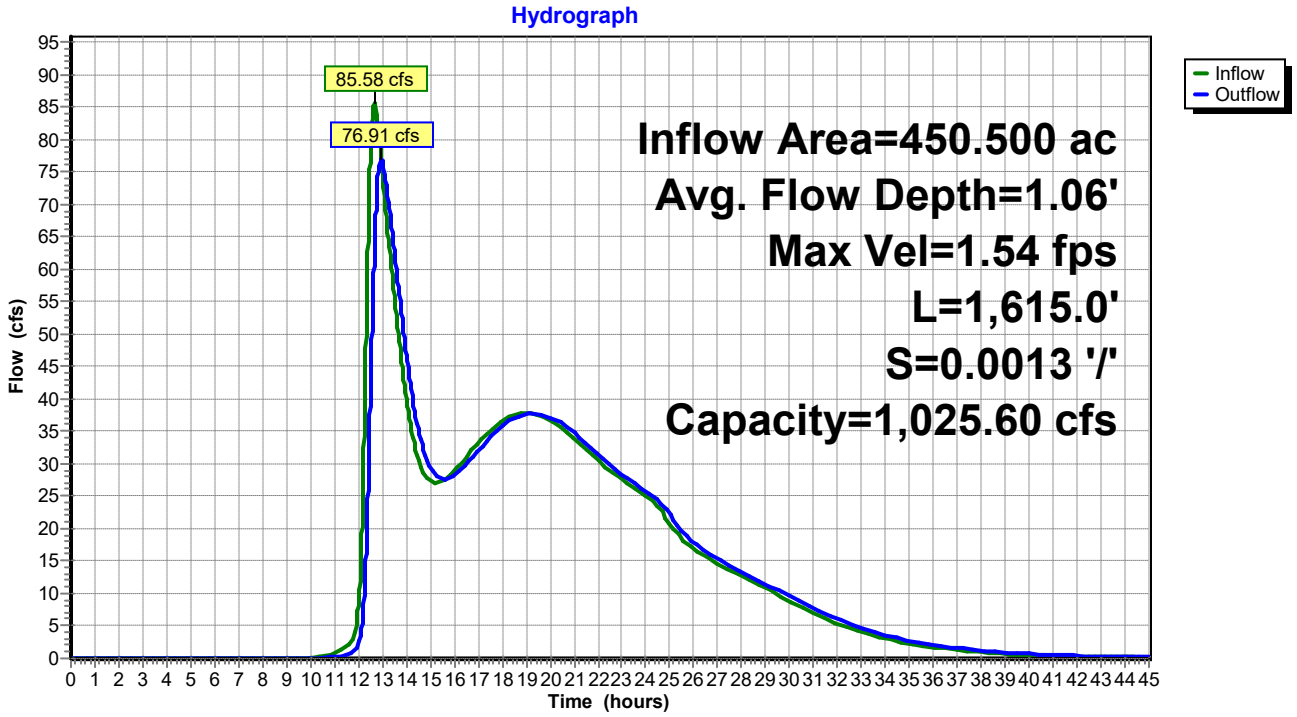
Peak Storage= 80,559 cf @ 12.95 hrs
Average Depth at Peak Storage= 1.06'
Defined Flood Depth= 426.00' Flow Area= 31,858.3 sf, Capacity= 198,961.16 cfs
Bank-Full Depth= 4.00' Flow Area= 250.5 sf, Capacity= 1,025.60 cfs

Custom cross-section, Length= 1,615.0' Slope= 0.0013 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.10', Outlet Invert= 421.00'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
15.00	426.00	0.00		
17.00	425.00	1.00	0.050	Earth, long dense weeds
19.00	424.00	2.00	0.040	Earth, dense weeds
21.00	423.00	3.00	0.035	Earth, dense weeds
50.00	422.00	4.00	0.030	Earth, clean & winding
80.00	422.00	4.00	0.030	Earth, clean & winding
83.00	423.00	3.00	0.035	Earth, dense weeds
85.00	424.00	2.00	0.040	Earth, cobble bottom, clean sides
87.00	425.00	1.00	0.050	Earth, long dense weeds
90.00	426.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	30.0	0	0.00
1.00	46.0	62.2	74,290	67.24
2.00	110.0	66.7	177,650	279.24
3.00	178.0	71.1	287,470	602.50
4.00	250.5	76.5	404,558	1,025.60

Reach R-3: Reach 3: Sections 4.5-11.0



Summary for Reach R-4: Reach 4: Sections 11.0-16.5

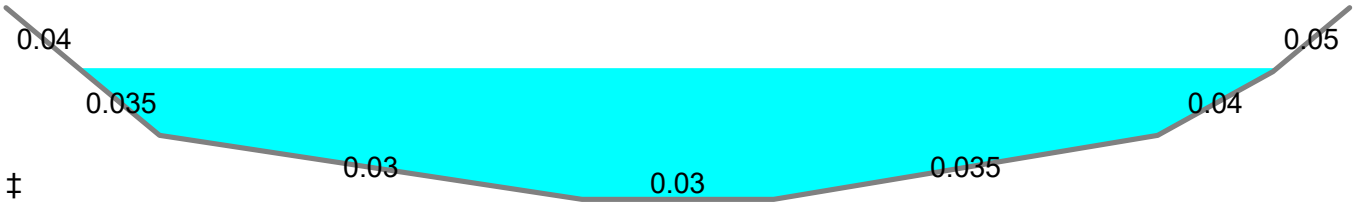
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 1.25" for 100-yr event
Inflow = 79.81 cfs @ 12.93 hrs, Volume= 48.337 af
Outflow = 76.89 cfs @ 13.11 hrs, Volume= 48.314 af, Atten= 4%, Lag= 10.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.68 fps, Min. Travel Time= 12.4 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 25.2 min

Peak Storage= 57,393 cf @ 13.11 hrs
Average Depth at Peak Storage= 2.05'
Defined Flood Depth= 426.00' Flow Area= 14,856.6 sf, Capacity= 48,804.33 cfs
Bank-Full Depth= 3.00' Flow Area= 77.0 sf, Capacity= 169.95 cfs

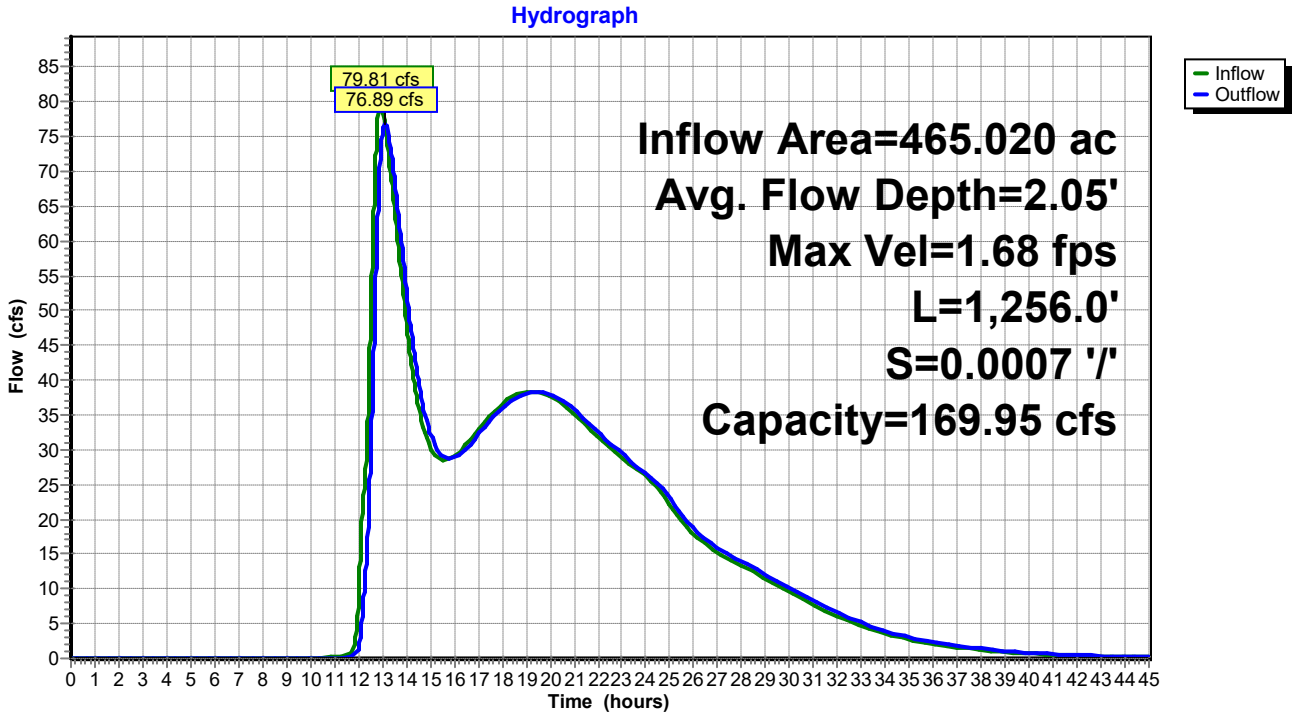
Custom cross-section, Length= 1,256.0' Slope= 0.0007 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 421.00', Outlet Invert= 420.11'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
35.00	425.00	0.00		
37.00	424.00	1.00	0.040	Earth, dense weeds
39.00	423.00	2.00	0.035	Earth, dense weeds
50.00	422.00	3.00	0.030	Earth, clean & winding
55.00	422.00	3.00	0.030	Earth, clean & winding
65.00	423.00	2.00	0.035	Earth, dense weeds
68.00	424.00	1.00	0.040	Earth, dense weeds
70.00	425.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	5.0	0	0.00
1.00	15.5	26.1	19,468	13.98
2.00	44.0	31.5	55,264	72.53
3.00	77.0	36.0	96,712	169.95

Reach R-4: Reach 4: Sections 11.0-16.5



Summary for Pond 1P: 36" RCP Storm Drain

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 1.25" for 100-yr event
Inflow = 76.89 cfs @ 13.11 hrs, Volume= 48.314 af
Outflow = 40.46 cfs @ 14.48 hrs, Volume= 48.314 af, Atten= 47%, Lag= 81.7 min
Primary = 40.46 cfs @ 14.48 hrs, Volume= 48.314 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 423.14' @ 14.48 hrs Surf.Area= 162,386 sf Storage= 214,973 cf
Flood Elev= 425.00' Surf.Area= 217,978 sf Storage= 570,044 cf

Plug-Flow detention time= 68.8 min calculated for 48.314 af (100% of inflow)
Center-of-Mass det. time= 68.8 min (1,284.7 - 1,215.9)

Volume	Invert	Avail.Storage	Storage Description
#1	420.11'	807,325 cf	**Canal (Prismatic)** Listed below (Recalc)

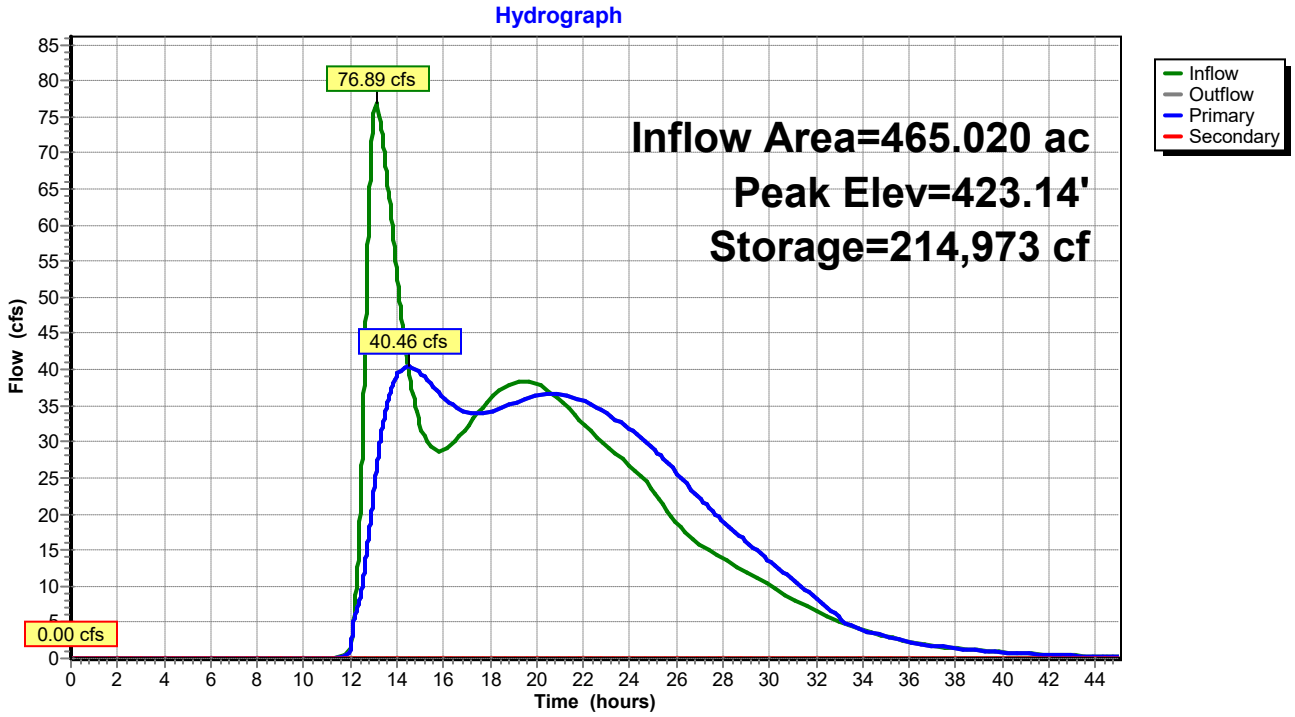
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.11	5	0	0
421.00	25	13	13
422.00	113,500	56,763	56,776
423.00	157,948	135,724	192,500
424.00	189,581	173,765	366,264
425.00	217,978	203,780	570,044
426.00	256,585	237,282	807,325

Device	Routing	Invert	Outlet Devices
#1	Primary	420.11'	**36.0" Round RCP_Round 36"** L= 155.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 420.11' / 419.37' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	425.40'	**260.0' long x 20.0' breadth Canal Overflow to Highway ROW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=40.46 cfs @ 14.48 hrs HW=423.14' (Free Discharge)
↑—**1=RCP_Round 36"** (Barrel Controls 40.46 cfs @ 7.04 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.11' (Free Discharge)
↑—**2=Canal Overflow to Highway ROW** (Controls 0.00 cfs)

Pond 1P: 36" RCP Storm Drain



Time span=0.00-45.00 hrs, dt=0.01 hrs, 4501 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment DA-1a: Existing Runoff Area=26.630 ac 31.07% Impervious Runoff Depth=2.83"
Flow Length=1,872' Slope=0.0370 '/' Tc=39.4 min CN=67 Runoff=53.24 cfs 6.276 af

Subcatchment DA-1b: Existing Runoff Area=336.510 ac 10.94% Impervious Runoff Depth>1.75"
Flow Length=8,612' Slope=0.0050 '/' Tc=494.2 min CN=55 Runoff=55.21 cfs 48.969 af

Subcatchment DA-2: Existing Runoff Area=27.280 ac 51.72% Impervious Runoff Depth=3.62"
Flow Length=2,428' Slope=0.0226 '/' Tc=49.9 min CN=75 Runoff=60.42 cfs 8.222 af

Subcatchment DA-3: Existing Runoff Area=60.080 ac 24.93% Impervious Runoff Depth=2.73"
Flow Length=3,650' Slope=0.0160 '/' Tc=105.0 min CN=66 Runoff=55.46 cfs 13.683 af

Subcatchment DA-4: Existing Runoff Area=14.520 ac 0.00% Impervious Runoff Depth=2.00"
Flow Length=830' Slope=0.0470 '/' Tc=23.0 min CN=58 Runoff=27.88 cfs 2.425 af

Reach R-1: Reach 1: Sections 0.0-3.0 Avg. Flow Depth=1.30' Max Vel=1.10 fps Inflow=57.41 cfs 55.245 af
L=850.0' S=0.0006 '/' Capacity=337.25 cfs Outflow=57.37 cfs 55.228 af

Reach R-2: Reach 2: Sections 3.0-4.5 Avg. Flow Depth=2.00' Max Vel=1.76 fps Inflow=105.85 cfs 63.450 af
L=400.0' S=0.0010 '/' Capacity=105.23 cfs Outflow=104.92 cfs 63.443 af

Reach R-3: Reach 3: Sections Avg. Flow Depth=1.33' Max Vel=1.86 fps Inflow=134.83 cfs 77.125 af
L=1,615.0' S=0.0013 '/' Capacity=1,025.60 cfs Outflow=124.76 cfs 77.081 af

Reach R-4: Reach 4: Sections Avg. Flow Depth=2.59' Max Vel=2.00 fps Inflow=130.06 cfs 79.507 af
L=1,256.0' S=0.0007 '/' Capacity=169.95 cfs Outflow=125.87 cfs 79.479 af

Pond 1P: 36" RCP Storm Drain Peak Elev=424.72' Storage=510,763 cf Inflow=125.87 cfs 79.479 af
Primary=59.22 cfs 79.479 af Secondary=0.00 cfs 0.000 af Outflow=59.22 cfs 79.479 af

Total Runoff Area = 465.020 ac Runoff Volume = 79.575 af Average Runoff Depth = 2.05"
84.05% Pervious = 390.852 ac 15.95% Impervious = 74.168 ac

Summary for Subcatchment DA-1a: Existing Subcatchment 1A

Area sized to give full flow through pipe during 10 yr storm.

Flow source assumed to be residential drainage from neighborhoods to the west.

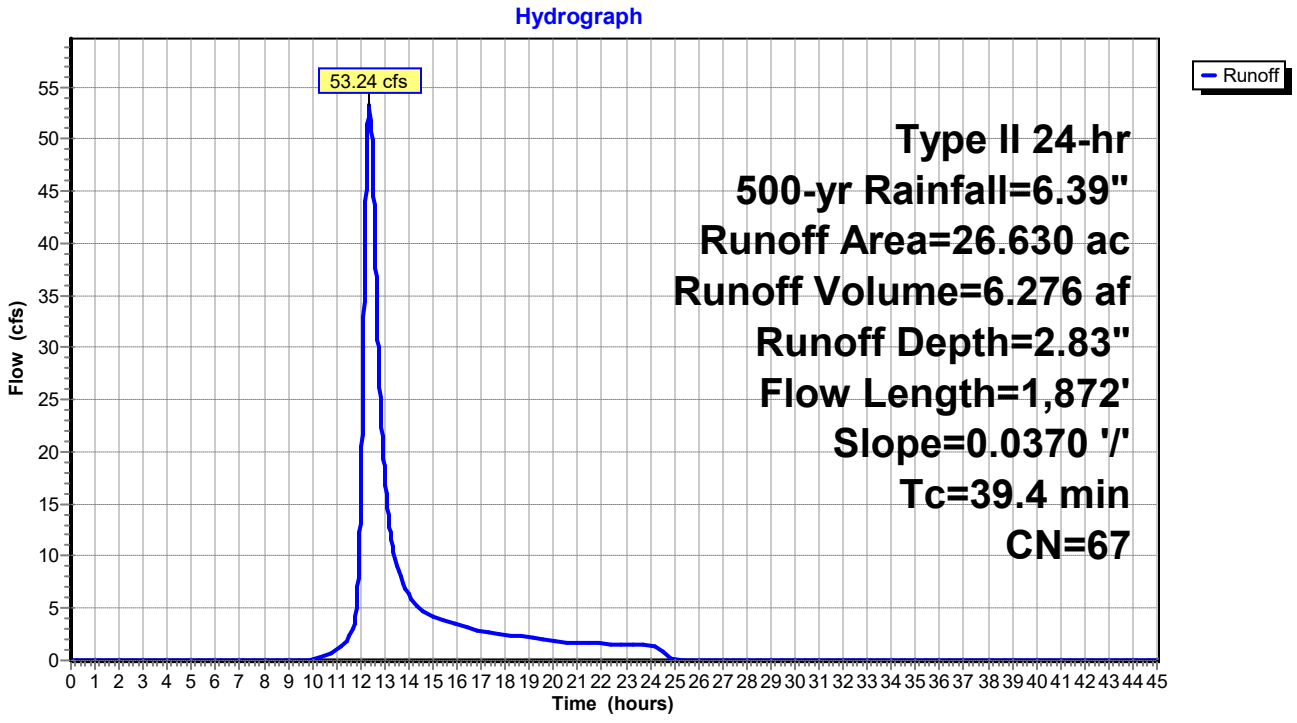
Runoff = 53.24 cfs @ 12.38 hrs, Volume= 6.276 af, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 500-yr Rainfall=6.39"

	Area (ac)	CN	Description
*	14.320	50	>75% Grass cover, Good, HSG A/B
	11.490	88	Urban industrial, 72% imp, HSG B
	0.820	77	Brush, Fair, HSG D
	26.630	67	Weighted Average
	18.357		68.93% Pervious Area
	8.273		31.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.4	1,872	0.0370	0.79		**Lag/CN Method,**

Subcatchment DA-1a: Existing Subcatchment 1A



Summary for Subcatchment DA-1b: Existing Subcatchment Area 1B

See map A for total area of 188,420 sf.

Estimated 10% roof surface, 70% gravel surfaces, 20% near water as grass and forest.

Slope of flow: 438 to 435 surface elevation over 300 feet for gravel; 435 to 421 over 50 feet

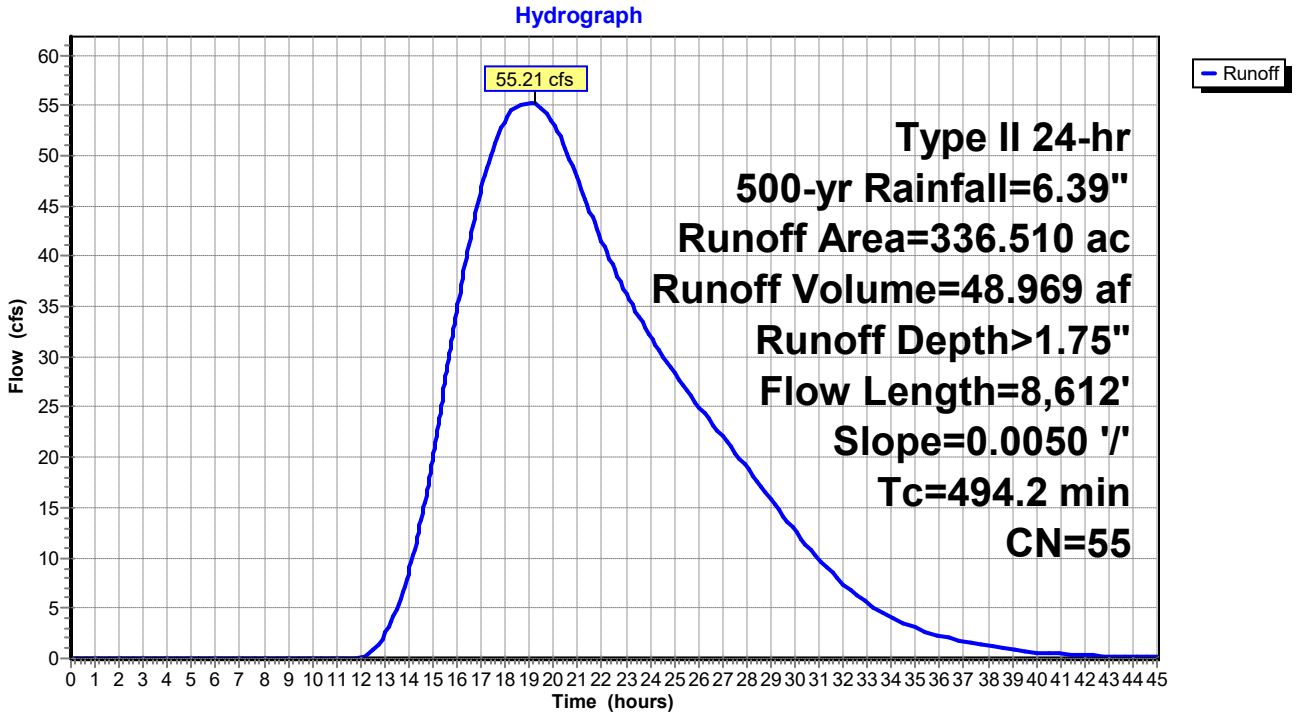
Runoff = 55.21 cfs @ 19.21 hrs, Volume= 48.969 af, Depth> 1.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 500-yr Rainfall=6.39"

	Area (ac)	CN	Description
*	43.640	62	1/2 acre lots, 25% imp, HSG A/B
	18.600	88	Urban industrial, 72% imp, HSG B
*	91.150	55	Woods, Good, HSG A/B
*	78.050	40	Brush, Good, HSG A/B
*	104.220	56	2 acre lots, 12% imp, HSG B/A
	0.850	77	Brush, Fair, HSG D
	336.510	55	Weighted Average
	299.702		89.06% Pervious Area
	36.808		10.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
494.2	8,612	0.0050	0.29		**Lag/CN Method, Incude Est Attenuation**

Subcatchment DA-1b: Existing Subcatchment Area 1B



Summary for Subcatchment DA-2: Existing Subcatchment Area 2

Cover type: industrial type A soils based on Maps C, D and F.

Channel Tc:

Slope as 445 inlet to 420 outlet over 460 feet.

Perimiter as length (460)x2 + width (50)x2.

X-sec area estimated as rectangular with 5' depth and 25' wide.

Other Tc area: 16' elev over 430 feet. Unpaved based on aerial photography.

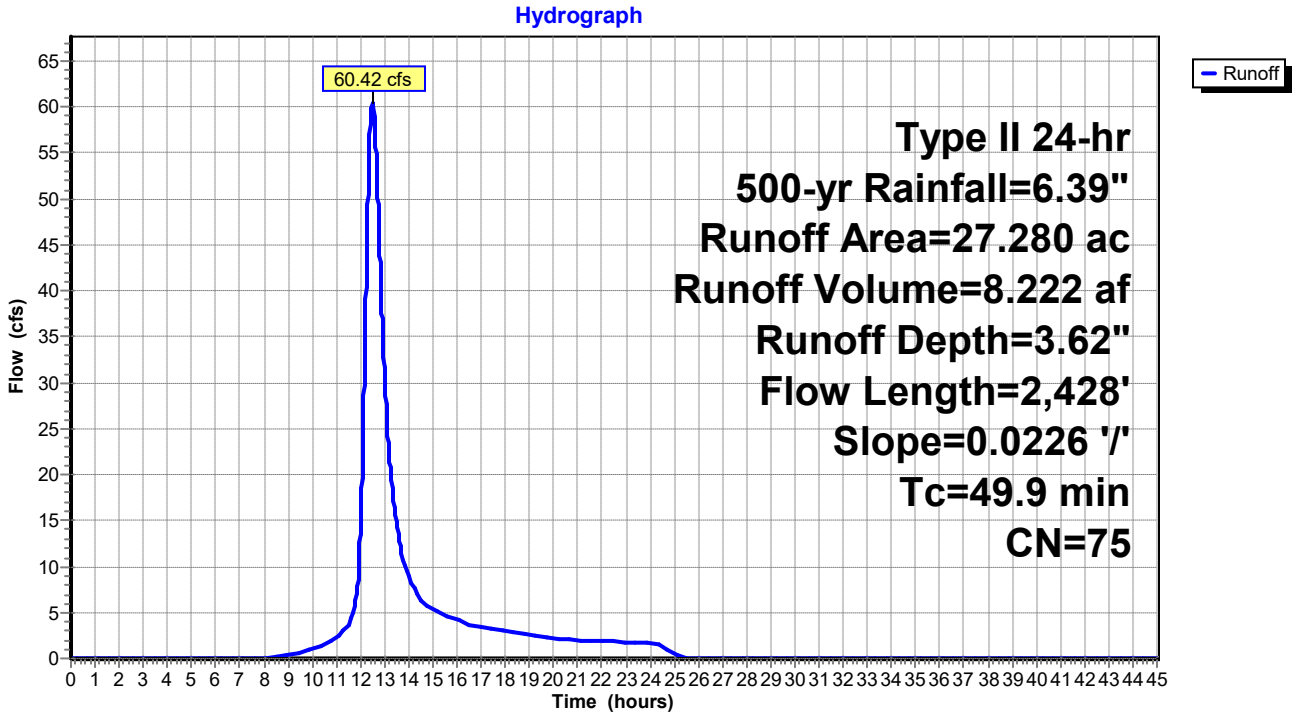
Runoff = 60.42 cfs @ 12.48 hrs, Volume= 8.222 af, Depth= 3.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 500-yr Rainfall=6.39"

	Area (ac)	CN	Description
*	16.600	92	Urban Ind/Com, 85% imp, HSG B
*	9.880	46	Brush, Fair, HSG A/B
	0.800	77	Brush, Fair, HSG D
	27.280	75	Weighted Average
	13.170		48.28% Pervious Area
	14.110		51.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.9	2,428	0.0226	0.81		**Lag/CN Method,**

Subcatchment DA-2: Existing Subcatchment Area 2



Summary for Subcatchment DA-3: Existing Subcatchment Area 3

Cover type: 20% industrial class A, 30% wood class B, 30% range class B, 20% grass class B for large area south of Bleecker. 55% grass 45% wood class B for area west of channel and north of Bleecker.

Channel Tc:

Slope as 452 inlet to 419 outlet over 565 feet.

Perimiter as length 565'x2 + width (12')x2.

X-sec area estimated as rectangular with 5' depth and 12' wide.

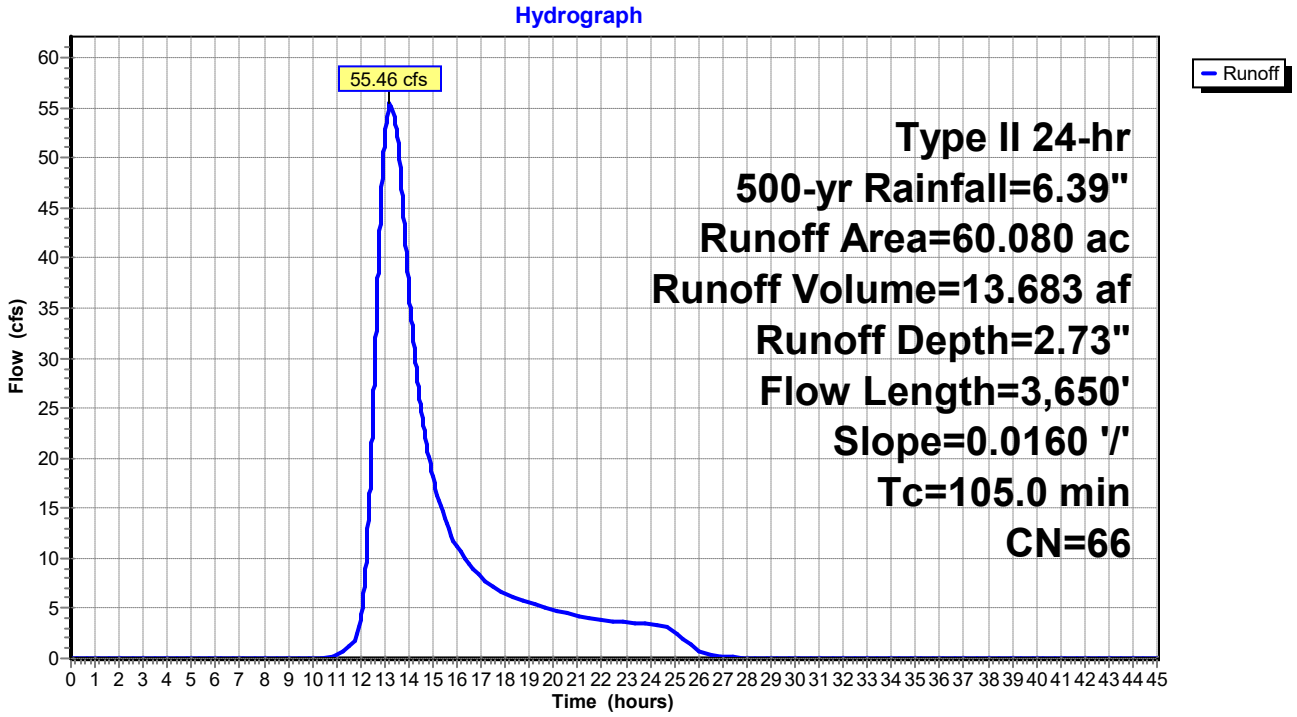
Runoff = 55.46 cfs @ 13.19 hrs, Volume= 13.683 af, Depth= 2.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 500-yr Rainfall=6.39"

	Area (ac)	CN	Description
	17.620	92	Urban commercial, 85% imp, HSG B
*	6.830	43	Woods, Good, HSG A/B
	34.150	56	Brush, Fair, HSG B
*	1.480	77	Brush, Fair, HSG D - Canal
	60.080	66	Weighted Average
	45.103		75.07% Pervious Area
	14.977		24.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
105.0	3,650	0.0160	0.58		**Lag/CN Method,**

Subcatchment DA-3: Existing Subcatchment Area 3



Summary for Subcatchment DA-4: Existing Subcatchment Area 4

See Map A for area of subcatchment and farthest run for Tc. Slope calculated as 725 foot run from 460 to 418 elevation.

CN for area average of A and B soil groups for grass/woodland.

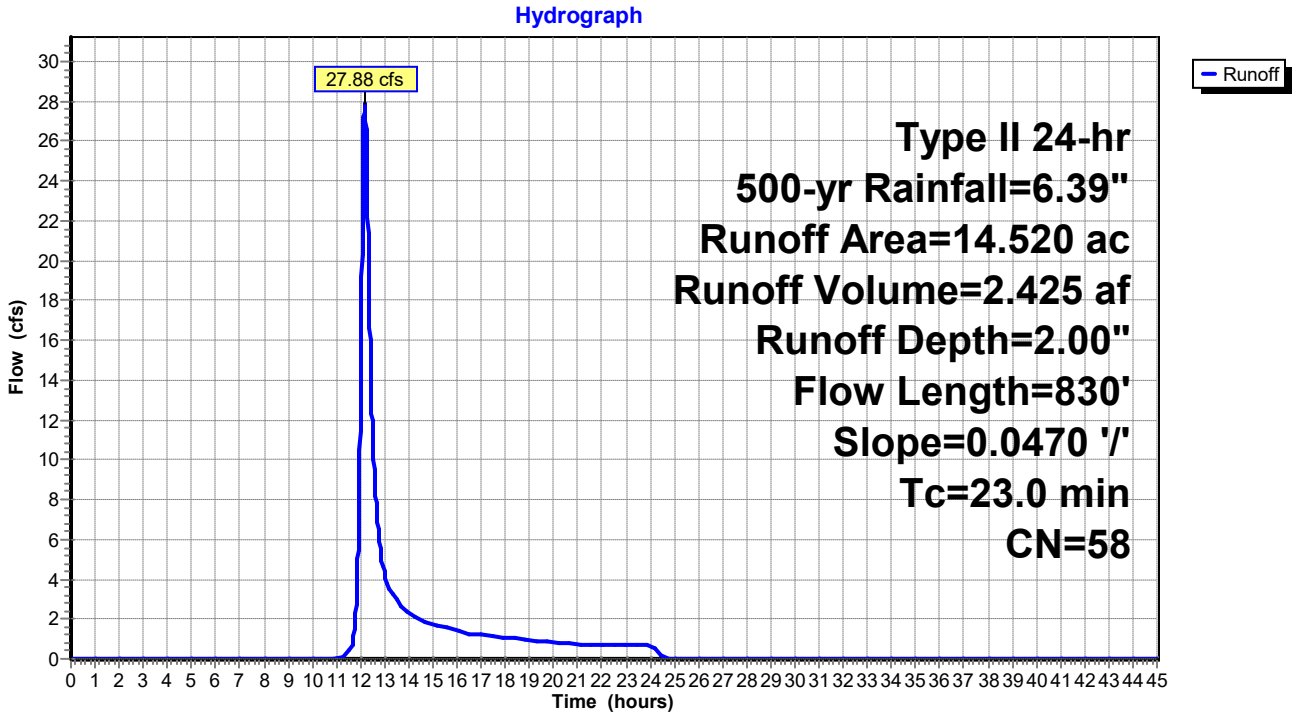
Runoff = 27.88 cfs @ 12.18 hrs, Volume= 2.425 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs
Type II 24-hr 500-yr Rainfall=6.39"

	Area (ac)	CN	Description
	12.880	56	Brush, Fair, HSG B
*	1.640	77	Brush, Fair, HSG D - Canal
	14.520	58	Weighted Average
	14.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	830	0.0470	0.60		**Lag/CN Method,**

Subcatchment DA-4: Existing Subcatchment Area 4



Summary for Reach R-1: Reach 1: Sections 0.0-3.0

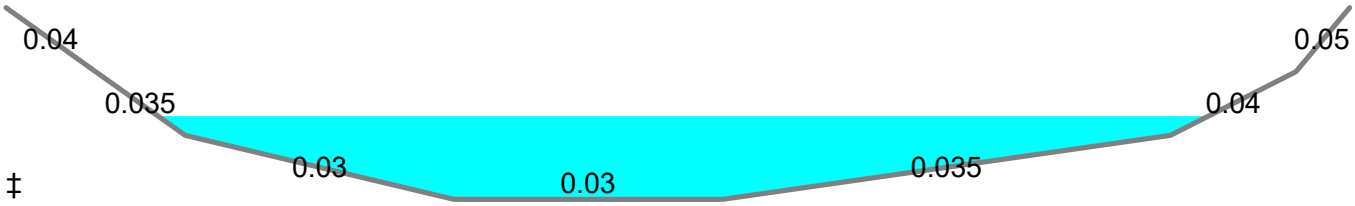
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 363.140 ac, 12.41% Impervious, Inflow Depth > 1.83" for 500-yr event
Inflow = 57.41 cfs @ 18.68 hrs, Volume= 55.245 af
Outflow = 57.37 cfs @ 18.99 hrs, Volume= 55.228 af, Atten= 0%, Lag= 18.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.10 fps, Min. Travel Time= 12.9 min
Avg. Velocity = 0.64 fps, Avg. Travel Time= 22.0 min

Peak Storage= 44,439 cf @ 18.99 hrs
Average Depth at Peak Storage= 1.30'
Defined Flood Depth= 426.00' Flow Area= 31,841.2 sf, Capacity= 95,948.09 cfs
Bank-Full Depth= 3.00' Flow Area= 167.0 sf, Capacity= 337.25 cfs

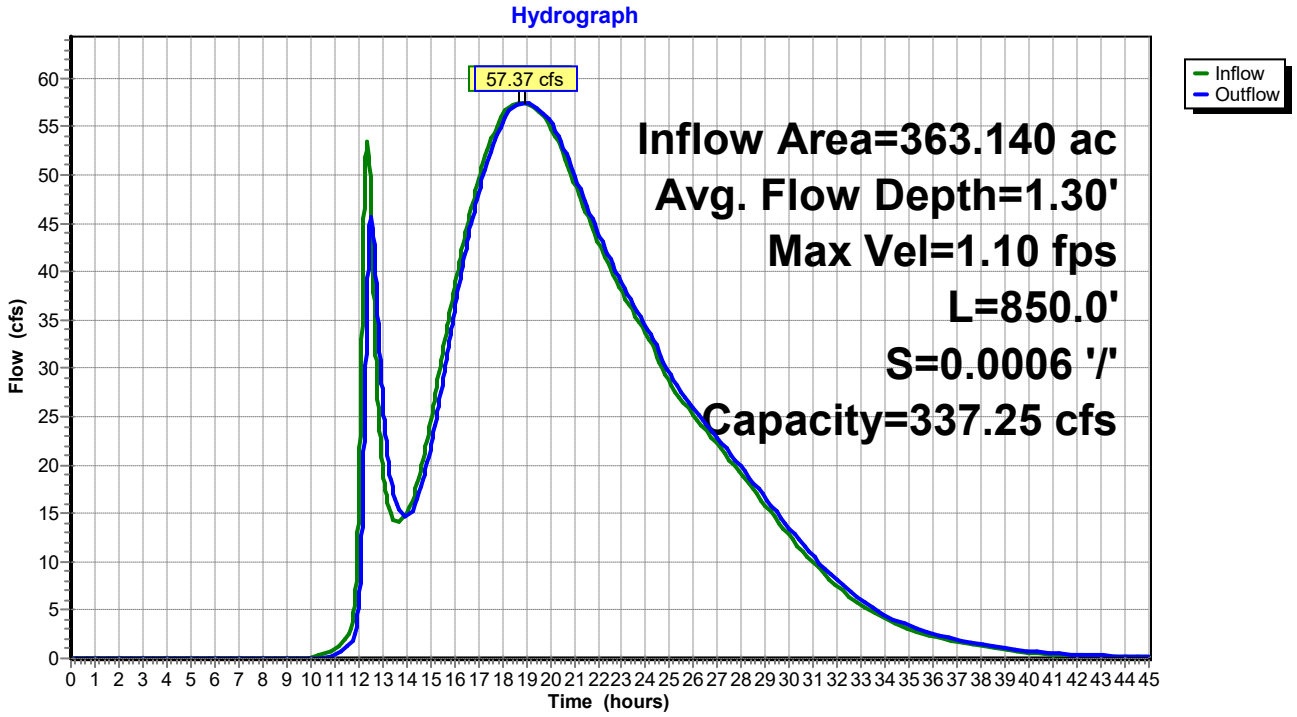
Custom cross-section, Length= 850.0' Slope= 0.0006 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 424.00', Outlet Invert= 423.50'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
25.00	425.00	0.00		
30.00	424.00	1.00	0.040	Earth, dense weeds
35.00	423.00	2.00	0.035	Earth, dense weeds
50.00	422.00	3.00	0.030	Earth, clean & winding
65.00	422.00	3.00	0.030	Earth, clean & winding
90.00	423.00	2.00	0.035	Earth, dense weeds
97.00	424.00	1.00	0.040	Earth, dense weeds
100.00	425.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	15.0	0	0.00
1.00	35.0	55.1	29,750	30.40
2.00	96.0	67.2	81,600	145.67
3.00	167.0	75.5	141,950	337.25

Reach R-1: Reach 1: Sections 0.0-3.0



Summary for Reach R-2: Reach 2: Sections 3.0-4.5

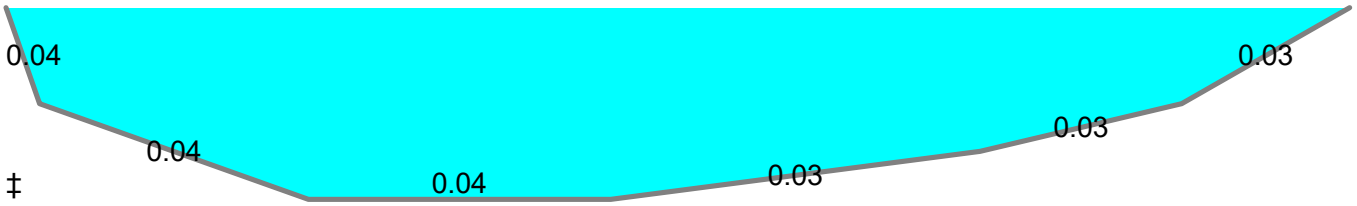
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 390.420 ac, 15.16% Impervious, Inflow Depth > 1.95" for 500-yr event
Inflow = 105.85 cfs @ 12.52 hrs, Volume= 63.450 af
Outflow = 104.92 cfs @ 12.56 hrs, Volume= 63.443 af, Atten= 1%, Lag= 2.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.76 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.82 fps, Avg. Travel Time= 8.1 min

Peak Storage= 23,854 cf @ 12.56 hrs
Average Depth at Peak Storage= 2.00'
Defined Flood Depth= 426.00' Flow Area= 16,994.3 sf, Capacity= 45,417.71 cfs
Bank-Full Depth= 2.00' Flow Area= 59.8 sf, Capacity= 105.23 cfs

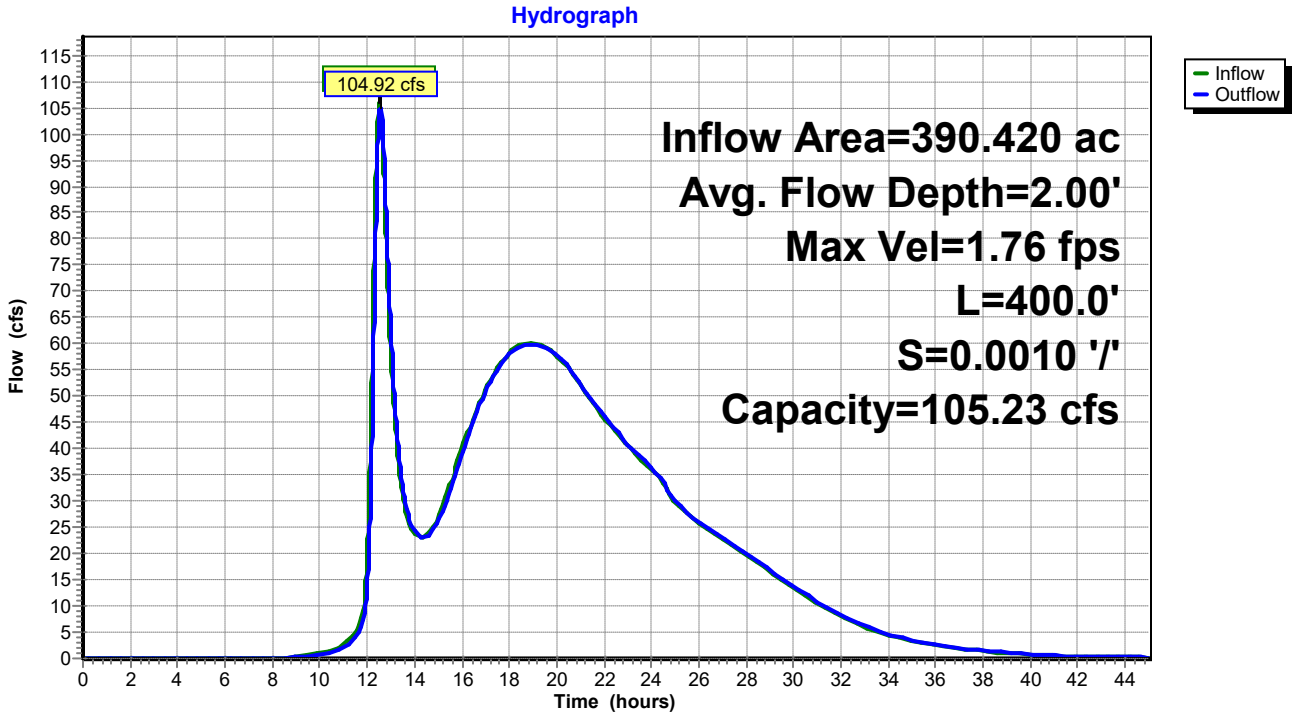
Custom cross-section, Length= 400.0' Slope= 0.0010 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.50', Outlet Invert= 423.10'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
40.00	425.00	0.00		
41.00	424.00	1.00	0.040	Earth, dense weeds
49.00	423.00	2.00	0.040	Earth, dense weeds
58.00	423.00	2.00	0.040	Earth, dense weeds
69.00	423.50	1.50	0.030	Earth, grassed & winding
75.00	424.00	1.00	0.030	
80.00	425.00	0.00	0.030	

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	9.0	0	0.00
0.50	8.3	24.0	3,300	5.34
1.00	22.8	34.1	9,100	23.27
2.00	59.8	40.6	23,900	105.23

Reach R-2: Reach 2: Sections 3.0-4.5



Summary for Reach R-3: Reach 3: Sections 4.5-11.0

Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 450.500 ac, 16.46% Impervious, Inflow Depth > 2.05" for 500-yr event
Inflow = 134.83 cfs @ 12.64 hrs, Volume= 77.125 af
Outflow = 124.76 cfs @ 12.85 hrs, Volume= 77.081 af, Atten= 7%, Lag= 12.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.86 fps, Min. Travel Time= 14.4 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 31.2 min

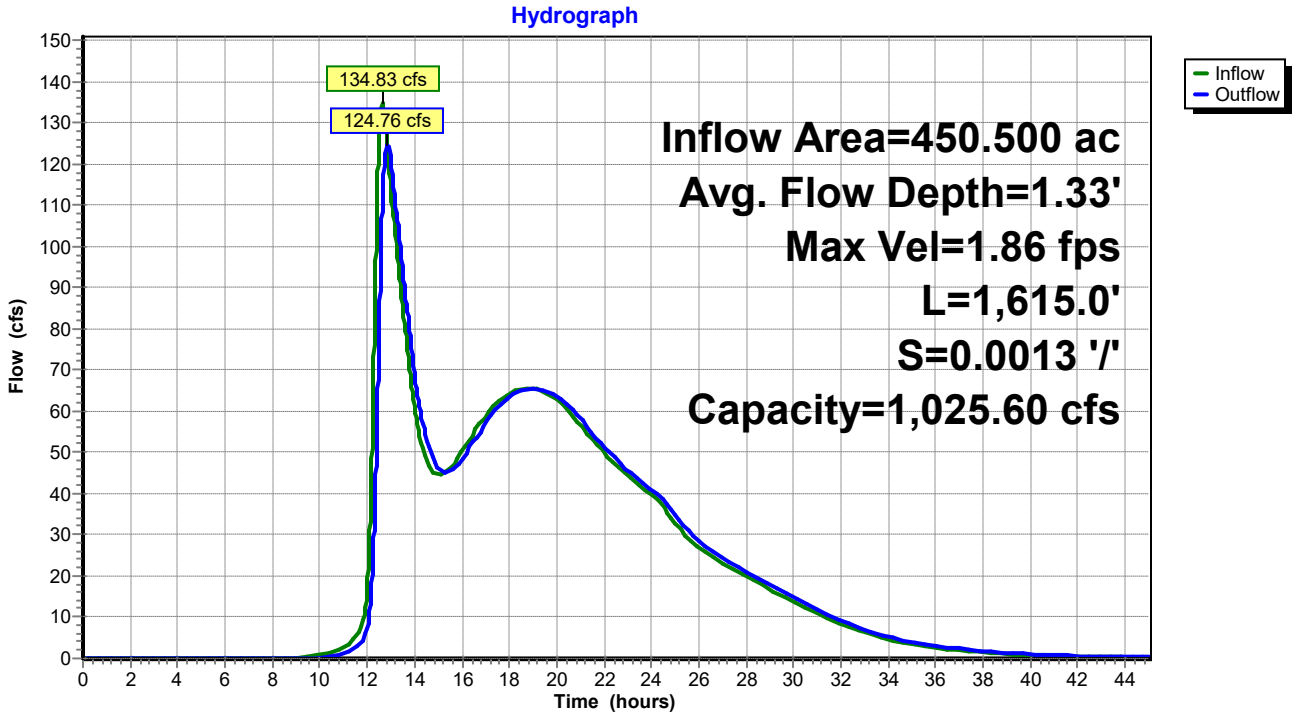
Peak Storage= 108,128 cf @ 12.85 hrs
Average Depth at Peak Storage= 1.33'
Defined Flood Depth= 426.00' Flow Area= 31,858.3 sf, Capacity= 198,961.16 cfs
Bank-Full Depth= 4.00' Flow Area= 250.5 sf, Capacity= 1,025.60 cfs

Custom cross-section, Length= 1,615.0' Slope= 0.0013 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.10', Outlet Invert= 421.00'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
15.00	426.00	0.00		
17.00	425.00	1.00	0.050	Earth, long dense weeds
19.00	424.00	2.00	0.040	Earth, dense weeds
21.00	423.00	3.00	0.035	Earth, dense weeds
50.00	422.00	4.00	0.030	Earth, clean & winding
80.00	422.00	4.00	0.030	Earth, clean & winding
83.00	423.00	3.00	0.035	Earth, dense weeds
85.00	424.00	2.00	0.040	Earth, cobble bottom, clean sides
87.00	425.00	1.00	0.050	Earth, long dense weeds
90.00	426.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	30.0	0	0.00
1.00	46.0	62.2	74,290	67.24
2.00	110.0	66.7	177,650	279.24
3.00	178.0	71.1	287,470	602.50
4.00	250.5	76.5	404,558	1,025.60

Reach R-3: Reach 3: Sections 4.5-11.0



Summary for Reach R-4: Reach 4: Sections 11.0-16.5

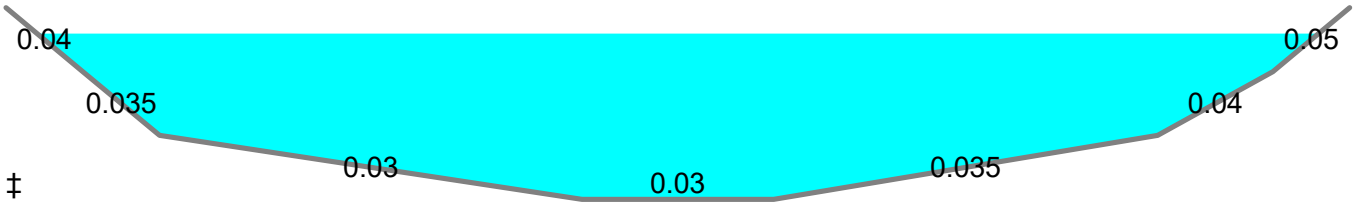
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 2.05" for 500-yr event
Inflow = 130.06 cfs @ 12.83 hrs, Volume= 79.507 af
Outflow = 125.87 cfs @ 12.98 hrs, Volume= 79.479 af, Atten= 3%, Lag= 8.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.00 fps, Min. Travel Time= 10.5 min
Avg. Velocity = 0.95 fps, Avg. Travel Time= 22.0 min

Peak Storage= 79,224 cf @ 12.98 hrs
Average Depth at Peak Storage= 2.59'
Defined Flood Depth= 426.00' Flow Area= 14,856.6 sf, Capacity= 48,804.33 cfs
Bank-Full Depth= 3.00' Flow Area= 77.0 sf, Capacity= 169.95 cfs

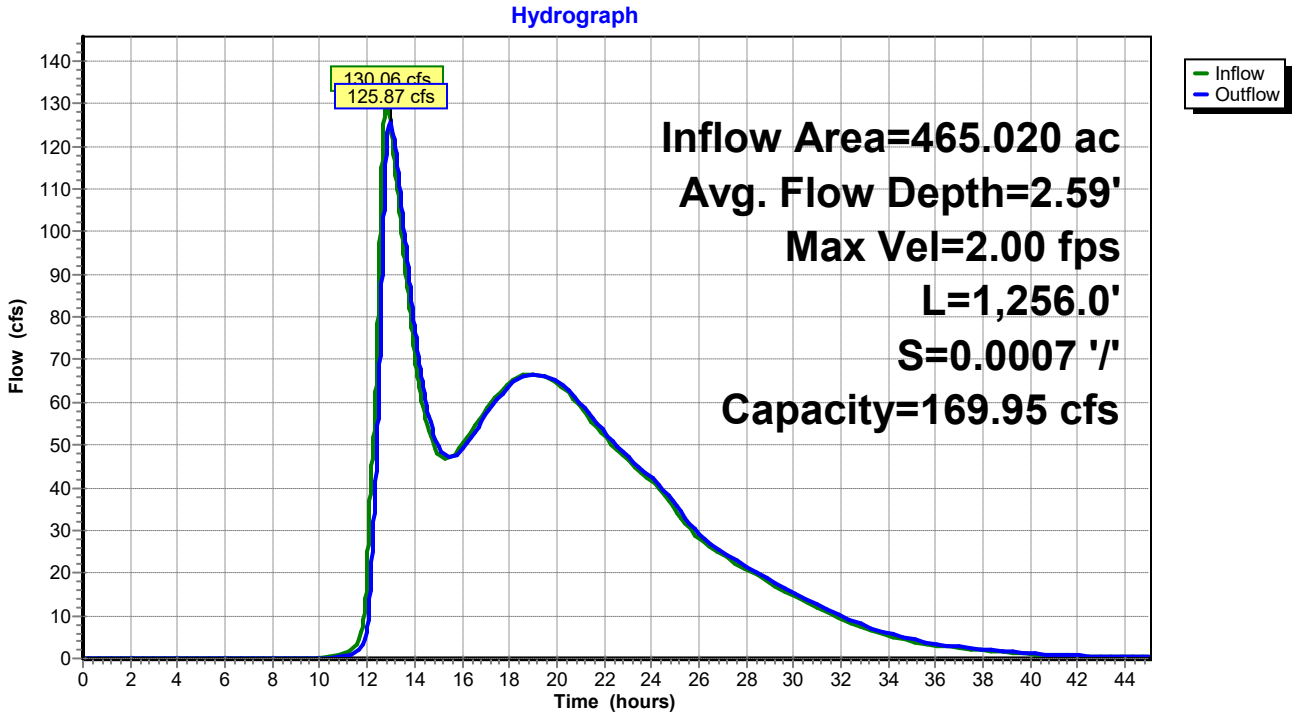
Custom cross-section, Length= 1,256.0' Slope= 0.0007 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 421.00', Outlet Invert= 420.11'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
35.00	425.00	0.00		
37.00	424.00	1.00	0.040	Earth, dense weeds
39.00	423.00	2.00	0.035	Earth, dense weeds
50.00	422.00	3.00	0.030	Earth, clean & winding
55.00	422.00	3.00	0.030	Earth, clean & winding
65.00	423.00	2.00	0.035	Earth, dense weeds
68.00	424.00	1.00	0.040	Earth, dense weeds
70.00	425.00	0.00	0.050	Earth, long dense weeds

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	5.0	0	0.00
1.00	15.5	26.1	19,468	13.98
2.00	44.0	31.5	55,264	72.53
3.00	77.0	36.0	96,712	169.95

Reach R-4: Reach 4: Sections 11.0-16.5



Summary for Pond 1P: 36" RCP Storm Drain

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 2.05" for 500-yr event
Inflow = 125.87 cfs @ 12.98 hrs, Volume= 79.479 af
Outflow = 59.22 cfs @ 21.10 hrs, Volume= 79.479 af, Atten= 53%, Lag= 487.2 min
Primary = 59.22 cfs @ 21.10 hrs, Volume= 79.479 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-45.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 424.72' @ 21.10 hrs Surf.Area= 210,113 sf Storage= 510,763 cf
Flood Elev= 425.00' Surf.Area= 217,978 sf Storage= 570,044 cf

Plug-Flow detention time= 113.8 min calculated for 79.461 af (100% of inflow)
Center-of-Mass det. time= 113.8 min (1,317.3 - 1,203.5)

Volume	Invert	Avail.Storage	Storage Description
#1	420.11'	807,325 cf	**Canal (Prismatic)** Listed below (Recalc)

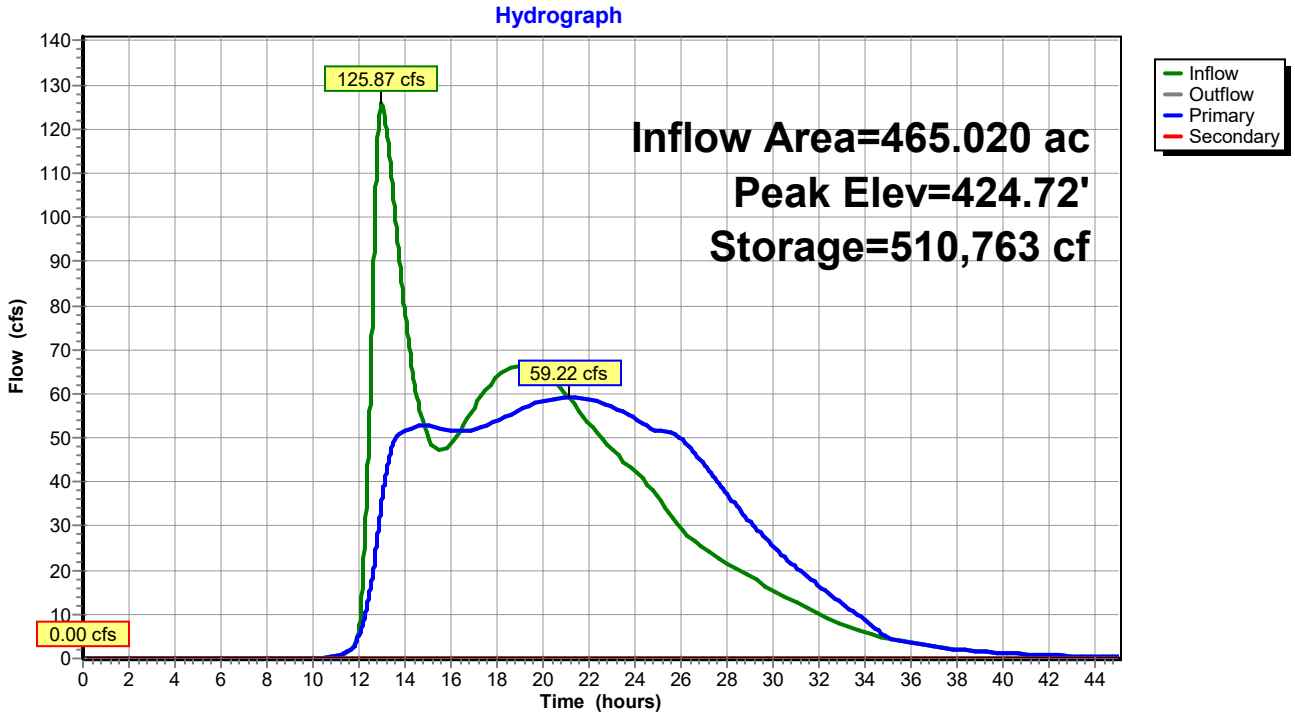
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.11	5	0	0
421.00	25	13	13
422.00	113,500	56,763	56,776
423.00	157,948	135,724	192,500
424.00	189,581	173,765	366,264
425.00	217,978	203,780	570,044
426.00	256,585	237,282	807,325

Device	Routing	Invert	Outlet Devices
#1	Primary	420.11'	**36.0" Round RCP_Round 36"** L= 155.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 420.11' / 419.37' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	425.40'	**260.0' long x 20.0' breadth Canal Overflow to Highway ROW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

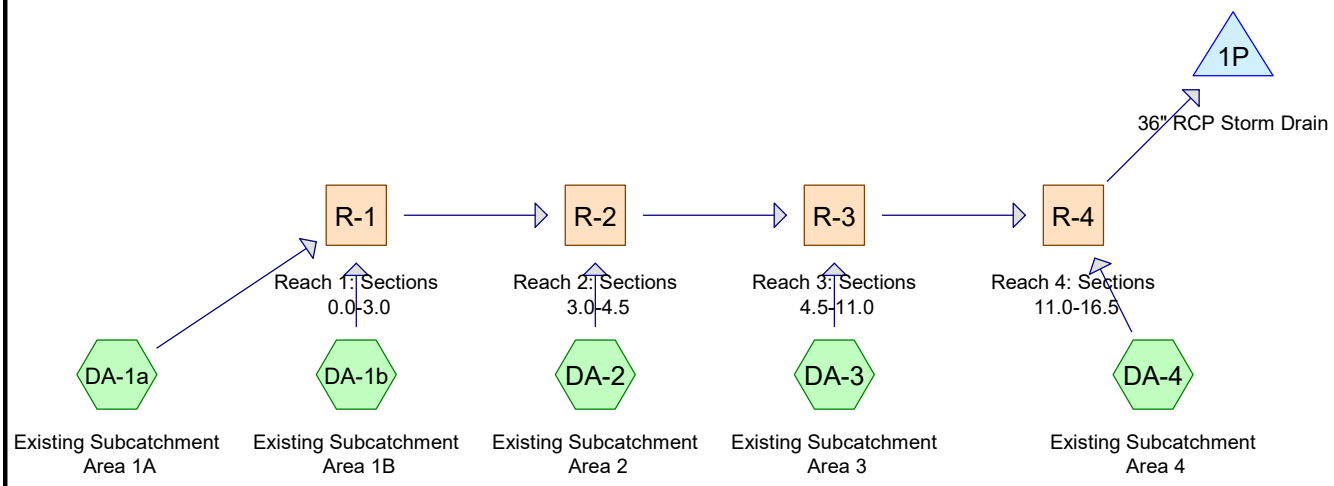
Primary OutFlow Max=59.22 cfs @ 21.10 hrs HW=424.72' (Free Discharge)
↑—**1=RCP_Round 36"** (Barrel Controls 59.22 cfs @ 8.38 fps)

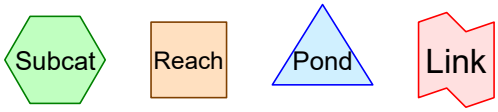
Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.11' (Free Discharge)
↑—**2=Canal Overflow to Highway ROW** (Controls 0.00 cfs)

Pond 1P: 36" RCP Storm Drain



APPENDIX C.2 HYDROCAD PROPOSED REPORT





Routing Diagram for Old Erie Canal - Proposed
Prepared by Wood, Printed 5/19/2020
HydroCAD® 10.00 s/n 00677 © 2011 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
47.030	39	Brush, Good, HSG A/B (DA-3, DA-4)
78.050	40	Brush, Good, HSG A/B (DA-1b)
6.830	43	Woods, Good, HSG A/B (DA-3)
9.880	48	Brush, Good, HSG A/B (DA-2)
14.320	50	>75% Grass cover, Good, HSG A/B (DA-1a)
91.150	55	Woods, Good, HSG A/B (DA-1b)
104.220	56	2 acre lots, 12% imp, HSG B/A (DA-1b)
43.640	62	1/2 acre lots, 25% imp, HSG A/B (DA-1b)
5.590	73	Brush, Good, HSG D - Canal (DA-1a, DA-1b, DA-2, DA-3, DA-4)
30.090	88	Urban industrial, 72% imp, HSG B (DA-1a, DA-1b)
16.600	92	Urban Ind/Com, 85% imp, HSG B (DA-2)
17.620	92	Urban commercial, 85% imp, HSG B (DA-3)
465.020	**56**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
290.900	HSG A	DA-1a, DA-1b, DA-2, DA-3, DA-4
168.530	HSG B	DA-1a, DA-1b, DA-2, DA-3
0.000	HSG C	
5.590	HSG D	DA-1a, DA-1b, DA-2, DA-3, DA-4
0.000	Other	
465.020		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
43.640	0.000	0.000	0.000	0.000	43.640	1/2 acre lots, 25% imp	DA-1b
0.000	104.220	0.000	0.000	0.000	104.220	2 acre lots, 12% imp	DA-1b
14.320	0.000	0.000	0.000	0.000	14.320	>75% Grass cover, Good	DA-1a
134.960	0.000	0.000	5.590	0.000	140.550	Brush, Good	DA-1a, DA-1b, DA-2, DA-3, DA-4
0.000	16.600	0.000	0.000	0.000	16.600	Urban Ind/Com, 85% imp	DA-2
0.000	17.620	0.000	0.000	0.000	17.620	Urban commercial, 85% imp	DA-3
0.000	30.090	0.000	0.000	0.000	30.090	Urban industrial, 72% imp	DA-1a, DA-1b
97.980	0.000	0.000	0.000	0.000	97.980	Woods, Good	DA-1b, DA-3
290.900	**168.530**	**0.000**	**5.590**	**0.000**	**465.020**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	420.11	419.37	155.0	0.0048	0.012	36.0	0.0	0.0

Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1a: Existing Runoff Area=26.630 ac 31.07% Impervious Runoff Depth=0.20"
Flow Length=1,872' Slope=0.0370 '/' Tc=39.4 min CN=67 Runoff=1.88 cfs 0.449 af

Subcatchment DA-1b: Existing Runoff Area=336.510 ac 10.94% Impervious Runoff Depth=0.02"
Flow Length=8,612' Slope=0.0050 '/' Tc=494.2 min CN=55 Runoff=0.70 cfs 0.668 af

Subcatchment DA-2: Existing Runoff Area=27.280 ac 51.72% Impervious Runoff Depth=0.46"
Flow Length=2,428' Slope=0.0226 '/' Tc=48.5 min CN=76 Runoff=6.31 cfs 1.047 af

Subcatchment DA-3: Existing Runoff Area=60.080 ac 24.93% Impervious Runoff Depth=0.03"
Flow Length=3,650' Slope=0.0160 '/' Tc=135.6 min CN=56 Runoff=0.19 cfs 0.161 af

Subcatchment DA-4: Existing Runoff Area=14.520 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=830' Slope=0.0470 '/' Tc=33.7 min CN=43 Runoff=0.00 cfs 0.000 af

Reach R-1: Reach 1: Sections 0.0-3.0 Avg. Flow Depth=0.40' Max Vel=0.58 fps Inflow=1.88 cfs 1.118 af
L=850.0' S=0.0012 '/' Capacity=1,965.69 cfs Outflow=1.37 cfs 1.118 af

Reach R-2: Reach 2: Sections 3.0-4.5 Avg. Flow Depth=0.91' Max Vel=0.97 fps Inflow=6.36 cfs 2.165 af
L=420.0' S=0.0010 '/' Capacity=358.88 cfs Outflow=6.17 cfs 2.165 af

Reach R-3: Reach 3: Sections 4.5-11.0 Avg. Flow Depth=0.48' Max Vel=0.75 fps Inflow=6.17 cfs 2.326 af
L=1,615.0' S=0.0013 '/' Capacity=1,686.70 cfs Outflow=4.15 cfs 2.326 af

Reach R-4: Reach 4: Sections 11.0-16.5 Avg. Flow Depth=0.75' Max Vel=0.90 fps Inflow=4.15 cfs 2.326 af
L=1,256.0' S=0.0007 '/' Capacity=170.12 cfs Outflow=3.93 cfs 2.326 af

Pond 1P: 36" RCP Storm Drain Peak Elev=420.69' Storage=16,085 cf Inflow=3.93 cfs 2.326 af
Primary=2.16 cfs 2.325 af Secondary=0.00 cfs 0.000 af Outflow=2.16 cfs 2.325 af

Total Runoff Area = 465.020 ac Runoff Volume = 2.326 af Average Runoff Depth = 0.06"
84.05% Pervious = 390.852 ac 15.95% Impervious = 74.168 ac

Summary for Subcatchment DA-1a: Existing Subcatchment Area 1A

Area sized to give full flow through pipe during 10 yr storm.

Flow source assumed to be residential drainage from neighborhoods to the west.

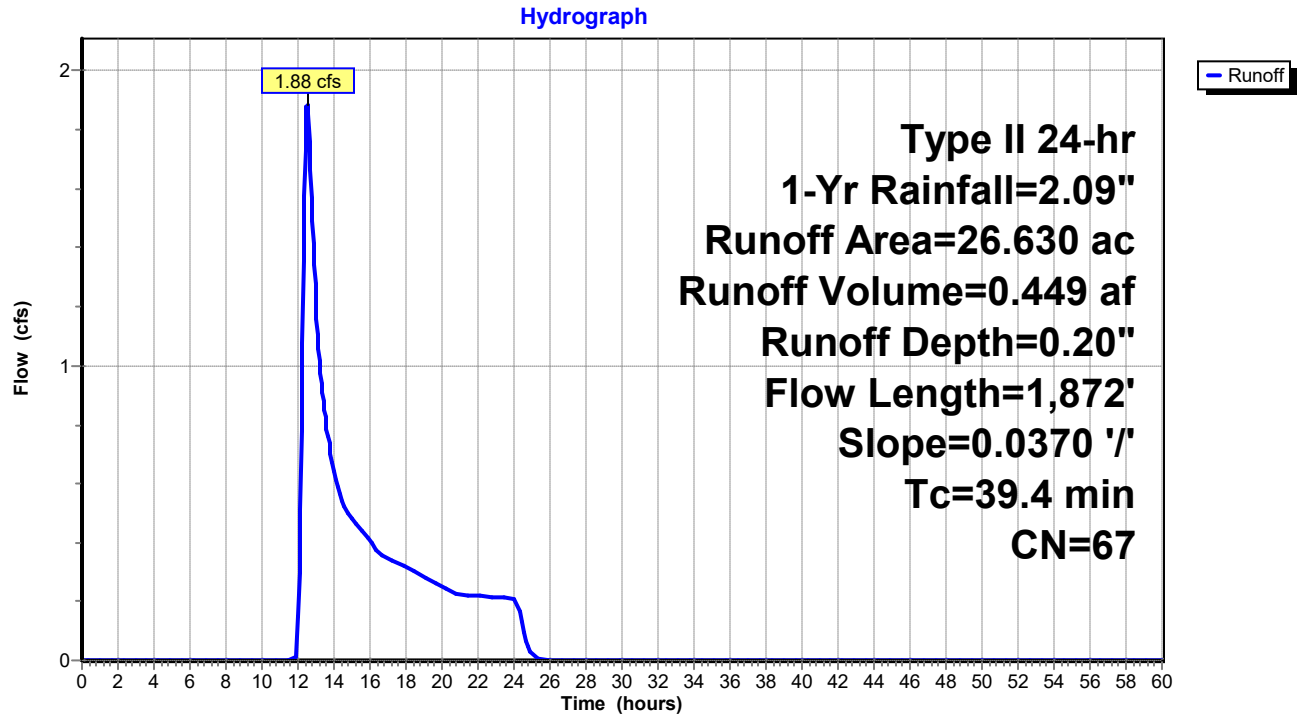
Runoff = 1.88 cfs @ 12.52 hrs, Volume= 0.449 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-Yr Rainfall=2.09"

	Area (ac)	CN	Description
*	14.320	50	>75% Grass cover, Good, HSG A/B
	11.490	88	Urban industrial, 72% imp, HSG B
*	0.820	73	Brush, Good, HSG D - Canal
	26.630	67	Weighted Average
	18.357		68.93% Pervious Area
	8.273		31.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.4	1,872	0.0370	0.79		**Lag/CN Method,**

Subcatchment DA-1a: Existing Subcatchment Area 1A



Summary for Subcatchment DA-1b: Existing Subcatchment Area 1B

See map A for total area of 188,420 sf.

Estimated 10% roof surface, 70% gravel surfaces, 20% near water as grass and forest.

Slope of flow: 438 to 435 surface elevation over 300 feet for gravel; 435 to 421 over 50 feet

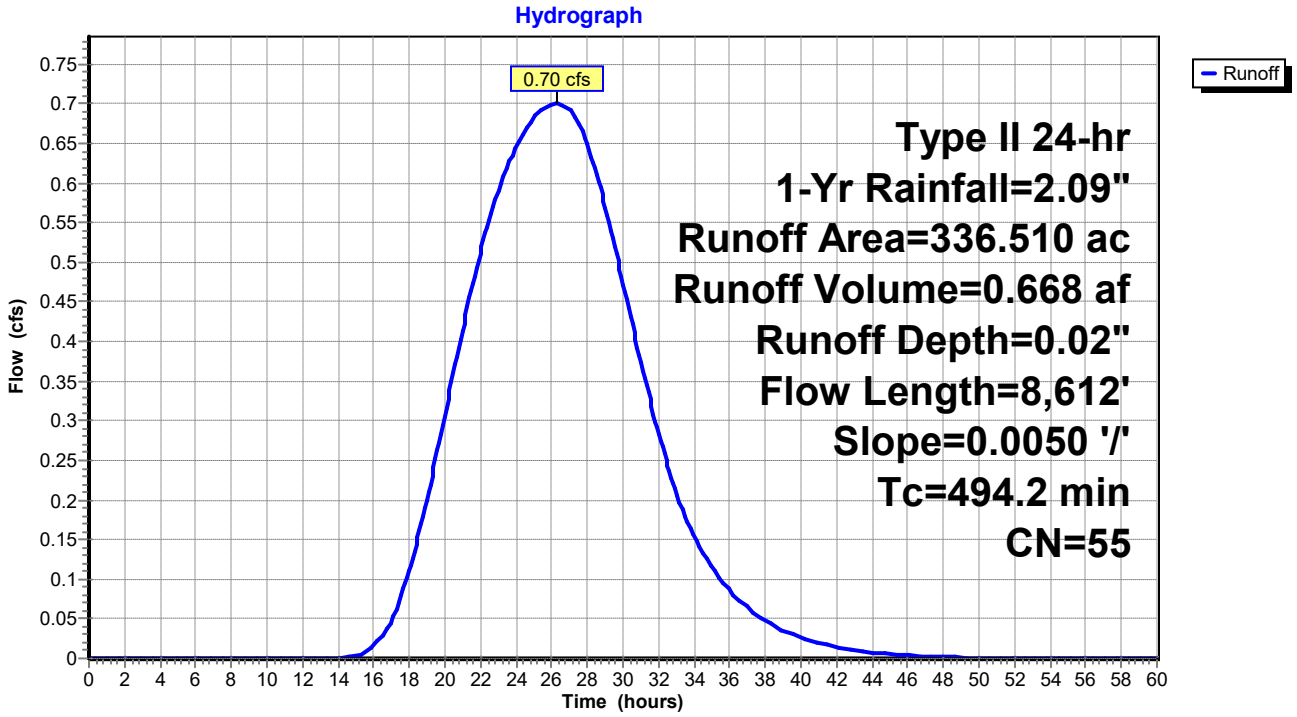
Runoff = 0.70 cfs @ 26.33 hrs, Volume= 0.668 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-Yr Rainfall=2.09"

	Area (ac)	CN	Description
*	43.640	62	1/2 acre lots, 25% imp, HSG A/B
	18.600	88	Urban industrial, 72% imp, HSG B
*	91.150	55	Woods, Good, HSG A/B
*	78.050	40	Brush, Good, HSG A/B
*	104.220	56	2 acre lots, 12% imp, HSG B/A
*	0.850	73	Brush, Good, HSG D - Canal
	336.510	55	Weighted Average
	299.702		89.06% Pervious Area
	36.808		10.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
494.2	8,612	0.0050	0.29		**Lag/CN Method, Incude Est Attenuation**

Subcatchment DA-1b: Existing Subcatchment Area 1B



Summary for Subcatchment DA-2: Existing Subcatchment Area 2

Cover type: industrial type A soils based on Maps C, D and F.

Channel Tc:

Slope as 445 inlet to 420 outlet over 460 feet.

Perimiter as length (460)x2 + width (50)x2.

X-sec area estimated as rectangular with 5' depth and 25' wide.

Other Tc area: 16' elev over 430 feet. Unpaved based on aerial photography.

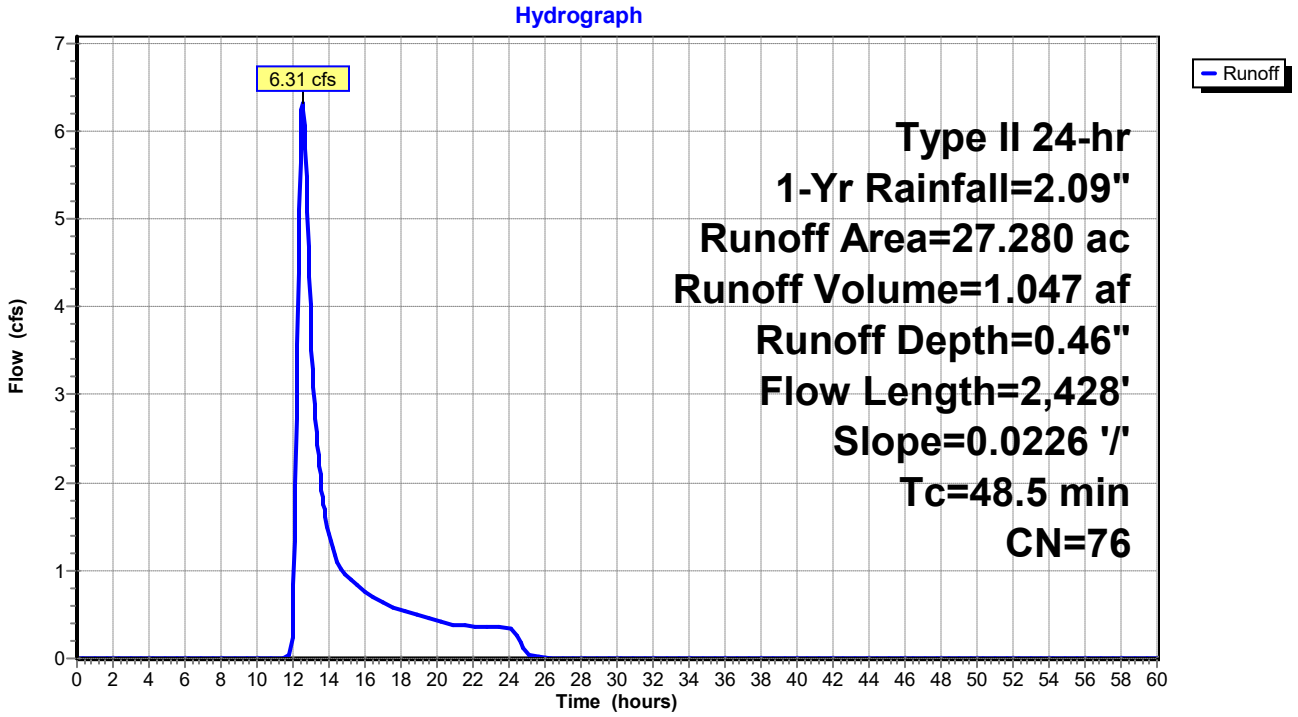
Runoff = 6.31 cfs @ 12.55 hrs, Volume= 1.047 af, Depth= 0.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-Yr Rainfall=2.09"

	Area (ac)	CN	Description
*	16.600	92	Urban Ind/Com, 85% imp, HSG B
*	9.880	48	Brush, Good, HSG A/B
*	0.800	73	Brush, Good, HSG D - Canal
	27.280	76	Weighted Average
	13.170		48.28% Pervious Area
	14.110		51.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
48.5	2,428	0.0226	0.83		**Lag/CN Method,**

Subcatchment DA-2: Existing Subcatchment Area 2



Summary for Subcatchment DA-3: Existing Subcatchment Area 3

Cover type: 20% industrial class A, 30% wood class B, 30% range class B, 20% grass class B for large area south of Bleecker. 55% grass 45% wood class B for area west of channel and north of Bleecker.

Channel Tc:

Slope as 452 inlet to 419 outlet over 565 feet.

Perimiter as length 565'x2 + width (12')x2.

X-sec area estimated as rectangular with 5' depth and 12' wide.

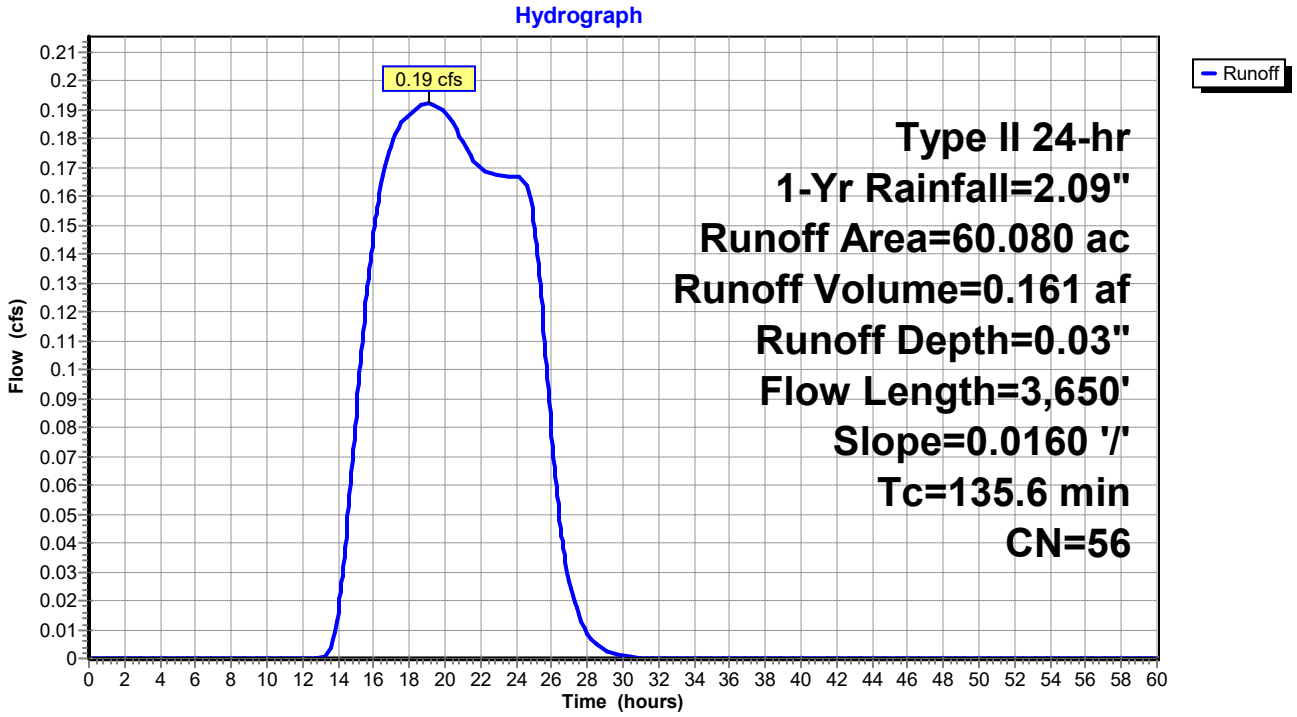
Runoff = 0.19 cfs @ 19.13 hrs, Volume= 0.161 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-Yr Rainfall=2.09"

	Area (ac)	CN	Description
	17.620	92	Urban commercial, 85% imp, HSG B
*	6.830	43	Woods, Good, HSG A/B
*	34.150	39	Brush, Good, HSG A/B
*	1.480	73	Brush, Good, HSG D - Canal
	60.080	56	Weighted Average
	45.103		75.07% Pervious Area
	14.977		24.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
135.6	3,650	0.0160	0.45		**Lag/CN Method,**

Subcatchment DA-3: Existing Subcatchment Area 3



Summary for Subcatchment DA-4: Existing Subcatchment Area 4

See Map A for area of subcatchment and farthest run for Tc. Slope calculated as 725 foot run from 460 to 418 elevation.

CN for area average of A and B soil groups for grass/woodland.

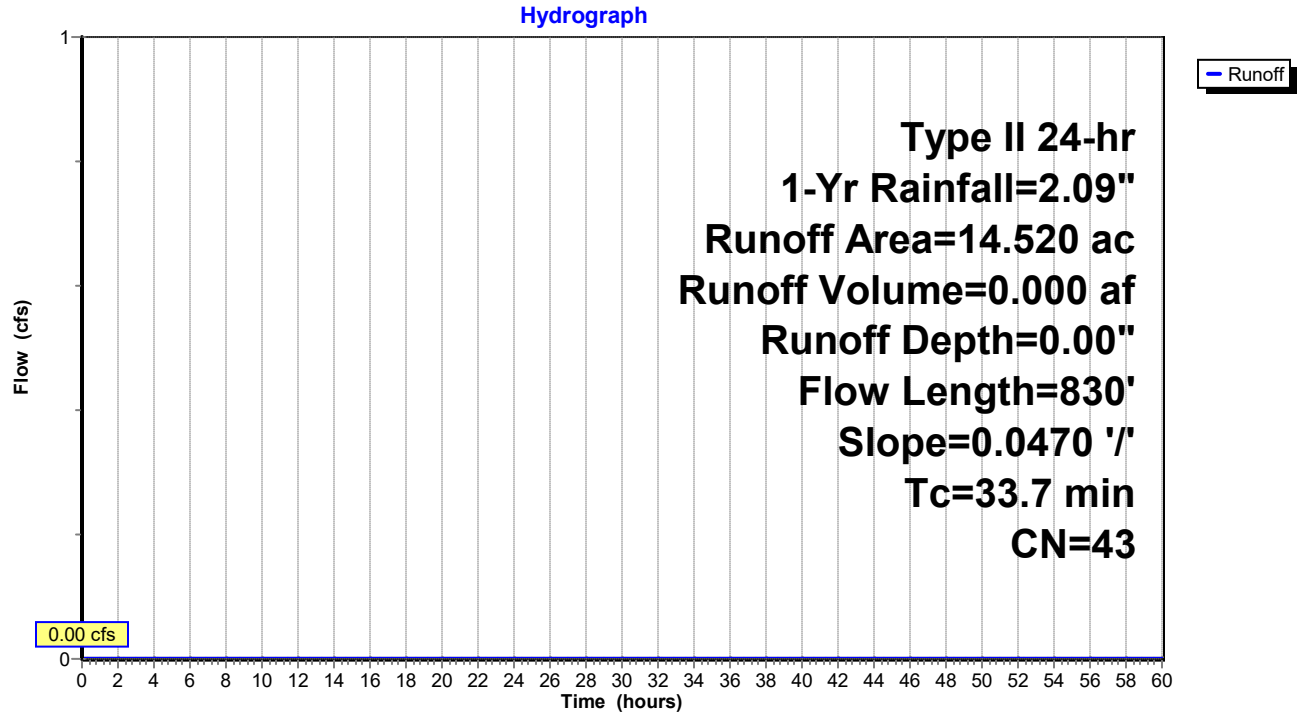
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-Yr Rainfall=2.09"

	Area (ac)	CN	Description
*	12.880	39	Brush, Good, HSG A/B
*	1.640	73	Brush, Good, HSG D - Canal
	14.520	43	Weighted Average
	14.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.7	830	0.0470	0.41		**Lag/CN Method,**

Subcatchment DA-4: Existing Subcatchment Area 4



Summary for Reach R-1: Reach 1: Sections 0.0-3.0

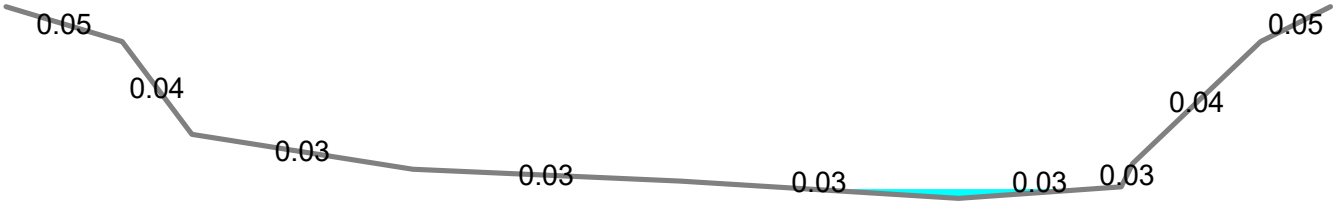
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 363.140 ac, 12.41% Impervious, Inflow Depth = 0.04" for 1-Yr event
Inflow = 1.88 cfs @ 12.52 hrs, Volume= 1.118 af
Outflow = 1.37 cfs @ 13.29 hrs, Volume= 1.118 af, Atten= 27%, Lag= 45.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.58 fps, Min. Travel Time= 24.4 min
Avg. Velocity = 0.35 fps, Avg. Travel Time= 40.5 min

Peak Storage= 2,012 cf @ 12.88 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 8.25' Flow Area= 336.1 sf, Capacity= 1,965.69 cfs

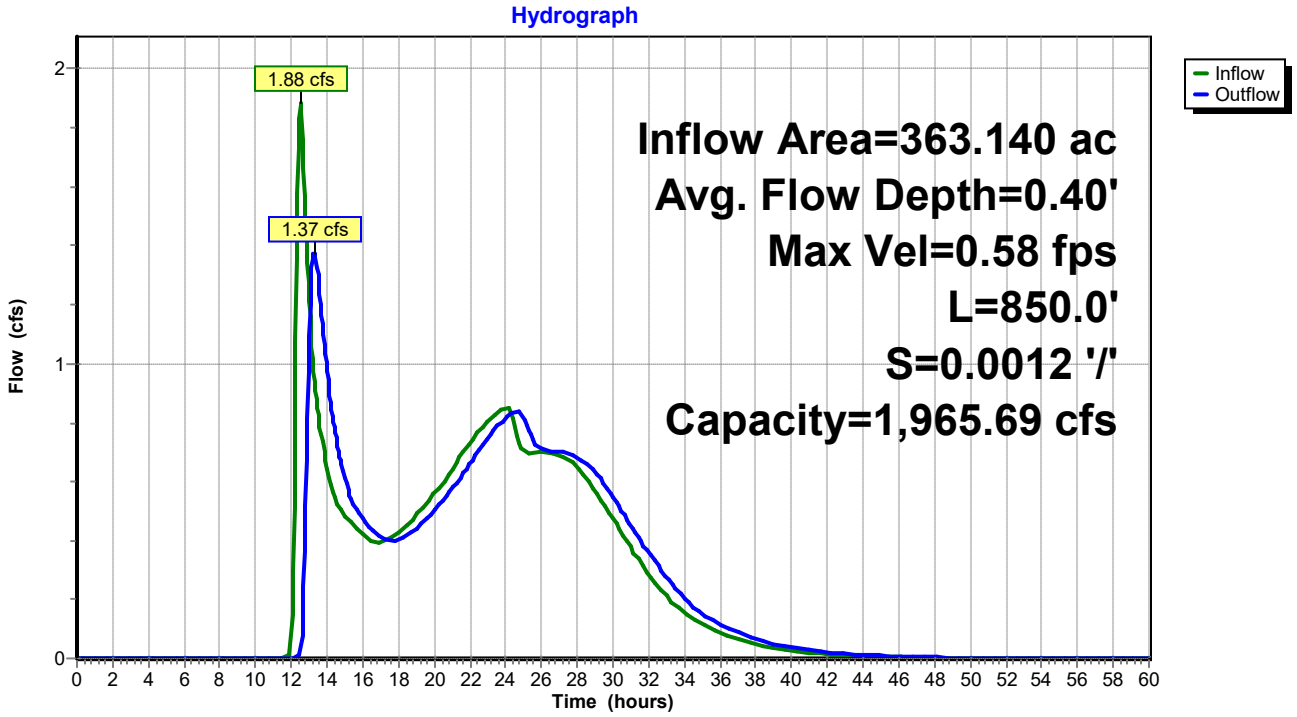
Custom cross-section, Length= 850.0' Slope= 0.0012 '/' (105 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 424.00', Outlet Invert= 423.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
21.00	425.00	0.00		
26.00	423.50	1.50	0.050	Earth, cobble bottom, clean sides
29.00	419.50	5.50	0.040	Earth, dense weeds
38.50	418.00	7.00	0.030	Earth, grassed & winding
50.00	417.50	7.50	0.030	Earth, grassed & winding
62.00	416.75	8.25	0.030	Earth, grassed & winding
69.00	417.25	7.75	0.030	Earth, grassed & winding
69.50	418.25	6.75	0.030	
75.00	423.50	1.50	0.040	
78.00	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.50	3.8	15.0	3,190	2.54
0.75	8.0	19.3	6,813	7.58
1.25	20.5	31.4	17,438	26.25
1.50	28.4	33.3	24,181	43.54
2.75	74.9	43.1	63,702	186.64
6.75	256.6	53.9	218,078	1,319.79
8.25	336.1	62.5	285,653	1,965.69

Reach R-1: Reach 1: Sections 0.0-3.0



Summary for Reach R-2: Reach 2: Sections 3.0-4.5

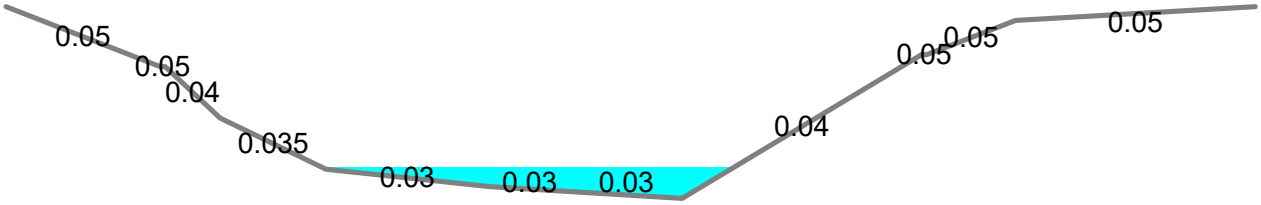
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 390.420 ac, 15.16% Impervious, Inflow Depth = 0.07" for 1-Yr event
Inflow = 6.36 cfs @ 12.56 hrs, Volume= 2.165 af
Outflow = 6.17 cfs @ 12.78 hrs, Volume= 2.165 af, Atten= 3%, Lag= 13.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.97 fps, Min. Travel Time= 7.2 min
Avg. Velocity = 0.38 fps, Avg. Travel Time= 18.6 min

Peak Storage= 2,670 cf @ 12.66 hrs
Average Depth at Peak Storage= 0.91'
Bank-Full Depth= 5.60' Flow Area= 103.5 sf, Capacity= 358.88 cfs

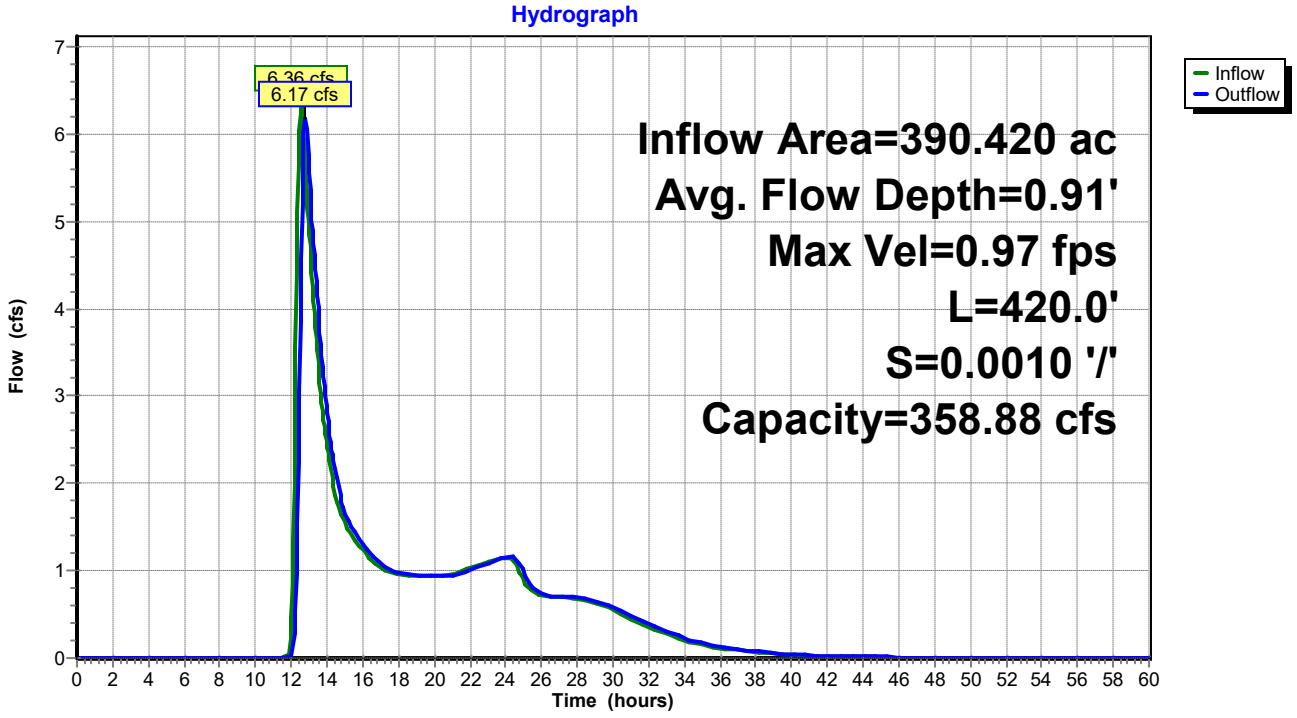
Custom cross-section, Length= 420.0' Slope= 0.0010 '/' (105 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.40', Outlet Invert= 423.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
33.50	425.00	0.00		
38.00	423.25	1.75	0.050	Earth, cobble bottom, clean sides
38.15	423.25	1.75	0.050	Earth, cobble bottom, clean sides
39.75	421.75	3.25	0.040	
42.85	420.25	4.75	0.035	
47.60	419.75	5.25	0.030	Earth, grassed & winding
50.00	419.60	5.40	0.030	Earth, grassed & winding
53.25	419.40	5.60	0.030	Earth, grassed & winding
60.25	423.60	1.40	0.040	
60.40	423.60	1.40	0.050	Earth, cobble bottom, clean sides
63.00	424.60	0.40	0.050	
70.00	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.20	0.4	3.6	151	0.11
0.35	1.1	6.3	460	0.51
0.85	5.6	12.1	2,355	5.04
2.35	27.5	18.4	11,564	57.22
3.85	56.7	23.7	23,827	162.15
4.20	64.6	25.5	27,122	194.15
5.20	90.5	31.0	37,994	306.46
5.60	103.5	39.2	43,451	358.88

Reach R-2: Reach 2: Sections 3.0-4.5



Summary for Reach R-3: Reach 3: Sections 4.5-11.0

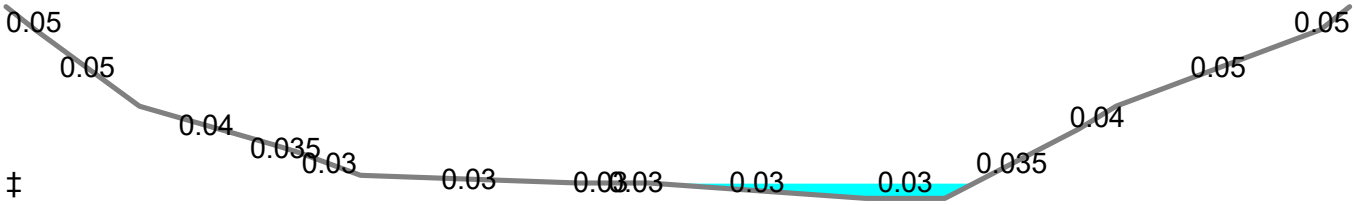
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 450.500 ac, 16.46% Impervious, Inflow Depth = 0.06" for 1-Yr event
Inflow = 6.17 cfs @ 12.78 hrs, Volume= 2.326 af
Outflow = 4.15 cfs @ 14.05 hrs, Volume= 2.326 af, Atten= 33%, Lag= 75.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.75 fps, Min. Travel Time= 35.8 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 69.1 min

Peak Storage= 9,319 cf @ 13.45 hrs
Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 6.25' Flow Area= 349.9 sf, Capacity= 1,686.70 cfs

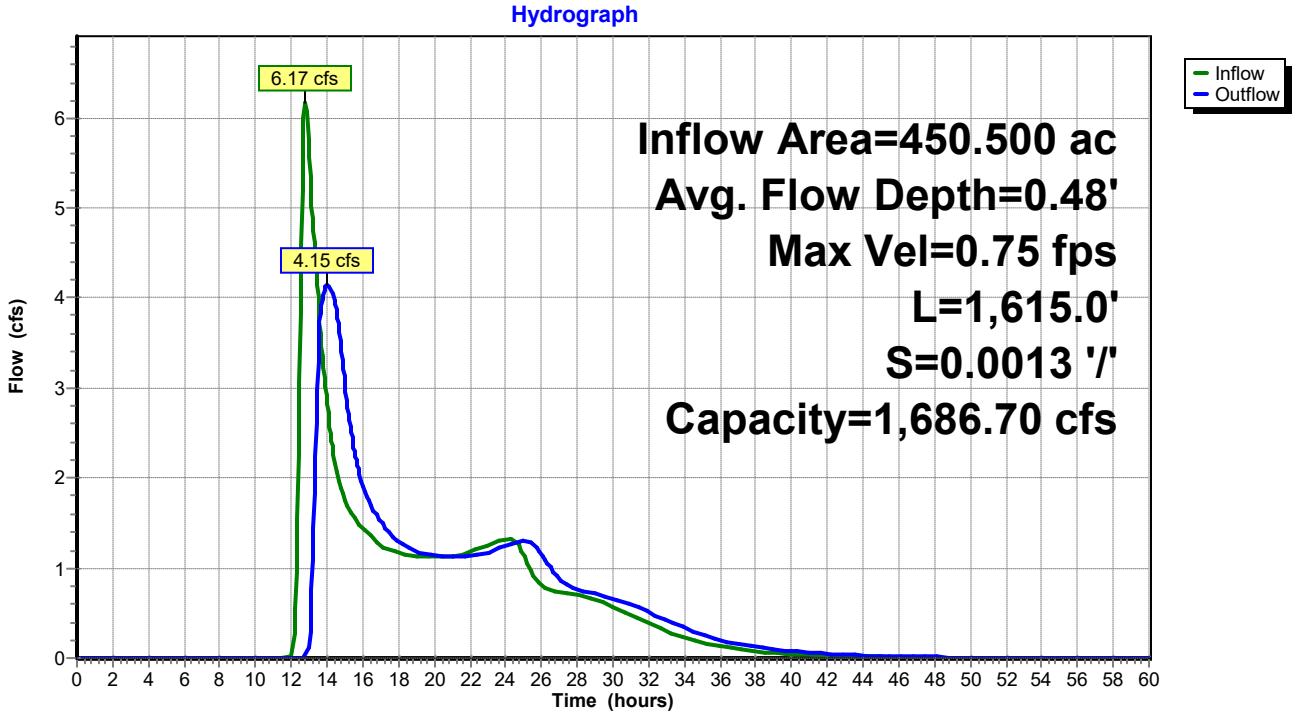
Custom cross-section, Length= 1,615.0' Slope= 0.0013 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.10', Outlet Invert= 421.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
13.00	425.00	0.00		
14.75	424.25	0.75	0.050	Earth, cobble bottom, clean sides
21.00	421.75	3.25	0.050	Earth, cobble bottom, clean sides
29.00	420.50	4.50	0.040	Earth, grassed & winding
30.50	420.25	4.75	0.035	Earth, dense weeds
34.25	419.50	5.50	0.030	Earth, grassed & winding
47.25	419.25	5.75	0.030	Earth, grassed & winding
50.00	419.25	5.75	0.030	Earth, grassed & winding
51.50	419.25	5.75	0.030	Earth, grassed & winding
64.50	418.75	6.25	0.030	Earth, grassed & winding
69.25	418.75	6.25	0.030	Earth, grassed & winding
77.25	421.00	4.00	0.035	
79.50	421.75	3.25	0.040	
91.75	424.25	0.75	0.050	Earth, cobble bottom, clean sides
93.50	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.8	0	0.00
0.50	6.1	23.9	9,802	4.31
0.75	13.8	37.8	22,206	12.39
1.50	44.4	44.4	71,716	79.03
1.75	55.7	46.8	89,997	113.53
2.25	80.2	51.9	129,533	198.84
3.00	121.4	59.1	196,122	370.72
5.50	290.8	78.4	469,662	1,302.31
6.25	349.9	82.2	565,048	1,686.70

Reach R-3: Reach 3: Sections 4.5-11.0



Summary for Reach R-4: Reach 4: Sections 11.0-16.5

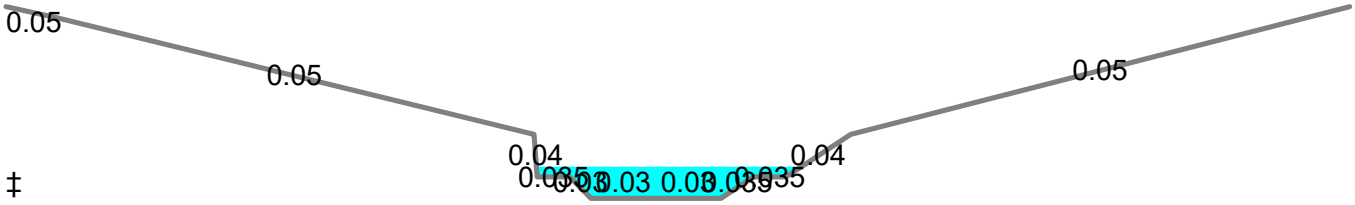
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth = 0.06" for 1-Yr event
Inflow = 4.15 cfs @ 14.05 hrs, Volume= 2.326 af
Outflow = 3.93 cfs @ 14.84 hrs, Volume= 2.326 af, Atten= 5%, Lag= 47.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.90 fps, Min. Travel Time= 23.2 min
Avg. Velocity = 0.40 fps, Avg. Travel Time= 52.9 min

Peak Storage= 5,468 cf @ 14.45 hrs
Average Depth at Peak Storage= 0.75'
Bank-Full Depth= 4.50' Flow Area= 87.5 sf, Capacity= 170.12 cfs

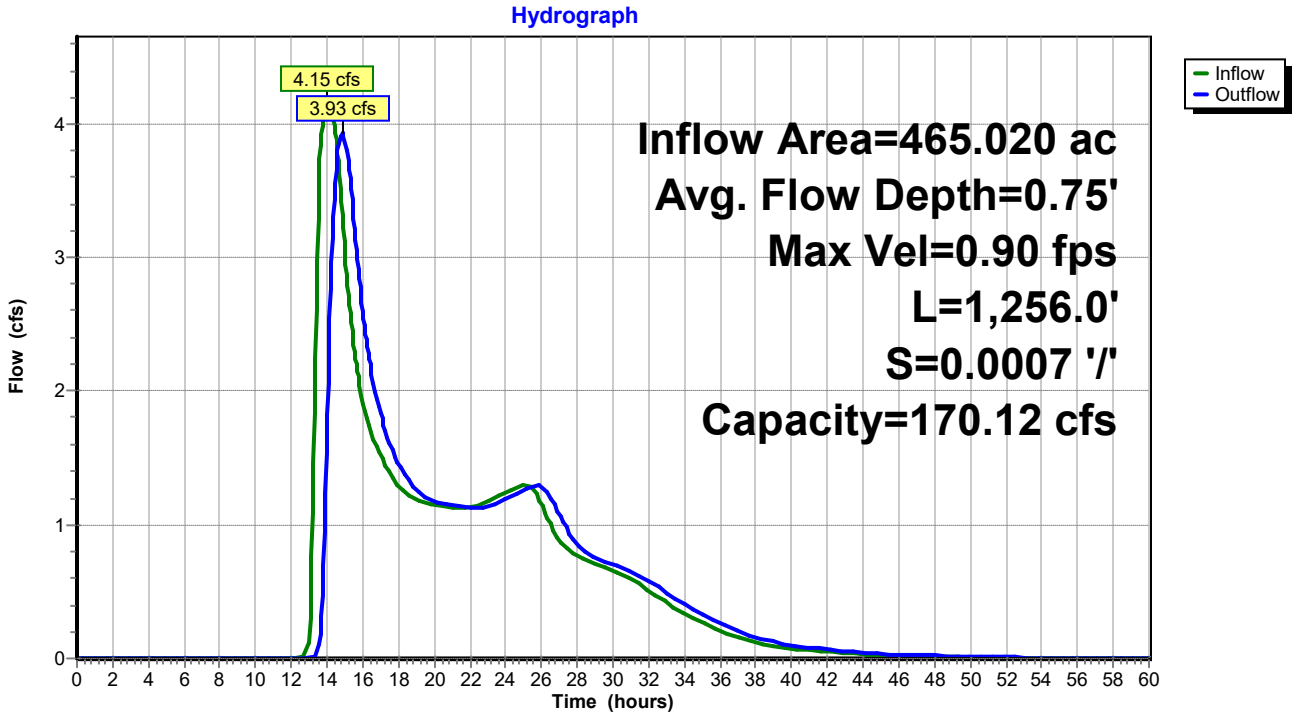
Custom cross-section, Length= 1,256.0' Slope= 0.0007 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 421.00', Outlet Invert= 420.11'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
30.00	425.00	0.00		
31.50	424.75	0.25	0.050	Earth, cobble bottom, clean sides
46.25	422.00	3.00	0.050	Earth, cobble bottom, clean sides
46.35	421.00	4.00	0.040	Earth, grassed & winding
47.35	421.00	4.00	0.035	Earth, grassed & winding
48.00	420.50	4.50	0.030	Earth, grassed & winding
50.00	420.50	4.50	0.030	Earth, grassed & winding
52.00	420.50	4.50	0.030	Earth, grassed & winding
53.00	421.00	4.00	0.035	Earth, dense weeds
54.00	421.00	4.00	0.035	Earth, grassed & winding
56.00	422.00	3.00	0.040	
71.35	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.0	0	0.00
0.50	2.4	7.9	3,042	1.78
1.50	11.1	11.2	13,957	15.68
4.25	77.6	40.5	97,407	148.42
4.50	87.5	43.3	109,955	170.12

Reach R-4: Reach 4: Sections 11.0-16.5



Summary for Pond 1P: 36" RCP Storm Drain

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 0.06" for 1-Yr event
Inflow = 3.93 cfs @ 14.84 hrs, Volume= 2.326 af
Outflow = 2.16 cfs @ 16.45 hrs, Volume= 2.325 af, Atten= 45%, Lag= 96.6 min
Primary = 2.16 cfs @ 16.45 hrs, Volume= 2.325 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 420.69' @ 16.45 hrs Surf.Area= 55,324 sf Storage= 16,085 cf
Flood Elev= 425.00' Surf.Area= 219,464 sf Storage= 650,922 cf

Plug-Flow detention time= 126.5 min calculated for 2.325 af (100% of inflow)
Center-of-Mass det. time= 126.0 min (1,455.6 - 1,329.5)

Volume	Invert	Avail.Storage	Storage Description
#1	420.11'	888,946 cf	**Canal (Prismatic)** Listed below (Recalc)

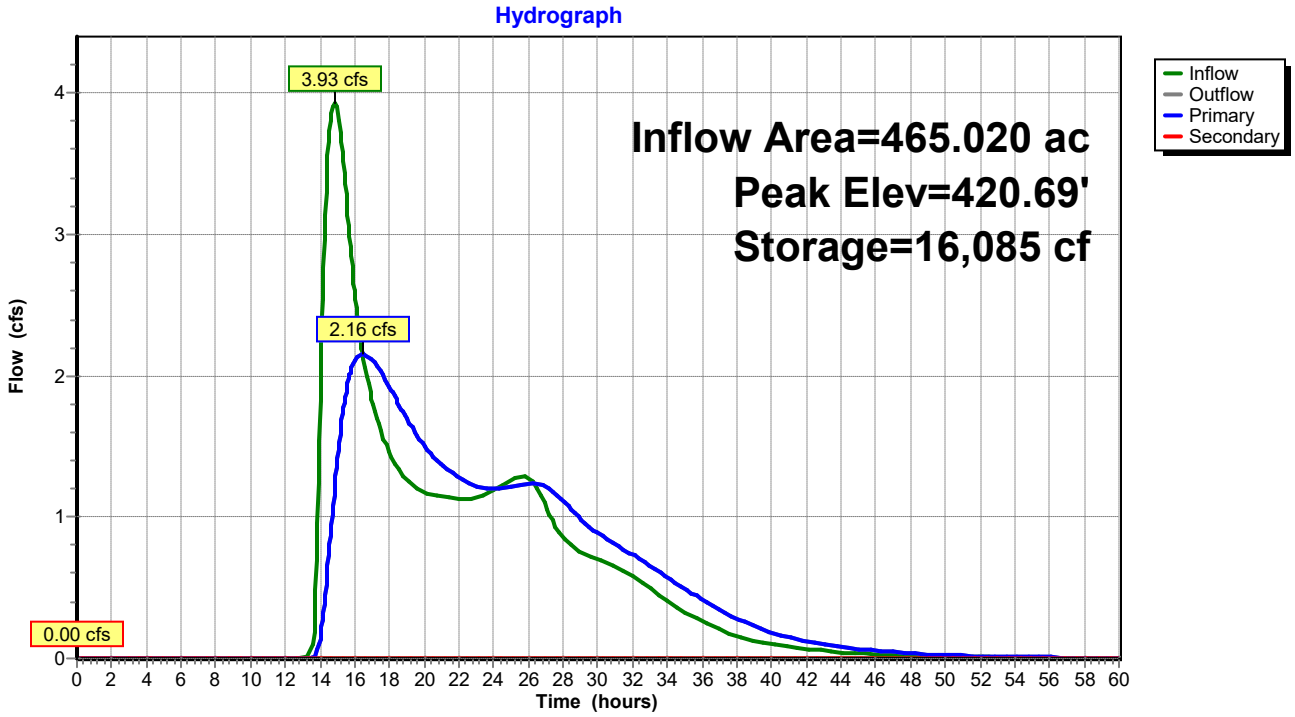
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.11	100	0	0
421.00	84,779	37,771	37,771
422.00	113,500	99,140	136,911
423.00	157,948	135,724	272,635
424.00	189,581	173,765	446,399
425.00	219,464	204,523	650,922
426.00	256,585	238,025	888,946

Device	Routing	Invert	Outlet Devices
#1	Primary	420.11'	**36.0" Round RCP_Round 36"** L= 155.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 420.11' / 419.37' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	425.40'	**260.0' long x 20.0' breadth Canal Overflow to Highway ROW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=2.15 cfs @ 16.45 hrs HW=420.69' (Free Discharge)
↑—**1=RCP_Round 36"** (Barrel Controls 2.15 cfs @ 3.40 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.11' (Free Discharge)
↑—**2=Canal Overflow to Highway ROW** (Controls 0.00 cfs)

Pond 1P: 36" RCP Storm Drain



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1a: Existing Runoff Area=26.630 ac 31.07% Impervious Runoff Depth=0.33"
Flow Length=1,872' Slope=0.0370 '/' Tc=39.4 min CN=67 Runoff=3.90 cfs 0.727 af

Subcatchment DA-1b: Existing Runoff Area=336.510 ac 10.94% Impervious Runoff Depth=0.07"
Flow Length=8,612' Slope=0.0050 '/' Tc=494.2 min CN=55 Runoff=1.82 cfs 1.968 af

Subcatchment DA-2: Existing Runoff Area=27.280 ac 51.72% Impervious Runoff Depth=0.65"
Flow Length=2,428' Slope=0.0226 '/' Tc=48.5 min CN=76 Runoff=9.64 cfs 1.483 af

Subcatchment DA-3: Existing Runoff Area=60.080 ac 24.93% Impervious Runoff Depth=0.08"
Flow Length=3,650' Slope=0.0160 '/' Tc=135.6 min CN=56 Runoff=0.55 cfs 0.423 af

Subcatchment DA-4: Existing Runoff Area=14.520 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=830' Slope=0.0470 '/' Tc=33.7 min CN=43 Runoff=0.00 cfs 0.000 af

Reach R-1: Reach 1: Sections 0.0-3.0 Avg. Flow Depth=0.53' Max Vel=0.71 fps Inflow=3.90 cfs 2.695 af
L=850.0' S=0.0012 '/' Capacity=1,965.69 cfs Outflow=2.97 cfs 2.695 af

Reach R-2: Reach 2: Sections 3.0-4.5 Avg. Flow Depth=1.09' Max Vel=1.16 fps Inflow=10.08 cfs 4.179 af
L=420.0' S=0.0010 '/' Capacity=358.88 cfs Outflow=9.99 cfs 4.179 af

Reach R-3: Reach 3: Sections 4.5-11.0 Avg. Flow Depth=0.62' Max Vel=0.80 fps Inflow=10.02 cfs 4.602 af
L=1,615.0' S=0.0013 '/' Capacity=1,686.70 cfs Outflow=7.40 cfs 4.602 af

Reach R-4: Reach 4: Sections 11.0-16.5 Avg. Flow Depth=0.99' Max Vel=1.08 fps Inflow=7.40 cfs 4.602 af
L=1,256.0' S=0.0007 '/' Capacity=170.12 cfs Outflow=6.93 cfs 4.602 af

Pond 1P: 36" RCP Storm Drain Peak Elev=420.86' Storage=26,861 cf Inflow=6.93 cfs 4.602 af
Primary=3.58 cfs 4.601 af Secondary=0.00 cfs 0.000 af Outflow=3.58 cfs 4.601 af

Total Runoff Area = 465.020 ac Runoff Volume = 4.602 af Average Runoff Depth = 0.12"
84.05% Pervious = 390.852 ac 15.95% Impervious = 74.168 ac

Summary for Subcatchment DA-1a: Existing Subcatchment Area 1A

Area sized to give full flow through pipe during 10 yr storm.

Flow source assumed to be residential drainage from neighborhoods to the west.

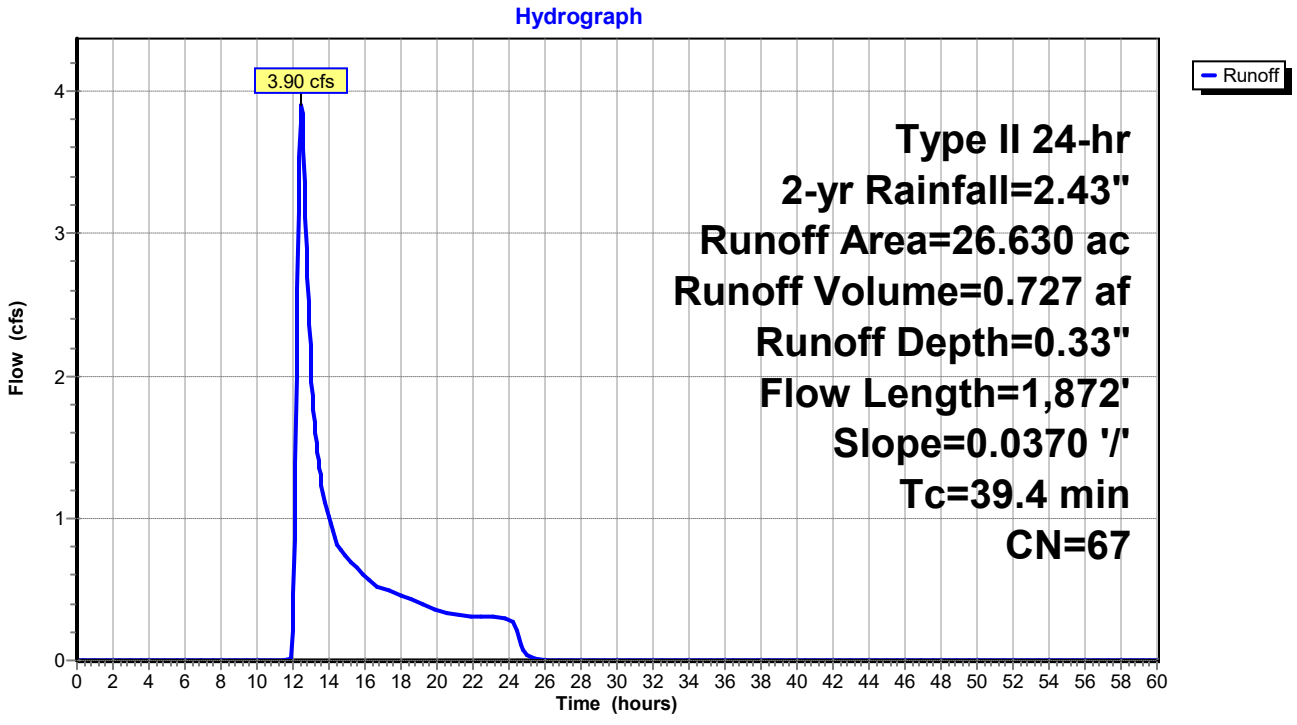
Runoff = 3.90 cfs @ 12.48 hrs, Volume= 0.727 af, Depth= 0.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=2.43"

	Area (ac)	CN	Description
*	14.320	50	>75% Grass cover, Good, HSG A/B
	11.490	88	Urban industrial, 72% imp, HSG B
*	0.820	73	Brush, Good, HSG D - Canal
	26.630	67	Weighted Average
	18.357		68.93% Pervious Area
	8.273		31.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.4	1,872	0.0370	0.79		**Lag/CN Method,**

Subcatchment DA-1a: Existing Subcatchment Area 1A



Summary for Subcatchment DA-1b: Existing Subcatchment Area 1B

See map A for total area of 188,420 sf.

Estimated 10% roof surface, 70% gravel surfaces, 20% near water as grass and forest.

Slope of flow: 438 to 435 surface elevation over 300 feet for gravel; 435 to 421 over 50 feet

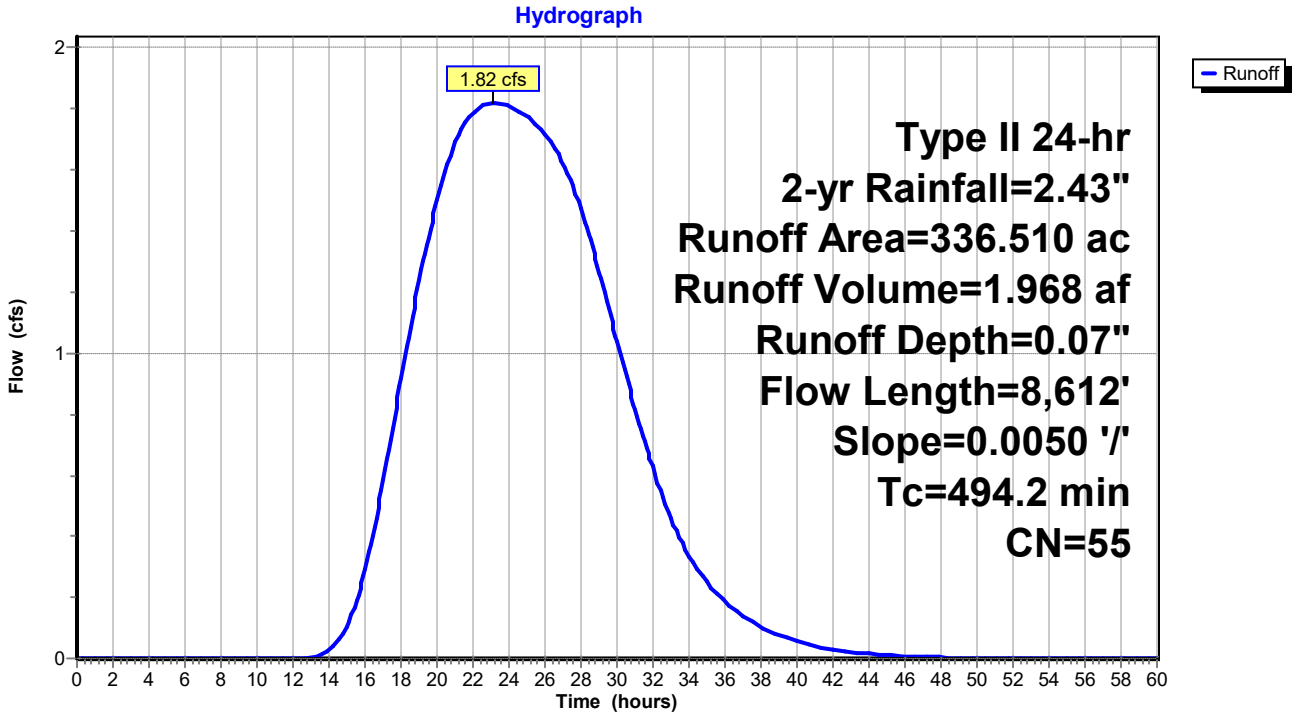
Runoff = 1.82 cfs @ 23.11 hrs, Volume= 1.968 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=2.43"

	Area (ac)	CN	Description
*	43.640	62	1/2 acre lots, 25% imp, HSG A/B
	18.600	88	Urban industrial, 72% imp, HSG B
*	91.150	55	Woods, Good, HSG A/B
*	78.050	40	Brush, Good, HSG A/B
*	104.220	56	2 acre lots, 12% imp, HSG B/A
*	0.850	73	Brush, Good, HSG D - Canal
	336.510	55	Weighted Average
	299.702		89.06% Pervious Area
	36.808		10.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
494.2	8,612	0.0050	0.29		**Lag/CN Method, Incude Est Attenuation**

Subcatchment DA-1b: Existing Subcatchment Area 1B



Summary for Subcatchment DA-2: Existing Subcatchment Area 2

Cover type: industrial type A soils based on Maps C, D and F.

Channel Tc:

Slope as 445 inlet to 420 outlet over 460 feet.

Perimiter as length (460)x2 + width (50)x2.

X-sec area estimated as rectangular with 5' depth and 25' wide.

Other Tc area: 16' elev over 430 feet. Unpaved based on aerial photography.

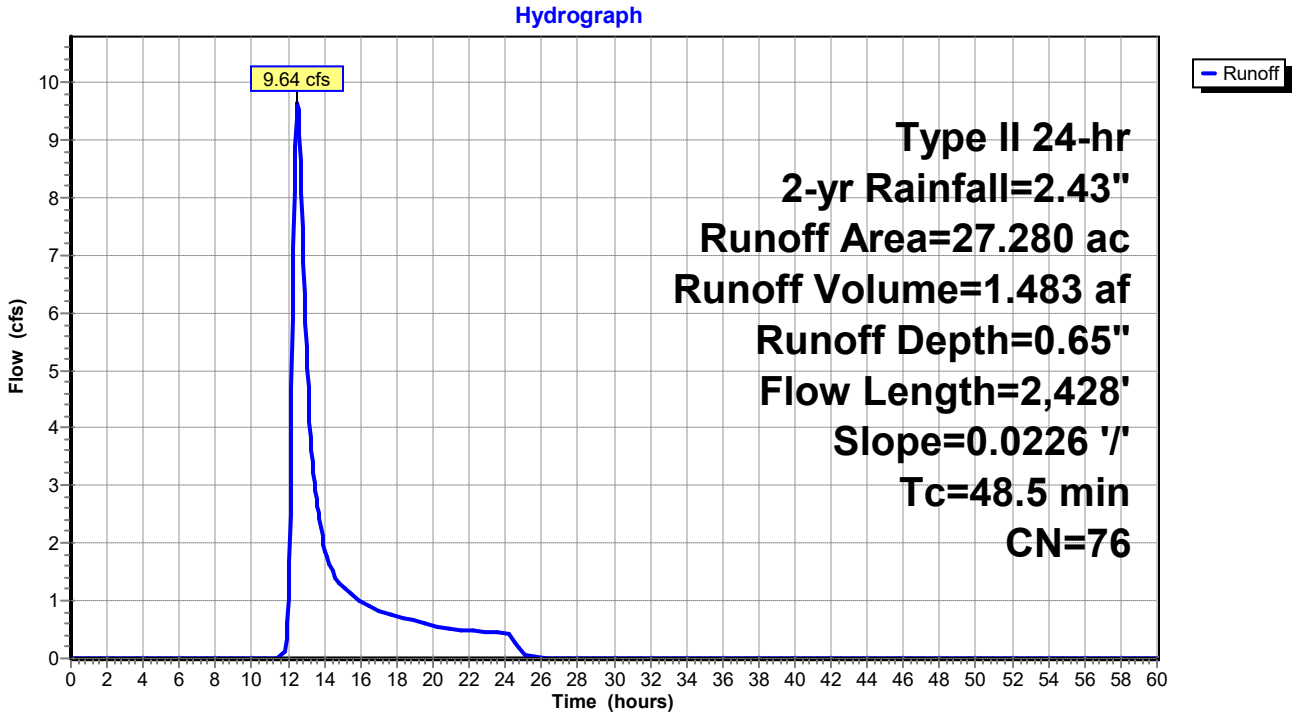
Runoff = 9.64 cfs @ 12.53 hrs, Volume= 1.483 af, Depth= 0.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=2.43"

	Area (ac)	CN	Description
*	16.600	92	Urban Ind/Com, 85% imp, HSG B
*	9.880	48	Brush, Good, HSG A/B
*	0.800	73	Brush, Good, HSG D - Canal
	27.280	76	Weighted Average
	13.170		48.28% Pervious Area
	14.110		51.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
48.5	2,428	0.0226	0.83		**Lag/CN Method,**

Subcatchment DA-2: Existing Subcatchment Area 2



Summary for Subcatchment DA-3: Existing Subcatchment Area 3

Cover type: 20% industrial class A, 30% wood class B, 30% range class B, 20% grass class B for large area south of Bleecker. 55% grass 45% wood class B for area west of channel and north of Bleecker.

Channel Tc:

Slope as 452 inlet to 419 outlet over 565 feet.

Perimiter as length 565'x2 + width (12')x2.

X-sec area estimated as rectangular with 5' depth and 12' wide.

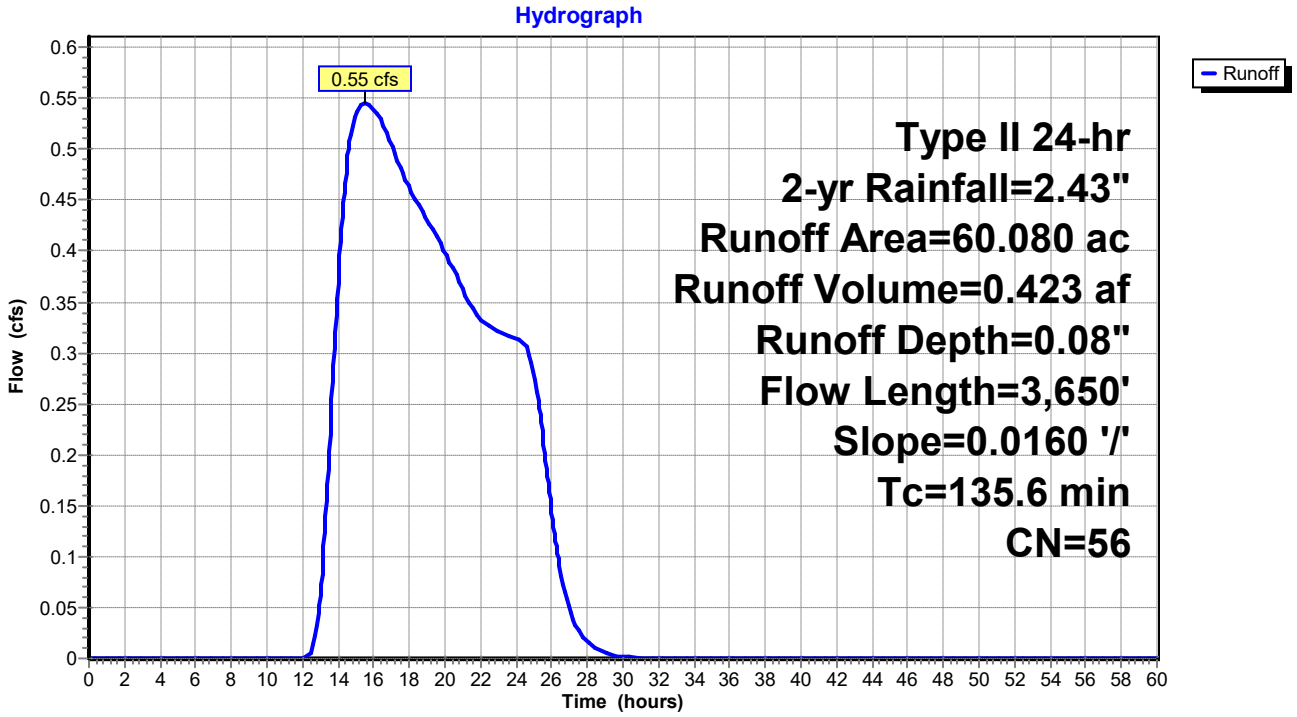
Runoff = 0.55 cfs @ 15.51 hrs, Volume= 0.423 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=2.43"

	Area (ac)	CN	Description
	17.620	92	Urban commercial, 85% imp, HSG B
*	6.830	43	Woods, Good, HSG A/B
*	34.150	39	Brush, Good, HSG A/B
*	1.480	73	Brush, Good, HSG D - Canal
	60.080	56	Weighted Average
	45.103		75.07% Pervious Area
	14.977		24.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
135.6	3,650	0.0160	0.45		**Lag/CN Method,**

Subcatchment DA-3: Existing Subcatchment Area 3



Summary for Subcatchment DA-4: Existing Subcatchment Area 4

See Map A for area of subcatchment and farthest run for Tc. Slope calculated as 725 foot run from 460 to 418 elevation.

CN for area average of A and B soil groups for grass/woodland.

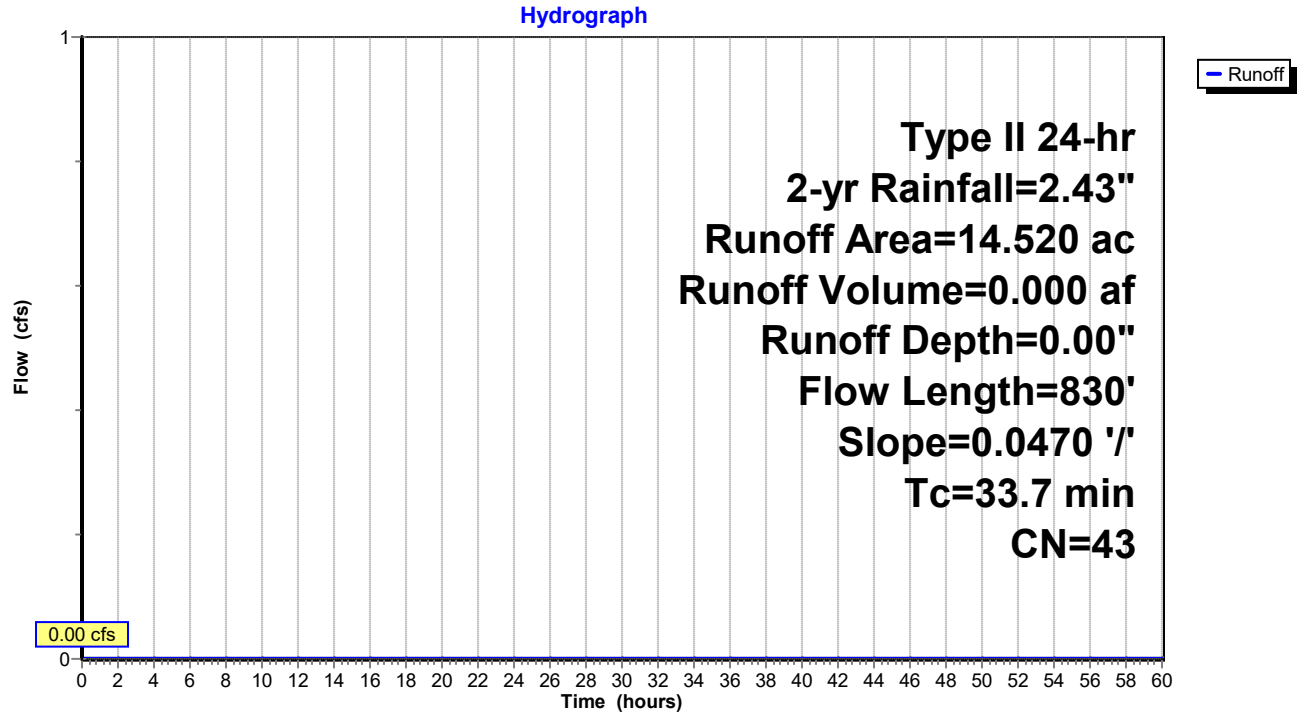
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-yr Rainfall=2.43"

	Area (ac)	CN	Description
*	12.880	39	Brush, Good, HSG A/B
*	1.640	73	Brush, Good, HSG D - Canal
	14.520	43	Weighted Average
	14.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.7	830	0.0470	0.41		**Lag/CN Method,**

Subcatchment DA-4: Existing Subcatchment Area 4



Summary for Reach R-1: Reach 1: Sections 0.0-3.0

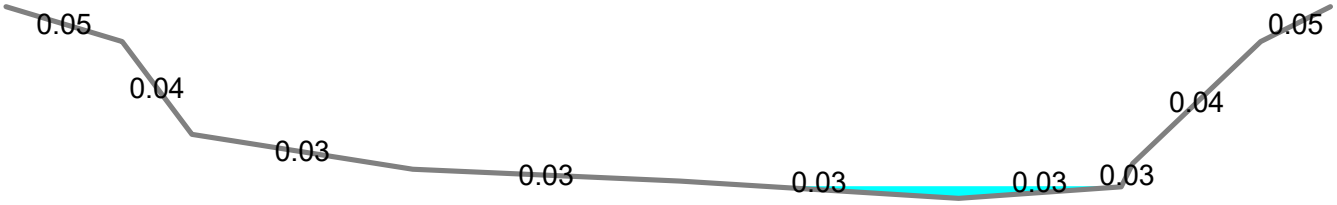
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 363.140 ac, 12.41% Impervious, Inflow Depth = 0.09" for 2-yr event
Inflow = 3.90 cfs @ 12.48 hrs, Volume= 2.695 af
Outflow = 2.97 cfs @ 13.07 hrs, Volume= 2.695 af, Atten= 24%, Lag= 35.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.71 fps, Min. Travel Time= 19.9 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 34.3 min

Peak Storage= 3,545 cf @ 12.73 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 8.25' Flow Area= 336.1 sf, Capacity= 1,965.69 cfs

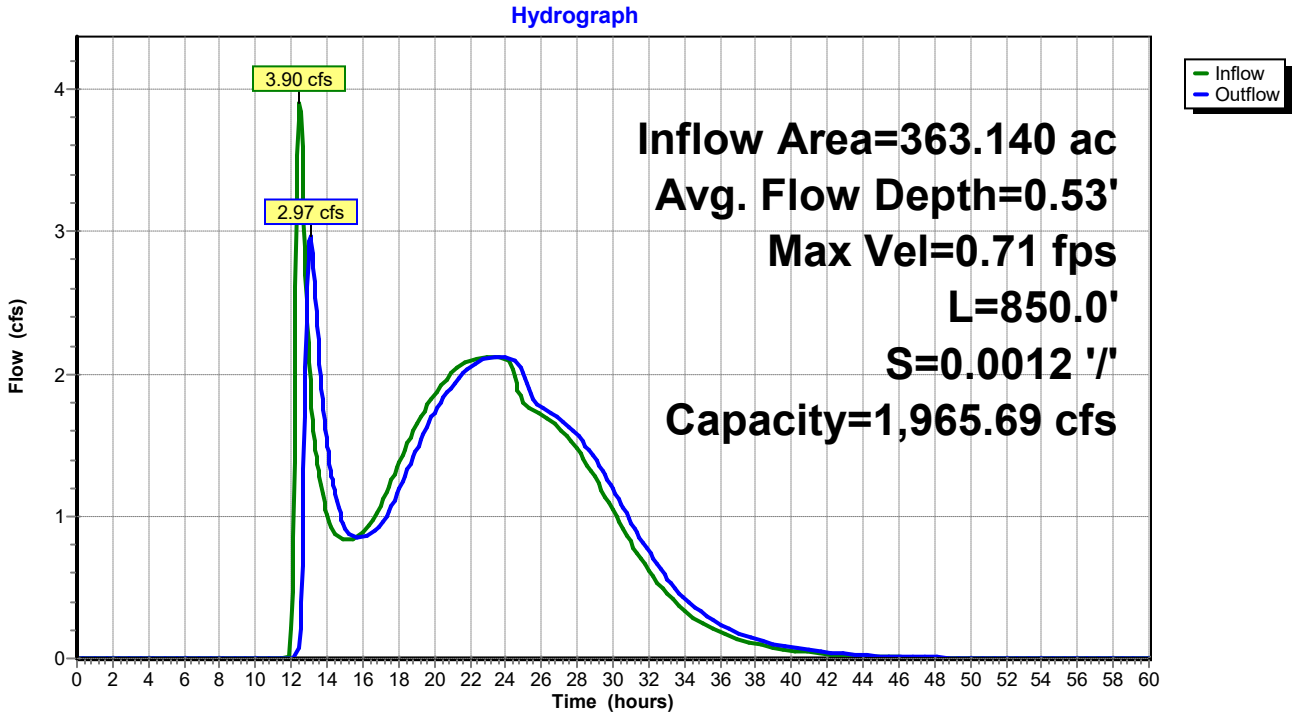
Custom cross-section, Length= 850.0' Slope= 0.0012 '/' (105 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 424.00', Outlet Invert= 423.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
21.00	425.00	0.00		
26.00	423.50	1.50	0.050	Earth, cobble bottom, clean sides
29.00	419.50	5.50	0.040	Earth, dense weeds
38.50	418.00	7.00	0.030	Earth, grassed & winding
50.00	417.50	7.50	0.030	Earth, grassed & winding
62.00	416.75	8.25	0.030	Earth, grassed & winding
69.00	417.25	7.75	0.030	Earth, grassed & winding
69.50	418.25	6.75	0.030	
75.00	423.50	1.50	0.040	
78.00	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.50	3.8	15.0	3,190	2.54
0.75	8.0	19.3	6,813	7.58
1.25	20.5	31.4	17,438	26.25
1.50	28.4	33.3	24,181	43.54
2.75	74.9	43.1	63,702	186.64
6.75	256.6	53.9	218,078	1,319.79
8.25	336.1	62.5	285,653	1,965.69

Reach R-1: Reach 1: Sections 0.0-3.0



Summary for Reach R-2: Reach 2: Sections 3.0-4.5

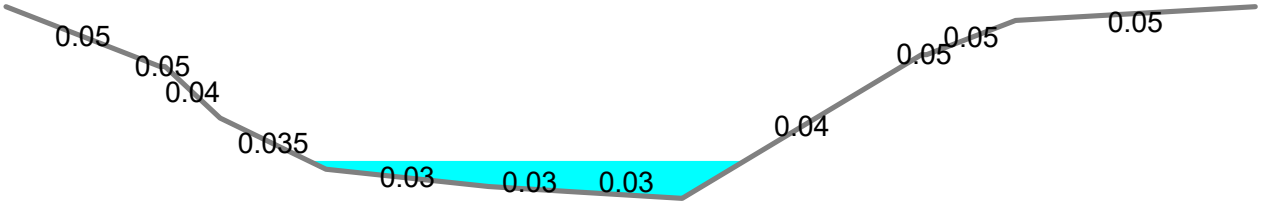
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 390.420 ac, 15.16% Impervious, Inflow Depth = 0.13" for 2-yr event
Inflow = 10.08 cfs @ 12.61 hrs, Volume= 4.179 af
Outflow = 9.99 cfs @ 12.79 hrs, Volume= 4.179 af, Atten= 1%, Lag= 10.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.16 fps, Min. Travel Time= 6.0 min
Avg. Velocity = 0.45 fps, Avg. Travel Time= 15.7 min

Peak Storage= 3,610 cf @ 12.69 hrs
Average Depth at Peak Storage= 1.09'
Bank-Full Depth= 5.60' Flow Area= 103.5 sf, Capacity= 358.88 cfs

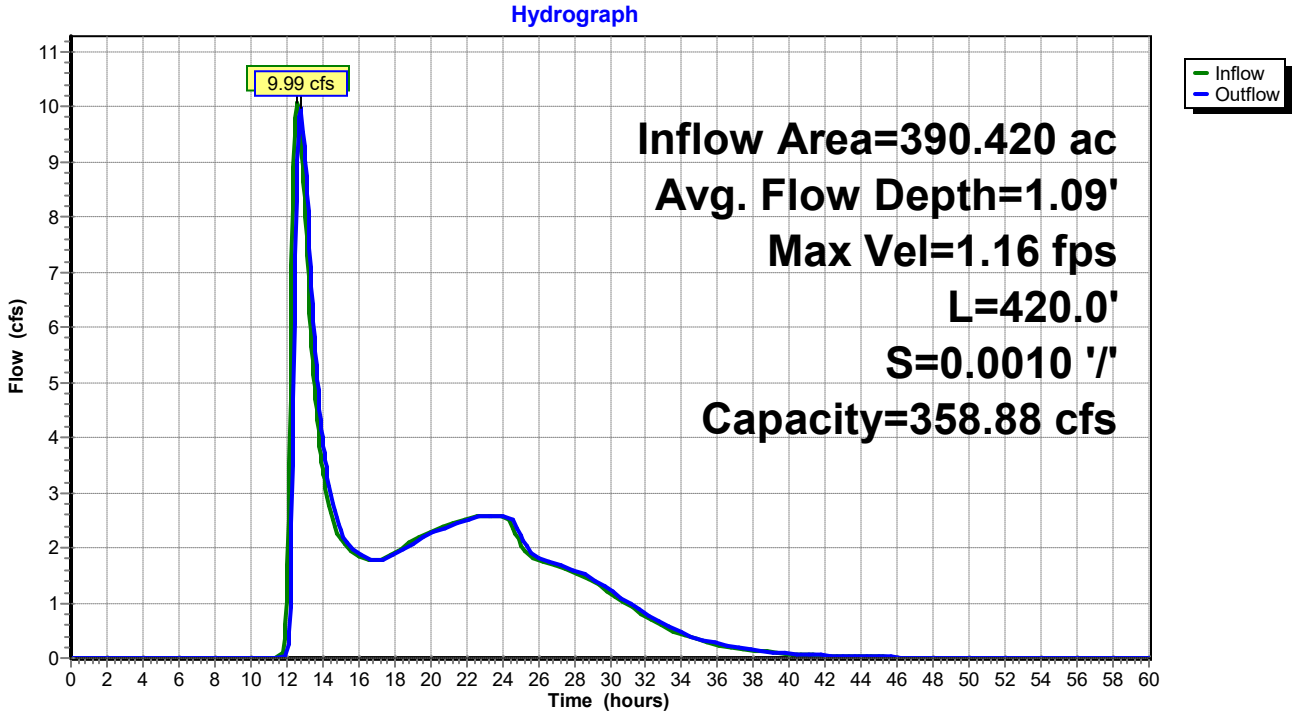
Custom cross-section, Length= 420.0' Slope= 0.0010 '/' (105 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.40', Outlet Invert= 423.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
33.50	425.00	0.00		
38.00	423.25	1.75	0.050	Earth, cobble bottom, clean sides
38.15	423.25	1.75	0.050	Earth, cobble bottom, clean sides
39.75	421.75	3.25	0.040	
42.85	420.25	4.75	0.035	
47.60	419.75	5.25	0.030	Earth, grassed & winding
50.00	419.60	5.40	0.030	Earth, grassed & winding
53.25	419.40	5.60	0.030	Earth, grassed & winding
60.25	423.60	1.40	0.040	
60.40	423.60	1.40	0.050	Earth, cobble bottom, clean sides
63.00	424.60	0.40	0.050	
70.00	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.20	0.4	3.6	151	0.11
0.35	1.1	6.3	460	0.51
0.85	5.6	12.1	2,355	5.04
2.35	27.5	18.4	11,564	57.22
3.85	56.7	23.7	23,827	162.15
4.20	64.6	25.5	27,122	194.15
5.20	90.5	31.0	37,994	306.46
5.60	103.5	39.2	43,451	358.88

Reach R-2: Reach 2: Sections 3.0-4.5



Summary for Reach R-3: Reach 3: Sections 4.5-11.0

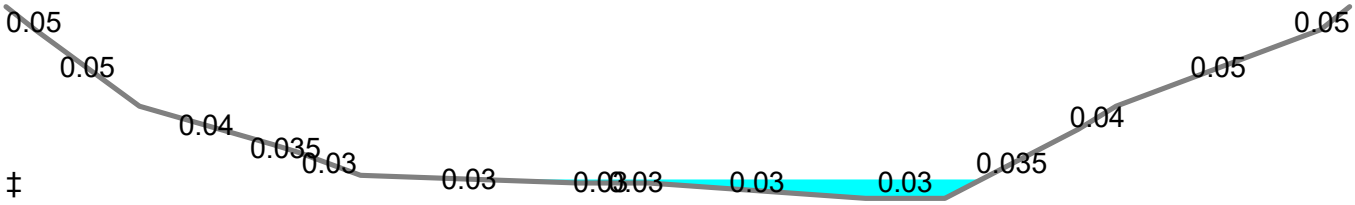
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 450.500 ac, 16.46% Impervious, Inflow Depth = 0.12" for 2-yr event
Inflow = 10.02 cfs @ 12.79 hrs, Volume= 4.602 af
Outflow = 7.40 cfs @ 13.89 hrs, Volume= 4.602 af, Atten= 26%, Lag= 65.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.80 fps, Min. Travel Time= 33.6 min
Avg. Velocity = 0.45 fps, Avg. Travel Time= 60.2 min

Peak Storage= 14,940 cf @ 13.33 hrs
Average Depth at Peak Storage= 0.62'
Bank-Full Depth= 6.25' Flow Area= 349.9 sf, Capacity= 1,686.70 cfs

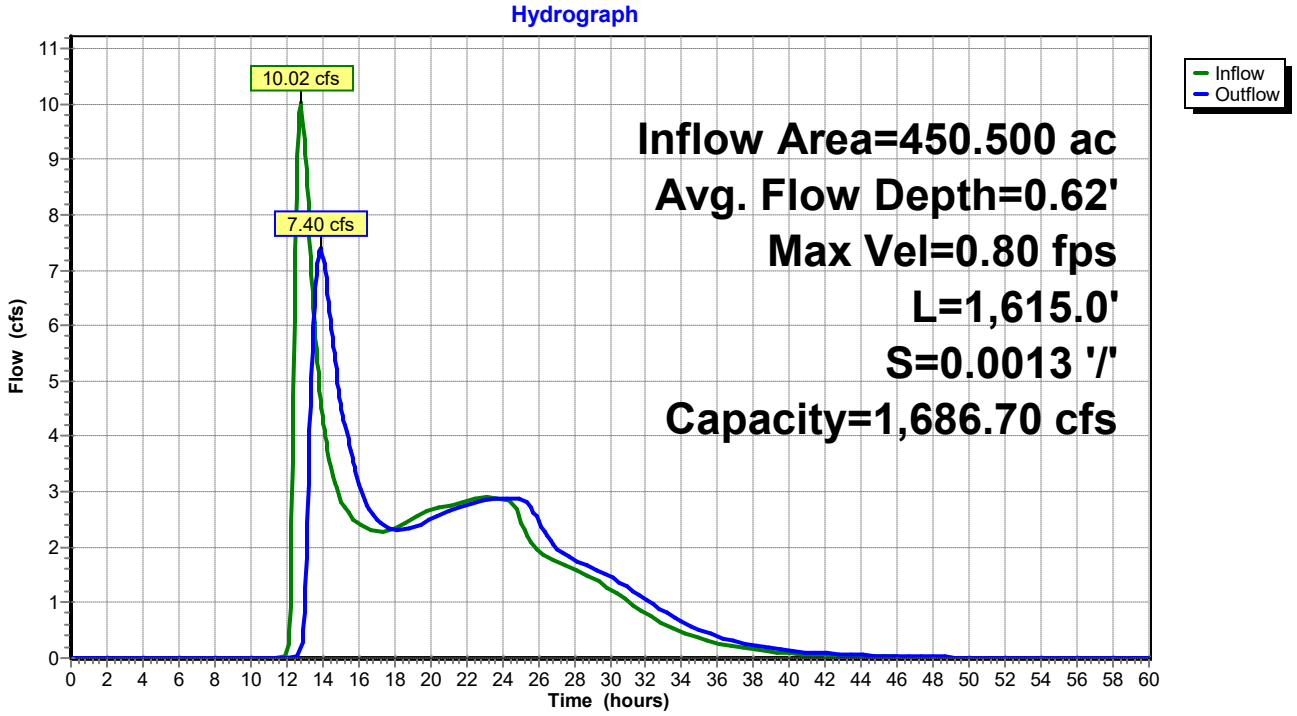
Custom cross-section, Length= 1,615.0' Slope= 0.0013 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.10', Outlet Invert= 421.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
13.00	425.00	0.00		
14.75	424.25	0.75	0.050	Earth, cobble bottom, clean sides
21.00	421.75	3.25	0.050	Earth, cobble bottom, clean sides
29.00	420.50	4.50	0.040	Earth, grassed & winding
30.50	420.25	4.75	0.035	Earth, dense weeds
34.25	419.50	5.50	0.030	Earth, grassed & winding
47.25	419.25	5.75	0.030	Earth, grassed & winding
50.00	419.25	5.75	0.030	Earth, grassed & winding
51.50	419.25	5.75	0.030	Earth, grassed & winding
64.50	418.75	6.25	0.030	Earth, grassed & winding
69.25	418.75	6.25	0.030	Earth, grassed & winding
77.25	421.00	4.00	0.035	
79.50	421.75	3.25	0.040	
91.75	424.25	0.75	0.050	Earth, cobble bottom, clean sides
93.50	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.8	0	0.00
0.50	6.1	23.9	9,802	4.31
0.75	13.8	37.8	22,206	12.39
1.50	44.4	44.4	71,716	79.03
1.75	55.7	46.8	89,997	113.53
2.25	80.2	51.9	129,533	198.84
3.00	121.4	59.1	196,122	370.72
5.50	290.8	78.4	469,662	1,302.31
6.25	349.9	82.2	565,048	1,686.70

Reach R-3: Reach 3: Sections 4.5-11.0



Summary for Reach R-4: Reach 4: Sections 11.0-16.5

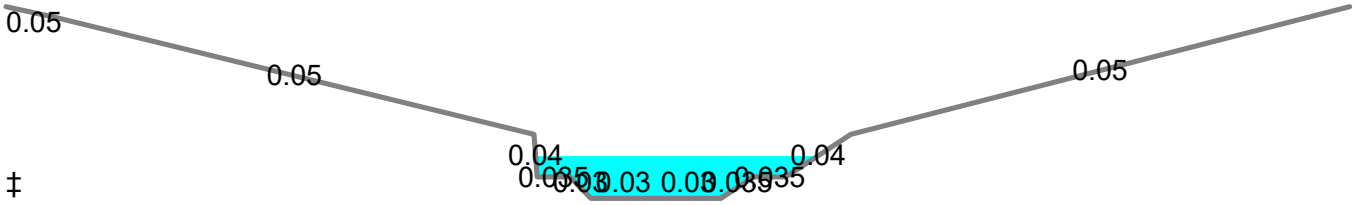
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth = 0.12" for 2-yr event
Inflow = 7.40 cfs @ 13.89 hrs, Volume= 4.602 af
Outflow = 6.93 cfs @ 14.50 hrs, Volume= 4.602 af, Atten= 6%, Lag= 36.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.08 fps, Min. Travel Time= 19.3 min
Avg. Velocity = 0.48 fps, Avg. Travel Time= 43.8 min

Peak Storage= 8,048 cf @ 14.18 hrs
Average Depth at Peak Storage= 0.99'
Bank-Full Depth= 4.50' Flow Area= 87.5 sf, Capacity= 170.12 cfs

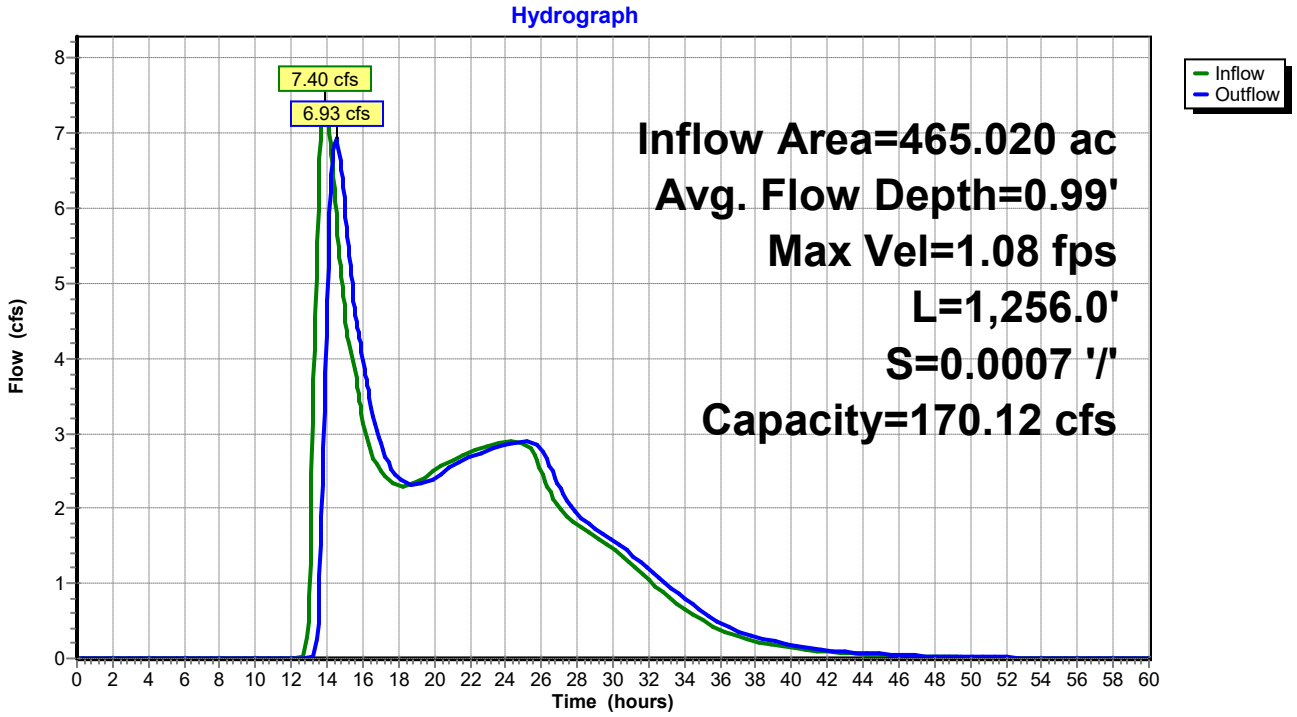
Custom cross-section, Length= 1,256.0' Slope= 0.0007 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 421.00', Outlet Invert= 420.11'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
30.00	425.00	0.00		
31.50	424.75	0.25	0.050	Earth, cobble bottom, clean sides
46.25	422.00	3.00	0.050	Earth, cobble bottom, clean sides
46.35	421.00	4.00	0.040	Earth, grassed & winding
47.35	421.00	4.00	0.035	Earth, grassed & winding
48.00	420.50	4.50	0.030	Earth, grassed & winding
50.00	420.50	4.50	0.030	Earth, grassed & winding
52.00	420.50	4.50	0.030	Earth, grassed & winding
53.00	421.00	4.00	0.035	Earth, dense weeds
54.00	421.00	4.00	0.035	Earth, grassed & winding
56.00	422.00	3.00	0.040	
71.35	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.0	0	0.00
0.50	2.4	7.9	3,042	1.78
1.50	11.1	11.2	13,957	15.68
4.25	77.6	40.5	97,407	148.42
4.50	87.5	43.3	109,955	170.12

Reach R-4: Reach 4: Sections 11.0-16.5



Summary for Pond 1P: 36" RCP Storm Drain

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth > 0.12" for 2-yr event
Inflow = 6.93 cfs @ 14.50 hrs, Volume= 4.602 af
Outflow = 3.58 cfs @ 16.30 hrs, Volume= 4.601 af, Atten= 48%, Lag= 107.8 min
Primary = 3.58 cfs @ 16.30 hrs, Volume= 4.601 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 420.86' @ 16.30 hrs Surf.Area= 71,494 sf Storage= 26,861 cf
Flood Elev= 425.00' Surf.Area= 219,464 sf Storage= 650,922 cf

Plug-Flow detention time= 125.3 min calculated for 4.597 af (100% of inflow)
Center-of-Mass det. time= 125.0 min (1,476.7 - 1,351.7)

Volume	Invert	Avail.Storage	Storage Description
#1	420.11'	888,946 cf	**Canal (Prismatic)** Listed below (Recalc)

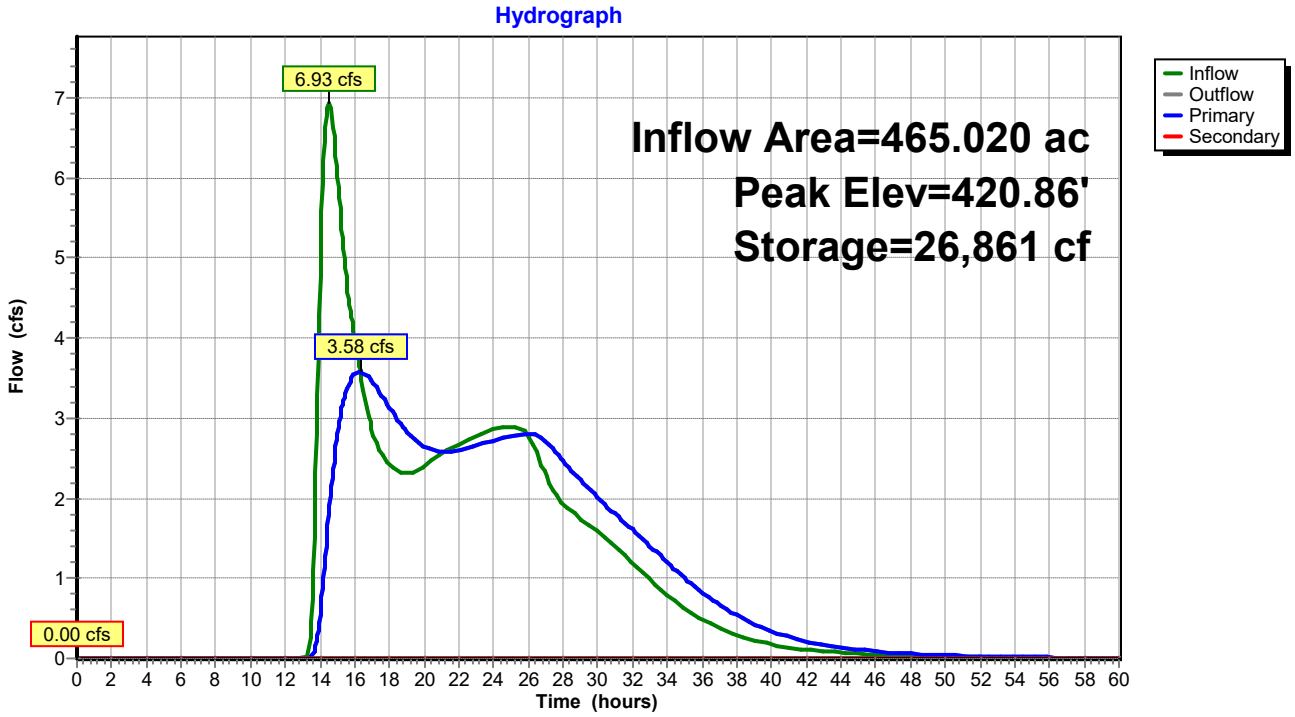
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.11	100	0	0
421.00	84,779	37,771	37,771
422.00	113,500	99,140	136,911
423.00	157,948	135,724	272,635
424.00	189,581	173,765	446,399
425.00	219,464	204,523	650,922
426.00	256,585	238,025	888,946

Device	Routing	Invert	Outlet Devices
#1	Primary	420.11'	**36.0" Round RCP_Round 36"** L= 155.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 420.11' / 419.37' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	425.40'	**260.0' long x 20.0' breadth Canal Overflow to Highway ROW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=3.58 cfs @ 16.30 hrs HW=420.86' (Free Discharge)
↑—**1=RCP_Round 36"** (Barrel Controls 3.58 cfs @ 3.90 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.11' (Free Discharge)
↑—**2=Canal Overflow to Highway ROW** (Controls 0.00 cfs)

Pond 1P: 36" RCP Storm Drain



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1a: Existing Runoff Area=26.630 ac 31.07% Impervious Runoff Depth=0.82"
Flow Length=1,872' Slope=0.0370 '/' Tc=39.4 min CN=67 Runoff=13.20 cfs 1.824 af

Subcatchment DA-1b: Existing Runoff Area=336.510 ac 10.94% Impervious Runoff Depth=0.33"
Flow Length=8,612' Slope=0.0050 '/' Tc=494.2 min CN=55 Runoff=9.11 cfs 9.228 af

Subcatchment DA-2: Existing Runoff Area=27.280 ac 51.72% Impervious Runoff Depth=1.33"
Flow Length=2,428' Slope=0.0226 '/' Tc=48.5 min CN=76 Runoff=21.54 cfs 3.022 af

Subcatchment DA-3: Existing Runoff Area=60.080 ac 24.93% Impervious Runoff Depth=0.36"
Flow Length=3,650' Slope=0.0160 '/' Tc=135.6 min CN=56 Runoff=3.85 cfs 1.815 af

Subcatchment DA-4: Existing Runoff Area=14.520 ac 0.00% Impervious Runoff Depth=0.05"
Flow Length=830' Slope=0.0470 '/' Tc=33.7 min CN=43 Runoff=0.07 cfs 0.055 af

Reach R-1: Reach 1: Sections 0.0-3.0 Avg. Flow Depth=0.88' Max Vel=1.04 fps Inflow=13.25 cfs 11.053 af
L=850.0' S=0.0012 '/' Capacity=1,965.69 cfs Outflow=11.08 cfs 11.053 af

Reach R-2: Reach 2: Sections 3.0-4.5 Avg. Flow Depth=1.71' Max Vel=1.67 fps Inflow=28.90 cfs 14.074 af
L=420.0' S=0.0010 '/' Capacity=358.88 cfs Outflow=28.60 cfs 14.074 af

Reach R-3: Reach 3: Sections 4.5-11.0 Avg. Flow Depth=0.94' Max Vel=1.16 fps Inflow=29.63 cfs 15.889 af
L=1,615.0' S=0.0013 '/' Capacity=1,686.70 cfs Outflow=24.42 cfs 15.889 af

Reach R-4: Reach 4: Sections Avg. Flow Depth=1.81' Max Vel=1.55 fps Inflow=24.43 cfs 15.944 af
L=1,256.0' S=0.0007 '/' Capacity=170.12 cfs Outflow=22.80 cfs 15.944 af

Pond 1P: 36" RCP Storm Drain Peak Elev=421.50' Storage=83,499 cf Inflow=22.80 cfs 15.944 af
Primary=11.39 cfs 15.942 af Secondary=0.00 cfs 0.000 af Outflow=11.39 cfs 15.942 af

Total Runoff Area = 465.020 ac Runoff Volume = 15.944 af Average Runoff Depth = 0.41"
84.05% Pervious = 390.852 ac 15.95% Impervious = 74.168 ac

Summary for Subcatchment DA-1a: Existing Subcatchment Area 1A

Area sized to give full flow through pipe during 10 yr storm.

Flow source assumed to be residential drainage from neighborhoods to the west.

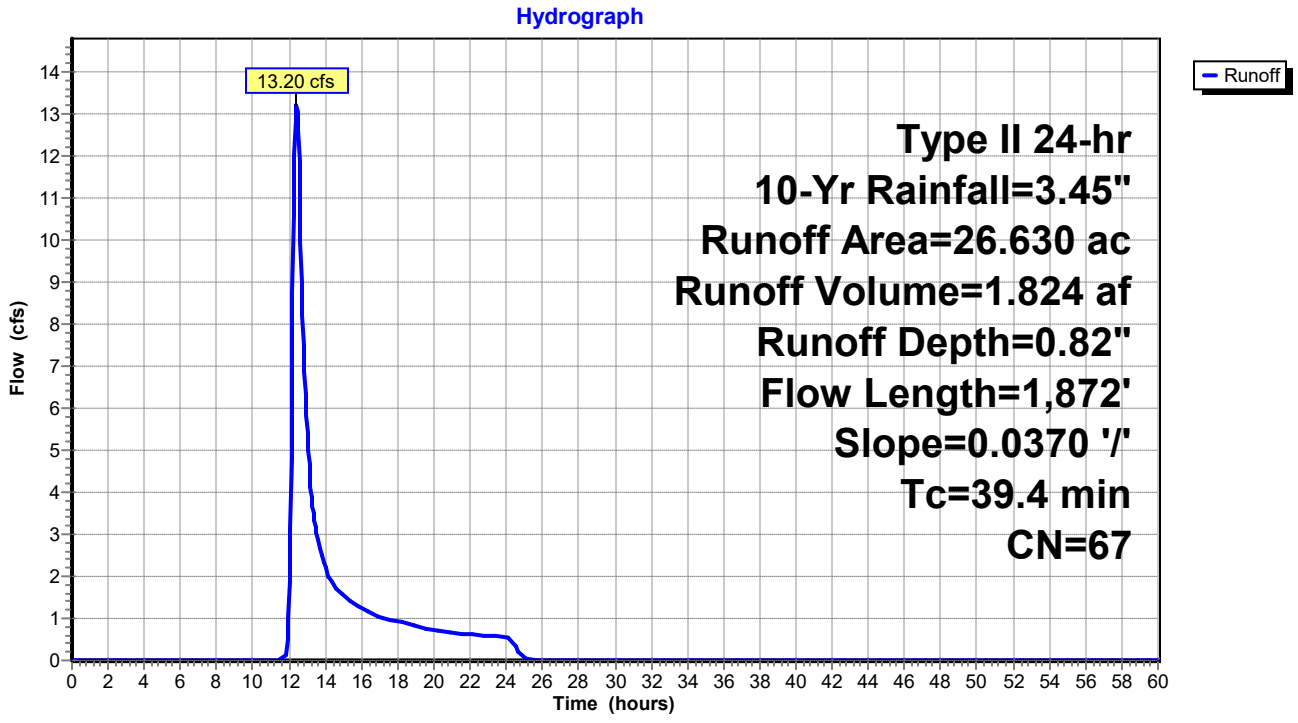
Runoff = 13.20 cfs @ 12.41 hrs, Volume= 1.824 af, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Yr Rainfall=3.45"

	Area (ac)	CN	Description
*	14.320	50	>75% Grass cover, Good, HSG A/B
	11.490	88	Urban industrial, 72% imp, HSG B
*	0.820	73	Brush, Good, HSG D - Canal
	26.630	67	Weighted Average
	18.357		68.93% Pervious Area
	8.273		31.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.4	1,872	0.0370	0.79		**Lag/CN Method,**

Subcatchment DA-1a: Existing Subcatchment Area 1A



Summary for Subcatchment DA-1b: Existing Subcatchment Area 1B

See map A for total area of 188,420 sf.

Estimated 10% roof surface, 70% gravel surfaces, 20% near water as grass and forest.

Slope of flow: 438 to 435 surface elevation over 300 feet for gravel; 435 to 421 over 50 feet

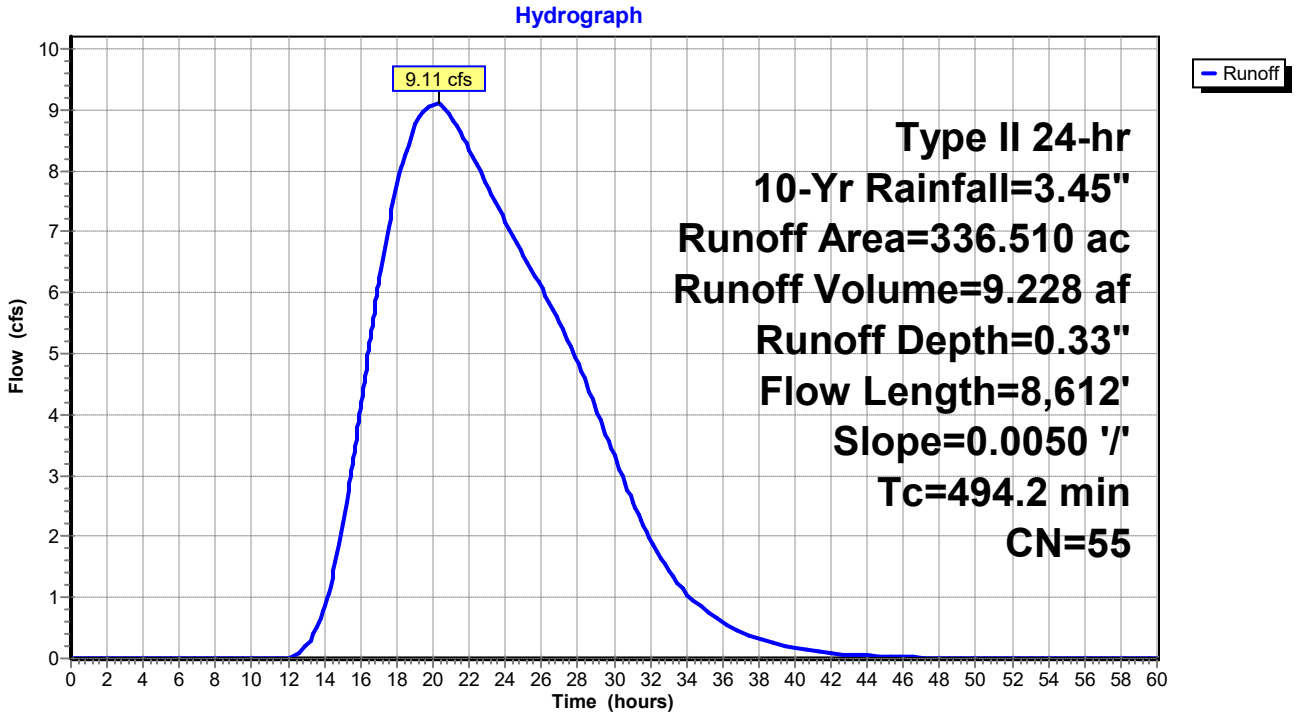
Runoff = 9.11 cfs @ 20.29 hrs, Volume= 9.228 af, Depth= 0.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Yr Rainfall=3.45"

	Area (ac)	CN	Description
*	43.640	62	1/2 acre lots, 25% imp, HSG A/B
	18.600	88	Urban industrial, 72% imp, HSG B
*	91.150	55	Woods, Good, HSG A/B
*	78.050	40	Brush, Good, HSG A/B
*	104.220	56	2 acre lots, 12% imp, HSG B/A
*	0.850	73	Brush, Good, HSG D - Canal
	336.510	55	Weighted Average
	299.702		89.06% Pervious Area
	36.808		10.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
494.2	8,612	0.0050	0.29		**Lag/CN Method, Incude Est Attenuation**

Subcatchment DA-1b: Existing Subcatchment Area 1B



Summary for Subcatchment DA-2: Existing Subcatchment Area 2

Cover type: industrial type A soils based on Maps C, D and F.

Channel Tc:

Slope as 445 inlet to 420 outlet over 460 feet.

Perimiter as length (460)x2 + width (50)x2.

X-sec area estimated as rectangular with 5' depth and 25' wide.

Other Tc area: 16' elev over 430 feet. Unpaved based on aerial photography.

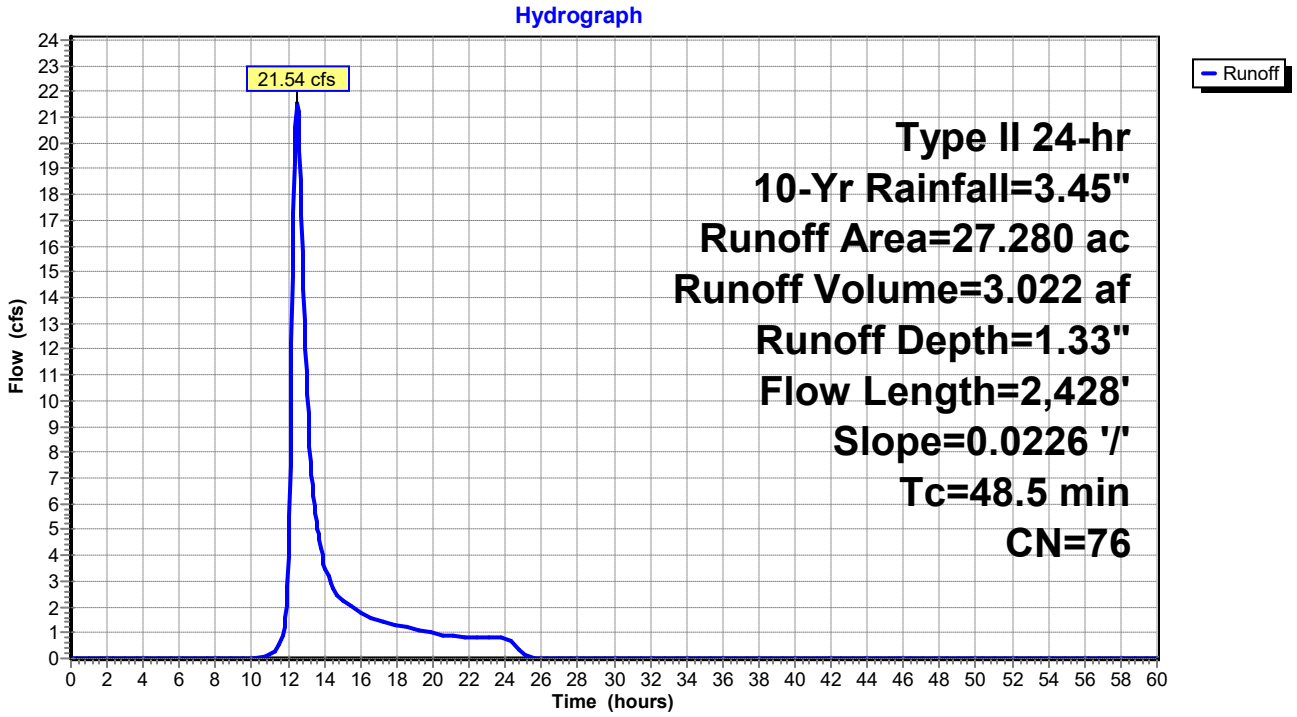
Runoff = 21.54 cfs @ 12.50 hrs, Volume= 3.022 af, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Yr Rainfall=3.45"

	Area (ac)	CN	Description
*	16.600	92	Urban Ind/Com, 85% imp, HSG B
*	9.880	48	Brush, Good, HSG A/B
*	0.800	73	Brush, Good, HSG D - Canal
	27.280	76	Weighted Average
	13.170		48.28% Pervious Area
	14.110		51.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
48.5	2,428	0.0226	0.83		**Lag/CN Method,**

Subcatchment DA-2: Existing Subcatchment Area 2



Summary for Subcatchment DA-3: Existing Subcatchment Area 3

Cover type: 20% industrial class A, 30% wood class B, 30% range class B, 20% grass class B for large area south of Bleecker. 55% grass 45% wood class B for area west of channel and north of Bleecker.

Channel Tc:

Slope as 452 inlet to 419 outlet over 565 feet.

Perimiter as length 565'x2 + width (12')x2.

X-sec area estimated as rectangular with 5' depth and 12' wide.

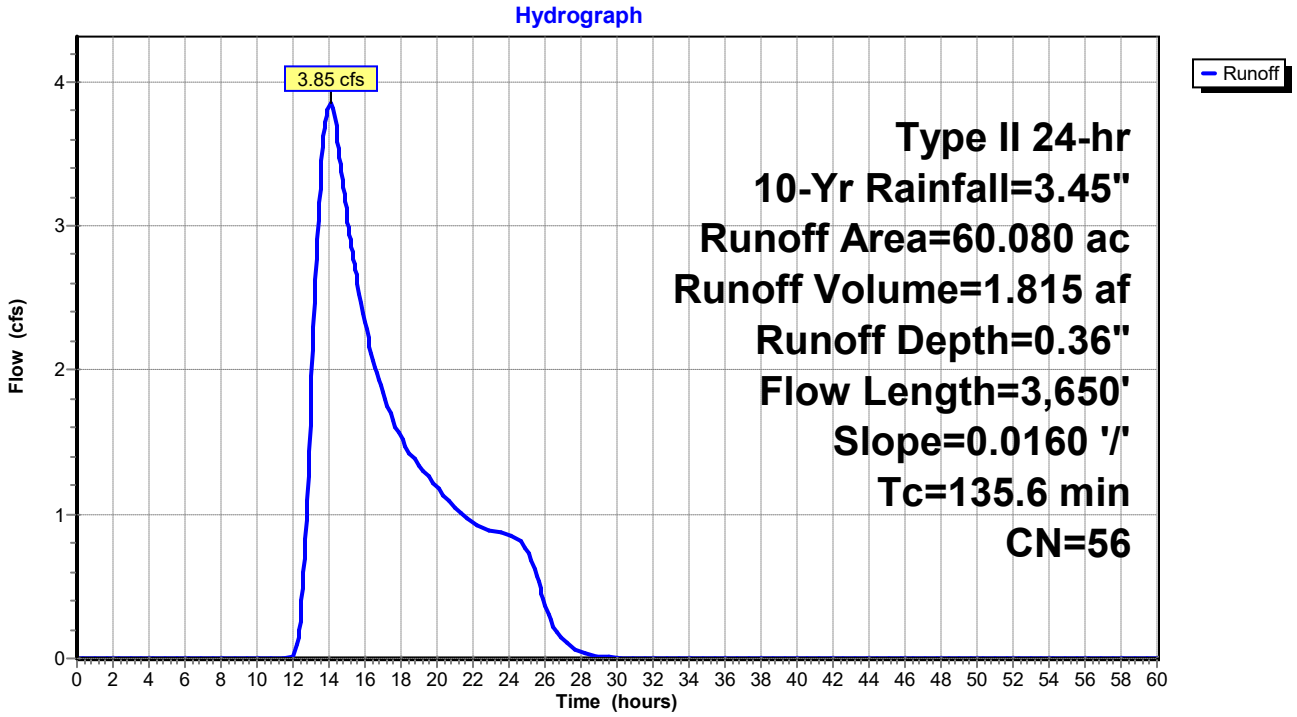
Runoff = 3.85 cfs @ 14.07 hrs, Volume= 1.815 af, Depth= 0.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Yr Rainfall=3.45"

	Area (ac)	CN	Description
	17.620	92	Urban commercial, 85% imp, HSG B
*	6.830	43	Woods, Good, HSG A/B
*	34.150	39	Brush, Good, HSG A/B
*	1.480	73	Brush, Good, HSG D - Canal
	60.080	56	Weighted Average
	45.103		75.07% Pervious Area
	14.977		24.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
135.6	3,650	0.0160	0.45		**Lag/CN Method,**

Subcatchment DA-3: Existing Subcatchment Area 3



Summary for Subcatchment DA-4: Existing Subcatchment Area 4

See Map A for area of subcatchment and farthest run for Tc. Slope calculated as 725 foot run from 460 to 418 elevation.

CN for area average of A and B soil groups for grass/woodland.

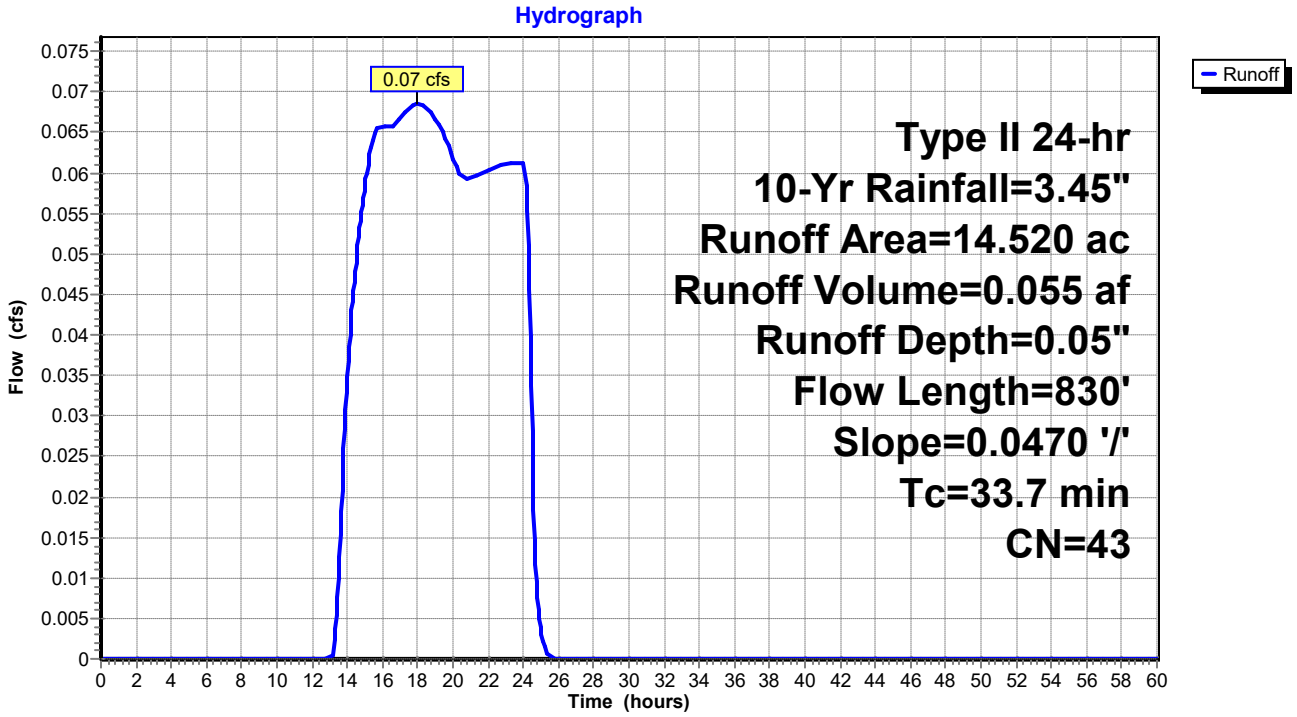
Runoff = 0.07 cfs @ 17.98 hrs, Volume= 0.055 af, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Yr Rainfall=3.45"

	Area (ac)	CN	Description
*	12.880	39	Brush, Good, HSG A/B
*	1.640	73	Brush, Good, HSG D - Canal
	14.520	43	Weighted Average
	14.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.7	830	0.0470	0.41		**Lag/CN Method,**

Subcatchment DA-4: Existing Subcatchment Area 4



Summary for Reach R-1: Reach 1: Sections 0.0-3.0

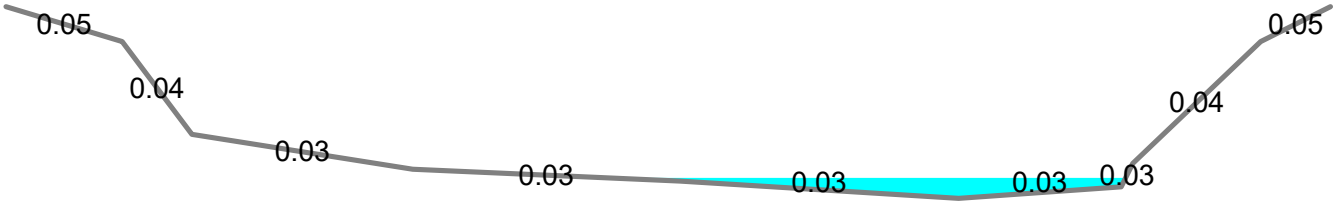
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 363.140 ac, 12.41% Impervious, Inflow Depth = 0.37" for 10-Yr event
Inflow = 13.25 cfs @ 12.41 hrs, Volume= 11.053 af
Outflow = 11.08 cfs @ 12.83 hrs, Volume= 11.053 af, Atten= 16%, Lag= 24.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.04 fps, Min. Travel Time= 13.6 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 25.1 min

Peak Storage= 9,101 cf @ 12.60 hrs
Average Depth at Peak Storage= 0.88'
Bank-Full Depth= 8.25' Flow Area= 336.1 sf, Capacity= 1,965.69 cfs

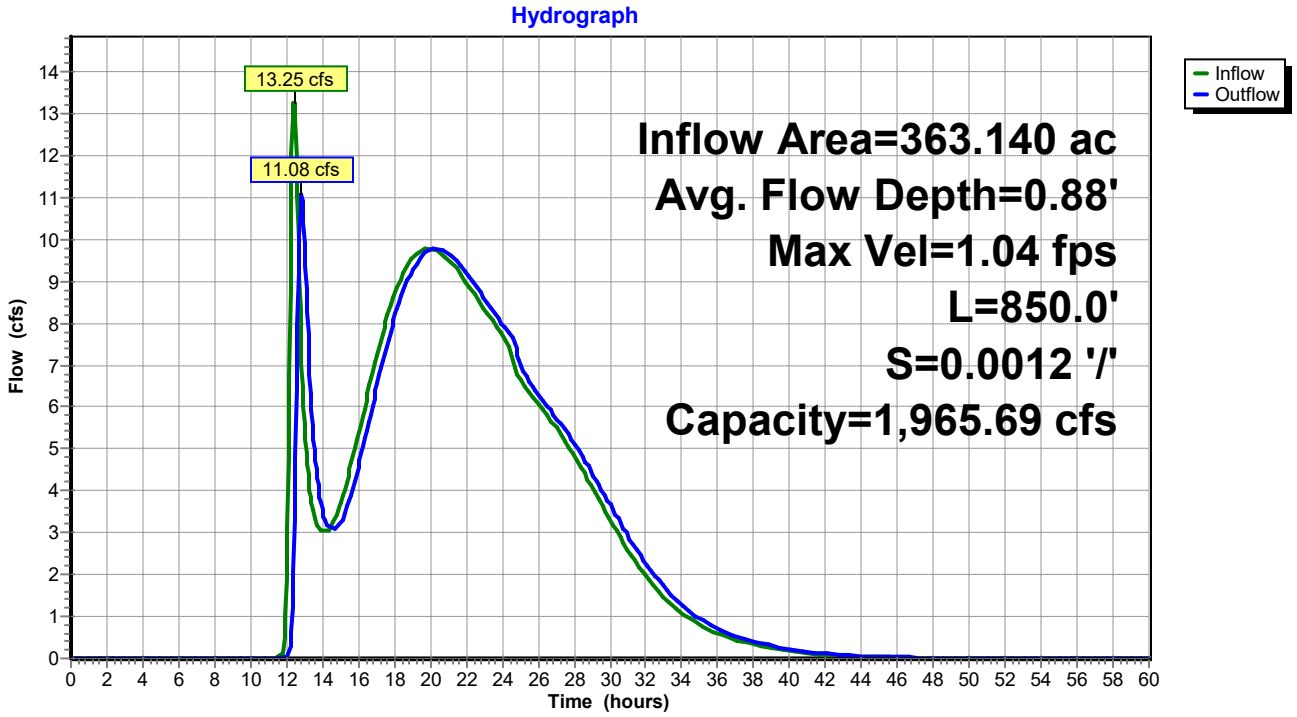
Custom cross-section, Length= 850.0' Slope= 0.0012 '/' (105 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 424.00', Outlet Invert= 423.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
21.00	425.00	0.00		
26.00	423.50	1.50	0.050	Earth, cobble bottom, clean sides
29.00	419.50	5.50	0.040	Earth, dense weeds
38.50	418.00	7.00	0.030	Earth, grassed & winding
50.00	417.50	7.50	0.030	Earth, grassed & winding
62.00	416.75	8.25	0.030	Earth, grassed & winding
69.00	417.25	7.75	0.030	Earth, grassed & winding
69.50	418.25	6.75	0.030	
75.00	423.50	1.50	0.040	
78.00	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.50	3.8	15.0	3,190	2.54
0.75	8.0	19.3	6,813	7.58
1.25	20.5	31.4	17,438	26.25
1.50	28.4	33.3	24,181	43.54
2.75	74.9	43.1	63,702	186.64
6.75	256.6	53.9	218,078	1,319.79
8.25	336.1	62.5	285,653	1,965.69

Reach R-1: Reach 1: Sections 0.0-3.0



Summary for Reach R-2: Reach 2: Sections 3.0-4.5

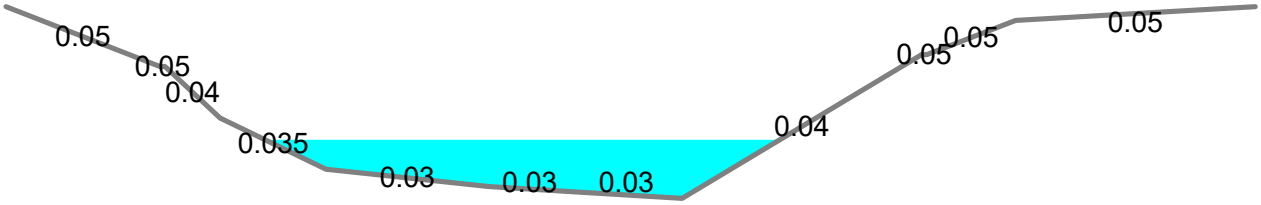
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 390.420 ac, 15.16% Impervious, Inflow Depth = 0.43" for 10-Yr event
Inflow = 28.90 cfs @ 12.65 hrs, Volume= 14.074 af
Outflow = 28.60 cfs @ 12.77 hrs, Volume= 14.074 af, Atten= 1%, Lag= 7.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.67 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 11.5 min

Peak Storage= 7,200 cf @ 12.70 hrs
Average Depth at Peak Storage= 1.71'
Bank-Full Depth= 5.60' Flow Area= 103.5 sf, Capacity= 358.88 cfs

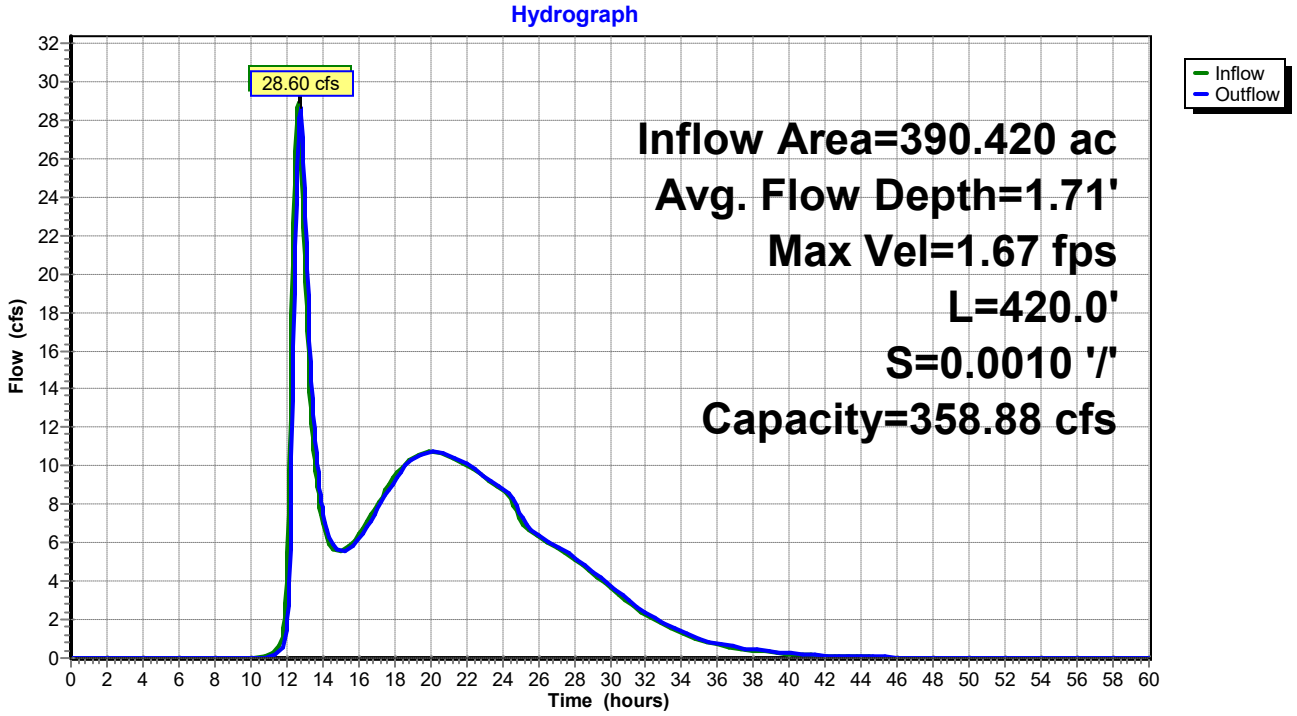
Custom cross-section, Length= 420.0' Slope= 0.0010 '/' (105 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.40', Outlet Invert= 423.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
33.50	425.00	0.00		
38.00	423.25	1.75	0.050	Earth, cobble bottom, clean sides
38.15	423.25	1.75	0.050	Earth, cobble bottom, clean sides
39.75	421.75	3.25	0.040	
42.85	420.25	4.75	0.035	
47.60	419.75	5.25	0.030	Earth, grassed & winding
50.00	419.60	5.40	0.030	Earth, grassed & winding
53.25	419.40	5.60	0.030	Earth, grassed & winding
60.25	423.60	1.40	0.040	
60.40	423.60	1.40	0.050	Earth, cobble bottom, clean sides
63.00	424.60	0.40	0.050	
70.00	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.20	0.4	3.6	151	0.11
0.35	1.1	6.3	460	0.51
0.85	5.6	12.1	2,355	5.04
2.35	27.5	18.4	11,564	57.22
3.85	56.7	23.7	23,827	162.15
4.20	64.6	25.5	27,122	194.15
5.20	90.5	31.0	37,994	306.46
5.60	103.5	39.2	43,451	358.88

Reach R-2: Reach 2: Sections 3.0-4.5



Summary for Reach R-3: Reach 3: Sections 4.5-11.0

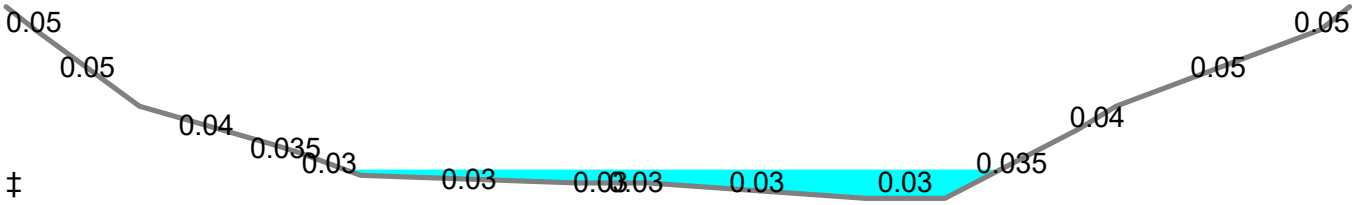
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 450.500 ac, 16.46% Impervious, Inflow Depth = 0.42" for 10-Yr event
Inflow = 29.63 cfs @ 12.79 hrs, Volume= 15.889 af
Outflow = 24.42 cfs @ 13.46 hrs, Volume= 15.889 af, Atten= 18%, Lag= 40.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.16 fps, Min. Travel Time= 23.1 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 50.0 min

Peak Storage= 33,926 cf @ 13.07 hrs
Average Depth at Peak Storage= 0.94'
Bank-Full Depth= 6.25' Flow Area= 349.9 sf, Capacity= 1,686.70 cfs

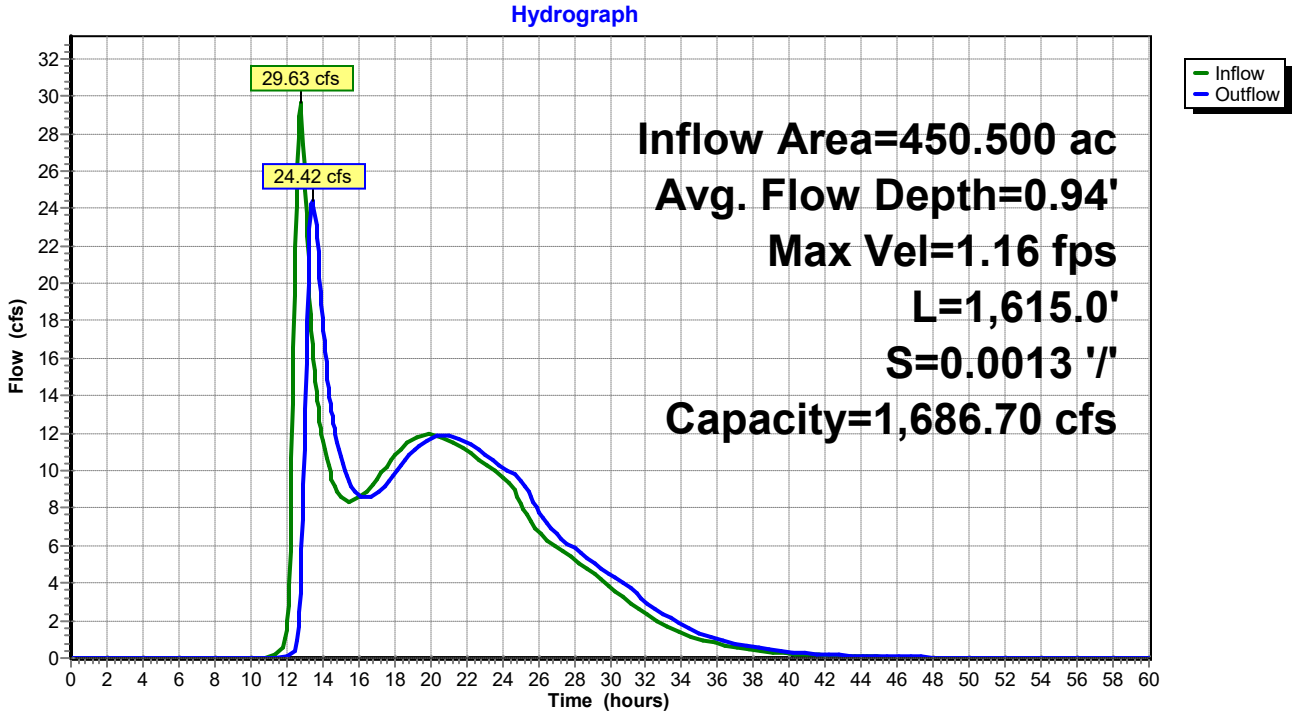
Custom cross-section, Length= 1,615.0' Slope= 0.0013 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.10', Outlet Invert= 421.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
13.00	425.00	0.00		
14.75	424.25	0.75	0.050	Earth, cobble bottom, clean sides
21.00	421.75	3.25	0.050	Earth, cobble bottom, clean sides
29.00	420.50	4.50	0.040	Earth, grassed & winding
30.50	420.25	4.75	0.035	Earth, dense weeds
34.25	419.50	5.50	0.030	Earth, grassed & winding
47.25	419.25	5.75	0.030	Earth, grassed & winding
50.00	419.25	5.75	0.030	Earth, grassed & winding
51.50	419.25	5.75	0.030	Earth, grassed & winding
64.50	418.75	6.25	0.030	Earth, grassed & winding
69.25	418.75	6.25	0.030	Earth, grassed & winding
77.25	421.00	4.00	0.035	
79.50	421.75	3.25	0.040	
91.75	424.25	0.75	0.050	Earth, cobble bottom, clean sides
93.50	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.8	0	0.00
0.50	6.1	23.9	9,802	4.31
0.75	13.8	37.8	22,206	12.39
1.50	44.4	44.4	71,716	79.03
1.75	55.7	46.8	89,997	113.53
2.25	80.2	51.9	129,533	198.84
3.00	121.4	59.1	196,122	370.72
5.50	290.8	78.4	469,662	1,302.31
6.25	349.9	82.2	565,048	1,686.70

Reach R-3: Reach 3: Sections 4.5-11.0



Summary for Reach R-4: Reach 4: Sections 11.0-16.5

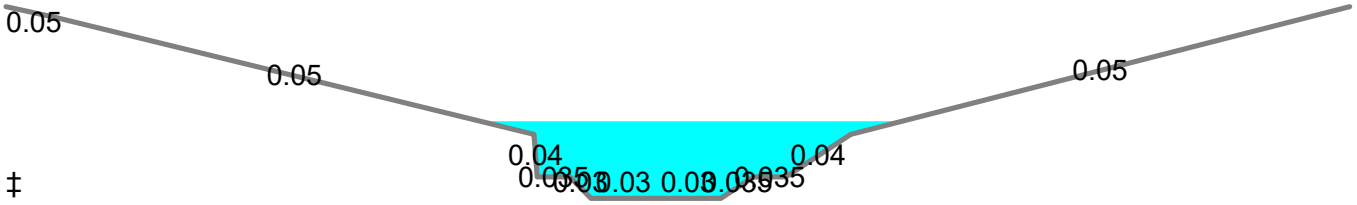
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth = 0.41" for 10-Yr event
Inflow = 24.43 cfs @ 13.46 hrs, Volume= 15.944 af
Outflow = 22.80 cfs @ 13.90 hrs, Volume= 15.944 af, Atten= 7%, Lag= 26.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.55 fps, Min. Travel Time= 13.5 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 31.5 min

Peak Storage= 18,439 cf @ 13.67 hrs
Average Depth at Peak Storage= 1.81'
Bank-Full Depth= 4.50' Flow Area= 87.5 sf, Capacity= 170.12 cfs

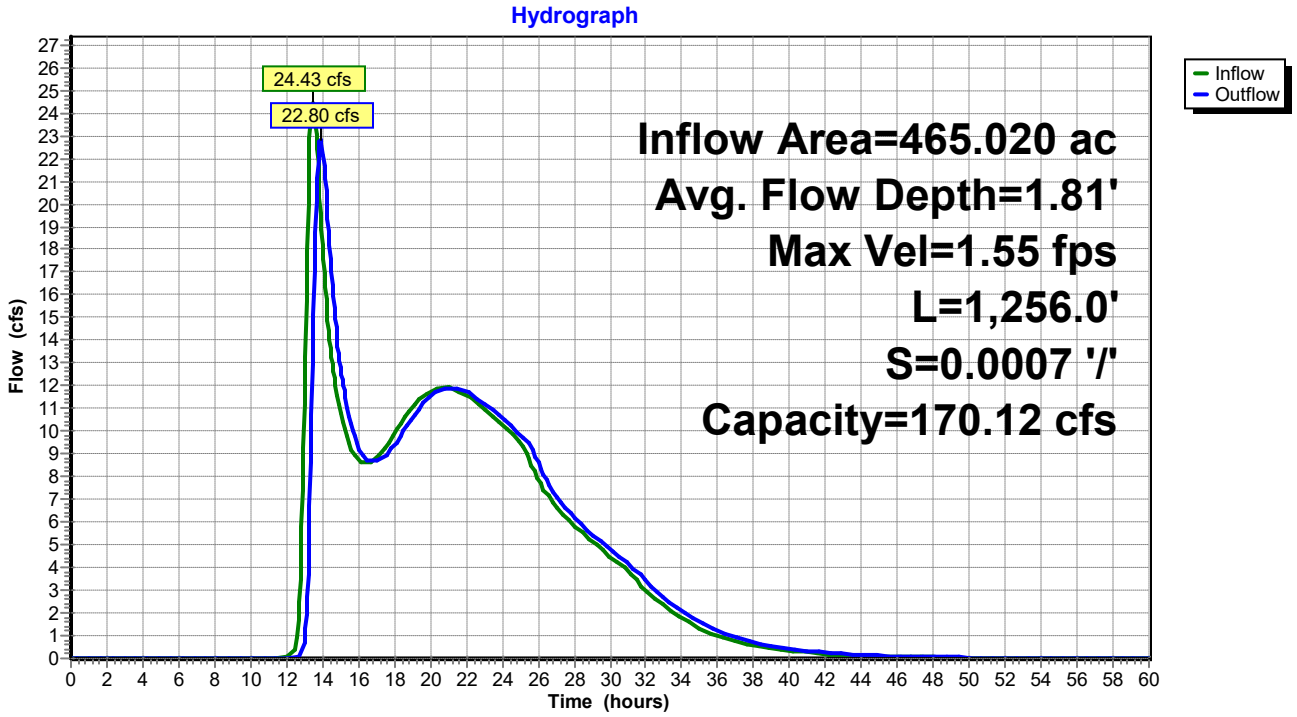
Custom cross-section, Length= 1,256.0' Slope= 0.0007 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 421.00', Outlet Invert= 420.11'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
30.00	425.00	0.00		
31.50	424.75	0.25	0.050	Earth, cobble bottom, clean sides
46.25	422.00	3.00	0.050	Earth, cobble bottom, clean sides
46.35	421.00	4.00	0.040	Earth, grassed & winding
47.35	421.00	4.00	0.035	Earth, grassed & winding
48.00	420.50	4.50	0.030	Earth, grassed & winding
50.00	420.50	4.50	0.030	Earth, grassed & winding
52.00	420.50	4.50	0.030	Earth, grassed & winding
53.00	421.00	4.00	0.035	Earth, dense weeds
54.00	421.00	4.00	0.035	Earth, grassed & winding
56.00	422.00	3.00	0.040	
71.35	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.0	0	0.00
0.50	2.4	7.9	3,042	1.78
1.50	11.1	11.2	13,957	15.68
4.25	77.6	40.5	97,407	148.42
4.50	87.5	43.3	109,955	170.12

Reach R-4: Reach 4: Sections 11.0-16.5



Summary for Pond 1P: 36" RCP Storm Drain

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth = 0.41" for 10-Yr event
Inflow = 22.80 cfs @ 13.90 hrs, Volume= 15.944 af
Outflow = 11.39 cfs @ 22.75 hrs, Volume= 15.942 af, Atten= 50%, Lag= 530.9 min
Primary = 11.39 cfs @ 22.75 hrs, Volume= 15.942 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 421.50' @ 22.75 hrs Surf.Area= 99,067 sf Storage= 83,499 cf
Flood Elev= 425.00' Surf.Area= 219,464 sf Storage= 650,922 cf

Plug-Flow detention time= 124.1 min calculated for 15.929 af (100% of inflow)
Center-of-Mass det. time= 124.0 min (1,442.5 - 1,318.5)

Volume	Invert	Avail.Storage	Storage Description
#1	420.11'	888,946 cf	**Canal (Prismatic)** Listed below (Recalc)

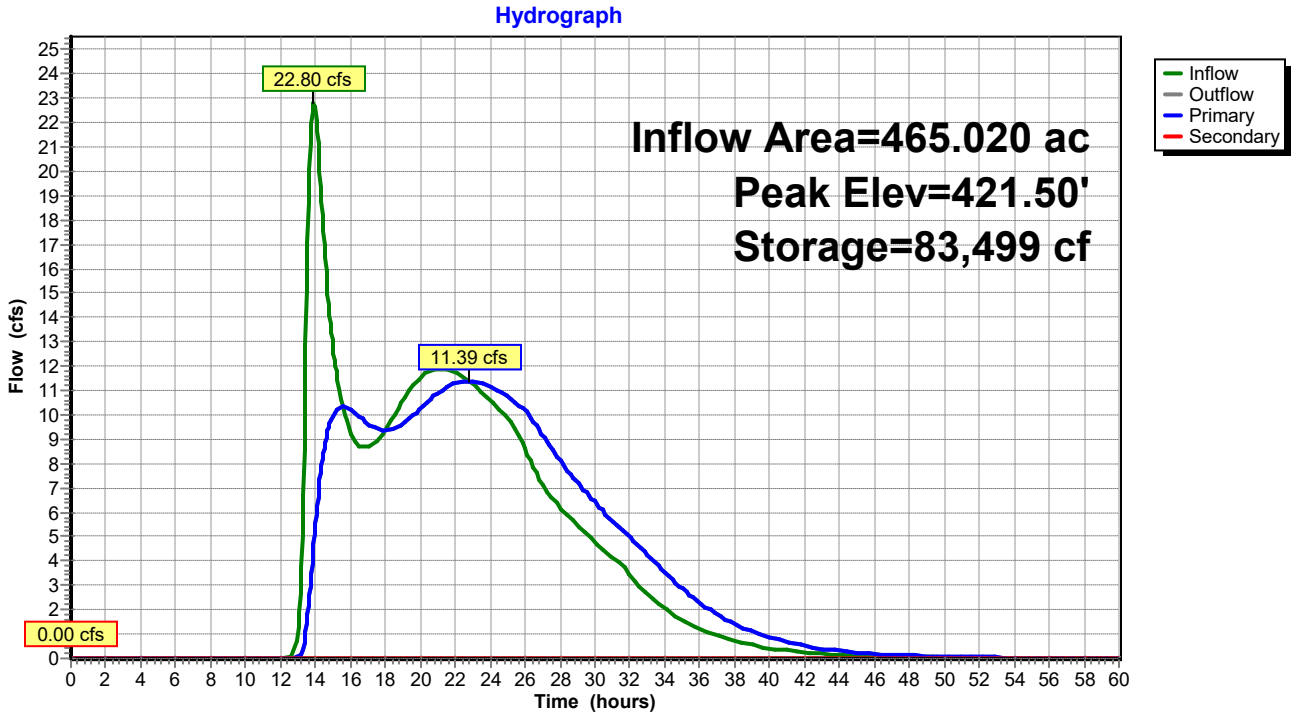
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.11	100	0	0
421.00	84,779	37,771	37,771
422.00	113,500	99,140	136,911
423.00	157,948	135,724	272,635
424.00	189,581	173,765	446,399
425.00	219,464	204,523	650,922
426.00	256,585	238,025	888,946

Device	Routing	Invert	Outlet Devices
#1	Primary	420.11'	**36.0" Round RCP_Round 36"** L= 155.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 420.11' / 419.37' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	425.40'	**260.0' long x 20.0' breadth Canal Overflow to Highway ROW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=11.38 cfs @ 22.75 hrs HW=421.50' (Free Discharge)
↑—**1=RCP_Round 36"** (Barrel Controls 11.38 cfs @ 5.23 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.11' (Free Discharge)
↑—**2=Canal Overflow to Highway ROW** (Controls 0.00 cfs)

Pond 1P: 36" RCP Storm Drain



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1a: Existing Runoff Area=26.630 ac 31.07% Impervious Runoff Depth=1.19"
Flow Length=1,872' Slope=0.0370 '/' Tc=39.4 min CN=67 Runoff=20.59 cfs 2.650 af

Subcatchment DA-1b: Existing Runoff Area=336.510 ac 10.94% Impervious Runoff Depth=0.56"
Flow Length=8,612' Slope=0.0050 '/' Tc=494.2 min CN=55 Runoff=16.25 cfs 15.759 af

Subcatchment DA-2: Existing Runoff Area=27.280 ac 51.72% Impervious Runoff Depth=1.80"
Flow Length=2,428' Slope=0.0226 '/' Tc=48.5 min CN=76 Runoff=29.82 cfs 4.092 af

Subcatchment DA-3: Existing Runoff Area=60.080 ac 24.93% Impervious Runoff Depth=0.61"
Flow Length=3,650' Slope=0.0160 '/' Tc=135.6 min CN=56 Runoff=7.48 cfs 3.040 af

Subcatchment DA-4: Existing Runoff Area=14.520 ac 0.00% Impervious Runoff Depth=0.14"
Flow Length=830' Slope=0.0470 '/' Tc=33.7 min CN=43 Runoff=0.26 cfs 0.168 af

Reach R-1: Reach 1: Sections 0.0-3.0 Avg. Flow Depth=1.07' Max Vel=1.16 fps Inflow=20.70 cfs 18.410 af
L=850.0' S=0.0012 '/' Capacity=1,965.69 cfs Outflow=17.86 cfs 18.410 af

Reach R-2: Reach 2: Sections 3.0-4.5 Avg. Flow Depth=2.06' Max Vel=1.91 fps Inflow=43.57 cfs 22.502 af
L=420.0' S=0.0010 '/' Capacity=358.88 cfs Outflow=43.18 cfs 22.502 af

Reach R-3: Reach 3: Sections 4.5-11.0 Avg. Flow Depth=1.12' Max Vel=1.38 fps Inflow=45.28 cfs 25.541 af
L=1,615.0' S=0.0013 '/' Capacity=1,686.70 cfs Outflow=38.76 cfs 25.541 af

Reach R-4: Reach 4: Sections Avg. Flow Depth=2.27' Max Vel=1.66 fps Inflow=39.03 cfs 25.710 af
L=1,256.0' S=0.0007 '/' Capacity=170.12 cfs Outflow=36.04 cfs 25.709 af

Pond 1P: 36" RCP Storm Drain Peak Elev=421.99' Storage=136,111 cf Inflow=36.04 cfs 25.709 af
Primary=19.43 cfs 25.707 af Secondary=0.00 cfs 0.000 af Outflow=19.43 cfs 25.707 af

Total Runoff Area = 465.020 ac Runoff Volume = 25.710 af Average Runoff Depth = 0.66"
84.05% Pervious = 390.852 ac 15.95% Impervious = 74.168 ac

Summary for Subcatchment DA-1a: Existing Subcatchment Area 1A

Area sized to give full flow through pipe during 10 yr storm.

Flow source assumed to be residential drainage from neighborhoods to the west.

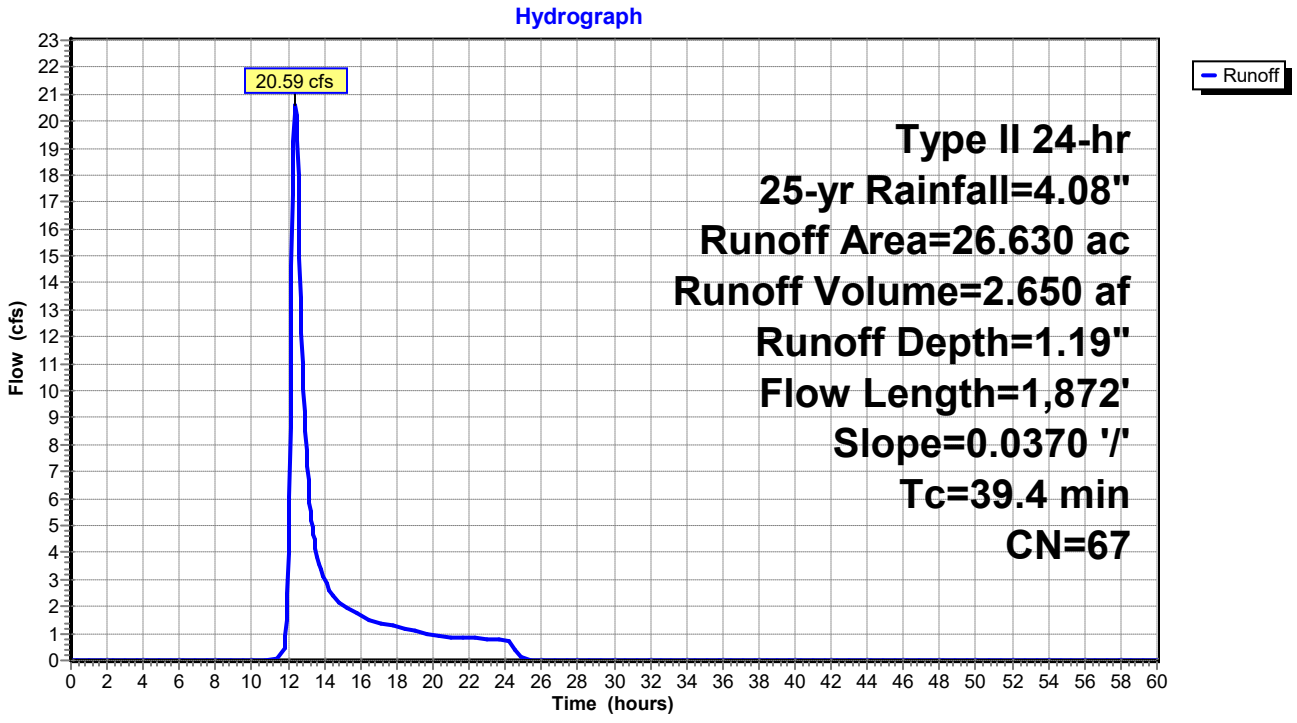
Runoff = 20.59 cfs @ 12.40 hrs, Volume= 2.650 af, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=4.08"

	Area (ac)	CN	Description
*	14.320	50	>75% Grass cover, Good, HSG A/B
	11.490	88	Urban industrial, 72% imp, HSG B
*	0.820	73	Brush, Good, HSG D - Canal
	26.630	67	Weighted Average
	18.357		68.93% Pervious Area
	8.273		31.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.4	1,872	0.0370	0.79		**Lag/CN Method,**

Subcatchment DA-1a: Existing Subcatchment Area 1A



Summary for Subcatchment DA-1b: Existing Subcatchment Area 1B

See map A for total area of 188,420 sf.

Estimated 10% roof surface, 70% gravel surfaces, 20% near water as grass and forest.

Slope of flow: 438 to 435 surface elevation over 300 feet for gravel; 435 to 421 over 50 feet

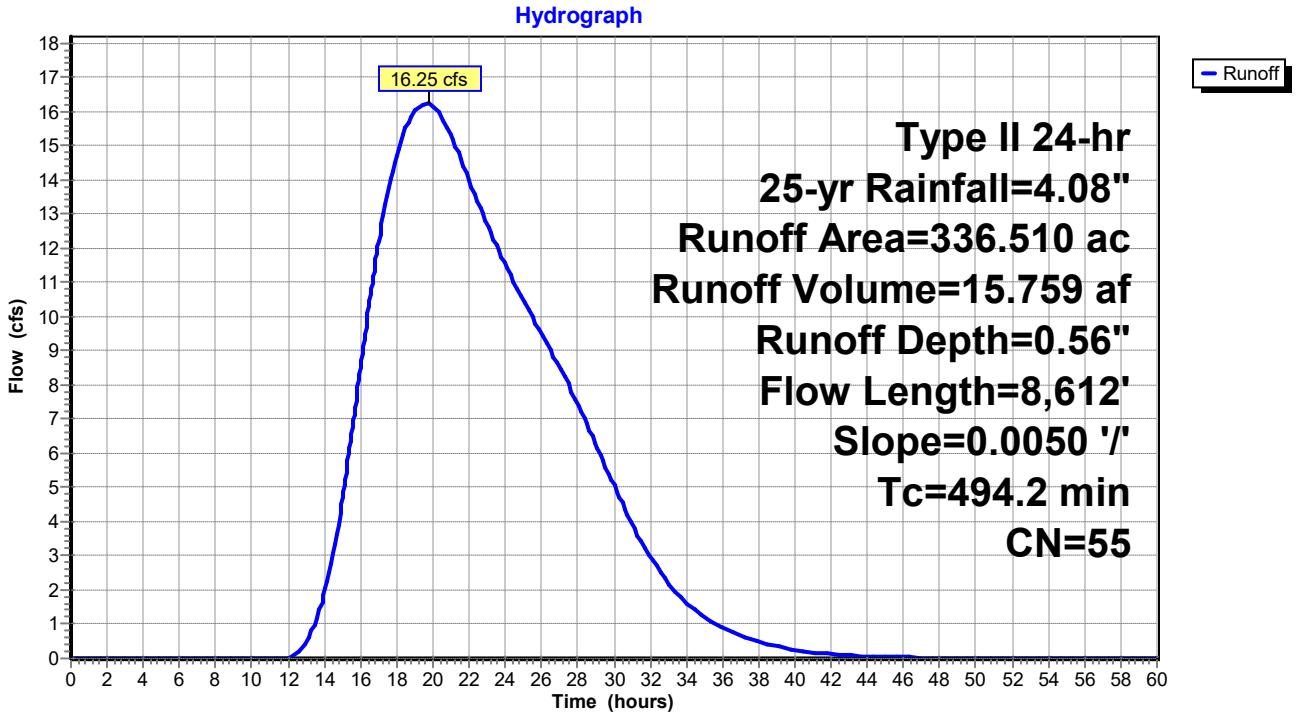
Runoff = 16.25 cfs @ 19.74 hrs, Volume= 15.759 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=4.08"

	Area (ac)	CN	Description
*	43.640	62	1/2 acre lots, 25% imp, HSG A/B
	18.600	88	Urban industrial, 72% imp, HSG B
*	91.150	55	Woods, Good, HSG A/B
*	78.050	40	Brush, Good, HSG A/B
*	104.220	56	2 acre lots, 12% imp, HSG B/A
*	0.850	73	Brush, Good, HSG D - Canal
	336.510	55	Weighted Average
	299.702		89.06% Pervious Area
	36.808		10.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
494.2	8,612	0.0050	0.29		**Lag/CN Method, Incude Est Attenuation**

Subcatchment DA-1b: Existing Subcatchment Area 1B



Summary for Subcatchment DA-2: Existing Subcatchment Area 2

Cover type: industrial type A soils based on Maps C, D and F.

Channel Tc:

Slope as 445 inlet to 420 outlet over 460 feet.

Perimiter as length (460)x2 + width (50)x2.

X-sec area estimated as rectangular with 5' depth and 25' wide.

Other Tc area: 16' elev over 430 feet. Unpaved based on aerial photography.

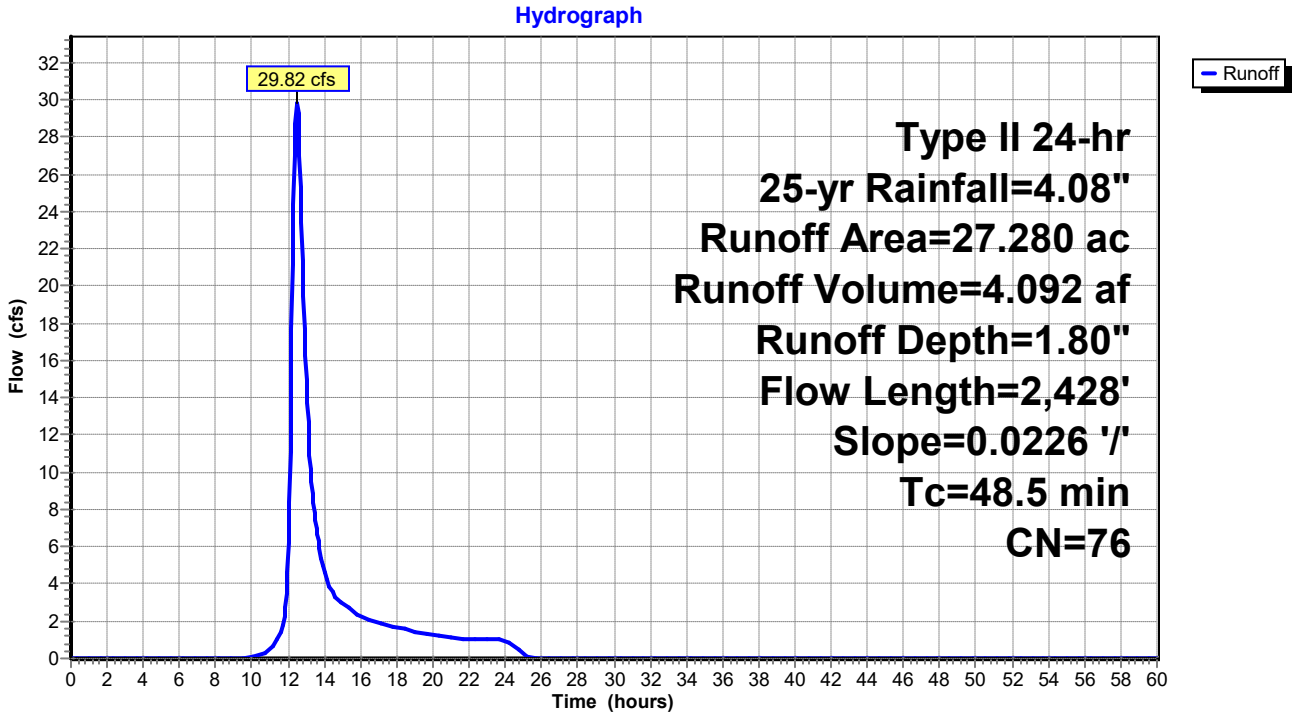
Runoff = 29.82 cfs @ 12.49 hrs, Volume= 4.092 af, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=4.08"

	Area (ac)	CN	Description
*	16.600	92	Urban Ind/Com, 85% imp, HSG B
*	9.880	48	Brush, Good, HSG A/B
*	0.800	73	Brush, Good, HSG D - Canal
	27.280	76	Weighted Average
	13.170		48.28% Pervious Area
	14.110		51.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
48.5	2,428	0.0226	0.83		**Lag/CN Method,**

Subcatchment DA-2: Existing Subcatchment Area 2



Summary for Subcatchment DA-3: Existing Subcatchment Area 3

Cover type: 20% industrial class A, 30% wood class B, 30% range class B, 20% grass class B for large area south of Bleecker. 55% grass 45% wood class B for area west of channel and north of Bleecker.

Channel Tc:

Slope as 452 inlet to 419 outlet over 565 feet.

Perimiter as length 565'x2 + width (12')x2.

X-sec area estimated as rectangular with 5' depth and 12' wide.

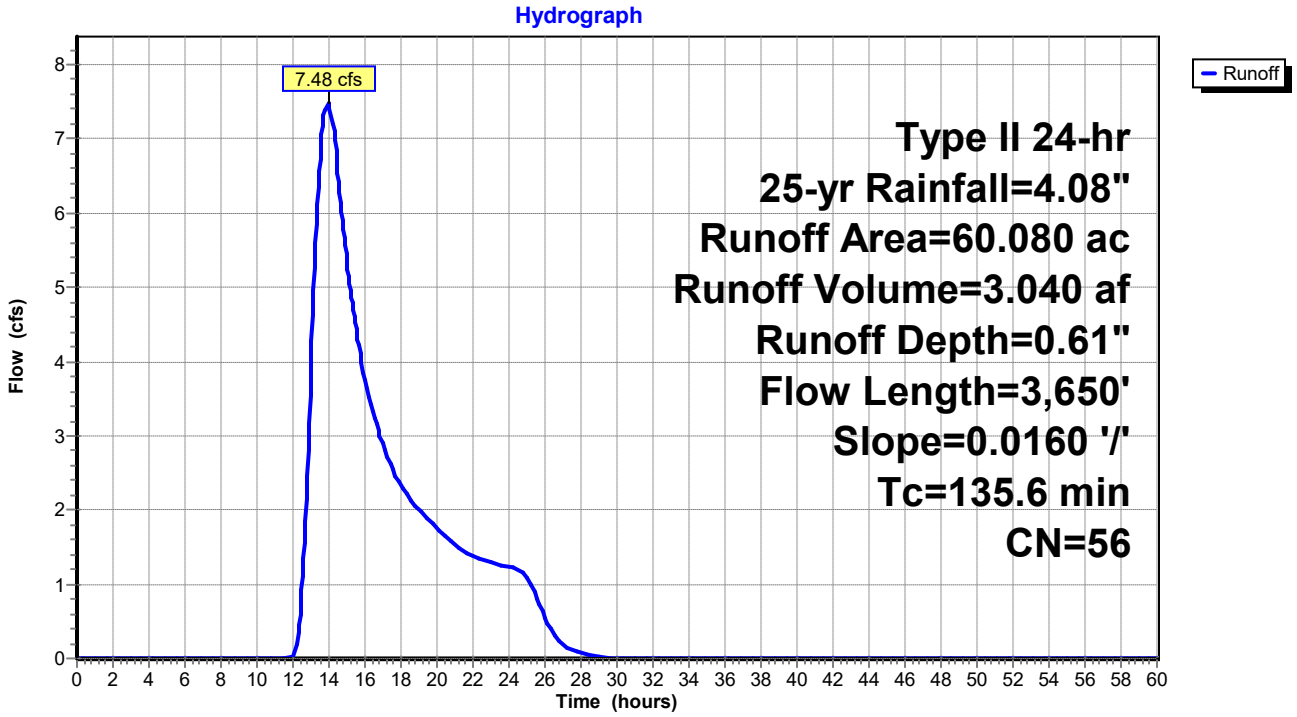
Runoff = 7.48 cfs @ 13.98 hrs, Volume= 3.040 af, Depth= 0.61"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=4.08"

	Area (ac)	CN	Description
	17.620	92	Urban commercial, 85% imp, HSG B
*	6.830	43	Woods, Good, HSG A/B
*	34.150	39	Brush, Good, HSG A/B
*	1.480	73	Brush, Good, HSG D - Canal
	60.080	56	Weighted Average
	45.103		75.07% Pervious Area
	14.977		24.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
135.6	3,650	0.0160	0.45		**Lag/CN Method,**

Subcatchment DA-3: Existing Subcatchment Area 3



Summary for Subcatchment DA-4: Existing Subcatchment Area 4

See Map A for area of subcatchment and farthest run for Tc. Slope calculated as 725 foot run from 460 to 418 elevation.

CN for area average of A and B soil groups for grass/woodland.

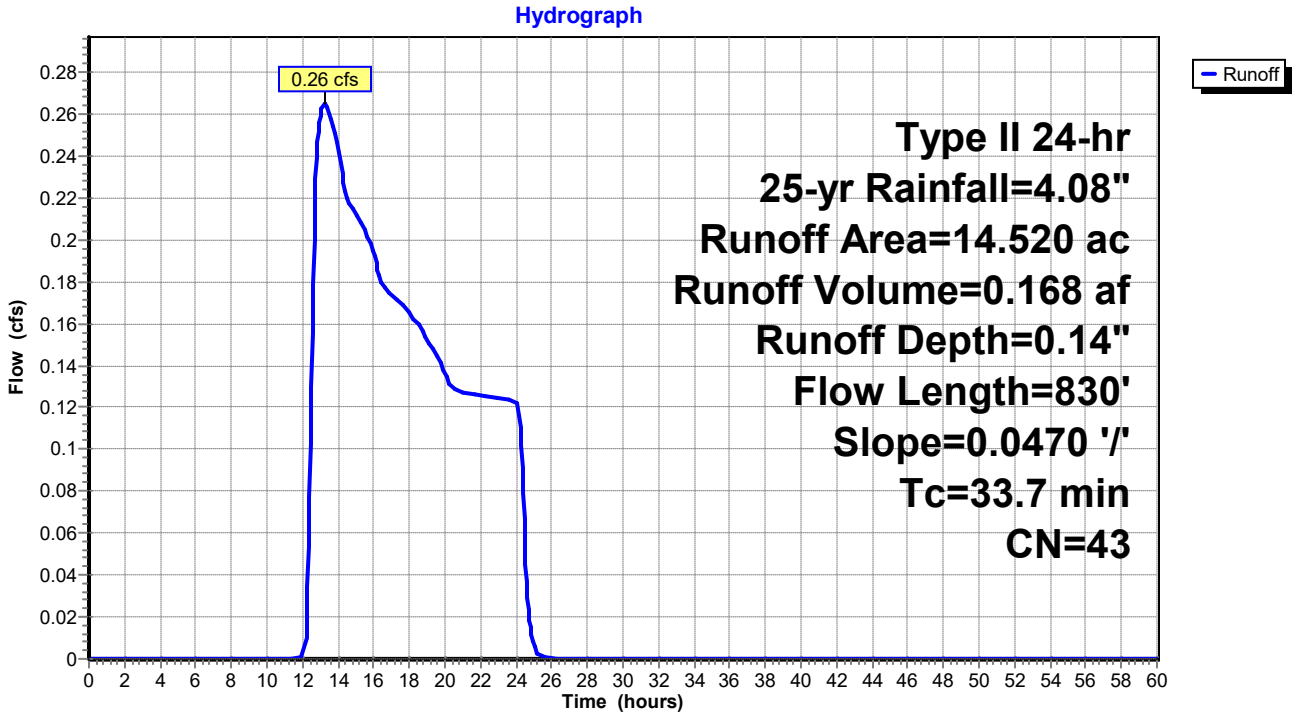
Runoff = 0.26 cfs @ 13.24 hrs, Volume= 0.168 af, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=4.08"

	Area (ac)	CN	Description
*	12.880	39	Brush, Good, HSG A/B
*	1.640	73	Brush, Good, HSG D - Canal
	14.520	43	Weighted Average
	14.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.7	830	0.0470	0.41		**Lag/CN Method,**

Subcatchment DA-4: Existing Subcatchment Area 4



Summary for Reach R-1: Reach 1: Sections 0.0-3.0

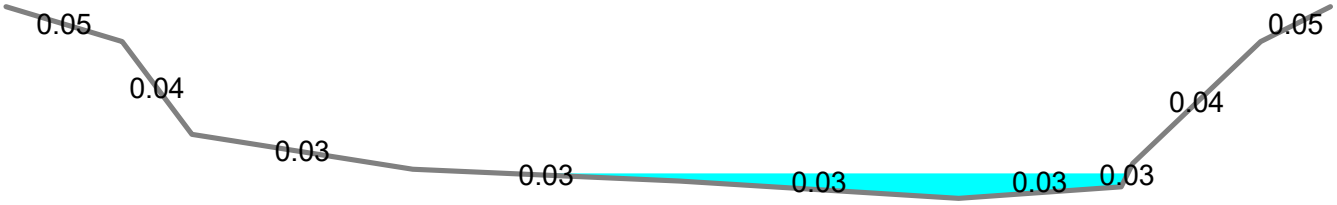
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 363.140 ac, 12.41% Impervious, Inflow Depth = 0.61" for 25-yr event
Inflow = 20.70 cfs @ 12.40 hrs, Volume= 18.410 af
Outflow = 17.86 cfs @ 12.77 hrs, Volume= 18.410 af, Atten= 14%, Lag= 22.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.16 fps, Min. Travel Time= 12.2 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 22.6 min

Peak Storage= 13,047 cf @ 12.56 hrs
Average Depth at Peak Storage= 1.07'
Bank-Full Depth= 8.25' Flow Area= 336.1 sf, Capacity= 1,965.69 cfs

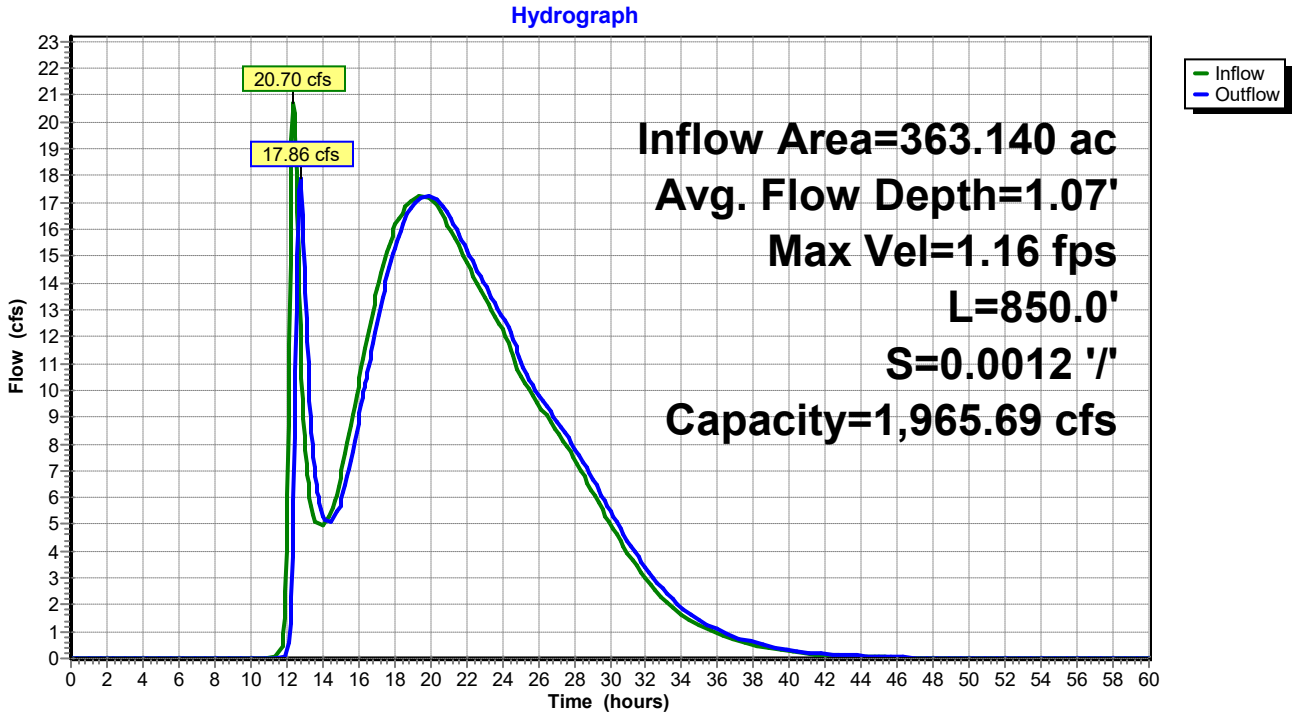
Custom cross-section, Length= 850.0' Slope= 0.0012 '/' (105 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 424.00', Outlet Invert= 423.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
21.00	425.00	0.00		
26.00	423.50	1.50	0.050	Earth, cobble bottom, clean sides
29.00	419.50	5.50	0.040	Earth, dense weeds
38.50	418.00	7.00	0.030	Earth, grassed & winding
50.00	417.50	7.50	0.030	Earth, grassed & winding
62.00	416.75	8.25	0.030	Earth, grassed & winding
69.00	417.25	7.75	0.030	Earth, grassed & winding
69.50	418.25	6.75	0.030	
75.00	423.50	1.50	0.040	
78.00	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.50	3.8	15.0	3,190	2.54
0.75	8.0	19.3	6,813	7.58
1.25	20.5	31.4	17,438	26.25
1.50	28.4	33.3	24,181	43.54
2.75	74.9	43.1	63,702	186.64
6.75	256.6	53.9	218,078	1,319.79
8.25	336.1	62.5	285,653	1,965.69

Reach R-1: Reach 1: Sections 0.0-3.0



Summary for Reach R-2: Reach 2: Sections 3.0-4.5

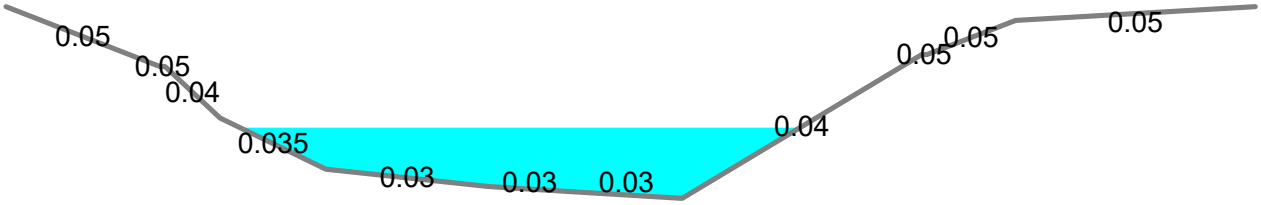
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 390.420 ac, 15.16% Impervious, Inflow Depth = 0.69" for 25-yr event
Inflow = 43.57 cfs @ 12.63 hrs, Volume= 22.502 af
Outflow = 43.18 cfs @ 12.74 hrs, Volume= 22.502 af, Atten= 1%, Lag= 6.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.91 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 10.1 min

Peak Storage= 9,527 cf @ 12.67 hrs
Average Depth at Peak Storage= 2.06'
Bank-Full Depth= 5.60' Flow Area= 103.5 sf, Capacity= 358.88 cfs

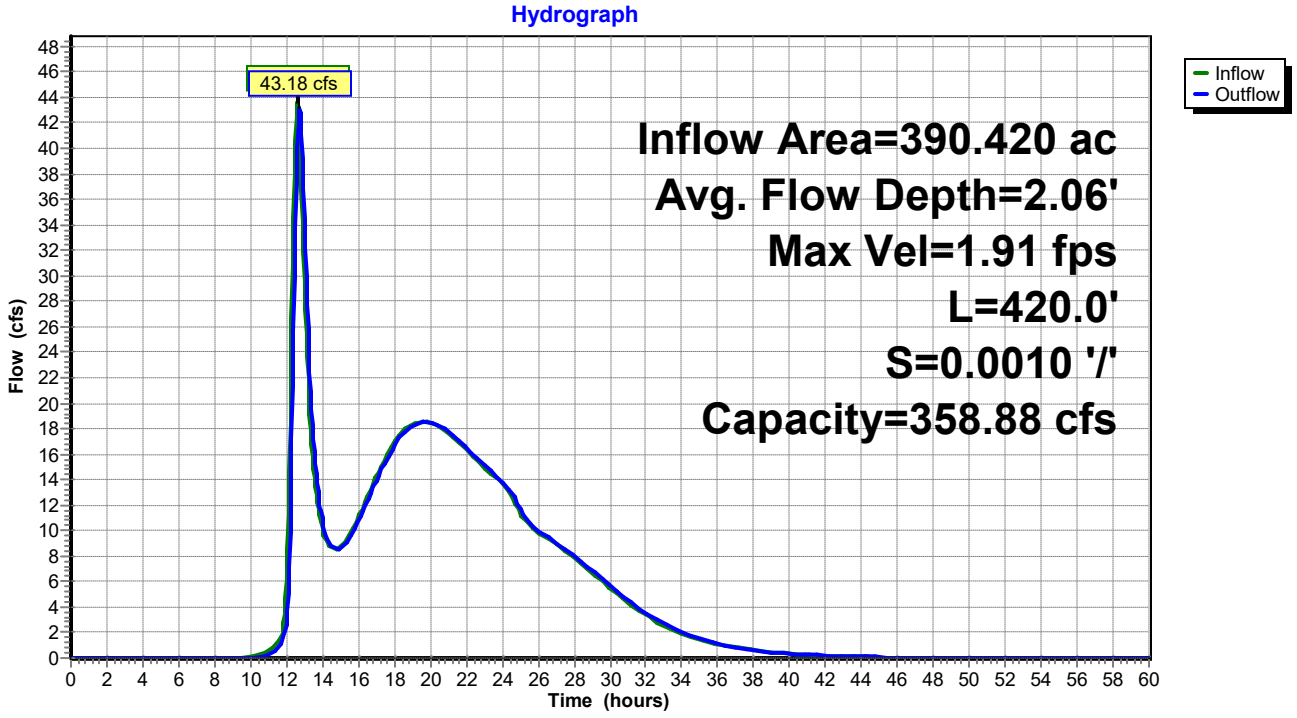
Custom cross-section, Length= 420.0' Slope= 0.0010 '/' (105 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.40', Outlet Invert= 423.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
33.50	425.00	0.00		
38.00	423.25	1.75	0.050	Earth, cobble bottom, clean sides
38.15	423.25	1.75	0.050	Earth, cobble bottom, clean sides
39.75	421.75	3.25	0.040	
42.85	420.25	4.75	0.035	
47.60	419.75	5.25	0.030	Earth, grassed & winding
50.00	419.60	5.40	0.030	Earth, grassed & winding
53.25	419.40	5.60	0.030	Earth, grassed & winding
60.25	423.60	1.40	0.040	
60.40	423.60	1.40	0.050	Earth, cobble bottom, clean sides
63.00	424.60	0.40	0.050	
70.00	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.20	0.4	3.6	151	0.11
0.35	1.1	6.3	460	0.51
0.85	5.6	12.1	2,355	5.04
2.35	27.5	18.4	11,564	57.22
3.85	56.7	23.7	23,827	162.15
4.20	64.6	25.5	27,122	194.15
5.20	90.5	31.0	37,994	306.46
5.60	103.5	39.2	43,451	358.88

Reach R-2: Reach 2: Sections 3.0-4.5



Summary for Reach R-3: Reach 3: Sections 4.5-11.0

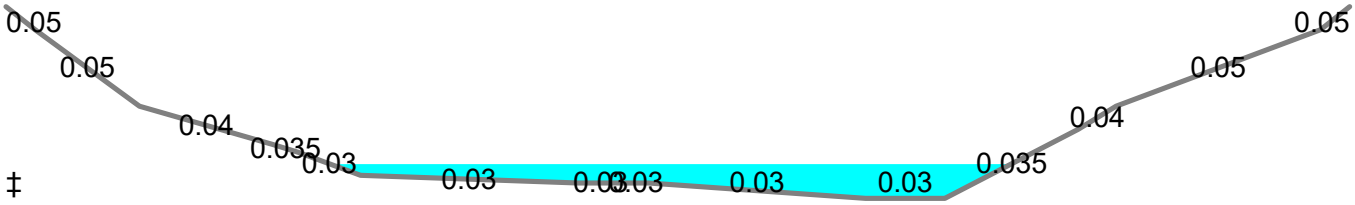
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 450.500 ac, 16.46% Impervious, Inflow Depth = 0.68" for 25-yr event
Inflow = 45.28 cfs @ 12.75 hrs, Volume= 25.541 af
Outflow = 38.76 cfs @ 13.32 hrs, Volume= 25.541 af, Atten= 14%, Lag= 33.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.38 fps, Min. Travel Time= 19.5 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 45.0 min

Peak Storage= 45,408 cf @ 12.99 hrs
Average Depth at Peak Storage= 1.12'
Bank-Full Depth= 6.25' Flow Area= 349.9 sf, Capacity= 1,686.70 cfs

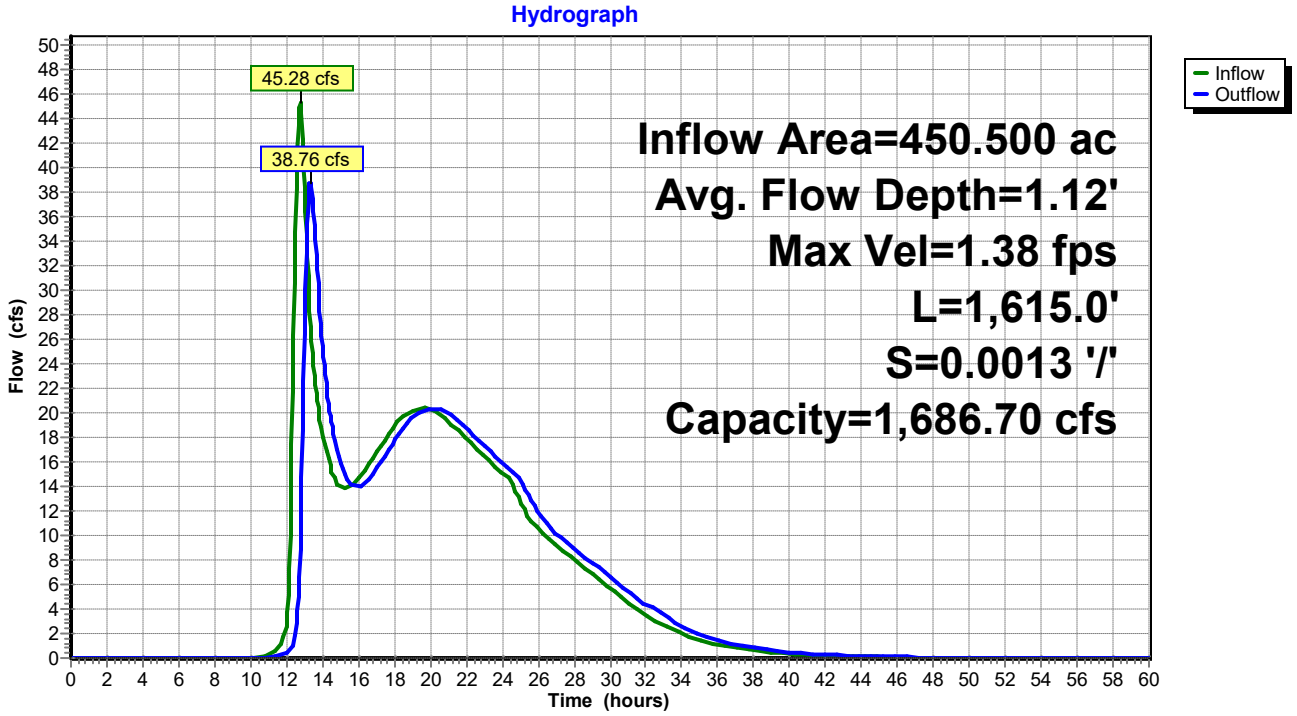
Custom cross-section, Length= 1,615.0' Slope= 0.0013 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.10', Outlet Invert= 421.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
13.00	425.00	0.00		
14.75	424.25	0.75	0.050	Earth, cobble bottom, clean sides
21.00	421.75	3.25	0.050	Earth, cobble bottom, clean sides
29.00	420.50	4.50	0.040	Earth, grassed & winding
30.50	420.25	4.75	0.035	Earth, dense weeds
34.25	419.50	5.50	0.030	Earth, grassed & winding
47.25	419.25	5.75	0.030	Earth, grassed & winding
50.00	419.25	5.75	0.030	Earth, grassed & winding
51.50	419.25	5.75	0.030	Earth, grassed & winding
64.50	418.75	6.25	0.030	Earth, grassed & winding
69.25	418.75	6.25	0.030	Earth, grassed & winding
77.25	421.00	4.00	0.035	
79.50	421.75	3.25	0.040	
91.75	424.25	0.75	0.050	Earth, cobble bottom, clean sides
93.50	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.8	0	0.00
0.50	6.1	23.9	9,802	4.31
0.75	13.8	37.8	22,206	12.39
1.50	44.4	44.4	71,716	79.03
1.75	55.7	46.8	89,997	113.53
2.25	80.2	51.9	129,533	198.84
3.00	121.4	59.1	196,122	370.72
5.50	290.8	78.4	469,662	1,302.31
6.25	349.9	82.2	565,048	1,686.70

Reach R-3: Reach 3: Sections 4.5-11.0



Summary for Reach R-4: Reach 4: Sections 11.0-16.5

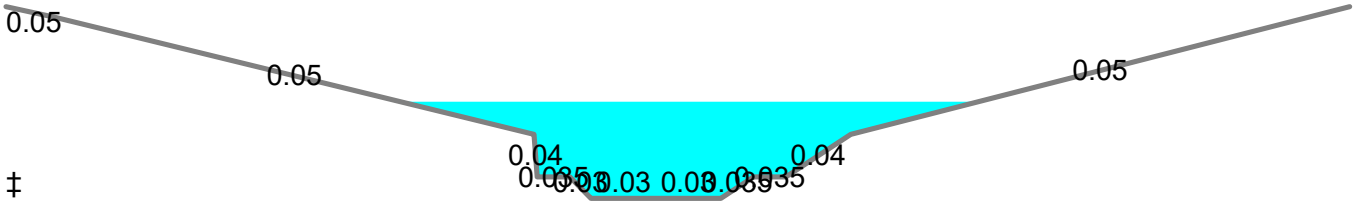
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth = 0.66" for 25-yr event
Inflow = 39.03 cfs @ 13.32 hrs, Volume= 25.710 af
Outflow = 36.04 cfs @ 13.74 hrs, Volume= 25.709 af, Atten= 8%, Lag= 25.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.66 fps, Min. Travel Time= 12.6 min
Avg. Velocity = 0.75 fps, Avg. Travel Time= 27.9 min

Peak Storage= 27,222 cf @ 13.53 hrs
Average Depth at Peak Storage= 2.27'
Bank-Full Depth= 4.50' Flow Area= 87.5 sf, Capacity= 170.12 cfs

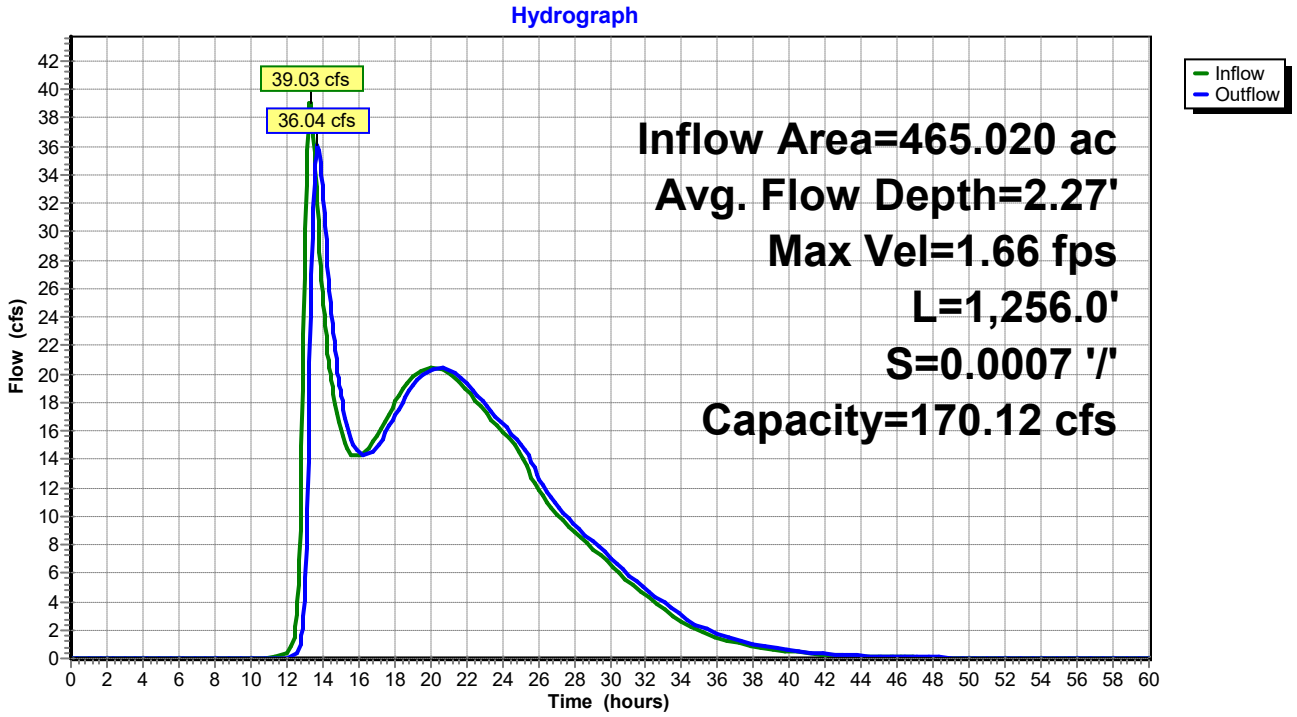
Custom cross-section, Length= 1,256.0' Slope= 0.0007 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 421.00', Outlet Invert= 420.11'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
30.00	425.00	0.00		
31.50	424.75	0.25	0.050	Earth, cobble bottom, clean sides
46.25	422.00	3.00	0.050	Earth, cobble bottom, clean sides
46.35	421.00	4.00	0.040	Earth, grassed & winding
47.35	421.00	4.00	0.035	Earth, grassed & winding
48.00	420.50	4.50	0.030	Earth, grassed & winding
50.00	420.50	4.50	0.030	Earth, grassed & winding
52.00	420.50	4.50	0.030	Earth, grassed & winding
53.00	421.00	4.00	0.035	Earth, dense weeds
54.00	421.00	4.00	0.035	Earth, grassed & winding
56.00	422.00	3.00	0.040	
71.35	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.0	0	0.00
0.50	2.4	7.9	3,042	1.78
1.50	11.1	11.2	13,957	15.68
4.25	77.6	40.5	97,407	148.42
4.50	87.5	43.3	109,955	170.12

Reach R-4: Reach 4: Sections 11.0-16.5



Summary for Pond 1P: 36" RCP Storm Drain

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth = 0.66" for 25-yr event
Inflow = 36.04 cfs @ 13.74 hrs, Volume= 25.709 af
Outflow = 19.43 cfs @ 21.98 hrs, Volume= 25.707 af, Atten= 46%, Lag= 494.5 min
Primary = 19.43 cfs @ 21.98 hrs, Volume= 25.707 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 421.99' @ 21.98 hrs Surf.Area= 113,298 sf Storage= 136,111 cf
Flood Elev= 425.00' Surf.Area= 219,464 sf Storage= 650,922 cf

Plug-Flow detention time= 119.7 min calculated for 25.686 af (100% of inflow)
Center-of-Mass det. time= 119.7 min (1,418.1 - 1,298.4)

Volume	Invert	Avail.Storage	Storage Description
#1	420.11'	888,946 cf	**Canal (Prismatic)** Listed below (Recalc)

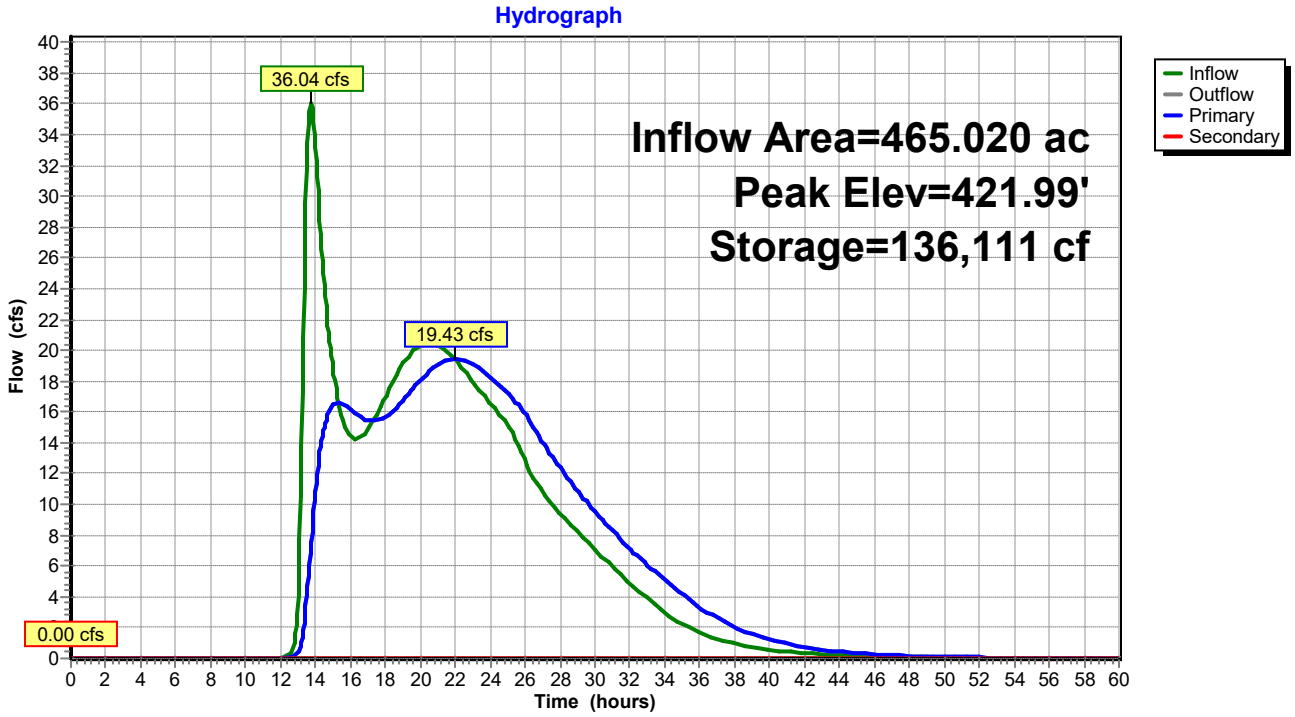
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.11	100	0	0
421.00	84,779	37,771	37,771
422.00	113,500	99,140	136,911
423.00	157,948	135,724	272,635
424.00	189,581	173,765	446,399
425.00	219,464	204,523	650,922
426.00	256,585	238,025	888,946

Device	Routing	Invert	Outlet Devices
#1	Primary	420.11'	**36.0" Round RCP_Round 36"** L= 155.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 420.11' / 419.37' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	425.40'	**260.0' long x 20.0' breadth Canal Overflow to Highway ROW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=19.43 cfs @ 21.98 hrs HW=421.99' (Free Discharge)
↑—**1=RCP_Round 36"** (Barrel Controls 19.43 cfs @ 5.94 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.11' (Free Discharge)
↑—**2=Canal Overflow to Highway ROW** (Controls 0.00 cfs)

Pond 1P: 36" RCP Storm Drain



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1a: Existing Runoff Area=26.630 ac 31.07% Impervious Runoff Depth=1.50"
Flow Length=1,872' Slope=0.0370 '/' Tc=39.4 min CN=67 Runoff=26.76 cfs 3.336 af

Subcatchment DA-1b: Existing Runoff Area=336.510 ac 10.94% Impervious Runoff Depth=0.77"
Flow Length=8,612' Slope=0.0050 '/' Tc=494.2 min CN=55 Runoff=22.87 cfs 21.584 af

Subcatchment DA-2: Existing Runoff Area=27.280 ac 51.72% Impervious Runoff Depth=2.18"
Flow Length=2,428' Slope=0.0226 '/' Tc=48.5 min CN=76 Runoff=36.45 cfs 4.951 af

Subcatchment DA-3: Existing Runoff Area=60.080 ac 24.93% Impervious Runoff Depth=0.82"
Flow Length=3,650' Slope=0.0160 '/' Tc=135.6 min CN=56 Runoff=10.91 cfs 4.123 af

Subcatchment DA-4: Existing Runoff Area=14.520 ac 0.00% Impervious Runoff Depth=0.24"
Flow Length=830' Slope=0.0470 '/' Tc=33.7 min CN=43 Runoff=0.69 cfs 0.291 af

Reach R-1: Reach 1: Sections 0.0-3.0 Avg. Flow Depth=1.21' Max Vel=1.25 fps Inflow=26.93 cfs 24.920 af
L=850.0' S=0.0012 '/' Capacity=1,965.69 cfs Outflow=24.11 cfs 24.920 af

Reach R-2: Reach 2: Sections 3.0-4.5 Avg. Flow Depth=2.31' Max Vel=2.06 fps Inflow=55.75 cfs 29.871 af
L=420.0' S=0.0010 '/' Capacity=358.88 cfs Outflow=55.32 cfs 29.871 af

Reach R-3: Reach 3: Sections 4.5-11.0 Avg. Flow Depth=1.25' Max Vel=1.52 fps Inflow=58.40 cfs 33.994 af
L=1,615.0' S=0.0013 '/' Capacity=1,686.70 cfs Outflow=51.03 cfs 33.994 af

Reach R-4: Reach 4: Sections Avg. Flow Depth=2.58' Max Vel=1.71 fps Inflow=51.58 cfs 34.285 af
L=1,256.0' S=0.0007 '/' Capacity=170.12 cfs Outflow=47.47 cfs 34.284 af

Pond 1P: 36" RCP Storm Drain Peak Elev=422.39' Storage=184,247 cf Inflow=47.47 cfs 34.284 af
Primary=26.57 cfs 34.282 af Secondary=0.00 cfs 0.000 af Outflow=26.57 cfs 34.282 af

Total Runoff Area = 465.020 ac Runoff Volume = 34.285 af Average Runoff Depth = 0.88"
84.05% Pervious = 390.852 ac 15.95% Impervious = 74.168 ac

Summary for Subcatchment DA-1a: Existing Subcatchment Area 1A

Area sized to give full flow through pipe during 10 yr storm.

Flow source assumed to be residential drainage from neighborhoods to the west.

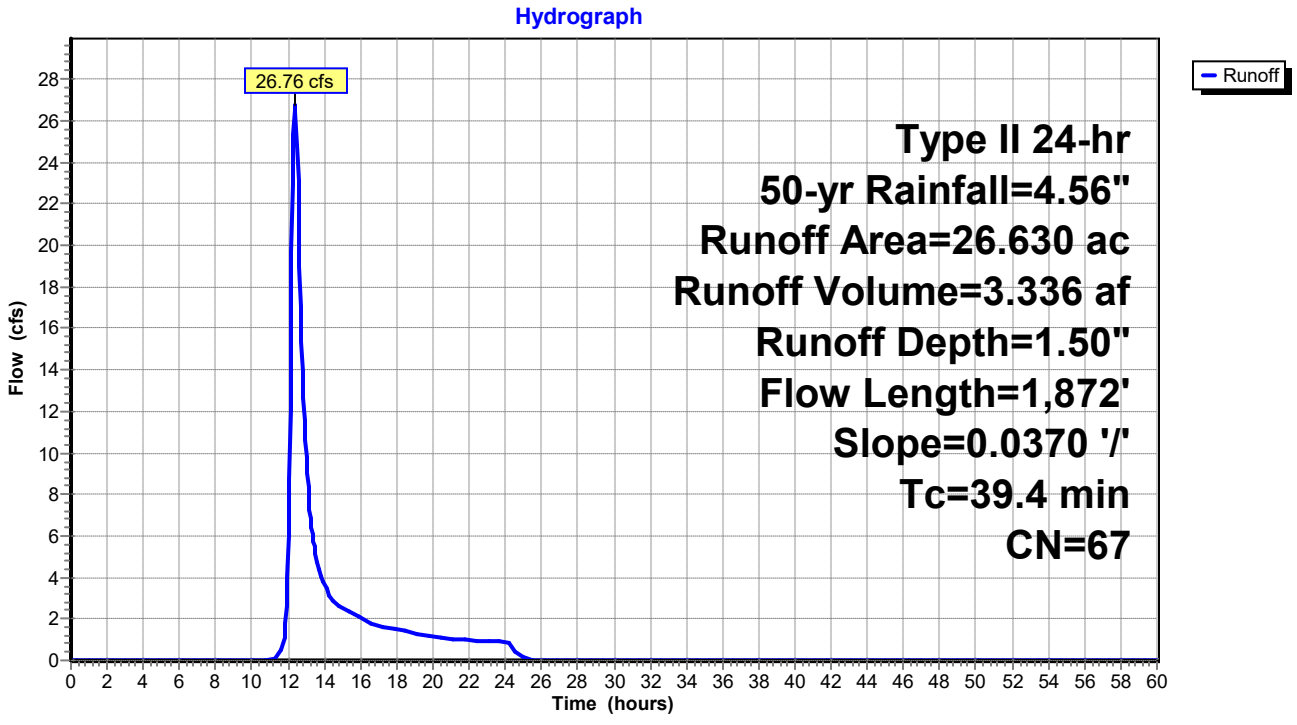
Runoff = 26.76 cfs @ 12.39 hrs, Volume= 3.336 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=4.56"

	Area (ac)	CN	Description
*	14.320	50	>75% Grass cover, Good, HSG A/B
	11.490	88	Urban industrial, 72% imp, HSG B
*	0.820	73	Brush, Good, HSG D - Canal
	26.630	67	Weighted Average
	18.357		68.93% Pervious Area
	8.273		31.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.4	1,872	0.0370	0.79		**Lag/CN Method,**

Subcatchment DA-1a: Existing Subcatchment Area 1A



Summary for Subcatchment DA-1b: Existing Subcatchment Area 1B

See map A for total area of 188,420 sf.

Estimated 10% roof surface, 70% gravel surfaces, 20% near water as grass and forest.

Slope of flow: 438 to 435 surface elevation over 300 feet for gravel; 435 to 421 over 50 feet

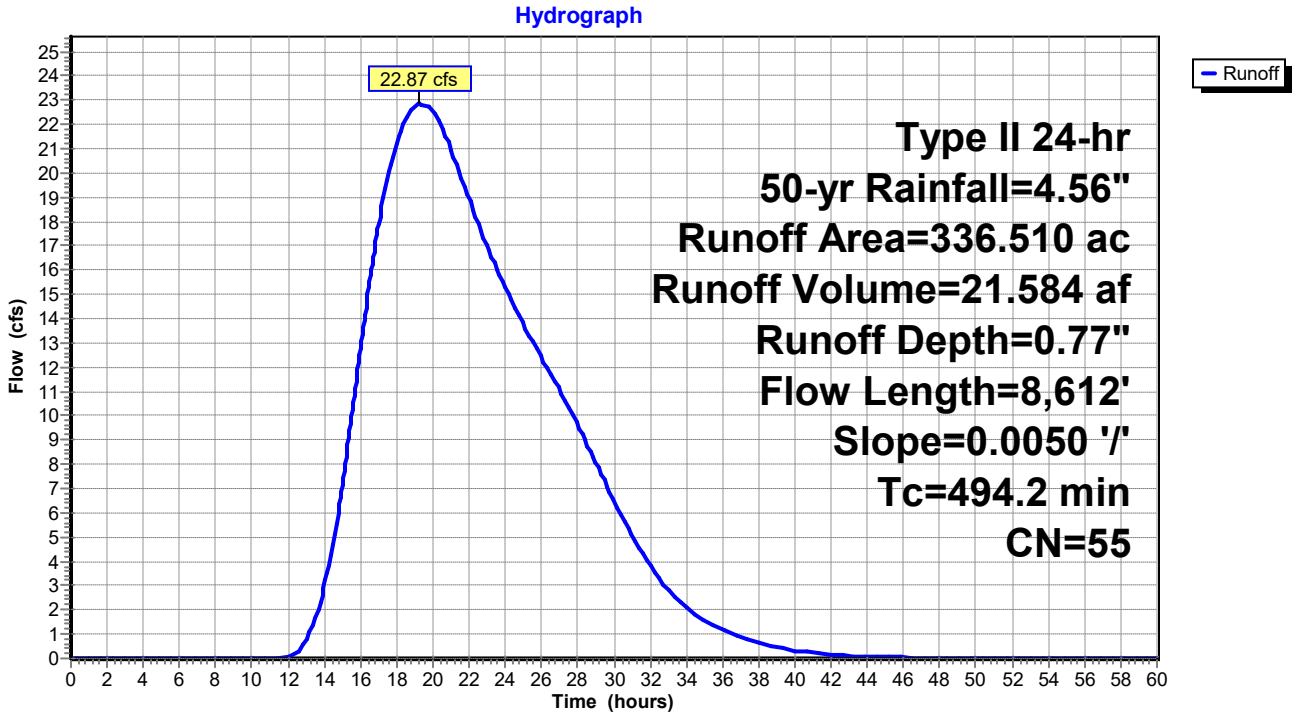
Runoff = 22.87 cfs @ 19.25 hrs, Volume= 21.584 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=4.56"

	Area (ac)	CN	Description
*	43.640	62	1/2 acre lots, 25% imp, HSG A/B
	18.600	88	Urban industrial, 72% imp, HSG B
*	91.150	55	Woods, Good, HSG A/B
*	78.050	40	Brush, Good, HSG A/B
*	104.220	56	2 acre lots, 12% imp, HSG B/A
*	0.850	73	Brush, Good, HSG D - Canal
	336.510	55	Weighted Average
	299.702		89.06% Pervious Area
	36.808		10.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
494.2	8,612	0.0050	0.29		**Lag/CN Method, Incude Est Attenuation**

Subcatchment DA-1b: Existing Subcatchment Area 1B



Summary for Subcatchment DA-2: Existing Subcatchment Area 2

Cover type: industrial type A soils based on Maps C, D and F.

Channel Tc:

Slope as 445 inlet to 420 outlet over 460 feet.

Perimiter as length (460)x2 + width (50)x2.

X-sec area estimated as rectangular with 5' depth and 25' wide.

Other Tc area: 16' elev over 430 feet. Unpaved based on aerial photography.

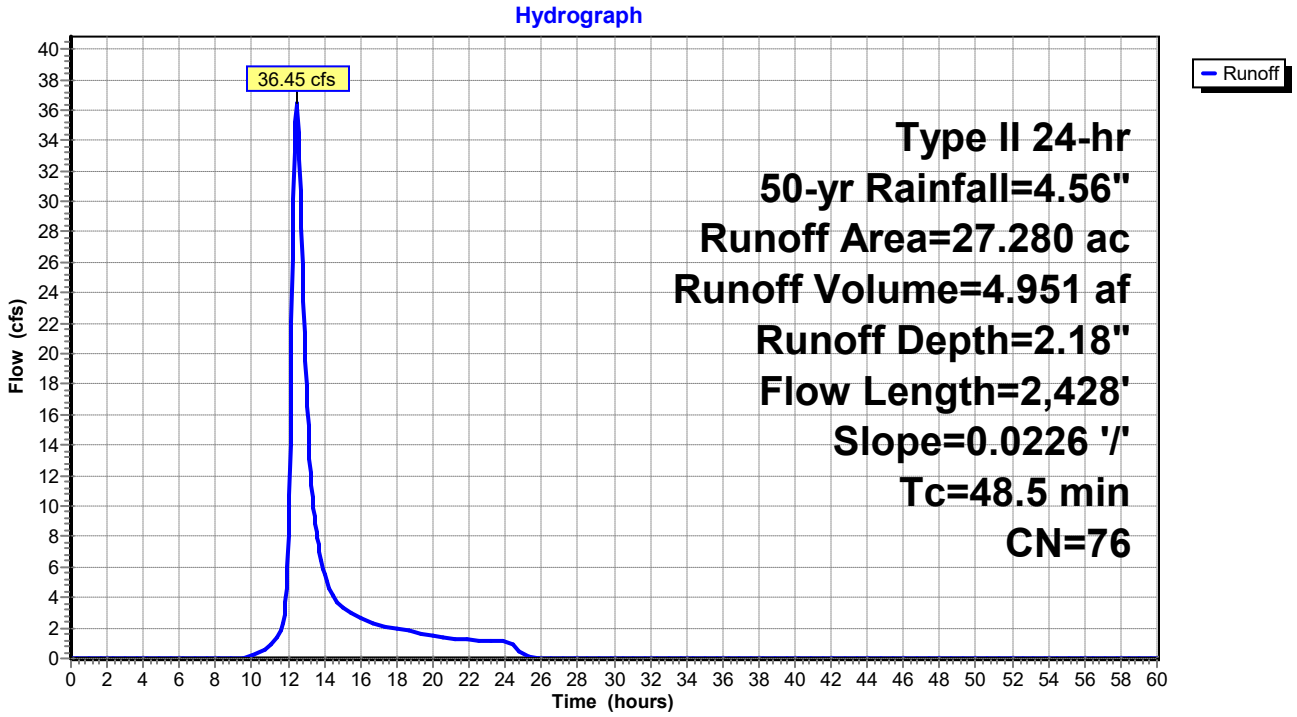
Runoff = 36.45 cfs @ 12.48 hrs, Volume= 4.951 af, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=4.56"

	Area (ac)	CN	Description
*	16.600	92	Urban Ind/Com, 85% imp, HSG B
*	9.880	48	Brush, Good, HSG A/B
*	0.800	73	Brush, Good, HSG D - Canal
	27.280	76	Weighted Average
	13.170		48.28% Pervious Area
	14.110		51.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
48.5	2,428	0.0226	0.83		**Lag/CN Method,**

Subcatchment DA-2: Existing Subcatchment Area 2



Summary for Subcatchment DA-3: Existing Subcatchment Area 3

Cover type: 20% industrial class A, 30% wood class B, 30% range class B, 20% grass class B for large area south of Bleecker. 55% grass 45% wood class B for area west of channel and north of Bleecker.

Channel Tc:

Slope as 452 inlet to 419 outlet over 565 feet.

Perimiter as length 565'x2 + width (12')x2.

X-sec area estimated as rectangular with 5' depth and 12' wide.

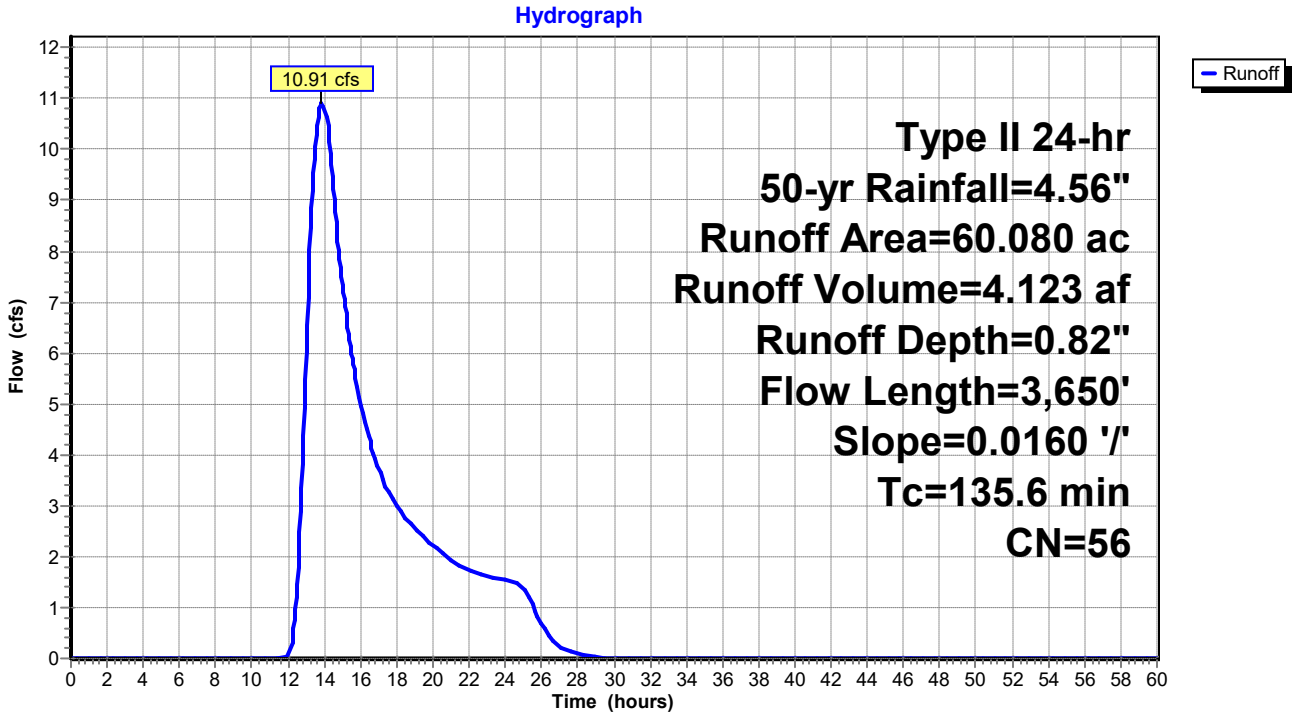
Runoff = 10.91 cfs @ 13.86 hrs, Volume= 4.123 af, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=4.56"

	Area (ac)	CN	Description
	17.620	92	Urban commercial, 85% imp, HSG B
*	6.830	43	Woods, Good, HSG A/B
*	34.150	39	Brush, Good, HSG A/B
*	1.480	73	Brush, Good, HSG D - Canal
	60.080	56	Weighted Average
	45.103		75.07% Pervious Area
	14.977		24.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
135.6	3,650	0.0160	0.45		**Lag/CN Method,**

Subcatchment DA-3: Existing Subcatchment Area 3



Summary for Subcatchment DA-4: Existing Subcatchment Area 4

See Map A for area of subcatchment and farthest run for Tc. Slope calculated as 725 foot run from 460 to 418 elevation.

CN for area average of A and B soil groups for grass/woodland.

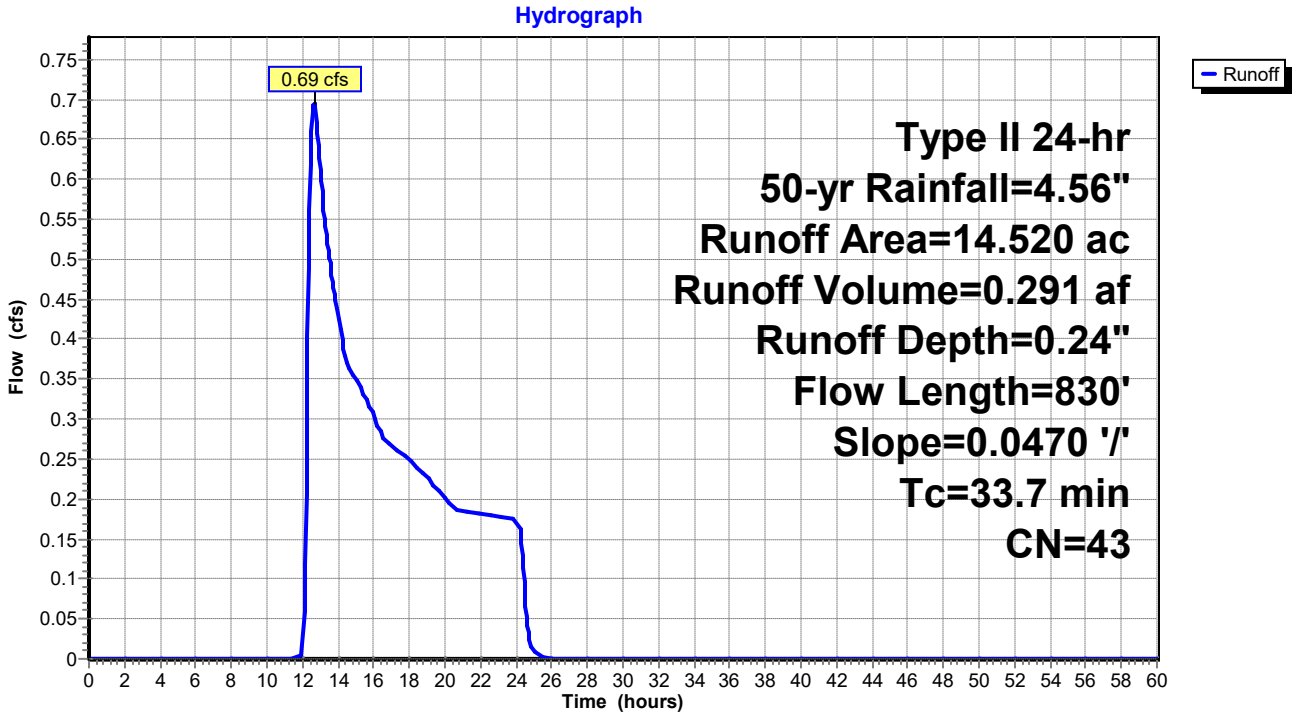
Runoff = 0.69 cfs @ 12.64 hrs, Volume= 0.291 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-yr Rainfall=4.56"

	Area (ac)	CN	Description
*	12.880	39	Brush, Good, HSG A/B
*	1.640	73	Brush, Good, HSG D - Canal
	14.520	43	Weighted Average
	14.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.7	830	0.0470	0.41		**Lag/CN Method,**

Subcatchment DA-4: Existing Subcatchment Area 4



Summary for Reach R-1: Reach 1: Sections 0.0-3.0

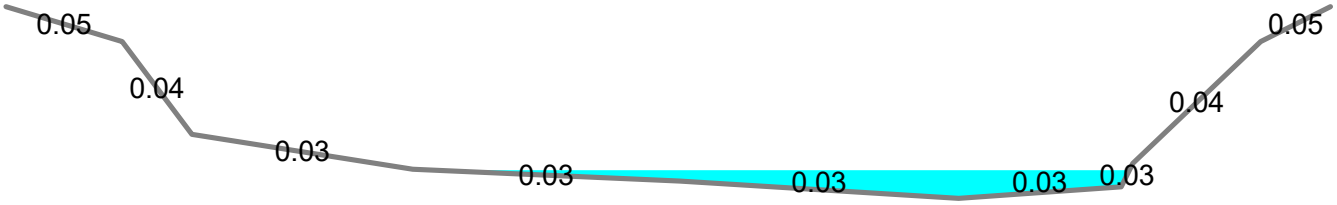
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 363.140 ac, 12.41% Impervious, Inflow Depth = 0.82" for 50-yr event
Inflow = 26.93 cfs @ 12.39 hrs, Volume= 24.920 af
Outflow = 24.11 cfs @ 19.56 hrs, Volume= 24.920 af, Atten= 10%, Lag= 429.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.25 fps, Min. Travel Time= 11.3 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 21.3 min

Peak Storage= 16,345 cf @ 19.37 hrs
Average Depth at Peak Storage= 1.21'
Bank-Full Depth= 8.25' Flow Area= 336.1 sf, Capacity= 1,965.69 cfs

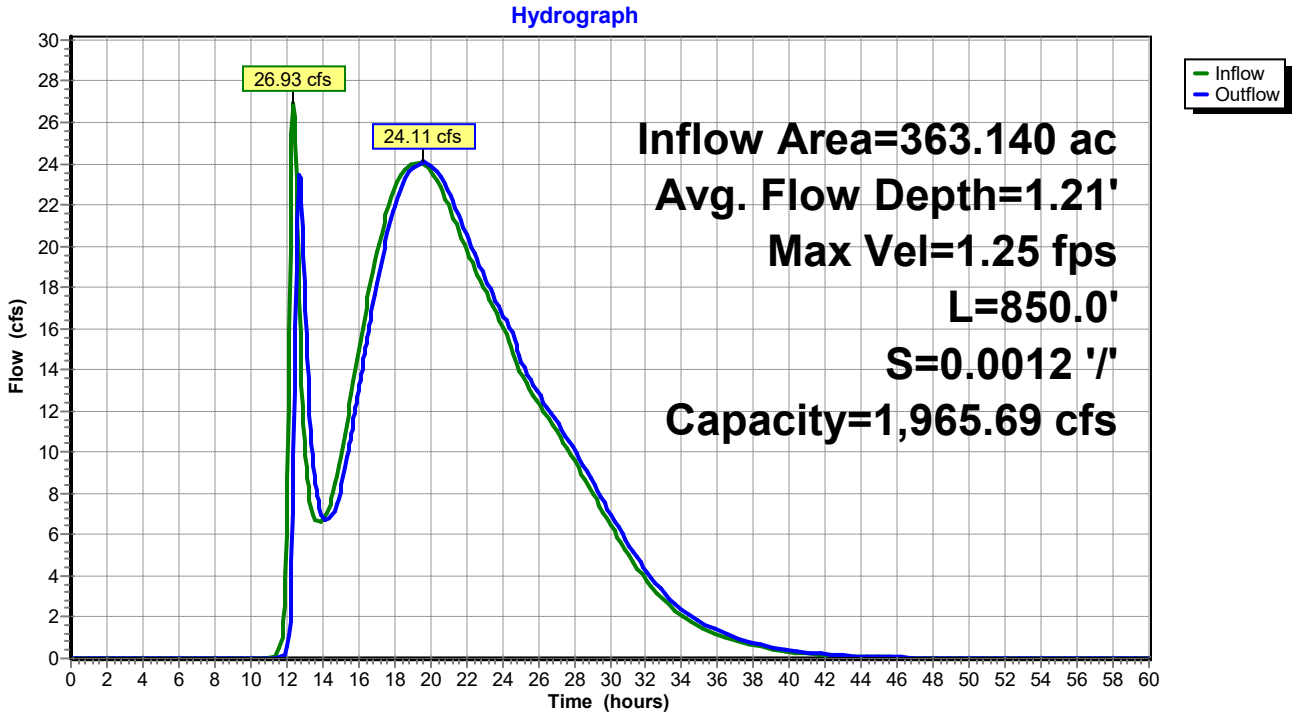
Custom cross-section, Length= 850.0' Slope= 0.0012 '/' (105 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 424.00', Outlet Invert= 423.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
21.00	425.00	0.00		
26.00	423.50	1.50	0.050	Earth, cobble bottom, clean sides
29.00	419.50	5.50	0.040	Earth, dense weeds
38.50	418.00	7.00	0.030	Earth, grassed & winding
50.00	417.50	7.50	0.030	Earth, grassed & winding
62.00	416.75	8.25	0.030	Earth, grassed & winding
69.00	417.25	7.75	0.030	Earth, grassed & winding
69.50	418.25	6.75	0.030	
75.00	423.50	1.50	0.040	
78.00	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.50	3.8	15.0	3,190	2.54
0.75	8.0	19.3	6,813	7.58
1.25	20.5	31.4	17,438	26.25
1.50	28.4	33.3	24,181	43.54
2.75	74.9	43.1	63,702	186.64
6.75	256.6	53.9	218,078	1,319.79
8.25	336.1	62.5	285,653	1,965.69

Reach R-1: Reach 1: Sections 0.0-3.0



Summary for Reach R-2: Reach 2: Sections 3.0-4.5

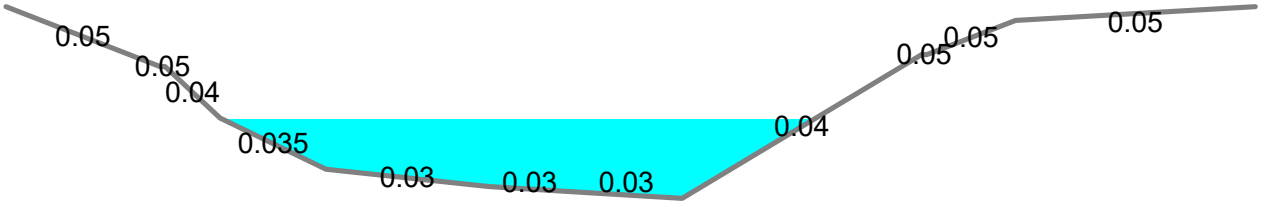
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 390.420 ac, 15.16% Impervious, Inflow Depth = 0.92" for 50-yr event
Inflow = 55.75 cfs @ 12.62 hrs, Volume= 29.871 af
Outflow = 55.32 cfs @ 12.71 hrs, Volume= 29.871 af, Atten= 1%, Lag= 5.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.06 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 0.75 fps, Avg. Travel Time= 9.3 min

Peak Storage= 11,303 cf @ 12.66 hrs
Average Depth at Peak Storage= 2.31'
Bank-Full Depth= 5.60' Flow Area= 103.5 sf, Capacity= 358.88 cfs

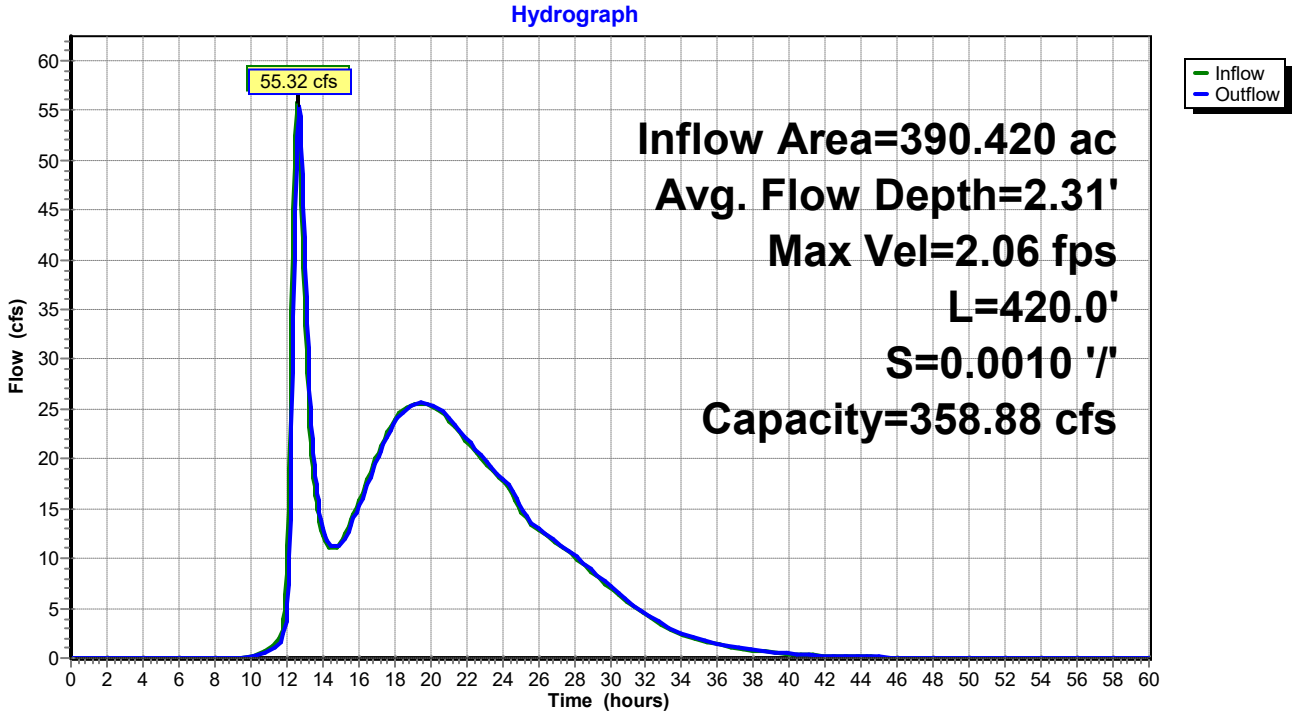
Custom cross-section, Length= 420.0' Slope= 0.0010 '/' (105 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.40', Outlet Invert= 423.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
33.50	425.00	0.00		
38.00	423.25	1.75	0.050	Earth, cobble bottom, clean sides
38.15	423.25	1.75	0.050	Earth, cobble bottom, clean sides
39.75	421.75	3.25	0.040	
42.85	420.25	4.75	0.035	
47.60	419.75	5.25	0.030	Earth, grassed & winding
50.00	419.60	5.40	0.030	Earth, grassed & winding
53.25	419.40	5.60	0.030	Earth, grassed & winding
60.25	423.60	1.40	0.040	
60.40	423.60	1.40	0.050	Earth, cobble bottom, clean sides
63.00	424.60	0.40	0.050	
70.00	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.20	0.4	3.6	151	0.11
0.35	1.1	6.3	460	0.51
0.85	5.6	12.1	2,355	5.04
2.35	27.5	18.4	11,564	57.22
3.85	56.7	23.7	23,827	162.15
4.20	64.6	25.5	27,122	194.15
5.20	90.5	31.0	37,994	306.46
5.60	103.5	39.2	43,451	358.88

Reach R-2: Reach 2: Sections 3.0-4.5



Summary for Reach R-3: Reach 3: Sections 4.5-11.0

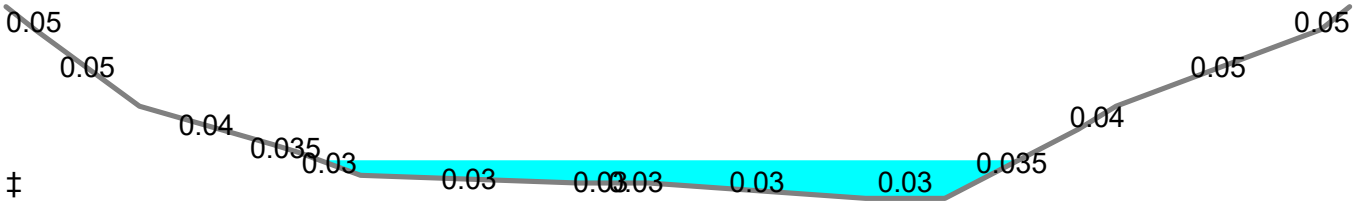
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 450.500 ac, 16.46% Impervious, Inflow Depth = 0.91" for 50-yr event
Inflow = 58.40 cfs @ 12.73 hrs, Volume= 33.994 af
Outflow = 51.03 cfs @ 13.24 hrs, Volume= 33.994 af, Atten= 13%, Lag= 30.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.52 fps, Min. Travel Time= 17.7 min
Avg. Velocity = 0.64 fps, Avg. Travel Time= 42.0 min

Peak Storage= 54,100 cf @ 12.95 hrs
Average Depth at Peak Storage= 1.25'
Bank-Full Depth= 6.25' Flow Area= 349.9 sf, Capacity= 1,686.70 cfs

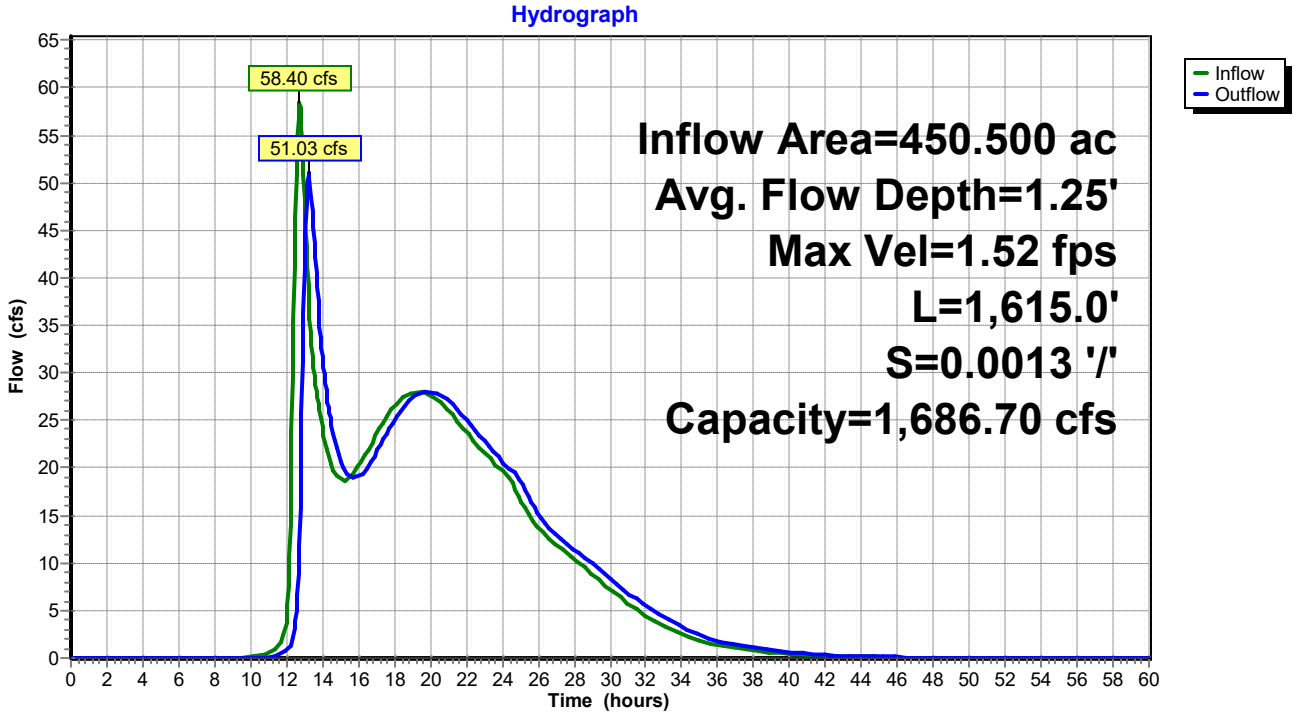
Custom cross-section, Length= 1,615.0' Slope= 0.0013 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.10', Outlet Invert= 421.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
13.00	425.00	0.00		
14.75	424.25	0.75	0.050	Earth, cobble bottom, clean sides
21.00	421.75	3.25	0.050	Earth, cobble bottom, clean sides
29.00	420.50	4.50	0.040	Earth, grassed & winding
30.50	420.25	4.75	0.035	Earth, dense weeds
34.25	419.50	5.50	0.030	Earth, grassed & winding
47.25	419.25	5.75	0.030	Earth, grassed & winding
50.00	419.25	5.75	0.030	Earth, grassed & winding
51.50	419.25	5.75	0.030	Earth, grassed & winding
64.50	418.75	6.25	0.030	Earth, grassed & winding
69.25	418.75	6.25	0.030	Earth, grassed & winding
77.25	421.00	4.00	0.035	
79.50	421.75	3.25	0.040	
91.75	424.25	0.75	0.050	Earth, cobble bottom, clean sides
93.50	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.8	0	0.00
0.50	6.1	23.9	9,802	4.31
0.75	13.8	37.8	22,206	12.39
1.50	44.4	44.4	71,716	79.03
1.75	55.7	46.8	89,997	113.53
2.25	80.2	51.9	129,533	198.84
3.00	121.4	59.1	196,122	370.72
5.50	290.8	78.4	469,662	1,302.31
6.25	349.9	82.2	565,048	1,686.70

Reach R-3: Reach 3: Sections 4.5-11.0



Summary for Reach R-4: Reach 4: Sections 11.0-16.5

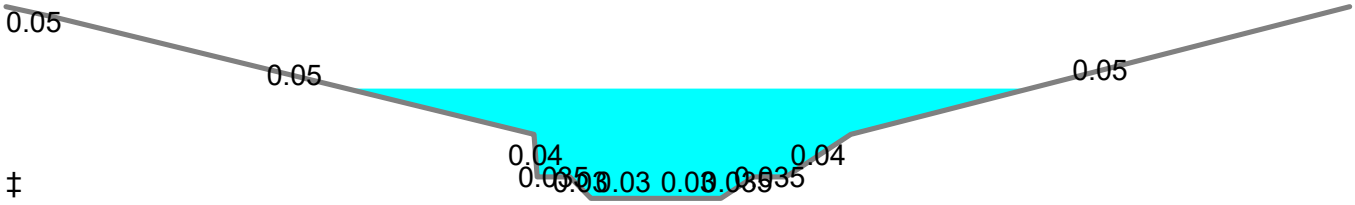
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth = 0.88" for 50-yr event
Inflow = 51.58 cfs @ 13.24 hrs, Volume= 34.285 af
Outflow = 47.47 cfs @ 13.66 hrs, Volume= 34.284 af, Atten= 8%, Lag= 24.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.71 fps, Min. Travel Time= 12.2 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 26.2 min

Peak Storage= 34,845 cf @ 13.45 hrs
Average Depth at Peak Storage= 2.58'
Bank-Full Depth= 4.50' Flow Area= 87.5 sf, Capacity= 170.12 cfs

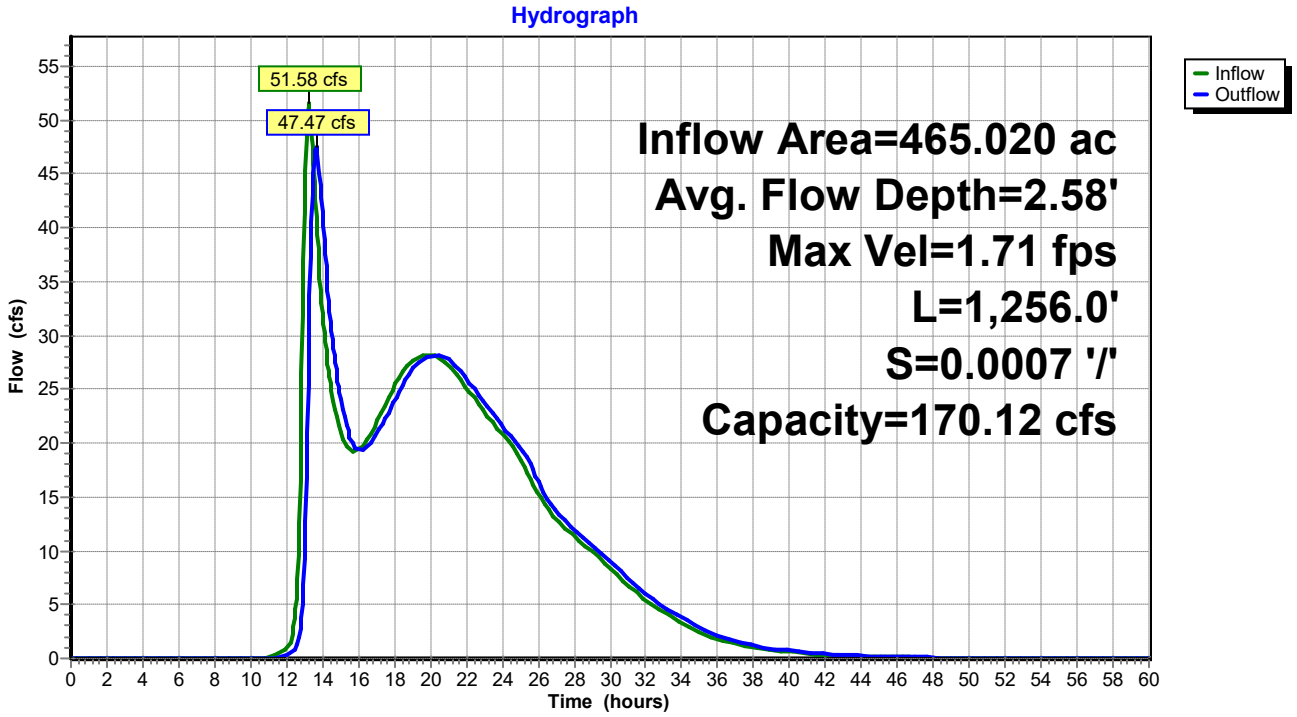
Custom cross-section, Length= 1,256.0' Slope= 0.0007 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 421.00', Outlet Invert= 420.11'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
30.00	425.00	0.00		
31.50	424.75	0.25	0.050	Earth, cobble bottom, clean sides
46.25	422.00	3.00	0.050	Earth, cobble bottom, clean sides
46.35	421.00	4.00	0.040	Earth, grassed & winding
47.35	421.00	4.00	0.035	Earth, grassed & winding
48.00	420.50	4.50	0.030	Earth, grassed & winding
50.00	420.50	4.50	0.030	Earth, grassed & winding
52.00	420.50	4.50	0.030	Earth, grassed & winding
53.00	421.00	4.00	0.035	Earth, dense weeds
54.00	421.00	4.00	0.035	Earth, grassed & winding
56.00	422.00	3.00	0.040	
71.35	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.0	0	0.00
0.50	2.4	7.9	3,042	1.78
1.50	11.1	11.2	13,957	15.68
4.25	77.6	40.5	97,407	148.42
4.50	87.5	43.3	109,955	170.12

Reach R-4: Reach 4: Sections 11.0-16.5



Summary for Pond 1P: 36" RCP Storm Drain

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth = 0.88" for 50-yr event
Inflow = 47.47 cfs @ 13.66 hrs, Volume= 34.284 af
Outflow = 26.57 cfs @ 21.76 hrs, Volume= 34.282 af, Atten= 44%, Lag= 485.9 min
Primary = 26.57 cfs @ 21.76 hrs, Volume= 34.282 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 422.39' @ 21.76 hrs Surf.Area= 130,730 sf Storage= 184,247 cf
Flood Elev= 425.00' Surf.Area= 219,464 sf Storage= 650,922 cf

Plug-Flow detention time= 117.8 min calculated for 34.282 af (100% of inflow)
Center-of-Mass det. time= 117.6 min (1,404.2 - 1,286.5)

Volume	Invert	Avail.Storage	Storage Description
#1	420.11'	888,946 cf	**Canal (Prismatic)** Listed below (Recalc)

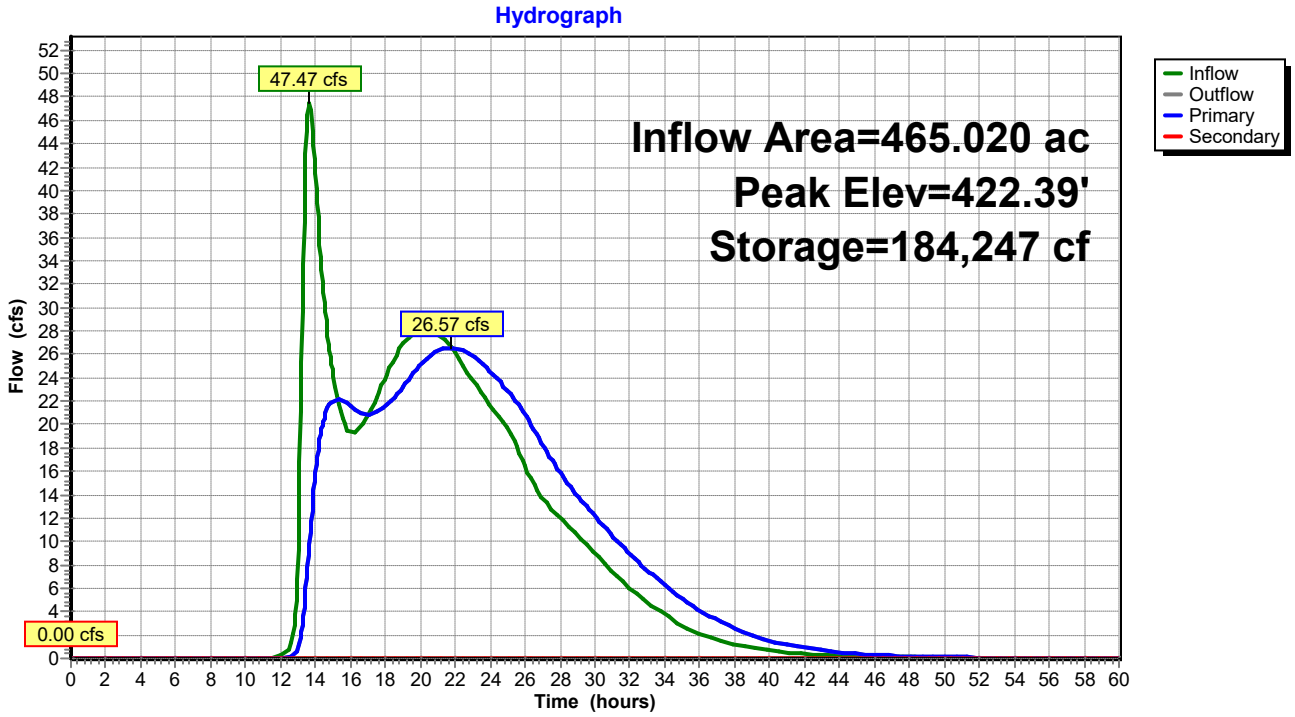
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.11	100	0	0
421.00	84,779	37,771	37,771
422.00	113,500	99,140	136,911
423.00	157,948	135,724	272,635
424.00	189,581	173,765	446,399
425.00	219,464	204,523	650,922
426.00	256,585	238,025	888,946

Device	Routing	Invert	Outlet Devices
#1	Primary	420.11'	**36.0" Round RCP_Round 36"** L= 155.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 420.11' / 419.37' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	425.40'	**260.0' long x 20.0' breadth Canal Overflow to Highway ROW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=26.57 cfs @ 21.76 hrs HW=422.39' (Free Discharge)
↑—**1=RCP_Round 36"** (Barrel Controls 26.57 cfs @ 6.39 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.11' (Free Discharge)
↑—**2=Canal Overflow to Highway ROW** (Controls 0.00 cfs)

Pond 1P: 36" RCP Storm Drain



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1a: Existing Runoff Area=26.630 ac 31.07% Impervious Runoff Depth=1.84"
Flow Length=1,872' Slope=0.0370 '/' Tc=39.4 min CN=67 Runoff=33.57 cfs 4.094 af

Subcatchment DA-1b: Existing Runoff Area=336.510 ac 10.94% Impervious Runoff Depth=1.01"
Flow Length=8,612' Slope=0.0050 '/' Tc=494.2 min CN=55 Runoff=30.71 cfs 28.322 af

Subcatchment DA-2: Existing Runoff Area=27.280 ac 51.72% Impervious Runoff Depth=2.59"
Flow Length=2,428' Slope=0.0226 '/' Tc=48.5 min CN=76 Runoff=43.63 cfs 5.877 af

Subcatchment DA-3: Existing Runoff Area=60.080 ac 24.93% Impervious Runoff Depth=1.07"
Flow Length=3,650' Slope=0.0160 '/' Tc=135.6 min CN=56 Runoff=15.00 cfs 5.370 af

Subcatchment DA-4: Existing Runoff Area=14.520 ac 0.00% Impervious Runoff Depth=0.37"
Flow Length=830' Slope=0.0470 '/' Tc=33.7 min CN=43 Runoff=1.56 cfs 0.448 af

Reach R-1: Reach 1: Sections 0.0-3.0 Avg. Flow Depth=1.34' Max Vel=1.38 fps Inflow=33.82 cfs 32.417 af
L=850.0' S=0.0012 '/' Capacity=1,965.69 cfs Outflow=32.18 cfs 32.417 af

Reach R-2: Reach 2: Sections 3.0-4.5 Avg. Flow Depth=2.57' Max Vel=2.21 fps Inflow=69.58 cfs 38.293 af
L=420.0' S=0.0010 '/' Capacity=358.88 cfs Outflow=69.12 cfs 38.293 af

Reach R-3: Reach 3: Sections 4.5-11.0 Avg. Flow Depth=1.38' Max Vel=1.66 fps Inflow=73.43 cfs 43.664 af
L=1,615.0' S=0.0013 '/' Capacity=1,686.70 cfs Outflow=64.84 cfs 43.664 af

Reach R-4: Reach 4: Sections Avg. Flow Depth=2.88' Max Vel=1.75 fps Inflow=65.77 cfs 44.112 af
L=1,256.0' S=0.0007 '/' Capacity=170.12 cfs Outflow=60.37 cfs 44.111 af

Pond 1P: 36" RCP Storm Drain Peak Elev=422.82' Storage=245,280 cf Inflow=60.37 cfs 44.111 af
Primary=34.69 cfs 44.109 af Secondary=0.00 cfs 0.000 af Outflow=34.69 cfs 44.109 af

Total Runoff Area = 465.020 ac Runoff Volume = 44.112 af Average Runoff Depth = 1.14"
84.05% Pervious = 390.852 ac 15.95% Impervious = 74.168 ac

Summary for Subcatchment DA-1a: Existing Subcatchment Area 1A

Area sized to give full flow through pipe during 10 yr storm.

Flow source assumed to be residential drainage from neighborhoods to the west.

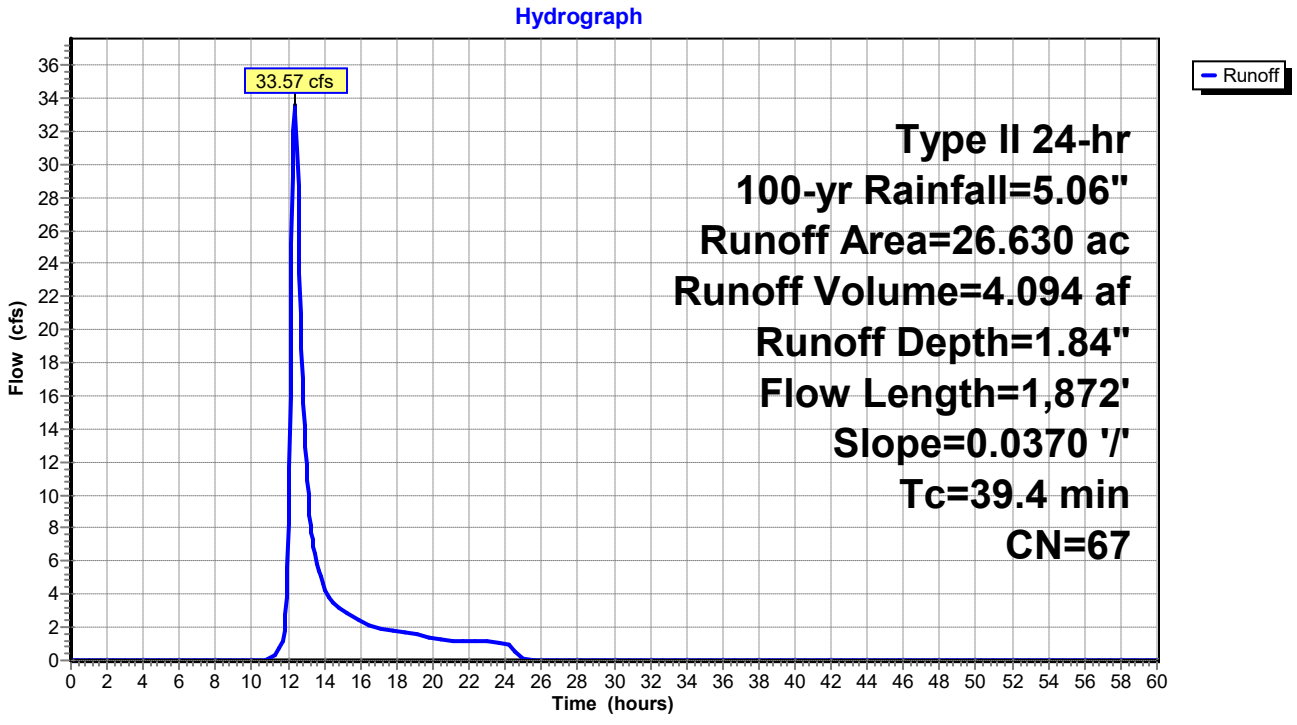
Runoff = 33.57 cfs @ 12.38 hrs, Volume= 4.094 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.06"

	Area (ac)	CN	Description
*	14.320	50	>75% Grass cover, Good, HSG A/B
	11.490	88	Urban industrial, 72% imp, HSG B
*	0.820	73	Brush, Good, HSG D - Canal
	26.630	67	Weighted Average
	18.357		68.93% Pervious Area
	8.273		31.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.4	1,872	0.0370	0.79		**Lag/CN Method,**

Subcatchment DA-1a: Existing Subcatchment Area 1A



Summary for Subcatchment DA-1b: Existing Subcatchment Area 1B

See map A for total area of 188,420 sf.

Estimated 10% roof surface, 70% gravel surfaces, 20% near water as grass and forest.

Slope of flow: 438 to 435 surface elevation over 300 feet for gravel; 435 to 421 over 50 feet

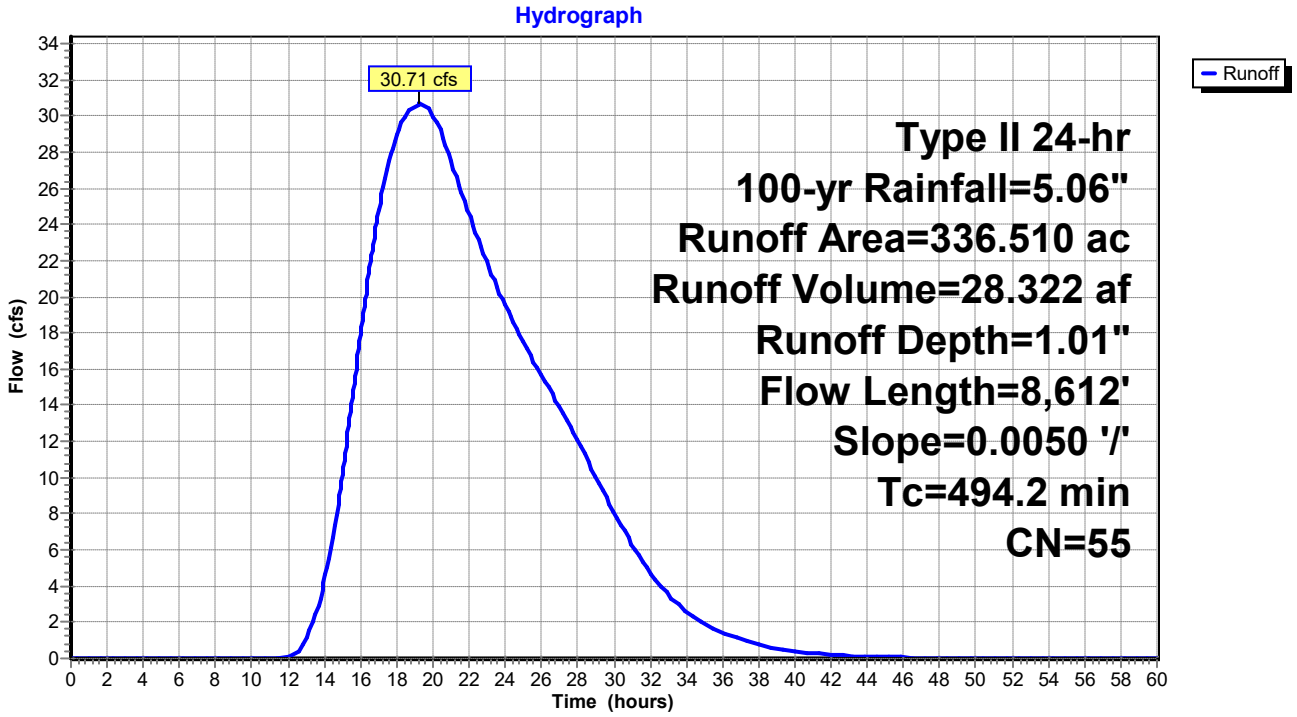
Runoff = 30.71 cfs @ 19.22 hrs, Volume= 28.322 af, Depth= 1.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.06"

	Area (ac)	CN	Description
*	43.640	62	1/2 acre lots, 25% imp, HSG A/B
	18.600	88	Urban industrial, 72% imp, HSG B
*	91.150	55	Woods, Good, HSG A/B
*	78.050	40	Brush, Good, HSG A/B
*	104.220	56	2 acre lots, 12% imp, HSG B/A
*	0.850	73	Brush, Good, HSG D - Canal
	336.510	55	Weighted Average
	299.702		89.06% Pervious Area
	36.808		10.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
494.2	8,612	0.0050	0.29		**Lag/CN Method, Incude Est Attenuation**

Subcatchment DA-1b: Existing Subcatchment Area 1B



Summary for Subcatchment DA-2: Existing Subcatchment Area 2

Cover type: industrial type A soils based on Maps C, D and F.

Channel Tc:

Slope as 445 inlet to 420 outlet over 460 feet.

Perimiter as length (460)x2 + width (50)x2.

X-sec area estimated as rectangular with 5' depth and 25' wide.

Other Tc area: 16' elev over 430 feet. Unpaved based on aerial photography.

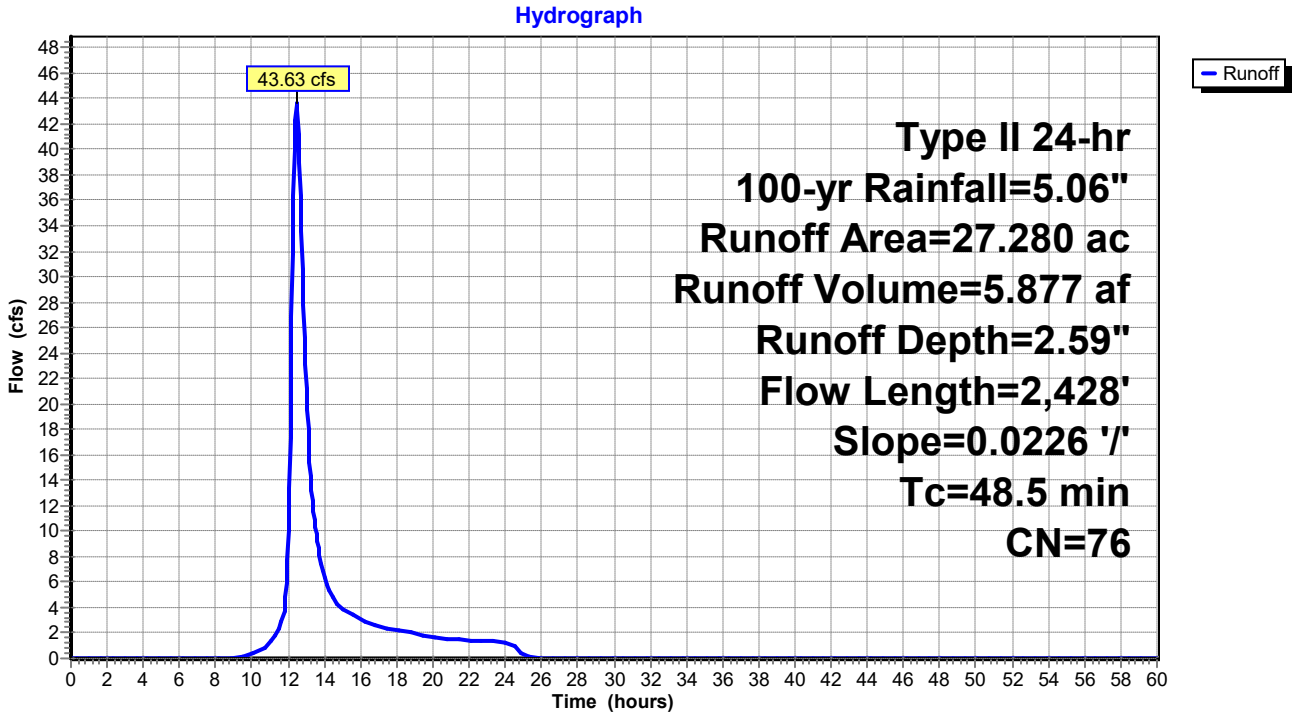
Runoff = 43.63 cfs @ 12.47 hrs, Volume= 5.877 af, Depth= 2.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.06"

	Area (ac)	CN	Description
*	16.600	92	Urban Ind/Com, 85% imp, HSG B
*	9.880	48	Brush, Good, HSG A/B
*	0.800	73	Brush, Good, HSG D - Canal
	27.280	76	Weighted Average
	13.170		48.28% Pervious Area
	14.110		51.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
48.5	2,428	0.0226	0.83		**Lag/CN Method,**

Subcatchment DA-2: Existing Subcatchment Area 2



Summary for Subcatchment DA-3: Existing Subcatchment Area 3

Cover type: 20% industrial class A, 30% wood class B, 30% range class B, 20% grass class B for large area south of Bleecker. 55% grass 45% wood class B for area west of channel and north of Bleecker.

Channel Tc:

Slope as 452 inlet to 419 outlet over 565 feet.

Perimiter as length 565'x2 + width (12')x2.

X-sec area estimated as rectangular with 5' depth and 12' wide.

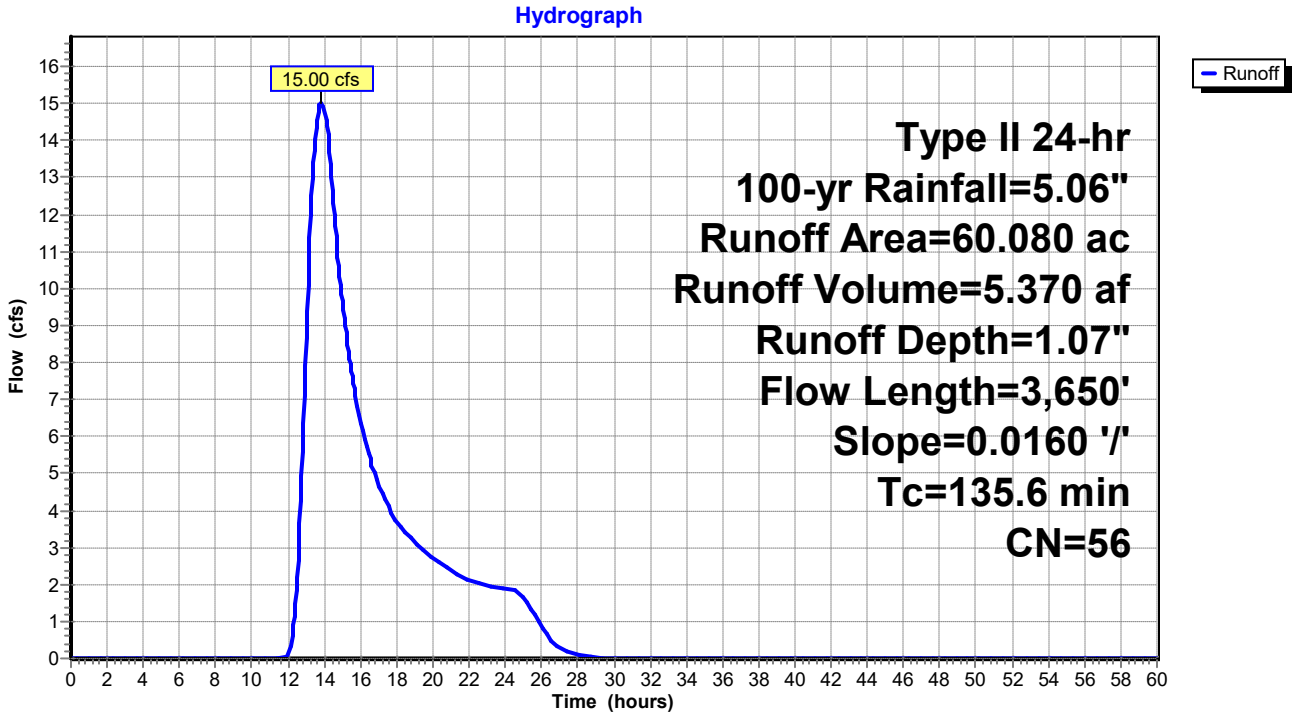
Runoff = 15.00 cfs @ 13.85 hrs, Volume= 5.370 af, Depth= 1.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.06"

	Area (ac)	CN	Description
	17.620	92	Urban commercial, 85% imp, HSG B
*	6.830	43	Woods, Good, HSG A/B
*	34.150	39	Brush, Good, HSG A/B
*	1.480	73	Brush, Good, HSG D - Canal
	60.080	56	Weighted Average
	45.103		75.07% Pervious Area
	14.977		24.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
135.6	3,650	0.0160	0.45		**Lag/CN Method,**

Subcatchment DA-3: Existing Subcatchment Area 3



Summary for Subcatchment DA-4: Existing Subcatchment Area 4

See Map A for area of subcatchment and farthest run for Tc. Slope calculated as 725 foot run from 460 to 418 elevation.

CN for area average of A and B soil groups for grass/woodland.

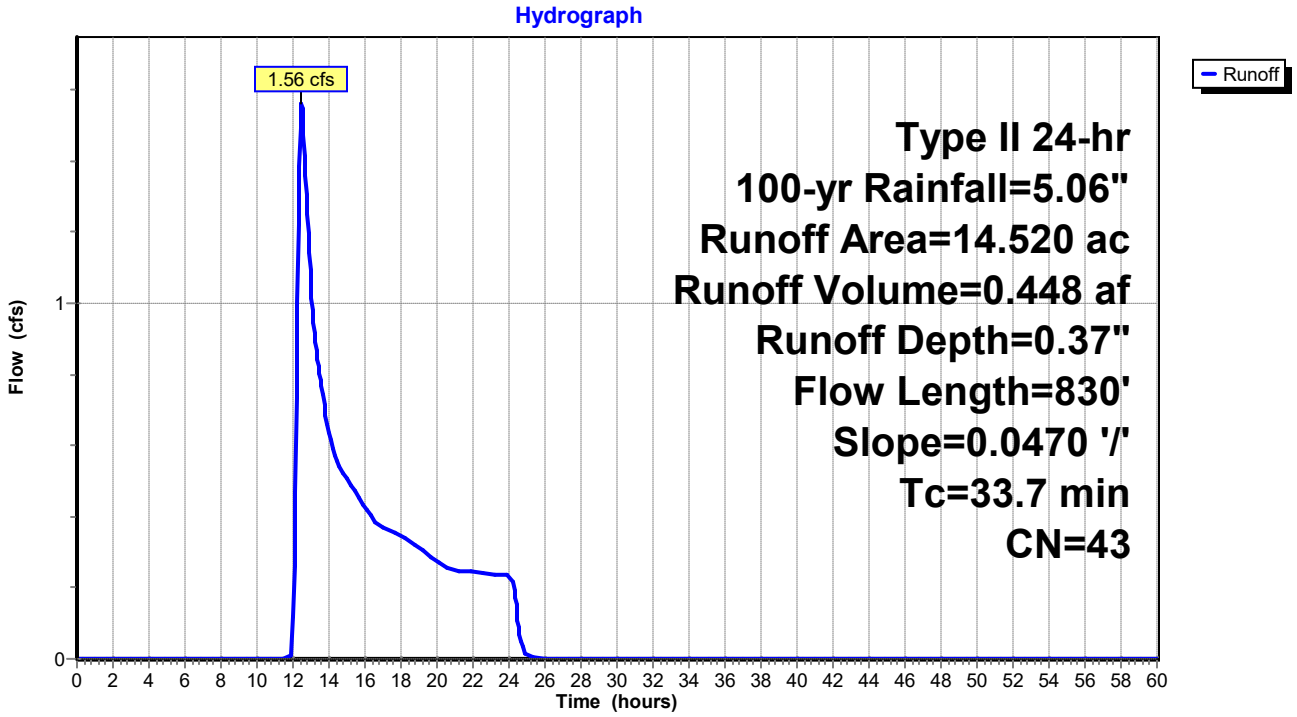
Runoff = 1.56 cfs @ 12.49 hrs, Volume= 0.448 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.06"

	Area (ac)	CN	Description
*	12.880	39	Brush, Good, HSG A/B
*	1.640	73	Brush, Good, HSG D - Canal
	14.520	43	Weighted Average
	14.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.7	830	0.0470	0.41		**Lag/CN Method,**

Subcatchment DA-4: Existing Subcatchment Area 4



Summary for Reach R-1: Reach 1: Sections 0.0-3.0

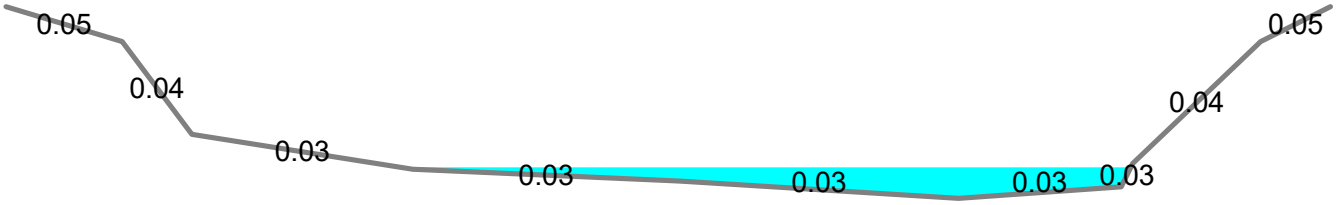
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 363.140 ac, 12.41% Impervious, Inflow Depth = 1.07" for 100-yr event
Inflow = 33.82 cfs @ 12.38 hrs, Volume= 32.417 af
Outflow = 32.18 cfs @ 19.45 hrs, Volume= 32.417 af, Atten= 5%, Lag= 423.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.38 fps, Min. Travel Time= 10.3 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 20.2 min

Peak Storage= 19,867 cf @ 19.28 hrs
Average Depth at Peak Storage= 1.34'
Bank-Full Depth= 8.25' Flow Area= 336.1 sf, Capacity= 1,965.69 cfs

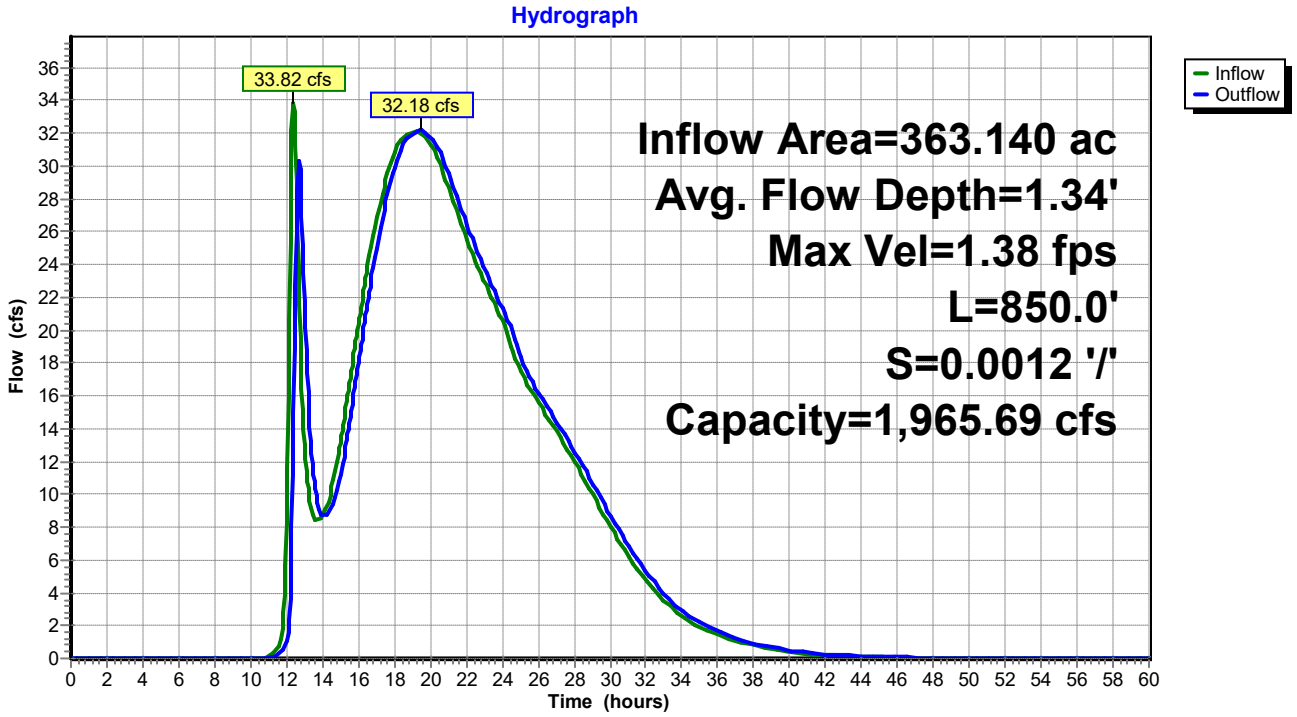
Custom cross-section, Length= 850.0' Slope= 0.0012 '/' (105 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 424.00', Outlet Invert= 423.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
21.00	425.00	0.00		
26.00	423.50	1.50	0.050	Earth, cobble bottom, clean sides
29.00	419.50	5.50	0.040	Earth, dense weeds
38.50	418.00	7.00	0.030	Earth, grassed & winding
50.00	417.50	7.50	0.030	Earth, grassed & winding
62.00	416.75	8.25	0.030	Earth, grassed & winding
69.00	417.25	7.75	0.030	Earth, grassed & winding
69.50	418.25	6.75	0.030	
75.00	423.50	1.50	0.040	
78.00	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.50	3.8	15.0	3,190	2.54
0.75	8.0	19.3	6,813	7.58
1.25	20.5	31.4	17,438	26.25
1.50	28.4	33.3	24,181	43.54
2.75	74.9	43.1	63,702	186.64
6.75	256.6	53.9	218,078	1,319.79
8.25	336.1	62.5	285,653	1,965.69

Reach R-1: Reach 1: Sections 0.0-3.0



Summary for Reach R-2: Reach 2: Sections 3.0-4.5

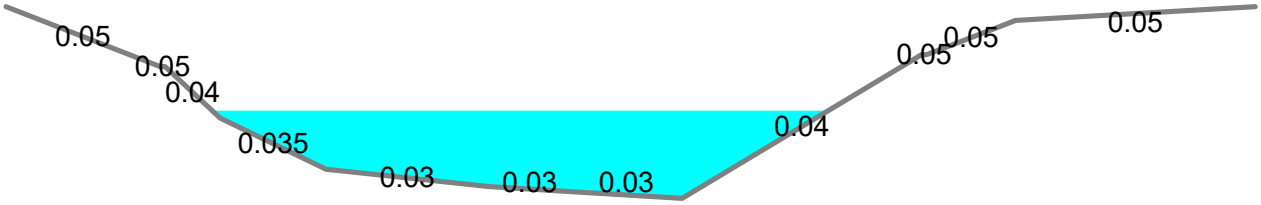
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 390.420 ac, 15.16% Impervious, Inflow Depth = 1.18" for 100-yr event
Inflow = 69.58 cfs @ 12.60 hrs, Volume= 38.293 af
Outflow = 69.12 cfs @ 12.69 hrs, Volume= 38.293 af, Atten= 1%, Lag= 5.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.21 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 8.7 min

Peak Storage= 13,167 cf @ 12.64 hrs
Average Depth at Peak Storage= 2.57'
Bank-Full Depth= 5.60' Flow Area= 103.5 sf, Capacity= 358.88 cfs

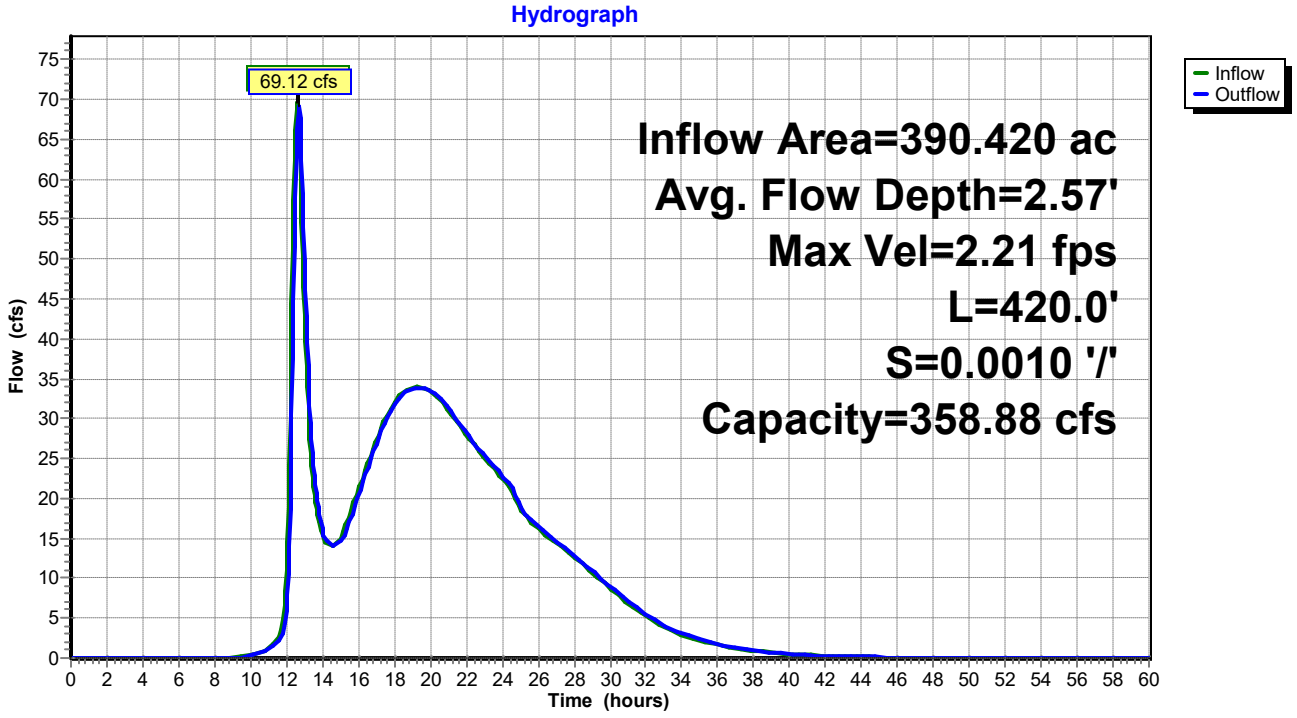
Custom cross-section, Length= 420.0' Slope= 0.0010 '/' (105 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.40', Outlet Invert= 423.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
33.50	425.00	0.00		
38.00	423.25	1.75	0.050	Earth, cobble bottom, clean sides
38.15	423.25	1.75	0.050	Earth, cobble bottom, clean sides
39.75	421.75	3.25	0.040	
42.85	420.25	4.75	0.035	
47.60	419.75	5.25	0.030	Earth, grassed & winding
50.00	419.60	5.40	0.030	Earth, grassed & winding
53.25	419.40	5.60	0.030	Earth, grassed & winding
60.25	423.60	1.40	0.040	
60.40	423.60	1.40	0.050	Earth, cobble bottom, clean sides
63.00	424.60	0.40	0.050	
70.00	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.20	0.4	3.6	151	0.11
0.35	1.1	6.3	460	0.51
0.85	5.6	12.1	2,355	5.04
2.35	27.5	18.4	11,564	57.22
3.85	56.7	23.7	23,827	162.15
4.20	64.6	25.5	27,122	194.15
5.20	90.5	31.0	37,994	306.46
5.60	103.5	39.2	43,451	358.88

Reach R-2: Reach 2: Sections 3.0-4.5



Summary for Reach R-3: Reach 3: Sections 4.5-11.0

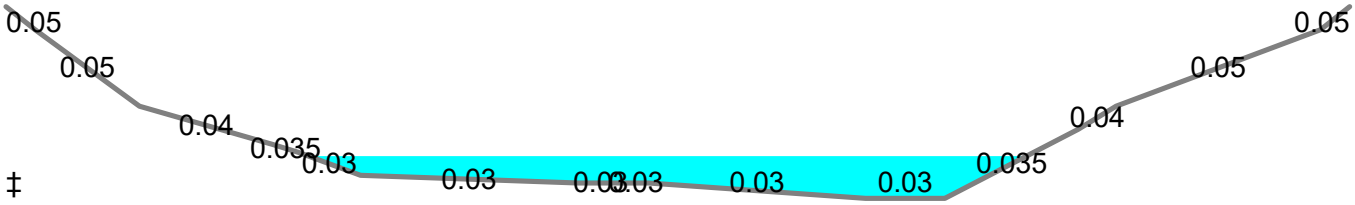
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 450.500 ac, 16.46% Impervious, Inflow Depth = 1.16" for 100-yr event
Inflow = 73.43 cfs @ 12.71 hrs, Volume= 43.664 af
Outflow = 64.84 cfs @ 13.18 hrs, Volume= 43.664 af, Atten= 12%, Lag= 27.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.66 fps, Min. Travel Time= 16.2 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 39.4 min

Peak Storage= 63,174 cf @ 12.91 hrs
Average Depth at Peak Storage= 1.38'
Bank-Full Depth= 6.25' Flow Area= 349.9 sf, Capacity= 1,686.70 cfs

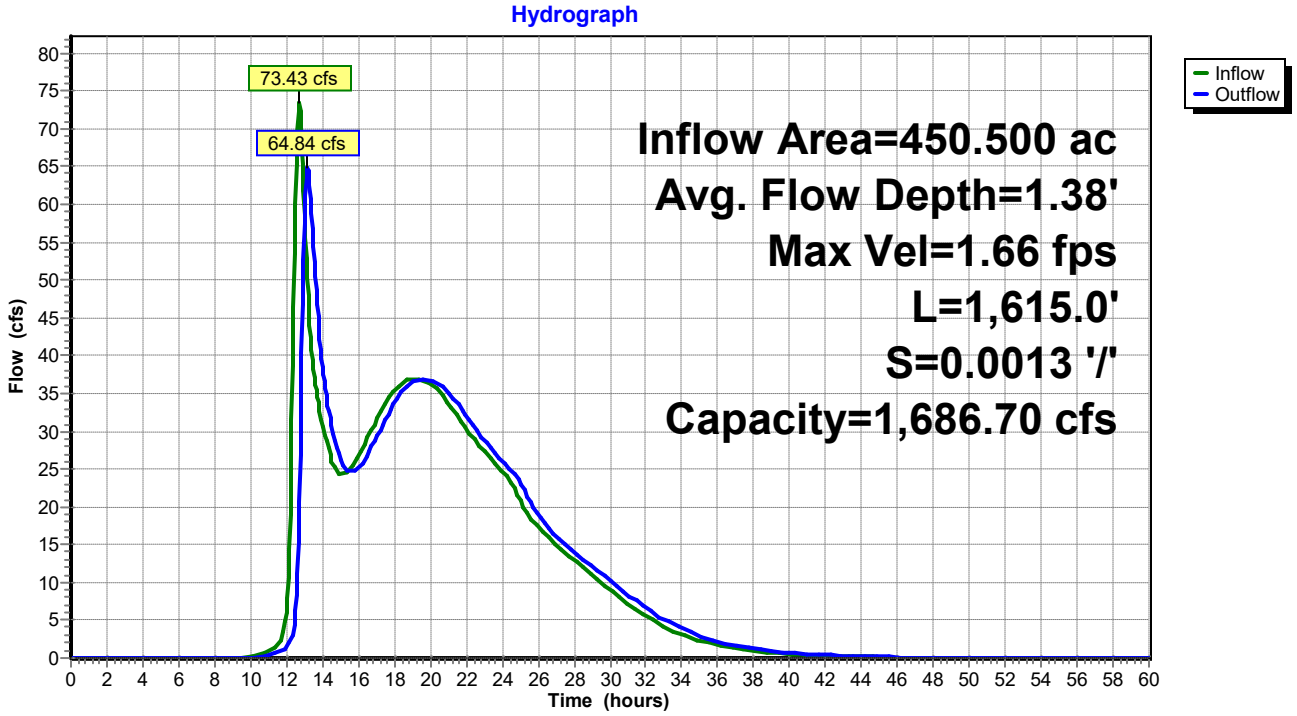
Custom cross-section, Length= 1,615.0' Slope= 0.0013 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.10', Outlet Invert= 421.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
13.00	425.00	0.00		
14.75	424.25	0.75	0.050	Earth, cobble bottom, clean sides
21.00	421.75	3.25	0.050	Earth, cobble bottom, clean sides
29.00	420.50	4.50	0.040	Earth, grassed & winding
30.50	420.25	4.75	0.035	Earth, dense weeds
34.25	419.50	5.50	0.030	Earth, grassed & winding
47.25	419.25	5.75	0.030	Earth, grassed & winding
50.00	419.25	5.75	0.030	Earth, grassed & winding
51.50	419.25	5.75	0.030	Earth, grassed & winding
64.50	418.75	6.25	0.030	Earth, grassed & winding
69.25	418.75	6.25	0.030	Earth, grassed & winding
77.25	421.00	4.00	0.035	
79.50	421.75	3.25	0.040	
91.75	424.25	0.75	0.050	Earth, cobble bottom, clean sides
93.50	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.8	0	0.00
0.50	6.1	23.9	9,802	4.31
0.75	13.8	37.8	22,206	12.39
1.50	44.4	44.4	71,716	79.03
1.75	55.7	46.8	89,997	113.53
2.25	80.2	51.9	129,533	198.84
3.00	121.4	59.1	196,122	370.72
5.50	290.8	78.4	469,662	1,302.31
6.25	349.9	82.2	565,048	1,686.70

Reach R-3: Reach 3: Sections 4.5-11.0



Summary for Reach R-4: Reach 4: Sections 11.0-16.5

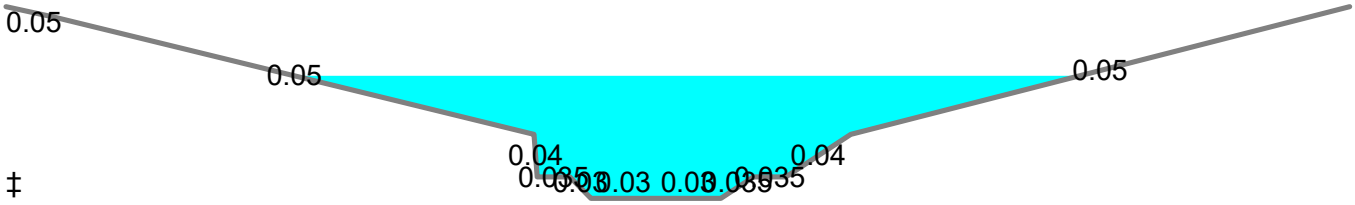
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth = 1.14" for 100-yr event
Inflow = 65.77 cfs @ 13.18 hrs, Volume= 44.112 af
Outflow = 60.37 cfs @ 13.58 hrs, Volume= 44.111 af, Atten= 8%, Lag= 24.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.75 fps, Min. Travel Time= 12.0 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 25.0 min

Peak Storage= 43,338 cf @ 13.38 hrs
Average Depth at Peak Storage= 2.88'
Bank-Full Depth= 4.50' Flow Area= 87.5 sf, Capacity= 170.12 cfs

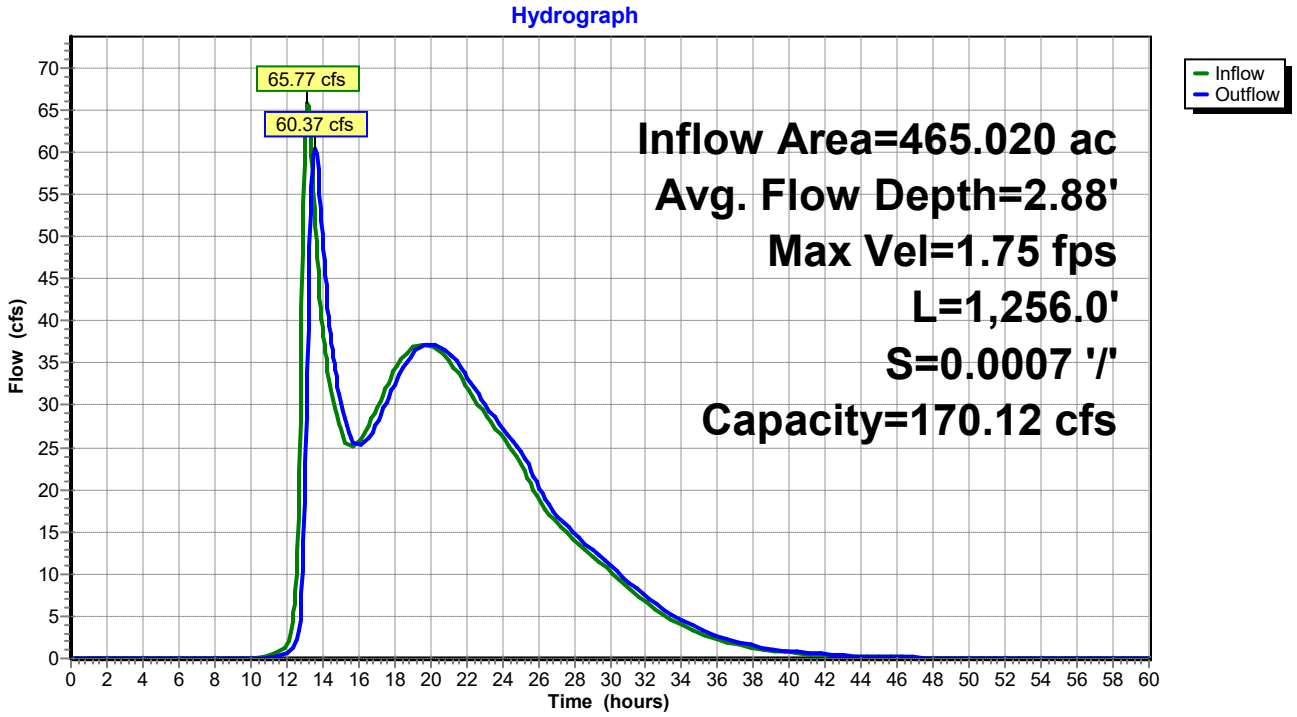
Custom cross-section, Length= 1,256.0' Slope= 0.0007 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 421.00', Outlet Invert= 420.11'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
30.00	425.00	0.00		
31.50	424.75	0.25	0.050	Earth, cobble bottom, clean sides
46.25	422.00	3.00	0.050	Earth, cobble bottom, clean sides
46.35	421.00	4.00	0.040	Earth, grassed & winding
47.35	421.00	4.00	0.035	Earth, grassed & winding
48.00	420.50	4.50	0.030	Earth, grassed & winding
50.00	420.50	4.50	0.030	Earth, grassed & winding
52.00	420.50	4.50	0.030	Earth, grassed & winding
53.00	421.00	4.00	0.035	Earth, dense weeds
54.00	421.00	4.00	0.035	Earth, grassed & winding
56.00	422.00	3.00	0.040	
71.35	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.0	0	0.00
0.50	2.4	7.9	3,042	1.78
1.50	11.1	11.2	13,957	15.68
4.25	77.6	40.5	97,407	148.42
4.50	87.5	43.3	109,955	170.12

Reach R-4: Reach 4: Sections 11.0-16.5



Summary for Pond 1P: 36" RCP Storm Drain

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth = 1.14" for 100-yr event
Inflow = 60.37 cfs @ 13.58 hrs, Volume= 44.111 af
Outflow = 34.69 cfs @ 21.63 hrs, Volume= 44.109 af, Atten= 43%, Lag= 482.7 min
Primary = 34.69 cfs @ 21.63 hrs, Volume= 44.109 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 422.82' @ 21.63 hrs Surf.Area= 150,053 sf Storage= 245,280 cf
Flood Elev= 425.00' Surf.Area= 219,464 sf Storage= 650,922 cf

Plug-Flow detention time= 117.7 min calculated for 44.109 af (100% of inflow)
Center-of-Mass det. time= 117.6 min (1,393.8 - 1,276.2)

Volume	Invert	Avail.Storage	Storage Description
#1	420.11'	888,946 cf	**Canal (Prismatic)** Listed below (Recalc)

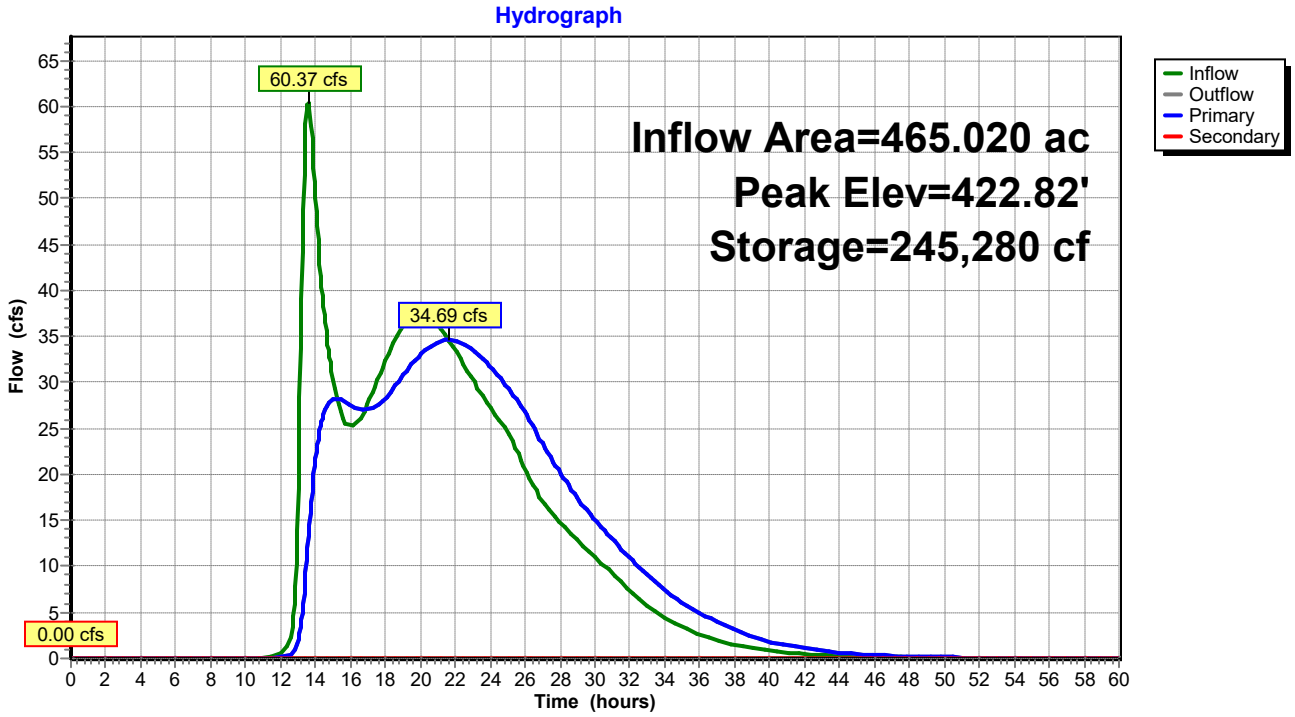
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.11	100	0	0
421.00	84,779	37,771	37,771
422.00	113,500	99,140	136,911
423.00	157,948	135,724	272,635
424.00	189,581	173,765	446,399
425.00	219,464	204,523	650,922
426.00	256,585	238,025	888,946

Device	Routing	Invert	Outlet Devices
#1	Primary	420.11'	**36.0" Round RCP_Round 36"** L= 155.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 420.11' / 419.37' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	425.40'	**260.0' long x 20.0' breadth Canal Overflow to Highway ROW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=34.69 cfs @ 21.63 hrs HW=422.82' (Free Discharge)
↑—**1=RCP_Round 36"** (Barrel Controls 34.69 cfs @ 6.80 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.11' (Free Discharge)
↑—**2=Canal Overflow to Highway ROW** (Controls 0.00 cfs)

Pond 1P: 36" RCP Storm Drain



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1a: Existing Runoff Area=26.630 ac 31.07% Impervious Runoff Depth=2.83"
Flow Length=1,872' Slope=0.0370 '/' Tc=39.4 min CN=67 Runoff=53.12 cfs 6.276 af

Subcatchment DA-1b: Existing Runoff Area=336.510 ac 10.94% Impervious Runoff Depth=1.75"
Flow Length=8,612' Slope=0.0050 '/' Tc=494.2 min CN=55 Runoff=55.21 cfs 48.988 af

Subcatchment DA-2: Existing Runoff Area=27.280 ac 51.72% Impervious Runoff Depth=3.72"
Flow Length=2,428' Slope=0.0226 '/' Tc=48.5 min CN=76 Runoff=63.30 cfs 8.454 af

Subcatchment DA-3: Existing Runoff Area=60.080 ac 24.93% Impervious Runoff Depth=1.83"
Flow Length=3,650' Slope=0.0160 '/' Tc=135.6 min CN=56 Runoff=28.19 cfs 9.171 af

Subcatchment DA-4: Existing Runoff Area=14.520 ac 0.00% Impervious Runoff Depth=0.82"
Flow Length=830' Slope=0.0470 '/' Tc=33.7 min CN=43 Runoff=5.75 cfs 0.995 af

Reach R-1: Reach 1: Sections 0.0-3.0 Avg. Flow Depth=1.67' Max Vel=1.69 fps Inflow=57.41 cfs 55.263 af
L=850.0' S=0.0012 '/' Capacity=1,965.69 cfs Outflow=57.38 cfs 55.263 af

Reach R-2: Reach 2: Sections 3.0-4.5 Avg. Flow Depth=3.18' Max Vel=2.54 fps Inflow=109.79 cfs 63.718 af
L=420.0' S=0.0010 '/' Capacity=358.88 cfs Outflow=108.99 cfs 63.718 af

Reach R-3: Reach 3: Sections Avg. Flow Depth=1.70' Max Vel=1.99 fps Inflow=116.98 cfs 72.889 af
L=1,615.0' S=0.0013 '/' Capacity=1,686.70 cfs Outflow=106.13 cfs 72.889 af

Reach R-4: Reach 4: Sections Avg. Flow Depth=3.58' Max Vel=1.83 fps Inflow=108.51 cfs 73.884 af
L=1,256.0' S=0.0007 '/' Capacity=170.12 cfs Outflow=99.11 cfs 73.883 af

Pond 1P: 36" RCP Storm Drain Peak Elev=424.40' Storage=525,242 cf Inflow=99.11 cfs 73.883 af
Primary=55.05 cfs 73.880 af Secondary=0.00 cfs 0.000 af Outflow=55.05 cfs 73.880 af

Total Runoff Area = 465.020 ac Runoff Volume = 73.884 af Average Runoff Depth = 1.91"
84.05% Pervious = 390.852 ac 15.95% Impervious = 74.168 ac

Summary for Subcatchment DA-1a: Existing Subcatchment Area 1A

Area sized to give full flow through pipe during 10 yr storm.

Flow source assumed to be residential drainage from neighborhoods to the west.

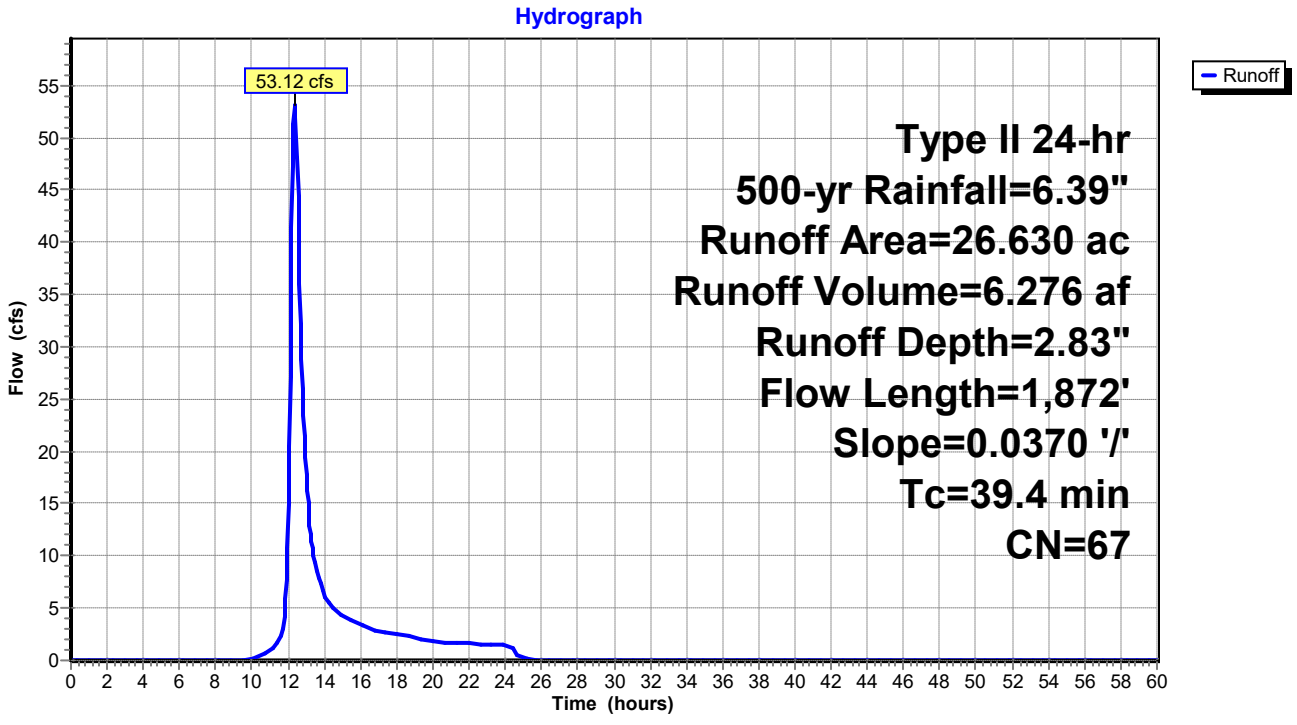
Runoff = 53.12 cfs @ 12.37 hrs, Volume= 6.276 af, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 500-yr Rainfall=6.39"

	Area (ac)	CN	Description
*	14.320	50	>75% Grass cover, Good, HSG A/B
	11.490	88	Urban industrial, 72% imp, HSG B
*	0.820	73	Brush, Good, HSG D - Canal
	26.630	67	Weighted Average
	18.357		68.93% Pervious Area
	8.273		31.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.4	1,872	0.0370	0.79		**Lag/CN Method,**

Subcatchment DA-1a: Existing Subcatchment Area 1A



Summary for Subcatchment DA-1b: Existing Subcatchment Area 1B

See map A for total area of 188,420 sf.

Estimated 10% roof surface, 70% gravel surfaces, 20% near water as grass and forest.

Slope of flow: 438 to 435 surface elevation over 300 feet for gravel; 435 to 421 over 50 feet

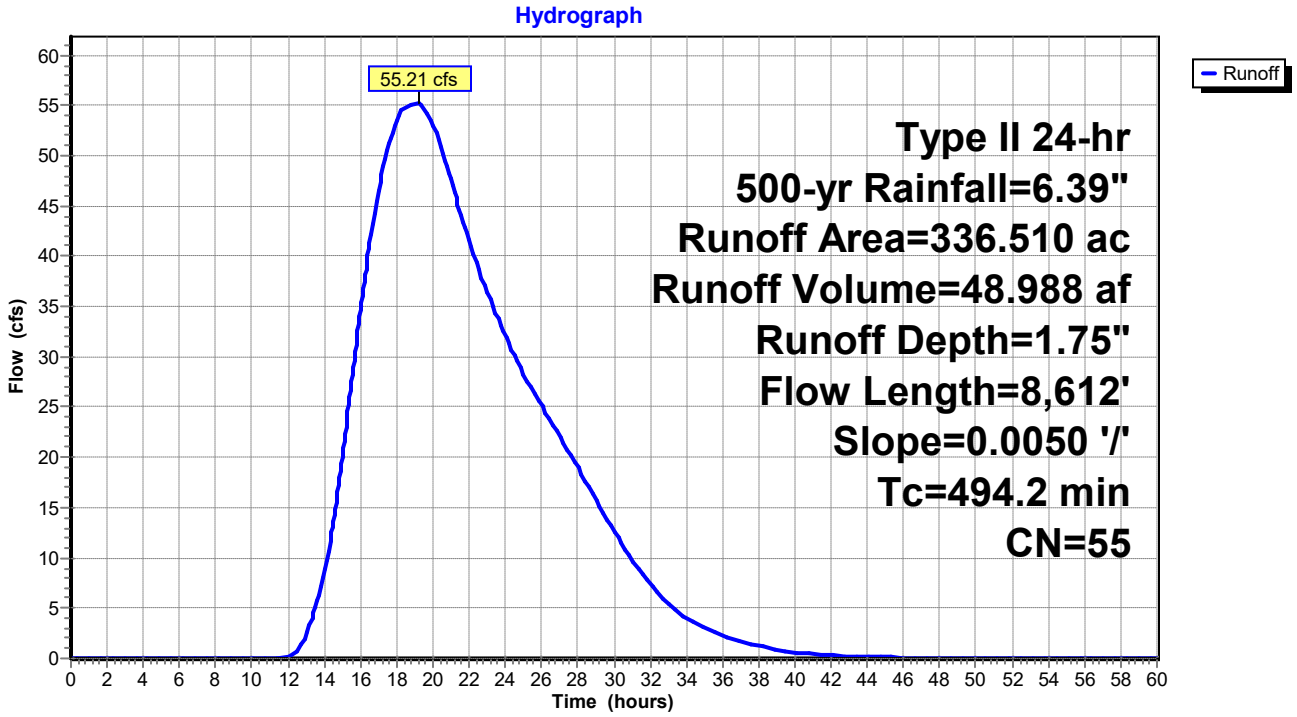
Runoff = 55.21 cfs @ 19.18 hrs, Volume= 48.988 af, Depth= 1.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 500-yr Rainfall=6.39"

	Area (ac)	CN	Description
*	43.640	62	1/2 acre lots, 25% imp, HSG A/B
	18.600	88	Urban industrial, 72% imp, HSG B
*	91.150	55	Woods, Good, HSG A/B
*	78.050	40	Brush, Good, HSG A/B
*	104.220	56	2 acre lots, 12% imp, HSG B/A
*	0.850	73	Brush, Good, HSG D - Canal
	336.510	55	Weighted Average
	299.702		89.06% Pervious Area
	36.808		10.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
494.2	8,612	0.0050	0.29		**Lag/CN Method, Incude Est Attenuation**

Subcatchment DA-1b: Existing Subcatchment Area 1B



Summary for Subcatchment DA-2: Existing Subcatchment Area 2

Cover type: industrial type A soils based on Maps C, D and F.

Channel Tc:

Slope as 445 inlet to 420 outlet over 460 feet.

Perimiter as length (460)x2 + width (50)x2.

X-sec area estimated as rectangular with 5' depth and 25' wide.

Other Tc area: 16' elev over 430 feet. Unpaved based on aerial photography.

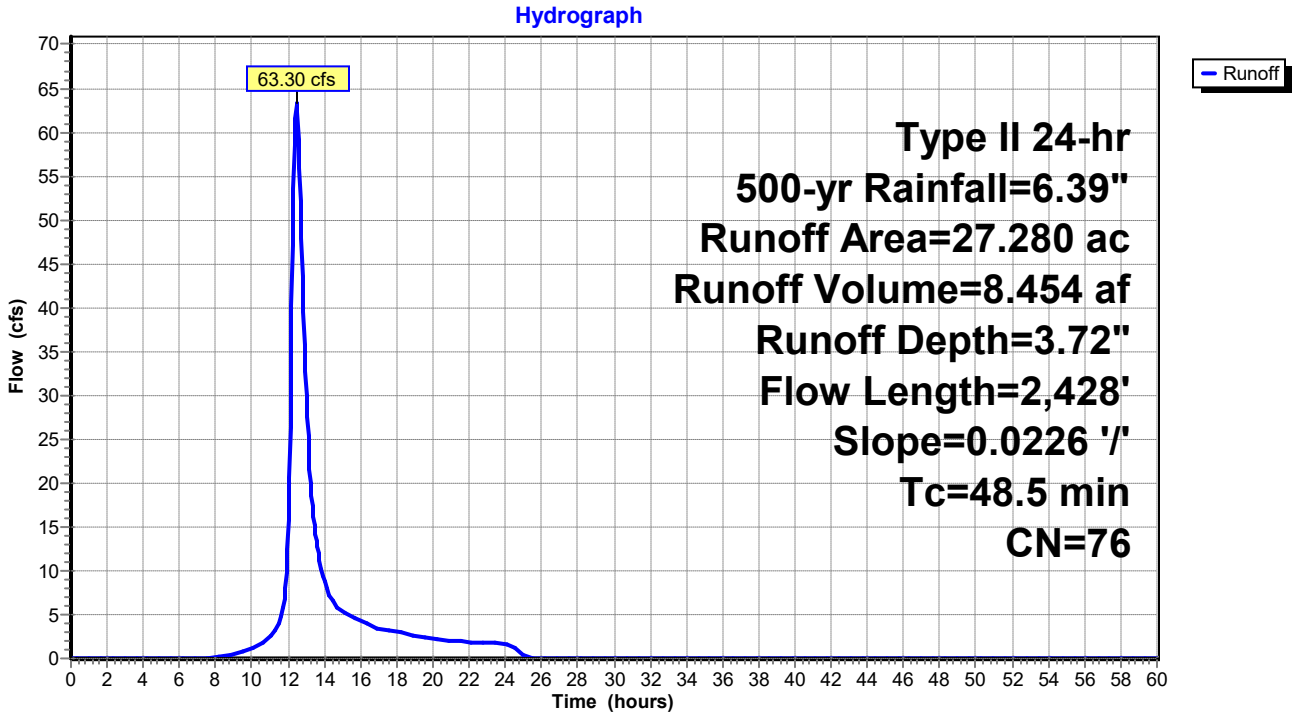
Runoff = 63.30 cfs @ 12.47 hrs, Volume= 8.454 af, Depth= 3.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 500-yr Rainfall=6.39"

	Area (ac)	CN	Description
*	16.600	92	Urban Ind/Com, 85% imp, HSG B
*	9.880	48	Brush, Good, HSG A/B
*	0.800	73	Brush, Good, HSG D - Canal
	27.280	76	Weighted Average
	13.170		48.28% Pervious Area
	14.110		51.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
48.5	2,428	0.0226	0.83		**Lag/CN Method,**

Subcatchment DA-2: Existing Subcatchment Area 2



Summary for Subcatchment DA-3: Existing Subcatchment Area 3

Cover type: 20% industrial class A, 30% wood class B, 30% range class B, 20% grass class B for large area south of Bleecker. 55% grass 45% wood class B for area west of channel and north of Bleecker.

Channel Tc:

Slope as 452 inlet to 419 outlet over 565 feet.

Perimiter as length 565'x2 + width (12')x2.

X-sec area estimated as rectangular with 5' depth and 12' wide.

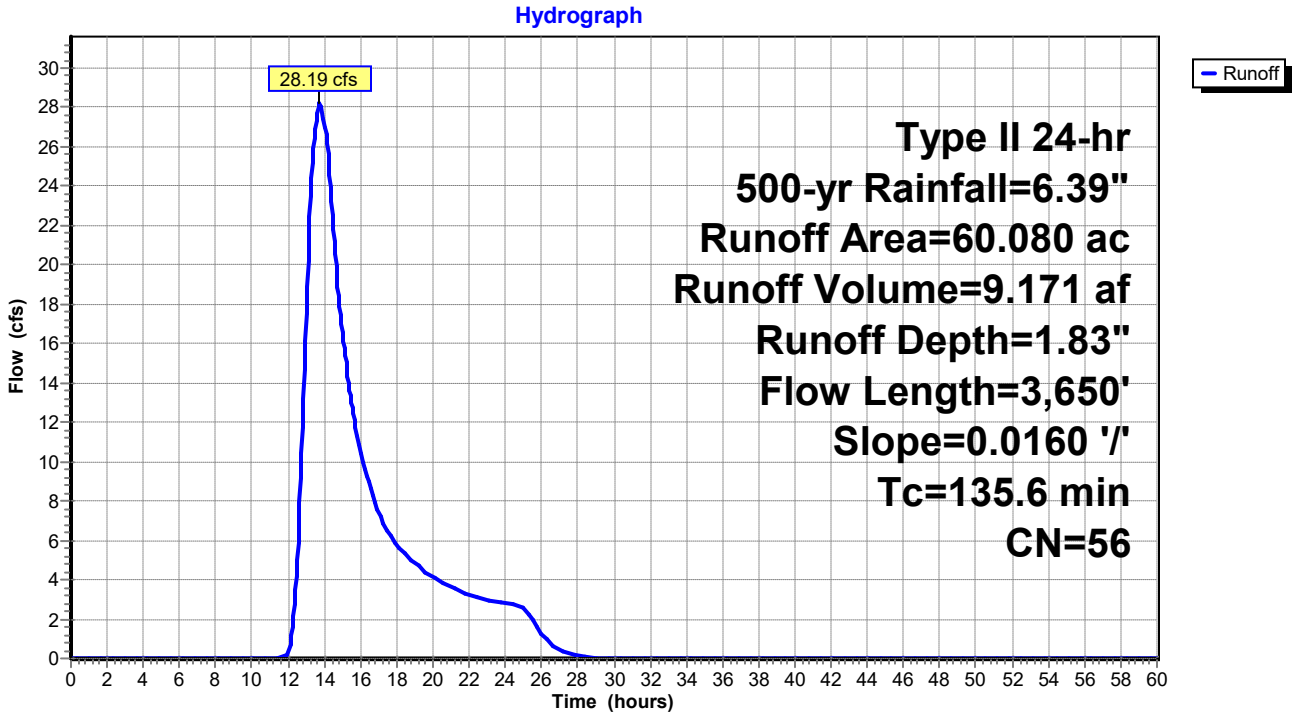
Runoff = 28.19 cfs @ 13.72 hrs, Volume= 9.171 af, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 500-yr Rainfall=6.39"

	Area (ac)	CN	Description
	17.620	92	Urban commercial, 85% imp, HSG B
*	6.830	43	Woods, Good, HSG A/B
*	34.150	39	Brush, Good, HSG A/B
*	1.480	73	Brush, Good, HSG D - Canal
	60.080	56	Weighted Average
	45.103		75.07% Pervious Area
	14.977		24.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
135.6	3,650	0.0160	0.45		**Lag/CN Method,**

Subcatchment DA-3: Existing Subcatchment Area 3



Summary for Subcatchment DA-4: Existing Subcatchment Area 4

See Map A for area of subcatchment and farthest run for Tc. Slope calculated as 725 foot run from 460 to 418 elevation.

CN for area average of A and B soil groups for grass/woodland.

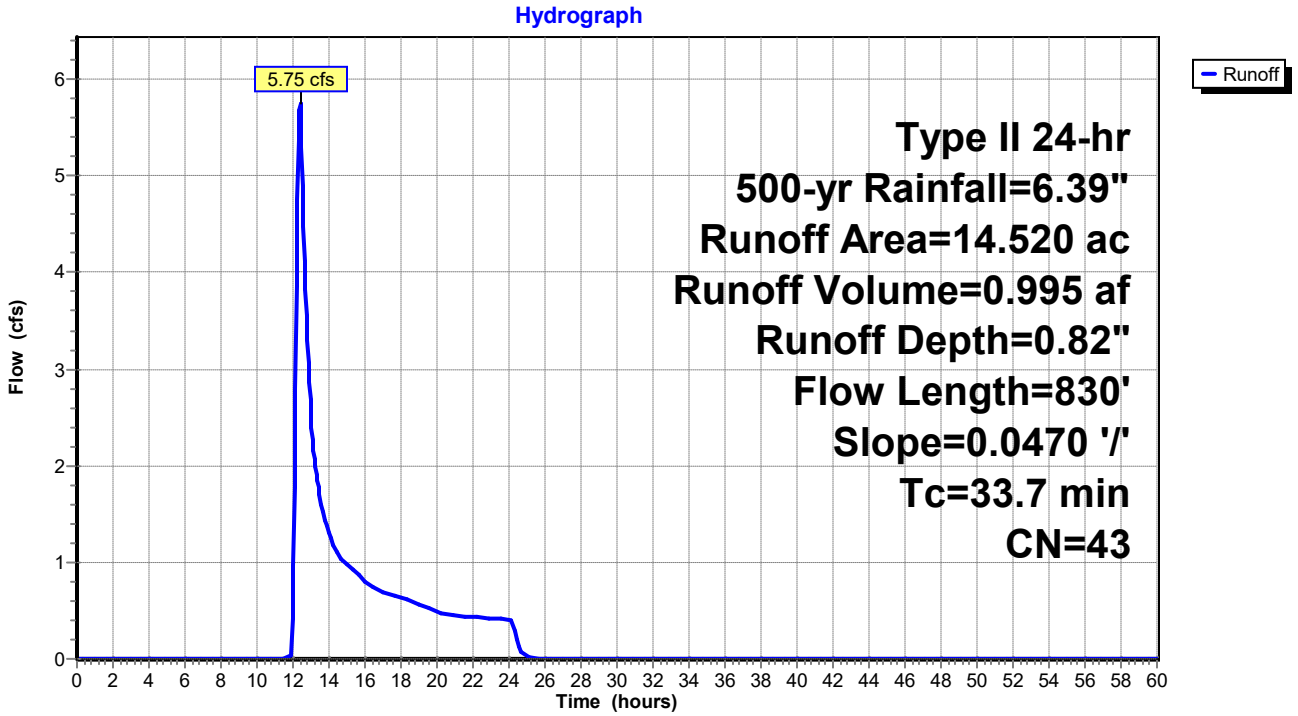
Runoff = 5.75 cfs @ 12.39 hrs, Volume= 0.995 af, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr 500-yr Rainfall=6.39"

	Area (ac)	CN	Description
*	12.880	39	Brush, Good, HSG A/B
*	1.640	73	Brush, Good, HSG D - Canal
	14.520	43	Weighted Average
	14.520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.7	830	0.0470	0.41		**Lag/CN Method,**

Subcatchment DA-4: Existing Subcatchment Area 4



Summary for Reach R-1: Reach 1: Sections 0.0-3.0

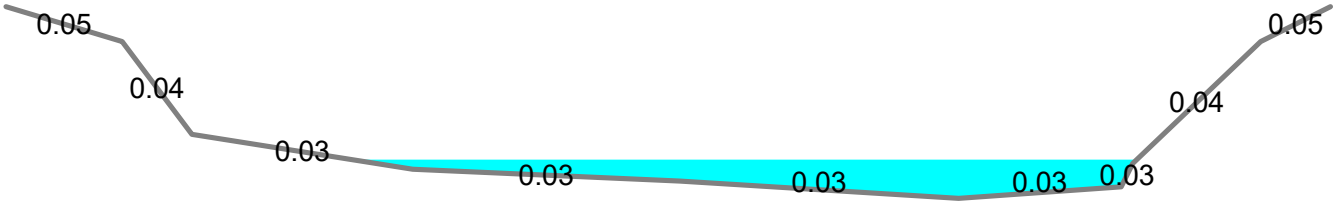
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 363.140 ac, 12.41% Impervious, Inflow Depth = 1.83" for 500-yr event
Inflow = 57.41 cfs @ 18.71 hrs, Volume= 55.263 af
Outflow = 57.38 cfs @ 19.03 hrs, Volume= 55.263 af, Atten= 0%, Lag= 18.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.69 fps, Min. Travel Time= 8.4 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 17.8 min

Peak Storage= 28,907 cf @ 18.89 hrs
Average Depth at Peak Storage= 1.67'
Bank-Full Depth= 8.25' Flow Area= 336.1 sf, Capacity= 1,965.69 cfs

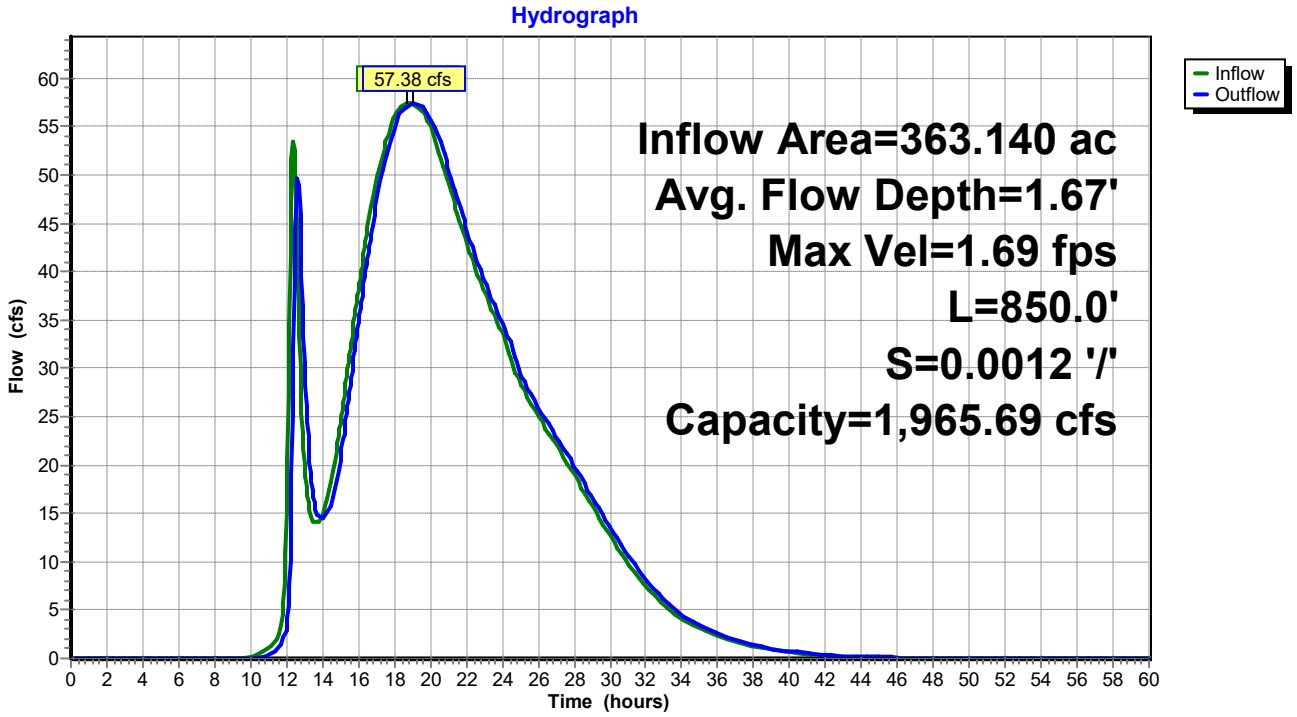
Custom cross-section, Length= 850.0' Slope= 0.0012 '/' (105 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 424.00', Outlet Invert= 423.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
21.00	425.00	0.00		
26.00	423.50	1.50	0.050	Earth, cobble bottom, clean sides
29.00	419.50	5.50	0.040	Earth, dense weeds
38.50	418.00	7.00	0.030	Earth, grassed & winding
50.00	417.50	7.50	0.030	Earth, grassed & winding
62.00	416.75	8.25	0.030	Earth, grassed & winding
69.00	417.25	7.75	0.030	Earth, grassed & winding
69.50	418.25	6.75	0.030	
75.00	423.50	1.50	0.040	
78.00	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.50	3.8	15.0	3,190	2.54
0.75	8.0	19.3	6,813	7.58
1.25	20.5	31.4	17,438	26.25
1.50	28.4	33.3	24,181	43.54
2.75	74.9	43.1	63,702	186.64
6.75	256.6	53.9	218,078	1,319.79
8.25	336.1	62.5	285,653	1,965.69

Reach R-1: Reach 1: Sections 0.0-3.0



Summary for Reach R-2: Reach 2: Sections 3.0-4.5

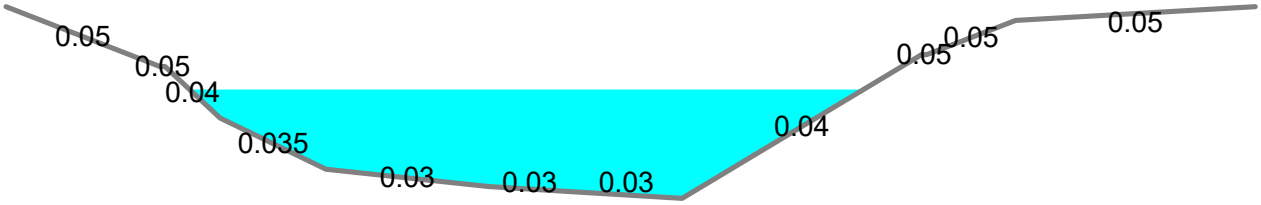
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 390.420 ac, 15.16% Impervious, Inflow Depth = 1.96" for 500-yr event
Inflow = 109.79 cfs @ 12.56 hrs, Volume= 63.718 af
Outflow = 108.99 cfs @ 12.64 hrs, Volume= 63.718 af, Atten= 1%, Lag= 4.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.54 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 0.92 fps, Avg. Travel Time= 7.6 min

Peak Storage= 18,042 cf @ 12.60 hrs
Average Depth at Peak Storage= 3.18'
Bank-Full Depth= 5.60' Flow Area= 103.5 sf, Capacity= 358.88 cfs

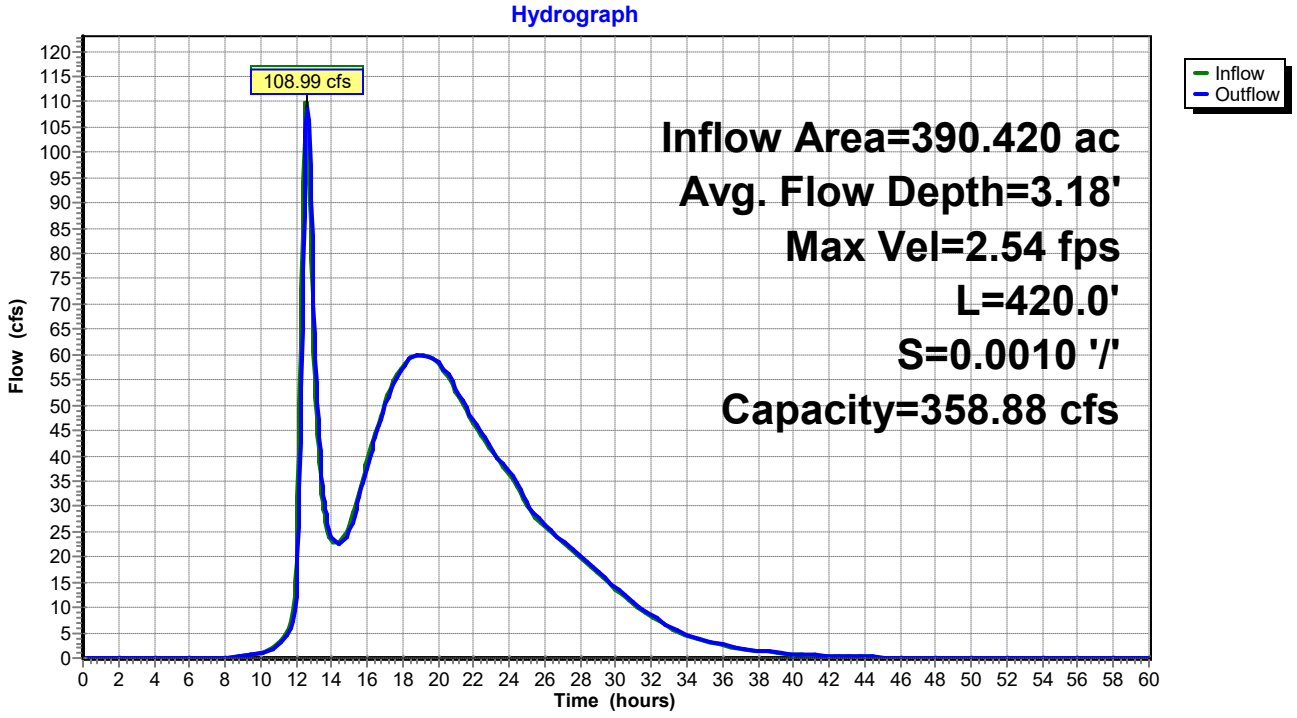
Custom cross-section, Length= 420.0' Slope= 0.0010 '/' (105 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.40', Outlet Invert= 423.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
33.50	425.00	0.00		
38.00	423.25	1.75	0.050	Earth, cobble bottom, clean sides
38.15	423.25	1.75	0.050	Earth, cobble bottom, clean sides
39.75	421.75	3.25	0.040	
42.85	420.25	4.75	0.035	
47.60	419.75	5.25	0.030	Earth, grassed & winding
50.00	419.60	5.40	0.030	Earth, grassed & winding
53.25	419.40	5.60	0.030	Earth, grassed & winding
60.25	423.60	1.40	0.040	
60.40	423.60	1.40	0.050	Earth, cobble bottom, clean sides
63.00	424.60	0.40	0.050	
70.00	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.20	0.4	3.6	151	0.11
0.35	1.1	6.3	460	0.51
0.85	5.6	12.1	2,355	5.04
2.35	27.5	18.4	11,564	57.22
3.85	56.7	23.7	23,827	162.15
4.20	64.6	25.5	27,122	194.15
5.20	90.5	31.0	37,994	306.46
5.60	103.5	39.2	43,451	358.88

Reach R-2: Reach 2: Sections 3.0-4.5



Summary for Reach R-3: Reach 3: Sections 4.5-11.0

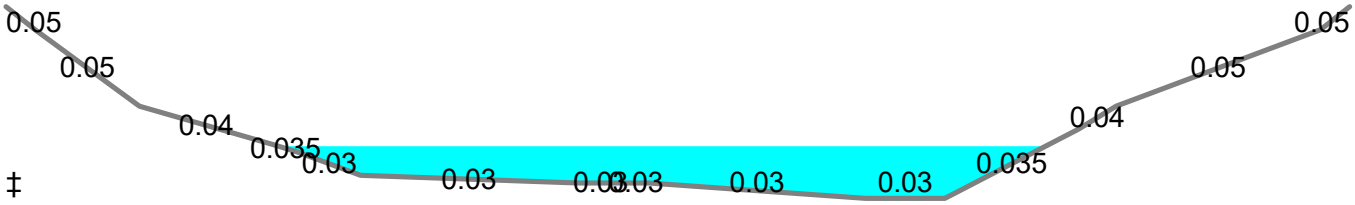
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 450.500 ac, 16.46% Impervious, Inflow Depth = 1.94" for 500-yr event
Inflow = 116.98 cfs @ 12.66 hrs, Volume= 72.889 af
Outflow = 106.13 cfs @ 13.06 hrs, Volume= 72.889 af, Atten= 9%, Lag= 23.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.99 fps, Min. Travel Time= 13.5 min
Avg. Velocity = 0.78 fps, Avg. Travel Time= 34.4 min

Peak Storage= 86,322 cf @ 12.83 hrs
Average Depth at Peak Storage= 1.70'
Bank-Full Depth= 6.25' Flow Area= 349.9 sf, Capacity= 1,686.70 cfs

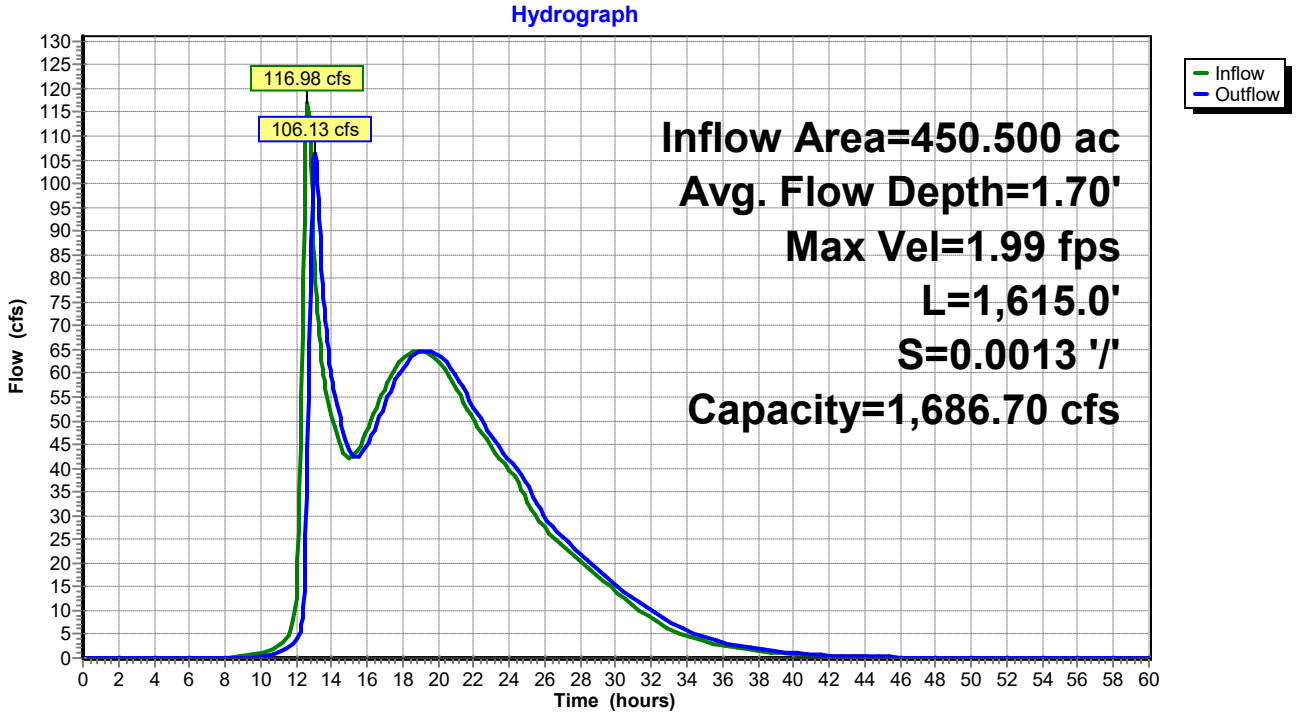
Custom cross-section, Length= 1,615.0' Slope= 0.0013 '/'
Flow calculated by Manning's Subdivision method
Inlet Invert= 423.10', Outlet Invert= 421.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
13.00	425.00	0.00		
14.75	424.25	0.75	0.050	Earth, cobble bottom, clean sides
21.00	421.75	3.25	0.050	Earth, cobble bottom, clean sides
29.00	420.50	4.50	0.040	Earth, grassed & winding
30.50	420.25	4.75	0.035	Earth, dense weeds
34.25	419.50	5.50	0.030	Earth, grassed & winding
47.25	419.25	5.75	0.030	Earth, grassed & winding
50.00	419.25	5.75	0.030	Earth, grassed & winding
51.50	419.25	5.75	0.030	Earth, grassed & winding
64.50	418.75	6.25	0.030	Earth, grassed & winding
69.25	418.75	6.25	0.030	Earth, grassed & winding
77.25	421.00	4.00	0.035	
79.50	421.75	3.25	0.040	
91.75	424.25	0.75	0.050	Earth, cobble bottom, clean sides
93.50	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.8	0	0.00
0.50	6.1	23.9	9,802	4.31
0.75	13.8	37.8	22,206	12.39
1.50	44.4	44.4	71,716	79.03
1.75	55.7	46.8	89,997	113.53
2.25	80.2	51.9	129,533	198.84
3.00	121.4	59.1	196,122	370.72
5.50	290.8	78.4	469,662	1,302.31
6.25	349.9	82.2	565,048	1,686.70

Reach R-3: Reach 3: Sections 4.5-11.0



Summary for Reach R-4: Reach 4: Sections 11.0-16.5

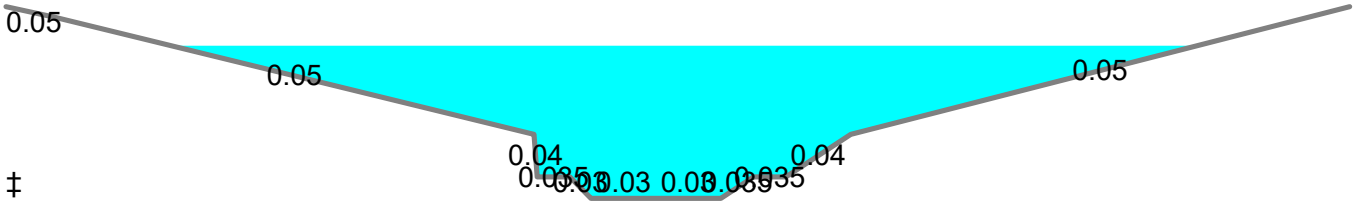
Section and profiles taken as typical values from transects in files "Remedy Sections".

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth = 1.91" for 500-yr event
Inflow = 108.51 cfs @ 13.05 hrs, Volume= 73.884 af
Outflow = 99.11 cfs @ 13.43 hrs, Volume= 73.883 af, Atten= 9%, Lag= 22.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.83 fps, Min. Travel Time= 11.4 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 23.1 min

Peak Storage= 67,980 cf @ 13.24 hrs
Average Depth at Peak Storage= 3.58'
Bank-Full Depth= 4.50' Flow Area= 87.5 sf, Capacity= 170.12 cfs

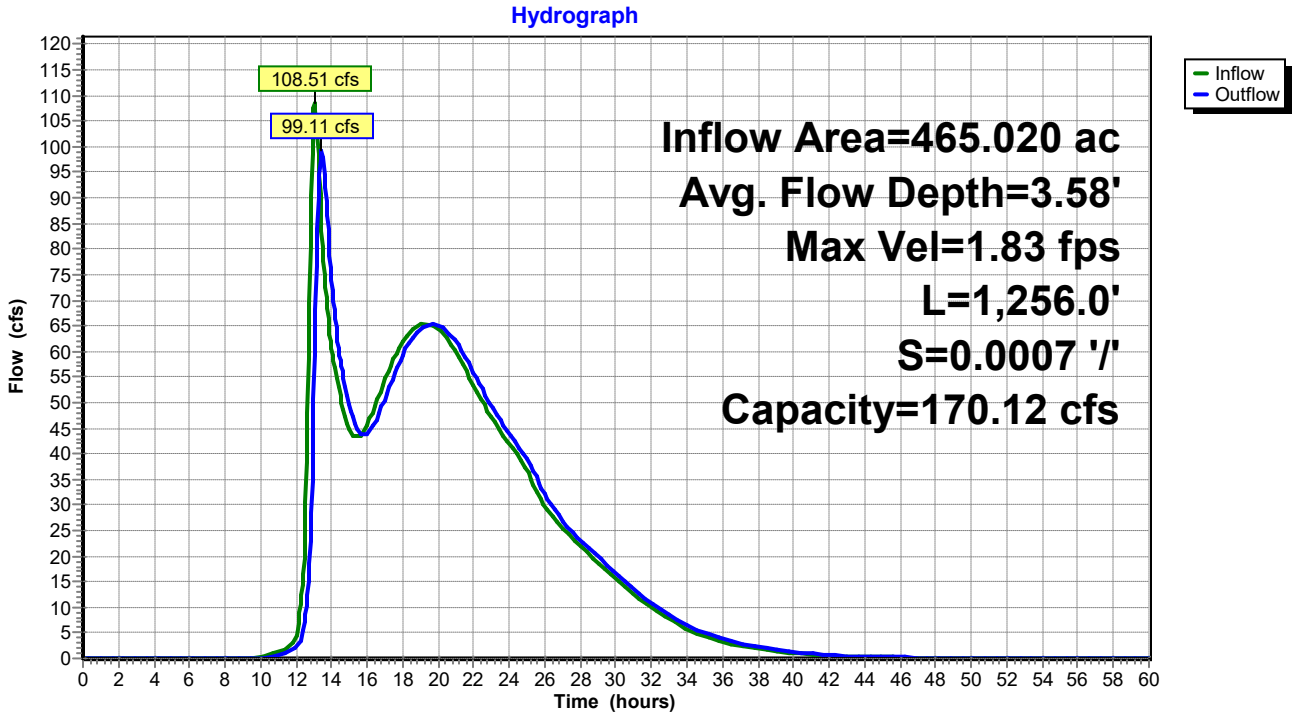
Custom cross-section, Length= 1,256.0' Slope= 0.0007 '/' (102 Elevation Intervals)
Flow calculated by Manning's Subdivision method
Inlet Invert= 421.00', Outlet Invert= 420.11'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)	n	Description
30.00	425.00	0.00		
31.50	424.75	0.25	0.050	Earth, cobble bottom, clean sides
46.25	422.00	3.00	0.050	Earth, cobble bottom, clean sides
46.35	421.00	4.00	0.040	Earth, grassed & winding
47.35	421.00	4.00	0.035	Earth, grassed & winding
48.00	420.50	4.50	0.030	Earth, grassed & winding
50.00	420.50	4.50	0.030	Earth, grassed & winding
52.00	420.50	4.50	0.030	Earth, grassed & winding
53.00	421.00	4.00	0.035	Earth, dense weeds
54.00	421.00	4.00	0.035	Earth, grassed & winding
56.00	422.00	3.00	0.040	
71.35	425.00	0.00	0.050	Earth, cobble bottom, clean sides

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.0	0	0.00
0.50	2.4	7.9	3,042	1.78
1.50	11.1	11.2	13,957	15.68
4.25	77.6	40.5	97,407	148.42
4.50	87.5	43.3	109,955	170.12

Reach R-4: Reach 4: Sections 11.0-16.5



Summary for Pond 1P: 36" RCP Storm Drain

Inflow Area = 465.020 ac, 15.95% Impervious, Inflow Depth = 1.91" for 500-yr event
Inflow = 99.11 cfs @ 13.43 hrs, Volume= 73.883 af
Outflow = 55.05 cfs @ 22.10 hrs, Volume= 73.880 af, Atten= 44%, Lag= 520.0 min
Primary = 55.05 cfs @ 22.10 hrs, Volume= 73.880 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 424.40' @ 22.10 hrs Surf.Area= 201,626 sf Storage= 525,242 cf
Flood Elev= 425.00' Surf.Area= 219,464 sf Storage= 650,922 cf

Plug-Flow detention time= 135.6 min calculated for 73.819 af (100% of inflow)
Center-of-Mass det. time= 135.6 min (1,391.8 - 1,256.2)

Volume	Invert	Avail.Storage	Storage Description
#1	420.11'	888,946 cf	**Canal (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.11	100	0	0
421.00	84,779	37,771	37,771
422.00	113,500	99,140	136,911
423.00	157,948	135,724	272,635
424.00	189,581	173,765	446,399
425.00	219,464	204,523	650,922
426.00	256,585	238,025	888,946

Device	Routing	Invert	Outlet Devices
#1	Primary	420.11'	**36.0" Round RCP_Round 36"** L= 155.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 420.11' / 419.37' S= 0.0048 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Secondary	425.40'	**260.0' long x 20.0' breadth Canal Overflow to Highway ROW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=55.05 cfs @ 22.10 hrs HW=424.40' (Free Discharge)
↑—**1=RCP_Round 36"** (Barrel Controls 55.05 cfs @ 7.79 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.11' (Free Discharge)
↑—**2=Canal Overflow to Highway ROW** (Controls 0.00 cfs)

Pond 1P: 36" RCP Storm Drain